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# The future of food in the Americas

Peter Engelke and Matias Margulis



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Cover: Lettuce, corn, and other crops on a mountainous farm in Quito, Ecuador. (Unsplash/Andres Medina).

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## Bottom lines up front

The Americas have traditionally been a food-secure region, but interlocking ecological, technological, and political trends could change that.

Ecological risks pose the greatest threat to hemispheric food production, though rising protectionism and the resultant market uncertainty also have a destabilizing effect.

There is little margin for error, as even moderate shocks can have profound consequences, and food insecurity raises the risk of political and social instability.

## Introduction

Food security is at the core of national, regional, and global security. When societies are food secure, they stand a much greater chance of social and political stability; when they are food insecure, the opposite is true. Fortunately, the western hemisphere—the Americas—is a food-secure region. Although access to food is an ongoing challenge deserving greater attention in every country (as there are hungry people across the hemisphere), food abundance generally characterizes the Americas. Historically, the hemisphere has owed its unique position to several factors: a favorable natural resource base; equally benign geopolitical conditions; and extensive public and private cooperation to improve production methods and support innovation.

However, the future is not guaranteed to look like the past. Several key drivers of change are afoot that could alter the trajectory of hemispheric food security. These drivers bring with them uncertain outcomes, alternatively threatening the stability and productivity of current agrifood systems or offering hope that they could become even stronger and more resilient in the years to come.

This report assesses the future of food in the western hemisphere. It focuses on the major uncertainties that are driving change in the agrifood systems within the hemisphere and the world. These drivers represent risks or opportunities, and sometimes both. They include the decline of healthy and stable ecosystems, rapidly changing geopolitics, the erosion of multilateral institutions, increasingly inflationary and volatile food prices, the promise of innovation and emerging technologies, and generational shifts in farming and agricultural production.

These forces are not siloed. Rather, they intersect. There might be an awareness that these individual drivers of change represent obstacles to (or opportunities for) achieving durable food-security solutions in the future, yet many leaders see them as isolated challenges rather than as intersecting ones, obscuring the bigger picture.

The drivers discussed in this report therefore are not just accumulating layers of risks and opportunities. Rather, their interaction multiplies the system's dynamism. This emerging dynamism will require policymakers, business leaders, investors, and farmers to find innovative solutions in the face of a rapidly changing, and not entirely predictable, agrifood landscape. Yet such outlooks may not arise. Complacency is a big risk, if leaders believe that the status quo will continue to improve, requiring changes only at the margins. In such a situation, the hemisphere would become far more vulnerable to unexpected shocks because there would not be enough appreciation for how ecological, technological, geopolitical, and institutional changes are reshaping the future.

This concern is not hyperbolic. A very recent external shock—the COVID-19 pandemic—erased major progress that the hemisphere had made on reducing hunger, which should remind us that the foundations of food security remain shaky. Looking ahead, there is little margin for error, as even moderate shocks can have profound consequences.

## Food, society, and politics

Food security is at the core of national, regional, hemispheric, and global security. When societies are food secure, they stand a much greater chance of social and political stability; when they are food insecure, the opposite is true.

This axiom, although a simple one, has been demonstrated time and again throughout history. High food prices occasioned by war, poor harvests, or high taxation of the peasantry (or all three) preceded the onset of the [French Revolution](#) in 1789 and the Russian revolutions of 1905 and 1917, to name just a couple of famous examples from history.<sup>1</sup>

Today, despite far greater agricultural production at national and global levels, such disturbances still recur with alarming frequency: The [2007–2008 food riots across Africa](#) followed commodity price spikes for agricultural inputs (oil, principally) that inflated the price of food; the 2010–2011 [Arab Spring](#) was preceded by food-price spikes owing to multiple breadbasket harvest failures across several world regions; and Russia's [war in Ukraine](#), which disrupted wheat, fertilizer, and natural gas exports, blocked the flow of agricultural inputs and outputs and dramatically raised food prices globally. Millions of additional people became food insecure around the world.<sup>2</sup>

No other good has such an impact on society and politics as food because people need to eat every day. “[Food riots are as old as civilization itself](#),” as one food security analyst summarized the impact of food on social and political stability.<sup>3</sup> Often, it will only take a single big food-price shock to change social and political dynamics within a country or even an entire region. Although high food prices have a disproportionately negative impact on vulnerable, poor, and fragile countries, they also can have an outsized impact on otherwise wealthy and stable ones. Japan offers a recent example. In July 2025, [soaring rice prices in Japan](#) directly contributed to the defeat of Prime Minister Shigeru Ishiba's Liberal Democratic Party in parliamentary elections.<sup>4</sup>

The Food and Agriculture Organization (FAO) adopted a definition of food security at the 1996 World Food Summit (see box 1 for the history of the concept), which has persisted with only slight revision:

Food security exists when all people, at all times, have physical, social, and economic access to sufficient safe and nutritious food that meets their dietary needs and food preferences for an active and healthy life.<sup>5</sup>

This definition contains four main dimensions, or pillars:

1. The physical, supply-side availability of food, typically assessed at the national level and consisting of domestic agricultural production plus food imports.
2. Household access to food, which is dependent on household incomes and food prices (set by a combination of market and nonmarket forces).

### Box 1: Food security: History of a concept

Although concerns surrounding hunger and famine are ancient, dating to human prehistory, the formal concept of food security is only about a half century old. Its institutional origins are often traced to a 1974 World Food Conference that defined the concept in terms of the global supply of food. The thinking at the time linked hunger with global supply (chiefly of staple crops, especially cereals), the idea being that hunger would be solved through adequate supply. Over the following decades, the concept of food security evolved in multiple key respects including: moving away from a sole focus on food supply and toward food distribution and access, especially by households and individuals; an acknowledgment that food security is not just a function of quantitative intake of calories but also of nutrition; the acceptance that importing food is a legitimate national means of achieving food security (as opposed to defining a food-secure country as one that domestically produces the entirety of its needs); an incorporation of social considerations (for example, inequalities in food access owing to ethnicity or gender). The definition adopted at the 1996 World Food Summit has become the default definition of food security: “Food security exists when all people, at all times, have physical, social, and economic access to sufficient, safe and nutritious food to meet their dietary needs and food preferences for an active and healthy life.” (The word “social” in this definition postdates the 1996 summit.)

Source: Hector E. Maletta, *From Hunger and Food Security: A Conceptual History*, Universidad del Pacífico, 2024 Revision, [https://papers.ssrn.com/sol3/papers.cfm?abstract\\_id=2484166](https://papers.ssrn.com/sol3/papers.cfm?abstract_id=2484166).

3. Nutritional intake by individuals, which is not the same thing as caloric intake; nutrition depends in part on dietary diversity.
4. Stability of the first three pillars over time.<sup>6</sup>

A couple important pieces of the food security puzzle are missing from this formulation. One is ecological stability. Food security depends on the sustainability of the underlying Earth systems that are essential to food production. Maintaining the integrity of these Earth systems, including the integrity of the world's soils, water, biodiversity, nutrients, and atmospheric conditions (precipitation and temperature, primarily), is critical. A second missing piece is the stability of the international sys-



Flint corn, seeds, beans, peppers, and other dried goods are displayed on a wooden wall-mounted rack in the indigenous town of Zinacantán, México. (Unsplash/Alan De La Cruz)

tem, specifically stability of a rules-based trading order that ensures that food moves easily from food-surplus to food-deficit countries. Such a trading order improves food security through enhancing agriculture productivity and (under emergency conditions) enables swift distribution of humanitarian aid in the form of food. Such a system helps to avoid trade conflicts and establishes international norms for the notion that food security is in the collective interest and responsibility of all parties.

The capacity of the current international system to encourage global production and trade in food has increased over time, dramatically so over the past several decades: The FAO reported that in 2021, the world traded some [5,000 trillion kilocalories of food](#), more than double the amount that it did in 2000.<sup>7</sup> A central piece of this equation has been the existence

of key multilateral institutions that have had the credibility and authority to provide a forum for states to negotiate trade agreements, resolve trade disputes, and monitor and enforce commitments.

None of these conditions should be treated as a given. Looking ahead, the odds are high that the world will become more dynamic rather than less so, with no guarantee that dynamism will have more upside than downside. To adapt and thrive within changing conditions (with both positive and negative impacts), the world's agrifood systems will need to become more resilient and adaptable. The good news is that humankind has the tools—or can develop the necessary tools—to ensure such outcomes.

