

Recent years have exposed the fragility of global food systems. Climate shocks have disrupted harvests and strained supply chains, while volatile markets for fertiliser, gas and other inputs have driven production costs to record highs. At the same time, conventional farming practices are accelerating land degradation, undermining long-term productivity.

This is the third in a series of briefings analysing the impact of extreme weather and geopolitical crises on food system resilience around the world.

Key points

- Extreme climate events are raising agricultural risk, disrupting the global food system, increasing the chance of multiple breadbasket failure and pushing up food prices around the world.
- In 2026-2027, a severe 'super' El Niño is intersecting with the geopolitical fallout of the Iran war, delivering a destructive shock to world food systems already destabilised by climate change and nature degradation.
- ZCA has mapped food price spikes caused by extreme climate events between 2022 and 2026, building on existing scientific research.
- Studies show that historically unprecedented heat, drought, rain and cold are causing food price spikes across all continents.
- As well as impacting staple grains, climate disruptions are driving up the prices of perishable, nutrient-dense foods, threatening dietary quality and nutrition.
- Many of the commodities impacted are dietary staples linked to daily nutrition and national identity, including beef in the US, tomatoes in the Mediterranean, nori in Japan, and lamb in the UK.
- Far beyond temporary market shocks, the compounding financial pressure of 'climateflation' will continue to inflate baseline prices until full decarbonisation and structural adaptation are achieved.

Climate impacts are undermining agricultural productivity

As greenhouse gases from industry and agriculture continue to accumulate in the atmosphere, the frequency, duration and intensity of extreme climate shocks – such as droughts, heatwaves, floods, wildfires and storms – are [escalating globally](#).

The physical damage from these events is acutely visible across the global food system, as increasing climate extremes in recent years have brought compounding impacts. Multi-hazard climate shocks – where multiple extreme events interact to amplify damage – have [combined with structural vulnerability](#), resulting in widespread [yield declines in major crops](#), [localised harvest failures](#), [disrupted transport networks](#) and [heightened price volatility](#) in commodity markets.

In 2022, for example, high temperatures disrupted crops across major breadbaskets – regions that produce large quantities of staple foods – in the Northern Hemisphere, triggering an agricultural drought. Climate change made the drought [at least 20 times more likely](#), and an event of that magnitude would only be expected to [occur once every 400 years](#) without human-caused warming.

Research shows that key global breadbaskets in sub-Saharan Africa, Europe, the US and South Asia [will see the greatest increase in compounding crop failures](#), and long-term drying across key production regions in Brazil, the US and Europe will more likely than not result in [unprecedented simultaneous drought this century](#) that will cause multiple breadbasket failures for maize, a key grain.¹ Under both moderate (SSP2-4.5) and high (SSP5-8.5) emissions scenarios.

The true scale of risk from climate shocks is difficult to predict, as they are happening against an already unprecedented climate baseline. A steadily changing climate has cut [21% off growth in global farm productivity](#) since 1961.² Measured as ‘[agricultural total factor productivity \(TFP\)](#)’, a ratio of total agricultural outputs to total inputs, with a higher TFP indicative of producing more with less.³ This is equal to losing seven years of technological and efficiency gains agriculture has made. and 26-34% off growth in warmer regions such as Latin America and Africa. Research suggests that the models commonly used to assess the impacts of climate change on agricultural yields [systematically underestimate the impacts of drought and heat](#).⁴ This suggests that projections of future price volatility are conservative and should be treated as lower bounds.

‘Super’ El Niño and the Iran war are worsening economic impacts

The global economy is currently enduring compounding crises. A historically severe ‘[super](#)’ [El Niño](#) is intersecting with the geopolitical fallout of the war in Iran, straining [already fragile global food systems](#). Extreme climate events caused by El Niño, which come on top of decades of rising global temperatures caused by climate change, are expected to disrupt crop yields, just as fertiliser shortages caused by war have [driven up input costs for farmers](#).

The World Food Programme (WFP) estimates that the 2026-2027 El Niño alone could cause at least [49 million more people to experience acute food insecurity](#) by the end of 2027, particularly in Central America and southern Africa.

The combined threats risk triggering price surges of [up to 100% on key commodities](#) – such as rice and coffee – according to the climate risk analytics provider Resilience. Goldman Sachs estimates that [global food commodity prices could surge by 15.8%](#), straining household budgets through 2028. The prospect of renewed inflation shock could mean interest rates will remain high, adding further pressure to households.

Even countries self-sufficient in staple commodities could be [hit by inflation](#) as local yields fail and El Niño disrupts global production and market prices.

