

# **Transforming Food Systems to End Hunger, Malnutrition, and Poverty**

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## **1. What is a food system?**

A food system “gathers all the elements (environment, people, inputs, processes, infrastructures, institutions, etc.) and activities that relate to the production, processing, distribution, preparation and consumption of food, and the outputs of these activities, including socio-economic and environmental outcomes” (HLPE 2014). It therefore encompasses elements from food supply chains and the systems that support them to consumer behaviors, diets, and nutrition and health outcomes. It further includes broad impacts of these elements on societies, economies, and the environment, as well as the policies that govern these elements. Food systems are therefore transnational and are dynamically affected by a host of drivers, including climate change, migration, urbanization, social norms, politics, conflict, trade, and technological innovations. Recent conceptualizations of food systems have increasingly emphasized the right to food as an underlying principle (HLPE 2020).

## **2. How do food systems relate to hunger and poverty?**

Food systems include crop and livestock production as well as agroforestry and fisheries. Employment in food systems, however, extends beyond production: it can include suppliers of agricultural inputs, traders, transporters, distributors, people and businesses involved formally or informally in food processing or packaging, wholesalers, retailers, street food vendors, and restaurateurs, among others. Recent estimates from the Food and Agriculture Organization of the United Nations (FAO) estimated that food systems globally employ 1.23 billion people, and 3.83 billion people live in households linked to livelihoods based on food systems (Davis, Mane et al. 2023). However, many of the world’s poor engage in multiple income-generating activities simultaneously, including household farming, and the same FAO report calculates that the true number of people engaged in food systems employment is on average 24 percent higher than estimated. Approximately half of food system workers are women, and a similar proportion are aged 15-35 years. Food systems are therefore a key source of livelihood and income for a significant portion of the world’s population, particularly in rural areas, and this employment is often informal, particularly among the poor.

The challenges faced by food producers, particularly those who are resource-poor, are well-documented. Rural smallholders have limited land and limited access to agricultural inputs, technologies, extension services, and credit, resulting in limited production. The nutritional quality of their diets is limited by the diversity of their home production (Ruel, Quisumbing et al. 2018) and access to local food markets (Nandi, Nedumaran et al. 2021). Many nutrient-dense foods, including vegetables, fruits, and animal

source foods, are perishable. Lack of infrastructure, including roads and cold chains, results in local food markets that have limited selection of these foods or selection that is expensive or seasonal. Shortages in food quantity and nutritional quality can lead to seasonal food insecurity and nutritional deficiencies, which often overlap with periods (e.g., during rainy seasons) of high incidence of infectious diseases, negatively affecting the growth, development, and long-term outcomes of children and the health, productivity, and well-being of vulnerable populations broadly.

As gross domestic product (GDP) increases, the proportion of people who are poor among those engaged in food systems employment decreases (Davis, Mane et al. 2023). However, those that remain may be increasingly vulnerable, especially when working, formally or informally, for wages in food production, processing, packaging, distribution, retail, or food service. For example, many of the world's 150 million international migrant workers are employed in food systems. Poor physical and mental health are prevalent among these workers, with high rates of workplace injuries (Hargreaves, Rustage et al. 2019). Well-enforced laws and policies are needed to protect both domestic and migrant workers in the workplace, and these workers need greater access to health care and other services.

This is particularly true for children employed in food systems. For example, while child labor laws exist in the United States, agricultural work receives several legal exceptions, and children as young as 10 years can be employed. Driven by family poverty and food insecurity, these children and adolescents, the majority of whom are Hispanic or Latino, face elevated risk of injuries, heat stress, and pesticide and other exposures (Arcury, Rodriguez et al. 2014, Arcury, Arnold et al. 2019, Quandt, Arnold et al. 2019). Importantly, the effects of employment in the food system may not manifest immediately or in the workplace itself. For example, Hispanic and Latino children and adolescents engaged in agricultural work in the US have also been shown to experience elevated psychological stress, faltering school performance, and even menstrual irregularities (Arcury, Rodriguez et al. 2014, Varnell, Arnold et al. 2021). Recent investigative journalism has found migrant and asylum-seeking children working dangerous jobs in food processing and packaging (Dreier 2023). Nevertheless, there are current efforts in several US states to ease protections for children to meet labor demands (Bogage 2023).

