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Capacity Development for Modernizing African Food Systems (MAFS) Working Paper

Technical and Institutional Capacities of
AET Institutions in Eastern and Southern
Africa: A Case Study of Three Universities
with a Regional Footprint

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The Modernizing African Food Systems (MAFS) Consortium



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Background on the Modernizing African Food Systems (MAFS) Consortium

Objective: The MAFS Consortium aims to help African agricultural education and training (AET) institutions develop the technical skills and institutional capacity required to modernize African food systems.

MAFS Consortium Members:

- Makerere University
- Michigan State University
- Stellenbosch University
- University of Pretoria

Activities and Outputs: The MAFS Consortium has assembled a technical team from four major agricultural universities to produce a series of empirical background studies that will provide evidence necessary for informing capacity development efforts in African AET institutions. Substantively, the activities center around the following four thematic areas.

Theme 1. Food System Dynamics in Africa and Consequent Skill Requirements in the Private and Public Sectors

Theme 2. Models of AET Engagement with Private and Public Sector Employers

Theme 3. Existing Capacity of African AET: Case studies of African universities with regional footprints

Theme 4. Impact of past AET institution-building efforts in Africa

Advisory Board:

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- Dr. Maggie Kigozi—Formerly Executive Director of the Private Sector Foundation in Uganda

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EXECUTIVE SUMMARY

This study sought to assess the technical and institutional capacity of tertiary agricultural education and training (AET) institutions in Africa with specific reference to three institutions in eastern and southern Africa—Makerere University, University of Pretoria and Sokoine University of Agriculture. The aim of the assessment was to determine the existing gaps between them and what we envisage a 21st century university to be. The technical assessment refers to the quality and quantity of programmatic side of things such as the number and quality of instructors for a given population of students, the types and relevance of the curricula, the research output and its relevance to the communities and linkages with the public and private sectors. The institutional capacity referred to the quality and adequacy of physical and infrastructure to support teaching, research and outreach activities. The rules of the game that govern the running of these institutions also fall into this institutional category.

Data and information were gathered through secondary sources including web-based materials and on the shelf-published sources. Visits to the three mentioned institutions were made to collect relevant published information and to discuss technical and institutional arrangements with a wide range of people in those institutions.

With a few exceptions, tertiary AET in Africa seem to be in a state of flux. The institutions seem to be caught unprepared to cope with the continuously changing internal and external environment. Firstly, the proportion of state funds allocated to run these institutions continues to fall at unprecedented rates. Secondly, the number of high school leavers aspiring and qualifying to join these institutions is phenomenally increasing to the extent that they no longer match the ability of these institutions to provide the necessary infrastructural facilities and skilled instructors to adequately serve them. In some of the AET institutions, the learning environment is so deplorable to the point of putting the quality of the resulting graduates into question. Thirdly, there is an increasing challenge regarding the relevance of the graduates in the industry and public sector. There is now a clear shift from knowledge to skills demand. In addition to having technical skills, increasingly, the public and private sector are now requiring graduates with soft skills such as communication abilities, critical thinking, problem solving and negotiating skills.

As way forward, three critical issues need to be urgently addressed:

- i) There is a dire need to recognize the fact that a paradigm shift is needed in the administration and management of AET institutions in Africa. To begin with, there is need for mindset change for those responsible for running these institutions. There is need to realize that AET institutions now have to be run on the basis of “business not as usual” because the operating environment has greatly changed. For example, the mindset change should lead to the realization of the fact that there is no way public universities can continue to rely on public coffers to run decent university programs. In addition, funds must be sought from elsewhere including deliberate approaches to boost revenues from internally generated sources such as profitable use of existing university assets such as land and buildings..
- ii) There is increasing need for relevance of the knowledge and skills that the graduates have as they get employed. Consequently, AET institutions must be conscious of the need to adjust the existing curricula to match the current

requirements of the public and private sectors. Initiatives such as field practical placement for students on farms and industries, internship programs, and, provision for sound, academically and technically competent industry personnel to teach special courses at universities, etc.

- iii) Refraining from politicizing the management of the affairs of universities is an issue which needs immediate attention. In many countries, increased enrolments are politically motivated as opposed to ensuring that the enrollments match the infrastructural and available number of qualified instructors. There are cases where each region within a country argues to have a university not because there is a real demand for it but just because they feel good to have one. Since these universities may not have the necessary facilities and proper instructors, the whole drive becomes counterproductive.

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1. Introduction and Background

1.1 Definition of AET Institutions and Their Evolution in Africa

The [World Bank](#) defines tertiary education as including universities as well as institutions that teach specific capacities of higher learning such as colleges, technical training institutes, community colleges, nursing schools, research laboratories, centers of excellence, and distance learning centers (<http://go.worldbank.org/HBEGA0G2P0>). [Higher education](#) is taken to include [undergraduate](#) and [postgraduate education](#), while [vocational entails education and training](#) beyond secondary education. At the global level, universities have evolved from the first generation in the 11th to the 15th century, whose focus was knowledge generation (teaching and producing professionals). The second generation which reined from the 16th to 20th century added research on top of knowledge generation. The third generation focus is three-fold; knowledge generation, research and use of knowledge for technology development and application. Many universities in Africa inherited the position of second generation from the colonial rule, and were fully financed by their governments. However, following economic hardship and decline in exports in the period 1980s-1990s, universities were forced to limit their roles to minimize the impact of social and economic changes. Financial constraints and pressure to increase the number of students has forced them to focus mostly on teaching-which means falling back to first generation universities.

Technically oriented institutions such as agricultural education and training institutions have particularly been more disadvantaged because they need relatively more financing to buy the necessary equipment, conduct experiments, demonstrations and the need to travel away from campuses for hands on- experience in farms and industry.

1.2 Objectives of This Paper

This paper assesses the technical and institutional capacities of tertiary agricultural institutions in Africa in general and in eastern and southern Africa in particular. In the latter, universities in three focus countries were studied in depth with a view to determine the extent to which they are prepared to meet the demands of the 21st century universities. These demands include inter alia, readiness to supply graduates with knowledge and skills required in the expanding private sector industry and the transforming food systems. This paper attempts to provide some answers to the question –to what extent are these AET institutions prepared to serve the industrial and community demands in Africa?. The paper then critically assesses the capacity of agricultural universities in three focus countries with a view to determine the extent to which they are ready to run programs that are in tune with 21st century universities.

1.3 Methods

Scoping Study (September 2012-April 2013): Activities in phase 1 in this theme were i) scoping study through review of literature based on web search, published and unpublished literature, and interviews with experts in AET institutions with a view to get a sense of technical and institutional issues on the AET institutions such as African-led capacity improvement efforts, student enrollments, fields of study, staffing levels, quality of students and quality of graduates, staff-student ratios, curricula content and frequency of its review, adequacy of funds and facilities, quality assurance kits (enrollment, teaching, examinations, research governance, etc.), application of ICT, adequacy of facilities that create a conducive

learning environment, forms and types of linkages with the farming community, the private sector, and regional and international bodies and other several indicators.

Field Work (June-September 2013): Phase 2 included i) Institutional visits--three AET institutions from the scoping study deemed to have regional footprints were selected for visits to verify the findings of the scoping study and to observe, measure and conduct detailed interviews on issues that could not be addressed in the scoping study, ii) Analysis and write-up of findings in phase 1&2 were then carried out. This theme had three persons located in three different sites and working with a number of assistants to collect and analyze the data and information. These individuals were: Dr. Bernard Bashaasha—Makerere University, Uganda, Dr. Casper Madakadze—University of Pretoria, South Africa and Dr. Isaac Minde based at Sokoine University of Agriculture in Tanzania.

2. Overview of AET Capacity in Africa: Key Drivers of AET Institutions in Africa

In order to try to understand the dynamics and the reasons for the rapid changes taking place in the AET institutions particularly in the last 20 years, it is important to identify and understand the key drivers of change. This will allow one to appreciate more the nature and scope of the forces and hence be in a better position to manage and influence the needed reforms. Some of the most important drivers of change noted in the literature can be summarized into the following categories.

- *Expansion in the number of higher learning institutions:* During the last 10-15 years, the number of universities in many countries has increased several folds. In this expansion, the rate of increase of private universities has been several times more than the public. As far back as 1982 for example, Nigeria had already instituted a legislation of private higher education and many private institutions were established in 1990s (Jibril, 2003). Uganda followed suit in 1990s with similar cases emerging in Cameroon, Mozambique and Zimbabwe. Kenya in eastern Africa was also in the lead in this race during this same time. In fact between 1991 and 1999 nearly 65 universities were established in sub-Saharan Africa (World Bank 2002). In fact by 2003 the number of private universities in selected countries had ballooned to almost 150 universities (Table 1).

In Tanzania they have increased from two public universities in 1990 to more than 30 public and private universities in 2013 (TCU 2012). This does not include other technical training institutions. In Zimbabwe, in the last 20 years, there has been on average one additional AET institution every year. All these have to compete for the same pool of applicants, the same sources of funding and the same sources of teaching staff. As a consequence, this has a potential, direct and negative impact on lowering the quality of the product.

