Level of Use of Open Access Electronic Resources by Scientists in Agricultural Research Institutes in Edo State, Nigeria

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Abstract

Purpose: *This study examined the level of use of open access electronic resources by scientists in two agricultural research institutes in Edo State, Nigeria.*

Methodology: Descriptive survey research design was adopted. One hundred and fifty research scientists in agricultural research institutes in Edo State (70 from Rubber Research Institute and 80 from Nigerian Institute for Oil Palm Research] constituted the population for the study. Questionnaire was used as instrument for data collection. Two research questions guided the study.

Findings: The result of the study showed that the scientists do not fully use agricultural based open access electronic resources in accessing information for research nor do they use them as outlets in disseminating research results.

Implications: The study implies the scientists have challenges that hinder their adequate use of open access electronic resources both for accessing and disseminating research results, and do not participate in global research community.

Value/originality: The value rests on the recommendations that the heads of Institutes library should endeavor to register their institutes online with agricultural based open access electronic resources databases so as to be given user id and password to access their contents and that the management of the research institutes should develop a functional institutional repositories and institutional websites and mandate their scientists to submit their research outputs there to build up databank for all.

Key words: Use, Open access electronic resources, scientists, agricultural research institutes, Nigeria.

Paper Type: Empirical

Introduction

Advancement in technology has revolutionalized information collection, dissemination and utilization. Today Information has gone digital and Internet via its open access resources have become one of the new tools for accessing, disseminating and utilizing such information (Obasuyi, 2006).

Research is an international activity where progress builds on the reported results of colleagues around the world. According to Arunachalam (2003), access to published results in refereed journals is a critical ingredient to forging a strong research environment. Open access electronic resources are all free credible published scholarly articles available on the public Internet which permits any users to read, download, copy, distribute, print, search or link to the full texts of articles, which can be crawled for indexing, pass as data to software, or used for any other lawful purpose, without financial, legal or technical barriers other than those inseparable from gaining access to the Internet itself (Arunachalam, 2003). Such free published quality scholarly articles are contained in electronic formats such as e-Journals, e-books, e-databases, e-newspapers, e-reports, among others. Some of these open access electronic resources are agricultural based which provides published articles in the field of agriculture. They are portals that contain free published journal articles mostly in the field of agriculture which if used can assist agricultural based scientists in the world, including those in the two research institutes in Edo State in achieving optimum research. These agricultural based open access electronic resources could also be called online databases that contain published scholarly articles in the field of agriculture which can be freely accessed by anyone. Some of these open access

electronic resources that are agricultural based are - HINARI, AGORA, OARE AND TEEAL and their full meanings are:

a. HINARI - Health Internetwork Access to Research Initiative
b. AGORA - Access to Global Online Research in Agriculture
c. OARE - Online Access to Research in the Environment
d. TEEAL - The Essential Electronic Agricultural Library

According to Obasuyi (2006) these open access electronic resources in agriculture are electronic portals or gateways that can provide free access to online agricultural based published literature or articles and through these portals, scientists can gain access to research articles in agriculture. In support of the above, Food and Agricultural Organization (2009) pointed out that there are over 7000 quality published journal articles in the fields of Agriculture and Environment that can freely be accessed and used by agricultural based scientists to achieve quality research.

However, for researchers to access information in cyberspace, they must have Internet knowledge and skills; they are also required to possess a corresponding electronic technology such as computer, good Internet services and stable and regular power supply, (Arunachalam, 2003). He further outlined that in developing countries, all these necessary facilities are lacking and where available they are inadequate. Christian (2008) also reported that most research institutes in many developing countries like Nigeria are still battling to overcome many challenging issues like inadequate access to information, lack of research funds, lack of awareness of open access electronic resources, inadequate ICT and Internet facilities and lack of competence in use of Internet which surround their research activities. More importantly, it is pertinent to note that all scientific research activities take place in an 'information space' in which researchers make contributions by adding to the body of existing knowledge (Kirshop, Arunachallam and Chan, 2007). Scientists need to have access to all the available relevant information in order to conduct researches at optimal level; of which the scientists in the agricultural research institutes in Edo State are no exception.

