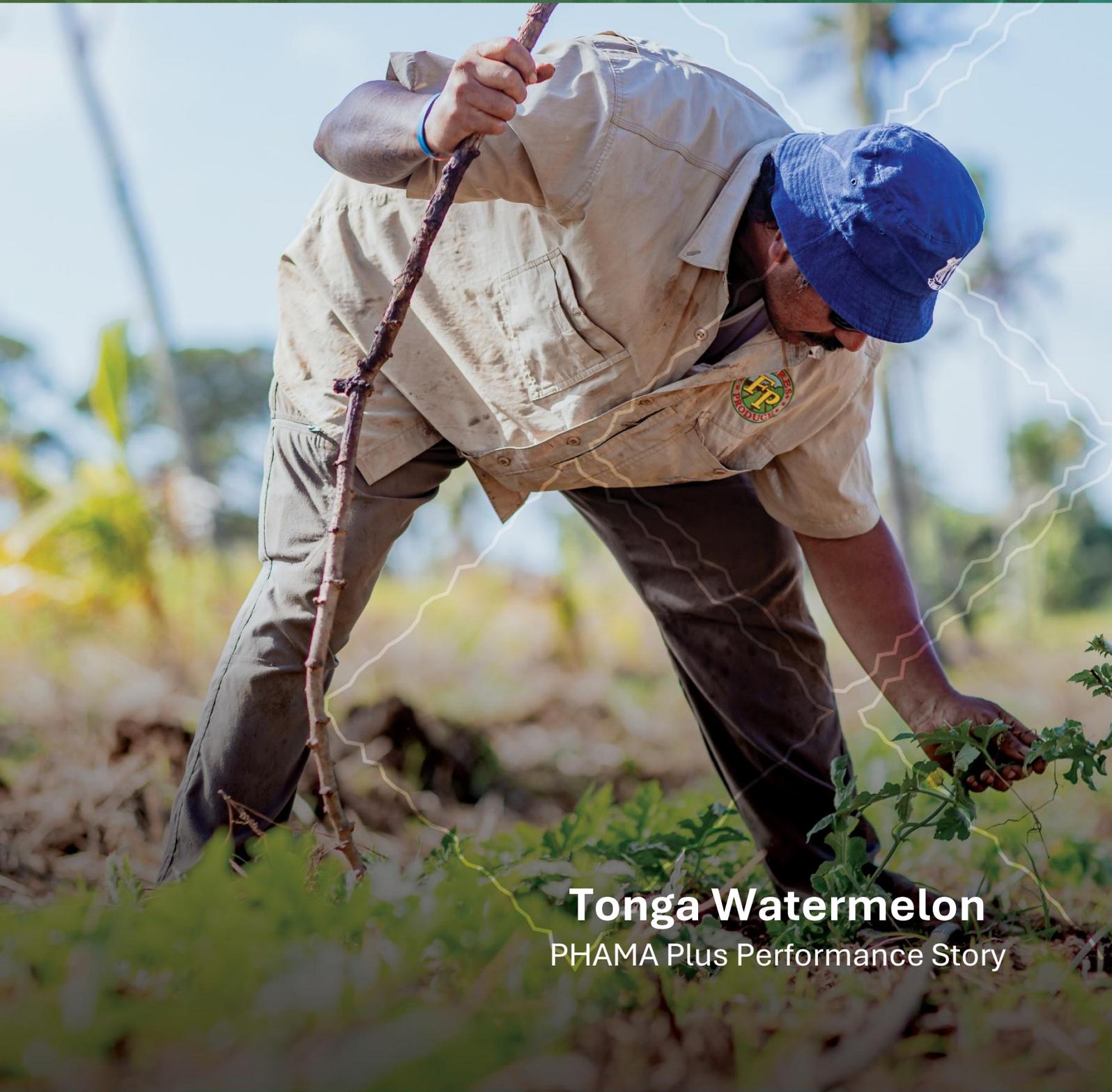




Pacific Horticultural
& Agricultural Market
Access Plus Program

Supported by Australia & New Zealand



Tonga Watermelon

PHAMA Plus Performance Story



Tonga Watermelon - PHAMA Plus Performance Story

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Quality Information

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Executive Summary

Horticulture is central to Tonga’s national identity; more than half of all households are engaged in farming¹. Much of the market is domestic-focused, with strong local demand and prices frequently out-compete higher-risk export opportunities. Yet despite this, horticulture was reported to make up 87% of Tonga’s exports as at June 2025². Within this context, PHAMA Plus has worked over many years to strengthen the export pathways for Tonga’s horticulture sector. In response to stakeholder priorities, the program has focused much of this effort through the watermelon sector, but with a view to delivering multiplier benefits for other key commodities such as root crops and kava.



A Tongan farmer tends young watermelon plants. Watermelon plays a modest but strategically important role in strengthening Tonga’s horticulture export pathways

Watermelons are a modest but strategically important crop in Tonga’s horticulture system, providing a reliable income opportunity for rural households alongside food supply for the domestic market. The sector also connects a predominantly semi-commercial farming base to a growing export value chain, creating seasonal income and employment, both on farm and throughout the industry. Watermelon production and exports sit within a wider national ambition to strengthen horticultural exports and, over time, build viable processing and value-adding options that can reduce losses and smooth seasonal volatility.

Tonga’s comparative export advantage is its alignment with New Zealand’s “winter window”, when New Zealand’s domestic supply is low and market prices tend to be firmer. However, the same seasonality concentrates commercial and compliance risk into a short period each year. Any disruptions, such as biosecurity non-compliance, extreme weather, pest or disease outbreaks, shipping delays, cold-chain failure, or shifts in buyer confidence can erase a season’s returns and discourage investment, particularly in a thin market where a small number of exporters and facilities carry much of the pathway. Many of the pathway risks are longstanding, but they became particularly apparent during PHAMA’s engagement since 2011. This performance story finds strong evidence that the PHAMA and PHAMA Plus programs, through partnerships with government and the private sector, have contributed to restoring and protecting watermelon exports from Tonga by addressing quality issues, strengthening coordination, and building farmer and exporter capability.

¹ MAFF Annual Report 2023-24

² [Foreign Trade | Tonga Statistics Department](#)

PHAMA Plus's analysis and partner diagnostics identified interlocking constraints affecting pathway stability and growth potential: public–private coordination; biosecurity and verification (treatment performance, hygiene and documentation); food safety, handling, and post-harvest discipline (grading, packing, temperature management and cold chain readiness); integrated pest management and crop health (including rotation guidance as wilt pressures emerged); climate and water risk; and limited value-adding options to absorb B-grade fruit and reduce seasonal waste.

In response, PHAMA Plus supported a connected package of interventions across the export pathway, working through government and private sector partners. This included strengthening coordination and decision-making through the Tonga Watermelon Export Taskforce, enabling joint planning, faster issue escalation and clearer role clarity across Ministry of Agriculture, Food and Forests (MAFF), exporters and other agencies.

It also included a 'reset' of practices with biosecurity authorities following detections. This was informed by technical diagnostics led by New Zealand Plant & Food Research and supported through engagement with New Zealand's Ministry for Primary Industries in its trading partner and regulatory role. The work translated into refreshed standard operating procedures (SOPs) for in-field and post-harvest activities by government and private sector, staff training, tighter verification routines and practical improvements to treatment and pathway readiness.

In parallel, there is strong evidence that PHAMA Plus, in partnership with the private sector and government stakeholders, strengthened on-farm production, processing and post-harvest capabilities. This included an array of interlinked interventions:

- Farmer, packhouse and MAFF staff training for better understanding of export standards and associated SOPs.
- On-farm irrigation/fertigation pilots for increased productivity, incomes and resilience.
- Support for extension services focused on improvements in fruit quality and productivity.
- Food safety certifications for packhouse facilities.
- Cold chain storage capacity and SOPs to maintain quality for exports and support growth of value-added products such as juices.

Considered together, these actions have strengthened the export pathway system: coordination is clearer, readiness routines are more established, and requirements are better communicated and understood from border expectations through to packhouse SOPs and on-farm practices. While results remain most visible among participating exporters and pilot cohorts, the pathway is better aligned to requirements and is now increasingly able to operate reliably within the 'winter window'.

To grow export opportunities further, the next steps will need to be primarily focused on scaling: expanding the supply base and increasing consistency while maintaining pathway integrity. Priorities include maintaining TWET's seasonal interventions; institutionalising light pre-season diagnostics and verification; scaling proven on-farm practices by addressing input availability and finance bottlenecks (particularly irrigation and related materials); and strengthening extension messages on crop rotation, soil health and disease management. Continued pursuit of commercially viable processing and value-adding opportunities where these can reduce losses, support domestic demand, and smooth utilisation of facilities across seasons will also be important.

Importantly, watermelons have offered an entry point for improvements for horticulture exports more broadly. The systems and capabilities strengthened for watermelons —coordination forums, SOP templates, documentation discipline, packhouse and cold-chain practices, and human capital — can be equally applied to other export-ready horticulture products.

PHAMA Plus's contribution remains catalytic — restoring trade confidence, strengthening systems that manage risk, and enabling farmers, processors, and regulators to perform. Expectations by the sector are for growth as these system changes continue to embed across the value chain, resulting in further social, economic and environmental benefits.

