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Global and local perspectives on food security and food systems

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Our health and active life depend critically on nutritious food. While agriculture and food production increased over the past decades, millions of people are still unable to meet their dietary needs, starkly contrasting the overconsumption and the enormous amount of food wasted daily.

Policy-makers worldwide are paying more attention to the whole food system—production, processing, distribution, consumption, and the link to food security and farmers' livelihoods. For example, in 2021, the United Nations Food System Summit opened the dialog between stakeholders from multiple fields and encouraged national actions to transform the food system. Most recently, the 28th Climate Conference of Parties resulted in a Declaration on sustainable agriculture, resilient food systems, and climate action. While these political commitments are essential foundations of change, research is needed to provide a scientific basis to support policy decisions and help design solutions that fit community needs.

In this Viewpoint, we asked six researchers to describe some of the challenges and opportunities for transforming food systems globally, within the region of South America and the Caribbean Islands, and in countries such as Bangladesh and South Africa.

Jessica Fanzo: Challenges to transform global food systems



Fruit and vegetables M.studio/stock.adobe.com.

Recent shocks, including the COVID-19 pandemic, conflict in Europe, and the impact of climate change, are pushing global food systems to breaking point. Around 42% of the World's population cannot afford a healthy diet that meets nutritional needs. We are witnessing political attention on food systems, with the United Nations hosting the Food Systems Summit in 2021, which brought together more than 100 countries and represented an opportunity to strengthen food system resilience. Yet, we must address challenges that inhibit progress.

The first challenge is to provide equitable, physical, economic, and social access to healthy, safe, and diverse diets. Solutions across food supply and demand have been proposed and implemented to address access constraints across local contexts. Some examples of solutions include homestead gardening, biofortification, reformulation of food products to remove unhealthy ingredients, taxes on sodas and highly processed foods, front-of-the-pack labeling to signal the healthfulness of food products to consumers, national food-based dietary guidelines, and food-related safety nets. However, many of these solutions have not been scaled sufficiently to have multiplier and positive impacts.

The second challenge is to address the power asymmetries in food policy and politics. Private companies involved at every stage of food supply chains are increasingly concentrated and wield significant economic and political power. Some companies continue to generate massive profits at the expense of public health and environmental sustainability, leading to a lack of trust from the other stakeholders. The disaccord jeopardizes an inclusive momentum to galvanize the transformation of the global food system.

Data are needed to assess the performance of food systems, determine where and how to intervene, and assess unintended consequences or trade-offs of tried solutions, which constitutes the third challenge. Sixty food system experts have developed the *Food Systems Countdown to 2030 Initiative*¹ to guide and hold public and private sector decisions to account. The Countdown monitors 50 indicators across food systems related to diets and nutrition, climate and environment, livelihoods and equity, governance, and

resilience. The indicators can track the holistic nature of food systems, align decision-makers around crucial priorities, incentivize action, sustain commitment, and enable course corrections. The Countdown shows that no single region has a monopoly on food system success.

Every region and country have room for improvement, and countries can learn from each other. Governments must step up and restore the power balance and play a more active role in shepherding food systems in positive directions. Investment in place-based solutions is critical to understanding what works, where, in what context, and for whom.

Bart de Steenhuijsen Piters: A practical framework to enhance food systems resilience

Resilience as a concept has been known for over a hundred years in many scientific fields, but its application to food systems is relatively recent. Given the complex nature of food systems, resilience is still difficult to define, but it is linked to the ability of food systems to deliver desired outcomes in the face of social, economic, and environmental shocks and stressors. Recently, a practical ABCD framework has been developed for decision-makers to identify and connect critical capacities of food resiliency². In short, the framework suggests (1) ensuring the Agency and the means and capacities of populations to mitigate risks and respond to shocks, (2) creating Buffers and resources to rely on in the face of shocks and stressors, (3) boosting Connectivity between market actors and segments, and (4) enhancing Diversity from production to consumption and across spatial scales (Fig. 1). The food system's resilience can increase if the people, communities, and institutions master these four capacities.