## Food security in the Americas

The western hemisphere is in a fortunate position regarding agriculture and food. Its natural endowment is significant, consisting of arable soils and plentiful rainfall distributed across numerous regions suitable for agriculture (temperate, subtropical, and tropical). The hemisphere’s highly productive agriculture benefits from relatively stable political and economic environments, medium-to-high income levels, and reasonably well-functioning domestic and international markets, all stimulated by public, private, and academic sector investments in agricultural research and development (R&D).

As a result, the hemisphere’s aggregate production capacity in both staple and specialized crops gives it an indispensable role in providing domestic food security but also meeting the world’s food needs.

There are several caveats to this picture, which this report endeavors to make clear. First, several driving forces are changing baseline conditions that will alter the hemisphere’s future, for better or worse. Second, the Americas might be fortunate in many respects, but it is not a single bloc of countries acting in unison. Trade disputes, unfortunately, are becoming a sharper and more common part of the hemisphere’s diplomatic landscape, for example. Finally, as this report also makes clear, food security is not just about supply-side agricultural production. Food insecurity remains a problem in the Americas as it does everywhere in the world.

### Supply side: Agricultural production in the Americas

The five largest primary crop producing countries (by tonnage) in the world are all in the Americas: Brazil, the United States, Argentina, Mexico, and Canada. As shown in table 1 and figure 1, the hemisphere also contains top exporters of all four primary crops: soybeans, corn, wheat, and rice. The largest producers of food in the Americas are, therefore, critical for ensuring global food security. What happens in the region matters greatly to the rest of the world, because developments in the Americas have an outsized effect on global trade in food.

In addition to the largest primary crop producers, the Americas also lead in the production of a wide range of specialty crops, including coffee, avocados, lemons, limes, oranges, blueberries, cranberries, quinoa, almonds, and more. Numerous countries in the hemisphere are leading producers of these crops. For example, Peru is in the top three global producers of avocados, blueberries, and quinoa, while Colombia is a leading global producer of coffee, sugar cane, avocados, and agave fibers.

For many countries in the Americas, agriculture continues to be a critical piece of their national economies. As shown in figure 2, agriculture’s share of gross domestic product (GDP) is above five percent in most countries and is above ten percent in a handful of countries in Central America, the Caribbean, and South America. Over the 2023–2024 period, [agriculture’s share of Brazil’s GDP](#) was 6.24 percent while its agricultural exports represented nearly half (49 percent, at \$164 billion) of [Brazil’s total exports by value](#). Both figures demonstrate the spectacular growth in Brazil’s intensive farming, especially of soybeans (see *also* box 2).<sup>8</sup>

### Demand side: calories and nutrition

The FAO’s definition of food security, which is broadly accepted among experts, emphasizes that food security is as much about access and affordability, especially by vulnerable populations, as it is about the aggregate production of food. If people cannot access a nutritious diet at affordable and stable prices, they will not be food secure.

In recent decades, the western hemisphere has gradually decreased its level of food insecurity. In comparative terms, it has done well. Between 1990 and 2015, for example, Latin America and the Caribbean (LAC) was the only region in the world to [reduce hunger by half](#).<sup>9</sup>

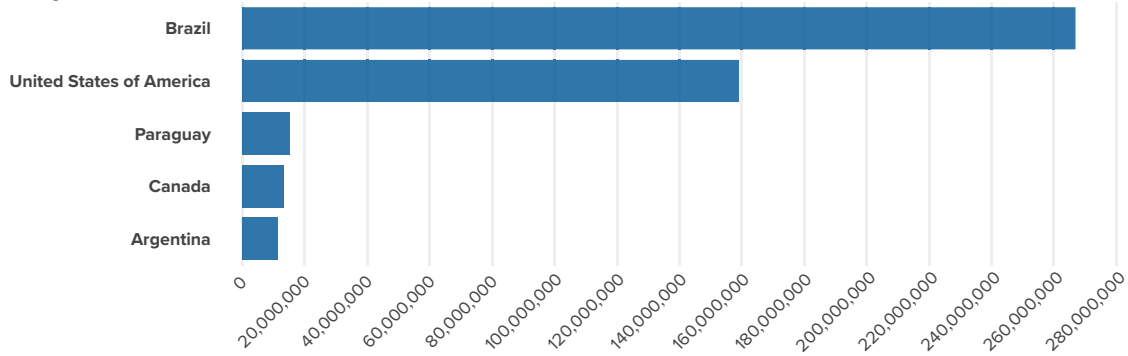
**Table 1: Top global exporters of primary crops by volume**  
(tons exported/year)

Overall	Soybeans	Corn	Wheat	Rice
1. USA	1. Brazil	1. USA	1. Australia	1. USA
2. Brazil	2. USA	2. Brazil	2. Russia	2. Brazil
3. Argentina	3. Paraguay	3. Argentina	3. Canada	3. India
4. India	4. Canada	4. Ukraine	4. USA	4. Uruguay
5. Canada	5. Argentina	5. Romania	5. France	5. Paraguay

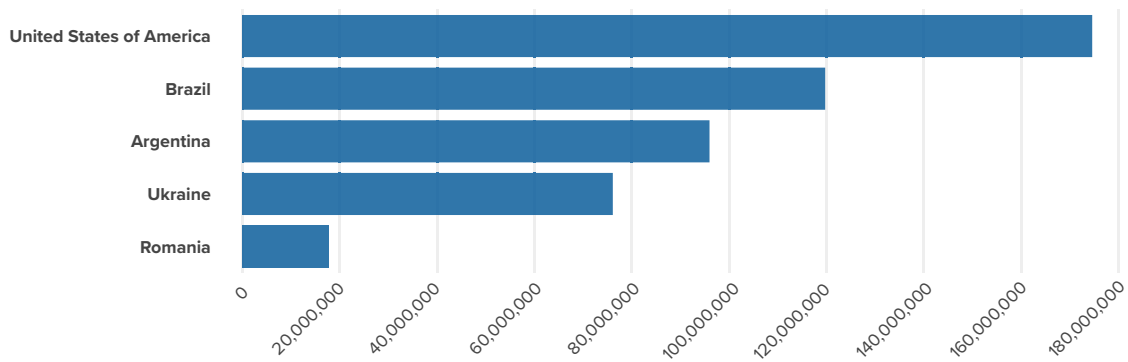
Source: Table generated from FAOSTAT data, accessed August 30 2025.

**Figure 1: Top global exporters of primary crops by volume (total tons exported/year - 2021-2023)**

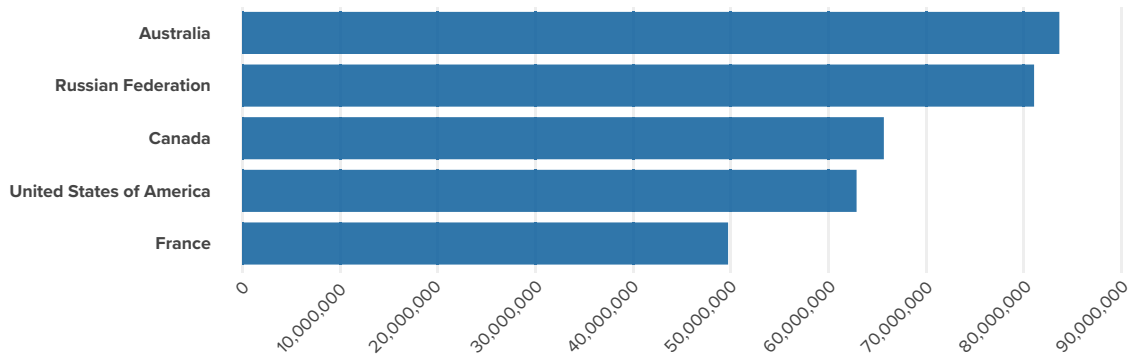
### Soya bean



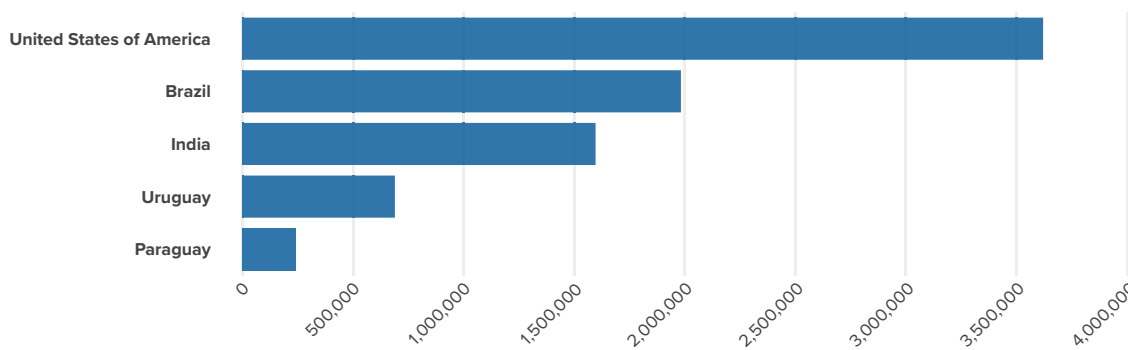
### Maize (corn)



