

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

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### Abstract

**Purpose:** This study was conducted to determine the level of awareness of open access electronic resources (OAER) by scientists in agricultural research institutes in Edo State, South – South geopolitical zone of Nigeria.

**Methodology:** Descriptive survey research design was adopted. One hundred and fifty research scientists in agricultural research institutes in Edo (70 from Rubber Research Institute of Nigeria 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 scientists in agricultural research institutes in Edo state are fully aware of the existence of open access electronic resources but yet have greater access to traditional library materials than electronic journals and books for their research work.

**Implication:** The study implies that the scientists though fully aware of existence of open access electronic resources but have challenges that compeled them to still access traditional library materials for their research work.

**Recommendation:** It is recommended that the management of the two agricultural research institutes in Edo State should provide functional Internet facilities for the scientists and organize regular workshops and seminars aimed at informing their scientists on the relevance and use of open access electronic resources.

**Keywords:** Awareness, Open Access, Electronic Resources, Scientists, Agricultural Research Institutes.

**Paper Type:** Empirical

### Introduction

There is no gainsaying that research is the bedrock of development. However, availability and accessibility of information is very essential for a productive research output. Scientists depend on available information resources to achieve quality research. They also need to be informed of new ways or new technology of achieving optimum research. They need to be aware or conversant with new trends in research exercise. Ojedokun and Owolabi (2003) stated that scientists can only excel in research when they are aware that information stored, can be freely accessed, used and shared amongst them. They therefore will depend on free information resources as these resources are the driving forces to making their research work easy and timely. Ojedokun and Owolabi (2003) also opined that open access electronic resources are invaluable tool for collaborative research among academic and research staff. Oketunji (2001) stated that the functions of Internet and its open access resources have always been to provide a way for academic and scientists to have better and free access to each other as tool to facilitate research. Internet is the world's most efficient means of communication when compared to other sources. Owolabi and Atama (2007) maintained that research communities in developing countries especially Africa cannot afford to ignore the potentials of the Internet and its open access resources in this global information age. Ruiz, Minitzer and Leipzigi (2006) stated that many leading Universities and Research Institutions in developed countries make constant use of these free electronic

resources in their research and have also developed open access repositories to supplement and enhance learning and research. To support this, Kalle and Matti (2006) observed that over the last several decades the use of open access information resources by research scholars in developed countries have improved the quality of research and that scholars' research work are enhanced and knowledge also updated. With the awareness of open access electronic resources by research scientists, they will be motivated to achieve quality and stress free research.

In analyzing the advantages of open access electronic resources, Dadzie (2005) explained that they are invaluable research tools that complement the print-based resources in a traditional library setting. According to her the advantages include access to more current information and access to information without restriction. Navijoti (2007) also reported that speedy publication and availability of free published articles on the Internet are the key advantages that attract research scholars to conduct research with ease. Hawthorne (2008) stated that the pursuit of open access electronic resources by libraries/institutions was driven by the core values of library science, which is to provide materials for every user. Scientists are finding it almost impossible to get literature from the few traditional materials in the library for their research activities. The library certainly cannot satisfy these researchers with only traditional materials as most libraries are under stocked. The library now promotes electronic resources for a better information collection, preservation and dissemination.

The emergence of open access electronic resources reposition the scientists to recognize the potentials of computer as a tool to work with and the Internet as a medium to reach out to their colleagues all over the world through their research results or publications. Hence the computer through the Internet makes published literature more accessible and timely. Rahman (2010) stated that with the advent of open access electronic resources, it is possible to recognize the Ranganathan's five laws of library science which stated that resources are for use, every person his or her resource, every resource its user, which saves the time of the user and made the library a growing organism. He therefore declared that technological development in library/research in the 20<sup>th</sup> century via the immergence of free electronic resources was intended to make access to literature more direct, convenient and timely for the user(s), thereby making the library a growing organism and the researchers and others to repeatedly accommodate the changes inherent in the use of constantly changing technology. According to Omotayo (2010), free electronic resources like e-journals are mostly valued information communication channel for research.

He stated further that with the advent of the Internet and open access resources, research out puts have been more easily accessible.

According to Varghese, Faith and Jacob (2012), Internet has had a growing influence on research and academics as a whole, and that open access electronic resources are now being widely acknowledged as an excellent means to support and aid researchers thereby make their research work easy hence enhance their productivity.

## **Research Questions**

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

- 1) To find out the extent scientists in agricultural research institutes in Edo state have access to relevant scientific literature?
- 2) To find out the scientists' level of awareness of open access electronic resources?

