



Building a critical mass of faculty to enhance Africa's diversity and competitiveness: opportunities and needed actions

A. GBAKIMA¹ and F.M. NAKAYIWA²

¹Ministry of Technical and Higher Education, Government of Sierra Leone, New England Ville, Freetown, Sierra Leone

²Regional Universities Forum for Capacity Building in Agriculture (RUFORUM), P.O. Box 16811, Wandegeya, Kampala, Uganda

Corresponding author: f.nakayiwa@ruforum.org

ABSTRACT

The higher education sector in Africa has over the past three decades experienced a significant level of both development and turbulence. Due to the unprecedented growth in enrolment and the number of institutions, universities compete for staff to run academic programmes. This does not only limit the potential to run quality graduate and research programs, but is a hindrance to differentiation and diversity of programmes offered at national and regional levels. Governments have to invest if they are to match the national ST&I requirements. Mechanisms to leverage funding for post graduate supervision, and to fund full-time masters and doctoral scholarships will be an incentive to dramatically increase the number and quality of PhD students and thus the building blocks for academic staff in African universities and the potential for enhanced competitiveness.

Key words: Africa, Higher Education, Staffing, Universities

RÉSUMÉ

Le secteur de l'enseignement supérieur en Afrique a connu au cours des trois dernières décennies un niveau significatif de développement et de turbulence. En raison de la croissance sans précédent des inscriptions et du nombre d'établissements, les universités se disputent le personnel pour gérer les programmes universitaires. Cela ne limite pas seulement la possibilité de gérer des programmes de recherche et d'études supérieures de qualité, mais constitue un obstacle à la différenciation et à la diversité des programmes offerts aux niveaux national et régional. Les gouvernements doivent investir s'ils veulent répondre aux exigences nationales en matière de ST&I. Les mécanismes permettant de mobiliser des fonds pour la supervision des études supérieures et de financer des bourses de maîtrise et de doctorat à temps plein seront une incitation à augmenter considérablement le nombre et la qualité des doctorants et donc les éléments de base pour le personnel académique des universités africaines et le potentiel d'une compétitivité accrue.

Mots-clés: Afrique, enseignement supérieur, personnel, universités.

BACKGROUND

The higher education sector in Africa has over the past three decades experienced a significant

level of both development and turbulence. Gross enrolment ratio has increased to 10% compared to 44% in Latin America and 77% in the OECD

Cite as: Gbakima, A. and Nakayiwa, F.M. 2020. Building a critical mass of faculty to enhance africa's diversity and competitiveness: opportunities and needed actions. *African Journal of Rural Development* 5 (1): 21-37.

Received: 15 January 2020
Accepted: 10 March 2020
Published: 30 March 2020

and the global average of 26%, (Arias *et al.*, 2019). Correspondingly, the graduation rates have increased as the system attempts to meet the surge in demand for university education as a result of the youth bulge. The number of universities has grown from less than fifty (50) recorded by UNESCO in 1962¹ to more than 1500 by 2017 (Darvas *et al.*, 2017). Indeed, some countries including Namibia, Cabo Verde and Botswana did not have any stand-alone university until the 1980s but have expanded to more than 10 higher education institutions by 2015. While enrolment has grown from approximately 400,000 in 1970 to over 7 million in 2015 and is projected to reach 21.7 million by 2040 (Darvas *et al.*, 2017; Calderon 2018), very few universities offer graduate programs and even fewer at the doctoral levels.

The configuration of the higher education system has changed from being predominantly public to an interface between the public and private sector that is unique to the continent. Due to the unprecedented growth in the number of institutions, universities compete for staff to run academic programmes. This does not only limit the potential to run quality graduate and research programs, but is a hindrance to differentiation and diversity of programmes offered at national and regional levels. In most countries (Table 1), the percentage of staff with PhD qualifications is still low (Hayward and Ncayiyana, 2014). Recent studies revealed that 8% of academic staff in Ethiopia have doctoral degrees, compared to 31% in Ghana, 19% in Uganda and 43% in Nigeria and South Africa (Bunting, *et al.*, 2017; British Council 2018). Table 2 shows that the trend of PhD qualified staff in Sierra Leone in 2019 was still low, which is the case in several African countries. Clearly, greater efforts need to be put to increase significantly the pool of PhD students in Africa universities. This will be a vital step to increase proportion of PhD staff

in African universities and research institutions. At the same time, cultural and gender issues have kept women in higher education at minimal levels. Only seventeen percent (17%) of vice chancellors are female, 21% are full professors, and 22% are members of the academy of Sciences (UNESCO, 2015).

Several countries do not have the research capabilities needed to combine global knowledge with national experience in support of innovation and problem solving that was articulated by Agenda 2063. In many countries, weak science, technology and innovation (ST&I) institutions encumber deployment of knowledge and technological innovations to spur socioeconomic growth (ACBF, 2017). Moreover, these institutions are inadequately staffed with evidence of shortfalls in skills, expertise, infrastructural and equipment capabilities defined as basics for world class universities (Salmi, 2009).

Based on available literature, this paper interrogates the trend of human resource capacity development for universities in Africa. There is now a consensus that Africa needs many more doctorate holders to develop the robust knowledge needed to promote development, (Hayward and Ncayiyana, 2014; Cloete *et al.*, 2015). Proponents have argued that higher education has to be included in all development agendas, especially since science, technology and innovations are vitally important for increasing Africa's competitiveness. The paper explores potential for diversity and provides pathways for building staff capacity through harmonisation of initiatives, differentiation of institutions and the creation of research and innovation hubs as mechanism of escalating staff capacity and access to key education resources.

