ASSESSMENT OF RUFORUM MEMBER UNIVERSITIES IN KENYA

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BACKGROUND

Credible quantitative and qualitative information on existing capacities in agricultural higher education agencies in Africa are important for decisionmakers at national, regional, and international levels. Decisionmakers require data and indicators for strategic planning, policy formulation, setting priorities and benchmarks, measuring progress toward benchmarks, and identifying capacity gaps. Decisionmakers need a better understanding of the specifics of existing staffing and student capacities in the higher education sector, as well as in the wider agricultural innovation systems in Africa south of the Sahara. Access to such information will result in better policies addressing capacity issues in agricultural higher education, research, extension, and other areas. The existence of such information, however, remains extremely limited.

To fill this data gap, the International Food Policy Research Institute's Agricultural Science and Technology Indicators (ASTI/IFPRI) and the Regional Universities Forum for Capacity Building in Agriculture (RUFORUM) initiated a partnership to pilot the collection of this type of data for RUFORUM's member universities. During phase I of the collaboration, ASTI/IFPRI and RUFORUM developed and launched a prototype of the the Portal on Agricultural Capacity in RUFORUM Universities. Phase II, which is currently being implemented, aims to further develop and launch the portal, and to obtain more detailed quantitative and qualitative information for RUFORUM member universities in Kenya and Uganda. This report summarizes the findings of the in-depth assessment for Kenya.

TEACHING STAFF TRENDS

The general ASTI survey round comprises 34 agricultural higher education agencies in Kenya. These include various agricultural faculties and other agriculture-related units at the 9 RUFORUM member universities, as well as a small number of non-RUFORUM universities and other higher education agencies. The quantitative overview in this report comprises all RUFORUM member universities with key agricultural faculties or schools (noting that the University of Nairobi includes both a faculty of agriculture and a faculty of veterinary medicine, resulting in a 10-unit sample overall):

- ✓ Egerton University, Faculty of Agriculture (EU-FA)
- ✓ Jomo Kenyatta University of Agriculture and Technology, Faculty of Agriculture (JKUAT-FA)
- ✓ Kenyatta University, School of Agricultural and Enterprise Development (KU-SAED)
- ✓ Maseno University, School of Agriculture and Food Security (MasU-SAFS)
- ✓ Masinde Muliro University of Science and Technology, School of Agriculture, Veterinary Sciences and Technology (MMUST-SAVET)
- ✓ Moi University, School of Agriculture and Natural Resources (MoiU-SAB)
- ✓ Pwani University, School of Agricultural Sciences and Agribusiness (PU-SASA)
- ✓ University of Nairobi, Faculty of Veterinary Medicine (UoN-FVM)

ABOUT ASTI/IFPRI AND RUFORUM

ASTI/IFPRI

Agricultural Science and Technology Indicators (ASTI) is widely recognized as the authoritative source of information on the status and direction of agricultural research systems in low- and middle-income countries. Facilitated by the International Food Policy Research Institute (IFPRI), the program functions through collaborative alliances with national research agencies, regional coordinating bodies, and international institutions. ASTI's mission is to support improved decisionmaking through high-quality data, research, and analyses; to disseminate the results of its analyses to promote advocacy and support policymaking; and to build national and regional capacity for data collection and analysis.

RUFORUM

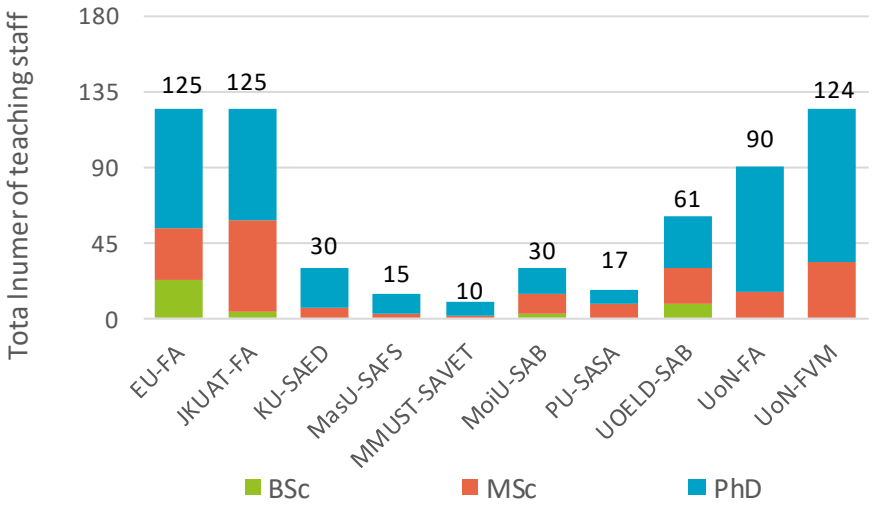
RUFORUM is a network of 85 universities in 36 African countries. RUFORUM's mandate is primarily to strengthen the quality and relevance of postgraduate training and research in African universities—especially in agriculture, science, technology, and innovation. As such, RUFORUM engages in activities including benchmarking, tracer studies, and capacity building aimed at improving the capacity of African universities and research centers to generate knowledge relevant to Africa's development challenges.

