

Enhancing graduate training and agricultural research in Eastern, Central and Southern Africa: Lessons and new thrusts

Adipala, E.¹, Blackie, M.² & Woome, P.³

¹Regional Universities Forum for Capacity Building in Agriculture, Plot 515 Garden Hill, Makerere University, P. O. Box 7062, Kampala, Uganda

²Smallholder Agricultural Development, 9 Meadow Farm Drive, Norwich, UK NR4 6TR

³FORMAT, P.O. Box 79, The Village Market, Nairobi, Kenya

Corresponding author: e.adipala@ruforum.org

Abstract

This paper was commissioned by the Regional Universities Forum for Capacity Building in Agriculture (RUFORUM), an association of 25 Universities engaged in natural resource management in Eastern, Central and Southern Africa to explore opportunities and modalities to enhance quality of graduate training and agricultural research in the region. It draws from experience of individual universities and recent trends in the region. The findings indicate that the university research mission has changed, and universities need explicitly to become integrated into the national and regional Research for Development communities, and of necessity, must closely network. Graduate training and research should continue to build on the competencies of individual scientists and universities, but these competencies should be harnessed to produce regional public goods, enhance economies of scale and scope and promote more efficient and effective utilisation of the region's resources. The trend towards joint degree programmes, as under the Collaborative Masters in Agricultural Economics, and Networks of Specialisation as under RUFORUM, offer opportunity for quality training and enhancing collaboration instead of competition. Nevertheless, greater use needs to be made of specialised facilities/competencies in the region, such as aquaculture facilities at Bunda, University of Malawi, to train for the region. Whatsoever option is adopted, there should be flexibility and consideration given to special needs and mutual support. Through networking opportunities, universities in countries where political or economic conditions are unfavourable can be kept operating at the highest possible standard. These institutions will be ready for action once the situation returns to normality and will quickly be able to play their role in national recovery exercises. This strategy can also be refined and developed to help participating universities adapt

to change and to expand their role within the National Agricultural Research and Extension Systems (NARES).

Key words: Africa, aquaculture, networks of specialisation, RUFORUM, Universities

Résumé

Ce document a été recommandé par le forum régional des universités pour le renforcement des capacités dans l'agriculture (RUFORUM), une association de 25 universités engagées dans la gestion des ressources naturelles en Afrique orientale, centrale et australe pour explorer les possibilités et les modalités afin d'améliorer la qualité de la formation des diplômés et la recherche agronomique dans la région. Elle s'inspire de l'expérience des différentes universités et les tendances récentes dans la région. Les résultats indiquent que la mission de recherche universitaire a changé, et les universités ont besoin explicitement de s'intégrer dans la recherche nationale et régionale pour le développement des communautés, et par nécessité, doivent étroitement s'associer en réseau. La formation de diplômés et la recherche devraient continuer à s'appuyer sur les compétences de chaque chercheur et des universités, mais ces compétences doivent être mises à profit pour produire des biens publics régionaux, améliorer les économies de niveau et aussi examiner et promouvoir une utilisation plus efficace et efficiente des ressources de la région. La tendance vers des programmes d'études communs, comme dans le cadre du Masters de collaboration en économie agricole, et les réseaux de spécialisation comme sous RUFORUM, offrent une opportunité pour une formation de qualité et le renforcement de collaboration au lieu de la concurrence. Néanmoins, une plus grande utilisation doit être faite d'institutions spécialisées/des compétences dans la région, telles que les installations d'aquaculture à Bunda, l'Université du Malawi, pour la formation dans la région. Quelle que soit l'option qui est adoptée, il devrait y avoir la flexibilité et la prise en compte des besoins particuliers et de soutien mutuel. Grâce à des possibilités de réseautage, les universités dans les pays où les conditions politiques ou économiques sont défavorables peuvent être maintenues en fonctionnement au plus haut niveau possible. Ces établissements seront prêts à l'action dès le retour à la normalité et vont rapidement être en mesure de jouer leur rôle dans les exercices de redressement national. Cette stratégie peut également être affinée et développée pour aider les universités qui participent, à s'adapter au changement et à élargir leur rôle au sein de la

recherche agronomique nationale et de systèmes de vulgarisation (NARES).