Why the sector is important. Rapid advances

¹UNESCO (1962). The Staffing of Higher Education in Africa. Development of Higher Education in Africa. Tananarive

Table 1. Percentage share of PhDs in selected countries

Country	Data /year	Percent
Ethiopia	% of HE staff with PhD qualifications (2016)	8%
Ghana	% of HE staff with PhD qualifications (2013)	31%
Kenya	% of HE staff with PhD qualifications (2016)	34%
Nigeria	% of HE staff with PhD qualifications (2012)	43%
South Africa	% of HE staff with PhD qualifications (2014)	43%
Rwanda	% of HE staff with PhD qualifications (2016)	20%
Uganda	% of HE Staff with PhD Qualification (2016)	19%

Source: British Council-DAAD study and Status of Higher Education (Uganda)

Table 2. Trend of PhD Qualifications as a percentage of staff in Sierra Leone

Year	2006	2007	2011	2012	2013	2014	2015	2016	2017	2018	2019
Total Staff	0	0	0	0	0	770	919	1051	1218	1374	1467
PhD staff	0	0	0	0	0	102	101	107	111	134	155
% staff with PhD	0%	0%	0%	0%	0%	13%	11%	10%	9%	10%	11%

in science and technology across a wide range of areas from information and communication technologies (ICTs) to biotechnology to new materials provide great potential for countries to accelerate and strengthen their economic development. The application of knowledge results in more efficient ways of producing goods and service delivery (Salmi, 2009). Unless countries build ST&I capacities to innovate and promote ST&I development, Africa risks being left behind in the race towards inclusive globalization. University education, in particular, has the potential to improve productivity and act as a catalyst for adaptation and growth in emerging high tech and other sectors.

The Higher Education rate of return average is > 20% percent compared to primary and secondary education (Montenegro and Patrinos, 2013). A one-year increase in average tertiary education levels would raise annual GDP growth in Africa by 0.39% and yield up to a 12% increase in GDP (Bloom *et al.*, 2006). The university system has a multiplier effect on the overall Science, Technology and Innovation. Equally important is the articulation in Agenda 2063 and national development plans that have placed premium on the importance of ST&I for Africa's development, not to mention the potential to harness the demographic dividend. The projected critical skills required to achieve Agenda 2063 as discussed by the African Capacity Building Foundation (ACBF) 2016 report is big, and needs to be urgently addressed.

Challenges in building a critical mass of faculty to enhance Africa's diversity and competitiveness. Strong education systems are key drivers of economic growth in African nations. Cloete *et al.* (2015) argue that Africa needs universities which can produce both highly-skilled labour forces and new knowledge; because both products are essential to the creation of national economies that are globally-competitive. Countries in East Asia

such as China, Singapore and Malaysia have demonstrated that investment in knowledge generation and the deployment of ST&I have the potential to change the development trajectory and move the population from low to middle- and high-income status. It is through a well-educated workforce that countries will create capacity to successfully integrate in, and benefit from, this 21st century knowledge-based economy. Cloete *et al.* (2015) however, underscore that the development of doctoral programs on the African continent should be part of the knowledge economy discourse and a broader context of how higher education can contribute to economic development. Other scholars, see for example Beintema and Stads (2017), indicate that conception, execution, and management of high-quality research is a function of high level qualifications. Africa has to generate the high-level skills and retain talent if it is to meet its schedule to grow and improve scientific output and find solutions to address local problems (Cloete *et al.*, 2015).

In catching up with the global ST&I movement, the role of universities in the research, innovation and knowledge production ecosystem cannot be over emphasised. Moreover, for Africa, which is predominantly agrarian with a youth bulge and a population expected to be more than 2 billion by 2050, the need to think through how to mobilise the youth for meaningful livelihoods is urgent. Science, technology and innovation research has to be harnessed to generate new knowledge that will increase production and engender new forms of social and economic interaction that are essential for any meaningful advancement. There has to be a deliberate effort by governments to invest in institutions and processes that promote knowledge generation as well as development of technologies and innovations. Special focus should be made on the inputs to the higher education process especially engendering a cadre of highly qualified staff that will spur institutional advancement and sustainability. This will not only facilitate the

competitiveness of the continent but create more jobs, improve service delivery and guide policy.

African countries lack specific human and institutional capacities, critical technical skills, and resources to promote ST&I and the capacity lag in ST&I is linked to the investment priorities of African countries (ACBF, 2016). The average of African spending on research and development (R&D) stands at approx. 0.5 percent of GDP below the 1% commitment. Indeed, Africa accounts for about 5 percent of global gross domestic product, but is responsible for only 1.3 percent of global expenditure on R&D (UNESCO, 2015). And average public spending on higher education represents approximately less than 1% of GDP (Arias *et al.*, 2019). The continent continues to experience deficits in ST&I skills and infrastructure as well as capital funding for ST&I based entrepreneurship, with limitations in ST&I deployment and uptake by both public and private agencies (ACBF, 2016). The key challenges associated with the efforts to build both the higher education and the ST&I sector have among others included, limited government and private sector investment. Notably, African countries are yet to convert their political commitments into practical programs for ST&I-based development (ACBF, 2017). Expenditure per student has declined in real terms averaging \$981 in 33 countries in 2009 compared to \$6,800 in 1980 (World Bank, 2009), and there is evidence of graduate unemployment. There is a disjoint between the outputs of the African higher education institutions and Africa's development vision/agenda and the inadequate links between universities, industry, and labour markets. Employers have experienced a skills gap and a mismatch between the education produced and the labour market demands, part of which is due to inadequate inputs and the inability of the higher education sector to match the changing knowledge economy skills needs (Arias *et al.*, 2019).