The proposed framework can help policy-makers in the most vulnerable countries of Africa and the Middle East, where the capacity of local populations to mitigate risks through, for example, social cohesion, democratic voice, or gender equity are often weak or lost. Protracted crises, such as conflict and climate-related shocks in the Horn of Africa, reduce the buffering capacities of households and communities. The lack of government investments in infrastructure and the



Fig. 1 | Agency, buffering, connectivity, and diversity, core elements of the food system resilience framework. Credit Bart de Steenhuisen Piters.

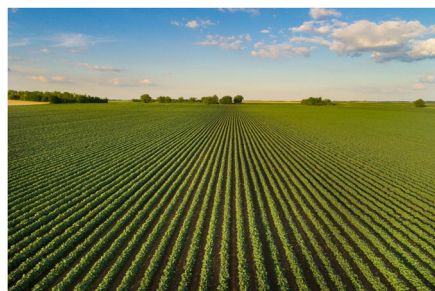
temporary reduction of human mobility, such as during the Covid-19 pandemic, led to a loss of connectivity and a subsequent decrease in food exchange between places. The diversity of food systems may also diminish with monoculture, corporate concentration, and the super-marketization of food systems.

Governments must provide targeted regulations and incentives to encourage stakeholders to act and rebuild resilience in the food system. They could more effectively regulate workers' and women's rights, provide incentives to the private sector to develop new information technology infrastructures or develop policies promoting domestic production of nutritious food crops.

After decades of open markets and an almost obsessive focus on the efficiency of food trade, we must consider resilience as an equally important objective of good food system governance to secure people's access to healthy food under all conditions. Effective and resilient balancing of objectives and alignment among key actors in the governance of a food system is perhaps the most important challenge of the coming decade.

Ariel Soto-Caro: South American agriculture needs support and guidance to meet the food demand of its population

South American countries like Argentina, Chile, Ecuador, and Peru have become critical players in the global agricultural market, exporting products such as blueberries, grapes, and broccoli to the United States and China. However, these countries often compete instead of fostering collaboration, striving to offer their crops at the most competitive prices. This unequal dynamic presents various challenges for South American agriculture that deserve attention.



Landscape of soybean fields. Budimir Jevtic/Stock.adobe.com.

Decades ago, Uruguay, Argentina, and Chile recognized the potential of exporting agricultural products to economic powerhouses in the Northern Hemisphere. This realization encouraged small and large-scale farmers to improve the quality of their products and professionalize their exports to meet the demands of discerning markets, particularly those importing agricultural goods during off-seasons. However, supporting farmers is not a straightforward task. Climate change has forced farmers to adapt to increasingly frequent weather shocks. While a wealth of literature attempts to determine if farmers are responding effectively to these challenges, the question remains whether the authorities provide the necessary financial and technical assistance in countries where government support is critical. This disparity underscores a significant difference in how developed and developing countries address such challenges. Moreover, social issues such as insecurity, crime, and corruption further complicate agricultural endeavors, problems that are not typical concerns in developed countries' agriculture.

Most South American countries do not produce enough agricultural commodities to meet domestic demand, resulting in considerable imports from various continents. At the same time, there is an overemphasis on selling in foreign markets, which exacerbates reliance on imports and reduces agricultural diversity. Additionally, the perception of rural life, including farming, as synonymous with poverty drives younger generations towards urban areas in search of alternative employment. This migration creates a shortage of agricultural labor, increasing costs and limiting specialization. Mechanization of agriculture is becoming more prevalent, yet it remains financially difficult for small-scale farmers.

The lack of consistent and appropriate support and guidance for agricultural production often stems from governments prioritizing more pressing issues such as crime, pensions, and healthcare. Agricultural governance is often maintained at a status quo level, lacking proactive planning for the sustainable development of farmers, who ultimately provide food security.

There is a pressing need for more proactive policies that consider local and foreign market

needs, adequately address climate change impacts, and encourage the growth of a more modernized agricultural industry.

