	Date : 06/06/2007
	Building Science Information Fluency In African Universities: How Libraries And Researchers Are Benefiting From Improved Access To Science Scholarship
	Edda Tandi Lwoga[1] **Gracian Chimwaza**[2] **Barbara Aronson**[3] **Olivia Vent**[4]

Meeting:	**87 Science and Technology Libraries**
Simultaneous Interpretation:	No

Introduction

The knowledge gap between rich and poor must be bridged if poverty is to be reduced. Access to information is an essential component in strengthening local teaching and research, improving local medical and agricultural practices, and empowering local experts to find solutions to local health, environmental, social, economic, and food issues, and supporting government officials to make informed decisions and formulate sound policies (5Aguolu 1997; WHO 2006). The recent revolutions in information and communication technology (ICT) have opened up an opportunity for addressing information poverty (Katikireddi 2004).

As this paper demonstrates, thanks to initiatives such as TEEAL, AGORA, HINARI and most recently OARE, which provide free or low-cost journals to developing countries, information poverty is no longer the challenge it used to be.

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[1]Librarian, Sokoine National Agricultural Library, Sokoine University of Agriculture, Morogoro, Tanzania.

[2] Director, Information Training and Outreach Centre for Africa (ITOCA), Harare, Zimbabwe and Pretoria, South Africa. ITOCA coordinates all AGORA, HINARI, OARE and TEEAL training at African universities and research organizations. http://www.itoca.org/

[3] Programme Manager, HINARI, World Health Organization, Geneva, Switzerland. The HINARI Program provides financial support to and collaborates with the ITOCA office to carry out national training workshops.

[4] TEEAL/AGORA Outreach Coordinator, Albert R. Mann Library, Cornell University, USA

According to external evaluations of TEEAL, AGORA and HINARI (TEEAL User Study 2004; Scott Report 2006), these programs are:

- Strengthening the intellectual foundation of universities, enabling faculty to perform research on a par with peers in industrialized countries, develop their own publishing record, and enabling students to conduct research and seek education in new and emerging scientific fields;

- Leading to more science-driven public policies and regulatory frameworks;

- Building the capacity of organizations to gather and disseminate to the public new scientific knowledge in the medical, agricultural and environmental sciences and deliver improved services;

- Increasing the participation of developing-country experts in international debates;

- Increasing patronage of libraries at universities and enhancing the status of libraries.

The major challenges now are to ensure that the programs and content are used to their fullest extent, which involves not only an adequate ICT infrastructure with computers, Internet connectivity and good bandwidth, but also training of librarians, users, and integration of the content in university curricula.

1. About TEEAL, HINARI, AGORA, OARE

Cornell University's Mann Library pioneered the way for electronic scientific journal delivery when it developed TEEAL (The Essential Electronic Agricultural Library) [www.teeal.org] in 1998-1999. TEEAL is a self-contained collection of over 145 scientific journals from 68 major publishers spanning 1993-2005. Its content was specifically selected in consultation with 600 agricultural experts around the world for relevance to low-income countries. Initially, because the Internet's penetration in the developing world was minimal, the collection was stored on CDs, as this was a robust system most universities and research organizations could use in the late 1990s. More recently, the "Library in a Box" has been compressed onto an external hard drive that can be connected to a Local Area Network (LAN). TEEAL was developed with grant support from the Rockefeller Foundation. Since the first TEEAL set was purchased by the University of Zimbabwe in January 1999, 164 CD and LanTEEAL sets have been acquired by 135 institutions in 55 countries.

TEEAL, which enlisted the cooperation of major publishers to provide their content for free, paved the way for the next generation of Internet-based journal delivery programs:

- **HINARI** (HINARI Access to Research Initiative) [www.who.int/hinari], launched in 2002 under the leadership of WHO, provides free or low-cost access to journals and key databases in health, medicine, and related biosciences;
- **AGORA** (Access to Global Online Research in Agriculture) [www.agInternetwork.org], is a sister portal led by the Food and Agriculture Organization (FAO), and went live in October 2003;

- **OARE** (Online Access to Research on the Environment) [www.oaresciences.org], focuses on the environment and was developed under the leadership of United Nations Environment Program (UNEP). It was launched October 2006.

