Climate change and the competitiveness of Timor-Leste's coffee

Market Development Facility

Warmer temperatures and irregular rainfall are affecting coffee production worldwide. Timor-Leste's native coffee variety, mountainous terrain and agroforestry systems give it a competitive advantage in a changing global market. But Timorese coffee is still vulnerable to climate change.

Australia's Market Development Facility (MDF) and the Australia Pacific Climate Partnership (APCP) recently conducted a study to understand the impact of climate change on Timor-Leste's coffee industry. This brief sets out the market landscape in which Timorese coffee operates, the study's projected impact from climate change, and suggestions on how coffee businesses, farmers and other stakeholders can invest in adapting to a changing climate and maintaining the competitiveness of Timorese coffee.

Market context

Variety

Arabica is the most popular variety of coffee, despite robusta being better suited to cultivation at higher temperatures and lower elevations. Arabica grows well at average temperatures of 18–21°C, heights of 1,000–1,500m and annual rainfall of 1,200–2,000mm.

Demand

In the past 30 years, global coffee consumption has almost doubled, and around 3 billion cups of coffee are consumed daily. In 2022, global demand was higher than supply. The global market for specialty coffee is growing 11.3 per cent annually and was valued at USD21.9 billion in 2022.

Climate change

Climate change, particularly the rise in global temperatures, is a threat to arabica coffee cultivation. Brazil and Ethiopia, two major coffee producers, could lose seven per cent and 40 per cent of their coffee-growing land respectively in the next decade if global temperatures increase by more than 1.2°C. The Intergovernmental Panel on Climate Change projects a 1.5 °C temperature increase by the first half of the 2030s.

Market requirements

European and North American markets increasingly prefer sustainably grown coffee. The new EU Deforestation Regulation (EUDR) will require proof ('traceability') that coffee was not grown in deforested areas. Countries with a high risk of deforestation, such as Brazil, Ethiopia and Indonesia, will be checked more. For countries like Timor-Leste, which have supply chains comprising many smallholder farmers, it will be difficult and costly for aggregators and processors to implement traceability systems, potentially closing them out of markets that implement the regulation.

Timor-Leste's advantage

Timor-Leste's most common native coffee variety, the Hibrido de Timor, is a hybrid of arabica and robusta that can tolerate higher temperatures. This heat tolerance allows arabica coffee plantations to expand into marginal areas with average temperatures as high as 24–25°C and in areas as low as 800m. Also, coffee is traditionally grown under shade trees, which helps regulate the temperature and moisture around the coffee plants, improving their climate resilience.

Quality over quantity

Timor-Leste is a low-volume coffee exporter, exporting 6,000 tonnes per year compared to major commodity-grade producers like Brazil (648,600 tonnes) or Vietnam (90,000 tonnes).[1] As such, Timor-Leste is more competitive in niche specialty coffee markets, particularly since its coffee is grown organically. Specialty markets pay higher prices for better quality and sustainably grown coffee. In 2022, bad weather resulted in a decline in Timor-Leste's total coffee harvest, but an increase in exports of specialty coffee balanced out the fall in overall revenue. As a result, farmers were able to increase their income from coffee by up to 17 per cent, selling at USD0.59/kg, higher than average commodity prices.

[1] International Coffee Organisation.

Projected impact of climate change on Timor-Leste's coffee

MDF and APCP assessed the effects of climate change on Timor-Leste's coffee industry. The study projected changes in temperature, rainfall and sea level under low- and high-emission scenarios for 2050 and 2070, compared to the baseline year, 2000. The study also identified ways to adapt to a changing climate.

Low-emissions and high-emissions future scenarios

A **low-emissions future** is the best-case scenario, where the world reduces greenhouse gas emissions and the temperature increases by approximately 1.1°C by 2050. A **high-emissions future** is the worst-case scenario, where the temperature increases by 1.8°C by 2050. Projections are simulations of Earth's future climate based on these 'scenarios'.

