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Improving nutrition through women's and men's engagement across the seaweed food chain in Kiribati and Samoa

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prepared by	Libby Swanepoel, University of the Sunshine Coast
co-authors/ contributors/ collaborators	University of the Sunshine Coast: Courtney Anderson, Nick Paul, Silva Larson Ministry of Agriculture and Fisheries, Samoa: Ulusapeti Tiitii, Losan Madar, Esmay Tanielu University of Canberra: Barbara Pamphilon
approved by	Dr Chris Cvitanovic, Research Program Manager, Fisheries
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Acronyms and abbreviations

ACIAR	Australian Centre for International Agricultural Research
ACPIR	Australian Centre for Pacific Islands Research
AGHE	Australian Guide to Healthy Eating
AI	Acceptable Intake
CBFM	Community Based Fisheries Management
CPPL	Central Pacific Producers Ltd
DAC	Development Assistance Committee
FFT	Family Farm Teams
FGD	Focus group discussion
HIES	Household Income and Expenditure Survey
MAF	Ministry of Agriculture and Fisheries, Samoa
MFMRD	Ministry of Fisheries and Marine Resource Development, Kiribati
NRV	Nutrient Reference Value
OECD	The Organisation for Economic Co-operation and Development
PAC24	Pacific 24-hour Dietary Recall digital tool
PEI	Photo Elicitation Interview
PGHL	Pacific Guidelines for Health Living
PIC	Pacific Island Country
PI-FCT	Pacific Island Food Composition Tables
PNG	Papua New Guinea
RDI	Recommended Dietary Intake
REDSAF	Revitalisation, Expansion and Diversification of Agriculture and Fisheries
SIDS	Small Island Developing States
SDG	Sustainable Development Goals
SDT	Suggested Dietary Target
SPC	Pacific Community
SRA	Small Research Activity
UNDP	United Nations Development Program
UniSC	University of the Sunshine Coast
VCE	Village Community Educators
VFT	Village Fishing Teams
WEAMS	Women's Empowerment and Market Systems
WHO	World Health Organisation

1. Acknowledgments

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2. Executive summary

Food and nutrition insecurity continue to increase in the Pacific. Nutrition-sensitive agricultural approaches that work across the entire food system focusing on short supply chains for local markets, production, post-harvest handling, processing, retailing and consumption for health outcomes are needed to improve environmental and socioeconomic outcomes. This project worked to transform seaweed fisheries into a nutrition-sensitive food system comprised of short supply chains, village-based processing, targeted use of natural resources and marketing for families. The project developed and evaluated gender-inclusive activities in Samoa, to focus seaweed production on the direct benefits to the health and wellbeing of communities.

Working with coastal communities, we defined the elements of Samoan seaweed food chains, uncovered perceived barriers and enablers to men's and women's participation, their strengths and aspirations, and identified entry points for addressing gender inequality and nutritional improvement. This informed the codesign of the Village Fishing Teams (VFT) program, based on the Teams approach, adapted from the Family Farm Teams (FFT). The adaptation, piloting and evaluation of this approach in a different context (Samoa) and commodity (fisheries, specifically seaweed), was a key achievement of the project. This has provided a valuable case study to better understand the codesign process for such a program, in order to mainstream gender across other fisheries value chains.

Key achievements and impacts:

- Nutrient analysis of a range of key nutrients in locally consumed seaweed.
- Development of an innovative digital 24-hour dietary recall interview tool for implementation in Pacific Island countries.
- Collection of dietary data from a large sample of Samoan adults, and establishment of a comprehensive Samoan dietary dataset including individual level macronutrient and micronutrient intake.
- New understanding of men's and women's roles (actual and potential) in the seaweed value chain, and strengths and aspirations for development of seaweed industries at the village level.
- Codesigned a village-based capacity building model, Village Fishing Teams (VFT) for gender-inclusive seaweed development activities.
- Piloted and evaluated the VFT program in one coastal village in Samoa.
- Additional training outcomes in Samoa included a range of qualitative methodologies, participatory research approaches, to upskill Fisheries staff in techniques for community engagement.

It is important to note that the intent of the project changed in its early stages. The project was originally designed with a focus on wild-harvest and gleaning, which aligned with existing village-based seaweed production. However, at the beginning of the project, MAF was working in partnership with the UNDP to implement the Revitalisation, Expansion and Diversification of Agriculture and Fisheries (REDSAF) Project, funded by the Government of Japan, whereby coastal villages were being introduced to a 'new' seaweed farming method utilising seaweed farming infrastructure (cages and trays). The MAF leadership team requested that our project activities be

conducted alongside the REDSAF Project, given both projects were targeting the same coastal communities. The REDSAF Project is best described as a 'transfer of technology' model, where technology and innovations from the outside/top-down were being delivered to smallholder famers with the expectation of adoption over time. As such, the intent of this project shifted to the application of a community-capacity building approach to the 'push' project (seaweed farming), as a means to achieve community empowerment and local ownership.

The first research objective of the project was to define the elements of Samoan seaweed food systems for improved nutrition outcomes. Production levels and market prices of *Caulerpa* were determined in Samoa, as well as comprehensive nutrient analysis of *Halymenia* and *Caulerpa* samples. An innovative and culturally aligned online dietary assessment tool was developed, enabling streamline collection of individual level dietary data, which has potential for validation and application in other Pacific contexts. Assessment of individual-level dietary intake from a large sample (n=233) of Samoan adults was undertaken, supporting the dietary simulation modelling for localised insight into the potential contribution of seaweeds in meeting nutritional requirements for individuals in Samoa

The second research objective applied participatory approaches to generate new understanding of men's and women's roles (actual and potential) in the seaweed value chain, and strengths and aspirations for development of seaweed industries at the village level. A series of training sessions with MAF staff built the individual capacity of fisheries researchers to work in community and social settings. Gender disaggregated photo elicitation and focus group discussions were conducted in 10 coastal communities in Samoa, resulting in the perspectives and aspirations of 135 participants being captured. This understanding informed the design of a model for equitable empowerment of men and women within seaweed harvesting villages, under the third research objective.

Codesigning the VFT program, as part of the project's third research objective, was an iterative process. Although codesign will be nuanced to different contexts and partners, this project has taken the first step to document the process as a series of phases that other teams can walk through in different countries and contexts. The codesign of the VFT was an ambitious achievement within the timeframe of the SRA. Success was largely due to the existing trust and relationships within the research teams, agile project management, and stewardship from the Samoan side. Undertaking such an approach requires a long-term timeframe and funding commitment to ensure sustainability beyond the lifetime of the project. The capacity building approach through the VFT demonstrated positive gains in increasing skills and knowledge, especially in relation to seaweed uses and nutrition, the value chain, and collaborative and equitable planning skills at the village. While this is a positive step towards empowering communities, the application of their learnings into practice is still unclear. The PNG FFT approach, on which the VFT is based, included the development of teams of local village community educators (VCEs), a model of brokered training or 'facilitated extension approach' whereby local people were developed and as facilitators of learning who could deliver course content as well as a provide support and mentoring role to other farmer families. In the short timeframe we had for research objective 3 (which was additionally impacted by COVID-19 travel restrictions) we successfully achieved 'phase 1' of developing such an approach, however, to further contextualise the program for all Samoan coastal villages, and accommodate scale-out, more time, resources and planning are needed.

The capacity impacts of this project have resulted in a more well-rounded Fisheries officer, who is better equipped to tackle broader Sustainable Development Goals (SDG) beyond ‘life below water’. Skill development in participatory research, qualitative methodologies, and community engagement, alongside knowledge gains relating to the nutrition and health value of seaweed, has built the capacity of Fisheries officers to tackle SDG 2 (hunger), 3 (health and wellbeing), 4 (quality education) and 5 (gender equality).

With multiple donors working simultaneously in the Pacific region, this project has highlighted a number of opportunities for harmonising and integrating concurrent activities (projects from different donors running in tandem). This was made possible through the leadership capacity of the Samoa MAF (coupled with the flexibility of the research team) to coordinate donor funds and initiatives, working to maximise integration opportunities between donor activities, whilst ensuring manageable workloads and capacity for staff and communities on the ground. In future, we need to look to better coordinate between donors, to complement and maximise each other’s efforts for achieving shared development goals in the Pacific. ACIAR can play a key role in achieving this and in revitilising partnerships for sustainable development (SDG17). This will require a clearer understanding of the ecosystem of development partners in the Pacific, harmonising our activities to work towards a common goal and working in horizontal partnerships.

3. Background

Livelihoods in Samoa and Kiribati are largely supported by a subsistence economy, which is still the backbone of local food production, consumption and income earning for these areas. Despite having a subsistence economy, Samoa and Kiribati face considerable challenges including some of the highest rates of malnutrition in the world (Haddad, Cameron et al. 2015), along with food insecurity and poor access to nutritious foods as a consequence of transition to a modern diet (Haddad, Cameron et al. 2015, NCD-RisC 2017). There is a need to continue to support the development of Samoa and Kiribati to meet the 2030 Sustainable Development Goals (SDGs) and ensure equitable outcomes for all.

Sustainable aquaculture is viewed as a promising solution to contribute to meeting the SDG targets (Stead, Burnell et al. 2002, Techera 2018, FAO 2022). Seaweed, and specifically gender inclusive, nutrition-sensitive seaweed aquaculture, has been realised as an opportunity to address these challenges and to support women and families. Not only are seaweeds a recognised and valued commodity for many developing nations across the world, including in the Pacific, they are a nutritious source of food containing many essential amino acids, vitamins and fibre (Macartain, Gill et al. 2007, Pereira 2016).

This project was designed to better understand and raise the profile of smallholder seaweed fishers in Samoa and Kiribati. Historically, income generated from most traditional fishing effort flows to men, whereas in seaweed fisheries women benefit from income-generating activities across the entire value chain, from harvesting through to processing and sales. Women's economic empowerment has been directly related to their ability to access funds of their own and increase women's control over that income. Enhancing our understanding of seaweed fisheries is the first step in production. By working with coastal communities to define the elements of Pacific seaweed food chains and understand barriers and enablers to women's and men's participation, potential intervention points for gender equality and nutritional improvement have been identified. Taking a bottom-up approach, working with women and families on the ground, allowed us to better understand how to accommodate their diverse needs and support them to jointly address issues at the beginning of the food supply chain. Determining what is happening at a village level has additionally informed strategies that engage women and men, in agreement, to establish sustainable food supply chains, which in turn provides reliable access to fresh food and income thus improving health and livelihoods.

3.1 Seaweed in Pacific

This research project focused on indigenous edible seaweeds species, specifically: *Kappaphycus* (red seaweed) and *Caulerpa* (seagrapes) in Kiribati, and *Halymenia* (red seaweed) and *Caulerpa* (seagrapes) in Samoa. In both Kiribati and Samoa, there are two species of *Caulerpa* available: *C. racemosa* and *C. chemnitzia*.

In Samoa, *Caulerpa* (both species) are traditionally known as limu fuafua. *Halymenia* (red seaweed) is called limu a'au. In our study, participants used the Samoan term "limu" and the English words "seagrapes" and "seaweed" interchangeably. Both species are harvested from the wild and typically eaten fresh or cooked as a side dish and accompaniment to main meals, although consumption of *Caulerpa* is more commonly reported (Tiitii, Paul et al. 2022). In Objective 2 and 3, while both seaweeds were discussed, limu fuafua was notably more prominent. Seaweed product sheets for Caulerpa and Halymenia have been produced as part of Objective 1 outputs (Appendix 1).

In Kiribati, there is reliable access to sustainable seaweed gardens on the surrounding reefs however *Kappaphycus* and *Caulerpa* are underutilised for food and income (Swanepoel, Tioti et al. 2020). As far as we are aware, there are no traditional names still being used. However in a previous project (*FIS/2010/098*), women participants agreed upon a local name for Caulerpa, referring to them in i-Kiribati as kureben taari ("grapes from the sea") (Swanepoel, Tioti et al. 2020).

3.1.1 Seaweed in Samoa

Seaweed, known as "limu" in Samoa, has been a part of the traditional diet of Samoan people for generations (Tiitii, Paul et al. 2022). Seaweed has important cultural significance in Samoa and is often served at special occasions such as weddings and funerals (Tiitii, Paul et al. 2022). For many Samoans, seaweed is eaten seldomly, and as an underutilized indigenous food, however there is great potential for seaweed as a source of nutrition (Butcher, Burkhart et al. 2020). The seaweed industry has potential to contribute towards Samoa's strategies to improve food security and healthy diets (MAF 2021). Edible seaweeds offer distinct nutritional, environmental, and livelihood benefits compared to terrestrial crops, namely the unique micronutrient content (Macartain, Gill et al. 2007), lesser demand on fresh water and arable land space, low operating costs and technically accessible farming techniques (Rimmer, Larson et al. 2021). The abundance, resilience, and sustainability of seaweeds make them a great candidate for food source diversification, reducing the country's reliance on traditional crops and imported foods. The added potential for income generation and economic expansion in rural coastal communities can in turn improve livelihoods for populations for whom employment opportunities are low (Cottier-Cook, Nagabhatla et al. 2021).

3.1.2 Seaweed in Kiribati

In comparison to Samoa, Kiribati does not have a strong history of using seaweed in their diet, despite having reliable access to seaweed on the surrounding reefs. Edible indigenous seaweeds grow in abundance in the surrounding reefs of Kiribati, including *Caulerpa* (*C. racemosa* and *C. chemnitzia*), *Kappaphycus* (*K. alvarezii*), and *Acanthophora (A. spicifera*), but these are currently underutilised in both the diet and as a commodity for economic opportunities.

Seaweed is recognised as an opportunity for improving livelihoods and economic outcomes by the national government in Kiribati. The *Kiribati 20-Year Vision 2016-2036* emphasises developing Natural Capital by "maximising returns through sustainable fisheries and marine development" (Pillar 1: Wealth). Furthermore, export and domestic opportunities for the seaweed industry in Kiribati is being driven by a recently formed national seaweed taskforce, which includes representatives from MFMRD and the Central Pacific Producers Ltd (CPPL).

At the local level, there is interest from community members to engage in seaweed work. Previous research (*FIS/2010/098)* confirmed that I-Kiribati women were interested in participating in seaweed work, including harvesting, marketing, and consumption (Swanepoel, Tioti et al. 2020). However, further participatory research to gain in-depth understanding of how to support and build roles for women and men as well as accommodate their diverse needs is still needed.

3.2 Overview of diets in Pacific

Many Pacific Island nations are experiencing a shift away from traditional indigenous foods towards a more westernized diet that includes processed foods, high levels of fat and sugar, and a lower intake of nutrient-rich traditional foods (Thow, Reeve et al. 2017, Choy, Hawley et al. 2020). This shift in dietary patterns is influenced by a range of factors, including changes in lifestyle and work

patterns, globalization, urbanization, and the availability and affordability of food. The transition towards a westernized diet and processed foods has significant implications for public health in Samoa. Non-communicable diseases such as obesity, diabetes, and cardiovascular disease have become major health concerns, and there is a growing recognition that changes in diet and lifestyle are contributing factors (Seiden, Hawley et al. 2012, Sievert, Lawrence et al. 2019).

While Samoa has a relatively high level of food self-sufficiency, with a large portion of the country's food being produced locally, concerns remain over access and availability of food. Vulnerability to natural disasters, limited arable land, and an increasing dependence on imported food are some of the challenges impacting food insecurity for Samoan people (MAF 2021). Recent reports indicate that one in four (27%) Samoans experience moderate to severe food insecurity (Troubat, Faaola et al. 2020), meaning they lack reliable access to enough affordable, nutritious food increasing their risk of malnutrition and subsequent poor health outcomes (FAO 2021). There are disparities in the availability of food throughout the country, and in Savai'i, for example, one-third of households are considered food insecure (Troubat, Faaola et al. 2020).

Food security challenges and poor dietary diversity are of growing concern in Kiribati. Nutrition transition in Kiribati has seen increased demand for packaged imported foods, and reduced consumption of traditional indigenous plants and animals (Eme, Kim et al. 2020). Kiribati is subsequently battling food and nutrition insecurity, with high rates of diet-related non-communicable diseases including obesity, anaemia and diabetes (Eme, Kim et al. 2020, FAO, SPC et al. 2021).

Climate change is expected to exacerbate issues of food and nutrition security for small island developing states (SIDS) by negatively impacting local food production. Issues of population crowding, limited access to arable land, and limited access to clean water all result in declining food production. Aquatic foods, however, play a central role in combatting food and nutrition security for SIDS. In addition to food and sustenance, aquatic foods offer livelihoods, economies, and cultures for many coastal communities.

3.3 Overview of socio-economic characteristics

3.3.1 Samoan characteristics

The country of Samoa consists of ten islands, located 4200 km southwest of Hawaii, 2900 km from New Zealand and 4300 km from Australia. Four of the islands are inhabited namely: Upolu, Savaii, Manono and Apolima. The total land area of Samoa is 2,830 square kilometers with Savaii as the biggest island (1,700 km2) and Upolu the second largest (1,110 km2) where the capital of Apia is located. Most of the commercial, trading and employment activities take place in Apia and the surrounding districts. The islands are of volcanic origin and the greater part of the territory is covered by lush vegetation and rainforest.

In the 2016 census (SBS 2016), the total population of Samoa was 195, 979 people (increase of 4.3% since 2011), with more than 75% of the population living in Upolu. The population was 51.5% male and 48.5% female. The average household size ranged from 7-8 people in 2016 (SBS 2016).

The unemployment rate in 2016 was 4% (2,117 people), a decrease from 6% in 2011 (SBS 2016). The employed population consists of people working as employee, employer, self-employed, volunteer and subsistence workers. The high employment rates in the rural areas are attributable to the subsistence economy, which is still the backbone of local food production, consumption and income earning for these areas.

3.3.2 Kiribati characteristics

The Republic of Kiribati, located in Micronesia, is one of the most remote and geographically dispersed countries in the world, comprised of 32 atolls and one coral island with a land area of 811 km2.

In the 2020 census (KNSO 2023), Kiribati had a population of 119,438, comprising of 50.6% female and 49.4% male. The proportion of the population under the age of 15 was relatively high at 36%. More than half of the total population reside on the Island South Tarawa, with 44,643 people (37%) living in the capital itself. Over the last 15 years, the population has grown significantly in South Tarawa with the population density in parts of South Tarawa reaching 8,000 persons per square kilometer, one of the highest in the world. The average household size was 6 people (6.5 in urban areas and 4.7 in rural areas). In 2020, according to World Bank classifications, Kiribati was ranked as a lower-middle-income country (WorldBank 2020). In 2020, the unemployment rate for citizens aged 15 and over was 5% (KNSO 2023).

Dietary diversity and food security for the Kiribati people is impacted by a number of factors, including high cost of imported foods, low socio-economic status, limited agricultural capacity, environmental effects of climate change and geographic remoteness. Due to limited land resources, poor soil, frequent droughts, along with traditional land tenure, large-scale agriculture is limited. Therefore, the livelihoods and food security of Kiribati's people depends significantly on marine resources. Fisheries and subsistence agriculture account for a quarter of Kiribati's GDP and involve the majority of the population. Both men and women participate in fishing activities, including aquaculture, gleaning, harvesting, hand fishing, gillnetting, spearing, driving or deep-sea boat fishing.

3.4 Village governance system

3.4.1 Samoan village governance

Traditional governance system - Fa'amatai

The Fa'amatai in Samoa refers to the social chiefly system as practiced in the established traditional villages (Va'a 2007). The Fa'amatai system revolves around matai (titled people) (Figure 1) and refers to leadership, decision-making processes and practices associated with matai (So'o 2006). Samoans continue to practice their chiefly system today and the Fa'amatai is a source of pride and a source of identity in today's world (Va'a 2007).

The Fa'amatai is a solid institution / social organisation (Figure 1). Some features of the Fa'amatai are:

- a well-defined hierarchy of chiefs and positions who meet regularly to discuss village affairs
- defined groups have a set of rights, obligations and responsibilities
- responsibilities of chiefs/council include determining/managing property rights (residential and plantation lands)
- underpinned by important and distinctive culture – the Fa'asamoa

The matai system operates at five levels (So'o 2006): the family, village, sub-district, district and national levels.

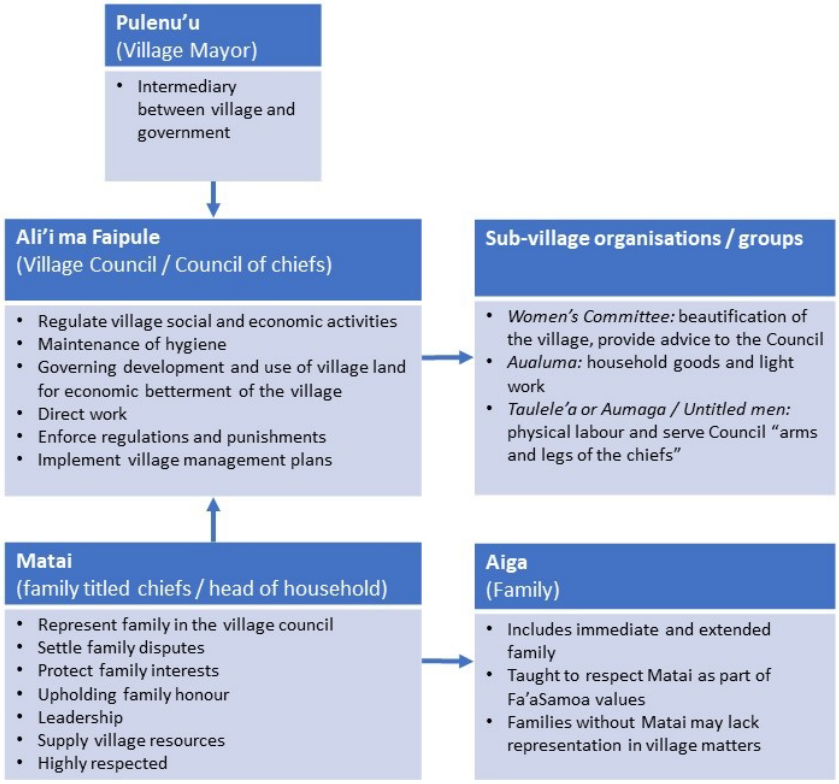
Families are headed by chiefs (whether present or not) (So'o 2006, Va'a 2007) (Figure 1). Holders of matai titles are elected by members of their respective families for life. Once elected and confirmed as a candidate for a family title, the new titleholder needs to be formally accepted into the village's council of matai or the *fono* (So'o 2006). A matai's responsibilities include: representing the family in the *fono*, settling family disputes, protecting family interests (e.g. lands and titles), upholding and advancing family prestige and honour, and providing leadership. It is also responsibility of *fono* to ensure a sufficient supply of resources for the village on a daily basis (e.g. the *fono* may place temporary ban on fishing of lagoon as a way to manage village resources and allow fish to grow/multiply) (So'o 2006).

The majority of Samoa's population live under the traditional authority of the *fono*. There are 238 village governments in Samoa (So'o 2006). The *fono* governs every village (So'o 2006). Village mayors (Pulenu'u) are elected by their respective *fono*, and they become the intermediaries between the Government and *fono* (So'o 2006) (Figure 1 and 2). Villages can be traditional or non-traditional (Va'a 2007):

- Traditional villages have solid Fa'amatai social structure.
- Non-traditional village systems generally located in urban areas such as Apia and come about mainly as result of mission or church settlements and urban migration (Va'a 2007).
- Non-traditional villages may not have the formal chiefly councils but will still have basic characteristics and operate under the fa'asamoa principles.

Below the *fono* and supporting the *fono* are various traditional and contemporary sub-village organisations or status groups in a village (Figure 1). These groups each have own set of responsibilities within the village governance structure (So'o 2006, Hassall, Kaitani et al. 2011) (Figure 2):

- Faletua ma tausi (wives of matai)
- Aulaluma (daughters/women of village) – represent the honor of the village and are responsible for household goods etc. and other light work.
- Taulele'a or 'aumaga – (sons/young men of village, who are not holders of matai titles) - they are the *malosi o le nu'u* (the strength of the village) and undertake the hard work
- Fafine laiti (junior wives – wives of untitled men)



Fa'amatai and Fa'aSamoa: "the Samoan way"

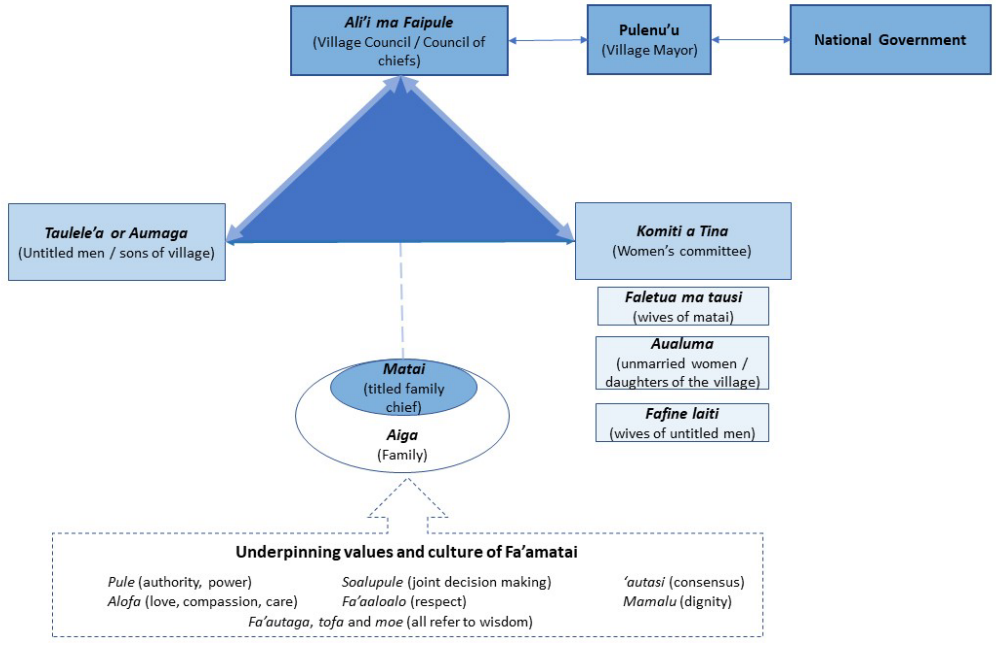


Figure 1. Visual representation of Samoan village structure for governance and decision (adapted from (Amosa 2010, Gero, Meheux et al. 2022).

Figure 2. Key roles and responsibilities of governance groups with Fa'amatai

The fa'amatai system is also structured at the **Sub-district, district and National level** (So'o 2006):

- **Sub-districts** are not as active now as they were in the past, however still apply in certain modern contexts such as when campaigning for parliamentary elections. A sub-district comprises several village settlements administered separately by their own *fono*.
- **Districts** – there are 11 distinct political divisions (six on Savai'i, four on Upolu, and one on islands of Manono and Apolima). Every district has established administrative structures and lines of communication, a capital village and at least one paramount title. The capital of a district administers and coordinates the affairs of the district among other responsibilities.
- **National** – a national system of dispersed power administered by capital villages of the 11 political districts forms the country's political system.

Culture and underpinning principles of Fa'amatai

The following are important underpinning principles of Fa'amatai in Samoa:

- Deep-seated respect for the authority of the chiefs (Va'a 2007).
- Cooperation among village community members, for example voluntary assistance provided by neighbours for any kind of work, and sharing of food & hospitality (Va'a 2007).
- Respect for matai and the fa'asamao are initially taught and learnt in the family – this contributes to order, peace, security and wellbeing of family members which in turn contributes to order, peace, security and wellbeing of the village and ultimately the country (So'o 2006).
- Important concepts that constitute the basis of Fa'amatai include *Pule* (authority, power), *Soalupule* (joint decision making), *'autasi* (consensus), *Alofa* (love, compassion, care), *Fa'aaloalo* (respect), *Mamalu* (dignity), and *Fa'autaga*, *tofa* and *moe* (all refer to wisdom)

Legislation and guiding laws

The village *fono* (councils) have been given the legal recognition by the constitution in general and the Village Fono Act of 1990, and are mandated to regulate village social and economic activities (Hassall, Kaitani et al. 2011). The Village Fono Act of 1990 empowers traditional leaders or village *fono* to deal with matters and residents of the village in accordance with customs and usages of that respective village. The act also provides *fono* with the powers to make rules for the maintenance of hygiene, governing development and use of village land for economic betterment of the village, power to direct work, power to impose punishments on wrong doers in the village (Hassall, Kaitani et al. 2011).

The villages are also governed by the Fisheries Act 1988. Village fisheries bylaws under this act require the village to have a Village Fisheries Management Plan. In this way, the State / Government are responsible for the seas / coastal management but then the village has 'defacto' control through implementing their village fishery management plan.

Importance and value of village governance in community development work

Chieftaincy is very much part of Samoa socio-political and economic life and it is still the rule for village life (Hassall, Kaitani et al. 2011). Samoan scholars (Meleisea 1987, Va'a 2007) maintain that the political relationship between the national government and villages and village *fono* as well as district *fono* is extremely important. Village governments are assets to the state (So'o 2006).

Implementation of government social service programmes in rural areas depend on the cooperation of *fono* (So'o 2006).

The *fono* have an important role in village authority and order. Meleiseä (1987, 218, as referenced in (So'o 2006)) quoted Gilson who has pointed out that the importance of upholding the authority of matai in their own villages is the reason for many of their punishments, and it does not really matter what the offense is: what matters is that "if left unpunished, [it] weakened Samoan confidence in village government."

These existing formal governance structures have an important place in the life of Samoans; they govern the lives of the majority of the population and it is through them that people make sense of their life in their island world (So'o 2006). The chiefly systems could be used as a point through which links between societies could be established to discuss and agree on regional issues (So'o 2006).

3.4.2 Kiribati village governance

Social units - Family, Village and Church

The family unit

A traditional Kiribati culture conforms to a **patriarchy system** placing **males as heads of households** and senior men as heads of village communities (Teuea 2018). The **family unit / household** most important economic group (Talu 1985). In traditional Kiribati culture, the extended family was most prominent and collectivism or *Kainga* as a value was important which referred to "kinship residential group composed of extended family" (Kuruppu 2009). Corcoran (2006) goes on to explains that in Kiribati tradition, the extended family was most important in terms of assistance and survival (looking after each other). However, with the impact of modernization such as in South Tarawa (Corcoran 2006) as well as influence of Christianity and colonization (Kuruppu 2009), there has been a breakdown of the *kainga* and a decline of Maneaba system of some islands which has meant the nuclear/immediate family type has become popular and for some areas the most important type of family unit (Talu 1985, Kuruppu 2009).

While Kiribati culture is predominantly a patriarchy system, culturally there is a high level of respect for women (source: anecdotal information from key informant interviews). Examples illustrating this respect include the shrines are usually female and that land ownership is often by women. In terms of women's roles within the family unit and village, Kiribati culture places women's important emphasis in the home and the women's social status in Kiribati is typically confined to domestic duties (Corcoran 2006). Within the family unit, the woman was always the man's companion, rather than his slave and was not expected to do hard manual labour (Low 2019). Women are valued as mothers/caregivers (children, cooking, home, gardening), and the outside world is "dangerous" therefore there is a desire to keep women safe which is why women tend to have home or village roles (source: anecdotal information from key informant interviews). Other examples of taking care of women because they are valued is that during pregnancy and breastfeeding, a protective mechanism is that men do the cooking to protect the breast milk (source: anecdotal information from key informant interviews).

Village decision making & Te Mwaneaba System

Every village has a Mwaneaba - its location, ordinarily in the middle of the village, is convenient for all people throughout the island (Low 2019). The Mwaneaba is a symbol of local authority; a place where elders (*unimane*) meet and make decision for their community (KiLGA 2016).

The Mwaneaba is the people or I-Kiribati's (Kiribati's citizens) own traditional way to meet, discuss and decide on matters regarding managing and coordinating the people's tasks and roles (Low 2019). TeMwaneaba ("The meeting house" (Whincup 2010)) represents "the unity", the "cooperation" and "smooth operations and functioning" of the lives of the people of Kiribati (Low 2019). Traditionally the operation of the Mwaneaba system is organised by gender relations – for example, women are allowed to attend the community meetings, but traditionally do not speak and their sitting position is always behind the men (Van Trease 1993).

For many villages particularly in South, the maneaba systems still exists. Village decisions are discussed as a community within the mwaneaba (meeting house) and **final decisions made by the *unimane*** (council of male elders) (Kuruppu 2009, Low 2019). Therefore, when it comes to making decisions in the villages, men are always the ones to talk and decide on what to do (Corcoran 2006). However, nowadays women are permitted to speak and be involved in decision making in some places.

The influence and importance of church & Christianity

The arrival of the Evangelical movement occurred in 1857 (Kuruppu 2009), and offered a new belief system as well as a new kind of authority viewed at the same level of the *unimane* (Kirata 1985). Most of the I-Kiribati population belongs to Protestant or Catholic Church (Kuruppu 2009). The church and Christianity are valued because they provide structure, community and a sense of spirituality (beyond materialism) (source: anecdotal information from key informant interviews).

Cultural values and characteristics

Social considerations take priority over economic ones (Dixon 2004). For example, family comes before anyone else or anything else (Dixon 2004), monetary gain and material wealth not as important ("less is more") and acquisition of modern conveniences are regarded as discretionary (Dixon 2004). **Time is not so important** – "tasks not done today will still be there tomorrow" (Dixon 2004).

Hospitality is very important, and it is how they show care and affection (source: anecdotal information from key informant interviews). In fact, the extended family is the main contributing factor for the low prevalence of poverty or homelessness in communities, due to this culture of sharing and caring and continued assistance provided by the extended family members. However, an important consideration raised by Corcocan (pp.56, 2006) is that the extended family's function could conceal poverty within the community and it "has become the responsibility of each extended family member to support and provide for the less fortunate relative."

4. Objectives

4.1 Overall aim

The project aim was to develop gender-inclusive seaweed development activities for long term health, income and wellbeing in coastal communities of Kiribati and Samoa. The aim was to be supported by three linked objectives (Figure 3).

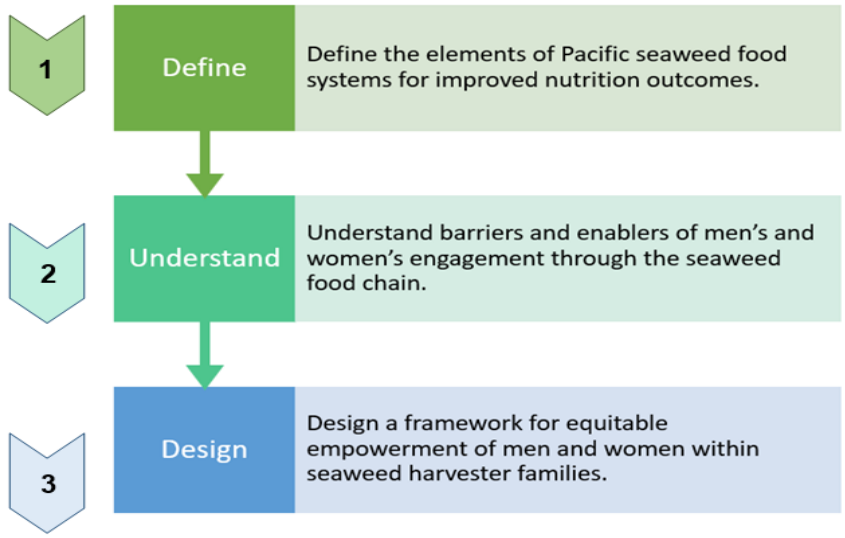


Figure 3. The three objectives of the project

4.2 Objectives

Objective 1: To define the elements of Samoan seaweed food systems for improved nutrition outcomes.

