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Editorial

Insights into efforts to build Africa's Science Capacity

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ABSTRACT
This Issue of African Journal of Rural Development (AFJRD) presents seven papers related to an Analysis of the Higher Education ecosystem in Malawi, ongoing efforts by RUFORUM (Regional Universities Forum for Capacity Building in Agriculture) to train PhD graduates for Africa in Africa, and an initiative to integrate Problem-based learning in teaching and learning in six African Universities. Six other papers, linked to crop improvement, present research findings from studies conducted to improve pest and disease resistance and enhance nutrition content of selected crop varieties. The studies provide insights into the next steps to develop improved crop varieties for the continent. The key message is that Africa must hasten efforts to strengthen its human and science capacity to drive development efforts in the continent and universities would need to be more integrated in such efforts. Special attention needs to be put into increasing the pool of women scientists in African Universities and Research Organisations, and indeed in broad development and livelihood processes.

Key words: Africa, crop improvement, gender, Higher Education, STI

RÉSUMÉ
Ce numéro du Journal africain du développement rural (AFJRD) présente sept articles portant sur une analyse de l'écosystème de l'enseignement supérieur au Malawi, les efforts en cours de RUFORUM (Forum régional des universités pour le renforcement des capacités en agriculture) pour former des doctorants africains en Afrique, ainsi qu'une initiative visant à intégrer l'apprentissage base sur la resolution de problème dans l'enseignement et l'apprentissage dans six universités africaines. Six autres articles, liés à l'amélioration des cultures, présentent les résultats de recherches menées pour améliorer la résistance aux ravageurs et aux maladies, ainsi que pour augmenter la teneur en éléments nutritifs de certaines variétés de cultures sélectionnées. Certaines études fournissent des aperçus sur les prochaines étapes pour développer des variétés améliorées de cultures pour le continent.
Le message clé est que l'Afrique doit accélérer ses efforts pour renforcer ses capacités humaines et scientifiques afin de stimuler les efforts de développement sur le continent, et les universités doivent être davantage intégrées à de tels efforts. Une attention particulière doit être accordée à l'augmentation du nombre de femmes scientifiques dans les universités et les organismes de recherche africains, ainsi que dans les processus de développement et de subsistance en général.

Mots-clés : Afrique, amélioration des cultures, genre, enseignement supérieur, STI

A strong science capacity has been the key driver for development across the world. It is even more so today as Artificial Intelligence takes a centre stage in spurring innovations for today and the future. Unfortunately, Africa's science base is still very low with the continent contributing barely 5% of the global knowledge science outputs. Fortunately the Continent has recognized these deficiencies and has put in place necessary frameworks to spur innovations and development. Central to this is the African Vision 2063 that lays out the dream and Vision for the continent: *Building the Africa We Want*. Necessary frameworks for achieving Agenda 2063 have been put in place even at country level including for example Malawi Vision 2063.

The African Journal of Rural Development (AFJRD) was founded in 2015 to support sharing of knowledge including research advances across the continent. In this publication of AFJRD Volume Seven Issue 1, we present four major highlights. First, we present a Malawi country case study to highlight ongoing efforts including policy frameworks for strengthening the country's science, technology and innovation capacity which aligns to the Science, Technology and Innovation Strategy for Africa (STISA 2024) and other related frameworks. The country case study conducted by Chibowa *et al*. (2022) describe the current status of Science, Technology and Innovation ecosystem in Malawi with a focus on the Higher Education Sector and examining gender issues. The review shows a strong Government commitment to build a strong STI ecosystem. Several frameworks are in place that have opened increased access to higher education with a focus on STEAM (Science, Technology, Engineering, Arts and Mathematics). Overall, there is increase in students' intake but female participation is still low requiring additional measures to address the gender gap including at leadership level of the education sector. Enrolment in Public Universities increased from 4,772 in 2017/18 to 7,410 in 2021/22 representing a 38 % increase in enrolment but overall enrolment in Higher education remains low, only about 38%. Initiatives are needed to address issues that limit participation of women in the broader education and development landscape. Similar issues have been raised such as in the case of DR Congo (see Majaliwa *et al*., 2020), South Sudan (Akec *et al*., 2020) and Uganda and in other African countries (Nakayiwa *et al*., 2020).