Extreme weather caused by climate change is pushing up food and headline inflation

By 2035, projected warming is expected to [add up to 3.23 percentage points annually](#) to food inflation and 1.18 percentage points to headline inflation, which many countries aim to keep at around 2%. The biggest pressures are set to fall on tropical regions, and the strongest seasonal spikes, peaking in summer, in higher-latitude regions.

Developing economies could be hardest hit, where [food can make up a much larger share of household spending](#) and countries lack the purchasing power to easily replace failed domestic harvests by buying on the international market.

Historically, bad weather has caused temporary food shortages that have self-corrected. But permanent changes to climate patterns mean [food price surges are becoming an ongoing driver of inflation](#).

Central banks' standard inflation-targeting approach of [raising interest rates in response to supply shocks](#) works reasonably well for temporary disruptions, but becomes costly as shocks persist.

Excessive tightening can [put stress on financial systems](#), [raise government borrowing costs](#), [worsen inequality](#) and [slow the investment needed](#) to address climate change itself. Evidence also suggests that this damage is not easily undone: the economic costs of overtightening [may persist long after policy is reversed](#).

Persistent, climate-driven supply crises are causing a [rethink of traditional economic policy](#), as interest rate hikes cannot fix declining crop yields or protect vulnerable households. The compounding financial pressure of [‘climateflation’ will continue to inflate baseline prices](#) until full decarbonisation and structural adaptation are achieved.⁵ A recent analysis estimates that a 3°C rise in global average temperatures could cause wheat prices to triple by 2100 compared to 2010, after deflation.

New analysis links unprecedented climate extremes in recent years to price surges in nutrient-dense foods

In 2025, Kotz et al. evaluated 16 cases across 18 countries in which [extreme heat, drought and heavy precipitation were associated with sharp price spikes](#) for specific agricultural goods between 2022 and 2024.

Their research shows that globally traded commodities experienced major shocks. For example, the price of West African cocoa increased by 300% following extreme heat in 2024, and the price of European olive oil jumped by 50% following historic 2022-2023 droughts in Spain and Italy. Local impacts also crippled daily staples, driving a 300% spike in Australian lettuce after compound flooding in 2022, and price surges for rice in Japan following a 2024 heatwave.

We used Kotz et al.’s methodology to extend the study to foods impacted by climate extremes since 2024.⁶ We quantify climate extremity using [ERA5 reanalysis](#) (temperature, rainfall), expressed as historical percentiles and return periods against the same 1940-2019 (ERA5) reference periods used in the original study. As our events occurred after 2023 and are therefore not covered by the official SPEIbase dataset used in the original analysis, SPEI was computed directly from ERA5 using Thornthwaite potential evapotranspiration. Nori was assessed using sea surface temperature, rather than air temperature, to match the relevant mechanism. Our literature search for food price impacts is not exhaustive and is biased towards English-language media, largely from the Global North. and mapped the combined datasets (Figure 1).⁷ In contrast to computing a percentile for every grid cell individually (as per Kotz et al. 2025 Figure 1), we computed a single area-weighted average across the tested region and then ranked that value against the same variable, over the same period, in each year prior in the historical record. This gives one percentile per case rather than a spatial field. Our 2024-2026 database is shown in Figure 2.

Together, the studies show that climate extremes are causing food price spikes across all continents⁸ With the exception of Antarctica. All but one of the food price impacts we mapped occurred in the wake of unprecedented temperature, drought or rainfall, meaning the event was more extreme than any

similar instance in the historical climate record.⁹With the exception of the tomato price spike following winter storm Gianna in Florida.

Many of the commodities impacted are dietary staples linked to national identity and daily nutrition: beef in the US, tomatoes in the Mediterranean, nori in Japan, and lamb in the UK. Price spikes in households’ go-to protein or vegetable can result in [substitution with cheaper, less nutritious alternatives](#).

