



Australian Government

**Australian Centre for
International Agricultural Research**

Final report

Project full title

Agriculture and fisheries for improved nutrition: integrated agri-food system analyses for the Pacific region

project ID

FIS/2018/155

date published

6 February 2024

prepared by

Neil Andrew, Jessica Bogard, Tom Brewer, Anna Farmery, Penny Farrell, Ellen Johnson, Helani Kottage, Eleanor McNeill, Dori Patay, Erica Reeve, Michael Sharp, Anne Marie Thow, Nathalie Troubat, and Lisa Wraith

approved by

Dr Ingrid van Putten, Research Program Manager, Fisheries

final report number

FR2024-005

ISBN

978-1-922983-86-2

published by

ACIAR
GPO Box 1571
Canberra ACT 2601
Australia

This publication is published by ACIAR ABN 34 864 955 427. Care is taken to ensure the accuracy of the information contained in this publication. However, ACIAR cannot accept responsibility for the accuracy or completeness of the information or opinions contained in the publication. You should make your own enquiries before making decisions concerning your interests.

© Australian Centre for International Agricultural Research (ACIAR) 2023 - This work is copyright. Apart from any use as permitted under the *Copyright Act 1968*, no part may be reproduced by any process without prior written permission from ACIAR, GPO Box 1571, Canberra ACT 2601, Australia, aciarc@aciarc.gov.au.

Abbreviations

ANCORS	Australian National Centre for Ocean Resources and Security
BACI	Base pour l'Analyse du Commerce International
CCAFS	CGIAR Research Program on Climate Change, Agriculture and Food Security
COICOP	Classification of Individual Consumption according to Purpose
COK	Three-character ISO code for Cook Islands
CROP	Council of Regional Organizations in the Pacific
CSIRO	Commonwealth Scientific & Industrial Research Organisation
DATs	Dietary Assessment Tools
DEC	Dietary Energy Consumption
DFAT	Australian Government Department of Foreign Affairs and Trade
DHS	Demographic and health surveys
FAFH	Food Away from Home
FAME	Fisheries, Aquaculture and Marine Ecosystems Division of SPC
FAO	Food and Agriculture Organization of the United Nations
FAO-HLPE	FAO High Level Panel of Experts on Food Security and Nutrition
FE	Food Environment
FGDs	Focus group discussion(s)
FSM	Three-character ISO code for Federated States of Micronesia
FSCI	Food Systems Countdown Initiative
HCES	Household Consumption & Expenditure Survey
HIES	Household Income and Expenditure Survey(s)
HOPS	Heads of Planning and Statistics
KIEP	Kiribati Integrated Environment Policy
KIR	Three-character ISO code for Kiribati
LMICs	Low-Middle Income Country(s)
M&E	Monitoring and evaluation
M4C	UN Women Markets for Change project
MHL	Three-character ISO code for Marshall Islands
MICS	Multiple Indicator Cluster Surveys
NIU	Three-character ISO code for Niue Niue
NRU	Three-character ISO code for Nauru
NCD	Non-Communicable Disease
NRU	Three-character ISO code for Nauru
NSO	National Statistics Office
ODA	Official development assistance
PFCD	Pacific Food Consumption Database
PFTD	Pacific Food Trade Database
PIC	Pacific Island Country(s)
PICTs	Pacific Island Countries and Territories
PIFS	Pacific Island Forum Secretariat
PL	Project leader

PLW	Three-character ISO code for Palau
PNDB	Pacific Nutrition Database
PNG	Three-character ISO code for Papua New Guinea
P-SPAFS	Pacific Strategic Plan for Agricultural and Fisheries Statistics
RQ	Research question
SDD	Statistics for Development Division of SPC
SDG	Sustainable Development Goals
SIDS	Small Island Developing States
SLB	Three-character ISO code for Solomon Islands
SPC	Pacific Community (previously Secretariat of the Pacific Community)
SSB	Sugar Sweetened Beverages
TOK	Three-character ISO code for Tokelau
TON	Three-character ISO code for Tonga
TUV	Three-character ISO code for Tuvalu
TYPPS	Ten Year Pacific Statistics Strategy
UOW	University of Wollongong
USYD	University of Sydney
VCA	Value chain analysis
VNSO	Vanuatu National Statistics Office
VUT	Three-character ISO code for Vanuatu
WG	Working Group(s)
WLF	Three-character ISO code for Wallis and Futuna
WSM	Three-character ISO code for Samoa

Contents

Abbreviations.....	ii
1 Acknowledgments	6
2 Executive summary	7
3 Background.....	9
3.1 Research questions	12
4 Objectives	13
5 Methodology	13
6 Achievements against activities and outputs/ milestones	15
7 Key results and discussion	26
7.1 A method to clean HIES data (Activity 1.9.1, WG 5)	26
7.2 Methodological issues in the design of HIES (Activity 1.9, WG 5)	27
7.3 Pacific Food Consumption Database (Activity 1.2 and 1.9, WG 6)	29
7.4 COVID responses (Activities 1.6 to 1.8, WG 1).....	29
7.5 Solomon Islands national food system (Activity 1.6, WG 2)	32
7.6 Regional food system governance (Activity 1.6, WG 3)	33
7.7 National food security profiles (Activity 1.6, WG 4).....	35
7.8 Wheat (Activity 1.6, WG 8).....	36
7.9 The rise and rise of chicken in Pacific Food Systems (Activity 1.6 WG 7)	37
7.10 Options for supplying dietary protein in the Pacific (Activity 1.6 WG 7).....	39
7.11 Continuity and change in Pacific food systems (Activity 1.10)	40
7.12 Aquatic foods and the blue economy (Activity 1.6, WG 3)	42
7.13 A method to clean international food trade data (Activity 1.9 and 1.11, WG 5).....	43
7.14 The Pacific Food Trade Database (Activity 1.11, WG 6).....	44
7.15 International food trade in the Pacific food system (Activity 1.11).....	46
7.16 Translation outputs summarizing Food System elements (Activity 1.11).....	48
7.17 Pacific Nutrient Database and PNDB Fish Addendum (Activity 1.3, WG 6).....	50
7.18 Framing food value chains in the Pacific context (Activity 2.2).....	51
7.19 Fruit and vegetable value chain in SLB (Activity 2.2)	52
7.20 Aquatic food and nutrition (Activity 2.2)	53
7.21 Opportunities and strategies to strengthen food policy (Activity 2.2 - 2.4)	54
7.22 Food prices and availability in Solomon Islands (Activity 3.1)	56
7.23 Monitoring food environments (Activity 3.1).....	57
7.24 Measuring natural food environments (Activity 3.1).....	58

7.25	Dietary diversity among women and children in SLB (Activity 3.1)	59
7.26	Indicators for food system analysis (Activities 4.1 and 4.4)	61
7.27	Typologies for food environment analysis (Activity 4.4).....	62
7.28	Measuring consumption of seafood in LMICs (Activity 4.4).....	63
7.29	Poverty, malnutrition and food security (Activity 4.7).....	65
7.30	Other contributions.....	66
8	Impacts	69
8.1	Scientific impacts – now and in 5 years	69
8.2	Capacity impacts – now and in 5 years	69
8.3	Community impacts – now and in 5 years	70
8.4	Economic impacts	71
8.5	Communication and dissemination activities	72
9	Conclusions and recommendations	78
10	References	80
10.1	List of publications produced by project.....	80
10.2	Outputs acknowledging support from current project	84

1 Acknowledgments

We acknowledge and thank national agencies from Pacific countries and territories for sustained efforts in data production and dissemination. Experts in HIES design and implementation, trade statistics and sectoral policy have guided project activities and grounded analyses. We acknowledge them collectively here and refer the reader to project outputs for further acknowledgement of people and institutions.

The project was implemented with a wide range of research collaborators, many of whom appear as co-authors of the reported outputs. We acknowledge them collectively here and refer the reader to those outputs for further acknowledgement of people and institutions.

From SPC, we thank David Abbott, Andrea Borlizzi, Phil Bright, Bertrand Buffière, Ed Boydell, Leo Cann-Polydor, Alison Culpin, Peter Ellis, Winston Faingaanuku, Sandra Gianini, Denis Grofils, Nilima Lal, Gaëlle Le Gall, Olivier Menaouer, Scott Pontifex, Toga Raikoti, Luis de la Rua, Thomas Tilak, and Epeli Waqavonovono, for collaboration and shared purpose.

From Solomon Islands, we are grateful to the WorldFish enumerators who implemented the COVID-19 market surveys under uniquely difficult circumstances: Ronnie Posala, Delia Roy, Duddley Satovaki, Janet Saeni-Oeta, and Margaret Batalofo.

We are grateful to external participants in the Objective 2 Advisory Group for sharing their insights and experience: Nemia Bainivalu, Itziar Gonzales, Nerida Hinge, Viliamu Iese, Leba Halofaki-Mataitini, Leba Mataitini, Nichol Nonga, Amerita Ravavu, Si Thu Win Tin, and Alisi Tuqa. We also thank those who participated in interviews as part of the policy research.

From University of Wollongong we thank Professor Stuart Kaye for sustained support and brokering significant co-funding from the University. We are grateful to Stefan Delfgou for guiding us through University contracting arrangements and enabling amendments as needed. From ANCORS we are grateful to Anica Damcevski, Jim Longley, and Yolanda Mudukuti for support.

From University of Sydney, we thank Sarah Mounsey and Phoebe O'Meara for research support.

From ACIAR, we are grateful to Ann Fleming for sharing and shaping the vision of a food system framing of Pacific food security within an ACIAR project. We are grateful to Ann Fleming and Chris Cvitanovic for guidance during project implementation and for their flexibility in the contract variations forced by COVID-19. We were fortunate to work with Rachel McGrath, Sarah Cullen, and Lia Fraser who always made the connections between our institutional machines work and enabled everything.

By the broad multidisciplinary nature of the work, aspects were co-funded by other projects or directly by smaller contracts within the overall ACIAR/UOW funding envelope. We acknowledge co-funding where appropriate and, in particular, note co-funding from FAO to UOW and the World Bank to SPC.

Finally, we acknowledge the Australian Government's long-term investment in food system research for development in the Pacific through ACIAR projects FIS/2018/155, FIS/2020/172, and FIS/2022/121.

2 Executive summary

Food is at the heart of both health and sustainability challenges: food production is now a major driver of environmental change, and food consumption is a key determinant of human health, wellbeing, and development. It follows that agriculture (including fisheries) is central to some of the most pressing issues in sustainable development.

These issues are in sharp relief in the Pacific region. The agri-food system is dysfunctional, both from a sustainability perspective and when measured against public health outcomes. Per capita agricultural and coastal fisheries production are declining, and imports of unhealthy foods are increasing. These trends, along with a host of external drivers such as the long shadow of colonialism, urbanization, climate change, migration, trade liberalization, ultra-processed foods, and a search for 'modernity' conflate to accelerate the nutrition transition from traditional diets to 'modern' foods that has been underway in the region for at least 50 years.

A transformation from mostly domestically produced fruits and vegetables, including root crops and fish and invertebrates, to dependence on imported cereals, meat and highly processed foods has contributed to significant non-communicable disease challenges across the region. Populations continue to grow and urbanise, particularly in Melanesia, and inshore fish stocks increasingly show signs of localized depletion. When the potential effects of climate change on both domestic production and imports are considered there is an urgent need for guiding food system policy and activities towards food security and nutrition through healthy domestic sources.

The evidence base to describe food and nutrition status and progress against Sustainable Development Goal (SDG) indicators is fragmented and weak. Baselines are missing for many indicators, and indicators measuring different dimensions of the same attribute appear to conflict in some cases. These limitations caution against drawing strong conclusions about poverty, malnutrition and food security in the Pacific region. Significant investment in national structures and tools to gather and interpret information is required in the coming decade to adequately report against SDG ambitions and targets.

The project developed and curated three significant regional databases that enable analyses of food system dynamics and the development of food security and development baselines. These were: the Pacific Nutrient Composition Database (with FAO) with an addendum that refines finfish nutrient profiles, the Pacific Food Consumption Database, and the Pacific Food Trade Database. The Pacific Food Consumption Database is a globally unique integrated database of household surveys from 12 countries and territories. Prior to the development of these databases, analyses of international food trade were unreliable, the national analysis of household food acquisition and consumption was *ad hoc*, regional analysis was not possible, and estimates of the nutritional adequacy of diets outdated or absent.

New methods were developed to create these databases. In the case of international trade, outlier detection and treatment and categorical error detection required mixed method techniques. For household surveys, outlier treatment, standardization of units was integrated with the incorporation of food away from home, and statistical procedures to correctly estimate variability around mean estimates. These methods will contribute to improved analyses beyond the project, particularly in small island developing states where data on food trade, and acquisition and consumption are sparse and unreliable. Experimental work on the implementation of household surveys has changed the design and conduct of household surveys in the region. The sum of these methodological innovations will have a lasting impact on the utility of surveys in the region and beyond.

International food trade is a major driver of the nutrition transition in the region. There is a growing dependence on imports of rice from South-East Asia, wheat from Australia, and recent growth in imports of meat from Australia, New Zealand and USA, and highly processed foods from South-East Asia. UN Comtrade and derivative databases are not reliable descriptors of this transition.

Tuna resources have significant potential to improve nutrition across the region, including to more marginalised populations, and enhance domestic food sovereignty, reducing food security risks associated with climate change and other global shocks. Currently, reef and coastal fish, imported chicken, wheat, and rice contribute a large proportion of dietary protein for most countries. Urban people consume more tuna and other pelagic fish, while rural populations tend to consume more reef and coastal fish.

The project developed a food environment typology for the Pacific based on sources of food acquisition in Solomon Islands. This typology offers a framing of food environments that better reflects how Pacific people acquire food and so will better inform the design of interventions and policies to reduce malnutrition and nutrition-related public health burdens. Informal sources of gifting, kin and community were notably important, in contrast to other typologies, offering an important window for intervention. Integration of the typology into household surveys design will incur a very small burden on data collection but create a wealth of data to understand where people source foods. Food away from home has emerged as an unexpectedly important source of food in the region.

The project completed an analysis of the Solomon Islands national food system. Such analyses are rare globally, and this is the first of its kind in the Pacific. Based on consultations and analyses, three key pathways for food system change were recognized: (1) strengthen and connect the rural food system; (2) strengthen the national policy environment; and (3) advocate for food environments that make healthy food more accessible, affordable, and convenient. These pathways are centred on different scales (provincial, national inward-looking and national outward-looking) but overlap and interact in important ways.

The majority of rural women in Solomon Islands and Vanuatu do not have adequately diverse diets. Rice, roots, tubers and plantains, and aquatic foods were highly represented in the diets of women. Dark leafy greens and vitamin A rich foods were also frequent in diets. Women reported low intakes of eggs, pulses, dairy, nuts and seeds. Diet diversity among 6–23-month-old children was very low, with very few reported to have consumed five or more food groups in the last 24 hours.

The Pacific Region is a leader in integrated food system policy and governance. Our research showcased regional and national strengths, including governance structures that span relevant sectors to improve policy coherence for food systems, nutrition and environmental sustainability; and policy innovation at the national level to integrate nutrition into food system policy, for example, including recognition of nutrition in trade policy frameworks and building resilience in the face of ongoing food crises. The research identified challenges and opportunities for action for food systems in the region, related to promoting healthy food supply, addressing food pricing and access (particularly during the pandemic), and strengthening governance and implementation to improve economic, nutritional and environmental outcomes of food systems.

By design, the project was a mix of strategic national and household-scale analyses of food system dynamics, policy and governance analysis, and a field component that allowed gendered analysis of food environments and diets. By circumstance, much of the local, field based work was curtailed by COVID-19. Gendered analysis was completed to the extent possible in HIES and policy analyses, but was limited in scope. A diverse range of stakeholders was consulted.

Many activities begun in this project will continue in the next phase (FIS/2022/121). This next phase will also see a return to the field through an important local-scale pathway for change focused on food environments with different attributes. Two other impact pathways will focus on data and training to address vulnerability to food and nutrition insecurity, and on coherent food system policy.

3 Background

Malnutrition and poor-quality diets are now the leading contributors to the global burden of disease, affecting around one in three people globally¹. Whilst progress has been made, declines in undernutrition in many regions are slow, and overweight and obesity is rapidly rising globally. In response, the United Nations has declared 2016–2025 the ‘Decade of Action on Nutrition’ – with a focus on healthy and sustainable food systems at its core. Two recent Lancet Commission reports² emphasise the importance of an agri-food systems approach to addressing poor nutrition and health. The Lancet Commission on Obesity frames three major global challenges; undernutrition, overweight and obesity, and climate change, as three interlinked challenges with common systemic drivers including food systems. In doing so, the agri-food system is highlighted as a key entry point for double or triple duty solutions to these challenges. Furthermore, the recent EAT-Lancet Commission on Healthy Diets from Sustainable Food Systems examines how current food systems are failing to provide the basis for healthy diets globally, whilst also contributing to unprecedented environmental damage. Nothing less than a ‘Great Food Transformation’ is called for by the Commission, including an emphasis on the need for agriculture to be reoriented towards producing the diversity of foods needed for a nutritious diet.

To paraphrase Gordon et al., food is at the heart of both health and sustainability challenges: food production is now a major driver of environmental change, and food consumption is a key determinant of human health, wellbeing, and development³. It follows that agriculture (including fisheries) is central to some of the most pressing issues in sustainable development. A developing critique of agriculture, and the research that underpins it, is that it has focused too much on producing more food, particularly staple grains, to solve problems that better characterize a world of scarcity that no longer exists in most places.

These issues are in sharp relief in the Pacific region. The agri-food system is dysfunctional, both from a sustainability perspective and when measured against public health outcomes. Per capita agricultural and coastal fisheries production are declining⁴, and imports of nutritionally unrewarding food are increasing⁵. These trends, along with a host of external drivers such as the long shadow of colonialism, urbanization, climate change, migration, trade liberalization, convenience foods, and a search for ‘modernity’ conflate to accelerate the nutrition transition from traditional diets to ‘modern’ foods that has been underway in the region for at least 50 years⁶.

While many causes underlie the rise of non-communicable diseases (NCDs), diet is a key factor. Modern Pacific diets are high in processed, energy-dense, and often imported foods, and low in vegetables and fruits. Because these diets often contain above-recommended amounts of fat, energy, and salt, they are contributing to the increasing burden of obesity and NCDs such as diabetes⁷. An estimated 75% of adult deaths in the region are due to NCDs and nine of the ten most

¹ GBD (2018) *The Lancet* 390.

² Swinburn, et al. (2019). *The Lancet*. doi:10.1016/S0140-6736(18)32822-8; Willett et al. (2019). *Lancet*. doi:10.1016/S0140-6736(18)31788-4.

³ Gordon et al. (2017) *Environ. Res. Lett.* 12:10021; see also Campbell et al. (2017) *Ecol. Soc.* 22:4.

⁴ Gillett (2016) SPC Report; Sharp et al. (in prep.) based on SPC/FAO analysis of national statistics.

⁵ Hughes et al. (2005) *Asia Pac. J. Clin. Nutr.* 14:298-306; Thow et al. (2011) *Ecol. Food Nutr.* 50:8-42; Snowdon et al. (2013) *Glob. Health* 9:1; Estime et al. (2014) *Glob. Health* 10:48; McLennan and Ulijaszek (2014) *Public Health Nutr.* doi:10.1017/S136898001400175X

⁶ Popkin (2002) *Public Health Nutr.* 5:93-103; Thow (2009) *Public Health Nutr.* 12:2150-2158; Thow et al. (2011) *Ecol. Food Nutr.* 50:18-42.

⁷ As specific examples: Between 1980–2008, Pacific Island populations experienced the largest increase in Body Mass Index (BMI) globally, with increases of 2kg/m² in many countries, notably higher than the global average increase of 0.4kg/m (Finucane et al. (2011)). Rates of diabetes in the Pacific are much higher than the global average of 10%

obese countries in the world are in the Pacific region⁸. The rise of NCDs has major implications for economic growth, development, and aid policy. In Solomon Islands, for example, diabetes is now the leading cause of death and disability, and diabetes care accounts for approximately 20% of the government's annual health care expenditure, placing significant financial strain on an already very limited health system⁹.

The NCD crisis is firmly on the political agenda and there is a broad acceptance of the health and economic costs of the current trajectory, but there is less consensus on the most effective way forward. Direct efforts to change consumption behaviour in the general population have had 'little if any impact'¹⁰. There is an urgent need for more exploration of the food system challenges that exist in Pacific Island countries, but also for development of solution pathways¹¹. This project brought together multi-disciplinary expertise to identify policy and regional solutions to strengthen food systems for nutrition. The project was strongly participatory and brought together key stakeholders at all levels in both research design and operationalization.

There is an emerging consensus that broader policy interventions are required to address the environmental and social changes that have contributed to the crisis – to influence the price, availability and promotion of healthy and unhealthy foods¹². Several scales of intervention appear to hold promise: multi-sector policies at national and regional scales, and the local food environment.

Multi-sector policies that address drivers beyond health and education have to be part of the solution. Bangladesh for example, in 2017 launched their second fully costed Country Investment Plan, titled 'Nutrition-Sensitive Food Systems'¹³. The Plan takes a truly multisectoral approach in detailing investment priorities at each stage of the food value chain from production to consumption, aimed at enhancing food and nutrition security for all. Whilst in their infancy, there are lessons to be learned from such policy approaches. We identified and filled gaps in the evidence base and, to better inform that process, took a more systemic approach to the policy coherence challenge. Central to this was to bring agriculture and policy around the trade of commodities into the public health narrative. Business as usual is unlikely to change policy and practice.

The region has and will continue to experience the effects of global and climatic change. During the past 40 years there have been dramatic environmental, social, cultural, and economic change in the Pacific. For example, the development of cash economies and trade ties has seen significant increase in the diversity and volume of food importation and the decrease of within-region per-capita production.

Alignment with Partner Australian research and development issues and priorities

The **ACIAR** 2018-2027 Strategic Plan articulates an ambition to tackle the complexities of achieving food AND nutritional security, specifically using an agri-food system framing and language. Achieving this ambition requires new strategic interdisciplinary research using new modalities to

<https://www.idf.org/e-library/epidemiology-research/diabetes-atlas>): 28% in Kiribati and 21% in Vanuatu (up from 2.8% in 1998; <http://www.who.int/ncds/surveillance/steps/>). See also DiBello et al. (2009) *J. Nutr.* 139: 1933-1943; Seiden et al. (2012). *Am. J. Hum. Biol.* 24:286-295; Snowden et al. (2013) *Global Health* 9:53; Chariton et al. (2016) *BMC Public Health* 16:285; <http://www.who.int/mediacentre/factsheets/fs355/en/>.

⁸ <https://renewbariatrics.com/obesity-rank-by-countries/>.

⁹ <https://daisi.com.au/wp-content/uploads/2016/09/Strategic-Plan-for-Solomon-Islands-2016-2010.pdf>; see also Tin et al. (2015 and references therein).

¹⁰ Hill et al. (2008) *Obes. Rev.* 9:41-47; Thow et al. (2011) *Obes. Rev.* 12:68-74.

¹¹ FAO HLPE (2017)

¹² e.g. Snowden et al. (2010) *Publ. health. Nutr.* 13:886-892; Waqa et al. (2017) *Health Res. Policy Sys.* 15:74; Thow et al. (2018) *Food Sec.* 10:1105-1130.

¹³ Government of the People's Republic of Bangladesh (2017)

broker collaborations. The project contributed to all strategic objectives and promoted linkages and broader understanding of agri-food systems research commissioned by ACIAR in the Pacific region.

The project contributed to ACIAR Objective 6 Building capacity (individual and institutional) by training regional experts through intensive short courses for NSO staff and postgraduate training for early career Pacific Islanders, with knock-on effects through their respective agencies and Universities. Within the project, UOW funded PhD scholarships for related topics.

More broadly, the project is aligned with **Australian ODA** priorities and contributes to all four objectives of the Australian Aid Programme's Pacific Region Aid Investment Plan 2015–16 to 2018–19 through: (i) economic growth by promoting the contribution agriculture to national economic output; (ii) supporting SPC and other regional institutions; (iii) making communities more healthy and resilient; and (iv) empowering women and girls to more effectively participate in, and enjoy the benefits of, improved agriculture. The Aid Investment Plan reinforces the case for investment in regional initiatives by noting they set norms and standards, support national reporting, and drive innovation and testing of new approaches.

The project aligned with and contributes to the **Solomon Islands** National Food Security, Food Safety and Nutrition Policy (2016-2020); a multi-sectoral policy between the ministries of health, fisheries, agriculture, education and commerce. The policy is guided by the principles of the regional Framework for Action of Food Security in the Pacific, with the goal to ensure sufficient, safe, nutritious foods are readily available, accessible, affordable and acceptable to all Solomon Islanders, at all times. This project also contributed to the *Nasinol Lokol Kaikai* Framework for Action, which focuses on the promotion of local food production and consumption for the health, socio-culture, environment, economic and food security for Solomon Island people.

Regional leaders have committed to the Sustainable Development Goals (SDGs). Pacific Island Forum Secretariat (PIFS) is coordinating development of a roadmap for SDG implementation and its integration into existing implementation plans, such as the S.A.M.O.A. Pathway¹⁴ and the Framework for Pacific Regionalism¹⁵. The project contributed to integrating the PIFS roadmap and other commitments and reporting frameworks developed by SPC and other Council of Regional Organizations in the Pacific (CROP) agencies. The project offers the potential to provide a programmatic foundation for long-term investment in Pacific agri-food systems structured around a network of partners and a coherent set of principles and evaluation metrics.

The SPC/FAO Pacific strategic plan for agricultural and fisheries statistics (P-SPAFS)¹⁶ highlights significant gaps in information needed for evidence-based policy in the region, and notes that most policy is developed on perceptions rather than data.

The project contributed to the Ten-Year Pacific Statistics Strategy (TYPSS)¹⁷, which prioritises the production of timely and reliable statistics for evidence-based policy formation to monitor progress towards achieving desired goals. It also contributed towards achieving the 5th Regional Conference of Heads of Planning and Statistics (HOPS)¹⁸ endorsement for increased use of existing data, increasing statistical availability through improved dissemination, and for statistical development activities to be delivered in partnership with development partners, academia, regional organisations and national government and non-government organizations¹⁹.

¹⁴ <http://www.sids2014.org/index.php?menu=1537>

¹⁵ <https://www.adb.org/sites/default/files/linked-documents/pacific-robp-2015-2017-sd.pdf>

¹⁶ <http://www.fao.org/3/I8344EN/i8344en.pdf>

¹⁷ <http://www.typss.org/>

¹⁸ <http://hops.spc.int/>

¹⁹ <http://hops.spc.int/wp-content/uploads/2018/02/2017-HOPS-5-Meeting-Report.pdf>

The project addressed common themes identified in sector plans, agency plans, and national development strategies as reported by Chapman and Caniogo (2016)²⁰. These themes generally cover food security, economic development through increased agricultural production, and governance. The national plans and strategies align with the Regional Framework for Accelerating Action on Food Security and Nutrition in Pacific Small Island Developing States (SIDS)²¹ where evidence driven policy supports food security and nutrition and sustainable, resilient, and nutrition-sensitive food systems.

The Pacific NCD Roadmap²² identifies the urgent need for a multi-sectoral and evidence-based approach to addressing the NCD crisis in the Pacific region. The project supported achieving this and test policy recommendation for regional scaling.

The project contributed to Australia and PIC commitments to the United Nations Sustainable Development Goals (SDGs)²³, through analyses and baselines, and therefore improved ability to report against SDG indicators. The most relevant SDGs are poverty reduction (SDG 1) and increasing food security (SDG 2), good health and wellbeing (SDG 3), gender equality (SDG 5), and sustainable livelihoods and economic growth (SDG 8), responsible consumption and production (SDG 12) and sustainable use of the ocean (SGD 14), and land (SDG 15). SDG 8 recognizes the importance of Small Island Developing States and the particular development challenges they face.

3.1 Research questions

The project sought to answer five overarching research questions which are framed at the scale of the project; many small questions are nested within them at the scale of activities and outputs (e.g. for each WG). The Objectives used to address these questions are indicated in parentheses. The research questions were:

1. What are the defining characteristics of national food systems in the region, how do they differ among PICs, and how do these characterizations offer opportunities for innovation? (Obj. 1 and 4)
2. What social and economic attributes (e.g. rural/urban, livelihood types, gender, and economic affluence) explain variation in food production, acquisition and consumption patterns? (Obj. 1)
3. What are the primary 'healthy' and 'unhealthy' foods acquired and consumed across PICs, and what factors influence consumption? (Obj. 1 and 3)
4. What are the defining characteristics of rural and peri-urban food environments in Solomon Islands, and what innovations and interventions are most effective to enhance nutrition outcomes? (Obj. 2 and 3)
5. How can improved knowledge of agri-food system dynamics, including political economy be used to strengthen consideration of food systems and nutrition in domestic and regional policy across sectors? (Obj. 2 and 4).

²⁰ http://pafpnet.spc.int/attachments/article/828/PAPP_Inventory%20Report.pdf

²¹ <https://sustainabledevelopment.un.org/content/documents/17753PacificFramework.pdf>

²² https://ncdalliance.org/sites/default/files/resource_files/NCD%20Roadmap%20Report.pdf

²³ <http://www.sustainabledevelopment.un.org/?menu=1300>

4 Objectives

The aim of the project is to characterize Pacific agri-food systems, recommend actions to improve local food environments, and support national policies to promote healthier, more diverse diets for people.

The outcomes of the project were delivered through four objectives and three crosscutting activities that focus on communication and influence, capacity development and M&E. The four objectives and research questions they address are:

1. Complete integrated analyses of dimensions of the agri-food system at regional and national scales (RQ 1, 2 and 4)
2. Analyse policy coherence across food system sectors and identify opportunities to strengthen policy in focal countries (RQ 4 and 5)
3. Characterize informal markets and prioritise actions that enhance nutritional outcomes from local food environments in Solomon Islands (RQ 2, 3 and 5)
4. Develop diagnostic tools to improve policy interventions in national agri-food systems and improved metrics for reporting status and progress against national, regional and global targets (RQ 1 and 5).

5 Methodology

By design, the project stepped back from the intense partner-led research in development modality that characterises our leadership of ACIAR projects FIS/2016/300, FIS/2019/124 and FIS/2020/172. We sought to reframe the food and nutrition security challenge in the Pacific region using a food system lens that explicitly connected the production, processing, acquisition and consumption of food. This framing affirms the central role of local agriculture in feeding people but requires a much broader investment in the evidence required to characterise the outcomes of growing and catching food, and the food and nutrition security impacts of food systems at national and regional scales. For fisheries, for example, it requires a shift from a preoccupation with ecological sustainability to a broader understanding of the role of aquatic foods in economies and diets.

As others before us have noted, the significant gaps in national capacity to quantify dimensions of food systems limit the evidence base needed to develop policy and other interventions to change the trajectory of national food systems. Under the leadership of project partner SPC, the project invested in a range of long-term strategic initiatives to improve that evidence base. In order to create the baselines needed, new methods were developed to better utilize existing data, notably international food trade statistics and in the food acquisition and consumption modules of national household surveys. These methods, the databases they enabled, and the analyses that followed, are described in detail in the project outputs and summarized in Section 7.