Second, the issue includes a paper by Adidja (2022) profiling the effort by the Regional Universities Forum for Capacity Building in Agriculture (RUFORUM) to build human and research capacity for the continent. This is being done using various mechanisms including joint efforts by African Universities to train academic staff through a Program where two universities co-fund the training of a staff member from one University in a partner University. The Program initiated by African Vice Chancellors in 2014 (Graduate Teaching Assistantship) primarily aims to increase the pool of PhD trained Staff in African Universities. RUFORUM has received funding support from a number of agencies to support training at both Masters and PhD levels and the training invariably includes research. To date RUFORUM has trained about 700 PhD and 2,500 MSc students. The paper by Adidja (2022) describes the partnership support from Carnegie Corporation of New York which has supported RUFORUM to beef up its graduate training program, and especially to increase the pool of women trained at MSc and PhD levels.

The third paper by Määttänen *et al*. (2022) describes an initiative funded by the EU-Erasmus Program to mainstream Problem based learning in African Universities. The initiative is led by HAME University in Finland and involves universities in Eastern Africa (Bishop Stuart University in Uganda and Egerton University in Kenya), University of Zambia in Zambia (Southern Africa) and University of Abomey Calavi in the Republic of Benin, West

Africa. Faculty academic staff are engaging in the implementation of the training and learning approaches in their respective Universities. The overall aim is to improve the teaching and learning approaches for enhancing quality of training in African Universities.

The remaining six papers present study results of efforts to develop improved crop varieties in the continent. The paper by Ayesiga *et al*. (2022) describes a study to improve maize genotypes for resistance to Fusarium Ear Rot, a widespread and devastating maize disease globally. But in the case of Sub-Saharan Africa the disease apart from reducing cob yield has the hidden impact of Aflatoxins infection that affects humans and livestock health and results in market rejection of maize grain. The study is part of a wider ongoing research efforts by national and International Research Centre (CIMMYT) to develop Fusarium Ear Rot resistant maize varieties. The paper by Ndusha *et al*. (2021) describes a study on identification of indigenous rhizobia species for enhancing yield of soybean in South Kivu, DRC. Indeed a number of nodulating indigenous rhizobia were identifies. Other studies done in Zimbabwe by Mpepereki *et al*. (1996 a&b); Musiywa *et al*. (2005) also identified nodulating strains of local rhizobia that have been adopted resulting in enhanced yield and production of cow peas and soybean in Zimbabwe. Similar findings have been reported on common beans in Kenya by Kawaka *et al*. (2018).

The paper by Badji *et al*. (2022) aimed to identify common genomic regions for short cooking time (CT) and iron and zinc content, which are key desirable Grain Quality Traits (GQT) in common beans (*Phaseolus vulgaris* L.). The study characterised 106 genomic regions of which 27 were associated with multiple traits, 17 with single trait for CT while nine were associated with both Fe and ZN contents. Both Fe and Zn contents are important for human health reasons and breeding for their increased content and short bean cooking time are desired. Hence, the study recommends that research, taking advantage of genomics-assisted breeding, should combine these trains into new varieties, as previously also suggested by the work of Saradadevi *et al*. (2021).

The last paper by Namakula *et al*. (2022) assessed variability and heritability of starch content in white fleshed and provitamin A cassava genotypes. A total of 112 cassava clones were studied in two locations in Uganda, East Africa. The study found significant variation in starch content and the trait appeared heritable. High starch content is a desired trait for human and livestock consumption but also in industrial uses such as production of bioethanol. Thus breeding programs for high cassava starch content should be supported

This Issue of AFJRD thus presents the need to beef up STI ecosystems in the continent, need to strengthen Higher Education in the Continent to build both Human capital and Science Capacity and the need for increased investment in Research for Development to address key gaps such as improving yield and nutritional quality of crop varieties.

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