Arlette Saint Ville: Imports and unhealthy choices increase food and nutritional insecurity in Caribbean islands

Caribbean Small Islands Developing States are the world's oldest colonies where food and nutrition insecurity is a persistent problem. Historically, food imports dominated domestic food systems, and they still do. Local fresh food producers are under-resourced and declining. Mostly rain-fed, small-scale farms of less than two hectares are highly vulnerable to climate variability and have low adaptive capacity to cope with rapid onset impacts from storms, droughts, and floods. Moreover, the production is also decreasing due to land degradation.

Although the food trade increases food availability for many net-importing Caribbean Small Islands Developing Nations, it also reduces food system resilience as policymakers wield little influence over food prices, volume, and nutritional quality. As a food systems researcher in Trinidad and Tobago, I often observe secondary school students consuming breakfast that consists of energy-dense, fried street foods and ultra-processed snacks such as chips or sweet biscuits. These are frequently combined with sugary beverages. Cheap, convenient, and unhealthy foods are increasingly common as breakfast options for children, leading to slower cognitive development and childhood obesity. Obese children are more likely to become obese adults with an increased probability of non-communicable diseases.

Although data for Small Island Developing States in the Caribbean are scarce, current health outcomes of these unhealthy choices can be estimated using life expectancy at birth. An indicator of health status, it measures the years from birth that an average person lives if mortality conditions remain constant. Regional trends from the past twenty years reveal that life expectancy is increasing only in five countries. In nine countries, life expectancy is less than 75 years (Table 1).

Creating a healthy food system that increases life expectancy must involve interventions such as nutrition education and nutrition-sensitive value chains to increase demand and supply of more local nutritious foods. Supporting initiatives could include child-protective food marketing policies, front-of-package labeling, and incentivizing healthier offerings.

Researchers have identified four main conditions^{3,4} that public policy could support

Table 1 | Life expectancy at birth for selected Caribbean Small Islands Developing States in 2005, 2010, 2015, and 2019

Country	2000	2010	2015	2019
Antigua and Barbuda	74.6	75.9	76.1	76.5
Trinidad and Tobago	69.7	72.1	74.6	76.1
Jamaica	74.2	75.8	75.9	76
Belize	70.3	73.4	74	74.4
Guyana	63	64.8	65.6	65.7
Haiti	57	31.1	62.6	64.1
Cuba	76.8	77.7	77.9	77.8
Barbados	74.5	75.9	76.2	76
Saint Lucia	73.2	75.2	75	74.3
The Bahamas	70.9	73	72.9	73.2
Saint Vincent and the Grenadines	70.6	72.9	72.5	73.2
Dominican Republic	73.2	73.2	71.8	72.8
Suriname	69.9	71.8	72.6	71.5
Grenada	72	72	72.7	72.9

Source: World Health Organization¹⁸.

building food system resilience in Caribbean Small Islands Developing Nations:

- (a) Integrate gender equity, vulnerability assessments, and urban and rural-poor food security monitoring to support data-driven interventions and social justice initiatives;
- (b) Develop and promote agricultural practices that enhance ecological processes rather than dependence on imported inputs;
- (c) Foster regional food production and distribution that involve minimal processing of fresh foods to sustain optimal nutrients while reducing food loss and,
- (d) Build nutrition-sensitive value chains that link human health and nutrition needs to agri-production policies.

Developing solutions to enhance food system resilience will require multi-sectoral policies and multi-stakeholder interventions in imports and local production. System-wide and transformative actions must consider specific drivers of societal vulnerabilities of island nations.

Mohammed Mainuddin: Targeted actions can boost Bangladesh’s food security

In the fifty years since its independence, Bangladesh, one of the most densely populated countries in the world, has transformed from a country constantly threatened by famine to a state that is food secure and self-sufficient in rice production, the main staple. The widespread adoption of dry season groundwater irrigation, selection of modern high-yielding rice crop varieties, and higher application of fertilizers have facilitated the transition. The increased crop harvest and storage capacity have also enhanced food resilience.