Mots clés: Afrique, aquaculture, réseaux de spécialisation, RUFORUM, Universités

Background

Human progress over many generations has depended on the ingenuity of mankind, and scientific breakthroughs have spiralled progress. In the recent past, university research done in partnership with the private sector and support from philanthropic organisations have particularly contributed to progress in the agriculture and health sectors. However, while progress is very visible elsewhere, this is not so in Africa. Numerous statistics, including one by the International Food Policy Research Institute (Rosegrant *et al.*, 2005), paint a gloomy picture: sub-Saharan Africa is the only developing region in the world where food insecurity has worsened instead of improved in recent decades. What this calls for is more concerted and innovative efforts to quickly build capacity, both human and infrastructure to drive Africa's agriculture.

Compared to other regions, university-based education came relatively late in the continent, at the turn of the 19th century, and was designed along the models of the colonial masters of the day. While regional based universities were common then, with the advent of independence, most countries opted for national universities, but maintaining linkage with overseas universities. Graduate training was largely done overseas, often usually with funding provided by donor agencies in the developed world. This "shipping model" has continued to the present day, but, as we will show in this paper, has important disadvantages including unsustainably high costs (in human and financial terms) and poor linkages to priority national problems. Governments which propagated the shipping model, such as the United States of America, are now reviewing modalities of supporting university education in Africa and are piloting other options, such as the sandwich programme under the Higher Education Partnership for Agricultural Development (HEPAD) and the recently launched \$15 M Africa-University partnership spearheaded by the American Public and Land Grant Universities. Other countries, such as Norway, for instance, through its development agency, NORAD (Norwegian Agency for Agricultural Development) have been even more innovative. NORAD is supporting a joint degree programme between Makerere University and the Norwegian University of Agricultural

Sciences. Students and staff from the two countries undertake joint coursework and research in the two universities. This serves not only to build capacity in Africa, but enhances settling-in of the trained personnel and builds long-term mutual understanding of problems and priorities.

In this paper we examine trends in mounting graduate training programmes with focus on universities offering agricultural training. The examples cited are not exhaustive; they only serve to illustrate issues and trends.

Trends and Lessons From the Region

Graduate training programmes in sub-Saharan Africa universities. Most universities in the region today have established graduate (Masters) training programmes. Until recently, most were based only on research, but there is now increasing tendency to have both coursework and research, following the USA model. However, the coursework is not as rigorous as in the USA system. PhD programmes are limited and rarely require extensive coursework. There are some resources to send PhD students abroad, or within the region, for short courses and specialised training. However, such opportunities are rare. The absence of quality coursework as part of graduate training has often been cited as a major weakness of the graduate training programmes in the region. Another is a perception that quality control of research-based graduate degrees needs enhancing. Particularly in Europe, it is now a requirement to have peer-reviewed publications before a PhD degree award; this approach is needed in the region to ensure quality of the research being pursued as part of graduate training.

Some regional-based graduate training programmes, mostly at Master's level, are on-going or have been tried. For example, in the SADC (Southern Africa Development Community), Deans of Faculties of Agriculture in the mid 1990's agreed that as part of efforts to cut costs and rapidly build graduate level human resource, four regional postgraduate programmes be established in the region. Direct management of the graduate programmes was vested in the departments that mounted them. The University of Malawi Bunda College of Agriculture provides a useful example of this approach. Bunda College was mandated to implement a regional MSc programme in Animal Science. Lecturers were drawn from Bunda and other SADC universities. Three lessons from this experience are worth noting. First, the cost of training was relatively low, in comparison to studies abroad (whether full time or under the sandwich model). But second, due to the

set up of the University of Malawi, the decision making process at the College and University levels were sometimes slow, particularly admissions and sharing of resources from the programmes. Third, the programme was entirely donor funded, and issues of sustainability and impacts were not adequately built into the design. The disadvantages imposed by the second and third issues above resulted in the regional programme in Animal Science being interrupted several times and finally terminated. The Bunda experience shows that a pre-requisite for sustainability is to have a programme of high academic standard producing quality graduates at economic and competitive cost. This means embarking on promoting ownership, public relations, marketing and aggressive fund raising from the outset.

