Food and Agriculture Organization of the United Nations

A snapshot of the status and way forward for transforming agrifood systems in the Pacific –

Identifying entry points and analysing trade-offs for policymakers

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Food and Agriculture Organization of the United Nations

Apia, 2023

Required citation:

FAO. 2023. *A snapshot of the status and way forward for transforming agrifood systems in the Pacific – Identifying entry points and analysing trade-offs for policymakers*. Apia. https://doi.org/10.4060/cc4940en

ISBN 978-92-5-137738-3

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Acknowledgements

The document was prepared by Dori Patay from The George Institute for Global Health, Australia, and Itziar Gonzalez from the Food and Agricultural Organization of the United Nations (FAO).

We would like to acknowledge the role of the following contributors in developing this policy brief: Kostas Stamoulis, Esther Silvana Wiegers, and Prof Jacqui Webster from The George Institute for Global Health.

Executive summary

Climate change has a devastating impact on agrifood systems in Pacific Island countries (PICs). The rise in air and ocean temperatures and sea levels, altered precipitation patterns, changing ocean salinity and acidity, and increased frequency and severity of extreme weather events, have major detrimental impacts on food production, food processing and supply chains, food trade, and population diets.[1] Climate change-induced exposures to agrifood systems and food security are aggravated by urbanisation and dependence on imported food products, and more recently by the COVID-19 pandemic and the war in Ukraine, contributing to a global energy and food crisis. As a result, Pacific agrifood systems are unable to ensure healthy, affordable, accessible, sustainable and equitable diets, livelihoods and inclusiveness. Food insecurity and malnutrition are major problems in PICs, contributing to the non-communicable disease (NCD) crisis in the region, with a particularly negative impact on vulnerable groups, such as women or youth. The correlated socioeconomic costs inhibit PICs from reaching their Healthy Island Visions and Sustainable Development Goals.[2, 3] The urgent need for a sustainable agrifood system transformation that ensures better socioeconomic, health and environmental outcomes has been recognised by PICs during the national level discussions leading up to the UN Food System Summit in 2021.

Alternative pathways have emerged in the Pacific that seek to provide entry-points to strengthen food system outcomes. However, these entry points present a number of trade-offs that PIC governments need to consider and that might pose barriers for sustainable food system transformation. This report provides an overview of the ways climate change impacts food systems, the entry points for sustainable food system transformation, and the trade-offs between the entry points, and it outlines opportunities to mitigate such trade-offs.

Responding to the impacts of climate change in decreasing crop yields and fish catch, and to other drivers of agrifood systems, smallholder farmers and small-scale fishers in PICs tend to turn to environmentally unsustainable methods of intensification of crop cultivation or coastal fishing, cash cropping, and cattle breeding. While these practices might provide more income in the short term, they leave food production vulnerable to climate change exposures and makes environmental degradation worse in the long-term, further lowering crop yields and fish catch, leading to a vicious cycle. In crop cultivation, the re-establishment of traditional Pacific farming practices and community-managed protection areas offer a pathway to sustainable livelihoods and food security. Agroforestry, crop diversification, traditional land preparation and crop protection practices provide opportunities to integrate food and nutrition security and environmental protection into operational actions. However, more research is needed to understand the ways these practices can be scaled up to support commercialisation to increase the domestic supply of fresh foods, and to overcome the short-term income-gap resulting from less intensification or cash cropping. In the meantime, the management of these trade-offs can be supported by conducting socioeconomic, health and environmental impact assessments, by additional research to identify resilient crops that are suitable for the Pacific climate through community-led crop breeding initiatives, by continuing the re-introduction of traditional knowledge into agricultural practices, and bridging the income-gap between short-term and long-term income with livelihood diversification.

[1] **McIver, L., Kim, R., Woodward, A., Hales, S., Spickett, J., Katscherian, D. *et al.*** 2016z. Health Impacts of Climate Change in Pacific Island countries: A Regional Assessment of Vulnerabilities and Adaptation Priorities. *Environmental health perspectives*. 124(11):1707-14.

[2] **UNGA.** 2015. Resolution adopted by the General Assembly on 25 September 2015 United Nations General Assembly (UNGA); Contract No.: A/RES/70/1.

[3] **McIver, L., Bowen, K., Hanna, E., Iddings, S. A.** 2017. 'Healthy Islands' framework for climate change in the Pacific. *Health promotion international*. 2017;32(3):549.

In fisheries, shifting to near-shore pelagic fishing from coastal fishing, in combination with establishing community managed marine protection zones, offers a more sustainable pathway to agrifood system transformation. However, such shift requires investment in equipment and skills, and it may be hindered by unaffordable fuel prices. These trade-offs might be mitigated by targeted capacity building and subsidies, community-ownership of equipment, reliance on traditional outrigger canoes – instead of motorboats – in combination with the use of fish aggregating devices. Socioeconomic and environmental impact assessments may be beneficial to understand the benefits of such investments.

Food processing and supply chains in the Pacific tend to be weak due to geographic isolation, vulnerability to extreme weather events, and the legacy of colonial agricultural policies and dominant development trends that focuses on export-oriented production and limited value-adding. This drives both import-food dependency and a high proportion of food waste in PICs. Climate change exposures further aggravate these issues by increasingly disrupting processing and supply chains. Although the need for strengthening domestic food supply chains has been recognised in PICs, governments in the region tend to invest fewer resources in this area.[4] The main trade-off between the continued reliance on imported food and strengthening local food supply chains is the short- and long-term investment needed from the government for the latter – in terms of infrastructure, capacity development and supporting local innovation – versus the allocation of resources to other areas in the agrifood system or another policy sector altogether. To understand these trade-offs, socioeconomic, health and environmental impact assessment of investment decisions can be undertaken, supported by development partner technical and financial assistance.[5]

A sustainable agrifood transformation will likely require considerable government investment to strengthen agricultural production for domestic consumption, and to advance supply and processing chains, in order to improve the availability and affordability of fresh foods and regulate ultra-processed foods.[6, 7] While it might be less challenging for governments to introduce and support initiatives that provide awareness raising on healthy diets, such measures are unlikely to achieve major results without complementary policies that make healthy foods relatively cheaper than ultra-processed foods and beverages. Industry and public opposition to measures that increase taxes on ultra-processed foods might be disregarded by governments when the revenue generation aspect of such policies is considered. The economic modelling of taxes on unhealthy commodities can help policy makers understand the potential revenue generated from such measures. This revenue could be used on subsidising local food production and transport. Such investment will likely be backed by considerable public support as it improves producers' livelihoods and communities' food and nutrition security.

Sustainable agrifood transformation requires coordination and collaboration among multiple government sectors, development partners, civil society and private actors. The barriers of effective multisectoral engagement in PICs include competition for funding, siloed support from development partners, the difficulty in reconciling conflicting mandates and interests, and the need for a transdisciplinary approach that enables the adoption of a comprehensive, systems integration perspective. These barriers might be mitigated by development funding that targets multisectoral initiatives, administered through multiple government sectors simultaneously to reduce tensions and competition between government agencies, and by establishing a transdisciplinary and multisectoral curriculum in higher education institutions that equip professionals with a comprehensive food systems lens.

[4] **Davila, F., Crimp, S., Wilkes, B.** 2021. A Systemic Assessment of COVID-19 Impacts on Pacific Islands' Food Systems. *Human Ecology Review*. 26:5-17.

[5] **Antle, J.M., Valdivia, R.O.** 2021. Trade-off analysis of agrifood systems for sustainable research and development. *Q Open*. 1(1).

[6] **Reeve, E., Ravuvu, A., Farmery, A., Mauli, S., Wilson, D., Johnson, E. *et al.*** 2022. Strengthening Food Systems Governance to Achieve Multiple Objectives: A Comparative Instrumentation Analysis of Food Systems Policies in Vanuatu and the Solomon Islands. *Sustainability*. 14(10).

[7] **Farrell, P., Thow, A.M., Wate, J.T., Nonga, N., Vatucawaqa, P., Brewer, T. *et al.*** 2020. COVID-19 and Pacific food system resilience: opportunities to build a robust response. *Food Security*. 12(4):783-91.

While further evidence is needed to understand the ways trade-offs can be managed in PICs, the entry points discussed reflect the intersectionality of agrifood systems: a shift in food production must be accompanied by the strengthening of food supply chains, and the resulting improvements in the availability and affordability of fresh, healthy foods need to be backed by government policies that encourage the population to support local producers and consume healthier diets. Due to this interdependency, the transformation of the agrifood system needs to be comprehensive and simultaneous in all food system functions. This requires tight multisectoral collaboration between policy sectors, supported by donor funding schemes that are designed to facilitate cooperation between government agencies.


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1.Introduction and context

The impacts of climate change on Pacific Island countries (PICs) are devastating. Climate change-induced exposures that affect and are projected to have an increased impact on PICs in the future include the rise in air temperatures, altered precipitation patterns, the rise in sea levels, changing ocean salinity and acidity, and increased frequency and severity of extreme weather events, such as storms, floods, droughts or extreme heat.[7] These exposures have a devastating impact on human and economic development, and population health and safety in PICs. Climate change-induced exposures result in the loss of land and livelihoods, damage agrifood systems, disrupt supply chains, aggravate dependency on imported foods, contribute to food and water insecurity and malnutrition, and often induce population displacement and social disruption.[7]

Their export-oriented agrifood system and dependency on imported foods make PICs particularly vulnerable to climate change. While traditional Pacific agrifood systems have been characterised by sustainable agroforestry and fishing practices, that provided livelihoods and food security, the remnants of PICs' colonial history and the global pressure for trade and investment liberalisation transformed production systems with the focus on commercialising and exporting local produce.[13-15] As a result, PICs are heavily dependent on imported food that are often high is salt, sugar, and/or saturated fat.[16] Increased food prices and supply chain disruptions, as a consequence of the COVID-19 pandemic and the war in Ukraine, have highlighted the urgent need for sustainable agrifood system transformation.[17,18]

Food insecurity and malnutrition are major problems in PICs, contributing to the non-communicable diseases (NCDs) crisis in the region.[19] The stunting rate hovers as high as 30 percent among children in some PICs, while wasting ratios range between 3 to 9 percent (Table 1). At the same time, 50 to 80 percent of the adult population in PICs is overweight, with obesity rates varying between 18 to 56 percent (Table 1). NCDs are responsible for closely three out of four deaths in PICs.[20] Food insecurity, malnutrition and the rise of NCD-related morbidity and premature mortality have major socioeconomic costs relating to the loss of productivity, coupled with health care costs, have a major detrimental impact on the development of PICs and make reaching their Healthy Island Visions and Sustainable Development Goals (SDG) challenging.[8,21-23]

Table 1: Agricultural, fisheries and nutrition context of Pacific Island countries

Indicators		Unit	Kiribati	Tuvalu	Samoa	Tonga	Fiji	Solomon Islands	Vanuatu
Surface area (2020)		'000 km²	0.81	0.03	2.84	0.75	1.83	28.4	12.2
Agricultural land (2020)		% of land area	42	60	12.4	45.8	23.26	3.9	15.3
Stunting rate (2020)	under 5 years	% of age group	—	10	4.9	8.1	7.5	31.6	28.5
Wasting rate (2020)	under 5 years	% of age group	—	3.3	3.9	5.2	6.3	8.5	4.4
Overweight (2020)	under 5 years	% of age group	—	6.3	5.3	17.3	5.1	4.5	4.6
	male	% of total population	77	80	74	75	60	50	52
	female	% of total population	81	84	82	82	68	60	62
Obesity (2020)	male	% of total population	42	47	40	41	35	18	20
	female	% of total population	50	56	55	54	25	27	30
Prevalence of undernourishment (2020)		% of total population	3.2	3.3	2.7	—	3.7	8.9	7.2
Population distribution (2020)	rural	% of total population	46	38	82	77	44	76	75
	urban	% of total population	54	62	18	23	56	24	25
Gross domestic product per capita (2020)		USD	3 894	3 701	4 183	4 364	6 267	2 138	3 214
Adjusted net national income per capita (2018)		USD	2 980	—	3 574	4 040	5 137	1 469	2 859
Agriculture and fisheries, value added (2016)		% of gross domestic product (2018)	30.8	16.5	9.8	17.2	9.2 (2012)	35	25.8
UNDP Human Index ranking (2019)		out of 189	132	not listed	111	105	98	153	141

Source: **Robins, L., Crimp, S., Wensveen, M., Alders, R.G., Bourke, R.M., Butler, J.** ***et al.*** 2020. ***COVID-19 and food systems in the Indo-Pacific. An assessment of vulnerabilities, impacts and opportunities for action.*** Australian Centre for International Agricultural Research.

The transformation of agrifood systems is necessary in PICs and globally not only to ensure that they support livelihoods but that they provide healthy, affordable and sustainable diets, are inclusive for all stakeholders, environmentally sustainable, and resilient to climate change and other food system shocks.[6,24] This requires a shift away from dominant agricultural development paradigms that focus on commercialising for export and improving productivity and production.[6,13] Several PICs have recognised this need and have started to incorporate environmental sustainability, food security and nutrition into their agrifood system plans; however, in most PICs, a gap remains between goals, strategies, and operational plans that are actually implemented on the ground.[11]

PICs are characterised by distinctive vulnerabilities arising from their "islandness" that make agrifood system transformation particularly challenging. PICs are particularly badly impacted by climate change because of "***their disproportionately high exposure to both slow-onset and extreme hydrometeorological events, and the limitations of their economic and natural resources for mitigating such risk***".[25] Moreover, their small population, land, and economy size, geographic isolation and concomitant infrastructure challenges, and their need for development, aggravate the multitude of trade-offs that PIC governments need to consider in their efforts to transform agrifood systems.[3,26]

While their vulnerabilities connect PICs, these states are diverse in size, culture, history, geography, and their agrifood systems are characterised by different factors. Table 1 provides an overview of agricultural, fisheries and nutrition characteristics of selected PICs. (The agrifood system differences are discussed in detail in Section 2.2)

Traditional knowledge provides a vital resource for sustainable agrifood system transformation in PICs.[13,27] Pacific island communities have a wealth of experience and traditional knowledge on surviving amidst challenging climatic conditions; this knowledge has been recognised as one of the most important resources that can lead a sustainable agrifood system transformation in PICs.[13,27] Moreover, land and coastal seas in the Pacific are traditionally owned by communities, which provides further opportunities for sustainable, community-led agrifood system transformation.[28-31]

This policy brief aims to provide a transdisciplinary, multisectoral overview of the ways agrifood systems, food security and nutrition in the Pacific are impacted by climate change (and other drivers of the agrifood system transformation), and to give account to a number of entry-points through what agrifood system transformation can be supported in PICs, with the consideration of trade-offs on the nexus of livelihoods, environmental sustainability, and food security and nutrition. This policy brief was informed by a scoping review of peer-reviewed and grey literature on agrifood systems transformation in PICs and by a series of consultations with key stakeholders and experts in this field.*

The first part of this policy brief (Section 2) summarizes evidence on the interlinkages between climate change, agrifood systems, and food security and nutrition in PICs. Section 2.1 provides a brief account of the effects of climate change in Pacific Island countries. Section 2.2 discusses the impacts of climate change on agrifood systems, focusing on production, supply chains, and trade, and the ways population diet, food, nutrition and water security are affected by the trends. Section 2.3 describes other drivers of agrifood systems transformation and trends. Section 2.4 briefly explains the ways Pacific agrifood systems contribute to climate change and impact local ecosystems.

