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Editorial

Agricultural production, food nutrition and capacity building in higher education in Africa

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ABSTRACT
Agriculture is a vital activity that sustain millions of people livelihoods and build local, national and regional economies. Progress in agricultural development is expected to translate in living standards in rural areas, commodities value chains and commercialization. However, in Sub-Saharan Africa, rural development faces a number of challenges such as poor soil restauration and agronomic practices leading to low agricultural productivity. Adding to this is the daunting task of securing food and enhancing food nutrition for the continent. This editorial of the African Journal of Rural Development introduces eight peer-reviewed journal papers that reflect on three key gaps areas deemed important for Africa in realizing the aspirations of the Agenda 2063. These include education, food nutrition and agriculture, including soil/agronomic practices, livestock and forestry. The information presented in these papers provides interesting insights on (i) soil fertility and soil water management through use of biochar produced from locally available sources as well as the need for monitoring of nitrate loading even at small scale; (ii) factors affecting citrus production and sawmill profitability and sustainability of wood resource utilization; (iii) production practices and quality defects of hides and skins, and gastrointestinal parasites in Angora goats; (iv) food nutrition and dietary intake patterns among agricultural households; and (v) capacity building the field of higher education, particularly the experiences on the implementation of the Intra Africa training initiative established by RUFORUM. It is our hope that the readers will find these information relevant for their own use and application in their respective fields.

Key words: soil water management; citrus; livestock; food nutrition; higher education

RÉSUMÉ
L'agriculture demeure une activité vitale qui contribue aux moyens de subsistance de millions de personnes et renforce les économies locales, nationales et régionales. Les progrès dans le secteur du développement agricole devraient se faire sentir à travers les conditions de vie dans les zones rurales, les chaînes de valeur des produits de base et la commercialisation. Cependant, en Afrique subsaharienne, le développement rural est confronté à un certain nombre de défis liés aux sols et aux pratiques agronomiques conduisant à une faible productivité agricole. À cela s'ajoute la nécessité de garantir la nourriture et d'améliorer la nutrition alimentaire pour le continent. Cet éditorial présente huit articles qui reflètent trois domaines clés jugés importants pour l'Afrique dans la réalisation des aspirations de l'Agenda 2063. Il s'agit notamment de l'éducation, de la nutrition alimentaire et de l'agriculture, y compris les pratiques pédologiques / agronomiques, l'élevage et l'exploitation du bois. Les données présentées dans ces articles fournissent des informations intéressantes sur

(i) la fertilité du sol et la gestion de l'eau du sol et la nécessité de suivre la charge de nitrate même à une petite échelle; (ii) les facteurs affectant la production d'agrumes et la rentabilité des scieries; (iii) les pratiques de production et les défauts de qualité des cuirs et peaux, et les parasites gastro-intestinaux chez les chèvres; (iv) la nutrition et les habitudes alimentaires des ménages agricoles; et (v) le renforcement des capacités dans le domaine de l'enseignement supérieur. Nous espérons que les lecteurs trouveront ces informations pertinentes pour leur propre usage et application dans leurs domaines respectifs.

Mots clés: gestion de l'eau du sol; agrumes; bétail; nutrition alimentaire; l'enseignement supérieur

Soil fertility and soil water management

Agriculture from a broad perspective, usually expands beyond crop production to encompass aspects that relate to soil fertility, soil water management and productivity. In most African countries, rain fed agriculture remain the most dominant system. For sustainable productivity, water management in agriculture requires approaches that can enhance soil water holding capacity. In this edition, Namagembe *et al*. (2019) explored the perspectives to improve soil water holding capacity using biochar from locally available bamboo (*Arundinaria alpina*) and sugarcane trash (*Saccharum officinarum* Linn) biomass. The authors found that water holding capacity of sandy loam soil could be increased by up to 124 % when biochar produced from bamboo and sugarcane trash was applied, leading to improved water availability for plant roots uptake, and hence increase in crop yields or drought resistance. They argued that application of biochar, from locally sourced biomass, has the potential to promote food production and reduce the high toll of undernourishment by better retention of irrigation and rain water. In terms of future perspectives, research avenues were proposed, for example, that consider effect of matching particle size distribution to soil water holding capacity, and biochar porosity measurement as affected by feedstock choice and processing (Namagembe *et al*., 2019).

