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Pacific Horticultural & Agricultural Market Access Plus Program

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Enhancing the resilience of agricultural market systems to climate change in the Pacific Islands Countries and Timor-Leste

A joint brief from PHAMA Plus and MDF

As the realities of climate change have become more evident globally and regionally, the urgency of finding workable solutions suited to the Pacific Island countries (PICs) context has grown.

PICs and Timor-Leste are particularly vulnerable to the impacts of climate change mainly because of their small land mass, limited resources and location. One way to enhance climate resilience in the agriculture system around PICs and Timor-Leste is to help businesses innovate and find profit in market opportunities that contribute to climate mitigation and adaptation.

The Market Development Facility (MDF) and the Pacific Horticultural and Agricultural Market Access Plus (PHAMA Plus) Programs are part of Australia and New Zealand's agriculture, food security and private sector development portfolio in PICs and Timor-Leste. MDF and PHAMA Plus often support common agricultural markets in the same country. This shared endeavour allows the programs to collaborate and leverage their respective strengths, share market intelligence and ensure that their aggregate value delivers the best possible value for end beneficiaries and partners.

MDF and PHAMA Plus have increased their focus on the challenges and opportunities climate change poses to PICs' agriculture and horticulture. This focus responds to our stakeholders' changing needs and priorities and aligns with Australian and New Zealand Government development policies. Both programs focus on identifying innovative business models that protect or increase the performance of prioritised value chains. This paper outlines some early examples of MDF and PHAMA Plus working with our agricultural partners to offset climate change risks, and develop and test business cases for investment in climate change adaptation and mitigation.

Climate change is a threat to agricultural production in PICs and Timor-Leste

Supporting climate change adaptation and enhancing resilience in PICs and Timor-Leste are core to the ongoing viability of agricultural markets. Both programs work closely with businesses and farmers to understand how climate change impacts them. Below is a summary of the observed and expected impacts on PICs and Timor-Leste horticulture and agriculture:

Changes in seasonal temperature patterns can cause heat stress in crops and shift crop production. These changes reduce the yields of temperature-sensitive crops. Higher temperatures can also alter the agroecological zones for certain crops, forcing farmers to change what they plant or seek access to land in other areas. For instance, coffee farmers in PNG have reported switching to new crops as arabica becomes less viable at lower altitudes.

> *I saw a lot of people planting [watermelon], and it grows well, so I will start farming it in December. I never planted watermelon before; this will be my first time. The weather is getting warmer up here, and we are seeing watermelon growing so well.*
>
> Coffee farmer in Jiwaka province, PNG

More frequent and extreme weather events can damage infrastructure and farms. They can have a devastating impact on farmers' livelihoods. For instance, farmers suffered significant losses in Vanuatu due to cyclones Kevin and Judy in 2023. In addition to crop damage, the impact of multiple severe cyclones in recent years has also required significant effort and resources to rehabilitate agricultural land and prevent pests and diseases in damaged trees and crops. While already common, these events are expected to worsen in intensity due to climate change.

> *My plants appeared at first to have survived and were still standing, however, the roots underground have all rotted due to waterlogging from the heavy rain. I have lost about 50% of my crop.*
>
> Kava farmer in Efate Vanuatu after cyclones Kevin and Judy in 2023

Changing rainfall patterns can damage crops and soil, and are a particular problem for root crop farmers. Root crops are a significant export commodity for PICs, but the production and supply of taro are vulnerable to heavy rainfall. Most of the agricultural output in the region is rain-fed rather than irrigated, so it is highly dependent on receiving appropriate rainfall across the year. Unusually heavy rain can also threaten livestock production systems. For instance, hefty rainfall in Timor-Leste's 2023 wet season led to farmers losing piglets to cold.

> *It has been raining more than usual this season. The piglets need warmth, and we can't provide it for them. I lost eight piglets from a litter of ten.*
>
> **Pig breeder in Maucali Metin, Timor-Leste**

Changed distribution of pests and diseases can reduce yields and change biosecurity risk profiles, and it requires increased investment in risk assessments, access to knowledge, advisory services, labour and inputs to manage outbreaks or increased severity. For instance, higher temperatures in Papua New Guinea and Timor-Leste are exacerbating the spread of coffee berry borer.

