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Sustainability

Food (in)security: Hungry for change

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Key takeaways

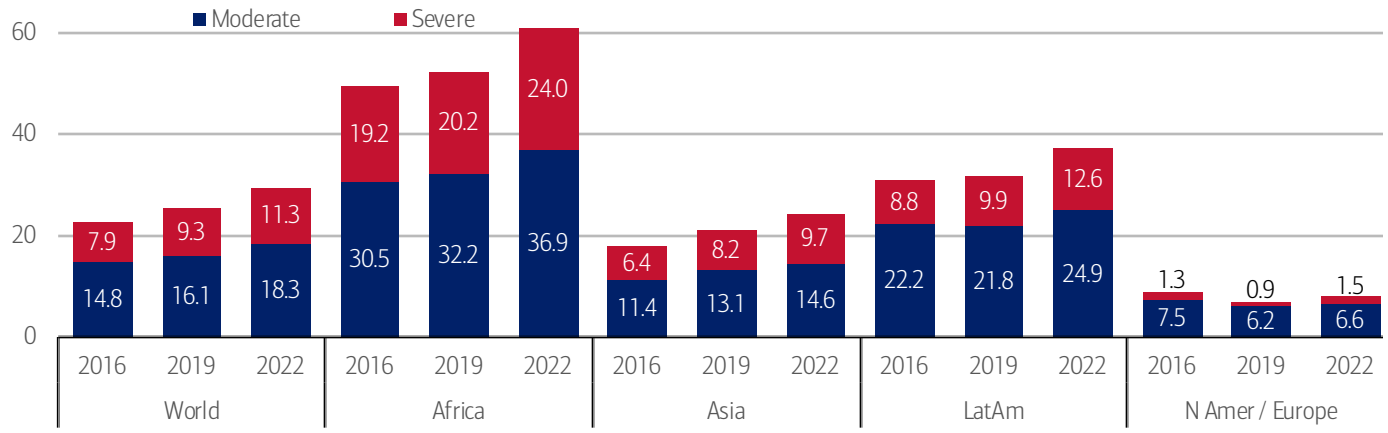
- Around the globe, an estimated 900 million people face hunger daily, more than 1.4 billion additional people lack vital micronutrients, and almost 40% of the population can't afford a healthy diet.
- However, this issue is not evenly dispersed. When the price of food is raised, it largely hits lower-income countries the hardest and can lead to lower food security, acute shortages and, ultimately, social unrest.
- Yet food is both a victim and a cause of climate change. Food systems need to adapt to a warming world; they need to be more resilient, feed more people, and also be sustainable.
- Wide-ranging solutions are needed, from increasing consumer education about healthy foods to making healthy foods more affordable and accessible. Longer term, poverty and inequality need to be addressed, as does a scaling up of climate resilience.

Post-pandemic: Falling food security

An estimated 900 million people around the globe face hunger or severe food insecurity daily. More than 1.4 billion additional people lack vital micronutrients, affecting their health and life expectancy. Globally, the prevalence of moderate to severe food insecurity was estimated at 29.6% in 2022, up from 22.7% in 2016. In Africa, the number of severely and moderately food insecure people rose almost 25% from 695 million in 2019 to 868 million in 2022. In Asia, the same group went from 982 million in 2019 to over 1.1 billion in 2022.

The Food & Agriculture Organization of the United Nations (FAO) estimates that the pandemic increased incidence of hunger and lack of access to adequate food by over 300 million people from 2019 to 2020 alone.

Exhibit 1: Moderate to severe food insecurity by region (shown in % of population)
Food insecurity has worsened in most regions since 2016 and since pre-pandemic levels (2019)



Source: Food and Agriculture Organization of the United Nations (FAO), International Fund for Agricultural Development (IFAD), United Nations Children's Fund (UNICEF), World Food Programme (WFP) and World Health Organization (WHO), *The State of Food Security and Nutrition in the World 2023*

As pandemic-era restrictions began to lift, supply chain disruptions dispersed, and demand returned in 2022, many businesses found it difficult to return to pre-pandemic levels of staffing and operation. Russia's invasion of Ukraine at the end of February 2022 sent energy and agriculture markets into a tailspin of uncertainty that pushed prices skyward.