With only 10% of Africa's youth enrolled in universities, higher education in Africa is characterised by inequitable access and inadequate capacity to accommodate an ever increasing number of youth demanding for entry into the sector (Darvas *et al.*, 2017). Similarly, Africa's ST&I readiness and capacity is still significantly low compared to the rest of the world. The continent lags behind in research and development. The 2015 UNESCO Science Report indicates that Sub Saharan Africa (SSA) contributed only 1% of the global researchers with only 70 and 90 researchers per million inhabitants by 2013. The number of publications by 2014 were only 18,000, a mere 1.4% of the total global publications (UNESCO, 2015). In agriculture (Figure 1) the mainstay of the biggest percentage of the population for example, PhD qualified researchers in universities and research institutions are less than 40% (Beintema and Stads, 2014).

Other documented challenges include, excessive reliance on external funding for research and development (R&D), uncompetitive incentives in terms of pay and infrastructure have continued to promote brain drain, while several universities have an ageing professoriate (Sawyer, 2004; Salmi, 2009). In the agricultural sector specifically, by 2014, more than half the region's PhD-qualified researchers were above 50 years, with several countries registering more than 70% of staff classified as ageing (see case of Sudan in Muna Elhag and Mutasim Ahmed Abdelmawla, 2020). By implication, the future of the agricultural research sector including universities are likely to experience critical staff shortages to lead research programs as well as mentor and train junior staff (Beintema and Stads, 2017).

The evidence of low ST&I investment is manifesting through poor science (laboratory) infrastructure, a small pool of researchers, and low patronage of science and engineering programs. Most countries have weak intellectual property frameworks, and there is minimal

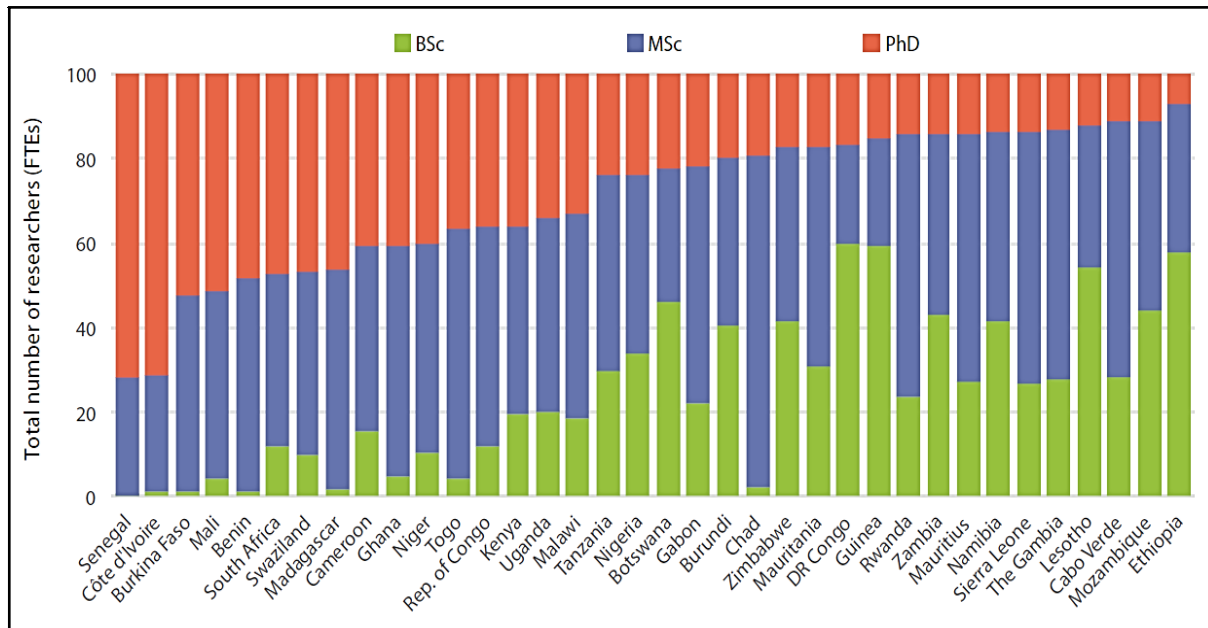


Figure 1. Distribution of agricultural researchers by country and qualification level 2014
Source: (Beintema and Stads, 2014)

scientific output relative to the rest of the world. Research output remains the lowest in the world at less than 1% of the world share (World Bank and Elsevier, 2015) and political commitments into practical programs for ST&I-based development. As a result, there is excessive reliance of African countries on external funding for research and development, and a disconnect between the private and industrial sectors. All of these are part of the context that hinders meaningful higher education to Africa's youthful continent.

Adequacy of human resource in the academe is one of the key challenges experienced in higher education in Africa. The total number of staff has grown from approximately 2,000 recorded in the 1962 UNESCO report to cases where most of the large universities have close to that number (Bunting *et al.*, 2017). Several systems however, still report major shortfalls. On average there are 50 percent more students per professor at African universities when compared to the global average (African American Institute, 2015). This has resulted in unrealistic workloads, overcrowded classrooms and limited space for research and postgraduate program development

(Sawyer, 2004; World Bank, 2009).

