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Editorial: Enhancing food production system resilience for food security facing a changing environment

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Editorial on the Research Topic
Enhancing food production system resilience for food security facing a changing environment

As the dominant source of the human food supply, the global land system underlies the foundation of the livelihood and wellbeing of humanity on Earth (FAO, 2022). On the one hand, the growth rate of the land system's production capacity for food has played a key role in global food provision. Technological breakthroughs in wheat and rice production during the past few decades, for instance, have greatly contributed to the maintenance of this growth rate in many parts of the world (Ye and Van Ranst, 2009). On the other hand, the terrestrial food production system is facing increasing challenges from environmental stressors ranging from climate change and air pollution to land degradation. Whether and how the global land system will support the food security of more than 10 billion people in the twenty first century while minimizing its environmental footprint remains open to debate (Meyfroidt et al., 2022). It is inevitable that the global food production system must shift its focus from expansion of production to land system resilience so that the dual goals of sustainable production and environmental friendliness can be simultaneously achieved.

In line with these perspectives, this Research Topic has published 12 articles, consisting of 11 research articles and one review article. The research articles are predominantly by authors from the Global South, showing a close association between the scientific community and the general public in these countries. The articles published as part of this Research Topic highlight ongoing hotspots in the current food system-related research landscape (Figure 1). These include income boosting (Zondi et al.), household food security and welfare (Olawuyi et al.), protection of crops and livestock from ongoing disease outbreaks and epidemics (Li et al.; Nanyiti et al.), yield trends (Wang et al.), policy interventions relating to the food (Neupane, Paudel et al.) and energy sectors (Neupane, Chaudhary et al.) under climate change, and the application of digital, geospatial, and remote sensing technologies to inform precision management (Chen et al.) and adaptation (Fu and Zhang; Varela et al.). Moreover, this Research Topic has also published forward-thinking articles focusing on integrated solutions (Yusriadi and Cahaya) and alternative foods (Siedenburg) that can help to build a more resilient food system for decades to come.

FIGURE 1
Components of food production system resilience, evaluated based on the articles published in this Research Topic.

It has been found that maintaining a stable supply has primary significance in ensuring food security at the regional to national scales. Based on a provincial panel dataset on rice production in six southern provinces in China between 2007 and 2017, Wang et al. investigated 710 high-quality rice varieties and found that yields of both *indica* and *japonica* rice increased significantly, illustrating the growing importance of rice crops in providing global food solutions. This is important because the reported yield increase was obtained for high-quality varieties, for which a stable increase in regional yield is more difficult to realize in comparison to hybrid varieties (Yuan, 2017). Similar to rice in Asia, cassava is an important staple crop in Africa and is a major source of carbohydrates for some 800 million people worldwide. Nanyiti et al. collected field data from Uganda and found that aphids can infect cassava plants with cassava brown streak disease (CBSD), causing devastating yield losses. This is the first report of CBSD infection by aphids in Uganda, revealing a new vector of transmission for cassava brown streak viruses. Furthermore, Li et al. stress the importance of biosecurity measures in livestock production systems. As the authors indicate, African swine fever (ASF) is the greatest challenge to the sustainable development of pig farming in many regions. By analyzing data from 351 pig farmers in Sichuan province in China, Li et al. statistically tested the effectiveness of government regulations against ASF. Based on their largely positive results, the authors recommend that government-mandated biosecurity measures should be continued and strengthened to curb future outbreaks.

It has also been found that new technologies and forward thinking are important pathways to improved resilience in future food production systems. Using GIS-based climate vulnerability maps, Varela et al. showed that well-timed adjustments to local cropping systems could avoid large losses caused by adverse climatic conditions; they therefore urge the development of harmonized measures in building agricultural adaptive capacity against climate change. Similarly, Chen et al. adopted a coupled remote sensing imagery approach to automatic garlic mapping in the North China Plain, demonstrating the role of satellite and other digital technologies (Fu and Zhang) in the precision management of essential crops in the food system. Yusriadi and Cahaya go one step further in provocative food system thinking, highlighting the need for interventions that include components relating to environmental conservation and social structures for a food-secure future. As the author of the sole review article presented in this Research Topic, Siedenburg argues persuasively that microalgae, a diverse group of microscopic aquatic organisms, could be used as a food, feed, biofertilizer, biostimulant, and biochar material, despite continuing issues with consumer acceptance, affordability, and food safety concerns.

Attention is merited not only to the technological aspects of building resilience into the current food production system, but also to the social and policy aspects of the challenge. Zondi et al. call for a clear government support plan for the vulnerable group of indigenous crop farmers in South Africa, while Olawuyi et al. report, based on their survey data collected from Nigeria, that women are disproportionately food-insecure under economic shocks and environmental stressors. These authors recommend careful planning of public investments, considering the special needs of vulnerable groups to build the capacity for resilience and to support wellbeing at the household level. In a broader context, following "systems" thinking offers a better approach to building resilience in food production systems (Neupane, Paudel et al.; Neupane, Chaudhary et al.), where a nexus approach to integrated planning, policy coherence, and institutional harmonization will enhance not only food security but also water and energy security, and lead to a higher quality of life.

Author contributions

The author confirms being the sole contributor of this work and has approved it for publication.

Conflict of interest

The author declares that the research was conducted in the absence of any commercial or financial relationships that could be construed as a potential conflict of interest.

Publisher's note

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