- ✓ University of Nairobi, Faculty of Agriculture (UoN-FA)
- ✓ University of Nairobi, Faculty of Veterinary Medicine (UoN-FVM)

The University of Nairobi, University of Eldoret, Jomo Kenyatta University of Agriculture and Technology, and Kenyatta University are among the universities with large faculties of agriculture in Kenya. However, with the expansion of university education since 2000, the number of public and private universities with important agricultural faculties offering training and research has increased.

Total teaching capacity among the RUFORUM members in Kenya ranged from 10 teaching staff at MMUST-SAVET to 124/125 teaching staff at EU-FA, JKUAT-FA, and UoN-FVM (Figure 1). The share of teaching staff qualified to the PhD-degree level was relatively high (ranging from 50 to 80 percent), PU-SASA being the only agency with fewer than 50 percent of its staff trained to the PhD level. Four agencies reported that 80 percent or more of their teaching staff held PhD degrees and none of their staff were only qualified to the BSc-degree level.

Figure 1. Total number of teaching staff by qualification level, 2016



Source: Compiled by authors from ASTI/IFPRI–RUFORUM surveys.

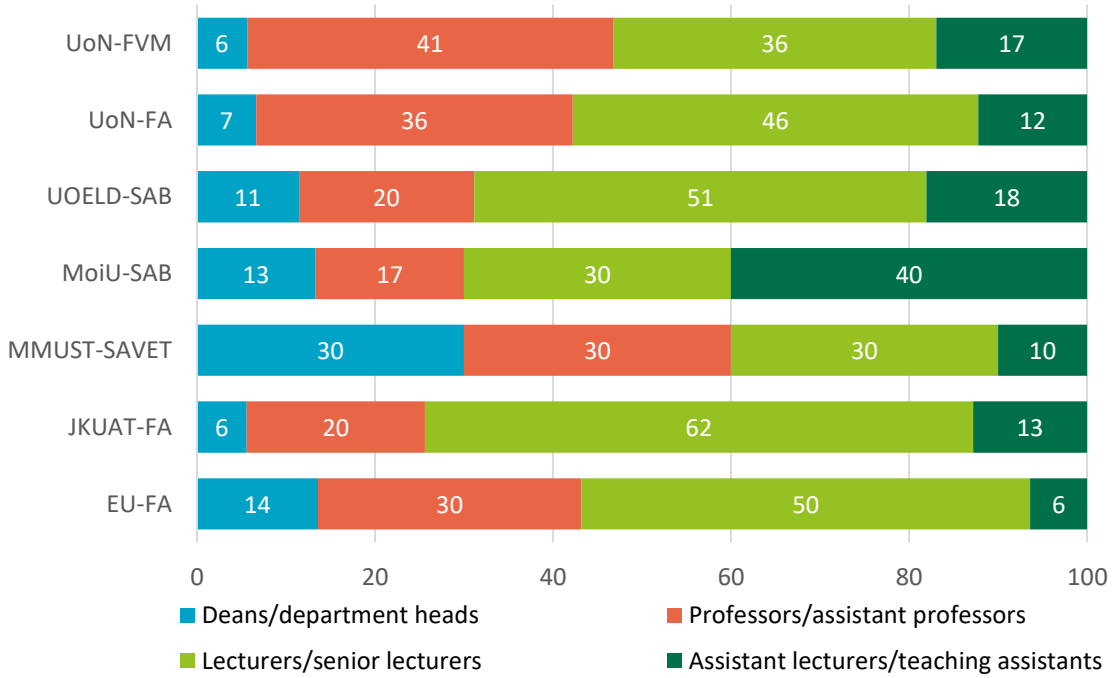
Significant numbers, and shares, of teaching staff among Kenya's RUFORUM members were approaching retirement age as of 2016 (Figure 2). This phenomenon is most acute among staff qualified to the PhD level and for the older, more established universities. For example, between 64 and 79 percent of the PhD-qualified teaching staff at JKUAT-FA, EU-FA, UoN-FVM, and UoN-FA were in their 50s and 60s. This situation indicates a significant risk that these universities could be left without a critical mass of senior, experienced staff needed to lead teaching and research programs.

Figure 2. Total and PhD-qualified teaching staff by age, 2016

Source: Compiled by authors from ASTI/IFPRI–RUFORUM surveys.

The majority of teaching staff are (senior) lecturers and (assistant) professors (Figure 3). MoiU-SAB employed a comparatively higher share of assistant lecturers and teaching assistants.

