

# Digital innovation for food security: a case study of the TEEAL programme and its contribution to agricultural research output in African institutions

Michael CHIMALIZENI<sup>1</sup>, Gracian CHIMWAZA<sup>2</sup>, Blessing CHATAIRA<sup>3</sup>, Baseema B. KRKOSKA<sup>4</sup>

<sup>1</sup>*Information Training and Outreach Centre for Africa (ITOCA), Block 12, Lords Office Estates, 276 West Avenue, Centurion, 0157, South Africa*

*Tel: + 27 12 6634062, Fax: + 27 12 6634052, Email: [michael@itoca.org](mailto:michael@itoca.org)*

<sup>2</sup>*Information Training and Outreach Centre for Africa (ITOCA), Block 12, Lords Office Estates, 276 West Avenue, Centurion, 0157, South Africa*

*Tel: + 27 12 6634062, Fax: + 27 12 6634052, Email: [gracian@itoca.org](mailto:gracian@itoca.org)*

<sup>3</sup>*Information Training and Outreach Centre for Africa (ITOCA), Block 12, Lords Office Estates, 276 West Avenue, Centurion, 0157, South Africa*

*Tel: + 27 12 6634062, Fax: + 27 12 6634052, Email: [yimbai@itoca.org](mailto:yimbai@itoca.org)*

<sup>4</sup>*Albert R. Mann Library, Cornell University, Ithaca, New York, 14853, USA*

*Tel: + 1 607 2557317, Fax: + 1 607 2553760, Email: [bb75@cornell.edu](mailto:bb75@cornell.edu)*

**Abstract:** This paper looks at The Essential Electronic Agricultural Library (TEEAL) [www.teeal.org](http://www.teeal.org), an innovative offline database and its impact on research output in agricultural institutions in Africa. The paper also looks at some lessons gathered from 10 years of training and outreach on the system in Sub-Saharan Africa. TEEAL, a project of Cornell University's R. Mann Library in cooperation with over 50 major scientific publishers, societies, and index providers is a digital collection of research journals for agriculture and related sciences. Researchers, students, faculty and librarians can discover and access thousands of full-text PDF articles without the use of the Internet. Through TEEAL, scientists in developing countries now have access to current research but has this access translated to effective research? Several studies were carried out to evaluate whether TEEAL was meeting its objective of contributing to the enhancement of the quality and effectiveness of agricultural research and teaching through improving students' and researchers' access to relevant literature. The studies took various approaches in collecting data including questionnaires, interviews and bibliometric analysis of publications from institutions that have acquired and are using TEEAL. Results generally show that TEEAL is successfully meeting its objective.

## **1. Background**

In the developing world agriculture forms the backbone of most economies and improvement and innovation in research is essential in ensuring food security both in the present and going into the future. However, such innovation depends on a vibrant research community and for such a community to be productive there is need for access to current scientific literature. In the early nineties researchers from Cornell University during their frequent travels to developing countries witnessed non-existent or outdated collections of agricultural journals that were the direct result of shrinking library budgets, inconsistent donor funding and increasing subscription costs<sup>1</sup>. Their concern would eventually lead to a partnership in 1998 between Cornell University's Albert R Mann Library and the Rockefeller Foundation that would see the birth of The Essential Electronic Agricultural Library (TEEAL). This Electronic library or 'library in a box' provides access to scholarly literature in agriculture and agriculture-related disciplines in a zero-bandwidth environment.

The Essential Electronic Agricultural Library (TEEAL) contains the full-text articles complete with graphics and illustrations of over 200 journals spanning seventeen years from 1993 to 2009. An external hard drive that is sold at cost to eligible countries worldwide, TEEAL works on either a standalone workstation or over a Local Area Network (LAN) and is available to 111 of the lowest income food deficit countries (as determined by the World Bank). An important feature of the product is that it does not require Internet bandwidth, although gradually improving, is still limited and expensive in most low-income countries.

## **2. Overview and Problem Statement**

This paper is a review of studies that have been undertaken to assess the uptake and use of TEEAL especially in Sub-Saharan Africa. It aims to answer the question: Has access to current scientific literature in agriculture through TEEAL contributed to improved research and teaching?

