



Safeguarding a future for the world's coffee genetic resources

Executive Summary

- The global coffee crop is vulnerable to challenges, including disease epidemics, pest pressures and a changing climate.
- Up to 50% of prime growing areas could be lost around the world by 2050, given the high sensitivity of arabica coffee to warming global temperatures.
- Research and plant breeding are essential to combat these challenges, and these depend on protecting and studying coffee diversity in genebanks.
- Direct investment, broader industry access and safety duplication are required urgently to preserve the world's coffee genebanks, and the diversity housed within them.
- Thanks to genebanks, disease resistant, climate resilient and high yielding coffee varieties have been developed in recent years.
- Genebanks also safeguard plants with an abundance of novel coffee traits – such as flavor, feel & aroma – which will deliver new premium and specialty varieties to end-users.
- The Crop Trust is working to secure funding for the creation of a secure, cost-effective, and rational conservation system for coffee diversity.

Global Coffee Amid Global Change – A Troubling Outlook

Arabica coffee cultivation began some 1,500 years ago in southwestern Ethiopia, spreading and developing over centuries into the crop and beverage we enjoy today. While 130 species belong to the *Coffea* genus, only two – arabica and robusta – are commercially important nowadays. Unfortunately, these crops – particularly arabica – have very low

genetic diversity, a function of global dispersal from a small genepool. Genetic diversity is needed to overcome the challenges coffee faces. Low genetic diversity leaves coffee vulnerable and ill-prepared for change.

The vulnerability of coffee to changes in the environment – be that new pests and diseases or, especially urgently, higher temperatures and lower rainfall – is well documented. [World Coffee Research](#) warns of a dramatic deterioration

in production conditions in the next 30-50 years, and that historic breeding efforts are 'profoundly inadequate and short-term given the climate crisis'.

Research points to a 50% decline in highly suitable coffee growing areas by 2050 (Grüter et al. 2022) – the result of increasing temperatures. Further studies conclude that 60% of all wild coffee species are under threat of extinction (Davis et al. 2019). This will have a significant impact on the livelihoods of coffee smallholders farmer across the world. It also poses an acute risk to the USD 200 billion (Samper et al. 2017) global coffee industry as a whole.

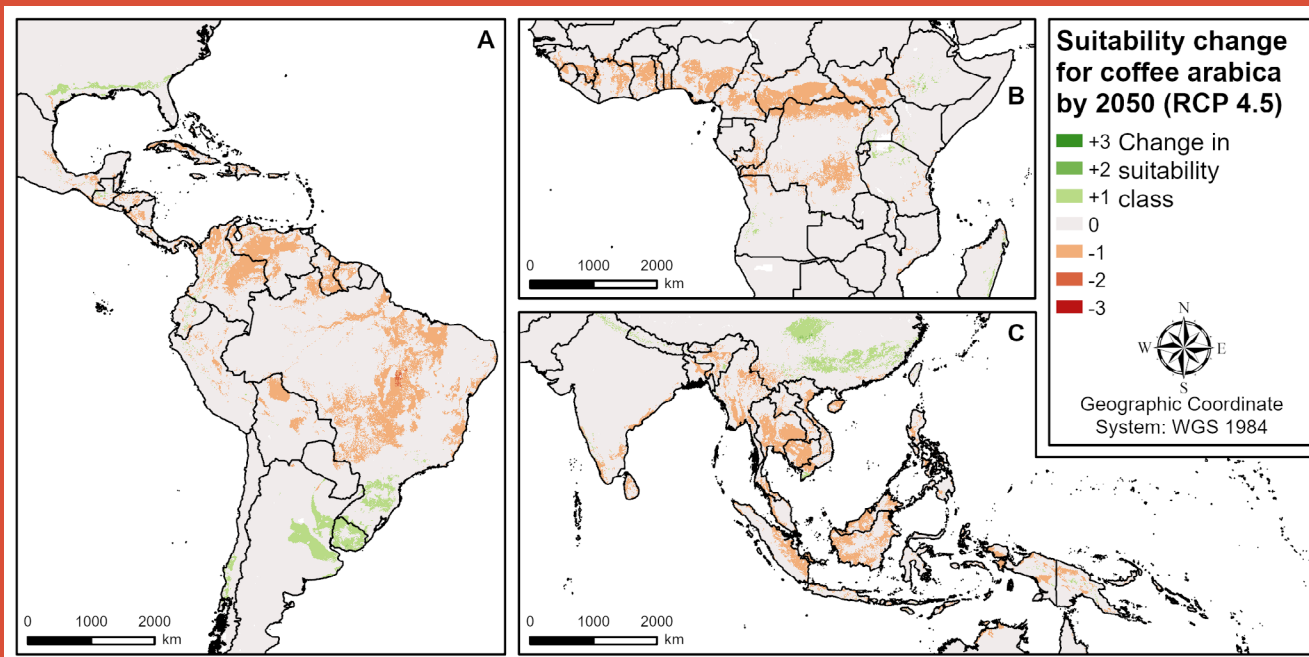
Major industry organizations are taking note. The US Department of Agriculture (USDA) has initiated its own coffee diversity program, after recognizing an urgent need for 'conservation, research and access to improved varieties by farmers' (Krishnan et al. 2021). Meanwhile, national research institutes in coffee producing countries and industry leaders – including [World Coffee Research](#) – are prioritizing breeding efforts in a bid to insure the crop against a rapidly changing environment. Simply put, the world's coffee diversity is more important now than ever, and the risk of losing it is simply too large and urgent to ignore.