Collectively, these programs make available to 113 of the poorest countries around the world for free or at very low-cost ($1000/yr) about 4500 journal titles. This collection, with an estimated annual market value per institution of US$4.5 million, includes approximately 75% of the world's most influential and widely cited scientific publications in the target disciplines, representing the intellectual foundation of the global health, agricultural and environmental science communities. The objective of these initiatives is to level the playing field in access to scientific scholarship in low-income countries, so that they are better equipped to solve their own problems in these sectors, leading to more likely achievement of the United Nations Millennium Development Goals (MDGs), more equitable participation in global research fora, and greater South-North and South-South collaboration.

These programs build on recent developments in academic publishing and library services, particularly the shift from print to electronic journal publishing (Aronson 2003). Over the past five years, they have emerged as important and unique international public/private partnerships involving the three United Nations agencies noted above, the world's major science, technology and medical (STM) publishers and Cornell University and Yale University as major stakeholders. Founding publishers include such industry leaders as Elsevier, Springer, John Wiley, BMJ Publishing Group, Nature Publishing Group and others. There are presently over 120 publishing partners from more than 15 countries, including a number of publishers from developing countries. They include commercial and not-for-profit publishers, university presses, academic society publishers and associations such as the American Association for the Advancement of Science (AAAS) and U.S. National Academy of Science.

1.1 Use
So far, the programmes have been successful in enabling access to high-quality, timely, relevant scientific information at affordable prices to the developing countries in the area of agriculture, health and environment (Aronson 2003; Wu and Ochs 2007). As of May 2006 there were 750 institutions registered for AGORA in 64 countries. The top seven countries with the most institutions registered were: Viet Nam (69), Nigeria (68), Tanzania (44), Bangladesh (42) Ghana (35), Ethiopia (33) and Kenya (30). Over half of the institutions registered for AGORA are located in Africa. As of May 2007, 2170 institutions from 107 countries were registered for HINARI: 1750 in Band 1 countries, which get free access and 850 in Band 2 countries, which have slightly higher incomes and institutions are required to pay an annual subscription fee of $1000.

Universities, teaching hospitals and research institutes represent the major users of AGORA and HINARI. On average in 2006, over 230,000 full-text articles in PDF files were downloaded from HINARI each month by institutions in Band 2 countries. The monthly average for Band 1 countries for 2006 was nearly 99,000. AGORA,

available only to Band 1 countries until autumn 2006 (when AGORA Band 2 was launched) recorded about 20,000 articles downloaded monthly.

1.2 Impact

Although usage statistics and anecdotal evidence strongly indicated that AGORA, HINARI, and TEEAL were becoming essential tools for research, education and even for formulating public policy, this was confirmed by two separate studies in 2004 and 2006. In 2004, Mann Library, with funding from the Rockefeller Foundation, carried out a TEEAL User Study to evaluate whether 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 TEEAL User Study included a survey questionnaire of over 1000 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 (TEEAL 2005).

In 2005, the HINARI-AGORA Partners commissioned an external evaluation of HINARI and AGORA (OARE had yet to be launched), to understand whether the programs were beginning to have some impact and to identify aspects that needed to be strengthened or changed for the programs to be more effective. The Usage and Infrastructure (Partners) Reviews, one looking at user satisfaction and the other addressing partners' satisfaction, were largely funded by the UK's Department for International Development (DFID). Although the reviews offered many suggestions for ways to improve uptake and enhance effectiveness of the programs, the overwhelming message was that *"users and librarians perceive access to the journals in AGORA and HINARI as one of the most valuable resources at their disposal"* and strongly urged that the programs be continued and expanded (Scott 2006). As a result, the HINARI-AGORA Partners agreed at their annual meeting in 2006 to extend HINARI, AGORA and OARE through 2015 to coincide with the timeframe for the MDGs. This is a significant contribution on the part of the publishing community and gives users the assurance that the content will be freely available for some time.