By the end of 2022, 66% of countries saw food prices up by more than 10% year-on-year compared to just 15% at the end of 2019 (just before the pandemic). Lingering high prices – and in developing markets, weak currencies – are exacerbating food insecurity issues.

Exhibit 2: Share of countries recording food price inflation > 10%*
66% of countries saw food prices up >10% as of end-2022 versus15% at end-2019 (pre-pandemic)

Source: FAO (FAOStat), BofA Global Research *Last data point as of 31 December 2022.

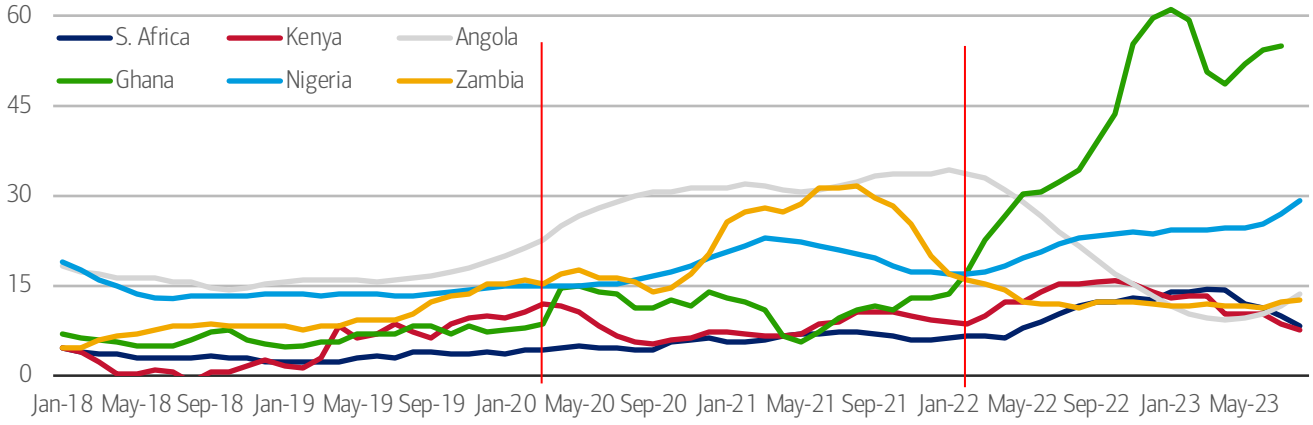
Food price increases hit lower-income countries hardest

While hunger is a global challenge, the issue is not necessarily evenly dispersed. When the price of food is raised, it largely hits lower-income countries the hardest and can lead to lower food security, acute shortages and ultimately, social unrest. Agricultural food prices are passed through to consumer prices in 2-5 months in emerging markets compared to 9-11 months in developed markets. Economies in Sub-Saharan Africa (SSA), India and Brazil have a pass-through lag of less than one quarter.

It's important to also note that in SSA, domestic food production does not sufficiently cover food consumption requirements, with the deficit filled by food imports which vary by country. IMF data shows the SSA region imports 85% of its wheat consumption: Kenya (33%), Ghana (33%) and South Africa (28%) have the largest wheat imports from Russia.

Food price inflation increased year-over-year (YoY) in the aftermath of Covid, as shown in Exhibit 3. While only a handful of countries are shown, by end 2022, more than two-thirds of countries globally saw YoY food price inflation over 10% (Exhibit 1). Even though food prices have come down in USD terms, this is cold comfort in countries where depreciating currencies buy fewer imports than they used to.

Exhibit 3: Food inflation in key African countries (YoY % change), Covid and Ukraine war in red
Food inflation increased year on year with Covid and continued to rise in many countries (YoY) after Russia's invasion of Ukraine at the end of February 2023. African countries have been hit particularly hard.



Source: Haver Analytics, BofA Global Research
Note: The first horizontal line indicates the start of Covid, and the 2nd indicates Russia's invasion of Ukraine.
Each line shows the YoY *increase*, not the actual inflation figure.