### Wheat

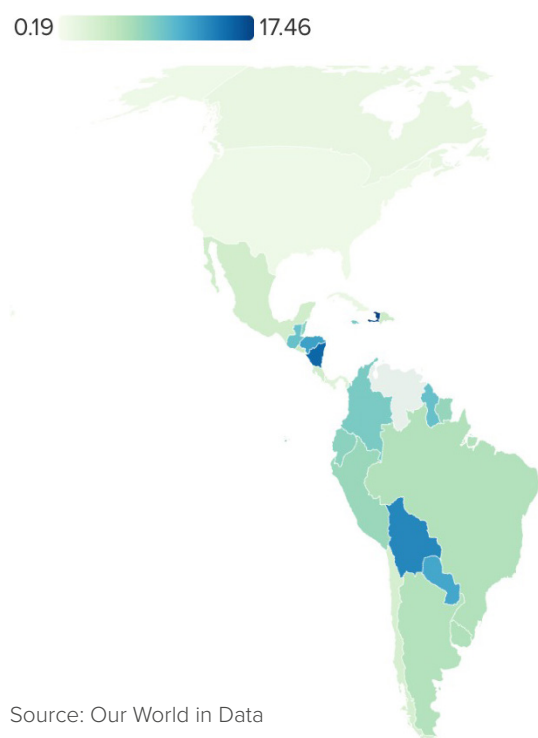


### Rice



Source: FAO.

**Figure 2: Share of GDP from agriculture, 2023**  
Agriculture, forestry, and fishing, value added (% of GDP)



Source: Our World in Data

As shown in table 2, the FAO’s latest data indicates that the western hemisphere continues to be relatively food secure. Over 2022–2024, the two major subregions in the Americas, North America on the one hand and LAC on the other, performed better than the world average. This is reflected in several key metrics related to the reduction of caloric intake of food, in particular undernourishment (calorie deprivation over time), severe food insecurity (a measurement of households going without food for periods of time), and the prevalence of wasting in small children (an indicator of undernourishment). On metrics related to poor diets such as overweight and obesity (both of which are indicators of too many calories rather than too few), the Americas performed less well.

These outcomes are consistent with levels of wealth. Although an oversimplification, as national wealth increases, [per capita consumption of food rises](#).<sup>10</sup> Most countries in the Americas are classified by the World Bank as either [high- or upper-middle-income](#) countries.<sup>11</sup> (Note, however, that lower-income populations, including those within both lower- and higher-income economies, are at [increasing risk of obesity](#), in part due to easy availability of inexpensive processed foods with low nutritional value.)<sup>12</sup>

**Table 2: Selected indicators of food insecurity**  
2022-2024 (%)

	Percentage of children under 5 years affected by wasting (%)	Prevalence of severe food insecurity in the total population (%; 3-year average)	Prevalence of undernourishment (%; 3-year average)	Percentage of children under 5 years of age who are overweight (modelled estimates) (%)	Prevalence of obesity in the adult population (18 years and older) (%; 2022 only)
Eastern Asia	1.50	1.00	0.00	9.60	8.10
Europe		1.80	0.00	7.60	21.40
Latin America and the Caribbean	1.30	8.70	5.40	8.60	29.90
Northern Africa	5.20	12.10	9.60	8.40	31.70
Northern America	0.20	1.10	0.00	9.60	40.30
Southern Asia	13.70	17.80	12.30	3.00	9.70
Sub-Saharan Africa	5.60	23.70	21.90	3.60	11.40
World	6.60	10.30	8.50	5.30	15.80

Source: Adapted from FAO, The State of Food Security and Nutrition in the World 2025, Annex 1A: Statistical Tables to Chapter 2, Table 1a



Fully stocked shelves of packaged rice and beans for sale in a grocery store in Utiva, Costa Rica. (Unsplash/Bernd Dittrich)

There are several countries in the Americas that underperform. According to the FAO, over half (54.2 percent) of Haitians are undernourished, while just 10.7 percent of adults are obese (compared with over 40 percent of US citizens); Haiti is the most fragile state in the Americas. Although undernourishment is much lower across the hemisphere now than in previous decades, it nonetheless remains high in several countries including Bolivia (21.8 percent), Honduras (14.8 percent), Ecuador (12.1 percent), and Guatemala (11.8 percent).<sup>13</sup>

There is a **gendered dimension to deprivation**, with women being more likely to be food insecure than men. This difference worsened during the COVID-19 pandemic, increasing to a 3.3 percent gap between the genders in Latin America in 2021, before reducing again by 2024. In North America, the gap has worsened every year since 2020, from 0.1 percent in 2020 to 0.5 percent in 2024.<sup>14</sup>

## Box 2. Case study: Brazil

Brazil might be the single most interesting agrifood production story in the entire hemisphere, and perhaps the most important as well. Brazil today is one of the world's great breadbaskets, being among the largest producers and exporters of primary crops and many specialized ones as well. Yet Brazil was a net food importer for much of its history, becoming a net exporter only over the past several decades. Starting in the 1960s, an agrifood production revolution occurred in Brazil, based on both extensification (expansion of agricultural land) and, just as critically if not even more so, an intensive modernization program based around research, capital investment, and technological development. Brazil's modernization program included cutting-edge research conducted by universities and its now world-famous agricultural research agency, Embrapa, into tropical soybean and corn cultivation. These efforts led to new seed varieties and technologies that in turn enabled primary crop production to occur at scale in vast regions of Brazil including the Cerrado. Over roughly the same period, the liberalization of agricultural trade allowed Brazil to grow into a global agricultural exporter. On the demand side of the food security equation, a combination of rising wealth plus innovative social safety programs, including the Bolsa Familia and Fome Zero (zero hunger) programs, helped to reduce hunger among the poor in Brazil. Yet Brazil's story has not been without its downsides, which in the past have included high deforestation rates in the Cerrado and Amazon regions, and related ecological damage.

Sources: "Trajetória da agricultura Brasileira," Embrapa, accessed October 7, 2025, <https://www.embrapa.br/en/visao/trajetoria-da-agricultura-brasileira>; <https://ifz.org.br/brazil-off-the-hunger-map-again-what-this-teaches-us/>; and Barbara Moran, "Farmers and Forests: Economist and Geographer Rachael Garrett Wants to Save Brazil's Rainforest, while Helping Farmers and Ranchers Thrive," The Brink, Boston University, accessed October 7, 2024, <https://www.bu.edu/articles/2018/deforestation-in-brazil/>.

## Drivers of change in the Americas and beyond

Strategic foresight asserts that the future likely will not conform to our expectations. It is risky to assume that the future will consist of a simple linear extrapolation of one or two current trends. Hence, the discipline focuses as much on the intersection of the drivers that together will drive multiple possible futures. Food security in the Americas is no different, as there are several significant intersecting drivers of change that will shape the hemisphere's future.

### Changing ecology

Ecological risks are among the greatest threats to food security in the Americas. A rapidly changing climate creates the primary set of risks, from rising heat and worsening drought and flooding. Other ecological risks exist as well in specific subregions, for example deforestation, biodiversity loss, and soil erosion and degradation.

Of these changing ecological conditions, perhaps the worst for agricultural production is the combination of drought and heat, or “dry-hot” conditions. Trend data show that such conditions are becoming more frequent and intense. An Organisation for Economic Co-operation and Development (OECD) [study](#) of drought patterns, released in July 2025, found that the share of land globally exposed to drought has doubled since 1900.<sup>15</sup>

Dry-hot conditions threaten to become more frequent across the Americas. In North America, for example, scientists [estimate](#) that the now decades-long megadrought that has impacted northern Mexico and the southwestern United States might be the worst in 1,200 years.<sup>16</sup> In South America, the frequency of dry, hot, and flammable weather has [increased](#) across much of the continent since the early 1970s.<sup>17</sup> Such changes are highly consequential for agriculture. A 2021 [study](#), for instance, showed that increases in Brazil's dry-hot conditions, combined with the impacts of deforestation on temperature and rainfall, have already pushed 28 percent of the country's agricultural land beyond its optimum productive range, with further projections of 51 percent by 2030 and 74 percent by 2060.<sup>18</sup>

One of the more discouraging climate-driven outcomes is the possibility, even probability, of future [multiple breadbasket failures](#) (i.e., “simultaneous harvest failures across major crop-producing regions” around the world).<sup>19</sup> Climate change [likely](#) will make [such failures](#) more common in the future.<sup>20</sup> A 2021 [study](#) projected that the probability of multiple harvest failures globally was “as much as 4.5 times higher by 2030 and up to 25 times higher by 2050.”<sup>21</sup> Another, focusing on the [impacts](#) that oscillations such as the El Niño-Southern Oscillation (ENSO) and North Atlantic Oscillation (NAO) might have under future warming, concluded that shifting ENSO and NAO patterns might “expose an additional 5.1–12% of global croplands” to such oscillations, with strong ENSO/NAO negative phases “likely to cause simultaneous yield losses across multiple key food-producing regions.”<sup>22</sup>

The Americas, home to several of the world's major producers of staple crops including soybeans, corn, and wheat, faces the possibility of multiple breadbasket failures. It is entirely possible that in the years to come, severe dry-hot conditions could strike simultaneously in the United States, Mexico, Brazil, and Argentina. The consequences for agricultural production and global food security would be enormous.