Figure 3. Teaching staff by position, 2016



Source: Compiled by authors from ASTI/IFPRI–RUFORUM surveys.
Note: Data for KU-SAED, MasU-SAFS, and PU-SASA were not available.

Female teaching staff offer different insights from their male counterparts, so it is important for higher education agencies to employ a balance of male and female staff. With 47 percent of its teaching staff being female in 2016, only MoiU-SAB approached gender parity overall (Table 1). In comparison, MasU-SAFS and UoN-FVM reported relatively low shares of female teaching staff (13 and 11 percent, respectively). Female staff were younger and less well-qualified compared with their male counterparts.

METHODOLOGY

In collaboration with the ASTI/IFPRI team, ASTI's country focal points (that is, points of contact) at the Kenya Agricultural and Livestock Research Organization (KALRO) and the Uganda's National Agricultural Research Organisation (NARO) developed a checklist to capture qualitative and quantitative information from RUFORUM member universities in both countries (Appendix A). The information captured was in addition to other data collected during ASTI's regular 2017–2018 survey round, administered to all higher education agencies in Kenya. The information included, but was not limited to the following categories:

- Data management
- Research outputs and their dissemination
- Influence of research in the community
- Student trends and motivations
- Capacity building plans for students
- Benefits of being members of RUFORUM and suggested ways of improvement

In Kenya, deans and chairs of faculties and departments relevant to ASTI were interviewed by a team comprising Lang Gao (ASTI/IFPRI) and Lawrence Mose (KALRO). The qualitative data collection covered a sample of RUFORUM member universities.

Table 1. Share of female teaching staff, 2016

	Share (%)						
RUFORUM member	Total	PhD	MSc	BSc	<41	41–50	>50
EU-FA	20.8	15.5	29.0	26.1	—	26.7	18.4
JKUAT-FA	26.4	22.4	31.5	25.0	19.1	34.4	28.3
KU-SAED	26.7	20.8	50.0	—	na	na	na
MasU-SAFS	13.3	8.3	33.3	—	100.0	12.5	0
MMUST-SAVET	30.0	25.0	50.0	—	—	0	37.5
MoiU-SAB	46.7	26.7	58.3	100	61.9	14.3	—
PU-SASA	29.4	37.5	22.2	—	75.0	10.0	33.3
UOELD-SAB	39.3	48.4	28.6	33.3	46.7	32.1	44.4
UoN-FA	31.1	29.7	37.5	—	26.3	31.3	32.7
UoN-FVM	11.3	10.0	14.7	—	13.0	15.0	9.9

Source: Compiled by authors from ASTI/IFPRI–RUFORUM surveys.

In order to fulfill teaching and research mandates effectively, it is important for higher education agencies to have a well-balanced pool of teaching staff, not only in terms of qualification levels, age distribution, and gender, but also in terms of disciplines. Except for UoN-FVM, the RUFORUM member universities' overall focus was agricultural, and as a result, the teaching staff employed by most agencies was qualified across a wide variety of agricultural disciplines (Table 2).

Table 2. PhD- and MSc-qualified teaching staff by discipline, 2016

Discipline	EU-FA	JKUAT-FA	MMUST-SAVET	MoiU-SAB	UOELD-SAB	UoN-FA	UoN-FVM
Plant breeding/genetics (incl. biotechnology)	6.9	7.4	10.0	11.1	5.8	5.6	—
Plant pathology	2.9	2.5	10.0	3.7	7.7	8.9	—
Plant physiology	4.9	1.7	—	—	1.9	—	—
Botany	—	—	—	—	—	—	—
Seed science and technology	2.0	3.3	—	3.7	9.6	—	—
Other crop sciences	19.6	16.5	30.0	—	15.4	17.8	—
Animal breeding/genetics	4.9	0.8	—	—	5.8	—	5.6
Animal husbandry	2.0	14.9	—	—	—	—	—
Animal nutrition	4.9	—	—	—	3.8	—	3.2
Dairy science	15.7	—	—	—	—	—	5.6
Poultry	2.9	—	—	—	—	—	—
Veterinary medicine	—	3.3	—	7.4	1.9	—	33.1
Zoology/entomology	2.9	—	—	—	—	—	—
Other animal and livestock	2.9	—	—	—	3.8	—	37.1
Forestry and agroforestry	—	—	—	3.7	—	—	—
Fisheries and aquatic resources	—	—	—	—	—	—	—
Soil sciences	6.9	8.3	20.0	—	13.5	14.4	—
Natural resources management	—	—	—	18.5	—	10.0	—
Water and irrigation management	—	—	—	—	—	—	—
Ecology	—	4.1	—	—	—	—	1.6
Biodiversity conservation	—	—	—	—	—	—	—
Food sciences and nutrition	2.9	23.1	10.0	—	26.9	20.0	—
Socioeconomics (incl. agricultural economics)	17.6	14.0	—	37.0	3.8	16.7	—
Extension and education	—	—	10.0	7.4	—	3.3	—
Other sciences	—	—	—	—	—	—	13.7
Total no. of PhD- and MSc-qualified teaching staff	*102*	*121*	*10*	*27*	*52*	*90*	*124*

Source: Compiled by authors from ASTI/IFPRI–RUFORUM surveys.
Note: Data for KU-SAED, MasU-SAFS, and PU-SASA were not available.