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Acronyms

AQSIQ	General Administration of Quality Supervision, Inspection and Quarantine (China)
DFAT	Department of Foreign Affairs and Trade (Australia)
FFT	Family Farm Teams
HACCP	Hazard Analysis and Critical Control Point
ICP	Industry Partnership Program (as used in “Soil Wealth ICP”)
IPM	Integrated pest management
LPG	liquefied petroleum gas
MAFF	Ministry of Agriculture, Food and Forests (Tonga)
MEL	Monitoring, Evaluation and Learning
MT	metric tonnes
MTED	Ministry of Trade and Economic Development (Tonga)
NCSU	North Carolina State University
NZ MPI	New Zealand Ministry for Primary Industries
NZ PFR	New Zealand Plant & Food Research
OPDs	Organisations of Persons with Disabilities
PHAMA	Pacific Horticultural and Agricultural Market Access Program
SOPs	standard operating procedures
TOP	Tongan pa’anga
TSD	Tonga Statistics Department
TWET	Tonga Watermelon Export Taskforce
UC ANR	University of California Agriculture & Natural Resources
UF/IFAS	University of Florida / Institute of Food and Agricultural Sciences

1 Tonga's Watermelon Sector

1.1 Why Watermelons Matter

The watermelon sector in Tonga is modest in scale, but it is crucial because it provides one of Tonga's clearer seasonal income opportunities for rural households and a small, strategically important export value chain. Tonga's farming base remains predominantly non-commercial: the 2023–24 Ministry of Agriculture, Food and Forests Annual Report states that, among 18,847 households, 55% are agriculturally active, and less than 10% are full-time commercial horticulture farmers. Within this structure, watermelons are typically grown on small plots as part of crop rotations and interspersed with other crops, rather than as a continuous monoculture. Mixed and scattered plantings are also common at village level, reflecting land availability, labour, and pest and disease pressures. In terms of land use, MAFF's 2023–24 Annual Report records 44 acres (approximately 18 hectares) planted with watermelon in 2024, underscoring that watermelon is currently a niche horticultural crop within Tonga's broader farming system (MAFF, 2024; MAFF Annual Report 2023-24).

Despite its niche status, the watermelon sector sits at the intersection of household food and income, export opportunity, and under-realised value-adding potential. In practice, there are 3 markets:

- First, the domestic market absorbs watermelons year-round and generally does not apply the same tight export grading and presentation requirements.
- Second, the commercial export sector is “thin” but organised and reliably active year-on-year: a small cohort of commercial producers and exporters coordinate quality-assured production from a wider base of semi-commercial growers, with exports focused almost entirely on New Zealand, with small consignments periodically to Samoa and American Samoa.
- Third, there is a recently established juicing operation for processing and value-adding (to reduce waste and smooth seasonal volatility).

Together, these 3 markets underscore why watermelons matter to communities and the economy in Tonga and also offer utility as a reliable ‘entry point’ for horticulture export pathway development more generally.

Key Industry Metrics:

Description	Value
# of households in the country	18,847 (2024)
# households involved in cropping	10,365 (2024)
# households involved in producing cucurbits (domestic and exports)	2,000 (estimate) (2020)
# households producing cucurbits^ for export	210 (2020)
Current production (MT)	322 MT (2023)
Current export (MT)	123 MT (2023)
Current Domestic Market Sales (MT)	199 MT (2023)

^ Cucurbits are a family of plants including zucchinis, cucumbers, squash, pumpkins and melons.

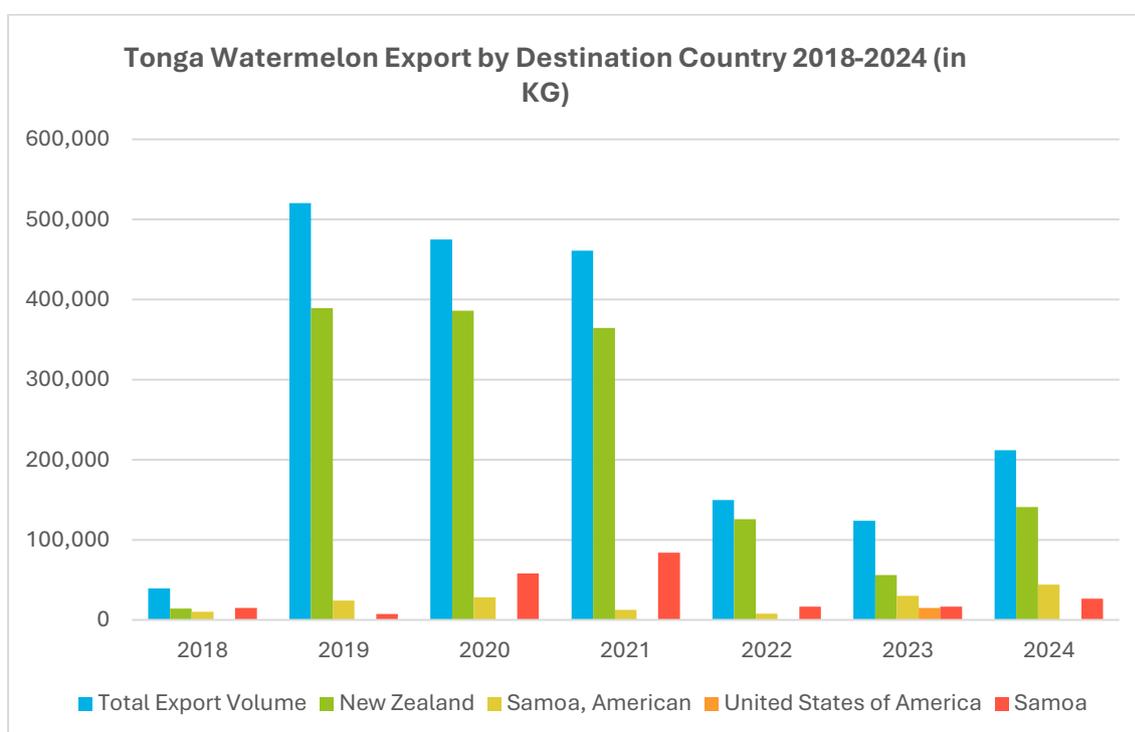
Source: Tonga MAFF Annual Report 2023–2024, MAFF, Tonga International Merchandise Trade Statistics 2023, Tonga Horticulture Intervention Plan 2020

1.2 Seasonal Advantages, Concentrated Risks

Tonga’s commercial watermelon exports mainly occur during July–December and are oriented almost entirely to New Zealand, peaking during October–December. Tonga competes with Australia for the New Zealand market (Australia dominates the market share), with greater opportunities for Tongan exporters occurring some seasons when Australian exporters face challenges such as market restrictions due to biosecurity concerns, or supply chain disruptions.

Official merchandise trade statistics report 460 tonnes of fresh watermelons were exported in 2021 (value TOP\$785,618), declining materially to 123 tonnes in 2023 (value TOP\$305,046), highlighting both the capacity to mobilise significant volumes in favourable seasons and exposure to year-to-year variability. The New Zealand market dominates, though small consignments have periodically gone to Samoa, American Samoa, and the United States (Tonga Statistics Department, 2024).

This seasonality gives Tongan exporters a valuable slot, but it also concentrates risk: biosecurity threats, weather shocks, logistics disruptions, or any loss of buyer confidence during this short window can erase a year’s returns.



Source: Tonga Statistics Department, 2024

1.3 Boom and Bust

Tonga’s horticulture exports more generally have a history of boom-and-bust dynamics where periods of promising growth—new plantings, rising consignments and buyer interest, are followed by setbacks linked to weather, biosecurity, quality, compliance or logistics. For example, in the 1990s, papaya was a significant export to New Zealand; however, market pathways were closed due to fruit fly concerns. Similarly, and more recently, breadfruit exports to Australia and New Zealand were suspended in 2016-17 due to biosecurity threats.

Setbacks (and rebounds) are also influenced by strong local market demand, which can disincentivise higher-risk export activity. Tonga’s watermelon production remains inconsistent compared to the steady growth of root crops (cassava, yam, taro), explained by several structural, environmental, and market-based factors. While root crops are the "mainstay" of Tonga's traditional cropping system, watermelons

are a high-value but high-risk niche horticultural crop. In comparison, root crops have a massive, stable domestic demand that often out-competes the higher-risk export market. Watermelon producers, facing tight export grading and presentation requirements, may shift away from the crop following a bad year – resulting in a lag to export market ‘rebounds’ - whereas root crops remain a staple for household consumption regardless of export conditions.