In addition to demonstrating the growing reliance of students on AGORA and HINARI as their principal research tool for thesis or dissertation writing (Scott 2006), the reviews traced the impact of the programs to improvements in university curricula, the accreditation of advanced-degree programs, the development of national policies, and in the case of HINARI, enabling the introduction of evidence-based medical interventions and policy in Africa. A particularly interesting example cited in the evaluation was the role HINARI played in shaping malaria prevention policies in Tanzania. Based on literature searches through HINARI, Tanzanian scientists were able to compare reports about bed net programs in China, India and Vietnam. Using this data, they recommended that the government promote local production of bed nets instead of reducing or removing import taxes on foreign-made bed nets as a way to increase the availability of bed nets. As a result, not only is Tanzania now realizing the medical benefits of increased use of bed nets, they have found a way to provide job opportunities and stimulate the national and local economies of the country (Scott 2006).

In another example from Tanzania, researchers from the Tanzanian National Institute for Medical Research (NIMR), which has a mandate to advise the Government of Tanzania on national health policy issues, have used information from HINARI to influence anti-malaria drug policy in Tanzania. NIMR drew on research evidence from HINARI journals to convince the government in 2006 to replace the first-line drugs for treating malaria from chloroquine and sulfadoxine-pyrimethamine to a combination therapy, artemether lumefantrine.

The report also found that by improving access to information, AGORA and HINARI have made it possible for academicians and researchers to interact and compete with their counterparts in the developed world. For example, access to papers available through HINARI made it possible for a research institute in Uganda to present 10 papers at the XVI International AIDS Congress in Toronto in 13-18 August 2006 (Scott 2006). And, by having access to current and high quality journals, African scientists have got a much better chance to reduce the "publishing gap" by improving the quality of locally produced journals and also to publish internationally, as they now can write based on up-to-date knowledge about their field (Aronson 2003; Aronson 2005).

Finally, TEEAL, HINARI and AGORA have enhanced the capacity of libraries, particularly in sub-Saharan African countries, by increasing the demand for the library services, expanding the client base, improving information literacy, and raising the profile and perceived value of the libraries and librarians (Scott 2006). The second part of this paper will provide some concrete examples of how TEEAL, AGORA and HINARI have been changing libraries, library services and how scientists and students carry out their work.

1.3 Constraints
As might be expected the evaluations of TEEAL and AGORA/HINARI also revealed important constraints or problems. On the technical side, it was entirely expected that usage is largely dependent on availability of computers, printers, paper and toner, Internet-connectivity and adequate bandwidth to handle large PDF article files. However, regardless of the high cost of ICT facilities, the content available through TEEAL, AGORA, HINARI and OARE offers a powerful rationale for campuses seeking to improve their technical infrastructure (Wu and Ochs 2007). Some institutions are using their eligibility of HINARI/AGORA to solicit funds for the improved ICT infrastructure from governments and donors (Aronson 2004; Katikireddi 2004). The reviews also noted the strong connection, particularly, in Africa between use and training and urged for substantially more investment in training. The role of training is elaborated in the third section of this paper.

How libraries and researchers are benefiting from improved access to science scholarship

2. African Libraries and TEEAL, AGORA and HINARI: SUA's Experience
Experiences at Sokoine University of Agriculture (SUA) in Tanzania mirror many of the exciting changes brought about by access to TEEAL, AGORA and HINARI but also the frustrations of institutions and scientists in sub-Saharan Africa.

Despite the rapid developments of ICTs, information poverty has traditionally dominated most African countries. The majority of researchers and academics were deprived from accessing the key research literature that is found mainly in expensive journals published in the developed countries. Other difficulties were that of getting their own research published (Aronson 2004; Long 2003), keeping up with advances in science and technology, updating their teaching curricula, and finding funding. Research efforts were duplicated, energies wasted and researchers were cut off from scientific developments (Wu 2003).