Table 1. Private Higher Education Institutions in Africa by 2003

Country	Number of Private Universities
Benin	27
Cameroon	17
Ghana	28
Nigeria	13
Kenya	14
Senegal	8
Tanzania	10
Uganda	15
Zimbabwe	4
Total	146

Source: World Bank: 2012

- *Rapid expansion of secondary school enrolment:* This has meant that universities have to provide education to a growing number of students. The rapid expansion of secondary enrolment has exerted pressure on the university to admit more and more students with the same facilities. The challenge is then how to use more innovative teaching-learning approaches and to deal with large classes. This will also demand new pedagogical and didactic skills from academic and technical staff.

In Nigeria the pressure of secondary school students aspiring to get into tertiary is arguably the highest in Africa given the population—80-90 percent of the secondary school finalists would like to get into college of some sort (Okebukola 2002).

- *Liberalization of admission to institutions of higher learning:* The current policies in many countries is to offer opportunity to as many people as possible to join institutions of higher learning, which has meant that universities now have to admit students from varied backgrounds. Furthermore, because of the many challenges associated with expansion of primary and secondary school enrolment many students admitted to the university are inadequately prepared in the basic skills of communication, language, writing and reading. Universities have to address these inadequacies of incoming students so that they may cope with university studies.
- *Changing labour market and employment opportunities:* Given the trend towards private sector-driven economies, the labour market is changing as now the employers are demanding a different set of skills than before. In addition to graduates possessing up-to-date knowledge in their fields of study, employers now need graduates with skills in problem solving, team work, creative thinking, communication, ICT, leadership and ability to work independently. In other words, employers expect university training to be skill-based rather than academic-based. A typical example is that a university of agriculture curriculum must adjust and accommodate courses addressing not only the farming skills—typically lower level value chain types of courses –but also accommodate value chain upstream courses such as logistics, processing, packaging, storage, quality control, financing, etc.
- *Dwindling public funding:* Resources from governments have been decreasing year after year and many universities are left to rely on student fees for their day to day operations, because the government budget has to be shared among many institutions of higher learning. This means that the universities have to look for other sources for financing their activities, including internal sources and the private sector. It is hypothesized that one of the key reasons for deterioration of universities and the quality of their graduates is due to lack of sufficient financial resources. There was consternation when the National University of Nigeria (NUC) reported that no Nigerian university (or other tertiary institution) was listed among the top 1,000 schools around the world in terms of publication of research output. The panacea proposed is for institutions to begin to develop websites and migrate their research reports online for the world to see.

Generally given the aforementioned, factors the quality of education and consequently the quality of the product has deteriorated. Summarizing the factors that contributed to this decline in Nigeria from late 1988 to 1996, and subsequent collapse from 1997 to date, Okebukola (2002) lists the following: lack of research skills in modern methods, lack of equipment for carrying out state-of-the art research, overloaded teaching and administration

schedules which leave little time for research, difficulty in accessing research funds and diminishing ability of seasoned and senior researchers to mentor junior researchers due to brain drain.

3. Capacity Assessment Focusing on Three Eastern and Southern African Universities with Regional Footprints

This section addresses key features of three representative universities in eastern and southern Africa. It points to some innovative advances over time as well as strengths and weaknesses of the institutions. These are universities that have some regional footprints—meaning that they to some degree serve as regional universities in the composition of the students they train. The last section of this chapter focuses on areas that are common in all the three universities and attempts to point out where each of the three is on the issue and how they managed to reach where they are. The motive is to create a platform for sharing lessons to enable the institutions to learn from one another. To quantitatively attempt to compare and or rank these institutions on all issues is difficult not only because of the complexity of dealing with institutions that are not similar but also because there are so many factors that shape the functioning of a particular institution which range from colonial history to socio-economic and cultural dimensions. To a very large extent as we address the three institutions, we go for factors that relate to the whole university but we zero in on the agricultural-related section of the university. The cut-off point of what is agriculture and what is not presents another complication. Livestock, veterinary sciences, forestry, fisheries, environment, etc. may not very neatly be carved into “agriculture” in some of the universities.

3.1. Makerere University

Historical background

Established in 1922 as a technical school, Makerere University is one of the oldest and most prestigious Universities in Africa. It expanded to become the center of Higher Education in East Africa in 1935. In 1937, the College became an institution of higher education, offering post – school certificate courses. In 1949, it transformed into the University College affiliated to the University College of London. In 1963 it became the University of East Africa, offering courses leading to general degrees of the University of London.

With the establishments of the University of East Africa on 29th June 1963, the special relationship with the University of London ceased and degrees of the University of East Africa were instituted. On July 1, 1970, Makerere became an independent national university of the Republic of Uganda, offering undergraduate and postgraduate courses leading to its own awards. The governing law is the Universities and Other Tertiary Institutions Act (UATIA). Makerere University as of 30th December 2011 officially transformed into a collegiate university with nine colleges and one independent school. These include:

- College of Health Sciences (CHASS)
- College of Agriculture and Environmental Sciences (CAES)
- College of Humanities and Social Sciences (CHUSS)
- College of Computing and Information Sciences (CCOCIS)
- College of Business and Management Sciences (COBAMS)
- College of Education and External Studies (CEES)
- College of Natural Sciences (CONAS)
- College of Engineering , Design Art and Technology (CEDAT)
- College of Veterinary Medicine, Animal Resources and Biosecurity (COVAB)
- School of Law

The University currently has in employment 1,300 members of the academic staff and 275 members of the administrative Staff and together with the affiliated institutions, offers 250 Accredited Academic Programs for its awards.

Makerere University offers day, evening and external study programs to a students' body of about 35,000 undergraduates and 3,000 postgraduates (both Uganda and International). The programs offered lead to awards of Certificates, Diplomas, Bachelor degrees, Masters and Doctoral degrees, at the Main Campus and at the Affiliated Institution which include:

Makerere University Business School, Nakawa; Alokolum National Major Seminary, Gulu; Katigondo National Major Seminary, Masaka, Ggaba National Major Seminary, Ggaba and Hospice Africa – Uganda Educational Unit, Makindye, Kinyamasika National Major Seminary, Fort-Portal, Nsamizi Training Institute of Social Development to Makerere University and Sheik Technical Veterinary School (STVS) located in Somaliland. Two off campuses have recently been opened at Jinja in Eastern Uganda and Fort Portal in Western Uganda.

Innovations in Teaching and Learning

Colleges such as COVAB, CAES and CHS have registered successful innovations that extend beyond the classroom to integrated community development needs. These are good examples to be emulated by other universities. The curriculum for the Masters in Veterinary Preventive Medicine (MVPM) hosted by College of Veterinary Medicine and Bio-security was reviewed to build capacity in field epidemiology. Field epidemiologists are one of the many professionals that are very instrumental in one health, a concept that is being spearheaded by both COVAB and the School of Public health (College of Health Sciences) under the One Health Central and East Africa (OHCEA) project with support from USAID through RESPOND initiatives. The program is research based, characterized by practical teaching methods and problem – based learning implemented through fieldwork.

The Department of Foundations and Curriculum Studies, (College of Education and External Studies) hosted by Professor Carol Sterling, a visiting Fulbright program specialist and professional educational puppeteer from New York City, USA. Professor Sterling taught a special course of educational puppetry -- a project aimed at motivating students to become more intellectually and artistically engaged as learners. The College of Education and External Studies, School of Education has introduced the concept of integrated sustainable development in its courses. As an educational concept, it goes beyond environment education to embrace the process of achieving human development through economic growth, social development and environmental protection in an inclusive, equitable and secure manner.

The College of Health Sciences has moved into competence based curriculum and is working with other universities in the country that offer health sciences programs to train – all round health professionals with the right attitude to stay and work in hard to reach areas. This work has been done under the Medical Education FOR Equitable services for All Ugandans (MESAU) consortium: a partnership of five universities with health training programs in Uganda.

The School of Law in its effort to enhance student centered learning has initiated the Public Interest Law Clinic (PILAC), this is designed to introduce students to the practical components of legal practice through legal aid to vulnerable communities, public debated and

guest lecturers. The clinic legal education program offered to third year students entails harvesting the legal skills of students to educate communities on the law, emphasizing the legal rights of individuals and the avenues they can use to enforce those rights.

The College of Humanities and Social Sciences, Department of Journalism and Communication, launched its quality media dialogues in which students of journalism, communications and media studies, practitioners, media managers, media trainers and other stakeholders discuss pertinent issues and trends in the mission. The dialogues are meant to help students further understand the practical aspects of the profession.

Health and security of staff and students

The university has a University Hospital. It has medical units which are available to staff, both senior and junior and to students. It offers both curative and preventative services. It also has a small dispensary which dispenses all essential drugs for treatment of any ailments. A university ambulance is available 24 hours and so are the nurses on the ward in case of emergencies. The hospital has 22 bed in-patient ward and admissions to the ward are exclusive for students only.

Counseling Services

The counseling center helps students who need assistance on guidance about their daily life problems which might hamper their steady progress in the academic field or prevent them from enjoying their life in general. Such problems embrace the whole range of health (medical and psychiatric) problems, socio-economic, marital, sexual, academic, spiritual and other problems.