> *Temperature [increases] encourages fast spread of coffee berry borer (CBB). Longer dry or rainy periods encourage this spread. In the Eastern Highlands, some new areas are now seeing CBB.*
>
> **Hosea Malil, Assistant Manager, Sustainable Management Services, a coffee buyer in PNG**

Impending El Niño conditions will exacerbate these challenges, with hot and dry conditions forecast for the South Pacific in late 2023, increasing the vulnerability of the agriculture and horticulture sectors.

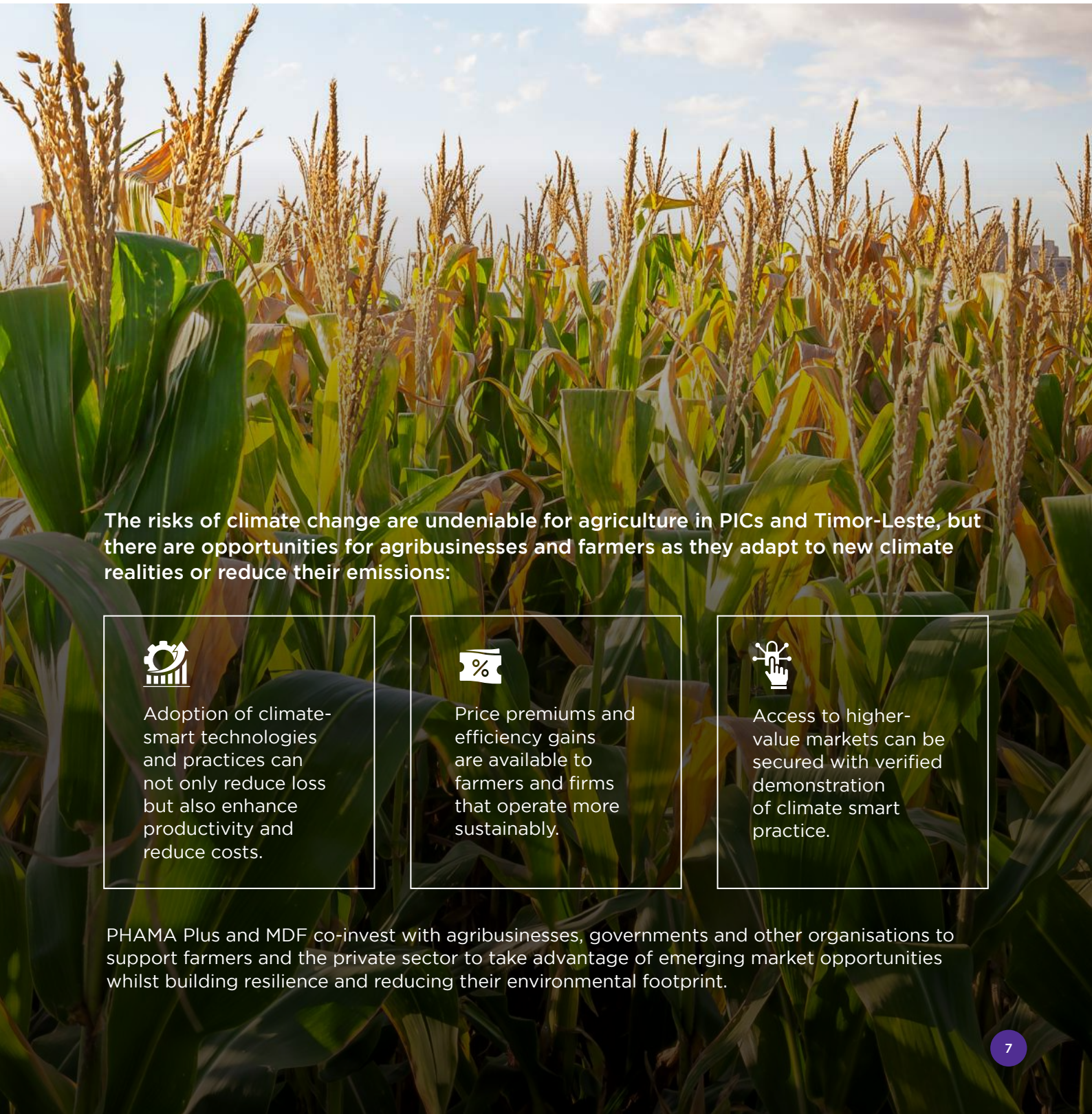
Markets are changing in response to global efforts to decarbonise economies

The physical risks of climate change to agricultural production in PICs and Timor-Leste are clear. Businesses also face growing risks due to global efforts to decarbonise economies. **Government policies and regulations, technologies, corporate commitments, and consumer preferences related to climate change are changing how markets operate**. Traceable produce, sustainable practices and verified carbon emissions data across the value chain are becoming increasingly important for buyers, particularly in European and North American high-value markets.