This was largely due to reduced library budgets, which could not cope with the enormous increases of journal costs and inadequate and expensive distribution mechanisms (Arunachalam 2003; Bergman 2006; Nyika 2006). Journal subscriptions usually increase in price between 11% and 16% every year, which is beyond the reach of many institutions in Africa (Nyika 2006). As a result, most African libraries still had small, old, incomplete collections, and most scientists did not have access to quality published literature.

For example, by the time SUA's library, the Sokoine National Agricultural Library (SNAL), started to acquire free access to science scholarship from HINARI, AGORA, TEEAL, OARE and other international initiatives, the library was subscribing to very few core journals in agricultural related subjects due to financial constraints. However, even these subscriptions to hard copy materials were finally stopped due to the inadequate funding.

Currently, the library depends entirely on access to science scholarship through HINARI, AGORA, OARE and other free initiatives such as INASP/PERI and other open access databases. The TEEAL, HINARI, AGORA and OARE programs have enabled access to diverse kinds of health, agriculture and environmental information, including things that were never found in the library in the traditional sense.

2.1 Strategies to increase the usage of e-resources at SUA

SUA promotes the TEEAL, AGORA, HINARI and OARE programs through information literacy (IL) training programs and posted announcements on notice boards and SUA email discussion groups that connect scientists and researchers within the university.

To ensure that students and academic staff acquire relevant information searching skills that will enable them to use TEEAL, AGORA, HINARI and OARE and other online databases effectively, SNAL conducts information literacy programs. These are conducted because of the following: (1) Lack of understanding among stakeholders of what information literacy is; (2) Little involvement of stakeholders in introducing the IL program into the university curriculum; (3) Change in leadership of head of department hosting the communication skills course which used to offer IL between 2000 and 2001; (4) Librarians were not aggressive enough to continue efforts that were initiated; (5) It was not officially recognized within academic framework of the university (Dulle and Lwehabula 2004).

These informal IL programs are conducted on a short-term basis to post-graduate students and academic staff. The postgraduate students programs are always conducted at the beginning of each academic year. Post-graduate (Masters and PhD) students are normally notified about the IL programs through announcements on

notice boards. Although these IL programs are conducted informally, the response from the students and academics has been progressively high. For example, during the period of October and December from 2005 to 2006, the library was able to train more than 100 post-graduate students in the university.

In collaboration with the university management, SNAL also organizes IL workshops for academic staff and researchers. For example, three IL workshops were conducted between November 2005 and March 2006 to junior academic staff in collaboration with the SUA Bureau for Agricultural Consultancy and Advisory Services (BACAS) at the university. At the end of each IL course, most of the library users were excited about being able to access information they could not get hold of prior to the IL training. In addition, IL online tutorials and compendia have been put on the SNAL website to allow library users to acquire information search skills on a self- learning basis.

There is also a proposal by SNAL and the University Computer Centre on ways to incorporate IL in the university curriculum so that the undergraduate students can also acquire the necessary information searching skills. Currently, curriculum review is going on and there are signs that the proposal will be implemented in the university.

In this way, the information accessed from TEEAL, AGORA, HINARI and OARE programs is leading to improvements in teaching and research at African universities, including those in Tanzania. For example, some of the lecturers consulted at SUA commented that they rely mostly on TEEAL, AGORA and HINARI to update their lecture notes, and to direct students to use those sources for further reading. Information accessed from these programs has enabled researchers at SUA to write and plan their projects on the basis of the current state of the art in their disciplines and, consequently, avoid duplication of efforts.

