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Editorial: Climate change, variability and sustainable food systems

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Editorial on the Research Topic
Climate change, variability and sustainable food systems in developing countries

Agri-food systems continue to play a major role in ensuring food security and economic development in many developing countries, particularly Africa and Asia (Tiwari, 2013; FAO, 2021; Norton et al., 2022). In these countries, agrifood systems are the main source of employment for many people at different notes of the chains (Tiwari, 2013). They facilitate industrial development by supplying raw materials, and contribute to curbing malnutrition and food insecurity through provision of nutritious foods (FAO, 2021). Agrifood systems are therefore key pillars to achieving the Sustainable Development Goals (SDG) of No poverty (Goal 1), No hunger (Goal 2), Good health and wellbeing (Goal 3). However, agri-food systems need to be resilient or sustainable enough to supply countries with sufficient and nutritious food to meet the ever-increasing demand under changing climate or climate variability. The greatest challenges confronting the twenty-first-century's food systems in many developing countries are climate change variability and the COVID-19 Pandemic. Notably, smallholder farmers who constitute a major component of agri-food sector in these countries are mostly rainfall-dependent in agricultural production. It is therefore important to build resilient and sustainable food systems by strategically strengthening the adaptive capacities of smallholder producers to sustainably increase farm productivity and food supply. Also, ensuring rural farmers' access and usage of climate information services is crucial in stimulating adaptation measures (Owusu et al., 2021).

In this special issue, we focused on thematic areas that analyzed the nexus between climate change, variability and sustainable food systems in Sub-Saharan Africa and Asia. In total, nine papers were received, including, three review papers and seven original research papers. Three themes that emerged include: (1) the knowledge, perception and impact of carbon-smart technologies, (2) the interaction of health and food systems in changing climate and (3) adaptation strategies to climate change.

Knowledge, perception and impact of carbon-smart technologies

In terms of knowledge and perception, the works by Umar and Horamo et al. evaluated farmers' knowledge and perceptions on the carbon-smart technologies. For instance, using Zambian data, Umar showed that women and men perceived conservation agriculture (CA) to be beneficial in enhancing moisture-holding capacity of basins and increasing crop yields. The study concluded that promotion of adoption of CA package in Zambia should include timely climate information and climate informed crop choices. The study Horamo et al. argued that farmers who accumulate knowledge on tree-crop and tree-animal interactions, on the role of trees in soil fertility, and on crop and livestock improvement, could significantly promote sustainable agriculture. These findings amplify the need to document local knowledge on CA and make them more accessible to development practitioners and other relevant key stakeholders.

From impact viewpoint, adoption of carbon-smart technologies, which are basically farm practices such as tillage reduction, planting of cover crops, using organic fertilizers, agroforestry, crop residue intention and biofuels (FAO, 2021; Yeboah et al.) have the potential to increase the amount of carbon sequestered in the soil. In addition to increasing carbon storage, these practices also improve soil fertility and contribute to sustainable food security by improving crop yields. The study by Yeboah et al. shows that conservation agriculture (CA) and agroforestry technologies tend to increase carbon storage and mitigate the effects of climate change while achieving sustainable food supply to enhance food security. In Ethiopia, Horamo et al. showed that smallholder farmers recorded improved crop yields when they adopted agroforestry as a soil fertility enhancing technology.

Interaction between health and food systems in changing climate

The interactions between food systems and health have also received considerable attention in the academic and policy domains in recent times. Agricultural interventions implemented in the past decades have focused on increasing agricultural productivity, with limited attention paid sustainability and health impacts. For instance, the study by John and Babu reported that the Green Revolution enhanced food security but had unintended negative effects on agriculture and human health in India. They pointed out in the paper that some of the negative health effects include the increasing use of agrochemicals (pesticides and inorganic fertilizers) in agricultural production, which leads to pollution of water bodies, air pollution, imbalance in pest predator and prey as well as extinction of local crop varieties. Using pesticides indiscriminately therefore have dire consequences on human health-related diseases in the nervous, endocrine, reproductive, and immune systems (John and Badu).

Promoting adaptation strategies to climate change

The promotion of climate change adaptation strategies within agri-food system is also gathering momentum in Africa and Asia among policy makers, researchers and development practitioners. For instance, promoting climate-resilient crops such as cassava among smallholder farmers is considered as an agri-food climate change adaptation strategy. A scoping review by Amelework et al. shows that cassava as a climate resilient crop, has the potential for industrial development in South Africa (SA). However, the potential can only be realized if there is reliable supply of quality cassava roots. The study found the lack of a well-established cassava research program and lack of an existing value chain for commercial cassava production as the main barriers to the development of the cassava sector in SA. Also, in India, Ghosh-Jerath et al. revealed that local communities attribute reduced crop yields, reduced diversity and food availability to low and erratic rainfall to long dry spells. Their study contends that declined agroforestry products and diversity could reduce household income and labor migration from agriculture to unskilled wage employment. Also, local communities use adaptation strategies such as climate-resilient indigenous crop varieties for farming, seed conservation and access to indigenous forest foods and weeds for consumption during adverse situations and lean periods to be able to cope with climate variability. The study concludes that promoting sustainable adaptation strategies, with adequate knowledge and technology, could increase farm resilience, income, household food security and dietary diversity. In Bangladesh, Hossain et al. identified high temperatures, cold spells, heavy rainfall and dry spells as key climatic shocks affecting the aquaculture activities, especially pond preparation and maintenance, fingerling stocking, grow-out management, and harvesting sub-sector in the country. The study proposed a decision framework to reduce climate risks and ensure resilience capacity for South Asian aquaculture system. McKinley et al. showed in their study that perceived heat stress, low yield, food insecurity, increased debt, gender (male), education, farm experience, farm size and household size were significant drivers of farmers choice of adaptation strategies to climate change in Vietnam.

Conclusion

In conclusion, sustainable food systems in changing climate should be given a priority by policy makers around the globe, especially in developing countries. This policy agenda could be achieved through the following strategies: First, as indicated in the studies of Yeboah et al. promotion of carbon smart technologies, especially conservation agriculture and agroforestry should be intensified. Secondly, following studies by Umar and Horamo et al., proper documentation of local knowledge on agroforestry practices to them more accessible to development practitioners, thirdly, promotion of climate resilient crop varieties as evidenced in Amelework et al. and Ghosh-Jerath et al.. Fourth, as outlined in Hossain et al., there is the need for development and implementation of appropriate decision framework to reduce climate risk and resilience in aquaculture system and fifth, conducting environmental risk assessment prior to implementation of major agricultural development policies to minimize unintended negative impacts.

Author contributions

All authors listed have made a substantial, direct, and intellectual contribution to the work and approved it for publication.

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Conflict of interest

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