

Awareness and Use of Information Communication Technologies by Farmers in Oyo State, Nigeria

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Due to inadequate personnel, information communication technologies (ICTs) have become an attractive option for delivery of extension information. This study examined awareness and use of ICTs by farmers in Oyo State, Nigeria. A total of 192 farmers were interviewed. Results indicate that most farmers had no formal education and small farm holdings. Awareness of older ICTs like radio and television was more prevalent among farmers as compared with newer ICTs such as Internet and cable television. However, use of modern ICTs like mobile phones and cable television was greater than that for older technologies such as fax machines. Farmers were constrained in ICT use by prohibitive cost and service failure. The Nigerian government should encourage a liberal policy for affordable prices for modern ICT products, especially mobile telephones.

KEYTERMS *agricultural extension, farmers, information communication technologies (ICTs), Nigeria*

INTRODUCTION

According to Abumere and Soyibo (2001), the need for information in any meaningful development effort, especially in building a nation's wealth, cannot be overemphasized. The role of information has gained greater recognition in recent years due to its increasing importance for development

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efforts. Myer (2005) states that information is a necessary resource with which problems are solved. While information is not necessarily the only resource needed for development, its centrality in influencing the utilization of other production resources makes it key to achieving development goals.

The use of Information Communication Technologies (ICTs) in agricultural extension and rural development in recent times is significant, given their widespread use in almost all areas of rural life—namely agriculture, health, and general social development. According to the Technical Centre for Agricultural and Rural Cooperation (CTA, 2003), ICT has provided a medium for rural dwellers in several African countries to adequately access agricultural information, despite the persistent problems of access, connectivity, literacy, content, and costs. With particular reference to Nigeria, Adebayo and Adesope (2007) viewed ICT as a very important feature in the Nigerian agricultural sector in contemporary times, though it is still a new concept, and an increasing number of professionals are appreciating its use for academic and development work. This is more so the case with the abundance of information in Internet- (e.g., HINARI, AGORA, and OARE) and non-Internet-based resources (e.g., The Essential Electronic Agricultural Library), for development and research work in the fields of health, agriculture, and the environment (Hinari/Agora/Oare, n.d.; TEEAL: The Essential Electronic Agricultural Library, 2010). Nevertheless, Omotayo (2005) observed that Nigeria's relative slowness in recognizing the importance of information, as well as in its awareness and use of ICT, had caused it to lag behind, as most institutions charged with providing agricultural extension services still persist in overreliance on the use of extension agents, with the agent-to-farm-family ratio estimated at 1:3000 (Bolarinwa & Oyeyinka, 2011).

Comparatively though, extension agents may be the most effective information source for farmers but certainly not the most efficient, as evidenced by the huge cost, extent of coverage, and time (Van den Ban & Hawkins, 1998). It is therefore clear that, no matter how effective extension delivery through the village extension service is, it can neither be efficient nor cost-effective for a developing country like Nigeria, with a whopping population of about 150 million, the majority of whom are engaged in one form of agricultural enterprise or another. On the other hand, Omotayo (2005) observed that agricultural extension depends largely on information exchange between and among farmers and a broad range of other actors. Therefore, frontline extension workers, who are the direct link between farmers and other actors in the Agricultural Knowledge and Information System (AKIS), should be well-positioned to make use of ICT to access expert knowledge or other types of information that could facilitate the accomplishment of their routine activities.

Many arguments have been put forward in favor of deployment of ICT both for agricultural information dissemination and subsequent use by farmers, especially in Nigeria. With the government's liberalization and

privatization policies to encourage private-sector participation and attract foreign investments, a drastic reduction in the prices of computer and other ICT equipment has occurred in recent years, thus making them more accessible, particularly given the proliferation of cybercafes in all major towns and even in semi-urban locations. The launch of Global System for Mobile (GSM) communications has made phone (an important ICT) equally accessible nationwide. Salau and Saingbe (2008) submit that the time is apt for the adoption of ICT by both researchers and extension workers to transmit relevant information to farmers in a more efficient way.