Unless key steps are taken the situation is likely to worsen. On the other side of the demographic spectrum the population trend indicates that Africa is likely to have the largest number of 18-23 year olds by 2050, these are prime candidates for higher education both within the continent and globally (Calderon, 2018). Africa is likely to see a spike in the demand for higher education. The HERANA² programme confirmed that over a 15-year period 2001 to 2015 the average annual growth in enrolment was greater than the growth in permanent academics numbers in eight African flagship universities (Bunting *et al.*, 2017). This is reflected in Figure 2. It is therefore important to put in place mechanisms to address the capacity bottlenecks that still hinder progression. It is urgent that governments in African countries devise strategies to facilitate institutions and higher education systems to handle the youth bulge.

From the governance perspective, there is incessant staff unrest and industrial action at best and a staff that is disengaged, disinterested with their services and loyalty spread across different engagements that they undertake

for survival. Furthermore, the reward and recognition system at institution and national level is underdeveloped and does not provide adequate motivation beyond the basic input. These factors combined have impacted on the academic productivity of staff. The capacity to undertake research and generate knowledge for development is mired by both the inadequacy of resources, a general lack of opportunities for scientific research, and the limitations of quality time dedicated to academic exploits and research. This has further manifested or resulted into limited availability of research positions and prospects for academic growth.

Current and projected Critical Training Skills (CTS) gaps. Graduate programmes are important because countries need doctoral graduates to train the next generation of academics. With an ageing professoriate (Sawyer, 2004), investments should be

targeting to create an academic system with regeneration capacity. This will not only boost existing numbers for the different technical and professional skills needed, but will provide the foundation for research within universities and research institutes, as well as build capacity for the lower levels of education.

The creation of the many new universities, which is a common trend across the continent has increased the demand for PhD trained staff in Africa. Most universities experience gross shortage of staff with the requisite qualifications and capacity to influence both the higher education outputs in terms of graduates, knowledge production and research. The situation is more acute in terms of the number of women in higher academic ranks. Table 4 gives a snapshot of the staff and enrolment trend in Uganda. It reveals that while the growth of staff with PhDs has increased

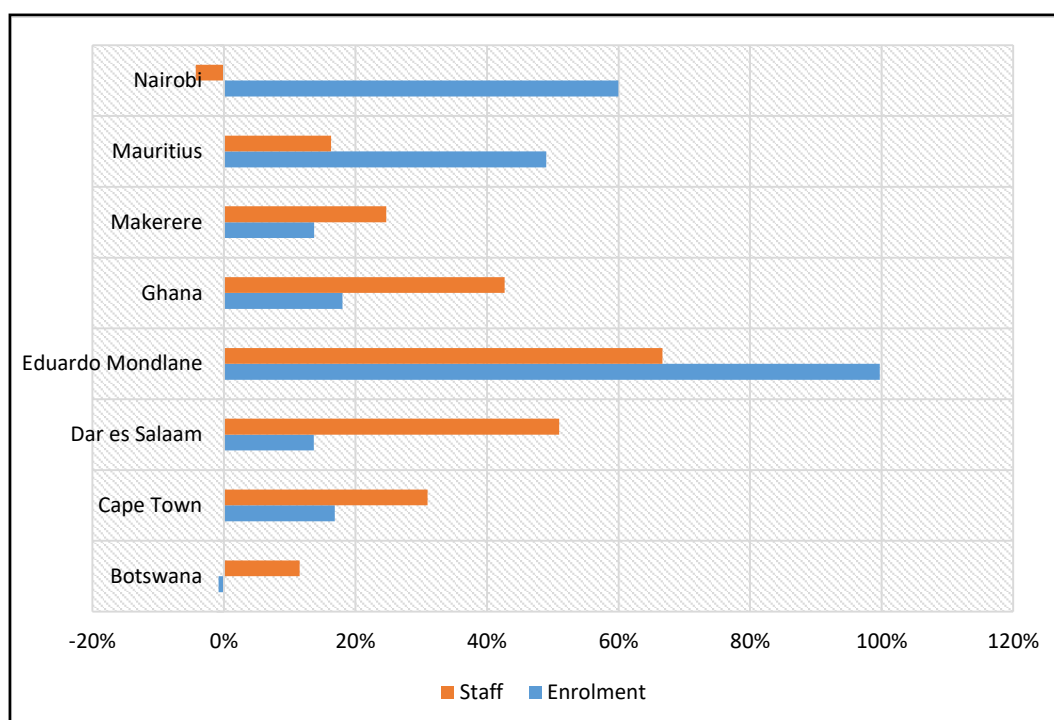


Figure 2. Enrolment and staff growth in selected African Universities
Source: Extracted from Bunting *et al.*, 2017

²Higher Education Research and Advocacy Network is an initiative tracking academic core and research activities in eight African Flagship universities.

significantly from 2006-2018, it is still below 13% of the total number of staff. This however, varies at institutional level with some universities having considerably lower percentage shares (NCHE, 2019). This is similar to the case of Sierra Leone shown in Table 3.

The challenges associated with the limitations in staff capacity among others include inadequately prepared graduates. Many employers in the

various productive sectors across Africa have been critical of the lack of basic, technical and transferable skills of graduates. There is a dichotomy in the employment position on the continent where employers are looking for skilled workers while the number of unemployed graduates is steadily increasing. This is an indication that the higher education provided may not be adequate to meet the employers' expectations and the development needs of most

African countries (Arias *et al.*, 2019).

The poor funding of institutions both by governments and private sector where the fee-paying model has been adopted generate inadequate remuneration for academic staff. Limitations in the purchasing power of the salaries of academics impact on the effectiveness and concertation of the staff.

