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Strengthening the Design and Management of PHD Programmes in African Universities

A CASE STUDY OF THREE RUFORUM REGIONAL PHD PROGRAMMES

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¹ The Regional Universities Forum for Capacity Building in Agriculture (RUFORUM), is hosted by Makerere University. It is a consortium of 42 universities in Eastern, Central and Southern Africa and was established in 2004. For more details visit www.ruforum.org.

SUMMARY OF KEY FINDINGS

While this study looked into the details of how three target regional PhD Programmes under the RUFORUM Network arrangements are run and sought to identify areas for improvement, this section only highlights major areas. It provides key findings and recommendations from this review. The target case study programmes were the PhD in Plant Breeding and Biotechnology at Makerere University (Uganda) and the two PhD programmes in Malawi at the Lilongwe University of Agriculture and Natural Resources (LUANAR): the PhD in Aquaculture and Fisheries Science² and the PhD in Agricultural Resource Economics. Separate studies were undertaken to capture issues and lessons from other PhD programmes in East Africa, Southern Africa and West Africa. These are presented elsewhere.

1. Demand and relevance of the programme. In the two countries and programmes in this study, there is strong evidence for demand. The three programmes contribute to replenishment of regional agricultural human resources, which is in line with RUFORUM's belief that the capacity of teaching staff must be improved in order to strengthen capacity for postgraduate training and improve the quality of training and research. Fifteen graduates, with ten coming from new universities, have been trained. They are back in their home countries and are fully engaged in training the next generation of scientists. The universities and the National Agricultural Research Systems (NARS) are the major employers of PhD graduates. These employers are seeking further opportunities to engage these programmes. For example, the Government of Uganda has requested the Plant Breeding and Biotechnology Programme to train 12 PhD level breeders for its research system (NARO).³ The Department of Agricultural Research in Malawi has only 45 % of its staff establishment filled, and seeks to further train their staff as well as to recruit well-trained personnel. Investing in such programmes, however, requires well-developed national human-resource development plans. ASTI⁴ statistics offer the only guidance available in some countries. But this data may require further clarity and updating. This study's action points are presented in the recommendations section.

2. Drivers of success and sustainability. There are several key factors that influence success and sustainability of these programmes:

- a) **Strengthening the university's academic core.** These programmes have been beneficial to host universities in terms of strengthening their academic core business of training, research and outreach. These positive outcomes stimulate support by

² <http://www.bunda.luanar.mw/index.php/faculties/faculty-of-environmental-studies/aquaculture-and-fisheries-science-department>

³ <http://www.naro.go.ug/>

⁴ Agricultural Science and Technology Indicators (ASTI). Go to <http://www.asti.cgiar.org/>

universities and partners, in effect, underpinning sustainability. The programmes have contributed to the university academic core as follows:

- i. PhD intake and graduation numbers at Makerere and LUANAR are higher. Graduates produced 87 research publications. In general, the two universities have a stronger research and internationalization agenda, albeit at different levels. The Plant Breeding and Biotechnology Programme takes the lead, followed by Fisheries and Aquaculture, and then Agricultural Resource Economics. Outcomes on outreach are presented under impacts below.
- ii. The programmes produce competitive graduates, who are already serving their countries and region in various capacities. Students from more than ten countries (Eastern, Southern and West Africa) are involved in these programmes. Graduates have also initiated training and research activities in their countries upon return.
- iii. All the students who have graduated from the three programmes have returned to their home countries. This allows strong universities to train for weaker and/or constrained universities and National Agricultural Research Systems (NARS). Again this is in line with country human-resource development visions, which aspire to see their highly trained staff return to serve their countries. This is an attractive model that African governments and institutions need to harness.
- iv. These programmes have already started contributing to transformation of academic activities in all host universities. Each programme is influencing the quality of teaching and research in host universities. This includes pioneering participatory programme design as well as developing e-courses and open learning resources, modular based teaching, grantmanship together with other specialized skill enhancement training including soft skills for students. These programmes put pressure on the faculty to improve both content and delivery of courses, albeit to different degrees.
- v. Student recruitment was varied in the two universities, initially starting with an average of eight-ten students for LUANAR and 22 for Makerere University. The high student numbers in year one for Makerere was due to strong internal recruitment drives. Subsequently, recruitment was low in all programmes, the only change being in year three at the Makerere Programme because of external funding from the Intra ACP-EU academic mobility programme⁵ and support from Carnegie Corporation of New York. Such volatility does not bode well for these programmes and highlights internal weakness in student recruitment.

⁵ This programme gives grants to support projects to promote mobility of students, academics and staff within and between the African, Caribbean and Pacific (ACP) regions. Go to http://www.welcomeurope.com/european-funds/intra-acp-academic-mobility-scheme-771+671.html#tab=onglet_details.

- b) **Institutionalization: Strengthening management.** This study finds that two different approaches are being used to manage these programmes. Approach one, used at Makerere University, is semi-autonomous in the host department, but suffers from a limited funding rebate from tuition paid by students. Approach two, used at LUANAR, is fully embedded (Institutionalized) in the university system, and similarly suffers from a limited funds rebate from tuition fees. In both cases, the major issue is not whether the programmes are embedded in the host department, but rather, that the universities have the supportive policies, organs and capacities needed to handle international programmes of this kind.
- c) **Strengthening Inter-University Collaboration in the field of Higher Education.** The study finds such strengthening to be a major contribution for joint degree training by RUFORUM universities, as it involves student and staff mobility amongst member universities the eastern, central and southern Africa regions. The geographic reach of these programmes has been further enhanced through support from Carnegie Corporation⁶ and the Intra-ACP Academic Mobility Programme, which is helping to link universities in eastern, central and southern Africa with those in West Africa. The Carnegie support has specifically supported linkage with universities in Ghana and Nigeria, while the Intra ACP Academic Mobility Programme has extended reach to Benin, Mali, Senegal and Togo. This is a great opportunity to build a pool of scientists with connections across the continent. It thus contributes significantly to fostering future regional integration in Africa.
- d) **Funding arrangements.** In all cases, limited availability of funds is a key issue. These programmes have not put in place effective resource mobilization strategies. None of the universities has good web visibility for their programmes, let alone for the host departments or schools. Lack of visibility for these programmes impedes both recruitment and also the ability to promote effective resource-mobilization strategies. This was the weakest element in all three programmes, regardless of the manner in which they were managed. Additional funding has been mobilized from the Association of African Universities (AAU)⁷ for staff mobility, Intra ACP Academic Mobility for student and staff mobility, as well as from Carnegie Corporation and the German Academic Exchange Service (DAAD).⁸ RUFORUM played a brokering role in securing this support. The universities will need to step up their resource-mobilization efforts.

3. Impacts of investment. These are summarized as outlined below

- a) In all cases these coursework-based PhD programmes are the first of their kind in each host University. At Makerere University, for example, this approach is now

⁶ <http://www.carnegie.org/>

⁷ <http://www.aau.org>

⁸ <https://www.daad.de/en/>

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being adopted, with research-based PhDs phased out where there is capacity in different colleges to do so.

- b) Graduates of these programmes are already contributing to regional agricultural research, policy and training. Collectively, 24 students have graduated (18 in plant breeding, four in Fisheries and Aquaculture and two in agriculture resource economics).
- c) Research outputs from the programme are being fully developed for wide use. For example, maize lines at the International Maize and Wheat Improvement Center (CIMMYT)⁹ and NARO are under evaluation for release to farming communities. Cost-efficient technologies for tissue culture of banana and sweet potato are now available.
- d) The programmes have also contributed to strengthening resource rationalization in capacity building. So far 18 staff from within and outside the region have been involved in staff exchange in all three programmes reviewed. This element needs to be further strengthened.
- e) The student exchanges between countries will ultimately facilitate the emergence of regional research teams that can respond to common challenges. Already, alumni from Malawi and Uganda are working together to initiate banana tissue culture, in effect transferring technology from Uganda to Malawi.

⁹ <http://www.cimmyt.org/en/>

RECOMMENDATIONS TO STRENGTHEN THE PROGRAMMES

Three critical areas are proposed for redress because they are pertinent to RUFORUM's strategic goals of establishing high quality and shared academic programmes for the eastern, central and southern Africa regions.

1. Improving student recruitment. This was one of the weakest areas for the three programmes and will limit their impact. Some action points are:

- a) A clear strategy for an MSc pipeline into PhD programmes. Strategic partnerships between masters and PhD programmes as a feed-in conduit for high quality MSc graduates should be explored at both Makerere University and LUANAR, using existing regional and national masters' degree programmes.
- b) Strategic partnerships. Each programme should develop and/or strengthen partnerships with the CGIAR,¹⁰ NARS and other relevant agencies, as well as with farming communities and development agencies (international, national, private and public). This approach has been used to fund graduate studies elsewhere and there is no reason why it cannot work for RUFORUM programmes. The CGIAR research programmes have funding for graduate studies that should be exploited. These issues were discussed during RUFORUM's July 2014 Biennial meeting in Maputo.
- c) Marketing strategies. In partnership with RUFORUM, aggressive marketing of these programmes to continental and global development partners is required. This entails development of simple, but effective, marketing information that universities should take the lead in creating. RUFORUM should also provide support in development and dissemination of promotional materials and marketing at appropriate forums. The universities should use these programmes to market their collective efforts to rebuild the continent's human resources under RUFORUM. Thus, the Programmes would be showcased as a collective effort rather than as separate regional programmes, which are sometimes hard to sell.

2. Inter-university teaching via credit transfer. An essential element of these programmes is the role of other universities in teaching. Fulfilment of credit transfer between universities would strengthen inter-university collaboration. It would allow students to access relevant courses and be exposed to teaching approaches. This study finds that none of the programmes is primed for credit transfer because the basics are not there. Suggested areas for improvement include:

- a) Ratification and approval of the regional quality assurance manual developed by RUFORUM member universities to provide a basis for common agreements on standards for teaching, supervision and examination within the RUFORUM network;

¹⁰ <http://www.cgiar.org/>

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- b) Institutional strengthening of quality assurance in all member universities, by creating a separate unit to manage quality assurance where it is absent;
- c) Creation of credit transfer standards, policies and protocols that are agreeable to the RUFORUM network and overseen by quality assurance units at each university;
- d) Digitizing courses to allow non-resident teachers to engage in training and non-resident students to benefit from the training.

3. Improve teaching quality and completion rates. Each university should take full responsibility for curriculum review and reform, particularly to improve graduation rates. This issue, if not addressed, will reduce the competitive advantage of these programmes. Suggested actions are indicated below:

- a) Implement modular based teaching to improve coverage and engagement by lecturers in the host university and RUFORUM community;
- b) Each programme needs to invest in ICT supported teaching. Video conferencing, e-courses etc. are essential if non-resident promoters of such programmes are to be engaged in teaching and student supervision. The University of KwaZulu Natal Plant Breeding Programme,¹¹ as well as the African Economic Research Consortium (AERC)¹² programmes both rely in part on web- based teaching. This approach will allow students' access to leaders in science not available in the host university or region.
- c) Improving completion rates by reducing red-tape, especially during thesis examination;
- d) Reviewing the roles of the doctoral committee (student advisory/supervisory committee) to empower the team to take full responsibility for thesis guidance and examination;
- e) Strengthening promotion and advocacy activities to attract funding so that thesis research is not curtailed;
- f) Strengthening regional peer learning and support via programme regional academic advisory boards. Online meetings could be encouraged to reduce costs but provide effective guidance to the programme.

¹¹ Go to <http://ndabaonline.ukzn.ac.za/UkzndabaStory/NdabaOnline-Vol2-Issue24-College-of-CAES-PMB/ACCI%20Produces%20New%20Crop%20of%20PhD%20Graduates%20/> for more information about this programme.

¹² <http://aercafrica.org/>

4. Improve funding. Some practical steps to improve funding arrangements include, as a start—maintaining the programme’s cutting edge and then Investing in the marketing of each programme, especially to governments. This will cushion the programme when there is limited funding for external students. It has been done before in Uganda, where 10 scholarships were secured, and 12 more are under negotiation with the Government of Uganda.

