RUFORUM Celebrating 10 years as a Network and
22 years supporting Agricultural Higher Education

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Celebrating RUFORUM@10

ICT in the RUFORUM Network: Changing Pedagogical Paradigms, Priorities, and Practices

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When, Where, and How It all Started

When the FORUM project began, connectivity was not taken for granted the way it sometimes is today. Email utilization on a measurable scale only began in the late 1980s. The story of ICT in Africa is one of profound need coupled with intense creativity to drive the rapid spread of these technologies. The FORUM and now RUFORUM epitomize this principle. In order to understand just how far RUFORUM has come, a few examples are highlighted below of innovative ICT deployment in universities in the five FORUM countries (Kenya, Malawi, Mozambique, Uganda, and Zimbabwe).

Above: Lisbeth Levey
Consultant, ICT for Development

- In 1990, the Bunda College of Agriculture library created an automated bibliographic database of research carried out in Malawi relevant to maize production. This was one of the first such bibliographies created anywhere in sub-Saharan Africa.
- Also in 1990, the small computer center at Eduardo Mondlane University installed an email system, first for the university and then for the entire country, using a dedicated telephone line and a painfully slow modem (1200 bps). These early experiments paid off. In 1995, UEM became the second university north of the Limpopo to achieve full Internet capability.
- In 1991, the University of Nairobi, Makerere University, and the University of Zimbabwe joined an ambitious effort to provide email to their university communities.

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- In the mid '90's, Rockefeller Foundation helped selected FORUM university faculties and departments create special computer labs and networks, equipped with CD-ROM, in order to access bibliographic and abstracting databases in the agricultural sciences, particularly TEEAL, the full-text CD-ROM agricultural library of about 130 journals. RUFORUM has continued to work with its network—organizing training workshops and subsidizing subscription costs. Because these universities have recognized the importance of TEEAL, more than half of them are paying for their own subscriptions, now that RUFORUM is no longer covering the costs.
- Not content with CD-ROM, the Rockefeller Foundation helped FORUM postgraduate students at Makerere University organize an information retrieval skills workshop in 1997 on using the Internet and search engines to access research information in the agricultural sciences. RUFORUM workshops such as this one continue.
- In 1993, the *African Journal of Crop Sciences* began as a print journal in the department of crop sciences at Makerere University. It is now fully online and freely accessible worldwide (http://www.bioline.org.br/cs). It was an important vehicle then for publishing FORUM research output and remains so today for RUFORUM.

Key findings from RUFORUM ICT studies

- In 2009 86 percent of the RUFORUM universities surveyed had a campus backbone; 58 percent had ICT policies in place; and 60 percent had central ICT units to manage and monitor ICT projects. However, the Colleges of Agriculture lagged behind in use of ICT for teaching, learning, and research in comparison to other disciplines within the university.
- In 2011 59 percent of the 29 universities surveyed had a rationale in place for e-learning within an explicit institutional plan; 45 percent had e-learning policies compared to 26 percent in 2009; and 32 percent had e-learning units. The situation for the Colleges of Agriculture, however, remained the same—teaching content in agriculture was almost negligible on institutional learning management systems.

The Centrality of ICT to RUFORUM

RUFORUM understands the centrality of ICT to the teaching, learning, and research process, and has worked to assist member universities change the way they view pedagogical practices. As a start, RUFORUM conducted an analysis of ICT infrastructure and e-learning readiness in RUFORUM institutions in order to establish a baseline.[1] This was followed by a more comprehensive

[1] Nodumo Dhlamini, *Analysis of Existing ICT Infrastructure & Readiness for E-learning*, RUFORUM, 2007, http://repository.ruforum.org/documents/analysis-existing-ict-infrastructure-readiness-e-learning

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assessment in 2009.[2] In 2011, RUFORUM surveyed all member universities on their e-learning capability.[3]

These studies provided RUFORUM with sufficient information to begin implementing ICT in an organized manner throughout the network. Noteworthy examples of the breadth of RUFORUM's ICT initiatives include:

