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Perspective

A research vision for food systems in the 2020s: Defying the status quo

Jessica Fanzo[a,*], Namukolo Covic[b], Achim Dobermann[c], Spencer Henson[d], Mario Herrero[e], Prabhu Pingali[f], Steve Staal[g]

[a] Berman Institute of Bioethics, Nitze School of Advanced International Studies (SAIS) and Bloomberg School of Public Health Johns Hopkins University 1717 Massachusetts Ave NW 730 Washington DC 20036 USA
[b] International Food Policy Research Institute, Poverty, Health and Nutrition Division, Addis Ababa, Ethiopia
[c] International Fertilizer Association, Paris, France
[d] University of Guelph Department of Food Agricultural and Resource Economics, Guelph, Ontario, Canada
[e] Commonwealth Scientific and Industrial Research Organisation (CSIRO), Brisbane, Queensland, Australia
[f] Cornell University Charles H Dyson School of Applied Economics and Management, Ithaca, New York, United States
[g] Kuala Lumpur, Malaysia

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1. Vision for a future food systems research agenda

As we enter the third decade of the 21st century, the world is at a crossroads. As the Editors of the journal *Global Food Security*, we share our perspectives on the food security challenges that face humanity and lay out our vision and call for stronger food systems research and science in this decade. The challenges and opportunities for food systems research that lay ahead are significant, requiring that high-quality science be translated into policy and action faster than ever before. Our vision is one in which research and science, and the evidence stemming from their application, not only inform food and environmental policy, but are adopted and mainstreamed into actions at the national, regional, and global levels. *Global Food Security* provides a platform where such evidence is shared in an accessible manner for those who need to use it and act on it.

2. Food security and nutrition: the path to sustainable development

Food security and nutrition have been prominent features of the international development agenda for decades (Byerlee and Fanzo, 2019). However, over time, development priorities and challenges have fluctuated, and the needed investment has not been sustained (Fukuda-Parr, 2012; Hulme et al., 2015). A broader consensus has emerged. One that ensures food security and eliminates hunger and malnutrition in all its forms to achieve thriving economies, human and planetary health, and sustainable development (Baye, 2017; Blesh et al., 2019; Schipanski et al., 2016). Following the Millennium Development Goal (MDG) era, the Sustainable Development Goal (SDG) 2030 agenda has given the global community a renewed opportunity to end hunger and all forms of malnutrition by integrating related objectives into a more comprehensive and actionable development agenda (Gödecke et al., 2018). Furthermore, tackling global food insecurity and malnutrition can only be achieved in the context of broader food systems thinking and policymaking (Ericksen et al., 2012; Haddad et al., 2016; Ingram, 2011), particularly in a world that will be increasingly affected by inter-connected, multi-sectoral risks.

The FAO et al., 2019 report *Food Security and Nutrition In the World: Safeguarding Against Economic Slowdowns And Downturn* highlights that after decades of steady declines, world hunger prevalence remains unchanged, whilst the actual numbers of people suffering from hunger are increasing (FAO et al., 2019). It seems to presage the current global downturn due to the COVID-19 pandemic and highlights the importance of policies and plans to counteract the adverse effects of such

* Corresponding author. Global Food Security, Journal Berman Institute of Bioethics, Nitze School of Advanced International Studies (SAIS) and Bloomberg School of Public Health Johns Hopkins University, 1717, Massachusetts Ave NW 730, Washington DC 200361717, Washington DC 20036, United States. Tel: +1 202 663 5946
E-mail address: jfanzo1@jhu.edu (J. Fanzo).

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shocks (Barrett, 2020a,b).

Several recent landmark reports focusing on food systems have amplified the message that if we do not address the stark food insecurity and multiple forms of malnutrition that many people still experience, the world will have significant challenges in moving sustainably forward. Numerous bodies including, for example, the Global Panel on Agriculture and Food Systems for Nutrition and UN High-Level Panel of Experts on Food Security and Nutrition (HLPE), have produced seminal reports that arrive at similar conclusions and have informed the global nutrition and the food system action agenda (GNR, 2020; Haddad et al., 2016; High Level Panel of Experts, 2017).