- a) Each programme should conduct a full cost recovery audit and, on that basis, develop a competitive fee along with high-level support at the level of Vice Chancellor/Rector/President for a resource-mobilization strategy. The RUFORUM Secretariat should play an advocacy and support role, as needed.
- b) Each programme should build functional partnerships with complementary programmes. The Fisheries Programme in LUANAR could harness its co-location with the NEPAD Fisheries Node on the same campus for support in research and training. Such co-location provides a strong foundation to sell the programme as one that provides prime training.
- c) Explore inter-university funding arrangements such as staff fee waivers for member universities, as proposed under the RUFORUM Graduate Teaching Assistantship Initiative.
- d) Undertake advocacy for support to escalate doctoral training in Africa, engaging both development partners, such as Carnegie Corporation, DAAD, the International Development Research Centre (IDRC),¹³ governments, Regional Economic Commissions, the African Union Commission¹⁴ as well as reaching out to new players in South Korea, Japan, Brazil, etc.

¹³ <http://www.idrc.ca/EN/Pages/default.aspx>

¹⁴ <http://www.au.int/en/commission>

Equivalents (FTEs), from 2000 in 1961, to 12,000 in 2008.²² It should be noted that in 2008, Africa's combined FTE was 50,000, but the vast majority were diploma and BSc level scientists. The African university therefore plays a key role in the level and quality of knowledge produced, accumulated, transferred and applied in the continent's development. African universities will influence the pace and sustainability of Africa's socio-economic development and reinforce the jump in agricultural innovation, adoption and ultimately development impact in Africa.

1.2 Mobilizing the African university to supply innovative human resources

1.2.1 The place for higher education in the knowledge economy

Bloom *et al.* (2006²³) have shown that a one-year increase in the tertiary education stock can raise the long-run steady-state level of African GDP per capita by 12.2%. The net impact of such growth would be a 3 % growth in incomes after five years and eventually 12%. Growth, particularly in research graduate programmes, could improve the competitiveness of Sub-Saharan African (SSA) economies by reinforcing higher education and innovation, which are the key pillars of economic competitiveness according to the World Economic Forum (Global Competitiveness Report 2009-2010). Revitalizing graduate training, particularly at PhD level, is thus critical, but must have the feed-in mechanism from Master's degree programmes. The ratio of one PhD to six masters students enrolled has been recommended (Cloete *et al.*, 2012). The current ratio of PhD to masters students' enrolments at Makerere is 4:10, the same as at the University of Cape Town, suggesting an improvement. In general, while the fundamentals for the revival of the research-led university in Africa is beginning to happen, growth in science, engineering and technology is still behind business and management studies. For agriculture, this is even more important, given the dismal statistics for agricultural science and technology. Today, less than 75% of the full time staff equivalents of African agricultural research are based at public research agencies (Beintema and Rahija, 2011). Yet with investments in research-led graduate programmes, universities can start playing a significant role in economic transformation. Indeed, in Ethiopia, a member country of RUFORUM, harnessing the capacity of higher education institutions to underpin its Accelerating Ethiopian Agriculture Development Strategy, is core to

²² Beintema, N. and Rahija, M. 2011. Human resource allocations in African agricultural research. Revealing more of the story behind the regional trends.. Agricultural R7D: Investing In Africa's Future. Analyzing trends, challenges and opportunities. FARA conference working paper. (<http://www.asti.cgiar.org/pdf/conference/Theme2/Beintema.pdf>)

²³ Bloom, D., Canning, D. and Chan, K. 2006. Higher Education and Economic Development in Africa. Human Development Sector Africa Region, Harvard University. (http://siteresources.worldbank.org/INTWBIAFRKEC/Resources/Higher_Education_and_Economic_Growth_in_Africa.pdf)

transformation of Ethiopian agriculture.²⁴ Accordingly, the Ethiopian Government is implementing one of the most ambitious university expansion programmes in Africa.²⁵

1.2.2 A legacy of limited investments in higher education

Over the last decade, there have been many reviews seeking to clarify the role of the African university in the continent's development. These reviews show that in sub-Saharan Africa, a region that has experienced a 7% annual decline in funding of higher education, the net impact of universities on the continent's transformation into a knowledge economy is limited.²⁶ Funding of graduate studies, particularly PhD or doctoral level training, is dismal, with negative consequences on the economy. The limited doctoral human resources, invariably reduces the capacity of many countries to train their own scientists at bachelors, masters and PhD levels. Within the RUFORUM member universities, as an example, for the period 2001-2007, masters and PhD enrolment in Makerere University and the University of Nairobi grew by 5% and 16% respectively, compared to 19% in the University of Cape Town, Africa's Premier research university (Cloete *et al.*, 2012). Within the same period, while Makerere University doubled enrolment of graduates in science engineering and technology, from 16% in 2001 to 32% by 2007, the University of Nairobi actually dropped from 33% in 2001 to 31% in 2007. These figures have nevertheless been improving. For example, Makerere University has had a fourteen-fold increase in PhD graduates from 28 in 2000 to 600 by 2012, but with capacity to handle up to 2000 PhDs.²⁷ The Masters students at Makerere University, similarly increased, from 1167 in 2000 to 2177 in 2012, the bulk being associated with computing, business and social sciences programmes. This sluggish growth in masters and PhD level training, as portrayed by the two universities (Makerere with a 2.3% growth in PhD enrolment, whilst University of Nairobi with -17%) is not atypical of most African universities, and invariably contributes to limited academic productivity and contribution to

²⁴ Federal Republic of Ethiopia, 2010. Accelerating Ethiopian Agriculture Development for Growth, Food Security, and Equity. Synthesis of findings and recommendations for the implementation of diagnostic studies in extension, irrigation, soil health/fertilizer, rural finance, seed systems, and output markets (maize, pulses, and livestock). (<http://www.ata.gov.et/wp-content/uploads/Ethiopia-Agriculture-Diagnostic-Integrated-Report-July-2010.pdf>)

²⁵ Ashcroft, K and Rayner, P. 2011. The Purposes and Practices of Quality Assurance in Ethiopian Higher Education: Journey, adaptation and integration. (http://www.na-businesspress.com/IJBA/AshcroftK_Web3_2_.pdf) Boersma, FK and Van den Heuvel, H (eds). Travelling Ideas in Higher Education Management and Organisation: Prominent developments in Ethiopia, Indonesia and South Africa.

²⁶ World Bank 2010. Financing Higher Education in Africa. The International Bank for Reconstruction and Development / The World Bank Washington DC. (<http://elibrary.worldbank.org/doi/book/10.1596/978-0-8213-8334-6>)

²⁷ Makerere University Self-assessment Report, 2013. Directorate of Quality assurance. Makerere University.

development processes on the continent.²⁸ In the 1990's Many African countries began to reform their higher education sectors, opening space for investment in privately funded education programmes as well as the opening of new universities (World Bank, 2010). While the impact of that change in the funding for higher education is not clear (Cloete *et al.*, 2012), a decade later, the African continent began to grow again with net GDP growth of 5%.²⁹ The net benefit to the wider population has been tremendous, with many youth accessing university education and beginning to lay a foundation for the renaissance of Africa's economy. However, the transition to knowledge economies, an aspiration of the continent, will require stronger capacity for research and innovation (World Bank, 2005³⁰). The vast majority of African universities will need to invest in strong graduate programmes that train the next generation of innovators and research leaders, who will champion the continent's transition to a knowledge-based economy (Blackie *et al.*, 2010).³¹ This process has started, with Mauritius and South Africa being good examples of cases where strategic investments in higher education, particularly graduate studies, are driving economic transition.³²

1.2.3 Mobilizing and catalysing investments in higher education

Liberalization of higher education and the opening up of many new universities in many sub-Saharan African countries presents both challenges and opportunities for strengthening the contribution of African universities to economic development. Coupled with an aging agricultural research community in the National Agricultural Research Systems (NARS) (Mukiibi and Mokwunye, 2007³³), the demand for PhD level human

²⁸ Lenga, F. 2009. An overview of the design and implementation of a national quality assurance and credit transfer system in Kenya. A paper presented at a consultative workshop on quality assurance systems for RUFORUM graduate training and research supported programmes. Entebbe, 23rd February 2009.

²⁹ NEPAD, 2007. New Partnership for Africa's Economic Development, NEPAD, Annual Report 2006-2007. African Union, Agriculture Unit.

³⁰ World Bank, 2005. "Korea as a Knowledge Economy." Knowledge for Development Program, World Bank Washington DC. (<http://web.worldbank.org/WBSITE/EXTERNAL/WBI/WBIPROGRAMS/KFDLP/0,,contentMDK:21480324~menuPK:1727232~pagePK:64156158~piPK:64152884~theSitePK:461198,00.html>)

³¹ Blackie, M., Blackie, R., Lele, U., and Beintema, N. 2010. Capacity Development and Investment in Agricultural R&D in Africa. Lead Background Paper presented during the Ministerial conference on Higher Education in Agriculture in Africa (CHEA). Speke Resort Hotel, Munyonyo, Kampala, Uganda, 15-19 November 2010 (http://www.ruforum.org/sites/default/files/file/CHEA/CHEA%20FINAL/Background%20papers/Capacity%20and%20Investment%20Development%20in%20Agriculture%20_Nov9.pdf)

³² Bloom, D., Canning, D. and Chan, K. 2006. Higher Education and Economic Development in Africa. Harvard University, Human Development Sector Africa Region.

³³ Mukiibi, J and Mokwunye U. 2007. A review of selected multi-country agricultural and natural resources management research programmes and projects in Africa: Lessons for the future. A commissioned study by the Forum for Agricultural Research in Africa (FARA).

resources to train the next generation scientists is high. It is worth noting that the most competitive economies in Africa are South Africa and Mauritius, ranked 52nd and 54th respectively, based on the Global Competitive Index (GCI).³⁴ Their GCI is just below the southeast Asian average (and above the emerging market economies of India and Russia. Africa's human-resource challenge is known and is widespread. This common challenge clearly demands investment approaches that are supranational in nature. Specialists in institution-building recommend a "systems approach" for coordinating investments in three basic and interlinked agricultural areas: research; extension-education and advisory services; and thirdly higher education.³⁵ There are a number of approaches currently in use or applied in the past that are briefly presented below:

Full-time studentship in the north. This approach has been particularly used in cases where human capital for collaborative training involving northern and southern universities is asymmetric. A typical example is the decade-long north-south programme, "Manpower for Agricultural Development" implemented by USAID and led by Ohio State University in Uganda in the 1980s (Okori, 2011³⁶). Such extensive north-south arrangements are expensive, and more often, do not increase human capital, because the staff trained may not return to the continent after PhD education abroad. Such models are nevertheless needed for emerging knowledge intensive programmes.

Sandwich models involving north-south partnership. This model was adopted to lower the cost of training abroad and increase opportunity for new PhD graduates to return and serve their countries. Sandwich programs involve training abroad, but with research conducted in the student's home country. In Eastern Africa, the BIO-EARN programme³⁷ used a modified sandwich model that trained 30 PhDs who, upon completion, were provided with foundation support to start their own research and training programmes in their home countries. Indeed, the new PhDs trained, within the space of three years of their return, a new crop of 30 MSc graduates. A similar approach is being used by the Education for African Crop Improvement (EACI) program of the Alliance for a Green Revolution in Africa (AGRA),³⁸ which is implemented at KwaZulu Natal University and the University of Ghana.

³⁴ World Economic Forum, 2013. The Africa competitive report. World Economic Forum, Geneva Switzerland. (<http://www.weforum.org/reports/africa-competitiveness-report-2013>)

³⁵ Eicher, C.K. 2004. Rebuilding Africa's scientific capacity in food and agriculture. Department of Agricultural Economics, Michigan State University, East Lansing, Michigan, USA.

³⁶ Okori, P. 2011. Role of Makerere University in providing human capital to the national and regional agricultural research systems. ASTI- IFPRI/FARA conference Accra Ghana, December 2011.

³⁷ Forsman, B., Virgin, I. and Komen, J. 2010. BIO-EARN: a decade of bioscience development in Eastern Africa. Stockholm Environment Institute, Sweden.

