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Editorial

Higher Education and Science, Technology and Innovation landscape in Africa

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ABSTRACT
This edition explores some of the issues facing universities as they fulfil their mandate of providing the human resources and strengthening the knowledge base of African societies. It explores the role of universities in science and technology and the links with agricultural extension and in using its post-graduate programmes to contribute to research with an overview of the evolving RUFORUM network and how it has impacted on universities relevance and quality. A review of selected country case studies shows how the sector is responding to gender inclusivity and how it could contribute better to science, technology and innovation.

Key words. Africa, gender inclusivity, Higher Education, Science, Technology, RUFORUM

RÉSUMÉ
Cette édition présente quelques questions auxquelles sont confrontées les universités dans leur rôle de formation des ressources humaines et de renforcement des bases de connaissances des sociétés africaines. Un accent particulier est mis sur le rôle des universités en sciences et technologie et les liens avec la vulgarisation agricole, et l'utilisation des programmes doctoraux pour la recherche, avec un aperçu de l'évolution de RUFORUM, et comment il a impacté sur la pertinence et la qualité des universités. Une revue de certaines études de cas au niveau national montre comment le secteur répond à l'inclusion des femmes et comment il pourrait mieux contribuer à la science, à la technologie et à l'innovation.

Mots clés. Afrique, approche genre, enseignement supérieur, science, technologie, RUFORUM

Higher Education issues in Africa

African universities have faced severe challenges as they emerged from a colonial past where they were established as bastions for the elite. They were well-respected and of high quality but served only the few. They were not an integral part of society and were the quintessential ivory towers they are often referred to. They were established as clones of the universities in France, England or Portugal, and often directly linked to universities in Europe. Their institutional structures, and many of the processes and governance, remain virtually unchanged today. But with declining financial support and strong pressure on significantly increased intake, the universities had to start to adapt. Within agriculture most of the research was carried out on campus, or at best on research stations mainly serving large-scale commercial agriculture. Lynam and Mukhwana (2020) provide some historical context to the effect this had on the linkages between universities and agricultural extension. Gbamkima and Nakayiwa (2020) look at the importance of post-graduate programmes to underpin research. All universities are faced with the need to attract

highly qualified staff, how to motivate them and how to strengthen and retool them to lead the universities that will drive Africa's growth. Gbamkima and Nakayiwa (2020) consider this in some detail. Zinnah and Jackollie (2020) highlight the critical gap that exists in Liberia because the universities are unable to attract well qualified staff who prefer to pursue more lucrative and influential positions than those offered in education.

Waswa *et al*. (2020) explore the role of RUFORUM in catalysing change to encourage collaboration, strengthen the role of universities in the broader society and invest in building relevant higher education capacity to meet the growing needs.

For too many decades the very scarce highly skilled human capital has been locked up in universities. The 21st Century has seen universities increasingly take up the role of reaching out and making universities more relevant to their societies. University-led research platforms working with farmers and all the stakeholders along the value chain, RUFORUM, has shown how effectively universities can generate and scale out knowledge in sustainable ways by working in partnerships. Universities have convening power and an impartial platform where it is safe to interact. By using their students to carry out their research on such platforms, universities are able to ensure that they develop the skills and the contacts they need. Universities are able to update and upgrade their own teaching and research for relevance. Universities are increasingly playing a role in leading change, in leading development and in providing a role in advocating for greater equity: in gender, in access to higher education and in producing the research and scaling out the information, that meets the needs and demand of the majority and of the poorer quintiles in society.

Universities have a primary function of preparing students for society, of providing the skilled human capital that will drive Agenda 2063. They are also required to develop, collate and share an advanced knowledge base, to stimulate research that will meet the future and to promote development that is inclusive and sustainable.

To meet radical technological change, universities across the world, have increasingly been encouraged to change the paradigm to one of facilitating learning rather than transferring information; of producing creative, adaptable graduates with strong interpersonal skills; and of working with end-users and multiple stakeholders on research and advocacy. Universities are called on to lead the evolution of systems that are more inclusive and sustainable. To do this, they must change themselves. Universities have been grappling with this across the world. In Africa the challenges are multiplied. In some they grapple with emerging from decades of war, as explored by Zinnah and Jackollie in Liberia. In most African countries women are poorly represented at all levels in universities, and more especially in science and technology. Analysis of how to change this in three countries is explored further in this edition.