Coffee plants in the nursery at CATIE's genebank in Costa Rica.

Securing Coffee Genetic Diversity – The Essential Role of Genebanks

The good news is that genebanks around the world safeguard a lot of coffee diversity: Over 100 wild species of the genus *Coffea*, alongside thousands of different varieties within each cultivated species. The world's genebanks play an essential role in research and in developing new varieties to overcome climate change, pests and diseases. Genebanks also hold enormous potential for innovative developments in taste and cup quality. As such, the main-



Expected global suitability of coffee due to climate change Roman Grüter, Tim Trachse, Patrick Laube, Isabel Jaisil

Coffee and Climate Change

The Intergovernmental Panel on Climate Change (IPCC) predicts global warming of 1.2-3° by 2050, which is expected to dramatically reduce the climate suitability of major coffee growing regions. Arabica coffee is known to be particularly sensitive to climate change.

For the world's major producers – Brazil, Colombia, Vietnam and Indonesia – a 50% loss of prime coffee-growing land poses a major threat to future

output (Grüter et al. 2022). Opening up new, more suitable, areas is limited by both terrain and potential negative environmental impacts, including deforestation.

Plant breeding and crop improvement will be key in adapting coffee to climate change, with a focus on higher yielding, more heat-tolerant varieties. For this, we need access to coffee genetic resources.

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tenance, improvement, and ongoing funding of these genebanks is crucial for the long-term survival of coffee cultivation. Among the world's coffee genebanks, however, the only internationally accessible collection is that held by the Tropical Agricultural Research and Higher Education Center (CATIE) in Costa Rica. Safeguarding this unique and invaluable collection is imperative in making coffee diversity available in the long term to researchers and breeders for the future resilience of the crop and the livelihoods that depend on it.

Developing Long Term Resilience in an Uncertain World

Long-term, stable funding of the world's coffee genebanks will build strength, resilience, and flexibility in the coffee supply chain. Prioritizing conservation of coffee diversity will benefit growers, industry, and consumers:

The [Global Conservation Strategy for Coffee Genetic Resources](#) looked into the current state of the world's coffee diversity. This in-depth investigation authored by World Coffee Research and the Crop Trust set out the following steps to secure the diversity of coffee:

1. Upgrade key existing coffee genebanks and secure their long-term funding.
2. Enhance accessibility to coffee diversity in genebanks for mutual benefits.
3. Safety duplicate all genebank collections.

Safeguarding Coffee for an Uncertain Future

The conservation of global coffee resources is pressing, the steps defined, and the benefits clear. We believe that the preservation of coffee genetic diversity is essential for the long-term prospects and sustainability of the coffee sector.

The Crop Trust is working to secure funding for the creation of a secure, cost-effective, and rational coffee conservation system. For this system to be in place, and provide the necessary long-term funding to sustain it, the Crop Trust is seeking to raise USD 25 million for the Crop Trust endowment fund. This will provide the annual USD 1 million needed to fund the four genebanks that are absolutely essential for the long-term preservation of coffee diversity (i.e. the origin collections in Madagascar, Ethiopia, Cote d'Ivoire and Costa Rica).



Coffee picker in Turrialba Volcano, Costa Rica (Photo: Luis Salazar/Crop Trust)

Coffee is predominantly produced by smallholder farmers. Conserving and utilising coffee genetic resources will be key for building resilience for the coffee industry and the livelihoods it supports.

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Industry leaders are needed to spearhead this critical work and ensure coffee can respond to existing and future challenges so it continues to be enjoyed by generations to come. For further information, please contact:

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