



## **FOOD SYSTEMS SOLUTIONS**

FSM R&D Division of Trade

Funded by the United States Department of Commerce

Economic Development Administration



## **Developing a Food Innovation System for Kosrae State:**

*Local Food Processing for Increased Health*

*Economic Growth and Job Creation*



# **Kosrae State Food Systems Solutions Framework**

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## FOREWORD

Food security has long been a top priority for our beautiful island state of Kosrae in the Federated States of Micronesia.


Kosrae's volcanic terrain, consistent high temperatures, high humidity, and high rainfall are ideal for our traditional crops like bananas, breadfruit, taro, and various citrus fruits, which are the mainstays of our subsistence agriculture. However, these same weather conditions, especially the heavy rainfall, also present significant challenges, such as soil saturation and the destruction of fragile plants, requiring protected cultivation methods such as greenhouses to improve vegetable production and manage water runoff.

Realizing our food production potential has also been hindered by climate change inspired crop diseases, extreme weather, sea level rise and coastal erosion threatening our agricultural areas. We also struggle with a high dependence on unhealthy imported foods that has led to our states' very high rate of obesity and non-communicable diseases.

Thus, we welcome this Food Systems Solutions Framework providing realistic and workable steps to building a sustainable food system for the people of Kosrae. This Framework is fully aligned with our states' many goals to: 1) establish protected growing environments for fresh vegetables and fruits; 2) provide reliable access to nutritious local foods; 3) reduce dependence on imported goods; 4) grow our economy and create new jobs; 5) educate our people, especially youth, about sustainable food production practices, and 6) explore our state's potential to export fresh product to neighboring atoll communities.

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Working together now to implement this Food Systems Solutions Framework will provide key steps to increasing our state's health, economy and long-term self-reliance.



Honorable Tulensa W. Palik  
Governor, Kosrae State, Federated States of Micronesia  
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# Executive Summary

## Food Systems Solutions Framework for Kosrae State, Federated States of Micronesia

*Map of  
Kosrae State*

*Courtesy of United  
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Kosrae State, a volcanic island within the Federated States of Micronesia, faces both pressing challenges and significant opportunities in building a stronger food system. With a population of less than 7,000 people, a subsistence-based economy, and limited private sector investment, the island relies heavily on government employment, fishing rights and imported goods. Despite these constraints, Kosrae is endowed with fertile soils, lush landscapes, and a resilient community, offering a strong foundation for developing a more self-reliant, climate-resilient, and inclusive food system.

To address Kosrae's local food production needs and potential, the FSM Department of Resources and Development, in partnership with Rutgers University, local stakeholders, and with the support of the United States Economic Development Administration within the Department of Commerce, launched the Food Systems Solutions project, the nation's most comprehensive effort to date to strengthen FSM's overall food sovereignty. Building upon prior recent studies funded by the Green Climate Fund SAP020 examining FSM family farms impacted by climate change, as well as the 2021 FSM Food System Dialogue, this project engaged farmers, fishers, traditional leaders, entrepreneurs, civil society, and policymakers by way of surveys, focus groups, community convenings, and workshops to design a food processing framework rooted in community priorities.

The **Food Systems Solutions Framework** outlines a pathway for Kosrae to modernize its agriculture, expand aquaculture, and strengthen food processing capacity while also creating new opportunities for

regional trade. Revitalizing the coconut industry, expanding taro cultivation, and scaling up greenhouse technology are central to improving local production and food security. The National Aquaculture Center further positions Kosrae to supply high-value marine products such as giant clams, sea cucumbers, and sea grapes for export, while bycatch can be transformed into animal feed and fertilizer. Beyond meeting local needs, Kosrae's proximity to the Marshall Islands creates a regional market opportunity, particularly in supplying Kwajalein and Ebeye with fresh produce and processed foods that can help close nutritional gaps and reduce reliance on costly imports for this neighboring atoll nation.

### **Enabling Growth Activity 1: Creation of Food Innovation and Processing Facilities**

The first enabling growth activity focuses on the development of Flexible Food Innovation Centers (FICs), which are designed as a tiered system to support crop aggregation, food processing, storage, and innovation. At the village level, small Tier I facilities will provide simple aggregation and low-level processing of coconuts, taro, bananas, and other crops. These will feed into Tier II specialized facilities dedicated to coconut processing on the one hand, and breadfruit, taro, and banana processing on the other. At the highest level, Tier III innovation centers will provide advanced food safety testing, large-scale storage, and community teaching kitchens, while also transforming bycatch and agricultural waste into animal feed and fertilizer. Aggregate greenhouse crops can be brought to higher tiers for storage and processing. Together, this network will reduce post-harvest losses, add value to raw products, and expand both local and export-oriented markets.

Kosrae State has strong potential to develop a range of microenterprises beyond agriculture that support local livelihoods, food security, and sustainable resource use. A key opportunity lies in establishing both marine and chicken hatcheries. Building upon the efforts of the Kosrae based National Aquaculture Center (NAC), a marine hatchery would enable the cultivation and restocking of valuable aquatic species, such as clams needed for the health of Kosrae's reef systems and supporting long-term aquaculture and marine conservation efforts. In parallel, a chicken hatchery would enhance local poultry production, reducing reliance on imported eggs and meat while creating small-scale farming opportunities for families and cooperatives across the island. Additional opportunities include aquaculture focused on high-value exports, such as sea cucumbers and sea grapes, which are in demand in East Asian markets. To complement these sustainable development efforts, two maritime food processing centers, one in Lelu and one in Utwa, are proposed.

### **Enabling Growth Activity 2: Improved Information Systems to Support Decision-Making**

The second enabling growth activity centers on improving information systems through the creation of a food systems app. This digital platform is envisioned as a modern complement to traditional knowledge, connecting producers, buyers, and distributors in real time while also serving as a hub for training resources, market information, and coordination across FSM states. By improving communication and transparency, the app will help Kosrae's farmers and fishers align production with demand, access new opportunities, and strengthen the overall efficiency of the food system. Content for such an app can be housed for free public access on the state's web platform.

### **Enabling Growth Activity 3: Education, Training, and Technical Support**

Kosrae's food producers have expressed a strong need for capacity-building in areas such as crop management, seed saving, greenhouse operations, aquaculture, livestock rearing, and food processing. Equally important is training in food safety, preservation, packaging, and business management. By combining modern agricultural and trade expertise with traditional knowledge, and by engaging women and youth as active participants, the project seeks to create a skilled and adaptive workforce capable of sustaining long-term growth while building resilience against climate change.

### **Enabling Growth Activity 4: Enhanced Community Management and Policy Advocacy**

Community leaders and managers in Kosrae see the establishment of food innovation facilities not only as

a means to strengthen the local economy, but also as an opportunity to improve nutrition and reduce dependence on imports. Policy-makers have voiced support for increased community involvement, training, and infrastructure development, and they are committed to aligning local policy with producer needs in order to sustain momentum and ensure broad-based participation.

Taken together, these four enabling growth activities form an integrated strategy for Kosrae to transition from dependence on imports and subsistence practices to a diversified food system that delivers health, nutrition, and economic opportunity. With an investment of \$10.5 million, the Food Systems Solutions Framework for Kosrae State envisions a future where innovation and tradition combine to build a resilient, self-reliant, and prosperous food system that benefits local communities and strengthens regional ties across Micronesia.



FSM's National Aquaculture Center in Kosrae State

# FOOD SYSTEMS SOLUTIONS

FSM R&D Division of Trade

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Economic Development Administration

## FOOD SYSTEMS SOLUTIONS PROJECT OVERVIEW

The Federated States of Micronesia (FSM) Department of Resources and Development (R&D) initiated the Food Systems Solutions (FSS) project, funded by the United States Economic Development Administration (EDA). This ambitious initiative aims to establish a sustainable national food system that strengthens supply chains and facilitates trade linkages both within and across the four states of the FSM. Through this project, FSM seeks to build a resilient and coordinated food system that enhances national food security by improving information systems, developing strategic plans for the creation of Food Innovation Centers in each state, building the capacity of local stakeholders, and empowering community-based management and advocacy efforts.

Recognizing the complexity and interdependence inherent in food system development, the Food Systems Solutions project has been designed to promote inclusive engagement across all sectors of FSM society. It acknowledges that achieving sustainable food system growth requires collaboration among farmers, fishers, consumers, sellers, entrepreneurs, policymakers, educators, and civil society leaders. Through strengthening communication channels and encouraging cross-sectoral decision-making, the project aims to significantly enhance the efficiency, resilience, and effectiveness of FSM's local and national food systems.

This FSS project is intended to improve food security across the nation through an innovative approach focused on strengthening and coordinating food systems through enhancing information systems, developing plans for Food Innovation Centers in each state, increasing local capacity, and community management and advocacy. The Rutgers Food System Science team was contracted to supervise the Food Systems Solutions project in partnership with FSM state partners and local NGOs.

This Food Systems Solutions (FSS) project evolved from the 2021 United Nations Food System Summit and the corresponding Federated States of Micronesia Food System Summit Dialogue.



The objective of the FSS project is **Economic Growth through Local Food Production.**

## Economic Growth through Local Food Production

**71% of FSM Household Expenditure goes to food**, primarily imported food (GCFSAPO20 Baseline Assessment 2024). This means the majority of FSM families' income is supporting companies outside our country.



If we took just 20% of the money we spend on imported food and use it to buy locally produced food, cooking oil and drinks, we would have an additional **5 million dollars** circulating in our economy each year (2016 FSM Agriculture Policy).



Producing and buying locally-grown and processed food generates local jobs and keeps our money in our states and our nation, making us more independent, wealthier and healthier.

Local Food Processing **strengthens the economy by replacing imported foods** with locally processed foods to support local jobs and businesses to keep money within the states.

## ECONOMIC GROWTH FRAMEWORK

The FSS project is designed to support community-led food system development by strengthening and sustaining local food markets. It does so by focusing on four interrelated and mutually reinforcing activities that enable growth.



## FOUR ENABLING GROWTH ACTIVITIES SUPPORT LOCAL FOOD PRODUCTION:

First, the project aims to expand supply through a **tiered network of Food Innovation Centers**, supported by training programs that help farmers increase both the volume and quality of their production. Second, it facilitates efficient market matching between buyers and sellers while reducing search costs through a **user-friendly information-sharing mobile platform**. This platform features buyer and seller chat functions, real-time inventories of surplus produce, and mapped delivery points to connect producers with markets. Third, the project emphasizes the development of **education and technical training** to support the operations of Food Innovation Centers and strengthen the local food supply chain. Finally, it promotes **improved local governance** through democratically managed cooperatives and public-private partnerships that set quality standards **and policy advocacy** to implement transparent profit-sharing rules, ensuring trust, compliance, and long-term market resilience. Demand is further stimulated through targeted policy interventions, such as state-led local food procurement mandates.

## Enabling Growth Activity 1: Development of Flexible Food Innovation Centers

**1<sup>ST</sup> Enabling Growth Priority Area:**

**Development of Food Innovation Centers (FIC)  
Processing of Local Foods for Import Substitution**

Dried local papaya, mango & pineapple

Smoked fish

Local Baked Goods: Example, banana bread and coconut cookies

Local Coconut Milk & Coconut Water

Local Flour: Breadfruit, Coconut and Taro

Local Chips: Banana, Breadfruit, Taro, Yam

Local Juice Drinks: soursop juice

## Enabling Growth Activity 2: Improved Information Systems to support Decision-Making

**2<sup>nd</sup> Enabling Growth Priority Area:**

**Develop FSM's Shared Information Systems  
Linking Food System Stakeholders  
Connecting Farmers and Markets**

**Pacific Pests, Pathogens & Weeds**

Identify Pests, Diseases & Weeds

Launch the interactive Key

Full Fact Sheets

Access the full detailed fact sheets

Mini Fact Sheets

**ICT and Mobile Apps Drive Global Agriculture**

Source: SourceTrace Systems, 2017. Pacific Pets Pathogens Weeds Phone App, 2023.

**Enabling Growth Activity 3: Improved Education, Training and Technical Support**

**3<sup>rd</sup> Enabling Growth Priority Area:**

**Develop Education, Training and Technical Support Plan for Food Innovation Center Jobs and Supply Chain**



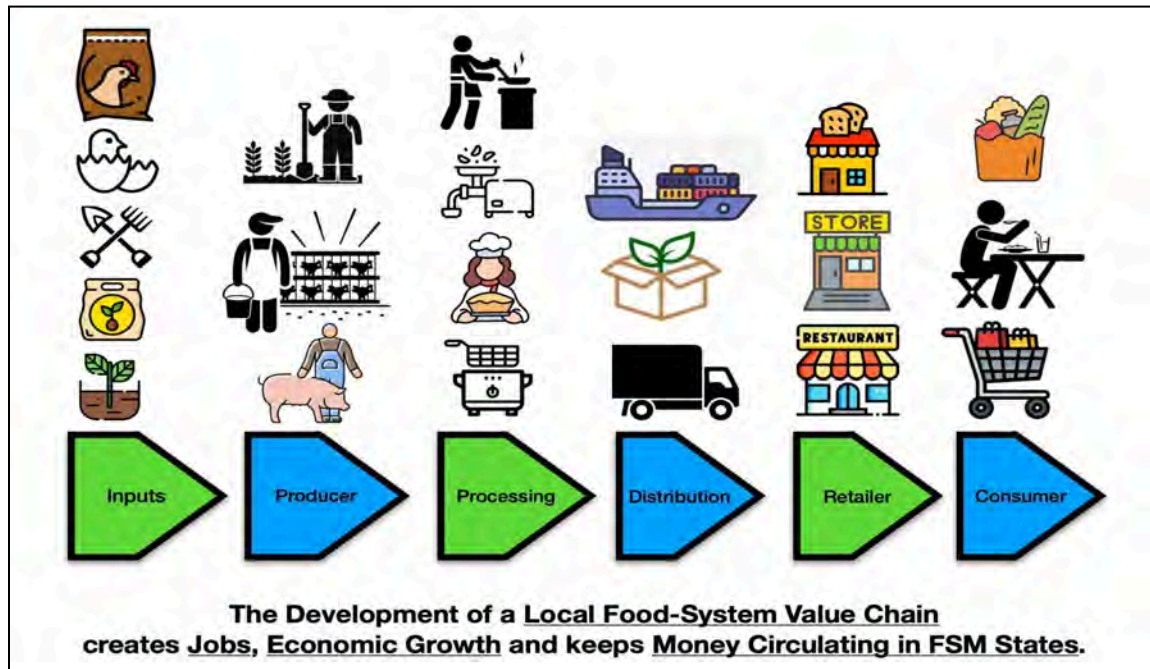
**Enabling Growth Activity 4: Enhanced Community Management and Policy Advocacy**

**4<sup>th</sup> Enabling Growth Priority Area:**

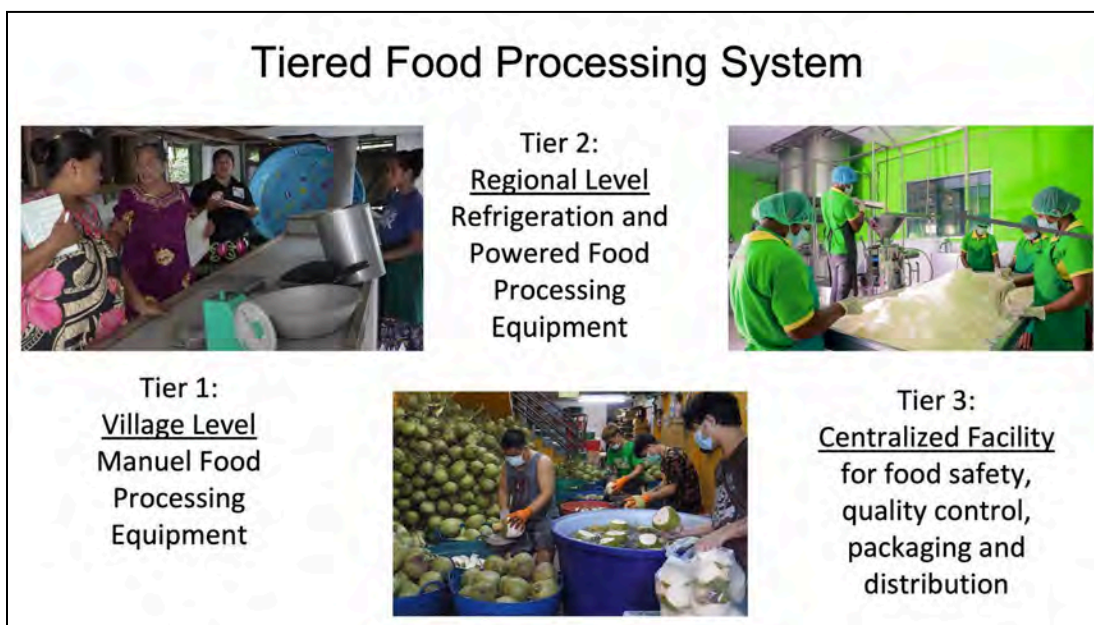
**Support Community Management and Policy Advocacy Capabilities for Effective Local Governance**



The Food Systems Solutions project seeks to support community-based food system development that builds each step of the **Local Food System Value Chain** by addressing four enabling growth pillar activities in a holistic, interacting manner that when brought together facilitates short and longer-term sustainable growth. We consider sustainability to be grounded and guided by cultural, environmental, and economic considerations.



A tiered food processing system offers **Value Addition Job Opportunities** throughout the community. This project stimulates the local economy through the use of a decentralized food system development approach to include as many people in the supply chain with a Food Innovation Center at the top tier for food safety, packaging, and distribution.



By strengthening and sustaining local food markets and raising farm productivity, this initiative lays the foundation for reliable access to affordable, nutritious food across all four states. The creation of value-adding processing hubs and support for smallholder agribusinesses generates new employment opportunities and broadens economic participation in rural communities. This integrated approach not only builds resilience against supply shocks and price volatility but also fosters sustainable growth, higher household incomes, and long-term food security for the Federated States of Micronesia.

**An example from Pohnpei State:** Imported foods that can be replaced with locally grown and locally processed foods. The amount of money spent on these food imports can be redirected to support local food producers and food processors. In 2021 alone, the people of Pohnpei spent more than 4.5 million US dollars on imported chicken meat and chicken/pig feed.

HS Codes-6 Digits	Import Items-Pohnpei(CIF\$)	2019	2020	2021
070490	Chinese Cabbage	\$44,384	\$30,436	\$40,710
070960	Bell Peppers	\$44,316	\$88,318	\$62,086
080450	Mango	\$14,235	\$5,542	\$24,848
080430	Pineapple	\$9,793	\$10,227	\$13,955
080711	Watermelon/Cantaloupe	\$42,299	\$42,348	\$30,102
070511	Lettuce	\$150,561	\$173,877	\$130,626
091011	Ginger	\$13,524	\$19,199	\$21,078
071420	Yam	\$25,805	\$31,283	\$52,673
080550	Lemons	\$4,443	\$3,839	\$6,731
151190	Vegetable Oils	\$3,116	\$33,558	\$50,328
040110	Milk (Fresh)	\$80,829	\$80,548	\$70,319
200410	Potato Chips	\$6,185	\$557	\$128,199
020714	Chicken (Frozen)	\$38,188	\$20,130	\$2,252,174
040721	Chicken Eggs (In Shell)	\$113,930	\$143,077	\$170,188
230990	Chicken and Pig Feeds	\$1,127,671	\$1,819,351	\$2,372,130
<b>Total</b>		<b>\$1,871,278</b>	<b>\$2,622,984</b>	<b>\$5,732,255</b>

As a nation, FSM imported \$5.64M in poultry meat in 2023 according to the Observatory of Economic Complexity (The Observatory of Economic Complexity, n.d.).

**A Community-Based, Participatory Approach to Food System Development:**

Community-engaged research plays a vital role in addressing food insecurity, reducing health disparities, and empowering communities to meet their own needs. In the context of food systems, this approach actively involves community members in the research process, ensuring that projects are place-based, culturally relevant, practical, and broadly supported. It also fosters trust and strengthens relationships between researchers and the community, contributing to the long-term sustainability of interventions.

To capture the aspirations of FSM’s farmers, fishers, and other key stakeholders in local food

production, a community-based participatory mixed methods approach was developed and implemented. Guided by the United Nations' *Rethinking our Food Systems: A Guide for Multi-Stakeholder Collaboration* and working in close partnership with local NGOs and community groups in each FSM state, ten FSS survey tools were created. These tools included both quantitative and open-ended questions to gather comprehensive data from food system stakeholders across all four states. A summary of the FSS community surveys are below.

**Food System Stakeholder Groups Surveyed in each FSM State:**

**Producer Survey:** 65 per state minimum

**Consumer Survey:** 65 per state minimum

**Community Management Leader Survey:** 10-12 per state minimum

**Food Distributors and Retailers:** 24 per state minimum

- **Local markets** 11-12, minimum per state
- **Restaurants** 10-12, minimum per state, 4 for Kosrae

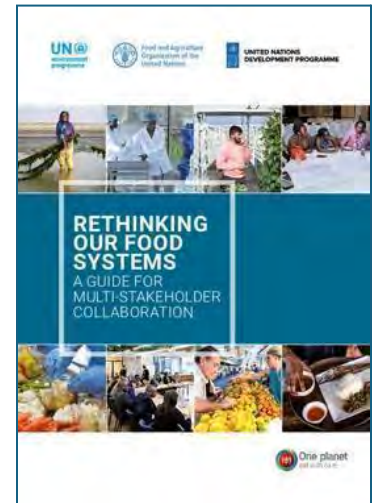
**Trainer Surveys:** 10-12 per state minimum

**Information Content Providers Survey:** 8 per state minimum

**Information Infrastructure Provider Survey:** 3 per state minimum

**Technical IT Survey:** 3 per state minimum

**Policymaker Survey:** 7-12 per state minimum



In addition to the surveys, qualitative data was also collected by way of focus groups, interviews

and a two-day FSS stakeholder convening with workshops in each state.

In February 2025, a joint delegation composed of representatives from the FSM National Department of Resources and Development and the Rutgers University Food Systems Science team conducted field visits across all four states. Together with in-state NGOs, two-day stakeholder workshops/convenings were organized in each FSM state during which the FSS project's survey results and findings were shared. Each in-state convening/workshop served as an important platform to engage local stakeholders and gather critical insights as to how local food production and processing can be implemented. Convening/workshop participants included representatives from state governments, traditional leaders and elected officials such as members of legislatures and mayors, farmer associations, members of crop and marine producer associations, and individuals from the private sector. These stakeholders had the opportunity to review FSS survey findings, participate in facilitated breakout sessions, and provide detailed feedback on the challenges and opportunities facing local food production and distribution systems. The stakeholders' contributions highlighted the pressing need to strengthen local agricultural production, enhance market access for producers, and build more robust trade networks within and between states.

The Food Systems Solutions (FSS) convenings emphasized the importance of developing locally driven food system strategies that **respect traditional knowledge** and support community resilience, while advancing sustainable economic development objectives and adhering to practices and growth that strengthen and protect the environment. The FSS project, therefore, **prioritizes sustainable economic growth and capacity building** in areas such as community led trade facilitation, agricultural economics, marketing strategies, and value chain development. By linking agricultural innovation with marketing and trade expertise, the project seeks to expand market opportunities for FSM's farmers and fishers, improve food availability, and generate new income streams that contribute to broader economic growth.

Working with the same NGO and community partners who collaborated on the Green Climate Fund SAP020 baseline assessment, the Food Systems Solution stakeholder survey tools were co-created to capture data relevant to local food system development from more than 600 farming families found here: <https://rd.gov.fm/food-security>

The results of the Green Climate Fund SAP020 baseline assessment informed the **Pohnpei Food Security Policy and Master Plan 2025** also prepared with support from the Rutgers Food System Science team:

<https://pohnpeistate.gov.fm/wp-content/uploads/2025/02/2025-Pohnpei-Food-Security-Policy-and-Food-Production-Master-Plan-submitted.pdf>

In 2024, 947 new mixed methods surveys of farmers/food producers were conducted by local enumerators conducted in local languages for this Food Systems Solutions project.

The 2-day workshops held in each of the FSM states in February 2025 included presentation of results from stakeholder surveys regarding challenges and goals for local food production with the following prompts for workshop breakout sessions:

**Prompt:** List the 3-4 most important local food raw materials that producers can supply to a FIC and what support do the producers need?

**Prompt:** Describe 3 ways community leaders can implement policy to support food production, food processing, increased nutrition and job growth.

**Prompt:** What features would be most useful in a food system app for your state?

**Prompt:** When developing a Food Processing System for your state, where and how should food be collected, stored, processed, and distributed per product?

What type of facilities and equipment are needed and where should they be located?

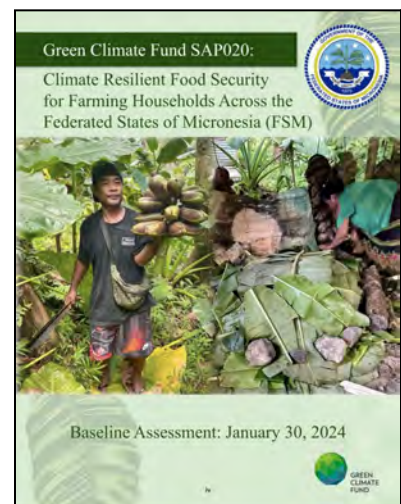
**Prompt:** How and where should training take place in your state to support food production, business management, and food processing?

Convening workshop participants, including food producers, food sellers, community leaders, and policy makers, worked in groups to respond to the above prompts and then presented their answers at the convenings. All answers were recorded by video and have been transcribed to be included and summarized in the final Food Systems Solutions reports and proposed food production strategies that will be presented to each of the FSM states.