### **3. Methodology**

A literature review of 11 original investigations on the utilization of TEEAL was conducted. In addition TEEAL usage data was collected from subscribed institutions via e-mail and telephone requests. Responses were received via e-mail from TEEAL contacts persons at the targeted institutions. To complement this data an assessment was done of ITOCA's TEEAL/Research4Life training workshops evaluation data collected from participants at the end of each workshop. The data was compiled from workshops conducted in various Sub-Saharan African countries during 2010.

### **4. Literature**

The literature review included 11 original investigations published in peer-reviewed journals, 1 monograph and 2 reviews. Most of the literature was obtained through Google searches. A search for 'TEEAL study' in Google returned about 9 500 results, relevant results were ranked in the top 30 of the listings. The initial Google search led to refined searches in other databases such as Emerald-insight and Research4Life products HINARI (Health InterNetwork Access Research Initiative [www.who.int/hinari](http://www.who.int/hinari), AGORA (Access to Global Online Research in Agriculture [www.aginternetwork.org](http://www.aginternetwork.org) and OARE (Online Access to Research in Environment [www.oaresciences.org](http://www.oaresciences.org) .

#### **4.1 Findings**

Four themes stand out from the literature reviewed: Access to quality Agricultural journals through TEEAL has been successfully addressed over the years; TEEAL's Contribution to research and teaching; Acceptance of TEEAL as a Digital Information System and constraints in using TEEAL. These are presented in the sub-sections below.

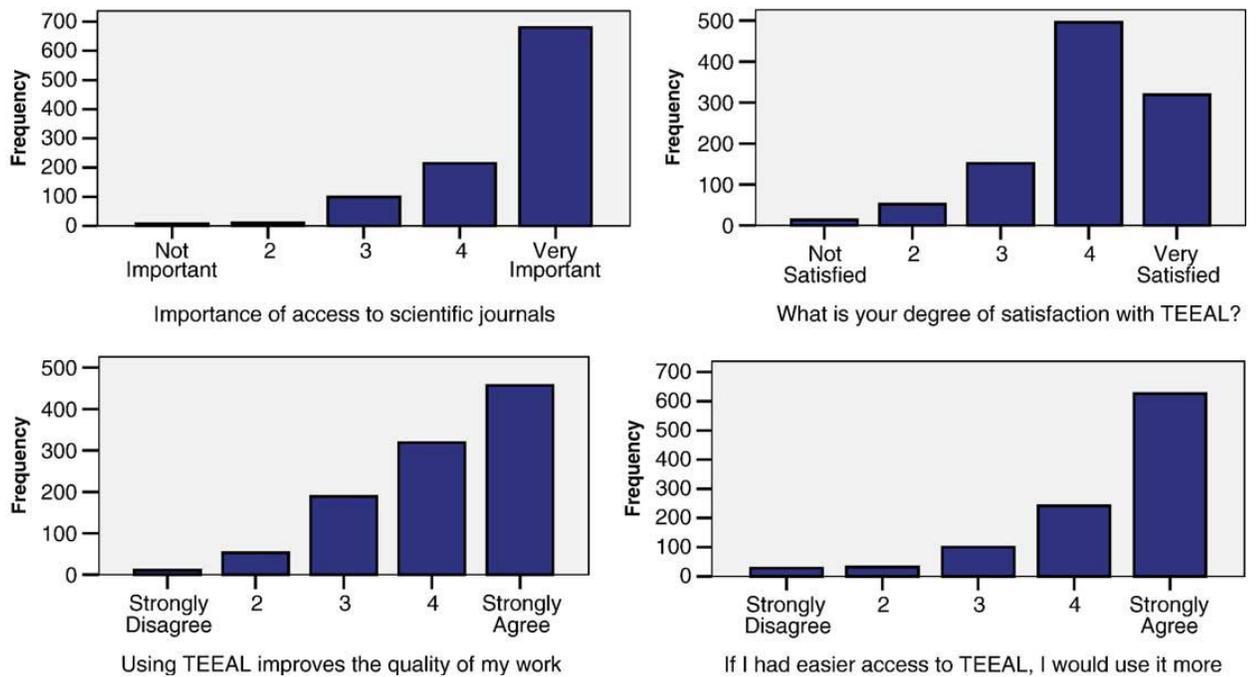
#### **4.1.1 Access to Peer-reviewed scientific literature through TEEAL**

