

RUFORUM Case Studies

An Advanced Training Programme in Plant Breeding Responds to the Needs of the Region

This document is an output from the Strengthening Capacity for Agricultural Research for Development in Africa project (SCARDA) funded by the UK's Department for International Development (DFID) for the benefit of developing countries. The views expressed are not necessarily those of DFID.

In a region characterised by post-conflict reconstruction, food insecurity and agrarian economies, the need for trained experts in agriculture is massive, and will only increase.

The Regional Universities Forum for Capacity Building in Agriculture (RUFORUM), an organisational network comprised of 29 member universities across the Common Market for Eastern and Southern Africa (COMESA) region, has positioned itself to ensure that universities respond to the needs of the region through the kinds of training and research they provide.

Working with universities within the network, RUFORUM has coordinated and helped to establish regional master's and PhD programmes that harness pockets of strength and expertise existing within the universities, in areas of strategic need.

"The aim of RUFORUM is not just to train students," says Prof. Venansius Baryamureeba, Vice-Chancellor of Makerere University, where the RUFORUM Secretariat is based.

"We want a strong link to the communities, and a strong component of community engagement, so that when students finish their training, they know their role... We want them to have the passion to go and work with farmers in the country, to look at the modernization of agriculture."

Prof. Venansius Baryamureeba,
Vice-Chancellor of Makerere University

The organisation also provides individual grants to researchers within the network, in order to support innovative research contributions in the region, particularly as a conduit for introducing their students to the concepts of research.

"It's a good way of enabling fresh PhD holders to work with senior mentors, then they're able to write their own research grants," says Prof. Baryamureeba.

Initially established as a programme of the Rockefeller Foundation in 1992, RUFORUM's purpose was to train more students at the master's level, and at the same time to foster greater connections between researchers and small-scale farmers, to ensure that research would address issues of importance to the small-scale farmers who constitute the backbone of the regional economy.

A Networks Approach to Capacity Strengthening

RUFORUM's strategy has been to build its programmes by tapping the pockets of expertise within its member universities for the benefit of the region, and at the same time to create new opportunities for advanced training and research to support the growth of new generations of academics in the region.

The organisation has created six new regional master's programmes since 2004, each one situated within one of its member universities.

The need for new cadres of plant breeders was one critical gap identified in the 2006 demand study conducted by the Strengthening Capacity in Agricultural Research and Development in Africa (SCARDA) programme. Plant breeding was an area where Makerere University already possessed strength.

The plant breeding programme at Makerere was a direct result of stronger linkages between different institutions in national agricultural research systems that came about through SCARDA.



"SCARDA helped us to reprioritise our training agenda," says Professor Adipala Ekwamu, the Executive Secretary of RUFORUM. "Makerere's plant breeding and seed systems programme was responding directly to the needs of research institutions. It was demand-driven."

Building on the expertise of just a handful of plant breeding scientists, the programme has, since its inception in 2006, developed into a thriving enterprise, tapping the expertise of renowned international scientists and local research institutions alike in order to offer top quality training to students from nine different countries.

Dr. Richard Edema, one of the first master's students to benefit from RUFORUM (then called FORUM), now coordinates the plant breeding programme. Originally from the Koboko District of Northern Uganda—the birthplace of brutal Ugandan dictator Idi Amin—his introduction to farming came when he and his family fled their homes during a regional conflict, and lived as refugees in Congo for several years, where he worked as a farm labourer in order to earn food for his family.

Strengthened by its Own Graduates

After obtaining his master's degree in plant pathology at Makerere in 1996, working under Prof. Ekwamu, Dr. Edema travelled to Ohio State University for his PhD, where he mapped the genome of the maize streak virus, examining the virulence of different strains, both genetically and in terms of their geographic distribution across Africa, for his dissertation.



Returning to Makerere after graduating from Ohio State with his PhD, Dr. Edema found both a \$73,000 research grant from the Rockefeller Foundation, and two master's candidates whom he was to supervise, waiting for him—an indication of RUFORUM's determination to harness his skills to expand its programmes.