The purpose of this study is to ascertain the level of usage of open access electronic resources by scientists in agricultural research institutes in Edo state, Nigeria. The specific objectives are:

i. To find out the extent of use of agricultural based open access electronic resources by scientists in agricultural research institutes in Edo State in accessing information for research.
ii. To find out the extent of use of open access electronic resources in disseminating research results by scientists in agricultural research institutes in Edo state.

The descriptive survey research design was adopted for this study. All the 150 research scientists (70 in Rubber Research Institute of Nigeria and 80 from Nigerian Institute for Oil Palm Research) were used for the study. Questionnaire was used for data collection. The questionnaire was structured in two sections. Section one provided responses on demographic data of the respondents. Section two was addressed to respond to the two research questions, constructed into 4 scales (i.e. Very High, High, Low, and Very Low).

The services of research assistants were employed by the researchers to administer the questionnaire to the respondents in the two agricultural research institutes in Edo State, Nigeria. Finally, 138 instruments were completed and dully returned by the respondents, and this represented 92% response rate. Descriptive mean statistic was used to analyze the data in line with the objectives of the study and decisions were taken in favor of items that have mean score of 2.5 and above, but against items with mean score less than 2.5.

Review of Related Literature

Use is the ability of using something for a purpose. It is the act of putting into action or services something that can be beneficial to someone. Omotayo (2010) defined use as the ability of academics or researchers to adopt and adapt technologies to achieve a purpose or set goals. The concept of use is the ability of someone or group of persons to learn to apply knowledge to service (Rahman & Ramzy, 2004). In this study, concept of use is the ability and the extent to which scientists in agricultural research institutes in Edo State, Nigeria could access and exploit open access electronic resources to achieve quality and easy research.

Open access has been identified as an initiative that can improve access to scientific literature and also provide global visibility for research work conducted by researchers anywhere in the world (Swan 2006). Bethesda Statement on Open Access (2003) defines open access as, where the author(s) and copyright holder(s) grant(s) to all users a free, irrevocable, worldwide, perpetual right of access to, and a license to copy, use, distribute, transmit and display the work publicly and to distribute the works, in any digital medium for any responsible purpose, subject to proper attribution of authorship as well as the right to make small numbers of printed copies for their personal use. Berlin Declaration on open access (2003), in its definition stated that open access is achieved when a complete version of the work and all supplemental materials, including a copy of the permission, in a suitable standard electronic format is deposited (and thus published) in at least one online journal or repository that is supported and maintained by an academic institution, scholarly society, government agency, or other well established organization that seeks to enable open access, unrestricted distribution, interoperability, and long-term archiving. Anyimadu (2003) sees open access as free on-line access to quality scholarly articles defined as "Open Domain" which means publicly supported research that can be openly accessed and copyrighted adequately. Christian (2008) defined open access as free and online access to research output devoid of any permission barriers and unnecessary legal restraints.

In this research open access can be defined as unrestricted online access to articles published in scholarly journals without price and other copyright laws attached except that the right of the author must be given by the user citing and referencing the used work.

Sethi and Panda (2012) defined electronic resources as resources in which information is stored electronically and are accessible through electronic systems and networks. In this study electronic resources (E-resources) are all information resources that are stored in the cyber space which can be accessed via electronic devices such as the computer and/or other ICTs simultaneously from any point by a variety of users e.g. e-journals, e-books, e-databases, and other free internet resources.

A scientist is one that has training in any of the scientific subjects on how to conduct investigations and then report on issues pertaining to that. The scientist conducts or investigates or undertakes research with a view to finding solution to an existing problem. A scientist can also be seen as an individual researcher who devotes himself or herself to doing research (Clipart, 2012). Furthermore, Clipart stated that scientist conduct research, develop theories and devise methods to apply scientific principles, theories and research in projects related to the overall mission of his or her institution or organization. In this study, a scientist is someone employed by agricultural research institutes to do in-depth study on rubber and other latex producing plants and also oil palm and other palms.