A related approach is currently being used to build capacity in Economics by the African Economic Research Consortium based in Nairobi, Kenya. Students from participating countries periodically assemble in Nairobi for short lecture sessions (one month) in specific modules. Lecturers are drawn from several African countries and elsewhere.

Forum on Agricultural Resource Husbandry. The deteriorating economic situation in sub-Saharan Africa, especially in the 1980's and early 90's led to dwindling of government subvention to universities, resulting in near collapse of several programmes. Worst hit were graduate training, research, infrastructure and staff development. Perversely, to halt the economic decline and spur recovery, Governments in the region initiated new development initiatives, with agriculture transformation envisaged as the engine to propel overall economic recovery. This paradigm shift needed skilled middle-level professionals (particularly Masters graduates) able to cope with the new rural development needs and challenges. There was also a realisation that African public universities and their faculties of agriculture offer unrealised potential to serve as catalysts for rural transformation.

To respond to the crisis facing universities in the region, the Rockefeller Foundation in 1991 launched the Forum on Agricultural Resource Husbandry (FORUM), a programme to stabilise faculties of agriculture in Kenya, Malawi, Mozambique, Uganda, and Zimbabwe by providing resources, mission and peer support, leading to knowledge contributing to improved lives of smallholder farmers (Patel and Woomer, 2000). This was accomplished through a competitive grants programme to

strengthen, encourage and support training of students in agriculture at the M.Sc/M.Phil level. The thrust was to create high quality graduate training programmes directly associated with research designed to address agricultural problems of smallholder farmers. In built within the competitive grant programme was overall institutional development in terms of infrastructural development, strengthening staff competence and facilitation of a functional collaborative linkages with agencies outside the university (e.g., agricultural research institutes, Non-Governmental Organisations (NGOs), private sector, etc.). The research and training programmes were as much as possible designed to involve interaction with farmers and utilise interdisciplinary, participatory and systems-level approaches. In-country and biennial meetings were held at which researchers and students presented results and often this included some non-FORUM associated invitees. Other initiatives were implemented to improve the quality of graduate training in terms of curriculum development, providing computers, software and other equipment and supplies, facilitating information access, remedial biometrics training, etc. Peer-reviewed scientific publication of papers was explicitly expected and supported. The programme also supported networking through regular in-country, regional and international meetings.

Through this support the programme was able to resurrect graduate training, and today, the graduate programmes in the various participating universities are functional and are attracting international scholars and students. As of 2003, there were 220 journal publications from FORUM research, an indication of the quality achieved. Close to 250 M.Sc. students have graduated and are working in different sectors- public and private. Several former FORUM students have advanced their academic careers and already 22 have completed PhD training. Already the programme has developed and disseminated several technologies which are enhancing productivity of smallholder farmers (see Adipala and Blackie, 2010, this volume). In some universities, there is adequate infrastructure to venture into new advanced fields such as biotechnology and bio-safety. Research has been invigorated and the faculties are able to compete internationally and attract resources. Generally, FORUM has helped to attract and retain staff and stimulated university engagement with communities. Thus, FORUM was able to achieve its goal of stabilising the faculties of agriculture and has positioned them to be able to respond more effectively to national demands (see Adipala and Blackie, 2010, this volume).

The need to consolidate this achievement is apparent. However, it is critical to ensure that university research and training becomes well integrated into the national agricultural innovation systems. Under the original Rockefeller Foundation funded FORUM, support mechanisms for technology disseminations and sharing information were limited and there was little value addition at regional level. The universities operated individually and it was not possible to take advantage of expertise, knowledge and skills generated, and facilities in the region. The collective bargaining power of the participating universities was also absent. Further, the whole programme depended on the good will of one donor and sustaining such a programme could therefore be a challenge, especially with donor fatigue (Banda *et al.*, 2005).