The second part of this report (Section 3) offers a brief description of some opportunities to achieve sustainable Pacific agrifood systems transformation through the linkages of agriculture, climate change, and food security and nutrition, both in the supply and demand dimensions.

* Due to confidentiality reasons, the identity of the parties consulted is not disclosed in this policy brief. Where information from the consultations is used in the brief, the interviewee's individual identifier number has been provided in brackets. Professionals working on agri-food system transformation are indicated with F and academic researching this field with an A.


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2. The impact of climate change on pacific agrifood systems

This section discusses the trade-offs between current trends and opportunities in transforming production, supply chains, and food trade, and it offers insights on the ways such trade-offs might be managed by PIC communities, governments and development partners. The final Section 4 concludes this policy brief.

2.1 The effects of climate change in Pacific Island countries

Table 2 presents the annual projected change in air temperature, precipitation and sea level rise for 2081–2100 compared to 1986–2005 in the North and South Pacific regions in the scenario of medium global emissions (Representative Concentration Pathway - RCP4.5).

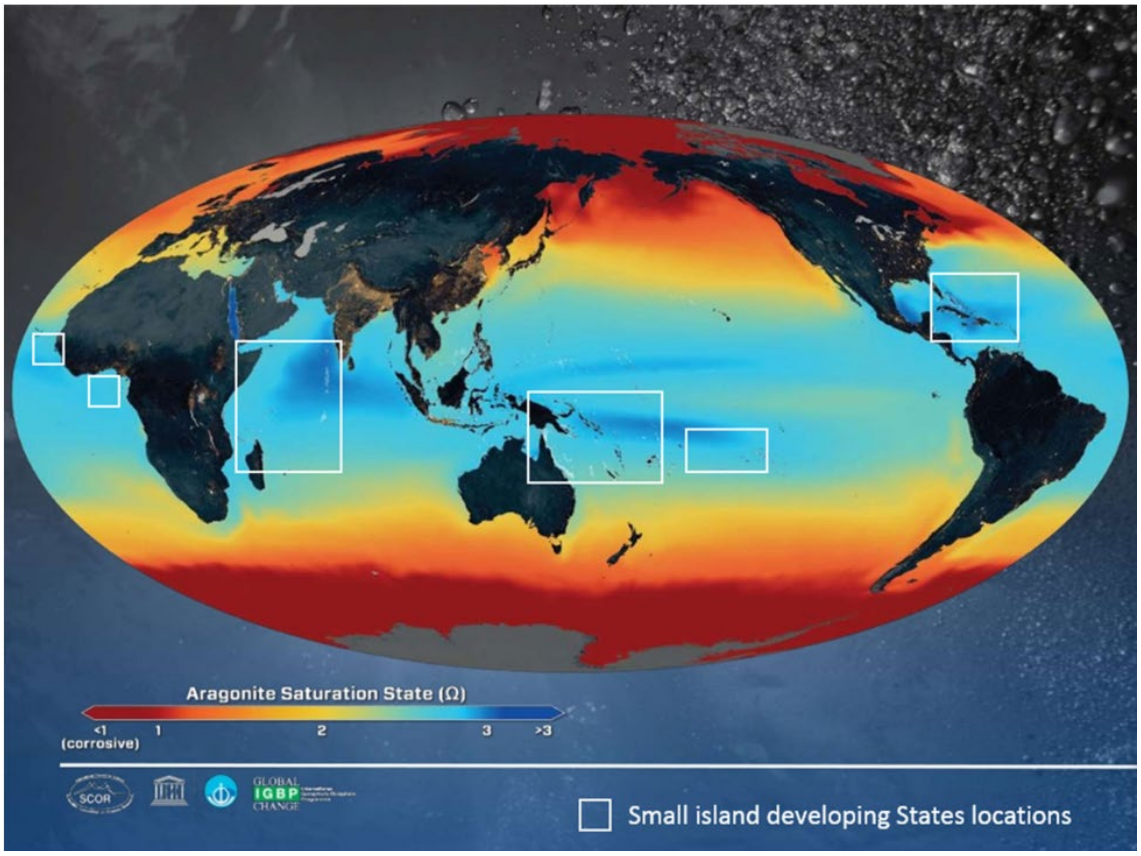
Table 2: Representative Concentration Pathway (RCP4.5) annual projected change for 2081-2100 compared to 1986–2005

	Temperature (Celsius degree)			Precipitation (%)			Sea level (m)
	25%	50%	75%	25%	50%	75%	Range
North Pacific region	1.2	1.4	1.7	0	1	4	0.5-0.6
South Pacific region	1.1	1.2	1.5	0	2	4	0.5-0.6

Source: **IPCC.** 2022. ***Six Assessment Report, Climate Change 2022. Impacts, Adaptation and Vulnerability.***

If the global emission levels remain high (RCP 8.5), a +2.0-4.0 °C **increase in air temperature** is projected in the Pacific region.[32] The rise in air temperature will contribute to **marine heatwaves –** when the average seawater temperature stays at least 3-5 °C above normal.[33,34] The rise of atmospheric CO_2 increases the amount of dissolved CO_2 in the oceans. This results in **ocean acidification:** lower seawater pH levels that create a more acidic environment for sea life.[7,35,36]

Figure 1: Expected acidification levels by 2100 globally with approximate locations to Pacific Island countries and other Small Island Developing States



Source: **Schmutter, K., Nash, M., Dovey, L.** 2017. *Ocean acidification: assessing the vulnerability of socioeconomic systems in Small Island Developing States. Regional Environmental Change*, 17(4): 973-87.

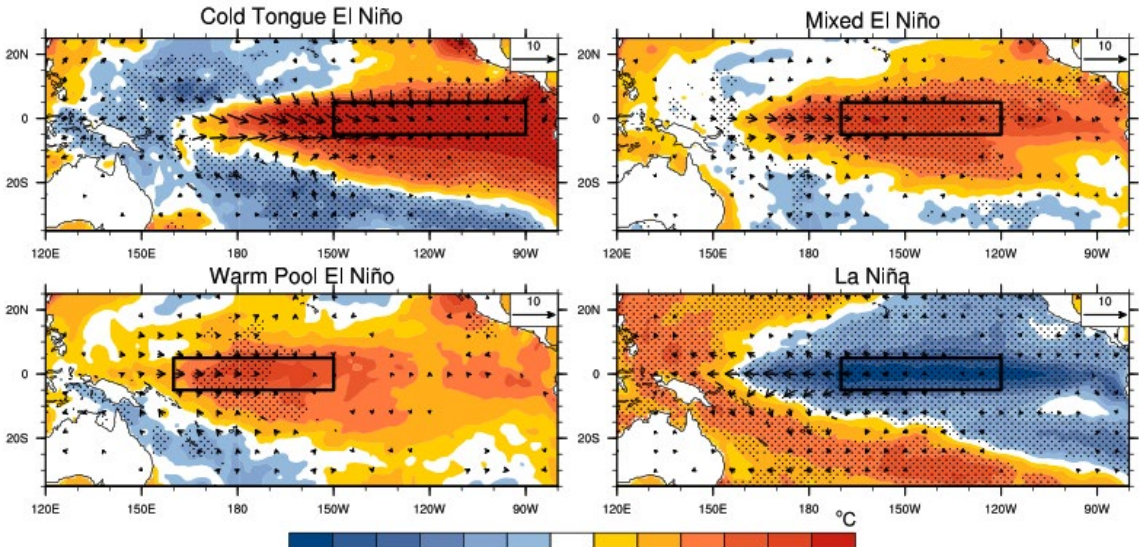
Sea levels are projected to **rise** at least by 0.4-0.5m by 2081–2100 in the Pacific.[2] This will result in the loss of land, saltwater intrusion and salinisation of wells.[37] Atoll countries, such as Kiribati, the Marshall Islands or Tuvalu, are in particular danger of losing their lands due to sea level rise. Populations in countries with higher altitude, such as Fiji or Tonga, are in less existential threat, as they might have the opportunity to migrate to higher land.

Precipitation patterns are also **changing** in the Pacific due to climate change: the southwest and northwest regions are receiving higher rainfall, and the central areas are becoming drier.[7,34] The **frequency and severity of cyclones and storms** have been reported and projected to increase as well.[7,34] The average **wave height** is predicted to grow as a result of increased wind activity.[32,34] Consequently, an increase in **salt sprays** in coastal areas will occur.[32]

Climate change increases the frequency of extreme *El Niño* or *La Niña* events in the Pacific, making the likelihood of cyclones, flooding, landslides, damaging wind and swell activity, and droughts higher.[34,38] The *El Niño*-Southern Oscillation is a cycle of *El Niño* and *La Niña* climatic phases that takes place in the tropical Pacific Ocean; it influences temperatures, precipitations and sea level patterns.[38,39] The *El Niño* phase is usually associated with warmer weather (although it may manifests with colder or mixed temperatures) coupled with unexpected weather events, such as storms, floods, or wildfires.[38,39] The *La Niña* phase is characterised by cooler temperatures and the usual weather patterns but with more extremes. During this phase, countries in the South-Western Pacific receive more rainfall than expected and the likelihood of flooding and landslides is higher, while states in the Central and Eastern Pacific will be more likely subjected to lower than usual precipitation rates, resulting in droughts.[38,39] Figures 2 and 3 show the air temperature and rainfall patterns in different *El Niño* and *La Niña* phases. While *El Niño*-Southern Oscillation is a usual phenomenon in the Pacific, climate change increases the likelihood of severe *El Niño* or *La Niña* years.[34,38]

The increased severity and frequency of extreme weather events affect PICs differently, partially depending on the type of islands. Table 3 provides a summary of the implications of hydro-meteorological hazards by island type.

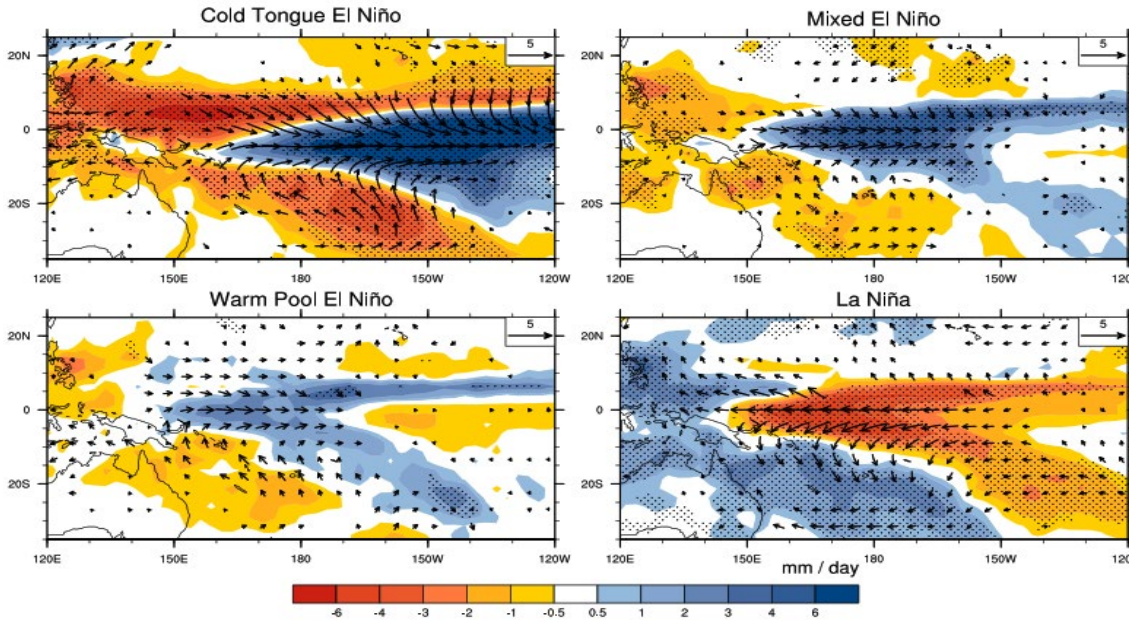
Figure 2: Mean September-February sea surface temperature anomalies for the three El Nino types and for La Nina events.



Notes: Arrows show the surface winds, the box shows areas where the temperatures are significantly different

Source: **Murphy, B.F., Power, S.B., McGree, S.** 2014. *The Varied Impacts of El Nino-Southern Oscillation on Pacific Island Climates. Journal of Climate,* 27(11): 4015-36.

Figure 3: Mean November-April rainfall anomalies for the three El Nino types and for La Nina events



Notes: Arrows show the wind anomalies

Source: Murphy, B.F., Power, S.B., McGree, S. 2014. The Varied Impacts of El Nino-Southern Oscillation on Pacific Island Climates. Journal of Climate, 27(11): 4015-36.

Table 3: Types of island in the Pacific region and implications for hydro-meteorological hazards

Island type	Size and basic geographic characteristics	Island elevation, slope, rainfall	Implications for hazard
Continental	Large	High elevations	River flooding more likely to be a problem than in other island types.
	High biodiversity	River food plains	
	Well-developed soils	Orographic rainfall	
Volcanic high islands	Relatively small land area	Steep slopes	Because of size, few areas are not exposed to tropical cyclones. Streams and rivers are subject to flash flooding. Barrier reefs may ameliorate storm surge.
	Barrier reefs	Less well-developed river systems	
	Different stages of erosion	Orographic rainfall	
Atolls	Very small land area	Very low elevations	Exposed to storm surge, "king" tides, and high waves. Narrow resource base. Exposed to freshwater shortages and drought. Water problems may lead to health hazards
	Small islets surround a lagoon	Convectional rainfall	
	Larger islets on windward side	No surface (fresh) water	
	Shore platform on windward side	Ghyben-Herzberg (freshwater) lens	
	No or minimal soil		
Raised limestone islands	Concave inner basin	Steep outer slopes	Depending on height, may be exposed to storm surge. Exposed to freshwater shortages and drought. Water problems may lead to health hazards.
	Narrow coastal plains	Sharp karst topography	
	No or minimal soil	No surface water	

Source: IPCC. 2022. **Six Assessment Report, Climate Change 2022**. *Impacts, Adaptation and Vulnerability.*

2.2 Impacts of climate change and resulting trends on agrifood systems in Pacific Island countries

Climate change exposures have major detrimental impacts on every part of the agrifood system, from food production – both in the crops and livestock and fisheries sectors –, through processing and supply chains to trade and diets. The lower crop yields and fish catch, and the rising frequency and severity of extreme weather events, resulting from climate change, contributes to shifts in smallholder farmers and small-scale fishers agrifood practices. Many of them turn to the intensification of crop cultivation or coastal fishing, or they pursue other forms of livelihood. Moreover, the increased vulnerability of supply chains increases post-harvest loss and limits the domestic uptake of local produce by markets and industries. While a number of other drivers are known to impact recent trends in agrifood practices, this section focuses on the ways climate change contributes to these patterns.