³⁸ <http://agra-alliance.org/>

Regional supranational training programmes. Regional supranational agricultural research and training programmes are not new to Africa. They were part of the colonial legacy, with research facilities such as IRAZ,³⁹ as well as post-independence regional economic communities, such as the East African Community. These training programmes mainly focused on student exchanges and required the creation of management organs such as the Inter-University Council for East Africa (IUCEA).⁴⁰ The emergence of regional training programmes hosted by African universities is more recent, especially after the creation by the Rockefeller Foundation in 1992 of the Forum on Agricultural Resource Husbandry.⁴¹ Student exchanges at that point in time were limited, the major focus being on strengthening country graduate programmes.

Today, there are several supranational programmes training agricultural graduates at masters and PhD level. These supranational higher education programmes are designed following the centre of excellence/leadership, with one lead university providing training for others in the region. An important innovation in the design of these programmes is the scaling out of jointly developed curricula. This approach is being used by the masters in Research Methods degree programmes developed by RUFORUM member universities, initially hosted by Jomo Kenyatta University of Agriculture and Technology (JKUAT)⁴² and now being scaled out to other universities. Equally important is the inclusion of leadership and entrepreneurial courses as part of soft skills enhancement for students and staff. These programmes, if well designed, have the capacity to produce “scientist entrepreneurs,” create professional career structures, ensure gender equity, build economies of scale and serve as leverage points for translating knowledge into innovation and application (Moock, 2011⁴³).

There are many advantages to these regional programmes: (1) Joint curricula development ensures relevance to the broader development challenges of the region,

³⁹ IRAZ stands for Institut de Recherché Agronomique et Zootechnique, a multi- country research facility set up in to serve Burundi, Rwanda and the Democratic Republic of Congo.

⁴⁰ Chacha Nyaigotti-Chacha, 2009. Introducing a higher education quality assurance system for East African universities. A paper presented during RUFORUM’s Deans’ Meeting during the Annual General Meeting. Serena Beach Hotel and Spa, Mombasa, 26th August 2009. The IUCEA website is located at <http://www.iucea.org/>.

⁴¹ Blackie, M. and Woome, P. 2005. Challenges and Opportunities of the Regional Universities Forum for Capacity Building in Agriculture (RUFORUM) in Kenya, Malawi, Mozambique, Uganda and Zimbabwe. Report of a commissioned study by RUFORUM, September 2005. (<http://repository.ruforum.org/documents/challenges-and-opportunities-regional-universities-forum-capacity-building-agriculture>)

⁴² <http://www.jkuat.ac.ke/postgraduate-courses/msc-research-methodology/>

⁴³ Moock, J.L. 2011. Network Innovations: Building the Next Generation of Agricultural Scientists in Africa. Paper presented at the ASTI/FARA conference on Agricultural R&D Investing in Africa’s Future: Analyzing Trend Opportunities and Challenges. December 6-7 Accra Ghana 23 pp. (<http://www.ifpri.org/publication/network-innovations-building-next-generation-agricultural-scientists-africa?print>)

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in line with the current wave of economic integration; (2) Regional student and staff exchange creates regional professional teams, which start to work together, leveraging each other's strengths; (3) Uncompleted research results, especially for the PhD thesis, can be ultimately developed into technologies that are relevant to local needs; (4) Hosting universities have an opportunity to strengthen their own curricula, and; (5) Young graduates trained in the region are retained and deployed to serve their countries (see Tables 1 and 2). This is one of the strongest pillars of regionally hosted PhD training or their variants, where student conduct thesis research in their home country. In this report, we review the performance of RUFORUM initiated PhD programmes to inform improvement in the future, using some of the vantage points of regional investments in higher education.

Table 1. Deployment of RUFORUM alumni in different market segments

Institution in which alumni are working	% MSc (n=184)	% PhD (n=40)	% Overall (n=224)
University	38	43	39
Research	27	28	27
Government agency/ministry	8	15	9
Extension	6	0	5
NGO	10	5	10
Industry	10	10	10

Source: RUFORUM Tracer Study Report 2014

Table 2. Retention of RUFORUM alumni within country, region and outside Africa

Location of the RUFORUM Alumni	% MSc reporting n=197	% PhD reporting n=44	% Overall reporting n=241
Live and work in own country	93.2	97.9	95.6
Live and work in ECSA but not own country	6.3	2.1	4.2
Live and work outside Africa	0.5	0	0.3

Source: RUFORUM Tracer Study Report 2014

2 STUDY APPROACH

2.1 Study aims and approach used

2.1.1 Study aims

The purpose of this study was to evaluate the performance of these graduate programmes, with a specific focus on the Regional PhD programmes initiated by RUFORUM in 2008. The study aimed (to draw lessons from the four years of implementation to guide future investments in such supranational or regional undertakings. One aspect of this study investigated implementation modalities in place at host universities, which underpin their competitiveness, such as quality assurance of the programmes i.e. (mechanisms in use, adherence to standards and relevance), financing arrangements and institutionalization. The second aspect assessed the outcomes of these investments at the institutional level and in the broader agricultural sector of the region and country. The study was conducted at two host universities: Makerere University for the Regional PhD in Plant Breeding and Biotechnology and Lilongwe University of Agriculture and Natural Resources (LUANAR) for the Regional PhD in Fisheries and Aquaculture and the Regional PhD in Agricultural Resource Economics.

2.1.2 Approach

Context. RUFORUM has been implementing supranational or regional MSc and PhD programmes as part of its strategy to leverage regional university strengths, and marshal efforts to rebuild Africa's agricultural research for development capacity.⁴⁴ The first cohort of PhD graduates under its regional programmes has by and large graduated. These training programmes have admitted a second and in some cases, a third cohort of students. These programmes are thus due for review and reform. This study is one of RUFORUM's efforts to draw lessons to inform the reform process.

Study design. The regional programmes having been created to provide unique services and/or products, must be competitive and produce high-quality graduates who can serve a complex but growing agricultural sector. The study was therefore designed to test on one hand, the competitive advantage of these programmes and on the other hand, the impacts of these investments, especially to the host university. Competitive advantage in this study is based on the theory advanced by Michael Porter in 1980s, arguing that competitive firms gain attributes and resources to perform at a higher level than others in the same industry or market.⁴⁵ According to Porter, firms seek competitive advantage to achieve lower production costs and product differentiation (variety of products, services, or features) to consumers that competitors are not yet

⁴⁴ RUFORUM 2005. Regional Universities Forum for Capacity Building in Agriculture (RUFORUM), 2005. Strategic Plan 2005-2015.

⁴⁵ Porter, M. E. 1998. Competitive Advantage: Creating and Sustaining Superior Performance: with New Introduction. The Free Press, Simon and Schuster Inc., New York.

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offering or are unable to offer). These issues are equally important to the regional PhD programmes, which must remain unique and add value to membership at lower comparative costs. These issues therefore formed the core of the study as outlined below:

1. Competitive advantage of the programme

- a) **Demand for the programme:** The aim was to assess the relevance of the programme to the university and users of the products of the training.
- b) **Drivers of success and sustainability of the regional programme.** The objective was to identify areas of strength (on graduate and research products) and opportunities for improvement to assure continued existence of the programme.
- c) **Institutionalization of programme management.** The aim was to assess the extent to which programme operation has been embedded within regular operations of the host department or to explore opportunities to do in instances where this is not the case.

2. Impacts of investments

- a) **Impact on implementing Institutions.** The study sought to gain a better understanding on how the programme stimulates and strengthens managerial, scientific and entrepreneurial talents of students and staff alike. It also examined whether these programmes provides mutual benefits to the institutions involved.
- b) **Impact on other partners and the agricultural sector.** The aim was to assess the outcomes of the investments on other complementary and or users of university outputs within the agricultural sector.

3 STUDY FINDINGS

3.1 The findings

3.1.1 *Investing in the PhD in Plant Breeding and Biotechnology at Makerere University*

3.1.1.1 *Programme brief*

The PhD in Plant Breeding and Biotechnology is hosted by the School of Agricultural Sciences, in the Department of Agricultural Production⁴⁶ following approval by the University in 2008. The objectives of the programme are:

- i) To give graduates an opportunity to broaden and deepen their knowledge in Plant Breeding and Biotechnology, which will permit them to engage effectively in science-led agricultural development.
- ii) To produce high-calibre scientists who will lead training and research and provide leadership by providing students with an understanding and hands-on experience of the different disciplines within the realms of plant breeding and biotechnology, research management and broader development issues.
- iii) To strategically invest in the building of a strong national-regional-global consortium to support and develop (where non-existent) PhD training programmes built on shared and rationalized regional resources for a strong agricultural science and innovative base within Eastern, Central and Southern Africa.

Programme structure

The programme operates through RUFORUM, with Makerere University taking leadership in the implementation and hosting. It is designed using a Centre of leadership model, according to the Blackie and Woomey (2005) study, which recommended establishment of 1-3 centres according to demand and strengths. The RUFORUM Secretariat brokers linkages with strategic partners, performs roles of advocacy, resource mobilisation and coordination at the regional level. RUFORUM partners play various roles in teaching, supervision, research and student mentoring.

3.2 **Competitive advantage of the programme**

3.2.1 *Demand for the programme*

The interview panel. In order to assess the competitive advantage and relevance of these regional programmes, interviews and focus group discussions were held with key partners from extension (the African Forum for Agricultural Advisory Services-AFAAS),⁴⁷ researchers from the National Agricultural Research Organisation (NARO) and programme managers for the Staple Crops and the Partnerships and Capacity

⁴⁶ <http://caes.mak.ac.ug/departments/agricultural-production.html>

⁴⁷ <http://www.afaas-africa.org/>

Strengthening Programmes of ASARECA.⁴⁸ Others interviewed included the Director, School of Graduate Studies and the Director, Quality Assurance of Makerere University, Head of the department hosting the programme, Graduate Study Coordinator of the College, the PhD Programme Manager, RUFORUM staff- M&E and Training Staff. These partners and leaders offer unique opportunities to gain insights into the regional demand for such programmes.

The benefits. The responses were affirmative, with a strong request for continued investment in regional higher education programmes. The key benefits are outlined below:

1. A complex but high-demand programme. Agricultural transformation was noted by respondents as deeply intertwined with rural transformation, therefore presenting a complex demand for diverse sets of skills, including soft skills as well as entrepreneurial, managerial and technical skills. In the case of plant breeding, there is still high demand for new varieties given the diverse crops cultivated and ever-present production deficits and threats of biotic and abiotic stresses. A balance between MSc and PhD training is needed to provide human resources for applied research (MSc) for short-term needs and strategic research, foresight planning and capacity strengthening at the PhD level.

2. Investing regionally to support weak NARS. It was noted that while strategic programmes such as Strengthening Capacity for Agricultural Research and Development in Africa (SCARDA⁴⁹), AGRA⁵⁰ and RUFORUM's own graduate research programme have contributed to capacity strengthening, especially at master's degree level in eastern, central and southern Africa, there are still severe human-resource needs, especially at PhD level. Many countries in the region do not have efficient PhD programmes especially those emerging from conflicts. Moreover, for such countries, training high-level academic staff with doctorates will play a major role in training the next generation of scientists. South Sudan, the Democratic Republic of the Congo, Burundi and Madagascar were noted as particularly still weak and could benefit from such regional programmes. For countries that do not have a recent history of conflicts, their relatively weak National Agricultural Research Systems (NARS) still require further investments. As such, regional programmes such as the PhD in Plant Breeding and Biotechnology are needed. As one respondent noted, *“Our region has such a dichotomy in the strengths of the NARS ranging from those with moderate staffing to almost nothing in some discipline areas. Therefore the*

⁴⁸ <http://www.asareca.org/>

⁴⁹ SCARDA was a capacity strengthening programme managed by the Forum for Agricultural Research in Africa (FARA) and strategic partners in sub-Saharan Africa. For details see www.fara-africa.org.