### **Comparing FSS data to GCF SAP020 data of climate change impact on more than 600 farming families**

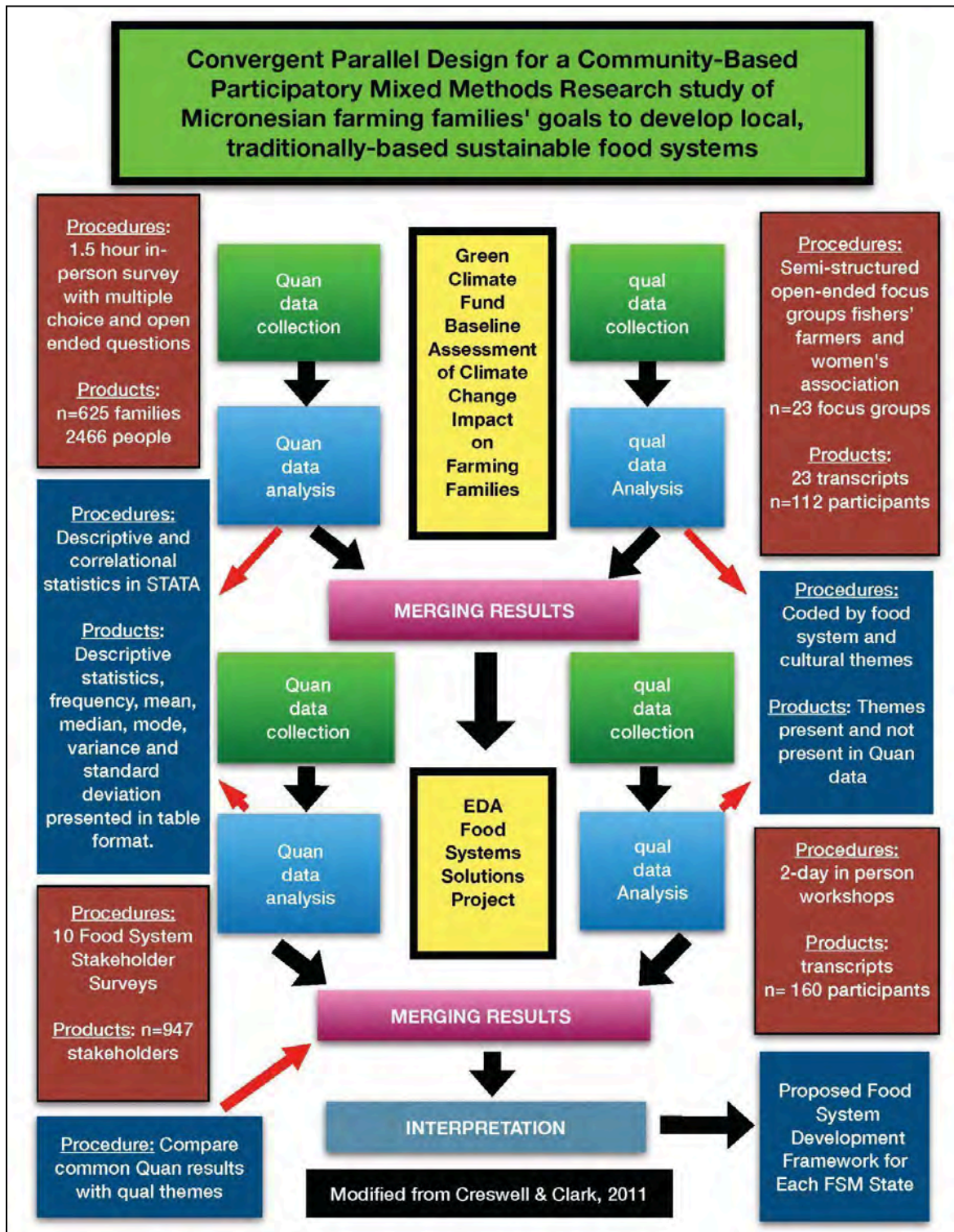
In 2022, the Rutgers Food System Science team was awarded a contract to conduct the baseline assessment for the FSM Green Climate Fund food security project GCF SAP020 that includes studying the impact of climate change on more than 600 Indigenous farming families across the nation. Using a community engaged, participatory approach in partnership with local NGOs and community groups, data was collected for the GCF baseline during 2022/2023. Working with the local partners, this data was shared with the community and final

baseline reports were prepared with local Micronesian partners as co-authors. Using a convergent parallel design, the Rutgers Food System Science team now compares data from these two large FSM food system research projects that include more than 1000 surveys, focus groups, community convenings, and interviews.



**Convergent Parallel Design Triangulation and Validation:** The convergent parallel design allows for the triangulation of data from two large FSM based projects (GCF Baseline and Food System Solutions), with results from the quantitative and qualitative analyses compared and

contrasted to validate findings and identify any inconsistencies or gaps in the research. The quantitative surveys provide patterns from large portions of the FSM populations, while qualitative interviews, focus groups, and convenings, provided more nuanced cultural perspectives and were conducted within a more traditional Micronesian context of community knowledge sharing.



The Food System Solutions project has now prepared this research-driven, community-based food system development framework specifically designed for each FSM state and built from a wide variety of stakeholder and food producer input.

## **Food Systems Solutions Data Collection Methods and Results**

The research protocol titled “Strengthening Food Security in the Federated States of Micronesia: An Innovative Approach to Enhancing Information Systems, Establishing an FSM Food Innovation Center and Supporting Local Capacity Building” received Institutional Review Board (IRB) approval from both the College of Micronesia-FSM and Rutgers University. At Rutgers, the protocol (IRB Number Pro2024000757) was reviewed under minimal risk and granted exempt status (Exempt 2i) on April 30, 2024, with approval issued by the Rutgers Human Research Protection Program. At the College of Micronesia-FSM, the protocol (WIRB® Protocol #0020724072024) was reviewed on July 2, 2024, and formally approved as exempt on July 29, 2024, by the COM-FSM IRB. Both approvals affirmed that the study may proceed in accordance with the approved protocols and applicable human subjects protection regulations. For the surveys, partnering NGO facilitated trained local enumerators to conduct the food system stakeholder interviews in local languages. All enumerators were required to complete and were awarded CITI certification and received training from the Rutgers Food System Science Team prior to conducting the surveys.

The data collection for this FSM National Food Systems Solution Project was conducted across Kosrae’s four municipalities of Utwe, Malem, Lelu, and Tafunsak from July 2024 to September 2024. A total of 186 interviews were completed. Of this total, 65 surveys were conducted with food producers, another 65 with consumers, 10 with community management leaders, 11 with food distributors and retailers representing store owners and other commercial operators, 4 with food distributors and retailers representing restaurants, 10 with trainers, 8 with information content providers, 3 with information infrastructure providers, 3 with technical IT contacts, and 7 with policymakers.

The interviewees were randomly selected and included men and women between the ages of 18 and 65. The surveys were conducted by Kosrae Conservation and Safety Organization (KCSO) staff, all of whom were CITI certified prior to conducting the studies. Surveys were administered through one-on-one interviews as well as small group and stakeholder consultations. The small group consultation method was used to collect data from producers, consumers, trainers, community managers, and policymakers, while the one-on-one interview method was applied to the other target groups.

Links to the complete Food Systems Solutions survey data methods and results can be found at <https://rd.gov.fm/fss> and by way of this QR code:





## **Part I: Kosrae State Evidence-Based** **Multi-Stakeholder Goals for** **Local Food Production and Processing**

### **A Participatory Approach to Ensure Place-Based, Culturally Appropriate Local Food System Development Data from Kosrae's Stakeholders:**

To ensure that food system strategies are place based, culturally appropriate, and aligned with the needs of each state, the Food System Solutions project adopted an extensive participatory data collection process centered on inclusive community engagement. In Kosrae, the Rutgers Food System Science team in concert with national FSM R&D Office of Trade worked closely with local partners including the Kosrae Conservation and Safety Organization to collect detailed, state specific data that would inform the design of food processing systems rooted in local priorities.

Using a mixed methods approach, the team developed ten distinct stakeholder surveys, each tailored to capture insights from a different segment of the food system. These included surveys for producers, consumers, community management leaders, food distributors and retailers, local

markets, restaurants, trainers, information content providers, information infrastructure providers, and technical information technology professionals. The surveys were conducted by trained local enumerators in the Kosraean language to ensure cultural relevance, accurate communication, and full community participation.

This methodology ensured that perspectives from all key stakeholder groups were represented, from small scale farmers and fishers to policy makers and entrepreneurs. By combining structured survey instruments with local facilitation and convenings over the project period, both quantitative and qualitative data on production capacity, market demand, training needs, and infrastructure gaps were collected and shared with stakeholders.

The participatory process did more than generate reliable data, it fostered trust, built local capacity, and reinforced community ownership of the food system planning process. The information collected now serves as a foundational resource for developing food processing strategies that are context specific, community supported, and aligned with Kosrae's long term goals for food sovereignty, economic development, and climate resilience.

#### **2024 Kosrae State Food System Solutions Survey summary:**

**Producer Survey:** 66 surveys conducted

**Consumer Survey:** 65 surveys conducted

**Community Management Leader Survey:** 10 surveys conducted

**Food Distributors and Retailers:** 15 surveys conducted

- **Local markets:** 11 surveys conducted
- **Restaurants:** 4 surveys conducted

**Trainer Surveys:** 10 surveys conducted

**Information Content Providers Survey:** 8 surveys conducted

**Information Infrastructure Provider Survey:** 3 surveys conducted

**Technical IT Survey:** 3 surveys conducted

**Policymaker Survey:** 7 surveys conducted

#### **Expanding FSS's qualitative data with 2-day stakeholder workshops/convening:**

In February 2025, the Food System Solutions project deepened its engagement with communities across the Federated States of Micronesia by organizing two-day stakeholder workshops in each of the four states. These workshops were the result of coordinated field visits carried out by a joint delegation from the FSM Department of Resources and Development and the Rutgers

University Food Systems Science team, working in close partnership with in-state nongovernmental organizations.

The workshops served as a critical platform for sharing the findings from the ten stakeholder surveys and for facilitating direct dialogue with community members. Participants reviewed the survey results, engaged in breakout group discussions, and provided valuable feedback on the priorities, challenges, and opportunities related to local food production and processing. These in person convenings offered an inclusive space for diverse voices to be heard and documented.

Stakeholders in attendance included representatives from state governments, elected officials such as mayors and legislators, farmer associations, members of crop and marine producer organizations, and individuals from the private sector. The workshops allowed these groups to examine the practical implications of the survey findings, express their priorities, and co-develop ideas for implementation. Many emphasized the urgent need to strengthen local agricultural production, improve producer access to markets, and develop more coordinated trade networks both within and between FSM states.

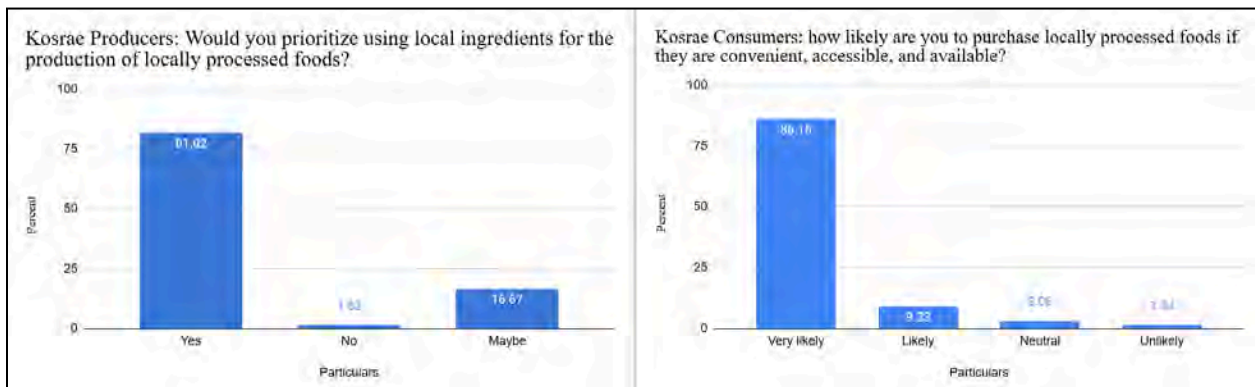
The convenings reinforced the importance of locally driven food system strategies that honor local knowledge systems, foster community resilience, and align with long term economic development goals. As a result, the Food System Solutions project places strong emphasis on building capacity in key areas such as trade facilitation, agricultural economics, marketing strategies, and value chain development. By integrating innovation in agriculture with market and trade expertise, the project seeks to open new opportunities for farmers and fishers, enhance the availability of local food, facilitate the export of produce, and create sustainable income sources that support broader economic growth throughout the region.

During the Kosrae FSS convenings, notable attendees include: Espil Tulensru, Juslina W. Thomas, Morris Geim, Maxmillon M, Keti William, Shruie T. Edwin, Hanlin Leh, Jacob C, Carson Nena, Jason Selo, Bolly Andrew, Jesse Tulensru, Marbe Martin, Palmer Seymour, Tulensa Palik, Stanley Raffilman, Faith A. Esahu, Emily O'steen, Emily Nena, Martin Selch, Keenen Weirlangt, Kyle Helgenberger, Lucus Cupps, Shanalin Lee Ling, Fred Taulung, John Alokoa, Trenton Skilling, Austin Tilfas, Skillor Jackson, Mixon Jonas, Maxson Nitmon, Roland Hagan, Delpha Martin, Menoleen Oswald, Ramu Govindasamy, Likiaksa Elsha, Marke Martin, Morris George, Keuge Espil, Juslinda Thomas, Kevin Jonithan, Harland Tilfas, Betty K. Phillip, Moses Thompson, Yamado Melander, Asha Aoh, Reed Tilfas, Sepe Hadik, Rolner Joe, Ruthsina Jonah, Molly Ryan, and Emily Stokes.

### **Summary of Kosrae Stakeholder survey/convening responses to support Local Food Production and Food Processing:**

Kosrae's surveyed stakeholders expressed overwhelming support for the development of food processing of local crops that are readily available to provide regular and nutritious import

substitution. Strengthening the economy through local jobs and food production is a primary focus for all stakeholder groups.



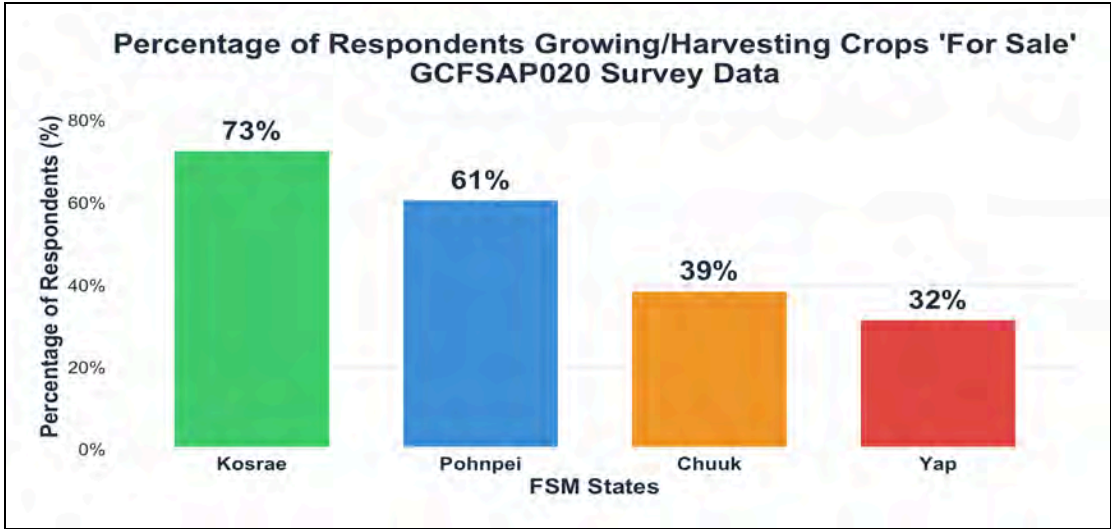
During the convening/workshop, Kosrae community members and stakeholders showed a strong interest in creating a circular economy through local food production with potential to move into an export economy. Members of Kosrae’s leadership, specifically state senators, discussed the importance of recirculating wealth within their own communities to support food producers, create local jobs, and strengthen the local economy.



*“Right now, there is enough demand on Kosrae to sell fresh vegetables. We have exported to Payless Store in Ebeye (RMI). Right now we are unable to get USDA certification to sell to the military base on Kwajalein.” – Nora and Robert Sigrah*

Kosrae State’s traditional food system revolves around locally grown and harvested foods, particularly taro, breadfruit, banana, and coconut, alongside fish and seafood. This system has been expanded upon in recent years through the emergence of greenhouses across all four municipalities in Kosrae. Locally produced food is currently being consumed by households and sold, more so than any of the other states in FSM, though Kosrae stakeholders have still identified ways to improve this system to help reduce its dependence on imported foods and to build an export economy.



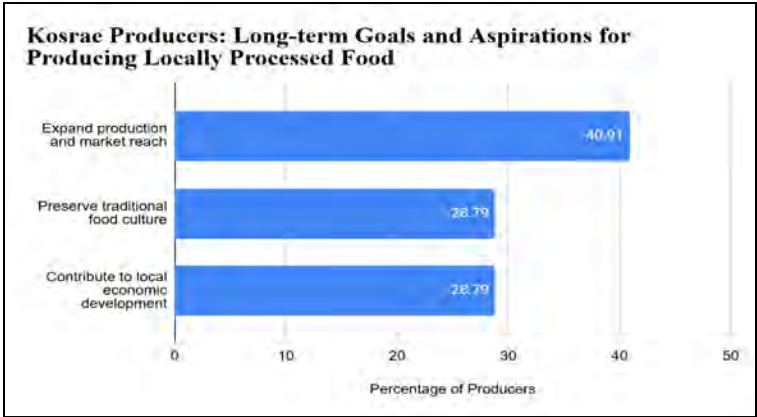


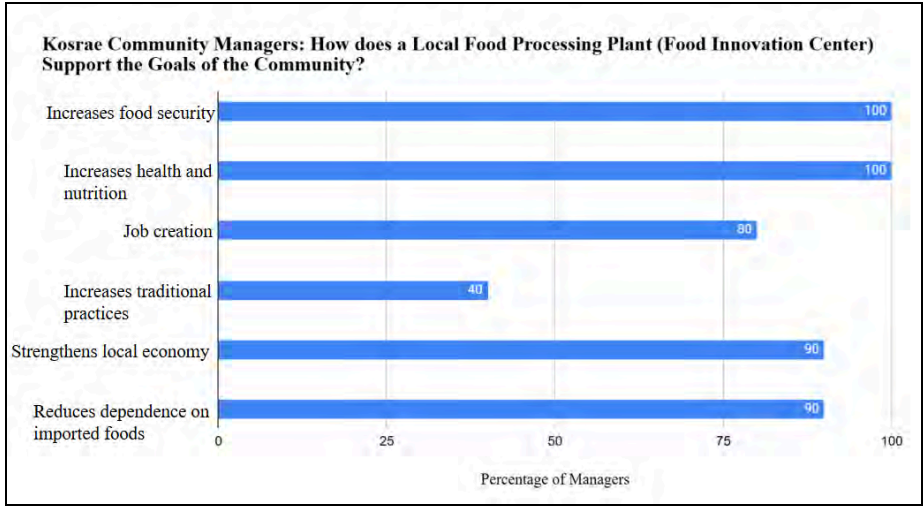
Examples of greenhouse crop production in Lelu Farms, Kosrae:



Kosrae producers, community managers, and restaurants have highlighted their desire to expand production and distribution of locally grown foods for expanded market reach and increased food security through health and nutrition.

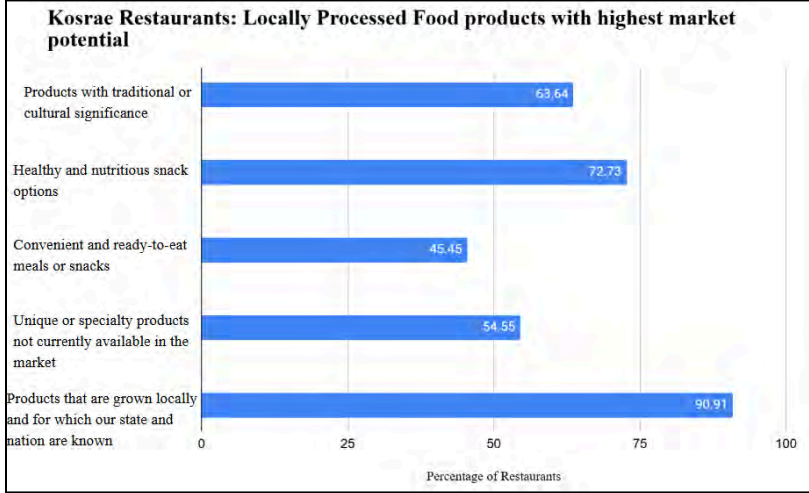
Kosrae’s producers highlight market reach and increased production as one of their main long-term goals of producing locally processed foods. This supersedes both economic development and cultural preservation.



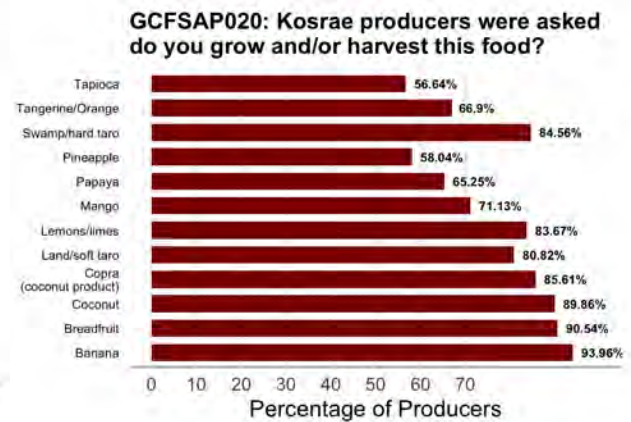
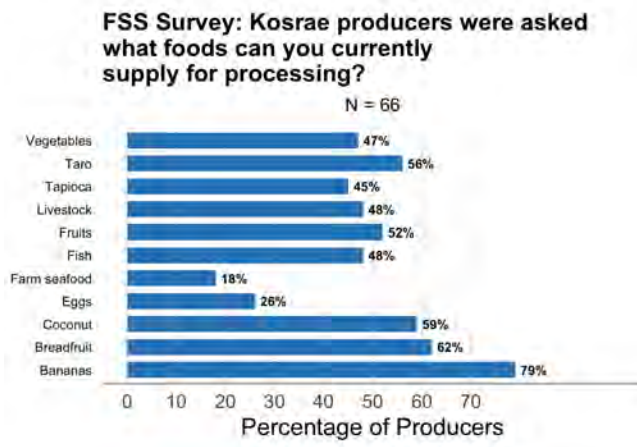


Kosrae's community managers are confident that a Food Innovation Center where large-scale processing and storage will be located will increase health and nutrition of Kosrae's population, while strengthening the local economy and reducing dependence on imported goods.

Kosrae's restaurants have identified products that are grown locally and for which the state and nation are known as having the highest market potential.



Based on the Global Climate Food Security Assessment Project 2020 (GCFSAP020) and FSS survey data, Kosrae food producers shared the local staple food crops that they currently harvest and can supply to local food processing facilities.



Stakeholders are currently experiencing limitations in the production of these food products due to lack of resources, training, and more extreme weather events affecting crop yields.

Stakeholders recognize the need for improved varieties, and better access to seeds, soil testing, and pest management to ensure successful cultivation of local crops. Introducing and improving upon agricultural technologies were also highlighted as key components of a successful food system.