Agricultural research institute all over the world is primarily established to focus on the real needs of the farming population with a view to improving the production potentials of farmers, be it at subsistence or commercial level. It is seen as the foundation for a productive and sustainable agricultural system within a nation. It helps in improving the research environment; pursue focused priority research and development agenda for the development of the agricultural sector, the economy of any nation and the creation of a sustainable food and raw material production and utilization system. (Shaib, Adedipe, Odegbaro & Aliyu, 2000). According to Shaib, Aliyu and Bakshi (2000), agricultural research institute as a zonal institute has a central role of transferring technology in collaboration with the Agricultural Development Projects (ADPs) and National Agricultural Extension and Research Liaison Series (NAERLS) to agricultural scientists. Therefore, agricultural research institute is a source for the generation of improved packages of technologies, and also provide crucial basis for sustainable food production which is a pre-requisite for ensuring food security in any Nation (Shaib, Adedipe & Aliyu; 2000). Agricultural research institute is a premier national institution that brings together research programmes in food crops, horticultural/industrial crops, tree crops, livestock/range management, land/water management, fisheries and socio economics to promote sound agricultural research, technology generations and disseminations to ensure food securities through improved productivities and environmental conservations. The Agricultural

Research Council of Nigeria (2011) magazine also stated that one of the major aims of agricultural research institute is to indulge in capacity and competence building through its various established research institutes for integrated agricultural research for development of nations.

In this study agricultural research institutes are institutions that are established by the federal government of Nigeria to carry out in-depth research on various mandate crops in the field of agriculture and are placed under the supervision of the Federal Ministry of Agriculture. Presently, agricultural research institutes are governed by a body called Agricultural Research Council of Nigeria (ARCN) which should make sure that these research institutes are funded adequately to carry out research in the field of agriculture and the general wellbeing of these research institutes. ARCN is also to ensure that these research institutes research on their various mandate crops by giving them research funds to do research and the research outputs made available to them (ARCN, 2011)

Usage of agricultural based open access electronic resources in accessing information for research by scientists:

There are some open access electronic resources which deal specifically on agriculture. They contain published articles in the field of agriculture which if accessed could be of immense help to scientists in agricultural institutions, whose research mandates are agricultural based. Subair and Kgnakenna (2002) stated that the use of computers and management system in agriculture makes it possible to collect information over many years and also store them for agricultural research and management purposes. They opined that usage of agricultural open access electronic resources like AGORA, quality e-journal articles can be accessed and processed freely, timely and also give the agricultural researchers exposure to new discoveries in agriculture.

HINAGOA resources in agriculture as Obasuyi (2006) stated have created positive impacts on agricultural based researchers and their libraries. According to him, HINAGOA is an acronym for HINARI, AGORA and OARE. Obasuyi (2006) called them electronic portals or gateways that provide access to free Internet resources through which researchers can gain access to reputable publishers and databases especially in agriculture. HINAGOA contains quality electronic journal articles that can be useful to agricultural based researchers anywhere in the world. According to Kaur (2006), these Agricultural based open access resources are good substitutes for conventional resources because of the speed at which access to all the important articles are provided. Economic Commission for Africa (2007) stated in its report on the need for capacity development in the use of online resources that AGORA, HINARI, OARE and TEEAL portals are necessary tools the universities and research institutions in developing countries of Africa need for gaining access to relevant and up-to-date scientific literature for research and to bridge the divide amongst researchers in Africa and developing countries. According to ECA(2007) AGORA provides a collection of more than 3000 published journal articles in the field of agriculture, environmental and other related social sciences that can be freely accessed, HINARI also provides free access to more than 1500 published journal articles in the field of sciences, OARE contains more than 1000 published credible journal articles in environmental sciences and agriculture also made freely available; and TEEAL contains over 140 collection of core published journals in the field of agriculture and related sciences that can be freely accessed. These agricultural based OAER are freely made available for developing countries of the world including Nigeria to assist researchers in both universities and research institutes in their research activities. However to freely access AGORA, HINARI, OARE TEEAL, the universities or research institutes must register online through their libraries to Information Training and Outreach Centre for Africa (ITOCA) to obtain user id and password for their institution (ITOCA, 2008). Explaining further, ITOCA (2008) report stated that electronic resources in agriculture and their services have become the most popular tools for excellent agricultural research and that these resources would make research activities easier and convenient with less time wasted. However, the (ITOCA) (2008) report stated that many Nigerian agricultural based scientists are not utilizing HINAGOA resources effectively and therefore advocated that these scientists should use these resources to gather useful and enough information needed for their research work timely and freely too. Ajala and Ebijuwa (2008) categorically declared that AGORA, HINARI and Science Direct provide electronically published articles in agriculture and other fields

of science and that they contain very vast and comprehensive collections to meet the needs of the researchers. They further declared that these resources have created high dependency value on their research work and that these electronic documents also provide current article alert services which any researcher needs for a better research.