DEGREE PROGRAMS AND STUDENT POPULATION

The eight higher education entities for which degree program data were available all offered BSc-, MSc-, and PhD-level training (Table 3). The older universities (EU, JKUAT, and UoN) offered a comparatively higher number of PhD- and MSc-degree programs. MMUST, PU, and UOLD offered the smallest number of programs overall, and only one or two PhD programs.

Table 3. Number of degree programs offered during 2015–2016

RUFORUM member	PhD programs	MSc programs	BSc programs
EU-FA	10	10	8
JKUAT-FA	9	8	10
MasU-SAFA	6	7	8
MMUST-SAVET	1	6	8
PU-SASA	2	3	7
UOELD-SAB	2	6	10
UoN-FA	10	17	8
UoN-FVM	16	19	na

Source: Compiled by authors from ASTI/IFPRI–RUFORUM surveys.
Notes: Number of degree programs were not available for KU-SAED and number of BSc-degree programs were not available for UoN-FVM.

The majority of students in the sample were enrolled in BSc-level training (Table 4). With close to 2,900 students enrolled in BSc programs, UoN-FA ranked first, by far, in enrollment numbers (although, based on lack of available data, it was unclear whether UoN-FVM had a similarly high number of BSc-level enrollments). Unsurprisingly, the agencies with the higher number of PhD programs had comparatively more PhD students enrolled.

Table 4. Student population by degree, 2016

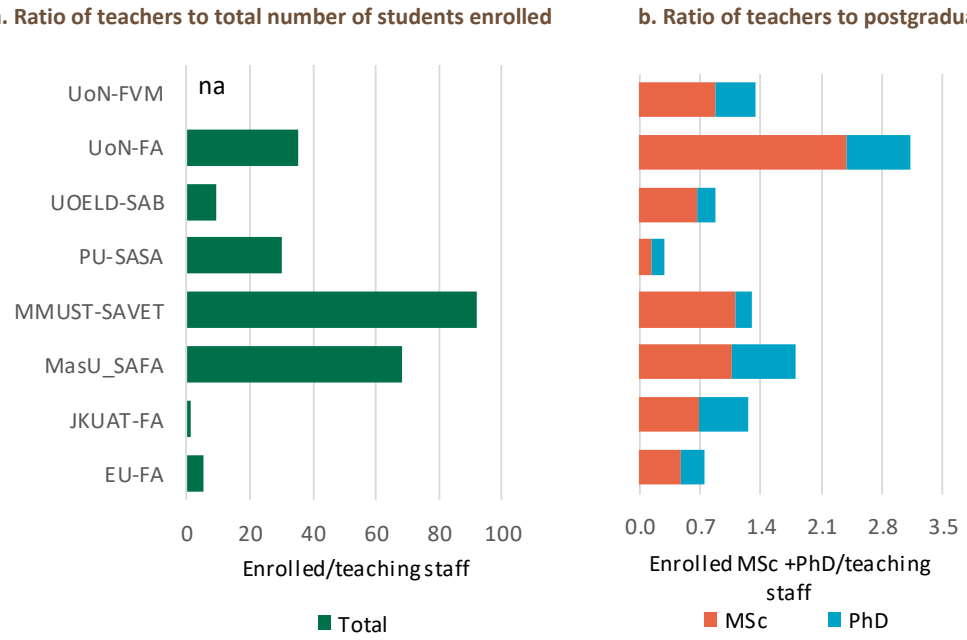
	Students enrolled			Students graduated		
RUFORUM member	PhD	MSc	BSc	PhD	MSc	BSc
EU-FA	36	59	573	15	35	515
JKUAT-FA	72	81	2	na	na	na
MasU-SAFA	11	16	na	2	2	109
MMUST-SAVET	2	11	904	—	3	131
PU-SASA	3	3	629	na	na	na
UOELD-SAB	12	41	512	2	18	393
UoN-FA	65	216	2,879	7	29	275
UoN-FVM	59	108	na	8	6	na

Source: Compiled by authors from ASTI/IFPRI–RUFORUM surveys.
Note: Enrollment and graduation data for KU-SAED, and graduation data for JKUAT-FA and PU-SASA, were not available.