Impact of COVID-19

By circumstance, the project scaled back field-based activities and outputs. The project began in Q3 2019, six months before sweeping domestic and international travel restrictions were introduced. These limitations remained in place for the following two years, effectively grounding all project partners and causing significant changes to planned activities in the project. As a consequence, across the project, greater emphasis was put on desk-based analyses of food systems and on building the evidence base for patterns in food system function at national and regional scales.

Project activities were significantly revised via a series of four project variations in agreement with the FIS RPM and as headlined below:

- Objective 1. The Working Groups changed from the planned modality of workshops of experts to a series of thematic areas of work. The first Working Group produced a series of *ad hoc* briefs for DFAT on commodities impacted by COVID-19 pandemic.
- Objective 2. Stakeholder consultations, workshops and key informant interviews were replaced by Zoom interviews where possible but overall engagement was reduced.
- Objective 3. Activities in Honiara and rural Solomon Islands were delayed and then terminated. In-country activities pivoted to vendor surveys of the impacts of COVID-19 on the price of food completed by staff based in Honiara and Auki.
- Objective 4. Field data could not be collected in KIR and VUT, and the food environment typology could only be applied during the market vendor survey in SLB. The typology was also adapted to application to HIES data for SLB.

Impact in Solomon Islands and on Objective 3: Activities under Objective 3, which focused on Solomon Islands were most impacted by COVID-19. From Q1 2020 to Q2 2022 domestic travel within Solomon Islands and internationally to Australia was stopped for key periods and reduced for longer periods. In March 2020, a State of Emergency was declared by GoSI as the country strengthened its response to the pandemic. Domestic travel was banned in 2022 after Solomon Islands' first COVID-19 case. Further, as government agencies pivoted to preparing for the disease's arrival, government agencies were not interested in engaging in longer term issues like food system governance and NCDs. Further, project staff from Solomon Islands were impacted in their private lives which compounded the direct impacts of COVID-19 on project activities. As a consequence, most activities in Objective 3 were either changed to COVID-19 related surveys of vendors or terminated.

Contraction to one country

The project proposed to work in Kiribati, Vanuatu and Solomon Islands. As a result of COVID-19 in-field activities were reduced to Solomon Islands where WorldFish had staff residing in Honiara, Auki and Gizo. Fieldwork reported on diet diversity in Vanuatu was completed in project FIS/2016/300 and combined with parallel work in this project. In-country work will be resumed in the next phase of the project in all three countries in 2024. All three countries, among others, were included in regional analyses based on data curated by SPC and UOW.

Partnership

The most pivotal partnership for the project was with SPC. As the lead technical agency in the region, SPC had the expertise and convening power needed to enable access to data, convene conversations and disseminate outputs. The Statistics for Development Division established a Food System page on their website (<https://sdd.spc.int/food-systems>) to make available project outputs to member countries. In addition, the food trade explorer (<https://stats.pacificdata.org>) allows easy interactive data queries of international food trade data, and the PNDB provide nutrient profiles for food commodities. Collaborations with other SPC Divisions either continue (e.g. FAME) or are being developed (e.g. LRD and in ongoing project with SPC). The current project contributed to SPC's cross-Divisional flagship programme on Food Systems and was influential in early thinking on the programme.

Disciplinarity

The project employed a range of research methods ranging from disciplinary to transdisciplinary. The statistical procedures used to clean complex datasets and correctly estimate standard errors across multiple HIES are purely disciplinary. The analysis of pathways for change in the Solomon Islands food system required the co-creation of knowledge with a diverse range of practitioners. In an early project output during the shaping of the project, Andrew and Fleming (2019) reflected on the challenges of interdisciplinary research in Pacific food systems. A food system framing of the complex and contingent challenges of food and nutrition security offered an integrative way to promote narratives of change.

6 Achievements against activities and outputs/ milestones

Objective 1: To complete integrated analyses of dimensions of the agri-food system at regional and national scales

	Outputs/ milestones	Completion date	Comments
1.1. Convene project inception meeting to confirm roles and schedule activities	1.1.1. Revised project document	2019	Completed. Inception meeting held at ANCORS in Wollongong in September 2019.
1.2. Clean HIES data sets available for 14 PICs (builds on work done in FIS/2016/300)	1.2.1. Cleaned data set archived with SPC for 12 PICs (Q3 2019, and then as new HIES become available)	2023	Completed. Contributes to WG 6. The Pacific Food Consumption Database (PFCD) contains curated data from HIES completed in 14 Pacific countries and territories: COK, FSM, KIR, MHL, NRU, NIE, PLW, WSM, SLB, TOK, TON, TUV, VUT, and WLF. Database archived with SPC SDD.
1.3. Publish Pacific Nutrient Database as PNDB on SPC website	1.3.1. PNDB publicly available on the SPC website (Q2 2020)	2020	Completed. Contributes to WG 6. Reported as: FAO and Pacific Community (2020a) Pacific Nutrient Database User Guide. Noumea, New Caledonia. Online at: https://sdd.spc.int/food-systems SPC, UOW and FAO (2020). The Pacific Nutrient Database. https://microdata.pacificdata.org/index.php/catalog/755
1.5 Select WG leaders and participants and schedule WG	1.5.1. Schedule of WGs agreed and participants for first non-COVID-19 one agreed (Q2 2021)	2023	Activity disrupted by COVID-19. A subset of WG were completed as planned, and two have been deferred to the second phase of the project (FIS/2022/121). WG outputs summarized below in 1.6.1; see also other activities.
1.6. ²⁴ Convene up to eight WG over three years (2 in 2019-20, 4 in 20-21 and 2 in 21-22) to address priority issues	1.6.1. Each WG will produce a minimum of one peer reviewed paper and one translation output (Q4 2020 and then six monthly thereafter)	2023	Partially completed. Note outputs also reported under other activities below as cross-referenced to Activity 1.6. Reported as: WG 1. COVID-19: Andrew, N.L. et al. (2020a) Trends in Rice imports to the Pacific region. Unpublished Information Brief to DFAT/ACIAR. 2pp. Andrew, N.L. et al. (2020b) Import of dominant commodity groups to Pacific Island Countries and Territories (PICTs). Unpublished Information Brief to DFAT/ACIAR. 3pp. Brewer, T.D. et al. (2020b) Trends in Wheat and Wheat flour imports to the Pacific region. Unpublished Information Brief to DFAT/ACIAR. 2pp. Eurich, J. et al. (2020) Per capita production of starchy vegetables (SV) through time in the Pacific region. Unpublished Information Brief to DFAT/ACIAR. 3pp.

²⁴ Activity numbers are not sequential. During the course of the project after the advent of COVID-19, activities were amended. Where activities were deleted, the remaining activities retained their original number for project management and tracking purposes.

Activity	Outputs/ milestones	
----------	------------------------	--

Sharp, M.K. (2020) Fruit and Non-Starchy Vegetable (FSNV) production in the Pacific region. Unpublished Information Brief to DFAT/ACIAR. 4pp.

Plus pre-COVID-19 baseline summaries for 9 countries, as reported in 1.8.1.

WG 2. Solomon Islands food system:

Farmery, A.K. et al. (2023a) National Assessment of the Solomon Islands Food System. FAO. <https://doi.org/10.4060/cc4175en>

Plus 6 policy briefs, reported under 1.11.6 as briefs 7-12.

WG 3. Regional food system governance:

Farmery, A. et al (2021c) Blind spots in visions of a “blue economy” could undermine the ocean’s contribution to eliminating hunger and malnutrition. *One Earth*, 4. <https://doi.org/10.1016/j.oneear.2020.12.002>

Patay, D., et al. (2023) Catalysing sustainable development through regional food system governance: strengthening the translation of regional food system policy guidance to national-level in the Pacific. *Sustainable Development*. <https://doi.org/10.1002/sd.2732>

Reeve, E., et al. (2023) Scaling up food pricing policies in the Pacific: a guide to action. *BMJ Global Health* 8, e012041.

Reeve, E., et al. (in prep) Scaling up food pricing policies in the Pacific: a guide to action. Toolkit, SPC.

Thow A.M. et al. (2022a) Regional Governance for Food System Transformations: Learning from the Pacific Island Region. *Sustainability*, 14, 12700.

Voyer, M. et al (2020) The role of voluntary commitments in realising the promise of the Blue Economy. *Global Environmental Change*, 71, 102372, <https://doi.org/10.1016/j.gloenvcha.2021.102372>

WG 4. National food security profiles:

Kiribati National Statistics Office (2022) Poverty in Kiribati based on analysis of the 2019/20 Household Income and Expenditure Survey. Bairiki, Kiribati: Pacific Community.

Sharp M. (2021) Kiribati 2019-2020 household income and expenditure survey report: copra brief. Noumea, New Caledonia: Pacific Community. 11 p.

Troubat, N. and Sharp, M.K. (2021a) Food consumption in Kiribati. Tarawa, Kiribati: FAO and SPC.

Troubat, N., Sharp, M.K. and Andrew, N.L. (2021b) Food consumption in Solomon Islands. Honiara, Solomon Islands: FAO and SPC.

Activity	Outputs/ milestones	Completion date	Comments
			<p>Vanuatu National Statistics Office (2021) Food Security in Vanuatu: 2019-2020 NSDP Baseline Survey. Port Vila, Vanuatu: VNSO. Online here.</p> <p>WG 5. Statistical methods (as Activity 1.9, 1.11) Brewer, T.D., Andrew, N.L., Sharp, M.K., Thow A.M., Kottage, H., Jones, S. (2023a) A method for cleaning international food trade data for regional analysis: The Pacific Food Trade Database. Version 2.1. Pacific Community Methods paper. Brewer, T. and Andrew, N.L. (2021a) The Pacific Food Trade Database. Food System Brief No. 3. Pacific Community. Sharp, M.K., Buffiere, B., Himelein, K. et al. (2022b) Effects of Data Collection Methods on Estimated Household Consumption and Survey Costs: Evidence from an Experiment in the Marshall Islands. World Bank Group Policy Research Working Paper 10029, 37 pp. Sharp, M.K., Troubat, N., Kottage, H., Menaouer, O. and Andrew, N. L. (in prep). Processing food data sourced from household consumption expenditure surveys and construct of the Pacific Food Consumption Database. Sharp, M.K., Troubat, N., Raikoti, T., et al. (in prep). Survey methods to improve data collection and estimation of food consumed away from home: protocols from an experiment conducted in Samoa.</p> <p>WG 6. Regional databases SPC, UOW and FAO (2020). The Pacific Nutrient Database. https://microdata.pacificdata.org/index.php/catalog/755. Brewer, T.D., Andrew, N.L. (eds) (2023b) The Pacific Food Trade Database. Version 2.1. (https://stats.pacificdata.org/). Koehn, J.Z, et al. (in prep). Nutrient composition of marine food fish from Pacific Island countries and territories. Target journal: <u>Fish and Fisheries</u>. Andrew, N., Koehn, Z., and Sharp, M.S. (in prep). PNDB Fish: An addendum to the PNDB to provide improved coverage of COICOP Chapter 3. SPC Technical Report. SPC (2023). The Pacific Food Consumption Database. V1. Curated database housed by SPC but not publicly available until permissions resolved with national agencies.</p> <p>WG 7. Commodity analyses Partially completed and ongoing to be completed within FIS/2020/172 and FIS/2022/121. Status is as:</p> <p>Fish: Sharp, M.K., Andrew, N.L, Kottage, H., Troubat, N., Golden, C. (in prep) Fish acquisition and consumption in 14 Pacific Island countries. Target journal: Fish and Fisheries. Wheat: Brewer, T.D., Andrew, N.L., Kottage, H. et al. (in prep) Wheat in the Pacific Food System. Journal TBD.</p>

Activity	Outputs/ milestones	Completion date	Comments
			<p>Chicken: Andrew N.L., Kottage H., Hegoda Arachchi N., Brewer T., Bogard J. (in prep). The rise and rise of chicken in Pacific Food Systems. Target journal: Global Food Security.</p> <p>Protein: Brewer, T., Kottage, H., Andrew, N.L. (2023). Options for supplying dietary protein for growing Pacific Island populations. Report prepared for the Pacific Community. 94 pp.</p> <p>Kottage, H., Bogart, J., Brewer, T., Sharp, M., Andrew, N. et al. (in prep) Protein consumption and the sources of protein in the Pacific diet. Target journal: Food Security.</p> <p>Translation briefs have been produced for a range of food commodities as interim outputs (see WG 1 and 1.11.6).</p>
	1.6.2. Paper to integrate findings and recommendations from the thematic WG (Q2 2022)	2022	<p>Partially completed. Integrative papers completed, but full integration deferred to project FIS/2022/121 once consumption analyses completed for key commodities. Reported as:</p> <p>Andrew, N.L., Allison, E.H., Brewer, T. et al (2022) Continuity and change in the contemporary Pacific food system. Global Food Security, 32, 100608, 1-11. https://doi.org/10.1016/j.gfs.2021.100608</p> <p>Golden, C.D., Gephart, J.A., Eurich, J.G. et al (2021) Social-ecological traps link food systems to nutritional outcomes. Global Food Security. 30, 100561, pp. 1-8. https://doi.org/10.1016/j.gfs.2021.100561</p>
<p>https://www.science-direct.com/science/article/pii/S2211912421001164</p>	1.7.1. Analysis and outputs as agreed with DFAT/ACIAR in Q2 2020	2020	<p>Completed by milestone. Prepared COVID-19 briefs for DFAT using the PFTD and the FAOSTAT production data, including:</p> <ul style="list-style-type: none"> i. Rice trade (Andrew et al. (2020a)) ii. Food imports (Andrew et al. (2020b)) iii. Fruit and non-starchy vegetable production (Sharp (2020)) iv. Starchy vegetable production (Eurich et al. (2020)) v. Wheat trade (Brewer et al. (2020b)) <p>Eriksson, H. et al. (2020) Changes and adaptations in village food systems in Solomon Islands: A rapid appraisal during the early stages of the COVID-19 pandemic. Penang, Malaysia: WorldFish. Program Report: 2020-22.</p>
	1.7.2. Paper on 'COVID-19 and vulnerabilities of the Pacific Food System: opportunities for a robust response'	2020	<p>Completed. Reported as:</p> <p>Farrell, P. et al. (2020) COVID-19 and Pacific food system resilience: opportunities to build a robust response. Food Security 12, 783-791. https://doi.org/10.1007/s12571-020-01087-y</p>
<p>1.8. Complete analyses of food systems at national scales for SLB, VUT and KIR</p>	1.8.1. Translation outputs quantifying food security profiles as baseline for CV-19 analyses in SLB (Q3 2020), VUT (Q4 2020, and KIR (Q1 2021), in collaboration with ACIAR project FIS/2016/300	2021	<p>Completed. Reported as pre-COVID baseline indicator fact sheets (Pacific Community (2021a – 2021i)) for:</p> <ul style="list-style-type: none"> i. Cook Islands ii. Federated States of Micronesia

Activity	Outputs/ milestones	Completion date	Comments
			<ul style="list-style-type: none"> iii. Nauru iv. Niue v. Palau vi. Solomon Islands vii. Tokelau viii. Tonga ix. Tuvalu
1.9. Contribute to improved methods for standardized HIES and food trade analysis and data collection	1.9.1. Paper on a new method to clean national HIES data sets (Q4 2022)	2023	Completed. Reported as: Sharp, M.K., Troubat, N., Kottage, H., Menaouer, O. and Andrew, N. L. (in prep). Processing food data sourced from household consumption expenditure surveys and construct of the Pacific Food Consumption Database.
	1.9.2. Paper on experimental design of HIES using Marshall Islands as a case study (Q4 2022)	2022	Completed. Reported as: Sharp, M.K., et al (2022b) Effects of Data Collection Methods on Estimated Household Consumption and Survey Costs: Evidence from an Experiment in the Marshall Islands. World Bank Group Policy Research Working Paper 10029, 37pp.
	1.9.3. Creation of unified food acquisition and consumption database (Q4 2022)	2023	Completed as part of WG 6. Reported as: Sharp, M.K., Troubat, N., Kottage, H., Menaouer, O. and Andrew, N. L. (in prep). Processing food data sourced from household consumption expenditure surveys and construct of the Pacific Food Consumption Database. SPC (2023) The Pacific Food Consumption Database. V1. Curated database housed by SPC but not publicly available until permissions resolved with national agencies.
1.10. Under SPC leadership convene a technical forum on regional HIES and trade analyses, with a particular focus on long-term implications for the region under a changing climate (Obj. 2)	1.10.1. Forum completed and policy briefs produced (Q2 2022)	2022	Presentation of HIES and PFTD outputs at SPC, Noumea followed by discussion on applications for databases, including relating to Climate Change.
	1.10.2. Journal article overviewing the regional agri-food system produced as a summary of the SPC technical forum (Q4 2021)	2022	Completed. Reported under Activity 1.6.2.
1.11. Regional and national trade analysis	1.11.1. Version 1 of the Pacific Food Trade Database (PFTD) cleaned and archived with SPC (Q3 2019)	2019	Completed. Version 1 of the PFTD now superseded by Version 2.1 reported under Activity 1.11.3
	1.11.2. Working Paper summarizing PFTD (v2) cleaning methods completed (Q2 2020)	2023	Completed. Reported as: Brewer, T.D., Andrew, N.L., Sharp, M.K., Thow A.M., Kottage, H., Jones, S. (2023a) A method for cleaning international food trade data for regional analysis: The Pacific Food Trade Database. Version 2.1. Pacific Community Methods paper.

Activity	Outputs/ milestones	Completion date	Comments
			Online at https://sdd.spc.int/news/2023/03/31/method-cleaning-int-food-trade-data-regional-analysis-PFTD
	1.11.3. Version 2 of the PFTD (1995-2018) cleaned (Q2 2020) and used for WGs 1 to 4	2023	Completed. Reported as: Brewer, T.D., Andrew, N.L. (eds) (2023b) The Pacific Food Trade Database. Version 2.1. (https://stats.pacificdata.org/).
	1.11.4. Journal article outlining the method used to clean regional food trade data (v2) (Q3 2020)	2023	Completed, but reported as a peer-reviewed SPC Methods paper – see 1.11.2 above - rather than a journal article.
	1.11.5. Journal article on spatio-temporal patterns of trade in key foods (Q3 2020)	2023	Completed. Reported as: Brewer, T.D., N.L. Andrew, D. Abbott et al. (2023c). The role of trade in pacific food security and nutrition. <i>Global Food Security</i> , 36: 100670.
	1.11.6. Translation outputs through SPC channels summarizing dimensions of regional trade in agricultural commodities (Q3 2020 and then annually)	2023	Completed. Reported as 20 Food system translation briefs on the SPC SDD Food System website: <ol style="list-style-type: none"> 1) Food systems briefs 2) Pacific Nutrient Database 3) Pacific Food Trade Database 4) Fruit and non-starchy vegetables 5) Food and beverage imports 6) Pacific Wheat 7) Solomon Islands food and beverage trade 8) Poverty, malnutrition and food insecurity in Solomon Islands 9) Food environments in food and nutrition security in Solomon Islands 10) Lessening import dependence in Solomon Islands 11) Policies for healthy and sustainable food systems in Solomon Islands 12) Pathways for food system change in Solomon Islands 13) Food and beverage exports 14) Starchy vegetables 15) Aquatic foods and their role in nutrition in the Pacific 16) Food trade within the Pacific Region 17) Regional food system governance 18) Fruit and Non-Starchy Vegetables in Solomon Islands 19) Dietary diversity in Vanuatu and Solomon Islands 20) Coastal proximity in the Pacific region 21) Translation of regional food system policy guidance to national level
	1.11.7. Journal article and translation output on spatio-temporal food trade between Australia and the Pacific region (Q4 2021)	2023	Completed. Reported as: Brewer, T.D., Farmery, A., Jones, S., Kottage, H., Makaafi, S., Andrew, N. (submitted). Food trade and geopolitics between Pacific Island Countries' and their dominant Asia-Pacific trade partners. <i>Asia and Pacific Policy Studies</i> .

Activity	Outputs/ milestones	Completion date	Comments
	1.11.8. Paper and translation output on broad characterisation of the Pacific diet (Q4 2021)		Not completed. Deferred to second phase of Food Systems project (FIS/2022/121) using the new Pacific Food Consumption Database with most recent HIES added.
	1.11.9. Paper and translation output on the broad characterization of food acquisition in the Pacific (Q4 2021)		Not completed. Deferred to second phase of Food Systems project (FIS/2022/121).
	1.11.10. Paper on price elasticity on selected foods and link to NCD prevention in the Pacific (Q4 2020)		Partially completed. Reported as: O'Meara, P., et al. (in prep) Systematic review and meta-analysis of price elasticity estimates for sugar-sweetened beverages, relevant to low and middle-income countries.
	1.11.11. v3 of the PFTD (1995-2020) cleaned (Q2 2022)		Not completed. Deferred to second phase of Food Systems project (FIS/2022/121) in order to capture the COVID-19 years of 2020 to 2022 for analysis in FIS/2022/121.
	1.11.12. PFTD v3 uploaded to SPC website (Q4 2022)		Not completed. As above.
	1.11.13. Paper and brief on Intra-regional trade (with FIS/2016/300; Q4 2022)	2022	Completed. Reported as: Thow et al. (2022b) Food trade among Pacific Island countries and territories: implications for food security and nutrition. Globalization and Health , 18:1-5.

Objective 2: Analyse policy coherence across food system sectors and identify opportunities to strengthen policy in focal countries

Activity	Outputs/ milestones	Completion date	Comments
2.1. Stakeholder engagement workshop in each country, presentation of data from Obj. 1, initiation of and input into Obj. 2 activities.	2.1.1. Workshops in KIR, SLB, VUT, conducted in collaboration with FIS/2016/300: SLB Q2 2021, VUT 2021, KIR 2022.	2022	Partially completed. In-country workshops were not held due to COVID-19 but a Policy Advisory Group was instead convened. The group met over five online meetings in 2021-2022 with representation from Vanuatu, Solomon Islands, SPC, and FAO. This regional stakeholder engagement enabled dissemination of data from Obj 1 and provided input into Obj 2 activities.
	2.1.2. Workshop reports (from Q2 2021 to Q1 2022)	2022	Partially completed. Workshops not completed but Objective 2 Policy Advisory Group meetings were minuted to record deliberations.
2.2. Compare and contrast supply chains for key agricultural commodities in KIR, SLB and VUT	2.2.1. Paper on fruit and vegetables supply and consumption in Solomon Islands (Q4 2022)	2023	Completed. Reported as: Farrell P. et al. (2023). Fruit and Non-Starchy Vegetable Acquisition and Supply in Solomon Islands: Identifying Opportunities for Improved Food System Outcomes. Sustainability . 15:1742.
	2.2.2. Paper on 'food systems framing must acknowledge informality' (with FIS/2019/172; Q4 2022)		Not completed.

Activity	Outputs/ milestones	Completion date	Comments
	2.2.3. Translation outputs for each country (national government level): Key information on optimizing health and environmental sustainability in supply chains for key agricultural commodities (Q3 2021 then ongoing)	2023	Completed. Reported in 1.11.6 above.
	2.2.4. Report on targets for win-win (ie healthy and environmentally sustainable) PIC diet (Q4 2021)	2023	Completed. Reported as: Farmery, A.K and Bogard, J.R. (2023b). Realizing the potential for aquatic foods to contribute to environmentally sustainable and healthy diets. In, Routledge Handbook of Sustainable Diets (pp. 106-118). Routledge.
	2.2.5. Papers: Improving nutrition and environmental sustainability in seafood rich, import-dependent diets (Q4 2021)	2020	Completed. Reported as: Farmery A.K. et al. (2020) Aquatic Foods and Nutrition in the Pacific. <i>Nutrients</i> , 12(12):3705. https://doi.org/10.3390/nu12123705
	2.2.6. Paper on conceptualising value chain analysis to integrate multiple food system elements (Q3 2020)	2021	Completed. Reported as: Farmery, A.K. et al. (2021b) Conceptualising value chain research to integrate multiple food system elements, <i>Global Food Security</i> , 28,100500, https://doi.org/10.1016/j.gfs.2021.100500 .
2.3. Policy and political economy research: national and subnational level in KIR, SLB and VUT	2.3.1. Reports: Policy content and stakeholder context in each country (2021)	2022	Partially completed – Solomon Islands only. See Activity 1.6.1, reported as WG2 Solomon Is. national food system analysis.
	2.3.2. Paper: Strengthening governance for sustainable food and nutrition outcomes (Q2 2022)	2022	Completed. See also WG 4 above. Reported as: Reeve, E. et al. (2022a) Strengthening Food Systems Governance to Achieve Multiple Objectives: A Comparative Instrumentation Analysis of Food Systems Policies in Vanuatu and the Solomon Islands. <i>Sustainability</i> , 14, 6139. Mauli, S., et al. (2023) Systemic capacity in food systems governance in Solomon Islands: "it's more than just training". <i>Sustainability</i> , 15(13), 10710. Mauli, S., 2023. Opportunities to Strengthen Fish Supply Chain Policy to Improve External Food Environments for Nutrition in the Solomon Islands. <i>Foods</i> , 12(4), p.900.
2.4. Synthesis and identification of policy opportunities; participatory workshop in each study country	2.4.1. Workshop (Q2 2022)	2023	Completed for Solomon Islands only. Workshop held in Solomon Islands in Q1 2023.
	2.4.2. Paper: Opportunities and strategies to strengthen food system policy regionally, with case studies on SLB and VUT (Q1 2022)	2023	Completed. Reported as: Patay, D., et al. (2023). Catalysing sustainable development through regional food system governance: strengthening the translation of regional food system policy guidance to national-level in the Pacific. <i>Sustainable Development</i> .
	2.4.3. Translation outputs: Policy opportunities to strengthen sustainable food and nutrition security (Q2 2022)	2022	Completed for SLB. Reported in 1.11.6 above.

Objective 3: To characterize informal markets and prioritise actions that enhance nutritional outcomes from local food environments in Solomon Islands

Activity	Outputs/ milestones	Completion date	Comments
3.1. Cyclical monitoring and analysis along a gradient of 'rural and peri-urban informal markets in Western and Malaita Provinces to understand external and personal food environment dimensions	3.1.1. Report: Rapid baseline survey of external food environment during COVID-19 with a focus on food price and availability in formal and informal markets (Q3 2020)	2023	Partially completed. The rapid assessment survey was conducted in July/August 2020 with 556 participants and repeated in 2021. Reported as part of a paper only, see 3.1.2 below.
	3.1.2. Paper: Fluctuations and drivers of food price and availability in informal markets in Solomon Islands (Q2 2021)	2023	Completed. Reported as: Farrell, et al. (2023) Food price and availability in Solomon Islands during COVID-19: A food environment survey. <i>Nutrition and Health</i> . https://doi.org/10.1177/02601060231183592
	3.1.3. Paper: Is a nutritionally sound food basket affordable for consumers? (using HIES derived food basket for SLB, market prices and availability) (Q2 2022)		Not completed. Deferred to FIS/2022/121.
	3.1.4. Scoping review on typologies of local environments in low- and middle-income settings (Q1 2021)	2021	Completed. Reported as: Farrell, P. et al. (2021). Food environment research is needed to improve nutrition and well-being in Asia and the Pacific. <i>Public Health Nutrition</i> . https://doi.org/10.1017%2FS136898002100241X Bogard J. et al. (2024) Convenience as a dimension of food environments: a systematic scoping 2 review of its definition and measurement. <i>Appetite</i> . https://doi.org/10.1016/j.appet.2023.107198 . Farrell, P. et al. (in prep). Measuring natural food environments: a scoping review. Journal TBD.
	3.1.5. Paper: Dietary diversity among women and children in SLB and VUT (with FIS/2016/300; Q4 2022)		Paper not completed. Research summarized in a translation output: Tutuo, J. et al. (2023) Diets among women and children in Solomon Islands and Vanuatu. Food System Brief No.19. Pacific Community.
3.2. Develop and sustain local partnerships and networks within the informal market sector in Solomon Islands.	3.2.1. Partnerships developed with organizations, vendors and projects involved in other market based initiatives in SLB (Q4 2019 and ongoing)	2020	Three partner meetings were held, in Honiara, Auki and Gizo. Documentation of meetings not completed.
	3.2.2. Report: Vendor constraints and opportunities to enhance nutritional food environments in informal markets in Solomon Islands (Q2 2020)		Not completed.
3.3. Participatory action research with key stakeholders to identify and	3.3.1. Awareness materials: Market billboards/ vendors display nutrition messaging (messages identified with vendors, and through 3.1 research) (Q1 2021)		Not completed

Activity	Outputs/ milestones	Completion date	Comments
prioritize actions and that enhance local food environments. (identified through 3.1 and 3.2)	3.3.2. Report/paper: Enhancing nutritional food environments; Recommendations and priority actions for informal market (Q4 2021)	2023	Completed. Reported in 1.6.1 above Farmery et al. (2023a) – see Chapter 8.
	3.3.3. Translation outputs: Opportunities for improving nutrition in local food environments in Solomon Islands and beyond (links to 2.3 and 2.4) (Q1 2022)	2022	Completed. Reported as Food System Briefs 10, 11, and 12 in 1.11.6

Objective 4: To develop diagnostic tools to improve policy interventions in national agri-food systems and improved metrics for reporting status and progress against national, regional and global targets (25%).

Activity	Outputs/ milestones	Completion date	Comments
4.1. Synthesis of node-level diagnostic tools tested through Obj. 1-3)	4.1.1. Working paper (Q4 2022)	2023	Completed. Reported as: Boylan, S. (2023) Developing indicators for food system strengthening in the Solomon Islands. Workshop Report. Unpublished CSIRO Report. 17 pp.
4.2. Convene WG of food systems experts to design high-level agri-food system diagnostic tool	4.2.1. Peer-reviewed publication and translation outputs (Q4 2022)	2023	Completed. Reported as: Boylan, S., Brewer, T., Farrell, P., Sharp, M., Mauli, S., Tuqa, A., Boydell, E., Farmery, A. (in review) Developing indicators for food system strengthening in the Solomon Islands. <u>Frontiers in Sustainable Food Systems</u> .
4.4. Adapt and pilot test the local food environment diagnostic tool(s)	4.4.1. Paper: Food system diagnostics for application to Pacific region		Not completed.
	4.4.2. Paper on vendor typology assessment (Q3 2021)	2021	Completed. Reported as: Bogard, J.R. et al. (2021). A Typology of Food Environments in the Pacific Region and Their Relationship to Diet Quality in Solomon Islands. <u>Foods</u> , 10, 2592. https://doi.org/10.3390/foods10112592
	4.4.3. Paper: measuring dietary intake in low- and middle-income countries: A systematic review of the methods and tools for estimating fish and seafood intake	2022	Completed. Reported as: Casey, E.M.D. et al. (2023). Measuring dietary intake in low- and middle-income countries: A systematic review of the methods and tools for estimating fish and seafood intake. <u>Nutrition Reviews</u> , https://doi.org/10.1093/nutrit/nuad067
4.6. Conduct the local external food environment assessment in	4.6.1. Dataset on local food environment compiled (Q1 2022)	2022	Partially completed. Due to COVID-19 travel restrictions, field data could not be collected in KIR and VUT. Instead, the typology was adapted to application to HIES data for Solomon Islands. Two datasets were compiled: 1) Food environment typology was applied during Market Vendor survey in SLB only.