According to Angelo and Wema (2010), livestock researchers in Tanzania having known the quality of agricultural based e-journals that are contained in AGORA, HINARI and TEEAL gateways, are using these subject gateways to search for information for their research work.

Usage of open access electronic resources outlets in disseminating research results by scientists.

Research institutions are seen all over the world as centers for intellectual and scholarly research and as such are expected to take interests in knowledge creation, dissemination and as well as preservation (Allan, 2005). According to him, this is a very complex process in any given society especially in developing countries where the economic, technological and institutional structures necessary to achieve the process are not well established. According to Allan (2005), knowledge dissemination is especially important in the third world context because the emergence of an independent intellectual life and some self-sufficiency in science is to some extent dependent on establishing the essential structure for dissemination of research outputs. Dulle (2010) stated that for centuries, institutional libraries and scholarly publishing were the conventional model adopted in preserving and disseminating research outputs from academic and research institutions. Furthermore, Dulle (2010) outlined that while institutional libraries housed research outputs in the form of grey literature, (documents and ephemeral materials issued in limited accounts outside the formal channels of publication and distribution) thus playing a greater role in terms of preservation and dissemination, scholarly publishing played a much greater role in terms of dissemination through scholarly journals. However, over the past several decades, the economic, market and technological foundations that sustained this publisher-library market relationship has begun to shift. This shift has resulted in what Dulle (2010) called the 'networked information economy'. According to Egwunyenga (2008), dissemination of research outputs by researchers from the developing world can be achieved through open access repositories and that it could be instrumental in increasing accessibility and visibility of research outputs from the region. Egwunyenga (2008) further stated that before now, researchers disseminate their research outputs in local journals but pointed out that this process has minimal circulation due to poor distributorship and marketing or prestige thereby the research results not being widely disseminated.

In his report, Christian, (2008) opined that open access institutional repository is one of the best avenues that could be utilized by research and academic institutions in developing countries to make their research outputs widely available and accessible to the outside world. He however outlined some issues that can affect the development and utilization of institutional repositories in developing countries like Nigeria to be: Lack of knowledge of open access, Inadequate ICT infrastructure, inadequate funding and inadequate advocacy. He presented a working definition of open access institutional repository as 'a digital archive of the intellectual product created by the research staff, faculty, and students of an institution which are made freely accessible to end users both within and outside the institution.

Chan, Kirsop, and Arunachalam (2005) stated that using institutional repository an open access outlet in disseminating and accessing research and scholarly output is desirable by researchers so that subsequent works can be informed by the earlier works of others otherwise there will be an endless circle of duplication and also that it saves time of the researchers. In citing Veltrophas (2008), Dulle (2010) stated that open access repositories increases the efficiency of scientific discovery since the likelihood of wasting resources and time on duplicative investigation decreases when researchers have comprehensive access to the results of earlier work, and that the fundamental principle of research is that wide dissemination of research results is vital for validating these results and advancing the field of knowledge. Chan et al (2005) stated that there are only two roads to disseminating research result openly, either through open access journal publishing (The Gold Road) and/or institutional repository (The Green Road). In their definitions they stated that open access journal publishing is a model of scholarly publication that makes journal articles available to the public by means of the Internet