Since 2013, the trend toward enrollment in postgraduate programs in agricultural and related fields has increased. This has stemmed from a number of factors, including increased employment opportunities and greater availability of scholarships in the field of agriculture relative to other disciplines. In a few instances, the agricultural sector has organized fairs in order to recruit students. The choice of agriculture by PhD students, in particular, has been positively influenced by the employment opportunities in the growing number of universities nationwide, and by more competitive job opportunities in specialized areas of research. The increase in interest in agriculture at the MSc-degree level stems from a combination of job opportunities and sociocultural influences (such as an increase in the prevalence of raising cattle as the primary source of economic activity). At the BSc-degree level, the rising trend is a combined result of parental and peer influence, job opportunities, and lack of choice of placement by university admissions offices.

The student/teacher ratio is an indicator of the quality of training offered by universities, but it is also a factor of the total number of BSc-level students enrolled. It is therefore more accurate to look at the ratio of the number of teaching staff to the number of MSc- and PhD-level students (Figure 4). In addition to having the highest number of BSc-level students enrolled, UoN-FA also had the lowest ratio of teaching staff to postgraduate students during the reporting period.

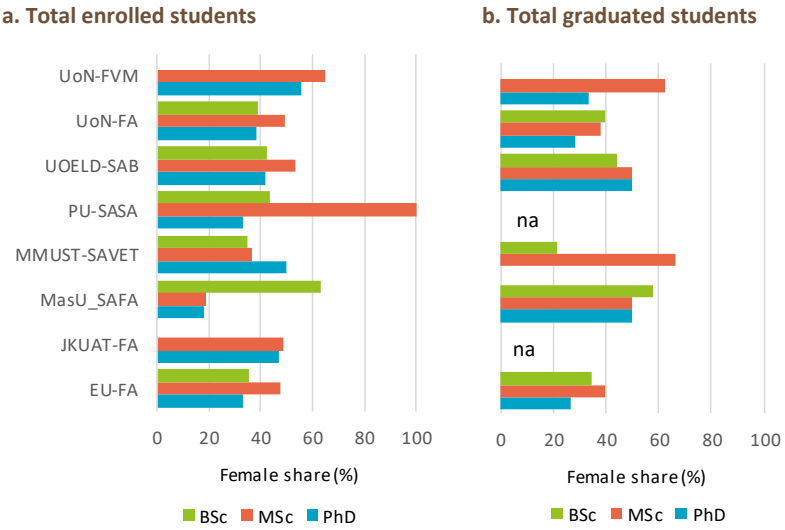
Figure 4. Student/teacher ratio, 2016



Source: Compiled by authors from ASTI/IFPRI–RUFORUM surveys.

The results of an assessment of gender parity among enrolled and graduating students are mixed (Figure 5). Overall, 43 percent of all students enrolled, and 39 percent of those who had graduated during 2016 were female. The greatest level of gender parity was reported among students enrolled in MSc-level training. Some higher education agencies (for example, MasU-SAFA, MMUST-SAVET, and PU-SASA) reported very low numbers of students enrolled in or graduated from MSc and PhD programs, which skewed the resulting shares. For example, only three students were enrolled at the MSc level at PU-SASA, and all were female.

Figure 5. Share of female students, 2016



Source: Compiled by authors from ASTI/IFPRI–RUFORUM surveys.

DATA-MANAGEMENT PROCEDURES

ASTI-type data are managed differently across universities and faculties/schools. UoN-FA, for example, maintains its staff and student records within each department, and they are collated and updated from time to time at the faculty level. At JKUAT-FA, personnel information (such as age and gender) are kept within the administration arm of the dean's office; student data are kept separately in the same office, but under student affairs. Project-related data are kept by the deans of the faculties within which projects are housed. At EU-FA, ASTI data are maintained across different departments and offices, including student affairs, finance and administration, and research and extension. At some agencies, such as UoN-FA, data are captured and stored within Microsoft Excel spreadsheets and are cumulatively collated as needed. Other agencies maintain a centralized database. UoN, for example, has a research management system that captures data on proposals, awards, and grants, including the total budget for each project, and its associated activities and the outputs. In all cases the agencies

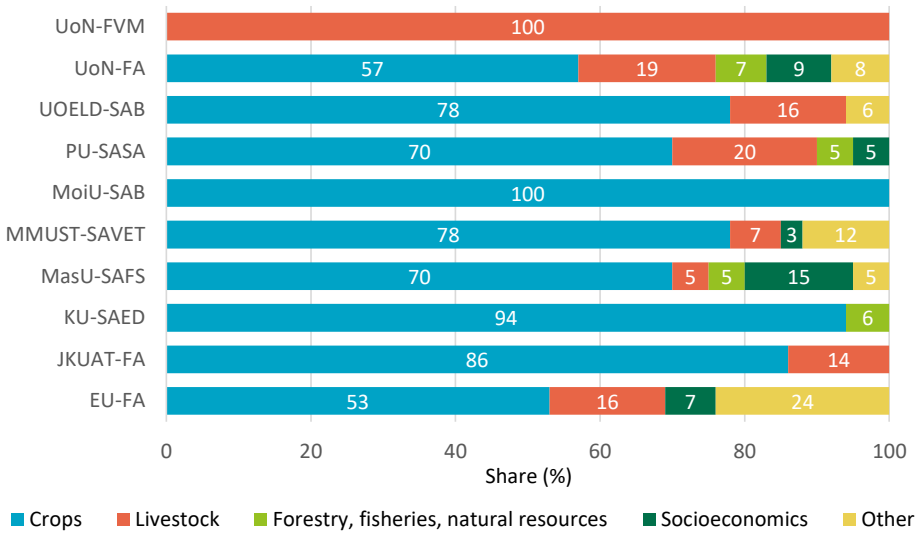
reported that the data were not checked for quality except in the case of performance contracts, which facilitated the verification of information.