Activity	Outputs/ milestones	Completion date	Comments
target communities in KIR, SLB and VUT			2) Analysis done on the HIES data for SLB.
	4.6.2. Policy brief published for each country (SLB Q2 2021, VUT Q3 2021, KIR Q4 2021)	2023	Policy briefs for Solomon Islands and Vanuatu reported in 1.11.6 above. Kiribati not completed.
4.7. Under SPC leadership, review and refine national SDG reporting for PICs relevant to food systems	4.7.1. SPC report and policy brief (Q4 2022)	2021	Completed. Reported as: Sharp, M.K. and Andrew N.L. (2021a) Poverty, malnutrition and food security in Pacific Small Island Developing States. Bangkok, Thailand: FAO. Food Security Profiles completed with FAO for: Kiribati , Marshall Islands , Solomon Islands , Tuvalu , Vanuatu , and Wallis and Futuna
4.8. Analysis and synthesis of local food environment and identification of leverage points for improving nutrition	4.8.1. Peer-reviewed publication and policy brief describing the tool and local food environment assessment (Q4 2022)		Fieldwork not completed because of COVID-19. Reported as 4.4.2 and 4.6.2.

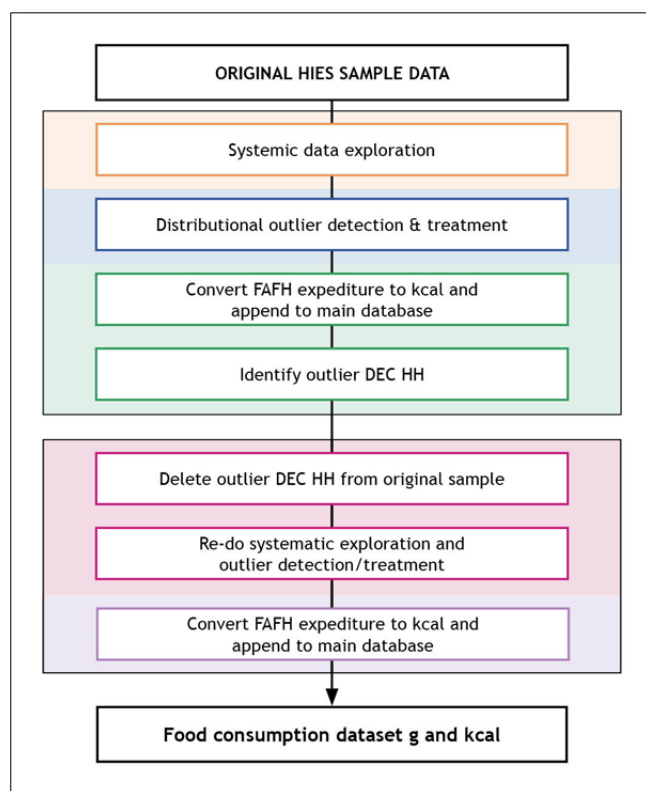
7 Key results and discussion

Here we report key results grouped by major theme or output(s). While broadly in order of Activity as per Section 6, sections are ordered by logical sequence rather than Activity number. ‘WG’ refers to Working Groups established under Activity 1.6. Not all activities and outputs are reported as ‘key’ results, a full listing of outputs and activities may be found in Section 6 Activity tables and listed as publications produced by the project in Section 10.2. Translation outputs are reported together in Section 7.1.16 rather than paired with their primary research output. Communication activities and outputs are reported in Section 8.4.

7.1 A method to clean HIES data (Activity 1.9.1, WG 5)

Overview:

Curating useable HIES datasets is a notoriously difficult and analyst-driven process. Using HIES surveys from 14 Pacific countries (COK, FSM, KIR, MHL, NRU, NIE, PLW, WSM, SLB, TOK, TON, TUV, VUT, and WLF) a method was developed to make the cleaning process both more rigorous and transparent, and therefore repeatable by other groups for other HIES.



The data cleaning process involved multiple steps and was carried out by a team of analysts from ANCORS and SPC. An overview of the complete process is provided by the figure shown at left. Sharp et al. (in prep) describes the method in detail with examples from selected PICTs as case studies to demonstrate the impacts of cleaning. The method takes a mixed-methods approach that utilizes both statistical procedures to recognize and treat outliers, and an ordered process for dealing with different dimensions of the surveys (e.g. non-standard units and food away from home (FAFH)).

Contribution to knowledge:

Global guidelines (along with other research, such as that of 7.3 below) exist for the collection of food consumption data that are produced via HIES/HCES in Low and Middle Income Countries, however the food data collected require significant processing and transformation to derive estimates of nutrient and dietary energy consumption. The food

data produced via HIES are being increasingly recognised globally as the only (in the case of the Pacific), or among the few, nationally represented estimates of food consumption, which is used in food systems related research and policy, however the lack of guidelines on food data processing has limited their production and comparability. In response to this, the United Nations Statistics Division tasked the United Nations Committee of Experts on Food Security, Agricultural and Rural Statistics (UN CEAG; formerly the Inter-Agency Expert Group on food security, agricultural and rural statistics), to develop global guidelines ‘Processing Food Consumption Data from Household Consumption and Expenditure Surveys (HCES)’ (see Section 7.1.30). The global guidelines were based, in part, on the food data processing protocols developed by the project, and the experience

in processing the food data to prepare the Pacific Food Consumption Database (described below in 7.1.2; see also Section

Application:

The method has enabled the construction of the Pacific Food Consumption Database (PFCD). This integrated regional database is now the standard SPC platform for analysis of food acquisition and consumption in the region. More broadly, the method developed is applicable as a protocol for HIES survey methodologists to follow when processing food consumption data. The method is documented (as reported below) to serve as a manual for household survey statisticians in the processing of food data and harmonizing it to be added to the PFCD.

Reported as:

Sharp, M.K., Troubat, N., Kottage, H., Menaouer, O. and Andrew, N.L. (in prep). Processing food data sourced from household consumption expenditure surveys and construct of the Pacific Food Consumption Database. Journal TBD.

7.2 Methodological issues in the design of HIES (Activity 1.9, WG 5)

Overview:

Method to collect consumption data for poverty and food policy. In the Pacific region, HIES have historically gathered expenditure data using open form diaries completed on paper. This methodology is costly to governments, burdensome for respondents, and takes substantial time to process results. These high costs were driven mainly by the need for interviewers to remain in villages for three weeks to oversee 14-day diaries for consumption data. As a result, HIES have been fielded only infrequently, with an average gap of nine years between national surveys in the region. These gaps, coupled with the time required to clean and process diary data, limit the usefulness of data from these surveys for national policy development and interventions based on trends in food acquisition and consumption. Noncompliance and partial compliance in diary keeping can artificially inflate poverty measures, biasing economic statistics.

Variable costs for the status quo diary survey design are between 2.8 and 4.4 times more expensive than a single-visit seven-day recall survey, which is the globally recommended method to collect consumption data via household surveys, with the tablet-based diary being even more costly. The highly monitored diaries give similar results to recall but at much greater cost; the status quo yields data of worse quality as effective completion rates with low monitored diaries are only two-thirds the completion rates of recall-based options.

Method to collect and estimate dietary energy consumption away from home. The consumption of food away from home, such as in restaurants and cafes, presents an emerging challenge to household survey practitioners as food away from home is a rapidly growing source of dietary energy consumption (in the USA, FAFH accounts for more than half of total dietary energy consumption) and its share in total dietary energy consumption is increasing globally. Consumption of FAFH was traditionally collected via one-household level-question on expenditure at restaurants and cafes, however this is then subject to statistical imputation to estimate dietary energy consumption and, with FAFH becoming so important with respect to food expenditure and consumption, more rigorous data collection is recommended. The current global recommendation to collect consumption of food away from home still only collects consumption expenditure (not quantity) and upwards of 50 percent of dietary energy consumption is therefore estimated via imputation and assumption when generating dietary energy consumption which is required when producing statistics on food poverty, consumption and nutrition. If food away from home accounts for 50 percent of dietary energy consumption, half of total dietary energy consumption is imputed, and this is becoming an increasing problem when it comes to data quality, particularly when they are used to estimate diet composition. To address this problem, SPC and Samoa Bureau of

Statistics implemented a survey experiment to test the validity of global recommendation in collecting and processing food away from home consumption data sourced from HIES.

Contribution to knowledge:

Method to collect consumption data for poverty and food policy. The objective of this research was to understand the implications of the choice of survey design – both mode and consumption measurement methodology - for poverty measurement in the Pacific Islands context. The experiment demonstrated that the choice of method matters to respondent participation, which

could either compound or offset errors, and introduce bias during the questionnaire completion process. The finding that recall data collection is the recommended method to collect consumption data is of global significance. The findings provide a basis for hope that regions like the Pacific, where some countries are far from meeting the 2030 poverty goals, could develop a much more effective poverty monitoring. Sharp et al. (2022) reports findings from an experiment in the Marshall Islands comparing the cost and accuracy of several collection methodologies.

Method to collect and estimate dietary energy consumption away from home. This research provides a protocol for more rigorous

collection of consumption of food away from home, as well as testing key assumptions made during food data processing. The results will directly improve understanding of composition of food consumption in Samoa and will be of interest globally as numerous countries struggle with the measurement of consumption away from home. Sharp et al. (in prep) reports the study protocols and preliminary findings.

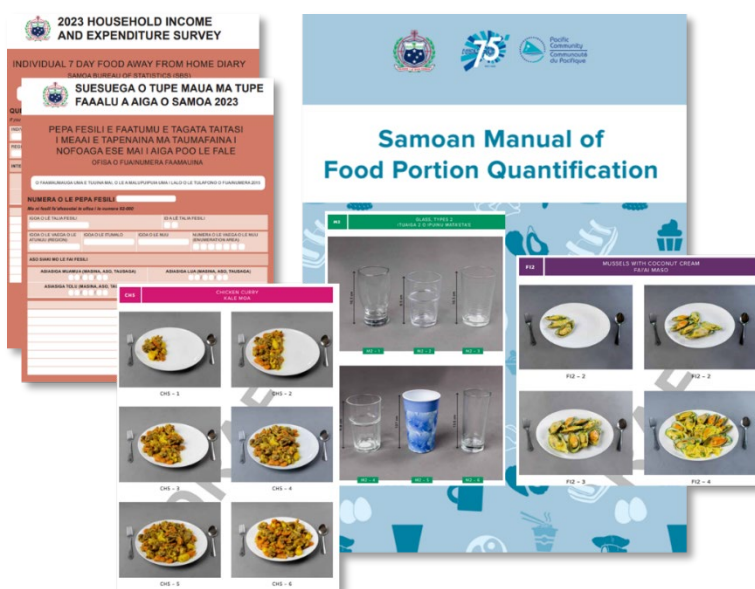
Application:

Method to collect consumption data for poverty and food policy. The experiment in the Marshall Islands tested the recommendation of the World Bank and FAO on the methodology to collect food consumption data via household surveys in a Pacific Island setting. The results of the experiment were presented to the Pacific Statistics Methods Board for their consideration and recommendation and, following endorsement by the Board, the recommendations of the experiment have resulted in the uptake of the new method for the national surveys of RMI (2019), VUT (2019), KIR (2019), WLF (2019), TON (2021), WSM (2022) and TUV (2022).

Method to collect and estimate dietary energy consumption away from home. The field work for the survey experiment will be completed in December 2023 and the results published in 2024. The adoption of a dedicated FAFH module has increased the share of consumption away from home in three of the four recently completed surveys in the Pacific, with the exception of in Vanuatu where FAFH expenditure remained on-par with those surveys without a dedicated FAFH module.

Reported as:

Sharp, M.K., Buffiere, B., Himelein, K. et al. (2022b) Effects of Data Collection Methods on Estimated Household Consumption and Survey Costs: Evidence from an Experiment in the Marshall Islands. World Bank Group Policy Research Working Paper 10029, 37 pp.



Sharp, M.K., Troubat, N., Raikoti, T., et al. (in prep). Survey methods to improve data collection and estimation of food consumed away from home: protocols from an experiment conducted in Samoa.

7.3 Pacific Food Consumption Database (Activity 1.2 and 1.9, WG 6)

Overview:

The Pacific Food Consumption Database (PFCD) comprises a set harmonised and nationally representative household food consumption data derived from HIES surveys of 14 PICTs conducted over a period of 2012 to 2019. The PFCD consists of data from 22,365 households from COK, FSM, KIR, MHL, NAU, NIE, PLW, WSM, SLB, TKL, TON, TUV, VUT, WLF. Excluding PNG, this sample represents ca. 5% of households in the region and 2.0%, 5.5 % and 4.4 % of households in the respective sub-regions of Melanesia (excluding PNG), Micronesia and Polynesia.

In addition to data on food acquisition and apparent consumption, the PFCD includes anonymised data on characteristics of the household and its members, such as participation in agriculture, education attainment and geographic data. This public good database offers significant opportunity for those wanting to understand acquisition and apparent consumption patterns for Pacific Island countries, sub-regions and the region as a whole.

Contribution to knowledge:

The PFCD is a unique compilation of food consumption data from the most recent HIES conducted in the Pacific Island countries. The PFCD is being used at the national level to develop national food profiles and consumption reports as outputs. When combined in a harmonised regional database along with the household characteristic variables, they provide a unique opportunity to characterize food consumption across numerous Pacific population. Important variables include where people live in the three sub-regions of Melanesia, Micronesia and Polynesia, in urban and rural areas, in rich and poor households, or those with a female head or one with low or high levels of education or access to safe drinking water. The database is, furthermore, dynamic in the sense that it provides information on food consumption composition by numerous food classifications and source, which allow for characterisation of diets and production of statistics by food groups (e.g., see above figure).

Application:

The database is being documented and is under peer review, however there are concurrently papers being produced on commodity consumption (fish, chicken, rice, and wheat), and opportunity for numerous other thematic national and regional analyses. The database, once published and upon completion of the peer review, will be made available for download via the SPC Pacific Data Hub – Microdata Library for use in applied research.

Reported as:

SPC (2023). The Pacific Food Consumption Database. V1. Curated database housed by SPC. Not publicly available until peer review completed and permissions resolved with national governments.

7.4 COVID responses (Activities 1.6 to 1.8, WG 1)

Overview:

The COVID-19 pandemic had an immediate and profound impact on Pacific food systems despite not actually 'landing' in the region until later than Pacific rim countries. The start of the pandemic coincided with the first six months of the project. The vulnerabilities of the Pacific Island food system

were in many ways highlighted and exacerbated by coping measures adopted to mitigate the spread of COVID-19.

The project focused on providing information as requested on an ad hoc basis, establishing baselines, and identifying key pathways of impact on food systems, and opportunities for Pacific food systems to adapt and show resilience during these difficult times.

SPC SDD produced a series of national pre-COVID baseline metrics summarizing a range of socio-economic variables in nine PICTs. (Farrell et al. 2020). In Reeve et al. (2023), we examined global evidence for food taxes as an avenue to support the post-COVID recovery.

Outputs from Solomon Island’s COVID response are reported in Section. 7.1.11.

Contribution to knowledge:

In Farrell et al. (2020), we hypothesised the key pathways of impact of the COVID-19 pandemic on Pacific food systems and identified opportunities to strengthen Pacific food systems. We presented import-export data and showed that domestic production has declined over recent decades while production has increased. We drew on available literature and expertise of Pacific food system

specialists to analyse the key potential food system impacts. Our analysis suggested that bolstering regional production and intraregional trade in a currently import-dependent region could strengthen the regional economy and provide the health benefits of consuming locally produced and harvested fresh foods – as well as decreasing reliance on global supply chains. However, significant production, processing, and storage challenges remain and would need to be consistently overcome to influence a move away from shelf-stable foods, particularly during periods when human movement is restricted and during post-disaster recovery.

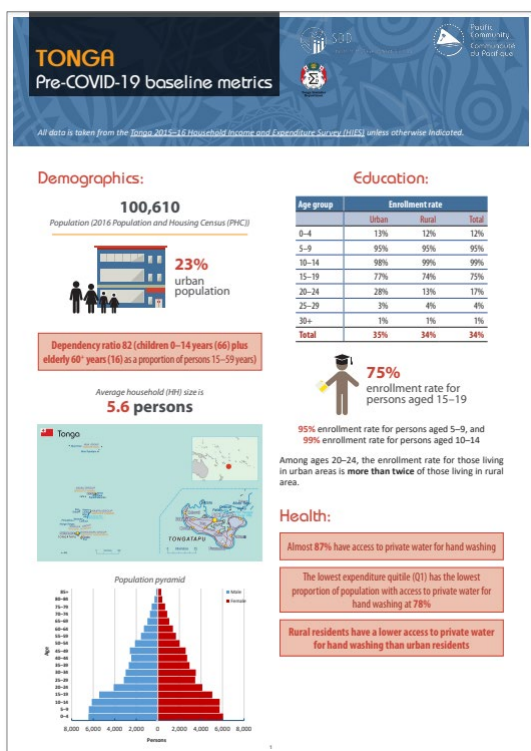
Reeve et al. (2023) showed that for economies in post-COVID-19 recovery, fiscal policy instruments such as taxes on unhealthy foods and subsidies for healthy foods have been recognised as a win-win for government revenue and public health gains. The analysis identified strategies and approaches to overcome barriers for many Pacific Island countries, including a lack of cohesive evidence on “how” to establish food taxes and subsidies.

As part of WG 1, the project produced a series of Briefs for DFAT summarizing elements of the regional food system likely to be impacted by COVID-19. Of particular interest to DFAT in the dynamic and uncertain early days of the pandemic were potential impact on the supply and affordability of imported staples.

Application:

Farrell et al. (2020) proposed that working through COVID-19 may strengthen the ability of sectors to work together in more coordinated integrated ways. The paper has been cited 160 times, including in FAO and ACIAR translational reports for Pacific food system policy.

Reeve et al. (2023) and the related translational ‘toolkit’ (in prep) supports post-COVID-19 recovery through operationalising food taxes as a critical revenue opportunity in the Pacific.



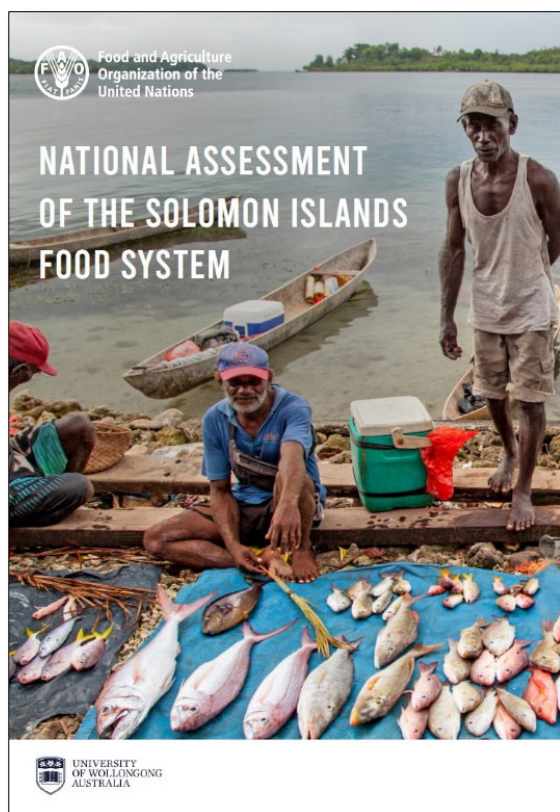
Reported as:

- Andrew, N.L., Brewer, T.D., Sharp, M.K. (2020a) Trends in rice imports to the Pacific region. Unpublished Information Brief to DFAT/ACIAR. 2pp.
- Andrew, N.L., Brewer, T.D., Sharp, M.K. (2020b) Import of dominant commodity groups to Pacific Island Countries and Territories (PICTs). Unpublished Information Brief to DFAT/ACIAR. 3pp.
- Brewer, T.D., Andrew, N.L., Sharp, M.K. (2020b) Trends in Wheat and Wheat flour imports to the Pacific region. Unpublished Information Brief to DFAT/ACIAR. 2pp.
- Eurich, J., Sharp, M.K., Andrew, N.L., Brewer, T.D., (2020) Per capita production of starchy vegetables (SV) through time in the Pacific region. Unpublished Information Brief to DFAT/ACIAR. 3pp.
- Farrell, P., Thow, A. M., Wate, J. T., Nonga, N., Vatucaawaqa, P., Brewer, T. et al. (2020). COVID-19 and Pacific food system resilience: opportunities to build a robust response. Food Security, 12(4), 783-791. doi:10.1007/s12571-020-01087-y.
- Pacific Community (2021a) Cook Islands: Pre-COVID-19 baseline metrics.
<http://purl.org/spc/digilib/doc/xzhkd>
- Pacific Community (2021b) Federated States of Micronesia: Pre-COVID-19 baseline metrics.
<http://purl.org/spc/digilib/doc/5fzd7>
- Pacific Community (2021c) Nauru: Pre-COVID-19 baseline metrics.
<http://purl.org/spc/digilib/doc/mqi4h>
- Pacific Community (2021d) Niue: Pre-COVID-19 baseline metrics.
<http://purl.org/spc/digilib/doc/gcu42>
- Pacific Community (2021e) Tokelau: Pre-COVID-19 baseline metrics.
<http://purl.org/spc/digilib/doc/ajukg>
- Pacific Community (2021f) Tonga: Pre-COVID-19 baseline metrics.
<http://purl.org/spc/digilib/doc/qt374>
- Pacific Community (2021g) Tuvalu: Pre-COVID-19 baseline metrics.
<http://purl.org/spc/digilib/doc/kdzrz>
- Pacific Community (2021h) Palau: Pre-COVID-19 baseline metrics.
<http://purl.org/spc/digilib/doc/3w7dd>
- Pacific Community (2021i) Solomon Islands: Pre-COVID-19 baseline metrics.
<http://purl.org/spc/digilib/doc/m3fvq>
- Reeve, E., Ravuvu, A., Johnson, E., Nasinga, S., Brewer, T., Mounsey, S., Thow, AM. (2023) Scaling up food pricing policies in the Pacific: a guide to action. BMJ Global Health, 8: e012041. <https://doi.org/10.1136/bmjgh-2023-012041>
- Reeve, E., Johnson, E., and Thow, A.M. (in prep) Scaling up food pricing policies in the Pacific: a guide to action. Toolkit, SPC.
- Sharp, M.K. (2020) Fruit and Non-Starchy Vegetable (FSNV) production in the Pacific region. Unpublished Information Brief to DFAT/ACIAR. 4pp.

7.5 Solomon Islands national food system (Activity 1.6, WG 2)

Overview:

A well-functioning Solomon Islands food system is critical for economic, physical and social wellbeing, and for environmental sustainability, yet many aspects of the system are currently considered to be underperforming. The Solomon Islands food system is predominantly rural and subsistence-based, with agricultural production dominated by staple crops, most of which are



produced by the household in which they are consumed or are shared with kin and community. The range of accessible and affordable foods is limited, meaning dietary diversity is generally low. Domestic supply chains are typically short, however, imported foods are increasingly part of the national diet, particularly in urban areas.

Domestic food production is increasing, but has declined on a grams per capita per day basis. Around 93 percent of households cultivate crops and more than half of rural households engage in fisheries. Imports of food and beverages, predominantly rice, wheat and wheat flour, are an increasingly notable component of the national food system. The exchange of food between producers and consumers occurs through a diverse range of pathways with strong social ties that often do not constitute a standard supply chain. Most food is acquired directly through people growing or wild harvesting. Not all households have access to a balanced diet, as fewer than one household in five reaches adequate amounts of proteins, fats and carbohydrates. Most people below the food poverty line live in rural areas and there is a degree of inequality in the distribution of dietary energy supply, particularly for vulnerable groups.

Solomon Islands have many policies relevant to food systems. A key policy overseeing all elements of the food system is the Solomon Islands Agriculture Sector Growth Strategy and Investment Plan 2021–2030. Building on current policy priorities and actions, there is an opportunity to reorientate policy from its current focus on economic issues, to further consider environmental and health impacts of the food system. There is an opportunity for provincial governments to take a more active role in food system planning and activities.

Solomon Islands' strong connection to traditional systems, in combination with development partnerships, creates a unique opportunity to undertake actions that simultaneously provide sustainable, affordable and healthy diets for the whole population as well as good livelihood opportunities.

Based on consultations and analyses the report identifies three key pathways for food system change. These pathways are centred on different scales (provincial, national inward-looking and national outward-looking) but overlap and interact in important ways. They promote prioritisation of rural areas alongside urban areas, and forging of strong connections between them for national prosperity. The pathways identified recognize areas of strength that are already being supported and that do not need to be “transformed” as much as they need to be strengthened to continue their positive trajectory.

Contribution to knowledge:

This report makes a significant contribution to food systems analysis. It is one of the first examples of food systems research that is place-based and covers a national food system. It is a timely contribution to the evolution of food systems research for development as the majority of food systems research and frameworks have been developed in North America and Europe and are not always relevant to the Pacific context.

Application:

Solomon Island food system stakeholders, including key government representatives, private sector and community groups, were key contributors to this report. In addition, the report was co-authored by Solomon Islander researchers and food system practitioners. These contributors co-developed pathways for food systems transformation that recognized areas of existing strength that are already being supported and that do not need to be “transformed” as much as they need to be strengthened to continue their positive trajectory. The involvement of government stakeholders in these pathways will help ensure their contribution to the development of more coherent food system policy and also support the implementation of policy that improves food systems for Solomon Islanders.

Reported as:

Farmery, A.K., Andrew, N.L., Brewer, T., Maelaua, J., Maui, S., Scott, J., Reeve, E., Farrell, P., Johnson, E., Thow, A., Sharp, M.K., Troubat, N., Bogard, J.R., Boylan, S., Gonzalez, I., Nonga, N., Eriksson, H., Tutuo, J. (2023a) National Assessment of the Solomon Islands Food System. FAO. <https://doi.org/10.4060/cc4175en>

Six policy briefs were produced based on this report. These are reported under Section 7.1.17 as Briefs 7 to 12, see also Section 10.2.

7.6 Regional food system governance (Activity 1.6, WG 3)

Overview:

Ensuring food systems deliver desirable social, environmental, and economic outcomes requires robust governance structures that help to create coherence between food system actors and policies. The Pacific region is a leader in integrated food system governance. Thus, understanding the barriers and enablers that shape the dynamic of regional and national food system governance structures in the Pacific can provide valuable insights to strengthen existing governance structures in this and other low- and middle-income country regions.

In Thow et al. (2022), we investigated regional food system governance structures and their role in supporting PICTs to strengthen food systems to achieve better social, environmental, and economic outcomes. By undertaking a qualitative policy analysis informed by interviewee and documentary data, we provided insights into how the region is shifting towards an integrated food system governance approach, partially fuelled by the COVID-19 pandemic. However, despite the major progress the Pacific Island region made in food system governance in the recent decade or so, our research revealed that the translation of regional food system policy guidance to the national level is often challenging. Therefore, in Patay et al. (2023), we investigated the barriers and opportunities to strengthen the translation of regionally developed food system policy guidance to national level.

Through a theory-informed analysis of the dynamic of regional and national level food system governance, we provided insights into the nature of the translation problem and the opportunities to strengthen this regional-national dynamic.

In addition to the national analyses implemented by the project, we supported publication of additional analyses for Tuvalu, Wallis and Futuna and the Republic of the Marshall Islands.

Contribution to knowledge:

Our studies on regional food system governance made original contribution to theoretical and empirical knowledge. We produced the first comprehensive analysis of the institutional, ideational, and interest-based conditions that shape food system governance in a region, and provided a theoretical, conceptual, and analytical approach to expand knowledge on food system governance. We created new knowledge on the structures and characteristics of effective regional food system governance in three ways. Firstly, we not only revealed the strengths and weaknesses of regional food system governance in the Pacific Island region, but provided insights into how these structures can be improved. Second, we conducted a comprehensive analysis of the institutional, ideational, and interest-based conditions that shape regional food system governance and its dynamic with national level structures and actors. Third, we have established a theory-informed analytical approach that can be applied in other LMIC regions, and which can offer lessons for further food system governance research.

We found that a regional approach to food systems can help PICTs to cope with shared and interconnected challenges, strengthen multisectoral and multi-stakeholder coordination, and improve dialogue and alignment between national, regional, and global level actors. Our results highlighted three opportunities to strengthen regional food system governance: (i) the diffusion of the 'food systems lens' that recognises broader food system objectives – social, economic and environmental outcomes – beyond sectoral objectives, leading to a focus on harmonisation between food system actors and policies; which leads to (ii) new approaches to multisectoral coordination; and (iii) strengthening feedback mechanisms from national and community levels to regional level.

Our research also revealed that difficulties of translating regional policy guidance lie in (i) the high, multi-faceted demands on limited national resources and the complexity of financing multisectoral policy implementation; (ii) the variable dialogue between regional and national level actors; and (iii) the perceived incoherence of social, environmental, and economic priorities in the currently dominant policy paradigms. Our study suggests three opportunities to address these issues: (i) establishing a regional food system governance structure (in the shape of formal or informal regional forum or a designated joint governance body), supported by national level multisectoral food system governance arrangements; (ii) establishing or strengthening accountability mechanisms in these mechanisms; and (iii) supporting the spread of the policy paradigm that sees the balanced focus social, environmental, and economic imperatives possible and necessary.

Application:

This research has showcased regional governance structures that span relevant sectors to improve policy coherence for food systems, nutrition and environmental sustainability. Our results have informed efforts to strengthen food system governance and policy guidance in the region. The outputs informed the latest regional decisions – suggested by FAO and endorsed by the Pacific Ministers for Agriculture and Forestry – to investigate the establishment of a regional food system coordinating forum or hub. Our outputs were also cited in several regional food system governance documents, and have informed the Vanuatu and Solomon Islands in their efforts to strengthen food system governance. In addition, the project outputs are informing the design of a \$100 M program of the Australian Government in Solomon Islands, the Health Sector Support Program Phase 4.

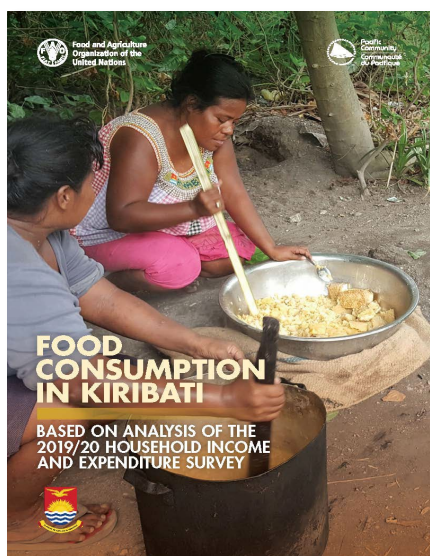
Reported as:

Thow, A.M., Ravuvu, A., Iese, V., Farmery, A., Mauli, S., Wilson, D., Farrell, P., Johnson, E., Reeve, E. (2022a) Regional Governance for Food System Transformations: Learning from the Pacific Island Region. *Sustainability*, 14, 12700. <https://doi.org/10.3390/su141912700>

Patay, D., Ravuvu, A., Iese, V., Wilson, D., Mauli, S., Maelaua, J., Farmery, A., Farrell, P., Reeve, E., Johnson, E., and Thow, A.M. (2023). Catalysing sustainable development through regional food system governance: strengthening the translation of regional food system policy guidance to national-level in the Pacific. *Sustainable Development*. <https://doi.org/10.1002/sd.2732>.