From the consumer perspective, food prices and affordability are major determinants of diets. A healthy diet, defined by national food-based dietary guidelines, is more expensive than a diet that only meets essential nutrient requirements, which in turn is more expensive than a diet that meets only energy (calorie) requirements. An study conducted before the COVID-19 pandemic and subsequent shocks analyzed ten different definitions of a healthy diet from United Nations member states and calculated a median daily cost of USD 3.75, substantially higher than the cutoff for extreme poverty of USD 2.15 per day (Herforth, Bai et al. 2020). The cost of a healthy diet was estimated to be nearly five times the cost of an energy-sufficient diet, with three billion people globally unable to afford the lowest-cost healthy diet and 1.5 billion people unable to afford a nutrient-adequate diet. A 2019 global analysis comparing the relative prices of foods found that in lower-income countries, healthy foods were generally expensive, especially animal-sourced foods and fortified infant cereals (Headey and Alderman 2019). Higher relative prices predicted lower consumption by children, and higher milk and fortified infant cereal prices specifically were associated with global child stunting patterns. Meanwhile, higher soft drink prices were associated with a reduction in prevalence of overweight, a risk factor for diet-related

non-communicable diseases. Among producers, higher relative prices for nutrient-dense foods such as vegetables, fruits, and animal source foods incentivize sale of these foods rather than home consumption.

For resource-poor consumers, informal and semi-formal food vendors, who are often women, can be important sources of nutritious foods. For example, a study conducted in peri-urban Tanzania found that informal food vendors, who were mobile and mostly women, were the primary source of vegetables, especially green leafy vegetables (Ambikapathi, Shively et al. 2021). Households surrounded by a greater density of vegetable vendors or informal food vendors in close proximity were more likely to purchase vegetables and have a lower (healthier) energy intake. Relationships of trust between consumers and informal vendors allow consumers to purchase food on credit when needed and provide confidence in food safety in the absence of food safety regulations or enforcement. These food vendors can also increase access to nutritious foods through willingness to sell food items in smaller quantities, making these foods more affordable. Given the informality of their employment, these food vendors often lack access to social protection programs and can be vulnerable to variable government or police enforcement. However, given their importance in increasing access to nutritious and healthy foods, gender-sensitive actions to promote their livelihoods are warranted.

Physical access to foods is another key barrier for consumers with limited resources. A study in Ethiopia found that households in remote areas far from markets were more food insecure, consumed less food, and consumed less diverse foods, indicating lower nutritional quality (Stifel and Minten 2017). Their children's school enrollment rates were also lower. These households had lower agricultural production and higher transaction costs when accessing markets for both purchase and sale. Another study, also in Ethiopia, found that young children living close to food markets ate more diverse diets and were better nourished than children living farther away. However, all children experienced seasonal fluctuations in their weights (Abay and Hirvonen 2017). Even in more urban areas, lower income populations may live in "food deserts", where there are few food entry points, or "food swamps", where food entry points offer unhealthy but not healthy foods (HLPE 2017).

More personal factors that shape consumer behavior include the time burden of individuals, particularly women, who often bear the household responsibilities of acquiring, preparing, and serving food. Women's time burden is greater when they must care for children or other members of the household, travel outside the home for chores such as fetching water or firewood, or work outside the home, doing farmwork or other income-generating activities. The cost or time to acquire water or fuel can also significantly affect food preparation and dietary choices in a household. Employment outside the home changes dietary patterns as individuals will have access to and may increasingly seek food outside the home, particularly as their time for shopping and cooking at home becomes more limited. Employment and food consumption outside the home are closely tied to urbanization (Seto and Ramankutty 2016). When women are employed outside the home but their role in household food acquisition and preparation does not change, the diets of the entire household can change. Limited time can lead women to make choices that save time or labor, leading to dietary changes such as increased purchase and consumption of prepared, instant, or fast-cooking foods, many of which may be less healthy options.