Nevertheless, constraints such as access, connectivity, and content often accompany this ICT revolution, leaving development workers to grapple with the twin challenge of the literacy level of farmers and the prohibitive costs of ICT resources, especially in developing countries. The awareness and use of these technologies among farmers, who grapple with challenges inherent in inadequate extension personnel for extension service delivery and their own self-efficacy (education), must be better understood, with a view to determining how farmers can best be reached and served by the ICT revolution. Therefore, this study investigated the awareness and use of old and new ICTs among farmers in Oyo State, Nigeria. Specifically the study:

1. identified the personal characteristics of farmers in the study area;
2. determined the awareness, use, and frequency of use of old and new ICTs among farmers in the study area;
3. examined constraints associated with the deployment of ICT for accessing agricultural information in the study area.

METHODOLOGY

The study was conducted in Oyo State, located in the Southwest region of Nigeria. Latitude 8 degrees North and longitude 4 degrees East bisect the state into four nearly equal parts. Oyo State covers a total of 27,249 square kilometers of landmass; the vegetation pattern is that of rain forest in the south and guinea savannah to the north, while thick forest in the south gives way to grassland interspersed with trees in the north.

There is a preponderance of farmers' groups in the study area and these groups constituted the study population. A multi-stage sampling technique was used to select respondents for the study. In the first stage, extension cells across all extension blocks were populated, and this resulted in 91 extension cells across the state's four Agricultural Development Program (ADP) zones. In the second stage, 15% of the extension cells were systematically selected, resulting in the selection of 16 cells. In the third stage, 10% of the farmers registered with the ADP were randomly selected, yielding 192 farmers who were interviewed for the study. However, only 158 interview schedules were

completely filled and used for data analysis. This represents over an 80% return rate. Variables measured included awareness, use, and frequency of use of ICT. These were measured as "Yes" or "No" for awareness and use and as "daily," "weekly," "fortnightly," or "monthly" for frequency of use. A score of 1 or 0 was assigned to awareness and non-awareness, as well as to use and non-use, respectively. For frequency of use, a score of 4, 3, 2 or 1 was assigned to daily, weekly, fortnightly, and monthly, respectively.

RESULTS AND DISCUSSION

Personal Characteristics

The data in Table 1 indicates that 39.2% of respondents were within the age bracket of 41–50 years, and another 33.6% were within 51–60 years of age. The majority of the farmers were married (93.0%) and male (88.6%). More than a third (34.8%) had no formal education. A household size of 6–10 persons was the modal category. Most respondents (78.5%) were small-scale farm holders, cultivating 5 hectares of land or less, with an average annual income of 100,000 or less worth of local currency—approximately \$700 per year—for more than one-third of the farmers and about half earning between \$700 and \$3,300 per year. Bolarinwa and Oyeyinka (2011) report a similar pattern with regard to farmers' income, educational attainment, household size, and farm holdings in their research based in the same study area. This is the picture of all typical rural locations in most parts of Nigeria. Large-scale, mechanized farming is not obtainable; farm holdings are generally used for subsistence farming, given little incentive from the Nigerian government that has consistently relied on earnings from crude oil to the outright neglect of the agricultural sector. The findings also underscore the relevance of similar research (Bolarinwa & Oyeyinka, 2011; Ndaghu, 2011; Slater & Kwami, 2005) citing farmers' low level of education and high cost as constraints impeding ICT use. There is no gainsaying the fact that the low socioeconomic status of rural and small-holder farmers, as reflected in the socio-demographic characteristics of farmers in this study, prohibits affordability of the cost currently charged by ICT providers in Nigeria.

Respondents' Awareness and Use of ICT

The data in Table 2 present a picture of greater awareness and use of old ICT as compared to new. Whereas awareness of old ICTs like radio (98.8%) and television (94.7%) was widespread among farmers, fewer were aware of new ICTs such as mobile phone (80.9%), Internet (26.6%), digital video disc (30.4%) and cable television (25.9%). The results corroborate the opinion of Arokoyo (2003), who asserts that radio and television have been the major ICTs used in agricultural extension delivery in Nigeria. Nevertheless, the