A changing climate also will negatively impact most—perhaps all—of the other crops grown across the Americas. Coffee and banana production, to name just two examples, likely will be severely affected by increased heat and altered precipitation patterns. A recent scientific study conducted by the University of Exeter forecasts that [60 percent of the regions](#) currently producing bananas—including regions in Central America—will be unable to do so before the end of this century, owing principally to increased temperature.<sup>23</sup> The world will not have to wait nearly that long to see such effects because climate-driven impacts are already occurring. In 2024, the [FAO reported](#) a 38.8 percent annual increase in global coffee prices “primarily driven by supply-side disruptions, stemming from adverse weather conditions” including drought, heat, and flooding in major coffee-producing countries including Brazil, Vietnam, and Indonesia.<sup>24</sup>

Because farmers are on the receiving end of changing ecological conditions, it is critical to understand how they are impacted by such change and how they process those changes.

Doing so will assist in defining the policy and investment options with the greatest likelihood of mass adoption on farms and in farming communities. Farmers will be impacted differently depending on where in the hemisphere they farm, their farm sizes and resources (financial and otherwise), whether they are subsistence farmers or integrated into national, regional, and global markets, and the types of crops they grow. Taken together, farmers do not experience changing ecological conditions in the same way at the same time. Smallholder farmers in poorer settings, for example, will be at [greatest risk](#) from climate-driven impacts given the small size of their landholdings and a lack of access to insurance and other sources of resilience.<sup>25</sup> It follows that [farmers' perceptions](#) of ecological impacts on their farming operations will not follow a straight line. Farmers will parse the impacts of environmental hazards such as drought, heat, or flooding differently.<sup>26</sup>

In sum, ecological change dramatically increases the risk of declining crop yields while shifting the locations where crops can be grown. Potentially, ecological change with impacts at scale could generate significant shortfalls in global food supply, causing market panics, high prices, hoarding, and a breakdown of trade. Food insecurity would spike.



A tractor trailer fills seed boxes in a Michigan field. (Unsplash/Loren King)

## Geopolitical and geoeconomic turbulence

A second set of risks stems from rising geopolitical and geoeconomic competition and uncertainty. An open, rules-based trading system has been essential to improving hemispheric and global food security. Trade in that system has precipitated more economic integration of the region—more bilateral trade and investment agreements, greater investment flows, and exchange of technical know-how—which benefits food security via higher economic growth, greater employment opportunities and rising incomes, poverty reduction, and general economic dynamism. It also has allowed governments to see that a set of policies, including more focus on innovation and competitiveness and less on trade distortions and protectionism, is the best path forward.

Yet this trajectory is now subject to geopolitical risk. Over the past two decades, the global food trading system has been disrupted by several significant events including wars and related phenomena (e.g., civil strife, terrorism). Such events generate (largely) unanticipated shocks to agricultural inputs, supply chains, and agrifood exports, resulting in higher production prices and, therefore, consumer prices. The most well-known and significant of these events is the full-scale war in Ukraine, which upon its onset in 2022 immediately resulted in higher global prices for key commodities including natural gas and nitrogen fertilizers (because Russia is the world’s third-ranking [natural gas exporter](#) and natural gas is a critical input for nitrogen fertilizers); potash fertilizers (primarily from Russia

and Belarus) and wheat (before the war, Ukraine was the world’s [seventh-largest wheat exporter](#)).<sup>27</sup>

Although global input markets, for example for fertilizers, are broadly resilient, at the same time they also clearly are affected by geopolitical turbulence arising from trade policies, sanctions, shocks such as wars, and other phenomena. While the war in Ukraine is an important case, it hardly exhausts the list of current examples. In July 2025, the [World Bank](#) said that sanctions and restrictive trade policies “are playing an increasingly significant role in reshaping global fertilizer markets,” citing China’s discretionary export restrictions on nitrogen and phosphate fertilizers to protect its domestic agriculture, and the [European Union’s \(EU\) June 2025 tariffs](#) against Belarusian and Russian fertilizers to reduce EU dependence on these countries.<sup>28</sup>

An even more difficult problem is the risk that the hemispheric and global agrifood trading system is returning to a protectionist order, which risks the benefits that have accrued since the emergence of a rules-based trading model in the 1990s for agriculture established under the World Trade Organization (WTO) 1994 Agreement on Agriculture. Under that model, countries tended to place high tariffs only on a few politically sensitive crops (such as sugar or cotton). Yet today’s rising protectionism is much broader, affecting a larger number of crops, including staple crops, and implemented by an ever-longer list of countries. The result is likely to undermine food security by increasing food prices—with impacts falling most harshly on

poor households—and reducing profitability by raising both producers’ and exporters’ costs, lowering investment and decreasing productivity.<sup>29</sup>

Over the past several decades, the largest agricultural producers in the Americas, including the United States and Brazil, have become the world’s largest agrifood exporting nations. Southern Cone states have pushed agricultural exports as key pieces of their [export-led growth](#) strategies, especially to China given its rapidly growing demand for commodities.<sup>30</sup> With such a high dependence on global agricultural exports, the biggest agricultural producers in the western hemisphere ought to be the most heavily invested in a global agrifood free-trading regime. Tariff and nontariff barrier uncertainty negatively impacts agrifood producers, processors, distributors, and consumers.

These disruptions have other distorting effects. Trade patterns within the Americas, and between the Americas and the rest of the world, are shifting because of trade tensions. China’s behavior in international agricultural markets is a significant example, with direct relevance to the western hemisphere. A decade ago, China imported more agricultural goods from the United States than from Brazil; today, China imports almost twice as much from Brazil as from the United States, including in soybeans and corn. China’s shift toward non-US sources (including but not limited to Brazil) began even [before the 2018 trade dispute](#) with the United States. In addition to supply diversification, China also has dramatically [increased its stockpiling](#) of food (grains, soybeans, and frozen meat), which it defines as a strategic good.<sup>31</sup>

Further, China’s decoupling from the US agricultural market has had major consequences for trade patterns in that it has helped Brazil become the world’s largest exporter of soybeans. [Since the 2018 Sino-American trade dispute](#), Brazil’s global soybean exports have increased by 40 percent, while those from the US have remained flat.<sup>32</sup>

Geopolitical and geoeconomic turbulence has distorting effects on global trade in food. The biggest concern for global food security is the impact on food prices, both in terms of inflation but also price variability. Such turbulence also can generate trade disputes and, therefore, contribute to fractured relations among states. After the United States [levied tariffs](#) in August 2025 of up to 50 percent against certain Brazilian agricultural goods including coffee, beef, and sugar, Brazil immediately [asked the WTO](#) for consultation, arguing that the tariffs violate international trade rules.<sup>33</sup> A likely immediate effect of the tariffs is to [hasten Brazil’s interest](#) in developing [alternative markets](#) for its agricultural products, including with China.<sup>34</sup> A second and (often) underappreciated concern is that unstable trade rules and fluctuating market access make it more difficult for farmers to plan and make production and investment decisions, increasing their economic uncertainty.

Geopolitical tensions and rising trade protectionism are also likely to lead to slower economic growth. This is important because in the Americas, as everywhere, economic growth coupled with rising incomes are keys to increased food se-

curity. If slower economic growth combines with higher food prices owing to increasing trade friction, then there is a greater risk of more food insecurity in the future. International food trade is being shaped increasingly by geopolitical considerations rather than market signals, thereby realigning trade patterns in unpredictable ways.