To build on the successes of the FORUM and to empower universities in the region to venture into new initiatives and to institutionalise these improved systems required a new institutional framework to make universities more responsive to the emerging challenges in the region. Thus, beginning January 2004, the FORUM was transformed into the Regional Universities Forum for Capacity Building in Agriculture (RUFORUM). RUFORUM is an independent organisation owned by the current 25 member universities (Botswana - University of Botswana; Burundi - National University of Burundi; DR. Congo - Catholic University of Bukavu; Ethiopia - Haramaya University and Mekelle University; Kenya- Egerton University, Jomo Kenyatta University of Agriculture and Technology, Kenyatta University, Moi University and University of Nairobi; Lesotho - National University of Lesotho; Malawi - University of Malawi; Mozambique - Eduardo Mondlane University; Rwanda - National University of Rwanda; Tanzania - Sokoine University of Agriculture; Uganda - Gulu University, Kyambogo University, Makerere University, Uganda Matyrs University; Zambia - University of Zambia; and, Zimbabwe - Africa University and University of Zimbabwe). To facilitate coordination and networking, a Secretariat was established, in Kampala, Uganda. The thrust of this new organisation is to enhance quality of graduate training and to engage universities in impact-oriented research within the broader national agricultural innovation systems.

Current Trends and Thrusts

Based on trends and lessons learned, described in the above sections, below we describe some of the recent approaches being piloted in the eastern, central and southern Africa region, as a means to enhance quality and capacity for graduate training

and agricultural research. They are by no means exhaustive, but offer possible options that could be adapted or modified for specific needs.

African Centre for Crop Improvement model. This is an initiative of the University of KwaZulu Natal (formerly University of Natal) and the Rockefeller Foundation with the aim of producing active and functioning plant breeders for Africa. The programme is based on two years of academic training for each student at the University of KwaZulu Natal, followed by three years in their home country, students undertaking research in their national research programmes. The aim is to ensure that the students work on African crops within their home environments. It is hoped that this will ensure high level of retention of scientists in their home countries. The target is to train ten cohorts of 10 PhD students per annum. To date 41 are being trained and additional 8 are due to start in 2011. A similar programme has been set at the University of Ghana, Legon, targeting West Africa, with so far about 18 PhD students under training. The breeding programme focuses on yield improvement, development of disease and pest resistance, and drought tolerance, in critical food crops especially cereals (maize, sorghum, pearl millet, finger millet, rice), tubers (cassava, sweet potato, potato) and legumes (cowpea, dry bean, pigeon pea, bambara groundnut) so as to address food security in African countries.

Training is undertaken by both established and newly-hired staff. International lecturers provide short courses. Field research supervision is from three sources: the University of KwaZulu Natal, local scientists, and international supervisors. The external supervisors visit students during the year and each student has a local-based supervisor within his/her country.

South-South Model. A different approach, being implemented through the University Science, Humanities and Engineering Partnerships in Africa (USHEPiA) initiative, which aims at developing African research capacity using a network of institutions. It is coordinated by the University of Cape Town (UCT), South Africa. The approach is based on a “sandwich model” in which the graduate students alternate between the home universities and the University of Cape Town. An International Steering Committee awards fellowship and to-date 39 fellowships have been granted. The awards are for either Masters/PhD degree (registration is permitted at UCT

or at partner university but to date only two fellows have registered at the Universities of Nairobi and Dar-es Salaam) or to spend a short period at UCT for a specific project. Current member universities include: Makerere University (Uganda), Jomo Kenyatta University of Agriculture and Technology, University of Nairobi (Kenya), University of Dar es Salaam (Tanzania), University of Zambia (Zambia), University of Zimbabwe, University of Botswana, University of Cape Town (South Africa).

The agricultural economics model. A different model is followed by the Regional Collaborative MSc Programme in Agricultural and Applied Economics. This aims to equip professionals with knowledge and skills essential for transforming the currently underdeveloped agro-food sectors and rural economies of Eastern, Central and Southern Africa to perform well in an environmentally sustainable fashion. It is an entirely inclusive programme and is based around 16 departments in the region. An Agricultural Economics Education Board (AEEB), currently comprising representatives of the 16 collaborating departments, approves programme content. A Programme Executive Committee guides the AEEB.