## **Research Method**

This study adopted a descriptive survey research design. One hundred and fifty research scientists (70 from Rubber Research Institute of Nigeria [RRIN] and 80 from Nigerian Institute for Oil Palm Research [NIFOR]) in Edo State, Nigeria were used as sample for this study. Questionnaire titled 'Questionnaire on Level of

Awareness of Open Access Electronic Resources by Scientists in Agricultural Research Institutes in Edo State, Nigeria (QLAOAERSARI) was used to elicit responses from the respondents. 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 (Regularly, Occasionally, Rarely, Never, and Very High, High, Low, Very Low).

The services of research assistants were employed by the researcher 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% of the population. Descriptive mean statistic was used to analyze the data in answering the two research questions 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**

Awareness is the ability of people to realize or know that something exists. It can also be defined as ones knowledge or understanding of a particular subject, situation or trend. According to Owolabi and Atama (2007), awareness is a pre-requisite to subsequent usage of open access publications unless an individual uses it unknowingly. Obuh and Bozimo (2012) stated that awareness raises consciousness and knowledge about a certain technology and its personal and social benefits. This view supported their study which established awareness as the central determinant of user attitude and behavior towards technology. Dulle and Minishi-Majanja (2010) observed that in the open access environment, awareness has been acknowledged as an important factor that determines usage of new technology. According to Fullard (2007), awareness is the state or the ability to perceive, to feel, or to be conscious of events, objects or a new trend such as new technology or system. It is the knowledge gained through one's own perceptions or by means of information. In this study, the concept of awareness is the degree to which scientists in agricultural research institutes in Edo State, Nigeria have heard about open access electronic resources and how informed they are concerning it.

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). Lawrence (2001) stated that the concept of open access is characterized by free availability of research output on the public internet granting a user the license to make legal and non-commercial use of such material subject to proper acknowledgement of the rights of the original owner. In this light, open access initiative makes it possible for researchers to make their scholarly articles freely available to the public by means of any open access electronic resource such as open access electronic journals or open access repositories. The resultant effect of this according to him is that scientists will now have almost instant access to a large and rapidly increasing amount of information that previously would have required trips to the library, interlibrary loan delays, or substantial effort in locating the source.

In this research open access is 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. Electronic resources also known as 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. In this study a scientist is someone employed by the agricultural research institutes to do in-depth study on rubber and other latex producing plants and also oil palm and other palms and produce result that could be externalized to farmers of the above crops.

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. Two agricultural research institutes namely Rubber

Research Institute of Nigeria [RRIN] and Nigerian Institute for Oil Palm Research [NIFOR] are located in Edo State, Nigeria.

According to Dulle (2010), and Obuh and Bozimo (2012), open access electronic resources concept is still not widely known among researchers from different geographical localities and research disciplines. Dulle (2010) in reporting the findings of Christian, 2008; stated that open access concept was an unknown issue to many researchers in developing countries. In his analyses, Christian (2008) revealed that open access electronic resources awareness amongst researchers at the University of Lagos were still below average while the majority of the researchers were completely unaware of the existence of open access e-resources. Ouya (2006), and Utulu and Bolarinwa (2009) in their various studies, reported that open access electronic resources awareness is below average. According to Swan and Brown (2004), researchers are mostly aware of open access repository than open access journals. Sanchez-Tarrago and Fernandez (2009) in their study have a different view. They stated that researchers are aware of the existence of open access journals and that they equally use these journals to source for scientific literature for their research work. Obuh and Bozimo (2012) also in their study reported that academics and researchers in Nigeria are aware of the existence and importance of open access contents and that they have started using them in their research exercise. A study by Rowlands and Nicholas (2005) revealed that while North America is ranked second after Europe in terms of awareness of open access repositories, their awareness of other open access electronic resources reported to have been low. Similarly, Asia and Africa are among the continents with quite few repositories, yet the reported level of awareness of open access electronic resources is quite high. The possible explanation of such contradictory findings is that researchers from such continents happen to know open access through accessing free web based information but have little investment in open access repositories for the dissemination of their research outputs. The above observation testifies that existence of open access electronic resources is still not well understood by the researchers or scholarly community and hence there is need for more awareness campaigns.