Tonga Watermelon Production and Export Trend (2019-2025) in Metric Tonnes

	2019	2021	2022	2023	2024	2025
Domestic Market Supply of Watermelon (Metric tonnes)	155	295	662	199		
Export (Metric tonnes)	520	460	149	123	211	122
Total (Metric tonnes)	675	755	811	322		

Source: (MAFF Annual Report 2023–24, Tonga International Merchandise Trade Statistics 2019–2024, MAFF Export Data 2025)

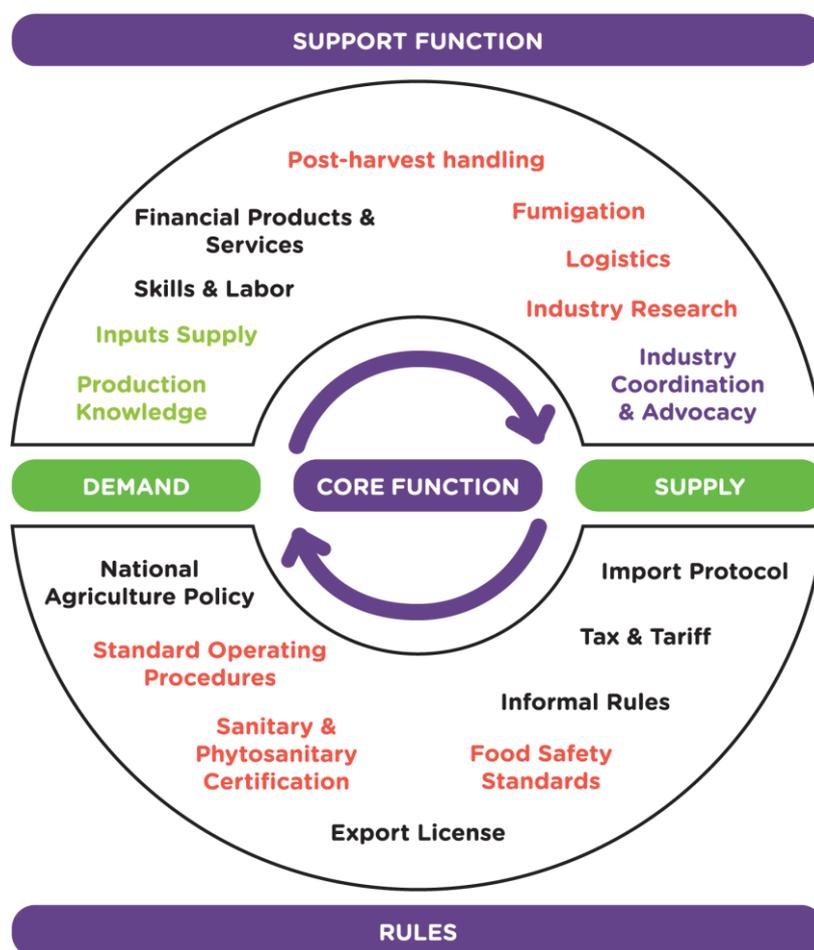
For Tongan watermelons, an acute shock arrived in 2020-21 when border detections in New Zealand raised red flags on pest risks, including fruit fly and mealybug, amid broader concerns about handling, grading and fumigation practices. The immediate response from authorities was necessarily precautionary, constraining routine access and prompting an emergency pathway contingent on tighter field hygiene, treatment performance and quality controls, and clearer documentation. This catalysed a more coherent response, including PHAMA Plus support for the formation of the Tonga Watermelon Export Taskforce (TWET) to align regulators, technical agencies and exporters around shared planning, accountability and a workplan (NZ PFR 2024; PHAMA Plus 2024).

Beneath the border incident sat long-running structural issues. On-farm practices were guided as much by tradition and peer learning as by consistent extension and technical advice. Tonga has one of the more heavily resourced government-supported agricultural extension systems in the Pacific, yet the level of technical expertise and practical advice provided to farmers for niche horticultural crops is limited and the level of on-farm productivity for farmers varies widely.

Across the value chain, other constraints compounded these risks. Logistics, packhouse capacity, post-harvest handling, coordination of sector-wide challenges, biosecurity and quality risks. In short, the sector’s narrow export window magnified the cost of these weaknesses—making shocks such as detections and drought not just one-off events, but stress tests for the entire system.

2 PHAMA Plus Interventions: Supporting the Pathway to Stability and Growth

Since 2011, PHAMA and PHAMA Plus have supported Tonga’s watermelon export pathway across the full value chain—helping partners identify binding constraints in the sector, coordinate effectively, and embed practical systems and capability so the pathway performs reliably within a short export window. The market systems diagram for the Tonga watermelon sector (below) outlines the support and regulatory functions essential for the development, learning, adaptation and growth of the market, with strong transferable benefits to other horticulture commodities. Notably, the key support functions where PHAMA and PHAMA Plus have intervened, in partnership with both public and private sector stakeholders, are shown in coloured text.



PHAMA and PHAMA Plus have contributed significantly to strengthening Tonga’s watermelon, and broader horticulture, export pathways through mutually reinforcing investments in: public–private coordination; biosecurity capabilities; food safety, handling and post-harvest systems; production resilience; and value-adding opportunities. These interventions are outlined in the graphic below and expanded on in the following sections.

Taken together, PHAMA and PHAMA Plus’s contribution shows a long arc from early market access feasibility and pathway analysis (2011), through infrastructure and systems diagnostics (2013–2016), to Phase 2 efforts that used shocks to tighten coordination, strengthen verification and embed better practices across production, treatment and post-harvest handling. The overall effect is a more coherent and credible pathway—better placed to scale watermelon supply while also establishing the opportunities for diversification by applying the same systems capability to other horticulture exports.

Improving on-farm practices'		Strengthening systems, knowledge and infrastructure for export pathway	
PHAMA		PHAMA	<ul style="list-style-type: none"> Established and supported Market Access Working Group Established and supported Watermelon Exports to New Zealand Action Plan Project Management Team Supported the adoption and operations of an Export Manager, as a new position in MAFF Supported Nishi Trading to upgrade its packing facility, achieve HACCP certification and develop and deliver training on watermelon production and handling to farmers and staff Tried shipments of watermelons to Samoa as part of expanding export opportunities
PHAMA Plus Phase 1	<ul style="list-style-type: none"> Helped Nishi Trading growers to access crop advisory and input supply support functions Engaged PFR to conduct diagnostic study to identify pest, disease, agronomic and post-harvest issues and management options across the watermelon supply chain 	PHAMA Plus Phase 1	<ul style="list-style-type: none"> Supported MAFF to maintain and improve their capacity and facilities to conduct fumigation treatments. Established Tonga Watermelon Export Taskforce (TWET)
PHAMA Plus Phase 2	<ul style="list-style-type: none"> Engaged PFR to provide training to MAFF, exporters and farmers on pest & disease control, harvesting and post-harvest handling Co-invested with Nishi Trading to pilot drip irrigation/fertigation and associated ag tech tools to improve climate resilience, with quantified business modelling to test financial viability of replication. 	PHAMA Plus Phase 2	<ul style="list-style-type: none"> Established Fumigation Working Group under TWET Established Shipping Taskforce Shipping Schedule Incentivised Scheme(SSIS) HACCP certification of MTED packhouse Co-invested with Nishi Trading to increase capacity including upgrading cold storage facilities Working with PPIU, supported MAFF to significantly expand fumigation capacities, including equipment, training and updated Standard Operating Procedures

Figure 1: PHAMA Plus Tongan watermelon interventions (2011–25)

3 Strengthening Private-Public Coordination

Watermelon exports require tightly sequenced actions across growers, exporters and packhouses, MAFF, and shipping and logistics. PHAMA has supported coordination since 2011 through the Market Access Working Group, established under the program. PHAMA Plus later facilitated a dedicated Tonga Watermelon Export Taskforce (TWET) to create a more focused, practical forum for shared problem definition, role clarity and pre-season “readiness” actions, and to provide a credible platform for engagement with trading partners’ expectations.

There is strong evidence that PHAMA Plus, in partnership with MAFF, New Zealand Ministry for Primary Industries (NZ MPI), New Zealand Plant & Food Research (NZ PFR), and exporters, strengthened the enabling environment for coordination by revitalising the TWET in 2021. It acted as the primary forum for joint planning and technical problem-solving in response to the threatened market pathway closure in 2020-21 and continues to drive public-private dialogue and actions. This collaboration improved alignment between policy and exporter needs, reduced duplication across training and extension, and created a single decision interface for fumigation, pathway updates and pre-season readiness — contributing to restored market access confidence (PHAMA 2016; MAFF 2024; NZ PFR 2024).

The TWET brought exporters (e.g., Nishi, Tonga Market Access Network), MAFF (Quarantine, Plant Protection), Ministry of Trade and Economic Development (MTED), farmer representatives, and PHAMA Plus around one table. Meeting monthly and more frequently in the lead-up to the export window—the TWET became the primary interface for decisions on fumigation operations, training schedules and extension alignment. Instead of parallel conversations, actors dealt with bottlenecks synchronously: agreeing who would act, by when, and how progress would be verified (MAFF 2024; NZ PFR 2024).

“One of the best things we had has been the partnership ... it was focused on ‘Team Tonga’, not MAF or an exporter” (Key stakeholder surveys).

Stakeholders reported that coordination improved alignment between government policy settings and exporter needs. Through the TWET, MAFF officials gained a clearer view of the commercial constraints facing exporters and growers, particularly around meeting market quality standards, treatment capacity and documentation timeframes (NZ PFR 2024; MAFF 2024). Exporters, in turn, contributed shipment data and packhouse feedback that informed national export strategies and the updated Export Pathway—making standards more usable and audit-ready (NZ PFR 2024; MAFF 2024).

“Coordination works well. Representatives are there from both sides [Government and private sector]. When there is a need to call the meeting, everybody is always there.”. CEO of Ministry for Trade and Economic Development

PHAMA Plus advisers supported TWET’s agenda with technical advice, evidence and lessons from watermelon trials and observations. This evidence centred discussions on what worked in practice—irrigation scheduling, pest scouting routines, packhouse hygiene checks, and how these could be institutionalised through MAFF extension and exporter SOPs. The result was fewer duplications and a tighter connection between trials, extension messages and compliance requirements; trials were not run in isolation but sequenced with government outreach so lessons could be internalised ahead of the window (PHAMA 2016; MAFF 2024).