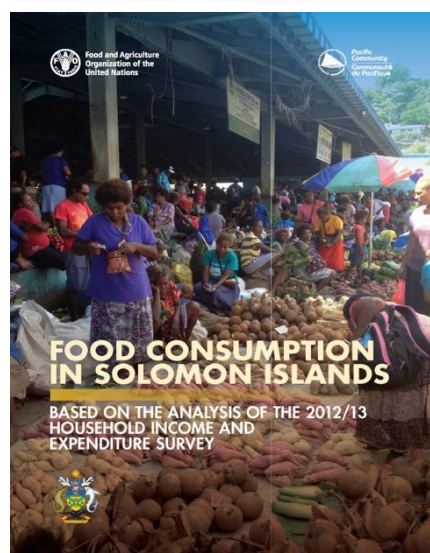
7.7 National food security profiles (Activity 1.6, WG 4)

Overview:



Led by SPC SDD, and implemented by Nathalie Troubat and Michael Sharp in collaboration with national statistics offices, the project completed a series of reports summarizing national food acquisition and consumption. Reports summarizing food security and consumption patterns for Solomon Islands, Vanuatu, and Kiribati were produced as project outputs; others are summarized in Section 7.1.30 as related outputs.

The reports are based on national household income and expenditure surveys (HIES) and utilize the FAO/WorldBank software ADePT-FSM to provide consistent food and nutrient consumption statistics from food consumption data collected in HIES. The reports provided, sometimes for the first time, comprehensive analysis of food security in PICTs, and are unique in their breadth of coverage and standardization of analysis. The national reports for Solomon Islands, Kiribati, Marshall Islands and Vanuatu were part of a larger and expanding series of national food security analyses, part of which was report under project FIS/2016/300.



Based on these in-depth analyses, a series of national profiles were produced to provide snapshots for a range of SDG-oriented indicators. Information is included on demographics, poverty, food security, food consumption, nutrition, and the adequacy of diets. At time of writing profiles had been completed for eight PICTs. National Poverty and Food Security Profiles are available at: <https://sdd.spc.int/food-systems>; three are cited here as project outputs.

Contribution to knowledge:

The national profiles produced provide, for the first time, comprehensive snapshots of food insecurity in each of the countries surveyed. As such they provide unique contributions to understanding of food security in the region.

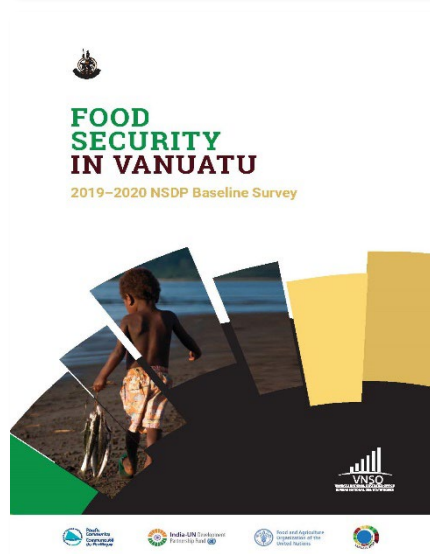
Application:

Based on national surveys implemented with national agencies, the findings are already embedded in national policy making, SDG reporting and supporting regional policy development. The relative dearth of empirical evidence to provide baselines for change makes these national summaries critical resources for future analyses of food insecurity and its drivers.

Reported as:

Troubat, N. and Sharp, M.K. (2021a) Food consumption in Kiribati. Tarawa, Kiribati: FAO and SPC. <https://doi.org/10.4060/cb6579en>

Troubat, N., Sharp, M.K. and Andrew, N.L. (2021b) Food consumption in Solomon Islands. Honiara, Solomon Islands: FAO and SPC. <https://www.spc.int/DigitalLibrary/Get/p7zkm>



Vanuatu National Statistics Office (2021) Food Security in Vanuatu: 2019-2020 NSDP Baseline Survey. Port Vila, Vanuatu: VNSO. https://sdd.spc.int/digital_library/food-security-vanuatu-2019-2020-nsdp-baseline-survey.

7.8 Wheat (Activity 1.6, WG 8)

Overview:

Wheat is a major component of Pacific diets, rivalling rice in terms of per capita consumption (see 7.1.16). Consumption varies significantly among PICTs. Wheat is not grown in any PICTs. All wheat is imported, with the vast majority of imports coming from Australia, primarily as cereal to PICTs with milling facilities including Papua New Guinea, Solomon Islands, New Caledonia and Fiji. Nutritionally significant quantities of wheat are then exported around the Pacific, particularly from Fiji. Unlike rice, wheat has relatively complex supply chains because of more complex processing and because it is a component of numerous baked foods. Wheat is also cheaper than rice on a price per unit basis. Additionally, wheat is generally fortified, adding vital nutrients to Pacific diets which would otherwise be lacking. Wheat has been overlooked in terms of its contribution to the Pacific Food System and is deserving of detailed investigation.

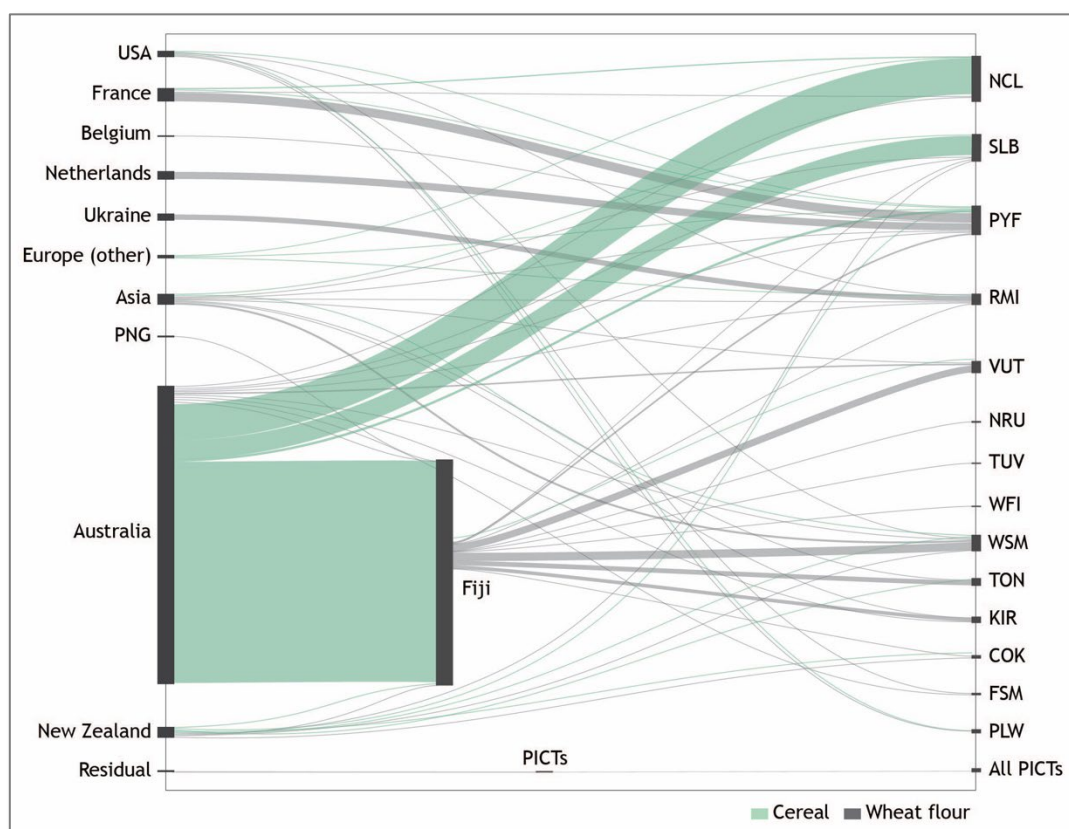


Figure. Relative annual average (2014-2018) flows of wheat cereal and wheat flour (edible equivalent) from exporting countries to country of consumption.

At time of reporting, a policy brief on wheat imports has been published and a paper is in preparation. The paper is focused on 'wheat in the Pacific food system' including imports, domestic processing and trade, consumption, and nutrition. The Pacific Food Trade Database and the Pacific Consumption Database (both products from this project) are instrumental in conducting this regional analysis. The analysis will be supplemented with nutrition information from the Pacific Nutrient Database and input from regional and national experts.

Contribution to knowledge:

The analysis highlights regional dependence on wheat and food security vulnerability associated with import dependence exacerbated with global shocks (e.g. Ukraine war and COVID-19) and dependence on a single importing country. The paper will provide an overview on the past, present and future role of wheat in the Pacific food system to forecast opportunities and constraints in enabling future food security and nutrition.

Application:

Wheat is largely invisible in narratives around food security and nutrition in the Pacific. This work will highlight wheat, providing new knowledge and support regional and national policy related to import dependence and food security.

Reported as:

Brewer, T.D., Andrew, N.L., Kottage, H. et al. (in prep) Wheat in the Pacific Food System. Journal TBD.

7.9 The rise and rise of chicken in Pacific Food Systems²⁵ (Activity 1.6 WG 7)

Overview:

The Pacific region is in the midst of a nutrition transition from traditional to more Western dietary patterns characterised by excess consumption of calories, saturated fat, salt and refined carbohydrates, contributing to a rapid rise in obesity and related non-communicable diseases. From a food system perspective, this transition manifests itself in changes in production, distribution and acquisition of food, and is reflected in food system outcomes, including environmental and public health outcomes. These current trends across the food system are neither healthy nor environmentally sustainable.

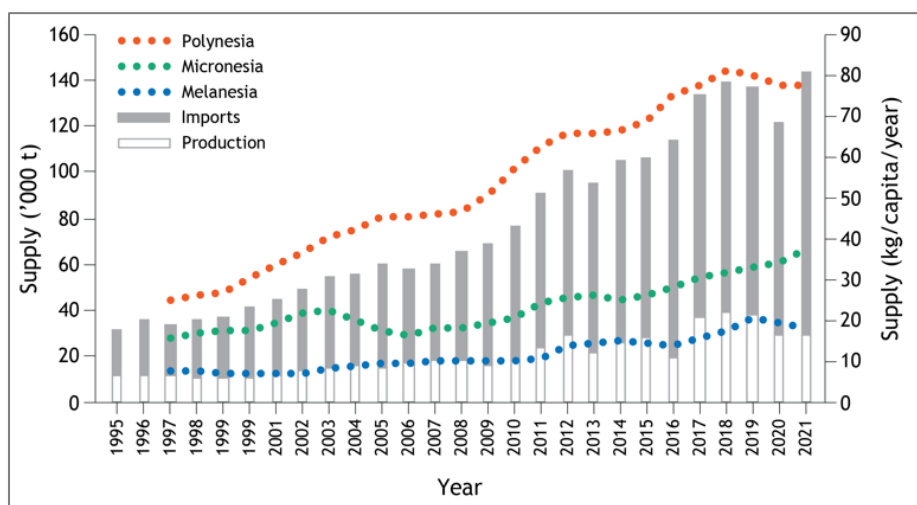
In this analysis, we examine the evolution of the Pacific food system through the lens of poultry, particularly chicken. While we recognise understanding food systems and nutrition requires a broader context and analysis of the whole diet, this rapidly evolving commodity in the diets of Pacific people offers a window into the transition underway. Specifically, we analyse dimensions of production, international trade, and acquisition and apparent consumption of poultry in the Pacific region guided by food system conceptual frameworks. We also explore the implications of this transition in terms of nutritional quality of diets.

Contribution to knowledge:

Supply of chicken throughout the Pacific has risen sharply over the last 3 decades growing nearly 5-fold from 31,500 t in 1995 to 143,900 t in 2021, driven predominantly by imports (see adjacent Figure). Imports to the region have increased by nearly 6-fold from 19,900 in 1995 to 113,700 t in 2021 in contrast to domestic production which has grown just over 2.5-fold during this time. Supply changes are most dramatic in Polynesia growing from 25 kg/capita/year in 1997 to 77 kg/capita/year in 2021, with slower growth from a smaller base in Micronesia (16 – 37 kg/capita/year) and Melanesia (7.7 – 18 kg/capita/year) over the same period. USA is the dominant origin of chicken imports to the region, supplying Samoa, French Polynesia and Tonga, followed by Australia and New Zealand supplying PNG and other Melanesian countries.

²⁵ *In homage to Iese V. et al. (2018) Facing food security risks: The rise and rise of the sweet potato in the Pacific Islands. Global Food Security 18, 48-56.*

Unsurprisingly, consumption has followed this trend, most notably in Polynesia from a higher base level and at a faster rate from 50 g/person/day in 1995 to 180 g/person/day in 2021, followed by Micronesia (37-87 g/capita/day) and Melanesia (7-17 g/capita/day). The growth in chicken consumption throughout the Pacific has mixed implications for the multiple burden of malnutrition.



On the one hand, chicken and eggs are rich sources of high-quality protein and bioavailable micronutrients. Increased consumption by those suffering from undernutrition and groups with heightened nutritional requirements such as infants, young children and pregnant and lactating women, will have health benefits. However, in cases where chicken consumption contributes to

overconsumption of calories as well as specific nutrients such as saturated fat or sodium, chicken consumption may be contributing to increased overweight, obesity and associated NCDs. When considered relative to total animal-source foods, it is likely that chicken consumption is contributing to overconsumption of body-building foods throughout Polynesia as well as Palau and urban consumers in Marshall Islands. Chicken consumption may also be contributing to declines in micronutrient adequacy in cases where chicken has substituted healthier animal source food such as fish and other aquatic foods as has been observed elsewhere.

Application:

This analysis highlights the utility of triangulating three major data outputs produced in this project: 1) the Pacific Food Trade Database, 2) the integrated Household Income and Expenditure Database and 3) the Pacific Food Composition Database, to understand how food systems are evolving in the region. This approach allows exploration of the Pacific food systems transition and represents a major and unique contribution to the literature in a region that is otherwise plagued by data gaps or missing entirely from other global and regional analyses.

The analysis reveals rapid shifts in consumption driven by trade liberalisation policy which has allowed rapid increase in supply of chicken via imports, predominantly from the USA and Australia. The nutritional implications of increased chicken consumption vary throughout the region with likely net positive benefits for some consumers that are nutritionally vulnerable, but likely larger net negative impacts on other consumers, throughout Polynesia and particularly urban consumers where chicken is contributing to overconsumption. This paper contributes to the body of evidence required to inform food systems policies that extend beyond economic outcomes to consider health and social equity dimensions of food systems.

Reported as:

Andrew N.L., Kottage H., Hegoda Arachchi N., Brewer T., Bogard J. (in prep). The rise and rise of chicken in Pacific Food Systems. Target journal: Global Food Security.

7.10 Options for supplying dietary protein in the Pacific (Activity 1.6 WG 7)

Overview:

Pacific diets have changed dramatically over the past ~50 years. A transformation from mostly domestic production of fruits and vegetables, including root crops and fish and invertebrates, to dependence on imported cereals, meat and highly processed foods has contributed to significant non-communicable disease challenges across the region. Populations continue to grow and urbanise, particularly in Melanesia, and nearby inshore fish stocks increasingly show signs of localized depletion. When the potential effects of climate change, on both domestic production and imports, are also considered there is an urgent need for guiding food system policy and activities towards food security and nutrition through healthy domestic sources. Tuna resources have significant potential to improve nutrition across the region, including to more marginalised populations, and enhance domestic food sovereignty, reducing food security risks associated with global shocks.

Across five chapters, Brewer et al. (2023) summarises the latest data spanning public health, food consumption, food nutrition composition, food pricing, and projected future fish requirements given population growth and dietary protein requirements. This set of analyses is then synthesised in the context of climate change and other plausible drivers of food security and nutrition outcomes across the region.



The analysis primarily draws from databases developed through activities in FIS/2018/155, including the Pacific Food Trade Database, the Pacific Food Consumption Database and the Pacific Nutrient database.

Contribution to knowledge:

This report has filled a number of regional food security and nutrition knowledge gaps.

Combined the report offers novel analysis to provide insight into current and future dietary patterns and options for improving food security and nutrition, given population growth and projected climate impacts on coastal fisheries. Specifically, the report summarises per capita consumption of protein intake across Pacific Countries, highlighting dominant protein sources including cereals, imported chicken and coastal and reef fish. Average prices (in US\$) of different food groups across countries are reported for the first time, highlighting disparities in affordability of different foods, with significant variation between countries. We also calculate future protein requirements, given body mass index estimates and population projections. This analysis, in addition to highlighted projected shortfalls in available protein, estimates the required increase in tuna harvest and consumption required to ensure adequate protein consumption.

Application:

This report contributed to a significant SPC-led grant application to the Green Climate Fund. The report provides concrete evidence of the potential for tuna and other foods to supply future food needs to growing Pacific populations facing the adverse effects of climate change. The report is central to securing this funding which will be used to develop multiple practical strategies for increasing the supply of tuna for Pacific populations. The presented data is also of value to national governments to assess consumption patterns across a diverse range of foods to better plan for future food security and nutrition.

Reported as:

Brewer, T., Kottage, H., Andrew, N.L. (2023). Options for supplying dietary protein for growing

Pacific Island populations. Report prepared for the Pacific Community. 94 pp.

Kottage, H., Bogart, J., Brewer, T., Sharp, M., Andrew, N. et al. (in prep) Protein consumption and the sources of protein in the Pacific diet. Target journal: Food Security.

7.11 Continuity and change in Pacific food systems (Activity 1.10)

Overview:

The Pacific food system has become progressively more integrated into global food regimes. The region is profoundly dependent on fisheries as well as globalized trade in food commodities, and so is vulnerable to trade dynamics and a range of other external drivers, most notably climate change. This integration has had impacts on availability and consumption of food, population health, and vulnerability to external drivers.

Given this context, there is a surprising dearth of region-scale analyses of food system trends. Previous national case studies have shed light on patterns and linked these to historical political events and trade policy, including in the Pacific region but regional and sub-regional analyses have been largely absent. Here we summarize three strategic articles that theorize Pacific food system research to provide a foundation for empirical studies.

In Andrew et al. (2022) we characterized the contemporary Pacific food system to better understand possible transitions towards improved health and sustainability. We describe major elements of the contemporary food system to provide a foundation for analysis of food system transitions and public health outcomes. Although crop production has doubled in the last fifty years, it has not kept pace with population growth. This deficit is increasingly filled by imported foods, particularly staples, meat and sugar. The burden of malnutrition and poor health outcomes are increasingly apparent. We propose seeds for transitioning the Pacific food system to a hybrid form that supports historical continuity with healthy regionally-produced food. We propose a 'localized modernity' framing of these transitions toward food systems that better serve Pacific people.

In Golden et al. (2021) we developed these themes of path dependence to argue that it is the feedback between coupled socioeconomic and natural dynamics within food systems that reinforces specific nutritional outcomes, and may result in a social-ecological trap. Improving both nutritional and environmental outcomes of food systems requires understanding the underlying drivers of each, and how they interact and reinforce each other. Only in recognizing these interactions and coupled dynamics will economic, governance, and environmental policies be positioned to address these food system challenges in an integrated fashion.

Contribution to knowledge:

Both Andrew et al. and Golden et al. contribute to a tradition of articles that seek to frame the Pacific food system in ways that capture broad patterns and drivers while acknowledging the great diversity of national food systems. Food system models may be critiqued as being static and ahistorical; yet useful insights can be drawn from understanding the way food systems evolve and are shaped by larger forces as well as innovations and threats within their domain. Andrew et al. merge the 'food regime' concept used at larger, global scales to theorize the political economy of agrarian change with the multi-level perspective on socio-technical transitions.

Application:

Together these theories offer an approach to understanding and influencing the evolution of the regional food system and its national components. Both papers are relatively new but are widely cited and continue to guide how we theorize empirical work in our projects. Both have influenced SPC's thinking as they develop their cross-programmatic Food Systems initiative.

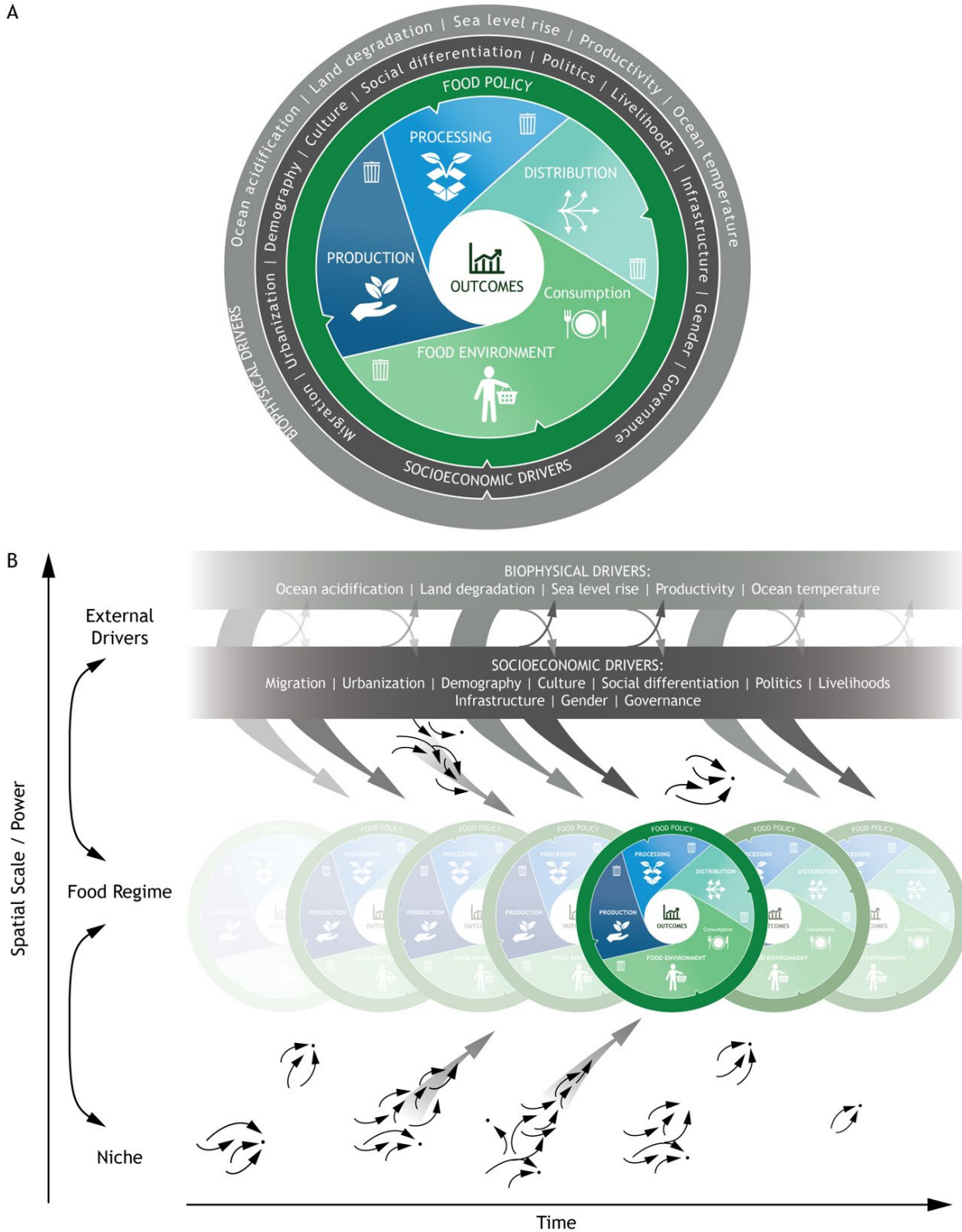


Figure. (A) A food system is the set of interacting activities, outputs and outcomes that encapsulate the production, processing, trade, and consumption of food. The food system is influenced by both internal dynamics and by external politics, processes and events. Waste occurs at all stages – symbolized by a trash can. **(B)** A food regime refers to the set of rules, norms, technologies, events and interactions acting within and on the food system that maintain its structure and functions. Within the food regime, innovations can be viewed either as niche events that fizzle out (graphically as ‘.’), or gather sufficient momentum to disrupt the system. Similarly, innovations in policies, shocks, and other external processes may align to amplify or dampen changes to the food system. Collectively, these processes co-evolve as the food system transitions from one configuration to another.

Reported as:

Andrew, N.L., Allison, E.H., Brewer, T. et al. (2022) Continuity and change in the contemporary Pacific food system. *Global Food Security*, 32, 100608, pp. 1-11.
<https://doi.org/10.1016/j.gfs.2021.100608>

Golden, C.D., Gephart, J.A., Eurich, J.G. et al. (2021) Social-ecological traps link food systems to nutritional outcomes. *Global Food Security*, 30, 100561, pp. 1-8.
<https://doi.org/10.1016/j.gfs.2021.100561>

7.12 Aquatic foods and the blue economy (Activity 1.6, WG 3)

Overview:

The Blue Economy is a rapidly evolving and under-governed space. Competition for ocean resources in an accelerating blue economy is overshadowing the importance of aquatic foods in reducing hunger and malnutrition. Our research on aquatic foods and the blue economy highlighted opportunities and gaps in current voluntary commitments on blue economy development as well as several blind spots around 'blue food' in current visions of a blue economy. Our work also examined



the current and potential contributions that the aquaculture can make toward achieving the Sustainable Development Goals (SDGs)/ Agenda 2030, and how these contributions are not clearly visible in the Agenda 21 declaration.

Contribution to knowledge:

Our research demonstrated the importance of voluntary commitments in shaping oceans governance. While small island developing states

are well represented in current commitments, the focus on growing capacity and new industries and shrinking fisheries does not reflect the importance of maintaining fisheries in Pacific Countries for food security, culture and livelihoods. Our research highlighted that growth in the blue economy does not equate to growth in aquatic food production and consumption, as evidence suggests industrialisation of the ocean economy may compromise its potential to provide food. Our research also showed that increasing aquatic food production would not directly lead to reduced hunger as there needs to be support to make increased production sufficiently accessible to those who need it. Lastly, we demonstrated that mariculture production is unlikely to replace declining capture fisheries, in particular in countries where fisheries still supply people with diverse and nutritious food and support the livelihoods. However, our research on aquaculture and the SDGs highlighted the need for better integration of aquaculture in food system dialogues. In the Pacific, as in many other regions, unpacking aquaculture's diverse functions and generation of values at multiple spatiotemporal scales will enable better understanding of aquaculture's present and future potential contribution to the SDGs.

Application:

The research on aquatic foods in the blue economy has been widely cited and used to inform submissions to the United Nations Food Systems Summit on the importance of fisheries for food and nutrition security. Our research has also informed a panel session on 'Transforming

aquaculture to achieve SDGs' during the FAO Global Conference on Aquaculture in Shanghai in 2021. The findings of the research on voluntary commitments have been used in articles published by SPC to help explain the new economic and political interests across public and private sectors in marine zones, including in the Pacific where new developments are seeing boundaries being drawn (and redrawn) under emerging marine spatial planning initiatives.

Reported as:

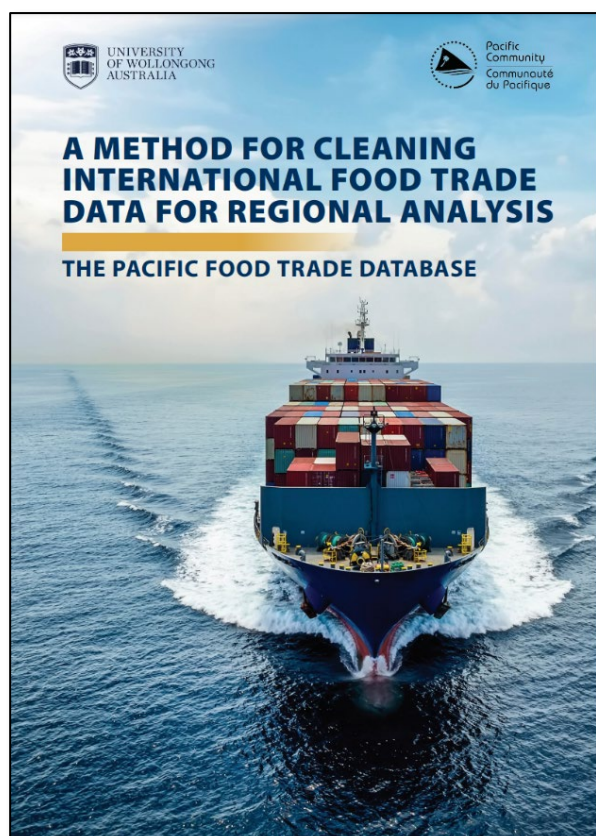
Farmery, A.K., Allison, E.H., Andrew, N.L. et al. (2021c) Blind spots in visions of a “blue economy” could undermine the ocean’s contribution to eliminating hunger and malnutrition. *One Earth*, 4. <https://doi.org/10.1016/j.oneear.2020.12.002>.

Voyer, M., Allison, E.H., Farmery, A. et al (2020) The role of voluntary commitments in realising the promise of the Blue Economy. *Global Environmental Change*, 71, 102372, <https://doi.org/10.1016/j.gloenvcha.2021.102372>.

7.13 A method to clean international food trade data (Activity 1.9 and 1.11, WG 5)

Overview:

International trade in food is an essential component of the global food system, with consequences ranging from environmental sustainability to public health. Evidence-based food policy requires analysis and interpretation of trade flows among countries.



UN Comtrade is the most important and authoritative source of international trade statistics. Many third-party databases use Comtrade in some form, often through web interfaces that simplify access. All these databases are, ultimately, reliant on data reported by countries.

We describe a stepwise mixed-methods process to identify and correct errors in international trade data to develop a reliable food trade database for the Pacific region. The method profoundly changes estimates of regional food trade. Similar results would likely be identified in other global regions with trade data quality challenges. If so, improved data quality could have significant food and other policy ramifications.

Contribution to knowledge:

The data generated in this study represent an important new opportunity for food policy research in the Pacific region. In the Pacific, net food import dependence follows relatively recent and rapid trade liberalisation, which has been associated with significant changes in diet. Diet-related non-communicable diseases now represent a

significant social and economic burden in the region. Reliable data are critical to monitoring the impact of trade agreements on food environments and nutrition in the Pacific, and to develop effective policy responses.

Application:

Our analysis confirms that great care should be taken in drawing conclusions from uncleaned UN Comtrade and derivative databases. For the 18 small countries and territories of the Pacific region, we conclude that uncleaned Comtrade-derived data do not provide a sufficiently robust foundation for analysis of international food trade.

The resulting database is available on the SPC SDD website (see Section 7.1.15 below). The database has been used in a growing number of regional analyses of food availability in the region, many reported within the current study (see Section 7.1.16 below).