### **Awareness of open access electronic resources by scientists**

Scientists can only excel when they are aware that information stored, can be freely accessed, used and shared amongst them (Ojedokun and Owolabi, 2003). They therefore will depend on free information resources as these resources are the driving forces to making their research work easy and timely. Furthermore, Ojedokun and Owolabi (2003) opined that free Internet resources are an invaluable tool for collaborative research among academic and research staff. Oketunji (2001) also opined that the functions of Internet and its open access resources have always been to provide a way for academic and scientists to have better and free access to each other as tool to facilitate research. He went on to say that the Internet is the world's most efficient means of communication when compared to other sources. Owolabi and Atama (2007) maintained that research communities in developing countries especially Africa cannot afford to ignore the potentials of the Internet and its open access resources in this global information age. Ruiz, Minitzer and Leipzigi (2006) in their study, stated that many leading Universities and Research Institutions in developed countries make constant use of free electronic resources in their research and have also developed open access repositories to supplement and enhance learning and research. To support this, Kalle and Matti (2006) stated that over the last several decades the use of open access information resources by research scholars in developed countries have improved the quality of research and that scholars' research work are enhanced and knowledge also updated.

According to Tella Jr, Tella, Ayeni, and Omoba (2007), open access electronic resources serve as motivating factors to researchers and students as it provides them the opportunity to transmit, acquire or download, process and disseminate information on any subject of interest speedily. They further stated that open access electronic resources can also be printed and searches saved to be repeated at a later date and that electronic resources are updated more often than printed tools.

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The emergence of open access electronic resources will reposition the scientists to recognize the potentials of computer as a tool to work with and the Internet as a medium to reach out to their colleagues all over the world through their research results or publications. Hence the computer through the Internet makes published literature more accessible and timely. Rahman (2010) stated that with the advent of open access electronic resources, it is possible to recognize the Ranganathan's five laws of library science which stated that resources are for use, every person his or her resource, every resource its user, which saves the time of the user and made the library a growing organism. He therefore declared that technological development in library/research in the 20<sup>th</sup> century via the immergence of free electronic resources was intended to make access to literature more direct, convenient and timely for the user(s), thereby making the library a growing organism and the researchers and others to repeatedly accommodate the changes inherent in the use of constantly changing technology. Omotayo (2010) in his publication stated that free electronic resources like e-journals are mostly valued information communication channel for research. He stated further that with the advent of the Internet and open access resources, research out puts have been more easily accessible.

According to Varghese, Faith and Jacob (2012), Internet has had a growing influence on research and academics as a whole, and that open access electronic resources are now being widely acknowledged as an excellent means to support and aid researchers thereby make their research work easy hence enhance their productivity.

## **Level of awareness of open access electronic resources by scientists**

Open access electronic resources concept is still not widely known among researchers from different geographical localities and research disciplines (Dulle, 2010). Dulle (2010) in reporting the findings of Christian, 2008; stated that open access concept was an unknown issue to many researchers in developing countries. In his analyses, Christian (2008) revealed that open access electronic resources awareness amongst researchers at the university of Lagos were still below average while the majority of the researchers were completely unaware of the existence of open access e-resources. Ouya, (2006), and Utulu and Bolarinwa, (2009) in their various studies, reported that open access electronic resources awareness is below average. According to Swan and Brown (2004), researchers are mostly aware of open access repository than open access journals. Sanchez-Tarrago and Fernandez (2009) in their study have a different view. They stated that researchers are aware of the existence of open access journals and that they equally use these journals to source for scientific literature for their research work. A study by Rowlands and Nicholas (2005) revealed that while North America is ranked second after Europe in terms of awareness of open access repositories while awareness of other open access electronic resources reported to have been low. Similarly, Asia and Africa are among the continents with quite few repositories, but yet the reported level of awareness of open access electronic resources is quite high. The possible explanation of such contradictory findings is that researchers from such continents happen to know open access through accessing free web based information but have little investment in open access repositories for the dissemination of their research outputs. The above observation testifies that existence of



open access electronic resources is still not well understood by the researchers or scholarly community and hence there is need for more awareness campaigns.

## Discussion of Findings

This section presents the findings of this study based on the research questions, using the inputs from the analyzed data collected from the research questionnaire administered to the respondents. The data collected were subjected to descriptive statistics using mean.