The environmental pressures exerted by food systems have increasingly dominated the research agenda on food security, focusing on agricultural and livestock production practices and related sustainability and welfare considerations. On the back of the increased attention to climate change and the momentum of the Convention of Parties (COP), more integrated views of food systems have featured in the reports produced by the Intergovernmental Panel on Climate Change (IPCC), the EAT-Lancet Commission Report on *Healthy Diets from Sustainable Food Systems*, the Food and Land Use Coalition's *Growing Better* and the World Resource Institute's *Creating a Sustainable Food* Future (FOLU, 2019; Searchinger et al., 2019; Watson et al., 2000; Willett et al., 2019). The recent FAO/WHO Sustainable Healthy Diets Guiding Principles have added to these voices (FAO and WHO, 2019). Each of these reports recognizes the need to transform food systems holistically, including addressing all forms of malnutrition without transgressing vital planetary boundaries. Environmental sustainability is now seen as critical to sustaining food security, nutrition and health in the long term, and essential to achieving the Paris Agreement's emissions targets.

Some influential research and development 'think tanks,' including the Institute of Development Studies (IDS), Overseas Development Institute (ODI), Brookings Institution and World Economic Forum (WEF), have furthered the case for mainstreaming food security and nutrition in development. The global network of international agricultural research institutes, the CGIAR, is undergoing reform towards a "One CGIAR" approach. Several proposals have advocated for the CGIAR's research agenda to be more inclusive, more focused on nutrition and more sustainable (Barrett, 2020a,b; Haddad, 2020; Lobell, 2020).

There are also moments and movements, such as the UN Decade of Action on Nutrition and the Scaling Up Nutrition Movement, that have served to increase attention to food security and nutrition in the UN system. The UN Food Summit in 2021 will hopefully be a pivotal moment within the broader UN system as well as global, regional and country commitments to address food system challenges head-on and with urgency. The theme of the 53rd Session of the UN Commission on Population and Develop for 2020 is "Food Security, Nutrition and Sustainable Development." The UN Committee of World Food Security has held consultations across the different UN regions on developing Voluntary Guidelines on Food Systems and Nutrition that will hopefully be adopted at the 2020 Committee on Food Security and taken seriously by member states. In Africa, the Comprehensive Africa Agriculture Development Program, that many African Union member states are implementing, has a strong sustainability component and has diet diversity as a critical outcome area.

The current COVID-19 pandemic has cast a new light on the governance, efficiency, resilience and functionality of food systems, with potentially long-lasting implications. The pandemic has also highlighted the strong interconnections between food and health. What began as a health crisis quickly became an economic, employment, energy, and social crisis, highlighting the inherent interdependencies of global risks. While it exposed significant vulnerabilities, it may also provide an opportunity for reimagining the system, if bold policies are chosen that accelerate economic, societal, and technological transformations towards a more socially just and sustainable global economy (WEF, 2020). At minimum, there is an urgent need for agri-food policies to be consistent with the goals and objectives of the 'One Health' approach.

Food systems and their health, economic, environment and sociocultural outcomes are high on the sustainable development agenda. The key question for research communities then is how to exploit the opportunities that this attention presents? And are we getting the right people's attention? Where are the crucial gaps in knowledge and influence that we still do not understand that stymie policy action? Where can evidence make a difference? How do we generate quality evidence faster as the solution space becomes broader while dealing with grander and more interconnected challenges across food systems?

3. Grander and interconnected challenges and constraints

We are heading on a trajectory that is far from ideal. The global population is forecast to grow by as much as five billion by the end of the century (UN, 2018). At the same time, more people now live in urban rather than rural areas; 55 percent of the world's population resided in urban areas in 2018, rising to a projected 68 percent being urban by 2050 (UN, 2018). Some of the poorest countries will experience high and sustained growth rates, particularly in sub-Saharan Africa (SSA). On the other hand, Asia's population growth is slowing, while some countries are beginning to see negative population pressure and aging populations as a threat to sustained economic growth (Bai and Lei, 2020; Espenshade and Serow, 2013). Food systems will have to feed this ever-growing and shifting population using the same resources that are on hand, but with additional pressure from climate change, environmental degradation and loss (EU European Commission, 2011; Willett et al., 2019). Food systems are further challenged by a global pandemic that is like nothing we have witnessed before.