New technologies provide opportunities to overcome many of the challenges. Public and traditional universities are not easy to change. But to survive they must adapt. The future workforce needs to be educated in ways that encourage continuous learning and adaptation. We do not know what the future of employment will be and our graduates must be fully engaged with internet, big data and virtual reality if they are to succeed. Universities in Africa must find ways of integrating modern technology into all facets of their systems: teaching, research, outreach and administration. They also need to find ways to broaden their reach so that they are part of the solution to inequality, not a vehicle for driving it. How will Africa massify higher education without losing quality and relevance? What steps are needed for universities to drive sustainable, inclusive growth? These questions

are looking for African solutions on how to take modern technology and fit it to local realities so that Africa can leapfrog older systems. This Edition provides ideas on how universities could be more effective and documents the situation in some of our countries and universities.

This edition opens with a paper by Lynam and Mukhwana (2020) that traces the history of agricultural extension and higher education since the colonial era. It articulates how the policy trends have affected engagement of universities in scaling out innovations and highlights the differences across the sub-regions. The pressure on time and the lack of clear targets for engagement has limited the time and resources directed at this engagement. Of particular interest for strengthening the links between agricultural extension and universities is their finding that, even with strong institutional will for collaboration, time and funds are needed to overcome the transactional costs of maintaining these relationships. Their paper also draws attention to the changing landscape in agricultural extension and the strengthening of the role played by the private sector. Lynam and Mukhwana (2020) bring to the fore how universities can improve their relevance by supporting extension. They also highlight the importance of TAE in producing graduates who have the skills and exposure to contribute. There are an increasing number of post-graduate students using modern technology to offer extension services and scale out their technologies (…….CARP Nairobi) more effectively linking universities to farmers.

Gbamkima and Nakayiwa (2020) carry out a detailed analysis of the role of universities in producing research. They provide evidence to support the importance of investing in raising the quality of post-graduate programmes and of strengthening supervision and standards. Recent news articles on the overloading of supervisors and the undermining of quality reinforce these findings[1]. They also focus on the issues raised by the rapid expansion of universities and the lack of faculty with advanced skills. This impacts the ability to offer post-graduate training and results in a vicious cycle. They show that Africa is under-served by universities and that the universities there are have too few qualified staff. This lack of well-qualified teaching staff is a recurring theme and is shown to be a key constraint in the paper by Zinnah and Jackollie in Liberia. However, as Gbamkima and Nakayiwa (2020) point out, it is not only the production of graduates that suffers, the role of universities in research, and more broadly in countries, is severely constrained. For Africa to take its place in the coming decades it is imperative for it to invest much more heavily in generating and adapting knowledge. In collating and sharing information to create a broad, highly-skilled locally-relevant human capital and advanced knowledge base, stimulating research, innovation and entrepreneurship.

A series of three papers explore the issue of gender in science and universities in Africa. The papers show that at all levels women are marginalised, in the student intakes, faculty and administration of universities. In Sudan although female students account for 54% of undergraduate intake, they account for only 23% enrolled in science and mathematics (Mayada et al., 2020; Muna and ….2020). It is interesting to note that the one metric where they surpass men in science, is that once accepted, women have a higher graduation rate than men. Sokona (2020) provides a very comprehensive analysis of the situation in Mali. This description includes current data and information. In Mali only 48% of girls are enrolled in secondary school and of all staff employed in STI only 10% are women holding a Master's degree and only 9% holding a PhD. The data show that there is a great need for more investment in upgrading the skills of all those involved in science, technology and innovation, but in particular the importance of supporting the advancement of women. Mali has allocated 15% of its budget to agriculture which is considerably more than most African countries. This paper shows that it needs to invest more in

[1]There is a crisis with inadequate supervision. For example a CUE report in Kenya in 2019 showed one example where a lecturer was supervising 30 PhD and 106 Master's students.

supporting tertiary agricultural education, and especially improving opportunities for women. Elhag and Abdelmawla (2020.) highlight the importance of the non-government sector in Sudan for supporting improved participation by women in science and technology. Although 54% of undergraduates are women only 5% of the science students are women. The study notes further that although the new constitution emphasises the need to increase women in leadership positions, less than 3 percent of the Vice Chancellors in Sudan are women. The constitutional mandate needs to be translated into specific policies to support the advancement of women. Giva and Santos (2020) provide an interesting analysis of the role of women in higher education in Mocambique. They show that this is a particular issue for science and show that it must be addressed early; that students are making choices in mid high-school that affect their future. They recommend that more attention needs to be given to counselling children about the implications of their choices at school. They also recommend greater institutional flexibility to make enrolment more feasible for women and show that participation increases with the offer of evening classes and greater flexibility in attendance structures.