More than three billion people can't afford a healthy diet

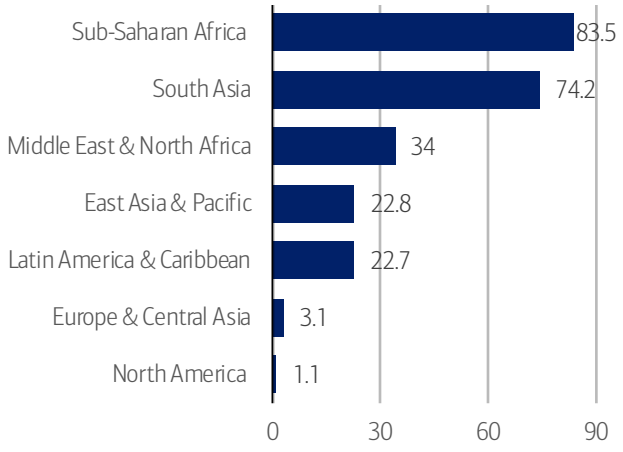
Almost 40% of the global population can't afford a healthy diet: in 2021, that was 3.1 billion people. Yet a third of the food grown for human consumption is wasted every year. So how do we close the gap between food production and affordability, particularly as climate change intensifies and the global population continues to grow?

What's 'affordable?'

A diet is considered unaffordable if it costs more than 52% of a household's income (source: World Bank). A 'healthy diet' consists of the lowest cost set of foods available that would meet requirements in government/public health agency dietary guidelines. For some countries in Africa and South Asia (excluding China), over 70% or even over 80% of the population cannot afford a healthy diet.

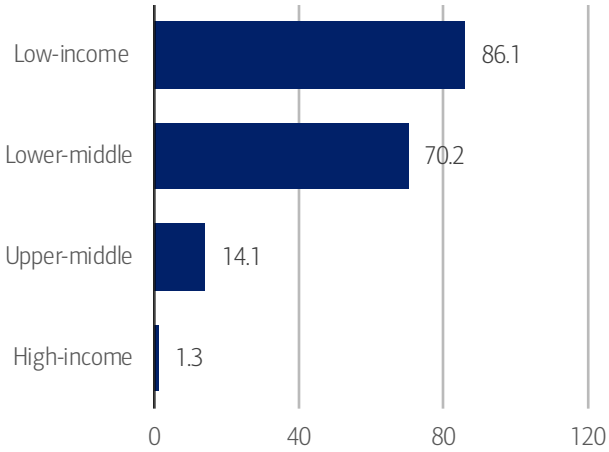
Living in a high-income country makes it much less likely that an individual will be unable to afford food, but the very opposite is true in low-income and lower middle-income countries. When adjusted for differences in cost of living, the price of a healthy diet is higher in most of Africa than it is in North America. While agricultural commodity prices have been falling in 2023, many of these are priced in US dollars, and, in many cases, that falling USD price is more than offset by weak emerging market local currencies.

Exhibit 4: Share of population who cannot afford a healthy diet, %
In Sub-Saharan Africa and South Asia, over 3 in 4 can't afford 'healthy'



Source: Our World in Data, *Share of the population who cannot afford a healthy diet, 2021*, World Bank, adapted from Herforth et al. (2022)

Exhibit 5: Share of population who cannot afford a healthy diet, %
Going from lower- to upper-middle income vastly improves affordability



Source: Our World in Data, *Share of the population who cannot afford a healthy diet, 2021*, World Bank, adapted from Herforth et al. (2022)

Further challenges: Environmental + social

Physical and human factors affecting food security are increasingly intertwined: think climate change, soil erosion and degradation, water stress and loss of farmland. Food systems drive up to 90% of deforestation and produce diets that are responsible for 20% of deaths worldwide. Food systems are also the primary driver of biodiversity loss and account for a third of greenhouse gas emissions (source: Rockefeller Foundation) (see Biodiversity means business for more).

Agriculture alone contributes 10-12% of annual greenhouse gas emissions, but only 20-25% of projected emissions can be reduced with current best practices. Much higher reductions could be delivered with changes including dietary shifts, more efficient supply chains or relocating production to more efficient locations (source: CGIAR Research Program on Climate Change, Agriculture and Food Security (CCAFS)).