While levels of hunger and undernutrition remain high in many of the world's poorer countries, diets are changing in rapidly-developing parts of the world along with income growth, urbanization, and shifting demographics (Popkin et al., 2020, 2012). Unhealthy diets are considered a top global risk factor for deaths and disability-adjusted life-years (DALYs) lost, surpassing other risks such as air pollution, tobacco smoking and high blood pressure (Afshin et al., 2019). Most of these deaths are from non-communicable diseases (NCDs) and are occurring in low- and middle-income contexts (Ezzati et al., 2018; Miranda et al., 2019). Many countries, including low- and middle-income countries (LMICs), now face challenges of rapidly increasing rates of overweight, obesity, and diet-related non-communicable diseases alongside persistent undernutrition (Popkin et al., 2020). These multiple burdens of malnutrition are wreaking havoc on already weak health systems. This further limits the capacity to move towards more sustainable development, with crippling consequences for human health, the environment, and social cohesion (Swinburn et al., 2019; Willett et al., 2019).

In the context of these broad global trends, food production will need to increase by upwards of 50 percent to meet the nutritional needs of the world's population in 2050 (FAO, 2018). Additionally, rising incomes will likely increase the demand for animal-source foods, some of which tend to have higher negative environmental impacts (Herrero and Thornton, 2013; Keating et al., 2014; Perry and Grace, 2015). These projections indicate that without new technology and significant transformation towards more sustainable food production practices, less waste and healthier diets, food systems will continue to exert high pressure on critical environmental functions and their currently known boundaries (Clark et al., 2019; Springmann et al., 2018). Transgressing these boundaries could constrain food systems' resiliency and the ability to provide safe and sufficient food for all, particularly in times of disturbances and shocks (Gaupp et al., 2019; Steffen, 2016). With the COVID-19 pandemic, there are significant new uncertainties and profound implications for achieving and maintaining this resiliency and sustainability across the globe (Barrett, 2020a,b; Gaupp et al., 2019).

Food systems are constantly bombarded by shocks, including climate-related natural disasters, global and local market distortions, and political upheavals and conflict, and now, the COVID-19 pandemic (Barrett, 2020a,b). The long, insidious shock of climate change is

coming into sharp focus (Hoegh-Guldberg et al., 2018; Watson et al., 2000). Climate change means that the fundamental realities of how the global food system operates will and must shift (Mbow et al., 2019). Every component of food systems, from farm to waste, contributes to climate change and environmental degradation (Aiking, 2019). Food systems account for 21 to 34 percent of global emissions, taking into account land-use changes (FAOSTAT, 2020; Rosenzweig et al., 2020; Watson et al., 2000). Expanding agricultural land use, in particular, is a significant contributor to rising atmospheric carbon dioxide levels and biodiversity loss due to deforestation and the draining of wetlands (Foley et al., 2005).

The intensification paradigm, which has been in place since the 1950s, has been tremendously successful in increasing agricultural productivity and keeping food prices low. However, it also led to a global imbalance, including many unintended consequences for the environment and health. During 1960–2000, in the developing countries across the world, every half-ton increase in staple yields generated a 14 to 19 percent higher GDP per capita and a 4.6 to 5.6 percent lower labor share in agriculture five years later, suggesting a strong role for agricultural productivity as a driver of structural change (McArthur and McCord, 2017). Increases in agricultural productivity have helped save some forests and vulnerable land, but the reality is also that deforestation and land-use change is accelerating (WRI, 2019).

Substantial progress has been made in many countries to increase nutrient efficiency in agriculture, while in others, this has not happened yet (Zhang et al., 2015). In most of SSA, the lack of fertilizer is the primary driver for insufficient crop yields and continuing mining of soils for nutrients. On the other hand, in other world regions, the excessive use of fertilizers or manure is responsible for nutrient pollution of rivers, lakes, or marine estuaries (Glibert et al., 2018; Nixon et al., 2008). Eutrophication can cause toxic algae blooms and hypoxia resulting in substantial environmental harm to aquatic wildlife and reducing water quality (Hester et al., 1996; O'Neil et al., 2012).