The final three papers focus on the role of higher education in the advancement of science and technology in Sudan, Ghana and Liberia. The challenges faced by Liberia are especially acute as it deals with emerging from decades of civil war, the Ebola epidemic and generations of lost education at all levels. In Sudan, Beshir, Ahmed and Mohamed (2020) highlight the problems for universities addressing financial constraints by increasing fee-paying students at the expense of quality. Not only is this increasing inequality, it also decreases the quality of higher education. The study also articulates the importance of investing in upgrading the qualifications of faculty. It recommends using the network of African universities to achieve this in ways that improves not only their qualifications, but also their local relevance and their teaching and research skills. They stress the importance of investing in entrepreneurship and practical training in their TVET institutes. Sam-Amoah *et al*. (2020) describe the STI landscape in Ghana and highlight the importance of the role of the private sector and of how Higher Education needs to co-operate more closely with them. They argue that investment in STI has shown some positive returns and that capacity is being built but that greater investment is required. They also note that investments and new programmes need to consult with all stakeholders while they are being developed and to have an adaptive management approach. They recommend setting up a monitoring and evaluation system to provide an ongoing assessment of the impact of that investment. Zinnah and Jackollie (2020) emphasise the very low base from which Liberia is trying to strengthen its capacity to support science and innovation. The most critical constraint is human capital with low salaries and poor conditions for research discouraging applicants. They identify areas that require investment with a focus on the need to attract, train and retain well qualified faculty for the growing tertiary education sector.

Universities in Africa post COVID 19

These papers were all written prior to the emergence of the Corona virus in January 2020. Everything they identify as important to build the human capital, knowledge and information sharing needed to achieve Agenda 2063, is still applicable. What this pandemic does is make the investment in producing relevant graduates and research even more critical. The requirement of physical distancing, as efforts are made to stop the spread of the virus, makes the task very much more difficult.

Pandemics are by their nature disruptive. They strain not only health services but all of human and economic life. They have changed societies in their wake from 524 in Egypt to the present day. The Bubonic plague of the mid-14th century killed a third of the population in Western Europe. But it changed society and

led to collective bargaining and reduced feudal obligations[2]. Pandemics have also shifted the underlying world view from one focused on theology to one that turns to science for understanding. In 1852 the cholera epidemic led to an understanding of the relationship between disease and clean water and there are other examples of positive impacts for humanity, albeit at heavy cost in life (John Snow in Barton, 2018). The 1918 Spanish flu, as with Covid-19 highlighted the inequality between social classes. Whitzman (2020) showed that it led to a better understanding of how important universal health care and improved low income housing is to the health of all. But societal change from pandemics will not necessarily be for the better. It depends on the structural relationships and how societies and economies respond. The Covid-19 pandemic could increase inequity between and within countries. The wealthy and professional classes have been able to adjust to social distancing while maintaining some income and their access to education. It could result in reinvestment in environmentally harmful systems. Or if we are able to provide a platform for new solutions, it could trigger real changes to institutions and result in much more inclusive and sustainable systems. Universities need to take leadership to ensure that happens.

Universities need to invest in systems that reach out across their countries, find ways to ensure that they are able to provide an education and support, even to students that are isolated. If no cure or vaccine is found, then it is more imperative than ever for Africa to rapidly increase digitisation of education. Unless we can ensure access to education across the continent, despite any on-going, or recurring, need for social distancing, Africa will not be able to compete. It will not be able to take advantage of its youth dividend and it will not fulfil its promise. It is essential for universities to very proactively change their systems to adapt, lobby governments and private communications companies to ensure that they can reach even the most marginalised students. To change the university systems is not easy, but the need for flexibility is imperative and there are many long term benefits that could accrue to these changes. They could benefit women by making it easier for them to participate in postgraduate education without leaving home for long periods; for mature students to be able to advance their qualifications while working; for students unable to physically access universities to be able to study. The new technologies are also able to make it easier for universities to reach even the most remote farmer, or the smallest trader in the value chain. It will allow its faculty the change to connect in meaningful ways with the best scientists in the world and to collaborate much more effectively with colleagues across the continent. But to have all these benefits, universities must adapt. They must be prepared to change their systems and to promote learning rather than try to transfer information.