2.2.1 Food production

Crops and livestock production

Crops and livestock production is the most important sector to provide livelihoods in many PICs. Agriculture, more specifically crop cultivation and animal husbandry, provides livelihood for approximately three-quarters of the population in PICs.[32,40] Moreover, local crops constitute a significant portion of diets in PICs.[40,41] Although due to differences in agroecological zones and precipitation patterns, the contribution of agricultural production to livelihood and food security differs by PICs.[17,41] Table 4 provides

a summary of the contribution of subsistence production to household income and GDP in selected PICs. The majority of agriculture is in the hands of smallholder farmers – while the land is often community-owned –, and it takes the form of subsistence farming and cash cropping.[40] The impacts of climate change on crop and livestock production are summarized in Table 5.

Table 4: The contribution of subsistence production to household income and gross domestic product in selected Pacific Island countries

	Federated States of Micronesia	Kiribati	Palau	Samoa	Solomon Islands	Tonga	Tuvalu
Subsistence production as % of household income	23%	21%	3%	26%	37%	17%	55%
Sales of own produce as % of income	N/A	11%	N/A	3%	6%	14%	2%
Range of contribution of home production (subsistence and sales) to subsistence	15-36%	19-50%	N/A	7-42%	7-71%	14-36%	30-65%
Subsistence agricultural production as a contribution to GDP	22%	48%	N/A	11%	N/A	7%	13%

Source: Nunn, P.D. 2021. ***Climate Change and Pacific Island countries.*** United Nations Development Programme.

Climate change exposures, such as increased air temperature and changes in rainfall can have devastating effects on crop cultivation. Higher air temperatures place abiotic stress on crops, resulting in slower growth and lower yields.[32,37] As most agricultural lands are rainfed and not irrigated in PICs, the changes in rainfall have a major impact on crop production: lower precipitation levels result in groundwater depletion, decreased soil fertility and higher soil salinity, which negatively impact crop yields.[32] Higher rainfall levels erode the soil and result in loss of nutrients, cause flooding and water logging that making many crops rot in the ground, and it facilitates the diffusion of pests and diseases in crops.[32]

The increasing frequency and severity of extreme weather events, such as storms, floods, and the droughts, pest and disease outbreaks that commonly follow, devastate harvests.[42] The strong wind damages crops, trees, and agricultural infrastructures and facilitates the diffusion of wind-borne diseases and pests.[32]

Table 5: The impacts of climate change-induced exposures on crops and livestock in Pacific Island countries

Effect of climate change	Key impacts
Increased air temperature	Plant stress including wilting of crops and pest and disease incidences
	Slow growth and low yields of food crops
Changes in rainfall	**Wetter climate:**
	Soil erosion and loss of nutrients
	Flooding and water logging of agricultural lands
	Contamination of groundwater resources
	Growth of less desirable pasture species
	Spread of pests and diseases in crops
	Drier climate:
	Water shortage for agriculture due to groundwater depletion and slow recharge of water lenses
	Increased soil salinity and reduced soil fertility
	Increased risk of ire outbreaks
	Reduced crop productivity

Effect of climate change	Key impacts
Sea level rise	Loss of arable land
	Saltwater intrusion into freshwater lenses
	Flooding of low-lying farms and settlement areas
	Erosion of soil and shorelines/coastal areas
	Increased soil salinity and reduced soil fertility
	Inundation of coastal springs and underground freshwater sources adversely affecting crop productivity
Increased severity of cyclones and storms	Damage to crops and trees due to strong winds and salt sprays
	Erosion of coastlines due to wave surges and flooding
	Destruction of agriculture infrastructure such as farm shelters and storage facilities due to strong winds
	Spread of wind-borne diseases and pests in food crops
	Outbreak of invasive species thereby affecting agricultural productivity
Wave surges and salt sprays	Damage to food crops and trees due to saltwater intrusion into fertile agricultural land
	Loss of traditional food crops as their habitats become damaged by wave surges and salt sprays
	Salt water intrusion into freshwater lenses
	Increased soil salinity and reduced soil fertility
	Erosion of shorelines and coastal areas
El Niño Southern Oscillation (ENSO)	Crop production losses, especially in rainfed areas with more frequent occurrences of ***El Niño***
	Coastal erosion due to intense wave action during ***La Niña*** events
	Drying of aquifers and freshwater lenses due to ENSO droughts

Source: **Palanivel, H., Shah, S**. 2021. ***Unlocking the inherent potential of plant genetic resources: food security and climate adaptation strategy in Fiji and the Pacific.*** Environment, development and sustainability, 23(10): 14264-323.

The rise of sea level, increasing swell activity, and saltwater intrusion decrease the supply of arable land and worsen freshwater scarcity. While the amount of available arable land differs by country – ranging from 165 000 Ha in Fiji to Cook Islands and Niue with 1 000 ha[43]–, it generally poses as a natural limitation for crop cultivation in PICs. The rise of sea levels, the higher and more powerful waves, and consequent saltwater intrusion into freshwater sources makes this issue worse.[44] Saltwater intrusion raises soil salinity, and the inundation of freshwater lenses negatively impact crop productivity.[32] The salinisation of wells contributes to drinking water scarcity.[50] Moreover, freshwater resources for irrigation and consumption get depleted after extreme weather events, with the usual drinking water sources, such as wells, getting contaminated due to flooding.[45] Water insecurity is often aggravated by rainwater containers getting cracked in extremely hot temperatures.[45]

Climate change-induced impacts on agrifood systems discourage Pacific Islanders from subsistence farming. The loss of crops, as a consequence of the rising frequency and severity of extreme weather events, discourages locals from farming. Therefore, farmers often choose to tend gardens closer to their homes and reduce the number of their gardens, or they abandon crop cultivation altogether and turn to other forms of livelihood that are not impacted by climatic events.[25,46]

Crop yields and animal husbandry production levels have been reportedly decreasing since the 1990s in multiple Pacific Island countries, with atoll countries most directly affected, as a result of climatic changes and other drivers.[12,47] The decrease in crop yield increasingly makes farmers turn to the intensification of production.[32,48] Inorganic fertilizers and pesticides are often not affordable or available in PICs – a situation aggravated by the global energy crisis. Thus, farmers tend to decrease or completely abandon fallow periods, as a means to produce more food in a shorter amount of time.[25] As this approach accelerates the loss of soil fertility, cash crops are planted first (because they require highly fertile soil), followed by less high maintenance and more resilient tuber crops, until the soil loses so many nutrients that the land is abandoned.[13] In some PICs, such as Fiji and Vanuatu, cattle farming supplements cash crop cultivation, particularly with copra production.[31,49]

Fisheries

Fishing is a fundamental part of Pacific Island communities' life and economy. Fish and aquatic foods constitute a major source of protein in traditional Pacific diets, and thus they play a vital part of food and nutrition security in the region.[50,51] Coastal communities usually take part in small-scale fishing focusing on coastal areas – a form of fishing that receives less government attention than pelagic fishing that tends to generate export revenue.[52] Nevertheless, coastal fishing provides a significant contribution to Pacific Islander communities' livelihoods.[51] The marine fishery production in PICs is presented in Table 6. Pelagic fish is a major export commodity in many PICs; although the amount of fisheries production greatly varies between countries, ranging from 200 000 tonnes in Kiribati, to 44 500 tonnes in Fiji and to 1 262 tonnes in Tonga.[53] The impacts of climate change on fisheries are summarized in Table 7.

Table 6: Marine fishery production in Pacific Island countries in 2014 (tonnes)

	Coastal commercial	Coastal subsistence	Offshore locally based	Offshore foreign-based	Total
Kiribati	7 600	11 400	510	217 871	237 381
Papua New Guinea	6 500	35 000	216 896	177 315	435 711
Nauru	163	210	-	124 481	124 854
Federated States of Micronesia	1 725	3 555	40 838	29 754	75 872
Marshall Islands	1 500	3 000	85 918	36 573	126 991
Solomon Islands	6 468	20 000	41 523	96 898	164 889
Tuvalu	300	1 135	-	-	1 435
Fiji	11 000	16 000	17 079	20 342	64 421
Cook Islands	150	276	194	10 942	11 562
Vanuatu	1 106	2 800	568	-	4 474
Samoa	5 000	5 000	1 254	1,891	13 145
Tonga	3 900	3 000	1 363	4,017	12 280
Palau	865	1 250	3 987	547	6 649
Niue	11	154	-		165
Total	**46 288**	**102 780**	**410 130**	**720 631**	**1 279 829**

Source: Gillett, R., Tauati, M.I. 2018. *Fisheries of the Pacific Islands. Regional and national information.* Apia: Food and Agriculture Organization of the United Nations.

Table 7: The impacts of climate change-induced exposures on fisheries in Pacific Island countries

Climatic threat	Key impacts
Short-medium-term marine heatwaves	Fish kills under persistently warmer conditions (e.g. due to low dissolved oxigen)
	Coral bleaching and subsequent overgrowth by macroalgae and increase in ciguatoxic microalgae.
	Changes in fish community composition and species' abundance
	Declines in extent and quality of habitats and loss/contraction of fishing grounds
	Depressed catch rates and declines in overall catches of key target species.
Increased severity of cyclones and storms	Declines in extent and quality of habitats and loss/contraction of fishing grounds
	Overgrowth of dead coral by macroalgae and increase in ciguatoxic microalgae
	Changes in fish community composition and species' abundance
	Depressed catch rates and declines in overall catches of key target species.
	Damage to fishing fleet.
El Niño Southern Oscillation	Movement of tuna eastward along the equator and at higher latitudes, with declines in catches occurring in western PICs.

Source: **Dunstan, P.K., Moore, B.R., Bell, J.D., Holbrook, N.J., Oliver, E.C.J., Risbey, J.** ***et al.*** 2018. ***How can climate predictions improve sustainability of coastal fisheries in Pacific Small-Island Developing States?*** Marine policy, 88: 295-302.

Higher ocean temperatures and acidification result in the loss of habitats, lower catch rates and a higher incidence of toxic seafood.[47] Short- and medium-term marine heatwaves and the consequently warmer conditions lower the oxygen content of seawater, resulting in the loss of fish stock.[34,36] Higher water temperatures and ocean acidification contribute to coral bleaching and the overgrowth of microalgae, including ciguatoxin species.[34,35] Thus, fish habitats will decline and seafood will become more frequently toxic.[35] Coral reef, mangrove, and seagrass populations have already been reported to decline in the Pacific.[54,55] In addition, the increasingly frequent and severe cyclones and storms damage fishing fleets and contribute to the loss of coral reefs and fish stock, thus further diminishing fishing catch.[34]

Climate change exposures are predicted to induce shifts in ocean currents, resulting in an eastward shift in pelagic fish availability.[56] Higher sea surface temperatures and ***El Niño*** Southern Oscillation are forecasted to drive major changes in ocean circulation in the Pacific region.[56] The projected weakening of the south equatorial and south equatorial counter currents will change nutrition delivery patterns and shift prime feeding grounds for pelagic fish species. This effect, combined with higher sea temperatures will result in an overall eastward shift of pelagic fish availability.[36,52] Thus, an increase in pelagic fish stock is expected in the marine territories of Fiji, French Polynesia, New Caledonia, Niue, and Tonga, while a decrease is likely in the waters of Micronesia, Marshall Islands, Palau, Papua New Guinea, Solomon Islands, Nauru and Tuvalu.[52] Table 8 provides a summary of projected tuna catches and estimated resulting government revenue.

Table 8: **Summary of projected percentage changes in tropical Pacific tuna catches by 2036 and 2100 relative to 1980–2000 for SRES scenarios A2 and B1, and the estimated resulting percentage change to government revenue**

Tuna fishery		Change in catch (%)		
2035: B1/A2		2100:B1	2100:A2	
Skipjack tuna	Western fisheries	+11	-0.2	-21
	Eastern fisheries	+37	+43	+27
	Total	+19	+12	-7
Bigeye tuna	Western oceans	-2	-12	-34
	Eastern oceans	+3	-4	-18
	Total	+0.3	-9	-27
Country		Change in government revenue (%)		
2035: B1/A2		2100:B1	2100:A2	
Federated States of Micronesia		+1 to +2	0 to +1	-1 to -2
Solomon Islands		0 to +0.2	0 to -0.3	0 to +0.8
Kiribati		+11 to +18	+13 to +21	+7 to +12
Tuvalu		+4 to +9	+4 to +10	+2 to +6

Note: Scenario A2 refers to more divided world with high emissions and scenario B1 refers to more integrated and more ecological friendly world

Source: **IPCC.** 2022. ***Six Assessment Report, Climate Change 2022. Impacts, Adaptation and Vulnerability***.

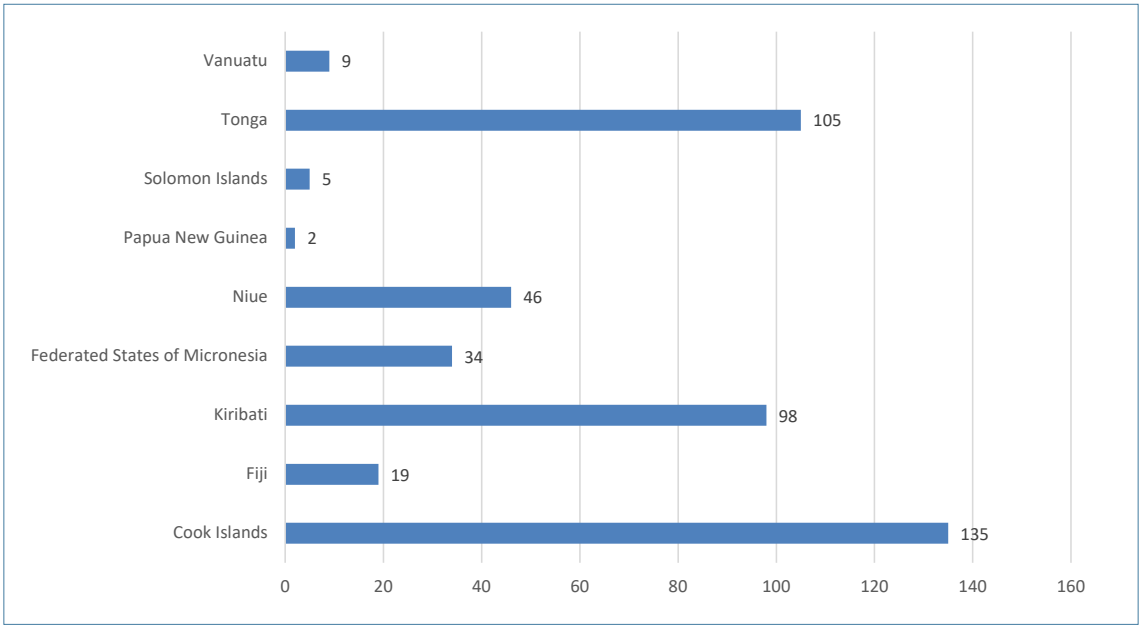
The intensification of coastal fishing has been observed in many PICs that is often explained as a response to the climate change impacts on seafood catch, lower crop yields, and increased frequency and severity of extreme weather events. As a result, destructive fishing practices, such as spear or night fishing, and growing disregard for costumery spatial and temporal protection zones, characterise small-scale fishers in many PICs.[57]

Climate change has a potentially positive impact on freshwater habitats, creating more favourable conditions for aquaculture, such as tilapia, giant clam or sea cucumber farming.[56,58] The change in precipitation patterns and air temperature makes certain forms of aquaculture more feasible. While freshwater fish or high-value aquatic species, such as sea cucumber is not part of the traditional diets in most PICs – therefore, it would likely take a long time for communities to adopt these food sources (A1, A2, A4) –, an opportunity to shift local fishing efforts to aquaculture to improve food security, diversify livelihoods, and support the protection and recovery of coastal marine habitats, has been recognised in the region.[56,59]

2.2.2 Food supply chains

Supply chains are ever more vulnerable to disruptions from extreme weather events that are increasingly frequent and severe as a result of climate change. Supply chains, that bring produce from farmers and fishers to markets and manufacturers, tend to be limited due to the geographical isolation and poor infrastructure in PICs.[60] (For example, Figure 4 shows the road density of selected PICs as a proxy of infrastructure development.) To aggravate this issue, roads and boats increasingly often get damaged during extreme weather events.[34,47] The disruption of local and international supply chains might result in the limited supply of gasoline – crucial to the transportation of food within and between islands –, labour and products that are needed for local food processing and manufacturing in PICs.[61] Due to the logistical challenges of transportation, sending produce to markets has a high cost to producers, resulting in higher food prices. Similarly, overseas food imports are impacted during and after extreme weather events, limiting their supply and making them less affordable, particularly in remote islands.[29,62]

Figure 4: Road density in selected Pacific Island countries (km/100km^2)



Source: **Secretariat of the Pacific Community**. 2018. *Food security in vulnerable islands. A regional food security atlas of the Pacific.* Suva.