TABLE 1 Respondents' Selected Personal and Socioeconomic Characteristics

| Personal characteristics | Frequency (%) |
|-------------------------------|---------------|
| 1. Age (years) | |
| Less than 40 | 24 (15.2)* |
| 41-50 | 62 (39.2) |
| 51-60 | 53 (33.6) |
| Above 60 | 19 (12.0) |
| 2. Marital status | |
| Single | 3 (1.9) |
| Married | 147 (93.0) |
| Divorced | 5 (3.2) |
| Widowed | 3 (1.9) |
| 3. Gender | |
| Male | 140 (88.6) |
| Female | 18 (11.4) |
| 4. Educational qualifications | |
| No formal education | 55 (34.8) |
| Primary education | 46 (29.1) |
| Secondary education | 39 (24.7) |
| Tertiary education | 18 (11.4) |
| 5. Household size (persons) | |
| ≤ 5 | 31 (19.6) |
| 6-10 | 90 (57.0) |
| 11-15 | 29 (18.3) |
| > 15 | 8 (5.1) |
| 6. Farm size (hectares) | |
| ≤ 5.0 | 124 (78.5) |
| 5.1-10.0 | 18 (11.4) |
| 10.1-15.0 | 4 (2.5) |
| > 15 | 12 (7.6) |
| 7. Annual income | |
| ≤ 100,000 | 57 (36.1) |
| > 100,000 to < 500,000 | 73 (46.2) |
| 500,000 to < 1 million | 23 (14.5) |
| 1 million to 5 million | 4 (2.6) |
| > 5 million | 1 (0.6) |

*Figures in parentheses are percentages.

proportion of farmers that were aware of these new ICTs (especially mobile phone) is commendable. This can be attributed to the unprecedented popularity of Global System for Mobile (GSM) communication in Nigeria, since its launch in 2001. Most GSM service providers have relentlessly penetrated all the nooks and crannies of the country, including the interior and hard-to-reach places, to make this service available to all classes in Nigerian society. Therefore, farmers can also access and use GSM, as long as they can afford the price tag. The percentage of farmers that were aware of other new ICTs

TABLE 2 Respondents' Awareness and Use of ICTs

| Types of ICT | Awareness | Use |
|-------------------------------|-------------|------------|
| Old ICTs | | |
| 1. Wireless radio | 134 (98.8)* | 140 (88.6) |
| 2. Television | 118 (94.7) | 124 (78.5) |
| 3. Overhead projector | 11 (7.0) | 6 (3.8) |
| 4. Fax machine | 12 (15.2) | 24 (7.6) |
| New ICTs | | |
| 5. Mobile Phone | 94 (80.9) | 6 (23.8) |
| 6. Internet | 42 (26.6) | 16 (10.1) |
| 7. Compact disc ROM (CD-ROM) | 11 (7.0) | 55 (34.8) |
| 8. Cable television | 41 (25.9) | 18 (11.4) |
| 9. Computer | 25 (15.8) | 17 (10.8) |
| 10. Visual compact disc (VCD) | 12 (7.6) | 24 (15.2) |
| 11. Digital video disc (DVD) | 48 (30.4) | 12 (7.6) |

*Figures in parentheses are percentages.

such as DVD, cable television, and the Internet could be the result of a phasing out of old analog recorders like cassette tape, as well as the proliferation of cybercafes in smaller towns and semi-urban locations, coupled with the coming of satellite television companies. In all, it can be safely concluded that, while awareness of the old ICT still predominates among farmers, the new ICTs are gradually gaining a foothold within the farming population in Nigeria.

Table 2 further indicates a similar trend with regard to use. More respondents used old ICTs like radio (88.6%) and television (78.5%) rather than new ICTs such as mobile phone (23.8%), CD-ROM (34.8%), and cable television (11.4%); however, the use of these particular new technologies was greater than the use of old technologies like overhead projectors (3.8%) and fax machines (7.6%). The results of this study align with those of Ndaghu (2011), who found the greatest use for old ICTs like radio and television, commendable use of new technology like mobile phone, and the least use for old technologies such as land phone and CD-ROM among women farmers in north-eastern Nigeria. The plausible explanation for this trend could be that, even when these old ICTs were in vogue, most people, including farmers, never really had access to them. The epileptic power supply and poor phoning facilities, as well as prohibitive prices, were not conducive to popular access and use. With attention being shifted to digitally compliant ICTs, the low usage levels for old technologies like fax machines, as reflected in the results, are understandable.