The Taskforce format also created discipline around readiness. TWET maintained a standing pre-season checklist—treatment equipment calibration, fumigator refresher training, inspector rosters, exporter documentation drills, and escalation points to NZ MPI so issues could be resolved before first sailings. In season, the same group monitored a short set of indicators (interceptions, documentation errors, treatment failures) and agreed on immediate corrective action when thresholds were breached. This cycle—plan, check, act—helped to reduce noise and focus attention where it mattered most for market access (NZ PFR 2024).

Beyond watermelons, coordination lessons are being ported into the broader horticulture agenda. The TWET model is now being adapted for whole of horticulture planning under the Tonga Horticulture Sector Strategy, recognising that shared communications, common SOP templates and a single calendar for readiness checks create efficiencies across crops (MAFF 2024).

Overall, the coordination mechanism turned disparate efforts into a coherent system response: one forum, common facts, clear roles, and time-bound actions. In this enabling environment, PHAMA Plus’s contribution was to convene, evidence and align—linking and informing government functions and private sector execution so that compliance and commercial viability advanced together (PHAMA 2016; MAFF 2024; NZ PFR 2024).



Left to right: PHAMA Plus Tonga Country Manager, Mr Tevita Lautaha with Nishi Trading Managing Director, Minoru Nishi and former Program Manager for DFAT.

4 Strengthening Biosecurity Capabilities



Improved fumigation practices and verification have strengthened biosecurity controls along Tonga's watermelon export pathway

As a fruit fly host commodity, watermelon market access hinges on credible phytosanitary risk management, consistent treatment performance, strong hygiene and reliable evidence to reassure trading partners—especially when compliance shocks occur. PHAMA's early contribution included technical analysis of pathway options (including the “winter window”). Across the 2013–2016 period, PHAMA-commissioned diagnostics and infrastructure-focused studies helped underpin improvements to export inspection and treatment systems (including the MAFF post-harvest facility and fumigation-related capability). Following detections in Phase 2, PHAMA Plus supported a structured diagnostic workplan response, helped formalise governance through TWET (including a fumigation working group), and supported expanded fumigation capacity through equipment, training and updated SOPs alongside efforts to improve hygiene, verification and documentation.

“Initially, when they found fruit fly in one of the breadfruit consignments, they pointed to MAFF as the issue – but after the audit, it became clear it was everyone in Tonga that had the issue ... and required a whole of industry response. Audit showed as part of the issue the fumigation and post-fumigation actions, as well as lack of compliance from the early stage of the value chain.”, MAFF Quarantine officer.

There is strong evidence that PHAMA Plus, in partnership with MAFF, NZ MPI and New Zealand Plant & Food Research (NZ PFR), strengthened the enabling environment for biosecurity—improving collaboration across agencies and exporters, lifting technical competency (training, SOPs, facility readiness), and restoring trading partner confidence in the biosecurity and export pathway for watermelons.

In response to the threatened market pathway closure in 2020–21, NZ PFR initiated targeted diagnostics that identified the biosecurity weak points undermining watermelon market access to New Zealand. This triggered a rapid, coordinated response by MAFF, PHAMA Plus, and NZ MPI to address them. Support focused on field and packhouse hygiene, pest risk management (notably fruit fly and mealybug), fumigation performance, and clearer roles and records along the export pathway. The result was a fast restoration of trading partner confidence and a stronger routine pathway for the winter window of watermelons (PHAMA 2011; PHAMA 2016; NZ PFR 2024; MAFF 2024). Key stakeholders from

MAFF noted that the market access was closed for a much shorter time than with other instances, such as papaya or more recently breadfruit, due to the support from PHAMA Plus and others.

Targeted diagnostics by NZ PFR, and PHAMA and PHAMA Plus technical reviews established a shared risk picture—pinpointing where consignments were failing: field sanitation, harvest handling, grading, treatment parameters and documentation (PHAMA 2011; NZ PFR 2024). These assessments triggered an accelerated workstream of technical dialogue between PHAMA Plus, MAFF (Quarantine and Plant Protection) and NZ MPI to agree an emergency pathway while corrective actions were implemented, with the goal of re-establishing confidence ahead of the export window (NZ PFR 2024; PHAMA 2016).

Training and capability building followed quickly. PHAMA Plus supported MAFF to deliver refresher training for fumigators, pest scouts and quarantine officers—reinforcing SOPs and recordkeeping, with practical emphasis on pre-fumigation preparation, dosage/time controls, leak testing and post-treatment verification (NZ PFR 2024). From the farm to the exporter, pest scouting protocols, basic field hygiene (host trash removal, crate cleanliness) and packhouse hygiene (wet/dry area separation, foreign matter control) were reinforced through practical checklists and posters (PHAMA 2011; NZ PFR 2024).

SOPs were updated and critical infrastructure refurbished with PHAMA Plus co-investment where needed—improving treatment chamber integrity and calibration, strengthening packhouse segregation and hygiene, and tightening documentation controls to maintain lot identity from farm to vessel (MAFF Fumigation 2025, NZ PFR 2024). Guidance to exporters and NZ PFR training on Integrated pest management (IPM) linked on-farm biosecurity to packhouse outcomes: clean fruit, clean bins, clean lines. Following PHAMA Plus support to expand fumigation facilities, MAFF and MPI committed additional staffing resources to ensure better coordination within MAFF’s divisions, and with exporters, development partners, services providers and farmers.

“We ensure compliance through enforcement – if people are not following the SOPs, then they are not allowed to export and need to go through the domestic market or to American Samoa [less biosecurity requirements]... MAFF extension officers are visiting every exporting/commercial farm once a week for 3-4 months during the growing and pre-harvest period” - Senior MAFF extension staff.

MAFF’s SOPs for Watermelon Export to NZ was formally updated and adopted, codifying who inspects, who certifies, what records are kept, and when checks occur (preharvest, prepack, pre-treatment, pre-departure), aligned with NZ import conditions. Early implementation feedback indicated fewer documentation errors and more consistent predeparture verification (NZ PFR 2024; MAFF 2025). Further underscoring its commitment, MAFF provided significant in-kind contributions, including staff overtime, electricity, and other essential services for the upkeep of the facility during a crucial 6-month watermelon season (July-Dec) where new equipment was trialled. (MAFF 2025). The updates to these SOPs and increased vigilance in their implementation built on earlier efforts including with PHAMA and PHAMA Plus support.

Coordination also improved through the TWET (see above), which provided a practical forum for pre-season readiness and in season issue-solving described by stakeholders as focused on “Team Tonga” rather than any single agency or exporter (key stakeholder surveys).

Interception pressures in 2020–21 were followed by stabilisation as SOPs and the updated Export Pathway bedded in. While shipment volumes fluctuate with production and logistics, documentary non-compliance reduced and buyers reported improved reliability during the winter window (NZ PFR 2024; MAFF 2024).

It is worthwhile to note that tools developed for watermelons—SOPs, checklists, training modules and documentation controls—are now being adapted across other horticulture pathways, consistent with PHAMA’s cross-commodity approach to pathway and infrastructure strengthening (PHAMA Plus Horticulture Sector Strategy 2024; MAFF 2024).

Case study: Maintaining export pathways through on-farm biosecurity

Nafetalai Makaui from Houma, Tonga, is one of 3 farmers working with Nishi Trading in the pilot fertigation project supported by PHAMA Plus.

The project promotes sustainable farming through small-scale, climate-smart irrigation systems designed to boost year-round watermelon production despite Tonga's changing climate — particularly the extended drought conditions that reduced soil moisture and placed crops under stress during critical growing stages.

Nafetalai and his family run a 24-acre farm with rich, fertile soil. He grows a wide variety of crops, including watermelon, cassava, taro, squash, butternuts, sweet potatoes, and tomatoes.



Nafetalai Makaui continues to invest in watermelons with the support of the Watermelon Wilting Guide by NZ PFR

Chosen by Nishi Trading as a lead farmer and champion for piloting the new fertigation equipment, Nafetalai saw his watermelon harvest jump from eight tonnes to 21 tonnes on his one-acre plot — enough to fill a 20-foot shipping container.

“I never imagined I could grow that much on just one acre,” Nafetalai beamed.

Inspired by this success, he planted watermelon again the following year, investing in seeds, fertilisers, herbicides, and dedicating many hours to tending his crop. Unfortunately, wilt disease wiped out 100% of his plants, leading to a significant financial loss.

“I did not know about crop rotation before. Losing the entire crop was tough, but it taught me the importance of rotating crops to keep the soil healthy and avoid disease,” he reflected.

“Through the training I received from PHAMA Plus and Nishi Trading, and learning as I go, I now understand how important crop rotation is to keeping my soil healthy, preventing disease, and improving my crop yields,” said Nafetalai.

Despite the setback, Nafetalai remains optimistic.

“I plan to rotate my crops and expand the irrigation system. I’m confident the next season will be much better.”

Strong on-farm practices aren’t just important for productivity, but for maintaining the integrity of Tonga’s export pathway: clean fruit, clean bins, clean export lines.