without financial, legal, or technical barriers other than those inseparable from gaining access to the Internet itself, and that institutional repository is a model of scholarly publishing whereby researchers and academics make pre-print or post-print copies of their research work or publications available in open access digital repositories or archives which could be the web page of a subject or discipline-based repository of any institution. They further stated that institutional repositories administered by universities or research institutes for members of their community, are the fastest growing form of open access archives. In the case of research and academic institutions in developing countries, developing and usage of institutional repository by researchers will not only boost the global visibility and utility of their research, but will also introduce a novel research culture focused on meeting international standard and values (Dulle 2010). When a researcher knows that his or her research will be openly accessible by a global audience will definitely inspire the researcher to produce a standard and quality research article. Christian (2008) went on to state that institutional repositories provide compelling responses to two strategic issues facing academic and research institutions. First, it expands access to research, reasserts control over scholarship by the academy, increases competition and reduces the monopoly power of journals, and brings economic relief and heightened relevance to the institutions and libraries that support them. Secondly, it serves as a tangible indicator of an institution's research quality and also demonstrates the scientific, societal, and economic relevance of its research activities, thus increasing the institution's visibility, status, and public value. Additionally, Christian (2008) pointed out that institutional repository could also be seen from two complementary perspectives. First as a natural extension of academic and research institution's responsibility as generators of primary research seeking to preserve and leverage their constituents' intellectual assets, and secondly as one potentially major component in the evolving structure of scholarly communication.

Level of usage of open access electronic resources by scientists

Usage of open access electronic resources in both disseminating and accessing scholarly information has attracted the attention of many scholars and researchers in recent time (Dulle, 2010). Varying levels of involvement of researchers in open access publishing were reported by Allan (2005), Kim (2006), Swan and Brown (2005), Sanchez-Tarrago and Fernandez (2009) and Utulu and Bolarinwa (2009). A study by Sanchez-Tarrago and Fernandez (2009) revealed that researchers that have published in open access journals are below average due to high publishing fees attached to these open access journals. Kim (2006); Swan and Brown (2005); and Utulu and Bolarinwa (2009) conducted studies that revealed more involvement of researchers in open access publishing. Kim (2006) reported that more than half of the respondents claimed to have made their research outputs publicly accessible through web sites. Similarly, Swan and Brown (2005) stated that few researchers have published at least one open access article during the last three years from the time of their study. The study by Utulu and Bolarinwa (2009) showed that the researchers have disseminated their scholarly output in open access journals.

However the general tendency is more involvement of researchers in the use of open access electronic resources rather than publishing scholarly outputs in open access outlets. Supporting this view, Mann, Walter, Hess and Wigand (2008) stated that a larger number of researchers used open access electronic resources to source for scientific articles while few of these researchers published their papers in open access avenues. More support for such findings are reported by Gadd, Oppenheim and Probet (2003) who also revealed that even among those who had never self-archived papers, that a good number of them had used others' self-archived works. A survey by Deoghuria and Roy (2007) also established that more researchers used open access electronic resources for literature search and few of these researchers used open access journals to publish their research outputs. In short term, such a trend may be considered undesirable, and in long term the increasing usage of open access electronic resources to source for scientific articles may also influence users of open access resources to publish their research outputs. Gadd, Oppenheim and Probet (2003) for example argued that those who have self-archived previously were more likely to have used other authors' self-archived materials. This means that by accessing open access resources such users become more aware of open access avenues for scholarly dissemination and may easily be convinced to make their research

outputs openly accessible. It is thus more likely that less effort may be required to promote the usage of open access electronic resources to researchers who are already benefiting from open access initiatives than those who do not.

Open access electronic resources have been found to differ in different disciplines. Lawal (2002) discovered that among nine different research disciplines, researchers from the chemistry discipline were the most non-users of e-prints archives. On the other hand, De Beer (2005) established the fact that the researchers in the humanities and social sciences are the ones that were very prominent in either engaging in self-archiving or hosting or promoting open access journals. Furthermore, Swan and Brown (2005) observed that most computer scientists used such services, followed by life and medical scientists. Researchers in the field of medicine were also rated low in the use of open access. An investigation by Zuber (2008) provides insights on the adoption of open access electronic resources by scholars from different research disciplines. He revealed that various research disciplines such as engineering, business education, physical sciences, humanities, social sciences, biology and agriculture, medicine, law, fine arts and communication in decreasing order of performance performed in terms of their tendency to publish in institutional repositories.