Figure 1

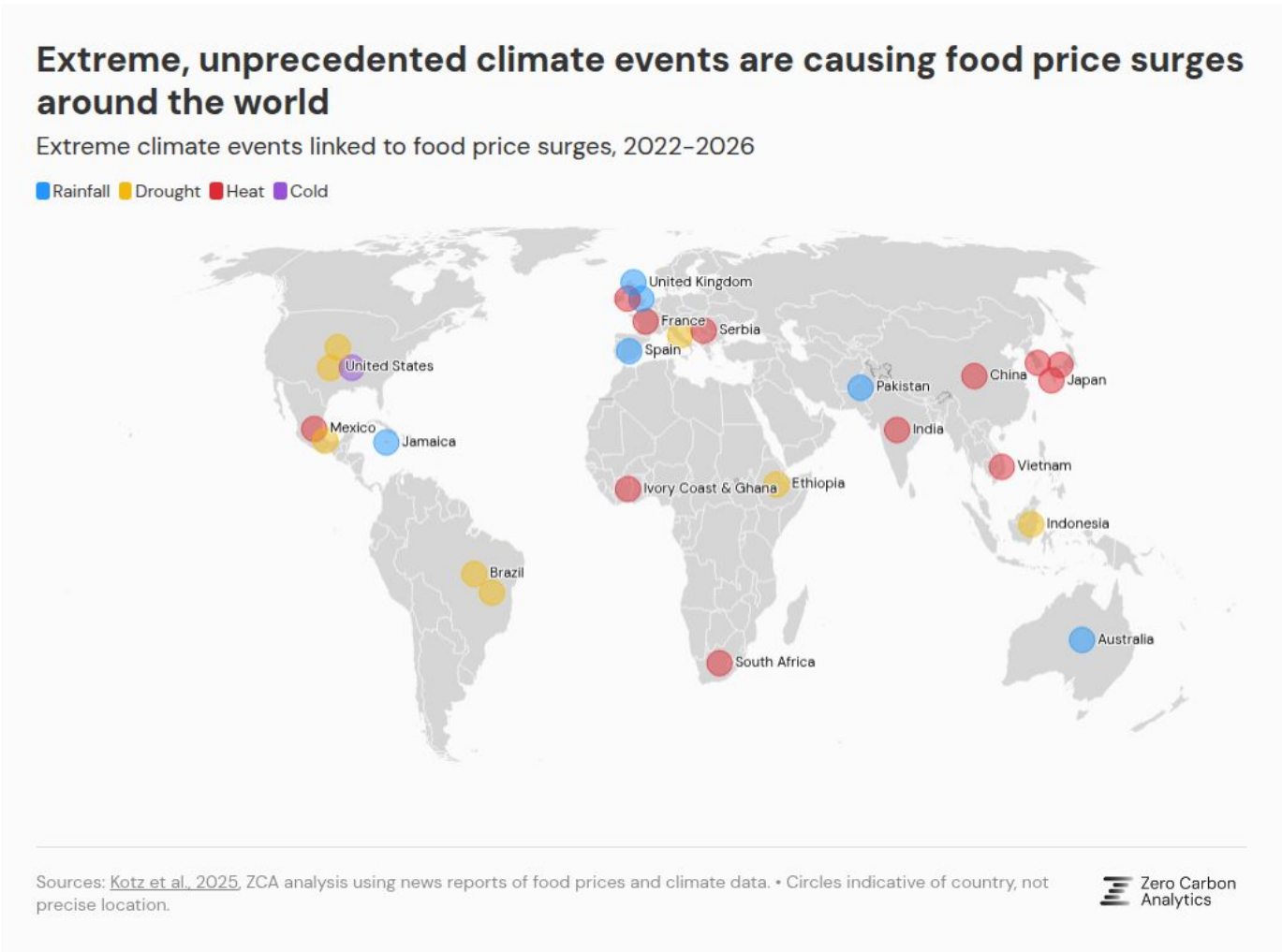


Figure 2

Unprecedented climate events in recent years have caused food price spikes

12 food price spike events across nine countries in the context of climate extremes, 2024 to mid-2026

Food impacted	Climate context	Severity of climate	Price impact
 Arabica coffee	May–September 2024 drought in Brazil	Driest May–September on record	35% higher in November 2025 than a year earlier
 Lamb	2023–2024 rainfall in the UK	Wettest 12-month period on record	19.9% higher in 2024 vs 2023
 Beef	March 2026 heatdome in the Mountain West states of the USA; Great Plains drought September 2025–February 2026	Hottest March on record; 26.7 years return period for September–February drought on record	14.4% higher in 2026 vs 2025
 Beef	Spring and summer heat in 2025 in the UK	Hottest spring/summer on record	12.8% higher in 2025 vs 2024
 Tomato	Winter rainfall in January and February in Spain	Wettest January and February on record	11% higher in 2026 vs 2025
 Tomato	Winter Storm Gianna in Florida, USA in 2026*	A 1-in-10–winter event	40% higher between January and April 2026
 Nori (seaweed)	Warm sea in Japan in October 2025	Warmest sea surface temperature in October on record	~20% increase in March 2026
 Scotch bonnet pepper	Rainfall in October 2025 in Jamaica linked to Hurricane Melissa	Wettest October on record	Ten-fold increase directly after Hurricane Melissa in October 2025
 Potato	High winter temperatures in Mexico in December 2025	The warmest December on record	57.3% higher in May 2026 than in May 2025
 Raspberry	Warm June in 2025 in Serbia	The warmest June on record	51% higher in September 2025 than a year earlier

Source: Zero Carbon Analytics analysis of news reporting and climate data. • Method follows [Kotz et al. \(2025\)](#). Price spikes were reported in association with extreme climate events. "On record" refers to [ERA5 hourly data on single levels from 1940 to present](#). Icons from [flaticon.com](#).
*This event was not unprecedented.