The more frequent and severe extreme weather events increase the already considerable food waste in the Pacific. The increasing logistical difficulties of transporting produce to markets, coupled with the limited availability of cooling equipment and rare use of preservation, hygienic and food safety practices, is a major cause of the considerable post-harvest loss reported in PICs, either because of the produce or catch goes off by the time it reaches the market or consumers are less likely to buy the produce if it does not look fresh anymore.[60,63] Such inefficiency is a major barrier to achieving food security in PICs.[60] Moreover, the supply chain issues make the uptake of smallholder farmers' produce limited in domestic manufacturing, hospitality venues and supermarkets.[63,64]

2.2.3 Food trade

Climate change exposures have a negative impact on the availability and affordability of foods. Due to the processing and supply chain issues in the Pacific, aggravated by climate change, manufacturers, food outlets and hospitality venues have difficulty in procuring locally produced, fresh foods that consistently meet standards of food safety, quality and quantity.[64,65] Moreover, after extreme weather events, smallholder farmers tend to keep their surplus produce for their own use, instead of sending it to the markets, further reducing the availability of fresh foods.[66] The reliability and the cost of import food supply also get impacted by extreme weather events; thus, imported foods become less available and affordable for Pacific Islanders.[66] This is especially relevant in this region, where most countries are dependent on food imports.[41]

The growing supply chain issues, resulting from climate change, discourage hospitality venues and food outlets from relying on local produce, which contributes to the limited availability and affordability of local, fresh foods in stores and restaurants.[64,65] Hospitality venues tend to import fresh food items from abroad, raising their food costs considerably.[64,65] Food stores tend to stock food items with long shelf-life that do not need refrigeration: rice, ultra-processed foods and beverages.[29,67] The procurement of these items is often cheaper than fresh foods as their transportation costs less.[25,61] Consequently, ultra-processed foods are relatively cheaper than locally produced, fresh foods in PICs.[29]

2.2.4 Food security, nutrition and diets

Climate change affects all aspects of food security, from food availability (both local production and imported food items), to food affordability, food quality and safety. Nutrition is also impacted since the supply of perishable labour-intensive food, such as fruits, vegetables and fresh fish, is particularly at risk of being affected by the different climatic threats. These products are also more vulnerable to spikes in prices that can raise the cost of a healthy diet in certain periods, forcing people to make more unhealthy choices and consume broadly available ultra-processed food at the household level. This coupled with lower income levels, will likely result in higher levels of food insecurity, adversely impacting the poorest households. There is a risk that the already low consumption of fruits and vegetables could decrease even more, with adverse consequences for nutrition and dietary diversity.

2.3 Other drivers of agrifood systems transformation and resulting trends in Pacific Island countries

Climate change-induced exposures to agrifood systems and food security are aggravated by urbanisation and dependence on imported food products, and more recently the COVID-19 pandemic and the war in Ukraine, contributing to a global energy and food crisis. After regaining independence from the colonial powers, PICs were left with the combination of an export-oriented agriculture and a dependency on imported food products.[41,68] Globalisation and the pressure for trade and investment liberalisation have reinforced these agrifood system trends.[14,68] The multiple impacts of the COVID-19 pandemic and the war in Ukraine, contributing to a global energy and food crisis, exacerbate the vulnerability of PICs to food insecurity.[12,18]

2.3.1 Food production

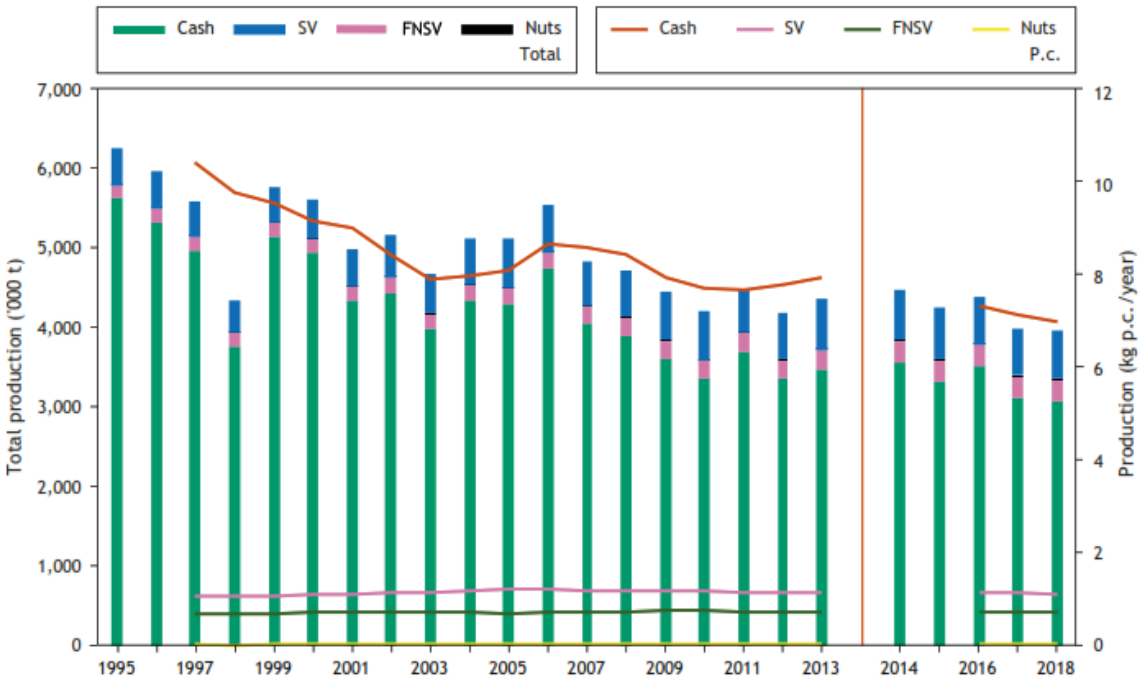
PICs' entry into the cash economy has displaced traditional livelihood approaches that were based on subsistence farming and communal food exchange.[31,66] As the population of PICs are increasingly subjected to urbanisation, customary lands in the rural areas are more difficult to access to urban-dwellers and farming becomes less viable, the need for purchasing store-foods rise.[28,67,69]

The cultivation of cash crops is common among farmers in PICs. With the introduction of the cash economy, Pacific Islanders increasingly turn to cash-generating activities so that they can pay expenses, such as electricity, mobile phone or school fees.[67,69] Consequently, farmers tend to switch to the cultivation of cash crops or, in some PICs, cattle breeding, and abandon traditional agrifood practices, that are based on agroforestry and the cultivation of diverse staple crops.[13,31] The trends in crop production in PICs are summarized in Figure 5. The narrow focus on selected crops results in the loss of biodiversity, making gardens even more vulnerable to climate changed induced exposure.[13,32]

In terms of fisheries, PIC governments tend to focus their policy activities and financial support to increase pelagic fishing. Pelagic fish serves as a high-value commodity that tends to be exported immediately, without making it to the domestic market. Thus, pelagic fish catch rarely contributes to local food security and nutrition. Subsistence fishing is diverse, labour-intensive and extremely important for the food security and nutrition in the region but quantitative information about it is scarce.[70] While in many PICs, agricultural plans and policies start to incorporate the importance of fishing as a potential contributor to domestic food security, small-scale, coastal fishers receive limited support from governments (A1, A2, A4).[11]

The global food and energy crisis in the wake of the COVID-19 pandemic and the war in Ukraine make food insecurity worse in PICs, driving communities to turn back to crop cultivation and coastal fishing. The COVID-19 pandemic impacted PIC economies in multiple ways, from increasing morbidity and mortality to the loss of livelihoods due to lockdowns and the dramatic drop in tourism.[71] The resulting decrease in incomes, coupled with the disruption of imported and domestic food supply, has induced a shift back towards crop cultivation and coastal fishing to provide livelihood and food security.[17,72]

Figure 5: Crop production and per capita crop production as a rolling three-year average in Pacific Island countries, 1995 to 2019.



Note: Cash: cash-crops, SV: starchy vegetables, FNSV: fruit and non-starchy vegetables)[1]
Source: FAO. 2021. Gender, women and youth: Implications for innovation and digitalization Pacific. SIDS Solution Forum 2021.

2.3.2 Food supply chains

The loss of catch and decreasing yields, as a result of climate change exposures, highlight the importance of improving preservation and processing practices in PICs. Currently, post-harvest handling, storage and processing of produce and catch is minimal in PICs.[73,74] This can be explained by the lacking infrastructure – in terms of refrigerators, freezers, and equipped kitchens –, limited local knowledge of post-harvest hygiene, and the shift away from traditional preservation practices.[34,65] Consequently, the harvested produce has a short shelf-life and issues in food safety tend to occur, particularly with seafood.[65,75]

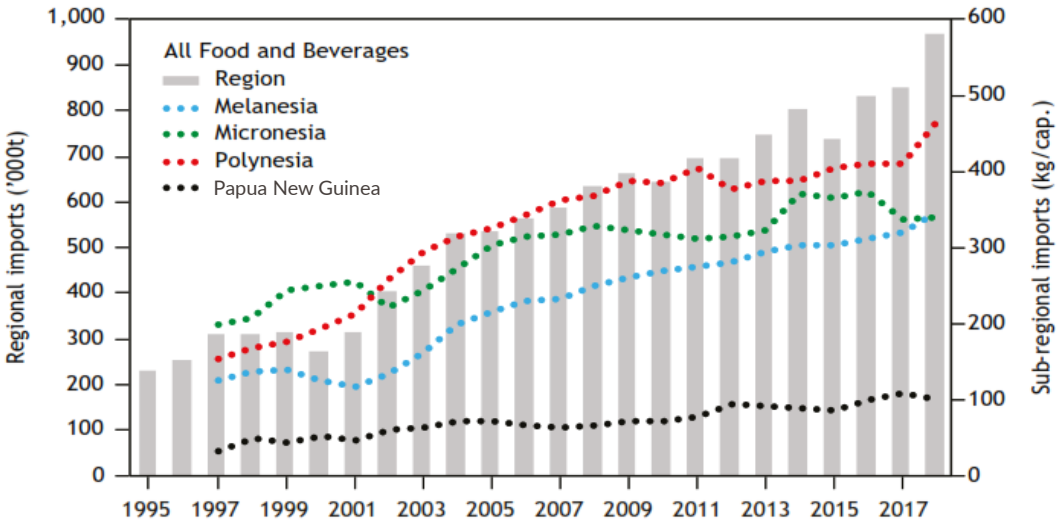
Local food manufacturing of ultra-processed foods and drinks masks issues of nutrition security in PICs. The global pressure for trade and investment liberalisation resulted in increased foreign direct investment in ultra-processed food and beverage, and alcohol industries in PICs.[14,15] The technology transfer occurring due to the investment tends to remain in the realm of ultra-processed, unhealthy foods; thus, it does not provide a significant positive impact on the development of healthy and sustainable processing practices.

The COVID-19 pandemic and the war in Ukraine have further disrupted global and regional supply chains in the Pacific, making food and other imported products, such as gasoline and raw materials for local manufacturing, and labour more expensive.[17,18] The global energy crisis has further exacerbated the issue of costly supply chains.[18] For example, producers in Tonga, Fiji, and Samoa reported challenges with accessing their agricultural lands, sourcing seeds, chemical, and farming equipment, or hiring labourers due to increased labour costs and lower labourer availability.[74]

2.3.3 Food trade and marketing

The supply chain issues limit "farm to plate" linkages between producers, the hospitality and retail sectors. The underdeveloped and vulnerable processing and supply chains are barriers to the uptake of local produce by hospitality venues and supermarkets.[64,65] Hotels and restaurants procure the majority of the ingredients from exported products, even in the case of vegetables, fruits and fish that could be obtained from local sources.[64,65] The hospitality sector maintains this practice because of the unreliability of quality, quantity, and food safety of the local catch and produce, and because the high-quality fish is most frequently sold to overseas markets, and only the lower quality, frozen fish remains on the domestic markets.[65] Without established supply chains, producers find it hard to access hotels and restaurants and meet the quality, consistency and volume requirements.[65] Moreover, the tender system of hospitality venues provides little planning security for farmers.[64,65]

Figure 6: Regional imports and subregional imports per capita of food and beverages



Note: Regional imports (y axis) and subregional imports per capita (z axis) of food and beverages (Papua New Guinea), is shown separately to Melanesia and excluded from the regional trend

Source: **FAO.** 2021. ***Gender, women and youth: Implications for innovation and digitalization Pacific***. SIDS Solution Forum 2021.