This trend is a challenge for the markets of PICs and Timor-Leste, which lack economies of scale and have comparatively high costs, especially for domestic and international freight. Exporters rely on price premiums from high-value markets to offset their high costs and remain competitive, so they have limited scope to raise prices further to invest in becoming more climate-smart. Their limited scale makes them unattractive for initial investments in climate-smart technologies, and they need to gain the know-how to prioritise and verify carbon emissions reductions. There is a risk that agricultural producers may lose access to markets beginning to demand low-carbon produce.

> *There is an increased demand for certified coffee from buyers. Therefore, more supply chains need to be certified as well to meet the demand.*
>
> **Delma Farokave, Sucafina, a coffee buyer in PNG**

Managing climate risk can create business opportunities



The risks of climate change are undeniable for agriculture in PICs and Timor-Leste, but there are opportunities for agribusinesses and farmers as they adapt to new climate realities or reduce their emissions:

Adoption of climate-smart technologies and practices can not only reduce loss but also enhance productivity and reduce costs.

Price premiums and efficiency gains are available to farmers and firms that operate more sustainably.

Access to higher-value markets can be secured with verified demonstration of climate smart practice.

PHAMA Plus and MDF co-invest with agribusinesses, governments and other organisations to support farmers and the private sector to take advantage of emerging market opportunities whilst building resilience and reducing their environmental footprint.

Climate-resilience on-farm

Climate-resilient seeds and crops

Adopting drought-tolerant and disease-resistant plants is an essential response to climate-related risks to agricultural production. In Samoa, Tonga and Fiji, PHAMA Plus is promoting access to climate and disease-resilient root crops, such as taro resistant to taro leaf blight (TLB) through government agriculture, forestry and fisheries agencies. A new business model for root crop exporters in Samoa includes the establishment of new nurseries for TLB-resistant taro and this is complemented by investment in a tissue culture facility in Samoa by SPC/Centre for Pacific Crops and Trees (CePaCT). The widespread use of these varieties in Samoa is crucial to efforts to rebuild the taro export sector, including to the New Zealand, Australian and US markets.

MDF has a partnership to introduce East-West Seeds' (EWS) drought and flood resistant seeds into Fiji and the region. Initial results are promising: farmers report that yields have improved and that they have been able to plant during the low season and capitalise on higher prices as a consequence. As a result of the outcomes of this partnership, MDF is working with EWS to expand the availability of high-quality seeds the in PICs and Timor-Leste. The increased availability of high-quality drought- and flood-resistant seeds can increase the resilience of farmers to extreme weather events exacerbated by climate change.

Farmers inspecting packets of East-West Seeds on Koro, Fiji

Integrated pest and disease management (IPDM) for farmers

An increase in temperature and fluctuating rainfall patterns will affect pest populations, the incidence of pathogens, and the geographic distribution of insects, weeds and diseases. As a strategy to prepare farmers, training in Integrated Pest and Disease Management (IPDM) can help manage the risks associated with these conditions. This approach focuses on long-term damage prevention by combining biological control, habitat manipulation, modification of cultural practices, and the use of resistant varieties. MDF and PHAMA Plus are working with agribusinesses to **introduce such practices to deal with current outbreaks and build resilience against future outbreaks, as well as increased severity made more likely due to climate change**.

ASF campaign in Timor-Leste

In PNG, PHAMA Plus supported the National Agriculture Quarantine Inspection Authority (NAQIA) by providing support to mitigate the spread of African Swine Fever (ASF). MDF provided technical assistance to this collaboration, drawing on its experience of combatting ASF in Timor-Leste. The practices promoted through awareness campaigns in both countries, such as penning pigs, improved feeding practices, and enhanced biosecurity practices on-farm, saved many pigs and supported farmers by building resilience to future disease outbreaks. Substantial investment was made in different communication channels, such as TV and radio, social media and word of mouth, to share key messages to prompt behaviour change. This helped contain ASF and avoided large scale economic losses and potential social disruption. In Timor-Leste, MDF's ASF communications campaign reached 207,000 farmers, with more than 124,700 farmers changing their pig- rearing practices.