Linked to the above and the need to improve and maintain soil health and fertility, Tenywa *et al*. (2019) evaluated the distribution of nitrate ion species and other important soil properties in a fertilised horticultural valley soil in central Uganda. It is well acknowledged that nitrate constitutes a major agricultural and mobile pollutant in the soil (Ascott *et al*., 2017). As such, wasteful use of nitrate fertilizer leads to accumulation of nitrates in various water bodies (Tenywa *et al*., 2019), and this can be dangerous to both humans and livestock. Therefore it is crucial to track and monitor nitrate level and distribution in agricultural soil. In their study, Tenywa *et al*. (2019) found remarkable vertical nitrate movement within the soil profile, which caused a bulge in the lower depths of the soil profile. The authors further observed that the potential for nitrate loading into groundwater was high. They argued against the belief that the quantities of soil fertility inputs used in Uganda are invariably meager at small scale level to impact the environment, basing from the possibility that in the long run, small scale nitrate loading may cause negative impacts on the environment, especially if their use is not well targeted and regulated in the horticultural sector where farmers are constrained to overstretch production mechanisms.

Horticulture and forestry

Two papers addressed aspects related to horticulture and forestry in this edition (Kongai e*t al*., 2019; Ngobi 2019). Ngobi (2019) developed optimal cutting patterns to guide operators on optimal extraction of timber volumes from the various logs sawn while Kongai *et al*. (2019) quantified the effect of socio-economic, institutional and infrastructural factors on citrus supply in Uganda. Citrus

is known to be an important diversification crop grown in many parts of Africa. While it is a high value crop with great potential in Uganda, its supply is still very low, and this limits benefits from opportunities offered by the increasing market demand. Information on factors driving citrus supply in Uganda provide important guide to strategic interventions for production planning. In their study, Kongai *et al*., 2019 found that market access, institutional belonging, mobile phone/contact, investment and fertilizer have significant effect on orange fruits coverage, thereby influencing citrus supply. The authors argued that strategic interventions should prioritize enhancing use of fertiliser, institutionalization of farmers groups and possession of mobile phones.

The Ngobi (2019) study contributes to the improvement of timber recovery from pine sawlogs using a band sawmill. While the forestry sector in Uganda has developed in the recent years, with more than 80,000 ha of plantations planted by 2017 (Nabanyumya, 2017), sawmill profitability and sustainability of wood resource utilization are negative impacted by a low recovery rate due to a number of factors including (i) sawing decisions made mostly by semi-skilled operators; and (ii) lack of recommended cutting patterns to guide operators on extraction of optimum timber volumes from processed logs. To address these gaps, Ngobi (2019) developed cutting patterns for maximizing recovery for each log top diameter using mathematical analyses. The author found that log classes significantly differed in recovery, and that optimal patterns yielded a mean recovery of 41% which was higher than the existing recovery of 27%, indicating a potential for recovery improvement. While the findings of the study suggests that the studied saw mill should adopt and implement the proposed cutting patterns, implementation of their recommendations in other mills should take into account revenue and market demands analysis and applicability of the proposed patterns.

Livestock production and gastrointestinal parasites

Livestock production has remained a vital and lucrative activity in dry areas where intense and frequent drought is a predominant factor. At the same time livelihoods of millions of smallholders farmers are sustained through livestock keeping in these and other areas. In Lesotho, Angora goat farming is an important economic activity which provides multiple services such as mohair, meat, income and capital for smallholder farmers (Moiloa *et al*., 2019). However, recent estimates show that Lesotho national population of Angora goats is declining due to a number of factors, including the impact of diseases often caused by gastrointestinal parasites (Annor-Frempong, 2008). Using information on gastrointestinal parasites prevalence and abundance collected from 1,795 goat faecal samples, Moiloa *et al*. (2019) determined whether prevalence and abundance of gastrointestinal parasites in Angora goats are influenced by the district, agro-ecological zone, goat age and sex. The authors found that geographical area (district and agro-ecological zone), season and goat age influenced gastrointestinal parasites prevalence and abundance, particularly for the coccidia more than nematodes. For an integrated GIP control programme for Angora goats in Lesotho, the authors recommend to take agro-ecological zone, age and season of the year into consideration.