*“We need to allow more production technologies into the state. Like the JUNCAO technologies which have been used in other countries for animal feed during droughts.”*

*“It is important to find seeds that are resistant to extreme weather events like droughts and heavy rains. Maybe if we get our hands on them, it will help with the problems of vegetables wilting from high heat.” – Robert Sigrah*



**Local food products that Kosrae stakeholders most want from a local food processing system, according to producer and consumer surveys:**

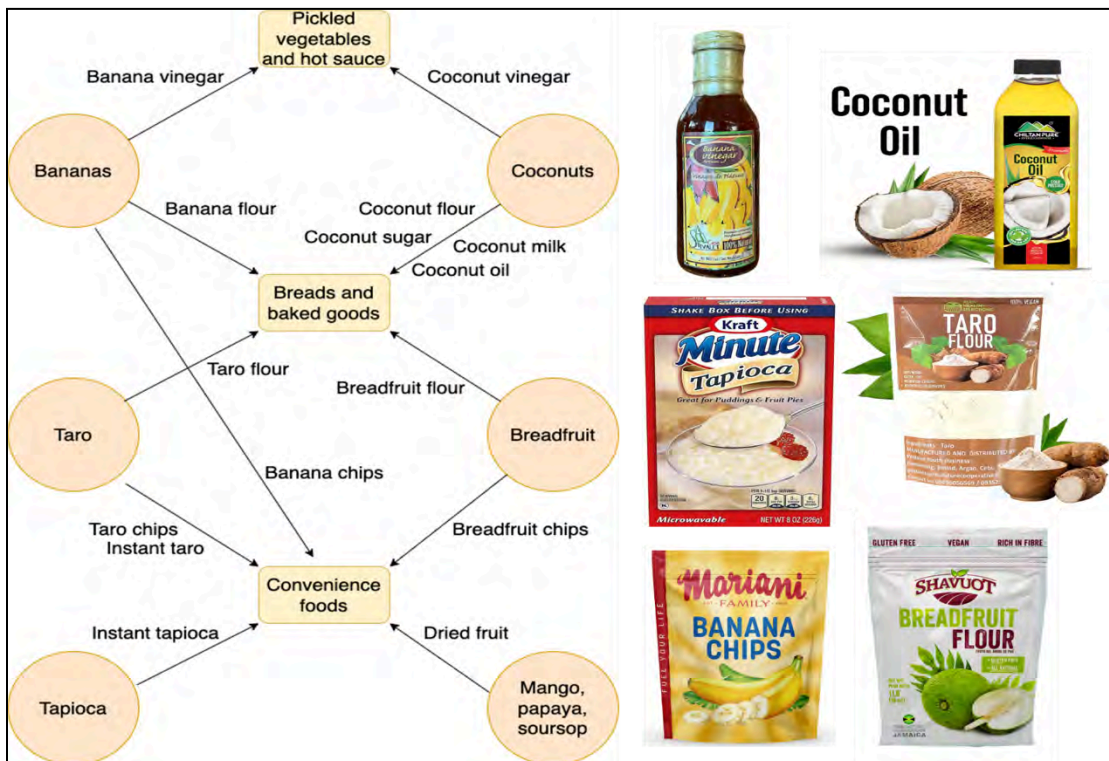
<b>Product</b>	<b>Producers (N = 66)</b>	<b>Consumers (N = 65)</b>
<b>Banana chips</b>	77%	92%
<b>Breadfruit chips</b>	67%	66%
<b>Chicken products</b>	36%	63%
<b>Hot sauce</b>	58%	62%
<b>Pork products</b>	33%	62%
<b>Breads and baked goods</b>	48%	62%
<b>Coconut milk</b>	41%	58%
<b>Salted fish</b>	45%	52%
<b>Dried fish</b>	47%	49%
<b>Rope/mats/fiber</b>	38%	49%
<b>Animal feed</b>	52%	49%
<b>Pickled vegetables</b>	35%	48%
<b>Coconut cooking oil</b>	45%	48%
<b>Smoked fish</b>	42%	48%
<b>Taro chips</b>	48%	43%
<b>Vinegar</b>	41%	36%
<b>Breadfruit flour</b>	42%	34%
<b>Dried vegetables</b>	21%	34%
<b>Coconut products (sugar)</b>	44%	32%
<b>Dried fruits</b>	21%	30%
<b>Dried spices</b>	39%	28%
<b>Taro flour</b>	35%	26%
<b>Coconut flour</b>	26%	23%

## Transforming staple crops into locally processed food commodities:

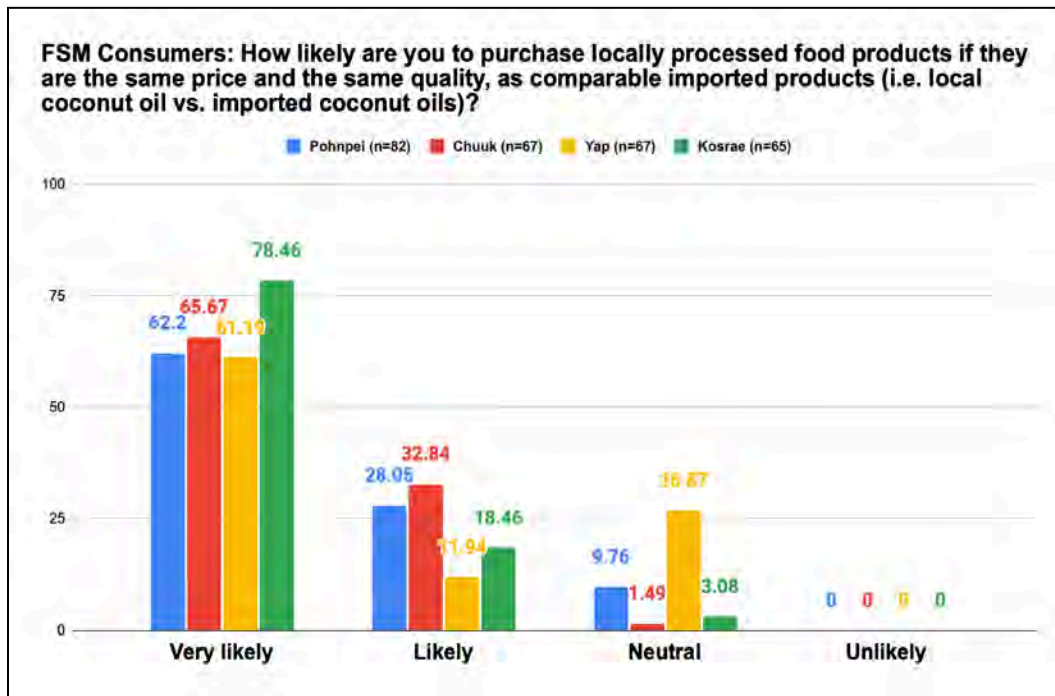
62% of surveyed consumers are requesting baked goods, but only 48% producers are interested in processing these foods. The core ingredients – flour, oil, milk, sugar – of baked goods are understood to be imported products like wheat, butter and cow’s milk. **Producers understand, however, that these raw ingredients can be made using staple crops like banana, breadfruit, and taro for flour, coconut sugar, oil, and milk.** In fact, 42% of producers are interested in producing breadfruit flour. The raw ingredients to create locally sourced baked goods are present and with enough training and creative recipes, these products can replace imported baked goods on Kosrae.

Product	Kosrae Main Island (65 Surveys)	
	Producers	Consumers
<b><u>Breads and baked goods</u></b>	<b><u>48%</u></b>	<b><u>62%</u></b>
Taro flour	35%	26%
Breadfruit flour	42%	34%
Coconut flour	26%	23%
Coconut cooking oil	45%	48%
Coconut milk	41%	58%
Coconut products (sugar)	44%	32%

## Local staple crops that can provide raw ingredients for highly desired processed foods as per FSS survey/convening data:



Import substitution with similar locally sourced products was highlighted throughout the GCFSAP020 surveys. Consumers recognize that many imported raw materials can be substituted from locally processed crops, and the majority are very likely to purchase local substitutions if they are comparable in price and quality.

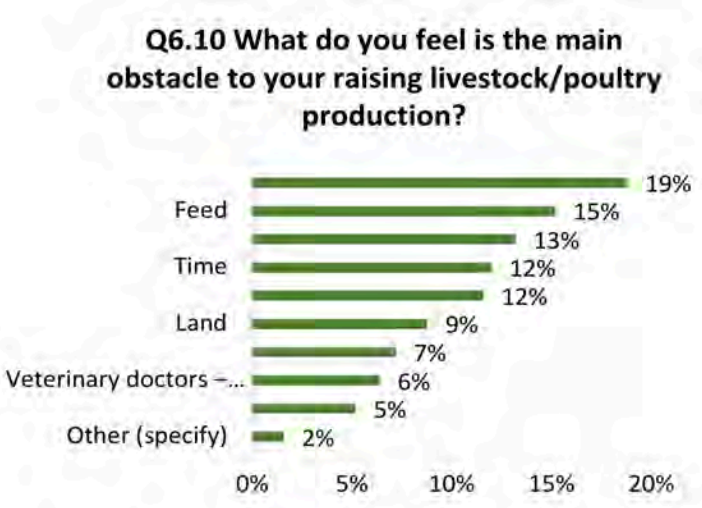


**GCFSAP020: Survey respondents were asked if they are interested in replacing imported milk products with coconut milk.**

Questions	Resp.	YAP		Pohnpei		Kosrae		Chuuk		All	
		Freq	%	Freq	%	Freq	%	Freq	%	Freq	%
Would you be interested in consuming <b>more locally produced coconut milk products</b> daily if they were more available and affordable?	No	13	8	26	17	5	3	7	5	51	8
	Yes	148	92	131	83	144	97	140	95	563	92
... <b>imported milk products</b> with coconut milk products for cooking?	No	54	33	40	25	9	6	11	8	114	19
	Yes	108	67	118	75	140	94	135	92	501	81

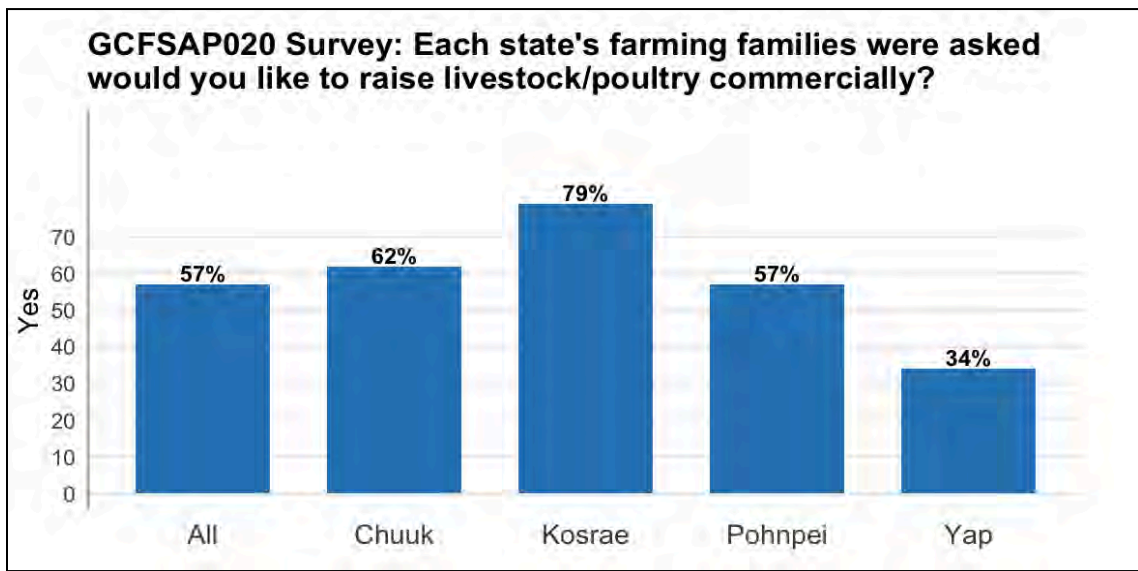
Coconuts offer a wide range of substitute products like oil and milk to replace imported goods. The vast majority of respondents from all four states in FSM are interested in consuming coconut milk instead of imported milk both for daily consumption and for use in cooking. Although producer and consumer demand has been identified, these products are currently of limited availability in restaurants and stores.

**Interest in livestock and poultry farming:**



The GCF SAP020 Baseline Assessment (2024) identified feed as the largest obstacle to livestock and poultry farming. Feed production training would further reduce dependency on external inputs, enabling producers to create balanced, locally sourced diets for their livestock.

Kosrae respondents were the most interested in livestock and poultry farming out of all four states. This can encourage interstate trade among FSM.



## Fishing and Aquaculture:

Aquaculture holds unique potential in Kosrae because of its economic opportunity and resiliency against climate change. As Kosrae's reefs are becoming increasingly endangered, aquaculture farms raising sea cucumbers and giant clams are valuable for increasing food security and local production.



*“Aquaculture is sustainable and allows us to bring back hard to find species. It also introduces new **opportunities for export trade networks** for us farmers, which makes me proud.” - Martin and Delphia Selch*

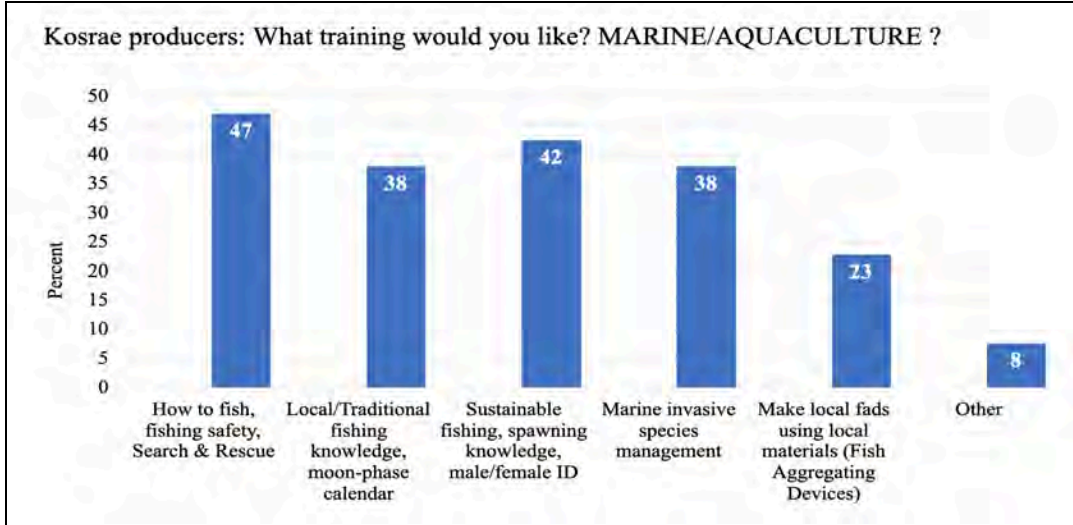
Fish farming is also an important industry in Kosrae, with three active markets across the island. Fishers bring in their daily catches to sell to local consumers, which is all priced per pound. Gas is expensive for off-coast fishing and daily catches fluctuate in success.

*“Gas is \$6 a gallon, one round of tuna fishing is around 12 gallons (\$60 per expedition). There aren't consistent amounts of tuna caught, it depends on the day and luck. It is still expensive to go out and get tuna. Fishermen come at 4 am to drop off fish.” – Kosrae fish market manager*

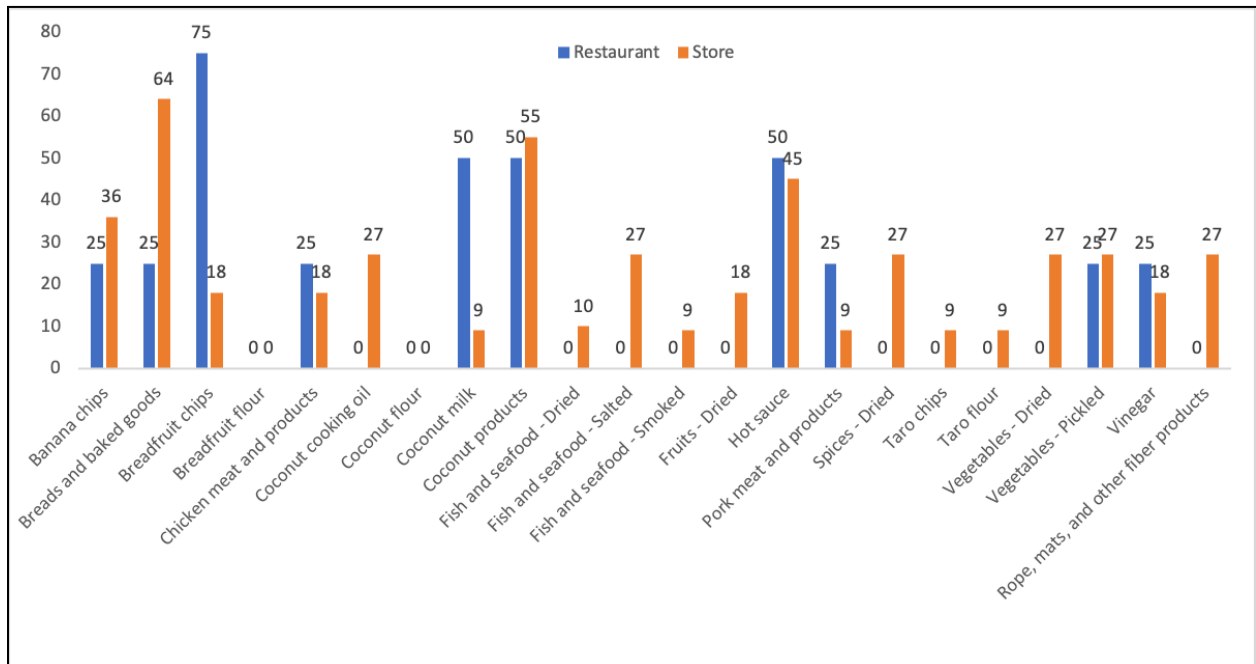


Kosrae producers in the FSS survey highlighted a need for training in safe and sustainable fishing.





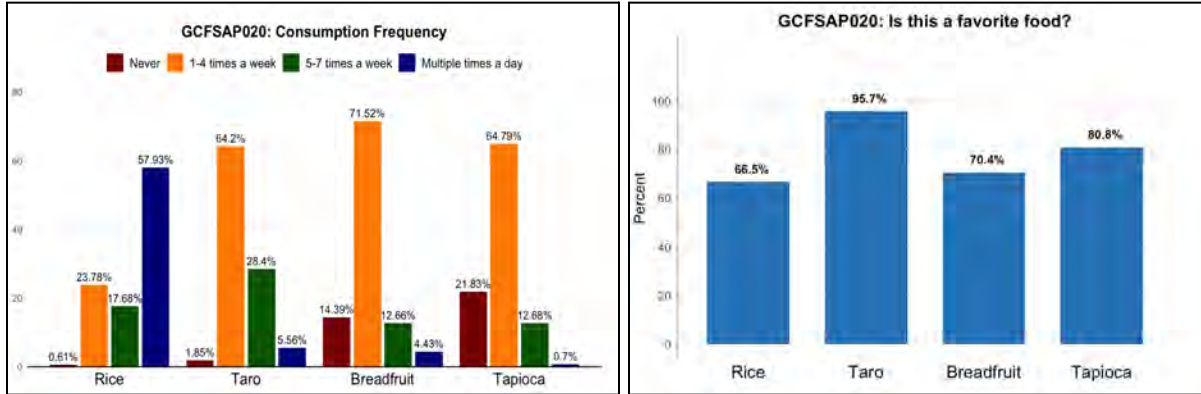
Kosrae maritime processing is at the forefront of the state's food system. Kosrae already has one aquaculture center and three fish markets across the state to be incorporated into a food processing center.



**Frequency of local processed foods currently available in Kosrae's restaurants and stores.**

## Rice is consumed for convenience but not for preference.

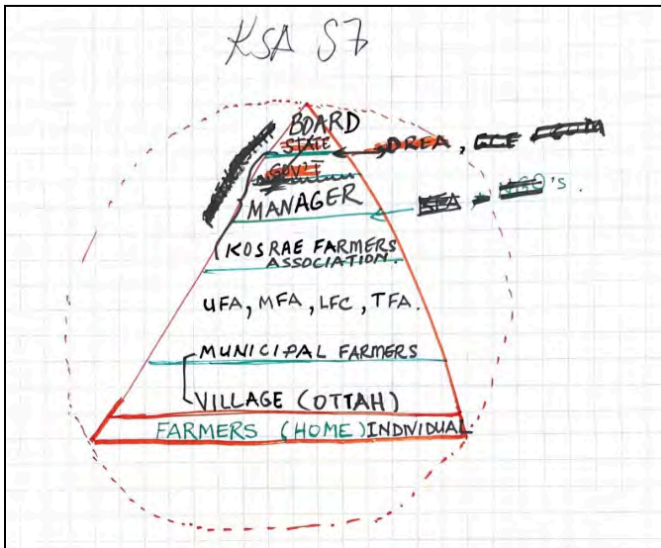
Based on extensive survey data (GCF SAP020 baseline) Kosrae stakeholders are communicating that they are consuming rice more frequently than staple crops, but it is not their preferred food.



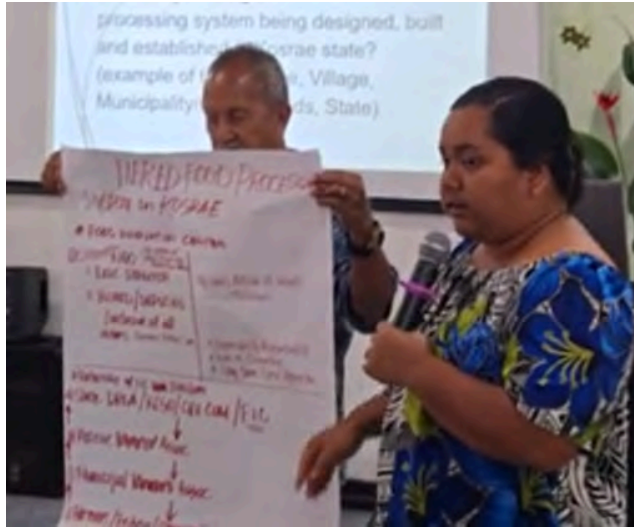
*“We are bringing in a lot of rice and things that are not very healthy. So we need policies and legislation that will have food nutrition. If we reduce the amount of rice coming in, we will create other means for local production.”*

In order to create a successful local food production industry, Kosrae state has identified a tiered processing system, from home processing all the way up to a Food Innovation Center to ensure maximum community participation and structural support.

## Tiered approach for staple crop production and processing:



*“The circle around this tiered processing system represents unity and respectful relationships across all levels of this system. We talk about sustainability and to keep this center working, there has to be respectful relationships and responsibilities. We have to be able to respect the leadership, respect ourselves and our people in the village and the municipality to work together.”*



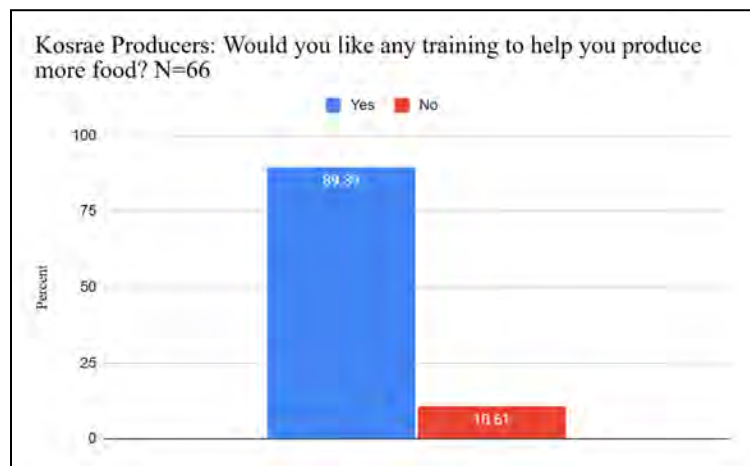
*“So we’re thinking farmers, fishers, or community members would be the first tier. The second tier would be the municipal associations. **So, if farmers or fishers have any issues, they can go to these associations like the Kosrae Farmers Association.**”*

Kosrae stakeholders are advocating for a tiered processing system, starting at the village/individual level up to a top tier processing center. This food processing center will work in collaboration with the

Department of Resources and Economic Affairs (DREA), the Kosrae Farmers Association, and College of Micronesia Cooperative Extension (COM-CRE). Using the **current network of local farmers and markets**, an efficient collection system can be created sharing equipment like trucks, freezers, and storage facilities for pick-up, delivery and distribution.

## Training:

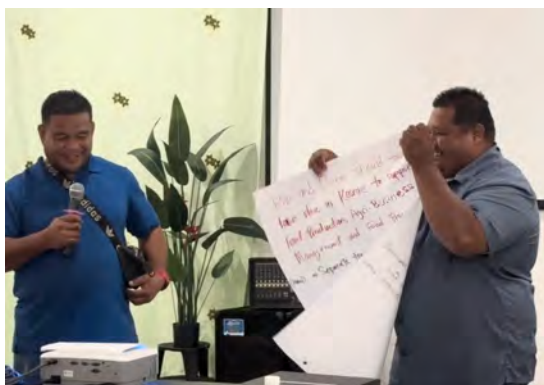
**A significant challenge to local food production is the shortage of technical expertise in product development**, as reported by 79% of survey respondents. Without skilled personnel, it becomes difficult to create, refine, or expand product lines, which stifles growth and diversification within the local food industry. Additionally, 70% of respondents mentioned a shortage of trained workers, reflecting a workforce gap that may further hinder productivity and the consistent quality of local products.





Training programs are crucial to the success of food systems development. Past projects have often largely focused on new infrastructure, and as soon as the equipment broke down, there was nobody to fix it. **Providing producers with comprehensive training resources can empower them to navigate the complexities of food processing and marketing, fostering a more robust and competitive local food industry.** It is necessary to ensure that trainers themselves have adequate training on topics of interest to producers and that such trainings are continuous.