Climate change

Climate change is increasing temperatures unevenly around the globe. Rainfall is becoming greater in some places and falling in others. Combined, these higher temperatures and changed or unpredictable rainfall patterns make farming more difficult. This is particularly true in more marginal growing areas and/or for farmers who are already struggling to survive. For more large-scale farming, climate change may force crop changes, which can be difficult to implement quickly due to existing expertise in other areas and uncertainty around future weather patterns.

Soil degradation, erosion, urban development

The United Nations (UN) reports that 120 million hectares (300 million acres) of natural habitats will be converted to farmland in developing countries by 2050. At the same time, the UN also sees a loss of 1.6 - 3.3 million hectares (4-8 million acres) of prime agricultural land annually in 2000-2030 due to urbanization. Yet agricultural land in use often fails to produce to its full potential. A study by Paul West in the magazine *Science* showed that yields are up to 50% lower than what is possible. Closing this gap – rather than clearing additional land – could feed up to 850 million people.

A third of the world's soil is moderately to highly degraded, which affects crop yields and increases carbon emissions. This degradation is the result of factors including industrial farming, deforestation, over-grazing and global warming. Soil degradation increases the risk of flooding, as soils lacking in organic matter cannot absorb and retain water effectively. This also leaves degraded soil at risk in drought conditions. An estimated 12 million hectares of land is lost to desertification annually – this land could produce the equivalent of 20 million tonnes of grain per year (source: UN Convention to Combat Desertification).

Urban development of fertile agricultural land results in a permanent loss of arable land, which has an outsized impact on subsequent crop production. This happens as urban sprawl pushes farmers to cultivate less productive land – land that is 'still available' rather than prime agricultural land.

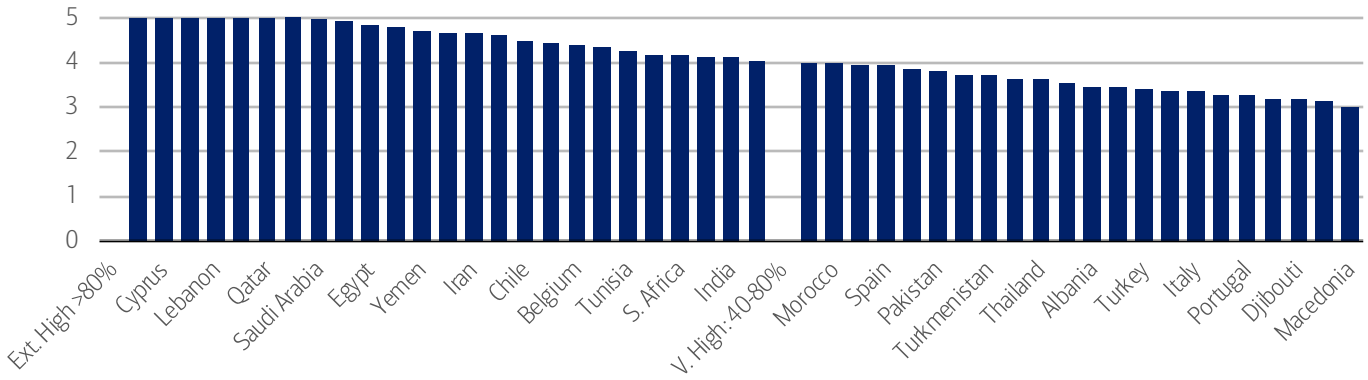
Water stress

Nine out of 10 natural disasters are water related. Yet the World Bank highlights that 2 billion people do not have safe drinking water services, and 3.6 billion do not have safely managed sanitation services. Competition for water resources is increasing with population growth, urbanization, and climate change. Gaps in water access, increasing rainfall variability, and this rising competition are making water a growing risk to economic growth and development.

Agriculture accounts for about 70% of global water withdrawals and up to 90% of water consumption. However, only about 20% of cultivated land is irrigated, although this land contributes ~40% of the total food produced globally. The World Bank estimates that agricultural production will have to expand by about 70% by 2050. As such, future demand for water (from all sectors) will require 25-40% of water to be re-allocated from lower to higher productivity areas, much of which will have to come from agriculture given its high proportion of water use.