Warmer temperatures and frequent heavy rainfall increase pest populations for watermelon farmers in Tonga. Watermelons exported to New Zealand need to be fumigated with methyl bromide (a greenhouse gas harmful to human health) as a quarantine treatment for pest control. PHAMA Plus is working with NORDIKO Quarantine services to introduce a re-capture system for safer fumigation treatments.

IPDM training by PFR in Tonga for watermelon farmers

Coffee berry borer (CBB) poses a significant threat to PNG's coffee industry. A warmer climate enables the pest to breed at faster rates. Once considered unsuitable for pest populations, higher altitude areas now see CBB thrive. In partnership with MDF, Sustainable Management Services (SMS), a coffee buyer from PNG, is training farmers to manage the outbreak of CBB through on-farm management practices. These farm management practices, such as tree pruning, will also build resilience to other pests and diseases exacerbated by climate change (e.g. coffee leaf rust).

A coffee farmer with a CBB trap

Improved waste management and soil health

Organic waste from packhouses and processing plants generates greenhouse gas emissions, and its disposal can be a significant cost for businesses. At the same time, farmers face the challenge of depleted nutrient levels in soils due to farming practices and the use of synthetic fertilisers. MDF and PHAMA Plus are workiung with firms to better utilise waste and develop organic agricultural inputs. Locally produced organic and sustainable soil conditioners increase the climate resilience of agriculutral production by improving water retention, nutrient cycling and reducing erosion. It can also mitigate greenhouse gas emissions through a reduction in the use of imported synthetic fertiliser and improving soil carbon levels.

In Fiji, PHAMA Plus has supported taro exporter Road Kings Farms in Taveuni with a biodigester. Biodigesters are another low- cost technology to convert organic waste into liquid fertiliser and biogas as a sustainable energy source. This technology is part of the new business model for Road King Farms, which increases income generation and provides a cheaper source of organic fertiliser for farmers, reducing the use of imported synthetic fertiliser.

In Small Island States, PHAMA Plus is supporting organic fertiliser trials to promote sustainable agriculture in Tuvalu through Goodman Fielder, a Fiji-based poultry processor. The fertiliser is a by-product of their operations. The correct application of organic fertiliser will enhgance agriculture production in Tuvalu and help to improve food security.

MDF is working with Baywater Fiji to use distillery waste and chicken manure to develop an organic soil conditioner for local farmers. Early results of this new business model are promising: farmers that have switched from imported synthetic fertiliser have experienced increased yields, reduced pest and disease outbreaks and lowered costs. MDF is exploring similar opportunities with agribusinesses in Samoa.

The maximum weight per ginger plant ranges from 2.5-3kg compared to just 1-2kg per plant previously.

Ginger farmer near Sigatoka Fiji, using Baywater's 'Liquid Compost'

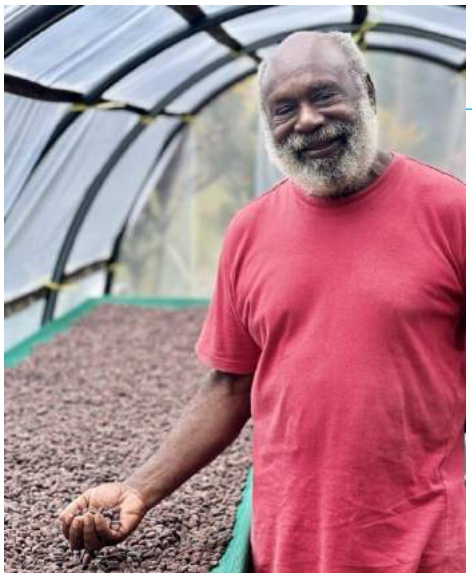
Improving efficiency and reducing emissions in processing

Clean energy in food production and primary processing

Burning biomass such as wood and plant waste to dry crops or to add value to products (e.g. coconut nectar) can significantly contribute to carbon emissions and it can also affect quality. For example, using biomass dryers to process cocoa beans can cause smoke taint and reduce market price. A cleaner alternative is using solar dryers. PHAMA Plus and MDF have worked with agribusinesses to introduce solar dryer technology.