PHAMA Plus has released a new Watermelon Wilt Guide designed to help farmers improve their practices and reduce the prevalence of wilt, linking on-farm biosecurity to packhouse outcomes. The guide is the product of collaborative research by NZ PFR and Tonga’s Ministry of Agriculture Research Division, funded by PHAMA Plus.

5 Improving Food Safety and Handling



Post-harvest grading and inspection at Nishi Trading's packhouse, a critical control point for quality, hygiene and export compliance

Export acceptance is shaped as much by post-harvest performance as by farm production—harvest maturity, grading, packing discipline, labelling, hygiene, cold chain and documentation all affect quality and buyer confidence. PHAMA-commissioned work helped clarify infrastructure and systems constraints and informed improvements to the MAFF post-harvest inspection facility over time. PHAMA Plus then reinforced clearer quality controls and SOPs for harvest and post-harvest activities, supported Hazard Analysis and Critical Control Points (HACCP) certification (including the MTED packhouse), and helped deliver practical training for farmers and packhouse staff; where feasible, it also supported cold chain improvements.

There is strong evidence that PHAMA Plus, in partnership with the private sector (i.e., Nishi Trading), MAFF, and MTED (with engagement from NZ PFR and NZ MPI), has strengthened processing and post-harvest capabilities for watermelons, particularly in terms of improved food safety and handling. Support focused on co-financing critical packhouse upgrades, refining SOPs and improving cold-chain readiness—enabling higher throughputs and contributing to tighter quality control and longer shelf life for export-grade melons (PHAMA 2016; PHAMA 2013; NZ PFR 2024; PHAMA Plus 2024; MAFF 2024; MTED 2024).

Reflecting Tonga's thin markets, Nishi Trading stands out as the sole private sector partner operating at scale. It maintains extensive farmer networks alongside its own farm supplying the processing facility, which supports more reliable intake planning and quality control. Nishi is also a major supplier of Tongan watermelons to New Zealand and Samoa, and one of the few companies with cold storage capable of holding a range of horticultural products at optimum temperatures while awaiting export vessels. In practice, its facility functions as a multipurpose packhouse and processing plant handling a mix of fresh and processed products (PHAMA Plus 2024).

Building on this platform, PHAMA supported Nishi to comply with China's General Administration of Quality Supervision, Inspection and Quarantine (AQSIQ) requirements for squash packhouses in 2016–

2017 and to achieve HACCP accreditation in 2017–2018, alongside technical training for growers to lift watermelon production (PHAMA Plus 2020). PHAMA Plus’s partnership with Nishi Trading has been focused on positioning Tonga’s horticultural exports for growth by improving quality and increasing export volumes through sustained public–private collaboration (PHAMA Plus 2020).

"Our major export is root crops — however, 70% of it is not commercial. However, for watermelons, there is a [commercial] NZ market — we rely on Nishi Trading, our largest exporter, to understand the markets. And they know that they could export more if it was available, so there is opportunity to increase production." — MAFF official.

With support from PHAMA Plus, Nishi Trading upgraded its packhouse with new washing/cleaning lines, chilling systems and additional cold storage. PHAMA Plus cofinanced these investments, leveraging Nishi’s resources and aligning upgrades to exporter SOPs and NZ import requirements. Technical support helped Nishi refine lineside SOPs (grading, sanitation, crate/line hygiene, precooling and temperature checks, management of gas levels associated with ripening), which reduced spoilage and improved presentation consistency at loadout (NZ PFR 2024, Key Informant Interviews). The upgrade also included training of packhouse staff in cold store management to ensure effective handling and storage for export (PHAMA Plus 2024).

The enhanced cold storage facility, a direct result of PHAMA Plus’s support in implementing improved precooling and temperature management, significantly elevates post-harvest handling quality and extends the shelf life of produce. This robust cold chain infrastructure ensures that Nishi can reliably preserve the freshness and integrity of not only export-grade watermelons but also other temperature-sensitive crops like taro, coconut, and squash. By reducing spoilage, maintaining optimal conditions during storage and transit, and enabling compliance with stringent international food safety standards (such as HACCP), Nishi Trading is better positioned to consistently deliver high-quality products to international buyers, thereby strengthening its market presence and fostering long-term export success across a diverse range of agricultural goods. (PHAMA Plus 2025)

Nishi Trading Export Volume Trend (2024-2025) in KG

Produce	2024 Export Volume	2025 Export Volume	Variances	YoY Growth
Butternut	23,319.50	71,640.00	48,320.50	207%
Watermelon	45,528.50	46,058.00	529.50	1%
Crown pumpkin	35,290.00	53,722.00	18,432.00	52%
Squash	24,359.00	56,269.50	31,910.50	131%
Taro	9,008.00		- 9,008.00	-100%
Kumara	2,220.50	478.50	- 1,742.00	-78%
Cassava	40,688.76		- 40,688.76	-100%
Total Cucurbits	128,497.00	227,689.50	99,192.50	77%
Total Root Crops	51,917.26	478.50	- 51,438.76	-99%
TOTAL	169,914.76	228,168.00	58,253.24	34%

Source: Nishi Trading Partner Data Collection, Jan 2026

The data clearly indicates that the improvements in the cold storage unit have been a crucial factor in the overall rise of fresh exports, contributing to a 34% total year-on-year growth in export volume (from 169,914.76 kg in 2024 to 228,168.00 kg in 2025). This growth is predominantly driven by cucurbit crops, which collectively saw an impressive 77% increase in export volume (from 128,497.00 kg to 227,689.50 kg). Individual successes like Butternut (207% growth), Squash (131% growth), and Crown pumpkin (52% growth) directly reflect the cold storage's ability to extend shelf life, maintain quality, and facilitate the export of a broader range of perishable goods. While watermelon was an entry point, its modest 1%

export growth (from 45,528.50 kg to 46,058.00 kg) is reflective of broader market drivers. Growth of complementary horticulture crops is consistent with PHAMA’s cross-commodity approach to pathway and infrastructure strengthening.

In Tonga’s small, thin market, there is limited expectation or commercial viability for establishing additional, standalone processing facilities dedicated to watermelons. This constraint was recognised from the outset: production, coordination and pathway reliability, and appropriate upgrades to facilities that can be used for multiple horticultural products were more scalable than duplicating infrastructure (PHAMA 2016; PHAMA 2013; Key stakeholder surveys). The practical implication is that quality improvements depend on strengthened skills and knowledge, disciplined SOP adoption and cold chain practices across existing facilities, rather than new bricks and mortar (NZ PFR 2024).

“Through this partnership, we hope to continue building our human resource capacity and skills,” said Minoru Nishi Junior.

Alongside Nishi’s upgrades, MTED’s Lapaha Packhouse achieved HACCP compliance, enabling operations to meet international food safety standards (PHAMA Plus 2025). PHAMA Plus supported hazard analysis (product and flow diagrams, hazard identification, critical control point determination) and provided coaching for packhouse teams on documentation and hygiene protocols (cleaning validation, allergen and foreign matter controls, traceability and records) (PHAMA Plus 2025). This lifted process discipline and audit-readiness, complementing MAFF’s Export Pathway updates (MTED 2024; PHAMA 2016; MAFF 2024). Following the achievement of HACCP compliance, MTED has strengthened its international market presence by exporting taro, coconut, and watermelon to 2 buyers in New Zealand: Market Gardener and Fresh Direct NZ. (PHAMA Plus 2025).

On farm and at the point of intake, PHAMA Plus and partners delivered training for farmers and packhouse staff on harvesting, field packing, bin/crate hygiene, and cooling protocols aligned with exporter and market requirements. MTED and MAFF extension officers were engaged as trainers—strengthening inter-agency collaboration and creating a clearer hand-off from extension messages to packhouse SOPs (MAFF 2024; MTED 2024). A small number of women and youth were employed in processing roles, expanding local employment and diversifying the workforce (Key stakeholder surveys). These interventions have increased postharvest handling quality, expanded effective processing capacity and extended shelf life for export-grade melons through improved precooling and temperature management (NZ PFR 2024; MTED 2024). “With this new partnership, we look forward to improving the volume and quality of watermelons for export.” (Minoru Nishi). The limitation on benefiting from this expansion of capacity is dependent upon farmers to grow and supply the primary product.

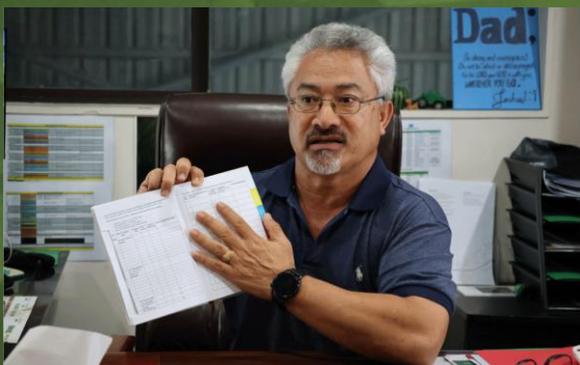
Case study: Nishi Trading invests to boost production and reduce waste

Nishi Trading is expanding production by collaborating with local farmers and investing in new packhouse capacities. With PHAMA Plus support, Nishi partnered with growers in an irrigation co-investment pilot to increase crop yields and resilience. The company has even expanded its own farm to meet rising demand. *“In 2024, we piloted drip irrigation with five local farmers, and the results have been impressive: higher yields and a more reliable watermelon supply,”* reports Packhouse Production Manager Tangitangi Fainga'a.