The method could be adopted by other global regions or country groups such as SIDS to improve trade data, and is not limited to food and beverage.

Reported as:

Brewer, T.D., Andrew, N.L., Sharp, M.K., Thow A.M., Kottage, H., Jones, S. (2023a) A method for cleaning international food trade data for regional analysis: The Pacific Food Trade Database. Version 2.1. Pacific Community Methods paper. 71 p. <https://purl.org/spc/digilib/doc/6rz4g>

7.14 The Pacific Food Trade Database (Activity 1.11, WG 6)

Overview:

The Pacific Food Trade Database (PFTD) is the output of a regional collaboration that has delivered improved trade data on 555 food and beverage commodities for 18 Pacific Island Countries and Territories, including tonnage of imports and exports from 1995-2018. With this long time-series, country and regional decision makers can review trade trends for specific foods, or groups of foods, to better understand economic and health impacts, and predict future trends. The database is the primary output of the methods paper described in activity 1.9.

The current database is version 2.1. The database includes two publicly available resources, the

The screenshot shows the Pacific Data Hub Explorer interface. On the left, there are filter sections for 'USED FILTERS' (17), 'TIME' (6/24), 'IMPORTER' (5/188), 'EXPORTER' (1/215), and 'COMMODITY' (8/18). The main area displays a table titled 'Pacific food and beverage trade: The Pacific Food Trade Database'. The table includes a search bar, a 'Search in all items' field, and a table with columns for 'Commodity', 'Time', and years 2013 through 2018. The data is as follows:

Commodity	Time	2013	2014	2015	2016	2017	2018
Fish, crustaceans, molluscs, aquatic invertebrates ne		16	28	19	54	35	38
Edible vegetables and certain roots and tubers		1 074	1 032	1 106	1 189	1 229	1 412
Cereals		11 484	16 924	16 230	16 808	14 174	21 215
Oil seed, oleag fruit, grain, seed, fruit, etc. ne		29	28	447	437	454	799

searchable database and a dashboard to explore key trends and patterns. The data made available through these two modes was enabled through collaboration with SPC SDD staff, who generated the data-linked interfaces through discussion with project staff. The downloadable and searchable data is available through the Pacific Data Hub data explorer (<https://stats.pacificdata.org>).



The dashboard (image to left) is also available through the Pacific Data Hub. (<https://pacificdata.org/pacific-food-and-beverage-trade>)

Contribution to knowledge:

Prior to the development of the PFTD, international food and beverage trade data for the region contained error and omissions significant enough to result in very different policy interpretations. Additionally, data on quantities traded, which is vital to understanding impacts of trade on

food security and nutrition, were extremely limited.

Application:

These resources provide a significant step forward for researchers, regional bodies and national governments in generating food and beverage trade analysis for the region. This data is expected to be foundational to all future quantitative analyses of regional food security and nutrition. The dashboard is also a tool for education purposes. All PICTs have been given data relevant to their trades. Additionally, regional bodies, including the Pacific Islands Forum Secretariat has engaged with the data and has requested the data for their own database, through which, regional decision making is supported.

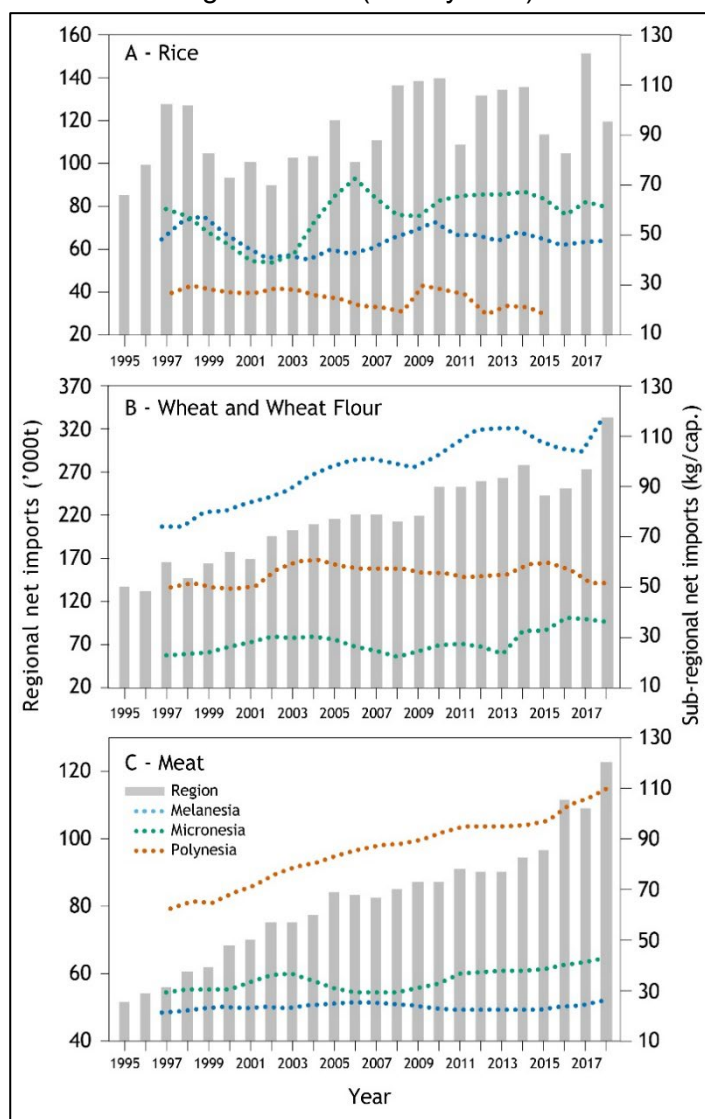
Reported as:

Brewer, T.D., Andrew, N.L. (eds) (2023b) The Pacific Food Trade Database. Version 2.1. (<https://stats.pacificdata.org/>). Downloaded 20/03/2023.

7.15 International food trade in the Pacific food system (Activity 1.11)

Overview:

The role of trade in Pacific food security and nutrition: The Pacific region is experiencing a non-communicable disease epidemic largely driven by an ongoing nutrition transition from nutrient rich whole foods to imported staples and highly processed foods. Food trade is a major driver of this transition. Using the PFTD (activity 1.11) we characterize regional and sub-regional trade from 1995



to 2018 for 18 Pacific Island Countries and Territories. Findings are discussed in terms of policy and trade agreements, and global shocks including COVID-19 and the war in Ukraine.

Intra-regional trade: There is growing attention to intra-regional trade in food. However, the relationship between such trade and food and nutrition is understudied. In this paper, we present an analysis of intra-regional food trade in the Pacific region, where there are major concerns regarding the nutritional implications of international food trade. Using the PFTD, we examine trends in food trade among Pacific Island Countries and Territories (PICTs) relative to extra-regional trade. We also determine whether trade agreements have influenced intra-regional food trade.

Role of Australia and New Zealand in Pacific food trade: The Pacific region is increasingly a contested geopolitical space. Understanding food trade, and its role in regional food security and nutrition can offer insights into geopolitics including potential for improving bilateral relations through trade controls to improve Pacific diets. In this paper we explored the export of both staples and unhealthy foods to Pacific Island countries from key food exporters; Australia, New Zealand, East

Asia and Southeast Asia. We explored both spatial and temporal patterns using the Pacific Food Trade Database and discuss implications and opportunities for trade policy reform.

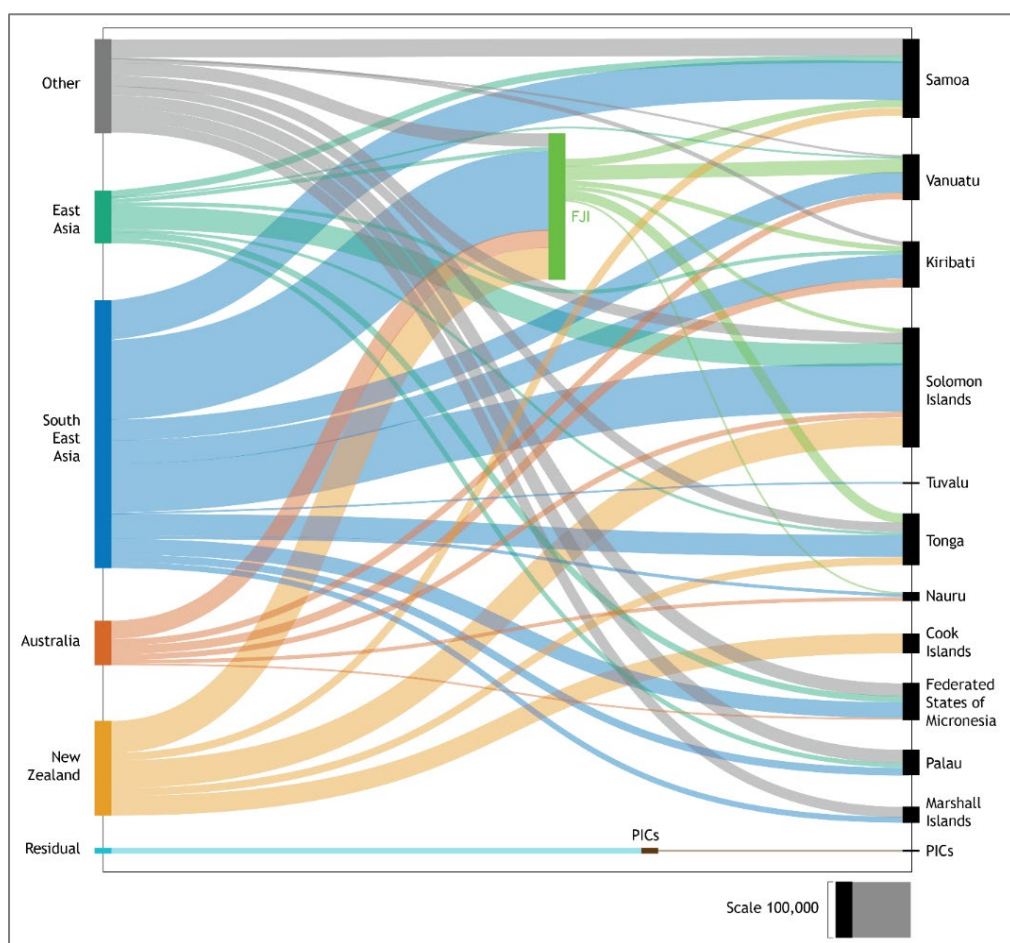


Figure. Export of unhealthy food from dominant exporters to PICs. Values represent the 2014-2018 annual average tonnage of trade flows.

Contribution to knowledge:

The role of trade in Pacific food security and nutrition: This research contributes to our understanding of imports and exports for 18 PICTs through time and across a diverse range of commodity groupings including those most pertinent to food security (grains, cereals and meats) (see embedded figure) and nutrition (unhealthy and healthy foods). The estimates provided in this research are foundational to regional food knowledge and policy.

Intra-regional trade: Intra-regional trade represents a small, but increasing, proportion of total imports. The major food group traded within the Pacific is cereal grains and flour, which represented 51% of total intra-regional food trade in 2018. Processed and prepared foods, sweetened or flavoured beverages, processed fish, and sugar and confectionary are also traded in large quantities among PICTs. Trade in root crops is negligible, and overall intra-regional trade of healthy foods is limited, both in terms of tonnage and relative to imports from outside the region. Fiji remains the main source of intra-regional imports into PICTs, particularly for non-traditional staple foods. Our analysis shows no effect of trade agreements on the quantity of food and beverages traded intra-regionally compared to trade between the region and the rest of the world.

Role of Australia and New Zealand in Pacific food trade: The Pacific is highly reliant on Australia for wheat imports, and Asia for rice imports, while the majority of unhealthy food imports originate in Southeast Asia. However, New Zealand exports significant quantities of unhealthy foods to some PICs. The distinct patterns that are observed, made possible through the development of the Pacific Food Trade Database, highlight key dependencies for food security and concerns regarding diet-related non-communicable disease.

Application:

The role of trade in Pacific food security and nutrition: This research represents the most up-to-date analysis of dimensions of food trade in the Pacific and is foundational to regional food security and nutrition research.

Intra-regional trade: The negligible quantity of intra-regional trade underscores the regions' reliance on imports. The absence of effect of trade agreements on food trade shows that trade agreements, alone, are not adequate for diminishing import dependence from outside the region.

Role of Australia and New Zealand in Pacific food trade: The presented results provide an accountability mechanism for both importers and exporters in terms of ensuring food security and in reducing incidence of diet-related noncommunicable diseases. It also highlights the understated importance of food trade in regional geopolitics.

Reported as:

Brewer, T.D., N.L. Andrew, D. Abbott et al. (2023c). The role of trade in Pacific food security and nutrition. *Global Food Security*, 36: 100670. <https://doi.org/10.1016/j.gfs.2022.100670>.

Brewer, T.D., Farmery, A., Jones, S., Kottage, H., Makaafi, S., Andrew, N. (submitted). Food trade and geopolitics between Pacific Island Countries' and their dominant Asia-Pacific trade partners. *Asia and Pacific Policy Studies*.

Thow, A.M., Ravuvu, A., Ofa, S.V. et al. (2022b) Food trade among Pacific Island countries and territories: implications for food security and nutrition. *Global Health* 18, 104. <https://doi.org/10.1186/s12992-022-00891-9>.

7.16 Translation outputs summarizing Food System elements (Activity 1.11)

Overview

The complex food and nutrition security challenge needs to be addressed using the language of 'food systems'. A food system framing helps to emphasize connections and the need to address dysfunctions in the whole system if progress is to be made in achieving food and nutrition security. As in other food systems, the literature on the Pacific Food System is fragmented and sectoral. As examples: strong voices have most usually articulated the NCD crisis as a public health issue; fisheries are framed as an economic and sustainability challenge; and connections drawn between climate change and public health outcomes are weak. As a related problem, the evidence base is sparse and delays in the translation of research hamper policy and action.

SPC and partners are working hard on many fronts to build an evidence base for decision-making in the region. In order to accelerate this, we developed a series of evidence briefs designed to improve the flow of information to policy makers and other stakeholders to achieve food and nutrition security in the Pacific region. The briefs are designed to provide snippets of analysis and short data summaries.

Food and Beverage Imports

KEY MESSAGES

- Trends in the quantity of food and beverages imported by Pacific Island Countries and Territories (PICTs) are not well documented.
- Understanding imports is central to managing food security and diet related health concerns.
- Using the Pacific Food Trade Database (PFTD); see Brief No. 3), this brief presents an overview of key trends and patterns in food imports between 1995 and 2018.
- Imports have increased dramatically since 1995, both in total tonnage, and when controlling for population growth, with differences between Pacific sub-regions.
- The majority of food and beverage imports by weight are from Australia, (primarily wheat and wheat flour), New Zealand, and East and South-East Asia (primarily rice).

CONTEXT

HISTORY OF FOOD AND BEVERAGE IMPORTS

Since around the beginning of this century, PICTs (excluding PNG) have, collectively, been a net food importing region (Figure 1). Regional population growth, combined with other factors including trade liberalisation and consumption preferences, has led to this rise in imports across all PICTs. Growth in imports has been dominated by rice and wheat, and highly processed foods. Imports of key staples ensures caloric needs are met, but erodes food sovereignty. Increased imports of highly processed foods and beverages has contributed to some of the highest rates of diet related non-communicable disease globally.

CHANGE IN IMPORT QUANTITY

Per capita imports of food and beverages have more than doubled since 1995, a trend that does not appear to be slowing (Figure 1). On a per capita

Figure 1. Total food and beverage imports per capita for the region (grey bars), Polynesia (red), Micronesia (green), and Melanesia (blue). Fresh fish including tuna, salt, oil palm nuts and kernels, alcohol, tobacco, water and Papua New Guinea data excluded.

Processed food for sale at a store in Gizo, Western Province, Solomon Islands. Filip Mlovac, 2015.

To date, 21 briefs have been published. The series will continue under ACIAR projects FIS/2020/172 and FIS/2022/121. The briefs are available on the SPC SDD Food Systems website at <https://sdd.spc.int/food-systems> and are listed in Section 10.1.

Contribution to Knowledge:

While some briefs present new knowledge (e.g. 19), the series is designed to contribute by making knowledge more available more quickly.

Application:

The briefs were designed as simplified syntheses of research outputs from the project and to respond to immediate food policy needs such as the COVID-19 pandemic (brief 5) and wheat price shocks caused by the war in Ukraine (brief 6). Demand for this format of information dissemination is reflected in the downloads, particularly from within the region. Since 2021, there have been over 1,400 downloads of the briefs from the SPC SDD Food Systems website. 70% of these downloads were by people located in the Pacific, Australia and Asia.

Reported as:

Brief	Year	Title	Authors
1	2021	Pacific Food System Briefs	Sharp and Andrew
2	2021	Pacific Nutrition Database (PNDB)	Sharp and Andrew
3	2021	The Pacific Food Trade Database (PFTD)	Brewer and Andrew
4	2021	Fruit and non-starchy vegetables in the Pacific	Sharp and Andrew
5	2021	Food and Beverage Imports	Brewer and Andrew.
6	2022	Pacific wheat: Import dependence and global shocks	Brewer and Andrew
7	2022	Solomon Islands Food and Beverage trade	Brewer and Andrew
8	2022	Poverty, malnutrition and food insecurity in SLB	Sharp et al.
9	2022	Food environments in food and nutrition security in SLB	Bogard
10	2022	Lessening import dependence in SLB	Thow and Reeve
11	2022	Policies for healthy and sustainable food systems in SLB	Reeve and Thow
12	2022	Pathways for food system change in SLB	Farmery et al.
13	2023	Food and beverage exports	Brewer and Andrew
14	2023	Starchy vegetables	Sharp et al.
15	2023	Aquatic foods in the Pacific food system	Farmery and Andrew
16	2023	Intra-regional food trade in the Pacific region	Thow et al.

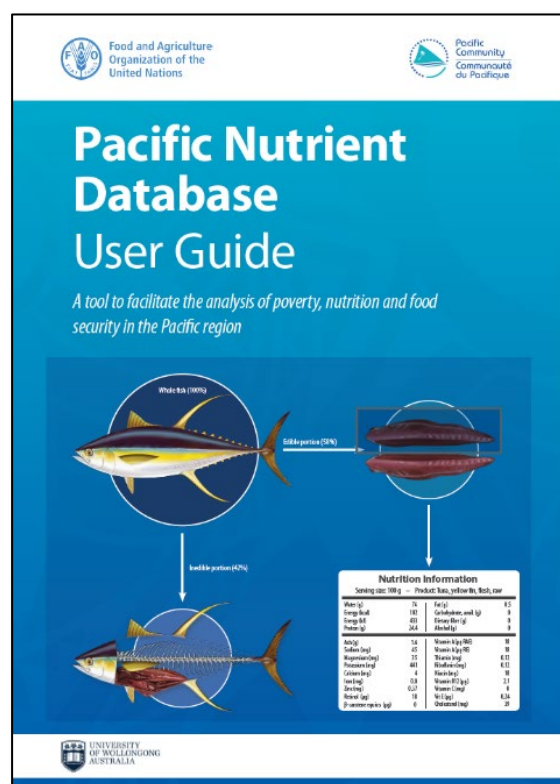
17	2023	Regional food system governance	Thow and Reeve
18	2023	Fruit and non-starchy vegetables in SLB	Farrell et al.
19	2023	Dietary diversity in Solomon Islands and Vanuatu	Wate et al.
20	2023	Living by the sea: coastal proximity in the Pacific region	Andrew
21	2023	Translation of regional food system policy guidance to national level	Patay and Thow

7.17 Pacific Nutrient Database and PNDB Fish Addendum (Activity 1.3, WG 6)

Overview:

Pacific Nutrient Database (PNDB): Household Income and Expenditure Surveys (HIES) are increasingly used in analyses of poverty, nutrition and food security. Such analyses require the use of edible-portion conversion factors to convert the reported acquisition of wholefoods into edible portions so estimates can be made of what people apparently ingest. These data then require the use of food composition tables (FCTs) to convert the edible portion into caloric and nutrient

consumption values, so total energy and nutrient consumption can be estimated.



HIES data in the Pacific region are coded using the United Nations Statistics Division’s Classification of Individual Consumption According to Purpose (COICOP); however, there is no regionally standardised linkage between COICOP and the Pacific Islands Food Composition Tables Second Edition (PIFCT). Furthermore, the PIFCTs do not have edible-portion conversion factors and are insufficient to cover the full list of foods reported in the HIES.

To address this, the Pacific Nutrient Database (PNDB) was developed to provide the Pacific region with a standard set of conversion factors and food composition data that are mapped to COICOP codes. To add more value to the database, each food item is also mapped to COICOP 2018, classified into FAO Commodity Groups and food groups to compute Household Dietary Diversity Scores (HDDS). The PNDB includes 26 components plus edible and inedible portions for a total of 822 foods.

PNDB Fish as an Addendum to the PNDB: In the PNDB published in 2020, the coverage of finfishes was heavily reliant on available sources of nutrition profiles from temperate and non-Pacific sources. In the interim, a global database of aquatic food was created which, when augmented by an exhaustive literature search, allowed a more comprehensive coverage. As a result, some 216 species of finfishes (Class Actinopteri) are now included as sources of nutrition information. These species account for ca. a quarter of the foodfish consumed by Pacific people (the full list is being developed in project FIS/2020/172).

Contribution to knowledge:

The PNDB has aggregated and systematized data from primary sources relevant to the Pacific region. It has not created novel data per se. The contribution made to knowledge has been in

enabling food security analyses based on HIES to be implemented. Note the PNDB was co-funded by project FIS/2016/300 and reported in the final report of that project.

Application:

The PNDB is now the standard reference for food composition analyses in the Pacific region. The database has enabled completion of significant studies of food security in the region, including those reported in as part of this project. The PNDB will continue to underpin analyses until it is revised in the coming years.

Reported as:

Andrew, N., Koehn, Z., and Sharp, M.S. (in prep). PNDB Fish: An addendum to the PNDB to provide improved coverage of COICOP Chapter 3. SPC Technical Report.

FAO and Pacific Community (2020a) Pacific Nutrient Database User Guide. Noumea, New Caledonia. <https://www.fao.org/3/cb0267en/cb0267en.pdf>

Koehn, J.Z, Wabnitz, C.C., Hazen, L., Golden, C., Andrew, N.L. (in prep). Nutrient composition of marine food fish from Pacific Island countries and territories. Target journal: Fish and Fisheries.

SPC, UOW and FAO (2020). The Pacific Nutrient Database. <https://microdata.pacificdata.org/index.php/catalog/755>.

7.18 Framing food value chains in the Pacific context (Activity 2.2)

Overview:

Value chains are key pathways within food systems and an important focus for analysis and policy intervention. A systematic scoping review was used to examine how different value chain

approaches consider food security and nutrition, with particular attention to examples of how these approaches can simultaneously address additional social, economic or environmental outcomes.



Contribution to knowledge

The research revealed that value chain research on food security and nutrition has addressed multiple outcomes within the social dimension, and across social and economic dimensions, although few studies incorporated the environmental dimension. The study also demonstrated that while current value chain approaches are useful to parse out problems within a food system, they may miss opportunities for more integrated analyses, particularly in integrating sustainability dimensions. These findings were significant when combined with findings from 7.1.29 Typologies for food environment analysis (Activity 4.4) and 7.1.5 Solomon Islands national food system (Activity

1.6, WG 2) as together they demonstrated the limitations of focussing research on value chains in food systems where most food does not enter a formal value chain.

Application:

The research was used as resource for National dialogues as part of the UN Food System Summit 2021. It has also helped to shape discussions and planning for the next phase of the project FIS/2022/121. The project team will continue to work with national food system stakeholders to better understand the relationships between formal and informal food chains and the implications for sustainable food and nutrition security.

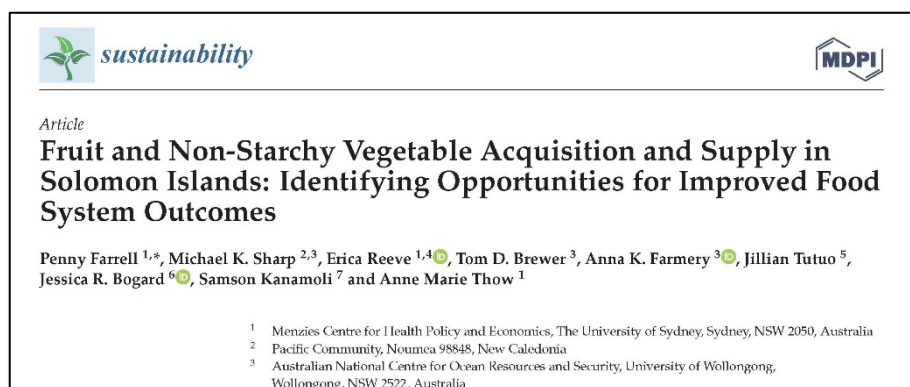
Reported as:

Farmery, A.K., Brewer, T.D., Farrell, P. et al (2021b) Conceptualising value chain research to integrate system elements. *Global Food Security*, Volume 28, 100500. <https://doi.org/10.1016/j.gfs.2021.100500>

7.19 Fruit and vegetable value chain in SLB (Activity 2.2)

Overview:

Shifting diets away from red meat and unhealthy processed foods, towards higher consumption of plant-based foods can lead to healthier and more sustainable food system outcomes. The Pacific Guidelines for Healthy Living (2018) recommend consuming a minimum of five servings of fruit and/or non-starchy vegetables (FNSV) each day. However, analysis of the latest Solomon Islands



Household Income and Expenditure Survey (HIES) 2012/2013 shows that per person average FNSV consumption is less than half of the recommended intake. Diets in Solomon Islands have been shifting away from traditionally high consumption of fruit and vegetables toward greater consumption of less-

healthy processed foods. These foods are contributing to the increasing burden of obesity and NCDs such as cardiovascular disease and diabetes. We examined key aspects of the food system with respect to FNSV in Solomon Islands, including production, trade, and food environments to provide a country-wide picture of the role and benefits offered by fruit and non-starchy vegetables.

Contribution to knowledge:

Our study highlighted that domestic production of fruit and non-starchy vegetables was insufficient to meet per capita requirements. We also found that per capita national level supply through imports was inconsequential. These findings combined illustrate that there are important FNSV undersupply issues in Solomon Islands. In addition, multiple challenges related to the food environment hamper FNSV consumption. Specifically, we found that people in urban areas were less likely to acquire sufficient FNSV for good health than those in rural areas. We also identified differences between the source of acquisition by location with people in rural areas mostly acquiring FNSV from home cultivation, while in urban areas, FNSV were mostly purchased from markets. Importantly, we demonstrate that urban affordability is a key access lever of FNSV.

Application:

The findings of this research support current national policy priorities relating to improved affordability of FNSV and investment in local production of FNSV. The findings also support efforts to increase livelihood equity through targeting youth and women. Investing in equitable fruit and vegetable supply processes will contribute not only to nutrition, but also to livelihoods and poverty reduction as fresh food markets are critical to FNSV supply, predominantly employ women and are a significant contributor to the Solomon Island economy.

Reported as:

Farrell, P., Sharp, M.K., Reeve, E., et al. (2023a) Fruit and Non-Starchy Vegetable Acquisition and Supply in Solomon Islands: Identifying Opportunities for Improved Food System Outcomes. *Sustainability*. 15:1742. <https://doi.org/10.3390/su15021742>

7.20 Aquatic food and nutrition (Activity 2.2)

Overview:

Aquatic foods, including plants and animals from fisheries and aquaculture, are often high in bio-available nutrients, and some can be harvested or produced with environmental impact and resource use that is lower than many terrestrial animal sourced foods or equivalent to plant-based foods. There is substantial potential for increased consumption to improve the diets of people who consume low amounts of aquatic foods. In Pacific Island Countries and Territories National, however, rates of aquatic food consumption are among the highest in the world, yet the region is suffering from extensive levels of diet-related ill health. We examined the variation in consumption patterns and in nutrient composition of aquatic foods in the Pacific, to help improve understanding of their contribution to food and nutrition security. We also examined the role of foreign fishing and

trade on small island developing states as this was previously not well understood.

Contribution to knowledge:

Our results showed that the potential of aquatic foods to contribute to improved environmental and health outcomes will be mediated by challenges including the impacts of climate change, habitat loss

and degradation, overfishing, and the provision of aquaculture feed. Realising the opportunities to manage and utilise aquatic foods to improve nutrition and reduce environmental food impacts, as well as to support peoples' cultures and livelihoods, will determine the extent to which aquatic foods can contribute to more sustainable diets. Consumption also depends on availability and the amount and type of aquatic food consumed, and its contribution to nutrition security varies within different geographic and socio-demographic contexts. We identified the need for more data on locally relevant species and consumption patterns, to better inform dietary guidelines and improve public health both now and into the future. We also revealed that foreign fishing is relocating valuable nutrients from developing countries to wealthier nations and that small island developing states currently benefiting from trade and foreign fishing, including many in the Pacific region, are most vulnerable to future changes in nutrient supplies.

Application:

Our research paper on aquatic foods and nutrition has been used to broaden the scope of recent sustainable food system analysis and to inform dialogue on diets and food systems, for example by



FAO in 2021 in their report on the role of diets and food systems in the prevention of obesity and non-communicable diseases in Fiji. It has also provided evidence for policy makers to help them harness the potential of global fisheries to address dietary deficiencies and focussing greater attention to nutrition objectives in fisheries' licensing deals and trade negotiations.

Reported as:

Farmery, A.K. and Bogard, J.R. (2023b) Realising the potential for aquatic foods to contribute to environmentally sustainable and healthy diets. In, Routledge Handbook of Sustainable Diets (pp. 106-118). Routledge.

Farmery, A.K., Scott, J.M., Brewer, T.D. et al. (2020) Aquatic Foods and Nutrition in the Pacific. *Nutrients*, Volume 12, 3705, <https://doi:10.3390/nu12123705>.

7.21 Opportunities and strategies to strengthen food policy (Activity 2.2 - 2.4)

Overview:

Recent food system shocks and increasing climate change exposures highlight the urgency of strengthening food systems at different scales, including global, regional, and national, to achieve Sustainable Development Goals. PIC governments have recognised the critical importance of strengthening food systems and have identified a range of challenges to current food policies achieving desired economic, nutritional, and environmental outcomes.

Integrated, coordinated and effective food policy is critical to achieving sustainable and nutritious foods systems. Achieving this requires the engagement of policy actors from across a large number of sectors, including agriculture, finance, trade, industry, health and environment. Decades of experience in implementing climate change and NCD prevention policies has demonstrated that operationalising multilateral and cross-jurisdictional policy is challenging, because sectoral mandates and budgets can be narrow, and each sector is governed by a different set of policy objectives.

We used a co-design approach to analyse national and regional policy to inform a number of linked research questions. This approach was, overseen by an Advisory Group that included representation from policy actors across food systems sectors, including SPC, FAO, governments of Vanuatu and Solomon Islands, and USP. Qualitative interviews were conducted with stakeholders at the regional and national level (Vanuatu and Solomon Islands), and extensive documentary analysis was undertaken.