PHAMA Plus has supported cocoa farmers and processors in PNG, Vanuatu and the Solomon Islands to improve the quality of dried cocoa beans with solar dryers. Gaston Chocolat in Vanuatu supported local farmers with solar dryers and training on solar-drying cocoa beans. The solar dryers have contributed to Gaston Chocolate increasing their processing capacity, allowing an expansion in their farmer network from 80 in 2020 to 135 in 2022 and the volume of beans sourced from 5,500kg - 12,000kg over the same period.

Currently, PHAMA Plus is partnering with the Vanuatu Primary Producers Authority (VPPA) to scale up the earlier work to trial and establish the solar dryer technology. Solar dryers have also been introduced into the kava sector in Vanuatu and Samoa through MDF and PHAMA Plus partnerships with kava exporters including Samoa Herbs.



Solar dryer for kava vanuatu

Solar dryer for cocoa in Vanuatu

Another option to reduce emissions and add value to coconut products is using low emissions stoves to process coconut sap into coconut nectar. PHAMA Plus is supporting coconut nectar producers in Tuvalu and Fiji with more efficient stoves. The improved stoves use much less firewood and produce fewer emissions when compared to the open fire stoves used for processing. Fewer emissions also reduce smoke tainting of the coconut nectar.

Energy-efficient post-harvest processing facilities

Post-harvest losses cost farmers and processors money and are a source of emissions. Cold storage can reduce post-harvest losses. Renewably-powered cold storage has lower carbon emissions and can be cheaper to operate than diesel-powered cold storage but has high initial capital costs, which can be a barrier to adoption. PHAMA Plus has incentivised the use of a hybrid solar-powered cold storage for taro by Road King Farms in Taveuni, Fiji. MDF supported CDP Logistics to establish solar-powered cold storage in Koro, Fiji. These investments aim to demonstrate the business case for investing in renewably-powered cold storage.

Responding to climate change demand signals

Climate-relevant certification

Demand for climate-sensitive agricultural produce in international markets is driving the need for third-party verification of climate-related agricultural and agribusiness practices. Some existing certifications already incorporate an environmental dimension. For example, organic certifications that require organic inputs instead of synthetic inputs also encourage practices that are less damaging to the soil and result in less greenhouse gas emissions. An expanding number of certifications are wholly or primarily about climate change but are expensive for smallholder businesses and farmers. Understanding and uptake of agriculture certifications is quite limited in PICs and Timor-Leste. Organic certification is gaining traction, particularly among producers of niche, high-quality products, but most agricultural exports from PICs still go into lower-value, bulk commodity markets where certification is not the norm.

MDF is working with certification agencies, including Fairtrade, the National Association for Sustainable Agriculture Australia (NASAA organic) and Control Union, to improve awareness and reduce the costs of certification services for agricultural producers. MDF is supporting Control Union to establish a permanent presence in PICs and conduct awareness-raising campaigns about the benefits of certification. Fairtrade and NASAA Organic are being supported to combine their audit processes to reduce certification costs and simplify agribusinesses' access to premium markets, which incentivises improved environmental practices.

PHAMA Plus partnered with Gaston Chocolat in Vanuatu to achieve a B Corp certification. B Corp certification indicates that a business meets high standards of verified performance, accountability, and transparency, from employee benefits and charitable giving to supply chain practices and input materials. Certified B Corps are part of the global movement that safeguards the environment and ensures businesses follow sustainable practices, such as using solar dryers instead of electric ones. These practices also reduce carbon emissions, which contribute to global warming. Gaston Chocolat is the first in the Pacific to attain B Corp certification.

Value chain emissions verification

Emissions validation and verification are becoming important as businesses and governments try to reduce emissions. Climate change is an increasingly important consideration for leading coffee roasters and retailers worldwide, keen to purchase sustainably produced coffee with a lower carbon footprint. More stringent environmental requirements in global coffee markets create new incentives for exporters and processors to map and mitigate the carbon footprint of their supply chains. Coffee produced in a low-carbon manner can be sold at a premium, which flows through the supply chain to the smallholder farmers that grow it – so long as low-carbon production can be verified.

MDF supported Sucafina to develop calculators to measure its supply chain emissions to enable it to reduce or offset them. The calculators demonstrated that smallholders, with their low use of inputs, were substantially lower emitters than plantations, potentially giving them a competitive advantage in low-carbon markets. Sucafina invested in greenhouse gas emissions reduction along its supply chain, including reducing synthetic fertiliser use and diesel generation at coffee mills.