Food choices are also driven by individuals' personal tastes and preferences, health status, life history, cultural background, knowledge of nutrition and health, and attitudes and beliefs about foods and what is acceptable for consumption. These are shaped by societal and cultural norms and beliefs, religion, health promotion campaigns, advertising, food-based dietary guidelines and policies, and social media, among others. Agency is a dimension of food security, and all people should have access to foods that meet their preferences as well as nutritional and health needs (HLPE 2020).

Family can also strongly influence dietary choices. Families who live together typically share food and meals. The diets of younger children are largely determined by parents, older siblings, and other caregivers (Verissimo 2022). While in many cultures, women make the primary decisions about what is purchased, prepared, and eaten in a household, these decisions and the resources required to carry them out are often influenced or made by men. When faced with food insecurity, parents, particularly mothers, may prioritize feeding children over themselves, or a family may provide additional food to members who are able to work and generate income. The health needs of individual members can also alter a family's diet. For example, a study in peri-urban Dar es Salaam, Tanzania, found that in families with limited resources that had a person living with HIV (PLHIV), other family members would sacrifice their own food needs and preferences to allow the PLHIV to eat adequately. As the PLHIV progressed in their disease, families would often borrow money to afford foods for their sick relative (Boncyk, Shemdoe et al. 2022).

### **3. How do food systems relate to nutrition?**

Food systems determine diets: which foods are eaten and their quantity and quality. In turn, diets are a major determinant of nutritional status. Poverty can lead to food insecurity, which can lead to inadequate food consumption and poor quality of consumed foods, thereby contributing to poor nutritional status. Similarly, poor nutrition can affect a person's ability to learn in school, work, and generate income, increasing the risk of poverty. Poor nutrition also increases the risk of both communicable and non-communicable diseases, which can decrease school and work performance and duration as well as quality of life. Poor health also increases the financial and caregiving burdens on individuals and families, which also increase the risk of poverty and its transmission across generations.

Diets can be poor in multiple ways. Consuming an inadequate quantity of food leads to hunger, underweight, and, in extreme cases, acute malnutrition. Eating food of inadequate quality can lead to micronutrient deficiencies and anemia, which in turn can lead to a range of poor health outcomes, with infants, young children, adolescent girls, women of reproductive age, and pregnant women especially vulnerable. Undernutrition and communicable diseases have strong bidirectional relationships, with inadequate quantity and quality of diets increasing the likelihood, severity, and duration of infections. Similarly, consuming excess calories and unhealthy foods, particularly those that are high in fat, salt, or sugar, can lead to overweight and obesity, high blood pressure, high blood sugar, and other metabolic changes that increase the risk of non-communicable diseases including cardiovascular diseases, diabetes, and certain types of cancer. Poor nutritional status in infancy and childhood is associated with morbidity and mortality in childhood; poor growth and cognitive, motor, and socioemotional development as the child ages; reduced learning and school performance; reduced work capacity and

productivity in adulthood; and increased adult risk of non-communicable diseases (Black, Victora et al. 2013). Poor nutritional status and anemia in girls during childhood and adolescence can affect future pregnancies, leading to intergenerational cycles of malnutrition.

While undernutrition remains a serious concern globally, approximately 40% of the global adult population is overweight or obese, and no country is on track to meet global targets for adult obesity (Development Initiatives 2021). Pediatric overweight and obesity are similarly on the rise. Suboptimal diets – diets high in unhealthy ingredients such as sodium or low in healthy ingredients such as whole grains – are globally responsible for more deaths than any other health risks (GBD 2017 Diet Collaborators 2019). Consequently, while undernutrition and communicable diseases remain global priorities, the world is witnessing a shift to an even higher burden of non-communicable diseases, with poor diets as a major contributor. This results in a “double burden of malnutrition”. Importantly, these multiple forms of malnutrition can co-exist at all levels. For example, most countries face overlapping burdens of child stunting and anemia and overweight in adult women (Development Initiatives 2018). Such overlaps can also occur in communities, families, and even individuals. Globally, millions of children are simultaneously stunted and overweight. This rapidly increasing double burden of malnutrition poses significant current and future challenges for health systems. However, a recent study of global commitments to improve nutrition found that governments still prioritize maternal, infant, and young child nutrition over diet-related non-communicable diseases (Development Initiatives 2022).