1.1 Engage in capacity building of Fisheries staff to conduct national seaweed production audits.

1.2 Determine production levels of seaweeds - *Halymenia* and *Caulerpa* in Samoa.

1.3 Engage with a team of 5 Fisheries staff country to deliver enumerator training in conducting individual dietary interviews.

1.4 Assess current dietary intake of Samoan individuals within 10 communities 5 families.

1.5 Review and analyse seaweed protein, fibre, mineral, pigment and vitamin contents.

1.6 Conduct dietary modelling to determine the potential contribution of seaweeds in meeting nutritional requirements for individuals in Samoa.

Objective 2: To Understand the barriers to, and enablers of, men's and women's economic empowerment through the seaweed food chain.

2.1 Engage with a team of 5 Fisheries staff in Samoa to deliver enumerator training in collecting gender disaggregated data through photo elicitation and focus group interviews.

2.2 Conduct photo elicitation and focus group interviews with male and female seaweed harvesters, processors and marketers, for 2 seaweed species in Samoa, to identify gendered roles across the seaweed food chain.

2.3 Conduct key-informant interviews with male and female ministry fisheries staff in Kiribati to understand gendered roles across the seaweed food chain.

Objective 3: Design a framework for equitable empowerment of men and women within seaweed harvester families.

3.1 Using data generated in Objective 2, identify entry points for equitable empowerment of seaweed harvester families and seek in-country feedback from participating families.

3.2 Engage with a team of 5 Fisheries staff in Samoa to deliver capacity building on implementing a Village Fishing Teams approach.

3.3 Pilot and evaluate an adapted Family Teams approach (Village Fishing Teams) in one village in Samoa (with 1-2 representatives from each of the 5-6 village groups) to raise awareness of gender inequality, nutritional benefits of seaweed and post-harvesting opportunities.

3.4 Co-design (with participating village groups) a community learning plan using the Family Teams approach to enable wider uptake across communities

3.5 Co-design a priority list of action areas to empower coastal families in seaweed harvesting and marketing pathways.

Due to COVID-19 related constraints, which impacted upon travel and subsequent engagement with Kiribati, objectives 1.1 and 2.3 were not undertaken.

4.3 Achievements against activities, outputs and milestones

Objective 1: To define the elements of Samoan seaweed food systems for improved nutrition outcomes.

Activity No.	Activity	Outputs/Milestones	Completion date	Comments
1.1	Engage in capacity building of Fisheries staff to conduct national seaweed production audits.	N/A	N/A	Not undertaken due to Covid-19 related travel and engagement issues in Kiribati.
1.2	Determine production levels of seaweeds - *Halymenia* and *Caulerpa* in Samoa.	Market data	December 2022	Sales data collected for a 12-month period from Jan-Dec 2022. Data only available for *Caulerpa* as *Halymenia* was not available at market vendors.
1.3	Engage with a team of 5 Fisheries staff country to deliver enumerator training in conducting individual dietary interviews.	An online app (PAC24) was developed for this activity (data collection tool). Training module developed (See Appendix X for examples of training material) Training delivered (via Zoom) to Samoan team (13 staff)	May 2021	Completed. Training with teams in both Samoa and Kiribati were delivered. Senior staff in both teams were instrumental in the facilitation and delivery of the training on the ground. Development of PAC24, ethics processes and prior commitments of the in-country teams delayed the dates of the training. Training activities were well received by participants.
1.4	Assess current dietary intake of Samoan individuals within 10 communities 5 families.	Presentation of preliminary findings	May 2021	Completed. Dietary interviews conducted in Samoa with 233 individuals. Dietary analysis completed.
1.5	Review and analyse seaweed protein, fibre, mineral, pigment and vitamin contents.	Analysis data ISS Conference presentation (Hobart, 2023)	September 2021	Completed. Seaweed samples were collected by MAF staff during September 2022, and transported to Australia. Samples were analysed by the National Measurement Institute (NMI), Department of Industry, Science and Resources.
1.6	Conduct dietary modelling to determine the potential contribution of seaweeds in meeting nutritional requirements for individuals in Samoa.	Journal publication (forthcoming) ISS Conference presentation (Hobart, 2023)	March 2023	Completed. Data officer appointed to undertake dietary modelling.

PC = partner country, A = Australia

Objective 2: To Understand the barriers to, and enablers of, men's and women's economic empowerment through the seaweed food chain.

Activity No.	Activity	Outputs/Milestones	Completion date	Comments

2.1	Engage with a team of 5 Fisheries staff in Samoa to deliver enumerator training in collecting gender disaggregated data through photo elicitation and focus group interviews.	Training materials developed Training delivered	May 2021 (Photo elicitation training) September 2021 (Focus group training)	Completed. Training in photo elicitation methods was delivered to 12 staff. Training in focus group interviews was conducted with 4 staff.
2.2	Conduct photo elicitation and focus group interviews with male and female seaweed harvesters, processors and marketers, for 2 seaweed species in Samoa, to identify gendered roles across the seaweed food chain.	Photo bank developed. Focus group discussion resources developed. Focus group sessions conducted by trained MAF staff. AFAF13 Conference presentation (Taiwan virtual, 2022) 2 x Journal publications	October 2021	Completed. MAF staff took photos during June and July 2021, which was developed into a photo bank. Focus group sessions were conducted in 10 coastal villages (n=135 participants) during September and October 2021.
2.3	Conduct key-informant interviews with male and female ministry fisheries staff in Kiribati to understand gendered roles across the seaweed food chain.	N/A	N/A	Not undertaken due to Covid-19 related travel and engagement issues in Kiribati.

PC = partner country, A = Australia

Objective 3: Design a framework for equitable empowerment of men and women within seaweed harvester families.

Activity No.	Activity	Outputs/Milestones	Completion date	Comments
3.1	Using data generated in Objective 2, identify entry points for equitable empowerment of seaweed harvester families and seek in-country feedback from participating families.	Meeting/workshop conducted. Objectives of modules and activities drafted.	December 2022	Completed. Co-design workshop was conducted with the research team (Samoa and Australia) to identify the entry points and focus areas for the VFT pilot.

3.2	Engage with a team of 5 Fisheries staff in Samoa to deliver capacity building on implementing a Village Fishing Teams approach.	Online codesign workshop delivered with fisheries staff (n = 2) and Australian research team (n = 2) to refine the VFT modules and activities. Training on facilitation skills included in this workshop. GAF8 Conference presentation (India, 2022)	Codesign workshop completed over two days in May 2022.	Completed. Two fisheries staff were involved in the codesign process and contributed to the codesign of the modules and activities. Four fisheries staff received further training in facilitation methods for the codesign workshop.
3.3	Pilot and evaluate an adapted Family Teams approach (Village Fishing Teams) in one village in Samoa (with 1-2 representatives from each of the 5-6 village groups) to raise awareness of gender inequality, nutritional benefits of seaweed and post-harvesting opportunities.	VFT Modules developed (Appendix 4) and resources/handouts developed. Pilot delivered and evaluated (Sept 2022). Journal publication (forthcoming)	December 2022	Completed. The Village Fishing Teams (VFT) pilot program was successfully delivered to the village of Vaisala over two days. Delivery was undertaken by four MAF staff from the Apia office. A total of 20 participants (14 men, 6 women) attended on Day 1, and a total of 21 participants (14 men, 7 women) attended on Day 2. All village groups were represented on each day. Evaluation of VFT activities was undertaken at the time of the pilot. A subsequent debrief focus group interview with the MAF staff was undertaken.
3.4	Co-design (with participating village groups) a community learning plan using the Family Teams approach to enable wider uptake across communities	Community action plan.	23/09/2022 (as part of the Pilot program)	Completed. As part of the VFT activities, a community Action Plan was developed and will be implemented under the Community- Based Fisheries Management Program (CBFMP) (see Figure 34, and Appendix 7 photo 14). The evaluation will be used together with the feedback from MAF staff to identify strategies for supporting wider uptake.
3.5	Co-design a priority list of action areas to empower coastal families in seaweed harvesting and marketing pathways.	End of project recommendations	March 2023	A priority list of actions is provided at the end of this project report. The priority list is derived from the pilot evaluation, rather than broader scale out of VFT across multiple Samoan coastal villages.

PC = partner country, A = Australia

5. Objective 1: Define the elements of Samoan seaweed food systems for improved nutrition outcomes

5.1 Methodology

Objective one aimed to define the components of seaweed food systems, including the production, current consumption, nutrient analysis, and simulation modelling of potential dietary contributions from seaweed. A mix of quantitative and qualitative approaches were used. Field audits determined the production level of seaweeds, whilst structured interviews collected data to determine the amount and regularity of seaweed consumption. From here, potential intervention points in the seaweed food chain could be identified, for improved nutrition outcomes. Institutional capacity development of MAF was promoted through the co-design and use of interview guides, which complemented existing Fisheries effort to monitor market product and prices. Quantification of the nutrient composition of seaweed fibre, protein, vitamins and minerals was used in dietary simulation modelling to determine potential nutritional benefits of different seaweeds.

5.1.1 Data collection and analysis

Study participants

Seaweed production audit data (Activities 1.1 and 1.2)

Field audits were conducted by Fisheries staff from MAF in order to determine production levels of *Caulerpa* in Samoa. Market surveys were undertaken on three randomly selected days (Monday – Sunday), and roadside vendor stalls are audited once per week.

The following locations are included in the production audit:

- Apia Fish Market,
- Fugalei Agriculture Market
- Salelologa Fish Market in Savaii
- Roadside vendor stalls from Apia to Faleolo

Training/capacity building evaluation (Activity 1.3)

Capacity building of Fisheries staff in Samoa (MAF) was essential in order to upskill the team to act as enumerators for the collection of dietary interview data (under objective 1.4). Capacity building involved a series of online training modules that were developed by the UniSC team and delivered to the in-country MAF staff. Thirteen staff were trained in dietary interviewing and using PAC24 to conduct the 24-hour dietary recall interviews with community members.

24-hour dietary data (Activity 1.4)

Dietary data was collected in June 2021 from 233 individuals residing in 20 geographically dispersed villages, the Apia Fish Market (Upolu Island) and Saleloga Fish Market (Savaii Island) (Figure 4). The villages included in this activity were Savaia, Safa'ato'a, Lealalii, Faleu-uta, Poutasi,

Matautu Falealili, Vailoa Aleipata, Amaile, Fagalii, and Saoluafata on Upolu Island; and Vaisala, Asau, Satuiatua, Siutu, Faletagaloa, Safotu, Luua, Malae, Sale-Saipipi, and Fogapoa. Villages were selected based upon knowledge of the marine and fisheries resources of the villages, including existing production and market landing data collected by the MAF Fisheries Division. Prior to data collection, the villages were contacted through the village mayor with a signed letter from the Fisheries Division explaining the study purpose and requesting their participation.

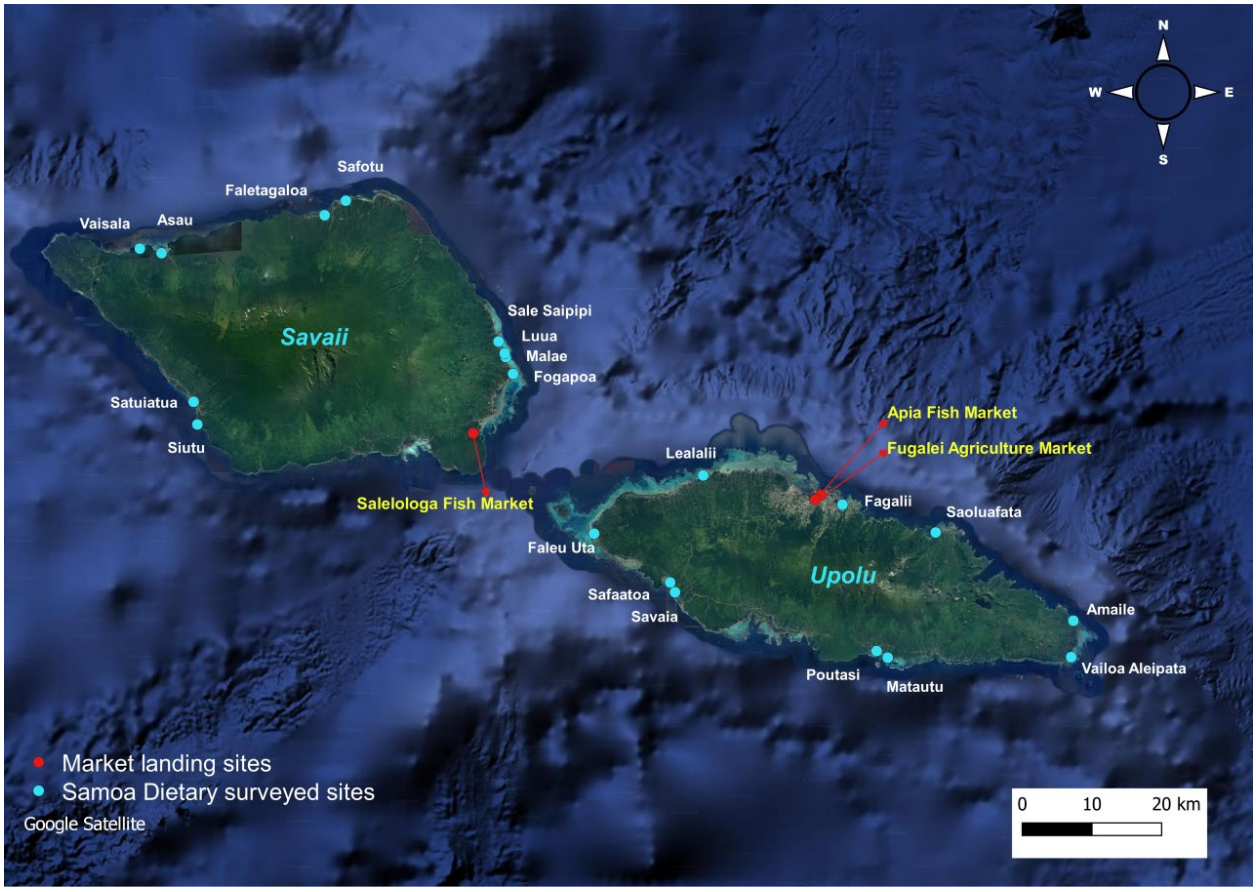


Figure 4. Map of Samoa indicating village sites from the study (blue dot white text) and key market sites (red dot yellow text) on the two main islands Upolu and Savai/i. Maps data Google, ©2020.

A convenience sampling method was used to recruit participants from the villages and markets. Within each village, attention was paid to ensure the sample included diverse ages and genders. This was achieved by inviting participants from the major groups within the traditional Samoan village structure; the Village Council, Women's Committee, Aualuma (daughters of the village) and Aumaga (untitled men), and additional youth and older participants to ensure broad representation of all village members. Structured interviews lasted approximately 40 minutes and took place in a central location, such as the villages' communal fale.

Seaweed samples and nutrient analysis (Activity 1.5)

Samples of *Caulerpa* and *Halymenia* were collected from multiple sites across Upolu and Savai'i (Table 1).

Table 1. Details for the seaweed samples collected for analysis

Sample No.	Genus	Island	Locality	Harvest date	Wet wt (kg)	Dry wt (kg)
1	*Caulerpa*	Upolu	Toloa	7/09/2022	1.46	0.105
2	*Caulerpa*	Upolu	Toloa	7/09/2022	1.46	0.105
3	*Halymenia*	Upolu	Salimu	19/09/2022	1.22	0.125
4	*Halymenia*	Upolu	Salimu	19/09/2022	1.22	0.125
5	*Halymenia*	Upolu	Salimu	19/09/2022	1.22	0.125
6	*Halymenia*	Savai'i	Sale Saipipi	19/09/2022	0.335	0.035
7	*Halymenia*	Upolu	Sogi	14/09/2022	0.855	0.07
8	*Halymenia*	Upolu	Sogi	14/09/2022	0.855	0.07
9	*Caulerpa*	Savai'i	Vaisala	20/09/2022	2.145	0.205
10	*Caulerpa*	Savai'i	Vaisala	20/09/2022	2.145	0.205
11	*Caulerpa*	Savai'i	Vaisala	20/09/2022	2.145	0.205
12	*Caulerpa*	Savai'i	Vaisala	20/09/2022	2.145	0.205

Data collection instruments

Production audit data (Activities 1.1 and 1.2)

In June 2022, the MAF team begun using the Ikasavea app, developed by SPC, Coastal Fisheries Division. The app simplifies data entry in relation to market surveys conducted by Fisheries staff in all Pacific Community member countries. Fisheries staff completed a series of training modules using SPC web and Cloud based electronic e-data system. Android tablets provided by this project were utilised for data collection in the field, whereby trained surveyors interviewed vendors and collected measurements, weights and photographs of the seaweed for sale.

Training/capacity building evaluation (Activity 1.3)

The training consisted of a whole day workshop (delivered via zoom) (Figure 5). The first half of the session covered dietary interview methods, interviewing skills and demonstration of the PAC24 tool, as well as ethics, consent and safety. The second part of the workshop was delivered as a hands-on session in which the staff applied their learnings and completed a series of exercises relating to measuring and quantifying food portions and serving sizes (Figure 6). The hands-on activity was facilitated by the Principals Fisheries Officer, while the Australian team provided real time support

via zoom. All staff received a certificate of completion for participating in the training and data collection.

Figure 5. Samoa fisheries staff participating the in dietary recall training

Figure 6. Hands on session facilitated by the Principal Fisheries Officer

24-hour individual dietary recall data (Activity 1.4)

The 24-hour dietary recall is a dietary assessment tool that consists of a structured interview where individual participants are asked to recall all food and drink they consumed in the previous 24 hours. To facilitate the collection of dietary information, a digital version of the 24-hour recall process was developed. A local app development business on the Sunshine Coast (Australia) was engaged to develop the app, called 'PAC24'. The design of PAC24 was based on the ASA24 Automated Self-Administered Recall System and 5-pass approach (validated Automated Multiple-Pass Method (AMPM)). The app was specifically developed for the Samoan context, with the use of culturally appropriate images and local foods.

The purpose of PAC24 was to facilitate the 24-hour recall process between the enumerator and individual, using a guided process, prompt questions and checklists. The Pacific Island Food Composition tables and the AUSNUT Food Composition tables (from FSANZ) were used as the database for food items. In addition, MAF Fisheries staff provided several recipes of common foods and meals eaten in Samoa, of which nutritional data was determined and these were added to the database. The app contained a search function in which enumerators could search and select from, as well as an option to manually add food items not in the database as a 'custom' food. The app contained several images to guide interview questions and support respondents in their answers, such as photos of hand measure estimates (based on WHO recommended hand measures of fist, palm and thumb) to guide accurate reporting of portion size.

The PAC24 guided enumerators through the structured interview process, ensuring all data was collected following a comprehensive and rigorous process (Figure 7). Demographic data was collected first, including place of residence, age, gender, pregnancy or lactating status (if applicable), and health status. The enumerator would then proceed to the 24-hour dietary recall. Participants were asked to name all the foods and drinks consumed the previous day including meal count, snacks eaten, dietary supplements, and amount of food eaten relative to usual intake. Names of food brands, preparation techniques, and occasions where food was consumed were also recorded. Figures 8-10 provide examples screenshots of the PAC24 tool, along with the

instructions for enumerators. The full step-by-step guide developed for the training is provided in Appendix 2 and an example of a resource for enumerators is provided in Appendix 3.

The app was built to be tablet and mobile friendly with offline ability. This allowed enumerators to use the tablets in the field during the interviews, with and without internet access. When connected to mobile data or Wi-Fi, data would automatically upload to the secure cloud storage. Users could also manually sync the data to the cloud when connected to the internet.

Initial user testing of the app to check intuitiveness, content and alignment to the 24-hour recall process was undertaken with final year Nutrition & Dietetic students at UniSC. The tool was refined based on their feedback, and then piloted with the Principal Fisheries Officer of MAF, for usability, intuitiveness and understandability as well as cultural appropriateness. Feedback was also obtained from the MAF staff participating in the dietary interview training, and the app further refined prior to commencing data collection in the villages.

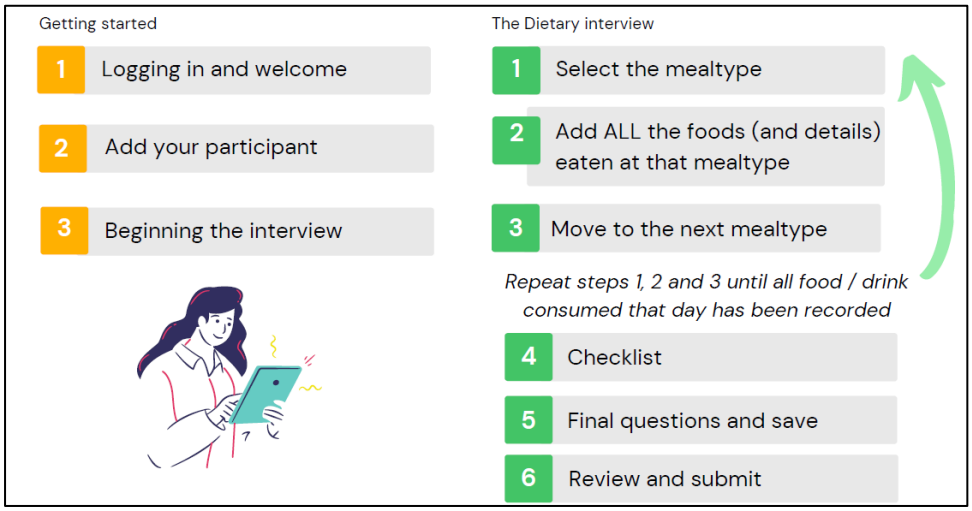


Figure 7. Overview of the steps for using PAC24

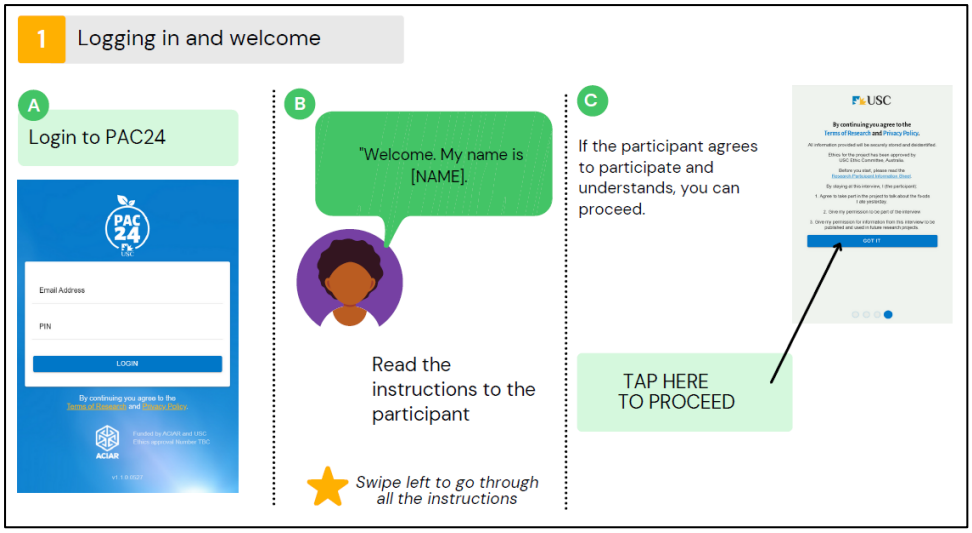


Figure 8. Opening steps (Getting started) with instructions and corresponding screenshots of PAC24 app

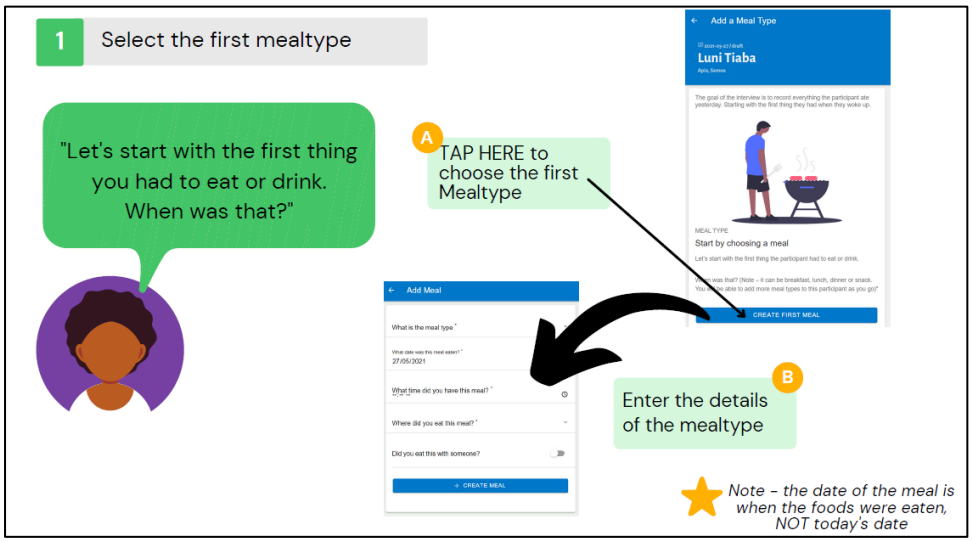


Figure 9. Step 1 of the Dietary interview with instructions and corresponding screenshots of PAC24 app

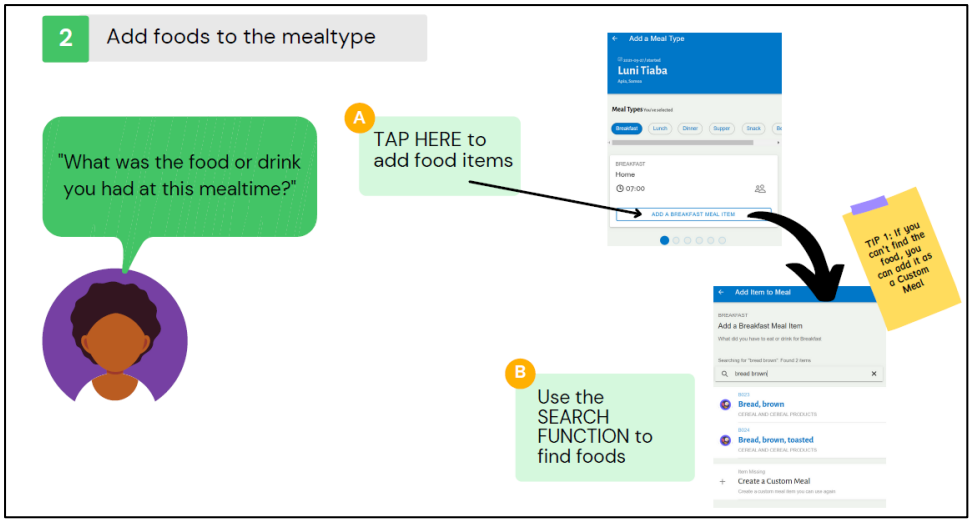


Figure 10. Step 2 of the dietary interview with instructions and corresponding screenshots of PAC24 app. Enumerators could select foods from the database or enter custom items

Seaweed samples and nutrient analysis (Activity 1.5)

The seaweed samples were cleaned, dried and vacuum packed on site, where sample location, date, and collection time were recorded. This process followed Standard Operating Protocols developed during ACIAR project FIS/2010/098 involved cleaning sediment from each sample, then removing excess water with a Zyliss salad spinner (sample weight recorded at this time), then finally samples were dried using an Ezidri Ultra FD1000 dehydrator, and the net dry weight was recorded. Dried samples were then packaged into vacuum sealed bags, with silica gel as a desiccant.

Analysis

Production audit data (Activities 1.1 and 1.2)

Production data was analysed descriptively and reported as total number of bundles, estimated value, estimated weight, and average price/kg (WST/kg) was determined.

Training/capacity building evaluation (Activity 1.3)

For the dietary interview training, pre and post training evaluation surveys were administered to measure changes in knowledge, skills and confidence, as well as intention to apply new learnings to their current work.

24-hour individual dietary data (Activity 1.4)

The 24-hour dietary recall data was reviewed to remove test participants, those under 18 years of age, duplicates, and data collected during the training. Participants were de-identified by numbering them sequentially before entering data into the dietary analysis program FoodWorks (Xyirs, 2017) to determine individual macro and micronutrient intake. Following analysis in Foodworks, nutrient intake data for each participant, including macronutrients and micronutrients, water, fibre, alcohol, caffeine and food groups according to the Australian Guide to Healthy Eating (AGHE) (Cox 2017), were entered into Microsoft Excel for descriptive analysis involving frequencies, percentages, means, and standard deviations. Descriptive analysis was undertaken for demographic data, including gender, age categories, pregnant/lactation status, self-reported health conditions,

numbers of main meals eaten in a day (breakfast, lunch, dinner), snack consumption, and whether food intake was a usual amount, or less than or more than usual.

Several adjustments were made, including entering as a serving size according to the AGHE (Cox 2017) when quantities of whole foods (fruit or vegetables) were not stated during the dietary interview. When needed, adjustments were made to these amounts to be consistent with the volume of food recorded as eaten in the meal. Estimations were also made for foods such as condiments, added sugar, and added salt, based on recall data across the whole participant group or common serving sizes. For food items that were not present in the Foodworks database (Xyirs, 2017), nutrient data according to the PI-FCT (Dignan, Burlingame et al. 2004) was used. When branded or packaged foods were not available in food composition tables, a similar food item was substituted based on internet searches of nutrition labelling and ingredient lists, where available. The recipes for common dishes that were provided by the Samoan research team were entered into FoodWorks as a new 'recipe', along with the usual serving sizes. Where recipes were not provided, an internet search was performed to find approximately 4-6 recipes of Pacific origin. A recipe based on these was then developed and entered into FoodWorks, along with the appropriate serving sizes.

Nutrient data obtained from Foodworks was exported into Microsoft Excel. Nutrients analysed included: total energy, protein, carbohydrate, fat and saturated fat, water, fiber, alcohol, caffeine, vitamins - thiamine, riboflavin, niacin, vitamins C, E, B6, B12, A (as retinol equivalents), folate (as dietary folate equivalents), minerals - sodium, potassium, magnesium, calcium, phosphorous, iron, zinc, selenium, and iodine. Participants were categorised according to gender, and pregnant or lactating women were subcategorised. In each gender, participants were categorised by age, and clustered for analysis according to the Nutrient Reference Values (NRV) for Australia and New Zealand. (18-30yrs, 31-50yrs, 51-70yrs, 70+yrs) (National Health and Medical Research Council et al., 2006). Each participant's intake was evaluated for meeting Recommended Daily Intake (RDI) or Adequate Intake (AI) for their demographic category as well as meeting the Suggested Dietary Targets (SDT) where appropriate.

Intake aggregate by gender and age group was analysed to obtain average, median, minimum, and maximum intake. The numbers and percentages of participants meeting their respective NRV targets were also calculated. Data for the number of serves consumed for each food group were included. Food groups were categorised based on the AGHE (Cox 2017) according to the following categories: Grain (subcategorised into refined grains and whole grains); fruits; vegetables (subcategorised into starchy vegetables, legumes, and other vegetables); protein (subcategorised into red meat, poultry, eggs, processed meat, fish, shellfish and molluscs, nuts, legumes, and soy); and dairy. Oil equivalents, saturated fat equivalents, added sugar, alcohol, and caffeine, were also categorised. Culturally appropriate categories from the Pacific Guidelines for Healthy Living (PGHL) (SPC 2018) were also used to classify food groups, these included: energy foods (including whole grain and starchy vegetables); protective foods (including fruits and other vegetables); and body-building food (including red meat, poultry, eggs, seafood, nuts, legumes, soy, and dairy).

Seaweed samples and nutrient analysis (Activity 1.5)

Dried samples were sent to an external laboratory (National Measurement Institute, Department of Industry, Science and Resources) for nutrition testing (see full list of standard methods and results

for 74 variables in Appendix 1). To prepare the data for the modeling, dry weight was converted to wet weight which were calculated by averaging the weights of the collected and subsequently dried seaweed samples (this equated to a wet:dry ratio of 9.6:1 for *Halymenia* and 13.9:1 for *Caulerpa*).

Dietary modelling simulation (Activity 1.6)

Dietary simulation modelling provides a way to predict dietary strategies that may improve nutritional or health outcomes (Grieger, Johnson et al. 2017). This approach is useful when intervention studies are not feasible (Homer and Hirsch 2006), which is particularly relevant when considering the cultural influences on food choice in Samoa. Dietary simulation modelling compares a range of dietary scenarios by forecasting via mathematical equations that compare hypothetical changes in dietary intake (Grieger, Johnson et al. 2017).

To understand the possible benefit of introducing regular consumption of seaweed in the Samoan population, a dietary simulation modeling was undertaken using the individual 24-hour dietary recall data and the nutrient analysis data of seaweed samples. Using Excel, an active data sheet was created to model *Halymenia* and *Caulerpa* consumption. Aggregated food and beverage intake data was imported for each participant. The modelling simulation scenario was then operationalised by creating modifiable cells to manipulate nutrient intake data with the addition of different seaweeds. The modelling scenarios were based on the addition of 75g *Halymenia* or *Caulerpa* each day. This serving size aligns with a standard serve size of vegetable according to the AGHE (National Health and Medical Research Council, 2021b) Additionally, current consumption of seaweed by Samoan's occurs on special occasions (averaging one to three times per month (Tiitii, Paul et al. 2022)). This estimated portion size represents a realistic and achievable target for the promotion of daily consumption of seaweed.