⁵⁰ AGRA, the Alliance for a Green Revolution in Africa is implementing the Education for African Crop Improvement (EACI) programme hosted at selected African Universities. For details see www.agra.org.

question of investing in higher education is unnecessary. In fact, we may need many more of such programmes at least for the next decade.”

3. Need for programmes that are drivers of economic growth. One of the interesting perspectives of the demand for this particular programme came from Makerere University, which has just completed a self-assessment of its operations, and their relevance to Uganda and to the region. Makerere University has adopted a “Fitness for Purpose” strategy, a key quality assurance principle that aims at assuring the implementation of the right programmes at the right intensity and scale to drive economic development. Agriculture and the demand for new and better-adapted varieties are issues that will remain for the long-term future. As such training of high-quality graduates is key for the sustainability of plant breeding in Uganda and the region, the regional PhD Programme in Plant Breeding and Biotechnology is well suited to produce both the technologies and the human resource to champion agricultural development in Uganda and the wider region.

Caveat. The respondents noted that whereas the demand for PhD level graduates is real, it is challenging to plan effectively and prioritize capacity strengthening investments because most countries lack national human-resource development plans. Review of the literature indicates that in the case of Uganda, the FTE of staff engaged in agricultural research, while improved, is still lower than regional leaders, Sudan and Kenya. As such, the demand for agricultural scientists especially plant breeders remains unequivocal.

3.2.2 Drivers of success and sustainability of the regional academic programme

Interview panel. The panel constituted respondents from the University (Academic Registrars Department, School of Graduate Studies and Directorate of Quality Assurance). They noted that, with exception of the composition of the students involved and the scope of research undertaken in regional programmes, both national and regional programmes are meant to be essentially the same in terms of quality and delivery. They also noted that the involvement of visiting lecturers and students “internationalized” the programmes. These are non-academic areas, whose importance cannot be underestimated. Discussions were also held with employers of the graduates to seek clarity on the quality of graduates coming from the programme and/or needed in the economies of the region. In this case ASARECA and AFAAS were engaged. The summaries of the drivers of success and sustainability are presented below.

Support to the university mission and vision

a) Strengthening university academic core. The contribution of a university to national development is mainly via knowledge. University graduates transmit knowledge to the broader economy and/or apply it to solve societal problems. This is the academic core of a University (Cloete *et al.*, 2012). This concept was used in this study, with the assumption that a strong academic core is a driver of success. One of the measures of the academic core, student enrolment in postgraduate

studies, has been improving. The University has made a leap in the number of PhD completions and graduations, improving from 12 in 2000 to 70 by 2012-2013. This Regional PhD in Plant Breeding programme contributed to that leapfrog. The programme also generated over 36 journal papers and 32 conference proceeding papers over a three-year period, up from an average of 12 papers from the host department over the same period. These remarkable contributions have strengthened capacity to generate and disseminate new knowledge. A recent self-assessment report by Makerere University confirmed the primacy of the College of Agricultural and Environmental Sciences, the host of the regional PhD and MSc in Plant Breeding.

- b) Training the next generation of scientists and academic staff.** This programme involved generally young PhD students (<30 years old). Those who have completed their degrees are playing various roles in the NARS, universities or the private sector. Nine students are currently working with universities in their home countries—Kenya (3), Zimbabwe (3), Malawi, (1), Zambia (1), and Uganda (1). The NARS in the region are employing 6 graduates—Zambia (1) and Uganda (5). One graduate is in the private sector as a maize breeder in Zimbabwe and three are serving different sectors in Uganda. In the second and third cohorts of students, the Programme will train for Burundi, DR Congo, Ethiopia, South Sudan, Sudan, Benin, Ghana, Mali, and Nigeria in addition to the previous countries in which the Programme has trained students (Kenya, Malawi, Uganda, and Zimbabwe). The Programme therefore has already contributed to building capacity for capacity strengthening in the region. As indicated earlier, several of the alumni are leading training programmes in their countries, while a few are working within the region thus leading to widespread spill-over.
- c) Catalysing change in teaching.** Within the Department of Agricultural Production, the programme has influenced the quality of MSc and PhD training. Students coming through this programme have been noted to have better scientific grounding and have completed their training in good time, with peer publications in highly regarded journals. Investments in teaching infrastructure by the programme are available to other graduate students in the department. Indeed, the current MSc crop science students take some courses together with the regional programme's group. Students in these programmes (regional PhD and MSc) inspire others to join them because of the quality with which they convey, conduct and communicate science.
- d) Producing proactive entrepreneurial graduates.** To-date, one student from the Programme has taken up a post-doctoral position at the Bioscience East and Central Africa (BecA)⁵¹ to complete his pioneering work on sorghum-maize interspecific hybrids. Two students in the second cohort were awarded scholarships

⁵¹ BecA Bioscience eastern and central Africa is a shared agricultural research and biosciences platform that exists to increase access to affordable, world-class research facilities. Located at and managed by ILRI in Nairobi, Kenya for details see <http://hub.africabiosciences.org/>.

for nine months to conduct research at BecA. These examples illustrate the competitiveness of graduates from the programme. As part of their training, students were trained on grantsmanship. Three students obtained additional support for their PhD theses from the International Foundation for Science (IFS).⁵² The inculcation of such skills to graduates, grounds them in science and provides a solid foundation for future scientific endeavour. With such a foundation, alumni can be proud of their academic history and will become strong advocates for the programme wherever they are, guaranteeing continued visibility.

e) **Stabilizing funding.** Initially the programme was started using a seed grant from RUFORUM. The grant provided scholarships, staff and student exchanges and infrastructure support. Makerere University on its part was to provide funding via tuition rebates to the hosting department. That part of resource management did not work effectively for the first four years of the programme, inadvertently affecting operations. Discussions with programme management show that it is still mainly externally funded through grants. The second funding stream through tuition rebate is still limited. The programme and the host department, in particular, do not have resource mobilization arrangements but rely on RUFORUM for advocacy and promotion, especially on the international scene. Under such circumstances, the financial stability of the programme is in jeopardy.

e) **Implementing regional quality assurance mechanisms.** The commonly developed quality assurance scheme for regional programmes seeks to ensure that all RUFORUM supported programmes meet requirements for, (1) Fitness for purpose i.e., to fulfil the aims and objectives of the programme with sufficient capacity, (2) Standards: Compliant to benchmarks set for the programme and, (3) Continuous enhancement (self-learning for improvement). These three critical areas can be used to review and monitor the academic core of each programme i.e., teaching and learning, research and outreach and credit accumulation and transfer. The study applied these tools and its findings are presented below.

Fitness for purpose: This aspect of the study investigated conformity to the standards set in the regional quality assurance manual developed by RUFORUM member universities. The indices and review conclusions and areas for improvement are presented below:

A) Quality of inputs used in training. These included: (1) programme design, (2) profile of students recruited and (3) facilities and infrastructure.

i. **Programme design for relevance.** The programme was developed by a national and regional team and reviewed for relevance by key stakeholders, such the National Agricultural Research Organisation (NARO), the Plan for Modernisation

⁵² <http://www.ifs.se/>

of Agriculture Secretariat—the Government of Uganda’s flagship agricultural development programme during that period, ASARECA and by international partners in the USA and Europe.

Review conclusion on relevance. According to the Inter University Council for East and Central Africa (IUCEA)⁵³ and Cloete et al. (2012), engaging stakeholders in the design of academic programmes is essential to maintain development relevance. The regional PhD in Plant Breeding and Biotechnology therefore meets the standards for relevance to development needs of the host country and region. Moreover, regular reflective meetings have continued to be held to review progress and student work. Similar engagement of stakeholders in design of academic programmes is recommended, especially during review after five years of implementation.

- ii. **Student recruitment requirements (regionality and gender balance).** The programme has maintained a fairly regional student composition. The first intake had 22 students, with 45% being Ugandan and 55% drawn from the region. Cohort two had six students; three students were from the region. Cohort three has a similar proportion of students. The student composition has been remarkable. Each cohort has had one-third of its composition being women, students drawn from NARIs, universities and talented young people. One major challenge for the programme is the absence of strong student recruitment both locally and in the region especially in the absence of “project type” engagements, such as Intra ACP Academic mobility. The advocacy and promotion of the programme still depend a lot on RUFORUM rather than on the host university. This type of support while pragmatic, may actually lead to apathy on the part of host intuitions. The university websites meant to be the information portal for prospective students primarily have just the name of the programme and no detail. This needs to be improved.

Review conclusions on student recruitment. The long-term success of this programme will depend on its ability to attract students. This requires putting in place an advocacy and promotional effort, including the use of web-based tools. RUFORUM can then provide a scaffold for wider regional visibility, but the host university should play a more significant role promoting the programme and seeking additional funding to support it.

- iii. **Teaching and research infrastructure.** Currently, the programme is housed at the Makerere University Research Institute in Kabanyolo. The programme has access to self-contained student accommodation for at least 17 students, a research

⁵³ IUCEA, 2009. The Inter-University Council for East Africa. Road Map to Quality. Handbook for Quality Assurance in Higher Education Volume 1: Guidelines for Self-Assessment at Program Level. (http://www.iucea.org/index.php?option=com_phocadownload&view=category&download=46:quality-assurance-handbook-vol-1&id=3:publications)

laboratory, with capacity for molecular breeding, controlled plant growth chambers, tissue culture laboratories and land for field research. It is also located less than 10 kilometres from the National Agricultural Research Organization facilities at Namulonge, where additional research facilities exist, including CGIAR centres. Teaching facilities have also been procured and deployed.

Review conclusions on infrastructure. The recommendation for Makerere University to host the programme was made after a review (Blackie and Woome, 2005). That process allowed the matching of existing resources to planned activities. This review finds this is the way to go, and strongly recommends that this process be carried out periodically, but this time round, in partnership with the universities as part of a quality assurance self-assessment. In so doing, RUFORUM will start catalysing change among its membership, a role it is meant to perform, rather than carrying the burden of assessments that directly benefit Universities.

B) Quality of teaching, learning and research activities. The study focused on two issues, (1) teaching and learning conditions and (2) research mentorship and supervision

- i. **Teaching and learning conditions.** During the formative years of the programme, investments in teaching were implemented by a team rather than by individuals. A module-based teaching approach, backed by research experience was used by lecturers drawn from Makerere University and the region. Inter institutional linkages with Bioscience East and Central Africa (BecA) was used to expand the learning experience. Overall, out of 10 courses delivered (seven core and three elective) Makerere University accounted for five courses during the first cohort. During the second cohort, due to funding challenges, only two courses were taught by non Makerere University staff. Courses were evaluated at the end, and comments used to improve quality. Lecturers were also encouraged to discuss the outcomes of the course evaluation with the students in order to build a culture of feedback and co-learning. A research and training mentoring system, involving a doctoral committee, and research mentor was established. The research mentor in this case is a retired professor who is resident on the university farm and provides both research and academic support to graduate students.
- ii. **Research supervision.** All thesis proposals were vetted externally by colleagues in the USA from the Crop Science Society of America, faculty from the Swedish Agricultural University and in Africa from the University of KwaZulu Natal. Through partnerships with CGIAR institutes and National Agricultural Research Organisations, students found placements in ongoing programmes and were able to get further mentorship. Students hosted at CGIAR centres were able to complete their research in time due to defrayal of costs by the CGIAR. This success notwithstanding was affected by a funding and supervisory burden, because 22 students were recruited at the same time. The absence of a clear resource mobilisation plan and the failure of the university systems to remit funds

when needed diminished the success of the programme, especially from year three of implementation. The programme began to exhibit signs of administrative stress; by year five of implementation, without major administrative changes especially with regard to rebate of expenses incurred in running these operations the programme faced major constraints. Nevertheless, efforts by the programme and RUFORUM to seek additional funding have been successful, and a third cohort of fully funded students has been recruited. Scholarships were obtained from DAAD and Carnegie Corporation of New York.

Review conclusions on teaching, learning and research. The engagement of teams rather than individuals in teaching is a strong point that should not be lost in subsequent implementation of the same or similar programmes. This approach reduces workload pressure on the university and also supports department team development. The engagement of other partners, especially the CGIAR and other centres of knowledge is also commended and should be further pursued. The major challenge to effective management of teaching and learning was funding and cash flow arrangements. This issue is the major challenge to sustenance of higher education investments and programmes in Africa and highlights the lack of congruence between university vision and mission.