Meanwhile Dr. Patrick Okori, another plant breeding scientist with a newly acquired PhD, from the Swedish University of Agricultural Sciences (SLU) had also begun working to expand Makerere's postgraduate training programmes in plant breeding through



RUFORUM. As the programme grew, FORUM morphed into RUFORUM, and Drs. Okori and Edema worked together to design a plant breeding master's and PhD programmes that could be accessed by students from all the member universities within the RUFORUM network.

There was a critical need for African institutions to train more scientists. While Africa lags behind the rest of the world in research output, the continent also suffers from a dearth of academics, as an older generation of professors nears retirement, and universities struggle to train new staff members to replace them, particularly as new universities open throughout the region, to help satisfy the rising demand for tertiary education amongst the continent's large youth population.

Some donors, however, were sceptical, raising doubts about whether African universities were well-enough equipped to train at the PhD level. The plant breeding programme was initiated as an MSc programme, but designed to feed into a PhD level programme, which was introduced in 2009 and now has 22 students.

Initial funding for the plant breeding programme came from the Rockefeller Foundation, through RUFORUM, and also from the Alliance for a Green Revolution in Africa (AGRA). SCARDA also provided funding for 13 students from Sudan (including South Sudan, now a separate country), Rwanda and Burundi, all of which are now grappling with post-conflict challenges, including agricultural development and food security.

Plant breeding is particularly important for Eastern and Southern Africa because of the region's environmental fragility and diversity of climates, conditions, and staple food crops. New crop varieties rapidly become susceptible to disease, requiring scientists who can help produce new disease-resistant varieties. The region needs to build up critical masses of scientists who can help to produce the appropriate responses to local challenges, says Dr. Edema.

"We're pouring in young men and women from Kenya, Mozambique, Burundi, Ethiopia, Uganda, Rwanda and South Sudan, Tanzania, Zambia and Zimbabwe, who will soon start sorting out food needs," he says. *"There are so many issues to do with water, climate change, food security. We need crops that are resilient to water shortages; crops that are nutritious, and contain micronutrients; crops that can grow on abandoned farmlands where production has ceased because of soil depletion and fertility issues."*

Plant Breeders for the Region

For Langa Tembo, a Zambian student who is working towards a PhD in plant breeding at Makerere University in Uganda, focusing on breeding resistance in maize to the ear-root disease, taking part in a regional advanced training programme provides the opportunity to bring much-needed skills in plant breeding and biotechnology back home.

He is completing his PhD research in an attachment with the National Crops Resources Research Institute (NaCRRI), a national agricultural research institution which is located near the campus where the plant breeding programme resides, in an area called Kabanyolo on the outskirts of Kampala.



The arrangement benefits the university, the research institution, and himself, says Mr. Tembo. The university, short on supervisors, benefits because a researcher from NaCRRI acts as one of his supervisors; while NaCRRI benefits from Tembo's labour; and Tembo benefits because he can tap the wide experiences, expertise and mentorship of the NaCRRI researchers.

"I learn a lot from them," he says. "People there have years of experience in cross-breeding and lab work. It gives us very good experience."

The plant breeding programme differs from many postgraduate programmes in Africa, in that it offers a wider breadth of skills, beyond the dissertation. The programme is one of the few on the continent to offer coursework alongside the dissertation. Students are required to publish journal articles in order to graduate, and also receive training and short courses in soft skills, such as giving presentations and conducting social research, that are necessary for African researchers who often need to work closely within communities, and to communicate the significance of their work to the wider population—but often lacking.

Returning to the University of Zambia, where he is a lecturer, after his training, Tembo will be equipped to begin building up the plant breeding and biotechnology strengths of the university and the country, he says. When he returns, he says, he will be put in charge of supervising MSc students and running the university's first biotechnology laboratory.

Unlike Uganda, where farmers cultivate and eat a wide variety of different food crops, maize is the primary staple crop in Zambia, and is therefore critical for food security. The prospect is exciting, but daunting.