The World Resources Institute's (WRI) Aqueduct Water Risk Atlas shows that 25 countries face extremely high water stress. The WRI defines these as countries that use >80% of their renewable water supply for irrigation, livestock, industry, and domestic needs. At least 50% of the world's population lives under high water stress conditions for at least one month of the year. And according to the WRI, the most water-stressed regions are the Middle East & North Africa, where 83% of the population is exposed to extremely high water stress, and South Asia, where 74% is exposed.

Exhibit 6: Country rankings of baseline water stress weighted by total and sectoral water demand, 2019 (shows Extremely High and Very High only)
A number of Middle East and North African countries fall into the Extremely High (>80%) national water stress rankings



Source: Kuzma, S., M.F.P. Bierkens, S. Lakshman, T. Luo, L. Saccoccia, E. H. Sutanudjaja, and R. Van Beek. 2023. *Aqueduct 4.0: Updated decision-relevant global water risk indicators* Technical Note. Washington, DC: World Resources Institute.

What are potential near-term solutions?

Given that global food consumption habits contribute to worsening climate and environmental crises while facilitating a wider public health crisis, a range of near-term policy recommendations have been floated by a host of international agencies. Many of these recommendations fall into one of three broad categories: 1) education and communications, 2) affordability and accessibility, and 3) policies that link dietary needs with sustainability issues and national health guidelines.

Ultimately, policy measures need to incorporate the interests of all stakeholders, from farmers and food producers to retailers and consumers. Policies need to be coordinated to maximize benefits while limiting negative trade-offs. Stakeholder responses should be measured and evaluated to enhance transparency and effectiveness.

1. Healthy eating requires education and communication

In 2022, only 0.9% of the millions spent on food and drink advertising in the UK was for fruits and vegetables (source: Food Foundation). Consumers change their behavior in response to information, so raising consumer awareness of the health and sustainability impact of different dietary choices is key. Ease of information is important – this includes product labelling, advertising, public service announcements, marketing campaigns, digital campaigns, and other avenues.

Increasing food literacy should also encompass food planning, purchasing, storage and preparation. Information campaigns can focus on preventing food waste by reducing overconsumption and encouraging more meal planning and preparation. Relying on more fresh food involves more perishable items, so better education on planning, storage and preparation could help to limit food waste.

Change must come from the entire food system

Changes in food systems need to involve all stakeholders and can't come down to consumers alone. Policymakers need to actively engage with farmers, food producers, retailers, and other interested parties – and information needs to flow in both directions.

Farmers, fishers, and aquaculture producers need to deliver optimal results while improving environmental standards. Reforms to the EU's Common Agricultural Policy (CAP) have introduced more ambitious environmental objectives in exchange for financial support. Farmers' incomes are still supported, but with more robust requirements for meeting environmental conditions. Further alignment between agricultural subsidies and production of sustainable and healthy foods is needed.

By including sustainability criteria in national dietary recommendations, policy changes can also nudge food producers toward change. The EC points to the US in 2005, when a revision of the US dietary guidelines started to recommend that at least half of a person's daily grain intake come from whole grains. The change led to a meaningful increase in the offer of wholegrain products.

Restrict advertising of unhealthy foods and counter misinformation

Should digital media be regulated similarly to advertising in order to avoid misinformation? Some policymakers are calling for restrictions on the promotion of unhealthy and unsustainable foods across media outlets (TV, radio, print, public spaces, and public transport). They also call for a ban on advertising unhealthy foods to children. The UK already restricts advertising on the Transport for London system (buses, subway, etc), which has resulted in reduced purchases of foods high in fat, salt, and sugar.

There will be detractors from advertising restrictions and improved food literacy – not least from food producers whose sectors benefit from the status quo, which makes communications about healthy eating even more important in the debate. Counterclaims may focus on the consumer's free choice and elitist agendas, or they may downplay the negative environmental and social impacts of unhealthy and unsustainable food systems.

While consumers need clear, accurate, and unbiased and information about food and healthy, sustainable diets, education alone is likely not enough to modify consumer behavior.

2. Make healthy food affordable and accessible

More often than not healthy foods are more expensive per calorie than less healthy foods. However, healthy options need to be affordable and accessible in addition to being desirable and well understood. When paired with strong communications and market education, affordability and accessibility create a formidable combination.