C) Quality of outreach: Knowledge and products generate. The aim was to investigate the level to which knowledge has been generated and disseminated to various publics as indicated below:

Research publications. At least 18 students out of 22 from the first cohort of PhD students have completed their studies within a four-year time frame. Each of these students has published at least one paper based on their theses in a peer-reviewed scientific journal and some had two-three papers. A number of papers are also under review. These students have collectively generated over 36 journal papers and 32 conference proceedings in a four-year period, up from an average of 12 papers from the host department over the same period. The academic core of the department i.e., contribution to knowledge has been strengthened. A recent self-assessment report by Makerere University indicates that the College of Agricultural and Environmental Sciences was the most productive in terms of PhD training and research publications. This strong rating is in part due to the major contribution of RUFORUM to assist both MSc and PhD training through its diverse grant schemes and strategic support.

Review conclusions on outreach. The visibility and competitiveness of the programme will depend on this particular element of the quality assurance mechanism. The programme has demonstrated that it is possible to undertake high-quality training, including publication of results prior to graduation. This aspect should not be diminished and in fact is now a requirement within the university. For the RUFORUM network, promotion of this locally tested approach to training the next generation of scientist is worth scaling up. It should be one of the issues to be pursued by the RUFORUM Deans, Technical Committee and the Board.

3.2.3 Institutionalization: Strengthening management of the programme

The study investigated the roles of the university and RUFORUM in ensuring that implementation is fully institutionalized. The programme, while approved by the university, was managed in a “ring-fenced manner” as a project. Its host, the Department of Agricultural Production, mainly plays roles in teaching and student supervision. Daily management is done by the programme coordinator, who serves as the student and teacher point of contact, reporting and coordinating all training and supervisory activities. This type of operation is a recipe for burnout and eventually poor performance. On its part, the university needs to go beyond “political support” by meeting its financial obligations, and providing the working environment needed to realize the full potential of internationalization.

Proposal for strengthening institutionalization. In order to institutionalize management of the programme, the university needs to strengthen its engagement. The College of Agricultural and Environmental Sciences should take full responsibility for curriculum review and reform particularly by: (i) Improving completion rates by reducing red-tape, especially during thesis examination; (ii) Reviewing the role of the doctoral committee to empower the team to take full responsibility for thesis guidance and examination; (iii) Strengthening promotion and advocacy activities to attract funding and students; (iv) Digitizing courses to allow non- resident teachers to engage in training. These responsibilities are way beyond the scope and scale of operations of the current “lone ranger” management style in use.

3.3 Impact of investments

3.3.1 Impact of the programme on transformation of the academic core of the university

The impact of this programme on the academic core of the university i.e. graduate training, research and outreach at Makerere University is presented below

- 1. Adoption of coursework based PhD programmes.** The College of Agricultural and Environmental Sciences is the first one in the university to graduate PhD students trained through coursework and thesis research. According to the Director of the School of Graduate Studies, the quality of theses coming from this programme is high. While the university is transitioning to this type of PhD training, its management, especially student supervision, will need strengthening as it scales out to other units.
- 2. Driving the national research agenda.** The agricultural sector will remain a major player in economy of several Sub-Saharan African countries for the foreseeable future. Such a strong sector requires active engagement of the university, especially innovative programmes. This is the space that universities can fill by contributing towards development of a research agenda and by being one of its key implementers. The PhD programme has contributed by incorporating students’ research especially within NARO and the CGIARs

- 3. Internationalization.** The university has prioritized internationalization as part of its strategy to serve the wider African continent. Currently Makerere University has post-graduate students from 22 countries including the USA, Syria, Canada, the United Kingdom and the rest of Africa. The Regional PhD Programme is one of the flagship academic activities and is in line with the internationalization vision of Makerere University. The programme has attracted students from 10 countries—Benin, Ghana, Kenya, Malawi, Nigeria, Sudan, South Sudan, Uganda, Zambia and Zimbabwe. Equally important has been the engagement of regional staff in course delivery, with seven staff out of 15 engaged in student training, four of whom were from the region. Other colleges in the university are also engaged in staff exchange, with 15 involved in 2013. In order to improve international relations, the university has established an International Office. The Regional PhD in Plant Breeding has contributed to the agenda of the International Office.
- 4. Credit transfer.** Credit transfer is an important component of any international programme, such as the Regional Plant Breeding PhD Programme. Makerere University is aware of this issue, and has piloted credit transfer in selected undergraduate degrees of the College of Health Sciences. However, the university leadership argues that credit transfer requires, among other things, a common agreement on standards of teaching, supervision and examination that is absent for most programmes. Currently, even for cases where there is some agreement on elements of teaching, supervision and examination, there is lack of confidence on quality of products from other universities.

Challenges to increased impact. Regional programmes require efficient staff mobility especially for cases where joint teaching is required. Yet currently, there is no clear mechanism for wider engagement because the process is fraught with absent or weak policies and implementation organs supportive of training and research activities. While there is an International Office, its operations are limited being largely centralized. Addressing these issues through inter-university exchange is critical for the long-term success of the programme

Opportunities to strengthen credit transfer. Some units of Makerere University are currently engaged in training that involves credit transfer. The East African Institute of Statistics, in partnership with Makerere University, is implementing credit transfer. The process is based on a joint quality assurance system that the university was involved in, from design to accreditation. According to the Makerere University Academic Registrar, putting in place international/regional regulatory frameworks and protocols is the first step needed to implement credit transfer. For its part, RUFORUM could support credit transfer by consolidating the creation of regional protocols for credit transfer and ratification by all member universities.

3.3.2 Impacts on agricultural sector

Agricultural research and training. Through the partnership, students have been placed at research stations both locally and at CGIAR centres. For the national research

systems, the presence of these students cultivated an academic environment needed to support innovation. The seminars, publications and research outputs provided by the students also improved the research core of the research institutes. As an example, the National Crop Resource Research Institute (NaCRRI),⁵⁴ located 10 km away from the University research institute, was host to five PhD students. The students working on maize revived breeding for tolerance to maize ear rot diseases, pyramiding resistance to foliar diseases in beans and on root and tubers to evaluate sweet potato for genetically engineered resistance to the potato weevil, the crop's most noxious pest. The materials from these students are now part of the pipeline varieties for release. Through partnerships with CGIAR, the students completed on time, published at least two papers and generated several breeding lines that are now being advanced for variety release. The programme has strengthened staff capacities of RUFORUM member universities and national agricultural research institutes in the region. Alumni of the programme, who have completed their studies, have returned to their home countries to lead plant breeding programmes and other leadership positions:

- a) Mcebisi Maphosa from Zimbabwe is now the Dean of the Agricultural Faculty at Lupane State University in Zimbabwe and has already established a plant breeding programme.
- b) Edmond Gasura has been appointed a lecturer at the University of Zimbabwe and has initiated a plant breeding programme
- c) Abel Sefasi has been appointed a lecturer at LUANAR and has been charged with establishing a biotechnology unit
- d) Langa Tembo now back at the University of Zambia as a lecturer, he is helping to build the plant breeding programme and establish a biotechnology programme
- e) James Mwololo from Kenya has been appointed lecturer at Pwani University, Kenya
- f) Sadik Kassim is now the Director of a Zonal Research Centre in Uganda
- g) Munyiri Wanja Shelmith is now a lecturer at Mount Kenya University in Kenya
- h) Mundigoto Pyani E. is a lecturer at Kyambogo University in Uganda
- i) Laban Turyagenda F. is now a lecturer at Makerere University

The programme has been earmarked by the Uganda Ministry of Agriculture, Animal Industry and Fisheries to train 12 PhD students, with support from the Uganda

⁵⁴ <http://www.nacri.go.ug/>

Government. Even within this short spell, the programme has already established a record for quality and relevant training: The East African Community (EAC) has earmarked it as its Centre for Crop improvement for the EAC region.

Knowledge and technologies for African crops. All these students studied African crops, with a focus on the major staples. Some of the issue studied had literature gaps and were thus difficult to improve. The reaction of genetically engineered sweet potato will, for example, underpin deployment of the technology against the noxious weevil; new cheaper options for tissue culture of banana will provide cheap means for mass production of disease free material; the breeding work on cassava rich vitamin A will provide cheap sources of Vitamin A for rural communities, once released. Ongoing work on sweet sorghum breeding will generate alternatives for producing jiggery, syrups and biofuels with less water compared to cane sugar. This work is funded by the private sector in Kenya. Products coming from the sorghum breeding work at Moi University and Makerere University is leading to joint release of material in both countries. These few examples illustrate the potential impacts of products from the training.

3.3.3 Investing in the PhD in Fisheries and Aquaculture at Lilongwe University of Agriculture and Natural Resources

3.3.3.1 Programme brief

The PhD in Fisheries and Aquaculture is hosted by Lilongwe University of Agriculture and Natural Resources (LUANAR), in the Department of **Aquaculture and Fisheries Science** of the Faculty of Natural Resources Management. The programme was launched in 2009 with four objectives: (1) Develop and build capacity in order to support economic advancement of the eastern and southern Africa region, especially in the aquaculture and fisheries sector; (2) Equip students with a deeper understanding of the theoretical framework underlying aquaculture and fisheries sciences and practices; (3) Equip students with skills in articulating aquaculture and fisheries issues for the public and private sectors, as well as, for international and non- governmental organizations; and (4) Strengthen regional collaboration, while rationalizing the use of existing resources (human and infrastructure) in the region.

Programme structure

The programme operates through RUFORUM, with LUANAR hosting the programme. It is designed in a similar manner to the Plant Breeding Programme at Makerere. The RUFORUM Secretariat brokers linkages with strategic partners, performs roles of advocacy, resource mobilisation and coordination at the regional level, just as it does for other regional programmes. RUFORUM partners play various roles in teaching, supervision and research.

3.4 Competitive advantage of the Programme

3.4.1 Demand for the Programme

The interview panel. At LUANAR, the interviewed persons included the Academic Registrar, the Head of the Department hosting the programme and the Director of the

School of Graduate Studies. A separate discussion was held with the Director and his deputy in charge of research and training at the Department of Agricultural Research in the Ministry of Agriculture and Food Security. These leaders offered insights into the demand for the two regional PhD programmes offered by LUANAR.

The benefits. The responses were affirmative, with a clear request for continued investment in regional higher education programmes. The key benefits are outlined below.

1. **High demand for graduates.** Currently within the Department of Agricultural Research (DARS)⁵⁵, staff establishment is at only 45%. This is a very low figure given the increased agenda for research in the country, some of which require specialization. In fact, the goal of the Department is to have two PhD-level scientists filling each specialization. The Department has currently 36 staff under various levels of training, with 22 being trained locally, mainly at master's degree level and 11 being trained abroad. From the discussions with the directors of DARS, and with LUANAR, it is clear that the major challenge to increased intake and training locally is not necessarily access to scholarships, but rather the slow graduation rates at local universities that discourage applications for graduate training.
2. **Inter-University capacity strengthening.** Respondents at LUANAR indicated that the programme was training staff for new universities such as Mzuzu in northern Malawi. According to the Department of Agricultural Research, graduates from new universities had performance limitations compared to those from older universities, such as the University of Malawi or LUANAR. This weakness is actually an opportunity for older universities to mentor emerging universities. Twinning programmes, even within the country could help improve the quality of graduates who are in high demand.

Caveat. The respondents noted that whereas the demand for PhD-level graduates is high, the major challenge is the slow rate of completion at local universities. As such the Department of Agricultural Research, the largest employer of agricultural graduates is now focusing its PhD level training at non- Malawi universities, because they are guaranteed in-time completion and high quality.

3.4.2 Drivers of success and sustainability of the regional academic programme

Interview panel. The respondents were from the University (Academic Registrar Department, Director School of Graduate Studies and the Head of the Department hosting the programme). The summaries of the drivers of success and sustainability are presented below.

⁵⁵DARS- Directorate of Agricultural Research of the National Agricultural research Institute of Malawi is mandated to undertake agricultural research.