### *Scientists' Access to Relevant Scientific Literature:*

**Table 1: Mean Rating of Scientists' Access to Relevant Scientific Literature**

S/N	Relevant scientific literature	Mean	Remark
1	Oral communication and Interactions with colleagues' literature	3.4	HA
2	Correspondences	3.0	HA
3	Seminar and Conference papers	3.0	HA
4	Relevant books and journals	3.0	HA
5	Newspapers	3.0	HA
6	Magazines	2.9	HA
7	Bibliographies	2.9	HA
8	Indexes and Abstracts	2.7	HA
9	Internet	2.5	HA
10	Electronic Journals	1.8	NA
11	Electronic Books	1.6	NA

### **Note: HA means Have Access and NA means No Access**

Table 1 shows the scientists' access to relevant scientific literature in the order of highest accessed to lowest accessed. It is shown that scientists in the agricultural research institutes in Edo State have highest access to Oral communication/Interactions with colleagues' literature (3.4). In other words, the scientists have access to all the relevant scientific literature listed in the table from items 1 – 9. The scientists have low access to electronic journals and e- books, items 10 and 11 with mean scores of 1.8 and 1.6 respectively. Thereby signifies the two items' mean scores are lower than the stipulated accepted range of 2.5. In a nut shell, it shows that the scientists in agricultural research institutes in Edo state have access to relevant scientific literature through oral communication and interactions with their colleagues' literature and traditional library materials only.

### *Scientists' Level of Awareness of Open Access Resources:*

**Table 2: Mean Rating of Scientists' Level of Awareness of Open Access Electronic Resources**

S/N	OAER	Mean	Remark
1	Google	3.91	Aware
2	institutional websites	3.19	Aware
3	free electronic materials	3.09	Aware
4	TEEAL	2.72	Aware
5	HNARI	2.72	Aware
6	e-books	2.69	Aware
7	e-journals	2.62	Aware
8	e-bulletins	2.62	Aware
9	AGORA	2.59	Aware
10	OARE	2.58	Aware

11	free subscriptional websites (e.g. slideshare, scribe, etc.)	2.57	Aware
12	professional blogs	2.43	Not Aware

Table 2 illustrates the scientists' extent of awareness of open access electronic resources. The table shows the mean scores of scientists' extent of awareness of OAER in the order to which they are most aware of to the least awareness. It was observed that the scientists in agricultural research institutes in Edo State are aware of the existence of OAER based on their respective mean scores from 3.91 - 2.57. These listed items have mean scores that are above stipulated 2.5 range and acceptable for (Aware). The same table also shows that the scientists are not aware of OARE as shown in only item 12 with mean score of 2.43. OARE is Online Access to Research in Environment. Therefore, the table revealed that the scientists in agricultural research institutes in Edo state are aware of the existence of open access electronic resources.

## Conclusions

With respect to the findings of this study it is concluded that scientists in agricultural research institutes in Edo State have access to relevant scientific literature through oral communication and interactions with colleagues' literature, and generally have access to traditional resources than electronic resources for research; the scientists are also aware of the existence of Open Access Electronic Resources.

## Recommendations

Based on the findings of this study, the following recommendations were made.

1. Researchers' 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 initiatives are exploited and success achieved by all scientists in research institutes as well as researchers in the tertiary institutions in Nigeria.
2. Government should empower scientists by giving them adequate research funds to enable them acquire ICT equipment like lap tops, Internet modems, generating sets for electricity supply and other gadgets to enable them learn and perfect on the use of Internet and its resources.
3. Information and communication technology (ICT) facilities such as functional Internet services, convenient building to accommodate all the ICT facilities and qualified personnel to teach and assist the scientists should be made available in all research institutes in Nigeria by the Federal government to make the adoption of open access avenues convenient for the scientists.
4. 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 .