Ultra-processed foods and beverages are increasingly more available and affordable than locally produced fresh foods in multiple PICs. Due to the remnants of colonisation, the agriculture sector of PIC governments tends to focus on export production, leaving the population increasingly dependent on imported foods.[14,68] For example, the proportion of imported food in the total food expenditure takes up 36 percent in Kiribati, 35 to 44 percent in the Solomon Islands, 39 percent in the Federated State of Micronesia, 45 percent in Tonga, and 56 percent in Samoa, while in Palau this ratio reaches 81 to 84 percent.[41] The global pressure for trade and investment liberalisation has aggravated this issue and contributed to the increased availability, accessibility and affordability of ultra-processed foods and beverages, such as tinned meats, instant noodles, sugar sweetened beverages, and alcohol.[14,15] For example, Figure 6 present the rapid increase in food and canned fish imports, respectively, in PICs between 1995 and 2018. Given the logistical and supply chain issues characterising PICs, it is more convenient and cheaper for stores to stock these items than fresh foods.[25,67] Consequently, ultra-processed foods are relatively cheaper than locally produced, fresh foods in PICs.[29,30]

Table 9: The implementation of food policies in Pacific Island countries

Country	Year	F1	F2	F3	F4	F5	F6
American Samoa	2019-2020						
Commonwealth of the Northern Mariana Islands	2019-2020						
Cook Islands	2019-2020	☆☆	☆	☆☆☆	☆	☆	☆☆
Federated States of Micronesia	2019-2020	☆☆			☆		
Fiji	2019-2020	☆☆☆			☆	☆	☆
French Polynesia	2019-2020	☆			☆	☆☆☆	☆☆
Guam	2019-2020	☆☆				☆☆☆	☆☆
Kiribati	2019-2020	☆☆☆		☆☆☆	☆☆☆	☆	☆☆☆
Nauru	2019-2020	☆			☆☆☆	☆☆	
New Caledonia	2019-2020	☆☆			☆	☆	☆☆☆
Niue	2019-2020				☆☆	☆☆☆	☆☆☆
Palau	2019-2020	☆		N/A		☆☆	☆☆
Papua New Guinea	2019-2020						
Republic of the Marshall Islands	2019-2020				☆		
Samoa	2019-2020	☆☆☆	☆☆	☆	☆☆☆	☆☆☆	☆☆☆
Solomon Islands	2019-2020	☆					☆☆☆
Tokelau	2019-2020						
Tonga	2019-2020	☆			☆☆☆	☆☆☆	
Tuvalu	2019-2020	☆	☆				☆☆☆
Vanuatu	2019-2020				☆☆		
Wallis and Futuna	2019-2020				☆		

Notes: F1. Reducing salt consumption; F2. Regulating trans-fats in food products; F3. Regulating unhealthy food marketing for children; F4. Fiscal policies; F5. Healthy food policies in schools; F6. Food-based dietary guidelines. Green: established, stars 1 to 3: strength of policy; yellow: under development; red: not present.[5]

Source: **The Secretariat of the Pacific Community**. 2022. *Pacific Data Hub. MANA Dashboard.* https://pacificdata.org/health-dashboard.

Fiscal policies and regulations on food and alcohol product labelling, marketing, advertising and promotion need to be scaled up in PICs.[76] Table 9 presents the implementation rate of selected food policies in PICs and Territories. Fiscal policies, such as taxes on ultra-processed foods and beverages, and alcohol, or subsidising fresh, local products to make them more affordable can help incentivise the population to consume a healthier and more sustainable diet.[77] Taxation policies are often preferred measures by governments due to their revenue generation effect. For example, Fiji, Kiribati, Tonga, Samoa, Nauru and Vanuatu implemented excise or duty taxes on sugar-sweetened beverages.[78] Regulations on product labelling to inform consumers about the salt, sugar, fat, and alcohol content of products or the environmental impact of their production are important tools to help consumers make healthier food choices.[79] Bans on marketing, advertising, promotion and sponsorship are also proven to be effective in positively influencing food choices.[80] As these regulatory food policies aim to reduce the consumption of ultra-processed foods and beverages, the industries producing and selling these products tend to oppose the introduction of such measures globally and in the Pacific.[81-84]

Locally based ultra-processed food and beverage companies have considerable undue influence on food policy making. Large domestic and multinational companies based in PICs often provide a significant contribution to the local economy through creating employment and generating government revenue. As a result, they often bear considerable influence on policy making.[81-84] The efforts of PICs governments to tackle the NCD crisis by introducing regulatory food policy measures are hampered by the opposition of ultra-processed food and beverage industries.[81,84] This leaves Pacific Island communities relatively unprotected from the well-versed market and non-market strategies of these industries that aim to ensure that their products are widely available, accessible, affordable and desirable across the Pacific.

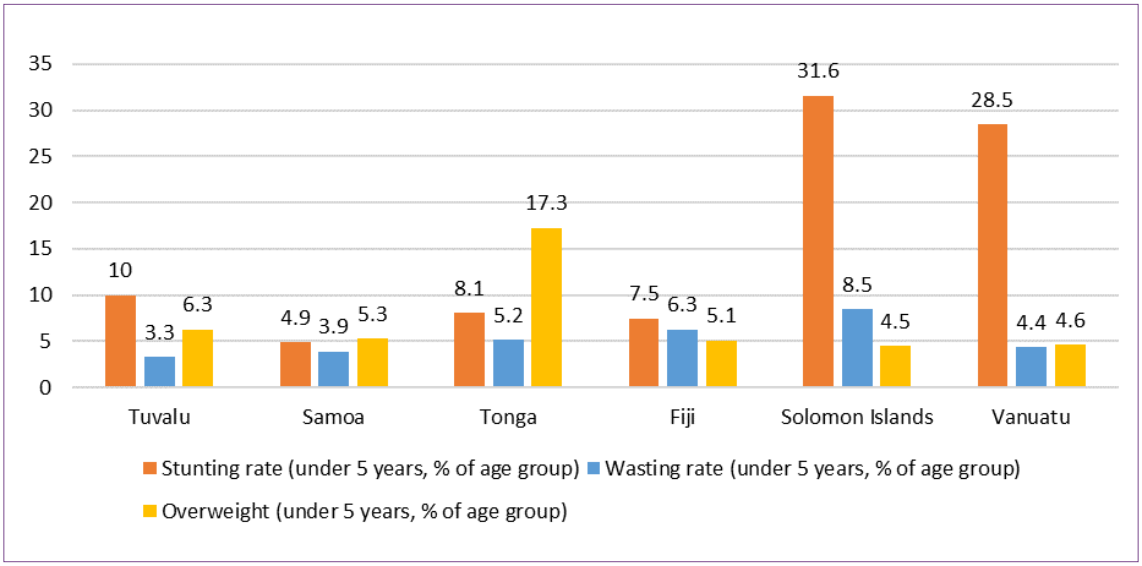
2.3.4 Food security, nutrition and diets

Current drivers of agrifood system transformation have led many PICs to increased production of cash crops contributing to the decreased availability and affordability of local produce, making food production in PICs less resilient to climate change and worsening food and water insecurity in the medium and long-term, and also in the short-term after extreme weather events.[13,17] The recent energy and food crisis in the wake of the war in Ukraine has made the availability and affordability of food even worse, serving as an additional driver for communities to increase their food production. However, the practices used for production intensification tend to be environmentally unsustainable, accelerating deforestation and overfishing.[17,18] Although the establishment of local ultra-processed food and drink factories in some PICs may create the illusion of food security, their presence contributes to the shift toward a less healthy diet, by making their unhealthy food products more available and affordable.[85-88] This contributes to the rise of non-communicable diseases (NCDs) locally and masks issues of nutrition deficiency in communities.[89,90]

These trends contribute to the shift from the consumption of traditional foods towards a more calorie-dense, less nutritious and diverse diet, overwhelmingly based on ultra-processed foods.[78] Rice and ultra-processed foods, such as canned meat and tuna, or instant noddles, are often preferred by locals more than traditional crops because they are cheap, do not require refrigeration, last long, are easy to prepare, and signal wealth to the community.[30,67] The higher calorie and lower nutrition content, and less diverse diets are major contributors to the increasing prevalence of NCDs in PICs.[89]

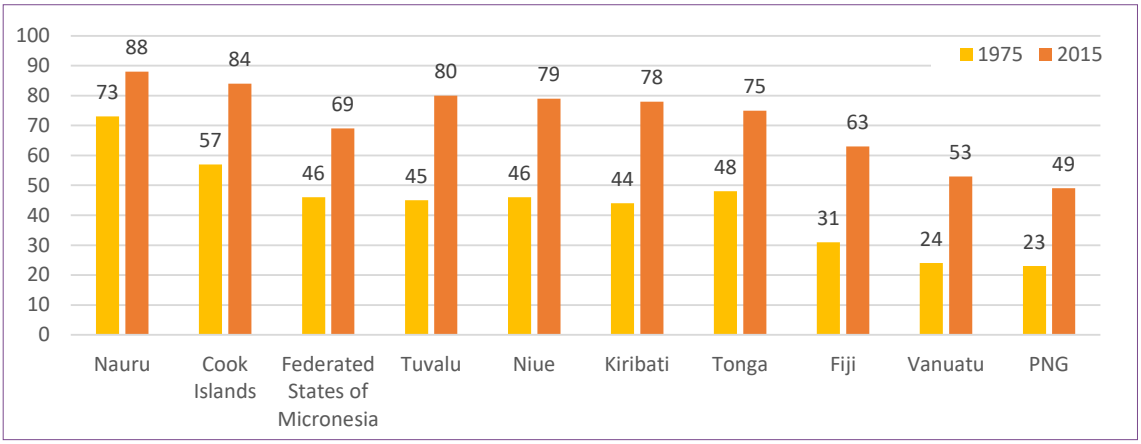
As a result, population level food insecurity and malnutrition are high in PICs.[91] Figure 7 shows the prevalence of stunting, wasting and overweight among children under 5 years. Figure 8 presents the rising ratio of overweight adults in PICs.

Figure 7: Prevalence of stunting, wasting and overweight under 5 years in selected Pacific Island countries, 2020



Source: **World Health Organization.** 2022. *Obesity and overweight: Global Health Observatory.* https://www.who.int/data/gho.

Figure 8: Changes in the prevalence of overweight adults in Pacific Island countries from 1975 to 2015.[3]



Note: overweight adults (BMI >= 25)

Source: **World Health Organisation.** 2022. *Obesity and overweight: Global Health Observatory*. https://www.who.int/data/gho.

2.4 The impact of the Pacific agrifood systems on climate change and local ecosystems

While the impacts of agrifood system practices in the Pacific on climate change globally are negligible, they effect local ecosystems significantly. The unsustainable methods of intensification of crop production, cash cropping, and cattle farming require the continuous expansion of the available arable land, resulting in land clearing and deforestation.[13] In some PICs, such as the Solomon Islands or Papua New Guinea, logging exacerbates this issue.[46,92] While most forests are on customary lands, areas under customary spatial or temporal protection ("tabu") are increasingly not respected.[54] Land clearing and vegetation burning in forest lands are common methods of expanding the supply of arable land.[13] The resulting deforestation does not only have a significant environmental impact but forms a major barrier to strengthening the resilience of agrifood systems.[49,93]

Deforestation and intensification of crop production result in higher greenhouse gas (GHG) emissions.[2,49] The establishment of up-to-date GHG activity data in most PICs is in progress, which is a crucial step, as such data is essential to enable PICs to benefit from global climate finance programmes (F6, F5, F4, F3).[49] In Vanuatu, the livestock sector contributes 56.5 percent of total GHG emissions of the country (including other sectors), followed by crop cultivation with 29.4 percent.[94]

The recent intensification of coastal fishing in PICs raises the issue of over-fishing. Small-scale fishers have reacted to lower food security after extreme weather events, during the COVID-19 pandemic and the global food and energy crisis due to the war in Ukraine, by intensifying coastal fishing efforts.[17,72] While traditional coastal fishing practices include measures that protect habitats against over-harvesting, intensification efforts in coastal fishing result in locals not complying with customary rules, such as spatial or temporal protection zones.[54,95] Over-fishing places coastal communities in danger of long-term food and nutrition insecurity.[46,54]

The loss of forest and coastal habitats and biodiversity increases vulnerability to the impacts of climate change. After severe weather events, locals are not able to balance the loss of their crops by foraging for wild foods in forests or opening customary protected fishing zones, which aggravates food insecurity.[46,96] Moreover, trees do not provide protection from damaging winds and floods, making the harm to crops and houses even more devastating. Furthermore, rainwater is not collected by the trees to reduce flooding and to provide drinking water.[46,96]

Local ultra-processed food and beverage industries might contribute to climate change. Foreign direct investment in local ultra-processed food and beverage factories has been increasingly common in PICs.[83,97,98] While governments tend to be supportive of such investment, large manufacturing sites often have a considerable negative ecological footprint, in terms of land clearing (deforestation), high GHG emissions and pollution.[99,100]

3. Promoting sustainable transformation of agrifood systems in Pacific island countries: policy entry points and trade-offs

The impacts of climate change and other drivers of agrifood systems transformation, such as globalisation, urbanisation and COVID-19 pandemic have led to important changes in food production, manufacture and trade in PICs, resulting in detrimental impacts on food security and nutrition. This situation has been exacerbated and is expected to further deteriorate as a result of the global food and energy crisis interrelated with the war in Ukraine. While many of the current trends and practices may be associated with improvements in people's incomes, they also have negative implications from a sustainability and food and nutrition security perspective. As such, they are raising critical questions about whether such approaches are the right pathways for improving the resilience of local agrifood systems, especially in the medium and long-term.

In response to such worries, alternative pathways have emerged and/or been proposed in the Pacific that seek to improve sustainable food system transformation with medium and long-term positive effects on food and nutrition security and resilience to climate. Interviews with agrifood experts and recent research suggest that a paradigm change to shift from export oriented agricultural production towards strengthening food production for domestic markets is likely to be necessary to achieve sustainable agrifood system transformation. However, PICs face multiple barriers in adopting such approaches, so the trade-offs between the different pathways to transformation need to be taken into account. In this section, some of the most common approaches for agrifood system transformation are discussed, with regard to their advantages, disadvantages and potential trade-offs in comparison with other pathways.

3.1 Entry points and trade-offs in food production transformation

In the crops and livestock sector, intensification of crop production, a shift from traditional practices to cash crop cultivation and, in some Pacific countries, cattle farming have become common ways of securing livelihoods and generating incomes.[31,46] In the fisheries sector, small-scale fishers tend to intensify coastal fishing efforts, which often results in breaching communal spatial and seasonal protection zones, and they often increase the use of destructive fishing practices, such as spearfishing and night fishing. Re-establishment of traditional Pacific farming practices and community-managed marine areas offer a pathway to sustainable livelihoods, and food and nutrition security; however, these approaches have trade-offs for the short-term and might not be the local communities' preferred approaches as explained below. Tables 10 and 11 provides a summary of the entry points and trade-offs in food production in crops and livestock production and fisheries, respectively.