1. Support to the University mission and vision

a) Strengthening University academic core.

The contribution of the programme to LUANAR's academic core is remarkable. Graduates have thus far published 15 journal papers, 10 papers in conference proceedings, and have held field and open days on the LUANAR facilities as part of outreach activities. The programme has contributed to improving the competitiveness of the host department and the university in general.

b) Training the next generation of scientists and academic staff. The respondents noted that LUANAR has a long history of training international students, particularly in fisheries and aquaculture, which started in 1994. Under the regional programme, the university has been able to train students for various African countries. The first student cohort had 10 students from Uganda, Kenya, Zambia and Malawi. Four students have graduated, and the rest are at advanced stages in their thesis research. Against an average annual intake of 4-5 PhDs, the Regional Fisheries Programme has contributed in a very special way to training for the next generation of scientists. Graduates from the programme are serving in various capacities in the NARS and universities.

c) Catalysing changes in teaching and curricula. One of the positive impacts of the Aquaculture and Fisheries Programme in the host department is on teaching and learning. PhD degrees in the department were previously solely research based. According to the department, the stratified teaching of different content for BSc, MSc and PhD became clearer, with the start of the PhD programme. The regional programme also necessitated the expansion of the curriculum to address regional challenges, thus broadening the scope of curriculum coverage. These changes and the fact that courses have to be taught in a modular manner, have contributed to improvements in teaching and learning.

d) Stabilizing funding. Like all regional programmes, initially the programme was started using a seed grant from RUFORUM. The grant provided scholarships, staff and student exchanges and infrastructure support. This funding ceased, however, and the programme faced severe funding challenges. By redirecting its funds flow, LUANAR has been able to complete some of the initiatives started by the programme. A self-contained students' dormitory is now complete and ready to house international students. The main challenge is that the programme and the host department, in particular, do not have resource mobilization arrangements, especially for direct support to the programme, but rely on RUFORUM for advocacy and promotion. Under such circumstances, the financial stability of the programme is uncertain.

e) Implementing regional quality assurance mechanisms. The academic core of the Aquaculture and Fisheries Programme was analysed using the same tools applied at Makerere University, focusing on the three areas of teaching and learning, research and outreach and credit accumulation and transfer.

Fitness for purpose: The indices used, review conclusions and areas for improvement are presented below:

A) Quality of inputs used in training. This included: (1) Programme design, (2) Profile of students recruited and (3) Facilities and infrastructure.

- i. **Programme design for relevance.** The programme, which was developed by national and regional teams, is designed to provide students with technical, business, policy and management skills. The programme was reviewed for relevance by key stakeholders in the country, ranging from government ministries, development and research programmes as well as by peers inside and outside of Malawi.

Review conclusions on relevance. The Regional PhD in Fisheries and Aquaculture meets the standards for relevance to development needs of the country and the region. Similar engagement of stakeholders in design of academic programmes is recommended, especially during the review after five years of implementation.

- ii. **Student recruitment requirements (regionality and gender balance).** The programme has maintained a fairly regional student composition. The first student cohort had 10 students from Uganda, Zambia, Malawi, and Kenya. However the gender balance is low with only 10% over the two cohorts of 12 students. The absence of strong student recruitment, both locally and in the region, is one major challenge. The programme relies almost entirely on RUFORUM for international visibility. Indeed the website of the university is not informative for students seeking to know about the Programme, other than providing the programme name and course titles.

Review conclusions on student recruitment. The long-term success of this programme will depend on putting in place a clear advocacy and promotional programme. As mentioned for the Makerere programme, there is need to improve downloadable information from the website of the hosting university. Interestingly, a search for the programme on the Internet by adding a RUFORUM prefix or suffice provides a better search than when the search is directly for the university. This again highlights the need to strengthen electronic communication tools available for marketing and advocacy.

- iii. **Teaching and research infrastructure.** The programme is supported by research facilities also shared by the NEPAD Regional Fish Node.⁵⁶ Students gain access to: (i) Fish biodiversity research; (ii) Aquaculture innovations in the value chain as implemented under the community action research programme of RUFORUM, which works with 68 fish farmers who own 80 ponds in total; (iii) Policy analysis

⁵⁶ <http://www.nepadsanbiofishnode.org/>

through partnerships for African fisheries that provide a platform for effective policy development and investment options for the aquaculture sector, and; (iv) A body of experts through the Afri-fishnet network, which aims to develop Africa's pool of experts to respond to the need for increased skills research and policy analysis as required by the Comprehensive Africa Agriculture Development Programme (CAADP).⁵⁷

Review conclusions. The location of the programme in LUANAR, which hosts the NEPAD Regional Fish Node, is a plus for the programme. Research laboratories and easy access to community based fisheries initiatives make this programme a prime candidate for strategic support to improve nutrition and income via investment in fish enterprises. The slow progress in harnessing this strong foundation to sell the programme as a prime training centre, requires intensified efforts to improve its visibility and competitiveness.

B) Quality of teaching, learning and research activities. The study focused on two issues, (1) teaching and learning conditions and (2) research mentorship and supervision.

iii. **Teaching and learning conditions.** Coursework-based training at PhD level is new at LUANAR and many African universities. So far, the programme has had four local staff and seven regional/ international staff engaged in teaching. This mixed staff composition improves the quality of delivery, as is expected by the RUFORUM quality assurance manual. The programme has also developed five e-courses, which are hosted on the LUANAR and on the RUFORUM websites.⁵⁸ They are: Aquaculture and Fisheries Economics; Fish Bioenergetics; Aquaculture Nutrition and Feed Technology; Aquaculture Production, Systems & Engineering; and Molecular Biology & Genetics. This e-content is freely available for sharing, modifying and re-use. That approach is innovative for Malawi and the region as a whole for PhD courses and demonstrates a bold move by the programme to open access to knowledge to the wider public.

iv. **Research supervision.** University and other partners supervise thesis research. So far the limited number of students do not pose any major constraint to supervision. However, during the discussions with different leaders, it was clear that the level of funding available is affecting the quality of research. The first student cohort almost entirely depended on funding from RUFORUM, which was not sufficient. This has caused delays in graduation, lowering competitiveness of the programme. The programme did not set up a regional Academic Advisory Board that could have provided additional guidance on implementation, as prepared in the programme

⁵⁷ <http://www.nepad-caadp.net/>

⁵⁸ <http://www.ruforum.activemoodle.com>

design. The absence of good mentors for the students is a challenge as some of the faculty appeared too busy with various management duties. The consequence is a group of students with insufficient supervision and guidance.

Review conclusions on teaching, learning and research. This programme was innovative in both design and delivery mechanisms. The digitization of curricula is a positive development that sets the stage for access to a rich knowledge pool for Malawians, the region, and the global community. It is a bold move by RUFORUM and LUANAR that sets the stage for African universities to contribute to global knowledge. Equally important, is the co-location of this programme with the NEPAD Regional Fish Node. The programme host department is also implementing the Community Action Research Programme (CARP), the RUFORUM flagship programme for research, training and outreach. This unique opportunity provides RUFORUM and LUANAR with prospects for longer term detailed studies on imperatives for improving fish sector productivity. The major challenge now is to sort out the funding and cash flow.

C) Quality of outreach: Knowledge and products generation. The knowledge and products generated and disseminated to various publics are indicated below:

Research publications. The programme has so far generated 25 publications with 10 being journal articles and 15 conference proceedings. More papers are under review. This demonstrates the level of quality, which is one of the key elements of the academic core of the department. Open days at department facilities have also been held as part of dissemination activities.

Review conclusions on outreach. The Programme has demonstrated that it is possible to undertake high-quality training, including publication of results prior to graduation, just like the plant breeding programme. This sets a high standard for LUANAR and indeed for other RUFORUM universities that should not be diminished, rather promoted within the network.

3.4.3 Institutionalization: Strengthening management of the programme

The Aquaculture and Fisheries Programme was initially implemented in a project manner, with funding coming from RUFORUM. This approach, while pragmatic, quickly ran into trouble when funds were not available in time. Accordingly, the university made the decision to manage the programme, using its existing mechanisms and own resources. One positive outcome of this process was the investment by the university in completion of the graduate student hostel. This process, however, while generally in line with principles of institutionalization, exposed the programme to competition for the limited funds available within the university. The limited funding available ultimately reduced the outcomes of this programme, which is essentially well- endowed with physical infrastructure.

Proposals for improving the institutionalization process. The programme is fully embedded within normal university operations without clear safeguards to allow the

programme to implement certain actions as part of the learning process. Fully embedding the programme into regular university programming subjects it to dilution of novel aspects especially for those still at an experimental stage, such as credit transfer, module-based teaching, OER, etc., as they are not yet fully developed for the entire university system but require adjustments to be made.. It is important that while the benefits of being fully embedded in the university system are realized, sight of the goal of this programme should not be lost. Some of the practical steps that could be done to maintain the programme's cutting edge include, among others: (i), Investing in marketing of the programme, especially to the Government of Malawi for the Malawi students. The Department of Agriculture has funding for PhD students under the Agricultural Productivity Program for Southern Africa (APPSA), funded by the World Bank.⁵⁹ The programme also needs to develop and implement external programme promotion and advocacy to attract funding and students, especially web-based information. There is little information on the LUANAR website to advertise the programme; (ii) Strengthening regional peer learning and support via the programme regional academic advisory board. Online meetings should be encouraged to reduce costs, but provide effective guidance to the programme; (iii) the success of any PhD programme depends on the feed-in of high quality MSc graduates. Currently the recruitment process for the PhD is ad hoc. A good strategy is to expand the pool of young talent ready for PhD by strengthening MSc programmes. The major complaint from clients is the slow graduation rate. The university is aware of this and should make improvements to ameliorate the problem. In so doing, scholarships will become available with potential spill over to other PhD programmes in LUANAR.

3.5 Impacts of investments

3.5.1 *Impact of the programme on transformation of the university's academic core*

The impacts of this Programme on the academic core of the university, i.e., graduate training and research and outreach at LUANAR are presented below.

- 1. Adoption of coursework-based PhD programmes.** Adoption of coursework-based PhDs has had positive impacts in the hosting departments. One of these is the stratification of course content across the four levels of training from diploma, BSc, MSc and PhD. The presence of international students has also meant that curricula reflect the broader needs of the region. This has already attracted students from as far away as Ghana.
- 2. Driving the national research agenda.** Twenty percent of Malawi's surface area (118,484 km²) is covered by water. This provides rich fish harvest, making it one of the largest sources of cheap protein (over 60% of animal protein consumed in the country). The Programme is therefore strategically important for food and income security. Such a strong sector requires the active engagement of the

⁵⁹ <http://www.worldbank.org/projects/P094183/agricultural-productivity-program-southern-africa-appsa?lang=en>

University, especially in innovative R&D programmes. This is the space that universities can fill in by contributing towards the development of the research agenda and by being one of its key implementers. Coupling the CARP⁶⁰ to the PhD programme could go a long way in realizing this vision.

- 3. Internationalization.** The programme is co-hosted with the NEPAD Regional Fish Node. It therefore has potential for visibility. LUANAR is also host to the Collaborative Masters in Agricultural and Applied Economics. Thus, LUANAR has many international partners and friends in overseas development agencies, international programmes, regional economic organisations and programmes. The major challenge is how to get these international bodies to invest in the programme. NEPAD has already done so; this could act as a scaffold to bring in other organizations.
- 4. Credit transfer.** Credit transfer is an important component of any international training programme. Fortunately, LUANAR has already started digitizing course modules for this programme. Full operationalization of credit transfer will allow better utilization of these open access resources. The major drawback is the lack of a quality assurance system in LUANAR to supervise credit transfer. Many courses are also due for review, and these issues reduce readiness for credit transfer. The imperatives for credit transfer stated for Makerere University apply here too.

Opportunities for increased impact at LUANAR. LUANAR is a new university that is still putting in place many new institutional policies. This sometimes poses a challenge, given the scale and scope of urgently needed investments. By hosting this regional programme, the university could benefit from staff and student exchange. The university may also need to set up an international office to intensify marketing and handle international student and staff affairs.