The center is also mandated to provide internship opportunities for counseling psychology students and related fields and carry out research on issues affecting people's lives. The center includes activities geared at enhancing students' academic life. These include career guidance and counseling, study skills training and support and others, enhance students and staff personal growth and psycho-social issues, health talks, safety talks, individual counseling, group counseling and outreach activities.

The architecture of the College of Agriculture and Environmental Sciences (CAES)

CAES which is our main focus in this study has a very clear architecture whereby there are three schools within the college that add up to form a very comprehensive agricultural systems program—agricultural sciences, forestry, environmental and geographical studies and Food, technology, nutrition and bio-engineering.

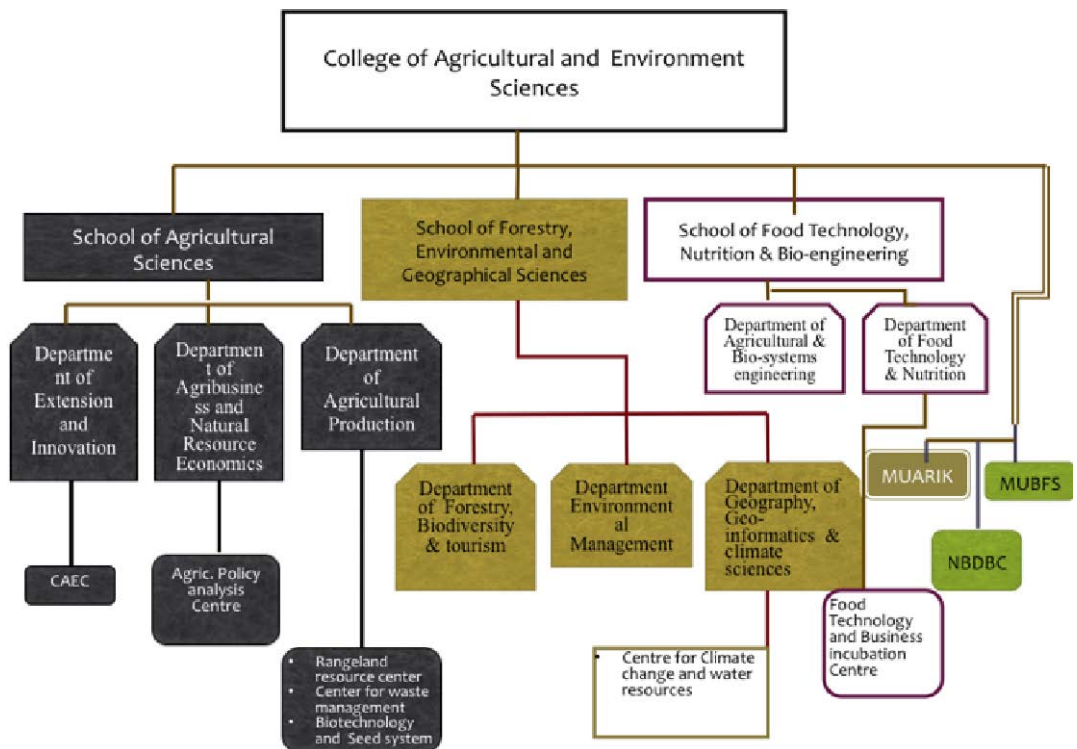


Figure 1. Makerere University: The architecture of CAES

Challenges facing the University

Makerere University has three admission channels to the undergraduate programs: Direct Entry Scheme, for students who have completed secondary school and sat the Uganda Advanced Certificate of Education with a maximum of two years preceding the year of admission; Diploma holders scheme, for students from other tertiary institutions seeking to obtain a university degree; and the mature age entry scheme for students who have been out of the formal education systems for not less than six years. Undergraduate admission criteria however, falls under two different categories:

- i) Based on scholarship and sponsorship; this includes state/government sponsored students and private/fee paying students, the government sponsored category is further sub divided into national merit, district quota, disabled and talented sports students. The category also includes students admitted under the Inter University Council for East Africa an exchange program for Uganda and Tanzania University students;
- ii) Students are also categorized according to the study time schedule of the program: day, afternoon, evening and/or external/distance learning. Day/afternoon and Day/evening programs are predominantly programs offered in distance education mode, this also has provision for face to face session to provide interaction between staff and students each semester. Table X presents undergraduate student admissions data since the academic year 2000/01 whereas Table 2 presents undergraduate admissions statistics for the academic year 2012/13. In addition, Table 2 indicates that a) the number of A-level candidates has trebled in the last 10 years, b) the number of students sponsored by government has remained almost constant at about 2000 as opposed to about 16,000 which is represents the total number admitted, c) private universities are picking up 89% of the total admitted, d) University-wide enrollment for undergraduate is 10% government, 88% private and 2% international students, e)

percentage of the eligible candidates getting admission to universities has fallen from 59% in 2000/1 to 27% in 2012/13. This is more than 50% shrinkage. In conclusion, more and more college eligible students are failing to get college placement.

iii)

Table 2. Student admission to Makerere University for undergraduate programs

Admission Year	Candidates sitting for exams Year	No. of A level Candidates	Eligible A level Leavers	Admission figures			Percent eligible Admitted %
				Gov't	Private	total	
2000/01	1999	35,706	22,712	1,943	11,350	13,293	59
2001/02	2000	39,000	22,021	4,002	11,798	15,800	72
2002/03	2001	44,404	25,555	2,795	11,554	14,349	56
2003/04	2002	54,032	28,892	2,527	10,755	13,282	46
2004/05	2003	55,253	32,613	2,268	12,938	15,206	47
2005/06	2004	59,288	35,196	2,212	13,731	15,943	45
2006/07	2005	72,083	45,558	2,162	11,828	13,990	31
2007/08	2006	84,947	54,044	2,071	10,175	12,246	23
2008/09	2007	88,383	57,485	2,030	12,385	14,415	25
2009/10	2008	96,638	60,634	1,979	13,342	15,321	25
2010/11	2009	99,802	60,370	2,015	13,974	15,989	26
2011/12	2010	101,495	61,820	1,919	15,683	17,602	28
2012/13	2011	102,296	64,417	1,800	15,839	17,639	27

Source: Makerere University Fact Book, 2012-2013

3.2. Sokoine University of Agriculture¹

Historical background

Sokoine University of Agriculture (SUA) was established on 1st July 1984 by the Act of Parliament No 6 of 1984. It was created from the former Faculty of Agriculture, Forestry and Veterinary Science of the University of Dar es Salaam. This faculty was created from the former Morogoro Agricultural College which reigned from 1965 to 1969. In 2005 SUA's Act was repealed by Universities Act No 7 of 2005 which mandated SUA to operate under a Charter. Since 2007, Sokoine University of Agriculture has been operating under its own Charter (2007). This Charter was signed for operationalization by the President of the United Republic of Tanzania on 28 March 2007. Sokoine University of Agriculture (including its Constituent College) is a body corporate with a total of 12806 students, 658 academic members of staff and 1256 administrative staff. The University has four campuses and one Constituent College namely; a. Main campus in Morogoro, b. Solomon Mahlangu campus in Morogoro; c. Olmotonyi campus in Arusha; d. Mazumbai campus in Lushoto and e. Moshi University College of Cooperative and Business Studies in Moshi.

The Main campus is 3 km from Morogoro municipality about 200 km west of Dar es, Salaam city. The campus is the main headquarters of the University Administration and has a total land area of about 3,350 ha. Out of this land, about 2,300 ha are used for farming,

¹ Adopted from SUA 2013. Internal Review and Assessment Report.

research, grazing, forestry, recreational and nature conservation. The Main campus lies on the slopes of Uluguru Mountains at an altitude of between 500-600m above sea level. A total of 15 undergraduate degree programs and 46 Postgraduate degree programs with a total of 5,116 students and 3 non-degree programs (Diploma) with a total of 185 students are conducted at the Main campus. Solomon Mahlangu campus which is located 10 km south west of Morogoro Municipality has an area of about 1,050 ha. A total of 13 degree, 1 Diploma and 1 Certificate programs are conducted here while the students' population of 2,907 students.

Olmotonyi campus is 16 km from Arusha city on the way to Nairobi, Kenya. The campus has a training forest of about 840 ha which is used for practical training, research and nature conservation. Apart from the forest which is leased from the Ministry of Natural Resources and Tourism on 10-year periods, the campus also has conference and accommodation facilities for students and researchers. Mazumbai campus is in Usambara Mountains which stretch between 1,300 to 1,900 m above sea level in Lushoto district. The campus owns about 320 ha of evergreen Montane rainforest called Mazumbai Forest Reserve. The forest is internationally used for tropical forestry training and research in the fields of botany, ecology, zoology and ecotourism.

Moshi University College of Cooperative and Business Studies (MUCCoBS) is a Constituent College of Sokoine University of Agriculture since 2004. It is located within Moshi Municipality on the slopes of Mt. Kilimanjaro. The College which has two campuses namely, Moshi Main campus (30 ha) and Kizumbi campus (107 ha) in Shinyanga region has a total of 4,611 students, 150 academic staff and 232 administrative staff. The College offers a total of 32 programs which include 10 undergraduate programs, 10 postgraduate programs and 14 non degree programs.