Curricula need to be adapted so that universities are able to stretch their scarce human capital, making use of all the open and special licence modules already available to them. Universities need to learn how to facilitate on-line learning in ways that promotes interaction and so expose their staff to new pedagogies. The better-resourced South African universities have used Covid19 to get the telecommunications industry to zero-rate data when accessing their websites, they have made efforts to get computers and internet access to all their students and to find ways to support those still unable to fully participate in on-line learning. The less well-resourced universities are still struggling to find their way. COVID 19 is a siren call to governments and development agencies to support all tertiary education institutes to be able to use modern technology to broaden their reach and improve the quality of delivery. They need to find ways to reach out to communities and to facilitate platforms of engagement.

This requires a large investment at a time when

[2]Excerpt: In Western Europe, as the surviving workers earned higher incomes, they could afford better food and clothing. Meanwhile, nobles and elite landlords found it hard to maintain their extravagant lifestyles. They tried to push back, but with mixed results. In England, they failed to enforce ordinances meant to compel workers to stay put and keep working for low pre-plague wages. Rural workers resented efforts to uphold these rules, which blatantly favoured employers, and also called for the abolition of feudal obligations. Even though a peasant uprising was put down, the wealthy ended up bargaining with the shrunken labour force in order to secure employees and tenants.

the world is under severe economic strain. But it is an investment that has to be made. Tertiary education institutions across the continent need to collaborate. They need to work together, to share courses, to share scarce human resources and to share lessons as universities adapt differently to the pandemic. Most of all they need to work together to lobby for their governments and the international telecommunications and development agencies to support effective internet access to all Africans, and to build the skills for Africa's universities to produce the graduates, research and outreach which will harness Africa's resources and catalyse sustainable and inclusive growth for the most marginalised communities.

We have to work together as a human species to be organized to care for one another, to realize that the well-being of the most vulnerable among us is a determining factor for the well-being of all of us (adapted from Snowdon, 2020). The current pandemic has shown the world how true this is. Universities need to organise and to work together to ensure that they use this moment to change themselves and to advocate for the support they need to make the change.

REFERENCES

Barton, M. 2018. John Snow and the 1854 Cholera Outbreak in Past Medical History. Accessed May 2020 https://www.pastmedicalhistory.co.uk/john-snow-and-the-1854-cholera-outbreak/

Beshir, M. M., Ahmed, N. E. and Mohamed, M. E 2020. Higher Education and Scientific Research in Sudan: Current status and future direction. *African Journal of Rural Development* 5 (1): 113-143.

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): 21-36.

Givá, N. and Santos, L. 2020. A gender-based assessment of Science, Technology and Innovation ecosystem in Mozambique. *African Journal of Rural Development* 5 (1): 77-93.

Lynam, J. K. and Mukhwana, E. J. 2020. The changing face of agricultural education and extension within a changing policy context in Africa. *African Journal of Rural Development* 5 (1): 1-20.

Muna Mohamed Elhag and Mutasim Ahmed Abdelmawla. 2020. Gender-based assessment of Science, Technology and Innovations ecosystem in Sudan. *African Journal of Rural Development* 5 (1): 95-111.

Scheidel, W. 2020. Stanford University newsletter. Accessed May 2020 https://news.stanford.edu/2020/04/30/pandemics-catalyze-social-economic-change/

Snowdon, F. 2020. Epidemics and Society: From Black Death to the Present. Yale University Press

Sam-Amoah, L. K., Agyei Frimpong, K. and Kumi, F. 2020. Role of higher education and science, technology and innovation in capacity development in Ghana. *African Journal of Rural Development* 5 (1): 145-164.

Sokona, D.S. 2020. Gendered assessment of Science, Technology and Innovation ecosystem: Case study of Agricultural Research and Training Institutions in Mali. *African Journal of Rural Development* 5 (1): 61-76.

Waswa, M., Okori, P., Mweetwa, A. and Adipala, E. 2020. Genesis, evolution and strategic thrusts of RUFORUM. *African Journal of Rural Development* 5 (1): 37-60.

Whitzman, C. 2020. Could COVID-19 Lead to a Better Future. The Conversation accessed June 2020 https://theconversation.com/silver-lining-could-covid-19-lead-to-a-better-future-134204

Zinnah, M. M. and Jackollie, M. S. 2020. Assessment of current status of technical and higher education sector in Liberia. *African Journal of Rural Development* 5 (1):165-187.