Contribution to knowledge:

In-depth analysis of food systems policies across sectors in Solomon Islands and Vanuatu identified priorities for greater efficiencies across the food system, and opportunities for integration of nutritional and environmental concerns through a stronger set of instruments that enforce and incentivise structural changes across the whole food chain and prioritise healthy plant-based foods and proteins, including fish, for domestic consumption. This research was extended to examine opportunities for improving regional-to-national policy translation and implementation, which is a high priority in the region. Our analysis identified a key opportunity in strengthening regional-national dialogue through national-level multisectoral food system coordination to ensure country representatives can adequately represent national interests.

In Solomon Islands, analysis of policy specific to fish supply chains found community-based fisheries management approaches offered opportunities to address malnutrition. However, gaps in implementation, variations in capacities across government actors and communities, and limited attention to domestic monitoring and enforcement limited impact. Improving the effectiveness of resource management efforts could act to deliver on outcomes for both livelihoods and health.

At the regional level, fiscal policy intervention to incentivise healthier food production and consumption has been identified as a priority. The analyses conducted under this project highlighted new opportunities to extend sugar-sweetened beverage (SSB) taxation in the region by applying taxes to unhealthy foods and improving policy coherence. The review of relevant SSB price elasticity estimates will support improved policy design.

Application:

The action-oriented policy analyses conducted have advanced knowledge on food system policy and informed food system policy guidance in the Pacific Islands region, and specifically in Solomon Islands and Vanuatu. The policy research has also strengthened research capacity and capability of Pacific Islander researchers through mentoring of three early career researchers from Vanuatu and Solomon Islands.

The project outputs have supported policy actors in the region to scale up 1) innovation in fiscal policy for nutrition, through translational outputs co-produced with SPC and new evidence regarding fiscal policy design; 2) efforts to strengthen national food system policy for nutrition, through identification of 'win-win-win' policy measures to support environmental, nutritional and economic outcomes, as well as strengthening regional-to-national translation of food system policies, communicated through advisory group engagement and participatory workshops; and 3) building resilience in the face of ongoing food crises, through identification of strategies to support capacity building of key policy stakeholders, including new knowledge and mentoring of in-country researchers.

Attendees of the workshop hosted in Solomon Islands indicated that this project contributed to collaboration and coordination of multisectoral food system policy. Additionally, attendees noted that outcomes of this project strengthened the integration and collaboration between all levels of Government in addressing food system challenges in Solomon Islands.

Reported as:

Mauli, S., Maeluau, J., Reeve, E., Thow, A.M., Johnson, E., Farrell, P., Patay, D. (2023) Systemic capacity in food systems governance in Solomon Islands: "it's more than just training". *Sustainability*, 15(13), 10710. <https://doi.org/10.3390/su151310710>

Mauli, S., Thow, A.M., Mulcahy, G., Andrew, G., Ride, A. and Tutuo, J., 2023. Opportunities to Strengthen Fish Supply Chain Policy to Improve External Food Environments for Nutrition in the Solomon Islands. *Foods*, 12(4), p.900.

Patay, D., Ravuvu, A., Iese, V., Wilson, D., Mauli, S., Maelaua, J., Farmery, A., Farrell, P., Reeve, E., Johnson, E., and Thow, AM. (2023) Catalysing sustainable development through regional food system governance: strengthening the translation of regional food system policy guidance to national-level in the Pacific. *Sustainable Development*, 1-18. <https://doi.org/10.1002/sd.2732>.

Reeve, E., Ravuvu, A., Johnson, E., Nasinga, S., Brewer, T., Mounsey, S., Thow, AM., (2023). Scaling up food pricing policies in the Pacific: a guide to action. *BMJ Global Health*, 8: e012041. <https://doi.org/10.1136/bmjgh-2023-012041>

Reeve, E., Ravuvu, A., Farmery, A. et al (2022a). Strengthening Food Systems Governance to Achieve Multiple Objectives: A Comparative Instrumentation Analysis of Food Systems Policies in Vanuatu and the Solomon Islands. *Sustainability*, 14, 6139. <https://doi.org/10.3390/su14106139>

Reeve, E., Johnson, E., and Thow, AM. (in prep) Scaling up food pricing policies in the Pacific: a guide to action. Toolkit, SPC.

7.22 Food prices and availability in Solomon Islands (Activity 3.1)

Overview:

In Solomon Islands, the retail food environment is an important food source for urban populations in particular, for instance the dominant source of fresh fruit and vegetables for urban consumers is open markets. The effects of COVID-19 mitigation measures in early 2020, such as restriction of



human movement and border closures, raised food security concerns in Solomon Islands. Of particular concern was the risk of price gouging in an already price sensitive market. We conducted studies in urban centres across three provinces in Solomon Islands mid-2020 and mid-2021 which aimed to provide rapid and policy relevant information on the pricing of foods in the context of the unfolding COVID-19 pandemic. The results are presented in detail in Farrell et al. (2023b).

Contribution to knowledge:

Farrell et al. (2023b) found price reductions among the majority of fresh fruit and vegetables available in 2021, compared with 2020. A trend of rising prices was reported for some other commodities, in particular fresh locally caught fish. The price of packaged starchy foods such as instant noodles seemed to remain relatively stable. The survey design

was successful in rapidly collecting pricing data from both the formal and informal food retail environments during a time of external 'shock to the system'. Our approach is scalable and applicable to other settings needing a rapid survey of the external food environment.

Application:

This study contributed to urban food environment monitoring relevant to food and nutrition security in a food system that is currently impacted by external and often concurrent shocks including the COVID-19 pandemic and the effects of mitigation measures, as well as extreme weather events, worldwide economic recession, and civil unrest (Farrell et al., 2023b). The price changes seen in our survey likely reflect a complex situation, with drivers associated with government pandemic mitigation policy including an urban-to-rural migration policy, and the effects of decreased tourism and economic downturn. The price drop seen in fresh fruit and vegetables likely also reflected increased subsistence production, as was hypothesised in Farrell et al. 2020 (Food Security) about the pandemic leading to an increase in local food production, but there are important questions around environmental sustainability with 'slash and burn' and other practices with such a rapid shift to local production. (Farrell et al., 2023b)

The implications of price fluctuations are also likely to have a mixed effect, for instance a reduction in market price of fruit and non-starchy vegetables would increase accessibility to this healthy food group for households reliant on purchasing them, but have a negative effect for the incomes of households dependent on fruit and vegetable market sales (Farrell et al., 2023).

The results were presented and discussed with key government stakeholders in workshops in Solomon Islands in 2021 and 2023. The study is also informing food systems programs and interventions run in Solomon Islands by organisations including WorldFish, and have been published in translation reports by the Food and Agriculture Organization (e.g. Farmery et al. 2023a, National assessment of the Solomon Islands food system). (2) This study was conducted entirely by

researchers in Solomon Islands. The research contributed to enhanced in-country research capacity for rapid food environment/food supply assessment. (3) The methodology presented in this paper offers a straightforward, low resource and rapid way to monitor the food retail environment in a mixed formal/informal setting, that could be applied in other low- and middle-income country contexts.

Reported as:

Farrell, P., Bogard, J., Thow, A.M., Boylan, S., Johnson, E., Tutuo, J. (2023b) Food price and availability in Solomon Islands during COVID-19: A food environment survey, *Nutrition and Health*, <https://doi.org/10.1177%2F02601060231183592>.

7.23 Monitoring food environments (Activity 3.1)

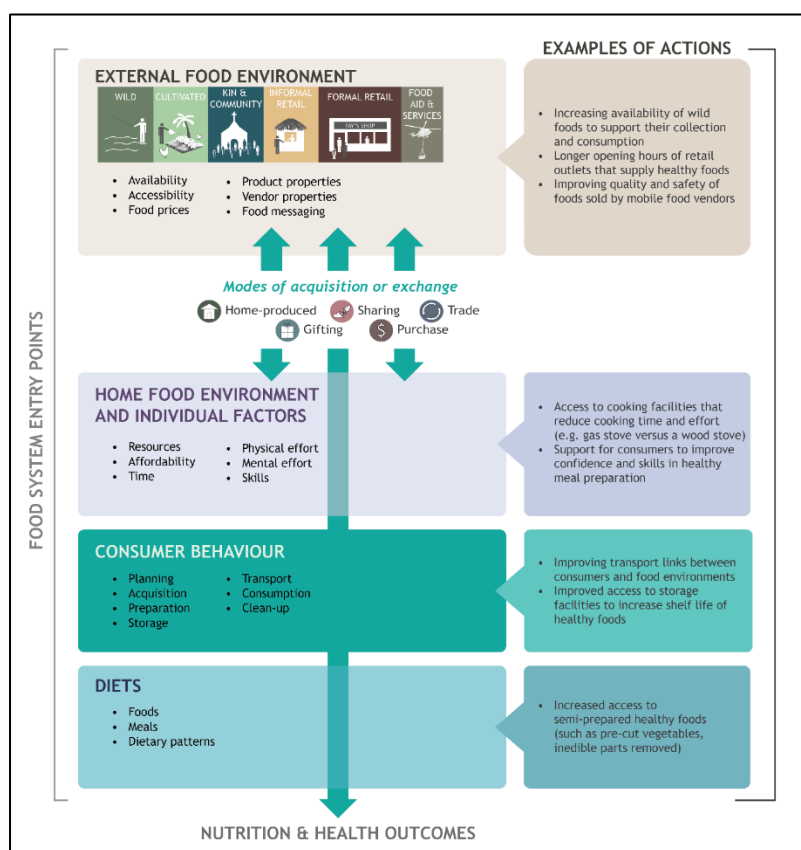
Overview:

Convenience is a major driver of food choice throughout the world, yet it is often inconsistently conceptualised, defined and measured. This limits the scope for food systems policy and interventions to leverage convenience to improve diet and nutrition outcomes. We conducted a systematic review of empirical research studies to determine how convenience is both defined and measured in food environment and nutrition research. We propose a framework for considering convenience as an entry point in food systems to improve diets and nutrition outcomes (see Figure).

Contribution to knowledge:

Convenience is being used in multiple ways within the food environment literature. More than half of the studies screened for this review have used it very simply to classify food (e.g., ultra processed foods) or food outlet type (e.g., convenience stores). Other studies take a broader conceptualisation by capturing the temporal or physical aspects of the acquisition process, or the resources and effort

required by the consumer. In contrast, many studies (77% of those reviewed here) rely on an implicit conceptualisation of convenience, contributing to a lack of consistency in methods and measures used to understand convenience as a driver of food choices. This can be problematic when the concept of ‘convenience’ is conflated with other characteristics such as nutritional quality. For example, many studies use ‘convenience foods’ as synonymous for foods that are energy dense and nutrient poor in contrast to a few studies which refer to ‘healthy’ convenience foods. 83% of studies used perceived measures of convenience rather than objective measures. Convenience was most commonly measured in high income countries (64%) and in relation to the home food environment (53%), followed by



formal retail (40%). Very few studies measured convenience in relation to the informal retail or cultivated food environments, and no studies considered convenience in relation to wild food environments. The vast majority of studies failed to consider the validity or reliability of the measures of convenience.

Application:

Based on our findings we propose a definition of convenience as *a characteristic that results in reduced resources including time, physical effort, mental effort and skills required by the consumer in relation to the planning, acquisition, preparation, storage, transport, consumption or clean-up of food*. This definition can be used to help guide the development of measurement tools that can be used to assess convenience across different dimensions and contexts in a more comprehensive way.

Future research should focus on developing and validating assessment tools that measure both the perceived and objective aspects of convenience in a comprehensive way that is aligned with the different components of the multifaceted definition of convenience presented here. In particular, assessment tools that are relevant to wild, cultivated, and informal built food environments as well as LMICs are needed. Having a more comprehensive, agreed upon definition, as well as assessment tools that are aligned to that definition, will enable improved measurement of the ways in which convenience influences consumer behaviour with the view to identifying policy levers and interventions aimed at increasing consumption of healthy diets.

Reported as:

Bogard et al. (2024) Convenience as a dimension of food environments : a systematic scoping 2 review of its definition and measurement. *Appetite*. <https://doi.org/10.1016/j.appet.2023.107198>.

7.24 Measuring natural food environments (Activity 3.1)

Overview:

Farrell et al. (2021) examined literature on retail food environments in Asia and the Pacific, and identified opportunities to strengthen research and policy to improve outcomes for nutrition.

Farrell et al. (in preparation) focussed on the natural food environment, which includes both wild sources (such as forests, oceans) and cultivated sources (subsistence agriculture), as this is a critical source of nutritious food for many populations. For instance, plant-based foods tend to be nutrient dense and good for health and ‘blue foods’ – fish, shellfish, and aquatic plants captured in freshwater and marine ecosystems – have significant importance for food and nutrition security and creating resilient, sustainable food systems. In countries with predominantly subsistence-based diets, the majority of fruit and vegetables are sourced directly from the natural food environment. Farrell et al. (in preparation) performed a scoping review which aimed to document and start to classify empirical methods and metrics used to characterize the person-food system interface (i.e. food environment) with regard to natural food environments – to collate ways of measuring health and environmental impacts. Measuring different components of the natural food environment (healthiness, food security, availability, food safety, environmental sustainability), can serve as a leverage points for policy action to improve food system outcomes. The primary aim of the review is to understand which metrics can measure the different elements of natural food environments, in order to protect the health and environmental sustainability of natural food environments. Farrell et al. (in preparation) analysed over 150 studies which included empirical measures of the natural food environment, and collated the most common measures across key food system components.

Contribution to knowledge:

Farrell et al. (2021) found that access to healthy food is heavily influenced by the food retail environment – including supermarkets, open market vendors, informal street vendors and restaurants. Food price also influences food consumption habits, with the cost of fresh fruit and vegetables being a major challenge.

Farrell et al. (in preparation) provides a comprehensive summary of the key methods and metrics used to measure the natural food environment, and presents this in relation to the multiple relevant outcome measures that are important for improved food system outcomes (i.e. healthiness, environmental sustainability).

Application:

Opportunities identified in Farrell et al. (2021) included advancing research into food environments within the region to support policy makers in implementing policies that improve outcomes for nutrition. Additionally, this research found potential benefits of examining food environments in light of the dietary transition away from traditional food cultures in Asia and the Pacific, which tend to include healthier foods than those offered by current food retail environments.

Farrell et al. (in preparation) makes a timely contribution to the emerging literature on conceptualising healthy and environmentally sustainable food environments, in particular in relation to the role of subsistence agriculture in food security and the value of protecting traditional practices such as harvest of wild native foods. The value of clarifying these definitions by curating the current literature in this way is that some of these measures act as critical leverage points for identifying need for policy intervention, and monitoring and evaluation of progress.

Reported as:

Farrell, P., Rachmi, C.N., Mulcahy, G., Helble, M., and Thow AM. (2021). Food environment research is needed to improve nutrition and well-being in Asia and the Pacific. Public Health Nutrition. <https://doi.org/10.1017/S136898002100241X>.

Farrell, P., Johnson, E., Reeve, E., Farmery, A., Thow, AM., Mulcahy, G., Patay, W, Wu, J., and Bogard, J. (in prep) Measuring natural food environments: a scoping review. Journal TBD.

7.25 Dietary diversity among women and children in SLB (Activity 3.1)


Overview:

Diets are influenced by many factors including affordability, domestic food production, international trade, culture, and preferences. The majority of Pacific Islanders live in rural settings where food access and availability vary according to factors such as the amount of arable land, distance from nearest market.

Solomon Islands and Vanuatu have favourable growing conditions for a range of crops and there are high rates of participation in agriculture food production. Fishing is widespread in Solomon Islands and to a lesser degree in Vanuatu, where livestock and meat are more common foods. However, national data from the Solomon Islands and Vanuatu show that women and children are vulnerable groups in terms of nutrition. Understanding patterns of dietary diversity is essential to better define gaps in diets and their relationship with health of rural populations. We assess diets of women and children in rural areas of the Solomon Islands and Vanuatu to help prioritise initiatives for food and nutrition security.

Contribution to knowledge:


Diet diversity among women was low in the Solomon Islands and Vanuatu. Rice, roots, tubers and plantains, and aquatic foods were highly represented in the diets of women. Flesh foods, particularly fish and canned fish, was reported to be consumed by 80% of women in Solomon Islands and 70% in Vanuatu. Dark leafy greens and vitamin A rich foods were also frequent in diets. However, women reported low intakes of eggs, pulses, dairy, nuts and seeds. Diet diversity among children was very low, with very few reported to have consumed five or more food groups in the last 24 hours (10% and 6% of children in the Solomon Islands and Vanuatu, respectively).



Diets of women and children in Solomon Islands and Vanuatu

KEY MESSAGES

- This brief presents analysis of the diets of rural women and children in Solomon Islands and Vanuatu, surveys were conducted at selected sites in both countries¹
- Legumes and pulses, nuts and seeds, dairy and eggs are underrepresented food groups in the diets of rural women
- 21% of women in Solomon Islands and 33% in Vanuatu consumed more than five food groups, indicating minimum dietary diversity
- Dairy, eggs, legumes and nuts are underrepresented food groups in the diets of rural children
- 10% of 6-23 month old children in Solomon Islands and 6% in Vanuatu consumed five or more food groups
- Aquatic foods are well represented among adult women in these sites (Vanuatu 69%, Solomon Islands 80%). This included the consumption of tinned tuna
- Aquatic foods were consumed by 60% of 6-23 month old children in Solomon Islands and 65% in Vanuatu
- Eggs, pulses and legumes and dairy were lacking food groups in diets of both women and 6-23 month old children



¹Due to the small sample sizes at selected sites (see Figures 1 and 2), data may not be representative of national consumption.

CONTEXT


Diets are influenced by many factors including affordability, domestic food production, international trade, culture, and preferences. The majority of Pacific Islanders live in rural settings where food access and availability vary according to factors such as the amount of arable land, distance from nearest market, population size and coastal habitats.

Solomon Islands and Vanuatu have favourable growing conditions for a range of crops and there are high rates of participation in agriculture food production. Fishing is widespread in Solomon Islands and to a lesser degree in Vanuatu, where livestock and meat are more common foods.

Rural populations mainly have access to locally produced foods, and also store-bought processed foods with long shelf life. National data show that women and children are vulnerable groups in terms of nutrition. Understanding patterns of dietary diversity is essential to better define gaps in diets and their relationship with health of rural populations. We assess diets of women and children in rural areas to help prioritise initiatives for food and nutrition security.

METHODS

Food consumption was surveyed in rural communities in Solomon Islands and Vanuatu using the Minimum Dietary Diversity for Women of Reproductive Age method. This is a 24-hour recall method that documents foods consumed as an indicator of the micronutrient adequacy of the diets of women of reproductive age (15-49 years).



A typical meal of rice, cabbage and cassava, One' Oneabu, Solomon Islands. Filip Miklovac, 2015. WorldFish.

PACIFIC FOOD SYSTEM BRIEFS

19

Dark leafy greens and vitamin A rich foods were also frequent in diets. However, women reported low intakes of eggs, pulses, dairy, nuts and seeds. Diet diversity among children was very low, with very few reported to have consumed five or more food groups in the last 24 hours (10% and 6% of children in the Solomon Islands and Vanuatu, respectively).

Application:

Important food groups are lacking in diets; focusing on increased intake of these food groups should be encouraged. Some of the food groups absent in diets are locally available or could be grown locally. Nutrition sensitive agriculture and food policy could help steer programming and planning for livestock and poultry for the integration of meat and eggs into diets. Additional agricultural policies could support pulse and legume production. Lentils like soya beans and wing beans are grown locally, and dried lentils which are also currently globally accessible, can be imported and traded like flour or rice. Aquatic foods are well represented among adult women in these sites (Vanuatu 69%, Solomon Islands 80%), and among children, rates of reported consumption are between 60% and 65%. Promoting fresh aquatic foods as opposed to

canned is recommended, to avoid highly processed and high-salt foods. The development of cultural and palatable aquatic food-based products is an opportunity to increase micronutrient intake in this group. While breastfeeding remains a priority among infants, programs which support cold and safe storage of healthy dairy food in rural areas are encouraged to increase accessibility to rural populations in Solomon Islands and Vanuatu.

Reported as:

Tutuo, J., Boylan, S. and Eriksson, H. (2023) Diets among women and children in Solomon Islands and Vanuatu. Food Systems Brief No.19. Pacific Community.

7.26 Indicators for food system analysis (Activities 4.1 and 4.4)

Overview:

Contemporary food systems frameworks typically include a range of indicators based on the influences (e.g. social), activities (e.g. production) and outcomes (e.g. health) of food systems.

While these indicator sets can be useful in characterising food systems, setting goals, tracking performance and evaluating the impacts of interventions, their application to low- and middle-income countries, such as the Pacific SIDS, is challenged by lack of data and relevance to predominantly rural populations. The result is that these countries are either left out of global food systems analyses, or when included, important local dimensions are missed.



We engaged with in-country stakeholders to explore key pathways identified through the National Assessment of the Solomon Islands Food System (see section 7.1.5) and to develop recommended actions to support the strengthening of food systems in Solomon Islands. These actions were also informed by the UN Food Systems Summit dialogues and regional directions articulated by SPC. We used this participatory approach to identify a list of indicators that could be used in the Solomon Island context to make the food systems framework more applicable and relevant.

Contribution to knowledge:

This research developed an alternate framework using context-specific indicators to track progress on national food systems goals. The findings show that contemporary frameworks and indicators are not always relevant for the Solomon Island context. The research flagged key areas where generic indicators miss important dimensions of Pacific food systems, including where indicators related to retail markets do not capture the reliance of people on cultivated or wild food sources. This research also highlighted the need for pragmatism in tracking change, given limitations in data collection, collation, analysis, and reporting. The approach taken in this research can be used as a template for comparable contexts, including in the Pacific region and for other SIDS.

Application:

Solomon Islands food system stakeholders worked with the authors to build on data provided through Project FIS/2018/155 and pathways described in the National Assessment of the Solomon Islands Food System report, to identify relevant indicators. The indicators identified can be used by these stakeholders to track progress towards international targets, in particular the Sustainable Development Goals, as well as national policy priorities.

The indicators identified in this research had some similarities with those identified for the Asia-Pacific region as part of the Food Systems Countdown to 2030 Initiative (FSCI). This work may therefore have potential application in engaging a broader range of multi-sectoral stakeholders from the Solomon Islands through coordinated efforts (regional collaboration was recommended at the FSCI regional consultations).

Reported as:

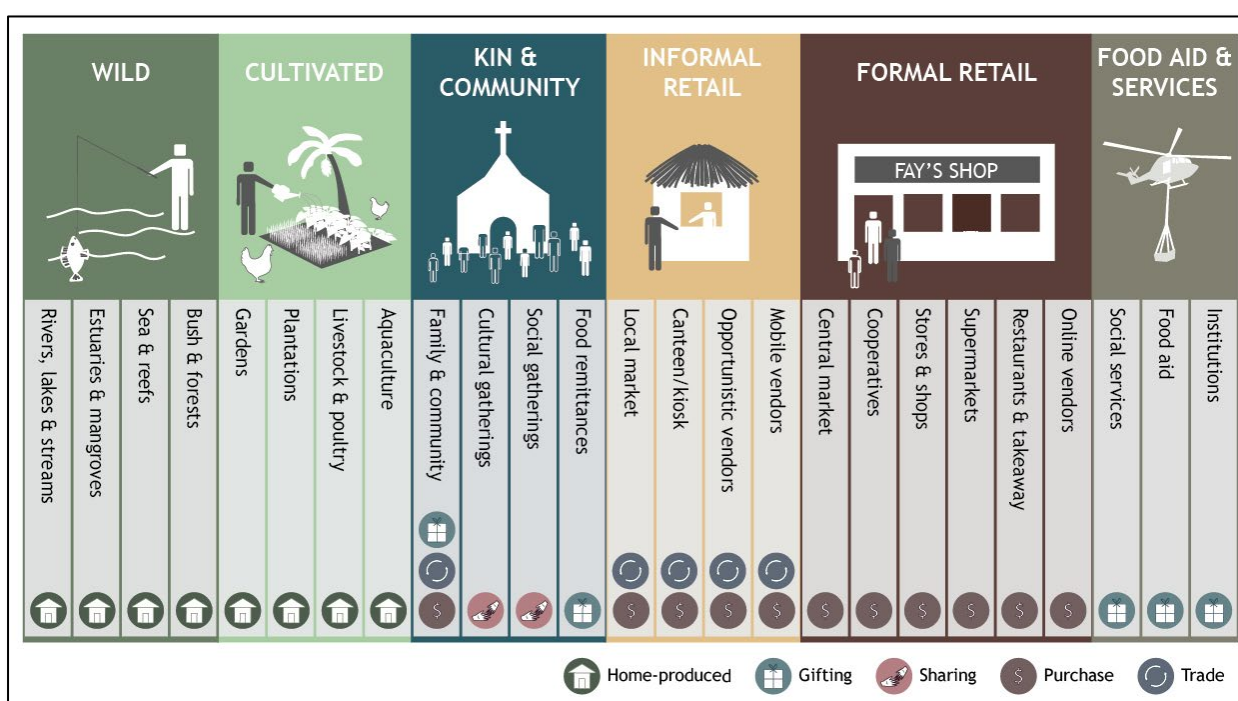
Boylan, S., Brewer, T., Farrell, P., Sharp, M., Mauli, S., Tuqa, A., Boydell, E., Farmery, A. (in review) Developing indicators for food system strengthening in the Solomon Islands. Frontiers in Sustainable Food Systems.

7.27 Typologies for food environment analysis (Activity 4.4)

Overview:

The food environment (FE) includes the places and pathways through which people acquire and/or consume food, and the various characteristics of those environments that influence food choices. FEs are a key determinant of food and nutrition security because they shape what food is available and accessible to consumers, as well as other characteristics such as the desirability or convenience of different foods that underpin food choices. FEs are also therefore, a key leverage point for improving food and nutrition security outcomes.

Previous conceptualisations of FEs have focused on FEs common in high-income country settings (such as supermarkets and fast-food restaurants) and do not capture the diversity of settings and pathways through which food is acquired in the Pacific region. Similarly, the methods and tools for analysing these FEs are not directly applicable. To address this gap, a typology of FEs was developed for the Pacific region and applied to a case study in Solomon Islands.



Contribution to knowledge:

FEs in the Pacific are diverse and strongly embedded in the subsistence nature of local fisheries and agriculture as well as the important historic and cultural role of community and kinship networks. This typology shows six primary FEs and 25 subtypes commonly found in the Pacific region. Wild FEs include foods harvested or collected from bush and forests, sea and reefs, estuaries and mangroves, and rivers, lakes and streams. Cultivated FEs include gardens as well as more commercially oriented production systems such as livestock or aquaculture – but only when used directly for own consumption (such as by owners or employees from those production systems). The kin and community FE encompasses the network of social relationships through which people acquire food, including family and community members, cultural and social gatherings, and food remittances where food is sent between provinces or internationally. Formal retail is differentiated from informal retail by the presence of formal governance structures such as licensing that govern operations. Formal retail includes central markets in urban centres, supermarkets, shops and stores, and others. Informal retail includes local markets, canteens and mobile or opportunistic vendors. Food aid and social services includes provision of food from

government or non-government organisations in response to acute or chronic food insecurity or as part of institutional food provision.

Analysis of FEs in the Solomon Islands has shown that the cultivated FE is by far the most important FE, providing 60% of all food nationally. This is followed by the wild FE (15%), kin and community (9%), and formal and informal retail FEs (8% each). Within retail FEs, central and local markets account for only 3 and 4% of all food acquired, respectively. Urban households rely more heavily on retail FEs compared to rural, and poorer households rely more heavily on cultivated FEs than wealthy households. Different FEs also contribute to diet quality in different ways. The cultivated FE provides the majority of roots and tubers (82%), fruits (73%) and vegetables (63%), and the wild FE provides the majority of fish and seafood (72%), and nuts (42%). In contrast, formal retail provides the majority of oils and fats (60%), breads and cereals (56%), meat (43%), and unhealthy junk food (43%). Kin and community plays a more moderate role across several food groups as a source of meat (29%), breads and cereals (18%), unhealthy junk food (14%) and fish and seafood (12%).

Application:

Greater knowledge of the contribution of FEs to diet quality, including how this varies within and throughout the region for different population groups, is crucial for informing the design of appropriate interventions and policies to reduce malnutrition and NCDs. When combined with data on food acquisition or consumption such as HIES surveys, this FE typology provides a framework for examining these relationships. Currently, for example, HIES often record data on food acquisition according to purchases, home-produced, or gifted transactions. Expansion of these options to reflect a FE typology would incur a very small burden on data collection but create a wealth of data to understand where people source foods and therefore better inform interventions to improve diets.

Reported as:

Bogard, J.R.; Andrew, N.L.; Farrell, P.; Herrero, M.; Sharp, M.K.; Tutuo, J. (2021) A Typology of Food Environments in the Pacific Region and Their Relationship to Diet Quality in Solomon Islands. *Foods*, 10, 2592. <https://doi.org/10.3390/foods10112592>.

7.28 Measuring consumption of seafood in LMICs (Activity 4.4)

Overview:

Fish and seafood consumption make an important but often under-recognized contribution to dietary patterns and nutrition, particularly in low-and middle-income countries (LMICs), including many in the Pacific region. This lack of recognition is partly due to lack of high quality data on dietary patterns. Dietary data in LMICs is often limited to household-level food acquisition or questionnaires involving a small sample population in specific geographic areas. This is largely due to a lack of resources for the collection of detailed dietary data on a large population scale. While household surveys, such as nationally representative income and expenditure surveys, provide useful insights into food acquisition patterns, they lack important detail on intra-household food consumption patterns. Therefore, valid, and reliable dietary assessment tools (DATs) and methods to measure seafood consumption in such settings are needed. A systematic review of the literature was conducted to review existing DATs that have been used to measure fish and seafood consumption in LMICs and to assess their quality.

Contribution to knowledge:

This review has revealed a lack of sufficient detail in the use of standard DATs to fully capture the contribution of fish and seafood to diets in LMICs. Consequently, the need to develop or adapt existing DATs to capture frequency, quantity, and type of fish and seafood intake with consideration

of cultural eating practices has been highlighted. This is essential for informing appropriate interventions to leverage the nutritional benefits of aquatic food consumption in LMICs.

The most common DATs used were Food Frequency Questionnaires (n=80, 58%) of which 36 (25%) were semi-quantitative. The vast majority (n=107, 78%) of tools included measurement of consumption frequency, while only 41 (30%) studies measured frequency, quantity, and type of seafood consumed. Only 41 (30%) DATs solely focused on fish or seafood intake. Most DATs were interviewer-administered (n=80, 58%), 23 (16%) mentioned the use of a portion size estimation aid and validity was tested for only 13% (n=18) of DATs.