Impacts on the health system can have dramatic consequences for food systems as the world is currently witnessing in the COVID-19 pandemic (Fanzo, 2016). At the same time, we must contend with shifting biosecurity and emerging diseases and pests that can present new risks to public health and threaten food production (Drummond et al., 1978; Evans and Inglesby, 2019). Examples of threats include Fall Armyworm, African Swine Fever, and the desert locust infestation in the Horn of Africa. As the pandemic has demonstrated, a crowded, more connected, more mobile world provides a perfect ground for the faster spread of such biotic threats (Gilbert, 2020). This is further complicated by insufficient preventative measures to contain the spread, which presents a challenge for many people not accustomed to their freedoms being limited.

The broader economic and political context is a critical influence on the operation of food systems. Some of the worst food insecurity problems today are seen in countries under conflict or conditions of political instability (Breisinger et al., 2015; FAO, 2018; Hendrix and Brinkman, 2013). Indeed, much of the increase in undernutrition in recent years can be attributed to acute food insecurity in unstable situations, for example in Central and West Africa and the Middle East (Dunn, 2018; Dureab et al., 2019; Kah, 2017). Furthermore, many countries are currently struggling with large-scale migration. Because food and nutrition insecurity can be both a cause and a consequence of instability and conflict, global chronic undernutrition has become increasingly concentrated in fragile countries (Harttgen and Klasen, 2013; Taylor et al., 2015).

Food systems are under pressure not only to deliver adequate quantity, safe, and quality food, but to also help address poverty by creating jobs and sustainable livelihoods (Mullen et al., 2020). Poverty remains the leading underlying cause of persistent hunger. While rural poverty is expected to decline faster than urban poverty due to the rural-urban migration, there are significant pockets of poverty in poorly designed urban slums which often go uncounted (Glaeser, 2014; Lucci et al., 2018). Many of the extremely poor are the producers of food; particularly smallholder farmers living in rural places where two out of three people are living in extreme poverty (Kharas et al., 2019; World Poverty Clock, 2020). In addition to farming, many of the resource-poor are involved in other roles in food systems, such as processing and packaging, transport, and retail and marketing (Tomich et al., 2019). In poorer countries, many of these roles and the markets they operate within are informal, lack investment or training, and are atomized (Dorward, 2006; Grace et al., 2014; Poulton et al., 2006). The foods needed to improve dietary quality in LMICs are also the ones that have increasingly become unaffordable to the poor (Headey and Alderman, 2019; Hirvonen et al., 2020). Food systems must ensure healthy foods are affordable even for the poor by improving supply chain infrastructure and supporting the competitiveness of smallholder farmers and fishers.

Modernizing food systems with targeted public support and partnership with private actors can increase the human capital of all participants, which is a primary means out of poverty. Rapid innovations in mobile data systems and technology, and financial services and partnership models are beginning to accelerate this change, and these new learnings need to be better understood and replicated with inclusivity in mind (Reardon et al., 2012; Reardon and Berdegué, 2002; Reardon and Hopkins, 2006).

The role of the private sector and the large role of multinational agri-food corporation voices and actions in the global food system is an important issue, although it tends to be clouded by entrenched positions and ideological perspectives (Swinburn et al., 2019). Global corporations have indeed played a role in the selling of unhealthy, highly-processed foods globally, and both their past and continuing behaviors in the nutrition space are issues of contention (Stuckler et al., 2012). At the same time, however, small rural farm and agricultural enterprises and large corporations often work closely together and are significant contributors to food system functioning and rural livelihoods and thus food security through various forms of contract farming. For many in the research community addressing food and nutrition, however, there is a reluctance to engage with the private sector due to real or perceived conflicts of interest (Brownell and Warner, 2009; Haddad, 2018), but often also due lack of knowledge about what the private sector actually does and their motivating factors. Such a lack of trust does not provide fertile grounds for partnership with the private sector in research or in practice (Brownell, 2012; Freedhoff and Hébert, 2011; Garrett et al., 2019). Research must support continued evolution of positive food corporation impacts on diet quality and consumption patterns, and positive innovative arrangements on food production and value chain developments for smallholder farmers. This support should, together with public service partners, lead to more constructive and balanced engagement and impacts across food systems.

