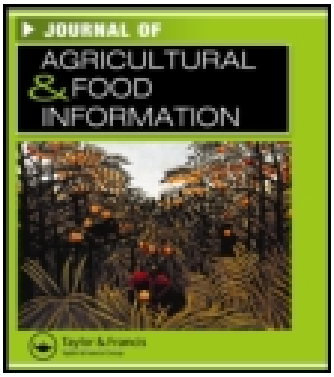

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Utilization of Satellite Imaging and Information Communication Technology in Agricultural Information Dissemination in Nigeria

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This study appraised the level of usage of satellite imaging and selected Information Communication Technology (ICT) tools by agricultural extension workers (EWs) in the North Central Zone of Nigeria. Specifically, information on usage of satellite imaging, personal skill ratings, and constraints faced by respondents in the usage of ICT equipment were gathered. Findings revealed that a majority of the respondents (97%) perceived themselves as incompetent in reading and interpreting satellite imaging for agricultural information dissemination. The study posited that government at various levels should assist in training EWs on digital compatibility.

KEYTERMS agricultural extension, agricultural information, Information Communication Technology (ICT), satellite imaging

INTRODUCTION

The world at present is undergoing a "knowledge revolution" as a result of the "information boom" that is being spearheaded by the rapid advancement in information technology through Internet/satellite technology. Expectedly, this has significantly changed the way people communicate, live, and conduct their business. More importantly, the revolution in communication has provided efficient ways for developing countries to grow economically and socially, as well as increase their agricultural productivity through information

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exchange between extension agents and farmers. According to Oladele (2010), knowledge and information are important factors in accelerating agricultural development by increasing agricultural production and improving marketing and distribution. Information Communication Technology (ICT) can enhance new communication pathways and reduce transaction costs, giving greater accessibility to information on fair prices, transportation, and production technologies.

Satellite imaging is remote sensing information in the form of digital photographic information collected with the use of a space satellite and received through a ground station. According to Shalal-Esa (2007), satellite imaging consists of photographs of Earth or other planets made by means of artificial satellites. The first satellite photographs of Earth were made on August 14, 1959 by a U.S. satellite (National Aeronautics and Space Administration [NASA], 2010); the "Blue Marble" photograph was taken from space in 1972 and has become very popular in the media and with the public. In their article titled "Fifty Years of Earth-Observation Satellites," Tatem, Goetz, and Hay (2008) argued that Landsat was used by both the Americans and the Russians for specific purposes. The NASA Earth Observatory, which is the control station for satellites, does give periodic information as required. According to Løvholt et al. (2006), most parts of Africa were left out in this space race; however, a few African countries such as South Africa and Egypt, with European collaborative partners, are able to possess their own satellite, mostly for communication purposes. Wikipedia ("Satellite Imagery," 2008) reported that, in the 21st century, satellite imagery became widely available when affordable, easy-to-use software with access to satellite imagery databases became available through several companies and organizations. Given its relative availability in the contemporary decade and its importance in agriculture due to climate change phenomenon, satellite imagery should be exploited for agricultural development; its use is paramount in agriculture in order to ensure global food security.

This study appraised the extent of use of ICT tools by agricultural extension workers. Arokoyo, Elevbaoje, and Oyebanji (2005) reported that agricultural extension depends, to a large extent, on information exchange between and among farmers on the one hand and a broad range of others on the other; the latter being identified as one area in which ICT could have a particularly significant effect. The authors argued that wider use of ICT has the potential to open up communication and sharing of information across traditional and social boundaries and to assist previously excluded groups in participating fully, ensuring an increase in agricultural production. Specifically, satellite imagery could be used for monitoring environmental disasters; impending possible hazards to agricultural crops due to climate change; and predicting information on storms, hurricanes, fires, and other meteorological phenomena. Exploiting the information boom provided by the Internet will bridge the information gap between developed and

underdeveloped economies. This will, in effect, narrow the economic gap and increase knowledge transfer to less developed countries. However, the big question is, "Does this information boom translate to greater economic development in the agricultural sector?" To answer this question, this study sought to appraise the level of usage of satellite imagery and selected ICT tools by agricultural extension workers (EWs) for agricultural information dissemination to farmers and information sharing among themselves. To achieve this aim, two major objectives were set for the study: (a) to examine EWs' personal skill ratings on the usage of satellite imaging and ICT tools and (b) to evaluate their level of access/ownership and usage of the selected ICT tools. A major advantage of these technological devices is that they can facilitate communication regardless of physical obstacles and geographical distance. ICTs could play important roles in supporting cooperation across social, ethnic, and cultural barriers and in strengthening effective farmer-extension dialogue.

MATERIALS AND METHODS

The study was carried out in three randomly selected states in the North Central Zone of Nigeria: Kogi, Niger, and Kwara. The three states have similar ecological climates and all have bodies of water for fishing. The study population consisted of all government and private agricultural EWs in the study area; 40 agricultural EWs from private- and government-owned establishments were randomly selected from each of the three states (total 120) as a representative sample. An exploratory survey was administered to EWs through focus groups, based on their organizational structure. This was done to achieve a common understanding of the satellite imaging- and ICT-related tools. After the Participatory Learning and Action exercise, a structured questionnaire was employed to elicit information from the randomly-selected EWs. The questionnaires were administered during the 2008 National Agricultural Show in Abuja. The national agricultural forum provides an opportunity to meet EWs from private, state, and local government areas.