The programme of study comprises five semesters over 20 to 24 months. Applications are entertained from graduates in any field and professionals in mid-career, provided they satisfy prerequisites considered necessary to succeed in a rigorous programme of study and research. Missing prerequisites are acquired prior to entry through courses offered separately or jointly by the collaborating departments and other reputable institutions within and outside the region. The first two semesters of 15 weeks each focus on core subjects. The third semester, to be held in a shared facility in the region (University of Pretoria), offers the student an expanded selection of elective subjects. Over the fourth and fifth semesters, students do their research and write up the results.

However, not all of the first five 'launch' departments are fully equipped to handle the demands of this very challenging exercise. It is vital to ensure that, as models are scaled up, participating departments indeed have the equipment and staff necessary to mount courses of the requisite quality.

RUFORUM graduate training and research models. Networks of Specialisation are recommended as a strategy for

RUFORUM members and possibly other universities to promote complementarity and synergy. This is because national public universities in Eastern, Central and Southern Africa have developed from differing starting points and invested their limited resources in ways which suit their particular circumstances. No university in the region operates at the cutting edge in all disciplines of science. Through greater collaboration among universities, students, staff, and (most importantly) farmers can access the range of knowledge and facilities held within the ambit of network member universities.

A Network of Specialisation among RUFORUM members may be viewed as having leaders, facilitators and needy members. Leaders are the universities that have greatest expertise and most up to date facilities in a certain area of instruction or research. Facilitators are universities with specialized, but incomplete capacities within that area. Needy members are those who acknowledge their weakness in that area and seek to collaborate within the network in order to broaden their services and capacities. By pooling their efforts through networking, RUFORUM members will have greater abilities to achieve their strategic goals in terms of training and impact-oriented research.

Figure 1 illustrates the general model recommended by RUFORUM. In this model, several different universities may pool their different strengths (for example, in curriculum, outreach, facilities) to put together a course which reaches both the needy and the less needy universities. The outputs are graduates well versed in the chosen discipline and increased capacity at the less well-endowed universities. This is then further enhanced by the stronger universities bringing in the weaker into the overall thematic research networks so as to enable them to build their field skills and reputations.

Disciplines with severe skills gaps. There is a definite need to develop a network to address specific gaps, for example, biometrics (Fig. 2). There is a critical shortage of professional biometricians and expertise at most, but not all, RUFORUM universities. The weaker universities require both near-term improvement in their quality of graduate-level biometrics instruction, and longer-term expansion in the number of trained biometricians within their faculty. Currently, three member universities of RUFORUM (Jomo Kenyatta University of Agriculture and Technology, Makerere University and the University of Nairobi) that are strong in biometrics could serve