We encourage researchers working in the public or 'not-for-profit' world in food and nutrition to become better informed about the private sector and its role as an agent of change concerning sustainability standards and practices, and the behavior of billions of people across the world. Whilst it is right that researchers should question the motivations and behaviors of commercial enterprises and highlight transgressions, they also need to be open-minded in order to find desirable solutions in areas of contention. Arguably, it will be difficult to achieve the true transformation of global or national food systems without more public-private collaboration (Fanzo et al., 2020). Many of the major companies operating in the food sector have already embraced the new SDGs as a framework for transforming their businesses, often in the face of consumer and investor demand. While we are yet to see the concrete impacts of many of these commitments, they do present new opportunities for researchers to engage with both small and large enterprises within the private sector.

4. Turning challenges into moments of opportunity

Ensuring food systems are equitable, sustainable, and healthy on all counts is impossible if the status quo is not significantly challenged.

While the world often seems to be on its knees, when we look at the whole picture and try not to react to the sensationalized news feed that inundates us 24/7, things have improved for many people in the world.

Steven Pinker, the author of *The Better Angels of Our Nature*, argues that we are doing better than we did 30 years ago and that the number of conflicts and genocides has declined since the end of the Second World War (Pinker, 2011). Furthermore, several countries have recovered since the end of the conflict. At the height of the Rwandan genocide in 1994, for example, the child mortality rate was 282 children per 1000 live births. The child mortality rate has since declined enormously, to 35 deaths per 1000 births in 2018 (UNICEF, 2019). In the book *Factfulness: Ten Reasons We're Wrong About the World–and Why Things Are Better Than You Think*, Hans Rosling, likewise, argues that there are reasons to be hopeful. He contends that, by looking at data over time and in the right way, one can see that the world is making huge strides overall (Rosling et al., 2018). It is just a matter of looking at the bigger picture and the broader trends over time. Indeed, many argue that there has never been a time in history as there is now when progress can be made towards a better world in the context of communication and other technologies, innovation, big data, and global integration.

Pre-COVID 19, the number of extremely poor people (those that live on less than $1.90 a day) had declined from 36 percent of the global population in 1990 to 10 percent in 2015 (The World Bank estimates that 40 million to 60 million people will fall into extreme poverty in 2020 as a result of COVID-19, depending on the magnitude of the global economic shock) (Bank, 2019; Mahler et al., 2020; Maloney and Taskin, 2020). Over the same period, premature mortality amongst children under the age of five has fallen by more than half from 93 per 1000 live births in 1990 to 38 in 2018 (Unicef, 2019). Chronic undernutrition, as indicated by rates of stunting, has also been declining. In 2000, 33 percent of children under the age of five were stunted, compared to 21 percent in 2019 (UNICEF et al 2019). However, this progress is too slow for the 2030 SDG to be met for many LMICs, especially in SSA. Research must provide innovative policy and program actions to accelerate progress.

Of course, progress in food security and nutrition is far from a finished agenda, even when there is sustained and substantial economic development, it is often distributed unevenly. Hunger numbers have risen over the last three years, and overweight and obesity continue to increase around the world (FAO et al., 2019; GNR, 2020). The gains of economic growth are diverge greatly. As a result, inequality has increased almost everywhere, suggesting that even more considerable progress would have occurred if the gains of economic development had been shared more equally. Indeed, in many contexts, these inequities come to bear in food systems - resulting in the poorest of the poor, the disadvantaged and marginalized, taking on the brunt of food insecurity and malnutrition (GNR, 2020).

Positive change comes through an almost unnoticed series of multiple, small changes as often as large-scale and dramatic advances that are instantly noticeable. Failures that counteract historic gains are also a frequent occurrence, although all too often, these are disguised and rarely diagnosed and analyzed. The task of researchers is to seek out where and how progress has (or has not) been made, to learn from what has (or has not) worked, and to make valid extrapolations to other contexts. Arguably, we know a lot about what has worked and why, particularly in places where hunger and undernutrition have rapidly declined; China, Brazil, and Ethiopia are all examples of where significant progress has been made to reduce hunger and malnutrition, yet much remains to be done (Chen et al., 2015; Headey and Others, 2014; Monteiro et al., 2009; Singh, 2014; Yosef and Pandya-Lorch, 2016).