Frequency of ICT Use Among Respondents

Table 3 presents data on frequency of ICT use among respondents. While old ICTs such as radio (65.8%) and television (62.0%) were reportedly used

TABLE 3 Frequency of ICT Use Among Respondents

| ICT | Daily | Weekly | Fortnightly | Monthly | Occasionally |
|-------------------------------|-------------|-----------|-------------|----------|--------------|
| Old ICTs | | | | | |
| 1. Wireless radio | 104 (65.8)* | 6 (3.8) | — | — | 48 (30.4) |
| 2. Television | 98 (62.0) | 36 (22.8) | — | — | 24 (15.2) |
| 3. Overhead projector | 24 (15.2) | 12 (7.6) | — | — | 122 (77.2) |
| 4. Fax machine | — | — | — | — | 158 (100.0) |
| New ICTs | | | | | |
| 5. Mobile phone | 28 (17.7) | 18 (11.4) | 13 (8.2) | 6 (3.8) | 12 (7.6) |
| 6. Internet | 6 (3.8) | 12 (7.6) | 6 (3.8) | 12 (7.6) | — |
| 7. Compact disc ROM (CD-ROM) | 6 (3.8) | 6 (3.8) | 6 (3.8) | 6 (3.8) | 76 (84.8) |
| 8. Cable television | — | — | — | — | 158 (100.0) |
| 9. Computer | — | 6 (3.8) | — | — | 152 (96.2) |
| 10. Visual compact disc (VCD) | 6 (3.8) | — | — | — | 152 (96.2) |
| 11. Digital video disc (DVD) | 6 (3.8) | — | — | — | 152 (96.2) |

*Figures in parentheses are percentages.

on a daily basis, new ICTs like CD-ROM (84.8%), computers (96.2%), DVDs (96.2%), and cable television (100.0%) were occasionally used by farmers. The use of mobile phone technology reflects an appreciable level of acceptance, as 17.7% of respondents indicated they used mobile phone daily, 11.4% weekly, and 8.2% fortnightly. When these figures are compared with the 100% "occasional" use reported for a fax machine, it is evident that the mobile phoning craze in Nigeria among the populace in general and farmers, in particular, is real. The import of this is only reinforced when one considers the fact that the popularity of mobile phoning is not fading but increasing each day, in spite of criticism of the tariff regime of most mobile companies in Nigeria. This is a positive development, as government agencies concerned with issues of health, environment, disaster management, and even governance had, at one time or another, deployed mobile phones to disseminate clear and concise messages to the populace. Interestingly, mobile phone companies discharge this task as part of their corporate social responsibilities. Agriculture would undoubtedly benefit immensely if farmers were ICT-compliant and empowered.

Constraints to ICT Use

Seven constraints—namely, cost, service failure, lack of maintenance, electricity, fake and substandard ICT accessories, illiteracy, and poor basic infrastructure—were identified as impediments to the use of selected ICTs by farmers (see Table 4). In all, these constraints can be categorized into three main subsets: provider- (cost, service failure, lack of maintenance), government- (electricity, fake and substandard ICT accessories, illiteracy, and poor basic infrastructure) and audience- (illiteracy) based challenges.

TABLE 4 Constraints to the Use of ICTs

| Constraints | Mobile phone | Internet | CD-ROM | Radio | Cable television |
|---|--------------|-----------|-----------|-----------|------------------|
| 1. Cost | 42 (26.6)* | 17 (10.8) | — | 18 (11.4) | 36 (22.8) |
| 2. Service failure | 49 (31.0) | 36 (22.8) | — | — | 5 (3.2) |
| 3. Lack of maintenance ability | 50 (31.6) | 8 (5.1) | — | — | 8 (5.1) |
| 4. Electricity | 4 (2.5) | 12 (7.6) | — | — | 57 (36.1) |
| 5. Fake and sub-standard ICT accessories | 10 (6.3) | 6 (3.8) | — | — | 34 (21.5) |
| 6. Illiteracy | 49 (31.0) | 36 (22.4) | 34 (21.5) | 10 (6.3) | 12 (7.6) |
| 7. Poor basic infrastructure to support ICT use | 49 (31.0) | 18 (11.4) | 36 (22.4) | 6 (3.8) | 36 (22.8) |

*Figures in parentheses are percentages.