Climate extremes impact micronutrient-dense foods the most, undermining diet quality and nutrition

Extreme weather drives up the prices of perishable, nutrient-dense foods more than those of staple foods like grains, meaning [climate disruptions threaten dietary quality, variety and nutrition](#), not just backbone calorie supply. Across 23 developing countries, [micronutrient-dense food prices grew 0.03 percentage points faster](#) per month than starchy food prices between 2000 and 2020 and were consistently more volatile, particularly in international markets.

Limited-shelf-life, micronutrient-dense foods such as fruits, vegetables and animal products face [higher supply chain losses from extreme weather](#). They require far more coordination across the value chain

from farm to consumer, so any disruption – such as damaged infrastructure or slowed transportation – can cause more pronounced price swings. Severe storms trigger sharp spikes, [increasing fruit and vegetable prices by 26%](#), according to one analysis.

In comparison, foods with longer shelf lives, multiple sourcing options and that can be substituted by consumers for similar foods can [better dampen price volatility](#). The sharp price spikes seen in recent years have clustered in [commodities that lack these characteristics](#): cocoa from West Africa, olive oil from Southern Europe and coffee from Latin America and Southeast Asia have seen sustained price spikes following heatwaves, droughts and erratic rainfall. Unlike grains, these foods have few substitutes and inflexible supply, as they are grown in limited regions and, as tree crops, have multi-year growing cycles.

Modelling of extreme weather scenarios in Australia found that the [fruit, vegetable and livestock sectors are most affected](#) by supply chain disruption, with the availability of healthy foods like vegetables and lean meats impacted more than that of less healthy foods, such as ice-cream and processed meats.

Disruptions can also propagate further up supply chains. Modelling shows that low-rainfall seasons in Californian strawberry supply chains reduce yields sharply enough to necessitate sourcing from further afield, [driving transportation costs for distributors by up to USD 21 million](#) compared to high-rainfall seasons.

As well as impacting price, climate extremes make healthy food less available compared to more shelf-stable, less healthy alternatives. In rural Uganda, extreme weather events have been linked to [lower availability of calories and nutrients for children](#), with droughts in particular reducing calorie, protein and zinc supply, and overall diet diversity by 67%, 37%, 28% and 30%, respectively. These deficiencies negatively affected child health indicators, particularly age-for-height and stunting.

Price spikes in a small number of foods can also be a significant driver of overall food price inflation. An analysis by the Energy & Climate Intelligence Unit (ECIU) estimated that UK food price inflation over the past two years was [overwhelmingly driven by climate-related shocks on a small group of foods](#) – butter, beef, milk, coffee and chocolate – rather than by wage increases or government regulation. The products accounted for 30-40% of UK food price inflation, despite making up only 11% of the typical shopping basket.

1. Under both moderate (SSP2-4.5) and high (SSP5-8.5) emissions scenarios. [↵](#)
2. Measured as '[agricultural total factor productivity \(TFP\)](#)', a ratio of total agricultural outputs to total inputs, with a higher TFP indicative of producing more with less. [↵](#)
3. This is equal to losing seven years of technological and efficiency gains agriculture has made. [↵](#)

4. This suggests that projections of future price volatility are conservative and should be treated as lower bounds. [↵](#)
5. A recent analysis estimates that a 3°C rise in global average temperatures could cause wheat prices to triple by 2100 compared to 2010, after deflation. [↵](#)
6. We quantify climate extremity using [ERA5 reanalysis](#) (temperature, rainfall), expressed as historical percentiles and return periods against the same 1940-2019 (ERA5) reference periods used in the original study. As our events occurred after 2023 and are therefore not covered by the official SPEIbase dataset used in the original analysis, SPEI was computed directly from ERA5 using Thornthwaite potential evapotranspiration. Nori was assessed using sea surface temperature, rather than air temperature, to match the relevant mechanism. Our literature search for food price impacts is not exhaustive and is biased towards English-language media, largely from the Global North. [↵](#)
7. In contrast to computing a percentile for every grid cell individually (as per Kotz et al. 2025 Figure 1), we computed a single area-weighted average across the tested region and then ranked that value against the same variable, over the same period, in each year prior in the historical record. This gives one percentile per case rather than a spatial field. [↵](#)
8. With the exception of Antarctica. [↵](#)
9. With the exception of the tomato price spike following winter storm Gianna in Florida. [↵](#)