## Institutional uncertainty

Multilateral institutions are a hallmark of the current international order. Most of the world’s biggest and most important institutions that exist today were created after 1945. Although not without criticism, much of it deserved, these institutions have been central to building a global order which has delivered unprecedented—if also uneven—prosperity. When it comes to trade, the data say as much: [Today’s global trade](#) is 45 times by volume and 382 times by value greater than it was in 1950. Moreover, since the mid-1990s, global trade growth has accelerated, averaging 4 percent growth by volume annually and 5 percent by value.<sup>35</sup>

However, the multilateral institutions that have facilitated this growth in trade now are under enormous pressure from all sides. One reason is that the world’s largest trading powers as well as many smaller ones have been willing to bend or even break established norms and international trade law. China, for example, has [taken advantage](#) of its status as a developing country under the WTO to engage in unfair practices, including massive subsidies, heavy use of state-owned enterprises, forced technology transfer, and protection of its domestic market (for example, limiting foreign companies’ and investors’ access to its technology and financial markets).<sup>36</sup> Further, the United States is [preventing](#) the WTO’s Appellate Body from functioning as designed, preventing the organization from enforcing its own rules.<sup>37</sup>

Such developments are important because they create uncertainty surrounding trading rules and thereby increase friction among countries when it comes to trade. Even worse, these developments create space wherein the breaking of rules by some countries prompts others to believe they can as well. Both India and Indonesia, for example, recently have taken advantage of the lack of a functioning Appellate Body to implement policies that likely are in violation; Indonesia instituted a ban on nickel exports (to induce nickel processors to relocate to Indonesia) while India heavily subsidized steel and pharmaceuticals. By some estimates, two-thirds of initial WTO rulings made about trade disputes [have been appealed](#), but the Appellate Body cannot convene itself.<sup>38</sup>

The decline of multilateral institutions is significant because the Americas benefit more than other regions from an open global trading system in agricultural goods, per table 1 above. Agriculture always has been a controversial topic in trade negotiations, extending back to the [origins](#) of the Global Agreement on Tariffs and Trade (GATT) in the 1940s. Despite this fact, functional multilateral institutions are [valuable](#) because they create a stable, rules-based global marketplace that in turn enables trade in food at scale.<sup>39</sup>

In sum, a breakdown of multilateral institutions and rising protectionism portend headwinds for agriculture in the years to come, increasing risks and possibly disincentivizing investments by farmers. Such developments erode the open agri-food trading system that globalization made possible. The Americas have utilized open trade to expand agriculture production and exports and, therefore, is most at risk from the unraveling of that system.

### Price inflation and variability

The price of food is a core metric for food security: For the world’s consumers, the most desirable food prices are both low and stable over time. Food insecurity is made worse when the opposite applies: rapid price inflation combined with high price variability. Unfortunately, as shown in figure 3, the latter situation has characterized global food prices for much of the past quarter century.

Since the 2000s, shocks have occurred with such frequency that prices settle on a new higher baseline rather than returning to previous levels. The FAO noted this trend as early as 2009: Prior to the 2006–2008 global food-price shock, “real prices [in food had] shown a steady long-run downward trend punctuated by typically short-lived price spikes.” But by the

mid-2000s, the FAO [observed](#), this trend no longer held. As of 2008, its own food-price index “still averaged 24 percent above 2007 and 57 percent above 2006.”<sup>40</sup> Indeed, as shown in figure 3, since the mid-2000s, global food prices have risen to a new and higher level after each exogenous shock. The most recent global shocks—the COVID-19 pandemic followed by the full-scale invasion of Ukraine—has had the greatest impact on sustained high food prices.

The upward trend in the price of food has important implications for food security around the world. Food is less affordable; households have more difficulty consuming a healthy diet, and they are forced to switch to less nutritious foods and/or reduce their total consumption of food. This cost-of-living crisis erodes food security gains and threatens to make societies less stable.

Food-price inflation and volatility is as problematic in the Americas as elsewhere in the world, increasing food insecurity and becoming a key social and political issue. In Latin America, rising food prices have been a major [driver of inflation](#) across the region.<sup>41</sup> In some cases, such as [Argentina](#), food prices have contributed to extreme inflation rates.<sup>42</sup> In North America, food prices also continue to rise and are a [major cause](#) of the cost-of-living crisis experienced by many households.<sup>43</sup>

Figure 3: Global Food Price Index



Source: International Monetary Fund.

### Investment: Innovation, technology, and infrastructure

Public- and private-sector investments in on- and off-farm innovation and productivity have been critical enablers of modern agrifood systems. A question to be answered in the years to come is whether such investments will increase agricultural productivity and sustainability enough to match or exceed demand-side pressures for more food (from population and income growth), even as baseline conditions from other drivers—ecological, institutional, geopolitical—become more challenging.

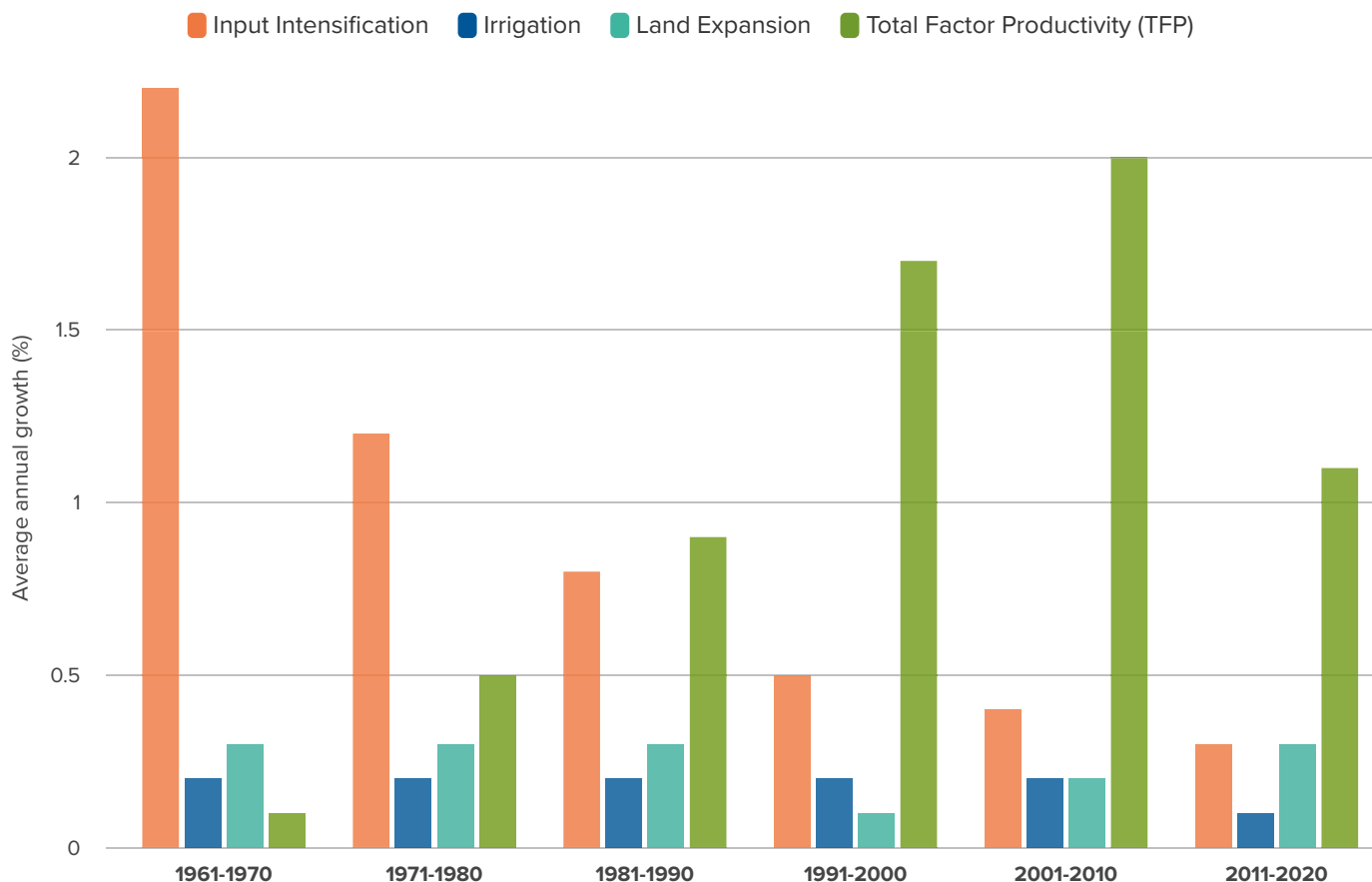
Historically, on- and off-farm innovation and productivity increases, which stem from process and technological developments plus infrastructural improvements, have been fundamental to increasing the supply of food to meet rising demand. Since the 1990s, global efficiency gains have been the largest contributors to global growth in agricultural output. Efficiency gains have far *outstripped* the other contributors, including the use of more inputs per hectare of land, greater extension of irrigation to cropland, and expansion of new agricultural land (e.g., expansion of agriculture into previously forested lands).<sup>44</sup>

In agriculture, efficiency is gauged using *total factor productivity* (TFP), a metric of inputs relative to outputs. If total on-farm output (e.g., volume of crops produced) is growing faster than inputs (defined as labor, capital, and material resources), then TFP is increasing.<sup>45</sup>

That is the good news. The bad news is that global TFP growth is now slowing. After steadily increasing from a 0.55 percent annual growth rate during the 1970s to a peak of 1.97 percent annual growth rate in the 2000s, TFP has since fallen back to 1.1 percent annually (figure 4). *Within the Americas*, the picture is even more dire. Between 2011 and 2020, TFP increased by only 0.9 percent annually in Latin America and the Caribbean. In North America, typically at the global forefront in productivity and efficiency gains, TFP grew over the same period by just 0.2 percent annually. The Americas significantly lagged the global average (figure 5).