Research policy, focus areas and guidelines

SUA formulated the first research policy, priority areas and guidelines in 1992. These guidelines have been reviewed twice in 2000 and 2010. The third edition (2010) of the University research policy, focus areas, guidelines and regulations was approved by the University Council in June 2010. In making revisions to the 2010 document, relevant agriculture and natural resources policies were referred to as well as the Commission for Science and Technology Research Priority Areas. University research agenda (2005-2010), which is already overdue for revision. The research policy is an instrument for giving direction and providing a broad framework to guide researchers, research administrators and management on the whole business regarding research. The policy document indicates research focus areas and strategies for research. In addition, guidelines are given on the following: (i) application of research grants administered or funded by SUA (ii) progress reports for research grants (iii) publication and dissemination of research results (iv) disposal of equipment purchased from research funds (v) subsistence, per-diem, other allowances, reimbursements and incentives (vi) professorial research chairs (vii) research associateship scheme (viii) research associateship guidelines (ix) administrative costs of grants and (ix) revenues from research projects and activities. While all guidelines are being used, the professorial research chair remains to be operationalized.

According to the policy document SUA's main research objective is to provide leadership in basic and applied research in order to generate knowledge and innovations that respond to contemporary and emerging needs of agriculture, natural resources and allied disciplines.

Research should be linked to development and in particular focus on specific problems including environmental concern and conservation of natural resources as well as providing scientific breakthrough. Thus research conducted is relevant to the development agenda of Tanzania, promotes innovation and solves immediate problems of the society as emphasized by TCU. Student and staff responses on the research policy document acknowledge the existence of the document and indicated that they adhere to the research focus areas while developing research proposals. Departments have indicated that they also have Departmental research programs.

Research activities and outputs

SUA has the highest concentration of highly trained manpower in Tanzania in the fields of agriculture, forestry, wildlife, and aquaculture, veterinary and allied or complementary sciences. Most of the staff are very active in research and have an excellent publication record in local as well as internationally refereed journals. Currently there are 247 ongoing research projects at SUA from 97 research projects in 2006. Some research is done in collaboration with other institutions (there are over 50 Memoranda of Understanding and Collaboration Agreements with institutions/agencies across the world). On average staff publish about 70 papers in journals and proceedings annually. Overall given the heavy teaching load of some staff, many staff being on training, the publication record is considered reasonable though lower than the TCU requirements. On line publication and other publications such as articles in newspapers are regular as per TCU requirements.

Research funding during the period 2006/7 was TZS 5.1 billion while in 2011/12 was TZS 57.6 billion. Research is largely donor funded and is biased towards applied research with little basic research being supported. Currently, the major donors include: Norwegian Agency for Development Cooperation (NORAD), Danish International Development Agency (DANIDA), International Development Research Centre (IDRC), United States Agency for International Development (USAID), Association of Agricultural Research Institutes for East and Central Africa (ASARECA) and Tanzania Commission for Science and Technology (COSTECH).

In addition to funding constraints, other constraints to research pointed out by staff and students include: inadequate research facilities (infrastructure and equipment). The university should strengthen research infrastructure by establishing and equipping research laboratories. Despite the indicated constraints, SUA has recorded some key achievements in research. These include:

- Portable log sawing platform.
- Development of biosensor technology using African giant pouched rat.
- Development of new bean and rice varieties.
- Improved postharvest processing of cassava through chipping.
- Improved technologies for processing of milk for small scale.
- Drug for treatment of East Coast Fever in cattle.
- Management of fruit flies

University Outreach

Two of the objectives of SUA relate to outreach. These are (a) to assist in the preservation, transmission, dissemination and enhancement of knowledge in the fields of agriculture, fisheries, forestry, veterinary and allied and complementary sciences (b) to develop, promote

and undertake the provision of adult and continuing education alongside the teaching of regularly enrolled students, designed to secure the development and dissemination of various applied sciences and technologies required for the enhancement of the rural economy and the efficacious solution of the economic and social problems of rural areas of the United Republic of Tanzania. The Institute of Continuing Education (ICE) and the Centre for Sustainable Rural Development (SCSRD), have as part of their responsibilities to work closely with the rural communities through research and training, in order to bring the knowledge and expertise at the university to bear on the problems of these communities. The ICE was established to collaborate with other university Departments to offer short-term training to farmers, community groups, local leaders, trainers, researchers, extension staff, and other government staff on various topics. The SCSR D was established to improve the capacity of SUA as a national higher learning institution, to develop and test participatory rural development approaches and strategies, which may lead to sustainable rural development. In addition, other academic Departments in the University also do undertake outreach activities.

Some of the major ongoing outreach programs include:

- The Uluguru Mountains Agricultural Development Project (UMADEP).
- The Soil – Water Management Research Group (SWMRG).
- Strategic interventions under the program on Enhancing Pro Poor Innovations in Natural Resources and Agricultural Value Chains (EPINAV).
- Diagnosis of animal diseases.
- Management of fruit flies.
- Rodent management.
- Plague prevention.

Human resource capacity, ranks and qualifications

SUA has high concentration of well-trained human resource in the fields of agriculture, veterinary, animal science, forestry and wildlife management. The number of staff trained in physical and biological sciences, mathematics, biometry, informatics, and education and development studies is also increasing. Table 3 shows SUA Departments, Faculties and Institutes where these staff are working.

As of 31 March 2013, the total number of SUA employees was 1532 compared to 1106 in 2006. Academic staff totals 508 from 305 in 2006 while Technical and Administrative total 1024 as compared to 801 in 2006. Academic female staff ratio is currently 19% while Administrative female ratio is 23%. Table 3 shows the number of academic staff in 2006 and 2013 and their academic qualifications. The number of academic staff with PhDs is 244, Masters 231 and Bachelor degrees 33.

Table 3. Number of SUA academic staff by ranks: Growth from 2006 to 2013

a). Position/Rank	2006	2013		
	Total	Female	Male	Total
1.Professors, Research Professors and Librarian Professors	48	6	69	75
2.Associate Professors, Associate Research Professors and Associate Librarian Professors	66	9	63	72
3.Senior Lecturers, Senior Research Fellows and Senior Librarians	47	12	61	73
4.Lecturers, Research Fellows and Librarians	49	28	72	100
5.Assistant Lecturers, Assistant Librarians and Assistant Research Fellows	38	34	121	155
6.Tutorial Assistants and Trainee Assistant Librarians	18	7	26	33
Total	305	96	412	508
b). Academic staff by qualifications				
1. Ph.D.	188	33	211	244
2. Masters degree	90	56	175	231
3. Bachelors degree	27	7	26	33
Total	305	96	412	508

Sources of funds

The University has three main sources of funds; (i) subvention from the government, internal income generation and donors funding for various programs, particularly research and training. Since to 2011/12, these sources have contributed 54.4%, 30.3% and 15.2% respectively. During the academic year 2011/12 the respective proportional contribution to funding was 48%, 33% from donors and 19% from internal sources as presented in Figure 2 and 3. Funding from the government has declined from 69% in 2006/07 to 48% in 2011/12. Meanwhile, donor funding has increases from 26% to 33% during the same interval. Internally generated funding has increases from 5% to 19% having declined from a peak of 21% during 2010/11(Figure 2 and 3). The level of internal income however remains low in nominal terms at slightly above ten billion during 2011/12.