We can also point to the success of policy efforts to tackle poor diets to combat overweight and obesity, including a tax on sugary beverages in Mexico (Colchero et al., 2017) and front of the pack labels on unhealthy foods in Chile (Taillie et al., 2020). There are other successes across food systems to improve food security, nutrition and livelihoods. In China, new agricultural policies focus on a greener development model with millions of smallholder farmers changing their management practices towards more sustainable crop production (Cui et al., 2018). In Western Europe and North America, productivity gains in crop production in the past 20–30 years have largely been achieved without parallel increases in fertilizer consumption (Cui et al., 2018). There have been advances in biofortification and the wide acceptance of its potential contribution to addressing selected micronutrient deficiencies (Bouis and Saltzman, 2017).

Shifts in aquaculture towards low-trophic species, those feeding lower on the food chain, have increased efficiency of resource use (Waite et al., 2014). A recent paper by Belton and colleagues (Belton et al., 2020) proposes three pillars of action to support sustainable commoditization of the current and future supply of seafood including sustainable intensification, supply chain transformation, and policy and regulation that the Global North and South could invest and scale.

The Comprehensive Africa Agriculture Development Programme (CAADP) of the African Union now includes dietary indicators in the Results Framework (NEPAD, 2015). This means that the 44 member states currently implementing CAADP must ensure that agriculture works to improve dietary quality providing an opportunity for research to support the desired progress. The world is changing rapidly and there are essential contextual differences that need to be taken into account when translating evidence into policy and program actions.

We also have the tools, innovations and knowledge that are backed by decades of research on how to adapt to and mitigate climate change, and how to protect natural resources and biodiversity (Herrero et al., 2020; Rosenzweig et al., 2020). The Food Systems Dashboard is a tool that brings together 170 plus indicators representing most countries and territories in the world, to better describe, diagnose and decide on actions to improve food systems (Fanzo et al., 2020a,b). FAO has developed two innovative tools, SmartForms and Calipseo, that collect and review fishery data and integrate and streamline fisheries data along the national data supply chain respectively (FAO, 2020). These are just a few of the many tools and databases available to better inform decision making. Innovations extend to circular economy thinking and technologies to reduce food loss and waste, nutrition value chains, and agriculture technologies such as artificial intelligence, robotics, drones, algae feedstocks and bioplastics (El-Gayar and Ofori, 2020; Jurgilevich et al., 2016; Klerkx and Rose, 2020). Cultivated meats, crowd farming and 3D printing are no longer future technologies but "now" technologies. These innovations could be game-changers for food security and nutrition when responsibly implemented (Downs and Fanzo, 2016; Neff et al., 2015). We cannot forget about the importance of knowledge, in particular, indigenous peoples' expert traditional knowledge on ecosystems, biocultural and biodiversity. It is a matter of translating their evidence into practice and scaling up solutions, focusing on food system actors who need the most technical assistance for rapid transformation (Reardon et al., 2019).

While we tend to think of technological advancements in high-income countries (HICs), there are many advances in LMICs that improve the lives of the poor. Kenya, for example, is a demonstrated leader within SSA in electronic transactions using mobile telephones, where the M-Pesa service has addressed many of the common challenges that the poor face in accessing banking services (Deichmann et al., 2016). The recent and widespread uptake of cellular telephones across SSA as a whole has been phenomenal. When technology meets a recognized need and is cost-effective for the intended beneficiary, uptake can be rapid. This should challenge researchers to foster innovation to bring about the positive transformation of food systems and related livelihoods.

Women are essential players in food systems, especially in LMICs. They not only make up a significant proportion of the food system labor force but are also the care custodians including the preparation of food for families and feeding of infant and young children (Quisimbing et al., 2000; Quisumbing et al., 2005; van den Bold et al., 2013). Attention to women's empowerment is an important element in fostering household food security and nutrition (Meinzen-Dick et al., 2019; Sraboni et al., 2014). The #MeToo and the Black Lives Matter movements that began in the United States could serve as powerful vehicles to address systemic injustices across food systems. Extending their message to address

equity across resources, including land, extension and finance as well as education, law and health services, is critical (Rasanathan and Rasanathan, 2020). Cutting-edge research could highlight the interrelated and compounded nature of disadvantages and inequities that perpetuate across food systems. For example, food and nutrition policies and interventions should effectively address inequities faced by women and not only women as mothers, but also women across the life course and as entrepreneurs (Fox et al., 2019).