The decline in TFP over the past fifteen years is a worrisome development, as it threatens to undermine progress toward an elusive goal, which is to produce enough food to meet growing global demand while simultaneously retaining on-farm profitability and reducing environmental impact. Analysts

**Figure 4: Global sources of output growth, 1961-2020**



Source: <https://globalagriculturalproductivity.org/2024-gap-report/>

at the US Department of Agriculture recently made this argument. “At the global level,” they wrote, “improvements in agricultural productivity have not been rapid or universal enough to make a significant dent in the effect of agriculture on the environment.” If TFP were to continue to slow down in the future, the impact “could [negatively] affect food prices, [lead to] the expansion of agriculture into more natural lands, and [threaten] global food security.”<sup>46</sup>

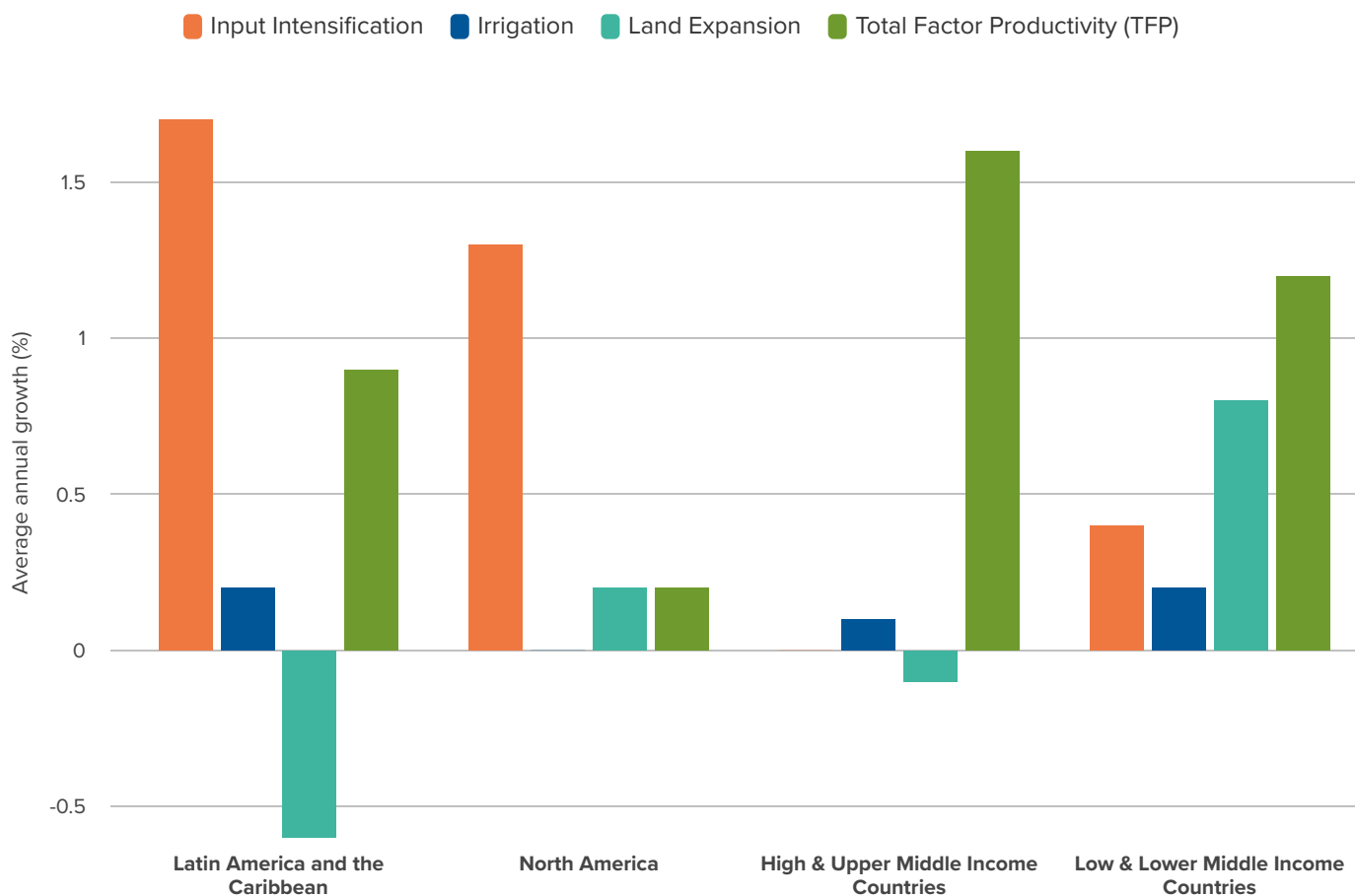
Nor is underinvestment in innovation the only form of investment risk. Despite the hemisphere’s reliance on trade in agriculture and food, infrastructure across much of the Americas remains underdeveloped. The so-called infrastructure gap in the Americas refers to how the hemisphere’s ports, railways, bridges and roads, telecommunications, and other forms of infrastructure are insufficiently robust in kind, quality, and/or maintenance. In 2021, for example, the Inter-American Development Bank (IDB) estimated that countries in Latin America and the Caribbean alone would need to invest \$2.2 trillion in “water and sanitation, energy, transportation, and telecommunications infrastructure” to meet the UN’s Sustainable Development Goals. The IDB’s estimate included not just funds for

new infrastructural investment but for maintenance and replacement as well (at some 41 percent of the total).<sup>47</sup>

North America is not exempt from this problem, as both Canada and the United States face large infrastructure deficits. As is well-known, for decades the United States has largely underinvested in infrastructure. Despite passage of the 2021 Infrastructure Investment and Jobs Act, which directed the federal government to spend some \$1.2 trillion over five years on infrastructure, investment levels in the United States will remain insufficient absent systematic changes in how funds are raised by local, state, and federal governments.<sup>48</sup>

Likewise, in Canada, the infrastructure deficit, which is estimated at \$196 billion, is of particular importance to that country’s globally important agricultural exports, which include foodstuffs such as grains (wheat, principally) and key agricultural inputs such as fertilizers, largely produced in the country’s vast interior.<sup>49</sup> Getting bulky grains and inputs to external markets more cheaply and efficiently will require Canada to upgrade its transport infrastructure, including railway lines, bridges, and ports, which are key in all circumstances but especially so during periods when unexpected disruptive factors, such as recent port labor strikes or extreme weather

Figure 5: Average sources of output growth by region, 2011-2020



Source: <https://globalagriculturalproductivity.org/2024-gap-report/>



A Colombian grocery store displays a variety of vegetables for sale. (Unsplash/nrd)

events, create choke points that necessitate rerouting. The recent announcements by the government of Canada to expand the Port of Montreal is a step in the right direction. However, significantly greater ambition will be required to push Canada's infrastructure investments to levels comparable to [other leading OECD countries](#).<sup>50</sup>

Policymakers, the private sector, farmers, investors, and the scientific and technological communities will need to find solutions to these challenges. Doing so will require some combination of enhanced public and private investment in on- and off-farm infrastructure, R&D, improved piloting and scaling of new technologies, and implementation of policies to encourage farmers to become more innovative, productive, and efficient.