A cornerstone of this expansion is a major co-investment with PHAMA Plus to upgrade Nishi Trading's facilities with new washing lines, chilling systems, and advanced cold storage. *“We have upgraded our cold storage by installing a humidity controller and ethylene extractor, allowing us to better preserve a wider variety of crops such as watermelon, squash, butternut, potatoes, taro, and breadfruit,”* explains Tangitangi. This enhanced infrastructure and revised SOPs for its use significantly elevates post-harvest handling quality, extends the shelf life of temperature-sensitive crops, and ensures compliance with stringent international food safety standards like HACCP.

Crucially, this upgraded facility and advice on harvest and post-harvest handling practices is provided free to farmers, a strategic move designed to drastically reduce post-harvest losses and ensure that a higher volume of the growers' harvest successfully reaches the market. New and refreshed SOPs are now available to guide best practice along the value-chain. From advice to farmers such as how to tell if a watermelon is ripe enough to harvest, the best time of day for harvesting, and avoiding damage and contamination, through to detailed procedures to accurately control temperature and gas levels during cold storage to manage product quality.

Beyond fresh produce, Nishi's product line now includes value-added goods made from surplus and lower-grade crops: frozen pumpkin and taro, gluten-free flours from breadfruit and cassava, and nutrient-rich powders like moringa and turmeric. Value-adding is also expanding to watermelons. *“We are pioneering a zero-waste initiative by turning B-grade watermelons, those unsuitable for export, into juice. This project is still in development and will first serve the domestic market. We aim to expand internationally later,”* Tangitangi says. These innovations have boosted production capacity and created new income streams for farmers by reducing waste.



This work helps us improve the reliability and quality of our watermelon supply to key markets, while also supporting our team and farmers with better systems and training.

Minoru Nishi
Managing Director, Nishi Trading

6 Strengthening Production Resilience

On-farm consistency is difficult in a short, high-pressure season, particularly when production is dispersed and technical practice varies. Integrated pest management (IPM) matters not only for yield and fruit quality, but also for pathway credibility (reducing damage, improving field hygiene and lowering reliance on higher-risk chemical practices). Climate and water insecurity, especially drought, can quickly undermine reliability of supply and quality, turning the seasonal advantage into concentrated risk. PHAMA Plus, with the Ministry of Agriculture and Fisheries (MAF), supported farmer capability building linked to export requirements (agronomy, hygiene and export-specification awareness), strengthened pest and disease management through targeted diagnostics and training, and piloted practical water-resilience measures such as drip irrigation and fertigation with private partners to test the business case and commercial viability for replication.

An emerging constraint to supply-side growth is the need to scale from household to semi-commercial production. This is a critical transition required for Tonga to achieve scale. In other countries facing similar constraints, PHAMA Plus has achieved good outcomes through the application of the Family Farm Teams approach. In future, a similar model could prove useful for Tonga's horticulture development ambitions.

What is a Family Farm Team?

The 'Family Farm Team' approach, or 'FFT', is a practical, family-centred training program that helps Pacific farming households to plan, grow and thrive together. Developed by Professor Barbara Pamphilon at the University of Canberra, with support from the Australian Centre for International Agricultural Research (ACIAR), FFT supports shared decision-making and the shift from subsistence farming to semi-commercial, small farm enterprises. Through interactive modules and Talanoa-based learning, FFT helps families; work together towards shared goals; plan farm businesses and diversify income sources; improve nutrition and food security; and strengthen communication and decision making. For further information on FFT, visit www.familyfarmteams.com or contact barbara@pamphilon.com

6.1 Expanding Integrated Pest Management

On-farm results indicate that crop rotations, mulching and plant hygiene can lift uniformity and reduce losses quickly, even on small acreages, when backed by regular extension contact and a clear hand-off to exporter SOPs.

Extension officers "provided such advice through various channels, including on-farm services, agricultural extension offices and the Department of Agriculture," and shared learnings across districts; they also observed a "reduction in instances of powdery mildew" among adopters (NZ PFR 2024).

PHAMA Plus's support significantly impacted MAFF extension officers by equipping them with new skills and knowledge in pest and disease management through dedicated training. These officers subsequently utilised this expertise to directly advise 82 farmers on effective pest and disease control and efficient chemical use, while also disseminating their new learnings among 9 colleagues across different districts. This cascading knowledge transfer led to tangible improvements for farmers, who reported better pest management, increased yields, and a notable reduction in issues like powdery mildew, ultimately enhancing watermelon quality. The officers themselves deemed the training highly effective and were further empowered to proactively address practical challenges, such as helping farmers access more affordable and appropriately sized chemical products. (NZ PFR 2024). A

compendium of technical reports and training materials have been shared with MAFF, Nishi Trading and PFR NZ for ongoing utilisation.

PHAMA Plus's training significantly impacted input suppliers by fostering a positive shift in farmers' pest and disease management behaviours, leading them to adopt practices such as alternating insecticides, planned spraying schedules, and proper chemical quantities. The introduction of more effective chemicals such as Fipronil, copper pesticides, and Myclobutanil during the training prompted farmers to invest in these newer solutions over traditional options. Consequently, input suppliers experienced an increase in sales, particularly for Fipronil, and adjusted their inventory to stock both recommended and affordable alternative chemicals, thereby improving accessibility for farmers. Beyond sales, input suppliers are now actively providing updated information based on the training, strengthening their relationships with farmers and evolving into key knowledge facilitators. While the training was highly effective in influencing practices and enhancing business revenue for suppliers, it is noted that broader external factors like drought impacted farmers' overall yield and sales. (NZ PFR 2024) Exporter alignment occurred mainly via packhouse feedback and company training. At Nishi, "Farmer training is undertaken through the company's farmer training centre, which has been accredited by the Tonga National Qualifications Accreditation Board." (PHAMA 2016, PHAMA 2018).

"Before, we worried the market would close. Now, we're thinking about how to grow more and do it better," shared one exporter (Key stakeholder surveys – Exporter).

Wilting disease became significantly more apparent for farmers Nafe and Apolosi when they replanted watermelons in the same field the following season. This issue resulted in several participants beginning to intercrop (e.g., pumpkin, cucumber) and trialling crop rotations that include non-cucurbit crops such as peanuts to better manage soil-borne disease pressure, suppress weeds and stabilise cash flow between watermelon cycles (MAFF 2024; NZ PFR 2024; Key stakeholder surveys). Stakeholders noted that repeated watermelon plantings on the same plots led to wilting disease, reinforcing the need for a break crop; intercropping within cucurbits helped with ground cover and weed suppression, while rotating to peanuts supported soil recovery (nitrogen fixation and organic matter) and reduced carryover of pathogens before the next watermelon crop (MAFF 2024; NZ PFR 2024). At the time, technical advice was often crop-specific and "lacked guidance on intercropping or mixed cropping approaches," rather than offering a simple farm-level rotation calendar tailored to local conditions (Key stakeholder surveys).

As the reliability of Tonga's horticulture export pathway and enhanced value-adding and processing opportunities emerge, intercropping should also be looked to as a commercial opportunity. Planned cycling of crops under production will lead to improved and more reliable quality and quantity of produce, and an opportunity to diversify market opportunities.

Watermelon Wilt & Rotations

Fusarium wilt of watermelon (*Fusarium oxysporum* f. sp. *niveum*) is a persistent, soilborne disease; the pathogen survives for many years, can be seedborne, and may eliminate marketable yield in infested fields (Roberts 2019; Cullen et al. 2022). Global guidance converges on **long rotations out of cucurbits** as the foundation: extensions commonly recommend **5–10 years** away from watermelon in affected fields, rotating to nonhosts (e.g., cereals or legumes such as peanut) to ‘starve’ inoculum (NCSU Extension 2018; UC ANR IPM 2012; Egel, Purdue Extension 2018; Soil Wealth Industry Partnership Program (ICP) 2024). Short rotations (≤ 2 –3 years) are typically insufficient once fields are infested (UC ANR IPM 2012), the pathogen survives for many years, can be seed-borne, and may eliminate marketable yield in infested fields (Roberts 2019; Cullen et al. 2022). Short rotations (≤ 2 –3 years) are typically insufficient once fields are infested (UC ANR IPM 2012).

Intercropping **within cucurbits** can improve ground cover and weed suppression but **does not replace** a true breakcrop rotation for Fusarium management (Soil Wealth ICP 2024). An integrated approach is recommended: disease-free seed/transplants; strict sanitation (clean equipment, remove infected vines); raised beds with mulch and balanced irrigation; planting **resistant cultivars** or **grafted seedlings** on resistant rootstocks where feasible; and, in warm climates, **soil solarisation** as a supplemental tactic (Roberts 2019; UF/IFAS Grafting Program 2020; Soil Wealth ICP 2024). Since the phaseout of methyl bromide, reliance on rotation, resistance/grafting and hygiene has increased (Plant Health Exchange 2020). -crop rotation for Fusarium management (Soil Wealth ICP 2024). An integrated approach is recommended: disease-free seed/transplants; strict sanitation (clean equipment, remove infected vines); raised beds with mulch and balanced irrigation; planting -out of methyl bromide, reliance on rotation, resistance/grafting and hygiene has increased (Plant Health Exchange 2020).