As noted earlier, free or low-cost journal access through TEEAL, HINARI and AGORA has had a positive impact on the role and perceived value of the libraries and librarians in Africa. For example, at SUA 30 computers are fully used for information searches in the library. In the period between 1st July, 2006 and 31st December, 2006, a total of 6,555 library patrons were recorded for searching information online in the computer lab. This is an average of 1093 patrons per month (36 patrons daily). Unfortunately, most of the students indicated only different kinds of CD-ROM they used, without indicating other online databases they utilized to access information. So the usage of online databases could not be established. Registration of post-graduate students for the short-term IL programs at SNAL has been progressively high since their inception in 2005 due to the good quality of IL instructions provided by the librarians. The ITOCA training workshops, which will be described in the following section, have helped significantly to upgrade the IL instructions librarians provide to the university community.

2.2 Continuing problems
In many African countries including Tanzania, Internet access is slow, unreliable and prohibitively expensive. This continues to be a major problem for the uptake of HINARI, AGORA and OARE in these countries. For example, Internet costs for the National Institute for Medical Research (NIMR) in Tanzania range from $5800 for the bandwidth of 512 Kbps Uplink and 1024 Kbps Downlink to $3062 for the bandwidth

of 256 Kbps Uplink and 512 Kbps Downlink per annum. SUA's bandwidth is as low as 128 kbps uplink and 256 kbps downlink. A meeting between SUA and ASARECA[5] staff in 2004 revealed that most users at SUA complained about spending a lot of time only to download one article. That is why they do not intensively access and use e-resources.

At the same time, most of the African institutions have inadequate ICT facilities such as computers, peripherals and supplies (workstations, printers, paper, toner and electric generators for backup supply). SUA has about 320 computers in total. The current ratio of computers to academic staff at SUA stands at 1:1, while the computer ratio to students stands at 1: 40. A lot needs to be done to improve the access of computers to the students.

Information culture in African universities and research institutions remains low despite of all the efforts by libraries to conduct more IL training. Low usage of e-resources is mainly contributed by the limited information searching skills among scientists in Africa. In Tanzania, Busagala and Msuya (2002) reveal that 72.5% academicians, researchers and graduate students of both SUA and the University of Dar es Salaam acknowledged that they do not know how to formulate information queries, while only 27.5% knew phrase and possibly Boolean query formulations. This establishes a need not only to strengthen the ICT infrastructure but also for librarians and institutions to step up training and awareness programs to the scientists for the wider usage of e-resources in Africa.

Inadequate access to local content is an additional problem that most scientists face in the African countries when using TEEAL, HINARI, AGORA and OARE programs. Researchers consulted at SUA and National Institute for Medical Research (NIMR) in Tanzania indicated a need for these programs to incorporate more core journals from the developing world so that they can access information from their own peers. This means strengthening local African publishers as well as motivating African scientists to publish in the international journals. Otherwise, African scientific scholarship will remain invisible to the global community. For instance, it was revealed that only 8.28% of articles on animal health published on the web were about Africa or in Africa (Lwoga and Sife 2007).

Despite Internet and other technological problems, HINARI, AGORA and OARE are important e-resources in most of sub-Saharan African countries. For instance, at SUA, to compensate for the low bandwidth (i.e. 128 kbps uplink and 256 kbps downlink) users search and download articles from HINARI, AGORA and OARE during late hours in the evening or very early in the morning when everybody else is not using the Internet.

Further, until the establishment of functional and reliable Internet connectivity, researchers and libraries will continue to obtain important benefits from using TEEAL (Hesse 2003). In fact, the provision of agricultural research information via TEEAL (through CDROM and Local Area Network), has enabled the scientists to access scientific information when Internet connectivity is too slow or unavailable in most of

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[5] ASARECA stands for Association for Strengthening Agricultural Research in Eastern and Central Africa.

the African countries. For instance, most researchers at SUA prefer to access information from TEEAL during the day when Internet connectivity is too slow or not available to access the online journals from AGORA and other online databases.

Adding to technological problems, lack of or retention of trained library staff is another problem which hinders the usage of e-resources in African universities and research institutes (Rosenberg 2006, Scott 2006). The insufficient human resources is widely contributed by the lack of trained IT professionals, lack of awareness on the part of librarians, faculty and administration and lack of training opportunities in using HINARI and AGORA and electronic information resources in general (Scott 2006).