*“We would like consultants to come to Kosrae to conduct training instead of sending people out because it is more efficient. We think that when trainers come to us, they have a better understanding of the challenges and goals we are trying to accomplish.”*

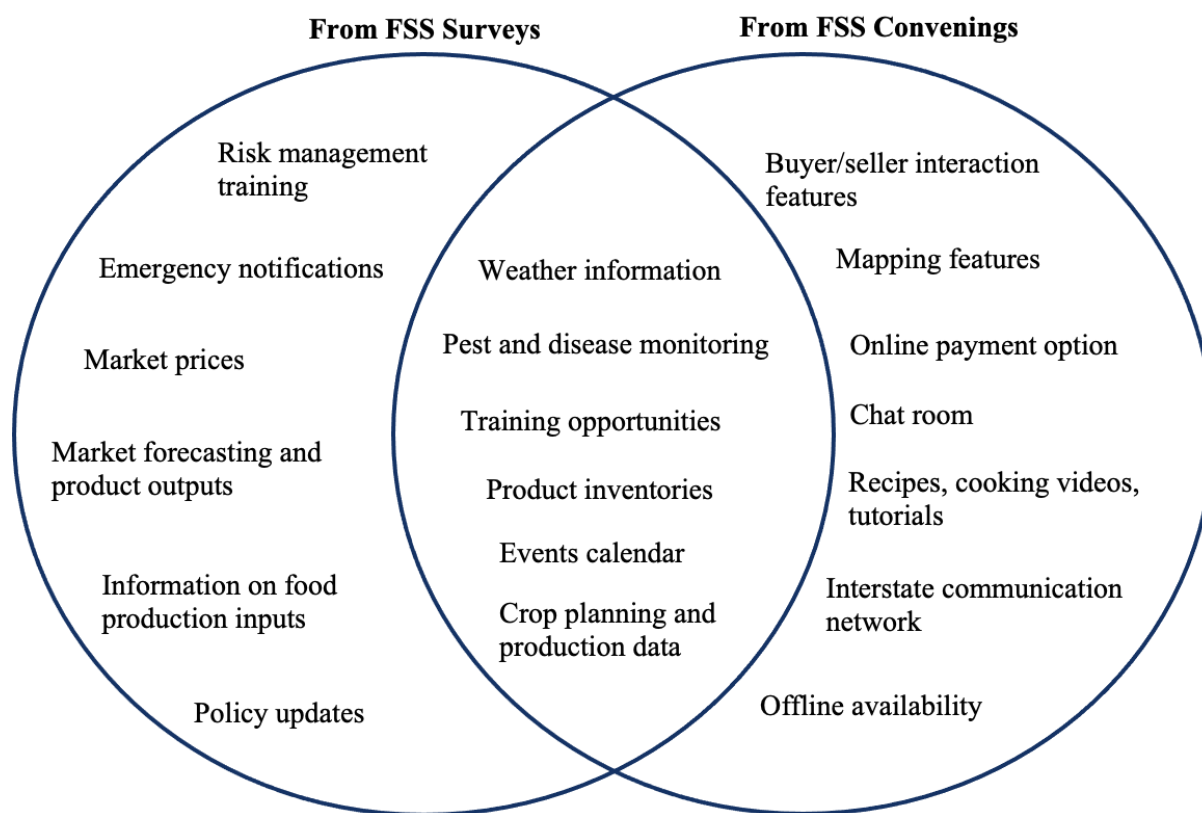


*“We need separate trainings for food production. Agribusiness, and food policy so we can have people specialized in each of these trainings.”*

## FSS Survey Results: Training requested by Kosrae Food Producers

	<b>Training Requested (&gt;50% of surveyors requested) from Producer Survey</b>	<b>Trainers Needed (&lt;50% of trainers knowledgeable) from Trainer Survey</b>
Agricultural	General crop management Seed collection and saving Banana, breadfruit	General crop management Local/traditional knowledge Seed collection Making fertilizer and compost Swamp taro, land taro, banana, breadfruit, tapioca, limes/lemons, papaya, hot peppers, sugar cane, durian, tangerine/oranges, medicinal crops
Livestock	General management	Making feed
Aquaculture	Greenhouse growing with protected systems	Fishing, safety, and search & rescue Local/traditional knowledge Sustainable fishing
Food processing	Food safety Food sorting and quality control Food preservation Cooking Food preparation and packaging	Food safety Food preservation and packaging
Agricultural technology	Greenhouse and nursery management	Greenhouse management Cold storage Solar power Hatcheries Aquaculture Equipment repair/maintenance
Climate change	Adaptation strategies	Climate change adaptation Sustainable farming and land management
Business management	How to run a business	How to run a business Financial management

## Requested Features for a Food System App for Kosrae Based on FSS Community Survey Data:

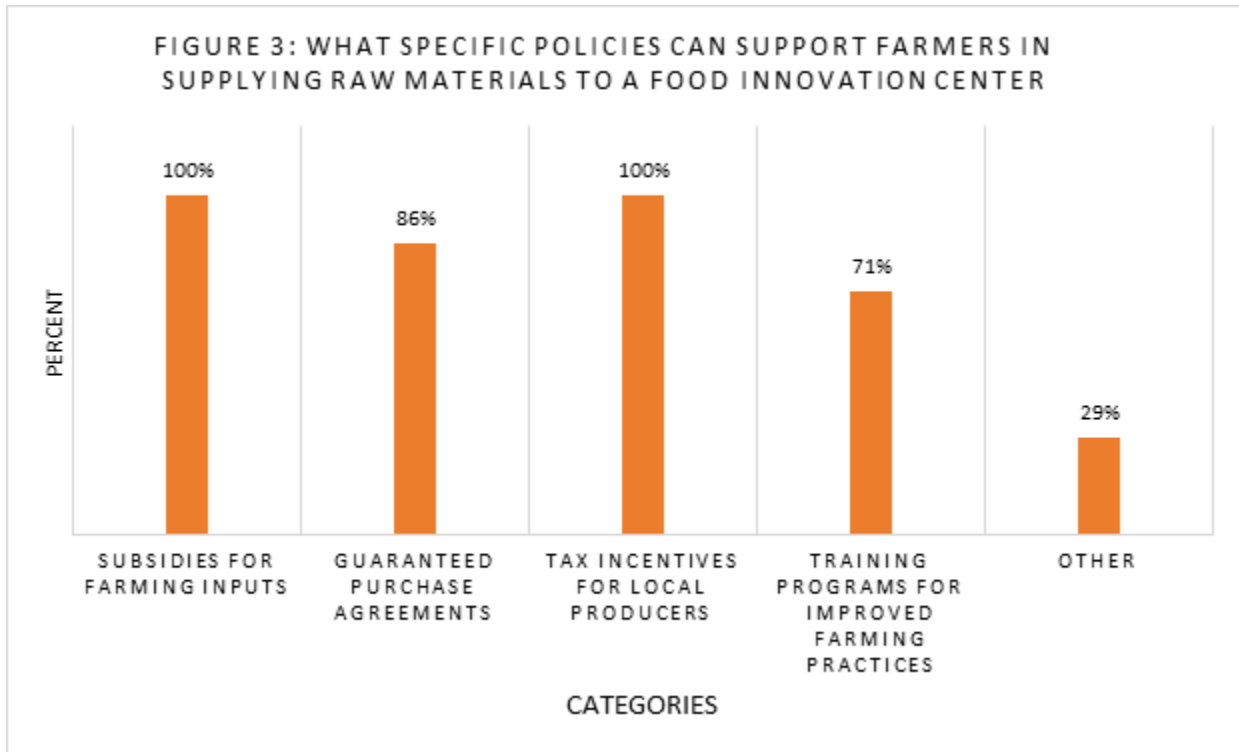


Kosrae stakeholders identified the need for a ‘food systems app’ to strengthen communication and information and for their own educational and training needs. Facilitating an easier way for groups to connect is essential in keeping the food system organized and productive. Sustaining a centralized hub for information ensures effective communication and for stakeholder groups alike to work together. Such a food systems app could also be linked to states in the FSM.

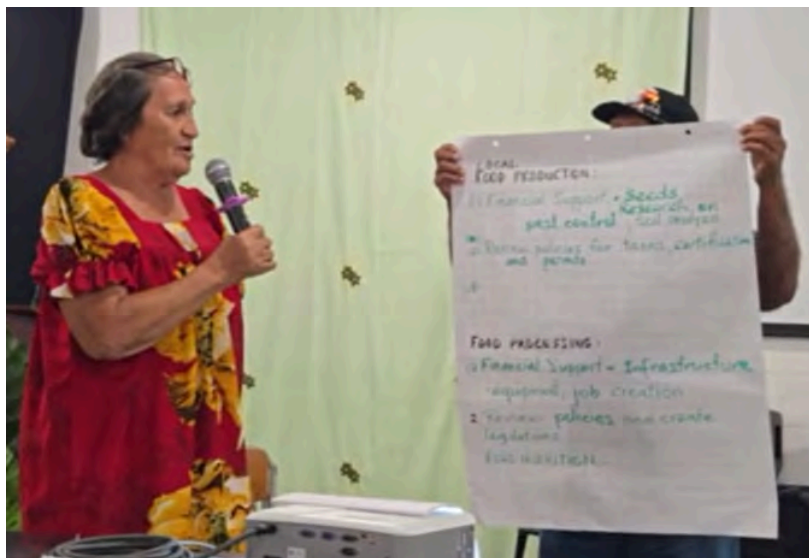
This new age technology is meant to build upon the foundation of traditional culture, not to replace it, and to assist in modernizing and disseminating the latest practical and science-based information that is available. Such technology can also bridge the gap between those seeking to

produce/collect/catch but needing markets- and those buyers, distributors and sellers seeking products and needing those products. Such apps can make all those involved aware of product availability and also events/opportunities when products are needed (both by the specific product and quantities needed).

**Role of policy makers and community leaders:**

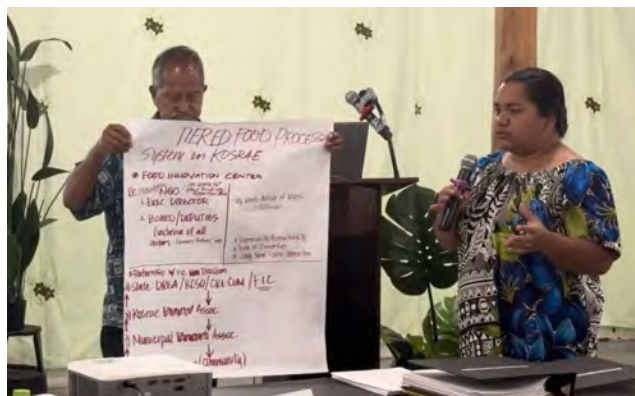


Policy makers report they can contribute to a stronger food system in multiple different ways. **There is a strong interest in increasing community involvement with local leaders and policy development.** Focusing on what producers need via training, infrastructure, selling, and security is largely supported by policy makers as they strengthen ties to local involvement.



*“We would like more pest control policies to help our farmers with **permits regarding food processing, infrastructure, financial support, and job creation.**”*

*“Our recommendation is to make the top tier facility like an NGO represented by farmers, fishers, and crafters as deputy directors. We want to make bylaws that will prevent easy turnover with government change.”*



## **Transitioning to an Export Economy:**

Due to Kosrae’s proximity to the Marshall Islands, there are exciting opportunities for exporting goods to be sold there. Specifically, the Kwajalein atoll and Ebeye island (located in Kwajalein) have an increased need for a consistent supply of fresh produce. In the Marshall Islands, fruit and vegetable consumption sits at about 150 grams per capita, much less than the World Health Organization’s (WHO) recommended 400 grams per day (Troubat & Sharp, 2021). Comparing Majuro, the capital of the Marshall Islands, with Kwajalein, people in Majuro consume an average of 3000 kilocalories per capita per day, while people in Kwajalein only consume around 2500. This difference can be partially attributed to the fact that foods are typically more expensive in Kwajalein, especially in Ebeye, the most densely populated island in the Marshall Islands. In Kwajalein, vitamin A available for consumption is only about 75-80% of the required amounts, with margarine and butter contributing 21% of the available vitamin A alone, while being high in fat. To increase vitamin A consumption, higher amounts of fresh produce such as carrots or leafy green vegetables (i.e. cabbages and taro leaves) need to be made available (Troubat & Sharp, 2021).

Kwajalein has a history of produce shortages. Scott Malcom, the spokesman for the Army Installation Management Command, stated that the produce shortage “is not a contracting problem or a funding problem. It’s a supply chain problem” (Jowers, 2016). Currently, most perishables that are imported into Kwajalein come from California, meaning they must be refrigerated for thousands of miles, a journey which takes over 48 hours. The current contractors face issues such as weather, loss of refrigeration due to technical issues, lack of space available on the barges, and temperature issues during travel (Jowers, 2016). Currently, Kwajalein receives restocks of produce biweekly, but produce is occasionally unavailable due to delays in shipping (Logistics Cluster, n.d.). Shipping products this far increases their prices, therefore further decreasing their accessibility. Distribution prices increase the price of fresh fruits and vegetables about \$0.77 to \$0.83 per pound, \$0.05 to \$0.09 per ounce for bakery items, and \$1.15 to \$2.69 per pound for frozen goods (GovTribe, 2025).

The Defense Logistics Agency (DLA) Troop Support Indo-Pacific is currently conducting market research for a long term contract to supply USDA Grade No. 1 or better

produce to customers located on the Kwajalein Atoll (GovTribe, 2025). This provides an incredible opportunity for Kosraean producers to export their products.

Kosraean producers were previously successful in exporting to the Payless Store in Ebeye via United Airlines cargo, sending about 500-800 pounds a week. Nora and Robert Sigrah of the Sigrah Family Greenhouse Project successfully organized these sales before the pandemic in 2020. During this time, however, they faced many challenges, including shipments going on standby when planes were fully loaded, and an inability to receive USDA certification.

To reduce reliance on inconsistent cargo space with United Airlines, alternative shipping methods should be explored, such as sea freight or partnering with regional airlines that may offer more dependable cargo services. Forming a cooperative among local growers could increase shipment volume and negotiating power with carriers. Enabling state policies in concert with national FSM policies relative to shipping and export are needed. Additionally, securing USDA certification is critical; this could be facilitated by collaborating with the FSM government and with a regional agricultural agency to provide technical support, training, and resources to meet certification requirements. Establishing a small local processing or inspection center in Kosrae, certified by USDA or its regional affiliate, could further streamline compliance. This coordinated effort would enhance reliability and market access for Kosraean produce.

**Draft concept of Kosrae policy makers' implementation plan over a 5-year period to enhance increased food security as developed by Kosrae stakeholders in the Food Systems Solution convenings focused on:**

**Year 1:**

- \*Expand and strengthen local vegetable and crop production
  - \*Improve soil health and introduce irrigation system
- \*Strengthen and expand grower and fisher associations and develop series of farmer training and capacity building programs to meet project objectives
  - \*Develop supply chains for fresh produce, poultry, and swine
    - \*Develop local feeds program
- \*Reconfirm locations and plans for the establishment of the Food Innovation System facilities-local, regional, and state
- \*Identify and procure home/village specialized equipment and begin processing of vegetables, poultry, and fish
- \*Work with traditional and local leaders and legislators for public policy advocacy and changes that foster enabling environment for investment and tax waivers for imported agricultural inputs
  - \*Promote organic and traditional farming practices
  - \*Establish local seed banks and improve seed access
  - \*Develop community farming programs and co-ops
  - \*Provide access to agricultural financing and subsidies

\*Strengthen farm-to-market infrastructure

**Year 2:**

- \*Secure funding and partnerships for infrastructure
- \*Develop processing units for vegetables, poultry, and fish
  - \*Install cold storage and packaging facilities
  - \*Establish food safety standards and certifications
- \*Train workforce in food processing and quality control
- \*Conduct workshops on modern and climate-resilient farming
- \*Provide training on organic farming and pest management
- \*Partner with institutions for agriculture research and extension services
  - \*Support youth and women in agribusiness development
  - \*Establish demonstration farms for hands-on learning

**Year 3:**

- \*Develop irrigation and water management systems
  - \*Improve farm roads and transportation networks
  - \*Establish local market hubs for fresh produce sales
- \*Build composting and soil fertility enhancement centers
  - \*Encourage the use of renewable energy in farming
  - \*Strengthen farm-to-market linkages
- \*Support local retail and institutional purchasing programs
- \*Facilitate between FSM state trade opportunities for feed and food products
  - \*Establish e-commerce and digital platforms for farmers

**Year 4:**

- \*Begin processing vegetables, poultry, and fish at the center
  - \*Develop packaging and branding strategies
- \*Train farmers and entrepreneurs in food preservation techniques
  - \*Introduce quality assurance and labeling standards
  - \*Expand product innovation for local and export markets
- \*Engage government agencies for policy and financial support
- \*Partner with universities and NGOs for research and development
- \*Secure investments from private sector and development banks
  - \*Apply for grants and international aid programs
- \*Build community-driven financing models for sustainability

**Year 5:**

- \*Identify grower engagement with the new food system

- \*Assess how many new locally processed products have been made and commercialized in volume (units) and sales
  - \*Identify consumer purchasing rates of local foods
  - \*Identify number of jobs created
- \*Assess import reductions of products produced locally

## **Conclusion:**

The Food System Solutions project provides a comprehensive set of evidence-based recommendations to guide the development of state specific food systems across the Federated States of Micronesia. These recommendations are grounded in input from stakeholders collected through surveys, workshops, and community convenings, ensuring that each strategy reflects the realities and priorities of the people it is designed to serve.

In Kosrae, as in other FSM states, the project aims to support increased local food production, improved market access, enhanced community leadership, and stronger coordination between states. By strengthening local food processing capacity and building community-based infrastructure, the project seeks to reduce reliance on imported food, generate income for local producers, and promote long term food security.

The approach emphasizes locally led management and culturally grounded practices, supported by investment in training, technology, and market linkages. These efforts are intended to build a more efficient, inclusive, and connected food system across the islands.

Ultimately, the Food System Solutions initiative aspires to help FSM create a resilient, self reliant, and prosperous food future. One that not only meets the nutritional and economic needs of its people, but also honors and sustains the cultural traditions that have shaped island life for generations. The following sections outline a detailed implementation guide based on the priorities and insights of the Kosrae community.

## Part II: A Kosrae Food Systems App

**Example:**  
Develop Kosrae State specific App to Connect Farmers and Markets with training videos



**ICT and Mobile Apps Drive Global Agriculture**

**Pacific Pests, Pathogens & Weeds**

Identify Pests, Diseases & Weeds  
Launch the interactive Key

Full Fact Sheets  
Access the full detailed fact sheets

Mini Fact Sheets

Source: *SourceTrace Systems, 2017. Pacific Pests Pathogens Weeds Phone App, 2023.*

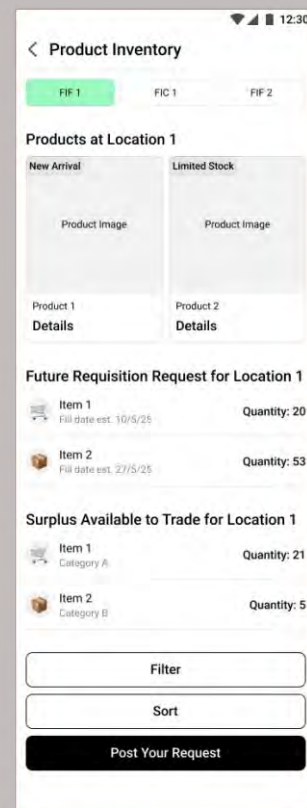
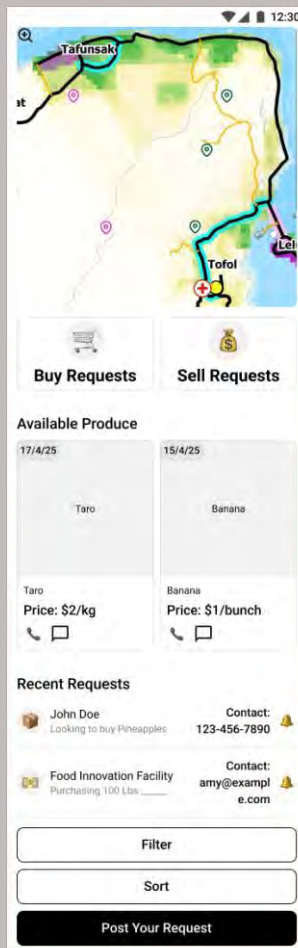
As identified by policymakers and stakeholders through FSS surveys and convenings, interconnectedness through technology is key to creating an integrated food system that connects all levels of the value chain to one-another. Sharing of information remains limited across FSM's islands, so using technologies such as websites and phone applications is essential to connecting producers, processors, sellers, and consumers. Such platforms offer repositories of information for people to share including agricultural practices (traditional and with new technologies), pest and disease management, market prices, harvest schedules, product availability, event calendars, real-time weather updates, special calls that require foods and other products, and a platform for communicating and linking producers with sellers. By enhancing interconnectivity across the entire food system, a web-based application will maximize efficiency and ensure all participants remain informed about developments in FSM's tiered agricultural ecosystem.

The centralized phone app is becoming popular within food processing hubs as a way to keep everyone connected. This proposed app is only one part of a larger information network, which includes websites that already exist.

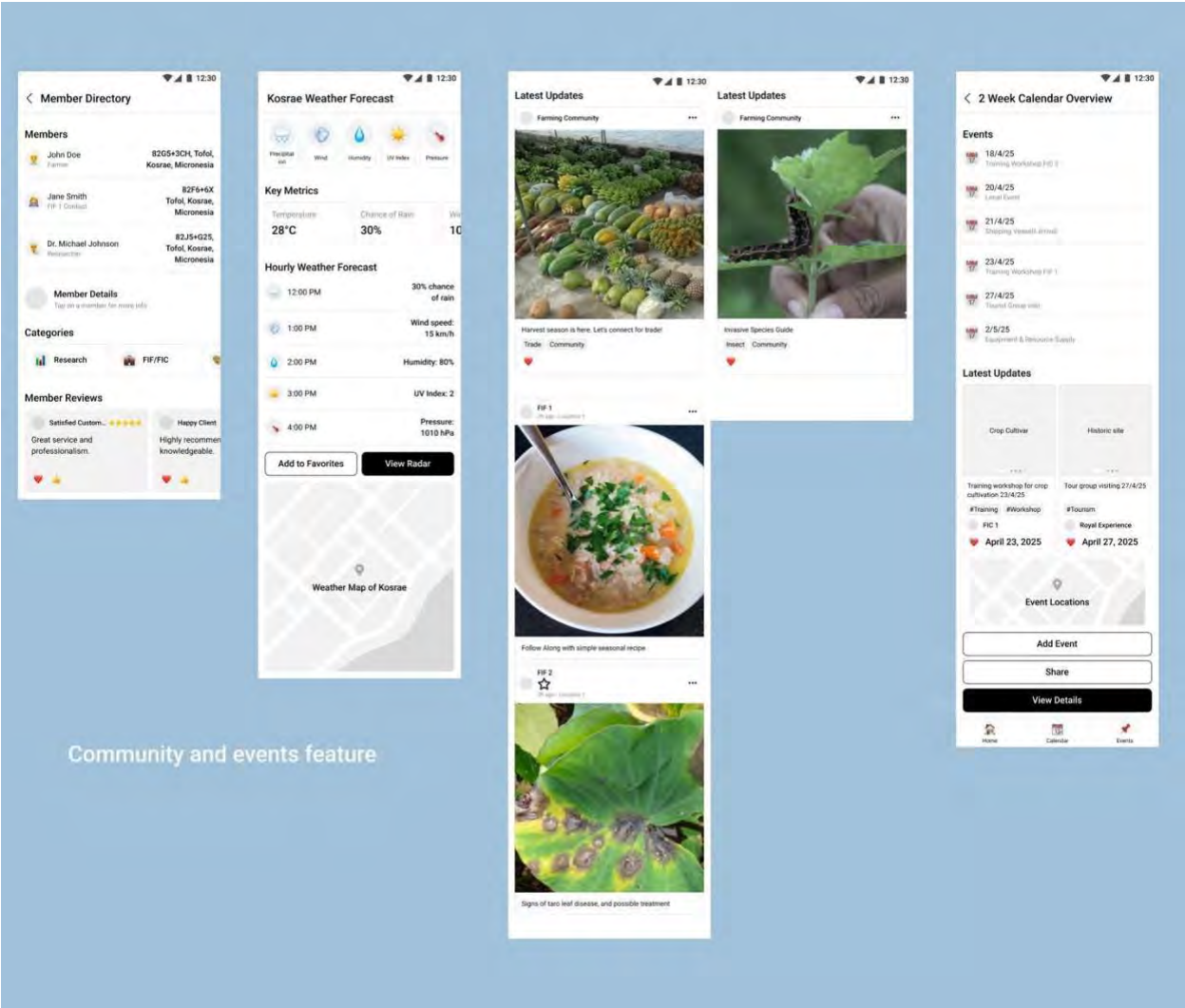
## Key features include:

1. A map of each state, identifying the locations of products or items available for purchase and if buyers want pins where they want food to be delivered.
2. Buyer-seller chat features to allow for bidding on wholesale produce as soon as it is harvested and to inform potential buyers of an upcoming collection or harvest. This chat feature is designed to be private between the two parties and enables the buyer to be in communication with the seller (collector/producer) to be kept aware of the product's availability, quantity, and processing status. This feature also is open to allow both parties to agree upon expectations as to the state and quality of product, from type of package and more. This site would be designed to accommodate and allow transfer of photos and agreements.

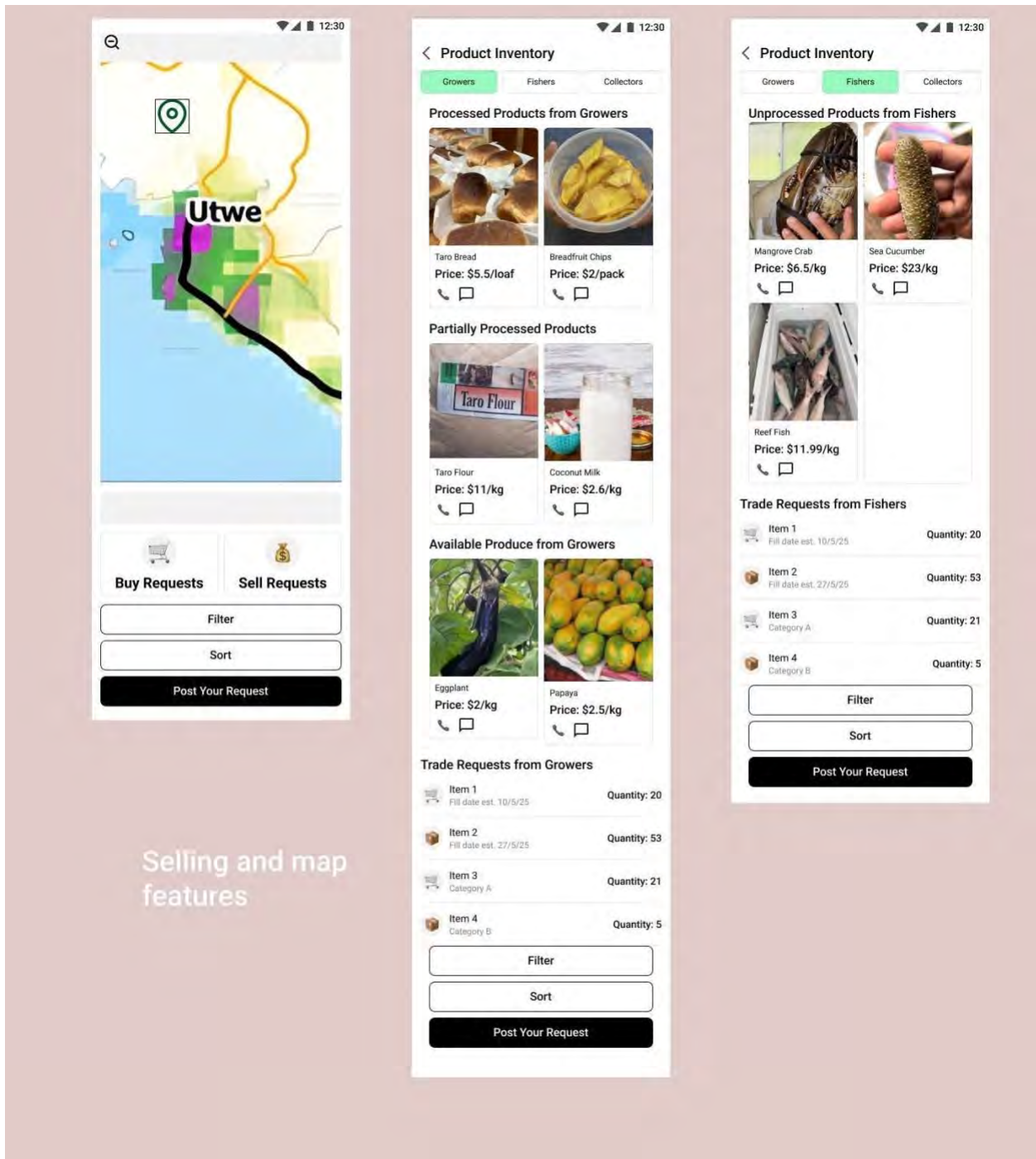
### Selling and map features



3. A comprehensive product inventory which highlights surplus produce available for trade and pre-order through future requisition requests.
4. A member directory of growers and processors, with business locations, contact information, and community member reviews.