5.2 Key results and discussion

5.2.1 Results

Seaweed market data

Table 2. Seagrape/Caulerpa market survey data – by values and weights per month in 2022

Month (2022)	No. bundles	Estimated value	Estimated weight (kg)	Est. weight (mt)	Average price (WST) /kg
Jan	42	$2,793.33	181.57	0.18	$15.38
Feb	216	$10,488.33	650.87	0.65	$16.11
Mar	117	$4,932.22	290.69	0.29	$16.97
Apr	**No market survey - COVID-19 lockdown restrictions**				
May	101	$6,654.00	432.51	0.43	$15.38
Jun	92	$3,096.67	199.33	0.20	$15.54
Jul	212	$15,365.00	896.35	0.90	$17.14
Aug	276	$16,893.45	929.79	0.93	$18.17
Sep	334	$20,638.75	967.04	0.97	$21.34
Oct	142	$22,064.37	791.3	0.79	$27.88
Nov	523	$79,855.50	2332.2	2.33	$34.24
Dec	215	$19,852.50	722.5	0.72	$27.48
TOTAL		**$202,634.12**	**8,394.1**	**8.39**	

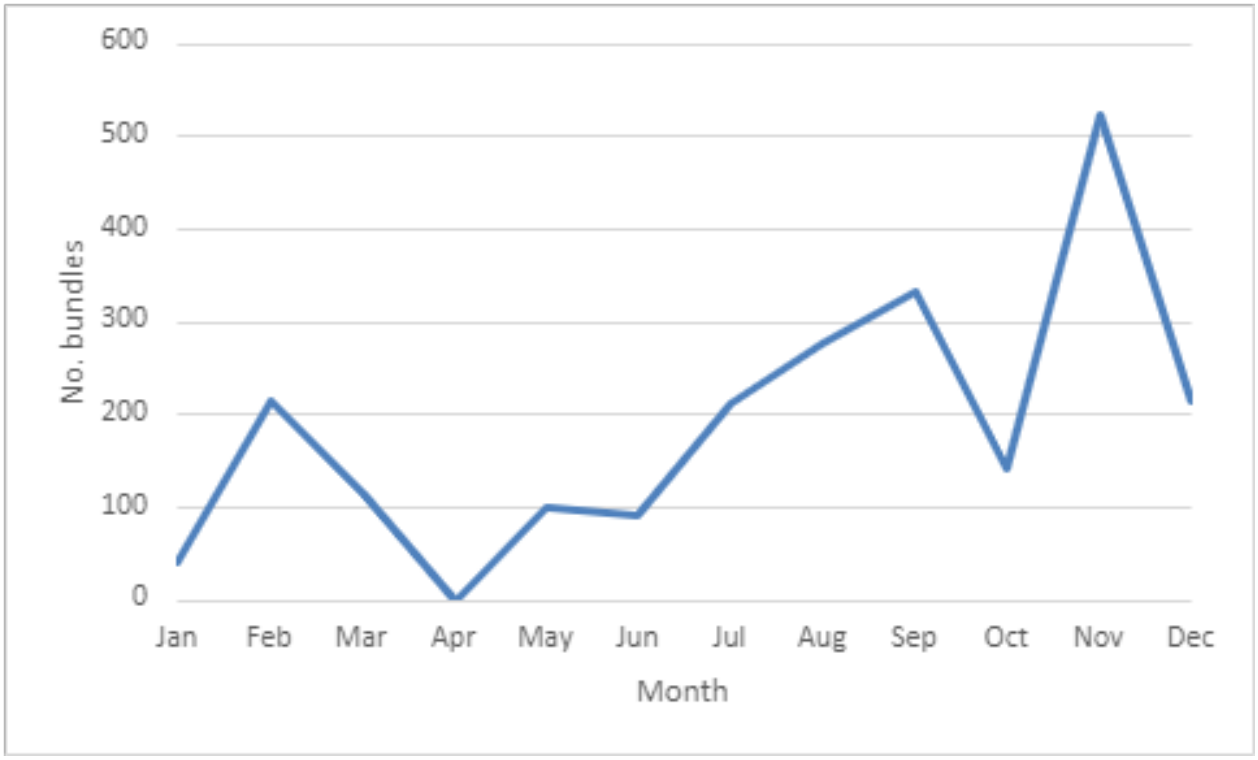


Figure 11. Total number of bundles of sea grapes/Caulerpa for sale over the year (2022)

Evaluation of dietary interview training workshops

Evaluation survey results demonstrated increased knowledge of how to conduct 24-hour individual dietary recall interviews and quantify food measures, as well as increased confidence of MAF enumerators to undertake dietary interviews in the community. This is evident through the following quote from one participant following the training workshop *"The hands-on activity clearly gave me a picture of how to estimate the amount of daily intake, I feel confident I can do this well in the villages."* Participants also felt they could apply their learnings to their usual role in the Fisheries Division, for example applying interview skills in collecting information from community members in the future. The following quote from the evaluation survey demonstrates one participant's intent to apply the new learning in their usual MAF role *"Our team often go to collect data in the field, doing this training improved our interview skills to collect information when talking with people and our customers"*.

Dietary intake data for Samoan individuals

Participant characteristics

Individual dietary recall data was collected from 234 Samoan adult participants. One participant was removed due to incongruity in the data, making the total sample size 233 participants. There was a balanced proportion of males (n=111, 48%) and females (n=121, 52%) including two pregnant and three lactating women. Ages ranged from 19 to 85 years for both men and women with a mean age of 46 years (median 45 years), which was consistent when data was disaggregating by gender for male and female participants. The mean age for pregnant and lactating women was 33 years (range 31 - 35 years). Figure 12 provides a summary of participant characteristics.

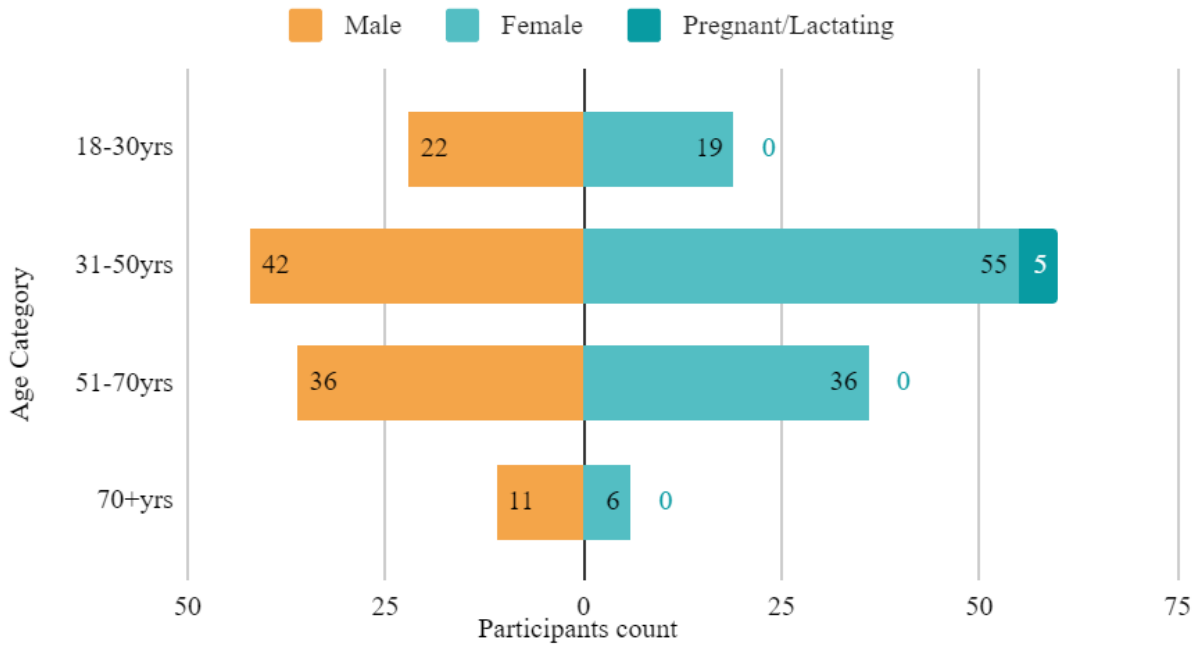


Figure 12. Summary of the age and gender distribution of sample participants.

More than one in four participants reported suffering from a non-communicable health condition (n=65, 28%). The most reported health condition was hypertension (n=27, 12%), followed by diabetes (n=17, 7%). The proportion of non-communicable health conditions was higher in women (n=30, 26%) than men (n=21, 19%) and null in the pregnant or lactating group. Given the small number of pregnant (n=2) and lactating (n=3) women in this sample, they have not been included in the remainder of analysis, thus making the total sample size 228 participants.

Meal frequency

Majority of participants (n= 209, 92%) consumed three meals per day. Of these, men (n=107, 96%) were more likely to consume three meals per day than women (n=102, 88%). Notably, the 31 to 50 years old group was the most likely to consume two or fewer meals per day (n=11, 9%) compared with other age groups. More than one quarter (30%) of the participants (n=69) reported consuming snacks in the past 24 hours, with snacking more common in women (n=38, 33%) than men (n=31, 28%).

Food groups

A qualitative analysis of 24-hour dietary recall data was undertaken, whereby food groups were coded to determine the number of each food group serves participants consumed. Individual food group consumption was compared with the AGHE “Recommended number of serves for adults” (National Health and Medical Research Council, 2021a) and the Pacific Guidelines for Healthy Living (PGHL) (The Public Health Division of the Pacific Community, 2018). Figure 13 illustrates the proportion of all participants meeting the recommended number of serves for each food group,

according to each of these guidelines (AGHE and PGHL), in addition to the proportion of different age and gender categories meeting the recommendations.

Overall, consumption of the fruit and dairy food groups was particularly low, 20% (n=46) and less than 1% (n=3) respectively. According to the PGHL, only 12% (n=27) of participants were meeting recommendations for protective foods. The percentage of men and women meeting the AGHE daily recommendations for grains, fruits, proteins, or dairy was similar, however, 20% more men met the recommendation for vegetables. Similar proportions of men and women met the recommendations for all three food groups according to the PGHL.

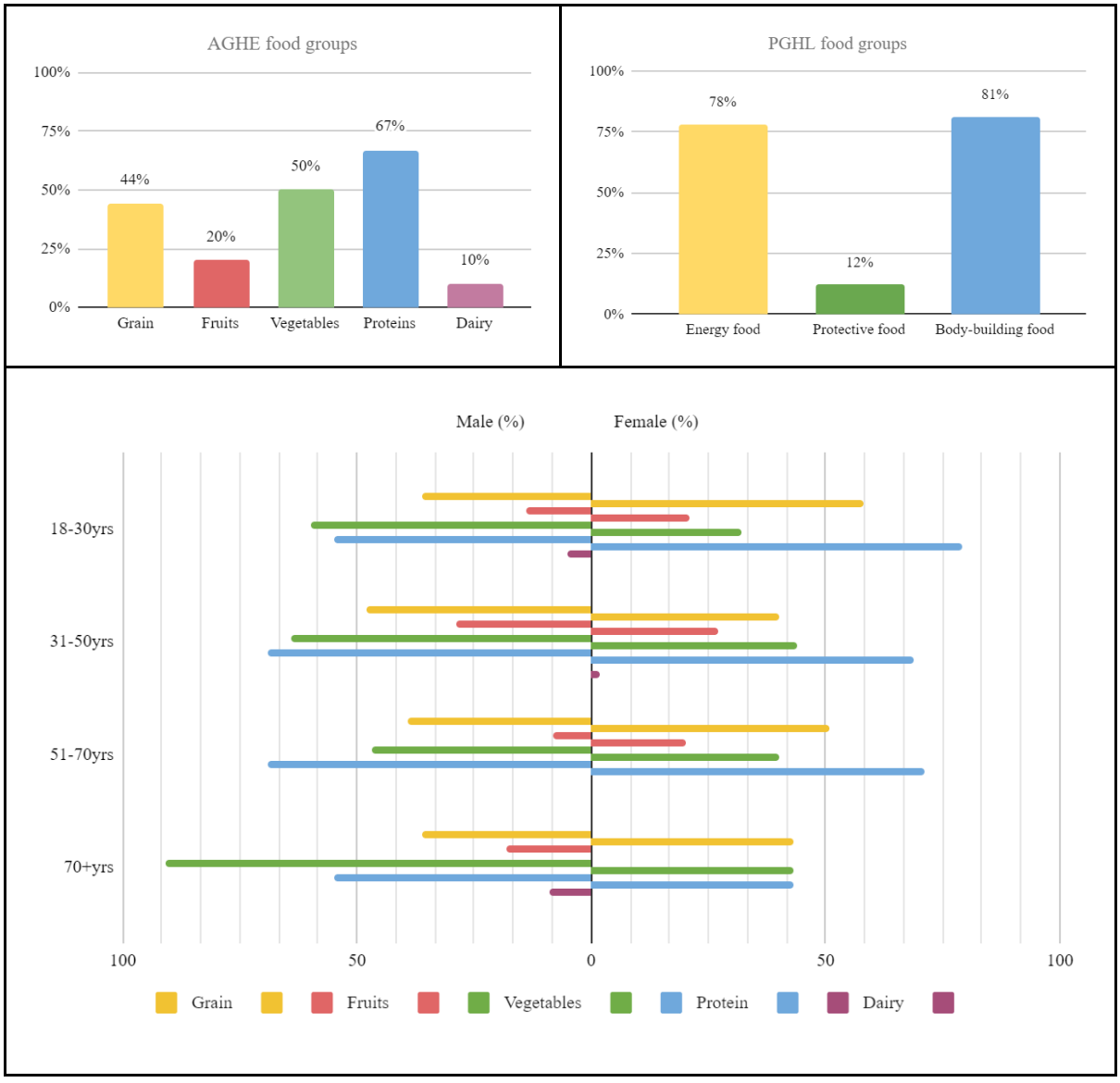


Figure 13. Proportion of all participants meeting the recommended number of serves for each food group, according to the AGHE (top left) and PGHL (top right). Gender and age disaggregated proportion of participants meeting the recommended number of serves for each food group according to the AGHE (bottom).

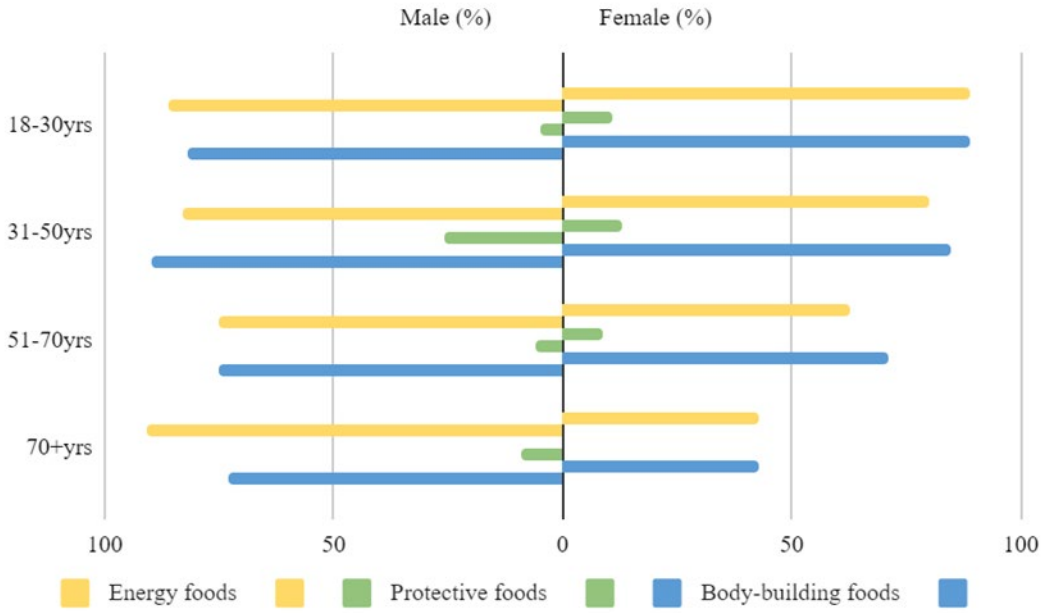


Figure 14. Gender and age disaggregated proportion of participants meeting the recommended number of serves for each food group according to the PGHL.

Energy intake

The average total energy intake for males (n=111) was 13300 KJ (median: 11600 KJ; range 2600-46500 KJ) and for females (n=116) was 11600 KJ (median: 10700 KJ; range 1700- 23700 KJ). Average intakes for men and women in this sample were in line with household level data, based on household income and expenditure surveys (HIES), for average daily energy intakes in Samoa (FAO 2017). The HIES is a comprehensive survey, last completed in Samoa in 2013, where household expenditure information is converted into a proxy of household food energy and nutrient intake, in order to establish the nutrient and food energy values for each household member (FAO 2017) (see Table 3). Figure 15 illustrates the results from this project for the average total energy intake, and range, for men and women of different age categories, presented against the average Samoan energy intake based on HIES data (presented as red X).

Table 3. The Average Daily Energy Intake for Samoan's based on household level data determined through HIES (FAO 2017).

	Male 18-30	Male 31-60	Male 65+	Female 18-30	Female 31-60	Female 65+
Kilojoules	15900	14800	10300	13600	11800	8700

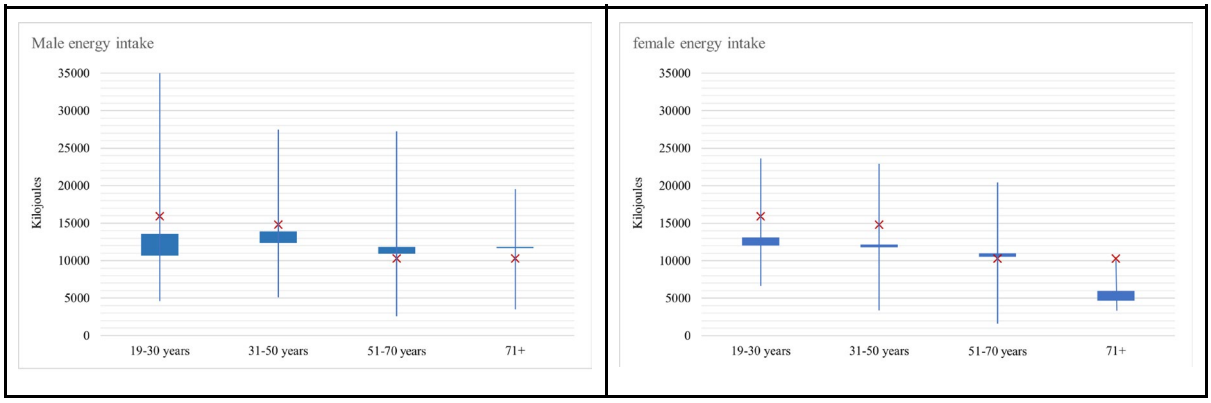


Figure 15. Average total energy intake and range, for men and women of different age categories, presented against the average Samoan energy intake based on HIES data (shown as red X).

Macronutrient intake

The diet of our sample comprised an average of 17% of total energy intake from protein, 38% from fat (including 13% saturated fat), and 43% from carbohydrate. When compared to essential macronutrient distribution (SPC 2018, Troubat, Faaola et al. 2020) this repartition exceeds recommendations for proteins (10-15%), fat (15-30%), and saturated fat (<10%) and is below the lower-level recommendation for carbohydrate (45-65%). Additionally, on average 40% of carbohydrate intake (and 18% of total energy intake) for our participants was provided by added sugars, which is 8% higher than WHO recommendations (WHO 2015). Figure 16 illustrates the average macronutrient distribution for this sample, presented against household level data for Samoa (FAO 2017), and the upper and lower bounds of the WHO recommendations for macronutrient distribution (WHO 2015).

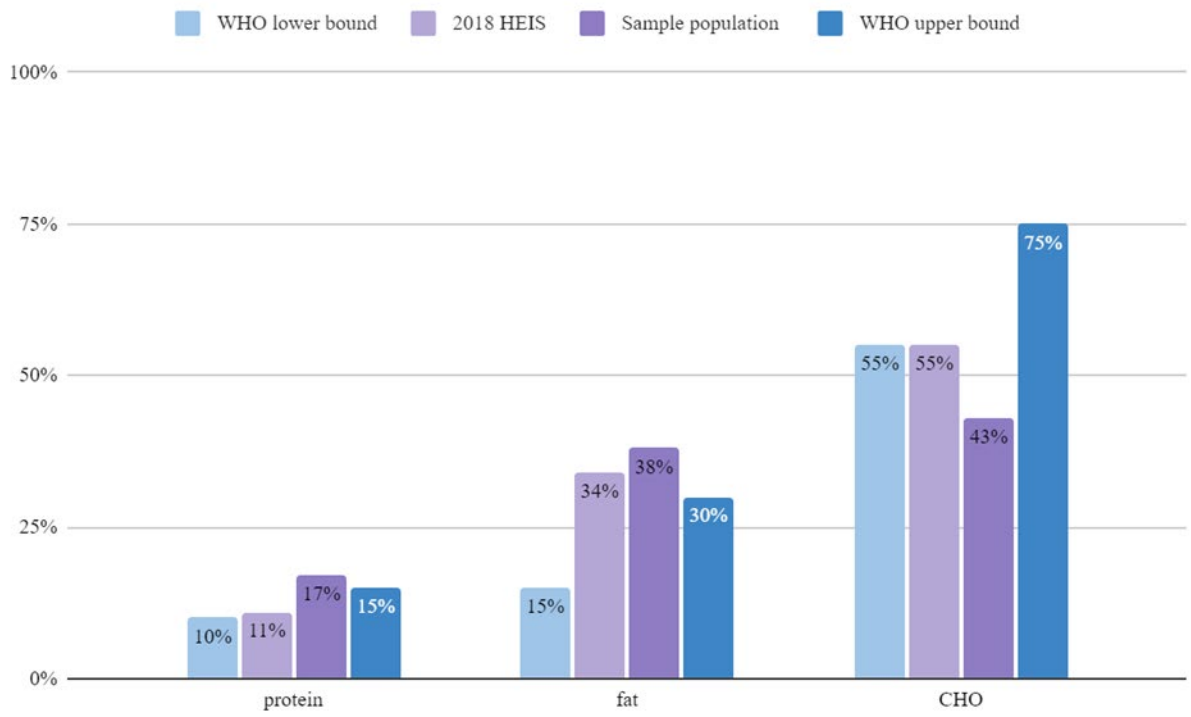


Figure 16. Average macronutrient distribution for this sample, presented against HIES household level data for Samoa, and the upper and lower bounds of WHO recommendations.

Micronutrient intake

The proportion of the total sample meeting NRV recommendations was: 51% met the RDI for dietary fibers; 3% met the RDI for calcium; 50% met the RDI for iron (with only 7% of women of reproductive age); 70% met the RDI for magnesium; 64% met the AI for potassium; 46% met the RDI for zinc; 62% met the SDT for sodium; 71% met the RDI for iodine, 42% met the RDI for Vitamin B2; and 88% met the RDI for vitamin B3. A full presentation of the proportion of the total, female, and male sample meeting NRVs for each micronutrient is presented in Table 4.

Table 4. Summary of the proportion of total, female and male participants meeting NRVs for each micronutrient.

	RDI Total Dietary Fibre	**RDI Ca**	**RDI Fe**	**RDI Mg**	**AI K**	**RDI Zn**	**<SDT Na**	**RDI I**	**RDI Vitamin B2**	**RDI Vitamin B3**
% Total sample meeting NRV recommendations	51	3	50	70	65	46	38	71	42	89
% Female sample meeting NRV recommendation	55	2	26	72	70	64	40	66	41	89

% Male sample meeting NRV recommendation	47	5	75	68	59	27	36	77	42	88

Seaweed nutrient testing data

Nutrient testing of *Halymenia* (Salima village sample) and *Caulerpa* (Vaisala village sample) was undertaken by the National Measurement Institute (NMI, Melbourne, Australia). Raw data on the biochemical composition, reported on a dry weight basis, covers both proximate (including sugars, vitamins, fatty acids and amino acids) and elemental components (74 variables in total, Appendix 1, Product Sheets_*Caulerpa* and *Halymenia*). This dry weight data was then used to calculate the content of 10 key variables (macronutrient, fibre and mineral) in one serve (75g) of these seaweeds (Table 5).

On average, one serve (75g) of *Halymenia* provides (% of RDI): Dietary fibre: 4% (range 3.7-4.4 %), calcium: 82% (range 71-92%), iron 35% (range 19-43%), magnesium: 12% (range: 10-13%), potassium: 2% (range1.7-2.4%), iodine: >100%, sodium: 87%, B2 vitamin: 1.5% (range 1-2%), B3 vitamin: 6% (range 7-6 %) (Table 5).

On average, one serve (75g) of *Caulerpa* provides (% of RDI): Dietary fibre: 7% (range 6-7.2 %), calcium: 2% (range 0.4-3%), iron: 6% (range 3-7%), magnesium: 17% (range: 15-20%), potassium: 6% (range 5-7%), iodine: >100%, sodium: 38%, B2 vitamin: 4% (range 3-4.5%), B3 vitamin: 12% (range 11-13 %) (Table 5).

Notably, some of these key nutrients – calcium, iron, fibre – were low in diet and high in the seaweed, indicating the potential for at least one of the seaweeds to become a significant dietary source. Whereas other important nutrients were either already high in diet (iodine, sodium, magnesium), or were too low in the seaweed to make an appreciable impact (potassium, vitamins B2 and B3).

Table 5. Nutrition information for serving size (75g) of Halymenia and Caulerpa.

NUTRITION INFORMATION		
Halymenia		
Serving size:	75.00 g	
	Average quantity per serving	% NRV
Dietary fibre	1.10 g	4 %
Calcium	924.19 mg	82 %
Iron	3.47 mg	35 %
Magnesium	40.94 mg	12 %

NUTRITION INFORMATION		
Caulerpa		
Serving size:	75.00 g	
	Average quantity per serving	% NRV
Dietary fibre	1.80 g	7 %
Calcium	31.09 mg	2 %
Iron	0.56 mg	6 %
Magnesium	61.55 mg	17 %

Potassium	66.21 mg	2 %
Iodine	346.57 µg	>100 %
Sodium	802.16 mg	87 %
B2 vitamin	0.02 mg	1.5 %
B3 vitamin	0.94 mg	6 %
Vitamin A (as retinol equivalent)	13.6 µg	2 %

Potassium	190.31 mg	6 %
Iodine	942.12 µg	>100 %
Sodium	351.72 mg	38 %
B2 vitamin	0.05 mg	4 %
B3 vitamin	1.82 mg	12 %
Vitamin A (as retinol equivalent)	8.72 µg	1 %

Dietary simulation modelling findings

Two simulation scenarios were modelled with participant's diets; 1) addition of a 75g serve of *Halymenia,* and 2) addition of a 75g serve of *Caulerpa.* The percentage variation in micronutrient intake, with the addition of these seaweeds to the diets of participants in this study, is presented in Figure 17. Modelling these scenarios revealed that adding a serve of *Halymenia* or *Caulerpa* would increase the proportion of participants meeting NRV targets for fiber and all micronutrients tested.

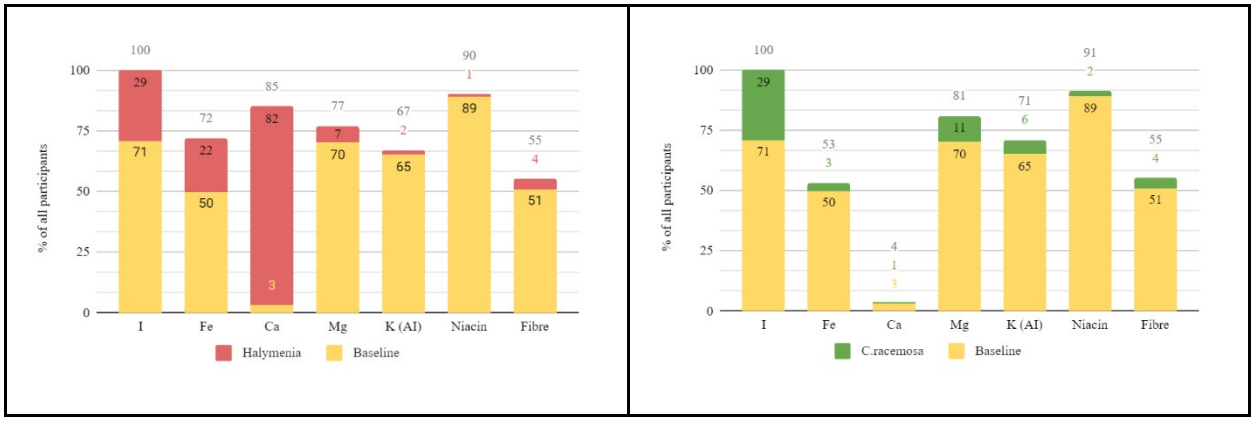


Figure 17. Proportion of all participants meeting micronutrient NRVs with the addition of a 75g serve of Halymenia or Caulerpa

Only 38% of all participants were within the suggested dietary target (SDT) for sodium (2000mg/day). Given the relatively high sodium content of seaweed, it was important to model the impact to sodium intake when adding seaweed into the diet. The addition of *Caulerpa* and *Halymenia* decreased the number of participants within the SDT to 26% and 16% respectively. This finding, and the gender disaggregated proportion of participants meeting the SDT for sodium with and without the addition of seaweed is presented in Figure 18.

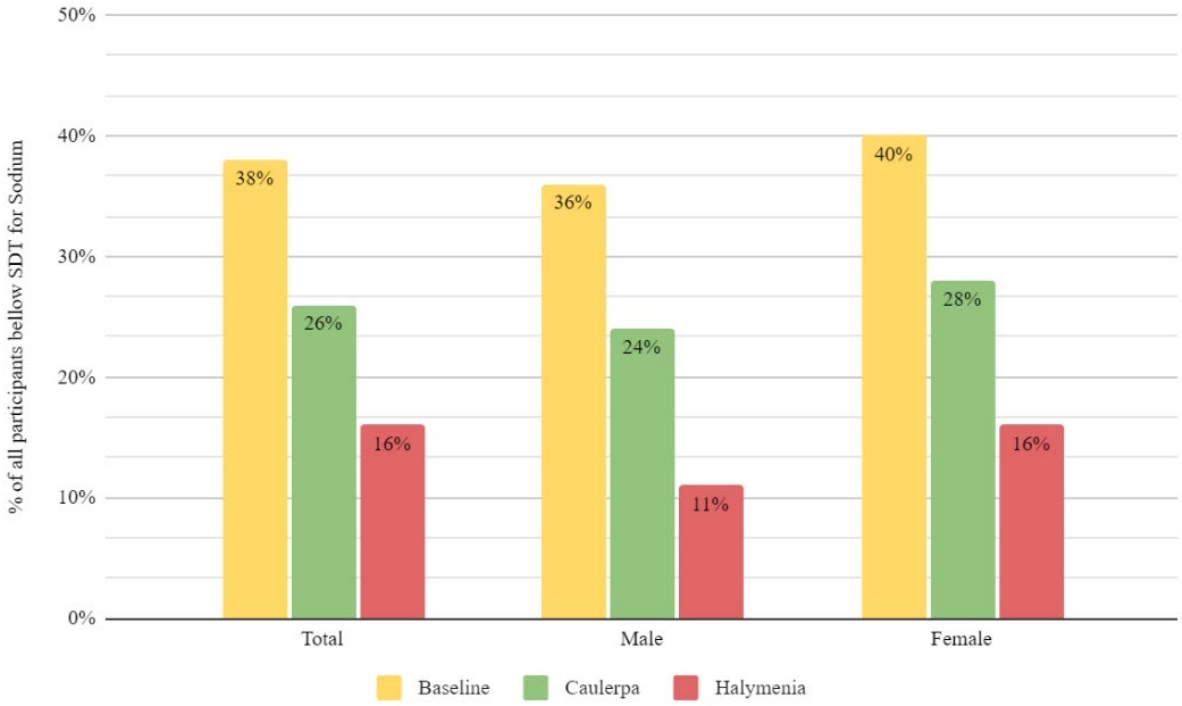


Figure 18. Proportion of total, male and female participants meeting the SDT for sodium, with and without the inclusion of seaweed.

A more detailed illustration of gender differences with the two modelling scenarios is presented in Figure 19 for *Halymenia* and Figure 20 for *Caulerpa*. When data was disaggregated by gender, there were no differences in the impact on NRVs between men and women, except for calcium which showed greater improvements with the addition of *Halymenia* for male participants.

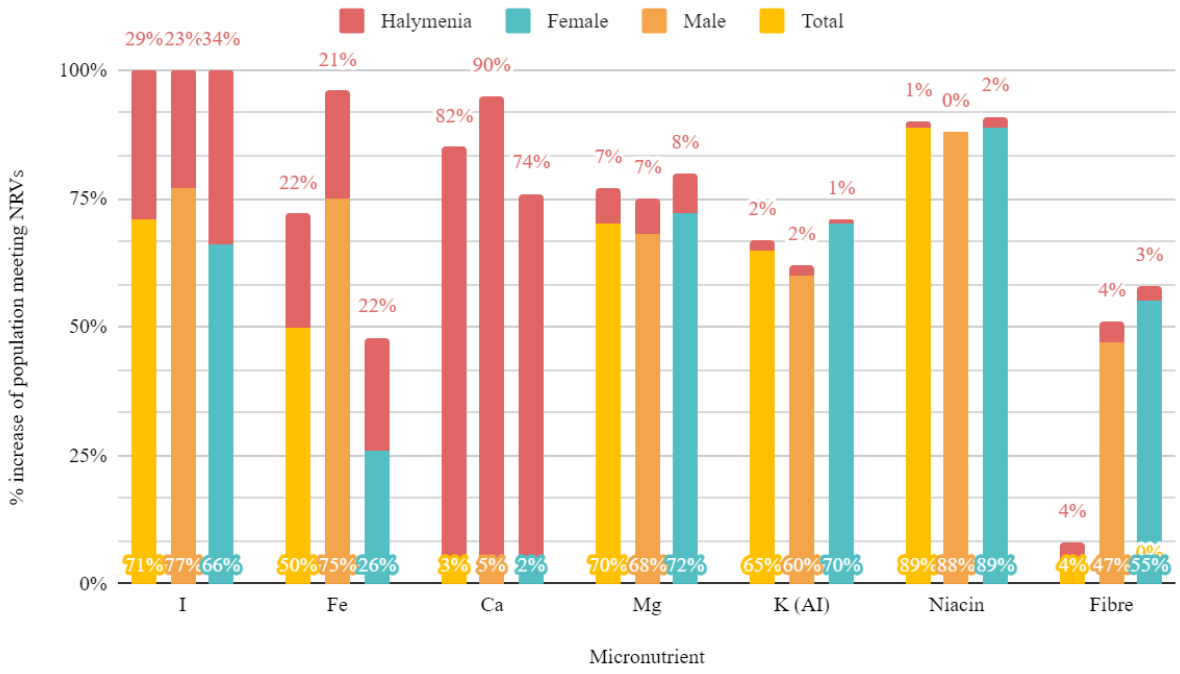


Figure 19. Proportion of sample meeting NRVs for micronutrients and fibre, with the addition of 1 serve (75g) of Halymenia.

Figure 20. Proportion of sample meeting NRVs for micronutrients and fibre, with the addition of 1 serve (75g) of Caulerpa.

5.2.2 Discussion

The activities within this objective enabled us to define the elements of Pacific seaweed food systems for improved nutrition outcomes. Determining production levels and market prices of *Caulerpa* provides vital information into the cost and availability of seaweed as a food for Samoan people. Assessment of current dietary intake of adult Samoan individuals was undertaken within 10 communities, providing a valuable dietary dataset from 233 participants. The collection of this comprehensive dataset was achieved through the development of an innovative and culturally aligned online dietary assessment tool, as well as built capacity of MAF Fisheries staff in conducting individual dietary interviews. The nutrient analysis of seaweed samples provided current data that could be included in the dietary modelling activity, to provide localised insight into the potential contribution of seaweeds in meeting nutritional requirements for individuals in Samoa.

Tracking the price and availability of *Caulerpa* for sale at market vendors throughout Samoa allows us to determine peak sale periods. There is a need to differentiate between *Caulerpa* species in the marketplace. This could be achieved through morphology assessments, visual observation (less confidence), or reporting of harvesting location (village source) as there is the assumption that *Caulerpa* from Savai'i is *Caulerpa chemnitzia*. This information on cost and availability of seaweed can inform village-based planning and management of seaweed fisheries (Objective 3) through the VFT program, to ensure villages are prepared for periods of greatest demand. Better understanding of supply and demand dynamics can further inform efforts to promote seaweed intake, such as through cultural events, peak periods of celebration and church occasions, to shift the equilibrium and boost market sales.