- Innovations in E-learning and Open Educational Resources (OER) in the RUFORUM Network—As a start, RUFORUM selected eight universities with which to collaborate, based on infrastructure and commitment to innovation. Rather than immerse Network partners in e-learning and OER without any context, the RUFORUM Secretariat worked to sensitize them to the importance of using technology to change pedagogical practices and the need for appropriate policies to ensure appropriate utilization of ICT. A number of training, writing, and policy workshops were organized, with the result that five universities have designed e-learning policies and twenty-six e-learning courses were created and licensed as OERs. RUFORUM is also collaborating with OER Africa on the AgShare project, an effort to create a scalable and sustainable method of filling critical gaps in agriculture related curriculum through a redesigned MSc process.[4] These efforts are just the beginning. RUFORUM will intensify its work in this area and is now exploring the feasibility of using MOOC principles to design content relevant to the RUFORUM community. This work is described in a later section below.


Above: Nodumo Dhlamini, ICT Program Manager (RUFORUM)

- The RUFORUM Institutional Repository—Following a lengthy advisory process, RUFORUM launched its Institutional Repository[5] in September 2013 at the Annual General Meeting (AGM) in Kigali, Rwanda. The Repository provides a home for research output carried out by

[2] CGNET, *Situation Analysis of ICT Capability and Infrastructure in RUFORUM Universities*, RUFORUM, 2009, http://repository.ruforum.org/documents/analysis-existing-ict-infrastructure-readiness-e-learning

[3] Nodumo Dhlamini, *The 2011 Results of the E-learning Capability Survey in RUFORUM Member Universities*, RUFORUM, 2011, http://repository.ruforum.org/documents/analysis-existing-ict-infrastructure-readiness-e-learning

[4] http://www.oerafrica.org/agshare

[5] http://repository.ruforum.org/

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network members and the Secretariat—case studies, policy briefs, theses and dissertations, journal articles, extended abstracts from conferences, and more. All resources mounted in the Repository are classified as Open Access and freely available to all. The goal is to ensure that African research information reaches the global knowledge pool and is recognized for its quality. RUFORUM is using a special FAO platform called AgriDrupal; the design process was complicated, but ultimately successful. Both FAO and the Global Forum on Agricultural Research (EFAR) have provided publicity for it.[6] Moreover, in addition to general search engines, such as Google, output from the Repository is now indexed in important agricultural indexing and abstracting services, such as AGRIS and CABI. It is envisaged that Network universities will establish a collection of their institutions' research results in the agricultural sciences in the RUFORUM Repository to promote better circulation of their work. The RUFORUM Repository, which collects research in the broad based agricultural sciences from different African institutions, is the first of its kind on the continent. RUFORUM will continue updating and strengthening the Repository's contents.

- Open Access and Intellectual Property Rights—Open access means that resources are free to users worldwide and that they may be distributed and used without requesting permission, but appropriate attribution is always required. Governments in North America and many donors, such as DFID and IDRC now require that all research they fund be made freely available to the public. Research has demonstrated that an open access designation increases visibility. Once RUFORUM established its own Open Access policy for the Secretariat and its competitive grants program, it began working with its network members on issues pertaining to Open Access and Intellectual Property Rights (IPR). Two brief papers have been circulated—one on open access publishing and one on IPR.[7] Although it is important for everyone in the RUFORUM network to understand these issues, it is particularly relevant to students, who are in the process of working on their research and theses and just beginning their careers in science.

- Using Technology for Outreach and as a Communications Tool—RUFORUM uses ICT in numerous ways for outreach and as a communications tool. RUFORUM envisages that its website, which is now in revision, will be a one-stop shop for anyone interested in agricultural postgraduate training and research in Africa. All of RUFORUM's publishing output is on the

[6] http://www.egfar.org/news/imported/ruforum-adopted-agridrupal-solution-their-institutional-repository and http://aims.fao.org/community/agridrupal/blogs/ruforum-adopted-agridrupal-solution-their-institutional-repository