#### **4. How have food systems been affected by recent shocks?**

The last few years have seen several global shocks, including the COVID-19 pandemic, the war in Ukraine, significant increases in the prices of food, fertilizer, and fuel, and climatic events such as droughts in several parts of the world. The latter years of the 2010s triggered warnings as the number of people globally facing hunger began to rise. Then, with the COVID-19 pandemic, this number increased dramatically from 618 million people or 8.0% of the world’s population in 2019 to an estimated 768 million or 9.8% of the world’s population in 2021, suggesting a loss of progress of nearly 15 years (FAO, IFAD et al. 2022). The poorest globally showed the greatest percentage reduction in income in 2020 and 2021. Severe food insecurity concurrently increased globally and in every region of the world. Data from 2020 indicate that the cost of a healthy diet also increased, making it more unaffordable in every region (FAO, IFAD et al. 2022).

The COVID-19 pandemic illustrated in particular how disruptions to food systems and food system workers can have widespread effects on food security, diets, and ultimately nutrition. Producers rely on affordable agricultural inputs including fertilizer, access to banks and credit, and labor, all of which were disrupted by the pandemic as well as subsequent shocks. In the absence of these, farmers may decrease their cultivated area or production or reduce their input use, thereby impacting later food production, food supply, and food security. Pandemic disruptions to food processing, packaging, transport, and retail – including temporary or permanent closures of businesses and COVID-19 outbreaks among workers – led to reduced food availability and high prices, particularly for foods not produced locally. Households meanwhile saw lost income and employment, reduced income from remittances, and loss of access to school feeding programs, all of which increased household food insecurity. The pandemic also made

clear the potential of social protection programs to reduce hunger and poverty. Some informal workers, however, were not able to access these programs, and many of these programs are now ending, though disruptions and high prices continue.

Two years after the onset of the COVID-19 pandemic, prices of food, fertilizer, and fuel were already high when war in Ukraine escalated in 2022. Ukraine and the Russian Federation are major producers of wheat, maize, and sunflower seed products, and the Russian Federation is also the world's leading exporter of nitrogen, potassium, and phosphorus fertilizers (FAO, IFAD et al. 2022). Conflict in these countries negatively impacts food production, storage, processing, transport, and export, with global consequences for food supply and prices. Reduced availability and increased prices of fertilizer can have even longer term effects on agricultural production and food supply and prices. FAO estimates that the ongoing conflict will increase the global number of undernourished people by 7.6-13.1 million in 2022, depending on the severity of the shock (FAO, IFAD et al. 2022). Women and children are particularly at risk, and actions are key to minimize restrictions on trade and disruptions to supply chains, to mobilize resources for and strengthen nutrition-sensitive social safety nets and humanitarian assistance, to ensure continuity of nutrition interventions, and to invest in timely, standardized data to inform policy and decision-making (Osendarp, Verburg et al. 2022).

Climate change and food systems have a bidirectional relationship: food systems contribute to climate change, and climate change affects food systems, agricultural productivity, and even the nutritional quality of the food supply (Myers, Wessells et al. 2015, Medek, Schwartz et al. 2017, Fanzo, Rudie et al. 2022). Climate change increases the likelihood of extreme weather events, e.g., heat waves, droughts, or storms, and such shocks have been shown to predict adverse outcomes such as low birth weight and child malnutrition (Grace, Davenport et al. 2015, Cooper, Brown et al. 2019, Brown, Backer et al. 2020). Low-income populations are more vulnerable to and affected by climate change, and these populations have fewer resources and lower capacity to respond and adapt over time (Ray, West et al. 2019).