Implications for Tonga: Where wilt appears after successive watermelon crops, shifting to a **multiyear rotation with noncucurbits (e.g., peanut)**, combined with hygiene and irrigation discipline, is consistent with international best practice and reduces carryover of soil inoculum. **-year rotation with non-cucurbits (e.g., peanut)**



Watermelon affected by Fusarium wilt, a persistent soilborne disease that can severely reduce yields and requires long crop rotations for effective management

6.2 Climate Adaptation and Drought Resilience

There is strong evidence that PHAMA Plus, in partnership with MAFF and exporters (notably Nishi Trading), supported farmers to pilot improved practices and technologies—centred on irrigation and fertigation, mulching and plant hygiene—resulting in better fruit size and uniformity, reduced spoilage risks, and stronger alignment with exporter and market requirements (NZ PFR 2024; MAFF 2024; PHAMA Plus 2024). Trials successfully tested the business case for capital investments and established commercial viability for replication, with pilot sites achieving a gross profit margin more than threefold that of non-pilot semi-commercial sites. However, high up-front costs and a lack of access to suitable financial products for smallholder farmers remains a constraint on expanded uptake.

Eleven farmers were selected for the irrigation and fertigation pilot, including 4 new entrants to formal horticulture. Selection prioritised willingness to co-invest labour, access to water, and proximity to exporter collection points, so that learning could be transferred quickly into commercial consignments (MAFF 2024; NZ PFR 2024). Equipment packages and hands-on extension training focused on irrigation scheduling, use of organic fertilisers and mulching for moisture retention and weed suppression, and clear plant hygiene routines from field to bin (NZ PFR 2024; MAFF 2024).

Demonstration plots were used alongside extension-led visits rather than as large “peer learning” hubs. MAFF and MTED reported they “organise fortnightly farm visits to ensure sustained farmer engagement and adherence to good practices.” (NZ PFR 2024). In practice, uptake was strongest via small group or neighbour learning and fortnightly extension visits, rather than large peer-learning hubs (NZ PFR 2024). The pilots and technical advice have had significant impacts on the champion farmers. Farmers Nafe Makau and Apolosi Tu’ivai reported significant productivity gains on their first irrigated plots, with more uniform fruit set and fewer culls at harvest. However, the long-term durability of those gains was impacted by wilting disease.

Despite this, the trials reinforced that productivity and quality improvements are achievable when irrigation discipline, basic hygiene and timely husbandry are in place (NZ PFR 2024). Exporters reported noticeable improvements in fruit size, quality, uniformity, and post-harvest condition from participating farms once irrigation scheduling and hygiene routines were bedded in (Key stakeholder interviews). This also resulted in participating farmers having higher yields and higher grading, leading to substantially higher incomes.

Farmer interest in scaling the irrigation systems is high, particularly among the 4 new entrants who saw quick gains in establishment and early fruit set. Further analysis by the PHAMA Plus team demonstrates the significant gross margins and profitability from improving practices (Figure 3). However, limited local supplies of irrigation equipment drive up initial set-up costs and access to suitable financial products for smallholder farmers constrains expansion beyond pilot plots (MAFF 2024; Key stakeholder surveys).

Access to finance needs to be considered in a holistic way, including opportunities to ‘de-risk’ growth instead of simply encouraging it. This would necessarily include a combination of financial tools and products — not just loan facilities, but consideration of small grants, savings models, revolving credit schemes, etc. A sophisticated and considered approach to finance, and commensurate investment in building business acumen, is needed to sustainably and realistically support next steps.

Description	Subsistence	Commercial	Irrigated
Scenario	Low Productivity (3t/acre)	Medium Productivity (6t/acre)	High Productivity (16t/acre)
Yield per Acre (kg)	3,000	6,000	16,000
A-Grade percentage of production	50%	75%	75%
Price per A-Grade (\$/kg)	\$ 6.00	\$ 6.00	\$ 6.00
Price per B-Grade (\$/kg)	\$ 2.00	\$ 2.00	\$ 2.00
Revenue per Acre (\$) = Yield * Price	\$ 12,000	\$ 30,000	\$ 80,000
Average number of acres	2	3	5
Total Revenue	\$ 24,000	\$ 90,000	\$ 400,000
VARIABLE COSTS			
Seeds	\$ 150	\$ 450	\$ 600
Labour	\$ 5,000	\$ 15,000	\$ 30,000
Herbicides	\$ -	\$ 1,000	\$ 5,000
Fertilizers	\$ -	\$ 2,000	\$ 10,000
Total Variable Costs per Acre	\$ 5,150	\$ 18,450	\$ 45,600
Total Variable Costs	\$ 10,300	\$ 55,350	\$ 228,000
FIXED COSTS			
Irrigation Equipment	\$ -		\$ 60,000
Other Equipment	\$ 1,000	\$ 3,000	\$ 10,000
Total Fixed Costs	\$ 1,000	\$ 3,000	\$ 70,000
TOTAL COSTS = Variable + Fixed	\$ 11,300	\$ 58,350	\$ 298,000
GROSS MARGIN = Revenue - Total Costs	\$ 12,700	\$ 31,650	\$ 102,000

Figure 2: Gross Margin Analysis of Watermelon Farmers With/out Irrigation (TOP)

Case Study: Irrigation pilot establishes the business case for expansion

Apolosi Tu'ivai is one of the farmers benefiting from the partnership between PHAMA Plus and Nishi Trading.

Through Nishi's drip irrigation and fertigation piloting program, Apolosi received irrigation equipment and plastic mulch to protect his watermelon crops and improve export quality.

This program tests a drip irrigation and fertigation system that uses water efficiently and boosts crop yield.

Traditionally, watermelons in Tonga have been grown only in the wet season (October to April), relying on natural rainfall. In recent years, rainfall patterns have become increasingly unpredictable, droughts have worsened, making it harder for farmers to depend solely on seasonal rains. With this climate-smart approach, farmers can now grow watermelons year-round.

“Using the irrigation system and plastic mulch, I almost tripled my watermelon production on one acre in the first season,” Apolosi said. “This has greatly improved my farm and income.”

“I used to get maybe 6 or 7 tonnes. Now with irrigation, I harvested over 18 tonnes from one acre.” The new system enables year-round cultivation, increasing supply and quality for export markets. Following guidance from MAFF, Apolosi rotated his crops the following season to pumpkins, a cucurbit not affected by the watermelon wilt disease.

He also attended training on disease control and crop management, provided by NZ PFR with support from PHAMA Plus.

He said he is grateful for the support and training provided, which have helped him adopt these new practices successfully.

Despite the clear benefits, access to materials remains a challenge, and further market development is needed to support accelerated uptake. “Plastic mulch and irrigation equipment are expensive and hard to find locally. Many farmers struggle to afford these materials.”



Apolosi Tu'ivai rotating his crops with pumpkin in the pilot irrigation area

Case study: Adapting and growing with sustainable irrigation

Sione Fotofili, a watermelon farmer from Makaunga, Tonga, is benefiting from a pilot irrigation and fertigation project supported by PHAMA Plus in partnership with Nishi Trading.

This initiative helps farmers adapt to Tonga's changing climate by improving water efficiency and boosting crop productivity.

On his farm, Sione now uses a solar-powered irrigation system featuring a borehole, water tank, drip lines and a soil moisture probe. He shares the borehole and solar pump with another farmer whose plantation is adjacent to his.

“Before, I watered by guesswork, but the moisture probe tells me exactly when my plants need water,” Sione said. “This technology, combined with training, has helped me improve my farming skills.” Sione also replaced chemical fertilisers with organic fertiliser made on farm using a small biodigester provided through the project. “Making my organic fertiliser saves money, and my crops look healthier than before,” he said. As an added benefit, Sione's family now uses the biogas produced by the system in place of LPG, offering a cleaner and more affordable renewable energy source for cooking.

Since adopting these sustainable practices, Sione has reported lower costs, stronger yields and growing confidence in managing his farm.

He continues to supply watermelon to Nishi Trading while also expanding his production of squash and yams using his innovation, trial-and-error ethos.

Sione has 2 full-time labourers, and during peak periods, he employs about 10 temporary labourers to help him. Before becoming a full-time farmer, he was a seasonal worker and returned to Tonga to pursue farming full-time.

“I'm grateful for the support from PHAMA Plus and Nishi Trading. They have given me tools and knowledge that will help me farm smarter and protect my land for the future,” Sione said.



Sione Fotofili with his irrigation and fertigation equipment in the background

7 Diversifying through Stronger Pathways

PHAMA Plus's contribution has strengthened the **export pathway system** for Tongan watermelons—improving coordination, verification and practical on-farm and post-harvest disciplines so the pathway can perform more reliably within a narrow seasonal window. Following a period where biosecurity and climate shocks made vulnerabilities highly visible, partners now have clearer roles, stronger operating procedures, and more consistent routines across the chain from field hygiene and handling to packhouse processes and documentation, supporting renewed confidence and a more stable platform for growth (NZ PFR 2024; MAFF 2024; PHAMA Plus 2024).

With this foundation in place, the pathway is better positioned to realise its growth potential: scaling supply and consistency without undermining biosecurity assurance or buyer expectations, and building a transferable set of capabilities that can support other horticulture exports over time (NZ PFR 2024; MAFF 2024). This will be particularly important to leverage in the context of improved crop rotation approaches and building the commercial strength of Tonga's horticulture sector as a whole.