[7] Lisbeth Levey, *Open Access Publishing and the RUFORUM Network*, RUFORUM, June 2014,), and *The Impact of Intellectual Property Rights (IPR) on Open Educational Resources (OER) and Open Access (OA) in RUFORUM Member Universities*, RUFORUM, September 2013

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website. RUFORUM is also adding a section on "Organizations Relevant to African Agriculture," which will include links to important resources, such as African journals in the agricultural sciences, associations and networks, open data and research organizations, and RUFORUM network universities. In addition, RUFORUM maintains an active Face Book alumni network, with over 300 participants. RUFORUM is also beginning to experiment with new uses for Twitter. As one example—RUFORUM has organized a social media and reporters' training workshop for postgraduate students at the 2014 Biennial, after which these students will attend plenary and other sessions and be responsible for inputting into a live Biennial Twitter feed. Finally, as a first for RUFORUM—biennial updates are now available through a mobile app. for Apple and Android devices.

- ICT at the Service of the RUFORUM Secretariat—RUFORUM has created a strong ICT platform, which includes online applications for finance, the competitive grants program, training and quality assurance, project management, monitoring and evaluation, and administrative functions. All components of the Competitive Research Grants (GRG) system are now online; supervisors can update the status of their grants directly into the RUFORUM system. To ensure that the Secretariat operates smoothly, RUFORUM installed a new Intranet and more robust fiber connections.

Investigating the Role of MOOCs in the RUFORUM Network

RUFORUM is conducting a feasibility study to ascertain whether Massive Online Open Courses (MOOC) make sense for agricultural postgraduate training and, if so, in what format. As part of this process RUFORUM convened an advisory meeting during which experts from the RUFORUM network, the private sector, and others participated to examine possible strategies. RUFORUM is now considering the most appropriate directions for a pilot activity.

What about ICT for Teaching, Learning and Research in the Future?

In comparison to the days of the FORUM initiative and the launch of RUFORUM in 2004, most of the countries and universities in the RUFORUM network already have significantly better high speed data connection networks, although eastern and southern Africa are more advanced in this regard than central Africa. All of the network countries either have or are building a national research and education network.[8] With some few exceptions, infrastructure should not be a problem—if RUFORUM network universities have the necessary campus backbone and equipment. Laptops and smart phones are coming down in price; most students have one or the

[8] Go to the UbuntuNet Alliance (http://www.ubuntunet.net/) for more information.

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other. If campuses have sufficient wireless hotspots, students should be able to take advantage of ICT innovations in their studies.

Admittedly, there are still a number of issues to be addressed, but also opportunities to be explored. For instance;

- Remote Desktop Computer Labs—What about remote access to computers in an academic computer facility? This would allow users to access special class software and other resources from home or hostels. Remote desktop provides the ability to use all of the software available in the university computer lab without leaving home. Users can even print their work to their home printers or save it to their laptops. Remote computer labs are offered at many US universities. For example, the College of Agricultural, Consumer, and Environmental Sciences, a land-grant institution in Illinois, permits remote access to one of its computer labs.[9] North Carolina State University has also installed a virtual computer lab for its entire student population. The lab contains access to all of the software packages that they need, such as 3-D modeling tools and advanced statistical programs, but it exists on powerful computer servers. Faculty can install their own software packages; students have access whenever they want; and administrators say that it was cheaper to build and maintain than physical labs. The idea has proven so popular and cost-effective that universities throughout North Carolina have bought into the system.[10] Would a virtual computer lab (VCL) make sense for any of the RUFORUM regional programs or for the RUFORUM network?

- Virtual Microscopes—If a VCL is not yet possible, what about virtual microscopes? The University of Delaware maintains a virtual microscope to teach beginning students how to use a microscope in order to improve their actual lab experience. This would probably be most useful to the RUFORUM network at the undergraduate level. The microscope has a Creative Commons license, so it is available to users right now.[11] There are other examples; this is just one.
- Virtual Experiments—What about virtual experiments? As just one example, the Massachusetts Institute of Technology (MIT) has developed a system to demonstrate concepts

[9] http://acf.aces.illinois.edu/remote/

[10] Jeffrey R. Young, "A Computer Lab that Students Use but Never See," *The Chronicle of Higher Education*, May 30, 2008, http://chronicle.com/article/A-Computer-Lab-That-Students/11537. Also, go to the VCL home page for more information: http://vcl.drupal.ncsu.edu/.