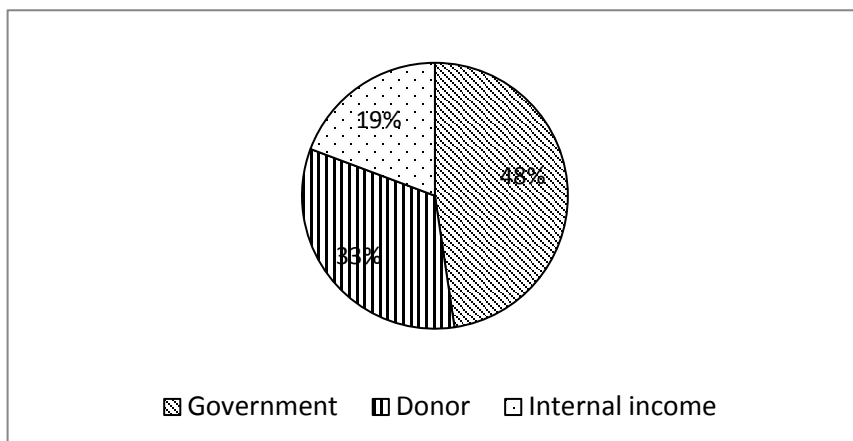


Figure 2. Main sources of funds by proportion: 2011/12

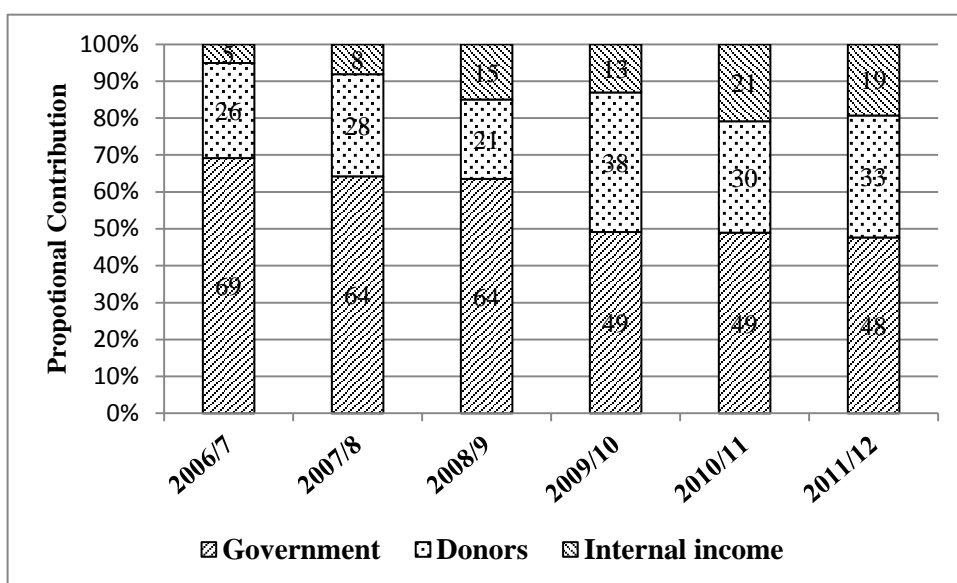


Figure 3. Proportional contribution of main funding Sources: 2006/7 – 2011/12

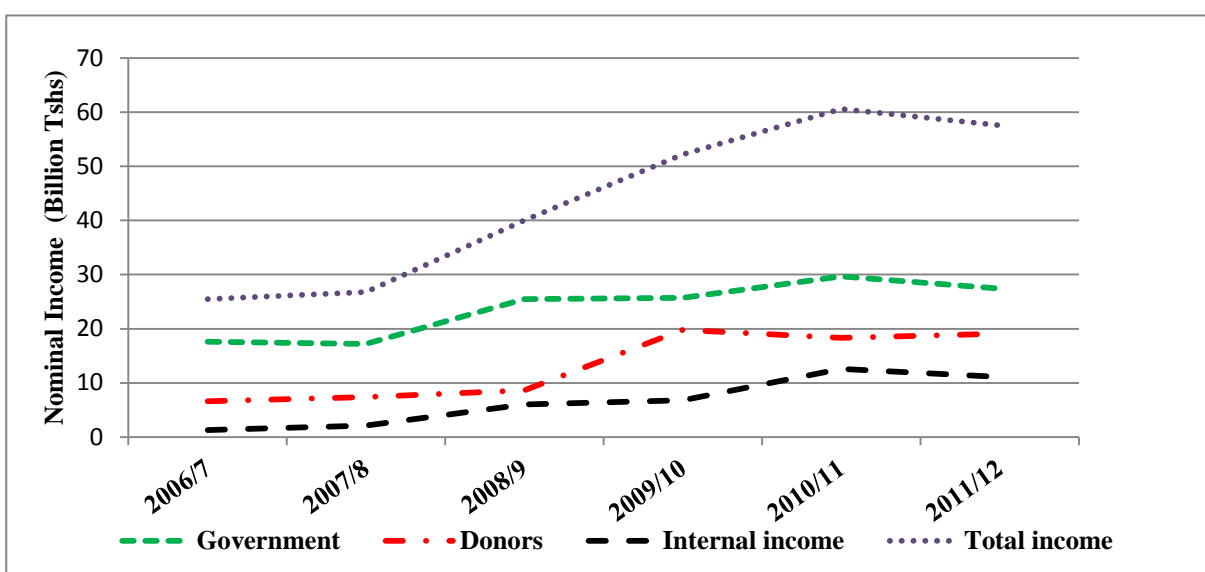


Figure 4 Trend in main sources of funds (Nominal (TZS))

While total funding has more than doubled since 2006/7, from 25.5 Billion to 57.6 billion in 2011/12, and the trend in the total income from all sources has been increasing in nominal terms, a declining trend is observed since 2010/11, particularly for government funding. Although funding has increased by 126% in nominal terms during this period, translated in real terms the rise is only 51%. The smallest increase in real terms occurred for government funding (4%) and the highest is for internally generated income but this amount remains small at slightly above 10 billion shillings.

Being a public institution, the university receives about 50% of her funding from the government. The University Council approves an institutional budget annually to implement activities consistent with the approved Corporate Strategic Plan (CSP). The government approved budget however falls short of the institutional budget approved by the University Council. Despite the observed decline, the institutional budget meets most of the guidelines for financial sustainability. The percentage of the budget received has been fluctuating and declining, especially for capital development, which has declined from 100% to 42% at times. However, over 90% of the budget has been disbursed on average. The proportion of the budget spent on personal emoluments remains within an acceptable range, with a mean of 53%. The proportion of income delivered as fees remains low, the highest level (15%) being attained during 2010/11). The percentage of income from other sources is also very low at 5.7% on average. Under the current CSP, the intention is to increase this portion using different options as discussed below.

3.3. University of Pretoria

Historical background

The University of Pretoria (UP) is a leading research university in South Africa and one of the largest in the country. The University has seven campuses as well as a number of other sites of operation, such as the Pretoria Academic Hospital. Central administration is located at the Hatfield Campus. The University of Pretoria offers more than 1, 800 academic programmes in two of the official languages, namely Afrikaans and English. The University of Pretoria celebrated its Centenary in 2008.

The academic programmes of the University are offered in nine faculties, viz. Humanities, Natural and Agricultural Sciences, Law, Theology, Economic Management Sciences, Veterinary Science, Education, Health Sciences, as well as a business school-- Gordon Institute of Business Studies. The faculties comprise a total of 140 departments and 85 centres, institutes and bureaus. UP is at the forefront of tertiary education in the country and collaborates with world-class partners to ensure continued excellence in learning and teaching.

Academic programs

UP offers 230 qualifications involving 1 669 academic study programmes, 1,343 of which are postgraduate programs. The rich cultural diversity of the South African population is reflected in the total student population of almost 62,000 students. There were almost 45,000 contact students of whom 54.9% are female and 45.9% are black students. The University has almost 18,000 distance education students, and nearly 4,000 international students, of whom more than 67% are from Southern African Development Community countries.

In recent times the University (*on an annual basis*) produced 15% of all three year bachelor's degrees, 14% of all professional four-year bachelor's degrees, 18% of all master's degrees and 16% of all doctoral degrees in South Africa. The University also contributed 29% of all engineers (with BEng degrees), 6% of all healthcare professionals, Eighteen percent of all natural scientists and all locally trained veterinary scientists in the country.

The University has nine faculties and a business school, spread over five campuses in Pretoria and one in Johannesburg. The six campuses together comprise 1 214 hectares and there are 781 buildings on this land.

3.3.3 Support Services

Physical infrastructure:

The University of Pretoria has a large and comprehensive range of physical facilities, spread over six campuses in Pretoria and one in Johannesburg. All campuses in Pretoria have residence accommodation, and the Illovo campus, a student hotel. There are also a number of satellite sites that enable the University to extend its clinical and teaching support services to more remote areas:

- i. The **Hatfield Campus** houses the Faculties of Humanities; Law; Theology; Economics and Management Sciences; Natural and Agricultural Sciences; Engineering, the Built Environment and Information Technology, in addition to the central administration and a number of women's residences.
- ii). The **Hillcrest Campus** contains the University's main sports facilities, most of the men's residences and the experimental farm.
- iii) The **Groenkloof Campus** houses the Faculty of Education, a number of residences and further sports facilities.
- iv) The **Mamelodi Campus** is home to a number of foundation programmes, residence accommodation the University's community engagement projects.
- v) The **Prinshof Campus** contains the Faculty of Health Sciences adjacent to the main provincial Academic Hospital used by the University, and residences.
- vi) The **Onderstepoort Campus** houses the Faculty of Veterinary Sciences, the University's Veterinary Academic Hospital, the Teaching Animal Unit, and residences and the
- vii) The **Illovo Campus** in Johannesburg contains the Gordon Institute of Business Science (GIBS), and a student hotel.

The expansion of physical facilities for an urban university often has a long gestation period due to the constraints posed by existing infrastructure and neighbouring users. Long range planning is therefore essential. It estimate that an additional 89 000 assignable square meters of building space will be required to accommodate the realistic growth till 2025, approximately an expansion of 17,6% in the University's facilities, largely by constructing new buildings.

The existing infrastructure is kept in good functional order and on a relative basis UP has some of the best infrastructure in the country. There is an effort to continuously plan for expected expansion, e.g. in lecture rooms. The Department of Facilities Management is responsible for the planning, development, maintenance, operations and record-keeping of the University's growing estate.

Library infrastructure:

The Department of Library Services is responsible for a world-class, modern academic research library network at ten faculty libraries spread across the six campuses. This service

is aligned to the UP faculties with customised services for undergraduates, postgraduates, staff, alumni and visiting scholars. All services are designed towards creating a gateway to global information, and supporting learning, teaching and research through interaction with professional staff.