- Real-time weather forecasts and emergency preparedness information. This could also be achieved by linking to existing platforms Kosrae State now uses with FSM Telecom and as practiced by DECEM. In this phone app, users would have the ability to report adverse weather and other emergencies in real time as they observe, thus serving as an early warning reporting that can complement the state and national services. Public service messages can be shared without cost, and private sector can use FSM Telecom for a fee to send out text messages alerting others to availability of produce or the need to purchase products.



Selling and map features

6. A community social media feature to highlight local recipes, pests and diseases that emerge, success stories, and event outreach.
7. Such an app can also be used to announce state public events, school events, cultural and religious events and holidays in which fresh and processed foods are needed to increase the opportunity to ensure all food used during such events are produced/collected/caught locally.
8. An overview of upcoming events happening in the state by the public or private sector, including training workshops and farm/facility tours to help grow the capabilities in all levels of the tiered food processing system.

This phone app needs to be commercialized by a local private vendor and made available to Kosrae State, compatible with Android and Apple phones and in concert with FSM Telecom and the State. The phone app is to include the following features and functions:

(i) Offline functionality to access information without continuous connectivity to users.

That is, there needs to be sufficient memory for photos and data collection remotely when offline for later automatic downloading into the app's system when online.

(ii) Ensure sufficient storage capacity and backup solutions built-in to safeguard data and ensure uninterrupted access.

(iii) Easy-to-follow guides to enhance functionality for use.

(iv) Information dissemination policy and guidelines. FSM Telecom already has policy and guidelines in place to allow for the rapid or timely dissemination of information via SMS text to subscribers. This system is available but has not been used for food security, food production and agriculture/forestry/marine uses per se. Expanding the usage by Kosrae State as is now done by DECEM's current system to share vital emergency information for the public good through use of SMS texts would greatly strengthen Kosrae's Food System. Messages and notifications prepared by the State (in concert with other organizations such as COM and CRE and others) and submitted to FSM Telecom for review and distribution are recommended. FSM Telecom has a review system in place and is willing and able to expand its use to distribute such information public good (and not commercial) for free to all their subscribers. In short, SMS-based systems are recommended to deliver agricultural information, market updates, and weather forecasts to growers and residents.

(v) FSM Telecom also has policy and guidelines to allow for the rapid or timely dissemination of information via SMS text to subscribers for a fee when such messages are for commercial gain (buying and selling for example). This can be used by commercial growers/fishers and food collectors/distributors if/as needed.

(vi) Discussion with regional STARLINK distributors to determine if such similar arrangements could be agreed upon for their subscribers to get free access to content and SMS as part of their subscription agreement.

(vii) Building the requisite content for the information hub app which can be then developed and placed onto an online website. We recommend that for Kosrae State, we make available space on the State's government website that can be linked to from National. Information relevant for the needs of Kosrae State would be coordinated by Kosrae State (e.g. Resources & Development) in concert with FSM National Resources & Development's Office of Agriculture and Office of Trade. Given the current role of COM, CRE, and state and national R&D as well as the limitations relative to staffing and expertise, we also propose to form a 'Food System Innovation Hub Committee' to include members from these sectors, as well as those who have been assisting us with our food system and environment, to join in order to have a state and national team that can assist us in building an information library hub for Kosrae and the FSM. As such, we recommend extending invitations to our current partners, including the Food Security Research Team at Rutgers, the University of Guam, and the University of Hawaii. This Committee can then assist in the development of background information and review the already online sources of information to recommend best practices and sound, reliable information for our crops, their nutritional content, production and processing systems, technologies of interest, identification of pests and diseases, as well as control recommendations. These information sources are to include scientific reports, state and national reports, and studies which have been conducted but were not previously made accessible, extension materials, learning modules, and easy-to-follow practical guides and information to our farmers and communities.

### **Information Sharing Use Web-Based Platforms**

To be efficient, phone apps will need reliable scientific data and sound information and content to be prepared and made available. To strengthen our Kosrae State Food System foundation, we recommend that staff within the State R&D office be given the responsibility to coordinate with the state government and the COM and CRE to form a committee as detailed above in section (vii).

A Kosrae State website that allows all users free access to information on agriculture, including marine and fisheries, food production and processing, weather and environmental practices to mitigate against climate change and food security will be developed. Kosrae State is committed to including a coordinator to contribute toward building and ensuring access to such an information repository.

## Part III. Kosrae’s Food Processing Implementation Framework

Here are the proposed steps to developing a food processing system for the State of Kosrae based upon community input shared as part of the Food System Solutions project surveys, focus groups, and convenings.

These sustainability strategies will inform both the economic opportunities available to local communities and the broader village and national approaches to improving food security and sustainable development systems. These adaptations to food prioritization and evaluation systems are flexible and responsive to real-time events, ensuring feedback from state government and community members to inform the development of a sustainable and culturally relevant local food processing system.

### The Value of a Food Innovation Center (FIC) in Food Processing System:

A Food Innovation Center (FIC) within a local food processing system offers **versatile equipment** for food safety, and commercial grade processing and professional packaging that can be used for the preparation of a variety of staple crops. Food Innovation Centers are intended to increase affordability and availability of local, healthy, and convenient food products while providing jobs, strengthening the economy, and reducing dependence on imported processed foods.



## Centralizing Processing of Local Crops for Convenient Processed Foods

**Taro** - high levels of vitamin C, vitamin B6, and vitamin E



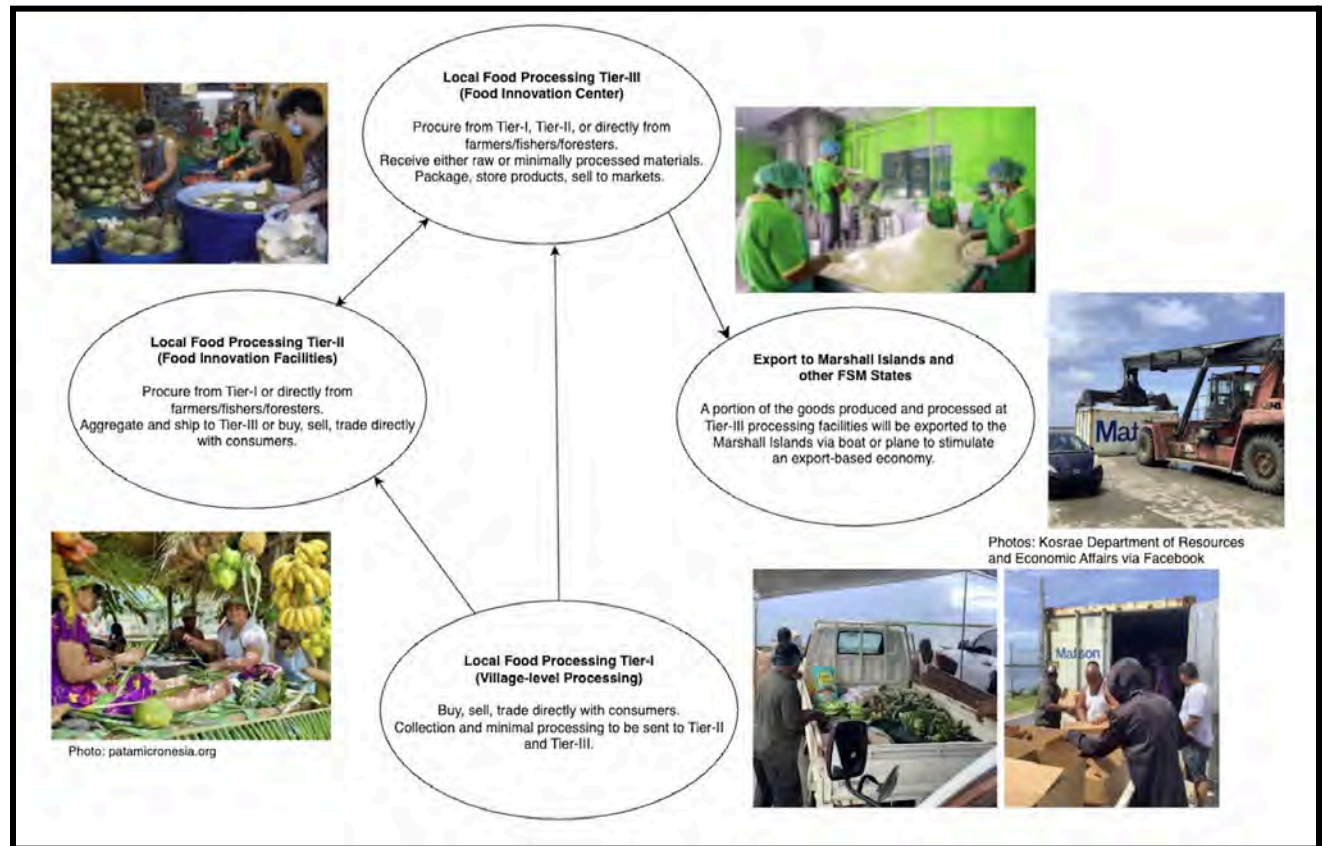
## Capacity Building and Job Creation examples



### Decentralized, Tiered Food Processing System for Kosrae State:

In Kosrae State, stakeholder feedback indicates that an FIC would be part of a decentralized food processing system with linkages from households and communities to municipalities and ultimately to the larger-scale shared FIC processing facility.

## Illustrated Example of the Connections between the Food Processing Facilities at each Tier with the Food Innovation Center at Tier III and Export Opportunities.



The proposed Kosrae State decentralized food processing system begins at the household and village level, referred to as **Tier-I**. This tier provides basic, cost-effective, and context-appropriate processing equipment, much of which can be operated without electrical power. **Tier-II** consists of community-level Food Innovation Facilities (FIFs), with approximately two such facilities in Kosrae State. These facilities include teaching and training kitchens for commercial food preparation, mid-scale processing equipment for priority products identified by Kosrae State representatives, and storage infrastructure. **Tier-III** represents a more advanced, state-level FIF, with one centralized facility per state equipped with modern, large scale processing technologies. These three tiers are designed to function both independently and in coordination with one another. This modular structure reduces operational risk, promotes rapid adoption, and creates opportunities for income generation and employment. Each municipality and the broader FIC system are intended to stimulate local food production and processing while enhancing food security. Key stakeholder surveys and multi-day convenings with grower, seller, consumer, and community leader representation were employed to identify the location of these facilities and priority food products to be processed. An in-depth analysis of survey and convening responses can be found in the evidence-based stakeholder goals document. These decisions were informed by tradition, culture, familiarity of traditional food systems, and market

demand and aligned with existing agricultural and foraging/collection practices. This design is rooted in a decentralized approach that emphasizes food safety, accessibility, and broad-based participation, and mitigates risk. The establishment and utilization of FIF and FIC as economic drivers of change will promote and increase local food production, processing, and consumption while reducing imports and creating a more circular economy that keeps more money in the state for families and communities.

### **Tier I Food Innovation Facility (FIF) – Low Level Processing Facilities:**

Tier-I facilities represent the foundational level of the food innovation processing system, consisting of specialized 100-200 square foot spaces. **Kosrae stakeholders have suggested four Tier-I facilities, spread across Kosrae.** These spaces are equipped with fully functioning workbenches and essential materials necessary for preliminary food staging and processing activities. Such facilities require the least investment and risk yet are fundamental to community engagement and building that local foundation.

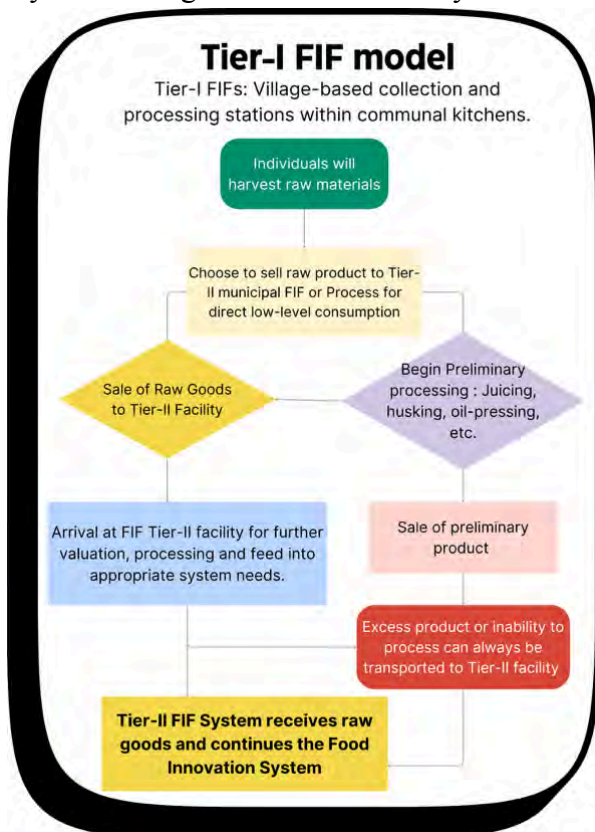


The operational workflow begins when individual community members harvest produce from greenhouses or raw materials from their local sources and deliver them to the village-level communal kitchen facility. They can choose to prepare raw materials for direct sale as inputs, making them available for weekly pickup by Tier-II and Tier-III facilities, or they can opt for low level processing that involves preliminary, low-energy equipment to create value-added products either for direct consumption or to be brought to Tier-II.

The processing activities at Tier-I facilities encompass a diverse range of products and techniques. For immediate sale items, the facilities focus on products like coconut water or fruit juice, which will perish quickly and therefore only be accessible for same-day consumption. This also includes coconuts that have been husked and pressed for oil extraction. Simultaneously, staple crops such as bananas, coconuts, breadfruit, and citrus are collected and stored in designated areas, awaiting transport to higher-tier facilities where they will undergo more sophisticated processing and/or packaging. Harvested greenhouse and garden vegetables like cabbage, tomatoes, cucumbers, peppers, and eggplants, will be shipped to the Tier-II processing facility for local consumption or directly to the Tier-III processing facility for packaging and eventually to the Marshall Islands. An important aspect of the Tier-I operation involves the strategic utilization of byproducts, where food processing waste is converted into valuable components for poultry and animal feed, ensuring minimal waste throughout the system.

Each Tier-I facility will use food waste to prepare compost piles, which will then be used to tend to soil in the surrounding area. Food waste, green kitchen waste, and locally available materials will be collected and placed on top of the ground in 1m x 2m x 1m piles or into specially constructed open boxes made of local materials. If space is available, the compost pile can be placed within a wooden frame. Composts will be placed away from toilets and streams, and will be watered during dry periods, but otherwise simply turned with a shovel or hoe every few weeks. The more poultry or animal manure that is added, the better the quality of the compost will be, because it will accelerate the decomposition process and make the compost more uniform.

Documentation and coordination represent critical components of the Tier-I operation, with community partners maintaining comprehensive records through both physical and digital logging systems. These logs capture detailed information about food harvesting activities, preparation and processing procedures, and all exchange transactions that occur within the facility. This meticulous documentation serves a dual purpose, providing immediate operational insights while feeding into the broader national food sustainability and security planning system through a dedicated food systems mobile application.



The market coordination and communication functions of Tier-I facilities rely heavily on the digital app system to maintain efficiency and prevent market oversaturation. Through this platform, facilities log processed items and raw material inventory, coordinate with community leaders to organize local sales events, and communicate product availability directly to local consumers. The system also enables sharing of information with other Tier-I processing centers, creating a network that helps prevent oversaturation of single products at higher-tier facilities and ensures balanced market distribution across the region.

Each Tier-I facility operates within a comprehensive output notification system that digitally reports critical operational metrics. These reports include the quantity of raw materials received during each operational

period, the amount of processed goods available for local market sales and export, the volume of materials designated as inputs for Tier-II value-added processing systems, and the quantity of food scraps that will be delivered to the local Animal Feed Processing Center. This systematic reporting ensures transparency and enables effective coordination across all levels of the food innovation network.

## **Tier-II Food Innovation Facility Layout (3,000–4,000 sq ft)**

Tier-II Facilities will receive raw and low-level processed materials from each of the four Tier-I facilities, or directly from individual farmers. Kosrae policymakers and the Kosrae Farmers Association will decide the locations, each equipped with manual and powered equipment, storage spaces for fruits/vegetables and staple crops, and outdoor community kitchens for workshops and training.

The Tier-II system has additional capabilities in its ability to process staple crops, including bananas, coconuts, taro, and breadfruit. These types of materials take added precautionary measures to ensure that they are all uniform, clear of contamination and ensure the most sanitary practices throughout the system workflow. Our core layout proposal includes designated square footage and functionality for each critical process area:

- Receiving/Loading Dock – 1,000 sq ft
- Staple Crop Processing - 600 sq ft
- Community Kitchen/Workshop Training – 500 sq ft [Outdoor]
- External Storage Container
- Factory Room 1,000 sq ft

### **Tier-II Food Innovation Facility 1:**

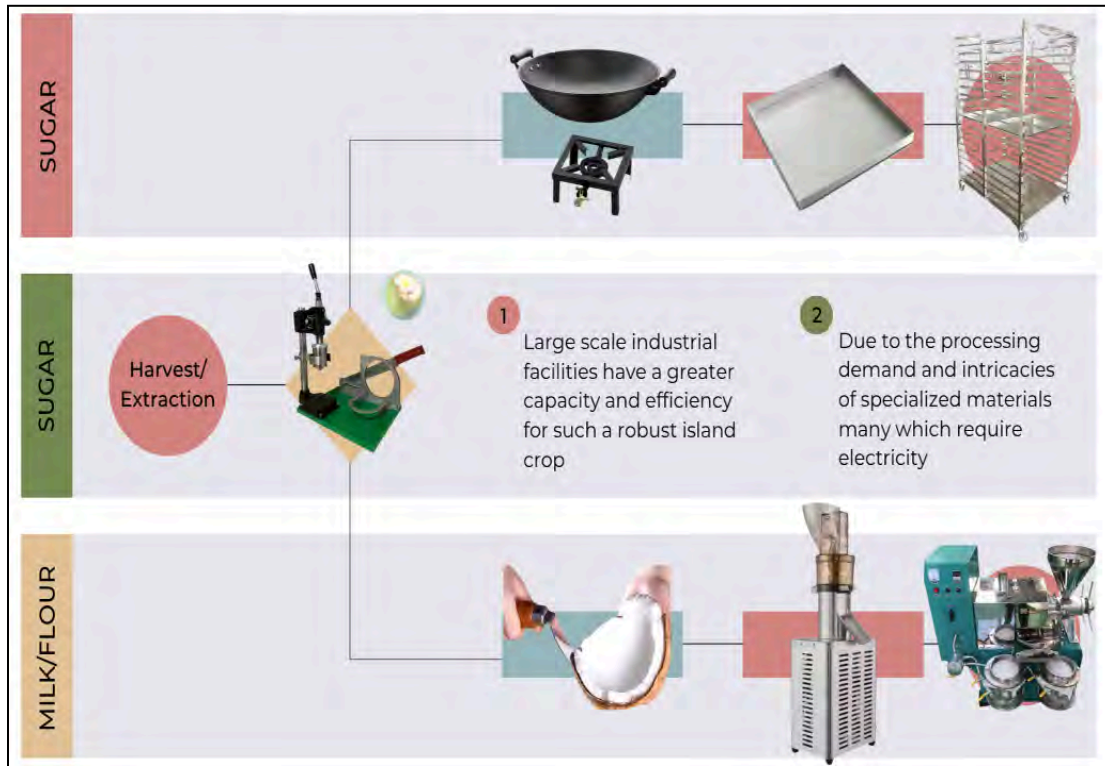
The first Tier-II FIF will be focused on processing coconuts for sugar, milk, and vinegar. Collected sap from coconut flowers will be brought for sugar extraction, while whole, dehusked coconuts will be bought for milk extraction. Processed sugar and milk will be sent in bulk to the Tier-III Food Innovation Center for food safety testing, packaging, and storing, while byproducts like coconut water and coconut cakes will be sent to the Tier-III Animal Feed Processing Center.

### **Tier-II Food Innovation Facility 2:**

The second Tier-II FIF will be focused on processing breadfruit, bananas, and taro for flour and chips. Cleaned breadfruits, taro, and bananas will be collected at Tier-I facilities across Kosrae state. Tier-I facilities will have the option to dry and grind their products for value-addition, or this can be done in Tier-II. Flour and chips will be created in bulk at this Tier-II facility and sent to the Tier-III Food Innovation Center for testing and packaging. Byproducts will be sent to the Tier-III Animal Feed Processing Center.



**Example Coconut processing for Milk/Flour/Sugar at Tier-II:**



Coconut processing is more integrated than most other fruits and vegetables and requires the use of more sophisticated technologies to ensure that all parts are used with the most efficiency. Certain aspects of the coconut processing system can be done at the Tier-I FIF level but the waste generated or its inability to retrieve all the flesh or all of the water will render it less efficient.



*Taro flour processing  
Pingalap atoll,  
Pohnpei State.*

## Tier III Food Innovation Center Layout (5,000–6,000 sq ft)

The proposed Tier-III layout includes designated square footage and functionality for each critical process area:

- Staple Crop & Vegetable/Fruit Processing – 1,000 sq ft
- Community Kitchen – 1,000 sq ft
- Storage Areas – 800 sq ft
- Administrative Office – 300 sq ft
- Food Testing Lab – 300 sq ft



Food quality check, packaging and distribution at Tier III facility.

### Technical Scope of Each Room Designation Area\*

Room Designation	Function, types of crops and types of technology
<b>Room 1</b> Staple Crop Processing	<p>Functions: Washing, chopping, drying (solar-assisted), grinding, and packaging.</p> <p>Crops: Breadfruit, taro, cassava, coconut.</p> <p>Technologies: Solar dryers, low-energy grinders, local packaging systems</p>
<b>Room 2</b> Vegetable & Fruit Processing	<p>Functions: Cleaning, peeling, slicing, dehydration, vacuum sealing.</p> <p>Produce: Banana, citrus, papaya, mango, greens.</p> <p>Technologies: Blade processors, solar drying systems, hand wash stations.</p>
<b>Room 3</b> Community Kitchen	<p>Functions: Cooking demos, nutrition education, recipe development.</p>

	Tools: Solar-powered stoves, fermentation crocks, culturally rooted recipe books.
<b>Room 4</b> Storage Areas	Features: Dry and cold storage, inventory tracking, adaptive cooling systems including eggs
<b>Room 5</b> Administrative Office	Functions: Recordkeeping, training coordination, business management.
<b>Room 6</b> Food Testing Lab	Functions: Nutritional testing, product development, food safety monitoring.
<b>Room 7</b> Workforce Training Room	Functions: Video display, hands-on workshops, youth and women engagement.

\*The use and application(s) of each room can be modified and changed. This is for illustrative purposes.

This full-scale regional Food Innovation Center will be supporting research, policy integration, high-volume processing, storage, logistics, and training. This facility will be on an agreed upon location in Kosrae and will be fully supported by electricity and back up generator power, which is crucial for the high-powered equipment for processing, testing, and long-term storage, and enhanced by solar power. The FIC will produce the highest level of value-added products with the longest shelf life and highest safety standards. This is crucial because of the level of sophistication, long-term storage particular for export needs and industry agreed upon during convening requests and suitable to meet the lion's share of the product requests. Such a facility will be used for the preservation, processing and new product development, introducing innovation, and serving when needed as a key aggregation collection and distribution center.

Food processing will be completed at this level and a long-term storage unit will be attached for export-ready preserved and dried goods, suitable for the Marshall Islands and other FSM States. This will also be the site of the larger research opportunities, providing both data analysis and tracking seasonal trends, purchase/sale schematics and informing representative food system input collaborators with up to date, real-time updates. This facility will host large conferences, address collaborative challenges, and facilitate large scale convenings, meetings, and trainings.

## Tier III Animal Feed and Fertilizer Processing Center Layout (3,000-4,000 sq ft)

The proposed Tier-III layout includes designated square footage and functionality for each critical process area:

- Terrestrial Byproduct Collection Area – 500 sq ft
- Marine Bycatch Collection Area – 500 sq ft
- Storage Areas – 800 sq ft
- Animal Feed Processing Area – 1,000 sq ft
- Fertilizer Processing Area – 1,000 sq ft

According to the GCFSAP020 Baseline Assessment surveys, Kosrae stakeholders emphasized that expensive imported animal feed is the largest barrier in livestock production. Pig producers in Kosrae will typically supplement store-bought feed with foraged crops like coconut and taro, but this takes time as the taro needs to be cooked and the feed has to be mixed. Fertilizer access is also a barrier to efficient crop production on Kosrae. Although Kosrae's



volcanic soil has the required nutrient for crop production, as Kosrae is shifting to greenhouse crop production, these operations will need sufficient access to fertilizer.

The Animal Feed and Fertilizer Processing Center will use waste from the tiered processing system, including but not limited to copra cakes, rotted breadfruit, coconut husks, taro, and scraps from processed crops, along with fish byproducts from the Da Yang fishing facility and other commercial fishers to create animal feed and fertilizer.