With respect to service providers, cost was implicated as a constraint to the use of mobile phones, Internet, and television by 26.6, 10.8, and 22.8% of respondents, respectively. Cost is, undoubtedly, a major constraint in the adoption or rejection of any innovation. If an innovation comes with an unbearable cost, the tendency is for a backlash among beneficiaries of that innovation. In this case, it is evident that mobile phoning and associated technologies like Internet and cable television come with fees considered prohibitive, especially in Nigeria. The prohibitive cost is largely responsible for patronage of commercial phone centers offering special reduced tariffs by farmers who need to contact extension agents for advisory services (Bolarinwa & Oyeyinka, 2011).

Also related to the issue of cost is the service failure of a majority of service providers. About one third of the farmers (31.0%) felt that mobile phone services fail intermittently and are therefore unreliable; 22.8% opined that Internet service is no better. Interestingly, most mobile phone companies in Nigeria provide Internet service and are thus culpable.

For government, very conspicuous among the constraints is the lack of basic infrastructure, registering an appreciable proportion of respondents for all technologies under consideration: 31.0% felt it affected mobile phoning, 22.4% the use of CD-ROM, and 22.8% the viewing of cable television. Bolarin and Ayanlade (2010) identify similar constraints in the use of satellite imaging and selected ICT tools for agricultural information dissemination by extension workers. Salau and Saingbe (2008), likewise, report a lack of basic infrastructure as an impediment to the deployment of new ICTs for agricultural information processing, dissemination, and sourcing. If mobile companies are held responsible for the cost and service failure, it is instructive to note that constraints such as poor power supply, poor basic infrastructure, and fake and substandard ICT accessories are clearly identifiable with endemic system failure in Nigeria. Therefore, the Nigerian government has a responsibility to guarantee basic infrastructure and regulate ICT

products so that substandard equipment does not proliferate in the country's markets.

On the audience side is the issue of farmers' self-efficacy (literacy) in utilizing ICT resources for sourcing agricultural information: 31.0, 22.4, and 21.5% were constrained by illiteracy in the use of mobile phone, Internet, and CD-ROM, respectively. This implies that farmers might have taken greater advantage of ICT resources were it not for their low literacy level. The proportion of farmers that indicated self-efficacy as a constraint can really be considered an underestimation, given the sophistication of some modern ICTs. Salau and Saingbe (2008) conclude that education and awareness are required to improve the level of ICT utilization by even more sophisticated groups like extension workers and scientists.

Relationship Between Respondents' Personal Characteristics and Awareness/Use of ICT

Inferential statistical analysis of some selected personal characteristics and awareness indicates that respondents' farm size ($\chi^2 = 1.44$, $p = .05$), marital status ($\chi^2 = 2.32$, $p = .05$), gender ($\chi^2 = 0.26$, $p = .05$), and educational status ($\chi^2 = 3.73$, $p = .05$) have no significant relationship with respondents' awareness of ICT (see Table 5). This implies that, irrespective of farmers' farm size, gender, educational, and marital status, ICT awareness is persistent. The sudden upsurge in the technological revolution in the last decade in Nigeria could explain this result. It is common knowledge that the general attractiveness of ICT is not rivaled by any singular development initiative Nigerians have witnessed in the last three decades. While the revolution is rapid, the ICT products it churned out are massive and limitless. This perhaps explains Oladele's (2011) conclusion that, since perceptions are overtly positive among researchers, extension agents, and farmers, access to agricultural information through ICT will continue to improve.