Nutrient analysis revealed, for the first time, a range of key nutrients in locally consumed seaweed that could have important functional impacts within the present diet of Samoans. Three seaweed biochemical components with substantive contributions to recommended daily intake were identified – calcium, iron and fibre. Furthermore, this was the first time that vitamins in the seaweed were quantified and mapped to against relative contribution to RDIs. These findings showed that seaweeds are in fact not important contributors to the intake of carotenes, retinol, ascorbic acid or thiamin (Appendix 1). We acknowledge that the samples processed for the full 74 health variables were taken from a single time point and location for each species of seaweed. We recommend that more extensive collection of *Caulerpa* and *Halymenia* replicates from multiple sites would increase the confidence in our nutrient analysis data.

Individual dietary analysis revealed the majority of participants total energy intake aligned with the Samoan average daily energy intakes determined through the HIES. This suggests the individual level dietary data collected under this objective is a true representation of actual intake, based on the alignment with known intakes at the household level (FAO 2017). A number of at-risk nutrients were identified, including calcium, iron and fibre. There is a need to collect more seaweed samples across different seasons and locations (within Samoa and in other PICs), before health professionals can broadly recommend seaweed as a solution for micronutrient deficiencies for all people. Further investigation of children's dietary intake at the individual level is also warranted to fill this current data gap in Samoa, and more broadly across other PICs. This will enable identification of at-risk nutrients for this sub-population and enable targeted food-based strategies to address potential inadequacies.

This project is the first to collect individual level dietary data from a comprehensive sample of adult Samoans. To date, household level data, most recently collected 2013, obtained through the HIES

has been used to understand the composition of Samoan diets at a household level (FAO 2017). Determining individual daily food and nutrient intake in this project, enabled us to establish that seaweed provides specific micronutrients that can address micronutrient deficiencies for adult Samoans. There is a need for individual level dietary data from other Pacific Island countries to expand our understanding here. The innovative, Pacific-focused, purpose built online dietary assessment tool developed in this project, enables efficient and rigorous collection, storage and management of individual level dietary data. This is the first tool of this kind to be implemented in the Pacific region. There is great opportunity for validation of the PAC24 as a quick, culturally rigorous and user-friendly online tool to guide enumerators in collecting individual level 24-hour dietary recall data. This would streamline the process of collecting dietary data and uncover entry points for the promotion of healthy and sustainable diets in the Pacific.

The activities under this objective have confirmed the need to build market pathways for local consumption of seaweed in Samoa. Providing opportunities to address key nutrient gaps through the consumption of indigenous seaweed additionally creates entry points for income generation and livelihood development of women and youth. We now know that indigenous seaweeds are currently not well utilised, yet they provide a novel solution to addressing micronutrient deficiencies in Samoa and beyond. Efforts to develop seaweed enterprises must ensure food sovereignty by protecting Samoan people’s rights to use and share their seaweed assets in socially and environmentally acceptable ways.

6. Objective 2: Understand the barriers to, and enablers of, men's and women's economic empowerment through the seaweed food chain.

The following section describes the methods and results for Objective 2 (Activity 2.1 and 2.2) that was undertaken in Samoa. Due to unforeseen circumstances and challenges associated with COVID-19, Activity 2.3 was unable to be completed in Kiribati.

6.1 Methodology

6.1.1 Conceptual approach

This study used a qualitative methodology, designed from a social constructivist paradigm. The social constructive perspective (Jackson and Klobas 2008) was considered most appropriate as the study attempted to identify and describe the roles of men and women across the emerging seaweed supply chain and understand the enablers and challenges to their participation, within the Pacific Island coastal community context.

Our conceptualisation was guided by the 'systemic' approach to value chain analysis, described by the International Labour Organisation (ILO 2021), where value chains are seen as part of a wider market system. With this approach, each link in the value chain is conceptualised as embedded within a larger influencing system of supporting functions, rules and regulations. The 'core' of the market system encompasses a central set of exchanges of goods and services between the providers (supply side) and the consumers (demand side). Potential barriers in the core market system relate to inputs (such as raw materials, labour, machinery) and outputs (price, access to markets). This central set is embedded in rules and supporting functions. The 'rules' include both formal rules, such as regulations, standards, and laws; and informal rules, such as cultural norms and value systems. Both formal and informal rules act to shape market outcomes and govern participation and behaviour in markets. Hence, rules can be both a barrier and play an enabling role in the system. The 'supporting functions' are the range of functions that support the core exchange and help the market to develop and grow. Supporting functions include aspects such as research and development, infrastructure, skills and capacity, and supporting services (such as financial or training/extension services).

In addition, a gender equality and equity lens underpinned the design of this study. To understand women's and men's roles in coastal seaweed fisheries, and their respective controls, access and agency and the gender dynamics at play, the Women's Empowerment and Market Systems (WEAMS) Framework (Jones 2016) was adopted. The WEAMS Framework provides structured understanding of economic (and other) systems and provides supporting tools for guiding actions to improve women's empowerment in market systems to become fully integrated into day-to-day work (Jones 2016). The five key dimensions proposed by WEAMS framework include:

1. Economic advancement – increased income and return on labour
2. Access to opportunities and life chances such as skills development or job openings
3. Access to assets, services and needed supports to advance economically

4. Decision-making authority in different spheres including household finances
5. Manageable workloads

Thus, building on market system approaches and related frameworks (Jones 2016, DFAT 2017, ILO 2021), we conceptualised the potential barriers of the Samoan seaweed value chain as barriers related to (Figure 21):

a. perceptions of the sector overall, future opportunities and the potential for economic advancement,
b. barriers to core functions (inputs and outputs),
c. barriers to supporting functions such as transport, finance, training,
d. formal institutional barriers, i.e. rules and regulations; and informal institutional barriers, i.e. social norms, equality and inclusivity,
e. personal agency (decision making, choices, time, workloads).

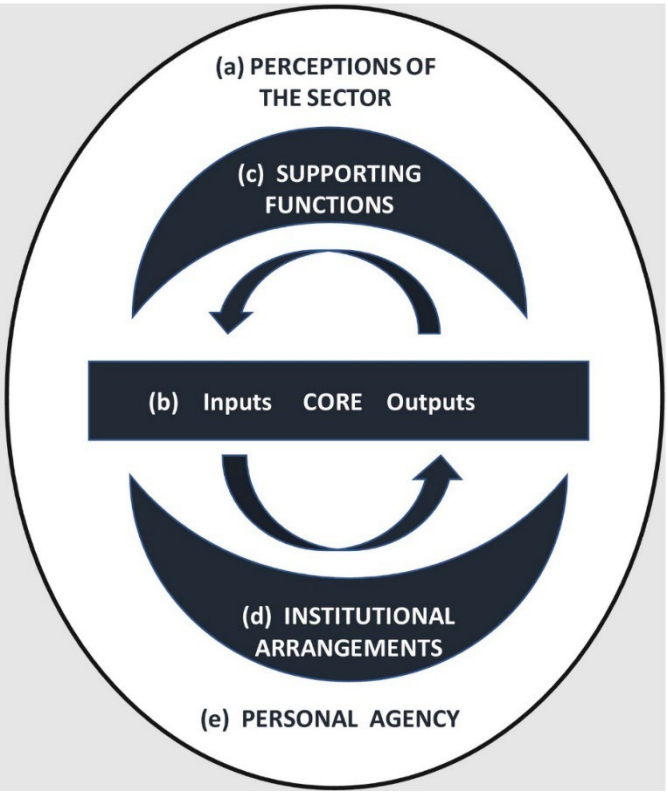


Figure 21. Conceptualisation of potential barrier points – and potential enablers – in the market system (Based on (ILO 2021)

Analysis of the focus group discussions were guided by this conceptual framework.

6.1.2 Data collection and analysis in Samoa

Study participants

This research study was conducted alongside a separate but related project: the Seaweed Farm Inception project (MAF in partnership with the UNDP under the Revitalisation, Expansion and Diversification of Agriculture and Fisheries Project, funded by the Government of Japan (hereafter referred to as the REDSAF Project)). The REDSAF Project involved the introduction and setting up

of seaweed farming infrastructure (cages and trays) as a new method of seaweed aquaculture (specifically for seagrapes) in the selected villages. As part of the REDSAF project, an inception meeting was held at MAF in Apia in early September 2021, in which three representatives from each village were invited (Village Mayor or “Sui o le Nu’u”, a Women Representative (Sui Tamaitai o le Nu’u) and a man representative (“Matai”). The inception workshop provided the research team the opportunity to explain the purpose of this study and outline the research activities involved.

Participants (≥ 18 years) were conveniently sampled from 10 geographically dispersed coastal villages on Savai’i island of Samoa from across five different districts (Figure 22). Selection of villages was guided by the experience of the research team from previous seaweed projects and was based on criteria including social and economic demographics and location of village as well as status local seaweed production. This was to ensure a diverse sample of villages were selected, including villages where seaweed is produced (grown, harvested, process) and/or sold at market outlets as well as villages where seaweed is not growing naturally (and therefore represents an opportunity for support via the REDSAF seaweed farming activity). Villages had between 219 and 1111 community members, of which 6 – 14% participated in our study (Table 6).

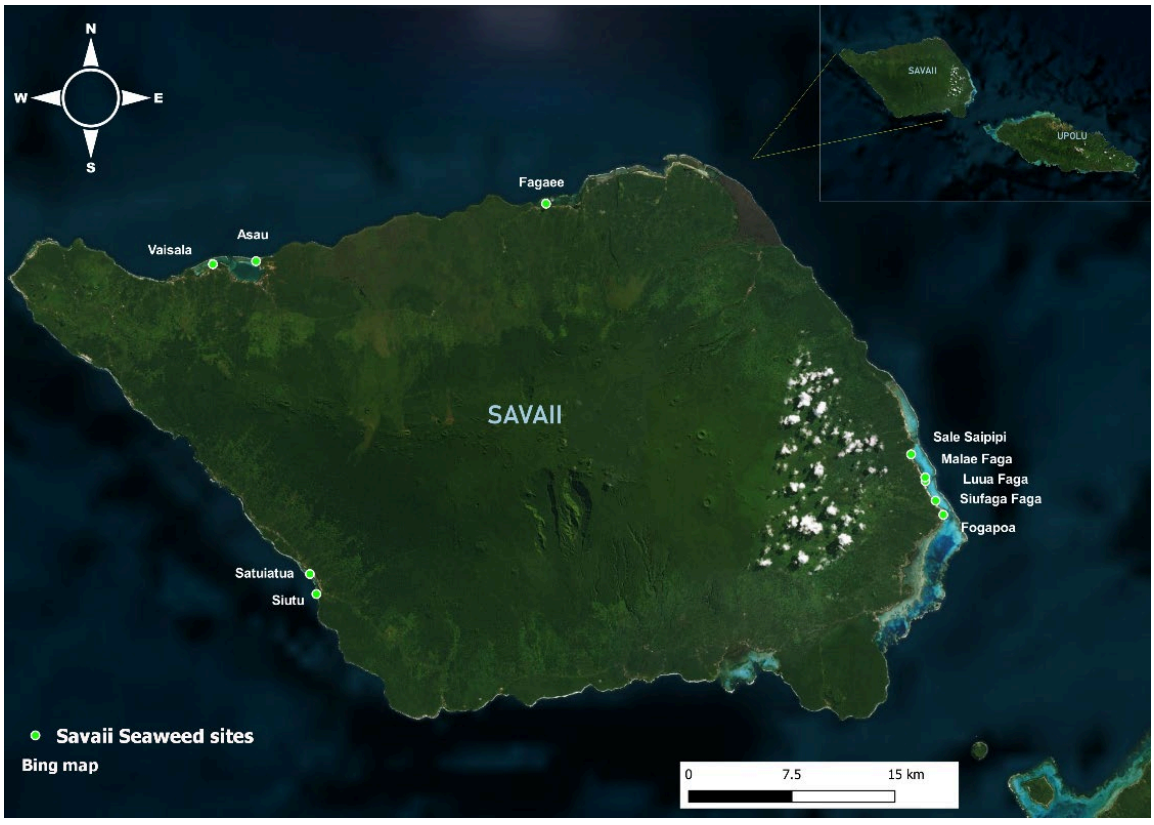


Figure 22. Map of Savai’i and the villages selected to participate in the focus groups (green dot, white text). Maps Data: Bing, ©2020

Table 6. Geographical locations / villages of participants, demonstrating reach and representation

Village name	District	Population size of village[1]	No. of participants in focus group (% of total sample)
Luua	Faasaleleaga III	300	12 (9%)
Malae	Faasaleleaga III	219	13 (10%)
Siufaga	Faasaleleaga III	575	15 (11%)
Fogapoa	Faasaleleaga II	302	15 (11%)
Saipipi	Faasaleleaga III	694	10 (7 %)
Fagae'e	Gagaifomauga III	200	17 (13%)
Asau	Vaisigano East	1111	13 (10%)
Vaisala	Vaisigano East	465	19 (14%)
Satuiatua	Palauli West	291	13 (10%)
Siutu	Palauli West	449	8 (6%)

[1] 2016 census data (SBS 2016)

The in-country research team, made up of researchers from MAF, followed culturally appropriate practices and observed roles of established governance structures Fa'amatai. The villages were initially contacted through the village mayor with a signed letter from the Fisheries Division explaining the study purpose and requested for their participation. This is the normal process of contacting villages under the Community- Based Fisheries Management (CBFM) program. The MAF staff were instrumental in establishing connection with village officials to conduct the study. The in-country research team spent two weeks travelling to each target village on Savai'i Island to conduct the project activities. At each village this involved a traditional welcome ceremony, the set-up of the seaweed farms (related to the (REDSAF project) and conducting focus group discussions (this project). Participants for the focus group discussions were purposively recruited by the in-country research team members to ensure representation of men and women of all ages and potential roles. Participation of villagers was voluntarily and ethical approval for this study was obtained from the Human Research Ethics Committee at the University of the Sunshine Coast (Ethics approval number: A211612).

Data collection instruments

The focus group discussion sessions (FGDs) were conducted in two parts. For the first, a semi-structured group interview process using photo elicitation was employed, in which photographs (were used as stimuli to promote ideas and discussions. The photo elicitation activity aimed to unpack gendered roles and responsibilities. The second part of the FGD was a facilitated discussion that aimed to uncover barriers and enablers to participation in the value chain. The FGDs were conducted during September and October 2021. Following participants' consent and prior to commencing the focus groups, participants were asked to complete a short online demographic survey (using Wi-Fi-enabled tablets provided) which included gender, age, village, role/which part of the supply chain they work in. Men's and women's groups were run separately in line with cultural customs, and each group followed the same photo elicitation process.

Prior to data collection, MAF fisheries staff were trained in conducting focus group discussions using the photo elicitation process. Two staff were present and facilitated each focus group and photo elicitation activity.

Training / capacity building in photo elicitation method and focus group facilitation

The training for this activity consisted of two components: training in the photo assignment activity and training in focus group facilitation. The two training modules were developed by the Australian team and delivered to the participating MAF staff via zoom.

Twelve MAF staff received training in photo elicitation methods and the photo assignment activity. The purpose of the training was to provide an overview of photo elicitation interview (PEI) as a research technique, and prepare staff for undertaking the photo assignment component to collect photos that could be used in the focus group discussions. During this training, an overview of the project objectives was covered as well as the ethical considerations for taking photos and obtaining consent and instructions on how to take photographs including using the camera and photography techniques such as composition. Staff also received a photo elicitation toolkit containing information on the photo elicitation training.

Pre and post training evaluation surveys were administered to measure changes in knowledge, skills and confidence, as well as intention to apply new learnings to their current work. Staff participating in the training reported an increase in skills relating to taking photographs and increase in knowledge around ethical issues and considerations. They also reported how they would apply learnings to their usual work by applying these skills to their field assignments, such as being able to take and use quality photos and descriptive captions for monitoring, assessment and reporting purposes.

Once the photo assignment activity had been completed by staff, the photos were compiled into a photokit by the in-country team. Following this, a second training session on facilitating focus group sessions was conducted with the three MAF staff who would be facilitating the groups in the villages. The training covered focus group and qualitative research methods, the underpinning framework for the research project, and how to be an effective facilitator. The training also covered ethics and obtaining informed consent from participants. In this session, the staff also role-played and piloted the PEI activities and focus group questions (Figure 23). Reflection and feedback from the staff were then used to refine the focus group discussion questions and approach.

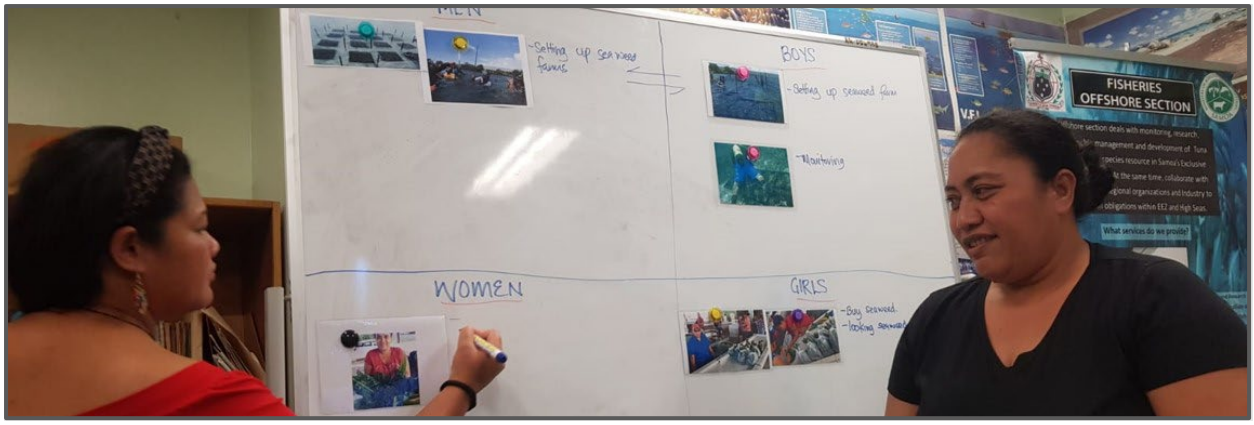


Figure 23. MAF staff piloting the focus group and photo elicitation methods during the zoom training session.

Photo elicitation

A photo elicitation approach was used as part of the study design. At its most basic, photo elicitation interview (PEI) simply calls for photographs to be used in the interview process (Biag 2014). The implementation differs in how participants are selected, the way photos are collected, how the photo interview is conducted, and how the resulting visual data are analysed. Typically, researchers identify topic for investigation and invite participants to the study. Either researchers or participants take pictures relevant to a particular question or topic. Then researchers use pictures to guide interviews and elicit dialogue and to analyse data and report findings.

For this study, photos depicting men and women participating in various aspects of the seaweed food supply chain were provided by the in-country research team. The Samoan research team were briefed as to type and nature of desired photos and were sent example photos sourced from previous seaweed projects from the Indo-Pacific region (FIS/2010/098 and FIS/2015/038). Next, the Samoan research team created all photos required, thus ensuring that all photos used in the project were culturally meaningful and appropriate. Specific care was taken to ensure no gender biases were formed in the selection of photos (i.e. selected photos depicted both women and men participating in all aspects of the seaweed food supply chain). All photos were collated into a photo-kit, where the identity of any people in the photographs was obscured and/or permission obtained where appropriate (Torre and Murphy 2015).

The method and design for the group interview process using photo elicitation was modified based on best practices and steps suggested by other studies (Rodriguez and Bjelland 2008, Ra and Casey 2009, Bignante 2010, Cooper and Yarbrough 2010). This part of the FGD was run as an interactive activity, in which the photographs were presented and displayed in front of all participants. As participants discussed the roles of women and men (actual/perceived and potential/future), they selected photos which illustrated their point of view (Figures 24) and then placed the photo onto the corresponding section of the grid drawn on butcher's paper (Figure 25). Where it was identified as a shared role between both genders, it was placed in the center of the grid.

Figure 24. Men and women participating in the photo elicitation activity

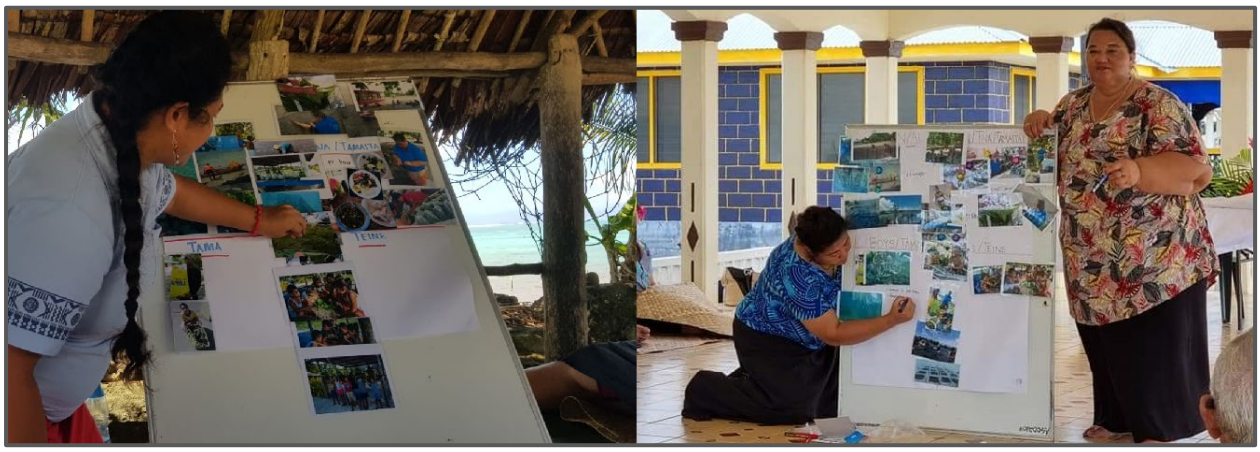


Figure 25. The Samoan research team facilitating the photo elicitation activity

Discussing perceived barriers and enablers

Photo elicitation was followed by a guided discussion. The focus group protocol was developed to align with the study objectives and informed by the WEAMS Framework (Jones 2016) and a prior review of the literature. Questioning centered on participants' perspectives of current or potential roles of men and women in the seaweed food supply chain, and their perceived barriers and enablers to engaging to participating in seaweed aquaculture activities including harvesting, marketing, and consumption. Probing questions were used to allow the researcher to clarify points and explore areas of interest further.

Prior to data collection, all questions were piloted with MAF staff to ensure their meanings were understandable and modified as required based on the feedback from the pilot participants. Moderator training was undertaken. Two researchers were present to facilitate each focus group. One researcher acted as moderator and facilitator, while the other assisted participants with placing photos on the butcher's paper grid and took notes on the butcher's paper during the discussion around the enablers and barriers to participating.

Analysis

Quantitative demographic data collected prior to the FGDs was summarised using Microsoft Excel and is presented in Table 7.

A digital audio of each focus group was recorded. A digital audio recording of each focus group was recorded, which is the preferred documentation, as it records knowledge accurately and within the cultural context, and thus reduces the likelihood of misinterpretation (Liamputtong 2011, Malsale, Sanau et al. 2018). The recordings were summarised from the native language into English by experienced in-country researchers as the primary source of data. The photographs representing the various roles and activities and their placement on the butcher's paper grid that was agreed upon by each group, were digitally captured as a photo-board and used as secondary sources of data.

During the discussions on barriers and enablers to participation, the key points as agreed upon by each group were written on butchers' paper by one of the in-country facilitators. The butcher paper notes were translated into English by the in-country team and used in the analysis.

Coding, sorting and comparing of all qualitative data was undertaken using NVivo software. For the data on the roles, constant comparison analysis was used, as developed by (Glaser and Strauss 2017) and (Strauss 1987), whereby data was analysed according to their relationship to each other, to the research questions and to the various nodes of the seaweed value chain. Coding, sorting and comparing of qualitative data was undertaken using NVivo software. During the first stage, data was chunked into smaller units and each unit was assigned a descriptor code. In the second stage, codes were grouped together into categories. In the final stage, the research team developed themes that expressed the content of each category group.

For the data on barriers and enablers, thematic analysis was performed, whereby data was analysed according to their relationship to each other, to the research questions and to the proposed conceptual framework. Data was coded, sorted into categories and then into common themes as they emerged.

During analysis, researcher triangulation was used to help ensure credibility as well as dependability and confirmability of the findings. Triangulation was undertaken by both the in-country research team from MAF and the Australian team.

6.2 Key results and discussion

6.2.1 Study participants

The focus group discussion sessions were undertaken during September and October 2021 and were conducted in two parts. For the first, a semi-structured group interview process using photo elicitation was employed, in which photographs were used as stimuli to promote ideas and discussions. The photo elicitation activity aimed to unpack gendered roles and responsibilities. The second part of the FGD was a facilitated discussion that aimed to uncover barriers and enablers to participation in the value chain.

In total, 10 FGDs were held with women and 10 with men, and a total of 135 people participated from across the 10 selected villages (Table 7), averaging 6-8 participants per group. Majority of participants (84%) were married, and 43% identified as female. Mean household size was 6.8 people, and 75% of participants had a level of secondary school education or higher. Remittance

played an important role in household finance (42% of participants). Other important source of income included land agriculture (30% of participants), while fishing and seaweed work were reported as one of the main sources of income by only 10% and 1% of participants, respectively. While only one person identified seaweed as the main source of income (Table 7), a proportion of participants (19%) reported that they were engaged in seaweed work in various modes (Table 8) with main tasks being gleaning seaweed from the inner and outer reef, followed by processing and selling (Table 8).

In terms of decision making related to household finances, overwhelming 60% of participants (both 60% of men and 60% of women participants) reported making decisions by themselves (Table 1). Other family member such as their spouse, parents or other relative (Aunty, sister, son) was reported as making a decision for 23% of participants, while only 6% reported that decision making is shared between husband and wife.

Results from the photo elicitation and focus group discussions are presented as follows: A summary of the value chains for seaweed as uncovered by the research activity is presented first in subsection 7.2.1, followed by the results of the identification of roles of men and women that arose from the photo elicitation activity with reference to the seaweed value chain in Samoa (input, growing, harvesting, processing, marketing, end market) in subsection 7.2.1, and a summary of the result of the elicitation of barriers and enablers to men's and women's participation in sub-section 7.2.2.

Direct quotes are provided for insight into the participant perspective. To protect the identity of participants, all quotations are de-identified. Results are also available in the publications from this objective:

- https://doi.org/10.1016/j.ocecoaman.2022.106420
- https://doi.org/10.1016/j.aquaculture.2023.739328

Table 7. Sociodemographic characteristics of participants (n = 135)

Characteristics	**Participants n (%)**
Gender	
Male Female	77 (57%) 58 (43%)
Age	
Age mean (±SD)	*50.47 (±15.64)*
18 – 24 years 25 – 34 years 35 – 49 years > 50 years	14 (10%) 10 (8%) 33 (24%) 79 (59%)
Marital Status	
Married (ua faaipoipo)	113 (84%)
Single / Never married (e le'l faaipoipo)	18 (13%)
Widowed (ua maliu, le toalua)	3 (2%)
Seperated / divorced (valavala/ tete'a)	1 (1%)
No. of children	
No children	14 (10%)
1	5 (4%)

2 to 4	44 (33%)
5	25 (19%)
6 or more	47 (35%)
Household size mean (±SD)	6.81 (4.18)[a]
Highest level of education	
Tertiary education (Certificate or University)	7 (5%)
Secondary school (senior / Year 11- 13)	95 (70%)
Secondary school (year 8 – 10)	24 (18%)
Primary School (year 7)	1 (1%)
Not stated	8 (6%)
Main sources of income[b]	
Fishing	14 (10%)
Seaweed	1 (1%)
Agriculture / plantation	40 (30%)
Government	18 (13%)
Remittance	57 (42%)
Pension	9 (7%)
Other	40 (30%)
Decision making (household finances)	
Self only	81 (60%)
Shared between husband and wife	8 (6%)
Other family members make decision	31 (23%)
Mixed	15 (11%)
Currently undertaking seaweed work/roles	
Yes	25 (19%)
No	110 (81%)

[a] 28 respondents (21%) reported that 10 or more people usually live in the household. [b] percentages do not add to 100% as respondents could select multiple responses

Table 8. Involvement in various seaweed related tasks by participants (n = 25) who reported currently undertaking seaweed work/roles

Task	N	%[c]
Collecting seaweed (gleaning from the outer reef)	13	52%
Collecting seaweed (gleaning from the inner reef/shallow water)	10	40%
Farming seaweed in shallow water from the shore	1	4%
Farming seaweed in deep water from a boat	0	0%
Processing seaweed (making products, kitchen work)	5	20%
Selling/marketing seaweed or seaweed products	5	20%
Leading/running a seaweed business	2	8%
Sharing knowledge or teaching others	3	12%
Other	4	16%

[c] percentages do not add to 100% as respondents could select multiple responses

6.2.2 Results – the seaweed value chains and roles

Two value chains for seaweed – existing and 'new'

The exploration of the roles of men and women (actual and potential) in seaweed work revealed two seaweed value chains. The first chain being an existing seaweed value chain from wild gleaning (both inshore and offshore) of naturally growing seaweeds, namely *limu fuafua* (sea grapes, *Caulerpa* species) and *limu a'au* (red seaweed, *Halymenia* species). The second value chain revealed a 'new' seaweed farming methodology (offshore farming of *limu fuafua* sea grapes) being introduced to the villages.

For many of the villages, gleaning wild seaweed was not new (Table 9). Half the villages had experience in gleaning and harvesting wild seaweed. Four of these villages explained they actively harvest seaweed to sell (markets, roadside vendors, and hotels) and the villages of Luua and Siufaga are particularly well-known for harvesting and selling seaweed in Savai'i and Upolu.

For the other villages where wild gleaning was not occurring, one village (Fogapoa) was aware of seaweeds growing abundantly in their reef and shores, but they were not actively harvesting or selling them. The remaining four villages (Fagae'e, Asau, Satuiatua and Siutu) noted that edible seaweeds were not growing wild in their marine areas, and thus there had been no history of wild gleaning. For these villages, the seaweed farming method (UNDP project) presented a new opportunity to establish a village-based seaweed food supply chain.

In terms of the formal seaweed farming of sea grapes (*limu fuafua*), seven out of the 10 villages specifically expressed that they had no previous experience in the formal seaweed farming and in particular the new farming method introduced (in cages). Therefore, some were not clear or sure on the roles required and thus whose responsibility work would be. Participants in one village (Vaisala) had been involved in seaweed farming as this was done before by the village in collaboration with MAF in the past years. The other two villages did not state either way.

Table 9. Participating village name, size and geographical location, and previous or current experience in seaweed

Village name	**District**	**Population size of village**[1]	**Previous or current experience in edible seaweed, as reported by the village**
Luua	Faasaleleaga III	300	Harvesting and selling wild seaweed for many years. Experience with farming method not stated.
Malae	Faasaleleaga III	219	History of wild gleaning of seaweed (women were reported to be once prominent). Experience with farming method not stated.
Siufaga	Faasaleleaga III	575	Harvesting and selling wild seaweed for many years. Farming method is new.

Fogapoa	Faasaleleaga II	302	Wild seaweed grows abundantly, but not being actively harvested nor sold. Farming method is new
Saipipi	Faasaleleaga III	694	Have traditional knowledge of harvesting wild seaweed (mothers used to do it). Harvesting wild seaweed occurs occasionally (for family food or village occasions). Farming method is new.
Fagae'e	Gagaifomauga III	200	Wild seaweed does not grow naturally in their marine areas. Farming method is new.
Asau	Vaisigano East	1111	Wild seaweed does not grow naturally in their marine areas. Farming method is new.
Vaisala	Vaisigano East	465	Wild seaweed grows, and occasionally being harvested for food or sold/supplied to nearby hotels. Village has previously done seaweed farming through the Fisheries Division
Satuiatua	Palauli West	291	Wild seaweed does not grow naturally in their marine areas. Farming method is new.
Siutu	Palauli West	449	Wild seaweed does not grow naturally in their marine areas. Farming method is new.

[1] 2016 census data (Samoa Bureau of Statistics)

Roles across the value chain

The photo elicitation process allowed participants to discuss the experience from current and previous work in relation to roles, as well as visualise who would do various roles where these would be 'new' or future roles. Figure 26 provides an overview of the two value chains consisting of wild gleaned *limu fuafua* and *limu a'au* (existing chain) and farmed *limu fuafua ('new' chain*), and the roles of men and women (actual and potential) as identified by participants. The later nodes (processing through to consuming) were not necessarily seen by participants as two separate processes, but rather a single agreed process emerged (incorporating seaweed, particularly focusing in on sea grapes, from both farmed and wild growing/harvesting nodes) based on their previous/current experience and how they visualised it to be in the future. Hence in Figure 26 the seaweed value chains merge after the harvest node and follow similar functions from processing through to end consumers.

A summary of results is described below and are related to the nodes of the two seaweed value chains and associated gender roles, as perceived by the participants.

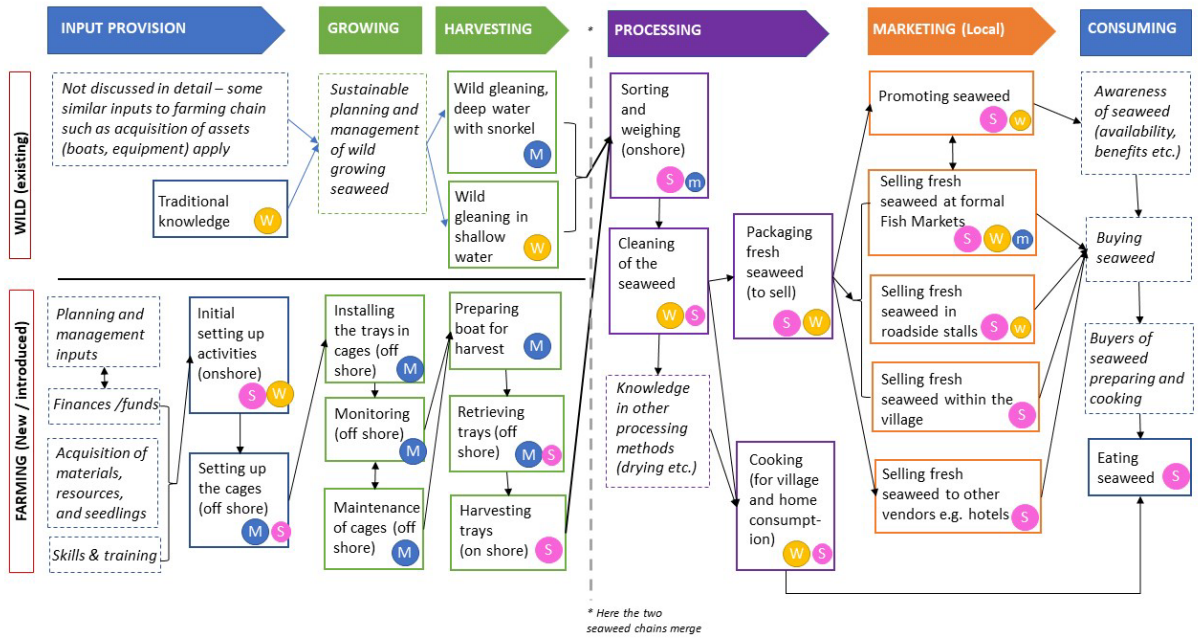


Figure 26. *Local Samoan seaweed value chains consisting of wild gleaned limu fuafua and limu a'au, and farmed limu fuafua. Arrows indicated flow of tasks. M=Men and young men (untitled men), W=Women, S=Shared role. Capital letter indicates a stronger presence/potential lead role. Dashed boxes indicate opportunities/tasks identified in the subsequent FGD that explored barriers and enablers to participation, but roles were not attributed to these.*

Men's roles

The division of roles between men and women was not unexpected. Men (namely young/untitled men and strong/able chiefs) were perceived to be more dominant in the earlier parts of the farming value chain, in particular the offshore activities relating to the growing and harvesting nodes. Key tasks discussed as men's roles included transporting/carrying materials, hammering and heavy lifting, carrying the cages to the boats and out to the reef, installing the rebars in the sea and building the cages, monitoring the seaweed underwater using scuba diving, and harvesting the seaweed (bringing the full trays back to shore when ready for harvest). The primary reasons provided for these being men's work included that being on the reef and diving was an accepted role and social norm for men to do, coupled with the risk associated with being on the sea and safety concerns for women such as drowning, large waves and tides (this came from both men and women), as well as the physical strength required for such tasks: *"installing and the setting up of cages would be the men's role especially the young boys (untitled men) because they are strong and it's a norm for them to do such task"* (Women's group, Village 1)

While these roles were perceived as male roles by the majority of men's and women's groups, a small number of men's and women's groups acknowledged that the installation, monitoring and harvesting of seaweed could be a shared responsibility and role: *"For harvesting activity both men and women can carry out this role because there are also women who are strong like men and are able to swim out and harvest limu (seaweed)"* (Male participant, Village 8). Nevertheless, there was still a recognition that men were more likely to undertake deep water work: *"The installation of cages can be done by both men and women, but men would be more likely to dive underwater and secure the cages"* (Women's group, Village 9).