Primary data were analyzed with the usage of both descriptive and inferential statistics; specifically, simple frequency, percentage, mean score, and Pearson correlation co-efficient were utilized. Independent variables were the EWs' personal demographic and socioeconomic characteristics, while the independent variables were the personal skill ratings on the extent of their usage of the ICT tools for agricultural information dissemination. Variables for the analysis were Computer Proficiency (CP = 1 if respondent can use; otherwise = 0), Computer Training (CT = 1 if respondent has had computer training; otherwise = 0), Computer Ownership (CO = 1 if respondent owns a computer; otherwise = 0), and Access to Computer (AC = 1 if respondent has access; otherwise = 0). Skill ratings (competency levels) were

TABLE 1 The Competency Levels of EWs with ICT Tools

	Satellite report from the ground station		Internet facilities		Mobile phone		Multimedia projector		Personal computer	
Usefulness	Freq.	Percent	Freq.	Percent	Freq.	Percent	Freq.	Percent	Freq.	Percent
Sourcing information	3	(2.5%)	62	(51.6%)	120	(100%)	82	(68.3%)	90	(75.0%)
Disseminating information	0	(0%)	44	(36.6%)	118	(98.3%)	80	(66.6%)	82	(68.3%)
Easy to use	0	(0%)	90	(75%)	120	(100%)	78	(65%)	84	(70%)
Technical and difficult to use	120	(0%)	22	(18.3%)	0	(0%)	18	(15%)	20	(16.6%)
Trained to use	0	(0%)	64	(53.3%)	120	(100%)	82	(68.3%)	90	(75%)
Can manipulate	0	(0%)	60	(50%)	100	(83.3%)	78	(65%)	86	(71.6%)
Not able to use and manipulate	120	(100%)	30	(25%)	120	(100%)	80	(66.6%)	88	(73%)

determined by the ability of the respondent to search for agricultural information and to disseminate it using computer packages such as PowerPoint, Microsoft Word, and the Internet: possessed ability to use = 1; inability to use = 0.

RESULTS AND DISCUSSION

The study revealed that the EWs possessed a very low technical competency on ICT tools and their usage for agricultural information dissemination. This in itself is an inhibitor for agricultural development, as timely and relevant farm information, coupled with information about fair prices, can boost farmers' productivity, thereby improving their standard of living. The extent of exposure to use of these ICT tools was measured on the basis of EW's ownership or access to them and the extent to which they could manipulate the tools to give a meaningful result. Findings indicate that the circumnavigating capabilities of these tools depend on technical manipulation in which most of the agricultural workers are not at all competent.

Table 1 reveals that a majority of the respondents (97.5%; i.e., 100% minus 2.5% who use satellite reports as a source of information) perceived themselves as incompetent in reading and interpreting satellite imaging for agricultural information dissemination, even after the focus group discussion to enhance understanding of issues. In addition, only 2.5% of the respondents perceived satellite imaging as nothing new and could attempt to interpret it, if reported using vegetative color variations. This is a poor result and a confirmation of the digital divide.

Table 2 shows that about 75% of the respondents, in one way or another, perceived themselves as frequent users of multimedia projectors and the Internet; although, in most cases, not for agricultural information dissemination. Interestingly, all the EWs reported having a functional mobile phone and using it, if need be, to give urgent information to farmers on fertilizer availability, meeting notices, and credit sources for their farm enterprise. Global System for Mobile Communications (GSM) phones were the most utilized. When probed further about constraints on use of ICT tools, they reported challenges such as power outages, cost, and inadequate training on

TABLE 2 Access to ICT Tools

	Internet facilities		Personal computer		Mobile phone		Multimedia projector	
	Freq.	Percent	Freq.	Percent	Freq.	Percent	Freq.	Percent
Yes	90	(75%)	120	(100%)	84	(70%)	90	(75%)
No	30	(25%)	0	(0%)	36	(30%)	30	(25%)

TABLE 3 Pearson Correlation Between Availability (Access and Ownership) and Use of ICT Tools by EWs

Variables (no. of responses)	*df*	Value
120	119	.093

the usage of the tools for agricultural information dissemination, especially between the EWs and their clientele.

In addition, findings revealed that mobile phones and computer systems are the most used and widely owned by EWs and their organizations. Further statistical analysis shows a strong correlation between ownership (access to use) and usage of computer systems, Internet, and GSM phones (Table 3).

CONCLUSION

The impact of agricultural extension agents who are expected to bridge the gap between the mostly illiterate farmers and research bodies has not been significant, owing to the fact that extension agents have not optimized the benefits of satellite technology and ICTs, in the acquisition and dissemination of agricultural information. Due to the huge capital outlay needed for satellite technology, governments at various levels should assist in training EWs on digital compatibility and provide ICT tools for use, in an effort to combat the digital illiteracy prominent among EWs.

The high level of digital illiteracy appears contrary to the report by the Pew Internet Project (Wortham, 2009) that mobile Internet use is shrinking the digital divide and that African-Americans are ahead of other groups in accessing Internet from mobile phones. The findings are explicable for African-Americans, who are not new to ICT tools, unlike their African counterparts. The study concluded that software that is readily affordable and easy-to-use, with less technical expertise required, is more commonly utilized. The authors suggest training and retraining of EWs on ICT tools to bridge the digital gap, thereby enhancing the capability of the EWs to utilize ICT in this 21st century as a tool for food security. With timely and relevant farm information, coupled with necessary farm inputs, farmers could increase their productivity.

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