Even when Internet and other technological facilities are available, developing an information culture in institutions that access TEEAL, HINARI, AGORA and OARE is still crucial (Ochs, Aronson and Wu 2004). Thus, librarians and institutions need to significantly increase their training and awareness programs to the scientists for wider usage of e-resources in Africa.

3. Information Literacy and the Importance of Training

As noted in the previous two sections, simply having access to a resource does not guarantee its use. Outreach and training are critical complements. For this reason, the TEEAL Project made training a high priority from the start in 1999. It opened a small outreach and training office in Harare, Zimbabwe, which trained almost 1000 librarians, students and scientists on using TEEAL from 1999-2003. The TEEAL User Study clearly demonstrates the critical connection between training and actual use (TEEAL 2005).

AGORA and HINARI built on the TEEAL model and have pursued an active, collaborative, cross-sectoral training program in Africa. Coordinating these efforts is the Information Training and Outreach Centre for Africa (ITOCA), formerly the TEEAL Africa Office [http://www.itoca.org/]. Backstopping is provided by Cornell, FAO, WHO, publishers and donor organizations.

The training model, which has proved to be very successful, focuses on reaching trainers. The ITOCA Train-the-Trainer workshops are intensive 3-4 day programs that accommodate about 30 participants from the agricultural and health sciences, and include a mix of library professionals and senior researchers. The national workshops are organized in partnership with a local major university or research institute. Basic training familiarizes librarians and researchers not just with the core programs and their major features (how to find articles, journals, browse and search), but also introduces other important electronic resources and builds skill and confidence in teaching others about them. They are accompanied afterwards by troubleshooting help from ITOCA, training CDs, Powerpoint modules, posters and brochures to support the training activities of the participants.

Since April 2004, ITOCA has conducted 22 workshops in 18 countries and trained a total of 603 participants. Nineteen of the workshops were held in English and two were conducted in French in French-speaking countries. The regional workshop in Mozambique for Lusophone countries was conducted in Portuguese. Three workshops took place in West Africa and the rest in Eastern and Southern Africa.

Over 600 librarians and researchers from about 250 institutions attended and completed the 22 national workshops. Over one-third of the participants were women. Based on follow up surveys, over 65% of the participants who attended workshops returned to their institutions and proceeded to train colleagues in the use of these resources. This means that roughly another 5,000 people were trained to use AGORA and HINARI. After each workshop, registrations for AGORA and HINARI and article downloads in the respective country increased.

Feedback collected after each workshop has been uniformly positive, demonstrating that the training has helped improve librarians' and researchers' skills in using electronic journal content. Since ITOCA workshops focus not only on skill building for use of the AGORA and HINARI resources, but also on learning to teach workshops in attendees' home institutions (Wu and Ochs 2007), the programs strengthen the function of libraries and librarians. Librarians improve their ability to provide Information Literacy instructions to researchers, academicians and students in their respective institutions.

Librarians have indicated that patronage has greatly improved as users become familiar with the availability and use of e-resources, especially people doing research and students conducting literature reviews. Further, the library network is also experiencing more traffic as patrons come to get access to the computers and Internet services. Whereas previously, libraries were limited in terms of what they could offer users in resources and knowledge, now they can train them in the use of TEEAL, AGORA and HINARI. The ITOCA training workshops to the library professionals and scientists have also increased the integration of the accessed information from HINARI and AGORA into the university curriculum and teaching in African countries.

ITOCA's training programmes have contributed to encouraging universities and research institutions to further invest in ICT training particularly in information literacy for their researchers, lecturers and students.

The current training activities in sub-Saharan Africa are largely funded by the Rockefeller Foundation, DFID, CTA, the HINARI Program (through subscription fees paid by Band 2 institutions) and Cornell University. The AGORA-HINARI-OARE Partners are currently seeking additional donor support to expand the training programme.