Women's roles

Women and girls on the other hand were perceived to have a more significant and lead role in the later stages of the value chain, including processing, marketing, and cooking tasks. Most groups felt that the onshore harvesting, weighing and sorting of seaweed could be a shared role that everyone could participate in. However, when it came to cleaning the seaweed, both men and women felt that women should have responsibility over this task. This was because women were perceived as performing this task better than men due to their attention to detail and their experience in doing these types of roles. This quote from one of the male participants summarises this sentiment: *"Because women can do things neatly and completed. If this is given to us, then you will see sea grapes still attaching to corals"* (Male participant, Village 6).

Marketing and selling seaweed were identified as a shared role and responsibility (Figure 26), although there were some comments to indicate that there is potential for women and girls to have a stronger role here. Selling of seaweed in roadside stalls or in the village were more likely perceived as shared roles, while women were seen as more likely to engage in market sales. For example, for some villages the women are the ones who already go to formal fish markets and perform these roles, so the selling of seaweed was viewed to be an extension of this. A women's group also discussed that women would be better trusted to handle money for the benefit of the family, an example being that men would use the money to purchase alcohol instead of spending for the family needs.

Preparing food for the household was viewed as the normal role of women and girls (typically a social norm in the household) and so the role of cooking seaweed for household consumption was viewed as primarily the role of women. However, there were some groups (both men and women's groups) argued that this could be a shared role, as both men and women can cook and should have this responsibility.

An important aspect to draw attention to is the traditional role of women in seaweed work and wild gleaning, which was highlighted by some villages. Some participants described the passing down of traditional knowledge from their mothers and other women in the village. A participant from one group shared how "back in the day" women were the only ones who were responsible in harvesting and production of seaweed. He went on to explain how the men were never involved until seaweed hit the market and market demand increased. Once men became involved in harvesting, the participant explained it was *"like women abandoned their role in limu (seaweed)"* (Male participant, Village 2).

Seaweed farming is a collective effort

Overall, the seaweed farm was perceived as a collective village asset and project, requiring men and women to work collaboratively and share roles across the value chain to ensure its success. This sentiment was summarised by various groups who all agreed that *"it's a combined effort needed from all the 4 groups (men, boys, women and girls) to achieve the successfulness of this project." (Men's group, Village 3)* and *"a collaborative effort from all groups will bring success to this project" (Women's group, Village 5).* The initial necessary inputs to seaweed farming (including planning, acquisition of materials and preliminary set up activities) were perceived as areas where women and men could participate jointly in shared roles. Participants also recognised the range of skills required across the whole chain and the individual skills each group could contribute to the

collective: *"… there are special areas where each group is specially involved" (Men's group, Village 2)*.

This theme of collective effort and success was also evident when discussing the photos that displayed villagers celebrating and showing off their successful harvest (see Appendix, Photo 31). Groups labelled this as a 'shared role' during the photo elicitation and spoke about the collective benefits that would come to the village through food and income.

While seaweed farming was largely viewed as a collective, a small number of participants were interested in the privatisation potential of seaweed farming and gleaning (creating small business opportunities) to be able to provide household income and livelihood. For example, one female participant suggested that if it was possible to have her own farm, she and her family would run it as a business as they do with their taro plantation.

6.2.3 Barriers and enablers to participation

For enablers and barriers component of the focus group discussions, villagers mostly focused on the 'new' farming method. Participants described barriers that had prevented or limited, or they thought might prevent in the future, their ability to participate in seaweed related work, across the value chain. Enablers or things that could support or help people were also identified and discussed. Given farming was a new potential activity for many, there was a strong emphasis on the future needs, or the key inputs needed to farm successfully, with barriers being 'what is missing' and enablers conceptualised by participants as 'what would need to happen to overcome the barrier'.

The enablers and barriers to participation are described in detailed in the publication in Aquaculture – https://doi.org/10.1016/j.aquaculture.2023.739328.

The following section provides a summary of the key themes with reference to the aspects of the value chain frameworks presented in Figure 21.

Perceptions of the industry and sector overall

Most villages were receptive and positive towards seaweed farming and selling, with some groups expressing the view that the introduction of seaweed farming can create job opportunities for their villagers. "*It can create job opportunities for village communities if they are well trained and specialised in farming of limu*" (Village 10, female group). A couple of villages (both women and men groups) also perceived the potential for upscaling and export market opportunities. Other groups, both men and women participants, highlighted that villages might not have a uniformed view of the industry, "*Different mentality of the community, some might think it's not profitable, not much to gain and that it is waste of time to be involved*" (Village 9, women group).

A consistent barrier identified by both men and women's groups, across 6 villages, was a lack of community knowledge and awareness about seaweed, specifically around aspects including nutritional and health benefits, as well as the potential uses of seaweed. Some participants questioned motivation of villagers to get involved, "*Too lazy and not interested due to limu being far from shore*" (Village 5, men group) and noted lack of interest in Government programs "*There is poor attendance by the village to some Government programs*" (Village 3, women group).

Core functions: Inputs and outputs

The barriers related to inputs included materials, tools and equipment, and workforce, in particular skilled people. In terms of outputs related barriers, participants discussed management practices and the need for sustainable harvesting practices that would ensure long-term survival of the seaweed stocks. Participants had several concerns, as well as ideas, related to markets and marketing opportunities.

Materials, tools and equipment

The need for (or lack of) equipment to be able to carry out seaweed farming activities emerged as a very strong theme. All groups in all villages (and all men and women's groups) identified a need for or lack of tools, equipment and materials to successful undertake seaweed farming and harvesting activities. This included diving equipment and protective gear (masks, snorkels, boots), boating (canoes, dingy), and farming equipment (seaweed trays, materials to build, maintain and protect farm). MAF was seen as the key enabling agent, provider of the tools and assets required. One female group also identified the need for a car (transportation of limu to markets), but also stated that cost of petrol would be a barrier.

People / workforce

Three villages identified lack of people available to do or commit to seaweed work as a barrier. Of those, two villages described how location of village being away from coast (main reason being that they had needed to relocate to higher grounds due to previous impacts) meant no one was available for seaweed-based work. This was also coupled with small number of households and therefore less people to participate.

Discussions on lack of people to be engaged in the seaweed work related to two themes. The first theme was lack of skills/ skilled people: although some villages do have prior experience with gleaning (collection of wild seaweed from the reef) the introduction of the seaweed farms was a new method for villages, so there was an absolute lack of people with the knowledge of or experience in seaweed farming. The other theme was general time poverty, with people having other jobs (most household engaged in fishing and agriculture) and competing priorities (household and community duties), leaving villagers with limited time available for new work. Uncertainty of remuneration for the work and the uncertainty around the profitability of the seaweed farming, were also noted, probably contributing considerably to the 'lack of people to be engaged': "*Looking at the first category, job opportunities; majority of the village youths are unemployed, so what kind of job opportunities does this project offer for us? Can you clarify please. Or do we work for your Ministry and the Ministry will pay us*?" (Village 4, men's group).

Demand and market outputs and opportunities

Supply and demand issues were discussed, and several groups raised concerns that there would not be sufficient market (not enough buyers) for seaweed to match high production, especially if there are several villages competing for the same market. This was also discussed in the context of lowering of the price and hence of potential income. Limited market opportunities such as access to markets or only being able to access local opportunities (roadside or fish markets) was also raised as a potential barrier.

Four groups (from four separate villages, 4a, 10a, 3b and 5b) described access to market opportunities as an enabler, which included finding and contacting domestic market opportunities and creating more access and opportunities for export. It was identified as a role of MAF for supporting linkages to available market and creating new opportunities.

Discussion on consumer preferences and needs was limited, indicating potential for better understanding of consumer needs (such as preferred appearance of the product, suitable bundle size, best days/seasons to sell, etc.), by villagers. The only issue discussed was related to pricing (and hence resulting profitability of the seaweed farming and/or gleaning). A couple of groups spoke about customers complaining that bundles are too expensive, and yet selling for lesser price would not be profitable for villages. The issue of on-selling was described by participants from one male group (Group 3b): "*Different prices of limu, in Upolu and Savaii. Other people buy limu for $10 and then they will resell it at Upolu for $15*".

Overall, only one (women) group specifically mentioned a lack of understanding and knowledge in the marketing aspect of the seaweed value chain, and one men's group identified a need for training on the whole production chain. Skills related to marketing side and budgeting of moneys earned from selling seaweed did not resonate with the participants, even after being promoted by the facilitator. In their words, "*This will be the last step to look into, we need to focus first on how to farm seaweed*". This is a very interesting point, especially given that the participants previously expressed concerns about the price of seaweed bundles and the potential for the farming to be profitable – yet were of opinion that marketing, pricing and budgeting are not worth learning about or discussing just yet.

Supporting functions

Access to information, skills and training was the most frequently discussed supporting function, both as a barrier and as an enabler. Finance and financial support were discussed mainly as a barrier. Of other possible support functions, such as availability of infrastructure, physical marketplaces, etc., only transport was mentioned.

Access to information, skills development and training

Lack of know-how and relevant skills was perceived as a barrier in all villages by both genders. For many villages, the introduction of the seaweed farms (UNDP project) was a new technology, and a practice they were not familiar with. The issue of skills was therefore not seen as a support function (i.e. supporting villages with more skills) but as an essential input for the start of farming (i.e. for the adoption of farming practices to occur). Formal training was the most mentioned requirement (27 comments), with participants identifying MAF as the key provider of formalised training opportunities to address gaps in knowledge and skills. Informal training and capacity building, via provision of support, advice and mentoring, was also discussed, and was also seen as a MAF role.

Training was expected on growing techniques and tools, seasonality, harvesting, and processing seaweed including cleaning and packaging. Groups expressed a need and desire for up-skilling and knowledge in aspects relating to seaweed farming, harvesting and processing. This included understanding of seaweed habitats and seasonality, farming and harvesting techniques and tools, and processing seaweed including cleaning and packaging. In terms of gleaning of the wild seaweed, there was an emphasis on environmental sustainability, in relation to harvesting, as

described by one participant "[We] *need skills and knowledge on how to harvest limu so that we are well aware of how to harvest in a sustainable way*" (Male participant, Village 4a).

Some of the women's group mentioned specific sea/water related skills such as learning how to swim and dive, and first aid response at sea (sea safety training). Also, several of the women's groups (villages 1a, 4a, 9a, 10a) were concerned about access to awareness programs and training, insisting that such programs should be for the whole of community. The following quote from the facilitator debriefing transcript from Village 4a summarises this sentiment: "Another issue raised was that there were no awareness programs done before and this one is the first in the village, thus more training and workshops like these are needed. Facilitator was asking them which groups needed to be included in these programs and they responded to include everyone in the village so they can be informed."

Five groups (Villages 9a, 10a, 2b, 5a, 7b) discussed the existing knowledge and skills within the village, as an asset/enabler. "*We can use a cocoa wire and our own techniques*" (Village 7b, men's group) and "*Village has a good knowledge and understanding of different habitats in our coastal waters, where areas suitable to set seaweed farm are*" (Village 5a, women's group). There was also acknowledgment that it would be beneficial to share this existing knowledge: "*Use people who are already trained to share knowledge to others*" (Village 10a, women's group).

Access to financial support

Villages did not explicitly express concern about monetary funding. Like participants' attitudes on tools, assets, and training, majority of villages appear to have an expectation of seed funding or direct support with the access to tools, equipment and materials, to be provided by MAF.

While there was a strong focus on the need or expectation of external funding, when discussing enablers half of the villages did recognise the business potential of selling the seaweed, stimulating the market (such as through limu competitions) and even upscaling supply for export. Profits thus made were seen as allowing for further advances and funding of seaweed work (economic advancement). Villagers also reported no knowledge of how to source appropriate funding such as writing proposals or seeking grants. This was further supported during the discussion on enablers, with many people then identifying that an enabler would be to seek funding support.

Infrastructure

There were no discussions on lack of physical infrastructure, such as roads, ports or physical marketplaces. Transport via car was the only issues discussed, in terms of transporting seaweed to markets as well as ensuring that seaweed reaches consumers while still fresh.

Institutional arrangements

Village level governance was the most discussed matter, in terms of general village decision making (solutions mentioned 59 times) but also specifically in terms of ensuring protection of the reef and farms (mentioned 22 time as a barrier and 18 times as an enabler. Ideas for governance of future seaweed farms were discussed on 30 occasions. Governance related to gender and equity was seen as a barrier (n = 15), with several enabling propositions discussed (n = 27). Formal laws, rules and regulations received least attention (n = 5 for barriers and n = 2 for enablers).

Gender and equity

Gender and equity discussions occurred in relation to general village governance; reef and farms protection; governance of the future farms; and manageable workloads. Gender and equity concerns are presented under those relevant themes, as to keep them in the context they were discussed in. In terms of decision making related to household finances, overwhelming 60% of participants (both 60% of men and 60% of women participants) reported making these decisions by themselves. Other family member such as their spouse, parents or other relative (Aunty, sister, son) was reported as making a decision for 23% of participants. Only 6% reported that decision making is shared between husband and wife, and 11% reported it is “mixed’ (depending on the context).

General decision-making

The concept of collectivism at the village level was present in all proposed structures, i.e. working together, collaborating, shared responsibility and decision making. In terms of general decision making at the village level, there was a noted point of difference between the men and women's groups. Six of the men's groups perceived there were no barriers or issues relating to community and household decision making, while three women's groups discussed the issue of unequal decision making and biased decisions within the village. In essence, all village decisions are made by Council (usually consisting of males only): *“Both women and men are involved in decision making within families. But the final decisions regarding the village issues are always done by the men of the village Council”* (Village 2, men's group). However, women's groups described how: *“Men and women have different opinions and decisions”* and that in such cases: *“[There is] little voice of women involved”* (Village 1, women's group). Concerns around equality of benefits from future communal farms, potentially leading to conflict within the village, was also discussed in one village (men's group): *“Worried in case when harvesting not all families will get a share and this will lead the community fighting over each other”*.

Social norms related to gender roles and views on women's abilities were raised by three women's groups. Some discussions were in relation to expectation at home, where women and girls are the main source of labour and responsible for all household duties: *“It can lead up to couples fighting with each other, if women spend too much time in limu farm, neglecting her family duties”* (Village 8, women's group). Another emerging theme was in relation to women's rights to participate in sea-based activities: *“No chance given to women to be involved. Men think all sea activities are mainly a man's job”* (Village 10, women's group). *“Women are not allowed to go harvest seaweed in deep water, it is risky for them to go out in the sea”* (Village 6, women's group).

There were also discussions about equity and participation of people with disability and in poor health. Although people with disability might not be able to participate in farming activities, there were parts of the value chain that were viewed by participants as suitable for them, such as the packaging or the selling.

Protection of reef and farms

When discussing the barriers, the need for governance over seaweed farming for management and protection was highlighted through various comments. Both men and women's groups from all villages, except for one village, expressed concerns and fears related to potential stealing of the seaweed by people from outside of the community, or fears of farm being damaged by other

fishers: "*Another challenge is damaging of habitats due to destructive fishing methods; we believe it will also have an impact on the seaweed farm"* (Village 4, men's group). Given the concern of damage was a strong theme, many also discussed need for mechanisms to protect new farms (e.g. setting up reserves or guard houses, structures to protect farm, conducting monitoring and maintenance activities). This discussion led to governance arrangements to oversee these mechanisms, and governance to implement and enforce rules and regulations designed to protect farm and coast. Some participants also highlighted a need for clear general coastal management rules or lack of rules (and their enforcement) such as: "*No rules and regulations in place to protect the coastal areas of the villages"* and *"No regulation to stop over harvesting"*. Thus, management plans for coastal protection were also discussed. Conversations on management inputs necessary for ensuring the success of the seaweed farms were lengthy, indicating this is an important issue for the villagers and hence an opportunity for future capacity building.

Governance of future farms

Only a few participants expressed interest in family-owned seaweed farming, but the governance of such arrangements were not discussed; rather, the discussions were about village-level governance arrangement for seaweed. A point of difference in these discussions was that women's groups more specifically referred to men and women working together/ collaborating and calling for women's involvement and voice in this. Whereas only two of the men's groups made specific mention of men and women working together.

The most common vision, and the one overwhelmingly preferred by male groups (8 groups), was that the responsibility for governance/ overseeing of the seaweed farms will sit with Council (Alii and Faipule): *"Decision should be made by village council, and they are the ones who decide who will be responsible for looking after the seaweed farm"*. (Village 9, men's group). Only two women's groups suggested this as the preferred vision. One women's group explained that within the village structure it would be the Council who would take the lead and make decisions in the first instance as it was a new project, and that women's involvement and advice would come later, when women are more familiar with the practices of seaweed farming. In some villages, the practice where women's committee gives advice to the Council and women's voices are heard under this mechanism, was noted.

Forming a special sub-committee that would be in charge was proposed by six men and two women groups. This was either stated as a recommendation to select/elect a new committee or recognition/ acceptance that the existing Village Fish Reserve Committee (which would have been selected by Council) would also be responsible for this role. Three of the women's groups made a specific recommendation that women need to be included on such a sub-committee: *"Select women representatives, to be part of the selected village committee responsible for looking after and maintaining the seaweed farm"* (Village 6, women's group).

On the other hand, two women's groups felt that the women's committee should be responsible for the governance and management of the seaweed farms.

Laws and regulations

There was very limited understanding of government laws and regulations, with some participants noting that they are unsure whether there's a license needed to operate a farm. No other

national/government rules and regulations were discussed, except one group that spoke about the role of MAF to monitor/set pricing regulations. Overall, the theme was about a need to have more, and clearer government rules and enforcement of rules related to the farming and farm protection, rather than rules being seen as limiting or impacting on the potential participation in seaweed industry.

Personal agency

A major barrier identified by about half of the groups (both men and women) was time available for seaweed work (n = 24, Table 1). This was mostly related to having to prioritise other responsibilities of the home (family and chores), their other roles within the village, or other paid employment. This meant people felt they had little time left available to contribute to seaweed related work. Both men and women's group discussed how time management and planning and scheduling time would better enable participation: *"Plan out well all roles and responsibilities so that seaweed activities should be incorporate into schedules."* (Village 2, women's group); *"The men have already planned out each daily activity. For example, daytime, we work in plantation but in the evening, we do clean up around schools. If the village mayor appointed or assigns us to be responsible for the seaweed farming, the men's group will then plan out activities accordingly to our scheduled so that we can incorporate this role into our responsibilities in terms of time and day of the week."* (Village 4, men's group). On a few occasions 'laziness' was also identified as an obstacle for engagement (rather than actual lack of time), however, from the discussions it appears to be more of the opportunity cost, with perceptions that effort involved in seaweed outstrips potential for profits.

Overall, manageable workloads and time appears to be more likely a barrier for women. Half of the men's groups perceived there were no barriers when specifically asked about barriers relating to manageable workloads; while seven women's groups identified not having time or having competing priorities.

Environmental context

Environmental context was brought into discussions by participants themselves (Table 1). The main theme was that of bad weather and increasing likelihood of bed weather and large storms under the climate change scenarios. Bad weather was seen as both preventing people from accessing the farm for harvest (n = 4), but also impacting the farm (n = 5), as villagers had experiences with the storms destroying seaweed stocks on the reef. In addition to weather and climate change impacts, people also spoke of pollution and dumping of rubbish in the sea impacting on water quality and seaweed growth.

Sustainable harvesting practices of the wild stocks were also discussed, in particular the need for management practices that would ensure sustainable harvests and the long-term survival of the wild seaweed stocks (n = 8). There were some poor management practices identified by participants (n = 4) that, in their view, negatively impacted on sustainability and quality of the wild seaweed. Development of governance structures and rules around seaweed gleaning would, in the view of participants, ensure sustainable harvesting practice in long term.'

6.2.2 Discussion

The research activities undertaken under this objective (Objective 2) explored the roles of women and men in the Samoan seaweed value chain, as well as the barriers and enablers for participation across the chain. Photo elicitation was a useful research method to understand the roles of women and men as well as the barriers they face in undertaking seaweed work. The use of photographs made the process of data collection more authentic by facilitating participants' ability to associate meaning as well as allowing participants to visualise a new chain and the potential roles they could undertake. However, careful selection of photos is required to ensure tasks depict diversity of genders and ages, otherwise there is a risk of unintentionally biasing participants to view certain tasks as women's or men's work only.

Our findings firstly bring to light gendered impacts, which may reinforce existing gender norms or shift labour efforts. The results from the photo elicitation showed the division of roles (actual and potential) across two seaweed value chains as perceived by men and women in the villages. Overall, while we found that both genders participate across the two seaweed value chains (farmed and wild gleaning), we found some evidence where cultural norms and social structures could impact participation. Formal institutional barriers relating to village level governance structures showed some differences in perceptions between men and women. For example, two-thirds of the men's groups perceived there were no barriers or issues relating to community or household decision making whereas some women's groups highlighted structures that may result in unequal decision making. For most women, the lack of engagement in the early parts of the chain was related to preference rather than denial of choice, but for some it was influenced by cultural norms and social structures such as needing permission, or roles being viewed as men's work only. We also heard from women across several villages their desire to be engaged in and heard in the committee or group that would oversee the management of seaweed farming, potentially indicating that the current arrangements at the committee level do not adequately represent women's needs.

Our study also highlighted a potential risk of gender inequality resulting from the shifting of labour efforts. In our study, we saw that women were acknowledged as holders of traditional knowledge relating to fishing practices and fishing grounds (including seaweed) and participants described the passing on of traditional knowledge from their mothers and women. However, we found some evidence that the introduction of formal seaweed farming at the village level may create a biased male-dominated value chain. While women are currently dominant in local trade-related nodes, such as the fish markets and road-side stalls (SPC 2018), some villages perceived the sale of seaweed as a shared role. This is node warrants further exploration and consideration, to ensure the presence of women and therefore flow of income, is not reduced. As one village noted, men were not initially involved in wild seaweed gleaning and harvesting, but rather women played a dominant role in gleaning, harvesting and selling "back in the day". However once demand at markets increased, men started to become involved in harvesting and the presence of women in this node diminished. Similar situations have occurred in other parts of Asia and the Pacific, for example in the mussel culture industry in India (Ramchandran 2011).

In introducing development initiatives that alter, supplement or diversify existing livelihoods and create new opportunities, we must therefore be cognisant to not inadvertently drive women out of the seaweed value chain (Jennifer 2016). Involving women in any new activity from the start is an important first step, so the social norm developing around the new technology is one of inclusivity.

Respecting the traditional village structures and organisations in Samoa while embracing the collaborative and collective nature of Fa'a Samoa (Fa'amatai) provide an avenue to support this inclusivity, an approach by which the MAF team continues to operate.

As well as gendered impacts and implications, our study also highlighted the need for further investment in creating market demand and supporting market integration. Seaweed farming as a sector was positively received by participants with interest in its potential for economic advancement. However, in comparison to the input side, discussions on outputs were rather limited. Some market opportunities were discussed, but overwhelmingly consumer education, pricing, and assistance with value adding were seen as issues to be addressed and resolved by MAF. In addition, there was a strong expectation from our participants that initial funding would be externally provided. Villagers also reported having no knowledge of how to source appropriate funding such as writing proposals or seeking grants.

This raises concerns regarding the sustainability of seaweed farming, where the introduction of the new value chain and farming method in this case is a 'push' technology approach (or 'transfer of technology (FAO 2016, Theis, Lefore et al. 2018, Alexander, Greenhalgh et al. 2020), rather than a response to market demand. The risk of 'push' projects ending at the farm gate and not providing market system integration for the outputs are well described in the literature (Isidiho and Sabran 2016, Joffre, Klerkx et al. 2017, Andriesse, Kittitornkool et al. 2021). It is also recognised that farmer understanding of risks and potential profitability of new activities and technologies is essential for the longer-term sustainability (Alexander et al., 2020) and for lower dis-adoption (Mantey, Mburu et al. 2020). We thus recommend that successful introduction and long-term sustainability of this and other farming initiatives requires comprehensive effort in terms of better understanding of outputs side (prices, markets, profits) and of financing opportunities, as well as assistance with the pricing, value adding, and customer awareness.

In addition to this, our findings emphasise that building community-capacity of villages for collective action is also needed to take the seaweed farming and value chain forward in Samoa. For most, the seaweed farm was perceived as a collective village asset and project, with many participants emphasising the need for men and women to work collaboratively, sharing roles across the value chain to ensure its success. Both men and women also discussed time management and how planning for roles and scheduling time would better enable participation. Building on this, we suggest that to further support Samoan villages to achieve sustainable change, communities need to be empowered – whereby they have agency to make and express choices and transform those choices into desired actions and outcomes (Narayan and Petesch 2002). Achieving community empowerment is not automatic, rather it is an active capacity-building process (Cayley 2006) and requires community collective action, equal engagement and social inclusion (Ahmad and Talib 2015). The existing collaborative nature of Samoan villages and the Fa'amatai social structure provides a ready opportunity to be further promoted and built upon.

In conclusion, this research has confirmed the division of labour with men dominating early parts of the seaweed value chain involving offshore activities and women appearing in the later stages including processing, marketing and cooking. Care must be taken when introducing new seaweed development initiatives to protect seaweed work as a women's asset, and not inadvertently shifting labour and economic benefits away from women and towards men. In addition, effort to support market integration and demand is needed in the context of 'push' projects as well as investing in

capacity building of villages for collective action. This includes ensuring women's representation in fisheries governance structures, and to understand their participation in such systems, within the cultural and practical sovereignty of Samoan village customs. From here, an assets-based approach to building community capacity, whereby women and men are supported from the bottom-up to draw on their own strengths and codesign their own solutions, is the next step needed to support seaweed-fisher villages in achieving authentic sustainable change (Objective 3).

7. Objective 3: Design a framework for equitable empowerment of men and women within seaweed harvester families.

Section 7 describes activities and findings related to Objective 3. The intent of Objective 3 shifted slightly during the implementation of the project, because of the broader context we were working in.

As detailed in Objective 2, our research was conducted alongside the REDSAF Project, whereby coastal villages were being introduced to a ‘new’ seaweed farming method utilising seaweed farming infrastructure (cages and trays) designed for growing and harvesting sea grapes (*Caulerpa* species). The REDSAF Project is best described as a 'transfer of technology’ model, where technology and innovations from the outside/top-down were being delivered to smallholder famers with the expectation of adoption over time (FAO 2016, Theis, Lefore et al. 2018, Alexander, Greenhalgh et al. 2020). However, as discussed in Objective 2 (6.2.2) the sustainability of the new technology was a concern and potential risk that we felt was important to address.

Samoa has a diverse ecosystem of development partners (Guerrero-Ruiz, Kirby et al. 2021), who contribute to agriculture development through donor funding and partnerships, from Development Assistance Committee (DAC) countries including Australia, New Zealand, China and Japan and international organisations including the UNDP, the World Bank, among others (Lowy 2023). The Principal Fisheries Officer (Ulusapeti Tiitii) at MAF has been instrumental in harmonising donor funds and initiatives, working to maximise integration opportunities between donor activities and to ensure manageable workloads and capacity for staff and communities on the ground.

Therefore, as we worked closely with MAF alongside the REDSAF Project for our research activities in Objective 2, our approach for Objective 3 shifted focus to focus more on applying a community-capacity building approach to the ‘push’ project (i.e. seaweed farming) as a means to achieve community empowerment and local ownership. The logic (or theory of change) behind the community-empowerment process is this: if communities are empowered then they will experience a greater degree of influence, decision making agency and meaningfulness, which will then lead to increased ownership. Hence, taking a capacity-building approach as a means to building community empowerment was a logical starting point for transitioning this initiative (seaweed farming) to being locally-led and owned.

Equipped with the knowledge from our needs assessment research (Objective 2) and with the desire to empower Samoan communities through a bottom-up approach, we set out to codesign the ‘Village Fishing Teams’ – a capacity building program. Design focused on the domains of capacity building (Liberato, Brimblecombe et al. 2011, Remling and Veitayaki 2016), specifically mobilising assets (existing skills, resources, strengths), building new skills/knowledge and supporting collaborative action through shared decision-making, partnership and social organisation.

The following section outlines the conceptual approaches underpinning the Village Fishing Teams (VFT) program (7.1.1) and details the process undertaken to codesign the VFT with Samoan in-country partners (7.1.2). Next the design and delivery of a pilot of the VFT program in a coastal village on Savai’i is described (section 7.1.3). Travel restrictions and community lockdowns delayed

the delivery of the pilot; therefore, the pilot was only conducted in one village. However, we also saw this as an opportunity to use the monitoring, evaluation and learning from this pilot as part of the co-design process for further development of the program before scale-out to other coastal villages in Samoa. Finally, the lessons learned from the codesign process and the results from the evaluation of the pilot are presented and discussed (section 7.2).

7.1 Methodology

7.1.1. Conceptual approach

Codesign methodology

Appreciative Inquiry

This section provides an overview of the methodology underpinning the codesign of the VFT as a gender-inclusive seaweed program that would support villages in their seaweed endeavours. Taking a participatory approach, the codesign process was underpinned by Appreciative Inquiry. As a strengths-based methodology, Appreciative Inquiry engages individuals within a system to work together towards change and improvement (Cooperrider and Whitney 2000). Appreciative Inquiry focuses on successes, strengths, resources and 'what works', and can assist participants in discovering and magnifying these successes (Cooperrider and Whitney 2000, Carter, Ruhe et al. 2007). The four phases of Appreciative Inquiry include 1) discovery, 2) dreaming, 3) design, and 4) delivery (see Figure 27). Using Appreciative Inquiry as our framework allowed us to embrace the strengths and voices within both communities and research teams. The codesign approach is valuable as it contests existing power structures through collaborative and bottom-up engagement. By directly involving people in the codesign of the VFT program, we aimed to create local ownership and long-term sustainability.

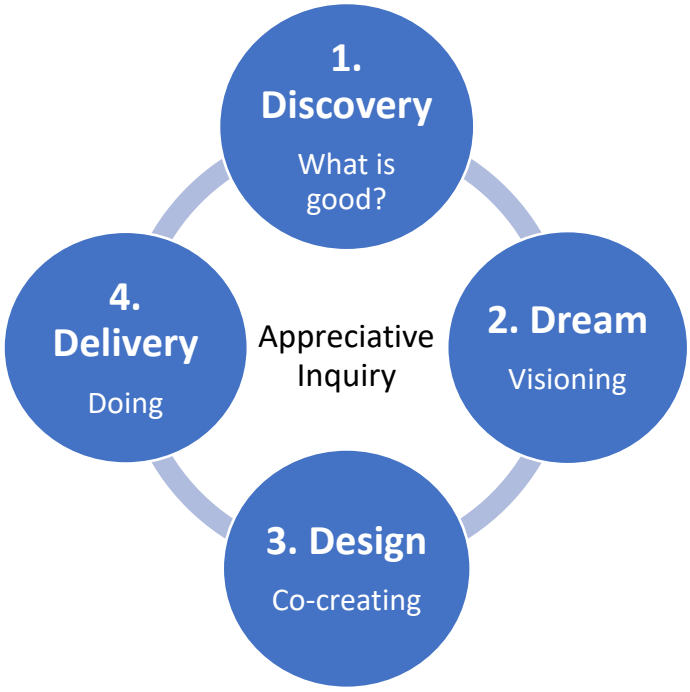


Figure 27. The four phases of Appreciative Inquiry

Community capacity building underpinnings and empowerment philosophies

The VFT program is based on the Family Farm Teams (FFT) approach (Pamphilon and Mikhailovich 2016), which was developed and implemented in Papua New Guinea between 2012 and 2015. Using the Family Teams approach as a starting framework, the VFT program was designed for the seaweed fisheries setting and the Samoan context and to meet the needs of community, as identified in Objective 1 and 2. The process for codesigning the VFT program is outlined in 7.1.2.

The conceptual underpinnings of the FFT approach and VFT program include:

- Adult learning theories as the pedagogical foundation
- Taking an asset based / strengths-based approach to development
- Understanding and embedding the program in the local context and culture

These approaches share an empowerment philosophy which understands that communities and their members are resilient and resourceful, aims to collaboratively identify and build on community assets, and direct research attention towards 'what strengths can be built on' rather than focusing on deficits and needs (Pamphilon and Mikhailovich 2016).

Adult learning theories

The Family Teams program intends to enable farming families to explore issues of gender and culture within families, seeking to encourage more effective, sustainable and gender-equitable farming and business practices (Pamphilon and Mikhailovich 2016). The program consists of modules that are integrated with agricultural production to ensure communities are connected to local resources. A people-centred learner approach was taken, rather than the typical knowledge transfer model.

The FFT (Pamphilon 2017) is underpinned by the following pedagogical foundations that have been applied as key adult learning domains in the VFT program:

- Empowerment education – farmers are active learners not 'empty vessels' to be filled
- Place-based pedagogy – integration of local culture and fisheries knowledge as an essential component of training
- Experiential action learning – a problem-solving learning orientation enabling farmers to become adaptive life-long learners
- Low-literacy learning – learning through visual, experiential, practical and discussion methods, for farmers who have had little or no school education

Asset based approached

Strengths-based framing and an asset-based community development approach was used whereby activities were developed to facilitate participants to focus on successes, strengths, 'what works' and to mobilise existing talents skills and assets (Mathie and Cunningham 2003, Green and Haines 2015). As opposed to a deficit discourse that focusses on problems and needs and can

undermine local efficacy and agency (Mathie and Cunningham 2003, Fogarty, Lovell et al. 2018). Throughout the development and implementation of the VFT program, the research team and the VFT facilitators used the “baskets of knowledge” analogy to describe our approach. In using this analogy, we described how everyone comes with existing knowledge and experience that was built upon, or filled up further, through the VFT program learning modules.

