



Editorial: Conflicts and Compromises Between Food Safety Policies and Environmental Sustainability

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Editorial on the Research Topic

Conflicts and Compromises Between Food Safety Policies and Environmental Sustainability

Global concerns over foodborne risks to human health have intensified to the point where some experts now argue for prioritizing food safety as a human right (Fung et al., 2018). Recurring foodborne illness outbreaks—even from previously unconventional sources such as fresh fruits and vegetables (Wadamori et al., 2016; Bennett et al., 2018; Machado-Moreira et al., 2019)—underscore the prevalence of health risks in contemporary food systems (Soon et al., 2020). Links between food systems and the COVID-19 pandemic have drawn renewed attention not only to infectious disease risks posed by food, but also to their interdependence with the vulnerability of food workers, agroecosystems, diets, and supply chains (Galanakis, 2020; Rizou et al., 2020).

The articles in this Research Topic take a systems perspective to address this interdependence, recognizing food safety as one of many services expected from food systems, including nutrition, livelihoods, cultural preservation, climate change mitigation, and biodiversity conservation. The overarching goal is to identify potential research, management, and policy pathways to ease frictions and promote synergies between safety and sustainability across food systems.

Garcia et al. argue that the multi-dimensional threats facing food safety and security necessitate strategic “One Health” networks: collaborative and transdisciplinary teams that assemble to solve complex problems at the intersection of soil, plant, animal, and human health. However, to unlock the full potential of One Health to address increasingly prevalent “wicked problems”—exemplified by the global COVID-19 pandemic (Amuasi et al., 2020; Bonilla-Aldana et al., 2020)—requires significant investment in data-driven, systems-based education and outreach for food producers, agrifood scientists, medical professionals, policymakers, and the consuming public.

Vågsholm et al. extend this systems-based perspective, asking how to balance food safety, sustainability, and security on a warming planet that will need to support 10 billion people. They revisit cases of “unsustainable intensification” to show how strategies to increase food production sometimes lead to unintended health crises. Reflecting on mad cow disease (BSE), for example, they conclude that recirculating nutrients by feeding food waste to animals can in principle benefit both food security and environmental quality, but only if the system explicitly avoids recycling pathogens and chemical hazards. Weighing potential tradeoffs among food system dimensions should precede any proposed intervention.

Olimpi et al. apply this lesson at a regional scale to reveal the conflicts created on California fruit and vegetable farms by “siloeed” food safety initiatives that fail to account for environmental or socioeconomic sustainability. They find that supply chain pressures and fear of liability can drive farmers to adopt unproven yet environmentally damaging practices, particularly for wildlife-suppression, in the name of food safety. Simultaneously, siloeed food safety policies may also

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impair socioeconomic sustainability by exacerbating barriers to entry and imposing compliance conditions that favor the largest-scale farms. Incipient policy reforms, such as heightened traceability requirements, may intensify the burden on food producers to bear disproportionate responsibility for systemic food risks.

Rothrock et al. offer a case study in anticipating and planning for emerging systemic risks at the interface of food safety and sustainability. Pastured poultry operations promise sustainable rural economic development for small-holders in the US Northeast. However, even though agricultural runoff is a primary threat to water quality nationwide, the authors found little research to inform best practices for pastured poultry farmers to minimize nutrient or pathogen pollution into lakes and rivers. While low-cost practices such as vegetated riparian buffers likely confer both environmental and health benefits, the paucity of evidence underscores the need for proactive application of One Health approaches to address novel food system risks before they reach a crisis point.

Weller et al. examine the downstream impacts of pathogen pollution in waterways used for irrigation, reinforcing the importance of research designed to measure potential cascading effects (Karp et al., 2015) and “boomerang” risks (Stuart and Worosz, 2012) within food systems. Combining data on water microbiology, weather, topography, and land use, they modeled pathogen prevalence and transport across an agricultural landscape in New York State. Their analysis reveals environmental factors that can help predict pathogenic risks in irrigation water, but the combined effects of these factors varies significantly by pathogen. While this study demonstrates the utility of transdisciplinary, systems-based risk assessment, the complexity revealed within this single region underscores the vast evidence base still needed to implement One Health.

This Research Topic makes a strong case for One Health as a compelling starting point from which to conceptualize the interrelated, multi-dimensional risks confronting modern food systems, both risks that can make food unsafe and risks that food intensification poses to sustainability. Striking examples of

wicked problems in food systems are increasingly prevalent, as illustrated by the recent African swine fever that led to mass culling of pigs in China. In that case, the resulting pork shortage in turn increased the demand for wildlife meat—raising the risk of further human crossover of exotic zoonoses (Brooks et al., 2021; Xia et al., 2021). The challenge for all food safety stakeholders moving forward is to acknowledge and, to the extent possible, plan for possible destructive chains of events, i.e., failure cascades, *before* implementing novel technologies, policies, and practices intended to reform food systems. In light of this systems-based and transdisciplinary perspective, it is also incumbent upon all stakeholders to design preventive measures that are economically and politically realistic to implement.

At the same time, the complex and emergent food risk frontiers discussed throughout this Research Topic suggest the need to better align One Health with social-ecological systems (SES) science, particularly with respect to resilience, vulnerability, and adaptive capacity (Gallopín, 2006; Engle, 2011). Increasing unpredictability in the face of global social and environmental disturbances means that food systems must be nimble and flexible in responding to novel risks (Petersen-Rockney et al., 2021). The same is true for the research enterprise that supports evidence-based action. Balancing the conflicts, compromises, and synergies between food safety and sustainability presents a daunting challenge, but many novel tools are available to meet this challenge if we have the foresight, imagination, and willingness to embrace them.

AUTHOR CONTRIBUTIONS

PB led the writing and editing of the Editorial. PB and JL summarized key findings and insights from articles included in the special Research Topic and identified cross-cutting lessons emergent from the Research Topic as a whole. PB, JL, and MJ-R provided comments, intellectual contributions, and Editorial guidance to the special Research Topic as a whole. All authors contributed to the article and approved the submitted version.

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