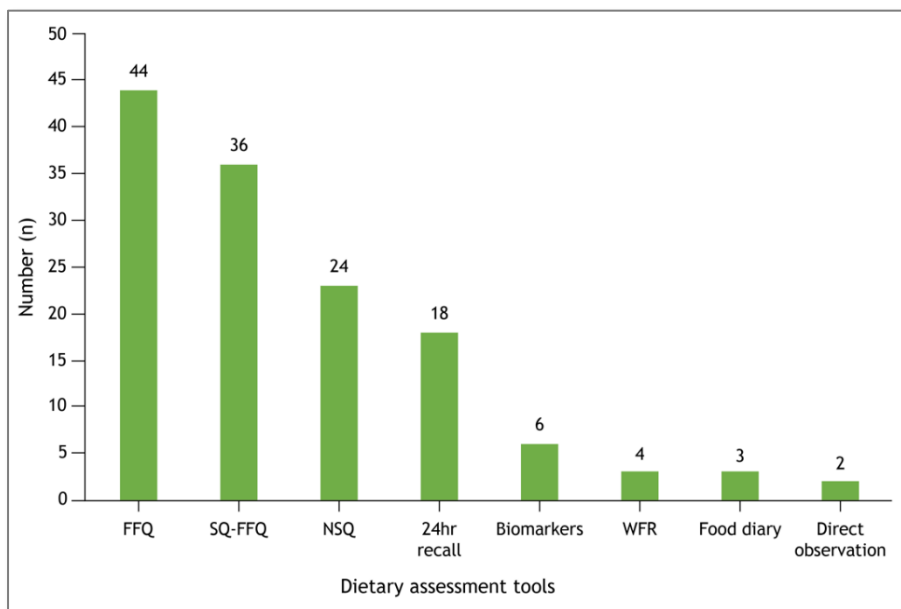


Figure: Types of dietary assessment tools identified in the literature (n=137). FFQ = Food Frequency Questionnaire; SQ-FFQ= Semi Quantitative Food Frequency Questionnaire; NSQ = Non-Standardized Dietary Questionnaire WFR= Weighed Food Record.

Application:

This review has highlighted the need to develop validated dietary assessment tools that are designed to capture quantity, type, and frequency of intake of aquatic foods with consideration of cultural eating practices, preparation methods and intra-household intake. This is essential in order to deepen the understanding of current aquatic food consumption patterns among those at increased risk of malnutrition, including women and children. To achieve this, validated DATs previously used in different settings could be used with adjustments for regional and cultural factors and following local validity testing. Additionally national health surveys, which often include the frequency of intake of common food groups, could be refined to categorize aquatic food products more comprehensively by separating them from other animal source food and including greater detail such as the type, size, source (such as aquaculture or capture fisheries) and preparation methods (fresh, dried, processed etc). This level of data would allow improved evaluation of the effectiveness of local, national, and international efforts that aim to increase aquatic food consumption in order to reduce the burden of malnutrition in LMICs.

Reported as:

Casey EMD, Mojarrabi M, Hannan-Jones MT, Bogard JR. Measuring dietary intake in low-and middle-income countries: a systematic review of the methods and tools for estimating fish and seafood intake. *Nutr Rev.* 2023 Jun 19:nuad067. doi: 10.1093/nutrit/nuad067.

7.29 Poverty, malnutrition and food security (Activity 4.7)

Overview

The evidence base to describe food and nutrition status and progress against Sustainable Development Goal (SDG) indicators in the Pacific is fragmented and weak. Baselines are missing for many indicators, and indicators measuring different dimensions of the same attribute appear to conflict in some cases. Sharp and Andrew (2021a) summarize the status of poverty, malnutrition and food security in Pacific SIDS.



To provide further insight into the underlying dynamics of poverty, malnutrition and food insecurity – particularly those related to food consumption – we characterised various aspects of Pacific SIDS’s food systems. We identified food system vulnerabilities and opportunities for innovation and digitalisation.

Pacific SIDS are diverse and heterogeneous. The food and nutrition security status of the 14 Pacific SIDS reflects this ecological and social diversity. Differences notwithstanding, it is clear that, to paraphrase the global 2021 State of Food Insecurity report, even before the COVID-19 pandemic, Pacific SIDS were and still are not on track to end poverty and malnutrition by 2030.

Poverty is a complex and sometimes contentious issue in the Pacific region, and there remains no consensus around its estimation. Available estimates of monetary poverty suggest, on average, 12 percent of Pacific SIDS populations live below the international poverty line and, on average, 25 percent live below national poverty lines. Broadly, this translates to some 3.85 million people living in

monetary poverty. Estimates of poverty for many Pacific SIDS are point estimates and inadequate to establish trends.

Contribution to knowledge

The analysis paints an uncertain but discouraging picture of poverty, malnutrition and food insecurity in the region. The triple burden of malnutrition in Pacific SIDS has dire social and economic consequences.

A stark finding is that the paucity of data makes it impossible, with any degree of certainty, to describe the current status of the region or the trajectories the Pacific SIDS are on in the run up to 2030. What is clear is that current health outcomes, derived in part from Pacific food systems, are not what they should be if Pacific SIDS are to achieve the SDGs. Bridging the consumption data void will serve to identify groups that are particularly vulnerable to poverty, malnutrition and food insecurity, such as women and children, and to form policy to improve their well-being.

The analysis highlights the scarcity of current available nationally representative and disaggregated data on consumption, food security and agricultural production in Pacific SIDS. More comprehensive regional analyses of food insecurity in the region will need to reconcile different data sources and estimates of progress by national and regional agencies.

Household and enterprise surveys present an enormous opportunity for Pacific SIDS to establish consumption and agricultural baselines and to measure progress towards achieving SDGs 1, 2 and 3. HIES are the underlying data source for the direct measurement of monetary poverty,

undernourishment and income from agriculture, agricultural value chains and the broader food system. Agricultural surveys present opportunities for rebasing production estimates in the compilation of food balance sheets.

The national food systems of Pacific SIDS are complex and exposed to many vulnerabilities. Agricultural production among Pacific SIDS is highly vulnerable to extreme climatic events, such as cyclones, floods and drought.

The region is heavily and increasingly dependent on imported foods, particularly rice, wheat and wheat products, and meat (especially chicken). PNG is much less reliant on imports than other Pacific SIDS. A heavy reliance on imported foods makes the region vulnerable to shocks and other dynamics in global food trade (including those from price shocks, supply shortages and the COVID-19 pandemic). East and South Asia are now the greatest sources of imported food for Pacific SIDS.

The projected medium to long-term consequences of climate change paint a difficult and changing picture for agriculture and fisheries in Pacific SIDS. These vulnerabilities notwithstanding, the production of root and tree crops provides a continuous connection to historical foodways and a source of resilience for Pacific communities.

Application

It is essential that statistics for Pacific SIDS continue to improve to ensure accurate baselines can be established to underpin the monitoring and evaluation of progress against the SDGs. Significant investment in national structures and tools to gather and interpret information is required in the coming decade to adequately report against SDG ambitions and targets.

The report has contributed to SPC's ongoing investments and ambition to innovate and improve digitization of national statistics collection. Specifically the report highlights eight areas where innovation would bring great improvements in the quality and availability of poverty and food security data.

Reported as:

Sharp, M.K. and Andrew N.L. (2021a) Poverty, malnutrition and food security in Pacific Small Islands Developing States. FAO Bangkok. 68 pp.

7.30 Other contributions

In addition to the contracted outputs summarized above in the Activity Tables, project members directly contributed to other outputs through fte and operating expenses, or covered publication costs. Although not claimed as project outputs, the project's direct contribution needs to be captured. Below we provide annotated summaries of such papers and peer reviewed reports based on their Abstracts.

Koehn, J.Z., Allison, E. H., Villeda, K. ... N.L. Andrew (2021) Fishing for health: do the world's national policies for fisheries and aquaculture align with those for nutrition? Fish and Fisheries, 23, 125–142. <https://doi.org/10.1111/faf.12603>

Whether fisheries and aquaculture sector and public health nutrition policies align to contribute to reducing global micronutrient deficiencies and diet-based health risks is unclear. We found that 77 of 158 national fisheries policies identified nutrition as a key objective in the sector, and 68 of 165 public health nutrition policies identified the importance of fish and shellfish consumption as key objectives. More recent policies were associated with improved coherence among sectors. Countries with higher prevalence of NCDs had fisheries and public health nutrition policies that were not aligned. There has been a promising recent trend for improved alignment of objectives between fisheries and public health nutrition policies, but more targeted and systematic policy approaches

are needed to realize the potential contribution of nutrient-rich fish and shellfish to healthier food systems.

Nash, K.L., MacNeil, M.A., Blanchard, J.L., Cohen, P.J., Farmery, et al (2022) Trade and foreign fishing mediate global marine nutrient supply. Proceedings of the National Academy of Sciences, 119(22), p.e2120817119. <https://doi.org/10.1073/pnas.2120817119>.

The world produces enough food to nourish the global population, but inequitable distribution of food means many people remain at risk for undernutrition. Attainment of Sustainable Development Goal 2 relies on greater attention to distribution processes that match food qualities with dietary deficiencies. We explored this in the context of fisheries. Foreign fishing and international trade divert nutrients caught in marine fisheries from nutrient-insecure toward nutrient-secure nations. Where nutrient-insecure countries do benefit from foreign fishing and trade, there tends to be high vulnerability to future changes in nutrient flows arising from changes to foreign fishing and trade. This research highlights the need for greater transparency around distribution of fish and for nutrition security to be considered more centrally in development of trade agreements.

Stetkiewicz S., ... Andrew N.L., Bogard J.R., plus 31 authors (2022) Seafood in Food Security: A Call for Bridging the Terrestrial-Aquatic Divide. Frontiers in Sustainable Food Systems, 5. <https://doi.org/10.3389/fsufs.2021.703152>

The contribution of seafood to global food security is being increasingly highlighted in policy. However, the extent to which such claims are supported in the current food security literature is unclear. This review assessed the extent to which seafood is represented in the recent food security literature, both individually and from a food systems perspective, in combination with terrestrially-based production systems. The results demonstrate that seafood remains under-researched compared to the role of terrestrial animal and plant production in food security. Furthermore, seafood and terrestrial production remain siloed, with very few papers addressing the combined contribution or relations between terrestrial and aquatic systems. We concluded that far more attention is needed to the specific and relative role of seafood in global food security and call for the integration of seafood in a wider interdisciplinary approach to global food system research.

Troubat, N. and Sharp, M.K. 2021. Food consumption in the Marshall Islands – Based on analysis of the 2019/20 Household Income and Expenditure Survey. Majuro, FAO and SPC. 78 pp. <https://doi.org/10.4060/cb7583en>

Republic of Marshall Islands Economic Policy, Planning and Statistics Office (2022) Poverty, food consumption, labour, and household income and expenditure in the Marshall Islands: a compendium of analyses of the 2019/20 Household Income and Expenditure Survey. Pacific Community, Noumea, 2022.

Troubat, N., Faaola, E. and Aliyeva, R. (2020) Food security and food consumption in Samoa – Based on the analysis of the 2018 Household Income and Expenditure Survey. 67 pp. Apia, FAO and SBS. <https://doi.org/10.4060/cb0613en>

[Pacific Community \(2022\) Kiribati Census Atlas. Noumea, New Caledonia. Pacific Community.](#)

[Buffière B. and Troubat N. \(2022\). Enquete budget des familles a Wallis et Futuna – 2020. Volume 3: Analyse de la consommation alimentaire. SPC 57 pp. <https://www.spc.int/DigitalLibrary/Get/78zph>](#)

The project directly contributed to a series of national food security profiles, principally through fte for Nathalie Troubat and Michael Sharp. As an example, the Marshall Islands report may be summarized as:

Marshall Islands is a small country in the Pacific composed of many atolls and islets. Contamination of the soil due to salination or as consequence of the US nuclear tests in the 1950s, water scarcity, limited infrastructure and difficulties in commuting from one islet/island to the other, and, among other factors, high population density are putting pressure on the agriculture sector and its capacity to ensure food for all. A high proportion of the food consumed is imported, with more and more consumers shifting from locally grown foods to ultra-processed imported foods rich in fats and sugars. As a result, the Marshall Islands has shown limited progress towards achieving the diet-related NCD targets. With around one in two adults obese, the Marshall Islands ranks fourth in the world by prevalence of obesity. Diabetes affects around one adult in five and more than one woman of reproductive age in four is affected by anaemia. Access to safe and nutritious foods therefore remains a serious challenge for the Marshallese. The analysis of the food insecurity experience scale data collected in the 2019/20 Household Income and Expenditure Survey (HIES) of the Marshall Islands reveals that more than one household in three is experiencing moderate or severe levels of food insecurity, which means they are lacking money or other resources to access foods in enough quantity or of good quality. The further analysis of the food data collected in the same survey finds that for around 5 percent of Marshallese, their dietary intake is lower than their basic dietary needs to maintain a normal active and healthy life. These results are reflected in the high level of dietary energy consumption (DEC) of 2 860 kcal/capita/day, evidencing a double burden of malnutrition with, on one hand, obesity through excess calorie consumption and, on the other hand, undernourishment through lack of access to enough calories.

Troubat N., Foster E., Moltedo A., Mathiassen A., Kjøsterud E.C., (in review). Processing food consumption data from household consumption and expenditure surveys (HCES). Guidelines for countries collecting data in line with the UNSC endorsed guidelines on food data collection in HCES. FAO/ UN-CEAG.

The guidelines describe how to process data collected in the food consumption modules of Household Consumption and Expenditure Surveys (HCES). These are the modules that collect the monetary value and quantity of each food item a household has acquired and consumed over a given reference period. They also capture from which sources the household obtained the food. Different users of this data have different priorities in processing the data. When these users process the data independently of each other, it often leads to inconsistent results from the same survey. It is also inefficient and costly. The primary goal of these guidelines is to articulate a repeatable data preparation process that produces a unique dataset with information on quantity, dietary energy and monetary value for every food item consumed by the household and from every source of consumption. The guidelines were in large part tested using HIES in the Pacific region.

8 Impacts

8.1 Scientific impacts – now and in 5 years

Scientific advances

Novel methods have been developed to generate the PFTD and the PFCD. Development of useful food policy requires a clear understanding of what foods people are consuming and where they are acquiring their food. Prior to the development of the databases that these methods enabled, data quality was poorly representative or of inadequate quality to conduct analysis for sound policy. The extensive mixed methods cleaning protocol developed for cleaning food trade data changed our understanding of food trade in the Pacific region, and could be applied to similar contexts (e.g. LMI's, SIDS) globally. For household surveys, a complex process was needed that integrated outlier treatment, standardization of units, the incorporation of food away from home, and statistical procedures to correctly estimate variability around mean estimates. These methods will contribute to improve analyses beyond the project, particularly in small island developing states where data on food trade, and acquisition and consumption are sparse.

The integrated Pacific Food Consumption Database brings HIES information from 12 PICs into a single database. This required, in a world first, the harmonization of survey design and implementation modalities. In addition, the project developed Stata code to correctly estimate standard errors for mean estimates of food acquisition and consumption.

Experimental work on the implementation of household surveys has changed the design and conduct of household surveys in the region. The sum of these methodological innovations will have a lasting impact on the utility of surveys in the region and beyond.

Scientific outputs

The project resulted in 36 peer reviewed reports, book chapters and journal articles. Further journal articles are being prepared and/or have been submitted for publication (see section 10.1).

8.2 Capacity impacts – now and in 5 years

Under Objective 1, the regional international merchandise trade statistics (IMTS) workshop was held in Fiji in December 2022. The workshop included attendees from all SPC member countries and representatives from regional bodies including Pacific Islands Forum Secretariat, Oceania Customs Organization and others. The PFTD was presented, and countries were provided with their respective data from the PFTD. Additionally, a training exercise was conducted on basic analysis of healthy and unhealthy foods. All attendees participated in the exercise, with country representatives using data specific to their country to complete the exercise.

Additionally, from time to time, and particularly during COVID-19, the team provided DFAT with data summaries and briefs (e.g., Andrew, N.L. et al. (2020a, b) with a focus on trends in rice and wheat imports by exporting country.

Sharing data and insights from the Pacific Food Trade Database has been well received, and we anticipate the value of the database will continue to grow to meet the demands of the region. Below are examples of some email correspondence, which reflect data needs and database value for individual and organisational capacity:

“Tom, I would love to know where I can sign up to be notified once your website is up and running. I am the founder of the Fiji SME Business Owners Network (the largest collection of SME's in Fiji) and I know what you have described will be on your website would be wonderfully useful for SME's in the

agricultural sector. Thanks again.” Fiji Small-Medium Enterprise Business Owners Network

“We are working with UNCTAD that is rolling out the automated customs system, called ASUCYDA, in all the Pacific countries. The 5 Pacific WTO Members (Fiji, PNG, Samoa, Solomon Islands, Vanuatu) are already using this system. The remaining PICs will also be adopting this in the next 2-3 years. This would greatly improve trade data capture and supply to SPC. In the meantime, we will rely on your policy briefs.” Permanent PIFS Geneva Representative

“This is very helpful for Samoa's compilation. Thank you very much and appreciate the hard work...” Government trade statistician of Samoa

“Thank you again for the PFTD. Given the fact that Samoa has hardly combined a database especially for quantities and units, this dashboard gives us hope...” Government trade statistician of Samoa

“...everyone was blown away by the data in PFTD. There are now plans to have a stakeholder consultation to showcase the PFTD data and the work we are doing [with it]. SPC Public Health Division representative on PNG trade and health experts engaging with the database

The Policy Advisory Group under Objective 2 comprised 11 participants (5 male; 8 female) with expertise in food systems, health and environment and experience relevant to food system policy making in the Pacific at regional and national (Vanuatu and Solomon Islands) levels. Participants represented next user groups, representing one multilateral organisation, five Pacific region technical, tertiary education institutions or NGOs, and three partner government departments. Participant feedback was solicited during the final meeting. Several participants reported change in knowledge and skills as one thing that they found useful from being part of the Advisory Group and involved in the project:

“Keeping updated on latest research in the ground from partners and the possibility of exploring synergies.”

“Sharing knowledge and information across different societal groups and institutions, academia, in the local, national, regional and international fora and focussing on Food Policy that can set standards which benefit everyone.”

On an individual level, the project has contributed to increasing the scientific capacity of Pacific Islanders conducting research through support to post-graduate students. The UOW contribution to the project supported Dorah Wilson with a PhD scholarship. Dorah is nearing completion of her PhD thesis, titled “Vanuatu food system governance: status and opportunity for transformation for improved food security and health outcomes”. She is additionally a co-author on three publications with members of the research team. The project also supported two Australian PhD students: Michael Sharp and Isuru Kodituwakkuarachchi.

8.3 Community impacts – now and in 5 years

As implemented, the project has had no directly attributable community impacts. Activities under Object 3 were curtailed as a consequence of COVID-19. The project was designed with long-term strategic ambitions to contribute to the characterization of national and regional food systems. The work has strengthened the evidence base needed for policy change. Many activities begun in this project will continue in the next phase (FIS/2022/121). This next phase will also see a return to the field through an important local-scale pathway for change focused on food environments with

different attributes. Two other impact pathways will focus on data and training to address vulnerability to food and nutrition insecurity, and on coherent food system policy.

8.4 Economic impacts

There were no directly attributable changes to the monetary wellbeing of individuals, communities or countries from the project. That said, the burden and threat of NCDs constitutes one of the major challenges for Pacific economies. The economic impact of the project will be felt in the long-term and potentially as many multiples of its cost. The many sectors (agriculture, health, finance, etc) and the multipliers (assumptions) used in scaling out estimates of economic impact from local to national scales leave any such estimate open to criticism. Even the most modest changes in the rates of NCDs in the region will generate economic impacts in households and national economies far greater than the cost of the project. Beyond this proposition, the complexity and length of impact pathways mean that plausible, quantified estimates of the attributable economic impact of the project are fraught.

The new method resulting from the Marshall Islands experiment is expected to reduce the cost of HIES by 2 to 4 times, depending on the geographic distribution of the population. It will also reduce respondent fatigue and, in turn, improve data quality, due to significantly reduced time to collect food consumption data reducing error of no or under response that was associated with the status quo. Household consumption is an important component of GDP in the Pacific Island countries and the data therefore contribute towards the measurement of headline development indicators, such as GDP, inequality, and unemployment, and in updating the CPI, which is increasingly important in the current inflationary environment, and also to update headline microeconomic indicators, including poverty prevalence rate. The reduced cost and burden of the new HIES method should theoretically result in the conduct of more surveys, so these macro and micro economic indicators will be updated more frequently.

Further economic impacts at the country- and region-level in five years are expected to comprise mostly of increased knowledge on the production and consumption of various foods, to enable informed and unified agri-food system policy design, including diagnostic tools, to improve agri-food system policy interventions. This knowledge will enable greater attribution of specific foods and food trade networks to NCD outcomes. Resulting policy could have the potential to drastically diminish the economic burden of NCDs in the region.

Nevertheless, to illustrate the gap between this project and the scale of the problem in just one dimension, we note some examples of the economic cost of NCDs:

- There are more than 250,000 people with diabetes in the region²⁶. Based on estimates of the cost of NCDs in the region, and with some simplifying and conservative assumptions, we estimate that the cost of the project will be recovered if we contribute to eliminating the need for 1,000 to 1,500 people to need treatment for, and lose their life from, NCDs by 2040²⁷.
- As an example of potential impact beyond the project, in Samoa, the total budget of the project would cover dialysis treatment for only ca. 48 people²⁸.

²⁶ WHO estimates there were 230,000 people in the region with diabetes in 2000 and predicted this would more than double to 567,000 by 2030; WHO (2000) http://www.who.int/diabetes/facts/world_figures/en/index6.html.

²⁷ Anderson (2013) World Bank report; based on an unpublished analysis by Michael Sharp.

²⁸ Anderson (2015) World Bank report; NCD Alliance (2015) https://ncdalliance.org/sites/default/files/resource_files/NCD%20Roadmap%20Report.pdf

- In Vanuatu, (i) every person who avoided becoming diabetic would save the government at least \$347 per year, and (ii) the cost of insulin treatment for a diabetic person absorbs the budgeted drug allocation of 76 other ni-Vanuatu people²⁹.
- The World Bank estimates that, if no action is taken, NCDs could cost the Pacific up to 33% (14% mortality and 19% morbidity) of GDP by 2040³⁰.

8.4.1 Social impacts

There were no directly attributable social impacts from the project at the individual or community level. The food environment intervention in Objective 3 did not happen due to COVID-19.

That said, in the long-term, the databases created, the analyses of food imports, and analyses of food policy coherence, and the national food system/consumption analyses completed will contribute to changing the policy and regulatory landscape to improve public health outcomes. The national food system analysis in Solomon Islands will contribute to providing evidence and pathways for impact.

8.4.2 Environmental impacts

There were no directly attributable environmental impacts from the project.

That said, the global food system is a major contributor to environmental impacts and providing growing populations with healthy diets from sustainable food systems is an immediate challenge³¹. In the Pacific, the production, supply and disposal of food has resulted in environmental issues on land and sea, including the overuse of natural resources, loss of biodiversity and pollution from waste. In the long-term, this research will contribute to reducing the impacts of the food system by firstly documenting the major issues related to PICs' food systems such as shifting dietary patterns to reduce pressure on natural resources³², and secondly, by identifying appropriate policy approaches (Obj 2). Re-orienting agricultural policies to prioritising the production of healthy food over high quantities of food, and halving food losses and waste have been identified as strategies for moving food systems toward more healthy and sustainable outcomes.

8.5 Communication and dissemination activities

A key outlet for disseminating the project's learning is the SPC Statistics for Development Division's Food Systems website <https://sdd.spc.int/food-systems>. From 1 January 2021 to 18 September 2023, there have been almost 1,500 visitors to the website, and views are growing. Of note, the website has had 587 visits from people in the Pacific region.

The Food Systems Briefs are a critical mechanism to communicate and disseminate the project's research. These have been downloaded widely with older briefs understandably seeing higher numbers, but several key topics such as wheat generating particular interest.

²⁹ *Op cit*

³⁰ https://ncdalliance.org/sites/default/files/resource_files/NCD%20Roadmap%20Report; <http://www.worldbank.org/en/news/press-release/2016/06/20/lack-of-action-on-non-communicable-diseases-damaging-pacific-economies-world-bank>; Hou et al (2016) *World Bank background paper*

³¹ Willett et al. (2019) *The Lancet* 393 (10170): 447-492.

³² Gordon et al. (2017) *Env. Res. Letters* 12: 100-201

Brief	Year	Title	Authors	# downloads ³³
1	2021	Pacific Food System Briefs	Sharp and Andrew	224
2	2021	Pacific Nutrient Database (PNDB)	Sharp and Andrew	170
3	2021	The Pacific Food Trade Database (PFTD)	Brewer and Andrew	199
4	2021	Fruit and non-starchy vegetables in the Pacific	Sharp and Andrew	104
5	2021	Food and Beverage Imports	Brewer and Andrew	125
6	2022	Pacific wheat: Import dependence and global shocks	Brewer and Andrew	139
7	2022	Solomon Islands Food and Beverage trade	Brewer and Andrew	25
8	2022	Poverty, malnutrition and food insecurity in SLB	Sharp et al.	70
9	2022	Food environments in food and nutrition security in SLB	Bogard	34
10	2022	Lessening import dependence in SLB	Thow and Reeve	35
11	2022	Policies for healthy and sustainable food systems in SLB	Reeve and Thow	29
12	2022	Pathways for food system change in SLB	Farmery et al.	28
13	2023	Food and beverage exports	Brewer and Andrew	25
14	2023	Starchy vegetables	Sharp et al.	25
15	2023	Aquatic foods in the Pacific food system	Farmery and Andrew	35
16	2023	Intra-regional food trade in the Pacific region	Thow et al.	36
17	2023	Regional food system governance	Thow and Reeve	25
18	2023	Fruit and non-starchy vegetables in SLB	Farrell et al.	29
19	2023	Diets of women and children in Solomon Islands and Vanuatu	Wate et al.	44
20	2023	Living by the sea: coastal proximity in the Pacific region	Andrew	34
21	2034	Translation of Pacific regional food systems policy guidance to national level	Patay and Thow	No data

A summary of the project's communication and dissemination outputs and activities are listed below.

Food system briefs and other translation briefs

Andrew, N.L. (2023). Living by the sea: coastal proximity in the Pacific region. Food Systems Brief No. 20. Pacific Community. Online [here](#)

Andrew, N.L., Brewer, T.D., Sharp, M.K. (2020a) Trends in Rice imports to the Pacific region. Unpublished Information Brief to DFAT/ACIAR. 2pp.

Andrew, N.L., Brewer, T.D., Sharp, M.K. (2020b) Import of dominant commodity groups to Pacific Island Countries and Territories (PICTs). Unpublished Information Brief to DFAT/ACIAR. 3pp.

Bogard, J.R. (2022) Food environments in food and nutrition security in Solomon Islands. Honiara, FAO. <https://doi.org/10.4060/cc2770en>

Brewer, T.D. and Andrew, N.L. (2022a) Solomon Islands Food and Beverage trade. Honiara, FAO. Online [here](#).

Brewer, T., Andrew, N.L. (2022b) Pacific Wheat: Import dependence and global shocks. Food System Brief No.6. Pacific Community. Online [here](#).

Brewer, T., and Andrew, N.L. (2021a) The Pacific Food Trade Database. Food System Brief No. 3. Pacific Community. Online [here](#).

Brewer, T., and Andrew, N.L. (2021b) Food and Beverage Imports. Food System Brief No. 5. Pacific Community. Online [here](#).

³³ Google Analytics recorded at September 2023

- Brewer T. and Andrew N.L. (2021c) Food and Beverage Exports. Food System Brief No.13. Pacific Community. Online [here](#).
- Brewer, T.D., Andrew, N.L., Sharp, M.K. (2020b) Trends in Wheat and Wheat flour imports to the Pacific region. Unpublished Information Brief to DFAT/ACIAR. 2pp.
- Eurich, J., Sharp, M.K., Andrew, N.L., Brewer, T.D. (2020) Per capita production of starchy vegetables (SV) through time in the Pacific region. Unpublished Information Brief to DFAT/ACIAR. 3pp
- Farmery, A. K., Maelaua, J., Mauli, S., Eriksson, H., Reeve, E., Thow, A.M., Andrew, N.L. (2022) Pathways for food systems change Solomon Islands. Honiara, FAO. <https://doi.org/10.4060/cc2749en>
- Farmery, A.K. and Andrew N.L. (2021a) Aquatic foods and their role in nutrition in the Pacific. Food System Brief No.15. Pacific Community. Online [here](#).
- Farrell, P. (2023) Fruit and Non-Starchy Vegetables in Solomon Islands. Food System Brief No.18. Pacific Community. Online [here](#).
- Patay, D., and Thow, A.M. (2023). Translation of regional food system policy guidance to national level. Food System Brief No. 21. Pacific Community. Online [here](#).
- Reeve, E. and Thow, A.M. (2022b) Policies for healthy and sustainable food systems in the Solomon Islands. Honiara, FAO. <https://doi.org/10.4060/cc2769en>
- Sharp M.K. and Andrew N.L. (2021b) Pacific Food System Briefs. Food System Brief No.1. Pacific Community. Online [here](#).
- Sharp M.K. and Andrew N.L. (2021c) Pacific Nutrient Database. Food System Brief No.2. Pacific Community. Online [here](#).
- Sharp M.K. and Andrew N.L. (2021d) Fruit and non-starchy vegetables (FNSV). Food System Brief No.4. Pacific Community. Online [here](#).
- Sharp, M.K. Eurich, J.G. and Andrew, N.L. (2021e) Starchy vegetables. Food System Brief No. 14. Pacific Community. Online [here](#).
- Sharp, M.K. (2020) Fruit and Non-Starchy Vegetable (FNSV) production in the Pacific region. Unpublished Information Brief to DFAT/ACIAR. 4pp.
- Sharp, M.K., Farmery, A.K. & Andrew, N.L. (2022a) Poverty, malnutrition and food insecurity in Solomon Islands. Honiara, FAO. <https://doi.org/10.4060/cc2830en>
- Thow, A.M. and Brewer, T. (2023a) Food trade within the Pacific Region. Food System Brief No.16. Pacific Community. Online [here](#).
- Thow, A.M. and Reeve, E. (2023b) Regional Food System Governance. Food System Brief No.17. Pacific Community. Online [here](#).
- Tutuo, J., Boylan, S. and Eriksson, H. (2023) Diets among women and children in Solomon Islands and Vanuatu. Food System Brief No.19. Pacific Community. Online [here](#).
- Thow, A.M. and Reeve, E. (2022c) Lessening import dependence in Solomon Islands. Honiara, FAO. <http://doi.org/10.4060/cc2755en>

Websites

Pacific Food Systems resources produced by the project are published on a page within the SPC Statistics for Development Division website: <https://sdd.spc.int/food-systems>

Pacific Food Trade Database dashboard: <https://pacificdata.org/pacific-food-and-beverage-trade>

Mailing list

A mailing list has been developed as part of the PFTD communication and dissemination activities. As of April 2023 the mailing list included 79 individuals. These individuals include government staff from all 18 PICTs included in the PFTD, including statisticians and customs staff. It also includes representatives across regional bodies including Pacific Islands Forum Secretariat, Oceania Customs Organisation, PACER Plus, DFAT, and ACIAR. The purpose of the mailing list is to build a community of practice around knowledge and policy of food trade in the region.