Place-based - local context and culture

Also underpinning the VFT program was the placed-based principle of local context and culture: ensuring our program was contextualised to the location, cultural values and community needs, as has been emphasised in previous research in the Pacific (Remling and Veitayaki 2016, Clarke, McNamara et al. 2019). More so, the program was designed to consider the local social and institutional structures. We did not want to undermine the cultural and social structures, but rather to facilitate men and women to work better together (McCarthy 2014). Hence the program design and its implementation were centred on the fa’aSamoa and the social structures of the fa’amatai. As detailed in Section 3.4 of this report, Fa’aSamoa (or the Samoan Way) is the traditional Samoan lifestyle, and refers to the values, rituals and practices which define the way of being and Samoan culture.

7.1.2. The Village Fishing Teams (VFT)

Codesigning the Village Fishing Teams (VFT)

The VFT program was collaboratively developed by the Australian and Samoan research team members over a six-month period between December 2021 to May 2022. A series of video meetings, virtual workshops and email correspondence was used to facilitate rich discussion and knowledge sharing.

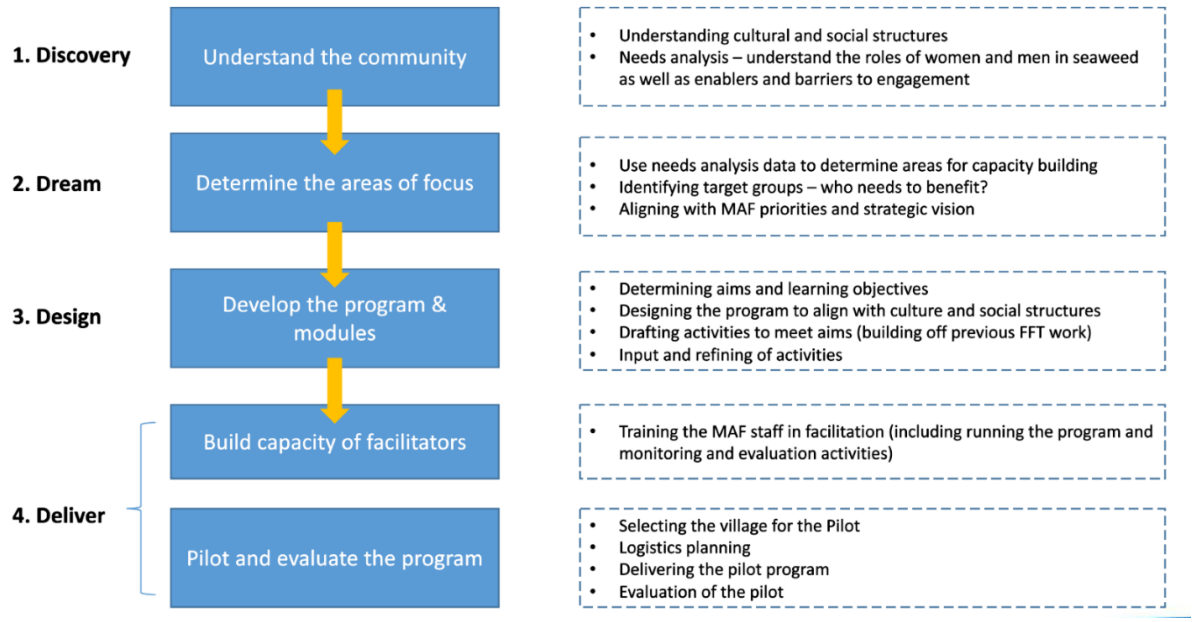


Figure 28. Four phases of Appreciative Inquiry aligned against the process of VFT codesign and related project activities.

The understanding of Samoan cultural and social structures, village roles and aspirations for seaweed, and seaweed production audit data gleaned from objectives 1 and 2 were brought together in phase 1 of the codesign (Discovery). This knowledge gained during the Discovery phase formed the basis of the Dreaming phase, where target groups and areas for capacity development that aligned with MAF priorities and strategic vision were agreed upon. The development of a shared vision for the VFT, and alignment with strategic priorities, started from the ground level with our newly gleaned understanding of community strengths and aspirations. Then, working in a horizontal manner, all partner priorities were considered and incorporated into the broader vision. The third phase of codesign (the Design phase) involved setting aims and learning objectives for the VFT program and drafting culturally and socially aligned activities to address these aims. The product was a community-based capacity building program (VFT) comprising three learning modules (Table 10), designed for delivery at the village level in Samoa. All learning activities and resources in the program were designed based on adult learning theories aligned with the Family Teams approach (Pamphilon 2017).

The Village Fishing Teams objectives and modules

The main objectives of the VFT program are to:

- provide key representatives (from each of the different village groups) with a series of workshops and activities that will enable them to work together as a family and village fishing team and to plan together the further development of their fishing and aquaculture activities.
- provide learning activities and family fishing development resources/tools that are suitable for those with low literacy and limited education.

There are three learning modules, which are:

1. **Seaweed as livelihood** – Food, nutrition and post-harvesting opportunities
2. **Working together towards a shared vision** – Strengths, assets and goal setting
3. **Planning together as a team** – Seasonal calendar, scheduling and developing a shared action plan

Each module contains 2 to 3 activities (Table 10), which take 30-60 minutes to complete. The module activities developed are detailed in Appendix 4 with instructions and reference to handouts or templates, and an example of a handout (Fact sheet) is provided in Appendix 5.

Table 10. Description of the three VFT modules, aim and activities

Module	Aim of Module	Activities
Module 1 – Seaweed as livelihood	• To increase awareness of the entire 'value chain' (i.e. post-harvesting opportunities) • To increase knowledge on nutritional benefits of seaweed • To allow participants to reflect on the value chain and think about opportunities for them and their village	**Activity 1: Verbal presentation** **Activity 2: Group reflection**

Module 2 – working towards a shared vision	• To support participants to identifying existing strengths and assets that they already have (in themselves and in the village and beyond) • To identify what and where seaweed grows and to map current seaweed related activities (and related assets) • To set a shared vision for seaweed by focussing on the 'why' (the purpose for doing seaweed work), who needs to be involved and what's most important them	**Activity 1: Our strengths – What makes our village a strong fishing village** **Activity 2: Mapping our fishing and seaweed activities** – where seaweed grows, where seaweed-related work takes place **Activity 3: Codesigning the vision** – Visualising the future for seaweed and setting a shared vision
Module 3 – Planning together as a team	• To build seaweed-related planning and management skills • To foster shared decision-making and collaboration skills and processes • To develop a shared action plan	**Activity 1 – Seasonal calendar** **Activity 2 -Scheduling time for seaweed work** **Activity 3 – Developing a shared action plan**

7.1.3. Delivery of the VFT pilot

Designing the pilot

During the planning stages of the program, the research team made an intentional decision that the pilot would be delivered in a single village (rather than multiple villages). While COVID-related travel restrictions and lock downs contributed to this decision, a central rationale for the decision was that the feedback from participants and facilitators (as part of the evaluation of the pilot) is an important component of the co-design process. By limiting the pilot to one village, the results of the evaluation could be used to refine the program before further scale-out to other villages.

The village of Vaisala on the island of Savai'i was purposively selected for the pilot based on social and economic data, the experience and knowledge of the village by the research team and MAF staff, as well as evidence of community readiness to engage, and opportunities that exist. In the case of Vaisala, seaweed is naturally growing in abundance in their local waters, but currently it is not regularly harvested or processed for both consumption and sale/income and therefore there is an opportunity to better support seaweed work. In addition, there is a potential and ready 'market', with interest in limu from the hotel owner previously expressed as well as there not being many villages in the northern part of Savai'i producing limu for sale (most marketed/sold limu comes from villages in the southern part of the island).

The VFT pilot was held at the Ministry of Fisheries office, in Asau (Savai'i) in September 2022 (See Appendix 6 for the Schedule). The village members from the village of Vaisala were invited to attend. Invitations were extended prior to the pilot through the MAF staff, who engaged with the village mayor with a signed letter from the Fisheries Division explaining the study purpose and requested for their participation. This is the normal process of contacting villages under the CBFM Program. A MAF Fisheries Officer based in Asau on Savai'i worked closely with the village Chief and village members to facilitate the logistics such confirming the date and time of the workshop and arranging participants' travel to the workshop venue.

Designing the evaluation

To evaluate the pilot, a process evaluation study was designed. Process evaluation is primarily concerned with the quality of implementation and provides information on the 'reach' of the intervention, which aspects of an intervention were delivered and how, as well as insight into the feasibility and acceptability of the program to inform further roll out.

Study participants

Participants of the VFT pilot program included men and women from the selected village (Vaisala) and four female MAF staff as the VFT facilitators. The VFT program was conducted over two days (Tuesday 20th September and Wednesday 21st September 2022) on the island of Savai'i. Photos from the two days are provided in Appendix 7.

Data collection

Evaluation data was collected via qualitative and quantitative methods and consisted of four data collection activities (Table 11). The evaluation was designed to collect data on the VFT Facilitator's and village participants' experiences of the process and short-term outcomes, including:

- Reach – did the program reach its intended target audience?
- Fidelity – how was the program was delivered and to what extent did delivery adhere to the program model developed?
- Context – where did the VFT workshop take place and how did it actually work?
- Participant experience and short-term outcomes including – learning and awareness outcomes (relating to the learning modules objectives); participant engagement and participation; and future intentions to apply learnings

Table 11. Data collection methods for evaluation on the VFT pilot

Data collection activity	**When administered**	**Target audience**	**What measured**
Attendance data and sign on sheet of village participants (age, gender, and village role)	At commencement of each day of the pilot	Village participants	Reach
Post-module feedback forms	At end of each module	Village participants	Participant experience and short-term outcomes
Interviewer-administered surveys	End of day two Completion of the pilot	Village participants	Reach Participant experience and short-term outcomes Strengths of the program and areas for improvement
Semi-structured group interview	Two days following the completion of the pilot	VFT Facilitators	Reach, fidelity, context, Participant experience and short-term outcomes Strengths of the program and areas for improvement

Village participant feedback was captured through the two mechanisms: the post-module feedback forms and an interviewer-administered survey. Prior to the pilot, the feedback forms and survey questions were piloted with the in-country team to check for ambiguity, appropriateness of wording, and cultural acceptability.

During the two days, short feedback forms (written in Samoan) were given to village participants after each module, to capture overall satisfaction with the content and the most valuable idea from each module. Responses were translated into English by the in-country team at the completion of the pilot.

At the end of the two-day pilot, participants were invited to take part in an interviewer-administered survey. The survey was designed to gauge the participants' overall satisfaction with and experience of participating in the program, and to assess the initial impact on skill development and knowledge of participants relating to the topic areas (i.e. the nutritional benefits of seaweed, the potential uses of seaweed (i.e. post-harvesting opportunities), and collaboration and shared decision making, goal setting and planning skills). The VFT Facilitators who administered the surveys were trained in the interview process prior to the pilot. Where responses were provided in Samoan (either written or verbally), the interviewer translated these into written English at the completion of the interview.

Following the delivery of the VFT program, the VFT Facilitators were invited to take part in a semi-structured group interview with the research team. Interview questions were designed to collect data on the process of implementing the pilot and their perspectives on the barriers and enablers to implementing the program, as well as the strengths of the program and areas for improvement. In addition, the interview questions were designed to explore and understand their experiences as a VFT facilitator. Interviews were facilitated by the Australian research team, who are highly experienced in cross-cultural communication and semi-structure interview facilitation. The group interview was audio-recorded and transcribed.

During the two-day pilot, field observations and field notes were captured by a member of the Australian team, to be used as secondary data, providing additional context.

Verbal consent was received from all participants in the program, and ethical approval was obtained from the University of the Sunshine Coast Human Research Ethics Committee (Ethics approval number A221704).

Analysis

Analysis of quantitative data from the attendance forms (demographics data), post-activity feedback forms and short interviewer-administered survey was undertaken using Excel. All coding, sorting and comparing of qualitative data was undertaken using NVivo software. Qualitative content analysis of answers to the open-ended question in the feedback forms was undertaken by two members of the research team to systematically classified common responses. For the qualitative responses from short interviewer-administered survey and the group interview, thematic analysis was performed. Data was analysed according to their relationship to each other and to the evaluation objectives. Data was coded, sorted into categories and then into common themes as they emerged. Researcher triangulation was used to help ensure credibility as well as dependability and confirmability of the findings.

7.2 Key results and discussion (Samoa)

7.2.1 Lessons learnt from the codesign process

Several lessons were learnt from the codesign process. In line with the horizontal partnership upon which the codesign process was built, these lessons have been summarised in Table 12 according to the Australian research teams and the Samoan research teams perspectives.

Table 12. Summary of the reflections and lessons learnt from the codesign process according to Australian and Samoan research teams' perspectives.

Australian perspective	Samoan perspective
Inclusivity The entire process embraced inclusivity. The process gave voice to the community to identify their own needs and solutions (Phase 1 Discovery), which were carried through the remaining phases of codesign.	**Creative** The process of codesigning the VFT allowed for creativity. Using photos in the PEI in Phase 1 allowed village members to visualise the future of the 'unknown'. As we were working during the COVID-19 pandemic, we also needed to find creative ways to stay connected as a team, like using WhatsApp for quick and instant dialogues, and Zoom for deeper discussions. Having this virtual communication was important for us at MAF and our confidence. It helped us to know that we were not out on our own, but support was always there if we needed it.
Relationships and trust Existing relationships and trust that had been established through a long history of working together were a substantial asset for this process. These relationships have been further strengthened through the codesign process. High levels of trust and communication (including active listening) are crucial to working in this way.	**Advocacy for gender inclusion** The process enabled advocacy for gender inclusion. We used photos of women doing physical seaweed work in the PEI in Phase 1, and also the MAF team is predominantly female. This is a strength that enables us to be able to advocate for women and their rights in fisheries.
Strengths-based framework Having a strengths-based framework from the outset was key. The VFT program was underpinned by adult learning theories and empowerment philosophies, through all phases, which ensured all voices were valued and considered.	**Respect** Throughout the codesign process, there was a high level of respect for MAF and Government priorities. The process ensured the community voice and Samoan customs were embraced across all phases.

Reflexivity and flexibility Early recognition that one size does not fit all, and adapting the PNG FFT approach for the Samoan village and fishing contexts. Making space for community, and their aspirations to drive how the VFT program came together. As Australian's, letting go of the 'expert mentality' and embracing that the Samoan team and community are the experts of their own lives.	**Capacity building** As the Samoan team was integrally involved in the codesign process, we were able to pinpoint opportunities for capacity building within our team. The process built on the capability of MAF staff by providing new skills in qualitative research and community engagement.
Leadership and visioning A key enabler and strength of this process was the leadership and visioning from Ulusapeti Tiitii, MAF Principal Fisheries Officer. Direction given in order to harmonise this project's activities with other projects running concurrently, in order to gain institutional and community support. Her position of leadership additionally gave her the agency to make decisions to drive the project forward.	**Location** Delivery of the pilot in Phase 4 at the MAF office in Asau instead of in Vaisala village was intentional. Holding the workshops at a neutral location helped to break down social barriers and norms that could have occurred if the program was delivered in the village. For example, cultural customs that influence who is permitted to speak in front of the Council were reduced, and mothers were not distracted by their home duties, because of the setup we had a the MAF office.
	Monitoring, evaluation and learning Including evaluation is an important part of our codesign process as this learning from MAF staff and participants will further shape and improve the program.

7.2.2 Results of the pilot

The results of the VFT pilot relating to reach and participant experience are presented in the following section.

Reach / participants

Village participants

A total of 22 individuals aged 19 to 61 years took part in the pilot over the two days (7 female, 15 male). All village groups were represented across the two days (Table 13), with 20 participants on day one (6 women, 14 men) and 21 participants on day two (7 women, 14 men). At the time of the pilot, there was a Church Conference being held on Upolu, which was being attended by some of the high chiefs from the village. However, despite this, the VFT Facilitators felt that there was still good representation from all groups over the two days.

Table 13. Reach and demographics of participants in the pilot (both days, n = 22)

Characteristics	**Participants n (%)**
Gender	
Male	15 (68.2%)
Female	7 (31.8%)
Age	
Age mean (±SD)	*46.3 (± 11.79)*
18 – 24 years	1 (4.5%)
25 – 34 years	4 (18.2%)
35 – 49 years	8 (36.4%)
> 50 years	9 (40.9%)
Highest level of education	
Secondary School / College	18 (81.8%)
University	2 (9.1%)
Vocational / Technical institute	1 (4.55%)
Not stated	1 (4.55%)
Marital status	
Married	17 (77.3%)
Single	4 (18.2%)
Not stated	1 (4.5%)
Main sources of income[a]	
Fishing	9 (42.9%)
Seaweed	1 (4.8%)
Shop or other small business	3 (14.3%)
Plantation (e.g. Taro, Coconut, Cocoa or other)	12 (57.1%)
Government	1 (4.8%)
Remittance	3 (14.3%)
Other	4 (19.0%)
Village groups represented	
Chief/Titled Men	7 (31.8%)
Women's Committee	5 (22.7%)
Untitled Men	7 (31.8%)
Aualuma (Daughters of the Village)	3 (13.6%)

[a] Adds to >100% because participants could select multiple responses

VFT Facilitators

The four VFT facilitators who delivered the pilot over the two days were female staff from the MAF Inshore Fisheries team. Two of these staff were also involved in the codesign of the VFT modules

leading up to the pilot. For the pilot, there were two facilitators per group; one acted as facilitator of the activities, and one acted as scribe/support. Activities were run in two gendered groups (1 men's group and 1 women's group) (Figure 29).

Figure 29. Men's and women's group in the pilot with VFT facilitators

Participant experience and outcomes of the pilot

Participant experience and short-term outcomes were also evaluated and presented in the section that follows in three sub-sections:

- *Module learning outcomes* (relating to learning and awareness related to the module's learning objectives) - what impact did the program have on learning outcomes? What learning outcomes were achieved?
- *Participation, inclusivity and empowerment* – how did the design and delivery of the program impact on participants' participation and engagement in the program and with each other? Did the program impact on confidence and empowerment of participants?
- *Intention to apply learnings and support needed* - Will participation in the program lead to behaviour change/application of learnings, and what's needed to support them?

Module learning outcomes

The results of the evaluation demonstrated that the VFT successfully built skills and increased knowledge of participants around the uses and nutritional value of seaweed and how to collaboratively plan and manage communal seaweed resources. Overall, majority of village participants agreed that the activities were useful and helped them to learn and build skills, and that the format of the program was engaging and enabled them to take part in a meaningful way (Figure 30).

A central focus of the program was to build skills in collaborative planning and management. This was achieved, with most participants strongly agreeing that it provided skills on how to work together to set shared goals (86%, n = 18) and to plan and manage seaweed resources (86%, n = 18) (Figure 30). The VFT facilitators also felt that the program provided participants with a greater

awareness of the *"kind of skills they need"* to successfully plan, farm and manage seaweed in their village.

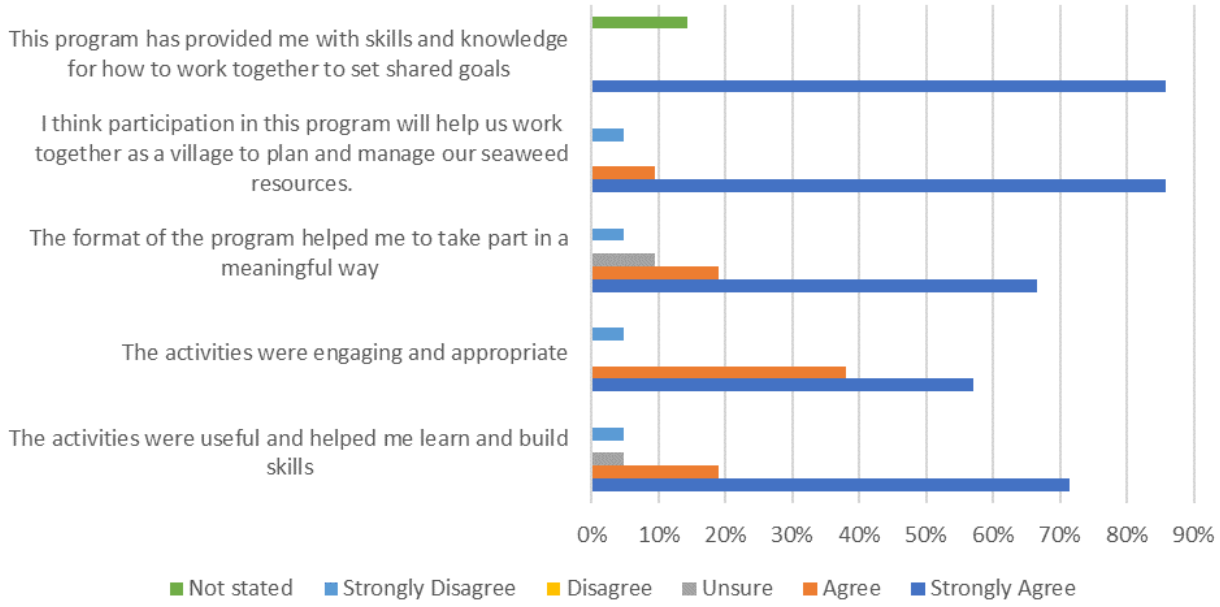


Figure 30. Participants (n = 21) level of agreement against statements. There were no significant differences when comparing men and women's responses.

As well as skills on collaborative planning, the VFT program also provided information on seaweeds' nutrition and health benefits, seaweed farming methods and the broader value chain, including different uses of seaweed. From the participants' perspectives, the new knowledge acquired relating to these aspects were reported as the most valuable learning outcomes of the program. This included how to grow limu for the best yield (farming and harvesting), farming limu for commercial purposes (income/selling and uses of limu e.g. products, food), monitoring and protection practices and conservation of limu, and the nutritional and health benefits of seaweed. Making the link between the uses of seaweed, its economic value, and its the nutrition and health value for the community was also highlighted: "*It was the most helpful because I know more about the important and the useful of seaweed for the health of our people*" *(female participant).*

There were some areas of skill and knowledge that were not covered in the pilot but were identified by the VFT facilitators as potential knowledge gaps. The facilitators reported that some of the participants who attended the VFT pilot had not been involved in the REDSAF Project nor earlier attempts at farming, therefore were new to seaweed farming. Others had some experience in wild gleaning of seaweed, but less in formal farming and the cage-method of farming that had been introduced to the village. Thus, potential knowledge gaps highlighted included a need for more specific knowledge on the farming techniques and the post-harvesting methods. A desire for more knowledge relating to farming and post-harvesting by participants themselves was evident through the questions from participants during interactive discussions with the VFT facilitators, such as enquiring on how to keep limu fresh for consumption as well as for sale. Other areas of knowledge

not covered (but also not raised as needs for this village) were conflict management, financial management and business acumen.

Participation, inclusivity and empowerment

The activities within the VFT training modules were designed to develop collaborative leadership and decision-making skills, and to foster positive dialogue and negotiation between men and women. The delivery and design of the activities enabled all voices to be heard, in particular the use of separate gendered groups and holding the training a 'neutral' location (being the MAF office, rather than in the village). The VFT facilitators were of the view that running the activities as men's and women's groups was a successful approach as *"they have different opinions, and the women will voice out their opinions freely" (VFT Facilitator 2).*

However, the facilitators raised concerns that the untitled men may have had less of a voice being in the same group as the chiefs and made suggestions for how this could be improved in future trainings: *"I really think that there should be another separate group for the untitled men, because they have a less voice, voicing their opinions because of the Chiefs. The Chiefs were there, yeah, and it was a very hard for them to voice out their opinions." (VFT Facilitator 2).* Even when untitled men did contribute their ideas, the social hierarchy structures limited the way in which this perspective was captured: *"On day two, there were some opinions from the untitled men that they were about to raise. But the Chiefs were like, 'oh we take it because you don't see that.' [So,] I didn't write their (the untitled men's) opinions, but it's good that they are voicing their opinion" (VFT Facilitator 3).*

While the use of separate groups is one strategy for overcoming these challenges, the ability of the facilitator to draw out voices and their role in advocating for (and raising awareness of) minority voices should also be acknowledged. In the post-pilot debrief, the VFT facilitators reflected on how they used effective facilitation skills to ensure equal participation opportunities were available: *"During day one with our discussion with the men's group that I facilitated, I got the untitled men to come to the front and I talked to them separately… And then when they raise an opinion, I always give them a chance for them to speak. I was like "oh, what did you say?". So that way it will give them a chance, and for the Chiefs to know that we acknowledge their voices. Yeah, so it's also part of the facilitating the group." (VFT Facilitator 1).*

The design of the activities and the program also had a positive effect on women's participation in the program. The VFT facilitators observed and described an increase in the confidence and agency of women participants over the two days: *"One of the highlights from my group was that after the activities in day two they (the women) wanted to present their activities by themselves. So, the pie charts, the calendar - they were all presented by the women, they wanted to present themselves so. So, I was like "oh OK. Go present your stuff, it's your thing. Go do your thing." And they presented very well. So, the activities gave them the confidence to speak up, not only in our group (the women's group). But they have the confidence to speak up in front of the men. And they can even defend their position, they were voicing out, so yes, that was one of the highlights I wanted to point out from my view." (VFT Facilitator 2).* (Figure 31).

Figure 31. One of the women presenting their work to the whole group on Day two.

As well as enabling women's participation, the program allowed women to see the opportunities for women in seaweed farming. For the women of the village, the program allowed them to advocate for the role and value of women in seaweed work and in the planning. One female participant described the 'most valuable idea' of the program being that *"It was important for me that women have a contribution in growing limu".*

Changes in attitudes towards gender relations and inclusivity were also observed. The facilitators reported a change in attitudes of the chiefs towards both women and untitled men, with a shift towards more inclusive thinking regarding both their role in seaweed work and as participants in the VFT workshop. *"On day 2, [VFT Facilitator 3] facilitated. One of the Chiefs called out to one of the untitled men, to come and help with the presentation. Yeah, so he came to the front. So, I think within these two days even the Chiefs recognise that they don't own the world." (VFT Facilitator 1)* (Figure 32).

Figure 32. One of the untitled men presenting to the whole group

Again, the central role of the VFT Facilitators as leaders and advocates for gender equality and enabling this mindset shift should also be noted. We heard from the facilitators how they consciously communicated a gender-inclusive message across the two days: *"…because I always emphasize to them that this project is improving gender equality. You know, empowering all the genders, yeah, and that's why we asked for both men and women….I told them at the beginning, you know, you heard it on the media and most of the programs that the government has with project, we are trying to deliver the message of equality, gender equality, you know. And I told them, you see our team here - we are mostly ladies, you know. [laughing]. Like most of us are ladies who are actually doing the fisheries work. And so, I remind them although it's seaweed work and its fisheries work, women can do it too, you know. So, I think it kind of put some sense in their brains" (VFT Facilitator 1).*

The program gave women the opportunity to participate in collective actions and decision-making on the same level as the men during the two days. However, while there were positive signs of women being able to influence decisions in the VFT activities, we observed that there is still room for improvement in terms of how this perceived/experience by participants as well as the translation of this into the planning activities. At the completion of the pilot program, only two thirds of participants strongly agreed that it would help them to look at how work could be done more effectively and equally (67%,n = 14), with a higher proportion of men agreeing compared with women (57% compared to 43%) (Figure 33). In addition, collaboration as the most important aspect or learning was only acknowledged by a small number of participants in response to the question 'What was the most valuable idea?', where only two participants responded with "*both men and women need to work together*".

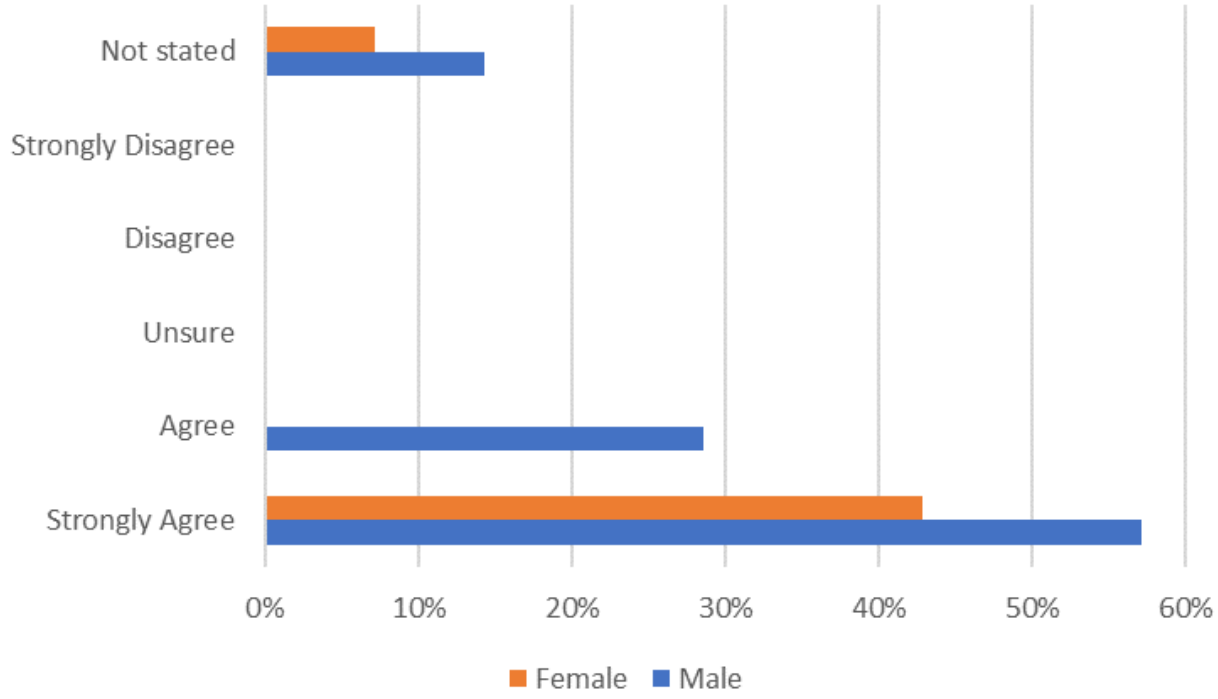


Figure 33. Participants (n = 21) level of agreement against the statement “This program will help me/us to look at the work done by all members of the village and how it could be done more effectively and equally”. A higher proportion of men strongly agreed to this statement compared to women but not significant.

Intention to apply learnings and support needed

Overall participants found the program motivating, and the activities and discussion seemed to reinvigorate their interest in seaweed. As a result of the program, both men and women appeared to place increased value on seaweed as a commodity to provide nutritious food as well as income for the village and their families: *“It's good for monetary gain and consumption for a healthy lifestyle”* (Male participant). For some participants, the value and benefits it could bring to the whole village for a better future, including expansion opportunities, were exciting: *“There's a future for the village in limu” (Male participant)* and *“[The program] gave me a clearer insight and understanding on the uses of limu for the future of Vaisala and future generations for a good future” ("ma ona tufulaga mo le agai i luma = its potential for advancement") (Male participant).*

The asset-based approach to the VFT program helped participants think about material and human resources they have access to and their ability to mobilise those. For example, the activities in Module 2 (Activity 1 and 2, see Table 10) took participants through a process of identifying existing strengths and assets that they already have (individual skills and strengths, as well as strengths and assets in the village and beyond including people, natural, build and organisations/institutions) as well as mapping where seaweed currently grows and where seaweed-related work currently takes place. The process/activity also enabled participants to identify gaps in their resources, which in this case was snorkel gear and equipment to carry out seaweed farming tasks. These aspects were seen as essential inputs needed to carry out activities, with some expectation of external provision, and a lack of these may hinder application regardless of intent.

The VFT program was successful in supporting the realisation of resources and agency, which

together are the building blocks for capability. We saw that the training activities supported participants to feel empowered to be able to implement limu farming through increased knowledge. This comment illustrates participants' sentiments around this aspect: *"The program was very helpful in which I gained more knowledge and understanding in farming of seaweed. (pololealame ua ou mana = I have power/empowered)" (Male participant / untitled man).*

While the VFT program has demonstrated increases in skills, knowledge and agency (i.e. capabilities), the evaluation data highlighted that the application into practice needs further attention. The facilitators were optimistic that the planning skills gained from the program would likely be applied, as they were perceived as useful and foundational skills for all different types of village-based work, which is a big part of Samoa culture: *"All the activities will be very useful, and they will be implementing it. You know, even with if it's not limu, surely they will apply it to anything… So, 2 and 1/2 days of the of the seven days of the week to do your family chores. But most of the time is community work" (VFT Facilitator 1)*.

However, from the participants' perspective, the need for ongoing support around both the applications of their learnings and undertaking seaweed work was important. Participants requested further support in the form of more workshops to keep building and reinforcing their own skills and knowledge: *"Need to have more workshops like this again."* (Literal translation: "repeating a school like a regular school") *(Male participant)*, and *"We need to be reminded over and over again"* (manoamia toe fai faamanatua ai pea = needs repeating) *(Female participant)*.

While there was intention from participants to take the project forward, there was recognition by both participants and the MAF facilitators that further support was needed to truly enable change. For example, participants highlighted how this one-off VFT workshop was just the first step in helping them succeed and to be able to teach others*: "I intend to work hard for this experience and I can't do it by myself, so I need some supporters from this programme to let it go strongly through" (Male participant)*, and *"I first need to understand the project better so I can be better at delivering to others." (Male participant)*.

In addition, participants also highlighted the need for and role of MAF to continue to walk alongside them as they learn to implement seaweed farming in their village: "*Support - try to be with us to conserve the limu in our village, also try involve in the program." (Female participant).* Participants also emphasised the value of collaboration between with the village and MAF to ensure the development of a successful seaweed program in their village, as well as the role of MAF to support trouble shooting during implementation: "*Collaboration of MAF and Village Council to create a foundation for a successful program" (Male participant)* and *"I ask the department to work together with the village to combat any problems that will arise in the project in the future" (Male participant).*

The VFT facilitators were also cognisant of this need for ongoing support, which was evident in the way in which they facilitated the final activity of the pilot. In this activity, all previous activities were culminated into a community action plan (Module 3, Activity 3, see Table 10 and Figure 34). Ideally this would be a community-led activity, however in this case the activity was led by MAF staff and outlined their intentions to support the village through the CBFM program and evaluation and monitoring activities.

Figure 34. Module 2 and 3 completed activities. Photos on left are from the two gendered groups (Module 2, Activity 3: top left photo – men's group, bottom left photo – women's group). Right photo is the combined action plan (Module 3, Activity 3) – the two visions from the Module 2 Activity 3 came together as a unified village vision in the top corner 'sun'.