3.1.1 Crops and livestock production: intensification of crop production and shift to cash crops vs traditional Pacific farming systems

Intensification of crop production and shift to cash crops

In PICs, the intensification of crop cultivation is usually practised through shortening fallow periods, the cultivation of high-value crops (mono-cropping), expanding land through deforestation (forest clearing and burning the vegetation), and in some cases by using inorganic pesticides and fertilizers, and irrigation.[13] In some PICs, like Fiji or Vanuatu cash cropping is combined with cattle farming.[31,49]

Advantages. Crop intensification is preferred by farmers because it can increase crop yields within a relatively short time, and rapidly generates relatively high income.[32] Cash crops and beef often have established supply chains (as opposed to other crops) and their market demand is perceived to be reliable by farmers.[32]

Issues. Intensification and cash cropping requires a well-established supply chain and adequate financial and technical resources from the farmers. For example, irrigation infrastructure can be expensive and vulnerable to extreme weather events. The costs involved can lead to wealthier producers to make significant gains in their production level, thus further increasing inequalities among farmers.[13,32]

Negative environmental impact. Crop production intensification, cash cropping and cattle grazing tend to increase and accelerate soil degradation by raising erosion risk and lowering soil nutrient content. Irrigation may lower the soil potential to store groundwater in the long run, and it can contribute to soil salinisation and water scarcity.[13,32] Once the soil nutrition levels run low and if no fertilizer is available, farmers need to look for another land, contributing to deforestation.[13,32] Updated information on deforestation by country is not available in the Pacific and some data are contradictory. The FAO Forest Future Report, 2019 affirms that for the period 2010–2015 the area of primary forests in Oceania was declining, but planted forests were expanding rapidly.[101] Forest area change reported for Samoa, Fiji, Kiribati, Tonga and Vanuatu was positive for the 1990–2015 period, whilst only Solomon Islands showed a negative value for these years.[101] More recent papers refer that deforestation has been increasing since 2020, and interviewees frequently confirmed this. Deforestation increases the likelihood of flooding after heavy rainfall resulting in the loss of ecosystem services, such as foraging for wild foods or herbs, or collecting firewood.[13]

Food security and nutrition impact. While higher short-term income from intensification and cash cropping can secure food and nutrition security through income, the shift to cash cropping decreases the availability of food crops in the household and markets, increasing dependence on imported food.[13] In addition, farmers become reliant on the yields of these few cultivars and more vulnerable to extreme weather events. Moreover, the availability and affordability of food in markets and stores dramatically decrease after such events, so even if producers have

cash available, it does not ensure food and nutrition security.[67,102] Thus, if intensification of crop cultivation and cash cropping is not combined with subsistence farming of diverse food crops or agroforestry, it potentially makes communities more vulnerable to climate change.[31,32]

Promoting traditional farming systems, including land preparation, pest control and disaster preparation practices

The revival of traditional Pacific farming systems and practices has been recognised as a valuable and feasible pathway that stems from customary, traditional knowledge, and provides an integrated approach to climate change adaptation and mitigation.[13,31] Traditional Pacific farming systems include the cultivation of a variety of diverse landraces, which supports both biodiversity and resilience against climate change, as climate change exposures are likely to affect each cultivar differently.[32] Planting underutilised crops that are resilient to certain types of pests or diseases or abiotic stresses (as soil salinisation or drought) can enhance the reliability of the harvest even among changing climatic conditions.[103,104] Traditional farming systems in the Pacific rely on agroforestry that can be combined with community conservation areas that protect the land from deforestation.[13,49] They also include its own land preparation and pest control practices, and traditional disaster preparation practices, as early harvest and preservation of produce, when an extreme weather event warning is announced.[31]

Advantages. Planting diverse food crops increases food security by raising the resilience of the harvest against climatic stresses.[32,55] Traditional practices help maintain soil fertility, not requiring the clearing of new land, keep the biological control of pests intact and thus support biodiversity and do not pollute the environment.[13] These practices support high crop yield in the long run, contributing to food security and income. In the short term, crop diversity and potential provision of forest ecosystem services may support food and nutrition security.[13,105] Traditional disaster preparation practices can further support food security after extreme weather events, and in addition, have lower GHG emission levels and smaller environmental footprint than production intensification or cash cropping.[31,49] They require less financial investment from farmers, and favour the use of traditional knowledge, strengthening communities' connection to their cultural heritage.[27]

Issues. Traditional land preparation practices are likely to take more effort from farmers producing lower yields, and thus generate lower income in the short run.[13] Traditional pest protection measures are likely to not provide the same certainty against pests as inorganic pesticides.[13,106] Moreover, the limited scalability of traditional practices will limit the dominant agricultural approach for commercialisation of production (A2, A5, F5).[13,107] These are some of the reasons why fewer and less influential actors advocate for traditional and organic agriculture compared to intensification and cash cropping.[13] Finally, in many communities, traditional knowledge practices need to be reintroduced since this knowledge has already been lost, and planting materials need to be distributed.[13,27]

Food security and nutrition impact. Traditional practices might produce lower yields, but farmers do not need to invest in inorganic fertilizers and pesticides.[13] On the one hand, these practices are likely to contribute to lower income generation in the short term, which limits farmers' resources to purchase food from market and food stores. On the other hand, such practices support food and nutrition security in both the short and long term, as the land remains more fertile, the diversity of produce enable more variety in diet, and they build on climate change mitigation efforts as they protect biodiversity and contribute to lower GHG emissions.[27,55,105]

Options to manage trade-offs between intensification and traditional farming

Evidence on the short and long-term trade-offs between both options is limited. Currently, while alignment with cultural heritage and environmental protection paradigms may not prevail, farmers' attitude and incentives to choose intensification and cash cropping over traditional farming systems are high (A1, A2, A5, F5, F6), based on a more certain, higher short-term income.[13] Although crop intensification might make sense in the short-term, it leaves food systems vulnerable to climate change and other disrupting events, thus raising critical food and nutrition security questions.[13,17] In this sense, traditional approaches may be able to integrate food and nutrition security and environmental protection into operational actions more easily, but for the reasons discussed above are not the preferred ones in many PICs (A2, A5, F5, F6).[13,107]

The first recommendation to manage trade-offs between intensification and cash cropping, and traditional farming systems is to collect more evidence by investigating the socioeconomic, health and environmental impact of these approaches through economic modelling.[10] Moreover, additional research is needed to identify resilient crops that are suitable for the Pacific climate through community-led crop breeding initiatives.[32,104]

The second recommendation is to continue the re-introduction of traditional knowledge into agricultural practices (A4) and reinforcing advocacy actions. Successful development partner programmes that provide seeds, gardening materials and technical skills have been reported in some PICs (A3, F3, F4, F7);[27,55,106,108] opportunities to scale up such initiatives through the support of the public or civil sector need to be explored (A3).

The third recommendation focuses on bridging the "returns-gap" between short-term and long-term income. This issue might be addressed through a common Pacific strategy: livelihood diversification.[46,75] Traditional food production systems have always been relying on the cultivation of a variety of crops, food trees, foraging, and fishing. More recently, the global food and energy crisis in the wake of the COVID-19 pandemic and the war in Ukraine have forced Pacific Islanders to innovative approaches to diversify their livelihoods, such as preparing and selling traditional foods.[17,18] In the short term, the integration of cash cropping into traditional farming systems might be a viable approach (F2, F7, A4, A1, A5, A6).

Table 10: Entry points and trade-offs in food production in Pacific Island countries – crops and livestock production

Current drivers of food system changes/ transformation in the Pacific Island countries	Type of driver (HLPE classification)	Entry points		Trade offs	Options to manage trade offs
		Current adoption trends	Sustainable and healthy food system approaches		
Impact of climate change → crop yields decrease	Biophysical and environmental drivers	**Intensification of crop cultivation:** Shortened or no fallow periods, mono-cropping, inorganic pesticides and fertilizer use (less common), expanding the supply of land through deforestation, irrigation (less common). **Pros:** • higher yields → more income in the short term. **Cons:** • faster soil degradation; • deforestation → loss of biodiversity; • vulnerability against extreme weather events; • long term food and water insecurity; and • increased GHG emissions.	**Promoting traditional land preparation and pest control practices, and planting diverse and resilient crops:** Long fallows, crop rotation, composting, mulching, raised beds, irrigated terracing; planting multiple root crops that are resilient to high soil salinity, waterlogging, wind damage; introducing less common foods, reintroducing some forgotten foods from traditional diets. **Pros:** • Sustainable soil use; • Maintained yields on long term; • Improved resilience against climate change exposures; • Food security and diet diversity; • Maintained biodiversity; • Strengthened connection to traditional knowledge; and • Lower GHG emissions. **Cons:** • Potentially lower yields → less income in the short term; • Potentially more effort than non-traditional approaches; • Less certainty in increasing yields and protection against pests; • Crop diversification requires the establishment of community seed banks.	Short term, potentially more reliable income, responding to global pressures. vs sustainability, resilience against climate change exposures, long term food and nutrition security. However, there is a reluctance among locals to re-adopt traditional approaches and step away from focusing on quick cash income.	Livelihood diversification: expanding the range of livelihood practices, planting diverse crops and integrate cash cropping into traditional farming systems in the short term. Conducting socioeconomic, health and environmental impact assessment, supported with technical assistance by development partners. Expanding research on identifying resilient crops suitable for the Pacific. Reinforcing advocacy actions and scale up initiatives to support the re-introduction of traditional knowledge intro agricultural practices.
Increasing frequency and severity of extreme weather events due to climate change	Biophysical and environmental drivers				
Increasing role of cash economy	Political and economic drivers				

Current drivers of food system changes/ transformation in the Pacific Island countries	Type of driver (HLPE classification)	Entry points		Trade offs	Options to manage trade offs
		Current adoption trends	Sustainable and healthy food system approaches		
Export oriented agriculture and policy focus on improving livelihoods	Political and economic drivers	**Cash cropping & cattle farming.** Cultivating cash crops, such as copra, kava, cocoa, specific yam species, tobacco, and expanding the supply of land by deforestation. **Pros:** • Perceived reliable market; • Supply chains are often already established; and • High income. **Cons:** • Faster soil degradation; • Fewer food crops for local consumption food insecurity; • Overgrazing; • Deforestation increases water and food insecurity. • Increased GHG emissions. • The sustainability and reliability of cocoa and kava markets are questionable. • Lower net present value and lower employment generation potential than other agricultural practices or agroforestry. • Reliance on store-bought foods	**Traditional farming practices, combined with community conservation areas.** Agroforestry, with the combination of cultivating several food crops and fruit, nut and other trees, foraging for wild food and medicinal herbs, and cutting firewood. Conservation combined with REDD+ **Pros:** • Diverse diet (nutrition security), food and water security • Sustainable ecosystem use, preservation of biodiversity • Resilience against climate change exposures • Low GHG emissions • Income from carbon trade and contribution to NDCs • It could attract agritourism **Cons:** • Less and potentially slower income than from cash crops, investment in conservation takes decades to return • It requires an established local supply chain to get the leftover produce to market • Potentially exacerbate water security issues • Effort of preparing food (store-bought foods are more convenient)	Short term, potentially more reliable income, responding to global pressures vs sustainability, resilience against climate change exposures, long term food and nutrition security However, there is a reluctance among locals to re-adopt traditional approaches and step away from focusing on quick cash income.	
Global demand for copra and beef	Political and economic drivers				
Smallholder farmers as primary producers/ Increased small holder farmers participation	Sociocultural drivers				

3.1.2 Fisheries: Intensification of coastal fishing vs shift to near-shore pelagic fishing combined with community-managed marine protected areas

Intensification of coastal fishing

Due to the decrease in crop yields and the reduced availability and affordability of food, many Pacific Islander communities turned to intensify their coastal fishing efforts as a means to secure food and livelihoods.[17,72] Intensification in this context means that small-scale fishers increasingly disregard spatial and seasonal protection zones, increase their spearfishing and night fishing efforts, and switch from traditional outrigger canoes to motorised boats.[95,109]

Advantages. Intensification practices increase the number of fish that fishers can catch, thus helping to generate more income in the short term and giving access to the community to highly nutritious, fresh food. The knowledge and skills for these fishing practices are already available in most communities and thus do not require much additional technical capacity.

Issues. Some PIC governments subsidise motorboats and fishing equipment to help coastal fishing efforts; however, increasing gasoline supply chain issues, especially after the energy crisis in the wake of the COVID-19 pandemic and the war in Ukraine, limits the availability and affordability of fuel for motorboats, leaving fishers reliant on traditional canoes (A5, F4). In addition, food processing and supply chains need to be strengthened to ensure that the larger catch translates to better food and nutrition security and that additional food waste is avoided (A1, A2, A3, A4, F7).[52]

Negative environmental impact. Intensification of coastal fishing may have a detrimental impact on local fish, shellfish and coral populations (overfishing), that have already been and are projected to be impacted by climate change exposures.[95,109] Spearfishing and night fishing are particularly destructive practices because they contribute to the overfishing of herbivores that feed on algae, thus maintaining low algae levels. This can accelerate the loss of biodiversity in coastal waters, endangering ecosystem services and food and water security in the long term.[109]

Food security and nutrition impact. The increased availability of fresh fish in communities contributes to food and nutrition security in the short term. However, if overharvesting is not avoided, intensification can result in overfishing, contributing to medium and long-term food insecurity.[52,109]

Shift to near-shore pelagic fishing combined with (re)establishing community-managed marine protection areas

Near-shore pelagic fishing is projected to offer a more sustainable alternative to coastal fishing.[52,110] Small-scale fishers can be empowered to increase their efforts in near-shore pelagic fishing by providing technical skills (including fishing and safety skills), subsidising fishing equipment (such as motorised boats or nets), and deploying near-shore fish aggregation devices (FADs) to attract fish closer to the shores.[95,111] At the same time, community-managed marine protected areas can be introduced or re-established to provide seasonal or temporal protection for coastal fish and coral populations. This can help improve fish stock and biodiversity, maintain ecosystem services (such as wave energy protection), and thus support long-term food and nutrition security.[57,112]

Advantages. The shift to near-shore pelagic fishing supports income generation because the high market value of the catch in comparison to the species in near-shore fishing.[111] The increased catch provides fresh, nutritious protein to communities contributing to their short-term food and nutrition security. If governments' focus remains on empowering small-scale fishers, and primary fisheries management practices are followed, near-shore pelagic fishing would offer food security and livelihoods in the longer term.[111] The climate change-induced shifts in the migration routes of larger pelagic species (towards the East of the Pacific) will not significantly affect near-shore fishing, particularly if diversity in fish targets is maintained (by also targeting smaller pelagic species).[111] Community-managed marine protection areas ensure the availability of fish and shellfish in the long term, providing sustainable livelihoods and food security and also serve

as food after extreme weather events or food security crises.[109] Reefs may provide a range of ecosystem services, such as protection from wave-energy, coastal erosion and damaging winds, and it can attract ecotourism.[55,57]

Barriers. Near-shore pelagic fishing is likely to require new equipment and the learning of new skills that are different from traditional practices. Governments or communities need to invest in FADs and these devices have to be maintained.[58,95] Moreover, food processing and supply chains need to be strengthened to ensure that the larger catch translates to better food and nutrition security and that additional food waste is avoided (A3, A4).[111] Finally, the most significant barrier is the disruptions of the gasoline supply chain and growing energy prices that inhibit fishers to use motorboats. Marine protected areas limit food security and livelihoods generation in the short term, and the enforcement of protection rules requires equipment and effort from communities.[57,95]

Food security and nutrition impact. Increased efforts into near-shore pelagic fishing are likely to improve the availability and affordability of pelagic fish in communities, providing highly nutritious protein to local diets, and thus contributing to food and nutrition security in the short, medium and long-term.[52,56] Marine protected areas ensure food security and nutrition in the long term.[57,95]