In conclusion from the above studies, there is no consistency in terms of differences by disciplines as far as open access usage is concerned. Ideally, one would have expected researchers from disciplines with a long history of subject repositories in the fields of physics and economics to have been leading in open access involvement, but that does not always seem to be the case (Dulle, 2010). Such results suggest that researchers in other disciplines including agriculture are increasingly being involved in open access electronic resources usage than it used to be the case a few years ago. It is thus important to understand the actual involvement in open access publishing by researchers from different research disciplines in order to design appropriate campaigns to specific research groups.

According to Sethi and Panda (2012), open access electronic resources have become a sign of modern age invaluable tool for agricultural research. Agricultural research is being transformed with the onset of the open access electronic resources (Obasuyi, 2006). The traditional environment has been gradually changing to an electronic one and the demand for Internet and open access e-resources among the academic and research community is increasing yearly and becoming the most popular source of undertaking research (Kumari, 2008). The usage of open access electronic resources is highly dependent on scholars and researchers being aware of them. However, in certain situations researchers benefit from open access initiatives without their knowledge of it (Papin-Ramechan and Dawe, 2006). This is especially true when they (the researchers) gain access to both free and subscribed content while searching for information on the Internet. It should therefore be noted that for researchers to make use of open access electronic resources for their research work, prior knowledge of this free resources is important.

Discussion of findings

The findings of this study based on the objectives are presented in tables 1 and 2.

Table 1: Mean Ratings of Scientists' Level of usage of Agricultural Based and its related OAER in Accessing Information for research.

S/N	OAER	M	Remark
1	Google	3.26	Used
2	Institutional websites	2.73	Used
3	AGORA	1.72	Not used
4	OARE	1.70	Not used
5	e-journals	1.68	Not used
6	professional blogs	1.68	Not used
7	HINARI	1.64	Not used
8	TEEAL	1.64	Not used
9	Free subscription websites	1.62	Not used
10	e-bulletins	1.51	Not used
11	e-books	1.49	Not used

Table 1 depicts the extent the scientists in agricultural research institutes in Edo state make use of agricultural based open access electronic resources in accessing information for their

research work. The scientist in agricultural research institutes in Edo State use only Google (3.26) and Institutional websites (2.73) to access information for their research work. It shows that the scientists in agricultural research institutes in Edo state do not use agricultural based open access electronic resources in accessing information for their research work.

Table 2: Mean Ratings of Scientists' Level of usage of Open Access Electronic Resources outlets in Dissemination Research results.

S/N	OAER	M	Remark
1	institutional repositories	2.62	Used
2	e-journals	2.05	Not Used
3	social websites e.g. face book, LinkedIn, etc.	2.01	Not Used
4	Institutional websites	1.94	Not Used
5	e-books	1.66	Not Used
6	professional blogs	1.61	Not Used
7	personal websites	1.54	Not Used
8	e-bulletins	1.52	Not Used
9	e-Proceedings	1.50	Not Used
10	free subscription websites	1.38	Not Used

Table 2 shows the scientists extent of use of open access electronic resources outlets in disseminating their research results. The scientists in agricultural research institutes in Edo State use only institutional repositories (2.62) in disseminating their research results.

Conclusions

Based on the findings of this study, it was concluded that the scientists from agricultural research institutes in Edo state, Nigeria:

- Do not use agricultural based Open Access Electronic Resources in accessing information for research.
- Do not use Open Access Electronic Resources outlets in disseminating their research results.

Recommendations

Based on the findings of this study, the following recommendations are made:

1. The scientists' awareness programs such as seminars and workshops on the relevance of open access electronic resources to research should be a continuous exercise until all open access avenues are exploited and success achieved by all scientists in research institutions.
2. Scientists should learn basic computer and Internet surfing skills to be able to make maximum use of these resources; as this will empower them for successful carrier in research.
3. The managements of these research institutes should develop a functional institutional repositories and institutional websites and mandate scientists to submit their research outputs there as a way of building a strong data bank for all.
4. The scientists should also be encouraged to publish their research articles in open access journals by their management paying the institutional publishing fees attached to some of these open access journals thereby encouraging the scientists to make their research outputs accessible to all.
5. The heads of the research institutes library should endeavor to register their institutes online with these agricultural based open access electronic resources – AGORA, HINARI, OARE, and TEEAL so as to be given user id and password to access their contents freely.

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