## References

- Agricultural Research Council of Nigeria – ARCN (2011) Strategic Plan 2011 – 2020. [www.arcnigeria.org](http://www.arcnigeria.org)  
Accessed 5 January, 2013.
- Christian, G.E. (2008). Issues and challenges to the development of open access institutional repositories in academic and research institutions in Nigeria. A paper prepared for the International Development Research Centre (IDRC).
- Clipart, F. (2012). WordNet 3.0, Fartex Clipart collections, Princeton University, Fartex inc.  
<http://www.thefreedictionary.com/research+scientist>
- Dadzie, P.S. (2005). Electronic resources: access and usage at Ashesi University college, *campus – wide information systems*; 22(5). <http://www.emeraldinsight.com>
- Danis, C. M. (2007). Extending the concept of awareness to include Static and Dynamic Person Information. TJ Watson Research Center, IBM. ACM Symposium on User Interface Software and Technology, New York: 37 - 44
- Dulle, F.W. (2010). An Analysis of open access scholarly communication in Tanzanian Public Universities, unpublished PhD Thesis from University of South Africa.  
[http://uir.unisa.ac.za/bitstream/handle/10500/3684/thesis\\_dulle\\_f.pdf?](http://uir.unisa.ac.za/bitstream/handle/10500/3684/thesis_dulle_f.pdf?)
- Dulle, F.W. & Minishi-Majanja (2010). Researchers' perceptive on open access scholarly communication in Tanzanian public Universities. *New library world*; 106(1210/1211):141-163.
- Fullard, A. (2007). Level of awareness and adoption of open access e-publications by stakeholders in the local research system in South Africa. *South African journal of library & information science*. 73 (1).
- Hawthorne, D. (2008). History of Electronic Resources. IGI Global Distributing Agency.
- Kalle, R. & Matti, A. (2006). A survey of use of electronic scientific information resources among medical and dental students. *BMC Medical Education Journal* 6 (28); p6 – 28.  
<http://www.biomedcentral.com/1472-6920/6/28>
- Lawrence, S. (2001). Access to scientific literature. *In Nature yearbook of science and technology*. (ed. 1); *Butln, London: Macmillan*, p.86 -88.
- Navijyoti, A. (2007). Snapshot of e-journals' adopters (research scholars) of Guru Nanak Development University, *NACLIN*; p.432 - 442.
- Obasuyi, L. (2006). Accessing and Utilizing HINAGOA Resources on the Internet by the Nigeria Institute for Oil Palm Research (NIFOR) Scientists. *An International Journal of Information and Communication Technology (ICT)* 7(1), p.141 – 153.
- Obuh, A.D. & Bozimo, D.O. (2012). Awareness and use of open access scholarly publications by LIS lecturers in Southern Nigeria. *International Journal of Library Science*, 1(4) 2012: 54 – 60.
- Ojedokun, A. & Owolabi, A. (2003). Internet use for teaching and research in Botswana. *African Journal of Library Archives and Information* 13 (1), p.43 – 53.
- Oketunji, I. (2001). Libraries and the Internet connectivity: what benefits?  
<http://www.unilorin.edu.ng/publications/...ICT/pdf>
- Omotayo, B.O. (2010). Access, Use and attitudes of Academics towards Electronic Journals: A case study of Obafemi Awolowo University, Ile – Ife. *Library Philosophy and Practice (e-journal)*.
- Ouya, D. (2006). Open access survey of African-published journal. *INASP infobrief*, 7; June 2006.  
<http://www.inasp.info/pubs/infobrief7-OA-web.pdf>
- Owolabi, K.A. & Atama, A. O. (2007). Level of awareness and use of open access electronic resources in agricultural research institutes in Ibadan, Nigeria. *An International Journal of Information and Communication Technology (ICT)*, 6 (1), p.17 – 23.
- Rahman, R. (2010). Editorial on Managing and accessing electronic resources. *Stocks and Commodities Journal* 18(64) Registered No. DA 1589, Dhaka, Oct. 5, 2010.



- Rowlands, I. & Nicholas, D. (2005). Scholarly communication in the digital environment: the 2005 survey of journal author behavior and attitudes. *Aslib proceedings: Now Information perspectives*, 57 (6), p. 481 – 497.
- Ruiz, J. G., Minitzer, M. U. & Leipzigi, R. M. (2006). The impact of e-learning in medical education. *Academic Medical Journal*, 81 (4); p.207 – 212.
- Sanchez-Tarrago, N & Fernandez-Molina, J.C. 2009. The open access movement and Cuban health research work: an author survey. *Health information and libraries journals*, 27 (1); p.66 – 74. Swan, A. (2006). The culture of open access: researchers' views responses in Jacobs Chandos (New Eds.) *Open Access: Key strategic, Technical and Economics Aspects*. <http://www.eprints.ecs.soton.ac.uk/12428/>
- Swan, A. & Brown, S. (2004). JISC/OSI journal authors survey report. [http://www.iise.ac.uk/uploaded\\_documents/JISCOAreport1.pdf](http://www.iise.ac.uk/uploaded_documents/JISCOAreport1.pdf)
- Swan, A. & Brown, S. (2005). Open access self – archiving: an author survey. <http://eprints.ecs.soton.ac.uk/10999/>
- Utulu, S.C. & Bolarinwa, O. (2009). Level of Open Access Initiatives adoption by Nigerian Academics. *Library Review*, 58 (9), p.660 – 669.
- Varghese, J., Faith, M. & Jacob, M. (2012). Impact of e-resources on learning in biochemistry: first – year medical students' perceptions. *B.M.C. medical education* 12(21). <http://www.biomedcentral.com/1472-6920/12/21>