Egg-laying chickens require a specific diet, which includes around 15-20% protein, 3-4% calcium, and 0.4-0.5% phosphorus. The rest of the diet should be carbohydrates/starches, traditionally grains but with available substitutions of FSM's staple crops (Pacheco, Gulizia, & Downs, 2022). Some raw materials used/incorporated in feed productions include fish meal, copra meal, palm kernel meal, coconut oil and added supplement costs (Glatz et al., 2013).

### **Proposed diet from available staple crops:**

40-45% taro, tapioca for starch

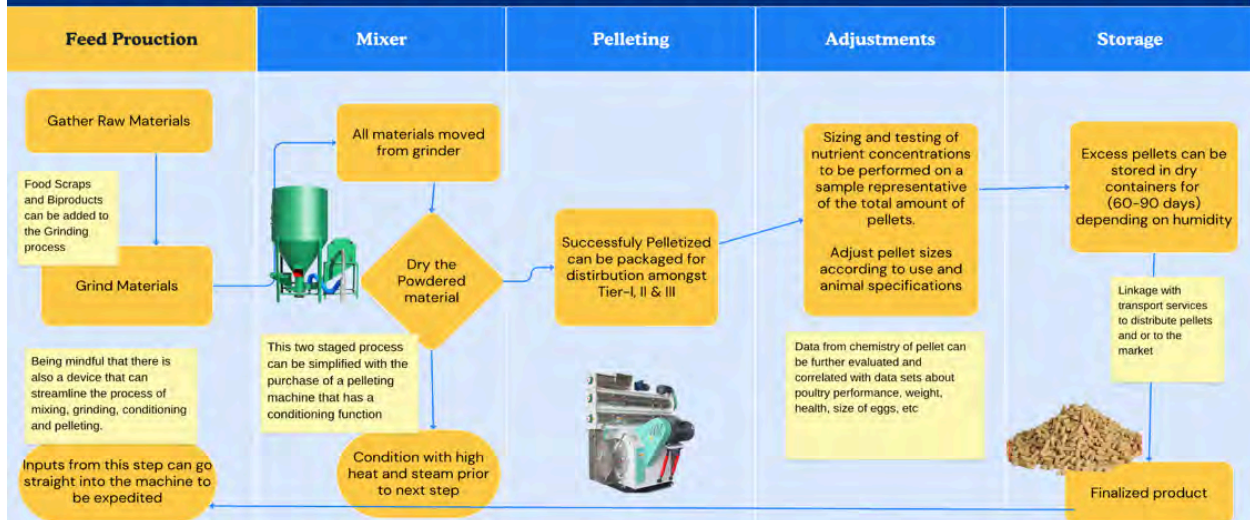
30-35% fish byproducts, for protein

10-15% coconut meat for healthy fats

10% mangos, papayas, seaweed, leafy vegetables for added vitamins and nutrients Supplement with giant clam shells for calcium

# Chicken Feed Workflow

Creating a streamlined and sustainable approach to chicken feed production



Mixing imported bulk ingredients for animal feed is less expensive than purchasing pre-mixed feed.

Fermented ingredients will help with nutrient uptake and digestion

Imported or farmed soybean or corn will also be beneficial to include in chicken feed for a complete diet.

## Local pig meal ingredients:

- Coconut meal and copra cake
- Sweet potato and taro leaves
- Breadfruit processing waste
- Fish processing byproducts
- Seaweed meal
- Kitchen/restaurant waste



### Technical Scope of Each Room Designation Area\*

Room Designation	Function, types of crops and types of technology
<b>Room 1</b> Terrestrial Byproduct Collection Area	Functions: Collecting, Sorting. . Crops: Breadfruit, taro, cassava, coconut, banana, green vegetables, mango, papaya. Technologies: Low-energy grinders, freezers, vacuum sealers
<b>Room 2</b> Marine Bycatch Collection Area	Functions: Collecting, Sorting. Produce: Fish byproducts from Da Yang and other commercial fishing vessels Technologies: Freezer, grinders, renderer, centrifuge, dryer, pulverizer.
<b>Room 4</b> Storage Areas	Features: Dry and cold storage, inventory tracking, adaptive cooling systems
<b>Room 5</b> Animal Feed Processing Area	Functions: Processing, Preserving, Packaging. Technologies: Freezers, dryers, grinders, centrifuges, pellet mills, pellet coolers, crumblers, packaging equipment
<b>Room 6</b> Fertilizer Processing Area	Functions: Processing, Preserving, Packaging. Technologies: Shredders, grinders, compost turners, pH monitors, packaging equipment

\*The use and application(s) of each room can be modified and changed. This is for illustrative purposes.

# Illustrated Example of the Animal Feed and Fertilizer Processing Center:



Photo from: <https://fnryx.en.made-in-china.com/product/LOPAMqXoGdkC/China-Fish-Animal-Small-Chicken-Feed-Production-Line-Pellet-Making-Machine.html>

## Local Food Processing Tier-III (Byproduct Processing Center)

Caught fish will be brought for cutting, cleaning, cold storage, smoking, drying, and packaging. Bycatch will also be processed into protein-rich animal feed.

- Equipment needed:**
- Filet cutter
  - Cleaner/gutter/descaler
  - Fryer
  - Ice maker
  - Smoking oven



Photo from: <https://food-drying-machine.com/food-drying-solution/fish-drying-in-bangladesh.html>



Photo from: <https://nmaquatics.com/blogs/the-benefits-of-steam-dried-fish-meal-in-animal-feed-a-high-protein-solution-for-healthier-livestock/>



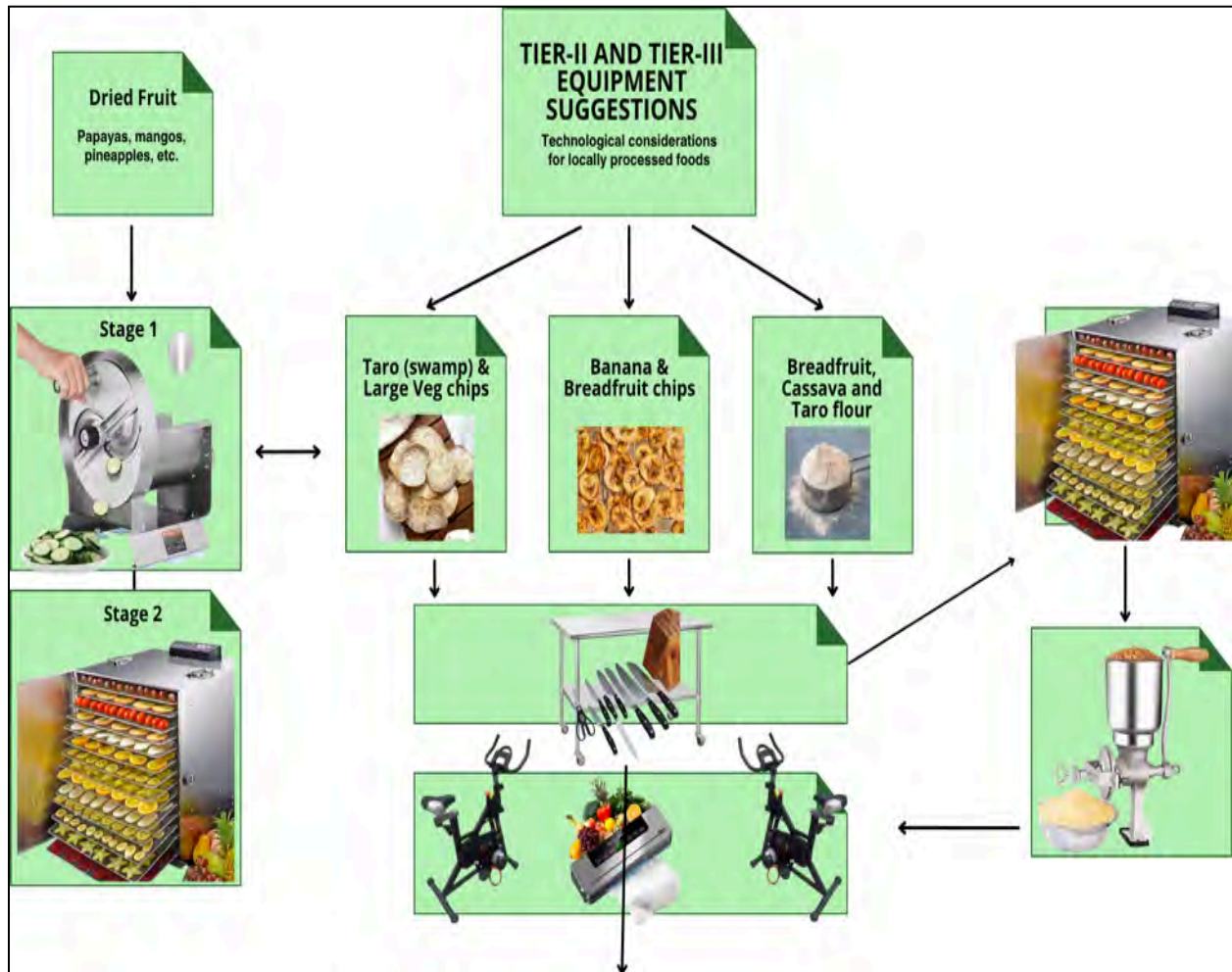
Photo from: <https://www.honupointvacationrental.com/where-to-buy-fresh-fish-north-shore-kaui-hawaii/>

## Local Food Processing Tier-I (Fishing Vessels)

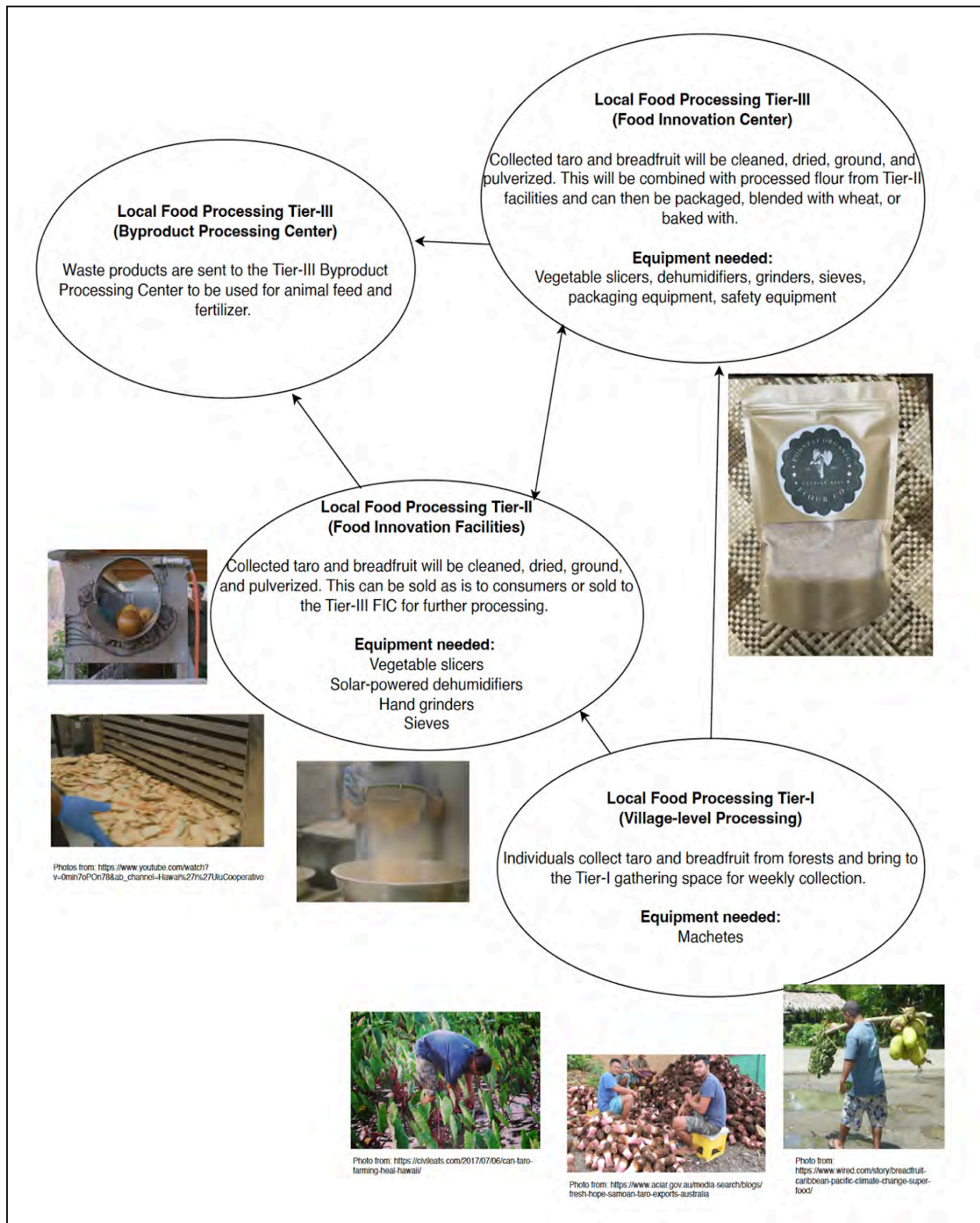
Bycatch from large fishing vessels will be brought to the Tier-III Byproduct Processing Center to be processed and sold directly to customers or to be converted into animal feed.



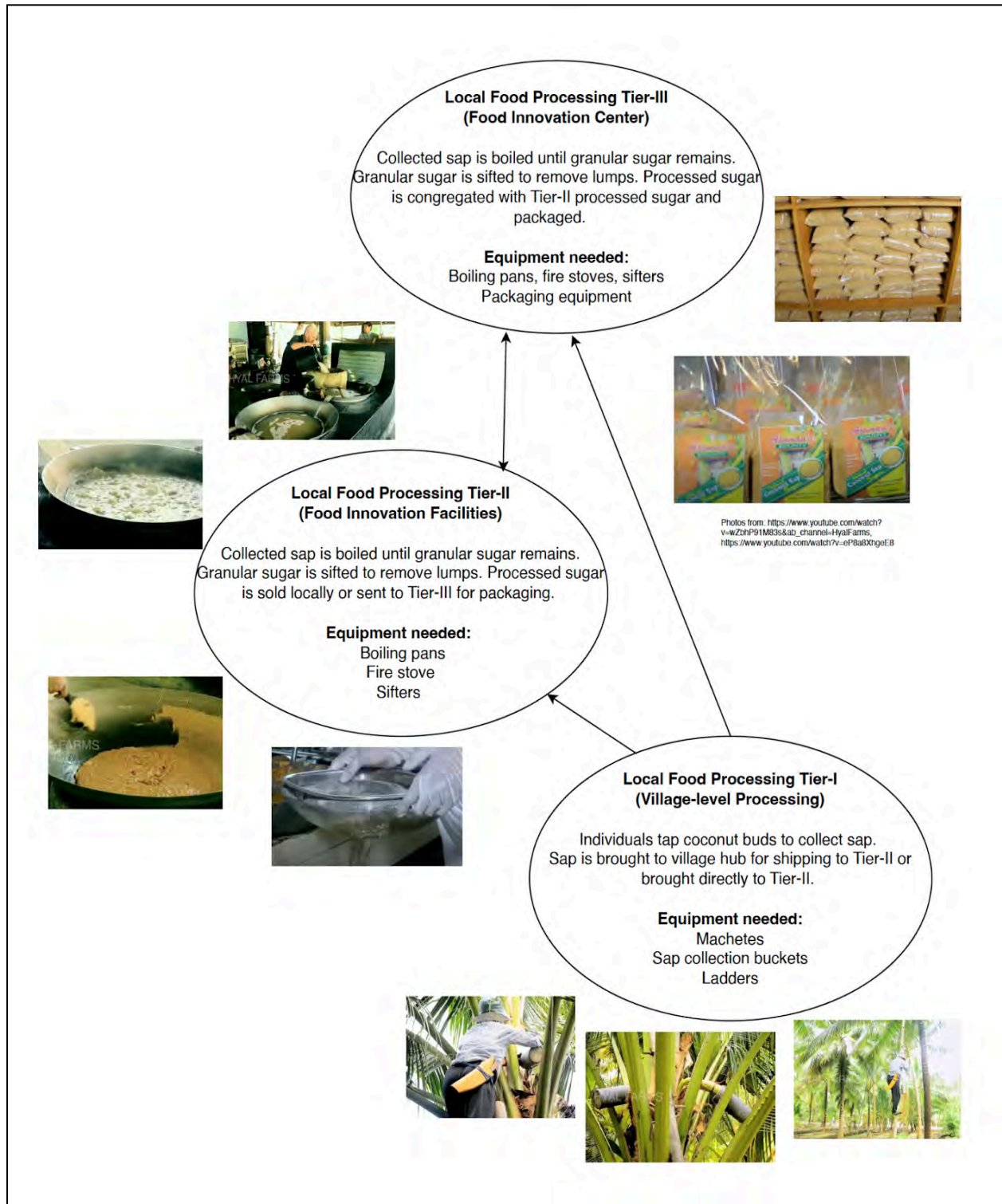
## Example of Tier-II and Tier-III Processing System:



## Example of Tiered System for Processing of Taro and Breadfruit Flour:



## Example of Tiered System for Processing of Coconut Sugar:



## Example of Bycatch Processing Facility:

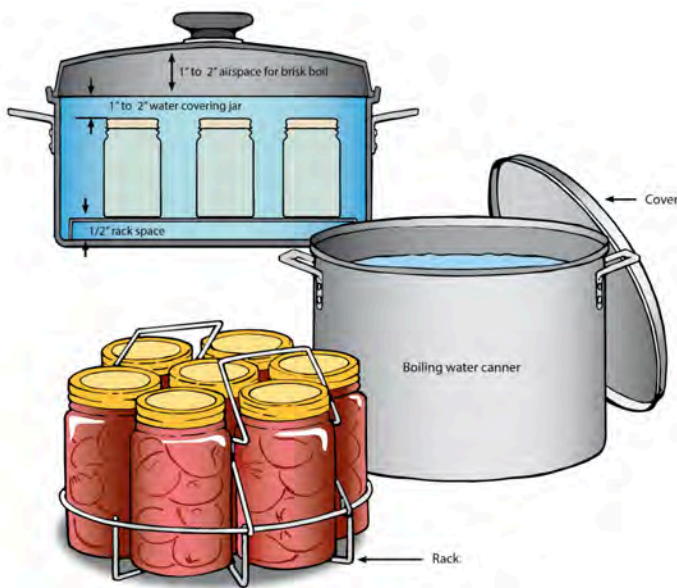


## Tropical Food Preservation through Canning and Pickling

Stakeholder surveys indicated the desire for longer term storage through shelf-stable, ready-made products. Consumer survey respondents ranked pickled vegetables as a top requested food item, and the seasonal availability of preferred fruits documented in the GCFSAP020 Baseline Surveys demonstrates a clear need for canning as an off-season preservation method. This overview brings together best practices in food storage through canning and pickling, adapted for environments of high heat and humidity, which accelerate food spoilage. Below is a review of canning and pickling practices that highlight food safety and longevity of shelf life.

### Fundamental Principles of Canning and Pickling

Canning works by heating food to very high temperatures (116-121°C) under pressure and sealing it in airtight containers. This heat kills harmful bacteria, enzymes, and other microorganisms that cause food to spoil. The airtight seal prevents new bacteria from getting in and keeps gases or liquids from escaping. This process makes food safe to store at room temperature without refrigeration.



Royer, 2022

Pickling preserves food by making it acidic. When food becomes acidic enough (with a pH below 4.6), harmful bacteria like *Clostridium botulinum* cannot grow. There are two ways to make food acidic for pickling: adding vinegar directly, or using natural fermentation where beneficial bacteria produce acid that lowers the pH naturally.

Both methods allow food to be stored safely for long periods without spoiling.

**Summary table of canning and pickling processes, from Peter & Lief (2003):**

Category	Canning	Pickling
Microbial Stability	Very High (Sterile)	High (if pH maintained < 4.6)
Shelf Life (in controlled environment)	1-5 years	6-24 months
Energy Input	High (Thermal technology, 1-2kWh/batch)	Low (Minimal heating)
Nutrient Retention	Moderate - Low (Thermal loss of Vit C & B-Complex)	Moderate to High (Some vitamin loss in brining)
Sensory Qualities	Texture/structure changes (Softening)	If Brine controlled can maintain crispness
Failure Points	If seal is compromised	pH drift, unstable fermentation, yeast/mold growth

### **Workflow steps for Canning (Pressure Canning Emphasis)**

Steps	Consideration
Step 1 (Selection)	Harvest selection of produce should occur at peak ripeness. <i>Bruised, moldy or overripe food items should be rejected</i>
Step 2 (Cleaning and Preparation)	Food stuffs should be washed in potable water with 50ppm chlorine solution <i>Provisions for food items should be discerned whether to peel, core, slice as needed based on food item</i>
Step 3 (Pre-treatment)	Blanch (high-acid foods) like tomatoes and fruits Boiling (low-acid foods) like green beans, poultry
Step 4 (Packing Jars)	Hot pack methods are often preferred in humid regions to reduce internal jar airspace Maintain headspace of about .5-1 inch
Step 5 (Sterilization/Pressure Canning)	Use Pressure Canner at 10-15 psi <i>(dependent on current altitude at time of processing)</i> Process 20-100 minutes <i>(depends on food density)</i>
Step 6 (Cooling and	Allow jars to cool undisturbed for 12-24 hours

Sealing)	<i>(Test seals, Label food item with date and other pertinent information)</i>
Step 7 (Storage)	Store in temperature controlled environment or low-humidity room <i>(Additionally can cover jars with cloth to reduce condensation-induced rusting due to environment)</i>

## Workflow steps for Natural Fermentation and Vinegar Pickling

Steps	Consideration
Step 1 (Selection)	Harvest selection of produce should occur prior to peak ripeness. <i>Selecting young vegetables without the presence of bruising. Moldy or overripe food items should be rejected.</i>
Step 2 (Cleaning and Preparation)	Looking for signs of pathogen presence on food stuffs and removal of those indicating (Salmonella, listeria and other risks in hot climates). Food stuffs should be washed in potable water with 50ppm chlorine solution <i>Provisions for food items should be discerned whether to peel, core, slice as needed based on food item</i>
Step 3 (Pre-treatment, Brine Preparation)	Fermentation brine 2.5-5% salt by weight Or Vinegar Pickling via 5% acetic acid vinegar (Commercial Standard)
Step 4 (Submergence)	Submerge food stuff under brine and ferment at 22-26 degrees Celsius for 5-14 days in a controlled environment Pickling causes immediate acidification (via use of vinegar) and therefore no fermentation processing is required
Step 5 (Monitoring)	Being mindful at this step for signs of yeast film, molds and other tropical susceptibilities. Skim off films if needed
Step 6 (Finishing Step)	Transfer fermented food stuffs into clean jars and top with fresh brine
Step 7 (Storage)	Store in/under refrigeration or vacuum seal in the case of ambient storage

## Summarizing Technical Strategies/Considerations

Therefore to Summarize Technical Strategies and evaluate which technique is not only preferential (according to current seasonal needs) but also which is best fit for the type of food you are processing, please see below:

Canning	Can you meet this parameter (Y/N)	Pickling	Can you meet this parameter (Y/N)
Strict adherence to pressure/time parameters  <i>(Please see USDA Canning Guidelines)</i>		Salinity adjustment <i>Aiming for 3.5-5% salt brine in hot/humid climates</i>	
Use of pressure rated glass jars and lids		pH testing <i>Using simple pH meters or test strips with a final pH target of &lt;4.0</i>	
Monthly inspection  <i>Stored goods for rust, leaks, or bulging lids</i>		Shortened fermentation times <i>Completing fermentation between 5-7 days in controlled environments/climates to avoid microbial ingress</i>	

## Microenterprises for Local Consumption and Export

### Hatchery

In order to maintain chicken egg production and processing, Kosrae State will require a chicken hatchery microenterprise, which will provide two week-old chicks to individuals to expand their flocks. The hatchery should aim to produce around 200 eggs per cycle (21 days).

#### Facility will include:

- Breeding flock space
- Climate controlled incubation room
- Brooding area to 2-week old chicks

To maximize egg production without stressing out chickens, there should be 5 roosters for 50 hens (1 rooster for 10-15 hens). Hens and roosters should be vaccinated for common avian diseases like Marek's Disease, Newcastle Disease, Bronchitis, Fowl Pox, and Bursal Disease.

### **Vaccine Schedule for Breeding Flock:**

Chicks:

- Day 1: Marek's Disease (at hatchery)
- Day 7-10: Newcastle + Infectious Bronchitis (eye drop)
- Day 14-21: Infectious Bursal Disease (drinking water)
- Week 4-6: Newcastle + IB booster (eye drop)
- Week 6-8: Fowl Pox (wing web)

Growing Birds:

- Week 12-14: Newcastle + IB booster
- Week 16-18: Infectious Bursal Disease booster (if needed)
- Week 18-20: Pre-lay vaccinations

Adult Breeding Birds:

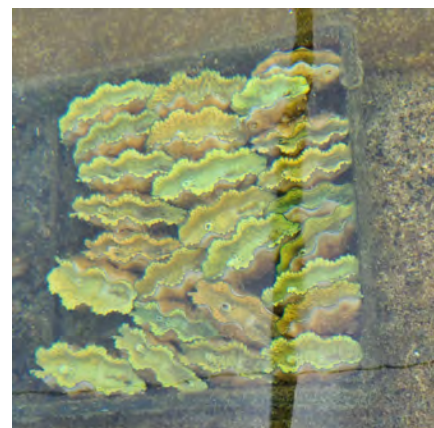
- Annual: Newcastle Disease booster
- Annual: Infectious Bronchitis booster
- Bi-annual: Fowl Pox (if high risk area)
- Before breeding season: Full health check and boosters



## **Aquaculture**

In Kosrae, aquaculture plays an important role in ecosystem restoration and providing traditional foods that are no longer readily available in Kosrae's reefs, like the giant clam. The National Aquaculture Center on Kosrae is aiming to repopulate the reefs with the giant clam and therefore reintroduce it as a food source for the people of Kosrae.