Strategies for reducing carbon emissions in Sucafina's coffee supply chain.

Reduction of fertiliser application

Local capacity building through farmer education on low emissions farming methods

Improved treatment of wastewater

Reduction of fossil fuel consumption in processing and logistics

Switching to renewable energy sources at coffee mills

More efficient ways of transportation

Lessons

Strengthening market systems against the impact of climate change is crucial to enhancing resilience for smallholder farmers and exporters.

Some experiences from both the programs from early investments are:

The business case for climate-related investment varies depending on region and crop type.

Agribusinesses must develop a practical understanding of climate shocks and risks in their region and how their markets could transition to a low-carbon future. A realistic business case can then be developed to manage risks, build enhanced adaptive capacity, and secure market access.

Development programs can play a helpful role in demystifying climate risks, identifying opportunities, and supporting early-stage climate investments.

Flexible initiatives like MDF and PHAMA Plus, with an on-the-ground presence in countries and sectors, can build trusted relationships and credibility with the private sector. This presence helps programs analyse how climate change is most likely to affect different sectors and businesses in PICs and Timor-Leste and work with them to offset risks and take advantage of emerging opportunities.

Biosecurity concerns are an increasing cause of crop and livestock losses in PICs and Timor-Leste and should be a focus for investment in climate change adaptation.

Private sector-led extension to farmers is an important network with a shared incentive to control pests and diseases. Leveraging these established connections can complement government extension efforts and amplify outreach campaigns' efficacy and measures to increase the availability of appropriate pest and disease control practices.

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Climate change is adding to existing labour pressures for the agriculture sector.

The farming population is aging and becoming more female-dominated in the Pacific due to seasonal worker schemes and urbanisation. Climate change adds to these pressures as additional labour is required for adaptation actions such as digging drainage trenches or managing pest and disease outbreaks. 'Increasing the availability of climate resilient seeds and planting materials, as well as climate-resilient mechanisation solutions such as solar pumps can help to increase resilience and reduce the labour burden. There is also a need to engage and train youths to be part of climate smart agriculture in PICs and Timor-Leste.

Carbon emissions are becoming a market access issue, particularly for well-traded commodity crops such as coffee.

Investment in traceability, carbon emissions verification and certification will become increasingly important to gain or maintain access to high-value markets. Smallholders in PICs and Timor-Leste are at risk despite their generally low-emissions practices because of the high verification costs and absence of in-country service providers.

Some climate change innovations supported by MDF and PHAMA Plus have been effective but have only been only applied on a small scale.

With public and private debt at record highs and interest rates as high as they have been for decades, the adoption of innovations to respond to changing climate may be hampered by a lack of large-scale investment finance. This gap is particularly challenging in PICs and Timor-Leste, which have historically struggled to attract finance due to their small market size.

Understanding climate change impacts on businesses and markets must be integrated into development program investment strategies.

This understanding can then provide market actors, stakeholders and policymakers with evidence to support climate-resilient investments, contribute towards sustainable and inclusive markets, and build research capacity in PICs and Timor-Leste.

The Pacific Horticultural and Agricultural Market Access Program (PHAMA Plus)

The Pacific Horticultural and Agricultural Market Access Plus (PHAMA Plus) Program supported by Australia and New Zealand, contributes to inclusive economic growth and improved livelihoods for Pacific people, with an emphasis on gender equality and inclusion, and environment and climate resilience.

Since 2011, PHAMA Plus has worked with Pacific businesses, industry groups and government partners to maintain and improve trade of agricultural products by assisting market participants to: adopt innovation, improve practices, share information and meet export market requirements.

Our aim is to benefit households in the Pacific economies of the Cook Islands, Fiji, Kiribati, Papua New Guinea, Niue, Samoa, Solomon Islands, Tonga, Tuvalu and Vanuatu, while also developing and growing export opportunities for Pacific primary exports to Australia, New Zealand and other countries.

Market Development Facility (MDF)

Market Development Facility is an Australian Government funded multi-country initiative which promotes sustainable economic development, through higher incomes for women and men, in our partner countries.

We connect individuals, businesses, governments and NGOs with each other, and with markets at home and abroad. This enhances investment and coordination and allows partnerships to flourish, strengthening inclusive economic growth.

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

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