CHANGE

Hotter air temperature

From a nationwide baseline of 24.3°C, air temperature is projected to increase:

Low-emissions future:

25.4°C (+1.1°C)
in 2050 and 2070

High-emissions future:

26.1°C (+1.8°C)
in 2050

- and -

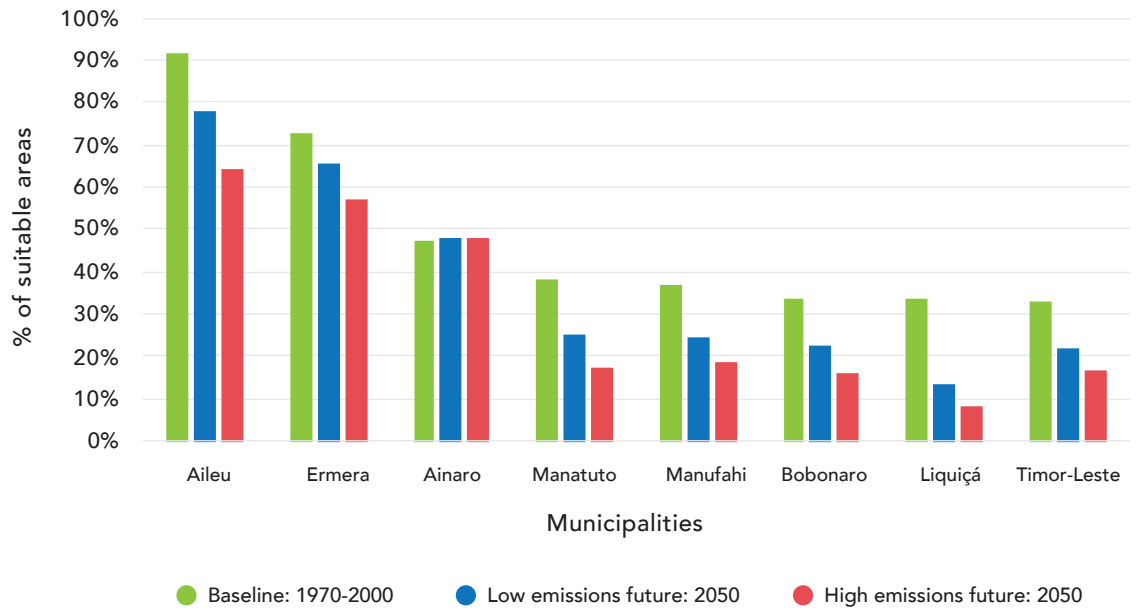
26.9°C (+2.6°C)
in 2070

Higher air temperature will affect coffee farming in two ways: land at lower altitudes will become increasingly unsuitable for growing arabica, and the frequency of diseases and pests will increase.

Impact 1: Less area to farm arabica coffee (see Figure 1)

By 2050, Timor-Leste's land area suitable for cultivating arabica is projected to decline from 33.2 per cent to 22 per cent (low-emissions scenario) or 16.6 per cent (high-emissions scenario). Coffee-growing land is projected to decrease in all municipalities except Ainaro. In Ainaro, higher-altitude land that used to be too cold for coffee cultivation would become suitable, maintaining its proportion of suitable land at 47 per cent.

Figure 1. Projected reduction of land area suitable to cultivate arabica coffee



Impact 2: Increased prevalence of diseases and pests

Global research shows that an increase in temperature leads to a higher frequency of diseases such as coffee leaf rust (CLR) and pests like the coffee berry borer (CBB), which affect yields and quality. Shade trees create a humid environment, increasing the spread of CLR but inhibiting the spread of CBB, which prefers low humidity. Understanding the effects of shade on these two threats is important for effective disease and pest management.