Beyond meat, there are also important livestock products that provide income for rural people and livestock farmers, such as hides and skins. This is particularly the case in Ethiopia, which possesses one of the world's largest livestock populations (FAO, 2001). In Ethiopia, hides and skins have significant economic importance, and as such effort is needed to improve the quality and the quantity for effective and efficient utilization (Alemu and Girma, 2019). In their

study, Alemu and Girma (2019) assessed the production practices and quality defects of hides and skins in Northern Ethiopia. The authors observed a number of factors that cause skin rejection, among others, smoke, fly cut, parasites, scratch, and putrefaction. The authors recommend use of appropriate knife and place for slaughtering, application of adequate method of preservation to improve the quality defects of hide and skin. Further, they argued that rigorous awareness and training should be given to value chain actors on proper handling, transportation and conservation of hides and skin.

Food nutrition and dietary intake patterns

Increased agricultural production is not always a guarantee for food nutritional security. In many rural areas that contribute to high agricultural and food production, households can experience high level of malnutrition due to inadequate food consumption, in terms of quantity and quality. In this edition, one paper features aspects of dietary intake patterns and food nutrition among agricultural households in West Africa. Using structured interview and a sample size of 302 households, Eforuoku and Thomas (2019) investigated the determinants of nutrient adequacy and dietary intake patterns among rural farming households in northwestern Nigeria. In particular, they studied the adequacy of calories and other food nutrients, which are vital in specific nutritional intervention and health risk assessment. They found that high cost of food items, low income from agricultural activities and seasonal availability determined dietary intake pattern. They also observed lower intake of protein, potassium and iron as compared to the recommended values. From their findings, the authors recommend promotion of cultivation of bio-fortified staple crops and design of interventions that will encourage changes in traditional dietary intake pattern in the long term.

Capacity building in the field of higher education: the RUFORUM GTA mechanism

In response to the increased needs for qualified human resources in science, technology and innovation on the African continent, RUFORUM has started implementation of a continental education initiative that aims at training Africans in Africa for Africa. In essence, the initiative called Graduate Teaching Assistanship (GTA) generally aims at providing opportunities to nominees from African Universities to undertake doctoral training in other African universities through a co-funding mechanism. In particular, the GTA mechanism aims to (i) provide opportunities for the doctoral research to contribute more directly to African development; (ii) improve the quality of higher education and increase the pool of PhD-level trained academic staff in African universities; (iii) strengthen inter- university collaboration in the field of higher education in Africa; and (iv) promote staff mobility among RUFORUM member universities, and across Africa. In this edition, Adidja *et al*. (2019) gives an overview of the implementation of the GTA mechanism since its establishment in 2015 by African Vice Chancellors under the auspice of the RUFORUM network. While the programme focused only on agriculture and related fields at its inception, the increasing demands for enrolments in other fields have led to its implementation across basic science and applied science disciplines including social sciences, engineering, statistics and research methods. As such, since the inception of the programme, over 450 university staff have been nominated, of which 30% have been successfully placed in 23 African universities across four regions on the continent. Nevertheless, despite the increasing efforts for inclusion of disadvantaged communities, there are still very low numbers of GTA nominees from conflict and post-conflict countries, suggesting a need for deliberate inclusion and reachout to support building and or rebuilding the human capacity of these States using the GTA programme (Adidja *et al*., 2019). The authors further provide future perspectives to help strengthen the GTA mechanism as well as the doctoral training in RUFORUM member universities across the continent.

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