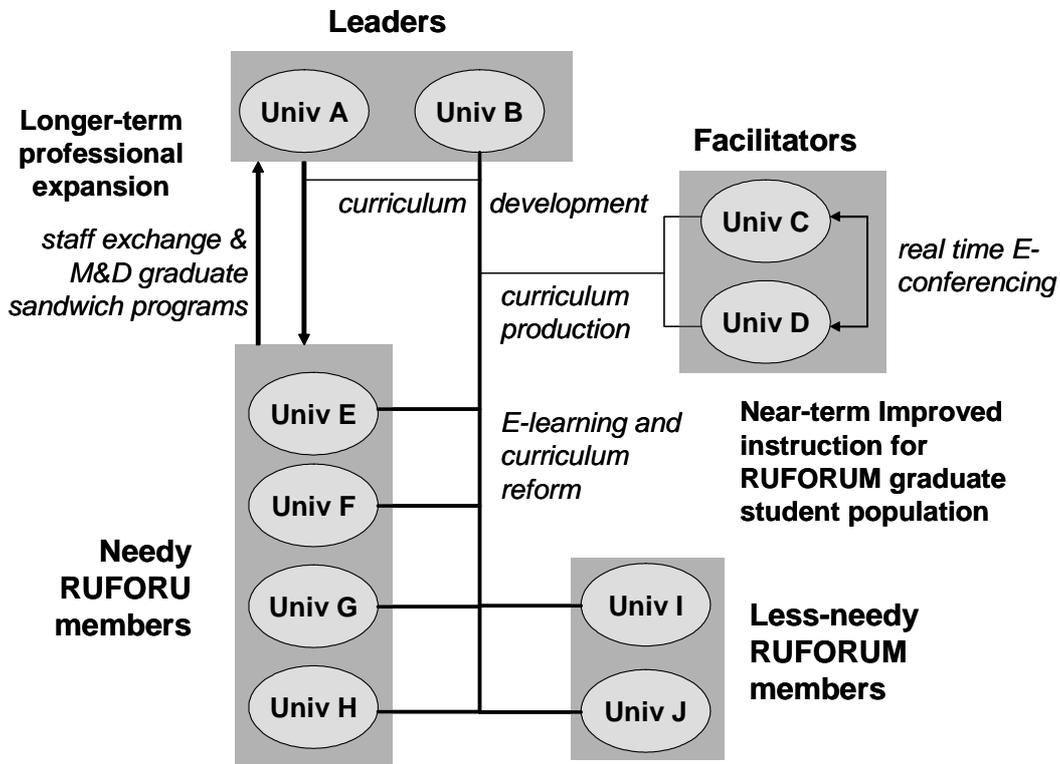


Figure 1. Generalised structure for a RUFORUM Network of specialisation.

as leaders, developing curriculum and hosting graduate students. The ‘reach’ of this effort can be extended by using a further two universities (Kenyatta University and Africa University) that host state-of-the-art “E-learning” facilities. These last universities could contribute to the network by producing and distributing improved course materials and conducting electronic conferences. Needy RUFORUM members receive these course materials and integrate them into their biometrics instruction. In this way, improved biometrics instruction can quickly impact upon the general graduate student populations within the RUFORUM. Over the longer-term, staff exchange and graduate “sandwich” programmes between leading and needy universities will result in substantial increase in the number of trained biometricians within the RUFORUM.

Accessing high quality facilities. Another situation requiring networking occurs when one RUFORUM member hosts state-of-the-art facilities. For example, Bunda College of Agriculture in Malawi has developed excellent facilities in aquaculture – which most other RUFORUM members lack. The general model

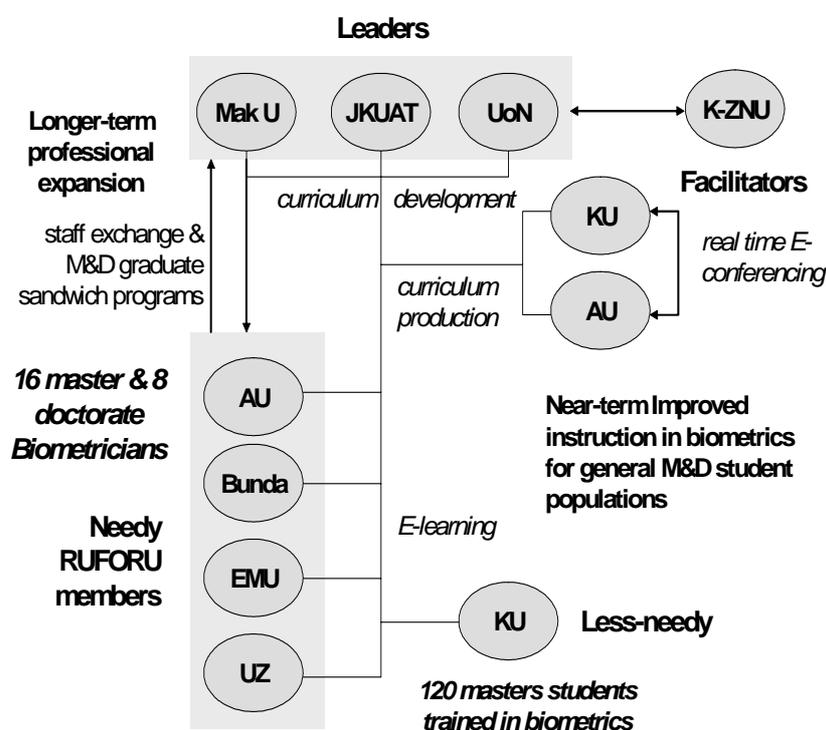


Figure 2. Structure and operations of a RUFORUM network designed to improve training and increase capacities in biometrics among its members.

of leaders and facilitators assisting recipient members again applies (Fig. 3). Bunda College’s strength in aquaculture is complimented by the expertise in fisheries held by other universities and the assistance of two universities to develop and disseminate course materials. Students and researchers in animal science and fisheries are then provided opportunity to participate in collaborative research with Bunda College and to use the facilities as required. The universities with less interest in aquaculture need not participate within the network.