Complementing the establishment of stronger export pathways, PHAMA Plus has also co-invested with Nishi Trading to expand their cold storage facilities, enabling their diversification into juicing. In 2025, Nishi Trading launched its new juice brand – 'Ouana Juice'. The company is processing lower-grade non-export melons, reducing post-harvest losses and creating additional value streams from product that would otherwise create a glut in the domestic market. Further value-adding options across Tonga's horticulture sector may also emerge as strategic investments in the future, as the export opportunities continue to diversify.

7.1 Increased social inclusion

There are few households in Tonga that do not rely on horticulture in some form, making the need for inclusion of women, youth and people with disabilities a given.

Gender Equality, Disability and Social Inclusion (GEDSI) were embedded in outreach and processing activities, where women are significantly involved. Female leaders, such as Tangi, played visible roles in quality management and farmer coaching: "I teach them how to handle the melons after harvest—cleaning, sorting, cooling. It makes a difference." (Key stakeholder surveys). Mapa Taulafo, a 67-year-old with a disability, received training and became a key advocate for juice processing to reduce waste and lift farmer income (Key stakeholder surveys). Training platforms also reached young and first-time farmers—4 of the 11 in the irrigation pilot were new to horticulture (MAFF 2024).

In 2025, PHAMA Plus led GEDSI training sessions for stakeholders from across Tonga's horticulture and export sectors. From farmers to exporters and government regulators, the trainings brought people together to understand GEDSI concepts in the Pacific, with a focus on Tonga; recognise gender norms, roles, and inequalities in families, villages, and workplaces; identify practical steps to integrate GEDSI into agriculture and trade; and how to address and remove barriers limiting women, youth, and persons with disabilities. The six sessions were run in partnership with Tonga's Organisations of Persons with Disabilities (OPDs), with participation by 63 women and 56 men. "This process has demystified inclusion and helped us to directly engage with OPDs and to take simple immediate steps," said Mele Sisi Finefeuiaki, Chief Executive Officer of Lotopoha Export Trading. Participation in the sessions demonstrated strong interest in advancing greater inclusion across agricultural supply chains. "I'm familiar with the concept of gender equality from my years as a police officer," said Kaufa'a 'o Tokanga Export member, Sione Panuve Fifita, adding "I'm glad this opportunity exists to raise awareness and exchange views on the subject."

Case study: Building resilience in Tonga's watermelon sector

In Tonga, watermelon is a vital crop for many smallholder farmers. However, export challenges such as pest rejections and limited market access continue to restrict returns.

For 67-year-old farmer Mapa Taulafo, developing value-added products for local markets is the more sustainable path.

Farming alongside support from his wife and up to 15 seasonal workers, Mapa grows watermelon, pumpkin and taro, supplying the MTED-owned Lapaha Packhouse.

Mapa is among a growing number of farmers supplying the packhouse, which has helped reduce rejection rates and improve export quality. Despite losing one arm, he remains active on the land. With support from PHAMA Plus and local extension officers, Mapa undertakes training in soil management, crop rotation and product quality.

He advocates processing and local sales to reduce waste and increase income.

“If we can make watermelon juice or taro and cassava chips, our produce won't go to waste. Older farmers like me won't need to sit by the dusty roadside selling,” he said. Mapa understands how different market channels affect his income.

“From two acres, I harvest one container of watermelon. Selling through the Lapaha Packhouse earns me about TOP20,000, while selling roadside takes longer and brings only around TOP10,000. It's hard work for little return, especially for older farmers,” he said.

With support from PHAMA Plus, MTED has achieved HACCP certification for the Lapaha Packhouse — a vital step for securing the quality and safety of its exports.

Mapa sees growing potential in value-added products, improved packaging, and farmer collaboration to strengthen Tonga's domestic market and reduce post-harvest losses.

“As more young people leave farming for seasonal work overseas, we need to recognise the value in growing local and have the right support for farmers to build stronger livelihoods, right where they are,” he said.



Mapa Taulafo, Watermelon Farmer.

Case Study: Empowering Women at the Nishi Trading Packhouse: Tangitangi's Story

At 6:00 a.m., Tangitangi "Tangi" Fainga'a begins another day at the Nishi Trading packhouse in Tonga, clipboard in hand and determination on her face. At just 30 years old, Tangi is the packhouse production manager – a role rarely held by women in Tonga's male-dominated agriculture sector. Initially trained in IT, she embraced a new path in horticulture and "thrived in production". Now Tangi leads a diverse team focused on quality and innovation, supporting local farmers and breaking barriers as a woman leader in agriculture. Her journey from tech to tomatoes and taro is inspiring proof that women can excel in any field with passion and opportunity.

Tangi's impact is felt far beyond the packhouse walls. Each day she ensures every watermelon, squash, and root crop meets export standards, personally training village growers in better post-harvest handling. "I teach them how to handle the melons after harvest – cleaning, sorting, cooling. It makes a difference," she explains. Under her guidance, even lower-grade fruits find purpose. Instead of going to waste, they're processed into products like watermelon juice, creating new income streams for farmers and a "zero-waste" culture at the packhouse. Tangi has also championed innovations like efficient irrigation and improved cold storage – upgrades made possible through PHAMA Plus support and Nishi's co-investment in training and equipment. "Our commitment to quality drives us," says Tangi, describing how these changes help farmers earn more while delivering produce to international customers.

Tangi's success is part of a broader movement for women's economic empowerment in Tongan horticulture. With Gender Equality, Disability and Social Inclusion (GEDSI) principles embedded in programs like PHAMA Plus, women are increasingly taking on skilled roles across the value chain. An increased appreciation for inclusion, shared decision-making, and the value of diverse contributions was also a key reflection from representatives of Nishi Trading and other partners during GEDSI sensitisation and awareness trainings that were delivered in 2025.

Nishi Trading's proactive hiring of women – from packhouse floor workers to management – has not only diversified its workforce but also boosted productivity. In fact, the performance of women employees has convinced Nishi's leadership that empowering women is good business. As a pioneer, Tangi hopes her journey will encourage more young women to join the industry. "You can learn on the job and make a real difference," she says – and her own story proves it. "Passion and persistence can break down barriers," Tangi adds, confident that the future of Tongan agriculture will be not only more prosperous, but more inclusive.



Tangitangi Fainga'a, Packhouse Production Manager at Nishi Trading, is helping lift production standards and inspire more women to enter Tonga's horticulture sector

8 Lessons and Recommendations

The program's key learnings and proposed recommendations emphasise scaling supply without weakening standards, and leveraging the systems and capabilities built for watermelon to support other horticulture exports (fresh and processed).

8.1 Key learnings

- While Tonga's horticulture exports continue to fluctuate, reliable export pathways have proven to be an integral part of the system and offer market confidence for continued growth ambition and economic opportunity. These pathways are achievable with regular public-private collaboration.
- **Growing export pathways requires good governance as well as technical practice.** Improvements in treatment, hygiene, documentation, handling and on-farm practice are more durable because of the strength of governance arrangements such as verification, surveillance, quality assurance and SOPs.
- **Coordination is most effective when institutionalised.** A standing mechanism (such as TWET) with a predictable annual cycle—preseason readiness, in-season monitoring and post-season review, reduces reactive responses and supports a collaborative model for continuous improvement.
- **Improved productivity is achievable,** as evidenced through irrigation and fertigation trials and business modelling. However, expansion will require appropriate financial products and support to de-risk capital investments. This needs to be complemented by targeted extension services aligned with exporter feedback and packhouse outcomes.
- There is strong appetite for more inclusive opportunities that broaden the participation of women, youth and people with disabilities in viable roles across the value chain. Based on learnings from other PHAMA Plus countries, this creates particular opportunity to leverage change at a household level and support growth of semi-commercial farming.

8.2 Recommendations

1. **Broaden the application of the watermelon export pathway improvements to build market confidence for other export-ready horticulture commodities.** Watermelon has similar processing and capability requirements as other crops for export, and the approach to strengthen reliability of the export pathway is highly transferable. Apply the coordination forums, SOPs, cold chain discipline and expanded post-harvest investments, including value-adding options, to other export-ready commodities, such as root crops and kava. This is consistent with the ambitions of Tonga's Horticulture Sector Strategy currently under development by MAFF.
2. **Expand watermelon production and the supply base while protecting pathway integrity.** Watermelon exports continue to fluctuate but offer a consistent and valuable export opportunity that is now grounded in a reliable pathway to international markets. Maintain TWET (including 'fit for purpose' fumigation and shipping subgroups) as a standing mechanism with an annual readiness cycle and a light preseason pathway health check. Continue to pilot new approaches to enhanced productivity, scaling what works such as irrigation and fertigation, mulching, hygiene and rotation practices. This requires bottlenecks to be addressed further, such as equipment availability, access to finance and appropriate extension advice.
3. **Expand the use of Family Farm Teams training to build an inclusive pathway from household to semi-commercial supply.** Use FFT as the structured 'on-ramp' from household production to semi-commercial supply. The FFT approach is designed to support farming households to shift from subsistence to more semi-commercial farming models. It also contributes to inclusion outcomes through shared decision-making and more equitable division of labour, and through household planning and goal setting. The approach builds skills, knowledge and capabilities around financial and business management for women and youth, recognising the valuable role they play in farm business operations. In Tonga, FFT delivery could be further contextualised through alignment of modules to exporter requirements (hygiene, harvest maturity, handling and basic record-keeping).

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