Key initiatives that contribute to a world-class learning environment are:

- A dedicated Library web site that gives access to all the services of the Library (<http://www.library.up.ac.za/>)
- A mobile web site and catalogue (<http://www.library.up.ac.za/mobi/>)
- online access to wide-ranging print and electronic collections
- the Learning Centre at the Merensky Library on the Hatfield Campus and online assignment support for undergraduate students (<http://www.library.up.ac.za/learning/index.htm>)
- a Research Commons, which is a dedicated space for postgraduates, researchers and academics
- an online reference service (Ask-a-Librarian)
- wireless hotspots in some areas
- federated search engines to access electronic journals, books and databases, electronic theses and dissertations (<http://upetd.up.ac.za/UPeTD.htm>)
- an institutional repository (<http://repository.up.ac.za/>)
- training in the use of various information literacy skills and programmes
- a facility for the digitisation of scarce and brittle research material
- various audio-visual materials

3.3 Comparison of selected common areas across the three universities

It was noted in general that comparing and or ranking universities in the region is a daisy exercise mainly because of the variation in history, purpose, types of programs, main business of the university, whether specialized in subject matter areas or not, etc. Sokoine university of Agriculture for example is dedicated to agriculture, forestry and veterinary sciences. To the contrary, Makerere University and the University of Pretoria are extremely diversified with both science and humanities. The foregoing differences notwithstanding, this section attempts to compare about 20 attributes across the three universities with a view to provide a sense of how advanced or backward a university may be from another in a particular issue such as ICT. In the process, those lagging behind may be able to learn what their counterpart did to reach that standard as well as gauging how much catching up may be required to attain that particular standard. The last column of Table 4 attempts to make an inference on each of the attribute across the universities.

Table 4. A Comparative Analysis of Selected Attributes in Three Universities in Eastern and Southern Africa

No.	Attribute	Makerere University	Sokoine University of Agriculture	University of Pretoria	Remarks
1.	Year of Establishment	1922	1984	1908	University of Pretoria is the oldest of the three. But also important to note that Sokoine University of Agriculture was home to an agricultural college dating back to 1965 and also a faculty of agriculture of the University of Dar es Salaam from 1969 to 1984 when it became a fully-fledged university.
2.	Vision and Mission	<p>Vision: To be a leading institution for academic excellence and innovations in Africa.</p> <p>Mission: to provide world class innovative teaching, learning, research and services responsive to national global needs.</p>	<p>Vision: To be a renowned center of learning and knowledge creation for sustainable land use, betterment of agriculture and improved livelihood.</p> <p>Mission: is to promote development through training, research, and delivery of services.</p>	<p>Vision: To be a leading research-intensive university in Africa recognised internationally for its quality, relevance and impact, as also for developing people, creating knowledge and making a difference locally and globally.</p> <p>Mission: In pursuing recognition and excellence in its core functions of research, teaching and learning, and integrating engagement with society and communities.</p>	The visions and missions of the three institutions are very similar in content. However, it is difficult to tell the extent to which the institutions stick to their visions and missions. But all in all, they remain important guiding posts.
3.	Governance	<p>Council: Highest decision making body</p> <p>Senate: Academic matters.</p> <p>Chancellor: The head</p>	<p>Council: Highest decision making body</p> <p>Senate: Academic matters.</p> <p>Chancellor: The head of the university followed by Vice</p>	<p>Council highest decision making body</p> <p>Senate: Academic matters, followed by faculties, departments, schools and such other academic</p>	Similar terminologies here include—Council, Senate, Chancellor, Vice Chancellor and Deputy Vice Chancellor.

		of the university followed by Vice Chancellor and Deputy Vice Chancellors.	Chancellor and Deputy Vice Chancellors.	structures of the University as may be determined by the Council. This is followed by Chancellor, Vice-Chancellor and Principal, Executive Vice-Principals, Executive Directors and Registrar	Similarities in terminologies assist in communication, cooperation and sharing. More trust is achieved while communicating if colleagues of the same role carry the same title.
4.	Core Values	Allegiance to the institution, integrity, customer responsiveness, professionalism and openness to diversity.	Academic excellence, integrity, and freedom, effectiveness; efficiency; participatory management; social responsibility, equity and social justice; professional and ethical standard and continuous learning.	Pursuit of knowledge; academic freedom; staff and students—the university core asset; academic citizenship; graduates appreciate the value of community	Usually difficult to gauge the extent these core values are adhered to but they are good reference material especially for new employees.
5.	Student Enrollment University – wide	Three admission channels exist for undergraduates: direct entry scheme, diploma holders scheme and mature student also categorized in terms of time schedule—day and night students. Admission in 2012/13 was 17,294 with registered being 12291 against 46,185 applicants. Total student population 2012/13→37,262	Since 2006, there has been an increase of students by almost three times from 2,753 to 8,208 students today. Unfortunately this increase has not matched the available teaching and learning facilities.	Total student enrollment has climbed to 62,000 in recent years. The enrollment in the Agriculture and Natural Resources is 7163 with the undergraduates being 5194.	The University of Pretoria has the largest student population in the region. In fact in terms of number of students, it is comparable to some of the big universities in the USA.
6.	Number of Int'l Students	In 2012/13 there were 712→about 2%	In 2013-14: Undergraduate students—54 [mainly from Mozambique and	The proportion of international students is 9%. In 2013 there were 4412	Given the student population of SUA (about 8000) the

			Namibia] Postgraduate students→43 [mainly from Namibia, Liberia and Zambia].	international students, of whom more than 67% are from Southern African Development Community countries. The number of international postgraduate students was 1837 in the same year.	proportion of international students to the total population makes SUA to be almost the same as UP.
7.	Student Enrollment in Agriculture and Natural Resources	Makerere's total student population is about 37,000. There are nine colleges. The proportion of the college of agriculture and environmental with a student population of 2261 makes the proportion to be only 6%.	This is a 100% agricultural university. Thus all the 8,208 are enrolled in agricultural-related disciplines.	The total student population is almost 62 000 students. There were almost 45 000 contact students. The University has almost 18 000 distance education students, and nearly 4 000 international students, of whom more than 67% are from Southern African Development Community countries.	The student numbers in the UP is by African standards quite large. It is a good referral point in understanding how to manage large student university populations.
8.	Total Number of Graduates	Postgraduate student population (2013): MSc and PhD is 1855.	Postgraduate population is 1831 out of a total population of 8208 students.	In 2013 there were 2112 graduate students in the Faculty of Agriculture and Natural Resources. This is out of 7163 students.	The graduate population is a far higher proportion compared to Makerere University.
9.	Student Gender Ratios	44% female undergraduates; 62% female graduate students Total graduate students population is 5% of the total student population.	Student female ratio is about 33% while for the staff female ration is about 19%	Sex ratio is 54.9% are female and 45.9% are black students.	The University of Pretoria has the highest proportion of women students in the enrollment. The impressive 46% of black students is a result of the majority rule in South Africa of 1994. Otherwise the proportion was less than this then.
8.	Curriculum Review	The review encompasses the currency of the curriculum, demand, teaching quality and	Curriculum reviews are a regular feature of SUA for improving and adjusting the curricula to the needs and requirements of stakeholders at	University of Pretoria has a very effective model of engaging the private sector in the curriculum review process. Private sector is consulted and is invited to have	The University of Pretoria is the best example among the three regarding the integration of the private and public sector in the

		outcomes; evaluation of student and external stakeholder feedback, compatibility with and differentiation from other course offerings. Annual comprehensive course reviews is facilitate by the DVC (Academic). It is part of the University planning and monitoring process	various levels. Curricula reviews are usually conducted every five years and/or after the first class has graduated which may be less than five years, if the need is urgent and cannot be delayed to follow the normal 5-year cycle. SUA’s curriculum review seems to be “internal” as opposed to the other universities where they also involve private sector.	input into the review process. Obviously, depending on the type of the course, input from the private sector may vary. More input being requested in courses that have more to do with the private sector such as business.	planning and implementation of the various university functions. This should be emulated by the other universities as well.
9.	Staff-Student Ratio	Currently at 1:21. This is improvement overtime.	Currently, 1:16—one staff to 16 students.	Currently 1:19—One staff to 19 students.	UNESCO recommended ratio is 1:25—which means that the teacher student ratio for the universities in question is favorable as it surpasses the UNESCO. The constraints are not necessarily confined to the ratio but more to the extent to which the learners and the instructors are facilitated to be effective in their delivery.
10.	Annual Number of Published Articles in Refereed Journals	For Makerere University, these are grouped into four categories: science and technology 2164, humanities 21, education 27 and, business and	SUA has a research policy which guides and regulates research activities to be undertaken and priority areas to focus. Research Agenda formulated in 2005, however, needs review. Currently there are 247 ongoing research	UP is a leading research university in South Africa. Number of publications in the Faculty of Agriculture and Natural Resources published in different journals was 750 in 2012	In the case of the University of Pretoria, the driving force to publish is stipulated in the vision of the University, i.e. “to be a leading research-intensive university in Africa recognised