"Here, I have the luxury of consulting the people around me," he says. "But when I go back, I'll be the expert!"

His colleague, Abel Sefasi, from Malawi, is for his PhD dissertation working on developing new proteins in sweet potatoes, to combat the problem of weevils devouring their roots, particularly during conditions of drought. Regional reports indicate that between 30 and 60% of sweet potato crops across the region are lost due to the problem, he says.

"I'm using genetic engineering to insert genes that can help the sweet potato to produce proteins that kill the weevils," he explains. "If we can solve this problem, we will give back to farmers across the whole of Sub-Saharan Africa, where weevils are a problem."



Abel Sefasi

Both young men say they are excited to use their skills to make a difference to combating poverty and food insecurity in the region. The work certainly comes with challenges: delays are frequent, due to power outages and shortages of the chemicals necessary for laboratory work. Yet by working in the midst of these challenges that the region's research systems face, they ultimately become better equipped to handle them.

"My capacity as an individual has increased," says Sefasi. "RUFORUM has given me skills that I can apply to other crops, and to other problems."

Both young men have one skill in particular which will be useful when they return home: the ability to understand and evaluate the potential of biotechnology for food security.

While Africa has lately served as an ideological battleground for proponents and opponents of biotechnology and genetic engineering, these technologies are new to countries like Malawi and Zambia, and there are few scientists who can parse the complexities and weigh the potential risks and benefits.

A Diverse Programme

One of the programme's major strengths is the diversity of the students, 70% of whom come from outside Uganda, says Sefasi. As he and his colleagues return to their countries and assume positions of responsibility, they will have built relationships that they can draw upon, in order to further strengthen research and training both locally and nationally, for example by collaborating on research publications.

Indeed, the graduates of these programmes then in turn become the means of ensuring the programmes' sustainability. Both Dr. Edema and Dr. Okori for example now receive research grants which pay for additional PhD students to be trained, thus boosting the university's research output and simultaneously contributing towards the sustainability of the plant breeding programme.

Increasingly, African governments are recognising higher education as a key cornerstone of national development: not only do they train the experts and professionals needed to build economies and provide services throughout the region, but they also are instrumental in producing indigenous research to respond to specific local and regional contexts.

Through greater coordination of the NARS, the structures and processes of SCARDA enabled the universities to interact at a higher level within the national research agenda.



Prof. Venansius Baryamureeba

Most universities across Africa developed as national rather than regional institutions, and were not historically oriented towards playing a regional role. The SCARDA approach helped to scientists at Makerere to design a new programme that took a new regional approach, harnessing the university's expertise to make a difference beyond national borders.

The plant breeding programme has produced a new generation of well-trained, highly motivated crop scientists who have the expertise and energy to make a difference in their home countries.

At the same time as regional strengths have been built, the rise of the plant breeding programme has also coincided with, and contributed towards, a wider flourishing within Makerere.

The university has been repositioning itself to respond to the nation's challenges, and has steadily climbed the international rankings. Currently, it is ranked eighth on the continent, according to the University Ranking by Academic Performance research produced by the Informatics Institute of the Middle East Technical University.

"Universities need to show their relevance, and how their research is translating into growth and development for the country," says Prof. Ekwamu.

Innovative Universities

The Ugandan government has signalled that it will invest in higher education as a major driver of the knowledge economy, investing for example in new science and technology parks at Makerere, says Prof. Baryamureeba, Makerere's vice-chancellor. Meanwhile, the university has shifted to a collegiate system, promoting what used to be the Faculty of Agricultural and Environmental Sciences to a college.



Bolstered by its involvement in SCARDA, RUFORUM was a driving force behind a Ministerial Conference held in November 2010, which brought together higher education and agricultural ministers from across Africa to craft a common agenda for strengthening higher education in agriculture, and culminated in a new process, called the Tertiary Education for Agriculture Mechanism (TEAM-Africa), which will be situated within RUFORUM.