One aim of the National Aquaculture Center is to expand production to other important foods while emphasizing ecosystem restoration. For export, emphasis can be placed on sea cucumbers, sea grapes, and similar specialty aquaculture items that are delicacies in Asia and around the world.





The National Aquaculture Center wants to work with the greater community of Kosrae by buying harvested specialty aquaculture products from individuals and selling them as value-added products internationally. In concert with the Food Innovation Center, this aquaculture facility will harvest and grow specialty items, and process and package them for the global market.

**Maritime Food Processing**

Kosrae currently has three accessible fishing ports across the island, in Lelu, Tafunsak, and Utwa Ma. While the Tafunsak port is used by large Purse Seine fishing vessels, the Lelu and Utwa Ma ports are used by local Kosraeans for daily access to fresh seafood. Rather than a three-tiered system for fish, a modified tiered system will be put into place for maritime food processing in Kosrae State.



Individual sub-contracted fishing boats will serve as Tier-I operations, collecting fish and transporting them to the ports in Lelu and Utwa Ma. These fishing boats will have handheld solar-powered communication devices for coordination and inventory tracking, and the crew will have basic training in catch quality maintenance. These Tier-I boats will be sub-contracted as an alternative to each independent fisherman expanding fuel and time to deliver their catch individually. This method will reduce fuel consumption and travel time for small fishers, ensure better fish quality upon arrival, standardize data collection and supply management, and encourage cooperative management and community participation, while creating jobs for fishermen who have been transporting their catches to markets for decades.

Fish salting and drying will take place in these fishing ports. This will require their respective microenterprise facilities to have the ability to capture salt from the ocean to use for fish salting and a designated place for fish drying and processing off the ground.



Fish drying methods include sun drying and hang drying. Sun drying can take 3-7 days with optimal conditions. Requires frequent flipping of fish. Hang drying can take 1-4 weeks depending on weather and environmental conditions. Additional low cost solar chimney dryers will be built with local materials and rubberized screens. Such systems can significantly reduce drying time. These systems work best with small fish or large split fish.

Each method is dependent on hot, dry conditions to reduce the spoilage from molding and bacteria. Pest pressure from birds, insects, and rodents is a concern and processing and handling technologies to reduce these issues will be introduced. These methods require constant attention to ensure that any spoiled fish are promptly removed. When done correctly, dried fish can last around 3 months.



Common methods of fish salting for preservation include dry and wet salting. Dry salting occurs when fish are coated with salt crystals. Wet salting (or brine curing) occurs when fish are submerged in a 15% saltwater solution. Dry salting typically has a longer shelf life and does not require clean water. Yet, it can lead to overly hard, salty fish. Brine curing is gentler on the fish, but needs clean salt water. For reference, ocean water is typically only 3% salt so it must be boiled down significantly to be used as a brine. It does not have as long of a shelf life but has a reduced risk of overly salty fish. For both of these methods, sea salt can be harvested and used.

### **Circular Village Egg Production:**

Key stakeholder surveys and convenings have highlighted the increasing demand for locally sourced eggs. Kosrae state has many wild chickens, but they do not consistently lay eggs due to an improper diet. The proposed egg farming model exists within the tiered Food Innovation System, with Tier-I being home-coops, Tier-II being microenterprises around chicken feed and hatcheries, and Tier-III being an egg congregating and processing center to be sold directly to restaurants/stores or to be used for baked goods and sold. The tiered structure enables a circular, zero-waste method that uses waste from the processing of staple crops for chicken feed and waste from poultry as manure for the crops.

The initiative prioritizes community engagement and value-added production through **Step 1: Community Organization & Training**, establishing training modules for community leaders and individuals that are interested in poultry farming for eggs. **Step 2: Coop Infrastructure & Design** utilizes local materials such as bamboo and coconut wood to construct elevated, climate-resilient structures with integrated rainwater collection and composting systems.

**Step 3: Chicken Acquisition & Care** identifies hardy, heat-tolerant egg-laying breeds and introduces best practices for maintaining a flock. **Step 4: Local Feed Production** meets the dietary needs of egg-laying chickens and transforms food scraps from other Food Innovation Facility operations into nutrient-rich fermented feed. **Step 5: Daily Maintenance & Biosecurity**

establishes protocols that support bird health, prevent disease and predation, and ensure long-term productivity.

The system addresses waste management through **Step 6: Waste Transformation**, converting manure, bedding, and spoiled feed into compost. **Step 7: Egg Collection, Grading & Storage** implements gentle handling procedures, clay pot cooling methods, and community recordkeeping systems. **Step 8: Sales, Barter & Community Distribution** creates micro-economic opportunities that reinvest local labor into community prosperity.

**Step 9: Feedback & System Monitoring** establishes monthly review processes, performance scorecards, and responsive improvement mechanisms to maintain system transparency and effectiveness. Finally, **Step 10: Circular Economy Integration & Innovation** ensures complete resource utilization by transforming every byproduct into a valuable input while building knowledge transfer systems that enhance regional resilience.

This framework extends beyond infrastructure development to embody the Food Innovation Center's commitment to collective restoration, where sustainable production methods, systematic feedback, and community-driven innovation create lasting food system transformation.

## **Community Organization & Training**

The goal and focus of this critical step should be creating a shared vision, a sense of cooperative trust and rotational sustainable responsibilities through strategic activities. Sufficient training was highlighted as one of the largest deficiencies in poultry farming. Kosrae State currently has wild chickens foraging in the woods and irregularly laying eggs, leaving community members to forage for a couple of eggs at a time. In creating an egg farming training program, community members will learn best practices for creating a coop, feeding chickens an appropriate diet, tracking trends in egg laying to understand seasonality or environmental barriers, and waste management for full utilization of the community's resources. Individuals will use the knowledge gained from these workshops to build their own backyard coops, purchase chicks from a hatchery, and begin their own Tier-I chicken production facility.

Recent research models complement some of the questions and ideas brought forth from community members and key stakeholder groups in the GCFSAP020 Baseline Assessment (2024), the FSS Kosrae stakeholder surveys and convening sessions (2025). This data was utilized to tailor the focus of this step to consider the following, from Besbes et al. (2012):

1. What are small-scale and village poultry production systems?
2. What practices will increase the supply of eggs throughout the year?
3. How will individual egg production lead to income generation?
4. What to do during extreme weather events?

5. How to monitor trends in individual and community egg production through the Kosrae Food Systems app?

These investigation tools will help create a community feedback mechanism for a living coop model and therefore ensure the long-term success of this aspect of the FIC system, and establish a shared governance/training and clarify roles for village residents.

In developing community organizational structures and public participation, we have:

Initiated contact through collective invitations to workshops, to be recorded and available on Kosrae State's food system app and radio notices to community leaders previously identified in our FSS 2025 surveys and convenings (Farmers, youth leaders, women's groups, school staff and elected leaders). Municipal representatives will be encouraged to attend workshops to bring the knowledge back to their communities, so coops and hatcheries can be set up on outer islands as well. Infographics will be used to succinctly show best practices for coop design, chicken feed, and waste management.

Discussed below, the project vision and invitation to the construction of orientation gatherings.

Gathering via Village assembly: with the use of visual aids, (maps, mockups, storyboards) and intergroup dialogue, we created a safe space for ideas, stories, wisdom exchange and resource identification.

We have formed working groups: which have identified prospective facilitators, leadership rotations and begins the establishment of teams to advance in the following areas:

1. Egg team
2. Feed team
3. Coop team
4. Compost team
5. Recordkeeping

These efforts need to continue and build upon such previous activities of Community Organizational development around the Chicken & Poultry model in the FIC system in the following steps:

**Foundational Trainings:** Covering chicken care, sanitation, egg handling, cooperative models and systems of transport/articulation with other FIC Tiered Structures. Additionally, community leaders have highlighted the importance of incorporating traditional cultivation techniques and successes and failures of past projects to ensure community members avoid the mistakes that were made in the past.

Communication mechanisms through the Kosrae food systems app, bulletin boards near coops, color-coded flag systems (Green = help needed, yellow = supply request and red = critical alert) will enable need-based monitoring system designs that improve our poultry system (Sari, Aritonang, & Sumarlin, 2021).

## Coop Infrastructure & Design

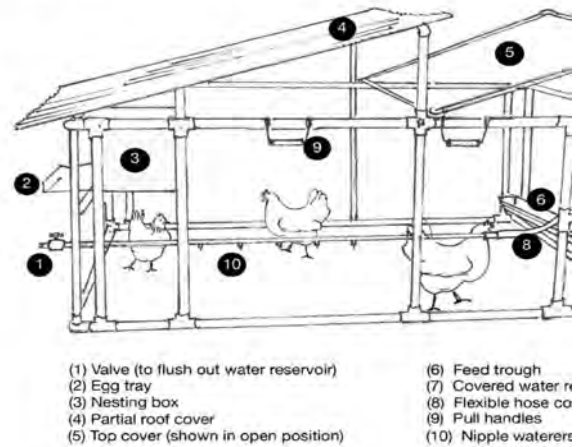
Ecological considerations and local resource availability are necessary in developing a protocol for coop design. Simple cages can be constructed from bamboo stems, wire mesh, and a tarp roof to house at most ten chickens. This has been successfully done in Yap through a USDA-SARE project by the College of Micronesia (Young-Uhk, 2011), shown in the image below.

Environmental considerations for coop design and maintenance include heat, high wind, heavy rain, saltwater inundation, and disease and pest pressure.



Young-Uhk (2011)

Figure 1. Diagram of grazing cage identifying the various components.



Fukumoto (2009)

Village-level design workshops will be administered by community leaders who have already completed this training. The workshop will engage villagers in a basic participatory sketch session. Utilizing ropes to map out the coop's geographic footprint on the land and especially considering the logistics associated with Food Innovation Facilities (FIF's). Participants will actively survey materials for harvest (including bamboo and coconut wood), collection of palm leaf, recycled tin sheets, and old barrels.

Construction of foundation and coop floor will be scheduled immediately following the design workshop to begin the implementation of skill development procedures, like that of digging post holes and installation of elevated supports utilizing coconut trunks and bamboo flooring slats for nutrient cycling (Brass et al., 2015).

Walls and roofing material can either be layered palm leaf (thatch) or tin roofing based on available viable materials. The structure of the pitch design for the roofing will be location

specific as well as the availability of bamboo panels or slats as building material. Nesting box installation and perches go hand in hand with the structural considerations of a locally sourced, sustainable chicken coop enclosure, and are essential compliments to elevated structures that undoubtedly serve the positive health supports for the chicken populations (Malchow et al., 2019). Other available building resources include coconut husks, old crates, and salvaged wood to begin the design for access hatches for egg collection.

The incorporation of rain catchment systems is especially important in anticipation of water scarcity (due to limited availability of liquid tanker trucks and heat conditions) and the high amount of agricultural and egg production needs in the future. Rainwater harvesting systems must incorporate precipitation measurements/trends (specific for each island community), roofing designs, demand-specific considerations (in reflection to the number of chickens to feed ratio) and production cycles (based on health, behavior and demand) (Arenas-Navarro et al., 2020). The rain catchment system will consist of bamboo or recycled PVC pipes. Additionally, incorporating recycled barrels or food-grade containers as forms of water storage.

### **Chickens: Acquisition & Care**

Adaptation to Kosrae’s climate is a crucial consideration in poultry selection. Kosrae currently has feral chickens across all of its populated islands, which offer an irregular supply of eggs. These chickens are likely a hybrid of domesticated chickens brought over by early settlers and redfowl, which is a wild chicken breed (Martin Cerezo et al., 2023). They are extremely resilient to the extreme heat and rainfall experienced throughout FSM and it is crucial to find similar chicken breeds that can withstand extreme climate conditions.

#### **Chicken breeds suitable for Kosrae’s climate include:**



Leghorns – Tolerant to high heat, good foragers, produce many crisp white eggs, the most common commercially available eggs. Enjoy a free range environment. Can be flighty, difficult for beginners. Start laying eggs between four-six months. Finish between 6-7 years.



Manorcas – Tolerant to high heat, tolerate foraging and free-range environment, also tolerate confinement.

Good layers, large white eggs. Flighty but can be socialized. Start laying eggs around 4 months. Finish between 5-7 years.



Rhode Island Reds – Can be raised for eggs and meat. Excellent layers, producing up to 300 eggs a year. Extra-large, brown eggs, two to three years of peak laying, can lay eggs all year. Relatively friendly, but can become territorial in confined spaces. Start laying eggs around 4-5 months. Finish around 5-7 years.



Australorps – Can be raised for eggs and meat. Excellent layers, producing up to 300 eggs a year. Active and enjoy foraging. Can adapt to warm climates with sufficient shade and water. Sit on their eggs, light brown eggs. Start laying eggs around 5-6 months. Finish around 4-5 years.

Raising egg-laying chickens in Kosrae’s tropical climate requires careful attention to heat management and humidity control. Provide adequate shade and ventilation in coops, as temperatures can remain consistently high year-round, and ensure proper drainage to prevent moisture buildup during the frequent rain showers. Hens should be fed a balanced layer feed supplemented with calcium sources like crushed oyster shells, and provided with constant access to fresh, clean water, as chickens consume significantly more water in hot climates. Flocks should be protected from tropical storms with sturdy, well-anchored coops, and a regular health monitoring routine should be maintained as the warm, moist environment can promote parasites and bacterial infections. The timing of egg collection is important, as eggs can spoil quickly in high temperatures, and predator protection should be planned for since island ecosystems may have unique threats, like crabs or introduced mammals.

### **Daily Maintenance & Biosecurity**

On average, poultry farming usually only requires 15 minutes a day (Diambra-Odi & Hollyer, 2017). Daily hygiene management includes disinfection, feeding, supplying fresh drinking water, replenishing bedding, checking ventilation and temperature, and manure cleaning.

**Feed and water:** Key considerations for water systems include quality, height, pressure, mineral content, and accessibility. A rainwater collection and storage system will be the simplest way to ensure that there is a water reserve during extreme heat or times with little to no rain. On

average, a mature hen should consume around 100-150 grams of feed (¼ pound) daily. It is important that this feed has the appropriate ratio of carbohydrates, protein, phosphorus, and calcium to ensure efficient and quality egg-laying. Fresh feed should be provided daily, as old or spoiled feed can lead to illness (APA Admin, 2022).

**Environmental Monitoring:** Temperature, humidity, and air quality should be monitored to ensure the chickens are comfortable. Chicken breeds that are resilient to FSM’s climate should be prioritized, as they will require the least amount of attention during extreme weather events. Appropriately selected chicken breeds should be able to withstand temperatures up to 40° C (105° F) and 75% humidity (Wilson et al., 1975).

**Biosecurity Considerations:** It is important for chickens to have a secured coop for protection from predators. Common predators of eggs and chicks include cats, dogs, birds of prey, monitor lizards, and large crabs (Yap, FM, 2018). The primary diseases that can affect chickens are Avian Encephalomyelitis, Avian Influenza, Avian Tuberculosis, and Newcastle Disease to name a few (Disease - Poultry Hub Australia, 2020). These diseases can be spread from wild migratory birds, so it is important to catch them early and separate birds that may have been exposed/infected. New birds should be quarantined before they are introduced to the flock to ensure that they are not carrying any diseases.

### **Waste Transformation**

When fed an appropriate diet, chicken manure is extremely nutrient-dense and can be used as a natural fertilizer for vegetable farming. Chicken manure contains significantly more nitrogen and phosphorus and about the same amount of potassium as other farm manures. It is also an excellent soil amendment, as it can increase the soil’s moisture-holding and nutrient-holding properties (McCall, 1980). Chicken manure can either be applied directly to the soil or it can be dried, pulverised, composted and/or packed to be sold as fertilizer. The dried or aged manure can then be added to an irrigation supply or simply sprinkled on the soil and tilled in before rainfall. Tilling the manure into the soil is not necessary, but will remove the odor. Only about 15-40 pounds of dried manure should be applied to 100 square feet of farmland (1 heaping shovel per large plant) to prevent nutrient burning of the plants. Manure should not directly touch the plants.

### **Egg Collection, Grading, and Storage**

Egg production typically varies throughout the year, depending on day length and temperature. In general, chickens need 14-16 hours of light to maximize egg production, and warmer temperatures typically lead to higher production (Diambra-Odi & Hollyer, 2017). In general, the summer months see the most eggs produced. During peak season, eggs should be collected twice a day. As long as the eggs are not rinsed with water, they do not have to be refrigerated. Once eggs are washed, however, they lose a protective membrane and require refrigeration. Egg color depends on the species of chicken. For example, Rhode Island Reds and Australorps produce

brown eggs, while Leghorns produce white eggs. Shell color does not have any effect on the quality of the egg. Unfertilized eggs are for consumption, while fertilized eggs are for chicken production, so it is important to keep roosters separate from egg-laying hens unless you want to increase your breeding stock.

### **Sales, Barter, and Community Distribution**

Chicken eggs will be sold to the Food Innovation Center (Tier-III) to be used for baked goods processing. Eggs will also be sold to restaurants and stores to be sold to consumers. Because individuals will all have the opportunity to produce eggs on their land, we expect that they will directly use some of the eggs in their own kitchens.

Stakeholders noted, however, that the largest barrier in poultry production is availability of feed. This creates an opportunity for a microenterprise separate from the FIC that makes chicken feed mixes to sell to farmers.

### **Feedback & System Monitoring**

All sales to the Food Innovation Center should be logged on Kosrae's Food Systems App. Individuals should also log any disease pressure that they experience within their coop to prevent an epidemic on an island.

### **The development of Appendices & Technical Tools**

Each facility includes testing kits and safety systems to ensure compliance with national and international food safety guidelines. These include:

- **Food Quality Testing Tools:**
  - pH meter (with calibration kit)
  - Thermometers (digital + infrared)
  - Water Activity Meter
  - Moisture Meter
  - Colorimeter
  - Brix Meter
  - Allergen Test Kits
- **Microbial Testing:**
  - Salmonella
  - E. coli
  - Staphylococcus aureus
  - Yeast & Mold
  - Listeria monocytogenes
- **Food Safety Systems:**
  - Consumer Complaint Program

## **Part IV: Management and Organization Structure for the Food Innovation Facilities and Food Innovation Center in Kosrae State**

There are several key factors critical to the success of food-based business enterprises in Kosrae. These include a clear vision and mission grounded in traditional values and community cohesion, supported by a strong management and organizational structure with clearly defined roles that are consistent with Kosraean customary leadership, municipal governance, state regulations, and applicable national policies.

To strengthen food security and economic resilience, Kosrae State aims to develop a decentralized food innovation system rooted in local realities such as low population density, reliance on imported foods, and smallholder-based production systems. The strategy focuses on the processing and value addition of locally sourced foods such as taro, breadfruit, banana, poultry, fish, and marine/aquaculture products through a tiered system consisting of village-based Tier I facilities, regional Tier II Food Innovation Facilities (FIF), and a central Tier III Food Innovation Center (FIC). Each facility will serve as a node for local food aggregation, small-batch processing, packaging, storage, and when feasible, more advanced value-added operations.

Given Kosrae's tightly knit communities and communal labor systems, this model will thrive when built around cooperative and inclusive ownership structures. It is proposed that each facility be established through a public-private partnership in which Kosrae State and municipal governments contribute public infrastructure, regulatory support, and seed funding, while the facilities are operated by independent cooperatives or community enterprises that emphasize local ownership, training, and employment. This model encourages entrepreneurial development without compromising environmental integrity or traditional knowledge systems.

The proposed organizational structure recognizes Kosrae's geographic spread and diverse community settings from Lelu and Tofol to more remote municipalities. Therefore, while the three tiered system is designed for coordination and vertical integration, each facility must also be capable of functioning autonomously as this both mitigates risk and offer significant opportunities while providing needed flexibility. This enhances resilience to transportation disruptions, ensures local control over production and revenue generation, and supports niche product development suited to the cultural and ecological assets of each region.

Operational success depends on recruiting and mentoring local talent, especially youth and women, integrating environmental safeguards to protect Kosrae's fragile ecosystems, such as low input processing and renewable energy integration, and ensuring transparency in cooperative governance. Community engagement must occur at every stage, from site selection and design to

management, so that the initiative reflects the values, food traditions, and development priorities of Kosraean people.

Accordingly, Kosrae State endorses the formation of public-private partnerships based on cooperative frameworks that allow communities to participate meaningfully in both governance and benefit sharing. This approach is vital to ensuring the economic, cultural, and environmental sustainability of the Food Innovation Center and associated facilities throughout Kosrae State.

## **The Partnership Framework can be built using a partnership model.**

The partnership framework in Kosrae can be structured using a culturally responsive and locally anchored partnership model. This model reflects the essential collaboration between the Kosrae State government, municipal councils, and an independently operated cooperative that is deeply embedded in the community. It aligns public development priorities with the practical efficiencies and entrepreneurial energy of the private sector, while fully honoring Kosraean traditions, environmental stewardship, and village-level engagement.

**Partnership Model:** A collaborative arrangement among state and local government authorities and a community based cooperative that is independently managed. This model is designed to support Kosrae’s goal of building food security and local economic resilience through food processing, value addition, and the revitalization of local agriculture, fisheries, and aquaculture sectors. This model will aim to expand the operation to export into the Marshall Islands, with collaboration from transportation services. It is built on respect for customary decision-making, recognition of land tenure systems, and equitable inclusion of remote municipalities.

**Core Principle:** The cooperative maintains full operational independence, both economically and technically, while working in partnership with public sector institutions to advance shared goals. These goals include creating decentralized facilities that can store, repack, distribute, and process fresh and locally harvested crops, poultry, and marine resources. The model is also committed to training and employing local community members, including youth and women, to build skills and provide livelihoods. Wherever feasible, facilities will be made available through rental or shared-use agreements to individuals, families, and community groups who wish to develop and market their own food products.

All activities must be carried out in ways that reflect Kosrae’s commitment to environmental protection, respect for traditional land and resource management systems, the recognition of climate change and need for adaptive flexibility and resilience along with the promotion of local self-reliance. This includes prioritizing low waste systems, the use of renewable energy, and aligning food production with climate resilience. The partnership model must also promote inclusive governance, fair benefit sharing, and decision making that reflects both modern and customary authorities.

This Kosrae-specific partnership model ensures that innovation and enterprise development proceed in ways that reinforce cultural values, sustain natural ecosystems, and maximize community ownership and participation across all islands and municipalities.

## **Formation Structure**

### **Public Sector Partners**

- **National Government Sector, Kosrae State Government and Local Municipalities**

Key agencies such as the **Department of Resources and Development**, **FSM Department of Agriculture and Forestry**, and **FSM Environmental Protection Agency** will provide regulatory policies that can enable state policies and as such should be involved as appropriate. State Government will provide oversight, policy support, and public infrastructure investment. Municipal governments will play a critical role in site identification, community mobilization, and integration with local planning priorities.

- **Community-Based Organizations and Producer Groups**

Established associations such as the **Kosrae Farmers' Organization** and **Kosrae Women's Association** will be essential partners for organizing producer networks, coordinating training, and promoting equitable access to processing and marketing facilities. These groups represent key agricultural, fishing, and value-adding constituencies in main island communities.

- **Public Financing and Development Institutions**

Institutions such as the **FSM Development Bank** and other financial institutions may offer financial support through concessional loans, microcredit schemes, or matching grants to support enterprise development and equipment procurement for cooperatives and facility users.

- **Research and Training Institutions**

Local branches and programs under the **College of Micronesia-FSM (COM-FSM)** including the **Kosrae Campus** and the **Cooperative Research and Extension (CRE) Program** should provide technical expertise, training modules, and participatory research to enhance the capacity of cooperatives and local entrepreneurs. Regional partners such as the **Pacific Community (SPC)** and the **University of Guam** and others should be engaged in ways to support research and value chain development efforts.

### **Private Sector Cooperative**

- **Independently Incorporated Cooperative Owned by Private Members**

The cooperative will be legally established as a Kosrae-based food processing and marketing enterprise, owned by individual member-producers, small businesses, and community groups who contribute equity and use the facilities.

- **Autonomous Governance Structure with Elected Board**

The cooperative will be governed by a locally elected board, ensuring representation from all municipalities, different producer sectors (e.g., poultry, marine, root crops, horticulture- fruits and vegetables), and key demographic groups including women and youth.

- **Self-Directed Management and Operations**

Day-to-day operations will be led by a professional management team drawn from local talent wherever possible, and supported through capacity building partnerships with **COM-FSM** and regional organizations.

- **Private Capital Investment from Member-Owners**

Initial capital will be mobilized through share purchases and in-kind contributions from member-owners, supplemented by reinvested profits and potential grants from development programs such as the **FSM Climate Change and Food Security Fund**.

This Kosrae-specific formation structure ensures that both traditional and modern systems are integrated to foster a cooperative model that reflects local realities, protects cultural values, and creates inclusive economic opportunities throughout the state.

## **Partnership Formation Process**

### **Phase 1: Partnership Development**

This phase focuses on building a shared vision and identifying aligned objectives among Kosrae's key stakeholders, integrating customary authority, public institutions, and community-based organizations.

- Identification of mutual objectives and complementary capabilities among Kosrae State Government, municipal councils, and organizations such as the **Kosrae Farmers' Organization**, **Kosrae Women's Association**, and the **COM-FSM Cooperative Research and Extension Program**
- Feasibility studies and market analysis tailored to Kosrae's food production systems, local consumer preferences, environmental constraints, and export transportation realities
- Stakeholder consultation and community engagement through participatory village meetings, and workshops held with producer groups from the main island
- Risk assessment and mitigation planning focused on Kosrae's geographic isolation, climate vulnerabilities (typhoons, sea level rise), energy and water reliability, and export logistical challenges
- Initial establishment of the cooperative model for food processing, drawing on lessons learned from the **Food Systems Solutions Project** and small-scale value-added activities piloted with groups like **Gargey Women's Group** and **Weloy Cooperative Farmers**

With Phase I largely completed through the groundwork laid by the Kosrae Food Systems Solutions Project as described in this report, which involved extensive fieldwork, community input, and technical assessments, the development and formalization of next steps should move ahead.