Food safety and zoonotic borne diseases are critical issues for food security, as COVID-19 has so vividly demonstrated. The world has seen several zoonotic disease outbreaks; HIV-AIDS, MERS, SARS and now the COVID-19 pandemic that is thought to have emanated from a wet market in China (Wu et al., 2020). Zoonotic diseases are infectious diseases that cross over from animals to humans or vise-versa. For some time, *One Health* advocates warned of the need to consider the interrelationship between humans and animals on zoonotic diseases (National Research Council et al., 2010). They have called for addressing food safety concerns around animal source foods. Scaling up a *"One Health"* approach is one way to prevent future pandemics by integrating animal, human and environmental connections. Humans coexist with animals - as companions for our overall well-being, as producers of food, and as a source of livelihoods. This interface between animals and humans and their shared environments can be a source of disease too (Deem et al., 2019). There is a need for smart crop and animal solutions grounded in agroecological and food systems thinking (Di Marco et al., 2020).

5. Research and innovation remain essential

Given the above information, it is clear that research has a vital role in charting a positive and sustainable direction for global food security, nutrition, and health. The needed research will require a creative, holistic approach across disciplines, bringing knowledge together into publications that inform action at different levels from sub-national, national, regional, global.

At a time when facts, science, and evidence are under ever greater scrutiny, and even openly disregarded as suspect by some political and business leaders, the rigors of research have never been more critical (Oreskes and Conway, 2011). It is also important not to become disheartened by the slow speed of change in policy and practice, even when the appropriate course of action is clear 'to us.' Research can and does bring about wholesale changes in attitudes, political thought, and action, but change takes time (Higgins, 2019). We have seen this with climate change science. It may have taken 40 years for scientists to convince political leaders, but we are now approaching consensus at a global level on the need for near-term action to combat climate change and many countries have taken some positive actions that would have been unthinkable in the not too distant past to change the behavior of their citizens (Rich, 2018). Researchers must continue to generate evidence that can help speed progress in time to sustain planetary integrity and human development.

At the same time, researchers need to better communicate their research findings to the wider world (Miller et al., 2006; Rowe, 2002). For too many researchers, the sole focus is on academic publishing. Researchers need to see their role in terms of knowledge generation and the translation of this knowledge into a form that is understandable and relevant to decision-makers in government, business, and civil society. Those who design, shape and enact policies and practices at the sub-national, national and international levels need to access the research they need in a digestible and accessible way. Failure to achieve this brings a very considerable risk of being ignored. Researchers must learn to sit at policy dialogue tables not set for them, but for the users of their research – that is, the policymakers. By listening to challenges policymakers face, the research community can better design studies that result in practical and relevant findings that policymakers look forward to receiving and using (Fracassi et al., 2020; Sogoba et al., 2014).

Food systems is often viewed as a source of problems needing innovative solutions (Béné et al., 2019). This view belies the fact that food systems themselves can be a source of innovations, and that many of the fundamental food security and nutrition problems facing the world are behavioral and require systemic change, including the perspective of the social sciences (Tallis et al., 2019). Embracing this more inclusive perspective on solutions to food security and nutrition challenges requires a fundamental cultural shift on the part of researchers, funders and business and policy decision-makers, and shifts in incentives (Karp et al., 2015). There is a need for research to be problem-focused and systems-based. Research and their funding agencies should embrace multiple perspectives (including those of individuals who live and work within food systems), and integrate natural and social science, innovation, policy, institutions and practice (Herrero et al., 2020). Taking this approach requires consideration for both quantitative and qualitative research methods. Generalizability is not always what is most desired in research, as many food system challenges require contextual solutions.

One of the most significant weaknesses in research on food security, nutrition, and food systems across the globe is the muted voice of LMIC researchers (Lachat et al., 2014a, 2014b). A simple scan of any of the key academic journals in this area will reveal the considerable bias towards researchers coming from HICs and contexts and universities with substantive resources. Indeed, much of the diagnoses of food security and nutrition problems facing poorer parts of the world come from researchers from HICs or work in institutions funded by HIC donors. Many LMIC researchers struggle to gain access to these journals, lack support or incentive systems to publish refereed journal articles, or simply do not have the infrastructure or resources to undertake cutting-edge research (Van Royen et al., 2013). The reality is that we very much have an elite HIC view of food security and nutrition for those living in LMICs. This situation presents not only huge questions over democracy and equity of research in this area, but also serves to ignore LMIC knowledge, experiences, and perspectives of their challenges (Lawrence et al., 2016). HIC bias has also meant that there has been significant underinvestment in research and technology development for crops and livestock important to poor farmers living in low-income contexts. Advances made in some institutions in sub-Saharan Africa and South Asia, for example, have not been as well recognized globally or have been under-funded. This must change.