### Demographic shifts

Agricultural employment as a share of global GDP has been trending downward for decades, owing to the ongoing mechanization of farmwork, increasing urbanization and industrialization, and other factors. According to the [World Bank](#), in 1991, 43 percent of the world's population was employed in agriculture. By 2023, that figure had fallen by almost half, to 26 percent.<sup>51</sup>

The western hemisphere has followed this trendline. In Latin America and the Caribbean, agricultural employment fell over the same 1991–2023 period from 21 percent to 13 percent and in North America from 2.8 percent to 1.6 percent. As can be ex-

pected, given differences in income levels, structure of national economies, and crop specialization, there are widespread differences in agricultural employment across the hemisphere. In 2023, several countries still had employment levels in agriculture above 20 percent: Haiti (by far the most, at 45 percent), Ecuador, Guatemala, Bolivia, Nicaragua, Peru, and Honduras. In contrast, the hemisphere's biggest producers of staple crops—the United States, Canada, Mexico, Brazil, and Argentina—are all well below the global average of 26 percent, in most cases in low single digits.

This demographic transition underscores how agriculture is becoming more capital-intensive and productive: more food is being produced per person employed in the sector. The largest food producers also typically have the lowest share of farmers and agricultural workers employed in the national economy, as the United States, Canada, and Argentina all show (each is at less than 2 percent of their populations employed in agriculture).

However, there is a generational downside to this demographic trend: farmers worldwide are aging in part because on-farm employment opportunities are declining. The trend appears to be worse in the wealthiest regions having the smallest share of employment in agriculture. In the EU, for example, only 11.9 percent of farmers were [under forty years old](#) in 2020.<sup>52</sup> In the United States, only 9 percent were [under thirty-five years of age](#) in 2022.<sup>53</sup>

## Toward a food-secure future

The world needs a bold new way of thinking about food security, one that incorporates a comprehensive understanding of how divergent forces, including those identified in this report, are creating a dynamic and unsettled agrifood landscape that will shape the future in unpredictable ways. To avoid negative future scenarios and increase the odds of positive ones, what is needed is a shift in the prevailing debate about food security that incorporates all these driving forces. That debate should stress that these forces combine in important and not entirely predictable ways to disrupt agrifood systems.

Such an outlook recognizes, for example, that geopolitical tensions add risk to other phenomena such as climate change to make an already perilous situation more difficult.

Policymakers and other leaders across the Americas should recognize that these drivers intersect and combine, in turn reshaping the hemisphere's agrifood outlook. The challenge is clear: They will need to develop strategies and design policies that will lead to resilient and sustainable food systems that minimize the impact of shocks—both natural and human-made—on the production, distribution, and access to food.

### Ecology

As stated above in the introduction, a central challenge will be to ensure that food production can remain profitable and resilient in the face of disruptive change. Ecological changes and the environmental resources that the world relies upon for productive and healthy agriculture systems are critical pieces of this equation.

A key task concerns how best to frame this problem for policymakers, business leaders, and farmers, to relay that ecological changes threaten to undermine progress toward a food-secure future. How these stakeholders act through policies, investments, and practices to mitigate and adapt to ecological changes will go a long way to determining whether the hemisphere's future is food secure or insecure.

Farming is inherently uncertain because of the vagaries of weather and disease, so efforts to minimize the instability caused by ecological changes, including climate change, extreme weather, disasters, and other phenomena, will help farmers to manage this complex set of risks. Integration across risks is an important way to frame the problem, not only because the problem itself is multifaceted but so too are the solutions. Synergies among healthy ecosystem services, robust agricultural production, and profitability can be found with the right application of imagination, creativity, policymaking, investment, and on-the-ground application by utilizing input and knowledge from farmers and farming communities.

Agriculture is a major driver of ecological change, including land-use patterns and carbon emissions. Yet at the same time, agriculture also holds enormous potential, under the right domestic and international conditions, to provide robust and

lasting solutions. Doing so would require that policymakers, investors, farmers, scientists, and technologists and society writ large coordinate efforts toward effecting scalable change.

Synergistic approaches include a range of alternative farming techniques and practices as well as novel technologies that collectively hold great potential not only to perform at a high level of output but at the same time go some way toward repairing the natural world. These strategies, which overlap in practice, include regenerative agriculture, no-till farming, agroforestry, climate-smart agriculture, and [4R nutrient stewardship practices](#) (referring to nutrient-management practices focusing on the right sources, right rates, right times, and right places for nutrients).<sup>54</sup> Such [approaches](#) aim to improve resource efficiency, reduce waste, protect ecosystems and ecosystem services including freshwater sources, soils, and biodiversity, while retaining profitability.<sup>55</sup> Through the more efficient use of resources, carbon sequestration in soils, land and forest conservation, and improved management (for example, of water and waste processes), these strategies also can [mitigate](#) the agricultural sector's significant greenhouse gas emissions.<sup>56</sup>

Although many of these approaches once were considered experimental, novel, and unproven, that is far less the case today. Regenerative farming, for example, now has [more adherents](#) (including farmers) who believe that the diverse methods falling under it deliver tangible environmental benefits [without sacrificing on-farm yields](#)—a claim that is also drawing greater financial-sector interest and investment.<sup>57</sup> A [global survey of farmers](#), conducted in 2024 by McKinsey and Company found that over three-quarters of farmers in Argentina, Brazil, Canada, and the United States were adopting no-till or reduced tillage practices. Farmers' willingness to adopt these and other regenerative practices were "underpinned by economics," according to McKinsey, with respondents in the Americas ranking increased yields as their primary motive for adoption, followed by lower production costs and additional revenue streams.

There is an enormous amount of land worldwide and in the Americas that could be revitalized through such approaches. Land degradation, which by extension means the degradation of the world's soils, is a massive problem. The world is losing [at least one hundred million hectares](#) of productive land each year, with some forecasts suggesting [up to 95 percent](#) of the world's arable land could be in some kind of degraded state by 2050.<sup>58</sup>

In the Americas, degradation is a serious problem but also a big opportunity for soil and land regeneration. Brazil alone has enormous swathes of degraded pastureland. Embrapa, Brazil's agricultural research agency, estimated in 2024 that the country has approximately [twenty-eight million hectares](#) of degraded pastureland (classified as intermediately or severely degraded).<sup>59</sup> Bringing this land back into production using



A drone hovers above a field. (Unsplash/Job Vermeulen)

regenerative methods would help [alleviate forest conversion pressures](#) in Brazil’s Cerrado and Amazon regions.<sup>60</sup>

One important consideration for policymakers is that if trade in agriculture and food becomes more costly, there is a risk that the fiscal capacity to invest in policies to make agrifood systems more productive and resilient in the face of ecological change will be reduced. Hence, this report focuses on understanding how these issues are linked and addressing them through greater international cooperation to promote more sustainable and resilient agrifood systems.

### Trade, geopolitics, and institutions

Rising protectionism and geopolitical competition undermine the incentives for states to cooperate. Trade tensions risk spilling over into diplomatic tension, eroding international trust. In such conditions, states will be less likely to collaborate, which can sour international relations. If the world’s biggest economies are becoming more protectionist and eschewing a rules-based trading system, a zero-sum world returns, with many states, concerned by protectionist measures placed on them from elsewhere, believing they must adopt such policies. More dialogue among states, not less, is an antidote.

An increasing number of governments around the world appear to no longer see the equation in these terms. China, for example, is seeking [greater self-reliance in food](#) through stockpiling and other measures.<sup>61</sup> It also has weaponized tariffs for its own purposes, imposing large tariffs on grain imports from

Australia and more recently on Canada. These are not isolated incidents but part of how China exercises its power, given its outsized impact on world markets.

As articulated in this report, global trade in food depends on the strength of multilateral institutions and international agreements. These institutions are often underappreciated contributors to global food security. Today these institutions are being eroded by rising geopolitical and diplomatic conflict and other forces. The rapid rate of their erosion is worrisome.

Despite the WTO’s flaws—of which there are many—it remains valuable because it has the reach and standing to create and enforce global trading rules. Yet the organization is failing at doing so, in large part because of its own rules (decisions are made by consensus) and even more so because the largest trading countries no longer want to abide by a rules-based system. The risk is a collapse of the entire multilateral trading system. “The reversal of global economic integration [if the multilateral trading system were to fail] would bring with it growing lawlessness, conflict, and disorder in the global economy,” one scholar [writes](#), and with it “the international system at large.”<sup>62</sup>

One aim should be to build alternative institutions within the hemisphere consisting of states having the critical mass to achieve desired outcomes. One such solution would be to mimic the Group of Seven and Group of Twenty, two examples of institutions that bring leaders from the world’s largest economies together to attempt to coordinate solutions to various

global challenges. One possibility would be to start with just the largest agricultural producers in the hemisphere—an “A5” consisting of the United States, Brazil, Mexico, Canada, and Argentina—to bring agriculture ministers together for systematized dialogue about hemispheric trade. Dialogue outcomes might include regional food-security compacts that generate commitments to invest in agricultural research leading to breakthrough technologies (“agtech”), to avoid the most trade distorting policies (export bans, for example), and more.