7.2.3 Discussion

The output of this final project objective was the codesign of a program for equitable empowerment of men and women within seaweed harvesting villages, the VFT. Learnings generated during objectives 1 and 2 were pulled together to inform the codesign process. Taking a participatory approach ensured that power within the research process was situated with Samoan village members and the Samoan research team. The lessons learnt from the codesign process (presented in Table 12) indicate that successful codesign of a Teams approach is reliant on partner trust and relationships, creativity and agile project management, reflexivity from Australia and localised stewardship from Samoa. Authentic codesign is a time-consuming process, and in this case was an ambitious undertaking within the timeframe of an SRA. In the short timeframe we had for Objective 3, 'phase 1' of developing a Teams approach program for equitable empowerment of seaweed harvesters has been achieved. However further contextualisation of the program for all Samoan coastal villages is needed, followed by supported scale-out and adoption under the CBFM program, which is dependent on more time, resources and planning.

Reflexivity was a key strength of the program and our approach. While we have demonstrated the Family Teams model can be successfully adapted for the fishing and Pacific context, this has been facilitated through an active process of reflexivity. Continual questioning of one's own thinking and personal assumptions through open dialogue between research team members and an emphasis on listening to local voices ensured the VFT was embedded in the Samoa social and cultural system. This had positive impacts in that it enabled the village to self-organise decision making and

actions around the social structures during the pilot. However, a word of caution in that if there is inequality in the social system at the village level (i.e. no women at village level decision making in general) then this won't necessarily filter down to VFT level. Thus, the first step in codesigning a Teams approach in other PICs is to first understand local social and cultural structures.

The results of the VFT pilot demonstrated positive outcomes around empowerment and agency, especially for women, where an increase in confidence was attained, as well as evidence of voice in decision making. However, the pilot also highlights that inclusivity in Samoa extends to the untitled men, as this is another vulnerable group that can be overlooked. We also stress the importance of the VFT Facilitators (in this case, these were MAF staff) as leaders and advocates for gender equality. Their leadership was evident in the way the pilot program was delivered, which we believe supported the shifts in gender relations observed across the two days. This should be celebrated and further enhanced through investment in gender awareness and training of key people, both decision makers and those on-the-ground, in institutions in our partner countries.

Moving forward, sustainability of the VFT program must be considered. At the outset, the project planned to deliver a priority list of actions as a framework for guiding equitable empowerment of men and women from seaweed harvesting villages. Given the short timeframe of the SRA, alongside challenges related to the COVID-19 pandemic, we were only able to pilot the VFT program. As such, sustainability of the program remains one of the biggest challenges for transitioning the program to full local-ownership and long-term sustainability. The future continuity of the VFT and its integration into the Samoan CBFM program requires further roll-out and contextualisation more broadly across Samoa, which will be challenging without the support of external funding.

ACIAR projects with proven sustainability, such as the Family Farm Teams project and Landcare LIFE project, have used ‘facilitated extension’ models. In this model, community-based officers such as extension workers (LIFE) and village community educators (FFT) act as facilitators and change agents to assist in the implementation and continuity of activities. In these projects, these community-based workers/educators are local people who are specially trained and are trusted community members from within the target communities. The participants in the VFT pilot themselves articulated a need for someone to ‘walk alongside’ and support them to implement their learnings. The facilitated extension model ensures a bottom-up, locally led approach, where community are in the driving seat. Having community-based officers walking alongside village members is a model that has worked in these other ACIAR project to support target communities embed their new learnings, take ownership of their own goals, and ensure the sustainability of the program and its intended outcomes.

Figure 35. Participants from Vaisala village who participated in the VFT pilot (end of day two), with three members of the research team (Ulusapeti Tiitii, Victoria Muavae and Courtney Anderson)

8. Impacts

8.1 Scientific impacts – now and in 5 years

The following scientific impacts were achieved by the project:

1. Biochemical analysis of seaweeds - added to seaweed database
2. Development of an online tool for individual dietary data collection – PAC24. Potential for validation in future projects
3. Dietary data – this comprehensive data set can be used for future projects potential to add this to FAO GIFT database
4. Digitalising data collection and field-based monitoring processes in Samoa has been a promising change in scientific practices resulting from this project. Utilising the android tablets supplied for dietary interviews in Objective 1 was positively received by the Samoan team and leadership. Subsequently, partnership between MAF and SPC implemented the use of a fisheries auditing app (Ikasavea) to simplify market survey data collection and management.
5. The qualitative participatory methods, including photo elicitation, were highly effective in gathering data with low-literacy villagers to uncover perceptions of the value chain, and understand the complex influences impacting livelihoods and agricultural practices of women and other marginalised groups.
6. Documenting the process for codesigning the VFT program provides a valuable contribution to the practice literature. In the short term, we are already applying the science of taking this approach using the same codesign model (VFT program) in Fiji with oysters and seaweed as part of ACIAR project FIS/2022/147.

8.2 Capacity impacts – now and in 5 years

8.2.1 Australian Research Team

Capacity impacts for the Australian research team included:

1. Opportunities for rich two-way learning across the research teams and between communities and researchers. As Australian researchers, the process of codesign enabled us to reflect on our assumptions and positionality and to challenge positions of power and privilege to transform our working relationship to one that embraced horizontality and genuinely allowed for a beneficiary-led approach. We also gained new knowledge on the cultural and social structures in Samoa, which has strengthened our research capability to work in more culturally rigorous ways.
2. Students from the University of the Sunshine Coast were engaged with project activities through UniSC's Australian Centre for Pacific Islands Research (ACPIR) Summer Scholarship Program. Four students from the disciplines of nutrition and dietetics, and biomedical science, led the development of the seaweed nutrition handouts and fact sheets (Appendix 5). As well as providing important resources for this project, these internships provided a valuable experience for undergraduate students to gain exposure to international agricultural research, whilst developing their own capacity and interest for undertaking a higher degree by research in their future.

8.2.2 Samoa Ministry of Agriculture and Fisheries

The following capacity impacts for the Samoa MAF team were achieved:

1. Partnerships – This project strengthened the capacity of the Samoan MAF to deliver partnerships for sustainable development (SDG 17) and lifted the profile of Samoa as a leader in delivering international partnership arrangements. As outlined in Objective 3, the leadership provided by MAF was instrumental in harmonising the range of 'donor' funding and activities, in alignment with MAF priorities to maximise development outcomes. Under the leadership of Principal Fisheries Officer, Ulusapeti Tiitii, our project activities were integrated with existing MAF work and other projects, in particular the REDSAF project. Our project has also further emphasised and strengthened the capacity of MAF and Samoa as recognised leaders in community-based fisheries management of seaweed resources and in village-based seaweed processing enterprises.
2. Training in 1) nutrition and health values of indigenous seaweed, 2) photo-elicitation interviews and qualitative research techniques, and 3) VFT group facilitation and community engagement approaches – built the capacity of individual fisheries staff to work in community and social settings. This has resulted in a more well-rounded Inshore Fisheries researcher, who is now capable of conducting community and social research. This built capacity within the Inshore Fisheries team equips them to tackle broader SDGs beyond 'life below water', where they can have ability and initiative to address SDG 2 (hunger), 3 (health and wellbeing), 4 (quality education) and 5 (gender).
3. At an organisational level, there is intention to incorporate the outcomes from the VFT pilot into the CBFM program. This will demonstrate organisational commitment, prioritisng equal engagement of men and women through dedicated staff and resourcing.
4. Handouts, fact sheets and posters promoting the nutrition and health benefits of seaweed were developed for the VFT pilot (Appendix 5). These resources were developed for the VFT pilot in English and have since been translated into Samoan and are being converted to poster and banner sizes for MAF to use in other community-based work.
5. Supply of the android tablets has built the capacity of MAF team to streamline usual practice when conducting regular market audits. The MAF team have expressed further desire to utilise the tablets in streamlining other activities, which can further be supported through the development of digital monitoring and surveillance processes.

8.2.3 Samoan community members and villages

Capacity impacts for Samoan community members and villages included:

1. Capacity impacts for the participating Samoan villages include development of skills in collaboration and planning; increased knowledge, awareness and opportunities across the seaweed value chain and in nutritional benefits of seaweed.
2. Following on from the development of the handouts, fact sheets and posters promoting the nutrition and health benefits of seaweed, an ACPIR student project is working to co-create a Samoan Seaweed Cookbook with a focus on healthy eating and seaweed utilisation to encourage inclusion of seaweed in the diet.
3. Using the VFT as a capacity building approach to engagement men and women in village-based seaweed enterprises, it is anticipated that this built community capacity increases

village ownership and self-mobilistaion, thus transitioning a push project to be locally-led and owned.

8.3 Community impacts – now and in 5 years

8.3.1 Economic impacts

This project did not set out to formally capture economic impacts, but rather support a new and emerging industry at the village level. However, there is potential for economic impacts for Vaisala village, as a result of their involvement along the research pathway. Vaisala was selected for the VFT pilot because at the time, seaweed was growing abundantly, but the village was not actively using it for economic income. It is anticipated that Vaisala village will be able to generate income because of their involvement in the VFT program, however follow-up evaluation was outside the scope of this project, and thus needs to be considered as a future direction.

8.3.2 Social impacts

All project activities were designed and undertaken through a gender lens. Activities were purposively inclusive of all village members, regardless of age, gender, social status according to Samoan village hierarchy. The design and facilitation of the VFT program fostered contribution from all voices. In particular, we witnessed how women had the opportunity and voice to participate in collective actions and decision making on the same level as the men. For the men, the role modelling provided by VFT Facilitators were instrumental in drawing out the voices of untitled men within the social hierarchy and positive shifts towards more equal inclusion of this marginalised group was evident by the end of day two.

The research team members were impacted by being more accountable to the beneficiaries during the project and beyond. Taking a locally-led, participatory approach allowed community to drive the way in which they work based on their own collectively agreed priorities and aspirations.

8.3.3 Environmental impacts

Villagers show concern about sustainability of seaweed and marine resources and a desire to better manage these into the future. The VFT program provided an opportunity to increase knowledge around sustainable practices and to build skills in planning and management. Further opportunities to build capacity in this area are warranted, as villagers are eager for formalised planning, monitoring and regulations for sustainable use of reef resources. An important impact of the project has been the incorporation of the VFT approach into the Village Fishing Management Plan for Vaisala, which will ensure sustainable development of seaweed commodities, promote conservation practices and minimise negative impacts to marine environments.

8.4 Communication and dissemination activities

For Journal publications, see section 10.2.

8.4.1 Community facing publications

The following community facing publications were developed:

Training materials for Dietary interviews (Objective 1)

- The Diet Interview Step by Step Guide (Appendix 2)
- Measures Guide (Appendix 3)
- Common Samoan Foods handout
- Dietary Interview and PAC24 Training (PowerPoint slides)
- Hands on activity resources for dietary interview training

Training materials for Photography assignment (Objective 2)

- Photo Assignment Toolkit for MAF Staff
- Photo Assignment Training Module presentation (Prezi slides)

Training materials for facilitators of the VFT program (Objective 3)

- Codesign workshop with MAF staff
- Presentation and training on evaluation research

The VFT Modules (Objective 3)

Module activities and instructions (Appendix 4)

- Module 1 - Resources and participant handouts
    - PowerPoint presentation
    - Handout: Overview of the Seaweed Project
    - Handout: Seaweed nutritional information fact sheets (Appendix 5 – note: these have been translated into Samoan and will be converted to poster and banner sizes)
    - Seagrape and Halymenia recipe cards
    - Handout: Seaweed value chain handout
    - Post harvesting opportunities handout/mini book
- Module 2 - Resources and participant handouts
    - Template: ‘What Makes Our Village Strong’ activity
    - Handout: Examples of strengths and assets
    - Handout: Individual Skills Audit
    - Handout: Example Village Map
    - Handout: Concept Map example
    - Template: Codesigning the vision pie
- Module 3 - Resources and participant handouts
    - Handout: Seaweed harvesting factsheet
    - Template: Cultural and seaweed seasonal calendar
    - Handout: Summary of roles for Vaisala (from Objective 2 FGD data)

- Template: Task and time management table
- Template: Action Plan template

8.4.2 Conference presentations and international meetings

Conference presentations and international meetings delivered through this project:

- 13th Asian Fisheries and Aquaculture Forum (Taiwan virtual conference, 02 June 2022) - Oral presentation "*Unpacking gendered roles across the seaweed value chain in Samoa: an exploratory study*" and poster presentation *"Contribution of seaweed to diets in Samoa: a simulation study".*
- 8th Global Conference on Gender in Aquaculture & Fisheries (Kochi, India, 23 November 2022) - Oral presentation *"Dialogue from the field: Embracing strengths and voices to codesign a gender inclusive seaweed program"*
- 6th International Meeting on Triangular Cooperation, hosted by the Organisation for Economic Co-operation and Development (OECD) (Lisbon, Portugal, 6-7 October 2022) - Discussion panel *"Triangular cooperation supporting the climate agenda – reflections from Australia-Pacific"*
- International Seaweed Symposium – ISS 2023 (Hobart, Tasmania, 19-24th February 2023) – Two oral presentations *"Photo elicitation as a method to investigate the seaweed value chain in Samoa"* and *"Contribution of seaweed to health and nutrition in Samoa: a dietary simulation modelling study".*
- FAO – United Nations' Food and Agriculture Organization (FAO) knowledge exchange session 'Bringing field voices to headquarters: the case of Pacific Small Island Developing States (SIDS)', FAO Headquarters, Rome, 22nd May 2023.

Other presentations

- MAF and REDSAF project inception meeting, Apia Samoa - Presentation by Ulusapeti Tiitii (September 2021)
- UniSC School of Health and Behavioural Sciences Research Seminar Showcase - Presentation *"Improving nutrition through women's and men's engagement across the seaweed food chain" (*25 March 2022)
- ACPIR Pacific Seminar Series Oct 2022 – Presentation "D*ialogue from the field: Embracing strengths and voices to codesign a gender inclusive seaweed program in Samoa*" (16 November 2022)
- UniSC Sustainability week hosted by Researchers in Agriculture for International Development (RAID) – Presentation to university students *"Reflections from a seaweed project in the Pacific"* (31 August 2022).

9. Conclusions and recommendations

9.1 Conclusions

This project demonstrated the importance of seaweed as an emerging livelihood opportunity in Samoa. Seaweed provides food and nutrition security, as well as social and economic benefits, particularly for women and other marginalised groups. The FIS-2019-125 project worked with coastal communities to define the elements of Samoan seaweed food chains, as well as identify perceived barriers and enablers to men's and women's participation, their strengths and aspirations, and entry points for addressing gender inequality and nutritional improvement. This informed the codesign, piloting and evaluation of a village-based capacity building model (VFT) for gender-inclusive seaweed development activities.

There are a number of key lessons. Most importantly, continuity of relationships is critical for our efforts to be locally-led. Longstanding partnerships have existing trust, established best modes of communication, and (in our case) embrace reflexivity, which allows for rich exchanges, resulting in authentic codesign. The individuals working on this project shared an eagerness to do things in a 'new way'. The project was driven by curiosity and continual questioning of one's own thinking and personal assumptions, supported by open dialogue between research team members and an emphasis on listening to local voices.

Measuring dietary intake at the individual level can be time consuming and labour intensive. This project highlighted the value of utilising an innovative online tool (PAC24) to support this process. Now that we have a comprehensive dietary data set for Samoan adults, there are an array of applications in which this can be used. From here, we are now able to pin-point areas of dietary inadequacy, undertake dietary patterning analysis, and better understand the contribution of ultra-processed foods to Samoan diets, to name a few. Validation of the PAC24 in Samoa and other PICs would create opportunities to establish entry points for food and nutrition interventions and health promotion.

Participatory approaches used in the project allowed us to move beyond passive forms of community participation, to more self-mobilised types of participation, including village members along the research journey. Photo elicitation interviews uncovered barriers and enablers to men's and women's economic empowerment, whilst interactive participation of village members uncovered community aspirations for seaweed. Active community participation can lead to self-mobilisation of people to take initiative independent of external institutions, but rather leverage external institutions for resources and technical advice, but they ultimately have control over how these are used and how systems are changed. Continuity of engagement and long-term investment are needed to ensure self-mobilsation of coastal villages in Samoa, for them to adopt these initiatives independently of the research team, thus reshaping the systems in which they work and based on their own desires and aspirations.

Finally, to be successful in mainstreaming gender across the seaweed value chain, both men and women need to be engaged in development activities. However, we have learnt to be cautious when introducing new farming technology in order to protect seaweed work as a woman's asset, and not inadvertently shift labour and economic benefits away from women and towards men. During the VFT pilot, we observed both women and untitled men participating equally, alongside

men in collective actions and decision making. This demonstrates the potential for positive shifts towards more equal inclusion of marginalised people.

9.2 Recommendations

The following recommendations are made:

9.2.1 Short term recommendations

1. Collection of more seaweed replicates to validate the nutrient levels and understand potential variation in the recommendations in the nutrient panel – which can be supplemented by seaweed nutrient data from the literature.
2. It is timely to build relationships with the Ministry of Health in Samoa to work towards population and individual based health education strategies that promote seaweed.
3. This project is the first to collect individual level dietary data from adult Samoans. Previously, we relied on household level data, of which the most recent is from 2013. Determining individual daily food and nutrient intake enabled us to determine that seaweed has a specific role in addressing micronutrient deficiencies for adult Samoans. There is a need to collect individual level dietary data from other Pacific Island countries to expand our understanding here.
4. There is currently no validated method for measuring individual dietary data in Pacific Island countries. The presents a clear opportunity for validation of the PAC24 in the future. The validation of a Pacific individual dietary assessment tool has potential for co-investment from multiple donors, such as FAO and WorldBank.
5. This project has resulted in a more capable and well-rounded Fisheries officer, with skills in participatory research, qualitative methodologies, and community engagement, alongside knowledge gains relating to the nutrition and health value of seaweed. This more comprehensive skillset, with knowledge, abilities and experience to perform in different contexts, may also appeal to the Offshore Fisheries section of MAF, and more broadly across the Pacific with expansion support from facilitators such as SPC.
6. Care must be taken when introducing new seaweed development initiatives that alter, supplement or diversify existing livelihoods and create new opportunities (such as seaweed farming, or village-based seaweed enterprises). In presenting new seaweed development opportunities, we must not unintentionally drive women out of the seaweed value chain, but rather protect seaweed work as a woman's asset, and not inadvertently shift labour and economic benefits away from women and towards men.
7. Formalising engagement processes by including the VFT as part of CBFM program is crucial for sustainability, as this ensures that these activities become part of daily responsibilities for MAF staff. Securing the VFT's place within the aquatic food systems will emphasise the development of gender-inclusive village-based governance models for seaweed, and for other fisheries commodities as well. This formalisation is additionally needed to ensure the MAF team's ability to undertake monitoring, evaluation and learning from activities.
8. There is a risk of losing continuity, which is a missed opportunity to formalise the priority action areas to be representative of Samoan coastal communities more broadly. At this stage, the priority list of recommendations is limited to the pilot village, Vaisala. Continued

investment is needed to contextualise the VFT program for all Samoan's, rather than just Vaisala. As this project was an SRA, and completed largely during the COVID-19 pandemic, targeting the ministry level and developing MAF staff as VFT facilitators was the logical place to start. However, there is a clear need to invest in village-based people and the next step is about timely engagement of community-based workers within each village (as VCEs or similar) to drive and champion the VFT program.

9. This project adapted the PNG FFT approach for application in a different context (Samoa) and commodity (fisheries, specifically seaweed). This has provided a valuable case study to better understand the codesign process for such a program, in order to mainstream gender across fisheries value chains. There is an opportunity, with the help of SPC, to extend this approach to other PICs to capture the impact of all fishing (or other) efforts and their intended beneficiaries over time. In the short term, a newly funded ACIAR project (FIS/2022/147) commencing in 2024 will apply this same model of codesign in Fiji, with oyster and seaweed mariculture.

9.2.2 Long term recommendations

This project has highlighted the need to better harmonise concurrent project activities (projects from different donors running in tandem). Although good from an efficiency point of view for the Samoan project team, implementing this project alongside the REDSAF project changed the intent of our project from the Australian perspective. Rather than being local-led and working from the bottom-up, the project become a push (farming focused) project. Partly because of COVID-related travel restrictions, the Australian team was not able to travel to Samoa to speak with the in-country research team or REDSAF team. Further harmonisation occurred with the MAF team streamlining market data collection for this project with the use of the Ikasavea app, developed by SPC. The provision of android tablets by this project were utilised for data collection in the field, whereby the MAF team collected various types of data from seaweed and other fisheries commodities, linking to SPC's cloud based electronic e-data system. In future, we need to look to better coordinate between donors, to complement each other's efforts and better address our shared goals.

A strength of this project has been the collaborative codesign process undertaken by the Australian and Samoan partners. Working in this way demonstrates that vertical structures in bilateral partnerships can be shifted towards more horizontal partnerships. This has been made possible first and foremost because of the pre-existing relationships between some of the project personnel from both countries. The appreciative inquiry approach to codesign strengthened and built on these relationships, while allowing a genuine reflexive approach to understanding the local context and needs and ensuring the VFT program developed was aligned with these and embodied Fa'a Samoa. To ensure that agriculture for development projects and initiatives are designed to meet the needs and priorities of the beneficiaries, it is important to dedicate time during the design phase for authentic co-design and recognize long-term partnerships as an asset. However, it is crucial to acknowledge the existing power relations that exist in bilateral partnerships (due to their very nature) and ensure that projects funded through Australia or other donors are driven by the recipient or are at least inclusive. This will prevent the design of projects from solely reflecting the experiences and preferences of the donor partner, which could overlook or misalign with beneficiary needs and priorities, and support the shift towards more horizontal relations.

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10.2 List of publications produced by this project

Journal publications

Tiitii, U., Paul, N., Burkhart, S., Larson, S., and Swanepoel, L. (2022) Traditional Knowledge and Modern Motivations for Consuming Seaweed (Limu) in Samoa. Sustainability, Volume 14, https://doi.org/10.3390/su14106212

Larson, S., Anderson, C., Tiitii, U., Madar, L., Tanielu, E., Paul, N., and Swanepoel, L. (2023). Barriers and enablers for engagement in a new aquaculture activity: An example from seaweed initiatives in Samoa. Aquaculture, Volume 571, https://doi.org/10.1016/j.aquaculture.2023.739328.

Anderson, C., Tiitii, U., Madar, L., Tanielu, E., Larson, S., and Swanepoel, L. (2023). Unpacking gendered roles across the seaweed value chain in Samoa using photo elicitation methods. Ocean & Coastal Management, Volume 232, https://doi.org/10.1016/j.ocecoaman.2022.106420

Papers in preparation

Forthcoming – Swanepoel, L., Tiitii, U., Paul, N., Casey, E., Stanley, C., and Anderson, C. (unpublished, forthcoming). Dietary simulation modelling demonstrates seaweeds' potential in combatting micronutrient deficiencies in Samoa. Target journal: Food Security.

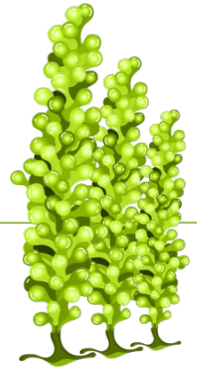
Forthcoming – Anderson, C., Tiitii, U., Larson, S., Pamphilon, B., and Swanepoel, L (unpublished, forthcoming). Transforming 'push'-projects to be locally-led and owned: Supporting empowerment and ownership using a gender-inclusive capacity-building program, a Samoan case study. Target journal: Agriculture and Human Values.

11. Appendices

Appendix 1. Seaweed Product Sheets

Product sheets documenting the biochemical data from nutrient testing of *Halymenia* (Salima village sample) and *Caulerpa* (Vaisala village sample) were generated from analyses by National Measurement Institute (NMI, Melbourne, Australia) using the following methods:

List of Methods for NMI Nutrient Analysis		
NT2_46	Aluminium; Calcium; Iron; Magnesium; Potassium; Zinc; Sodium	
VL286	Ash	
VL287	Retinol (Vitamin A)	
VL289	Saturated Fat	
VL289	All fats; All fatty acids	
VL290	Thiamin; Riboflavin (Vitamin B2)	
VL292	alpha-Carotene; beta-Carotene	
VL293	Niacin (Vitamin B)	
VL295	Fructose; Glucose; Sucrose; Maltose; Lactose	
VL298	Moisture	
VL299	Protein (N x 6.25)	
VL301	Ascorbic Acid	
VL302	Fat (Mojonnier extraction)	
VL345	Iodine (I)	
VL412	Carbohydrates	Energy (kj)
VL450	All amino acids	



Caulerpa Biochemical Data Sheets

Proximate composition	**% dry weight**
Carbohydrate (CHO)	8%
Protein	16.6%
Fat	1.2%
Ash	36.2%
Moisture	9.5%
Total Dietary Fibre	28.1 *g/100g*
Energy	*690 kJ/100g*

Mineral	**mg/kg**
Aluminium	13.0
Calcium	4,950.0
Iron	89.0
Magnesium	9,800.0
Potassium	30,300.0
Zinc	3.8
Sodium	56,000.0
Iodine	150.0

Vitamins	**µg/100 g**
Alpha-carotene	570
Beta-carotene	340
Retinol (A)	<5

Vitamins	**mg/100 g**
Ascorbic Acid	24
Thiamin	<0.02
Riboflavin (B2)	0.87
Niacin (B3)	29

Caulerpa Biochemical Data Sheets

Proximate composition	**% dry weight**
Carbohydrate (CHO)	8%
Protein	16.6%
Fat	1.2%
Ash	36.2%
Moisture	9.5%
Total Dietary Fibre	28.1 *g/100g*
Energy	*690 kJ/100g*

Mineral	**mg/kg**
Aluminium	13.0
Calcium	4,950.0
Iron	89.0
Magnesium	9,800.0
Potassium	30,300.0
Zinc	3.8
Sodium	56,000.0
Iodine	150.0

Vitamins	**µg/100 g**
Alpha-carotene	570
Beta-carotene	340
Retinol (A)	<5

Vitamins	**mg/100 g**
Ascorbic Acid	24
Thiamin	<0.02
Riboflavin (B2)	0.87
Niacin (B3)	29

Caulerpa Biochemical Data Sheets

Sugars	g/100g
Total	<1
Fructose	<0.2
Glucose	<0.2
Sucrose	<0.2
Maltose	<0.2
Lactose	<0.2

Fats	g/100g
Sat Fat	0.6
Mono trans fats	<0.1
Mono-unsaturated fat	0.2
Omega 3 fats	0.2
Omega 6 fats	0.2
Poly trans fats	<0.1
Poly-unsaturated fat	0.4
Trans fat	<0.1

Amino Acids	mg/kg
Total	159,670
Aspartic Acid	21000
Serine	9400
Glutamic Acid	23000
Glycine	10000
Histidine	2700
Arginine	11000
Threonine	8400
Alanine	12000
Proline	6700
Tyrosine	6100
Valine	8000
Lysine	10000
Isoleucine	6100
Leucine	12000
Phenylalanine	7100
Methionine	1900
Hydroxyproline	170
Taurine	4100

Fatty Acids	%
Total Saturated	50.4
C4:0 Butyric	<0.1
C6:0 Caproic	<0.1
C8:0 Caprylic	<0.1
C10:0 Capric	<0.1
C12:0 Lauric	0.7
C14:0 Myristic	1.3
C15:0 Pentadecanoic	0.6
C16:0 Palmitic	45.4
C17:0 Margaric	0.1
C18:0 Stearic	1.5
C20:0 Arachidic	0.2
C22:0 Behenic	0.1
C24:0 Lignoceric	0.4
Total Mono-unsaturated	18
C14:1 Myristoleic	<0.1
C16:1 Palmitoleic	1.9
C17:1 Heptadecenoic	<0.1
C18:1 Oleic	13.8
C18:1 Vaccenic	2
C20:1 Eicosenic	0.2
C22:1 Cetoleic	<0.1
C22:1 Docosenoic	<0.1
C24:1 Nervonic	0.1

Fatty Acids	%
Total Poly-unsaturated	31.5
Total Mono Trans Fatty Acids	<0.1
Total Poly Trans Fatty Acids	<0.1
P:M:S Ratio	0.6:0.4:1
Omega 3 Fatty Acids	14.5
Omega 6 Fatty Acids	17
C16:4 Hexadecatetraenoic	<0.1
C18:4 Moroctic	0.2
C18:2w6 Linoleic	1.5
C18:3w6 gamma-Linolenic	1.1
C18:3w3 alpha-Linolenic	0.1
C20:2w6 Eicosadienoic	<0.1
C20:3w6 Eicosatrienoic	0.5
C20:3w3 Eicosatrienoic	<0.1
C20:4w6 Arachidonic	13.9
C20:5w3 Eicosapentaenoic	14.1
C22:2w6 Docosadienoic	<0.1
C22:4w6 Docosatetraenoic	<0.1
C22:5w3 Docosapentaenoic	<0.1
C22:6w3 Docosahexaenoic	<0.1

Caulerpa Biochemical Data Sheets

Proximate composition	% dry weight
Carbohydrate (CHO)	9%
Protein	8.2%
Fat	0.6%
Ash	64.4%
Moisture	3.4%
Total Dietary Fibre	14.8 *g/100g*
Energy	*430 kJ/100g*

Mineral	mg/kg
Aluminium	250.0
Calcium	128,000.0
Iron	480.0
Magnesium	5,670.0
Potassium	9,170.0
Zinc	2.9
Sodium	111,100.0
Iodine	150.0

Vitamins	mg/100 g
Ascorbic Acid	6
Thiamin	<0.02
Riboflavin (B2)	0.32
Niacin (B3)	13

Vitamins	µg/100 g
Alpha-carotene	1,100
Beta-carotene	270
Retinol (A)	<5

Caulerpa Biochemical Data Sheets

Sugars	g/100g
Total	<1
Fructose	<0.2
Glucose	<0.2
Sucrose	<0.2
Maltose	<0.2
Lactose	<0.2

Fats	g/100g
Sat Fat	0.4
Mono trans fats	<0.1
Mono-unsaturated fat	<0.1
Omega 3 fats	<0.1
Omega 6 fats	<0.1
Poly trans fats	<0.1
Poly-unsaturated fat	0.1
Trans fat	<0.1

Amino Acids	mg/kg
Total	73,930
Aspartic Acid	9000
Serine	4500
Glutamic Acid	12000
Glycine	5000
Histidine	1400
Arginine	4100
Threonine	4200
Alanine	4100
Proline	3300
Tyrosine	2900
Valine	3600
Lysine	3900
Isoleucine	2600
Leucine	5400
Phenylalanine	3500
Methionine	1400
Hydroxyproline	450
Taurine	280

Fatty Acids	%
Total Saturated	67.3
C4:0 Butyric	<0.1
C6:0 Caproic	<0.1
C8:0 Caprylic	<0.1
C10:0 Capric	<0.1
C12:0 Lauric	0.2
C14:0 Myristic	3.0
C15:0 Pentadecanoic	0.4
C16:0 Palmitic	52.9
C17:0 Margaric	0.4
C18:0 Stearic	3.3
C20:0 Arachidic	0.3
C22:0 Behenic	1.1
C24:0 Lignoceric	5.7
Total Mono-unsaturated	12
C14:1 Myristoleic	0.1
C16:1 Palmitoleic	4.8
C17:1 Heptadecenoic	<0.1
C18:1 Oleic	3.7
C18:1 Vaccenic	3.3
C20:1 Eicosenic	0.2
C22:1 Cetoleic	<0.1
C22:1 Docosenoic	<0.1
C24:1 Nervonic	<0.1

Fatty Acids	%
Total Poly-unsaturated	20.5
Total Mono Trans Fatty Acids	<0.1
Total Poly Trans Fatty Acids	0.5
P:M:S Ratio	0.3:0.2:1
Omega 3 Fatty Acids	8.6
Omega 6 Fatty Acids	11.5
C16:4 Hexadecatetraenoic	<0.1
C18:4 Moroctic	0.4
C18:2w6 Linoleic	7.1
C18:3w6 gamma-Linolenic	0.4
C18:3w3 alpha-Linolenic	6.8
C20:2w6 Eicosadienoic	0.5
C20:3w6 Eicosatrienoic	0.3
C20:3w3 Eicosatrienoic	<0.1
C20:4w6 Arachidonic	0.9
C20:5w3 Eicosapentaenoic	1.3
C22:2w6 Docosadienoic	<0.1
C22:4w6 Docosatetraenoic	2.4
C22:5w3 Docosapentaenoic	0.1
C22:6w3 Docosahexaenoic	<0.1

Appendix 2. Step by Step guide for dietary interviews using PAC24

Diet Interview

A step by step guide for dietary interviewing using PAC24 (online tool)

Overview of the steps

Getting started

1. Logging in and welcome
2. Add your participant
3. Beginning the interview

The Dietary interview

1. Select the mealtype
2. Add ALL the foods (and details) eaten at that mealtype
3. Move to the next mealtype

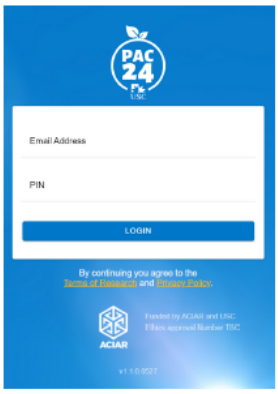
Repeat steps 1, 2 and 3 until all food / drink consumed that day has been recorded

4. Checklist
5. Final questions and save
6. Review and submit

1 Logging in and welcome

A

Login to PAC24



B

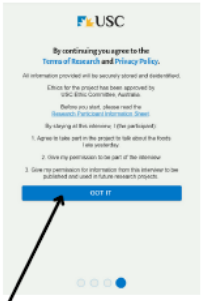
"Welcome. My name is [NAME].

Read the instructions to the participant

Swipe left to go through all the instructions

C

If the participant agrees to participate and understands, you can proceed.



TAP HERE TO PROCEED

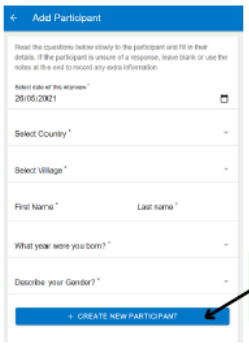
2 Add your participant

A

To add a new participant TAP HERE

B

Enter the participant details



TAP HERE to create participate and proceed

3 Beginning the interview

A

"The goal of the interview is to record everything you ate yesterday. Starting with the first thing you had when you woke up to the last thing before you got up the next morning."

B

You will be asked to report all the foods and drinks you had on [yesterday's date]".

Now you are ready to start the diet interview

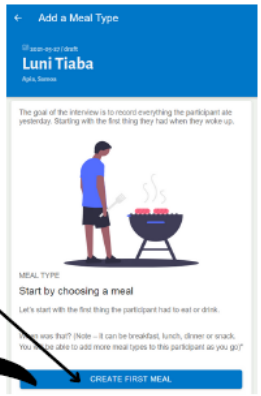
Let's begin!

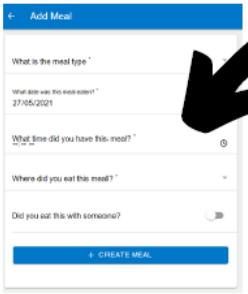
Tap on the button to begin Interview

1 Select the first mealtype

"Let's start with the first thing you had to eat or drink. When was that?"