3.5.2 Impacts on agricultural sector

Agricultural research and universities. LUANAR is making a strong contribution to the human resources needed in the fisheries sector of Malawi and the region. The programme has contributed to building the capacity of the staff of RUFORUM member universities as well as of national research institutions. Some of the PhD students have graduated and resumed duties at their workplaces. Examples:

1. Wales Singini graduated and is now the Dean of Faculty at Mzuzu University, Malawi
2. Fanuel Kapute – Lecturer, Mzuzu University, Malawi
3. Sr Jane Yatuha – Lecturer, Mbarara University, Uganda

⁶⁰ The Community Action Research Programme (CARP) provides grants designed to encourage universities to develop and invest in more comprehensive and sustained action research into a particular geographical area or in a selected commodity along the full value chain.

4. Joshua Valeta – Lecturer, Lilongwe University of Agriculture and Natural Resources
5. Godfrey Kamugisa – Lecturer, Busitema University
6. Alexander Bulirani – Director of Fisheries, Ministry of Agriculture – Fisheries Department, Malawi
7. Alexander Kefi - National Aquaculture Research and Development Centre (NARDC), Kitwe, Zambia.
8. Albert Nsonga – National Aquaculture Research and Development Centre (NARDC), Zambia.
9. Leston Yoyola Phiri – Department of Fisheries, Zomba, Malawi.
10. Caleb Lewuantai – Lecturer, Egerton University, Kenya.

3.5.3 Investing in the PhD in Agricultural Resource Economics at Lilongwe University of Agriculture and Natural Resources

3.5.3.1 Programme brief

The Regional PhD in Agricultural Resource Economics hosted by LUANAR was launched in 2009 and is based in the Department of Agricultural and Applied Economics of the Faculty of Development Studies. The objectives of the programme are: (1) To equip students with a deeper understanding of the theoretical framework underlying economic policy decision-making in social sciences, agricultural resources and rural development areas, and (2) To equip students with analytical skills in deriving policy prescriptions for the public and private sectors, as well as, for international and non-governmental organizations.

Programme structure

The Programme operates through RUFORUM with LUANAR taking leadership in the implementation and hosting. It is designed based on a similar approach to the Aquaculture and Fisheries Programme. The RUFORUM Secretariat brokers linkages with strategic partners, performs roles of advocacy, resource mobilisation and coordination at the regional level, just as it does for other regional programmes. RUFORUM partners play various roles in teaching, supervision and research.

3.6 Competitive advantage of the Programme

3.6.1 Demand for the Programme

The interview panel. With exception of the Head of Department hosting the programme, the interviewed persons were essentially the same as those interviewed for Aquaculture and Fisheries. These leaders offered a unique opportunity to gain insights into the demand for such programmes in the country and the region at large.

The benefits. The responses were affirmative, with a clear request for continued investments in supranational higher education programmes. The key benefits are outlined below.

1. **High demand for graduates.** All countries in eastern, central and southern Africa, RUFORUM's operational domain, are either in transition to a diversified economy, which is largely agrarian and input driven and or in a pre-transition to a diversified

economy (weak economies emerging from war).⁶¹ Agriculture is still an important part of both categories of economies (World Economic Forum, 2013). There is therefore high need for agricultural and resource economics professionals to identify investment challenges and opportunities in the agricultural sector, to design appropriate policies and investment streams, and evaluate for impact and lesson learning. Malawi is no exception, and still needs to break the market barrier for many of its agricultural commodities, with a concomitant need for policy analysts. While the positions for agricultural and resource economics professionals exist, especially in government, they are filled by masters-level graduates. The Department for Agricultural Research, for example, has three positions occupied by master's degree holders. Thus the gap for agricultural economics professionals previously reported over a decade ago,⁶² while improving, through masters' degree level gap-fill recruitment, is still large especially in terms of PhD level trained professionals.

- 2. Inter-university capacity strengthening.** LUANAR is host to the Collaborative Masters in Agricultural and Applied Economics Programme of the African Economic Research Consortium (AERC). It is already training for other countries; the PhD in Agriculture and Resource Economics builds on that. The Programme has so far admitted 10 students in two cohorts, with cohort one comprising eight students from Kenya, Malawi, Tanzania, and Uganda. The challenges related to programme management are similar to those highlighted in the section on the Fisheries and Aquaculture PhD Programme at LUANAR.

Caveat. The study notes that this particular programme has had a lower completion rate compared to the Fisheries PhD Programme. Meeting demand and expectations for the programme is not likely to happen, unless pragmatic remedial measures are put in place. Funding student recruitment, supervision and mentorship are some of the highlighted areas by respondents that can be improved. Interestingly, most of these are actually things that need attention by the host university overall. RUFORUM certainly still has a role to play, especially in advocacy and marketing of the programme.

3.6.2 Drivers of success and sustainability of the regional academic programme

Interview panel. The panel consisted of respondents from the university (Academic Registrars Department, School of Graduate Studies and the Head of the Department that hosts the programme). The summaries of the drivers of success and sustainability of the programme are presented below.

⁶¹ Mckinsey Global Institute, 2012. Lions on the move: The progress and potential of African countries

⁶² Obwona, M and Norman, D. 2001. Status of agricultural economics in selected countries in eastern and southern Africa. The International Food Policy Research Institute (IFPRI) 2020 Vision Network for Eastern Africa. Prepared for the IFPRI 2020 Vision Network for Eastern Africa; The East and Central Africa Program for Agricultural Policy Analysis (ECAPAPA) and The African Economic Research Consortium (AERC). (<http://www.ifpri.org/sites/default/files/publications/statusafrica.pdf>)

1. Support to the University mission and vision

a) Strengthening University academic core.

This is one of the programmes that is contributing to the academic core of LUANAR. The programme so far has published eight journal papers, and 18 papers in conference proceedings. The programme therefore has contributed to improving the competitiveness of the host department and the university.

b) Training the next generation of scientists and academic staff. Under the regional programme, the university has been able to train students for a number of countries in Africa (see list of graduates and where they are below). The first cohort had eight students from Uganda, Kenya, Zambia and Malawi. Two students have graduated, two have submitted their theses for examination and the rest are at an advanced stage in their thesis preparation. Cohort two has two students, a drop in intake, perhaps indicative of limited marketing, coupled with insufficient resource mobilization. Graduates from the programme are serving under various capacities in the NARS and universities.

c) Catalysing change in teaching. One of the positive impacts of the Agricultural Resource Economics Programme in the Host Department is on teaching and learning. According to the Department Head, the Programme was well-received and allowed stratification of the curriculum content for BSc, MSc and PhD. The presence of the PhD Agricultural Resource Economics and the Collaborative Masters in Agricultural and Applied Economics, provided for expansion of the curriculum to address regional challenges. These changes in the scope of coverage, and the fact that courses have to be taught in a modular manner, have contributed to improvements in teaching and learning.

d) Stabilizing funding. The issues raised for this Programme are the same as for the Fisheries PhD Programme. The issues of fund flow and marketing to attract new students, along with tuition rebates, are the biggest challenges to the success of this Programme. Initiative on the part of the Host Department has been limited. RUFORUM is still the main resource mobilization agency outside of internal funding by the university. Thus the scale of operation of the Programme and its outcomes will remain limited due to financial unreliability.

e) Implementing regional quality assurance mechanisms. The academic core of the Agricultural Resource Economics Programme was analysed using the same tools applied for the other regional programmes, focusing on the three areas of teaching and learning, research and outreach and credit accumulation and transfer.

Fitness for purpose: The indices, review conclusions and areas for improvement are presented below:

A) Quality of inputs using in training. This included: (1) programme design, (2) Profile of students recruited, and (3) Facilities and infrastructure.

- i. **Programme design for relevance.** The programme adds value to regional efforts in training economists at PhD level. The Agricultural Economics Research Consortium is supporting a related programme called the Collaborative PhD Programme (CPP) in Economics. It is hosted in East and Southern Africa by the University of Cape Town for southern Africa and the University of Dar es Salaam for eastern Africa. The regional ARE programme focuses on agricultural resource economics and thus has a special niche. It was developed by national and regional teams, and is designed to provide students with the skills to handle agricultural marketing and international trade; food and agricultural (policy analysis and rural development; and environmental and natural resource economics and management.

Review conclusions on relevance. This programme meets the standards for relevance to development needs of the region. Similar engagement of stakeholders in design of academic programmes is recommended especially during the review after five years of implementation.

- ii. **Student recruitment requirements (Regionality and gender balance).** The programme has maintained a fairly regional composition. The first student cohort had eight students from Kenya, Malawi, Uganda, and Zambia. However, the gender balance is low with only 10% over the two cohorts of 10 students. One major challenge for this programme is the absence of strong student recruitment, both locally and in the region. Two students are in the second cohort, by any standards, uneconomical, given the cost of teaching and supervision. During our discussions, it was also noted that two students had dropped out, citing funding challenges; others declined their admission offer. Moreover, the programme relies almost entirely on RUFORUM for international visibility.

Review conclusions on student recruitment. The comments on how to improve student recruitment are basically the same as for the other programmes. Additionally, it is recommended that this programme, due to the slow start, needs to address its internal weaknesses in earnest first. Improving completion rates are a critical first step to attract students and sponsorship.

- iii. **Teaching and research infrastructure.** The programme is endowed in terms of human resources who can provide both theoretical and supervisory guidance to students. The Department is also host to the AERC Collaborative Masters in Agricultural and Applied Economics. It therefore has the staffing and experience to teach such a programme.

Review conclusion. The co-location of the programme with the AERC master's programme is a plus. Cross-learning and shared implementation of some activities provide leverage for either programme, which may have not have been fully exploited. For example, The AERC master's programme should naturally be the source for graduate students for the PhD programme, and its presence could provide arguments for potential funders, such as the Government of Malawi, to

support training of their staff in one centre without having to leave the country. Slow progress in harnessing this strong foundation to sell the programme, as a prime training opportunity requires intensified efforts to improve its competitive advantage.

B) Quality of teaching, learning and research activities. The study focused on two issues, (1) teaching and learning conditions, and (2) research mentorship and supervision

- i. **Teaching and learning conditions.** Coursework-based training at PhD level is new at LUANAR. In addition to the local staff, with support of the Association of African Universities, staff from Tanzania, Kenya, and South Africa have participated in the teaching. This serves to bring in experience from the region and other programmes being implemented under AERC.
- ii. **Research supervision.** University staff and other partners supervise thesis research. So far the limited number of students do not pose a major constraint for supervisors. However, during discussions with different leaders, as in the case of the Aquaculture and Fisheries PhD, the level of funding available is affecting the quality of research. The first cohort almost entirely had funding from RUFORUM, which was insufficient. There is currently very little major funding to support programme implementation, hence the limited student intake.
- iii. **Review conclusions on teaching, learning and research.** This programme was innovative in both design and delivery mechanism. Equally important, is the co-location of this programme with the AERC master's programme. This unique opportunity provides RUFORUM and LUANAR with prospects for a seamless mechanism to train agricultural natural resource economics professionals in one place. The major challenge now is to sort out the funding, cash flow and forge stronger strategic partnerships with AERC.

C) Quality of outreach: Knowledge and products generated. The knowledge and products generated and disseminated to various publics are indicated below:

Research publications. The programme has generated 26 publications with eight being journal articles and 18 conference proceedings. A number of papers are under review. This demonstrates the level of strength of the programme, and is one of the core elements of the academic consideration of the department.

Review conclusions on outreach. The programme has demonstrated that it is possible to undertake high-quality training, including publication of results prior to graduation just as in the plant-breeding programme. This sets a high standard for LUANAR and indeed for other RUFORUM universities that should be strengthened and promoted within the network. However the issue of weak students supervision needs to be addressed.

3.6.3 Institutionalization: Strengthening management of the programme

The Agricultural and Resource Economics PhD Programme, like the Aquaculture and Fisheries Programme, was initially implemented as a project, with funding from RUFORUM. It therefore faced the same challenges as all other programmes when funds were not availed in time. While the university took over full funding of programme operations, except for scholarships, the decision to direct funding towards infrastructure may have had the biggest negative impact on this programme. Being largely class-based training coupled with thesis research, the limited remuneration of lecturers inadvertently reduced morale for engaging in the programme.