TEEAL has been available to Sub-Saharan Africa and other developing countries for close to 11 years now. Jonathan Harle (2010:9), reporting on a case study of 4 African universities (i.e. University of Nairobi; University of Dar es Salaam; University of Rwanda and Chancellor College at the University of Malawi) access to electronic journals states that using “top-20 ISI ranked journals as a proxy measure, the four universities considered have a journal availability approaching that of major European universities”. Increased access has also been attributed to the training and outreach strategy that has been part of TEEAL’s rollout since 1999. In her review of TEEAL and AGORA, Vent (2005:267) points to, “A key feature of the TEEAL strategy has been outreach and training”. ITOCA has delivered training workshops resulting in over 2500 information professionals, faculty, researchers and students in about 30 Sub-Saharan African countries in the last 11 years being trained in the use of TEEAL. Participants to these workshops continue to increase every year. Other approaches that have been implemented in recent years include pairing institutions with donors that assist in the acquisition of TEEAL sets. Since July 2009 CTA of Netherlands had a small grants support programme that assisted universities and research institutions to acquire TEEAL. To date, over 65 TEEAL sets have successfully been placed at the institutions in ACP countries.

#### **4.1.2 TEEAL’s contribution to Research and Teaching**

In 2004 the Rockefeller Foundation commissioned a user study (Ochs 2005:3) of TEEAL whose objective was to investigate the effectiveness of TEEAL in institutions that had acquired it and ascertain whether access was contributing to research and teaching. The findings from the study show that TEEAL “was meeting its objective of

enhancing the quality and effectiveness of agricultural research and teaching by improving students' and researchers' access to relevant literature". The study included a survey questionnaire of 1384 TEEAL users at 16 institutions in Africa, Asia and Latin America. 80% of respondents said that TEEAL improved their productivity and about 75% agreed that it improved the quality of their work (figure 1). Another study on the impact of TEEAL carried out by Professor A.A. Oduwole (Aduwole 2006:160) at the University of Agriculture, Abeokuta (UNAAB) in Nigeria also gives interesting insights into why researchers and faculty use TEEAL. Collecting data from a sample of 150 respondents using a questionnaire Aduwole reports that the majority 71.2% (n=74) accessed TEEAL for research purposes.(figure 2). Another study conducted at the same university by M.O. Salaam (Salaam 2010:6) confirms that users feel that the quality of their work and research output is greatly improved by virtue of access to TEEAL. 47% answered that they strongly agreed that using TEEAL improved the quality of their work.



**Figure 1.** General satisfaction with TEEAL registered by surveyed users (source: Ochs, 2005)

Purpose	No. of respondents	Per cent
Class assignment	11	10.5
Research purpose	74	71.2
Current awareness	18	17.3
Leisure	1	1
Total	104	100

**Table IV.**  
Purpose for consulting  
TEEAL

**Figure 2.** Purpose for consulting TEEAL (Source: Utilisation and Impact of TEEAL on Library Services In a Nigerian University Of Agriculture (Aduwole, 2006)

#### 4.1.3 Acceptance of TEEAL as Digital Information System

Looking at TEEAL, a recent study by Miller and Khera (2010:1) looked at “factors contributing to adoption of this offline digital library, a tool which can potentially help the dispersal of global knowledge – particularly that of developing world researchers – and create a more vibrant global knowledge community”. The most important finding of this study was that TEEAL’s usefulness in the context of developing countries is the relevance of its content<sup>ii</sup>. A similar study done earlier by Raul Roman (2007:60) concluded that TEEAL’s simplicity and ease of use contributed to its “perceived usefulness” among researchers and students.

#### 4. 1.4 Constraints in Using TEEAL

Oduwole in his study identifies a number of factors that militate against full capacity utilization of TEEAL. He mentions high costs of printing, lack of computer skills, recurrent power shortages and breakdown of equipment as ranking high from the responses gathered. The 2004 TEEAL user study further identifies language barriers (TEEAL journals are mostly in English), limited library hours and lack of database search skills as additional factors limiting the use of TEEAL (Ochs 2005:20). Major inroads have been made in addressing the problem of limited capacity and skill

through the Training of Trainer model, writing on this Chimwaza et al state that, “The cascading effect has been so tremendous, with trained participants carrying out their own training workshops at their institutions”(Chimwaza...*et al* 2010:5). Another factor that may negatively impact on the use of TEEAL is its perceived foreign bias. In her study Salaam found that users “complain that TEEAL offers only a limited number of journals published in Africa” (Salaam 2010:6).