4. Conclusions and Recommendations

The assimilation of scientific and technological information is an essential precondition for progress in developing countries (UNESCO 1982:157). On the whole, TEEAL, AGORA, HINARI and OARE provide better access in developing countries to science scholarship. As their use at universities, hospitals and research centers increases, their impact on improved sustainable agriculture development, public health and health care delivery and environment conservation will accelerate. Nonetheless, in sub-Saharan Africa as elsewhere, it is important to keep in mind that improvements in these sectors are influenced by many other factors, which also need to be addressed. Some of the problems in the health sector include poor health services infrastructure, poor nutrition, lack of clean water, and poor sanitation, armed

conflict, drought, and political corruption (Aronson 2004). In agriculture, attention is also required to the structural changes, land tenure, planning, extension principles, credits and marketing, price controls, parastatal monopolies and overstaffed bureaucracies, lack of political and economic freedom and infrastructure (Makings 1967; Southgate and Graham 2006). Exacerbating environmental problems in sub-Saharan Africa are air and water pollution, deforestation, loss of soil and soil fertility, and a dramatic decline in biodiversity throughout the region (EIA 2003).

However, inadequate funds to acquire and maintain ICT infrastructure together with the deficiency or problems in retention of trained library staff continue to be the main challenges in Africa. Continued international donor support, in terms of training and science scholarships remains crucial, though ways have to be found to strengthen the ICT infrastructure for the wide usage of these e-resources.

Given the demonstrated impact on education, research and libraries themselves, we urge the international library community to think creatively and collaboratively about how to support these programs. One idea might be the following. Despite the modest $1000/yr fee for an AGORA or HINARI subscription, many institutions still cannot find budgets to cover that fee. Perhaps university libraries in North America, Europe and Oceania could sponsor one low-income university library and cover their subscription. Fees collected from Band 2 subscriptions are invested directly into training activities. The AGORA-HINARI Partners are working to expand the base of donor support for the programs, however, this kind of distributed support would not greatly tax most US library budgets and would immediately increase the number of institutions having access to AGORA and HINARI. Presently, institutions get a 3-month free trial period after which they are invoiced for the $1000. At HINARI we have found that only 20% of institutions are able to pay the fee and renew their annual subscription. With usage in Band 2 countries almost 10-fold that of usage in Band 1 countries due to the greater availability of IT infrastructure, this is a major opportunity that we should not lose.

Another criticism of the programs has been that more efforts are needed to increase better access to the scientific research produced in developing world. Thus, efforts should be made to strengthen local African publishers, drawing on the journals in TEEAL, AGORA and HINARI. Those of us working in these programs are also looking for ways to increase the content of local and regional journals in AGORA and HINARI without undermining their sales base.

References
Aguolu, I. E. 1997. Accessibility of information: a myth for developing countries? *New Library World* 98(1):25-29.

Aronson, B. 2003. World Heath Organization: forty new countries given low cost access to health journals. <www.who.int/mediacentre/releases/2003/pr3/en/print.html> 26 March 2007.

Aronson, B. 2004. Improving online access to medical information for low-income countries, *New England Journal of Medicine*. 350(10):966-968. < http://content.nejm.org/cgi/reprint/350/10/966.pdf> 27 March 2007.

Aronson, B. 2005. Journal access programs? for developing countries: who has access to what, and does it work? Paper presented at the 28th UKSG Annual Conference and Exhibition from 11th - 13th April 2005 at Heriot-Watt University, Edinburgh. <http://www.uksg.org.uk/presentations5/aronson.ppt> 26 March 2007.

Arunachalam, S. 2003. Information for research in developing countries – information technology: a friend or foe? *International Information and Library Review* 35(2-4): 133-47.
Bergman, S. S. 2006. The scholarly communication movement: highlights and recent developments. *Collection Building* 25(4):108-128

Busagala, L.S.P and Msuya, J. M. 2007. Awareness and skills of the Tanzanian researchers about scientific literature searching on the Internet, *The South African Journal of Clinical Nutrition* 15(2):18- 22

Dulle F.W. and Lwehabura, M.J.F. 2004. User information literacy: Challenges of facing university libraries towards effective implementation. Paper presented at the 6th standing conference of African national and university libraries. 30th June 2004 – 3rd July 2004, Kampala, Uganda.