RESEARCH ACTIVITIES

Faculty members often conceptualize research ideas and formulate them into research proposals and projects. The research undertaken may focus on general information or knowledge (basic research), solving specific problems (applied research), or modifying existing technologies to local conditions (adaptive research). In some instances, universities undertake research of long-term agricultural importance, such as food security and natural resource management (strategic research). Most ASTI-related activities fall under adaptive or strategic research. KU's Microbiology Department reported that professors conduct research through a participatory process. Extension agents and opinion leaders identify and establish multidisciplinary and interdisciplinary research sites that incorporate farmer participation. Research evolves through a bottom-up process focusing on real issues facing farmers and involving collaboration among professors, donors, and grassroots actors.

Most agriculture-related research at the universities falls into the category of applied or adaptive research. Data indicate that the predominant focus of research undertaken by the RUFORUM member universities during 2016 was crops—with the obvious exception of UoN-FVM, whose mandate is veterinary medicine (Figure 6). Forestry, fisheries, and natural resources received limited research attention by the agricultural faculties/schools of the RUFORUM member universities. These areas are often covered by other schools or departments (for example, the School of Environmental Sciences at UOELD or KU).

Figure 6. Focus of research activities, 2016



Source: Compiled by authors from ASTI/IFPRI–RUFORUM surveys.

The universities use a multi-institutional and multidisciplinary approach to research, primarily in cooperation with the extension staff of county governments. For instance, EU has an extension department whose goal is to be accessible to constituents across all levels in addressing society's agricultural issues. All research activities have a community component involving extension officers. At MoiU and UOELD, linkages with county governments ensure that farmers are capable of contributing to the conceptualization, implementation, and evaluation of research activities not only to ensure that relevant problem-solving research is undertaken, but also to ensure ultimate ownership of the research results. Plant Sciences Department at KU links with extension officers who mobilize farmers, participate in joint experiments, and validate results. Linkages between universities and national agricultural research institutes include collaborative research activities, joint academic program review meetings, and the participation of key stakeholders and value chain actors at all stages of the research process. As part of its extension efforts, the UOELD-SAB is establishing an outreach center that will offer subsidized tuition to farmers in the form of short courses.

Research Funding

All the RUFORUM member universities visited indicated that they obtained funding from foreign sources, although they could not divulge the amounts received (partly due to lack of automated record systems). In addition to winning grant proposals, as in the case of RUFORUM, the universities received funding from numerous regional and foreign governments, donors, and agencies, such as the Alliance for a Green Revolution in Africa, the Bill & Melinda Gates Foundation, BMZ (Germany's federal ministry of economic cooperation and development), Danida (Denmark's development cooperation agency), the European Union, the Food and Agriculture Organization of the United Nations, the Ford Foundation, the German Academic Exchange Service, the Government of the Netherlands, Mastercard Foundation, the Peoples'

Republic of China through Confucius Institute of Agriculture, the Rockefeller Foundation, the Swedish International Development Cooperation Agency, the UK Department for International Development, the United States Agency for International Development, and the World Bank.

UoN also obtained funding through numerous additional sources, including the African Development Bank, the African Union, the Association for Strengthening Agricultural Research in Eastern and Central Africa, the Intergovernmental Authority for Development, CGIAR centers such as the International Maize and Wheat Improvement Center and International Potato Center, the International Centre of Insect Physiology and Ecology, and the United Nations Environment Programme. In addition to the Government of Kenya, UoN's internal donors included the National Research Fund, the National Commission for Science Technology and Innovation, the National Environment Management Authority, the Higher Education Loans Board (student loans provided by the Government of Kenya). The university also generates its own revenues through grants to university teaching staff to encourage research for innovation (up to 1.5 million Kenyan shillings); EU also generates funds through research and teaching consultancies.