A related idea is to construct a standing (as opposed to episodic) *hemispheric food security council* to bring willing governments together for discussing responses to future shocks, identifying pathways for greater scientific and technological cooperation, and buttressing the norm regarding the hemisphere’s responsibility to the rest of the world as a major food supplier. Hemispheric institutions such as the Organization of American States (OAS) and Inter-American Development Bank can be leveraged to convene this council, given their credibility in addressing hemispheric affairs, including in trade. Using the inter-American system to convene a hemispheric food security council consisting of foreign, environment, and agriculture ministers—alongside representatives from industry and producer groups—should appeal to a wide set of stakeholders.

### Investment in innovation, technology, and infrastructure

The constant improvement of on- and off-farm activities, including innovative use of new technologies and processes, and capital investment in the phenomena that enable them (including infrastructure), are central to ensuring that the hemisphere and the world are food secure. Innovation and investment also are critical components of agrifood systems that not only are productive but also sustainable and resilient, given the need to prepare for climate-driven shocks in the future. Innovative technologies and processes, and the infrastructure that undergirds them, can build redundancy and efficiency into the agrifood system in anticipation of such shocks.

Regenerative agriculture and other agrifood systems focused on sustainability can be enhanced through the application of advanced technologies. [Examples](#) include:

- Alternative energy sources can enhance on- and off-farm systems while reducing carbon footprints.
- Geospatial remote sensing tools for precision farming can identify and help safeguard ecological assets.
- Robotics and mobile digital technologies (including deeper integration of handheld devices into farming practices) can improve agricultural efficiencies while reducing environmental impact.
- AI-driven analytics can integrate and utilize data streams from numerous applications.<sup>63</sup>

Such technologies will become more critical in the future, as ecological changes make farming more difficult. Rising heat, for example, will create harsher working conditions for farm labor, in turn requiring machines and other technologies to alleviate workers’ outdoor exposure during periods of extreme heat.

Biotechnologies should be added to this list, given their promise to improve on-farm productivity and nutrient use efficiency while protecting ecological assets such as soils and water. [Biofertilizers](#), for example, aim to improve soil fertility and nutrient use efficiency through application of living organisms including bacteria, fungi, and algae, with crop yields increasing by an estimated 10 percent to 40 percent.<sup>64</sup> They also help plants withstand abiotic stressors, some brought on by climate change, including drought, salinity, and extreme temperatures.

How can governments, the private sector, and other actors together ensure that the right mix and scale of investments are being made that will lead to innovative technologies and processes across the hemisphere’s agrifood systems? Additionally, how can they ensure that innovative technologies and processes are transformative at all scales, including for the hemisphere’s millions of smallholder farmers in addition to its largest producers? Some technologies and processes are more suitable for large-scale applications because of high cost or other considerations, for example. Improving access to the benefits of such technologies will require improved pathways for dissemination of knowledge, practical know-how, access to capital, and other services (e.g., training).

Every year, researchers at Virginia Tech produce the Global Agricultural Productivity Report, which tracks and analyzes TFP trends. The 2025 version [asserts](#) that reversing the decline in TFP growth—including low growth in the Americas—will require five “policy, investment and research priorities,” which are:

- Invest more in strengthening and expanding multis-takeholder dialogues, agriculture extension services, and incentive structures for technology transfer to smallholder farmers.
- Expand access to markets for all participants in the agrifood value chain, including smallholder farmers.
- Strengthen trade as it “enhances competitive prices, which incentivizes investment in improved inputs and technologies” while facilitating “the exchange of knowledge, innovations, and best practices across borders, driving productivity gains.”
- Reduce food loss and waste.
- Invest in public-private partnerships, joint ventures, knowledge-sharing agreements and platforms, and interdisciplinary research.<sup>65</sup>

These types of innovative practices have real impact on agrifood systems at every level, down to the farm itself. Innovation delivers new seeds and crop varieties, creates more efficient production methods, solves practical problems faced by farmers (pests and disease), and creates new markets for goods and services provided by farmers (such as using sugarcane to produce ethanol to reduce carbon emissions of transport fuels).

Farmers are both users and creators of innovative technologies and processes, so their knowledge and experience should be included in robust feedback loops. Moreover, farmers must be able to adopt and utilize innovative technologies and processes to realize their full positive contributions. This is not an automatic process, as on-farm adoption is not the same thing as laboratory invention. When making investment decisions, farmers are businesspersons, concerned about the upfront costs and return on investment (ROI). Global [surveys of farmers](#) indicate they are hesitant to adopt new technologies and processes if the technologies and processes are unfamiliar or they face high initial investment costs or uncertain ROI.<sup>66</sup>

Publicly funded [agricultural extension programs](#), which connect researchers at universities and other institutions to farmers—in the process, enabling mutual learning and successful technology transfer—are critical to improving agtech adoption.<sup>67</sup> Maintaining and strengthening extension services (including public funding) should be central to any country's aspiration to build world-class agrifood systems based on widespread technology and process adoption by farmers.

Improving infrastructure to strengthen agrifood supply chains is also critical, especially as higher temperatures, changing precipitation patterns, more frequent and powerful disasters, and other problems will put more infrastructure—e.g., ports, bridges, roads, railroads, canals— at risk. [Ports](#) are especially at risk, with most food trade moving by cargo ships.<sup>68</sup> The Panama Canal, which in recent years has had [low water levels](#) due to Central American drought, is a good example.<sup>69</sup> (Chinese ownership of port facilities also has proven controversial in the United States.) Beyond adaptation measures designed to improve individual pieces of infrastructure, there is much need for strategies that will frame the challenge in terms of societal and even transboundary (international) resilience. Canada, for example, in 2023 released a whole-of-society [National Adaptation Strategy](#) that emphasizes the need to make

physical infrastructure (and communities) more resilient to climate-driven impacts.<sup>70</sup>

## Farmers for the future

Ensuring a food-secure future in the Americas must place human beings at its center. This formula long has been the focus on the demand side of the food-security equation: The goal always is to ensure that all humans always have access to affordable and nutritious food.

Yet the same logic also holds on the supply side of the equation. To avoid the demographic decline of farming amid the chronic aging of the world's farmers, it is imperative that farming be made financially, socially, and culturally attractive to younger generations. Unfortunately, such conditions are not prevalent in many countries (perhaps most) around the world. The reasons for this are many. To young people, particularly those without a family heritage in agriculture, farming can be perceived as backward, unprofitable, difficult, alien, or uncool—or all the above.

There is no single set of recognized solutions to assist in turning the demographic trendlines around. However, evidence from around the world suggests that a combination of interventions, some obvious and others not so much, might suffice. The obvious ones are to make it [easier to gain access](#) to farming in the first place by reducing barriers to entry (access to affordable financing or access to farmland through ownership or long-term contract), and closing knowledge and skills gaps through on-farm training programs, scholarships, and apprenticeships.<sup>71</sup> There are less obvious interventions, too. One such intervention is to [incentivize nontraditional candidates](#) to enter farming, for example, young women, in addition to traditional candidates (typically men). Another is to stress the increasingly important role played by digital technologies, robotics, big data and remote sensing, artificial intelligence, and other technical applications that appeal to tech-savvy and ambitious young people.<sup>72</sup>

Although none of these solutions will guarantee a demographic rebound in farming, there are examples of where the curve has been bent toward youth. [Brazil's farmers](#) are getting younger rather than older. They appear to be attracted by the prospect of getting rich in Brazil's booming, forward-facing, and tech-savvy industry.<sup>73</sup>



Three locomotives haul goods over the Ascotán Pass to the Bolivian border. (Wikimedia/Kabelleger)

## Brief conclusion

The issues outlined in this report should be seen as a starting point for discussion. The challenges and the opportunities facing agrifood systems in the Americas in the coming decades will be profound. A central question is whether the hemisphere's key actors—governments, farmers, the private sector, researchers, foundations, civil society groups, and the public—will be willing to invest in the transformative processes and approaches that will reduce risk while increasing prosperity, sustainability, and resilience.

This report has put great emphasis upon generating productive dialogues among key stakeholders. Promoting the diffusion of critical innovations for food security will be an important piece of this process. It is imperative that governments and multilateral institutions in the hemisphere find financing and pool technological know-how to support programs tailored to meet the needs of the region.

Beyond that, however, it is critical that nongovernmental stakeholders, including investors, the private sector, researchers, scientists, analysts, farmers, and farming communities, act in concert with one another. They must themselves build the transnational dialogues to assist in envisioning, creating, and strengthening the tools that will be needed to ensure a food-secure future.



A combine harvests corn in a field in Southern Michigan. (Unsplash/Loren King)

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