Table 4. Trend of PhD Qualifications as a percentage of staff in Uganda

Year	2006	2007	2011	2012	2013	2014	2015	2016	2017	2018
Total Staff	5258	6465	7785	8594	9464	10173	12845	13485	13967	12638
PhD staff	558	746	858	914	973	1096	1579	1755	1865	2109
% staff with PhD	11%	12%	11%	11%	10%	11%	12%	13%	13%	17%
Enrolment	124313	137190	173369	198066	220201	247473	257855	254043	259027	261087

Compiled by authors from the Uganda Status of Higher Education 2019

Even the highest paid earn much less than their counterparts in the western world mainly Europe and USA as well as several multilateral and national agencies (Sawyer, 2004; World Bank, 2009). Tettey (2006) affirms that the dissatisfaction with salaries is a major inhibitor that undermines commitment of academics to their institutions and careers. This has generated several key factors that deserve mention.

i) a stagnation of the academic capacity of the university as a result of national and international brain drain since well qualified staff look for alternative sources of employment. For example, apart from employment in Universities abroad, it is not uncommon to find the key program officers in the World Bank and American Foundations being headed by former university professors and in some cases vice chancellors. The African Union in 2006 estimated that there were more African scientists and engineers working in the US than in the entire continent. This combined with the freeze in recruitment and an ageing professoriate has led to an escalation of vacancy rates in university staff positions that range between 25 and 50%, being more acute in the STEM disciplines (World Bank, 2009) and gross deficit in capacities needed to drive attainment of Agenda 2063 (Figure 3).

ii) Limited diversification of the staff profile, the capacity to attract international scholars diminishes with the inability to meet the basic requirements for both social and academic needs. Equally evident from publication data is that staff from African universities usually look for research and other academic facilities such as laboratories off the continent. Implicitly, these limitations mean that there is no motivation in African universities to attract and or retain international staff. As a consequence, the capacity for high level training at doctoral and post-doctoral level is curtailed. Kenya for example has 1% of PhD enrolment (see Table 5), compared to Most universities in Africa have experienced, low quality supervision; limited academic freedom; and inadequate international

information-sharing leading to inadequate responsiveness to national, social and economic needs as well as weak links to industry (Arias *et al.*, 2019).

iii) Limitations in differentiation of the higher education sector. Several of the new universities are serviced by academics from existing universities either on a full time or part time basis. This curtails the diversity in institutions, a situation made worse by the conversion of most of the tertiary institutions into universities.

Furthermore, the capacity to undertake research is limited as the few available staff are overworked and loaded with teaching responsibilities to the detriment of research and community engagements. This coupled with inadequate financial and physical infrastructure resources have ensured that Africa lags behind in knowledge production. It will be through increased research engagement that higher education and universities in particular will identify avenues for linkages with industry and private sector and create opportunities for youth to harness their productive potential in all fields as well as prospects for meaningful employment.

African potential for diversity and competitiveness. Critical for Africa's future is strengthening educational systems and institutions for generating and applying knowledge by assuring long-term public support with emphasis on teaching and research capacity. In addition to individual skills developed in research work, research capacity includes: quality of the research environment, funding, adequate infrastructure, research incentives and time available to the researcher. In most African countries, conditions for research have been severely compromised as manifest by the generally poor remuneration, inadequate qualifications and low staff numbers mainly at the lower academic ranks, heavy teaching loads, inability to mentor young faculty, and inadequate infrastructure.