Proposals for improving the institutionalization process. The programme is fully integrated into the regular activities of the university. During discussions with various leaders, it became apparent that there are issues related to low staff enthusiasm and, in some cases, competence to mobilize resources. Low morale is in part due to limited remuneration for teaching in the programme. The university is already constrained. During the discussions, it was revealed that, overall, the university is over staffed with a ratio of 1 staff: 10 students, compared to the SADC ratio of 1 staff: 250 students. This low ratio or over staffing, places a heavy wage bill on training programmes and affects fund allocation, even when students pay tuition.⁶³ Accordingly, dealing with these internal contradictions is necessary to lay a foundation upon which external support, such as from RUFORUM or other partners, will generate higher levels of productivity and outcomes. Otherwise, given the current situation, asymmetry in funds flow means that when external support stops or is delayed, the programme is left in jeopardy. All other recommendations made for the Aquaculture and Fisheries Programme also apply to this one.

3.7 Impacts of investments

3.7.1 Impact of the programme on transformation of the academic core of the university

The impacts of this programme on the academic core of the university, i.e., graduate training and research and outreach at LUANAR are presented below

- 1. Adoption of coursework-based PhD programmes.** Adoption of the coursework-based PhD has positively impacted on the hosting departments. One of the positive impacts is the stratification of course content across the three levels of training from BSc, and MSc to PhD. The presence of international students and engagement of visiting lecturers has also meant that curricula reflect the broader needs of the region.
- 2. Driving national research agenda.** This programme is strategically important for food and income security, given its strong position in the economy of most

⁶³ World Bank, 2010. The Education System in Malawi. WORLD BANK WORKING PAPER NO. 182. Washington DC. (http://siteresources.worldbank.org/EDUCATION/Resources/278200-1099079877269/Education_System_Malawi.pdf)

countries in eastern, central and southern Africa. For example, in Malawi, smallholder agriculture contributes about 80% of the country's total workforce, 75% of foreign exchange earnings and 38% of GDP. The pivotal role of this sector requires strong policy analytics, project design and impact assessment of investments targeting rural transformation. The graduates and research outputs from this programme will therefore contribute to the national and regional agenda. Indeed, the graduates are attached to relevant public institutions in the region and are already making contributions.

3. **Internationalization** The programme is co-hosted with the AERC Collaborative Masters in Agricultural and Applied Economics. Thus LUANAR also has many international partners and friends in overseas development agencies, international programmes, and regional economic organisations and programmes. The major challenge is how to get these international agencies to invest in the programme.
4. **Credit transfer.** Credit transfer is an important component of any international programme such as the regional programme. The general feeling in the department is that it is not yet ready for this to happen. Without a thriving programme, it is unlikely that students will be willing to take courses remotely. However, the digitization of teaching may allow the programme to overcome some of the funding hurdles by leveraging capacities in other partner universities. This will require investment in video conferencing and chalkless classes. The other major drawback is the lack of a quality assurance system in LUANAR to supervise credit transfer. Many courses are also due for review. These issues impede readiness for credit transfer. The imperatives for credit transfer stated for other regional programmes remain the same.

Opportunities for increased impact at LUANAR. LUANAR is a new university that is still putting in place many new institutional policies and strategies to implement them. This sometimes poses a challenge given the scale and scope of investments urgently required. By hosting this regional programme, the university could benefit as it has already done from the Aquaculture and Fisheries programme in staff and student exchange.

2.7.2 Impacts on agricultural sector

Agricultural research and universities. The programme has contributed to building the capacity of the staff from RUFORUM member universities as well as national research institutions. Some of the PhD students have graduated or are near graduation and resumed duties at their workplaces. Examples:

1. Horace Phiri – Lecturer, Lilongwe University of Agriculture and Natural Resources, Malawi
2. Mildred Barungi – Makerere University – Economic Policy Research Centre
3. Hellen Kongai – Assistant Lecturer – Kyambogo University, Uganda
4. Vincent Ekiyar- Ministry of Local Government, Amuria, Uganda

5. Boniface Kakhobwe – Researcher - UNICEF
6. France Tilapasila Gondwe – Training Officer, ICRISAT, Malawi
7. Mirau Mbise – Lecturer - Mkwawa University, Tanzania
8. Irene Nambuya Musebe – Ministry of Agriculture, Kenya

4 CONCLUSION AND RECOMMENDATIONS

4.1 Conclusions

While this study looked into the details of how the three target PhD programmes are run and sought to identify areas for improvement, in this section, only major areas are highlighted. This section captures the key findings and recommendations.

1. Demand and relevance of the programme. In all countries and programmes studied, there is strong evidence of demand. All programmes are contributing to replenishment of regional agricultural human resources. These graduates will take leadership in providing solutions as well as training the next generation of scientists for Africa. The graduates received diverse sets of skills, including soft skills, entrepreneurial, managerial and technical skills to meet the challenging demands of agricultural and rural transformation. Investing in such programmes, however, requires having national human resource development plans as guidance. Unfortunately this is lacking for most countries served by these programmes. The only guidance now is from ASTI statistics.

2. Drivers of success and sustainability. The key factors that influence success of sustainability of these programmes are presented below:

- a) **Strengthening the University academic core.** These programmes have contributed to strengthening University academic core in terms of mission of training, research and outreach by:
 - i. Increasing the PhD intake and graduations, 87 publications generated and, in general, the research and internationalization agenda of host universities, albeit to different levels, has taken place. The Plant Breeding Programme, takes the lead, followed by Fisheries and Aquaculture and then Agricultural Resource Economics.
 - ii. Producing competitive graduates, who are now serving their countries and region in various capacities. Students from more than 10 countries in eastern, central, southern and west Africa are involved in these programmes. Some of the graduates of have already initiated activities in their home countries. Those in the university system have taken leadership of subject-matter teaching and/or of their own research programmes. One student has already taken up a post-doc position at Bioscience Eastern and Central Africa to complement his PhD training.
 - iii. These programmes have already started contributing to the transformation of academic programmes in all host universities. Each programme is influencing the quality of teaching and research including, pioneering participatory programme design, development of e-courses and open learning resources, modular-based teaching, grantmanship and other specialized and soft skills.
 - iv. Student recruitment was varied in all the universities, initially starting at an average of 8-10 for LUANAR programmes and 22 for the Makerere University programme. Subsequently, recruitments were low in all programmes, the only change being in year three at the Makerere programme, again because external funding was secured through intra-ACP academic mobility, DAAD and Carnegie. Such volatility does not bode well and highlights internal weakness in student recruitment strategies.

- b) **Institutionalization: Strengthening management.** The study investigated the roles of the university and RUFORUM in ensuring that implementation is fully institutionalized. This study finds that two different types of approaches are being used to manage these programmes. Approach one, used at Makerere University, is fully autonomous to the host department, but suffers from limited funding rebates for tuition paid by students. Approach two, used at Lilongwe University of Agriculture and Natural Resources, is fully embedded (Institutionalized) in the university system and similarly suffers from funds rebate for tuition paid by students. In both cases, the major issue is not whether the programmes are embedded in the host department, but rather that the universities lack supportive policies, organs and capacities needed to handle international programmes of this kind.
- c) **Funding arrangements.** In all cases, funding was a major constraint. These programmes have not put in place effective resource mobilization strategies. None of the universities had good web visibility for their programmes, let alone for the host departments or schools. Clearly, this was the weakest element of every programme, regardless of the manner in which it was managed. Additional funding nevertheless has been mobilized from the Association of African Universities for staff mobility, Intra-ACP for student and staff mobility, as well as DAAD, IDRC and Carnegie. Again RUFORUM has been the key player in mobilizing the funding. The universities will need to step up their efforts in resource mobilization.

3. Impacts of investment. These are summarized below

- a) In all cases these coursework-based PhD programmes are the first of their kind in each host university. At Makerere University this approach is now being adopted; the solely research- based PhD is being phased out, where there is capacity.
- b) Graduates from these programmes are already contributing to the regional agricultural research, policy and training environment. Collectively 24 students have graduated (18 in plant breeding, four in fisheries and aquaculture and two in agriculture resource economics).
- c) Research outputs from the programme are being fully developed for release. For example, maize lines with CIMMYT and NARO are under evaluation for release. Cost-efficient technologies for tissue culture of banana and sweet potato are now available.
- d) The programmes have also contributed to strengthening resource rationalization for capacity building. So far 18 staff from within and outside of the region have been involved in staff exchange in all three programmes reviewed. This process is supported through various funding agencies.
- e) The student exchanges between countries will ultimately allow the emergence of regional research teams that can then respond to common challenges. Already alumni from Malawi and Uganda are working together to submit joint proposals on banana tissue culture and other research areas.

4.2 Recommendations for improving performance

Three critical areas are proposed as frontline areas for redress, because they relate to RUFORUM's strategic goals number one and two to establish high-quality and shared academic programmes for eastern, central and southern Africa. They are also important for the RUFORUM expansion strategy, including to West Africa.

1. Credit transfer. Credit transfer is an important component of any international programme, especially for organizations such as RUFORUM, which seek to ensure continued benefits to all its members. This study finds that all programmes are not yet primed for credit transfer because the basics are not there yet. Suggested areas for improvement include:

- Ratification and approval of the quality assurance manual developed by the RUFORUM member universities to provide the basis for common agreements on the standards for teaching, supervision and examination within the RUFORUM network;
- Institutional strengthening of quality assurance in universities by all member universities, by creating a separate unit to manage quality assurance where it is absent, such as at LUANAR;
- Creation of credit transfer standards, policies and protocols that are agreeable to the RUFORUM network and overseen by quality assurance units of each university;
- Digitizing courses to allow non-resident teachers to engage in training and students to benefit from online training.

2. Improving completion rates and teaching quality: Each university should take full responsibility for curriculum review and reform particularly by:

- Improving completion rates by reducing red-tape especially during thesis examination;
- Reviewing the roles of the doctoral committee to empower the teams to take full responsibility for thesis guidance and examination;
- Strengthening promotion and advocacy activities to attract funding, so that research and student intake are not curtailed;
- Exploring inter-university funding arrangements such as staff fee waiver for member universities. Operationalizing the RUFORUM Graduate Teaching Assistantship (GTA) programme would address this need. Under the RUFORUM GTA, RUFORUM universities have agreed that they send staff to train in other member universities, who would provide fee waivers. The sending university has responsibility to support upkeep and research of their staff undergoing the PhD training.
- Strengthening regional peer learning and support via the programme regional academic advisory boards. Online meetings could be encouraged to reduce costs, but provide effective guidance to the programme.

3. Improving funding. Some of the practical steps that could be done to improve funding arrangements include: keep the cutting edge of the programme intact as well as:

- a) Invest in marketing of each programme, especially to governments. This will cushion the programme when there is limited funding for external students. It has been done before in Uganda, where 10 scholarships were secured, and 12 more are under negotiation.
- b) Each programme should conduct a full cost recovery audit, and on that basis, develop a fee that is competitive, along with a high level (Vice Chancellor/Rector/President level) supported resource mobilization strategy. The RUFORUM Secretariat should play an advocacy and supportive role as needed.
- c) Developing a clear strategy for an MSc pipeline into PhD programmes. Strategic partnerships between masters and PhD programmes as a feed-in conduit for high quality MSc graduates could be explored. Both Makerere University and LUANAR have that opportunity, which should be explored.
- d) Each of the Programmes should build functional partnerships with complementary programmes. The Aquaculture and Fisheries programme in LUANAR could harness its co-location with the NEPAD Fisheries Node on the same campus to support research and training. Such co-location provides a strong foundation to sell the programme as a prime training one.
- e) Each of the programmes should build powerful partnerships with CGIARs, NARS and other relevant agencies as well as with farming communities and development agencies (international, national, private and public). This approach has been used to help graduate studies elsewhere (such as in Brazil); there is no reason why it cannot work for RUFORUM programmes.