In 2023, many of these crises are ongoing: COVID-19 is transitioning from an acute to a chronic situation as infections continue and long-term health effects ("Long COVID") are observed; food, fertilizer, and fuel prices remain high; the world faces slower economic growth and high inflation, with several countries struggling with debt; the war in Ukraine continues; and climate change and extreme weather events remain a persistent threat. These crises and shocks have immediate and long-term effects on hunger and malnutrition, and they can have broader impacts as well, particularly on children's growth, development, and education; mental health and psychosocial well-being across the life course; and conflict and violence, from the interpersonal to the national and global levels. To identify and address disparities in a timely way, data must be gathered, analyzed, and reported with disaggregation based on vulnerabilities such as gender and income. Care is needed as the COVID-19 pandemic spurred what is likely a permanent trend towards increased remote data collection, which may be more likely to exclude the most vulnerable populations.

## 5. What is meant by food systems transformation?

In the last several years, calls have increased to “transform” food systems, i.e., to change them qualitatively and at a scale that will ensure food security and healthy diets for all people, good livelihoods, and sustainable operation within planetary limits (Fanzo, Rudie et al. 2022). The Global Panel on Agriculture and Food Systems for Nutrition has identified priority policy actions to transform food systems and enable sustainable, healthy diets (Global Panel on Agriculture and Food Systems for Nutrition 2020). These actions aim to produce foods of sufficient diversity and quantity to deliver such diets, to ensure that all people have access to and can afford such foods, and to ensure that such foods and diets will be desirable to all consumers.

Agriculture today is not producing adequate amounts of the types of foods needed to feed all people a sustainable, healthy diet. Unless actions are taken, global fruit and vegetable production, for example, is unlikely to meet global dietary recommendations (Mason-D'Croz, Bogard et al. 2019). Agricultural subsidies heavily favor staple foods, and even if achieved, increased demand for nutritious non-staple foods may remain unmet (Pingali 2015). Actions to increase availability of sustainably-produced, healthy foods include reforms to agricultural subsidies; support for agricultural research and development to increase production and prevent losses of nutritious non-staple foods without increasing costs for consumers; and development and implementation of other policies that would promote production of a wider range of nutrient-rich foods (Global Panel on Agriculture and Food Systems for Nutrition 2020).

Trade policies, including trade agreements, tariffs, and food safety regulations, can be utilized to enable access to sustainable, healthy diets by influencing the availability and price of foods (Global Panel on Agriculture and Food Systems for Nutrition 2020). Policies and resources can support innovations and development along food supply chains to reduce food loss and waste, improve quality and food safety, and lower the ultimate costs to consumers. Policies can also support job and livelihood growth across the food system, beyond agricultural production.

Healthy diets are more expensive, and recent shocks and crises have further reduced their affordability. Safety net programs and policies that target the needs of the poor and promote equitable growth can help to increase the affordability of sustainable, healthy diets (Global Panel on Agriculture and Food Systems for Nutrition 2020). Technological innovations across the food system can also help to reduce costs to consumers. Taxes and subsidies can be used as levers to promote consumption of healthy foods. Similar tools can be used to reduce the consumption of unhealthy foods that increase the risk of non-communicable diseases. Throughout the world, there is substantial and sustained growth in the availability and affordability of ultra-processed foods (UPFs), many of which have high amounts of salt, sugar, or fat (Baker, Machado et al. 2020). However, UPFs can also increase nutrient availability and food safety while decreasing food waste, and therefore more nuanced research is warranted to inform policy (Valicente, Peng et al. 2023).

Finally, policy actions are needed to empower consumers, supporting them to make informed food choices and increasing the demand for sustainable, healthy diets (Global Panel on Agriculture and Food Systems for Nutrition 2020). Engagement between the public and private sectors is key, as transnational

food corporations have concentrated economic and market power and have strong influences on people's food preferences and choices (Béné 2022). Regulation of advertising and marketing and behavioral nudges, e.g., through taxes and subsidies, can increase demand for healthier diets. Development of food-based dietary guidelines could be supported in more countries and could consider the needs of both human and planetary health. Effective utilization of these guidelines, both for individual use and for development of programs and services, can also promote healthier diets. Ultimately, transformation of food systems will be challenging and will require systems thinking, multisectoral coordination, and navigation of multiple tradeoffs and competing interests. However, a coordinated commitment to these efforts is vital for achieving equity and all people's fundamental right to food.

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