Recent food inflation caused the cost of staple items like bread, cheese, and milk to rise. These increases in food staples impact poorer households the most, as low-income families typically spend a higher proportion of their incomes on food. Low-income families are also more likely to have unhealthy diets because healthy diets are more expensive than diets high in fats, salt, and sugar. Highly processed foods also tend to have a longer shelf life, are readily eaten by children, and are faster to prepare.

Increasing food affordability and accessibility can take many forms, including tax incentives/disincentives, shortening supply chains, changes to product placement and product reformulation.

Make healthy foods cheaper

Progressive taxation of unhealthy and/or unsustainable foods could disincentivize or reduce consumption. At the same time, revenues from those taxes could subsidize low-income households and/or reduce the cost of healthier options. These food subsidies must be accompanied by strong consumer education. Taxes on red meat and processed meats could contribute to lower greenhouse gas emissions. Again, all stakeholders need to be consulted on these measures, as transformations at other stages of the food system could improve health or environmental impacts (for instance, through regenerative farming or grazing as part of a larger ecosystem).

Improve availability of healthy foods

Making healthy foods cheaper may be a first step to increasing availability by increasing demand, but shorter supply chains – farmers' markets, food boxes, and similar measures – could also increase consumer engagement and have educational value. Retailers can review product placement strategies to favor healthy options over those that are unhealthy or less sustainable. Admittedly, this may have to be forced rather than voluntary.

Reform(ulate) to reduce fats, salt and sugar in everyday products

Today, only 7% of breakfast cereals and 8% of yogurts marketed to children are low in sugar. Near-term policy changes could encourage food producers to create healthier options with lower fat, salt, and sugar – which may involve reformulations of existing products. A change such as this may come in response to taxes on unhealthy or unsustainable foods, or it could come from consumer pressure.

Governments are calling for tighter regulation on industry to force healthier food alternatives. As an example, the UK introduced the Soft Drinks Industry Levy (SDIL) in 2018 to tax drinks with added sugar and/or encourage reformulation. In the five years since introduction, the Obesity Health Alliance estimates that the SDIL has removed 48 million kg of sugar from the nation's diet every year. It led to an 8% relative reduction in obesity among 10–11-year-old girls (about 5,200 cases) and raised £334 million in tax revenue in the 2021/2022 tax year alone. A December 2022 Yougov poll showed 61% of the UK public were supportive of the Government expanding such industry levels if the money raised went to children's health programs.

Globally, the World Health Organization reports that at least 85 countries now have some sort of sugary drinks taxation. The World Health Organization (WHO) published a manual for sugar-sweetened beverage tax policies in December 2022, highlighting success stories from Mexico, South Africa and the UK.

3. Diversify diets

About 60% of all calories consumed come from rice, wheat, corn, and soy – that's it! Fewer than 15 crop types and five livestock species provide about 80% of our global food supply. A wider range of foods would allow greater crop rotation practices to maintain soil nutrients. Using more 'native' crops could produce larger yields in specific areas. Overreliance on just a few crop varieties also leaves the food system vulnerable to shocks and stresses and does little to prepare for climate change scenarios.

Based on current supply and demand factors for agricultural commodities, some experts believe that we are at peak food for many food/commodities and are predicting long-term annual production shortfalls (source: Seppelt et al, Ecology & Society 2014). Peak food is when agricultural production plateaus and does not grow any further and may even go into permanent decline. If this is the case, it must be counter-balanced by the advances made possible in future technology solutions.

4. Cut food waste

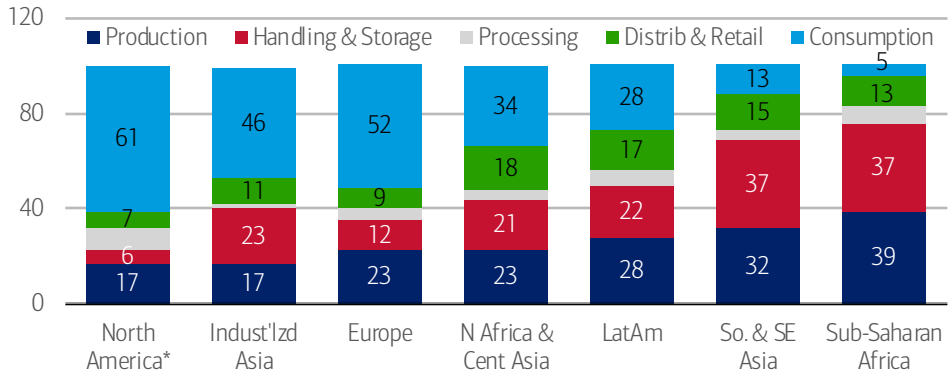
Food waste alone is responsible for 8-10% of global greenhouse gas emissions (source: Drawdown, by Paul Hawken, 2017). And growing food that is ultimately not consumed uses a land mass larger than China annually. This land also accounts for 25% of all fresh water consumption globally (source: Olio). Additionally, wasted or lost food costs the global economy over $1 trillion annually (source: FAO).