Research Outputs

Teaching was recognized as the core function of the RUFORUM member universities; however, some degree of research was undertaken at all the faculties/schools visited. More research was conducted in agricultural faculties/schools than in related areas, such as plant sciences, microbiology, and environmental sciences, partly because of reduced access to external and, in some cases, internal funding sources. Direct research outputs reported include the following:

1. New technologies, information and knowledge, and patents (KU-Zoological Sciences), information on which is published in journal articles and as theses, papers, posters, book chapters, manuals, leaflets, and other extension materials
2. Research protocols, such as between MoiU and Toyota Shusho, and patenting procedures/products, such as the case of the Egerton Yoghurt; the Agro Science Park Flagship Project of EU-FA, an incubation center that promotes the generation of many products
3. The development of capacity of both scientific and nonscientific staff members, such as the empowerment of women and youth through the development of knowledge and expertise within KU-SAED, and enhanced research-extension-training linkages through community outreach and student training

Indirect outputs include the following:

1. The empowerment of farmers through the provision of training
2. The provision of forums for disseminating research results, sharing information and knowledge, and eliciting feedback, for example, through yearly scientific conferences at EU UOELD's Faculty of Environmental Studies and the University of Rome (on culture and biodiversity) and locally with the North Rift Regional Centre of Expertise on Environmental Education (on creating community awareness regarding environmental issues)
3. Support to the Environmental Students Association, where students contribute to community clean-up and tree-planting campaigns
4. Only UoN has an intellectual property policy in place, and patents are applied for and registered on behalf of the innovators by the intellectual property office.

Data on the number of peer-reviewed publications per year were only available for five of the RUFORUM member universities (Table 5). International journal articles, including those published in African journals, accounted for the majority of the publications. The number of publications per teacher per year ranged from close to 0.5 for MasU-SAFS, UOELD-SAB, and UoN-FA to 1.23 for MMUST-SAVET.

Table 5. Publications per teacher per year, 2012–2016

Type of publication	MasU-SAFS	MMUST-SAVET	UOELD-SAB	UoN-FA	UoN-FVM
Journal articles					
International	0.47	0.35	0.24	0.31	0.42
African	0.02	0.42	0.13	0.10	0.07
National	—	0.25	0.06	0.03	0.10
Books	—	—	—	0.01	0.01
Book chapters	—	0.02	0.02	0.01	—
Other peer-reviewed	—	0.19	—	—	—
Total	0.49	1.23	0.46	0.45	0.60

Source: Compiled by authors from ASTI/IFPRI–RUFORUM surveys.

Notes: Data for EU-FA, JKUAT-FA, KU-SAED, MoiU-SAB, and PU-SASA were not available. Data indicate the yearly average for the period 2012–2016, or for a subset of years for which data were available.

The agencies generate research outputs through a variety of mechanisms, including stakeholder participation, variety release committees and partnerships with seed companies (once new varieties are ready for dissemination); registration and commercialization of new innovations; publications and yearly conferences targeting different audiences; a patent, negotiation, and registration office; and annual

"innovation week." The outputs generated are disseminated through publications and at conferences; through online learning and teaching modules; through the print media (for example, EU's "Seeds of Gold" in the Daily Nation Newspaper), television programs (for example, Kenyatta University Television), and local FM Radio programs; through Agricultural Society of Kenya Shows; through field days; through student attachments (under the county government extension service); through promotional launches, for example, of major outputs by high profile politicians and policymakers; and through linkages with Confucius Institute Expo and the Innovation Incubation Centre of EU.

THE RUFORUM PARTNERSHIP

Benefits of Membership

The main activities of the RUFORUM member universities centered around capacity development and sharing scientific information and knowledge. All faculty members interviewed expressed considerable satisfaction with the RUFORUM partnership. The most commonly reported benefits included the following:

- *Enhanced funding opportunities for students and researchers (professors).* This is made possible through a combination of (1) developing the capacity to source grants and write scientific proposals, (2) having the opportunity to network with researchers abroad, and (3) participating in multi-country collaborations that lead to winning grant proposals and ultimately obtaining funding for a large number of students.
- *Enhanced supervision of students.* This involves greater coordination, collaboration, and provision of research materials, leading to timely and successful completion of degree programs by MSc students.
- *Capacity building of staff and students.* This includes offering PhD scholarships to teaching staff of member universities, specifically, the Graduate Training Assistantship Programme; provision of research funding and stipends for MSc students; exchange of information/findings by student researchers; provision of funds for equipment, including computing equipment and lab materials; training in preparing publications by students; opportunities for undergraduate students to undertaking small subprojects for MSc Students; and finally, training on procedures for calls, such as Intra-Africa calls.
- *Sharing of research outputs with peers in RUFORUM member universities.* This provides researchers with opportunities to attend conferences to share findings, thereby exposing students' work to a broader audience.
- *Creation of networks and partnerships.* This facilitates internship and exchange programs within universities, both nationally and abroad.
- *A near "borderless" university.* This enables interaction among university programs across Africa, enhancing the profile/visibility of member universities; for example, EU is managing unique regional programs, such as an MSc in agricultural sciences and communication and a PhD in agricultural rural innovation systems.
- *Collaborative research.* RUFORUM membership facilitates collaborative research partnership and the sharing of research findings.
- *Building capacities for universities in postconflict countries.* Examples include the University of Burundi, Gulu and Juba Universities in South Sudan, and Rwanda National University.
- *Training programs.* This includes programs focusing on mentorship, leadership, and technical and scientific writing both for senior managers and student, as well as one-year funding for African Women in Agricultural Research (AWARD) trainings through RUFORUM.
- *Networking*. Donors work with different universities and other organizations within and outside Kenya, so RUFORUM members benefit from networking opportunities both within and beyond the pool of members.
- *Information sharing.* Conferences (such as the 2018 Nairobi Conference) and scientific meetings provide opportunities for member universities to showcase innovations and share other information.
- *Scholarships and other opportunities.* Scholarships are awarded equitably across the RUFORUM member universities; students undergo benchmarking, receive exposure through the network, and are able to participate in competitions; students build capacity, for example, in conducting onfarm research; and training and monitoring and evaluation for students activities are regularly conducted.