A somewhat comparable situation pertains to biotechnology in the RUFORUM member universities. Makerere University and Kenyatta University have a clear advantage in biotechnology facilities at the time of writing – but several of the other RUFORUM universities are either at the advanced stage of introducing biotechnology into their programmes or are planning to do in the near future. Moi University in Kenya, for example has established the Faculty of Agriculture and Biotechnology. Pulling together in a collaborative framework based on centres of leadership provides an efficient and equitable mechanism for

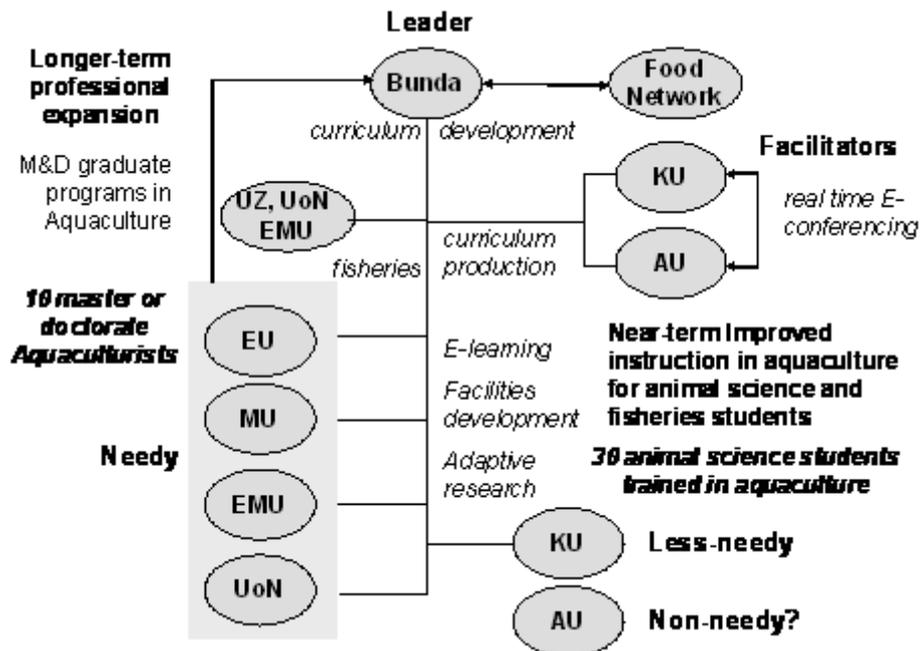


Figure 3. Structure and operations of a RUFORUM network designed to capitalise upon the outstanding facilities in aquacultural science at Bunda College in Malawi.

this new technology to be incorporated into the overall efforts of RUFORUM. Unnecessary competition is eliminated, and best practices are reinforced.

The Agricultural and Rural Innovations Model (ARI) programme was conceived in the context of RUFORUM where Makerere University, Egerton University and Sokoine University of Agriculture (SUA) are members. The three universities have twinned with two European Universities namely Wageningen University in the Netherlands and Montpellier SupAgro in France to jointly implement the programme based on the rationale of sharing essential capacities for a quality PhD programme to build human resource capacity for agricultural and rural innovation systems.

Different from the existing model of regional programmes premised on building centres of excellence, the ARI programme pursues the model of distributed institutional capacity building among the three East African partner universities. The long-term goal is for the three universities to gain capacity to implement the programme in a dynamic manner that responds to their respective national development needs as well as regional development agendas in the areas of agriculture and

rural development. Whereas the programme is interdisciplinary by design, the Department of Agricultural Extension/Education in Makerere University, and the Departments of Agricultural Education and Extension in Egerton and SUA will be the host units. Each of these units will have a programme coordination desk, though at the moment, a regional secretariat is hosted by Makerere University under the guidance of a regional Steering Committee comprising of members from the three African partner universities and a representative of RUFORUM. The regional coordination arrangement may change as the partners deem it necessary.