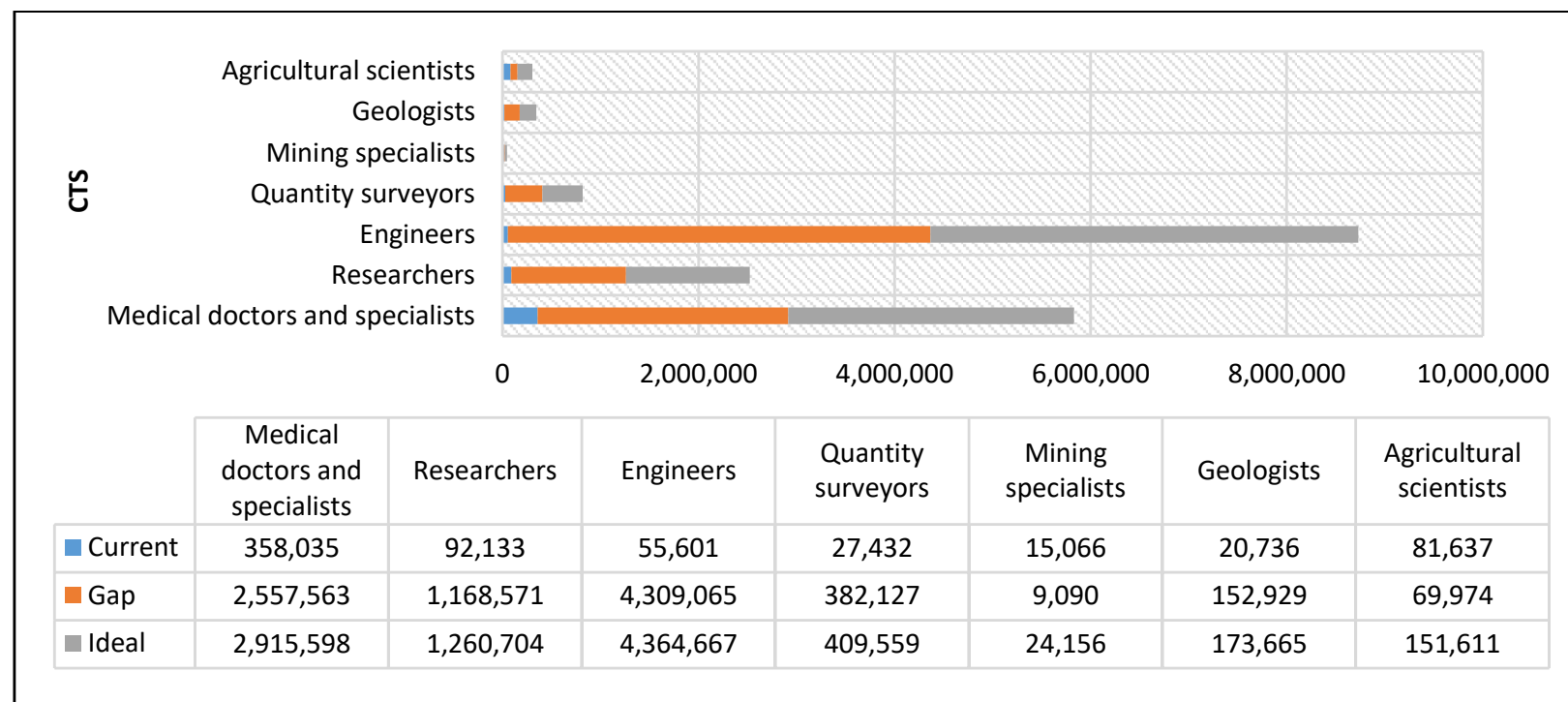


Figure 3. Examples of Africa's critical training skills shortages. Source: ACBF (2016)

Table 5. PhD Enrolment and qualifications for academic staff in Kenya (2016)

Category	PhD	Masters	Bachelor	Dip	Total	%PhD
Public Chartered Universities	4,215	5,661	1,004	530	11,410	37%
Public University Constituent Colleges	133	292	100	78	603	22%
Private Chartered Universities	923	1,936	168	43	3,070	30%
Private University Constituent Colleges	113	91	6	2	212	53%
Private Universities with LIA	220	713	87	3	1,023	22%
Total	5,604	8,693	1,365	656	16,318	34%
Enrolment	7,146	55,461	475,750	1,392	539,749	1%

Source: Computed from the State of University Education in Kenya 2016

One of the initiatives tracking staff capacity and development in Africa is the Higher Education Research and Advocacy Network (HERANA). The initiative tracked the growth of eight flagship universities in Africa over a 10-year period (Cloete *et al.*, 2015). While the HERANA study focus is the academic core which had a broader scope, it emphasises the impact that academic staff have on research output, high-level knowledge production and ultimately the development impact of the flagship universities in Africa (Figure 2). The key parameters of focus for academic staff under the HERANA initiative include growth and adequacy in number with implications from the appropriate staff student ratio; the staff profile and qualifications they possess; the ranks in seniority at professorial level and capacity for mentorship; discipline focus; as well as productivity in terms of research output. When appropriately interrogated and the right mix established, these parameters provide a benchmark for investment into the potential for diversity and competitiveness derived from the higher education sector in Africa.

Beyond the need for increased public investment, institutions can improve capacity through programmatic, management and leadership adjustments. Universities and research institutes can create research excellence and communities of practice that generate ideas that link Universities to industry and other development needs. Universities can strengthen graduate programs and create an environment that will attract young faculty and stem brain drain. A collective effort that leverages comparative advantage across the continent if adopted will benefit from economies of scale and scope in investment.

Pathways for building African higher education staff capacity. The challenge of PhD programs in sub-Saharan Africa is to train professionals with the skills and knowledge for the emerging knowledge economy calls for deliberate interventions not only to address

the shortfalls in knowledge generation, but to leapfrog research, science, technology and innovation to drive production systems. Governments have to explore avenues for increasing research output that will positively influence local communities as well as national and global institutions. The role of higher education and research institutions, as the most logical and cost-effective mechanism for this to be achieved cannot be over emphasised. Countries will have to invest in universities and position them to play an active role in generating the skills, the research and the policies necessary for Africa to be competitive.

A systemic approach to doctoral education is imperative for all academic systems on the continent. Noting that the next generation of academics will come from the higher education pipeline by harnessing the potential of talented students at undergraduate level and nurturing their capacity to develop academically through the postgraduate training at masters, doctoral and post doc level is therefore essential. The increase in graduate enrolment not only increases the capacity for research but is the foundation for the future of the higher education quality and quantity. The proportion of graduate students against the total enrolment will provide an indication on the potential for academic staff in the universities. There are a few enablers and institutional frameworks that will enhance Africa's potential for capacity building and development. These among others include:

1. Strong graduate programs, indicators of which can be the percentage of graduate enrolments. The quality and number of graduate enrolments provide a talent pool for future research. It provides the basis for knowledge generation and increased level of publications. All of which have been key indicators in university rankings.

2. To create strong graduate programs there is need for an institution environment that will nurture and attract seasoned researchers to the institution. Institutional factors include:

research infrastructure, research management systems as well as a recognition and incentive system to promote the research.

3. Institutions need to develop mentorship programs and build research teams to promote learning on the job. This is especially urgent noting the age profile of professors and other academic staff as well as the ratio of senior staff to junior staff (Bunting *et al.*, 2017). As noted by Akilagpa (2004), the skills, competencies, attitudes and values of individual researchers is developed through training and experience derived from involvement in research activity. Categorized as the active component, this is nurtured by cultivation of a positive research culture and creation of an incentive system to make the research career effective.