Accessing cutting edge research is also problematic. The *Global Food Security* offers two options to publish. One is gold access in which open access is immediate and permanent to everyone to read and download. The article publishing costs are covered by the author or by their institution on their behalf. The other option is the green access in which an article published under a subscription model in which no fee is payable by the author because publishing costs are covered by subscriptions and only subscribed readers can access these articles. As the editors, we acknowledge that the high cost of subscribing to the Journal excludes many in poorer parts of the world from accessing the work that we publish. Furthermore, the high cost of fully open access prevents many researchers from ensuring their publications are available to all. This situation both maintains and perpetuates the North-South divide in research on food security and nutrition we highlight above. The *Global Food Security,* which belongs to an Elsevier, has not found an equitable way with the parent company in which to overcome these barriers. As editors, however, we remain committed to reducing these barriers, for the good of all in the research community, and wider society.

Perhaps the most welcome and vital trend in research related to food security and nutrition is the breaking down of disciplinary silos and the shift to more multi-disciplinary, multi-sectoral research. There is also evidence that this multi-sectoral approach is influencing policy and development practice. For example, efforts to promote nutrition and agricultural development and environmental sustainability are arguably better aligned today than ever before. Nevertheless, there are still knowledge gaps in how to scale-up and improve the cost-effectiveness and sustainability of interventions and programs that bridge nutrition and agriculture (Pingali, 2015; Ruel et al., 2018).

6. Challenging the status quo to shape food systems transformation

While the challenges we face are daunting, the opportunities are also vast. Food systems must adapt and transform to deliver sustainable, healthier diets, and durable livelihoods without decimating the planet. The research community should rise to this challenge, and we provide a platform to challenge the status quo and take food system transformation in a direction we have not yet imagined.

Global Food Security strives to publish evidence-informed strategic views of experts from a wide range of disciplinary perspectives on prospects for ensuring food security, nutrition, and health across food system issues. We wish to publish reviews, perspectives articles, and debates that synthesize, critique and extend findings from the rapidly growing body of original publications on global food security, nutrition, food systems, and related areas; and special issues on critical topics across food security, food systems, and nutrition including how these are impacted by climate and environmental dynamics.

There are still many areas that require more research, evidence, and knowledge. Some of these topics need a jumpstart or a fresh look. The Journal has had several special calls on high-tech agriculture 4.0, sustainable diets, and zoonotic diseases 1during the COVID-19 pandemic. The Journal has also hosted several special issues including price volatility and food security; social protection and agriculture; ethics and global food security; food security governance in Latin America; stories of change in nutrition; measuring food and nutrition security; biofuels and food security, drivers of dietary choice; and biodiversity, ecosystem services, and food security.

Through this vision paper, we are making a call to action to researchers to challenge the status quo and bring forth knowledge syntheses that can inform the desired actions across food systems. We encourage strategic reviews and perspectives submissions that synthesize lessons and recent learnings, ask critical questions that challenge the status quo, and foster new ways of thinking that can propel new research questions to drive progress. We are looking for key research papers that will disrupt and move the field forward and impact policies and programs.

Positively transforming food systems to ensure that the food we produce is accessible, sustainable, safe, healthy, and equitable for all is our moral imperative. At the same time, food systems should continue to be a vehicle to reduce poverty, directly improving food security for everyone. Current food system transformation is creating significant sustainability and equity gaps that will make future food security and continuity of life on the planet difficult. As global citizens, we will have to fill in those gaps: We all have a role to play in ensuring we meet the demands of a growing population sustainably while co-existing in amity with the planet. We need to find the stitched pockets of progress and small glimmers of hope as the basis of our knowledge to move forward; ever-changing and ever-evolving in the remarkable pattern of human endeavor.

Declaration of competing interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

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Further reading

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