



Brewing resilience: researchers safeguard coffee and chocolate from climate threats

From droughts to disease, coffee and chocolate are under threat, but scientists and farmers are working together to keep these daily treats on the table.

30 September 2025 – By TOM CASSAUWERS

In the hills above Matagalpa, Nicaragua, farmer Juan Pablo Castro has been growing coffee for 25 years. His two-hectare farm, dotted with citrus trees, is typical of the smallholdings that supply much of the world's beans. But in 2023, he began to see the first direct effects of climate change on his crop.

“Because of drought, we got so-called vain beans,” explained his son, Jeffry Castro. “Instead of a cherry containing two beans, as is normal, the pod is either empty or has only one misshapen bean.”

These lighter beans, considered defects, float away during the washing process and can spoil the taste and aroma of the final cup.

Another climate-driven problem is a rising incidence of coffee leaf rust. This fungal disease (*Hemileia vastatrix*) causes yellow-orange spots on leaves, weakens plants, and is one of the biggest threats to global coffee production.

Jeffry now works as a technician in an experimental station run by the Nicafrance Foundation, a Nicaraguan development organisation collaborating with EU-funded researchers to protect the future of coffee and cacao.

Towards climate-smart coffee and chocolate

Both coffee and cacao prices are at record highs, partly because volatile weather is reducing harvests. That hurts farmers like the Castros – and also European consumers.

Europe is one of the world's largest consumers of coffee and cacao, accounting for around a third of global [coffee](#) consumption, and slightly less than half of all [cacao](#) consumption. Climate change is already being felt in the rising price of a morning espresso or a bar of chocolate.

“If we want to keep eating chocolate and drinking coffee, we need to work together globally,” said Sophie L  ran, a plant biologist and researcher at CIRAD, the French Agricultural Research Centre for International Development.

L  ran coordinates the EU-funded BOLERO initiative, an international team developing new coffee and cacao varieties that can withstand drought, pests and extreme temperatures.

“We need to grow these crops in a different way. The plants need to become more resilient to cope with climate change,” she said.

Breeding resilient crops with the BOLERO approach

The BOLERO research team brings together experts from Europe, national research institutes in three producing countries (Nicaragua, Uganda, Vietnam) and industry partners. It focuses on breeding coffee and cacao plants with both improved resilience and a reduced need for external inputs such as fertiliser.

The researchers are focusing on a technique called grafting – joining the tops of coffee and cacao plants onto hardier roots or root stocks, often from wild coffee or *robusta* varieties, which already show more resilience.

Why graft? Because traditional plant breeding is simply too slow. Creating a new variety through cross-pollination and years of growth can take 20-30 years – far slower than the pace of climate change.

“We take varieties that were already developed, tested and approved, and graft them on rootstocks adapted to, for example, drought,” said L  ran. “This is a much faster way to cope with climate change.”

For farmers, it means keeping the beans they know while getting sturdier plants – in just a few years, not decades. Jeffry sees the potential.

“With grafted plants, we can keep our favourite varieties, but make them cope with climate change rapidly. A plant with drought-tolerant roots will last longer and have less impact on production.”

Working with farmers and industry

The downside is that grafting is more expensive than growing from seed. That is why the BOLERO team works with big agricultural companies like ECOM and Agromillora to scale it up and bring prices down.

The experts are also breaking new ground by studying root systems in detail and building computer models to predict the best plant-root pairings.

Some grafted plants could be ready for farmers within five years. Taste tests with companies like Nestl  , Illy and Lavazza show they deliver the same flavour and aroma that coffee drinkers expect.

“We checked the cup quality, which includes taste and aroma, of the coffee as well,” L  ran said. “This is very important if you want to export these plants worldwide.”

From lab to field

Usually based in Montpellier, France, L  ran moved to Nicaragua to work directly with farmers in the highlands. On the experimental farm there, new varieties are being tested under real conditions: different fertiliser doses, shade levels and drought exposure.

“We are doing a lot of experiments,” said L  ran. “Some plants receive half the regular dose of fertiliser. Others are planted under trees to see if they can grow in the shade. And then, of course, we analyse the drought tolerance.”

Used to working in a lab, L  ran admits that the move was initially challenging, but that she has grown to love it. “Moving to the field and learning from farmers and technicians has been a new experience for me. Most of the time, I am the one learning.”

Global efforts

The challenges are not unique to Central America. In Vietnam’s Dong Nai province, just outside Ho Chi Minh City, farmer Nguyen Quy Tuan tends around 1 500 cacao trees.

“We need to water more,” he said. “We are also facing more pests and diseases. This means spending more money on pesticides and fungicides, plus electricity for irrigation.”

In Vietnam, the BOLERO network is working with ECOM, a major commodities trader and producer, to test new cacao varieties.

“We are having more and more droughts,” said Laurent Bossolasco, the company’s sustainability manager. “In April last year, we had a particularly severe one, which drove coffee prices to a record high.”

The hope is that new, more resilient plants will help farmers adapt and stabilise prices. “The last time I was back in France, I was shocked at the prices of coffee,” he said.

“We are seeing major price swings, partly caused by climate change. Of course, we cannot stop climate change alone, but we can help farmers deal with it.”

Trickle-down effect

The work being carried out is already finding its way into Vietnam’s countryside, where agronomists are collaborating with farmers and agricultural institutes to trial new plants.

Nguyen is keen to get hold of the new cacao seeds. “We have already identified the best varieties for us, together with the technicians,” he said. “The soil nutrients on our farm will need to improve. Let us hope this will do it.”

As the initiative enters its final year, the focus is on turning experiments into usable seeds and plants. If successful, it will safeguard farmers’ livelihoods and ensure that staples such as a morning espresso or a square of chocolate remain part of our daily lives.

“This is about making sure these cherished crops can survive in a rapidly changing climate,” said L  ran.

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