However, there is enough food produced globally to feed everyone. If just 25% of the food currently lost or wasted globally was used, it could feed almost 900 million hungry people.

Food waste occurs at all steps in the value chain, but there are telling regional differences. In more developed countries, the lower relative cost of food increases the incentive to waste. Food is also abandoned for cosmetic reasons, such as odd shapes or sizes that don't meet regulatory requirements. The most commonly wasted food items are potatoes, bread, rice, bananas, and apples. Some 46% of fruits and vegetables produced are thrown out and up to 40% of fruit and vegetable crops are discarded for being 'ugly' or misshapen (source: Too Good to Go).

In less developed parts of the world, more food is lost in the production phase, or due to lack of infrastructure to move it to market effectively or to keep food fresh.

Exhibit 7: Where in the value chain food loss occurs varies by region, % of calories lost or wasted
Developed countries see more waste at the consumption stage



Source: World Resources Institute (WRI), *Creating a Sustainable Food Future* (Note: * Includes Oceania)

A reduction in food waste could occur by bringing improved production and storage techniques to developing countries and launching initiatives to reduce waste at the consumption level in developed countries. Growing more food on an existing land base limits pressure on natural ecosystems; reducing food waste would save on water usage, labor and greenhouse gas emissions.

In response to this need, scientists are actively exploring ways to increase land productivity, including 1) more efficient use of fertilizers and pesticides, 2) improved irrigation and encouraging crops that use less water, 3) targeting food for direct consumption (rather than animal feed, for instance), 4) reducing food waste. Here are just a few examples of improvements:

- The UK launched a successful campaign to reduce food waste in 2007: by 2012, household food waste was down 21%, for a national reduction in total food waste of 14%. The UK has since become the first country to get halfway to its 2030 target of a 50% reduction in food waste.
- In Senegal, moving from hand threshing of rice to a mechanized threshing tool in the late 1990s reduced losses from 35% at harvest to just 1%.
- In developing countries, limited refrigeration and food processing often lead to large storage losses, yet innovative, cheap alternative storage systems provide powerful technical options to reduce handling and storage losses.

No single action will solve the food waste challenge, and some improvements require longer term, large-scale infrastructure development. But changes in technology, policy, and consumer behavior are all needed.

5. Let technology step in - AgTech solutions

As discussed in our recent publication, Feeding the future: How climate and agriculture intersect, the impact of climate change is multifaceted. The UN warns that climate change is set to expose up to 80 million more people worldwide to hunger by 2050. In fact, the global population, which is expected to grow by an additional ~2 billion people by 2050, will require the global agriculture industry to produce more food in the next 3-4 decades than was produced in the last 8,000 years (source: World Wildlife Foundation).

Innovations in agriculture technology (AgTech) can help to address environmental sustainability, food security, food safety, and farmworker health & safety by increasing efficiency and reducing input costs. The global AgTech market is expected to double to $40 billion by 2030, which includes bioengineering, precision agriculture and genetic modification. Target areas for sustainability in agriculture include seeds, pesticides, bacteria-based pesticides and products, and new cover crops.

What are potential long-term solutions?

Governments need to address food security in the longer term with advance planning, budget measures and policies for Sustainable Development Goals (SDGs) #1 (Zero Poverty) and #2 (Zero Hunger). The 2021 edition of the UN report, *The State of Food Security and Nutrition in the World*, makes six recommendations for increasing food security, including:

1. Integrating humanitarian, development & peacebuilding in conflict-affected areas

The majority of the chronically food insecure and malnourished live in countries impacted by insecurity and conflict. The UN highlights the need for policies that address reductions in immediate food insecurity as well as conflict mitigation. Conflict disrupts food systems, as we've discussed in the context of the invasion of Ukraine, and may also disrupt clean water, quality health services and sanitation.