		management 10 total articles. These are data for 2012. Publications for the College of Agriculture and Environmental Sciences are therefore embedded in the “science and technology” category.	projects of which majority are applied research aimed at reducing poverty amongst the Tanzanians. About 70 papers are published in scientific Journals and edited Proceedings each year by SUA staff and students. In addition SUA hosts 6 professional Journals of which some are registered on line.		internationally for its quality, relevance and impact”. Research is deliberately mentioned and there is no question that this has served as a big push. And it is research output that has made it possible for the University to maintain its top five position in the ranking of African universities for many years now.
11.	Ranking Among African Universities	Web-based metrics ranking moved Makerere from 9 th position in 2012 to 4 th in 2013. However, based on the same metrics used for SUA and University of Pretoria, Makerere is ranked 28 th .	SUA has always ranked amongst the best 100 Universities in Africa due to its publications. With more SUA publishing in International journals, SUA Journals going on line and improvement of SUA website, SUA ranking is expected to rise significantly. The current (2013) ranking is 48 out of the 100 best universities in Africa.	The University of Pretoria has always been among the best 5 in Africa and currently it is number 4. Within South Africa t ranks number 2—coming immediately after the University of Cape Town.	Makerere high ranking is due to integrating ICT in the functions of the University. The interpretation of the rankings should be taken with caution because there are several indices that are used. All in all, websites seem to be of paramount importance in selling a university. Universities that are good managers of their websites tend to do well in the ranking.
12.	Finance Status	Sources of funding: government subvention, internally generated revenue from tuition and other fees and funding from	There are three main sources of funding to the University; Government subvention, Donor funding and internal generated income. In 2011/12, Government subvention	Income2012 in (ZAR-m) was as follows: Government grants 1 699m Tuition fees 1 086m Income generation 1 017m Income from contracts and others	Makerere is demonstrating the extent to which private students can pay for their own education. The University of Pretoria is

		development partners who number 17. Latest funding (2012) the institute had UgShs 148 billion equivalent of US \$ 59 million. From this approximate shares are as follows: government 36%, private sector 59% and donors 4% and internally generated funds about 1%	accounted for 48% of the total funds while donor funds and internal generated income accounted to 33% and 19% respectively. In recent years, subvention from the Government especially funds for Development and Other charges have been decreasing leading to deterioration of quality of services offered by the University.	526m Service rendering 495m. Donations and gifts 143m making the total to be ZAR 4 966 mi per year.	well supported by treasury funds. Makerere University on the other hand depends significantly on fees. Sokoine University seems not to rely heavily on either of these issues. As such, we find that SUA is the one with the least comfort in funds.
13.	Private – Public Sector- Linkages	The university has actively engaged with the media, the legislature, the private sector, local government and international bodies. International partnerships that are in several cases have been operationalized though memoranda of understanding further define the international character of the university. However, unique to calendar year 2012, is an attempt by the university to engage with local agencies as partners in development highlights	All SUA students undertake practical training in their respective fields of specialization. Due to increasing number of students, the available field practical training stations are increasingly becoming inadequate.	Tailored courses built around private sector specification. Formal and informal periodic AET consultation with industry & professional associations. The link with the private sector is fairly strong and felt across the universities. Field attachment to industry is a common phenomenon.	Private sector forum mentioned in Makerere University is a great innovation—it provides space for innovators to discuss innovative ideas and also enables stakeholders to discuss what has worked and what has not worked and why. Based on these forums, a number of ideas are picked up by the universities and private sector for putting into action.

14.	Library Status	Impressively very active library; seating capacity 3879; book: student ration, 1:7. Library has most of what is expected in a modern library; viz: Workstations, Computers , Servers Sunray terminals, Digital Library (Dspace) full text records, Digital Music Archive , online books, E-journals , Print journals, Library Collections, Bookbank Collection Book Bank – Registered Student Ratio Registered Student.	SUA library is a designated National Agricultural Library (SNAL) and a depository of all agricultural publications in the country. SNAL is a member of National and International library associations and subscribes to free open access books and references through Online Public Access Catalogue. Through a recently installed Lib-Hub system, students and staff can now access as many journals as any student or staff would do in any modern university.	The Department of Library Services is responsible for a world-class, modern academic research library network at ten-faculty libraries spread across the six campuses. This service is aligned to the UP faculties with customized services for undergraduates, postgraduates, staff, alumni and visiting scholars. All services are designed towards creating a gateway to global information, and supporting learning, teaching and research through interaction with professional staff.	Today, a successful library is no longer only measured by the number of books or student: book ratio. Rather, it is more a function of how active the library is in embedding ICT utilization—including digital access to literature. We also find many libraries still being used as a venue for sitting and studying. This comes about because in a majority of cases, the universities do not seem to have alternative sitting places for students.
15.	Community Service	Each college has community –based initiative(s)...pharmacy , medicine, law, vet medicine, and agriculture and environmental sciences and education. Community service has been introduced as an integral part of the university curriculum.	The Uluguru Mountains Agricultural Development Project (UMADEP). The Soil – Water Management Research Group (SWMRG). Strategic interventions under the program on Enhancing Pro Poor Innovations in Natural Resources and Agricultural Value Chains (EPINAV). Diagnosis of animal diseases. Management of fruit flies. Rodent management.	The Law Clinic has a proud tradition of rendering legal services to the community, more specifically to the less privileged and often marginalized members of the community. Largely as a response to unmet legal needs, the Clinic was in fact originally founded, managed and staffed by law students on a voluntary basis. They received no remuneration or academic credit for their services.	Building a sense of service to communities is a topic which is gaining a significant amount of attention at the moment. The three universities each seemed to have approached “community service” from the point of view where a university seemed to have a comparative advantage. On the average, key areas

			Plague prevention.	<p>Although the Clinic of today bears very little resemblance to the initial Clinic the commitment to <i>pro bono</i> work remains just as strong. For the past few years, the Clinic has handled in excess of 2 000 cases per year.</p> <p>All the departments in the School of Dentistry contribute to the community service projects in the School.</p>	are in agricultural extension (SUA) and medics for Makerere University and law for the University of Pretoria.
16.	General Status of University Infrastructure	The basic infrastructure has been improving from the war times of 1979-1984 which almost tore the infrastructure apart. Space for various functions is not superbly adequate but it is within reasonable range with regard to quantity and quality. A number of new buildings have come into place in the last 10 years. There is a fair repair and maintenance of the existing buildings.	Overall, library, laboratory and workshop sitting spaces and facilities are not adequate. In order to ensure that teaching facilities in lecture theatres and lecture rooms are adequate and in good working conditions the University through USAID support plans to establish a well-equipped University wide Unit which will ensure that all the necessary facilities are in place and are working properly. Staff houses (200) in both campuses are inadequate and in poor conditions due to increased number of staff and lack of regular maintenance.	<p>The expansion of physical facilities for an urban university often has a long gestation period due to the constraints posed by existing infrastructure and neighboring users. Long range planning is therefore essential. It estimate that an additional 89 000 assignable square meters of building space will be required to accommodate the realistic growth till 2025, approximately an expansion of 17,6% in the University's facilities, largely by constructing new buildings.</p> <p>The existing infrastructure is kept in good functional order and on a relative basis UP has some of the best infrastructure in the country. There is an effort to continuously plan for expected expansion, e.g. in lecture rooms. The Department of Facilities Management is responsible for the planning, development, maintenance,</p>	The University of Pretoria serves as a model for how a modern university has to be kept in terms of repairs and maintenance of buildings and grounds. The place is well kept and relatively all seemed to work well. Advanced planning helps to show future space utilization resulting in there being no serious shortage of space to run basic university functions. Makerere University has been struggling for several years but of late, new buildings are coming up through the help of some donors. SUA seems to be the most struggling of the three. Simply put, available budgets are not sufficient to keep the

				<p>operations and record-keeping of the University's growing estate. The University of Pretoria has a large and comprehensive range of physical facilities, spread over six campuses in Pretoria and one in Johannesburg.</p>	<p>University at a reasonable and desirable state.</p>
17.	ICT Status	<p>The university has fully adopted ICT integration in teaching and learning key improvements include:- Online access to examination results and course work by students has now improved, Use of the Drop Box, wiki spaces were explored for teaching purposes. The integration of e-learning in medical education using platforms that are popular with students like face book and, using the (Makerere University E -Learning (MUELE) concept.</p>	<p>The Computer Centre (CC) was established in March 1991. The main functions of the CC is to work out and maintain a University ICT system in order to support the functions of the University in teaching, research, outreach, consultancy, library and administrative activities. ICT functions at SUA are an integral part of the teaching, learning and administrative services.</p>	<p>The University has arguably the most advanced ICT infrastructure in the region. The main objective of ICT at the University is to explore and research the scientific basis of new technologies. Furthermore to promote the proliferation of reliable, robust and innovative computing and information technologies into the IT industry in South Africa.</p> <p>Excellence in computer science education, the development of internationally and nationally recognized research initiatives, and strong industry collaboration, are the driving factors underpinning the success of ICT at the University.</p>	<p>ICT is a driver in the elevation status and ranking of universities. It also remains to be a great opportunity in tertiary agricultural universities for use in teaching, research and outreach. There are several initiatives in all the three universities meant to boost ICT utilization in the running of the university business such as in admission of students, examinations management and release of results, etc.</p>
18.	Gender Mainstreaming	<p>The university has an affirmative action policy that has assigned extra 1.5 points to all female applicants. The</p>	<p>SUA has a gender policy which was formulated in 2000 and revised in 2012. The policy ensures that gender issues are mainstreamed into all SUA</p>	<p>Gender at the University is pioneered by the Institute for Women's and Gender Studies. The Institute envisions that through the promotion of gender justice and</p>	<p>Broad based development can only be achieved if gender is embraced in all the institutional functions. Makerere and SUA seem</p>