[11] Go to http://www.udel.edu/biology/ketcham/microscope/ for a tour and to http://www.udel.edu/biology/ketcham/microscope/scope.html for the actual 'scope.

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in genetics to students. MIT has developed a freely accessible program called StarGenetics, a Mendelian genetics cross simulator developed by biology faculty, researched-trained scientists and technologists. StarGenetics allows students to simulate mating experiments between organisms that are genetically different across a range of traits to analyze the nature of the traits in question. Its goal is to teach students about genetic experimental design and genetic concepts.[12]

- Crop Simulation Models—The University of Georgia is leading efforts to deploy a Decision Support System for Agrotechnology Transfer (DSSAT), a software application program that comprises crop simulation models for over 28 crops, including maize, rice and other crops relevant to Africa. The crop simulation models in DSSAT simulate growth, development and yield as a function of the soil-plant-atmosphere dynamics, and they have been used for many applications ranging from on-farm and precision management to regional assessments of the impact of climate variability and climate change. It has been in use for more than 20 years by researchers, educators, consultants, extension agents, growers, and policy and decision makers in over 100 countries worldwide.[13]

- Open Data—What about using open data databases that are already available? The African Soils Information Service (AfSIS) is a digital soil mapping system that makes available accurate, up-to-date, and spatially referenced soil information to support agriculture in Africa.[14] As an example, we hope that in a short while RUFORUM cassava researchers and others will be using and feeding into the cassava open data project.[15] A key question though is whether the RUFORUM network should consider designating the data collected through its research as "open"? Should RUFORUM be working in this area in the same way it does for open access?[16]

[12] http://star.mit.edu/genetics/index.html?gclid=CJiouam3y74CFfQbtAodsg8ARg

[13] http://dssat.net/

[14] http://www.africasoils.net/

[15] http://www.cassavabase.org/

[16] Go to Global Open Data for Agriculture & Nutrition: http://godan.info/

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Changing Pedagogical Paradigms, Priorities, and Practices

Intelligent ICT deployment requires commitment on the part of university leadership, champions, and a stable funding base. Leaving aside funding and infrastructure requirements for a moment, it is incumbent for RUFORUM universities to get the basics right to enable them to implement technological innovations. What needs to be done to change course design in order to ensure that students are active participants in the learning process? How can we shift the paradigm on how teaching and learning take place and how research feeds into this process? How can we make use of ICTs to strengthen University outreach activities and to tract impact as envisaged under the RUFORUM Community Action Research Program?[17] How can the network move from establishing policies to implementing them? What can the Secretariat do to help its members make ICT innovation happen?

This is our fourth issue in a series of articles we are releasing as part of our 10 year anniversary. Download by clicking on the following issues to access the previous issues; Briefing note on the 4th biennial conference (third issue), RUFORUM's Developmental Roots (second issue) and RUFORUM@10 (first issue).

Updates on the Upcoming Biennial Conference, 2014

1. Online Registration has commenced with over 250 participants registered online. All invited participants are encouraged to register online.
2. Exhibitors need to register twice - for their booth and also as individuals.
3. The Online Registration Link is: http://www.cvent.com/d/p4q1cb/4W.
4. Participants with Mozambique Embassies in their countries should apply for visas prior to travel. A Mozambique Visa is estimated at US$98 per person; others may obtain visa on arrival in Maputo
5. All participants should ensure that they have confirmed accommodation booking by 30th June, 2014.

For details and updates on the conference, please click here to visit the official Biennial Conference Website.

[17] There are three papers about the CARPs. Go to: http://repository.ruforum.org/documents/experiences-community-action-research-programme-carp, http://repository.ruforum.org/documents/ruforum-community-action-research-programme-programme-link-african-universities, and http://repository.ruforum.org/documents/university-outreach-support-farmer-associations-western-kenya-case-ruforum-s-community-0.

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