## 5. Data and findings

### 5.1 TEEAL Usage at the institutions

Data collected from subscribing institutions shows the rate of access to TEEAL is mixed. Out of about 40 African institutions only 11 responded with usable data (see Table 1). The data shows access to TEEAL varies depending on size of institution and location, the lowest being 1 time per year and the highest 606 times a year. One has to take into account down times due to technical glitches and power outages which often leads to loss of usage statistics for other periods of time. The usage statistics also show a variety of subjects being searched for in TEEAL from genetic diversity in plant species to poultry farming in Malawi.

**Table 1: TEEAL Usage Statistics 2010**

Institution	No. of Times Accessed in 2010
Ahmadu Bello University	376
University Of Zimbabwe	606
Forestry Research Institute- Ghana	65
NUST- Zimbabwe	47
CSIR- Ghana	14
Africa Rice Centre - Benin	13

University of Ghana	9
Egerton University Kenya	6
Uganda Martyrs University	5
AGRIS Resource Centre Sudan	1
Sokoine University of Agriculture Tanzania	1

## 5.2 TEEAL/Research4Life Training Workshops

From January to December 2010, 577 participants attended ITOCA’s National TEEAL/R4L programs training courses in Sub-Saharan Africa. Included in these courses were modules on the use and manipulation of TEEAL. In pre-assessment surveys carried out to ascertain individual skill and experience the majority indicated that they had previous knowledge of TEEAL. This shows that TEEAL has a considerable presence in major centers of study and research in Africa. Trend analysis shows an increase in the number of professionals taking part in these training workshops. For example in 2009, 289 people were trained. This figure doubled in 2010 to see 577 people taking part in TEEAL/R4L training workshops.

Most studies that were reviewed confirm that access to current journals through TEEAL is enhancing research and teaching in universities and other institutions. The foremost study to confirm this was the TEEAL User Study of 2004. The TEEAL User Study included a survey questionnaire of over 1384 TEEAL users at 16 institutions in Africa, Asia and Latin America. Almost 80% of respondents said that TEEAL improved their productivity and about 75% agreed that it improved the quality of their work. A case study by Oduwale at the University of Agriculture Abeokuta Nigeria shows similar findings. 74 out of 104 respondents said that they consulted TEEAL primarily for research purposes.

## **6. Conclusion**

This paper demonstrated that issues of access and capacity to use TEEAL in developing countries have been addressed progressively over the years. This improved access and capacity has logically resulted in enhanced research and teaching. Studies conducted at various stages also confirm that TEEAL is achieving its main objective. However there are also factors that are limiting the maximum utilization of TEEAL with erratic power supply in developing countries and high cost of printouts being major challenges.

Extended use of TEEAL can be achieved by making it platform independent. The current situation means that only institutions with Windows based servers and workstations can have access to TEEAL. Making it compatible to other Operating Systems like Apple and Mac will increase its user-base thereby benefiting more researchers and students. More Journals from developing countries must also be included in TEEAL sets as a way of further enhancing its appeal to a wider audience.

## References

---

Chimwaza, G, Nyareza S and Hungwe V. 2010. *ICT User skills building and the possibility of incorporating intelligent content in Research4Life programmes in Sub-Saharan Africa*. Pretoria: IST Africa.

HARLE, Jonathan. 2010. *Growing knowledge: access to research in East and Southern African Universities*. London: ACU.

Miller, J And Khera, O. 2010 Digital library adoption and the Technology Acceptance Model: a cross-country analysis. *EJISDC*. Vol. 40(6):1-19.

Ochs, Mary. 2005. *TEEAL (The Essential Electronic Agricultural Library): a user study*. New York: Cornell University.

Oduwole A.A and Sowole A.O. 2006 Utilisation and impact of The Essential Electronic Agricultural database (TEEAL) on library services in a Nigerian university of agriculture. *Program: electronic library and information systems*. 40(2): 157 – 167.

Roman, Raul. 2007. User acceptance of a digital library system in developing countries: an application of the Technology Acceptance Model. *Paper presented at the annual meeting of the NCA 93rd Annual Convention, TBA, Chicago, IL*.

Salaam, M.O. 2010. *Awareness and utilization of The Essential Electronic Agricultural Library by academic staff: a case study of University of Agriculture, Abeokuta, Nigeria*. Abeokuta: UAA.

VENT, Olivia. 2005. TEEAL and AGORA: improving access to agricultural journals in low-income Countries. *Serials Review*. 31(4): 267-269.