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EDITORIAL
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Editorial: Soil Fertility Management for Sustainable Food Production in sub-Saharan Africa

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Editorial on the Research Topic

Soil Fertility Management for Sustainable Food Production in sub-Saharan Africa

Agriculture is the mainstay of the economies of sub-Saharan Africa as it employs 60% of the active population and contributes up to 35% of the GDP (AGRA, 2014). Yet, agri-food systems are bedeviled with a lot of challenges regardless of the unrelenting efforts made by the scientific community and the flagship agricultural programs initiated by governments of the sub-region. Agriculture in SSA is predominately rainfed and is managed by smallholder farmers who are too cash-strapped to afford the recommended inputs. Cereal yields in SSA, for example, are extremely low and average about 1.6 tons ha^{-1} compared to the global average of 3.9 tons ha^{-1} (FAOSTATS, 2020). While a plethora of constraints may account for the fragile food systems, prolonged decline in soil fertility, and low and erratic rainfall have been cited as the key biophysical constraints (IFDC, 2007).

These precarious agri-food systems are worsened by the impact of climate change. According to IPCC estimates, climate change-induced drought may shorten growing periods in SSA by an average of 20% by 2050 and cause a decline of 40% in cereal yields (Lobell et al., 2011). While judicious use of fertilizers could improve soil fertility and increase crop yields, smallholder farmers in SSA only use limited amounts of fertilizers. The fertilizer use in SSA is constrained by several factors such as high cost, limited access, and poor producer price. Consequently, smallholder farming systems often rely on inherent soil organic matter (SOM) content to sustain crop production. While SOM can help to maintain soil fertility by enhancing the retention and release of soil nutrients as well as improving the water holding capacity of the soil, continuous cropping and soil erosion can reduce the native SOM content, resulting in a rapid decline in soil fertility.

Integrated soil fertility management is a credible pathway for building resilient agri-food systems to mitigate the adverse effect of climate change and boost agricultural productivity. This Research Topic presents original research articles on recent scientific advances in the detection of limiting nutrients, quantification of soil loss and integrated nutrient management, and its effects on crop quality. Integrated soil fertility management was studied in detail in six of the articles in this special issue. Of special interest, soil organic amendments such as bioplant, neem seed cake, biochar, and biosol were shown to be effective soil conditioners for optimizing mineral fertilizer use efficiency in cropping systems (Ebanyat et al., Nartey et al., Traore et al.). In these studies, the role of organic amendments in increasing soil buffering capacity and preventing soil

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acidification, which is a chronic problem in the humid zones of SSA was demonstrated. Two articles by Yaro et al. and Wilson et al. investigated the effectiveness of native rhizobia strains and rhizobium biofertilizers for improving the grain yield of groundnut and highlighted biological N fixation as an environmentally friendly approach to improving soil fertility. One study (Jaiswal et al.) also evaluated mineral nutrient concentrations, P-enzyme activity, and changes in microbial communities in the rhizosphere of sole and intra-hole planted cowpea. This study suggested that an intra-hole cropping system can provide protection against soil-borne diseases possibly through elimination by antibiotics and/or phytoalexins present in plant and microbial exudates in the rhizosphere.

The study by Baijukya et al. addresses the issues associated with "non-responsive" soils in sub-Saharan Africa. In a study to estimate soil loss for sustainable crop production in the semi-deciduous forest zone of Ghana, Sekyi-Annan et al. using modeling demonstrated how site-specific land cover management strategies such as tree-cover intercropping, and reduced tillage could have a huge potential in reducing soil loss and sustain soil fertility. In a related study, Baath et al. demonstrated the potential of using readily accessible satellite data to develop methods for improved crop management decisions in precision agriculture, related to finger millet, an important small grain crop in the savannas of West Africa. The paper by Nkansah et al. addresses challenges associated with tomato production under greenhouse conditions in tropical environments.

Overall, these ten contributions published in the special issue further strengthen the role of integrated soil fertility management and modeling in addressing widespread land degradation and food insecurity on the continent.

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AO made the first draft which was edited by SA-N. ID and KF made additional contributions. All authors contributed to the article and approved the submitted version.

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Conflict of Interest: The authors declare that the research was conducted in the absence of any commercial or financial relationships that could be construed as a potential conflict of interest.