The programme will be undertaken by both course work and research, with cohorts of students admitted by the three universities. A cohort in this case is a group of students admitted in the same year in all the three universities. Each of the three universities will admit up to ten students each year. A cohort (of up to 30 students) will undertake course work in a central place in one of the three universities for purposes of sharing capacity and quality assurance. The European partner universities will initially provide lead resource persons in some courses but in such cases they will be paired with African partners as a capacity development strategy. Resource persons for course work and research supervision will also be drawn from competent organisations in and outside Africa working alongside counterparts from among the three universities. For purposes of relevance to national development, students will undertake research in their respective countries in compliance with the rules and regulations of the admitting/awarding universities. The first cohorts are due to start in 2011. The programme duration will be 3-4 academic years with the first year devoted to course work and at least two years for research. The first year of course work will also include research proposal development.

The four RUFORUM models are intended to enhance overall quality of graduate training programmes in the region. They are based on centres of leadership which are facilitated or linked through the associated networks of specialisation. This will ensure that courses are up to date, and that experience and best practice from throughout the RUFORUM networks are incorporated into graduate learning experiences.

Agricultural and Rural Innovations Model. A key challenge that emerged initially, and occasionally re-surfaces, is the urge by each member university to be able to award its

own degree. RUFORUM is therefore piloting with a fourth model, largely drawing lessons from the European Erasmus Mundus model.

Concluding Remarks

RUFORUM is adopting an explicit programme of graduate training enhancement. This will involve three levels of activity (1) building capacity in areas of general weakness (such as biometry), (2) increasing the reach and impact of existing state-of-the-art facilities at RUFORUM universities (for example, biotechnology and aquaculture), and (3) routinely and regularly raising the quality of existing graduate programmes. These objectives will be achieved through the use of RUFORUM supported centres of leadership and networks of specialisation to create effective networking and distance learning exercises for both staff and students. It is major paradigm shift- not shipping students overseas and competition-but using local human resource to build capacity for the region within the region in a collaborative and synergistic manner. The Agricultural Rural Innovation model of a joint curriculum and some joint coursework among several universities is another promising option for addressing collaboratively, a specific need but providing leadership to several universities to offer the same degree training. While many options of sandwich programmes, the ACCI model is noteworthy-it is based on close interactions among all partners.

Acknowledgement and Disclaimer

This paper is based on a study commissioned by the Regional Universities Forum for Capacity Building in Agriculture (RUFORUM). Lessons were also drawn from Bunda College of Agriculture (University of Malawi), the Collaborative Masters Program in Agricultural Economics and Management, the Higher Education Partnership for Education (HEPAD), African Centre for Crop Improvement (ACCI) and Universities Science, Humanities and Engineering Partnership for Africa (USHEPiA). However, the views expressed do not necessarily reflect those of the institutions mentioned above.

References

- Banda, J.W., Mangisoni, J.H. and Phoya, R.K.D. 2005. Lessons and experiences in running regional postgraduate programmes at Bunda College of Agriculture, University of Malawi. *African Crop Science Conference Proceedings 7*: (in press)
- Adipala, E. and Blackie, M. 2010. Breaking out of poverty through enhanced scientific networking in Africa: The Regional Universities Forum for Capacity Building in

Adipala, E. et al.

- Agriculture. Second RUFORUM Biennial Meeting, 20 - 24 September 2010, Entebbe, Uganda (this volume).
- Patel, B.K. and Woome, P.L., 2000. Strengthening agricultural education in Africa: The approach of the Forum on Agricultural Resource Husbandry. *Journal of Sustainable Agriculture* 16(3):53-74.
- Rosegrant, M.W., Cline, S.A., Li Weibo, Sulser, T.B. and Valmonte-Santos, R.A. 2005. Looking Ahead: Long-term prospects for Africa's agricultural development and food security. Discussion paper 41. International Food Policy Research Institute, Washington DC.