RUFORUM has also been brought into the process of planning and designing a new \$300 million programme for a World Bank-financed project which will focus on strengthening science, technology, engineering and mathematics (STEM); agriculture; and health within Africa.

With such new developments on the horizon, new opportunities will arise for RUFORUM to engage with other areas of strength within the

university. "The President is emphasizing the knowledge economy, and looking for the universities to be the driver of this," says Prof. Baryamureeba.

One area, for example, with strong and obvious links to agriculture is food science and technology—and the university has recently invested in developing a state of the art facility that serves for both training students and incubating commercial enterprises developed by students and staff members.

The incubation centre offers free workspace, machinery, business development services and coaching to these small businesses. Inside a gleaming, open-plan factory space, entrepreneurs and their employees are busy working on sleek machines, preparing all manner of food products in discretely designated areas, from smartly packaged juices to prime beef fillets for export to Congo.

The aim is to build industries that will contribute towards economic development, so that all the actors in the value chain, from the farmers who grow the produce to the retailers of the finished products, can benefit, explains Prof William Kyamuhangire "We want to have successful companies grow from here," he says. "The country will benefit from job creation and tax payment, and it will also grow the economy."

The College of Health Sciences at Makerere also has a track record of innovation and excellence, and a number of potential openings for collaboration with RUFORUM. Through its internationally renowned Infectious Disease Institute, for example, the College has contributed to key HIV/AIDS studies on the prevention of transmission from mothers to infants, and on the effects of male circumcision on lowering the risk of transmission.

The College, like RUFORUM, has also been involved in building regional networks, and testing new approaches to help strengthen the connections between the College and the outside world, and particularly between research and policy.

"The concern is, how is research translating into policies and practices, and impacting on peoples' health?" explains Professor Nelson Sewankambo, the Principal of the College.

One network in which the College is taking part, the Sustained Use of Research Evidence in Africa (SURE) is pioneering a rapid response unit, which responds to policy makers' needs with easily digestible briefs that can be used, for example, in a parliamentary debate. In addition, the College has established a new post for an innovations and knowledge translation officer, whose role is to act as a liaison between researchers and policy makers, ensuring that the College's research outputs are both accessible to and understood by policy makers, and that they are in line with national priorities.

Recently the College invited the Minister of Health to their annual research conference, Prof. Sewankambo explains. Looking at the posters being exhibited, he says, the Minister was particularly interested in one, which outlined a master's student's research, which had tested the properties of a number of bottled and powdered traditional herbs sold on the streets, and found that most of them were contaminated with bacteria that would cause disease.

As a result of the encounter, the Ministry has requested quarterly briefings from the College on its key research findings. "All of these kinds of innovations are strengthened by partnerships," says Prof. Sewankambo. "We like networks; we like collaborations within the country, the region and beyond."

Prof. Baryamureeba, Makerere's Vice-Chancellor, agrees. The networks approach, combined with the trend in higher education towards open content, as pioneered by institutions such as the Massachusetts Institute of Technology, will revolutionise African universities in the future.

"The future of higher education in Africa is open and collaborative," he says. "When I look at RUFORUM, I see it growing stronger as a network of universities, and as a vehicle for the universities to collaborate."

"In the next five years, it will contribute a lot to the development of the economy and of ordinary people, from top-level research PhD's to working with communities, bachelor's students, and diploma-holders."

Prof. Baryamureeba, Makerere's Vice-Chancellor





Email: megan.lindow@gmail.com | Cell: +27 82 227 9404
Skype: [meganlindow](#) | Twitter: [@meganlindow](#)
www.meganlindow.com | www.mind-fields.biz

AUTHOR/RESEARCHER: Megan Lindow
DESIGN AND LAYOUT: Natalie van der Walt
PHOTOGRAPHS: Chris Alan



This work is published under the Creative Commons Attribution 3.0 Licence.
Copyright © 2012

Regional Universities Forum for
Capacity Building in Agriculture
(RUFORUM)



Makerere University