		<p>policy which has been in place for the last 25 years has greatly contributed in narrowing the gender disparity in student enrollment.</p>	<p>activities and there is a gender balance in all sections. Through this policy, it has been possible to increase female students' ratio at SUA to 33% from 22% in 2006 and academic female staff ratio from 16% in 2006 to 19% in 2013. Unfortunately Technical and Administrative female ratio which was 31% in 2006 has gone down to 23% in 2013.</p>	<p>human rights, it will assist in building a culture of tolerance, diversity and democracy. To this end, the Institute is embarking on a program to promote gender and transformation, in collaboration with cognate departments, as well as with colleagues and stakeholders from civil society, government. The mission is to promote the production of critical knowledge about gender relations in all aspects of social life, to build the intellectual capacity of the University in South African civil society, state and the continent, and to realize this vision of gendered development.</p>	<p>to have very specific policies for raising gender awareness as well as putting in place affirmative action sort of policies to ensure women participation –student enrollments, appointments, recruitment for training, etc.</p>
19.	Other Innovative Features	<p>Student counseling services, orienting staff to new ways of teaching, etc. Other innovative features are as follows: community and action research on several types of technologies, novel extension approaches including linkage of school programs to extension. Others include new cowpea and soybean varieties grown by over 60% of farmers in Uganda Tanzania and Kenya,</p>	<p>Besides Research Policy, SUA has an Intellectual Property Rights Policy (IPR) and a Technology Transfer office has been established. Since its establishment in 2006, this office has facilitated the registration of six innovation patents with Business Registration and Licensing Agency (BRELA) and made SUA acquire two plant breeders' rights from the Ministry of Agriculture, Food Security and Cooperation.</p> <p>Other features: ranking of teachers by students; external examiners to oversee</p>	<p>Three units in the University have been brought together to form the Department of Institutional Planning which comprises-- Bureau for Institutional Research and Planning, Quality Unit and Unit for Academic Planning.</p> <p>The Department of Research and Innovation Support (DRIS) facilitates the creation of an enabling environment to conduct research and obtain funding from third parties through contract writing, monitoring and execution (research, contracts and innovation support). The department provides information and operational support to the University's research</p>	<p>In all of the three universities, there is an increasing awareness towards innovations directed to serving communities. The universities gradually seem to be re-thinking about their roles in society as opposed to the past when their role was solely to impart knowledge.</p>

		tissue culture bananas and incubation of technologies and market including industrial scale development of the banana industry.	examinations.	program. It also provides the University with strategic and operational links with external agencies, including funding bodies.	
20.	Regional Training and Research Status	Since 2011, the College of Agriculture and Environmental Sciences has been hosting three regional programs (i) PhD in Plant Breeding and Biotechnology, (ii) MSc Plant Breeding and Seed Systems and Masters in Agricultural and Applied Economics. All these programs have a foreign student population of about 50%. The students come from Burundi, Ethiopia, Kenya, Malawi, Mozambique, Rwanda, Sudan, Tanzania, Zambia and Zimbabwe.	Currently, there are approximately 100 foreign students most of them from the region. There is one Japanese and one Austrian student. Taking into account that the University has about 8000 students, this is just 1.25% as compared with Makerere which has 2% foreign students.	The University of Pretoria offers more than 1 800 academic programs in two of the official languages, namely Afrikaans and English. The proportion of international students is 9% which makes the University to rank the highest in the region. This proportion comprises both undergraduate and graduate students.	All these universities are training students both at undergraduate and graduate level from the region. However, the University of Pretoria has the greatest international student proportion nearing almost 10%. It is also important to note that because of increasing regional integration and networking, students from countries within the region are increasing. For example, SUA now has more Zambian, Namibia and Mozambican students than before.

4. Conclusions and Recommendations

4.1 Underlying Features and Differences across AET Institutions

Higher education in Africa is shaped by history of colonialism, independence movements, post-independence development efforts and conflicts. Tertiary level enrolment ratios in the region are generally low and range between 2 and 4 (Mauritius 17 %). Other than South Africa, most AET institutions rely on enrolment of national citizens. South Africa has considerable number of students from SADC countries as well as non-SADC countries. Funding of higher and tertiary education is largely by government and different countries have different funding allocations. Funding is generally inadequate for effective operation especially the public funded institutions. The three case study universities have clear vision and mission statements and the language is more or less similar. A wide variation exists in the institutional structure, conduct and performance of higher institutions in Africa and more specifically the agricultural education and training institutions. This variation is caused by a number of factors; amongst them are the histories of the country in question which might have contributed to the institution having systems that resemble for example the colonizing country. Another factor is the political regime(s) which the country then followed after independence. National policy on education as it relates to the proportion of the budget allocated to education also matters. The architecture of the ministries within a country and where AET institutions are placed within that country may affect the effectiveness and efficiency of AET institutions. The size of the private sector and how it has been nurtured overtime by the political regimes across the years also matter. The age of an AET institution also determines its ability to cope with challenges of current operating environments. The three universities for which this study has focused on are all different in the aforementioned attributes. Makerere University and University of Pretoria are 92 and over 100 years old respectively as opposed to Sokoine University which is 30 years. Grappling with increased enrollments and the need for critical infrastructural facilities are likely to be more critical in young universities. Based on the foregoing attributes, it is important that as we rank universities we take into account the above dimensions.

4.2 The Value of This Study

This study has been able to provide an account of how different universities run key university functions and also how they maintain the university environment to make it conducive for learning. Based on this, universities can learn from each other and in so doing be able to improve on the areas that they are not doing so well. Some improvements may not necessary require increased funding but only change in management and the way business is done. Many universities are grappling with funding deficits to run their basic functions. But Makerere University is showing a good example by securing a significant proportion of the internally generated funds to come from student fees that they pay themselves or through the private sector that may have funded their tuition. Through the same process, they are able to in part get around the problem of increased enrollment by maintaining day and night shifts for classes. These and many more are areas in which shared learning across universities could enable low performing institutions to catch up.

4.3. Pan-territorial and Regional Supportive Structures for AET Institutions

All regions and Africa as a whole have academic quality assurance tertiary institution associations— Association of African Universities and the Inter-University Council of East Africa. Southern African Regional Universities Association, etc. These entities have done well in terms of defining quality standards across these institutions. While a number of institutions have adopted them and are doing well, some are struggling to operationalize them because of lack of funds or lack of commitment to the same. Although an institution is party to the regional or African organization, those quality standards although known to be good, they are still taken as coming from outside the institution—and hence the reason for the struggle in domesticating them as they are taken to be externally imposed rather than internally generated policies and procedures. One would expect more commitment in their operationalization when the latter is the case. The best approach would therefore be to encourage institutions to set up their own internal quality assurance systems.

4.4. Mindset Change Absolutely Critical

Clearly, many universities are doing the best they can to operate given the very difficult funding and economic and political environment. However, a lot more could be achieved if there is a deliberate attempt to induce mindset change for those responsible for running these institutions. There is need to realize that AET institutions now have to be run on the basis of “business not as usual” because the operating environment has greatly changed. For example, the mindset change should lead to the realization of the fact that there is no way public universities can continue to rely on public coffers to run decent university programs. Innovative approaches for funding should be sought—and these are plenty. For example, strengthening linkages with the private sector through tuning research proposals to partly suit their interest; better organizing the alumni to support various university functions and infrastructure; involving the private sector in the teaching of specific topics and hence raising their interest to support AET institutions. In addition, AET institutions should have solid investment plans aimed at using the brains of their institutions and the land and buildings they own to raise funds. Linkages with relevant external bodies is critical because it will allow adapting and adopting strategies and mechanisms of value to their AET institutions and often times with at a minimal or no cost.

4.5. The Need for Relevance: Conscious to the Needs of the Communities Being Served

The skill demand pattern for both the farm and industry is rapidly changing. This should shape the way the curricula are being formed and implemented. New courses to serve critical areas in the food systems value chain must come into place. The curricula must embrace courses in processing, logistics, quality control packaging, storage, etc. in addition to the more traditional low lying value chain courses like breeding, agronomy, entomology, pathology, etc. The curricula should provide the necessary ‘soft skills’ to make the students more marketable. Recent experiences have shown that apart from the traditional technical skills, employers are looking for soft skills such as communication skills, critical thinking, negotiation skills, ethics, leadership skills, etc.

The three case study universities had an impressive list of ways in which they are extending the knowledge and skills by reaching communities around them—in health, agricultural

technologies, information and communication technologies, law and justice. However, there is room to do a lot more.

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