Options to manage trade-offs between intensification of fishing and shifting to near-shore pelagic fishing

Shifting to near-shore pelagic fishing from coastal fishing needs investment in equipment and skills, and may be hindered by unaffordable fuel prices for small-scale fishers. The first aspect can be addressed by government or development partner investment through capacity building or subsidies to purchase near-shore fishing. This seems to require considerable resources but, more research and evidence is needed about the socioeconomic, environmental and health benefits of supporting near-shore pelagic fishing and marine protection areas to understand the impact of such investment.[113] In the long run, coastal fishing intensification efforts are projected to be unsustainable; therefore, an early government investment to empower small-scale fishers might be a reasonable pathway.[111,114] Community-ownership of FADs can help diffuse investment and maintenance costs.[66,115]

The "fuel barrier" might be mitigated if small-scale fishers continue to rely on traditional outrigger canoes instead of motorboats. Studies suggest that near-shore FADs can enable increased catch even if fishers use traditional boats.[110,113] However, evidence on the benefits of near-shore FADs in such situations and other practices that can support near-shore pelagic fishing without the need for motorboats is still limited.[113]

Table 11: Entry points and trade-offs in food production in Pacific Island countries – Fisheries

Current drivers of food system changes/ transformation in the Pacific Island countries	Type of driver (HLPE classification)	Entry points		Trade offs	Options to manage trade offs
		Current adoption trends	Sustainable and healthy food system approaches		
Increasing role of cash economy	**Political and economic drivers**	**Intensification of coastal fishing.** Spatial and seasonal taboo areas are increasingly not respected. Shift from traditional outrigger canoes to motorboats. Increase in spearfishing and night fishing. Pros: • Rapid cash generation. • improved food and nutrition security It doesn't require much technical capacity. Cons: • Potential over-fishing, damage of reef habitats. • The establishment of local processing and supply chains is required to avoid food waste. • If motorboats are used, disruption of gasoline supplies becomes a problem. • Spearfishing and night fishing are destructive practices, contribute to over-harvesting of herbivores that keep algae levels in check	**Shift from coastal fishing to near shore pelagic fishing and introduce locally managed marine areas (LMMAs).** Empowering small scale fishers, increasing capacity and efforts in near shore pelagic fishing, and promote community-led seasonal and permanent closures for fishing, to reduce threats for coral reefs, based on traditional practices. Pros • Rapid cash generation. • Improved food and nutrition security (both short and long term). • Increased catch in the short and long term. • Protecting reef biodiversity and volume of fish, protected areas can serve as food reserves after extreme weather events • Protection from wave-energy, coastal erosion and damaging winds. • It can attract ecotourism. Cons • Requires a change in traditional fishing practices. • Requires investment to technical skills, gear, boats (both for fishing and enforcement) The establishment of local processing and supply chain is required to ensure that catch reaches local markets and hospitality venues (and not only exported).	If there is adequate government support in empowering smallholder fishers to shift to near shore pelagic fishing, there should be no significant trade off.	Technical and infrastructural capacity building by government and development partners to encourage near shore pelagic fishing and the supply of catch to domestic markets. Near-shore FAD deployment in combination with the use of traditional canoes when fuel prices are high. Community ownership of FADs.
Decrease in coastal fishing catch due to climate change	**Biophysical and environmental drivers**				

3.2 Entry points and trade-offs in food supply chains transformation

Although the need for strengthening domestic food supply chains has been recognised for a long time in PICs, governments in the region tend to invest fewer resources in this area.[11] Hospitality venues, food manufacturers and supermarkets thus tend to rely on imported food.[64,65] This approach limits local livelihoods from food production and it is vulnerable to disruptions to supply chain, and the increase in global food and energy prices. Sustainable agrifood system transformation in the Pacific will likely require a shift from import-food dependency. Table 12 summarizes the entry points and trade-offs in food supply and processing chains in the Pacific.

Reliance on imported ingredients in hospitality, food manufacture and retail sectors

The hospitality, food manufacturing, and food retail sectors tend to purchase the majority of their food ingredients and products from overseas.[64,65] This trend is partially driven by the local weaknesses of supply chains, such as the low reliability of quality, quantity, seasonality and safety of produce, other limitations posed by the tendering practices, the logistical and infrastructure challenges of moving products between islands, and food safety.[63-65] Local food production and manufacturing are limited and Western foods, often demanded by tourists in hospitality venues, come from abroad.[64,65]

Advantages. Imported food is perceived to be more reliable in supply, quality, quantity and food safety, and is not impacted by seasonality.[64,65] There is a high local demand for imported, ultra-processed foods that last long, do not require cooling, are convenient to prepare, and taste good.[25,67] Often these products are relatively cheaper and easier to procure than local produce, even with the additional import costs.[25,67] Because of these reasons, food outlets might have a higher profit margin if they sell ultra-processed foods.

Barriers. Importing fresh food has a higher cost than using local produce.[64,65] Moreover, food imports are subjected to disruptions in global and regional supply chains.[18] The increasing frequency and severity of extreme weather events, the COVID-19 pandemic, and more recently the global energy and food crisis makes the supply of imported food significantly less reliable and more expensive.[12,17,72]

Negative environmental impact. The transportation of food is a major contributor to GHG emissions globally.[94] In addition, the manufacturing of ultra-processed foods is likely to have a larger environmental footprint than food that is produced locally with traditional methods.[99,100]

Food security and nutrition impact. Reliance on imported food products makes the local hospitality venues, food manufacturers, and the population vulnerable to the disruption of import supply chains due to extreme weather events and the global rising of energy and food prices.[64,65] The increased availability and affordability of ultra-processed foods have contributed to the shift away from traditional diets to less healthy diets, high in saturated fats, salt, and sugar.[67,78] While the rise of obesity in PICs might signal food security, in reality this masks the issue of overnutrition or malnutrition: the high consumption of unhealthy foods with inadequate nutrition diversity.[89,116]

Strengthening local food supply chains

The strengthening of local supply and processing chains is necessary to connect producers with markets, food manufacturers, hospitality venues, and food outlets, improve food safety and food processing practices, and reduce post-harvest loss (i.e. food waste) (A1, A2, A3).[65,117] Supply chains can be improved by infrastructure investments to roads, subsidising food transport vehicles and their equipment for in-transport cooling, or costs in general.[63,118] Government provided or subsidised food storage in market locations would reduce post-harvest loss (A3). Food processing practices can be strengthened through the promotion of traditional and innovative preservation practices to increase the shelf-life of produce.[27,111] Local innovation to establish food processing

procedures to produce healthy food products from local ingredients should be encouraged.[52,111] Value chain mapping might be a useful approach to identifying key entry points for strengthening food supply chains.[11]

Advantages. The strengthening of local food processing chains and the investment into local infrastructure generate employment opportunities for all, especially for rural young people that may find them more attractive than farming, and thus support livelihoods.[12,63] These approaches help improve the availability and affordability of local, fresh and healthy food. The improved preservation practices will lengthen the shelf-life of produce and thus contribute to food security.[52] Improved food handling and safety practices will support the uptake of local produce in local manufacturing, hospitality venues and food outlets decreasing dependence on food imports and contributing to the resilience of these venues against any disruptions increasing benefits because of the lower cost of local produce.[52,65] Moreover, as women constitute a major workforce in both local food processing and supply chains, investment in this area might be aligned with other initiatives focusing on empowering women and gender equality.[11,17]

Barriers. The strengthening of the domestic food supply chains requires a considerable government investment, in knowledge, equipment and infrastructure which don't seem to be prioritised in the region's development efforts.[11,117] Traditional food processing and preservation practices might be lost, requiring their reintroduction in many communities.[27,66] Although Pacific Islanders often express how much they value traditional foods, in practice they prefer to prepare ultra-processed foods or rice as it takes considerably less effort and time than traditional food preparation methods (A2).[29,30] Innovative approaches to food preservation, such as solar-powered freezers or driers might not be utilised as intended or require some form of maintenance.[27,66]

Food safety, food security and nutrition impact. The strengthening of the local food supply increases the availability, accessibility and affordability of fresh foods, and thus contributes to food security, nutrition and healthy diets. The improved food handling and safety processes decrease the prevalence of food-borne diseases. The concomitant decrease in dependence on imported food products supports resilience and food security in the event of extreme weather events and disruptions to global and regional supply chains.

Options to manage trade-offs between reliance on imports and strengthening local food chains

The main trade-off between the continued reliance on imported food and strengthening local food supply chains is the short- and long-term investment needed from the government for the latter – in terms of infrastructure, capacity development and supporting local innovation – versus the allocation of resources to other areas in the food system or another policy sector altogether. However, if PIC governments do not invest into the strengthening of the local food production and processing for domestic consumption and into improving supply chains, the price of local foods will likely remain relatively higher than imported foods. Additionally, communities will remain vulnerable to food and nutrition insecurity.

These trade-offs might be mitigated by the targeted support of development partners dedicated to help government invest into strengthening local food chains. Although with the increasing ratio of government budget support in official development assistance, such earmarked assistance is less likely to be feasible or beneficial.[71] Moreover, to understand the socioeconomic, health and environmental impact of investment decisions, economic modelling can be undertaken.[10] As many PICs are likely to lack the necessary human and technical capacity to undertake such assessments, development partners are encouraged to support governments through providing targeted technical assistance. Additionally, efforts to continue the re-introduction of traditional knowledge and supporting local innovations should be encouraged. Campaigns implemented by the government or development partners to encourage food outlets to stock locally produced and processed foods could be beneficial, alongside with public awareness raising about the consumption of such foods to support local, small-scale manufacturers.

Table 12: Entry points and trade-offs in food supply and processing chains in Pacific Island countries

Current drivers of food system changes/ transformation in the Pacific Island countries	Type of driver (HLPE classification)	Entry points		Trade offs	Options to manage trade offs
		Current adoption trends	Sustainable and healthy food system approaches		
Geographic isolation and high risk of extreme weather events → logistical and infrastructural challenges of processing and supply chains.	**Biophysical and environmental** **Drivers / Innovation, technology and infrastructure drivers**	**Reliance on imported ingredients in food industry and hospitality.** The food and hospitality industry tends to purchase the majority of its food ingredients from overseas, due to issues of supply chain (reliability of quality and quantity of produce, tendering practices) and food safety. Pros: • Reliability and food safety. Cons: • High cost. • Vulnerability to disruptions of supply chain due to extreme weather events.	**Establishing local supply and processing chains** to connect producers with factories/ food processing establishments and hospitality venues, improve food safety and reduce food waste. Pros: • Improved livelihoods for farmers • Improved food and nutrition security • Improved affordability, availability and accessibility of fresh foods • Less dependence on imported foods Cons: • Requires considerable government investment	Short- and long-term investment from the government vs versus the allocation of resources to other areas in the food system or another policy sector	Socioeconomic, health and environmental impact assessment supported with technical assistance by development partners to improve governments attitude towards investing into local food chains Targeted development partner support. Continuous encouragement for the re-introduction of traditional knowledge and supporting local innovations.
Limitations of local processing infrastructural capacity (e.g. kitchens, refrigerators and freezers), resulting in high food waste.	**Innovation, technology and infrastructure drivers**		**Promotion of traditional and innovative preservation practices** to increase the shelf-life of produce. Traditional drying, fermenting, storing techniques, solar-powered driers or freezers. Pros: • Improved food security and nutrition • improved shelf-life for produce Cons: • It takes effort that could be spent on other income-generating activities (to buy store foods that are easy to cook, have a long shelf-life, and need to refrigeration) • freezers might be used to store other items (e.g. beer) that might contribute to income generation (e.g. selling beer in the community) • maintenance or repair of equipment is needed		
			Encouraging local innovation to establish food processing stations/factories that produce healthy food products from local ingredients. Pros: • Improved food security and nutrition • Less reliance on imported foods • Potential export products Cons: • Requires considerable government investment • Might disrupts traditional ways of living • Potentially higher demand for unhealthy foods • No guarantee that they will produce affordable diets		

3.3 Entry points and trade-offs in food trade: supply and demand side approaches

Many governments worldwide and in the Pacific have adopted the norm of relying on individual responsibility to encourage the public to consume a healthy diet.[119-122] Public education and awareness raising programmes are often favoured over policies that regulate food industry products and activities. However, in PICs the wider – social and commercial – determinants of diet and health, such as the limited availability and affordability of healthy foods relative to less healthy alternatives, are major drivers of poor diets and the rise of NCDs.[29,85] A sustainable agrifood transformation will likely require considerable government investment to strengthen agricultural production for domestic consumption, and to advance supply and processing chains, in order to improve the availability and affordability of fresh foods and regulate ultra-processed foods.[11,12] Table 13 provides a summary of the entry points and trade-offs in food trade and consumer demand in PICs.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Focus on public education and awareness raising about healthy diet and re-adopting traditional food preparation methods

The improvement of health literacy is essential to help communities understand the importance of diverse, nutritious diets in PICs.[29] Public education and awareness raising activities are commonly conducted by the Ministry of Health and development partners in PICs. Several initiatives exist across the region that focus on encouraging communities to re-adopt traditional food preparation practices, as an attempt to improve nutrition security and decrease dependence on imported foods.[27,31]

Advantages. Local NGOs or development partners may support public education and awareness raising initiatives since they are not very costly, tend to be widely supported by the public and do not attract political opposition.[120,122] The reconnection to traditional practices strengthens communities' roots to their customary heritage and identity.[27,106] These communication and education initiatives require minimal multisectoral coordination and are aligned with dominant, global ideologies that emphasise the role of individual responsibility in preventing NCDs.[120,122]

Barriers. Evidence shows that public education and awareness raising initiatives need to be part of a comprehensive set of policies or programmes that include addressing the wider determinants of diet and health (e.g. policies that make healthy foods more affordable and accessible, or ensure that families have adequate cooking spaces and equipment), because, by themselves, they rarely bring long-term results.[123,124]

Environmental impact. Public education and awareness raising initiatives have the potential to reduce the consumption of ultra-processed foods, resulting in less food packaging polluting the environment.

Food security and nutrition impact. Public education and awareness raising initiatives about healthy diets and traditional food preparation practices have the potential to improve food and nutrition security by improving the nutritional variety and decreasing the consumption and dependency on imported foods.[27,66]

Increasing the relative affordability of healthy foods

Effective regulatory food policy measures can have a great benefit to support sustainable food system transformation in PICs.[77,79] The relative affordability of local, fresh foods in comparison

to imported, ultra-processed foods can be improved by increasing excise tax on ultra-processed foods and beverages, in combination with measures that support producers, strengthen supply chains and upgrade market infrastructure to enable lower local food prices.[11] Since many Pacific communities depend on cheap, ultra-processed foods, such measures need to be carefully planned and implemented and combined with more affordable and accessible locally produced foods to ensure that their food security is not compromised (A1, A2, A5).