CHANGE

Irregular and extreme rainfall patterns

By 2070, annual rainfall could decrease by 30–50mm under low- and high-emission scenarios, a variation of less than 5 per cent. However, the frequency and intensity of drought or heavy rain are projected to increase. Rainfall patterns in Timor-Leste are affected by multiple interacting factors that are poorly understood, making projections less accurate. These factors include the El Niño-Southern Oscillation, Indian Ocean Dipole, South Pacific Convergence Zone, trade winds and topography.

Irregular and extreme rainfall patterns could affect coffee farming in two ways: damaging flower growth and making harvesting, processing and transporting difficult, all of which hurt yields and quality.

Impact 3: Lower coffee production

Short-term weather irregularities, like more rain in the dry season and less rain in the wet season, can damage coffee flowers and affect yields. These rainfall changes can also cause erosion, affecting soil fertility and reducing future harvests.

Impact 4: Lower coffee quality and post-harvest management

Unpredictable and extreme rainfall patterns can reduce coffee quality by increasing humidity and making it challenging to harvest, dry and store beans. Extreme rainfall can also damage roads, causing post-harvest losses when transporting coffee cherries and parchments to processors.

CHANGE

Rising sea level

Little change is projected in sea level, with a 1mm rise under the high-emissions scenario. As coffee plantations are located at high altitudes, rising sea levels would have no impact.

Recommendations for adapting to climate change

To maintain and take advantage of its competitive position in the specialty coffee market, Timor-Leste's specialty coffee sector will need to invest in becoming more resilient to the impacts of climate change.

The MDF-APCP study sets out recommendations that can be taken up at government, business and industry association levels. These recommendations align with the Government of Timor-Leste's *National Coffee Sector Development Plan Timor-Leste, 2019-2030*.
MDF supports business partners to invest in these adaptation strategies and has been co-investing with partners in coffee rehabilitation since 2021.

Adopt good agricultural practices

Adopt good farming practices, including soil management, pest management, mulching, and building terraces on steep slopes. Improve harvesting, processing and drying of coffee beans.

Benefits:

- Improved soil health and fertility and sustained yields.
- Fewer pests and diseases.
- Reduced soil erosion.
- Increased yield.
- Reduced post-harvest loss.

Challenges:

- Implementing new practices can be expensive and time-consuming.
- Organic pest management is expensive and difficult to implement.
- Farmers need knowledge and support to adopt improved practices.

Improve competitiveness

Shift from commodity-grade to specialty-grade coffee. Invest in better quality control and international certifications such as organic and fair trade.

Benefits:

- Better prices for farmers and higher revenues for businesses.
- More resources to invest across the value chain.
- Easier access to high-end markets with eco-conscious consumers and sustainability/ deforestation regulations.
- Greater global recognition as a specialty coffee brand.

Challenges:

- Certification can be costly.
- Systems to collect data (e.g. geolocation) needed for traceability can be expensive.
- Being recognised as a quality producer requires commitment, promotion and marketing.

Rejuvenate farms above 1,200m

Rejuvenation involves rehabilitating and renovation. Rehabilitating plantations involves pruning large and unproductive trees and removing damaged and diseased trees. Renovation entails replacing removed trees and planting shade trees to provide 6 per cent cover.

Benefits:

- Improved yields in long term.
- Cut branches and wood can be used to build terraces to reduce soil erosion and improve soil health.

Challenges:

- Benefits materialise in the long term – rehabilitation results in an initial decline in total production as it takes two years for the plant to fruit.
- Business must invest in extension services to support rejuvenation.

Diversify crops in farms below 1,200m

Diversifying involves growing other crops suited to warmer weather, such as robusta coffee, spice and fruit trees. Agroforestry could be combined with livestock and poultry.

Benefits:

- Farmers and businesses reduce their dependence on coffee for income.
- Protected biodiversity and a healthier ecosystem reduce the spread of diseases and pests.

Challenges:

- Benefits only materialise in the long term.
- New crops need new buyers, who will determine the quantity and quality required.
- Efforts to grow new crops might not match the revenue earned.