However, conversion of agricultural land to urban and industrial areas, unsustainable use of groundwater for irrigation, climate change, and natural disasters, such as cyclones and floods, threaten food production and security and question self-sufficiency.



Rice. Egdao/stock.adobe.com.

There are many opportunities to help overcome these challenges. Many crops, including rice, can be grown in the southern coastal region during the dry season between December and April when water for irrigation is limited, high salinity poses a constant threat, and land is often left fallow or uncultivated. Crop production can be achieved by planting short-duration and high-yielding rice in the monsoon season between July and November, which facilitates sowing sunflower, watermelon, maize, and zero-tillage potatoes. During the dry season, the farmers can increase the freshwater supply for crop irrigation by re-excavating canals and improving the management of polder infrastructure. There is also potential to use groundwater for sustainable irrigation through its conjunctive use with surface water or through managed aquifer recharge in the northwest and central regions.

Scaling up local knowledge to the regional level requires understanding the suitability of crop varieties in different localities. For example, shorter season varieties can help overcome seasonal food shortages among poor farmers before the northern region’s main harvest. Transportation options to connect farmers with major markets in the capital city of Dhaka need to be further developed. The volatility of rice prices must be addressed, as stable prices could improve farmers’ confidence and promote production.

While rice production is sufficient in Bangladesh, the country still must import wheat, pulses, and oils. As per capita gross domestic product has increased, the average Bangladeshi diet has become more diverse, although it is still dominated by rice. A further increase in dietary diversity, including more vegetables, fruits, fish, and meat intake, will reduce the demand for rice and wheat and provide greater nutritional security.

Despite the region’s many challenges, it is possible to sustain food security by implementing the appropriate measures outlined in the Delta Plan 2100⁵.

Jane Battersby: Poverty shapes food access in urban areas of South Africa

South Africa has high levels of food insecurity and a growing burden of malnutrition, particularly within urban areas^{6,7}. The majority of the population cannot access a healthy diet. Here, I argue that the ways in which “access” is understood need to be expanded beyond physical access and affordability of food. In the low-income neighborhoods I work in, residents live within walking distance—or a short trip on public transport—of a full-service supermarket, and fresh produce vendors are scattered across the neighborhood. These vendors sell fresh produce at cheaper prices than the supermarkets. The problem is, therefore, not one of physical accessibility.



Group of African girls sitting on a mat, dividing their meal, eating with their hands from a large metal plate. Riccardo Niels Mayer / stock.adobe.com).

Economic accessibility is a consistent challenge that needs to be understood beyond the retail cost

of food alone. It is essential to know how multi-dimensional poverty shapes food access in these settings. In low income urban neighborhoods in South Africa many households depend on state social grants, which fall well below the official food poverty line⁸. In urban areas of South Africa, as in many places worldwide, healthier foods are more expensive than less healthy options⁹. In the context of income poverty, the food basket is one of the few flexible costs: food budgets are worked out only after fixed rent costs, servicing debt, and school uniforms have been paid, and diet quality is sacrificed to meet essential expenditures¹⁰. Hard financial choices are made daily, and healthy diets are sacrificed to meet other needs.

Additionally, the embedded costs of cooking healthy meals—such as energy, preparation time, and refrigeration—increase the price of a nutrition-rich diet compared to consuming highly processed foods that require less cooking time and energy use and are easier to store safely¹¹. Finally, access is curtailed by wider infrastructure deficiencies in low-income neighborhoods, where a household's ability to safely store and cook fresh foods is determined by limited access to water, sanitation, solid waste management, and reliable energy and housing¹².

The solution is not to make healthy foods more physically accessible or to make unhealthy foods more expensive and subsidize healthy foods. Instead, policymakers must understand and improve infrastructure inadequacies and how households navigate systems to meet their dietary needs. The food and nutrition security questions must be brought into broader urban planning decision-making processes.

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Competing interests

The authors declare no competing interests.

Additional information

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