Similarly, farm size ($r^2 = .03$, $p = .05$), family size ($r^2 = .01$, $p = .05$), and income ($r^2 = .06$, $p = .05$) do not relate to farmers' ICT use. The

TABLE 5 Relationship Between Respondents' Personal Characteristics and Awareness/Use of ICTs

| Variables | Awareness | | | Use | | |
|--------------------|-----------|----------|----------|---------------|-------|----------|
| | Df | χ^2 | Decision | Variables | r^2 | Decision |
| Farm size | 1 | 1.44 | NS | Age | 0.17 | S* |
| Marital status | 4 | 2.32 | NS | Family size | 0.01 | NS** |
| Gender | 2 | 0.26 | NS | Farm size | 0.03 | NS |
| Educational status | 5 | 3.73 | NS | Annual income | 0.06 | NS |

*S = significant difference; NS = non-significant difference.

TABLE 6 *T*-Test Analysis of Difference Between Small- and Large-Scale Farmers in Their Awareness and Use of ICTs

| Farm size | N | Awareness | | | | Use | | | | Decision |
|-----------|----|-----------|------|-----------------|-----|-------|------|-----------------|-----|----------|
| | | Mean | SD | <i>t</i> -value | Df | Mean | SD | <i>t</i> -value | Df | |
| Small | 99 | 15.50 | 2.38 | .24 | 156 | 14.07 | 3.87 | -.90 | 156 | NS* |
| Large | 59 | 15.32 | 2.69 | | | 14.61 | 3.2 | | | NS |

*NS = non-significant difference.

aforementioned explanation for ICT awareness may account for this result as well. However, age ($r^2 = .17$, $p = .05$) is significantly related to farmers' use of ICT. This means that, the younger the farmer, the more he/she tends to be ICT-compliant. This result confirms the general disposition to ICT use in Nigeria, even among other sophisticated and elite groups. While young people tend to put both ICT accessories and products to maximum use, older folks use ICT sparingly and, in fact, only when absolutely necessary. This is typified in the number of hours young people browse the Internet, use sophisticated phone features with uncommon flare, and subscribe to and use social networks.

The result of *t*-test analysis in Table 6 reveals that there is no significant difference between small and large scale farmers in their awareness ($t = 0.24$, $p = 0.05$) and use ($t = -0.90$, $p = 0.05$) of ICTs. All parameters indicative of difference between sets of data indicate no discrimination between small and large scale farmers both in awareness and use of ICTs. For instance, small farmers' mean of 15.50 for awareness does not differ significantly from large scale farmers' mean of 15.32. Similar trend is observed for standard deviation for small (SD = 2.38) and large (SD = 2.69) scale farmers.

For real use of ICTs, both small scale farmers and large scale farmers do not differ in the uses they put ICTs to, therefore, there is no significant difference in the use of ICTs between small and large scale farmers. It is instructive to note at this juncture that, the ICTs revolution in Nigeria hardly discriminate in terms of reach to all categories of people as different companies that have interests in one form of ICTs or the other had gone extra mile to reach clients with very competitive prices and promotion to attract customers' patronage. Though, the prices are still subject of criticism as available prices from among the service providers are still considered comparatively exorbitant and unreasonable from what obtains in other regions or countries in Africa.

SUMMARY, CONCLUSION, AND RECOMMENDATIONS

Data from the study indicates that most farmers are illiterate, with small farm holdings, low income, and large family size. Whereas awareness of

old ICTs like radio and television was widespread among farmers, fewer were aware of new ICTs such as mobile phone, Internet, digital video disc, and cable television. A similar trend was observed for use of old and new ICT; however, new ICTs like mobile phone and cable television were used more than old technologies like overhead projectors and fax machines. The reported use of mobile phone technology indicates an appreciable level of acceptance, spanning all frequency categories. Prohibitive cost, service failure, epileptic power supply, and substandard ICT products were the most significant constraints to ICT use, and use was significantly related to farmers' age. From the foregoing, it is recommended that:

1. The Nigerian government should encourage popularization of the use of new ICTs for agricultural information dissemination by encouraging liberal policy for affordable prices for modern ICT products, especially mobile telephones.
2. The government should improve the power supply and fortify its standard maintenance organization to ensure ICT product regulation.
3. Agricultural development initiatives in Nigeria should explore the use of mobile telephoning in agricultural information dissemination by fostering partnerships with telephone companies.

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