Research and development

Identify coffee varieties more resistant to CLR, CBB and higher temperatures. Understand current farming practices and recommend improved practices that are economically viable.

Benefits:

- Improved yields and increased resilience to climate change.
- Improved agronomic practices.

Challenges:

- Research organisations in Timor-Leste need to conduct and disseminate research continuously.
- Adopting improved farming practices can be expensive and not economically viable.

Carbon farming

Planting new trees and monitoring their growth to generate carbon credits.

Benefits:

- Earn a passive income.

Challenges:

- Only applicable to deforested land and to 'new' trees.
- A nascent market for Timor-Leste.
- Expanding plantations in existing forests can make it difficult to quantify additional carbon.

Expand farms at altitudes above 1,200m

Increase coffee farmland at higher altitudes.

Benefits:

- Supplement land lost to a warmer climate.
- Increased and protected yields from the impact of climate change.

Challenges:

- Limited land availability and sloping terrain make it difficult to expand cultivation.
- Limited road access to remote high-altitude areas.

Improve support services

Increase farmers' access to weather information, finance and extension services.

Benefits:

- Better knowledge to improve coffee farming and post-harvest management.
- Finance available to invest in improved practices, rejuvenation and expand coffee farming areas.

Challenges:

- Weather systems and insurance are nascent in Timor-Leste.
- Weather information is difficult to monitor and disseminate.
- Limited access to financial services and little collateral.

If you are a coffee business looking to invest in production, quality and/or climate resilience, get in touch with us: ferdiana.goncalves-mdf@thepalladiumgroup.com

Glossary

Agroforestry systems

Systems with combined agriculture crops and forest to create productive and sustainable land-use practices.

Arabica

Arabica (*Coffea arabica*) is a species of coffee tree. Arabica coffee is considered of high quality and is prized for its smoother, sweeter flavour profile compared to Robusta coffee.

Robusta

Robusta (*Coffea canephora*) is a species of coffee tree. Robusta coffee is known for its distinct flavour profile, higher caffeine content and resilience to pests and diseases compared to Arabica coffee.

Specialty coffee

Specialty coffee is coffee that scores above 80 points on a 100-point scale on various attributes, such as fragrance, aroma, flavour, aftertaste, acidity, body, balance, sweetness, clean up, and flavour uniformity.

El Niño

El Niño Southern Oscillation is a natural phenomenon. It contributes to higher temperatures in many parts of the world. In Timor-Leste, it increases the likelihoods of droughts.

Market Development Facility

The Market Development Facility (MDF) is a multi-country initiative which promotes sustainable economic development, through higher incomes for women and men, in our partner countries across the Indo-Pacific.

We support partners from business and government to identify and grow commercial opportunities that are profitable, scalable and deliver social and environmental value.

MDF is funded by the Australian Department of Foreign Affairs (DFAT) and co-funded by the New Zealand Ministry of Foreign Affairs and Trade (MFAT) in Samoa, Tonga and Vanuatu. It is implemented by Palladium in partnership with Swisscontact.

Australia-Pacific Climate Partnership

The Australia Pacific Climate Partnership (Climate Partnership) is supporting the Australian Government to integrate climate and disaster resilience in Australia's aid program in the Pacific and Timor-Leste. The Climate Partnership provides technical advice, expertise, and resources to program managers and implementing partners on climate change, disaster risk reduction, and gender, disability, and social inclusion. It also partners with scientific agencies, regional programs, and local organisations to fill critical knowledge gaps and broker climate and disaster information, ensuring it is accessible and useful to those who need it.

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This publication has been funded by the Australian Government through the Department of Foreign Affairs and Trade (DFAT) and co-funded by the New Zealand Government through the Ministry of Foreign Affairs and Trade (MFAT) in Samoa, Tonga and Vanuatu. The views expressed in this publication are the author's alone and are not necessarily the views of either government.