Development efforts in conflict-ridden areas need to emphasize sustained positive change or moving populations away from a future need for humanitarian intervention. This may happen in tandem with emergency food assistance programs, but it should also address development of sustainable livelihoods which includes consistent access to food systems and improved nutrition.

2. Scaling up climate resilience across food systems

Agriculture as we know it today won't be as successful in a warmer world. Adaptation of crops, including more drought-resistant strains of seeds, for example, will be just one change demanded, but in some regions, crops grown will have to change altogether in response to warmer and/or drier climates. And where seawater inundation raises the salinity in water sources, rice production may shift toward aquaculture.

Climate change will also bring new technologies and methods to agriculture. For example, in India, low-cost plastic greenhouses protect produce from more severe storms. These 'polyhouses' also enable cultivation of a wider range of vegetables and facilitate more efficient water usage.

Governments will need to plan for climate change and integrate adaptation research into policies, budgets and funding plans, which will mean encouraging changes in types of crops to pursue (or reduce), what production systems may need relocating and creating incentives to facilitate investments.

3. Strengthening resilience of the most vulnerable to economic adversity

In 2020, the Covid pandemic caused global GDP to plunge. Governments globally reacted with social assistance, employment and social insurance programs and other emergency measures to support and protect populations. The UN suggests that social programs must continue to increase food security among vulnerable populations, first by supporting household incomes, but also by improving access to affordable, healthy diets.

4. Intervening along the food supply chains to lower the cost of nutritious foods

Healthy diets cost 60% more than diets that only fulfil requirements for essential nutrients. As previously mentioned, more than 57% of the populations of sub-Saharan Africa and Southern Asia cannot afford a healthy diet. The high cost of healthy diets is linked to greater food insecurity, malnutrition, child stunting and adult obesity, which in turn limit an individual's future prospects and impact on communities and economies.

Policies that look across the food chain can realize efficiency gains and reduce loss and waste. Incentives should favor more nutritious foods over heavily processed food choices. Additionally, nutritional quality of foods can be enhanced with post-harvest fortification: we have near universal iodization of salt, and wheat and corn flours are often fortified with iron, folic acid or vitamins. Fortifying foods can help to address micronutrient deficiencies in large portions of a population. Policies can also encourage food manufacturers to re-formulate products to reduce or remove elements like added salt or sugar or trans-fatty acids.

5. Tackling poverty and structural inequalities, ensuring interventions are inclusive

Poverty rates are three times higher in rural areas than urban areas; in fact, 80% of the extreme poor are rural. The UN advocates reducing extreme poverty in part through accelerated food systems transformation, something well-suited to the more rural setting for many poverty-stricken populations. This might include improving access to finance and productivity-enhancing technologies, increasing market integration for small farmers, and introduction of public-private-producer partnerships.

Additionally, food insecurity is 10% higher for women than for men (2020). Greater opportunities for women often improve outcomes for diet quality and family health. Policies that support women in the economy should also aim for better income and resource distribution.

6. Strengthening food environments and changing consumer behavior to promote dietary patterns with positive impacts on human health and the environment

Obese people now outnumber the underweight – that's food security, right? Not quite – a quarter of obese people are also malnourished. Changes in food systems in recent decades have increased availability of ultra-processed foods linked to weight gain but lacking in necessary micronutrients.

The policies recommended for changing consumer behavior rely on a combination of taxes and policies to curb consumption of less nutritious foods together with policies to support more healthy choices. Healthy choices would be supported through more nutritious school/hospital meal programs and better product labelling, while taxes on less nutrient-rich foods could encourage product reformulations and make nutritious foods more affordable.

Contributors

Vanessa Cook

Content Strategist, Bank of America Institute

Taylor Bowley

Economist, Bank of America Institute

Sources

Kay Hope

Research Analyst, BofA Global Research

Tatonga Rusike

Research Analyst, BofA Global Research

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