4. International partnerships can play a critical role in strengthening PhD provision, create diversity and enable institutions to address doctoral thesis supervision, one of the major challenges of doctoral education in Africa. It is important to build collaboration models that leverage capacity from the region and from the wider global scientific network to boost their graduate programme management and supervision capacity.

A differentiated and diversified education system especially at the higher education level ensures that institutions effectively and efficiently utilise available resources. National systems should create innovation hubs and centres of excellence in institutions that have comparative advantage for graduate programmes and research. Staff and other resources will be focused in institutions and areas where they will have a multiplier effect and maximum impact. This, not only increases access to education as different levels and institutions feed into and interact but escalates the number of doctoral students and ensures that adequate human resource capacity is created for all levels.

New pathways for capacity building for these staff characterized as third generation staff have to be adopted to increase exposure and access to international resources. Among these is incubation of new innovations and linkage with the industry and private sector and building capacity for and cooperation to promote consulting jobs. These enable staff to access additional remuneration, recognition beyond the academe as well as exposure to research problems. Universities should explore options for movement from a standard payment structure to a performance based one which will recognize highly productive staff across the three core functions. This will change the mindset of staff from the existing public support dependence for salaries and other remuneration to active engagement in research.

It is envisaged that these pathways as outlined above will attract research-oriented staff, increase research output and provide capacity for increased graduate enrolment.

Ongoing initiatives to strengthen human capacity development and staffing in African universities. There is a dearth of continent-wide information about the PhD programs and capacities created over the past few years. Recognising the need for high level doctoral training, several initiatives have come up to develop doctoral capacity for sub Saharan Africa. Most of these, are mainly collaborative research programs that target universities and other research institutions. Several are discipline specific- three categories of initiatives have emerged- institutional/national based, network based and continental policy driven initiatives. However some cut across disciplinary, institutional and cluster categories. Beyond the regional and continental initiatives, Institutional and national initiatives have played a significant role in improving staff capacities in African Universities. For example, the collaborative research program supported by the Government of Sweden under the Swedish Development

Agency (Sida) has increased the number of PhDs in public universities in Uganda, Tanzania and Mozambique. Other initiatives include the Carnegie Corporation of New York supported Next Generation of African Academics. At the national level, there are different tracks and attempts to manage the PhD shortage with partial success. Indeed, the current average estimate of 30% PhD holdings in universities has been as a result of such initiatives.

In the majority of countries, the driving force for expansion of PhD programs is the pressure for an upgrade of the academic staff qualifications. Countries such as South Africa have set the target of 75% of permanent academic staff in higher education institutions holding PhD qualifications by 2030. Similar regulations with varying targets have been adopted in Senegal, Kenya, Nigeria and Uganda (Cloete *et al.*, 2015; British Council, 2018).

The Regional Universities Forum for Capacity Building in Agriculture (RUFORUM). Building Africa's human capital and capacities for agricultural research and training through competitive research, innovation grants, postgraduate training and institutional support to member universities RUFORUM programmes were designed to foster co-operation in the field of agriculture within and between universities in Africa. Competitively awarded graduate research grants, scholarships for Master's and Doctoral training and direct support to create new or upgrade and reform existing training programmes result in graduates with the appropriate skills set as well as more relevant research. Furthermore, it was assumed that institutional strengthening grants and community action research grants, given to university researchers to work more closely with industry and communities, would bring the two groups together to: solve areas of mutual interest; enhance training and mutual learning; allow industry and communities to utilize research and graduates to enhance agricultural

productivity; and, increase overall productivity, performance and visibility of universities within the country, regionally and globally.

RUFORUM brings together, bilateral, multi-lateral, Foundations and other support to the higher education sector to link to agricultural and economic development. Multi-disciplinary teams and collaboration across the region provide a mentorship program and peer to peer support to improve quality and efficiency. This raises the staffing capacity in the member universities. While these initiatives have limited numbers, they represent a vital component of the support to increase in PhD capacity on the continent, and they are an indication of potential for building a critical mass of highly qualified individuals. Moreover, tracer studies have revealed that 94% of these are employed in the academia or research institutions on the continent, a departure from similar initiatives that have resulted in brain drain. Importantly the gender focus is above average at 40% of scholarship and research grant recipients.

The Partnership for Skills in Applied Sciences, Engineering and Technology (PASET). This is an initiative by three African Governments (Ethiopia, Rwanda and Senegal) with facilitation from the World Bank. This initiative is designed to strengthen skills in the Applied Sciences, Engineering and Technology. The initiative leverages lessons from Asia, Europe and Latin America. The Initiative set ambitious targets to include boosting the PhD capacity in sub Saharan Africa by at least 10,000 in ASET fields and in addition double the number of students in ASET programs in at least 10 countries in SSA. Since its inception in 2013, PASET launched the Regional Scholarship and Innovation Fund to train quality PhD students and post-doctoral researchers at African Host Universities' in seven African Countries. One hundred and twenty-nine students have benefited from scholarships to pursue advanced degrees.

The African Higher Education Centres of Excellence (ACE) is yet another continental initiative designed to boost the number both the science capacity and the level of PhD holders on the continent. Presently implemented in two phases, the West African as well as the East and Southern African tranches, the project support the recipient countries to promote regional specialization among participating universities in thematic areas that address regional challenges and strengthen the capacities of these universities to deliver quality training and applied research as well as meet the demand for skills required for Africa's development.