Advantages. The price of food is an important driver of diet[38], and the public tends to support government measures that make healthy, fresh food more affordable and available.[29,125,126] By improving the accessibility of locally produced fresh foods, the consumption of these products is likely to increase, supporting producers' livelihoods, reducing dependency on imported foods, and improving food security for both producers and consumers but, depending on the method use to improve accessibility.[77]

Barriers. The food industry is likely to oppose measures that increase taxes on their products, and the public tends to dislike policies that raise the cost of ultra-processed foods.[81,82,125,126] This might make it politically challenging to introduce such policies in PICs. While increasing taxation on ultra-processed foods is often attractive for governments as a means of revenue generation alongside its potential beneficial public health impact, the provision of subsidies for healthy, fresh foods requires government resources.[77] The removal of duty tariffs from imported fresh foods has been recognised as an option, but it may take the risk of imports becoming cheaper and local producers being unable to compete with the new import prices. Moreover, considerable proportion of food trade in the Pacific is conducted via informal channels which makes the administration of taxes and subsidies challenging.

Environmental impact. Government subsidies in local food production and transportation will likely increase emissions arising from these sectors, but further evidence is needed to understand how this compares to the potential reduction of emissions arising from importing food from overseas.

Food security and nutrition impact. By making healthy foods relatively more affordable than unhealthy options, food and nutrition security will improve in PICs and population diets will likely become more healthy, leading to reduced NCD morbidity and mortality rates.[77]

Options to manage trade-offs between public education and awareness and increased affordability of healthy food

While it often proves to be less challenging for governments to introduce and support initiatives that provide public education and awareness raising on healthy diets, such measures are unlikely to achieve major results without complementary policies that make healthy foods relatively cheaper than ultra-processed foods and beverages. Industry and public opposition to measures that increase taxes on ultra-processed foods might be disregarded by governments when the revenue generation aspect of such policies is considered. The economic modelling of taxes on unhealthy commodities can help policy makers understand the potential revenue generated from such measures. However, it is likely that such extra income will need to be spent on subsidising local food production and transport. Such investment will likely be backed by considerable public support as it improves producers' livelihoods and communities' food and nutrition security (as discussed in section 3.2). Thus, governments might be able to ensure political and public support by emphasising that the generated revenue will be dedicated to improving local food production and food security. The public attitude to such measures can be measured by targeted surveys. Development partners can support governments by providing the necessary technical and human capacity to conduct these studies.

Table 13: Entry points and trade-offs in food trade and consumer demand in Pacific Island countries.

Current drivers of food system changes/ transformation in the Pacific Island countries	Type of driver (HLPE classification)	Entry points		Trade offs	Options to manage trade offs
		Current adoption trends	Sustainable and healthy food system approaches		
Low availability and relative high cost of fresh foods.	**Political and economic drivers.**	**Focus on public education** and awareness raising about healthy diet. Pros: • It is aligned with dominant ideologies related to personal responsibility. • It does not require much resources, can be outsourced to development partners/NGOs. • It does not attract much political or industry opposition. Cons: • Studies show that public education is not effective without comprehensive food policies to make healthy foods more affordable and accessible and accompanying social policies to ensure that families have adequate cooking spaces and equipment.	**Implementing comprehensive food regulatory measures, such as increasing taxes on unhealthy foods and beverages to make them less affordable, in combination with government subsidies to strengthen local food chains to make locally produced, fresh foods more affordable.** Pros: • Better diet → lower rates of NCD morbidity and injuries, and related premature deaths → better productivity, lower health system costs. • Increase in government revenue. • Improved food security. • Improved livelihoods for local producers. Cons: • Tend to be unpopular measure with the public and industry. • Potentially worse food security if healthy alternatives are not made cheaper and available. • Potentially improved financial security: less money is spent on alcohol or junk food. • Potentially worse financial security if healthy alternatives are not made cheaper and available. • Government subsidies require considerable government resources and investment in supply chains and infrastructure.	Popular, relatively cheap, and easily implemented public education programmes vs politically unpopular measures with better health significant government investment to supply chains, and increased government revenue.	Economic modelling to predict the impact of taxes on unhealthy foods, supported with technical assistance by development partners. Socioeconomic, health and environmental impact assessment supported with technical assistance by development partners to improve governments attitude towards investing into local food chains.
High availability and relative low cost of less healthy foods and beverages (tinned meat and fish, instant soup, rice).	**Political and economic drivers.**				
Large unhealthy food and beverage companies have considerable undue influence over food policy making.	**Political and economic drivers.**				
High consumer demand for foods with long shelf-life, easy preparation, not needing cooling.	**Sociocultural drivers / Demographic drivers.**				
High consumer demand for foods that taste good, but often high in added sugar, salt, or saturated fats	**Sociocultural drivers**				
High consumer demand for fresh, local foods that are cheap and easily accessible	**Sociocultural drivers**				

3.4 Multisectoral governance and policy coherence for a sustainable agrifood system transformation in Pacific Island countries

Policy incoherence and the limited coordination and collaboration between government sectors decrease the efficiency of the agrifood systems in PICs.[11,13] An effectively transformed agrifood system ensures income, improves livelihoods, and provides sustainable, healthy and affordable diets. It is also resilient to climate change and other food system shocks.[6,24] However, the various parts of the agrifood system are under different government sectors and supported by a range of development partners.

For example, food production is usually regulated by the Ministry of Agriculture and, in some PICs, the Ministry of Fisheries as a separate entity, while the local customary governance structures often have a parallel role in regulating the use of communal lands and waters. In addition, in several PICs, the Ministry of Environment has the mandate to support sustainable food production practices. Food supply chains are often regulated by the Ministry of Industry and Trade; however, the Ministry of Health is often mandated to regulate food safety and hygiene. Given the commercial determinants of health arising from food trade, ministries for Agriculture, Health and Trade need to work together to govern both the supply and demand side of food, while the Ministry of Finance (or Economy) is responsible for implementing fiscal policies that ensure that healthy diets are more affordable than unhealthy diets. In addition, in some PICs, government agencies responsible for empowering women and youth may implement initiatives that support food production, processing or trade and also complementary social protection programmes aiming at the most vulnerable populations. Other government agencies might be mandated with preserving and advocating for the use of traditional knowledge in agrifood systems.

A range of development partners tend to have the mandate to work on one aspect of the agrifood system. For example, FAO mostly works with the agriculture and fisheries sector, while the World Health Organization (WHO) can only support the health sector. Some organisations, such as the Secretariat of the Pacific Community (SPC) or the United Nations Development Programme (UNDP) have access to several government sectors. In addition, a multitude of local, regional and global civil society organisations are active in supporting various parts of the agrifood system in PICs. The lack of coordination or collaboration between the different government sectors and development partners often lead to the duplication of efforts, while policies or initiatives might have unintended negative consequences (i.e. externality) on the efforts of other actors in transforming agrifood systems in PICs and LMICs in general. For example, agricultural efforts to support cash cropping can have negative consequences for the availability of domestic, fresh food products and thus contravening efforts of the health sector to improve population diet.

Therefore, multisectoral governance and policy coherence (i.e. the alignment of policy goals) between the different sectors is necessary for sustainable agrifood system transformation. The first step of effective multisectoral governance of agrifood systems is the establishment of common goals between the government sectors, in terms of livelihoods, sustainability, food and nutrition security, resilience, inclusiveness, and equity. The second step is the alignment of government strategies, plans, policies and initiatives with such goals in a way that they complement each other and negative externalities are mitigated. The third step is the incremental, coordinated or collaborative implementation of policies and initiatives with continuous monitoring, evaluation, and adjustments to optimise socioeconomic, health and environmental impact.

The structural drivers of policy incoherence in food system governance and opportunities for change

The establishment and maintenance of effective multisectoral governance are challenging for any government, and PIC governments have a strong tendency to operate in siloes.[11] The most likely barriers to multisectoral engagement are the following. Firstly, there is **competition** between sectors for government and donor funding, and given the scarcity of resources, a potential collaboration with another sector might mean the loss of income for the initiating sector (A1, A2, A5, A6, F4). This leads to **territorialism**: government agencies might be reluctant to initiate

collaboration with another government agency, because in fear of admitting that a particular area of work is outside of its mandate and expertise, resulting in losing funds dedicated to managing that field (A1, A2, A6, A5, F4). Secondly, **development partner and funding support** is usually provided through a particular sector; thus, it is difficult to establish multisectoral projects (A2, A6, A5, F4). Thirdly, government agencies naturally have **different interests and mandates** (A2, A6, A5, F4), and reconciling such differences and finding a common ground for sustainable agrifood system transformation takes significant effort and resources.[11] The small population size of PICs generally generates a small administration in size, which limits government administrative capacity;[122] thus, governments often simply do not have enough staff to manage issues that are multisectoral in nature (F6). Fourthly, multisectoral approaches to agrifood system strengthening require **a transdisciplinary approach** between disciplines of agriculture, industry, trade, environment and health, and people working in these fields might have divergent ideas about the issues at hand, the solutions, and the aim of agrifood system transformation (A4, A5). Due to the limited resources of PICs and the urgency of agrifood system transformation, governments need to make sure that any duplication of work is avoided or that the implemented policies hinder other sectoral measures that target another part of the food system. However, working across disciplines is a challenging and resource intensive process, and the limited resources characterising PICs are major barriers in this work.

Pathways to support multisectoral collaboration

Addressing the drivers of policy incoherence is essential for establishing and sustaining multisectoral engagement for agrifood system transformation in the Pacific. Firstly, the provision of development funding targeting multisectoral initiatives, administered through multiple government sectors simultaneously could be a way to reduce tensions and competition between government agencies (A2, A5). While certain development partners are mandated to support particular sectors, the collaboration of such organisations with a singular mandate would enlarge their reach within national governments. In addition, several development partners are not limited by a sectoral focus, such as the Secretariat of the South Pacific Community, the United Nations Development Programme, the World Bank, the Asian Development Bank or funding bodies, such as the Department of Foreign Affairs and Trade of Australia or the New Zealand Ministry of Foreign Affairs and Trade (A2). An increased collaboration between these organisations is likely to reduce the siloed functioning of recipient governments.

Secondly, experts in the different aspects of agrifood system transformation should be encouraged to adopt a systems integration perspective.[133,134] Education institutes have already recognised the value of establishing transdisciplinary programmes to equip future professionals with the necessary skills and knowledge to comprehensively view food system transformation in the Pacific (A5).

4. Conclusions

Agrifood systems in the Pacific are severely impacted by climate change and other drivers, highlighting the urgent need to achieve sustainable agrifood system transformation that protects and improves livelihoods, provide healthy and affordable diets, is inclusive for all stakeholders, environmentally sustainable, and resilient to climate change and other food system shocks.[6,24] This paper discussed a number of entry points for transformation in different food system functions, namely food production, food processing, supply, trade and consumer demand.

In food production, recent trends of intensification of crop cultivation, mono cropping, cash cropping, and cattle grazing contribute to the greater vulnerability of agrifood systems. Similarly, intensification of coastal fishing have a detrimental impact on long term food security and environmental sustainability. Yet, these practices are preferred by communities due to their ability to bring in high income in the short term. The legacy of colonial agricultural policies and dominant development paradigms that emphasise export production have encouraged PIC governments to support such approaches, rendering communities dependent on imported food. However, the growing impacts of climate change, and more recently the COVID-19 pandemic and the global food and energy crisis have highlighted the vulnerability of Pacific agrifood systems, and the support is growing to shift food production to fulfill domestic needs and reduce dependence on imported food. While home gardening and coastal fishing is increasingly advocated by development partners and governments, it is essential that the expansion of subsistence production follows traditional approaches that balance environmental sustainability with nutrition and livelihood diversity.

The geographic characteristics of PICs, including geographic isolation and spatial "scatteredness", result in major infrastructure challenges in terms of food supply. Transporting food and necessary materials for food production and manufacturing is an expensive and complex task, and the increasingly frequent and severe extreme weather events due to climate change make food supply chains even more vulnerable. Consequently, food waste is high and the availability and affordability of fresh, domestic foods is often limited in PICs. In addition, processing chains tend to

be underdeveloped in these states, characterised by limited value adding. Government investment into strengthening infrastructure, providing transport subsidies, and promoting traditional and innovative processing and manufacturing practices provide opportunities to strengthen existing food supply and processing chains. While these require significant government investment, socioeconomic and environmental impact assessments can provide useful information to policy makers to understand the benefits of such spending on supporting the domestic supply of fresh, healthy foods and provide livelihoods.

Creating a food environment that supports communities' efforts to maintain a healthy diet requires ensuring that local, fresh foods are relatively more affordable than imported, ultra-processed alternatives. Fiscal policies, such as taxes and subsidies, in combination with efforts to strengthen food production and processing for domestic consumption may help achieve a shift in consumer food prices. Through increasing the availability, accessibility and affordability of sustainable, healthy and equitable diets, PICs may not only decrease their dependency on imported food and ensure better dietary and health outcomes for their populations, but provide livelihoods and strengthen economies in a way that drive the achievement of their Sustainable Development Goals and Healthy Island Visions.

While further evidence is needed to understand the ways trade-offs can be managed in PICs, the entry points discussed reflect the intersectionality of agrifood systems: a shift in food production must be accompanied by the strengthening of food supply chains, and the resulting improvements in the availability and affordability of fresh, healthy foods need to be backed by government policies that encourage the population to support local producers and consume healthier diets. Due to this interdependency, the transformation of the agrifood system needs to be comprehensive and simultaneous in all its functions. This requires tight multisectoral collaboration between policy sectors, supported by donor funding schemes that are designed to facilitate cooperation between government agencies.

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Glossary

Agrifood systems: Actors and their value-adding activities, engaged in the primary production of food and non-food agricultural products, as well as in storage, aggregation, post-harvest handling, transportation, processing, distribution, marketing, disposal and consumption of all food products including those of non-agricultural origin.[1]

Agroforestry: the combination of cultivating several food crops and fruit, nut and other trees, foraging for wild food and medicinal herbs, and cutting firewood.[2]

Cash crops: High-yielding cultivars that can be sold for a high price and have a perceived stable market. In Pacific Island countries, common cash crops are copra, kava, cocoa, coffee, tobacco, and certain yam and taro species.

Food security: When all people, at all times, have physical, social and economic access to sufficient, safe and nutritious food that meets their dietary needs and food preferences for an active and healthy life.[3]

Malnutrition results from the insufficient, excessive or imbalanced consumption of macro- and micro-nutrients and includes undernutrition, overnutrition, and micronutrient malnutrition, the latter often being referred to as 'hidden hunger'.[4]

Non-communicable diseases (NCDs): chronic, non-infectious diseases, for example cardiovascular diseases, cancer, or diabetes.

Nutrition: Nutrition is the study of nutrients in food, how the body uses them, and the relationship between diet, health, and disease. Nutrition starts with what we eat, the products of the food and agriculture sector. By working on our food systems, on the way we produce, collect, store, transport, transform and distribute foods, we can improve our diets, our health and our impact on natural resources.[3]

Subsistence agriculture: Farming system emphasizing production for use rather than for sale.[5]

Sustainable agrifood system transformation: Ensuring that agrifood systems support livelihoods, provide healthy, affordable and sustainable diets, are inclusive for all stakeholders, environmentally sustainable, and resilient to climate change and other food system shocks.[6]

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ISBN 978-92-5-137738-3
9 789251 377383
CC4940EN/1/04.23