Suggested Areas for Improvement

RUFORUM collaborates with several member universities in Africa by providing funding for postgraduate training through a process that involves competitive grants. While the arrangements have conferred several benefits on the recipients, still more could be achieved. The following are some of the areas suggested by the interviewees:

- Widen scope of funding, given the need in research areas/disciplines beyond agriculture, such as pathology and entomology, which often fall under other university departments (for example, plant sciences)
- Broaden scope for funding beyond student training to include, for example, manuals/leaflets on topics such as the adoption and impact assessment of developed technologies for extension staff to give farmer
- Consider adopting the Rockefeller Foundation model of professor-student engagement, whereby the focus is on both the professor and the student; incentives for professors are lacking under the RUFORUM model, and communication and research is student/principal investigator-based, disregarding senior researchers/professors

- Allow time to recruit students and synchronize disbursements with the university calendar; in addition, in case of unavoidable circumstances (such as strikes, which are common) continue to offer stipends to students who do not graduate within the stipulated 24 months
- Consider paying students stipends in addition to tuition (the Graduate Training Assistantship only provides partial tuition payments, and payment of university stipends to sponsored students is delayed)
- Consider providing funds for monitoring the adoption of developed technologies/innovations and other follow-up research beyond thesis writing
- Allow more flexibility in the timing of deliverables to allow for research follow-up, especially in the event of a mistake occurring
- Consider having more than one cohort of students for continuity
- Provide incentives for senior researchers/professors to search for grants (for example, opportunities to attend conferences, receive a share of grant funding, or receive relevant equipment and computer equipment)
- Increase capacity building (for example, field attachments or internships at the undergraduate level, and support funding at the postgraduate level since students need to work with farmers for at least three months)
- Create centers of excellence for economies of scale in sharing expensive machinery and equipment
- Issues researched and addressed by the RUFORUM students should be community- or industry- based, in the sense of solving actual problems rather than only having academic relevance
- The inter-country experience is considered an added advantage for students

CONCLUSIONS AND WAY FORWARD

RUFORUM has conferred immense benefits to participating universities and students in terms of capacity building, solutions to community problems in member universities, and the creation of networks and partnerships. It is recommended that the scope of coverage be widened beyond agriculture, and the funding amounts allocated be increased. In addition, greater flexibility could be instituted, for example, to include the use of the Rockefeller model of agricultural research funding.

Appendix A. Checklist for RUFORUM Member University Visits in Kenya and Uganda

ASTI regular survey tool

- ✓ Validate 2012–2014 data and revise where needed (teaching staff, student population by degree program specifically)
- ✓ Update data for 2015 and 2016
- ✓ Explore whether additional years are available for teaching staff and student population
- ✓ Explore additional relevant indicators (for example, nationality of student population, more detailed output data)

Data management

- ✓ How are data organized?
- ✓ What is available and where (central database or multiple datasets at different offices)?
- ✓ What is missing?
- ✓ Are there data-quality checks in place?

Research activities

- ✓ How are outputs are generated (technologies, varieties, breeding, agricultural implements, publications, patents)?
- ✓ How are they captured?
- ✓ Dissemination activities?
- ✓ What are the linkages with farming communities and extension agents (how, what stage of research, when, how long)?
- ✓ What are the linkages with NARIs and other research agencies, and other universities?
- ✓ How is research being funded (government, S&T, university budget, donors, regional organizations, and so on)?
- ✓ What is the status of agriculture as a field of study: are there more or fewer students interested to study; are numbers of MSc and PhD programs increasing?
- ✓ Major constraints to research (if not already covered?)

Partnership with RUFORUM

- ✓ What activities are being implemented through the RUFORUM network?
- ✓ What are the benefits of being a member of RUFORUM, what have been challenges, what could be improved?

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