These initiatives although laudable require the appropriate policy environment to thrive. There is need to take stock of progress and build data systems that provide adequate information to create cohesion for a coordinated and harmonised higher education staff capacity building process in Africa. Ownership at the highest continental level will provide the legitimacy and drive implementation. That they are anchored and respond to Agenda 2063 is an indication that there is need to

galvanise support at the continental level. The African Union Committee of Ten Heads of State (C10) championing Education, Science, Technology and Innovation in Africa is a beacon for continental collaborative programmes to strengthen staff capacities and increasing the pool of women scientists in African Universities and other research and development institutions. It is an opportunity to build on national and regional initiative and upscale the strategic interventions targeting graduate and postdoctoral training to bolster the capacity of universities to generate the requisite knowledge, skills and innovations. This coupled with the promotion of national higher education and research systems to establish centres of excellence for building Africa's science, technology and innovation capacity will ensure that Africa can be an active player in the global knowledge economy space.

CONCLUSION

Collectively, the African continent has made a commitment to transition from a largely agrarian to an integrated, prosperous and peaceful Africa, driven by its own citizens and representing a dynamic force in the global arena. Agenda 2063

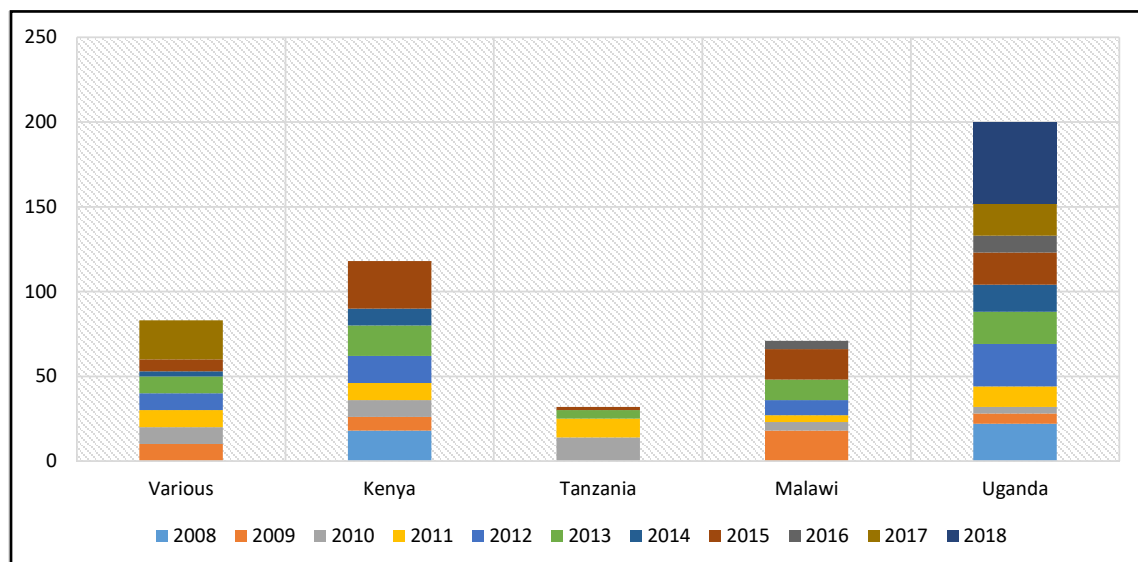


Figure 4. PhD Scholarship recipients 2008-2018

Source: Compile by Authors from RUFORUM documentation

in tandem with the Sustainable Development Goals has set a target that 70% of all high school graduates will proceed to have tertiary education, nominally this represents more than 20 million in the 18-23 age bracket (Calderon, 2018). For this to be realized, there has to be deliberate and substantial investment in higher education, technology, science, research and innovations capacity by national governments. This according to Agenda 2063 will lay the foundation for competitive economies built upon human capital to complement Africa's rich endowments in natural resources. The need to build a critical mass of staff with the requisite qualification and academic environment for the advancement of the higher education is more urgent than earlier envisaged.

It is important to acknowledge that increasing the number of staff who have doctorates; providing support for female researchers; and increasing awareness around funding opportunities are some of the initiatives that will unlock the potential of African higher education systems. Education systems and universities need to devise mechanisms for providing research support for postgraduate students and incentives for staff who publish and supervise postgraduate students.

Postgraduate study and especially in ST&I is quite expensive, and as such governments have to invest if they are to match the national ST&I requirements. The poor funding, the large classes and heavy teaching loads, the resultant student dissatisfaction and protests, all create a climate inimical for advanced research to flourish in the universities (Sawahel, 2018). Mechanisms to leverage funding for post graduate supervision, and to fund full-time masters and doctoral scholarships will be an incentive to dramatically increase the number and quality of PhD students and thus provide the building blocks for strong and competitive academic staff in African universities. This

requires improving the expertise of supervisors and ensuring a better student to supervisor ratio.

Governments' dedicated and long-term commitment to invest in universities and build a critical mass of highly qualified staff to drive Africa's development process is a viable starting point. It has been argued that African governments must make serious commitments to develop human and institutional capacities by investing substantially in high-quality universities, state-of-the art equipped and maintained laboratories, ICT infrastructure, and research funding. African governments and institutions alike should commit and provide for high-level political and financial support for sustainable ST & I capacity-building solutions to accelerate Africa's knowledge output necessary for transformation.

ACKNOWLEDGEMENT

The authors acknowledge the Regional Universities Forum for Capacity Building in Agriculture (RUFORUM) for commissioning this paper.

STATEMENT OF NO CONFLICT OF INTEREST

The authors declare that there is no conflict of interest in this paper.

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