A TAP HERE to choose the first Mealtype





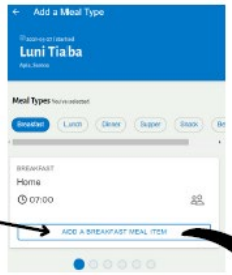
B Enter the details of the mealtype

Note – the date of the meal is when the foods were eaten, NOT today's date

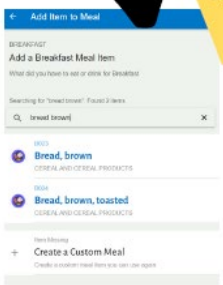
2 Add foods to the mealtype

"What was the food or drink you had at this mealtime?"

A TAP HERE to add food items



TIP 1: If you can't find the food, you can add it as a Custom Meal

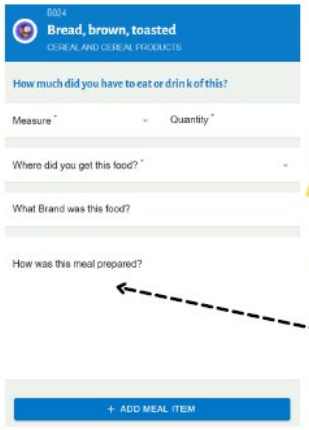


B Use the SEARCH FUNCTION to find foods

Now, add the details of the food item

"How much of this food did you have to eat or drink?"

Enter the details of the food



TIP 2: Use the Measures Guide to help you quantify amount of food or drink eaten

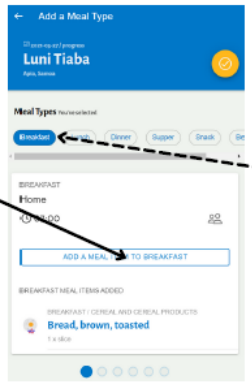
TIP 3: Use this box to add as much detail as you can about the food

Now, add more food items to the mealtype

"Did you have anything else to eat or drink at this time?"

If "Yes"

TAP HERE to add another food item to the Meal



Tip 4: Make sure the mealtype you want to add foods to is selected (Blue).

You can also scroll left and right to go between mealtypes.

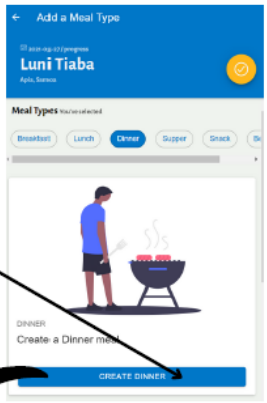
If "No"

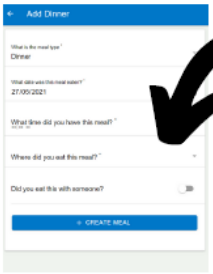
Proceed to Step 3

3 Move to the next mealtype

"When did you eat or drink next?"

TAP HERE to create another mealtype





Add the details of this meal, then **repeat step 2** to add food items to this mealtype

Repeat Steps 2 and 3 until all food and drink for the day (24 hour period) has been recorded

Once ALL food and drink for the day has been entered, TAP HERE

Proceed to Step 4

4 Checklist

A

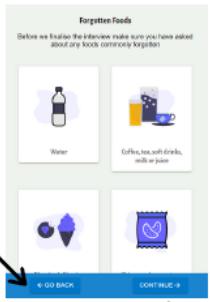
"Certain foods are often forgotten. In addition to what you have reported, did you eat any of these?"

Read the checklist aloud

B

If they say "Yes" to any, tap here

This will take you back to the main page, so you can add the missing foods to the meal (Step 2)



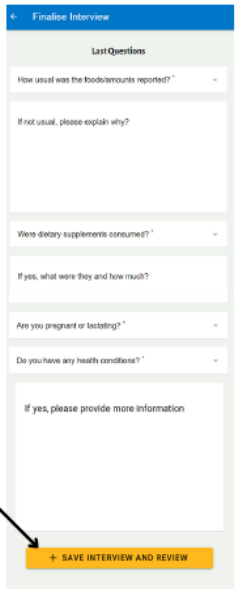
If "No", tap continue to move to the next page

5 Complete the interview

"Nearly done, just a couple more questions"

A

Read the questions to the participant



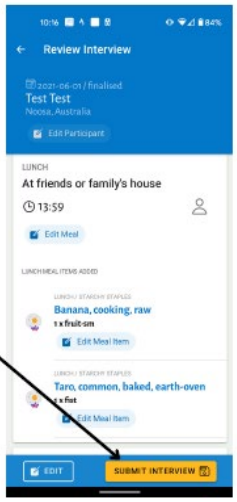
B

Then, TAP HERE to save and review!

6 Review and submit

"Let's review everything - Is this everything you had to eat and drink yesterday?"

If there are no more changes and the interview is complete, TAP HERE to submit.

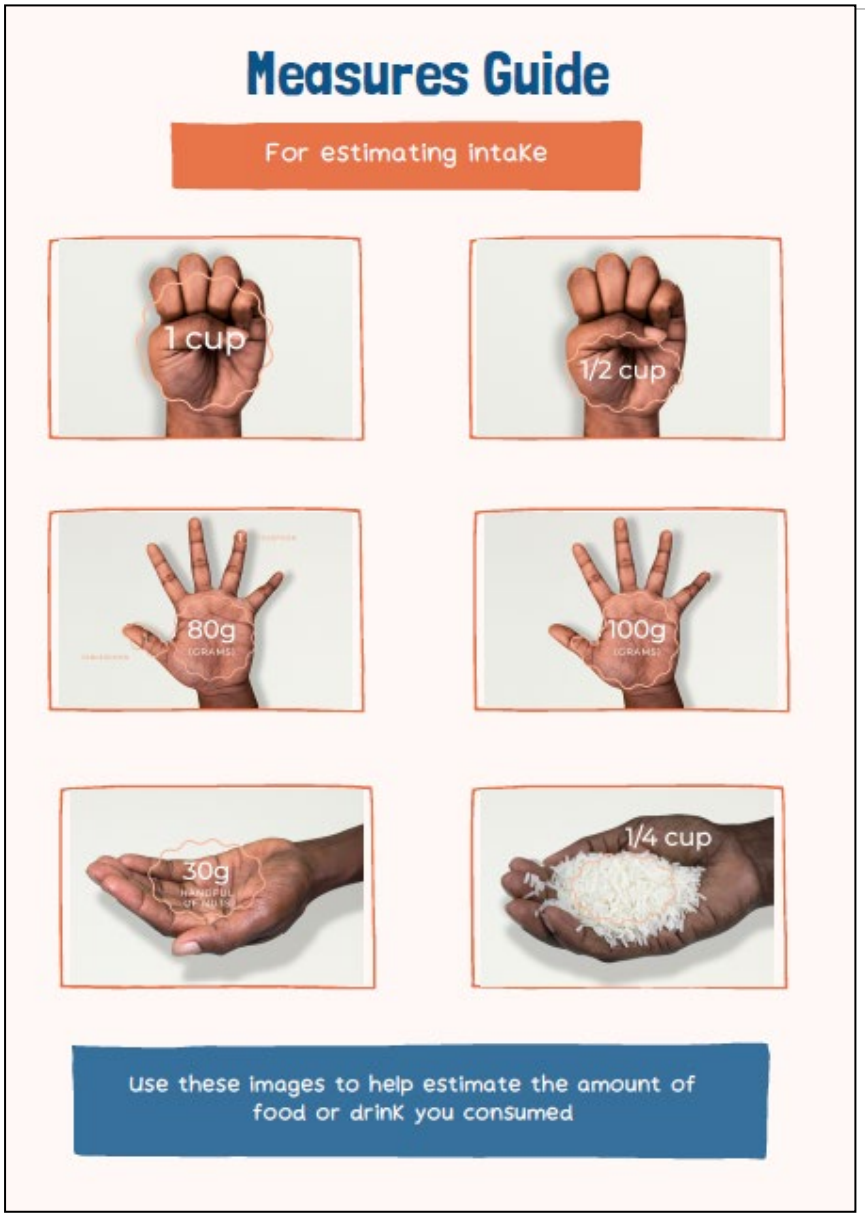


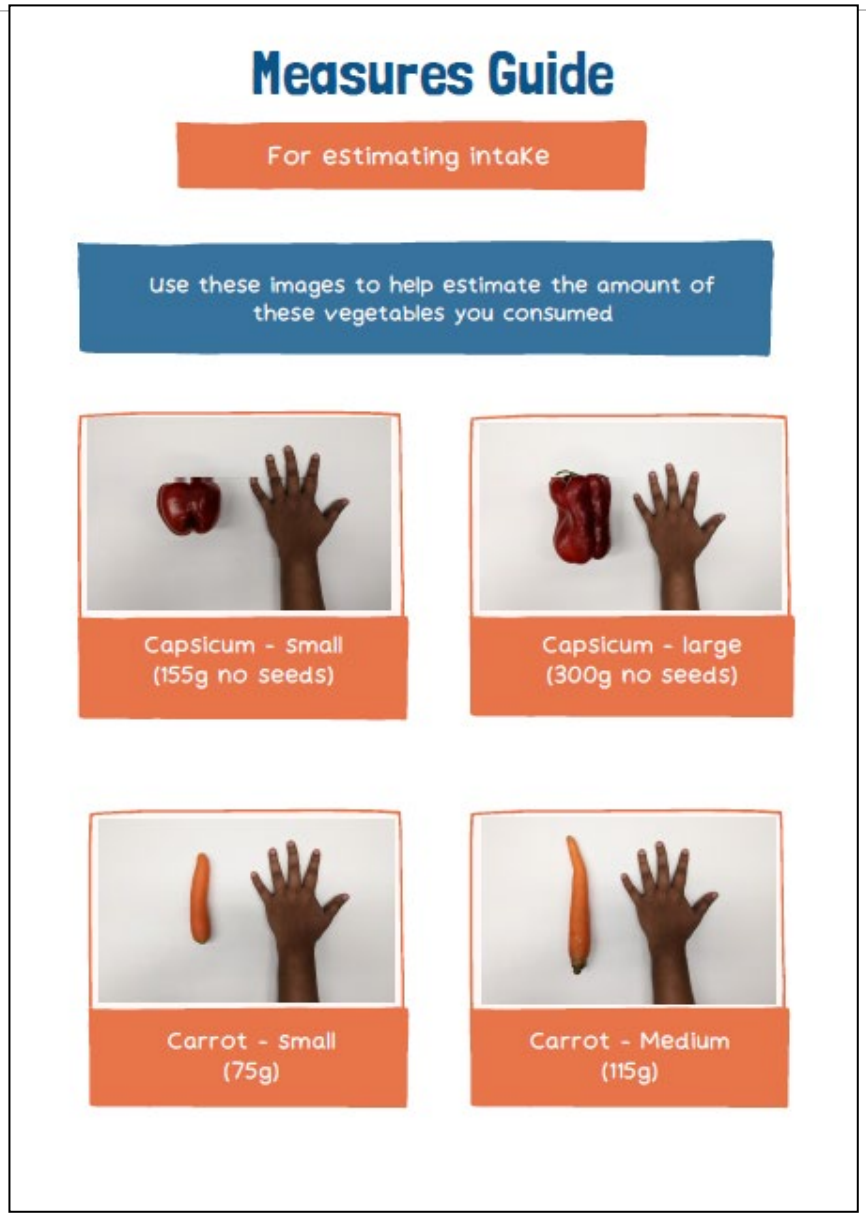
IMPORTANT: Once you have submitted you will not be able to make further changes. Ensure you have collected all the information you possibly can before submitting.

We're done!

Thank you for participating. Have a great day ahead.

Appendix 3. Example resources/handout guides for enumerators (for the dietary interviews)





Measures Guide

For estimating intake

Tomato Roma - Small
(60 g)

Tomato - Small
(90 g)

Tomato - large
(170 g)

Cucumber - very Small
(30g)

Cucumber - Small
(110 g)

Cucumber - medium
(170 g)

Measures Guide

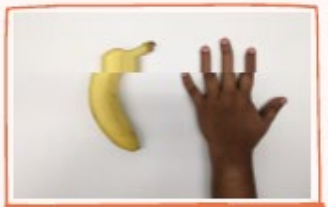
For estimating intake

Avocado - Small
(65g flesh only)

Avocado - medium
(150g flesh only)

Banana cooking - Small
(60 g flesh only)

Banana ladyfinger- Small
(60 g flesh only)

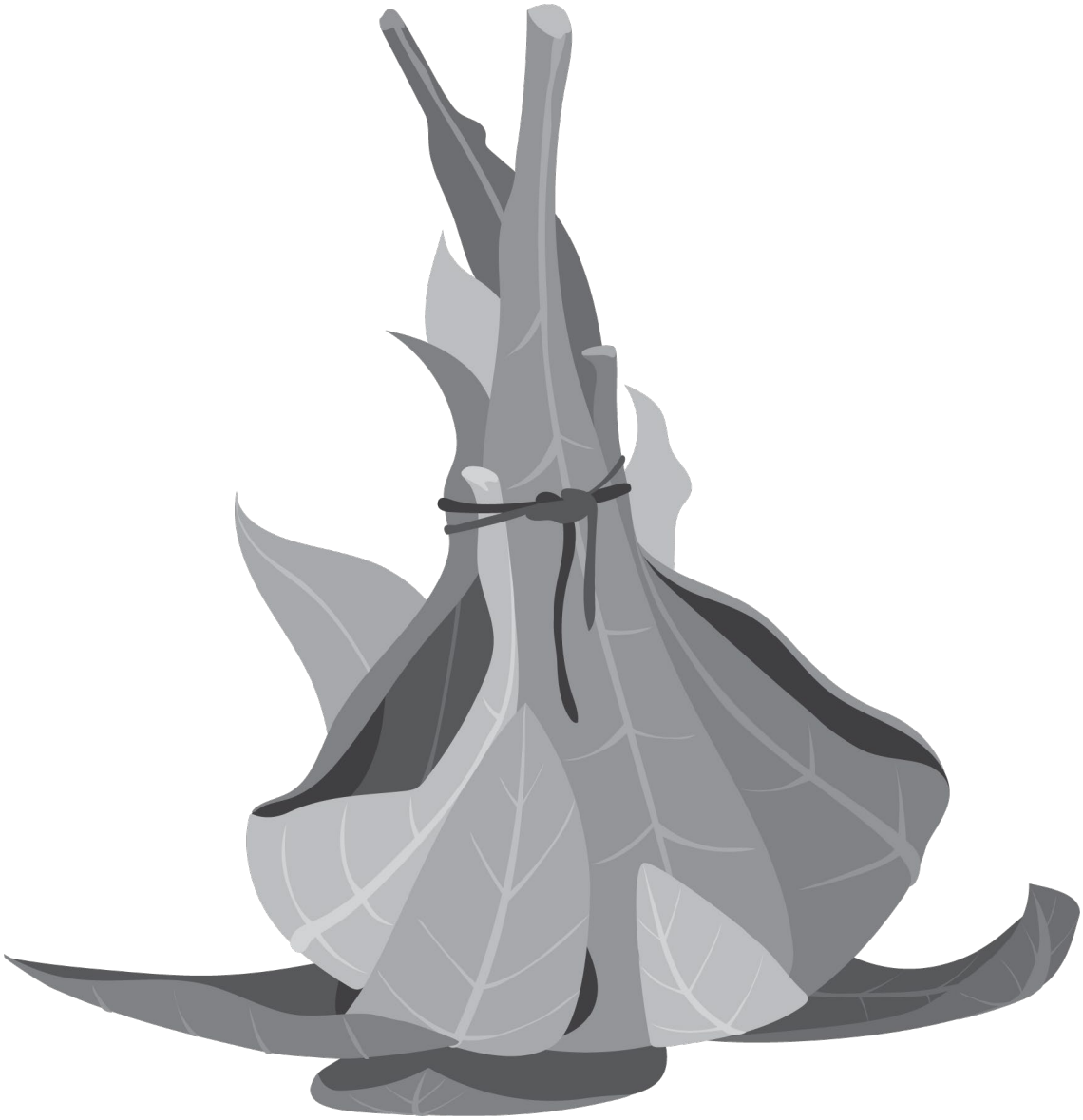


Banana cavendish -
medium
(100 g flesh only)

Banana cavendish -
large
(145 g flesh only)

Australian Centre for International Agricultural Research

University of the Sunshine Coast Australia



MODULE 1 – Seaweed as Livelihood

May 2022

Seaweed as Livelihood – verbal presentation

Aim:

- Awareness of the entire 'value chain' (i.e. post-harvesting opportunities)
- Increase knowledge on nutritional benefits of seaweed

Time: 45 mins
(this is following the traditional welcome and protocols)

Instructions:

PART A: Verbal presentation

- Provide an overview of previous objectives and how this program is a follow-on (Summary sheet)
- Overview of the Village Fishing Teams program and overarching aim (shared Action Plan)
- Describing the seaweed value chain

PART B: Group reflection – Seaweed value chain

- *"How is this information (resource 3) similar or different to how you have viewed seaweed in your village before?"*
- *"Which parts of the value chain do you see the most value or opportunities for you and your village?"*

Handouts for participants:

- ✓ Seaweed Value Chain handout
- ✓ Fact sheets: Nutritional benefits of sea grapes and halymenia
- ✓ Recipe cards

Resources for facilitators:

- ✓ Summary of research project & preliminary findings
- ✓ Copy of Powerpoint presentation
- ✓ Seaweed Value Chain – laminated version
- ✓ Post harvesting opportunities – laminated booklet

Australian Centre for International Agricultural Research

University of the Sunshine Coast Australia

MODULE 2 – Working towards a shared vision

May 2022

Working towards a shared vision

Aim of module:

- Identifying existing strengths and assets that they already have
- Setting a shared vision for seaweed by focussing on the 'why' (the purpose for doing seaweed work), who needs to be involved and what's most important them

Objective / intent of activity	Time	Instructions	Tools/ templates
What we have / existing strengths and assets - Identify assets and strengths - Identifying where seaweed grows in our village (types, location) (Note - Activities 1 and 2 can be done simultaneously)	45 min	**Activity 1: Our Strengths - "What makes our village a strong fishing village?"** **Step 1:** In small groups of 4-5 people, complete the Strengths template **Step 2:** Each person to also complete the skills audit form for individual strengths and skills **Step 3:** Once completed, each group shares what they wrote to the whole group. **Step 4:** Transfer the strengths and assets to the Action Plan template. ** Facilitators to collect the individual skills form, to collate data. The collated information will be used as a resource in Module 3.	Strengths template: 'What makes our village a strong fishing village'? Individual skills audit form

	45min	**Activity 2: Mapping our fishing and seaweed activities** – where seaweed grows, where seaweed-related work takes place **Step 1:** Use the example map to explain the activity **Step 2:** Divide into small groups of 4-5 people, and each group draws a map of the village **Step 3:** Presentation of the maps by each small group to the larger group **Step 4:** Once all maps are pinned up, the Facilitators can bring across the details into one map to make a combined detailed map.	Example village map
Using the 'pie' template to help groups think about their vision for future and what's most important to them about it, from different perspectives of range of stakeholders. By focussing on the 'why' (purpose) and what's most important, they can then to come up with a collective agreed vision for the future in relation to seaweed *Note – breaking the vision into achievable steps/goals will be covered in the Action Planning Activity in Module 3.*	1 hr	**Activity 3: Codesigning the vision -** Visualising the future for seaweed and setting a shared vision *"What's your vision in the next 2-3 years for seaweed?"* **Step 1:** Break into small groups and give each group a blank wedge of the 'pie'. Each small group completes their wedge. (see note) **Step 2:** All groups come back together and put their wedges together to form one big pie. Each group shares what they wrote. Then as a whole group, look for areas of consensus across all wedges (as well as where there are conflicting or different ideas). Facilitator to link ideas/themes (e.g. using different coloured pens etc.) Then write a shared vision – this may be more like a collection of words or ideas, rather than a fully formed statement. **Step 3:** Transfer the shared vision to the Action Plan template.	Concept mapping of stakeholders (to help identify who's got a interest in this, who benefits, who needs to be involved) – note: the concept map might be useful to do before Step 1. It can also be built upon to think about who else needs to be involved to help achieve the vision. 'Pie' template for a shared vision

Australian Centre for International Agricultural Research

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MODULE 3 – Planning together as a team

May 2022

Planning together as a team

Aim of module:

- To build seaweed-related planning and management skills
- Support shared decision-making and collaboration
- Develop a shared action plan (that could go in the Village Fishing Management Plans)

Objective / intent of activity	Time	Instructions	Tools/ templates
To develop a seaweed seasonal calendar • **Knowing when (and where) seaweed grows** • **Mapping seaweed activities against cultural and village activities**	1 hour	**Activity 1 – Seasonal calendar** **Step 1. Whole of group activity** – Complete the Seasonal Calendar: • First Row: Start with cultural activities first (. These are important cultural events for the village such as Mothers Day, Easter, Independence Day, White Sunday. The village may either not work over this time, or may like to have ample seaweed for celebration. • 2nd Row: Map other activities that occur in the village. This could be things such as plantation activities that involve villagers (e.g. taro harvest), or school activities etc. • Rows 3 – 6. Map out each type of seaweed across the months (when to plant, grow, harvest and sell). Use symbols to represent different types of seaweed (e.g. wild vs farmed grapes; halymenia) **Step 2.** To complete rows 7 & 8, as a group discuss how money from seaweed could be used. Then as a group, complete the last two rows of the table (this corresponds with when they sell seaweed or other village income)	Harvesting fact sheet Seasonal calendar template

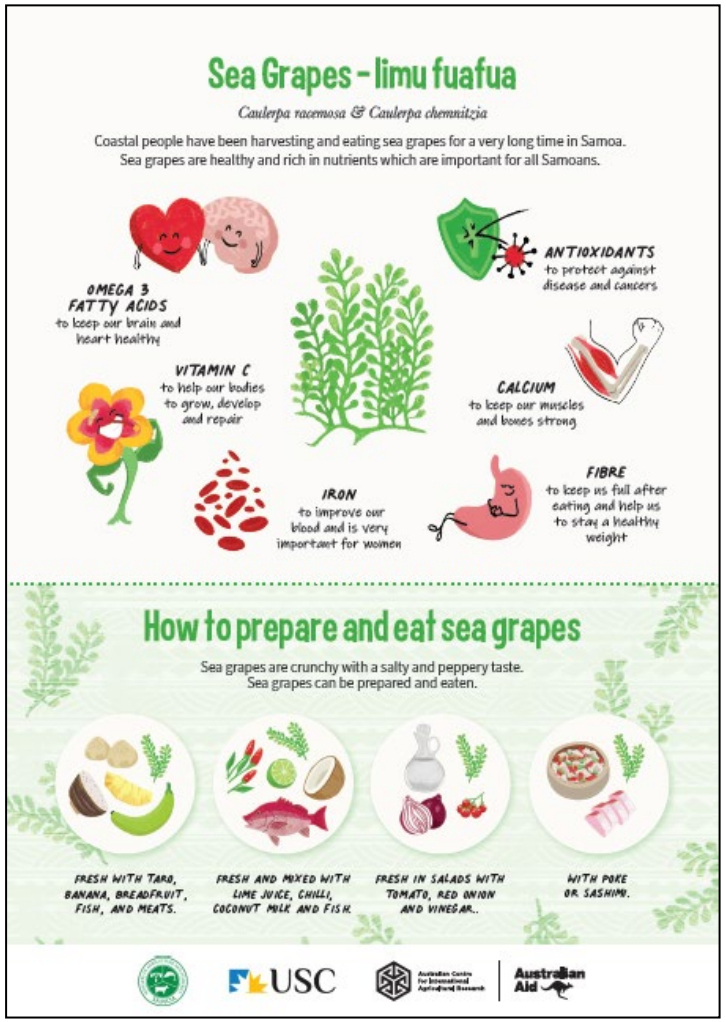
		• Money for seaweed might include things like saving for equipment or materials • Money for village this might be income from seaweed that is put in village account for other village activities **Step 3. Group reflection** – how is this kind of planning useful?	

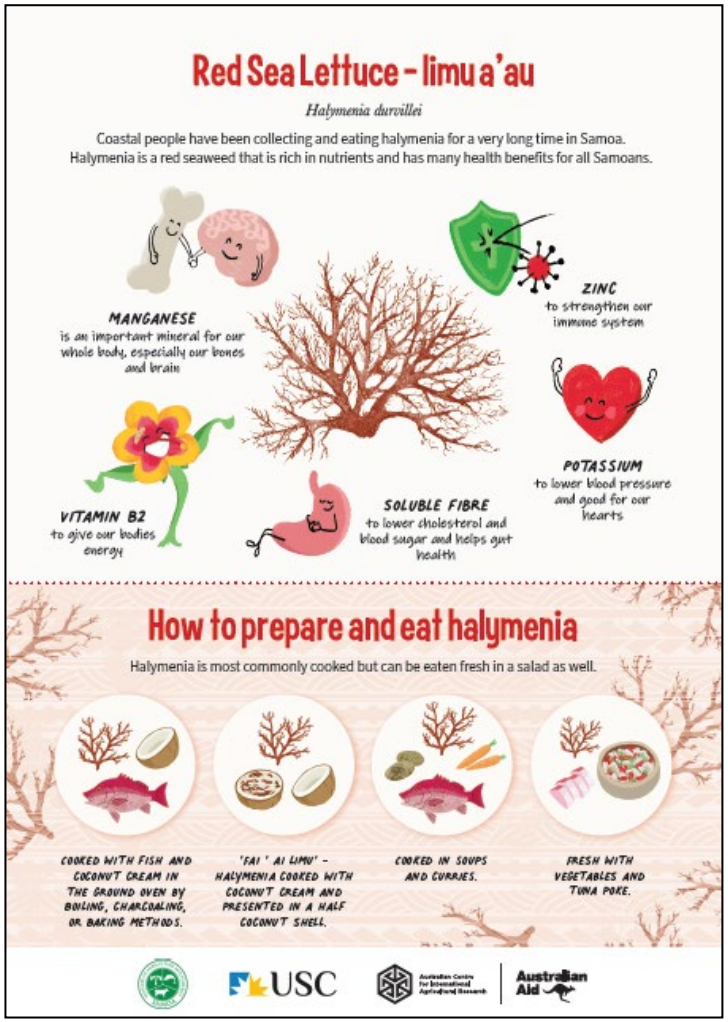
Scheduling time – delegating tasks and time management skills
• **Identifying all tasks required to do seaweed work**
• **Assigning who is responsible and when**
	45 mins – 1 hour	**Activity 2 – Scheduling time for seaweed work**
		
		Step 1. Use the FGD Roles summary sheet to set the scene. As a whole group, reflect on results of their focus group data. Ask the group:
		• "Does this reflect what you shared last time?" "Is there anything you want to change?"
		• "Now you know more about the Value Chain, are there any other tasks missing & where do they fit?"
		
		Step 2. Using Value Chain handout and their village map, brainstorm all key tasks required for village seaweed activities and list in Column 1 & 2 of the 'Task and Time Management Table'.
		
		Step 3. For each task, discuss and complete the corresponding column.
		• When does the activity/task occur? (Column 3)
		  • *Frequency / how often*
		  • *Day of week*
		  • *Time of day*
		• Who does the task (who is responsible)? (Column 4)
			FGD Roles Summary sheet
			
			'Task and Time Management' Table
			
			Other helpful resources: The skills audit data combined (from Module 2)
			
			Value chain handout

To develop a clear agreed Action Plan • **Consolidating everything from previous activities into a shared action plan**	1 hour – 1 ½ hours	**Activity 3 – Developing a shared action plan** The facilitator may like to set the scene by explaining how all the learnings and discussions from the last 2 days will come together in this plan. The facilitator may also like to share a story of a successful village and how good planning has helped them.	Action Plan template (large)

• **Identifying the next action steps to take** Note – this is a long activity, and most villages will need to continue this after the workshops. In the activity, it is good if they can write something in each section as a start☺		**Steps:** Group activity – as a group, complete the Action Plan template. Fill the information in the template in this order: • **Our vision** (this is the shared vision from Module 2, activity 1). This can broken down into smaller goals (in the sun rays) • **What we have** (strengths/assets) – these were identified in Module 2 • **What we need** – this is any gaps or challenges they have identified (e.g skills gaps). Also include the solutions to these. • **Next steps**– These are practical steps needed to progress towards the short term goals and vision. Ask the group "What if our success was completely guaranteed, what bold steps would we take?"	

Appendix 5. Example handout for participants in the VFT pilot – Fact sheets: Nutritional benefits of sea grapes and halymenia





Appendix 6. Schedule for the Village Fishing Teams pilot

Day 1

Time	Activity
0900	Opening & Welcome
0915	Module 1 • Seaweed as livelihood – Verbal presentation (PowerPoint) and Handouts
1000	Module 2 • Activity 1: Our strengths – What makes our village a strong fishing village
1030	Morning Tea served
1045	Module 2 • Activity 2: Mapping our fishing and seaweed activities
1115	Presenting completed activities back to the whole group by participants
1135	Wrap up and close
1200 – 1300	Lunch served

Day 2

Time	Activity
0900	Welcome and Presentation (uses of seaweed, seaweed farming)
0930	Introduction/explanation of the activities
0935	Morning tea served
0945	Module 2 • Activity 3: Codesigning the vision
1015	Module 3 • Activity 1: Village seaweed seasonal calendar • Activity 2: Scheduling time for seaweed work
1045	Evaluation surveys/interviews with Participants
1130	Presenting completed activities back to the whole group by participants
1155	PowerPoint presentation of the “Our Skills” summary from Day 1 (Module 2, Activity 1)
1200	Module 3 • Activity 3: Developing a shared action plan
1215	Presentation of certificates to Participants and Facilitators Closing remarks, thank you and formal farewell
1230 – 1300	Lunch served

Appendix 7. Photos from the Village Fishing Teams pilot

Photo 1 – MAF Fisheries staff who facilitated and delivered the Village Fishing Teams pilot program in Asau (from Left to right: Malaeulu Mamoe (Support), Losan Madar (VFT Facilitator), Ulusapeti Tiitii (VFT Facilitator), Courtney Anderson (UniSC), Victoria Muavae (VFT Facilitator) and Therese Levi (VFT Facilitator).

Photo 2 – MAF fisheries team and Courtney in Salelologa.

Photo 3 – 9 - Women and men participating in the Village Fishing Teams Pilot group activities and presenting back to the whole group (Objective 3).

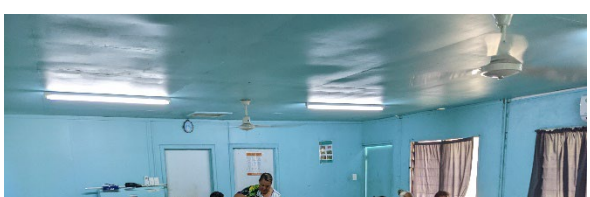
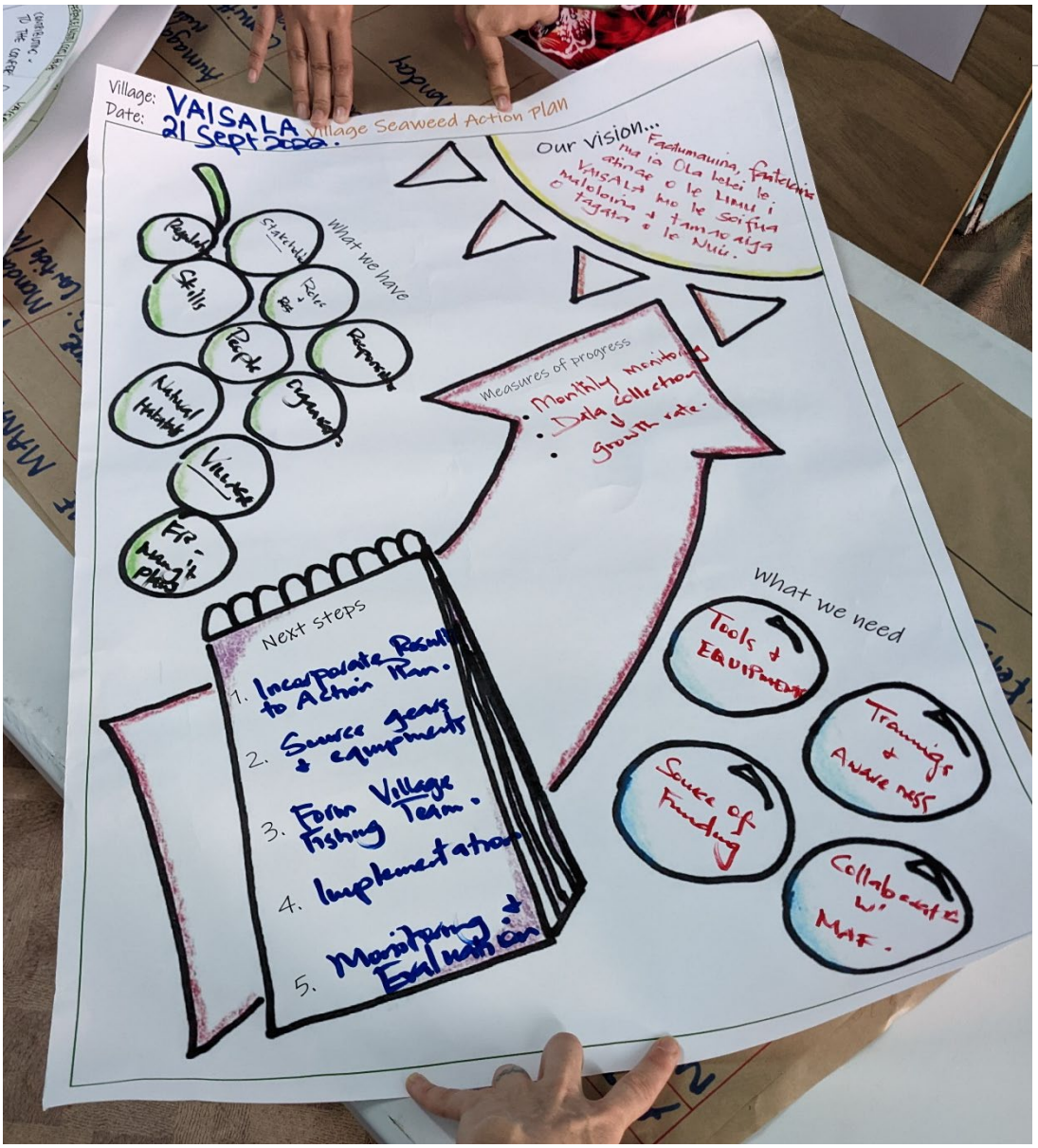


Photo 10 and 11 – The participants with their completed activities and certificates.

Photo 12 – The village participants from Vaisala, pictured with Courtney (middle) and Ulusapeti (left) end of Day 1.

Photo 13 – The village participants from Vaisala, pictured with Courtney (middle) and two MAF facilitators - Ulusapeti (right) and Victoria (left) end of Day 2.

Photo 14 – The shared action plan that will be implemented under the Community- Based Fisheries Management Program (CBFMP).


Village: VAISALA
Date: 21 Sept 2022.
Village Seaweed Action Plan
Our vision...
What we have
Measures of progress
Monthly monitoring
Data collection
Growth rate.
Next steps
1. Incorporate Result to Action Plan.
2. Source gears & equipments
3. Form Village Fishing Team.
4. Implementation
5. Monitoring Evaluation
What we need
Tools & Equipments
Trainings & Awareness
Source of Funding
Collaborate w/ MAF.