Energy information administration (EIA). 2003. Sub-Saharan Africa: environmental Issues. <http://www.eia.doe.gov/emeu/cabs/subafricaenv.html> 26 March 2007.

Hesse, E. 2003. Assessment of the readiness of libraries in Uganda, Kenya, and Ethiopia to access online scientific information resources (particularly AGORA). <http://www.ciat.cgiar.org/biblioteca/Documentos/Africa28aug03.pdf> 16 March 2007.

Katikireddi, S. V. 2004. HINARI: bridging the global information divide. *BMJ* 328: 1190-1193. < http://www.bmj.com/cgi/content/full/328/7449/1190> 16 March 2007.

Long, M. 2003. Bridging the knowledge gap: the HINARI program. *The Biochemical Society*. <http://www.biochemist.org/bio/02506/0027/025060027.pdf> 17 March 2007.

Lwoga E. T and Sife, A. S. 2007. African web-based animal health information: analysis of online databases. *University of Dar es Salaam Library Journal* 9(1).

Makings, S. M. *Agricultural problems for developing countries in Africa*. Lusaka: Oxford University Press.

Nyika, E. 2006. Development of an African marine science repository for electronic publication OdinPubAfrica: experience of the Institute of Marine Sciences, University of Dar es Salaam, Tanzania. Paper presented at the Open Repositories 2006 Conference, 31 January–3 February, 2006, Sydney. <http://www.apsr.edu.au/Open_Repositories_2006/edna_nyika.ppt> 13 March 2006.

Ochs, M., Burge, P., Chimwaza, G., Dauphine, N. and Joos, N. 2002. TEEAL Internet readiness survey report.
< http://info.worldbank.org/etools/library/latestversion.asp?39538> 7 April 2007.

Ochs, M. Aronson, B. and Wu, J. 2004. HINARI and AGORA: revolutionizing access to scientific information in the developing world. *Serials* 17(2):175-182. <http://uksg.metapress.com/media/d86tgdpafp4trnd01aak/contributions/d/0/p/k/d0pkwck9clh589vc.pdf> 13 March 2007.

Rosenberg, D. 2006. Towards the digital library in Africa. *The Electronic Library* 24 (3): 289-293

Scott, J. C. 2006. HINARI/AGORA Usage Review. Unpublished report. Arlington: Center for Public Service Communications.

Southgate, D. and Graham, D. 2006. *Growing green: the challenge of sustainable agricultural development in Sub-Saharan Africa*. London: International Policy Press. <http://www.sdnetwork.net/files/pdf/growing-green-final.pdf> 14 April 2007.

TEEAL [The Essential Electronic Agricultural Library]: A User Study. Report to the Rockefeller Foundation. 2005 Prepared by Mann Library, Cornell University. http://www.teeal.org/userstudy.pdf

United Nations Educational, Scientific and Cultural Organization (UNESCO). 1982. Draft medium-term plan (1984-1989), second part, VII, information systems and access to knowledge. General Conference, 4th Extraordinary Session, Paris.

World Health Organization (WHO). 2006. Access to the world's leading journals. <http://www.who.int/hinari/Hinari%20Agora%208pp%20English%20leaflet%20FINAL.PDF> 13 November 2006.

Wu, J. 2003. The FAO David Lubin Memorial Library, AGORA and information for developing countries. 2003 Round table on developing countries access to scientific knowledge, The Abdus Salam ICTP, Trieste, Italy <http://www.ejds.org/meeting2003/ictp/papers/Wu.pdf> 13 March 2007.

Wu, J. and Ochs, M. A. 2007. AGLINET, AGORA, et al.: enhancing access to information in support of research and extension in the developing world. *Information Development* 23(1):55-62.