Blogs

Brewer, T. (2021) The importance of good data: Pacific food trade. Pacific Community web story, 6 September 2021. <https://www.spc.int/updates/blog/partners/2021/09/the-importance-of-good-data-pacific-food-trade>

Mayron, S. Food insecurity weighs on nutrition expert. Samoa Observer, 21 April 2020. <https://www.samoobserver.ws/category/samoa/61345>

Presentations

The Pacific Food Trade Database has been presented to international expert groups and regional forums including to FAO and UN trade experts, at Pacific Agriculture and Forestry Week, SPC/FAO Regional Food Security Cluster, and the Regional International Merchandise and Trade Statistics workshop.

Other presentations include:

Bogard J, Andrew N, Sharp M, Farrell P, Tutuo-Wate J. Understanding the importance of wild, cultivated and community food environments in the Pacific region. In: ANH-Academy Week 2021. https://www.anh-academy.org/sites/default/files/2021-08/ANHAcademyWeek2021_Final.pdf (p6, 'Food environments: global and local' session)

Bogard, J. Development of a food environment typology for the Pacific Region: kin and community is an overlooked source of food. Agriculture Nutrition and Health Academy Research Conference (virtual). 29 June - 1 July 2021.

Brewer, T. Food Security and Global Shocks. Quarterly meeting of the Pacific Regional branch of Food Security Cluster. May 2022.

Brewer, T. Food Systems outcomes and discussion related to increasing linkages and making best use of data and other information derived from Food Systems 1. Noumea, New Caledonia. 26 - 30 September 2022.

Farmery, A. Aquatic foods and Sustainable Food Systems. Blue Economy CRC workshop. Hobart, May 2022

Farmery, A. Sustainable Seafood Planning workshop, hosted by University of Queensland. Heron Island, April 2022

Farrell P, Wate J, Thow A, Bogard J, Scott J, Andrew N. Food access in Solomon Islands during COVID-19: a rapid baseline survey. In: Australian Public Health Conference 2020.

Farrell P, Thow A, Reeve E, Sharp M, Brewer T, Bogard J, Farmery A, Tutuo J. Fruit and vegetable acquisition and supply in Solomon Islands: identifying opportunities for improved health outcomes. In: 2022 International Congress on Obesity (ICO); Melbourne.

Farrell P, Thow A, Wate JT, Nonga N, Vatucawaqa P, Brewer T, Sharp MK, Farmery A, Trevena H, Reeve E, Eriksson H, Gonzalez I, Mulcahy G, Eurich JG, Andrew NL. COVID-19 and Pacific food system resilience: opportunities to build a robust response. In: Australian Public Health Conference 2020.

- Farrell P, Thow AM, Bogard J, Tutuo J. Why is measuring local food environments important for influencing food policy making – and how can we actually do this? In: 2021 Global Food Governance Conference
- Farrell P, Wate J, Thow A, Bogard J, Scott J, Andrew N. Food access in Solomon Islands during COVID-19: a rapid baseline survey. In: Australian Public Health Conference 2020.
- Farrell P, Wate J, Thow AM, Bogard J, Scott J, Andrew N. Food access in Solomon Islands during COVID-19: a rapid baseline survey. Australian Public Health Conference 2020 (virtual). 19-30 October 2020.
- Farrell, P., Sharp, M.K., Reeve, E., Brewer, T.D., Farmery, A.K., Tutuo, J., Bogard, J. R., Kanamoli, S., and Thow, AM. (2023). Fruit and non-starchy vegetable acquisition and supply in Solomon Islands: opportunities for improved food system outcomes Conference presentation. 8th Annual Agriculture, Nutrition and Health Academy Week, 19-30 June 2023. Malawi.
- Farrell, P., Thow, AM., Bogard, J., and Tutuo, J. (2021). Why is measuring local food environments important for influencing food policy making – and how can we actually do this? In: 2021 Global Food Governance Conference
- Farrell, P., Thow, AM., Reeve, E., Sharp, M., Brewer, T., Bogard, J., Farmery, A., and Tutuo, J. (2022). Fruit and vegetable acquisition and supply in Solomon Islands: identifying opportunities for improved health outcomes. In: 2022 International Congress on Obesity (ICO); Melbourne.
- Farrell, P., Thow, AM., Wate, J.T., Nonga, N., Vatucawaqa, P., Brewer, T., Sharp, M.K., Farmery, A., Trevena, H., Reeve, E., Eriksson, H., Gonzalez, I., Mulcahy, G., Eurich, J.G. and Andrew, N.L. COVID-19 and Pacific food system resilience: opportunities to build a robust response. In: Australian Public Health Conference 2020.
- Farrell, P.; Sharp, M.K.; Reeve, E.; Brewer, T.D.; Farmery, A.K.; Tutuo, J.; Bogard, J. R.; Kanamoli, S.; Thow, A. Fruit and non-starchy vegetable acquisition and supply in Solomon Islands: opportunities for improved food system outcomes Conference presentation. 8th Annual Agriculture, Nutrition and Health Academy Week, 19-30 June 2023. Malawi
- Mauli, S. 2023: Opportunities to strengthen fish supply chain policy to improve external food environments for nutrition in the Solomon Islands. Conference presentation. 8th Annual Agriculture, Nutrition and Health Academy Week, 19-30 June 2023. Malawi
- Mauli, S.; Strengthening Alignment Between Rural Development and Fisheries Management Policy to improve better outcomes for communities. International Conference on Achieving Ocean Equity: Innovative, Fair, Inclusive and Sustainable Strategies and Blue Impact and Investments. 27 February – March 1, 2023. Wollongong
- Patay, D. The role of Indigenous knowledge of food systems in improving sustainable food production in the Pacific. United Nations Development Programme (UNDP) program design workshop - 'Food Systems Deep Dive to inform the design of the Blue and Green Islands Integrated Programme'. March 28th, 2023. Online.
- Patay, D., Ravuvu, A., Iese, V., Farrell, P., Farmery, A., Reeve, E., Wilson, D., Mauli, S., Maelaua, J., Johnson, E., and Thow AM. (2023). The impossible choice? Balancing policy paradigms to strengthen food systems in the Pacific. 8th Annual Agriculture, Nutrition and Health Academy Week, 19-30 June 2023. Malawi
- Reeve, E. (2022). Food systems governance in the Pacific Islands: an analysis of policy tools promoting healthy and sustainable food systems. 7th Annual Agriculture, Nutrition and Health Academy Week, 30 June 2022, online.
- Sharp, M. Monitoring SDG Target 2.1 in the Pacific region - filling the data gap. 29th Session of the Asia and Pacific Commission on Agricultural Statistics. Ulaanbaatar, Mongolia. 22-25 November 2021.

Sharp, M. The Pacific Community (SPC) Food Away from Home research project and the UN CEAG working group. Seminar on household food consumption data and statistics. UN-CEAG (virtual). 14 October 2022.

Sharp, M. Use of HCES data in the Pacific Region. Seminar on household food consumption data and statistics. UN-CEAG (virtual). 14 October 2022. <https://infofish.org/Webinar/index.php/technical-virtual-workshop-on-analysis-of-national-household-survey-data-to-inform-sdg-target-2-1-indicators>

Sharp, M., Brewer, T. and Motokula, A. Pacific Food Systems and Data. Pacific Data Community of Practice Talanoa session (virtual). July 27 2021.

Tutuo J, Farrell P, Bogard J, Andrew N. Food markets in Solomon Islands - availability, price, and opportunities for improving nutrition. In: 2022 TropAg Conference; Brisbane.

Tutuo Wate, J. Solomon Islands Market Vendor and Price Survey. DFAT webinar: Solomon Islands and COVID-19: What do we know about impacts to livelihoods, food systems and food and nutrition security? 25 September 2020.

Tutuo, J., Farrell, P., Bogard, J., and Andrew, N. (2022). Food markets in Solomon Islands - availability, price, and opportunities for improving nutrition. In: 2022 TropAg Conference; Brisbane.

Workshops

Michael Sharp and Nathalie Troubat presented multiple sessions at the Technical virtual workshop on analysis of national household survey data to inform SDG Target 2.1 indicators. FAO and SPC. 2-6 August 2021. 41 participants from five countries.

9 Conclusions and recommendations

Analysis conducted in the project provided, for the first time, a descriptive analysis of the different food environments in the Pacific region, and a quantitative assessment of the role they play in food acquisition in the Solomon Islands. Wild, cultivated and informal food environments are critical for food acquisition, particularly for vulnerable (especially rural) people not engaged in the formal economy. A focus solely on formal value chain and market-oriented approaches is, therefore, not adequate to respond to food system challenges that are deeply connected to place-based dynamics of culture, kin and community, and the diverse, often informal, ways people produce and acquire food. **Recommendation 1: develop methods and tools for assessing the characteristics of different food environments, including attributes such as availability, affordability, convenience, quality and sustainability of foods, which influence consumer behaviour and ultimately nutrition and health outcomes.** Project FIS/2022/121 will respond to this recommendation to build understanding of where, and what, the key entry points are in local food environments to improve dietary patterns and nutrition outcomes.

Policy analyses highlighted innovative approaches to food system policy in the Pacific, for example, adopting integrated food and nutrition strategies (Vanuatu) or undertaking new food systems approaches to agricultural policy (Solomon Islands). However, there remain ongoing challenges in coordination and implementation of policy across relevant food system sectors. Creating an enabling environment for strengthening food system governance at a sub-national level is also key to improving food and nutrition outcomes. **Recommendation 2: identify and support national processes for food systems policy coordination and implementation.**

The publication of the National Assessment of the Solomon Islands Food system report was a significant achievement in compiling information to characterise a local food system. Based on the consultations and analyses undertaken through this process, three key pathways for food system change were recognized. **Recommendation 3: strengthen and connect the rural food system; strengthen the national policy environment; and advocate for food environments that make healthy food more accessible, affordable and convenient.** The pathways identified recognize areas of strength that are already being supported and that do not need to be “transformed” as much as they need to be strengthened to continue a positive trajectory.

Based on project activities in Marshall Islands, we concluded that the use of diaries to collect food data required to estimate apparent consumption in household surveys resulted in biased estimates compared to recall methods. **Recommendation 4: future HIES in the Pacific employ participant recall methods to collect food consumption data in household surveys as they provide more reliable and cost-effective estimates of household expenditure and consumption.** As a direct result of this work, national surveys in Marshall Islands (2019), Vanuatu (2019), Kiribati (2019), Wallis and Futuna (2019), Tonga (2021), Samoa (2022) and Tuvalu (2022) utilized recall methods, with significant savings in the cost of the surveys and improved statistics. The lessons learned are applicable beyond the Pacific region as there are few examples of such experiments, or consumption datasets using the recommended method, which provides insights globally into emerging issues, such as the collection of food away from home data.

Based on national HIES-based estimates of consumption, we concluded that Pacific Islanders are among the highest consumers of fish in the world, but not uniformly or consistently so. **Recommendation 5: policy and research priorities need to move beyond simplistic ‘eat more fish’ narratives to: (i) better contextualize the role of aquatic foods with the full diversity of Pacific diets, (ii) improve understanding of the role of invertebrates in diets, (iii) reassess the role of canned fish in Pacific food systems.** These recommendations are being progressed through a range of initiatives led by SPC, through ACIAR projects FIS/2020/155 and FIS/2022/121, and in other ACIAR initiatives in the region.

Despite broad consensus that a nutrition transition is underway in the region, there is a dearth of quantitative studies of trends in supply, importation, acquisition and consumption in a range of important food groups, notably animal source foods (particularly chicken), wheat, rice, and sugar.

Recommendation 6: Complete integrated analyses of major food commodities and use them as a foundation for policy development and research prioritization. This recommendation is being furthered in project through ACIAR projects FIS/2020/155 and FIS/2022/121 as a continuation of work begun in the present project.

The PFCDB consists of data from 22,365 households from COK, FSM, KIR, MHL, NRU, NIU, PLW, WSM, SLB, TKL, TON, TUV, VUT, and WLF. Missing are the two largest PICTs, Papua New Guinea and Fiji, and the American and French territories. About 86% of Pacific people live in these places and the unavailability of HIES limits inferences in region-wide analyses of food system dynamics. **Recommendation 7: Household consumption surveys be completed following international recommendations to improve the evidence base needed to alleviate poverty and achieve food and nutrition security.**

In the course of implementing commodity-based analyses, and during analysis of the Solomon Islands national food system, the project reaffirmed the well-known gap in estimates of domestic agricultural production in PICTs. Agriculture, in its broadest sense, has been a subsistence mainstay for generations, and its sustainable development is essential for food and nutrition security in the Pacific region. National production statistics, as available through FAO, are poor or absent.

Recommendation 8: Long-term investments are needed to develop the systems and capacity to quantify domestic agricultural production in PICTs. Of particular importance will be to conduct agricultural surveys that collect food production data that are complementary to the data collected in HIES, such as in collecting production data on foods and their associated units and values that are commonly consumed.

Our analysis identified that much of the dietary energy available in Pacific SIDS is imported. Therefore, the curation of reliable international trade statistics will serve to improve the understanding of available dietary energy and nutrients at a national level. While the use of mirror trade statistics provides a stopgap measure to reconcile missing data, global databases, including those held by the UN, do not have sufficient resolution or quality to underpin national- or commodity-level analyses of food trade in the region. These data gaps limit the capacity of national governments in the region to understand, and respond to, the impact of food trade on their food systems. **Recommendation 9: continue development of the Pacific Food Trade Database and further integrate the database into national statistics collections and methods, and provide training in the use of the database for national policy development.** This recommendation is being pursued in project FIS/2022/121.

The creation of the Pacific Nutrient Database and its addendum PNDB Fish filled a gap in enabling HIES-based analyses of consumption and dietary adequacy in the region. The work highlighted the paucity of information on the nutrient composition of a range of Pacific aquatic foods.

Recommendation 10: Invest in (expensive) nutrient composition studies with a focus on the finfish families Acanthuridae, Labridae (including Tribe Scarini), Siganidae, Holocentridae, and Lutjanidae. Nutrient profiles for other taxa, notably invertebrates and algae are similarly sparse and improved profiles much needed, but gaps have not yet been prioritised.

10 References

References cited in report but not produced by the project are cited as footnotes.

10.1 List of publications produced by project

- Andrew, N. L., & Fleming, A. E. (2019). Reflections on interdisciplinarity in aquaculture and food systems research for development in Australia and the Pacific region. *Agricultural Science*, 30(2/1), 82-91.
- Andrew, N.L., Allison, E.H., Brewer, T. et al (2022) Continuity and change in the contemporary Pacific food system. *Global Food Security*, 32, 100608, 1-11. <https://doi.org/10.1016/j.gfs.2021.100608>
- Bogard, J.R., Andrew, N.L, Farrell, P. et al. (2021) A Typology of Food Environments in the Pacific Region and Their Relationship to Diet Quality in Solomon Islands. *Foods*, Volume 10, 2592, pp.1-17. <https://doi.org/10.3390/foods10112592>
- Bogard, J., Downs, S., Casey, E. et al. (2024) Convenience as a dimension of food environments : a systematic scoping 2 review of its definition and measurement. *Appetite*, 194. <https://doi.org/10.1016/j.appet.2023.107198>.
- Boylan, S. (2023) Developing indicators for food system strengthening in the Solomon Islands. Workshop Report. Unpublished CSIRO Report. 17 pp.
- Brewer, T.D., Andrew, N.L., Sharp, M.K., Thow A.M., Kottage, H., Jones, S. (2023a) A method for cleaning international food trade data for regional analysis: The Pacific Food Trade Database. Version 2.1. Pacific Community Methods paper. <https://sdd.spc.int/news/2023/03/31/method-cleaning-int-food-trade-data-regional-analysis-PFTD>
- Brewer, T., Kottage, H., Andrew, N.L. (2023b). Options for supplying dietary protein for growing Pacific Island populations. Report prepared for the Pacific Community. 94 pp.
- Brewer, T.D., Andrew, N.L., Abbott, D. et al. (2023c). The role of trade in pacific food security and nutrition. *Global Food Security*, 36: 100670. <https://doi.org/10.1016/j.gfs.2022.100670>.
- Casey, E.M.D., Mojarrabi, M., Hannan-Jones, M.T., Bogard, J.R. (2023) Measuring dietary intake in low-and middle-income countries: A systematic review of the methods and tools for estimating fish and seafood intake. *Nutrition Reviews*. <https://doi.org/10.1093/nutrit/nuad067>
- Eriksson, H., Ride, A., Boso, D. et al (2020) Changes and adaptations in village food systems in Solomon Islands: A rapid appraisal during the early stages during the early stages of the COVID-19 pandemic. Penang, Malaysia: WorldFish. Program Report: 2020-22.
- FAO, VNSO, and Pacific Community (2021a) Vanuatu: Food Security Profile. Apia, Samoa: FOA. Online [here](#).
- FAO, KNSO, and Pacific Community (2021b) Kiribati: Food Security Profile. Apia, Samoa: FAO. https://sdd.spc.int/digital_library/kiribati-food-security-profile
- FAO, STSEE and Pacific Community (2021c) Wallis and Futuna: Food Security Profile (French). Apia, Samoa: FAO. Online [here](#).
- FAO, EPPSO and Pacific Community (2021d) Republic of the Marshall Islands: Food Security Profile. Apia, Samoa: FAO. https://sdd.spc.int/digital_library/republic-marshall-islands-food-security-profile
- FAO, TNSO, and Pacific Community (2020) Tuvalu: Food Security Profile. Apia, Samoa: FAO. Online [here](#).

- FAO and Pacific Community (2020a) Pacific Nutrient Database User Guide. Noumea, New Caledonia.
- FAO and Pacific Community (2020b) Solomon Islands: Food Security Profile. Apia, Samoa: FAO. Online [here](#).
- Farmery, A.K., Andrew, N.L., Brewer, T., Maelaua, J., Maui, S., Scott, J., Reeve, E., Farrell, P., Johnson, E., Thow, A., Sharp, M.K., Troubat, N., Bogard, J.R., Boylan, S., Gonzalez, I., Nonga, N., Eriksson, H., Tutuo, J. (2023a) National Assessment of the Solomon Islands Food System. FAO. <https://doi.org/10.4060/cc4175en>
- Farmery, A.K. and Bogard, J.R. (2023b) Realising the potential for aquatic foods to contribute to environmentally sustainable and healthy diets. In Routledge Handbook of Sustainable Diets (pp. 106-118). Routledge.
- Farmery, A.K., Brewer, T.D., Farrell, P. et al (2021b) Conceptualising value chain research to integrate multiple food system elements. Global Food Security, Volume 28, 100500. <https://doi.org/10.1016/j.gfs.2021.100500>
- Farmery, A.K., Allison, E.H., Andrew, N.L. et al. (2021c) Blind spots in visions of a “blue economy” could undermine the ocean’s contribution to eliminating hunger and malnutrition. One Earth, 4. <https://doi.org/10.1016/j.oneear.2020.12.002>.
- Farmery, A.K., Scott, J.M., Brewer, T.D. et al (2020) Aquatic Foods and Nutrition in the Pacific. Nutrients, 12, 3705, <https://doi:10.3390/nu12123705>
- Farrell, P., Sharp, M.K., Reeve, E., et al. (2023a) Fruit and Non-Starchy Vegetable Acquisition and Supply in Solomon Islands: Identifying Opportunities for Improved Food System Outcomes. Sustainability. 15:1742. <https://doi.org/10.3390/su15021742>
- Farrell, P., Bogard, J., Thow, A.M., Boylan, S., Johnson, E., Tutuo, J. (2023b) Food price and availability in Solomon Islands during COVID-19: A food environment survey, Nutrition and Health, <https://doi.org/10.1177%2F02601060231183592>
- Farrell, P., Rachmi, C.N., Mulcahy, G., Helble, M., and Thow A.M. (2021) Food environment research is needed to improve nutrition and well-being in Asia and the Pacific. Public Health Nutrition. <https://doi.org/10.1017/S136898002100241X>
- Farrell, P., Thow, A.M., Wate, J.T., et al (2020) COVID-19 and Pacific food system resilience: opportunities to build a robust response. Food Security, Volume 12, pp. 783-791. <https://doi.org/10.1007/s12571-020-01087-y>
- Golden, C.D., Gephart, J.A., Eurich, J.G. et al (2021) Social-ecological traps link food systems to nutritional outcomes. Global Food Security. 30, 100561, pp. 1-8. <https://doi.org/10.1016/j.gfs.2021.100561>
- Kiribati National Statistics Office (2022) Poverty in Kiribati based on analysis of the 2019/20 Household Income and Expenditure Survey. Bairiki, Kiribati: Pacific Community.
- Maui, S., Maelaua, J., Reeve, E., Thow, A.M., Johnson, E., Farrell, P., Patay, D. (2023) Systemic capacity in food systems governance in Solomon Islands: "it's more than just training". Sustainability, 15(13), 10710. <https://doi.org/10.3390/su151310710>
- Maui, S., Thow, A.M., Mulcahy, G., Andrew, G., Ride, A. and Tutuo, J., (2023) Opportunities to Strengthen Fish Supply Chain Policy to Improve External Food Environments for Nutrition in the Solomon Islands. Foods, 12(4), p.900.
- Pacific Community (2022) Kiribati Census Atlas. 87 p. Noumea, New Caledonia: Pacific Community.
- Pacific Community (2021a) Cook Islands: Pre-COVID-19 baseline metrics. <http://purl.org/spc/digilib/doc/xzhkd>

- Pacific Community (2021b) Federated States of Micronesia: Pre-COVID-19 baseline metrics. <http://purl.org/spc/digilib/doc/5fzd7>
- Pacific Community (2021c) Nauru: Pre-COVID-19 baseline metrics. <http://purl.org/spc/digilib/doc/mqi4h>
- Pacific Community (2021d) Niue: Pre-COVID-19 baseline metrics. <http://purl.org/spc/digilib/doc/gcu42>
- Pacific Community (2021e) Tokelau: Pre-COVID-19 baseline metrics. <http://purl.org/spc/digilib/doc/ajukg>
- Pacific Community (2021f) Tonga: Pre-COVID-19 baseline metrics. <http://purl.org/spc/digilib/doc/qt374>
- Pacific Community (2021g) Tuvalu: Pre-COVID-19 baseline metrics. <http://purl.org/spc/digilib/doc/kdzrz>
- Pacific Community (2021h) Palau: Pre-COVID-19 baseline metrics. <http://purl.org/spc/digilib/doc/3w7dd>
- Pacific Community (2021i) Solomon Islands: Pre-COVID-19 baseline metrics. <http://purl.org/spc/digilib/doc/m3fvq>
- Patay, D., Ravuvu, A., Iese, V., Wilson, D., Maui, S., Maelaua, J., Farmery, A., Farrell, P., Reeve, E., Johnson, E., and Thow, AM. (2023) Catalysing sustainable development through regional food system governance: strengthening the translation of regional food system policy guidance to national-level in the Pacific. *Sustainable Development*, 1-18. <https://doi.org/10.1002/sd.2732>
- Reeve, E., Ravuvu, A., Johnson, E., Nasinga, S., Brewer, T., Mounsey, S., Thow, AM. (2023) Scaling up food pricing policies in the Pacific: a guide to action. *BMJ Global Health*, 8: e012041. <https://doi.org/10.1136/bmjgh-2023-012041>
- Reeve, E., Ravuvu, A., Farmery, A. et al (2022a) Strengthening Food Systems Governance to Achieve Multiple Objectives: A Comparative Instrumentation Analysis of Food Systems Policies in Vanuatu and the Solomon Islands. *Sustainability*, 14, 1-23. <https://doi.org/10.3390/su14106139>
- Sharp, M.K. and Andrew N.L. (2021a) Poverty, malnutrition and food security in Pacific Small Islands Developing States. Bangkok, Thailand: FAO
- Sharp, M.K. (2021) Kiribati 2019-2020 household income and expenditure survey report: copra brief. Noumea, New Caledonia: Pacific Community. 11 p. <https://purl.org/spc/digilib/6qc6v>
- Sharp, M.K., Buffiere, B., Himelein, K. et al (2022b) Effects of Data Collection Methods on Estimated Household Consumption and Survey Costs: Evidence from an Experiment in the Marshall Islands. World Bank Group Policy Research Working Paper 10029, 37pp. Online [here](#).
- Thow, A.M., Ravuvu, A., Iese, V., Farmery, A., Maui, S., Wilson, D., Farrell, P., Johnson, E., Reeve, E. (2022a) Regional Governance for Food System Transformations: Learning from the Pacific Island Region. *Sustainability*, 14, 12700. <https://doi.org/10.3390/su141912700>
- Thow, A.M., Ravuvu, A., Ofa, S.V. et al. (2022b) Food trade among Pacific Island countries and territories: implications for food security and nutrition. *Global Health* 18, 104. <https://doi.org/10.1186/s12992-022-00891-9>
- Troubat, N. and Sharp, M.K. (2021a) Food consumption in Kiribati. Tarawa, Kiribati: FAO and SPC. <https://doi.org/10.4060/cb6579en>
- Troubat, N., Sharp, M.K. and Andrew, N.L. (2021b) Food consumption in Solomon Islands. Honiara, Solomon Islands: FAO and SPC. <https://www.spc.int/DigitalLibrary/Get/p7zkm>

Vanuatu National Statistics Office (2021) Food Security in Vanuatu: 2019-2020 NSDP Baseline Survey. Port Vila, Vanuatu: VNSO. Online [here](#).

Voyer, M., Allison, E.H., Farmery, A. et al (2020) The role of voluntary commitments in realising the promise of the Blue Economy. Global Environmental Change, 71, 102372, <https://doi.org/10.1016/j.gloenvcha.2021.102372>.

Datasets

Brewer, T.D., Andrew, N.L. (eds) (2023b) The Pacific Food Trade Database. Version 2.1. (<https://stats.pacificdata.org/>).

SPC (2023). The Pacific Food Consumption Database. V1. Curated database housed by SPC. Not publicly available until peer review completed and permissions resolved with national governments.

SPC, UOW and FAO (2020). The Pacific Nutrient Database. <https://microdata.pacificdata.org/index.php/catalog/755>

Submitted papers

Boylan, S., Brewer, T., Farrell, et al. (in review) Developing indicators for food system strengthening in the Solomon Islands. Frontiers in Sustainable Food Systems.

Brewer, T.D., Farmery, A., Jones, S., Kottage, H., Makaafi, S., Andrew, N. (in review) Food trade and geopolitics between Pacific Island Countries' and their dominant Asia-Pacific trade partners. Asia and Pacific Policy Studies.

In preparation

Andrew, N.L., Kottage, H., Hegoda Arachchi, N., Brewer, T., Bogard, J. (in prep). The rise and rise of chicken in Pacific Food Systems. Target journal: Global Food Security.

Andrew, N., Koehn, Z., and Sharp, M.S. (in prep) PNDB Fish: An addendum to the PNDB to provide improved coverage of COICOP Chapter 3. SPC Technical Report.

Brewer, T.D., Andrew, N.L., Kottage, H. et al. (in prep) Wheat in the Pacific Food System. Journal TBD.

Farrell, P., Johnson, E., Reeve, E., Farmery, A., Thow, AM., Mulcahy, G., Wu, J., and Bogard, J. (in prep). Measuring natural food environments: a scoping review. Journal TBD.

Koehn, J.Z, Wabnitz, C.C., Hazen, L., Golden, C., Andrew, N.L. (in prep). Nutrient composition of marine food fish from Pacific Island countries and territories. Target journal: Fish and Fisheries.

Kottage, H., Bogart, J., Brewer, T., Sharp, M., Andrew, N. et al. (in prep) Protein consumption and the sources of protein in the Pacific diet. Target journal: Food Security.

O'Meara, P., Wansuda, G., Veerman, L., Thow, A.M., Mounsey, S. (in prep) Systematic review and meta-analysis of price elasticity estimates for sugar-sweetened beverages, relevant to low and middle-income countries.

Reeve, E., Johnson, E., and Thow, AM. (in prep) Scaling up food pricing policies in the Pacific: a guide to action. Toolkit, SPC.

Sharp, M.K., Troubat, N., Kottage, H., Menaouer, O. and Andrew, N.L. (in prep). Processing food data sourced from household consumption expenditure surveys and construct of the Pacific Food Consumption Database. Journal TBD.

Sharp, M.K., Troubat, N., Raikoti, T., et al. (in prep). Survey methods to improve data collection and estimation of food consumed away from home: protocols from an experiment conducted in Samoa.

Sharp, M.K., Kottage, H., Troubat, N., Golden, C., Andrew, N.L (in prep) Fish acquisition and consumption in 14 Pacific Island countries. Target journal: Fish and Fisheries.

10.2 Outputs acknowledging support from current project

The following outputs acknowledge support from FIS/2018/155 but are not included as planned or contracted outputs. Support took the form of, for example, publication costs, fee for editors or authors and so forth.

Buffière B. and Troubat N. (2022). Enquete budget des familles a Wallis et Futuna – 2020. Volume 3: Analyse de la consommation alimentaire. SPC 57 pp. <https://www.spc.int/DigitalLibrary/Get/78zph>

Koehn, J.Z., Allison, E. H., Villeda, K. ... N.L. Andrew (2021) Fishing for health: do the world's national policies for fisheries and aquaculture align with those for nutrition? *Fish and Fisheries*, 23, 125–142. <https://doi.org/10.1111/faf.12603>

Nash, K.L., MacNeil, M.A., Blanchard, J.L., Cohen, P.J., Farmery, et al. (2022) Trade and foreign fishing mediate global marine nutrient supply. *Proceedings of the National Academy of Sciences*, 119(22), p.e2120817119. <https://doi.org/10.1073/pnas.2120817111>

Pacific Community (2022) Kiribati Census Atlas. Noumea, New Caledonia. Pacific Community.

Republic of Marshall Islands Economic Policy, Planning and Statistics Office (2022) Poverty, food consumption, labour, and household income and expenditure in the Marshall Islands: a compendium of analyses of the 2019/20 Household Income and Expenditure Survey. Pacific Community, Noumea, 2022.

Stetkiewicz S., ... Andrew N.L., Bogard J.R., plus 31 authors (2022) Seafood in Food Security: A Call for Bridging the Terrestrial-Aquatic Divide. *Frontiers in Sustainable Food Systems*, 5. <https://doi.org/10.3389/fsufs.2021.703152>

Troubat, N. and Sharp, M.K. (2021c) Food consumption in the Marshall Islands. Based on analysis of the 2019/20 Household Income and Expenditure Survey. Majuro, Republic of the Marshall Islands: FAO and SPC. <https://doi.org/10.4060/cb7583en>.

Troubat, N., Faaola, E. and Aliyeva, R. (2020) Food security and food consumption in Samoa – Based on the analysis of the 2018 Household Income and Expenditure Survey. 67 pp. Apia, FAO and SBS. <https://doi.org/10.4060/cb0613en>

Troubat, N., Foster, E., Moltedo, A., Mathiassen, A., Kjøsterud, E.C. (in review). Processing food consumption data from household consumption and expenditure surveys (HCES). Guidelines for countries collecting data in line with the UNSC endorsed guidelines on food data collection in HCES. FAO/ UN-CEAG.