### **Phase 2: Legal Framework**

This stage formalizes the institutional and legal basis for operation while ensuring both cooperative autonomy and alignment with state and customary systems.

- Development of a formal partnership agreement outlining the roles and responsibilities of Kosrae State Government, local municipalities, traditional councils, and cooperative members

- Governance protocols that respect cooperative independence while incorporating traditional oversight where appropriate
- Agreements on intellectual property, data sharing, and the use of local knowledge in product development and marketing
- Establishment of performance metrics related to food production increases, job creation, environmental sustainability, and cooperative profitability

Kosrae State recommends moving forward based on existing public-private arrangements that have proven effective in areas such as microenterprise development and fisheries/aquaculture management, and to build upon institutional structures already supported by the FSM National Government and international partners, such as SPC and the FAO.

### **Phase 3: Implementation**

This phase initiates operations across tiers, guided by clear structure, community representation, and infrastructure readiness.

- Formal incorporation of the cooperative and recruitment of active member-owners from each municipality
- Institutionalization of cross-tier representation, ensuring that members involved at the Tier I village level also have seats or advisory roles in Tier II regional FIFs and the Tier III FIC, to build vertical integration and maintain feedback loops
- Allocation of public resources for equipment, site preparation, water and sanitation infrastructure, and cold storage systems by agencies such as **Overseas Development Assistance, Kosrae Division of Agriculture, and Kosrae Conservation and Safety Organization.**
- Joint development or upgrading of facilities with local contractors, use of government buildings when feasible, and integration of climate resilient design principles
- Launch of operations with defined service levels including training, facility use access, processing schedules, and packaging support
- Involvement of the **Kosrae Utilities Authority** to plan for reliable electricity access, renewable energy integration, and long-term utility expansion aligned with facility growth
- Involvement of **Kosrae Port Authority** and **Matson Logistics** to facilitate export of Kosraean value-added agricultural products to the Republic of Marshall Islands

This phased formation process ensures that the Food Innovation Center and related facilities are rooted in Kosrae’s social structure, supported by technical expertise, and responsive to the realities of a remote island economy. It also helps cultivate ownership and accountability across all levels of the system and demonstrates transformative change to make a difference..

## **Operational Structure**

### **Cooperative Independence**

In Kosrae, the cooperative model is rooted in community trust, shared responsibilities, and cultural governance traditions. The cooperative will function as a self-sustaining, member-driven enterprise that reflects Kosraean values of mutual support and transparency.

- Ownership is held by private members including farmers, fishers, women’s groups, youth entrepreneurs, and small agribusinesses organized through entities such as the **Kosrae Farmers’ Organization**, **Municipal Agricultural Cooperatives**, and **Kosrae Women’s Association**. Each member has equal voting rights regardless of financial contribution, aligning with Kosraean values of communal equity.
- An independent board of directors will be elected by cooperative members, with initial nominations guided by Kosrae State in consultation with farmers’ associations, municipal governments, and key producer organizations to ensure geographic and demographic representation.
- Management and staff hiring will be autonomous, with preference for local candidates trained through institutions such as the **College of Micronesia–FSM Kosrae Campus**, and with support from regional partners like the **Pacific Community (SPC)** and the **USDA Natural Resources Conservation Service (NRCS)** technical assistance programs.
- Business strategy and daily operations will be designed and implemented by the cooperative, with flexibility to respond to market trends, seasonal production changes, and community needs, while maintaining full compliance with state regulations and traditional protocols.
- Financial operations including budgeting, reinvestment, and profit distribution will be conducted transparently, with dividends distributed based on usage volume, and a portion retained for reinvestment into equipment, training, and infrastructure maintenance.

## **Public Sector Role**

The public sector will play a vital enabling and regulatory role without interfering in the daily management of the cooperative, supporting the broader goals of sustainable development, economic resilience, and food security in Kosrae.

- The Kosrae State Government will establish and maintain the enabling policy and regulatory framework in consultation with national stakeholders to ensure environmental protection, land use respect, and food safety compliance.
- Financial assistance will be provided through grants or guarantees from sources such as the **FSM Development Bank** and climate adaptation funds, with support from partners like the **Food and Agriculture Organization (FAO)** or **Overseas Development Assistance**.
- Technical support and capacity building will be offered through the **COM-FSM Cooperative Research and Extension Program**, **Small Business Development Center**, and regional programs focusing on value chain development, business literacy, and climate-smart agriculture.
- The government will assist in facilitating market access by promoting or even requiring that Kosrae-branded products are used for all state and public events, in regional tourism markets, government food procurement programs (e.g., schools, hospitals), and through connections to regional trade fairs and niche markets for traditional foods.
- Infrastructure investments will focus on improving access to transportation for export shipment, expanding cold chain and storage capacity, enhancing telecommunications for business operations, and securing reliable utilities in partnership with **Micronesia Management and Marketing Enterprises**, **Kosrae Port Authority**, and **Matson Logistics**.

## **Governance and Accountability**

## Dual Accountability System

The governance structure in Kosrae reflects the importance of local leadership, community consensus, and modern cooperative principles. It is designed to promote transparency, equity, and responsiveness while aligning with Kosraean cultural values and public policy goals.

- The cooperative is accountable to its member owners including farmers, fishers, women's groups, and local producers through democratic processes. One member, one vote elections will ensure equal participation and accountability. Organizations such as the **Kosrae Farmers' Organization**, **Kosrae Women's Association**, and municipal farmers associations will support broad member engagement across Kosrae's diverse communities.
- The public-private partnership is accountable to municipal leaders and Kosrae State agencies through performance indicators that reflect Kosrae's unique priorities. These include increased use of local raw materials, job creation for youth and women, affordability and access for remote municipalities, and adherence to cultural and environmental values.
- Regular reporting on cooperative and partnership outcomes will be conducted through quarterly community meetings, municipal consultations, and an annual public review. These reports will be accessible through the **Kosrae Department of Resources and Economics** and will be shared at community outreach sessions supported by the **COM FSM Cooperative Research and Extension Program**.
- Independent monitoring and evaluation mechanisms will be developed in collaboration with external partners such as **SPC** or **FAO**, and coordinated locally by institutions like **COM-FSM Kosrae Campus** and the **FSM Department of Agriculture and Forestry** to ensure transparency and local relevance.

## Decision Making Authority

The decision making process will balance cooperative independence with meaningful collaboration and oversight.

- The cooperative retains full authority over internal operations including hiring, pricing, sourcing, product development, and business planning. Decisions will be guided by the elected board and local management, grounded in the needs and realities of Kosrae's producers and communities.
- Joint decisions between the cooperative and public sector partners will be required only in areas where state investment or shared oversight is involved, such as public land use, facility development, and alignment with state food security policies.
- Public sector involvement will remain advisory. Agencies such as the **Kosrae State Department of Resources and Development**, **Environmental Protection Agency**, and **Department of Health Services** will provide technical guidance, regulatory clarity, and program coordination without direct control of operations.
- Dispute resolution will use both formal legal pathways and culturally grounded mediation methods involving municipal leaders. This ensures both procedural fairness and harmony within Kosrae's close knit communities.

## Financial Arrangements

## Public Sector Contributions

The Kosrae State Government and its development partners will play a foundational role in supporting the financial sustainability of the Food Innovation Center and its associated facilities. Contributions will reflect Kosrae's need for small-scale infrastructure, climate resilient design, and capacity building for remote municipalities.

- Infrastructure support may include grants for construction, renovation, and equipment installation through the **Kosrae State Department of Transportation, Communication, and Infrastructure** and targeted allocations from the **FSM National Government's Compact funding and Climate Change and Food Security programs**.
- Technical assistance and training will be delivered through local institutions such as the **COM FSM Kosrae Campus** and its **Cooperative Research and Extension Program**, supported by external partners like the **Pacific Community (SPC)**, **Overseas Development Assistance**, and the **USDA Natural Resources Conservation Service**.
- Risk mitigation will be facilitated through tools such as loan guarantees or micro-insurance programs offered by the **FSM Development Bank** to encourage smallholder and cooperative investments in processing and value addition.
- Market development support will include product branding initiatives by the **Kosrae Department of Resources and Development**, **Micronesia Management and Marketing Enterprises**, and promotional opportunities through the **Micronesian Trade Fair**, tourism platforms, and potential exports to regional niche markets.

## Private Sector Investment

To ensure ownership and long term viability, private capital will be mobilized from individuals, families, and community enterprises, faith-based organizations or others that are actively engaged in Kosrae's agriculture, fisheries, and food service sectors.

- Member equity contributions and share purchases will come from farmers, fishers, women entrepreneurs, and small businesses organized through groups like the **Kosrae Farmers' Organization**, **Kosrae Women's Association**, and municipal producer cooperatives.
- Retained earnings from facility operations will be reinvested into maintenance, equipment upgrades, and training programs to strengthen long term sustainability.
- Private debt financing, where feasible, will be supported by the **FSM Development Bank** or revolving loan funds linked to enterprise development programs led by NGOs and faith-based economic initiatives.
- Performance-based returns will be distributed to member owners based on their level of usage and contribution to the cooperative's services, promoting equitable growth and reinvestment.

## Shared Benefits

The financial structure is designed to generate broad based benefits across Kosrae's diverse communities, particularly those in rural municipalities.

- Job creation will be localized and tied to food production, processing, logistics, and cooperative management, providing income opportunities for youth, women, and returning migrants.
- Agricultural and marine value chains will be strengthened by providing stable markets, reducing post harvest losses, and supporting the development of locally branded products such as

smoked fish, dried banana, or coconut oil.

- Food security will be improved by reducing reliance on imported products, increasing the availability of processed local foods, and reinforcing self reliance at household and community levels.
- Knowledge transfer will be promoted through applied training in processing techniques, food safety, small business operations, and environmentally sound practices, delivered by **COM FSM** and partner organizations and content provided in web-based information platforms..

## **Risk Management**

Risk management in Kosrae must address its unique challenges, including the small and dispersed population, limited infrastructure, and strong reliance on local leadership and community cohesion. The following framework aligns with Kosraean governance norms, environmental constraints, and cooperative principles.

### **Public Sector Risks**

- Ensuring consistent performance monitoring by Kosrae State Government agencies without interfering in the internal operations of the cooperative. Oversight responsibilities will be coordinated through agencies such as the **Kosrae State Department of Resources and Development** and the **Kosrae State Economic Planning Office**.
- Maintaining political continuity and long term support for cooperative initiatives across different administrations.
- Promoting transparent and appropriate use of public resources including Compact funds, climate adaptation grants, and development bank financing. Accountability will be ensured through publicly accessible reports and regular reviews involving municipal governments and community based organizations.

### **Private Sector Risks**

- Exposure to market volatility due to Kosrae's small market size, seasonal fluctuations in agricultural output, and vulnerability to shipping delays. This risk is especially significant for products exported to Marshall Islands.
- Ensuring cooperative autonomy from political influence, especially during public investment phases or when engaging in government procurement. Operational independence will be safeguarded through strong bylaws and member-led governance.
- Sustaining active participation and long term commitment from cooperative members, including smallholder farmers, women entrepreneurs, and youth. Fluctuations in income, migration, and competing livelihood priorities may affect continuity.

## **Mitigation Strategies**

- Developing clear contractual agreements between Kosrae State, municipalities, and the cooperative that define responsibilities, resource use, and exit procedures. These agreements will be supported by local legal advisers and aligned with Kosraean norms.
- Implementing regular performance reviews and learning-based evaluations that involve cooperative members, public sector stakeholders, and external technical partners such as the **COM-FSM Cooperative Research and Extension Program** and the **Pacific Community**
- Diversifying funding sources through a blend of member contributions, earned income from processing and packaging services, technical assistance grants from donors, and financing from local institutions like the **FSM Development Bank**
- Reinforcing strong governance structures through training and support for cooperative boards, ensuring representation from each municipality and sector. Guidance from institutions such as the **COM FSM Kosrae Campus** and partner NGOs will help build transparency and resilience.

## Success Factors

### Critical Elements

- Respect for cooperative autonomy is essential to build trust and accountability among Kosrae’s producers, fishers, and community members. The cooperative must operate independently while remaining aligned with public development goals and cultural values. Groups such as the **Kosrae Farmers’ Organization**, **Kosrae Women’s Association**, **National Aquaculture Center**, and municipal agricultural groups exemplify grassroots ownership and governance models that can inform cooperative design.
  - Clearly defined roles, responsibilities, and boundaries between the cooperative, Kosrae State Government, and municipal authorities are necessary to avoid overlap, confusion, or undue influence.
  - Alignment of objectives between public sector agencies and private cooperative members must be based on shared goals such as food security, local employment, import substitution, and environmental protection while preserving day to day operational independence for the cooperative.
  - Strong leadership is required in both public and private components. This includes committed officials from agencies such as the **Department of Resources and Development**, and experienced community leaders from producer groups and local cooperatives who understand Kosrae’s market and logistical challenges. Yet the management of commercial operations needs to be private sector led.
- Adequate financing and timely resource allocation must come from a mix of public investment, member equity, donor support, and small scale financing tools through institutions such as the **FSM Development Bank**.
  - Community support and active stakeholder engagement are central to long term success. The project must regularly engage communities through participatory planning, feedback sessions, and traditional consultative forums led by village chiefs and local associations.

### Performance Indicators

- Financial sustainability of the cooperative, including consistent revenue from processing services, product sales, and member use. Member satisfaction will be measured through annual surveys and participation rates in governance activities.
- Achievement of public policy objectives such as reduced food imports, improved nutrition, support for youth entrepreneurship, and economic diversification across Kosrae’s municipalities.
- Community economic impact demonstrated through increased household income from agriculture and fisheries, local job creation especially for women and youth, and new business formation linked to value added products.
- Innovation and technology adoption including the use of solar powered cold storage, low input processing methods, low cost refrigeration such as with the CoolBot refrigeration systems, and appropriate packaging technologies developed through partnerships with **COM FSM** and the **Pacific Community**.
- Environmental and social responsibility measured through waste reduction, sustainable sourcing, protection of marine and land resources, gender equity, and inclusive participation from remote communities.

## Long-term Sustainability

### Partnership Evolution

- An annual review process will be institutionalized to assess cooperative performance, community outcomes, and alignment with state and municipal development priorities. These reviews will be facilitated by the **Kosrae State Economic Planning Office** in collaboration with the **Department of Resources and Development**, the cooperative board, and farmers associations.
- Over time, the cooperative will move toward full operational and financial independence, reducing reliance on state or donor subsidies. This transition will be supported by leadership training through **COM FSM Cooperative Research and Extension Program** and by developing internal systems for budgeting, marketing, and procurement.
- A culture of continuous learning and innovation will be cultivated. The cooperative will regularly test technologies including solar powered equipment, low waste packaging, and indigenous preservation methods. Support from regional partners such as the **Pacific Community** and **University of Guam** and other regional partners will be essential for applied research and training.

### Exit Strategy

- A clear set of performance benchmarks and governance milestones will define when the public sector can transition from a direct partner to an oversight and support role. These criteria will be set during the initial agreement and reviewed annually.
- If public infrastructure or funding is used, there will be transparent arrangements for asset ownership transfer to the cooperative or to local governments, depending on the nature of the investment and agreements in place. Legal guidance from the **Kosrae State Office of the Attorney General** will ensure clarity and fairness. It may be that the State will opt to retain a minority ownership in the business.

- The cooperative is expected to continue operations beyond the end of formal partnership agreements. This will be supported by a strong member base, diversified revenue, and connections to local institutions like the **FSM Development Bank** for future financial needs.
- The legacy of the partnership will be sustained through ongoing community relationships, regional knowledge sharing, and the visibility of Kosraean products in local and regional markets. Schools, health programs, and tourism operators may continue sourcing products from the cooperative, reinforcing its role in the broader economy.

## **II. Food Innovation Facilities and Food Innovation Center will operate as a Food Processing Cooperative**

### **Cooperative Principles**

The Kosrae-based cooperative will follow internationally recognized cooperative values while fully integrating local customs, decision-making practices, and community-based economic models. It will operate under the principles of democratic member control, shared ownership, and active economic participation, adapted to Kosrae’s village-based production systems and communal norms. Equal voting rights will be extended to all members regardless of the size of their financial investment or land holdings, consistent with Kosraean traditions of consensus and equity.

### **Membership Structure**

#### **Member Owners**

The cooperative will be owned and governed by active producers and small enterprises engaged in agriculture, fisheries, aquaculture, and food processing. Members may include individuals, families, village groups, and producer cooperatives. Priority groups include:

- Members of the Kosrae Farmers’ Organization
- Women entrepreneurs affiliated with the Kosrae Women’s Association
- Aquacultural and maritime cooperatives
- Youth-led enterprises and faith-based community farming initiatives

#### **Membership Requirements**

- Active engagement in agricultural, fishing, or related value-added production
- Purchase of a minimum number of shares, with options for in-kind contributions such as raw materials or labor in the startup phase
- Commitment to using the cooperative’s facilities or services such as drying, packaging, storage, or labeling
- Agreement to uphold the cooperative’s bylaws, which will be reviewed and endorsed by municipal councils and the membership

### **Governance Structure**

## Board of Directors

- The board will consist of 7 to 9 members elected through a democratic process involving all active member owners, with at least one seat reserved for representation from faith-based organizations and one for a women's group.
- Board terms will be staggered to ensure continuity, with initial appointments possibly guided by Kosrae State to build balance and trust.
- The board will provide strategic oversight, set policy direction, and appoint and evaluate management. It will also ensure alignment with local development plans and uphold community values.
- Meetings will be held quarterly and rotated between locations when possible to facilitate inclusion from remote areas.

## Executive Leadership

- **General Manager:** Responsible for day-to-day operations, community relations, and ensuring services meet member needs. Preferably a Kosraean professional with experience in cooperative management or agribusiness.
- **Operations Manager:** Oversees all processing activities, including food safety, quality control, scheduling, and equipment maintenance. Will coordinate closely with village-level collection points and seasonal production cycles.
- **Financial Manager:** Manages bookkeeping, budgeting, and transparent reporting, with support from the **Kosrae State Credit Union** or outside auditing firms for accountability.
- **Marketing Manager:** Develops local and regional sales strategies, supports branding of Kosrae-made products, and maintains relationships with buyers such as schools, tourism outlets, and shipping distributors.

## Operational Management

### Processing Operations

The day-to-day operations of the Food Innovation Center and regional Food Innovation Facilities in Kosrae will reflect local production rhythms, community labor structures, and environmental constraints such as water availability and energy reliability.

- Production supervisors from within Kosrae will oversee daily processing of local crops such as taro, breadfruit, banana, coconut, and marine products like tuna and rabbitfish. These supervisors will be trained through the **COM FSM Cooperative Research and Extension Program** and mentored by external experts in food safety and small-scale processing.
- A dedicated quality assurance team will ensure that food products meet safety and hygiene standards. They will be guided by protocols developed with the **FSM Environmental Protection Agency** and the **Department of Health Services**.
- Maintenance staff will be responsible for regular cleaning, equipment repair, and facility upkeep. Whenever possible, youth from vocational training programs at **Kosrae High School** and **COM FSM Kosrae Campus** will be recruited and trained to handle these roles, fostering local employment.

## **Member Services**

Member services will be community-centered and reflect Kosrae's strong tradition of cooperation, respect for elders, and inter-village coordination.

- A member liaison will act as the primary contact for cooperative members, including farmers, fishers, and women-led microenterprises. This individual will speak local languages, regularly visit remote sites, and report feedback to the cooperative board.
- The liaison and their team will coordinate raw material receiving, grading, weighing, and payment. Payment systems will be designed to accommodate cash-based and barter-based interactions where appropriate.
- Technical assistance and market information will be provided through partnerships with **Kosrae Farmers' Organization**, the **Kosrae Women's Association**, and support from regional programs led by the **Pacific Community** and the **University of Guam**. Services will include training on product grading, packaging, business skills, and value chain linkages.

## **Decision Making Process**

Cooperative decision making will blend formal governance procedures with traditional consultative methods to ensure transparency and cultural legitimacy.

- Major decisions such as bylaw revisions, large capital investments, or membership rule changes will require a vote at annual or special member meetings. These meetings will be rotated across municipalities and scheduled in consultation with municipal leaders to ensure inclusive participation.
- The elected board of directors will be responsible for developing strategic plans, approving budgets, and monitoring cooperative performance in line with community values and economic sustainability.
- Management will handle operational decisions such as staff schedules, pricing strategies, and procurement within board-approved guidelines. This structure supports efficient responses to market needs while preserving member oversight.
- Financial transparency will be ensured through quarterly reports presented at member meetings and public forums. Visual tools and local language summaries will be used to promote accessibility and understanding.

## **Profit Distribution**

The cooperative will reinvest in its future while sharing financial benefits fairly among members.

- Net margins will be distributed to members based on their patronage, meaning the volume of raw materials supplied or services used. This ensures that rewards are tied to active participation.
- A portion of annual profits will be retained for capital improvements, maintenance, training, and emergency reserves to ensure the long-term stability of the facility.
- Patronage dividends will be distributed once financial and operational benchmarks are met, in line with cooperative bylaws approved by the membership.

## Accountability Measures

- Annual member meetings will present audited financial statements, cooperative achievements, and development plans. These meetings will also provide a platform for feedback from village representatives.
- Board meetings will be held at least once per quarter and documented with written minutes in both English and local language where feasible.
- Independent financial audits will be conducted annually by a third-party accounting firm or in collaboration with the **Kosrae State Auditor's Office**.
- A clear grievance and conflict resolution process will be established, combining formal procedures and community-based mediation. This will include anonymous feedback options, member dispute panels, and where needed, involvement of respected elders for culturally appropriate resolution.

*This structure ensures democratic control while maintaining efficient operations, balancing member interests with business sustainability and growth.*

# Part V: Food Innovation Centers and Facilities

## Kosrae State Proposed Budget

**Total estimated cost for building and equipping two US FDA Compliant Tier III Food Innovation Centers (FIC) plus two regional Food Innovation Facilities (FIF) and 4 village level Tier I FIFs is: \$10.5 million (USD)**

### **Total Budget: \$10.5 million USD**

Below is a **comprehensive budget narrative** that aligns with the facilities layout and equipment zones described in the design document. We present these plans recognizing that each needs to be flexible and adaptable while allowing for the core products to be processed efficiently and safely, packaged and commercially sold. The following description separates the most advanced FDA compliant two Tier III Food Innovation Centers (FIC) with their own respective estimated breakdown and costs; then provides a proposed budget for the lesser sophisticated regional Tier II Food Innovation Facilities (FIF) that focused on processing too also presented with their respective breakdown and costs; and finally, the village level Tier I FIFs that include the smallest investment of equipment and processing that can be done easiest locally and smaller-scale. This decentralized approach allows for each Tier to operate, manufacture and sell locally operating independently as well as in coordination and connection with the larger FIFs and FIC to procure adequate product supplies for increased production capacity and with increasing sophistication and quality from Tier I, Tier II and Tier III.

A. FIC- First Tier III. Total cost = \$5,344,827.95

**A Tier III FIC is envisioned to be developed at a single site in Tofol, with the specific location to be determined by Kosrae State. This facility will be focused on processing of staple crops, poultry, and greenhouse vegetables.** At this stage, we present the FIC as a unified entity with the objective of establishing FDA compliant food safe infrastructure, focusing on the processing and value addition of all terrestrial food products (plant based such as breadfruit, bananas, taro, yam, coconut) as well as greenhouse vegetable crops. The Tier III FIC is designed also for community, private sector trainings and product development and with a community commercial kitchen and food safety lab.

FIC- Second Tier III. Total cost = \$2,448,860.18

**The second Tier III Food Innovation Center (FIC) proposed in Kosrae is dedicated to bycatch from commercial fishing vessels and agricultural/aquacultural waste.** Commercial vessels that dock at Kosrae's Tafunsak harbour will be able to bring their bycatch to this Tier III facility for animal feed production using locally available byproducts such as marine bycatch fish waste, coconut cake, and legume and other plant biomass waste including waste from the food innovation center. This standalone facility, proposed to be located also in or near Tofolis designed to meet USDA/APHIS, Codex, and HACCP feed safety standards and will span 3,000 square feet. Built with climate-resilient materials and equipped with energy-efficient feed processing

technology, the center is expected to produce approximately 260 metric tons of high-protein animal feed annually. The initiative complements Kosrae’s broader food security strategy by transforming underutilized waste into value-added feed, reducing import dependency, and supporting smallholder livestock and poultry productivity. This facility is designed to meet the ANIMAL/POULTRY FEED and FERTILIZER needs of Kosrae and over time for shipment to the Marshall Islands and for the substitution and replacement of imported animal feed into the FSM.

B. FIF- Tier II (2 total). Total cost= \$2,692,560.76

Two regional Tier II Food Innovation Facilities are proposed to be located on Kosrae, with one FIF designed for coconut products (sugar, oil, milk) and one for local crop flour/chips/vinegar. Each of these FIFs are designed at 2,500 square feet each, with construction costs estimated at \$450 per square foot, totaling \$2,250,000. When equipment, administrative setup, training infrastructure, and contingency allowances are included, the full cost for both facilities amount to \$2,692,560.76. These centers will support value-added processing of coconut-based and plant/crop-based products, advancing enterprise development and market integration across the state.

C. Village Level Tier I (4 total) = \$22,689.22

The total estimated investment for 4 Tier I village level Food Innovation Facilities (FIFs) within Kosrae is \$22,689.22, with 1 unit per each of its four municipalities, each costing \$5,672.31. Designed to support pre-processing, aggregation (the receiving, holding and distribution of food products to Tier II or III facilities), and trainings, these community-level facilities are key to promoting inclusive participation, localized trade and sales and localized value addition within Kosrae’s food system.

**Grand Total= \$10.5 million**

## **A. The Kosrae Tier III Food Innovation Center (FIC)**

A. FIC- Tier III. Total cost = \$5,344,827.95 (4,500,000 + 494,827.95 + 90,000 + 185,000 + 75,000)

### **Budget Narrative:**

#### **1. Construction and Infrastructure for the Terrestrial Tier III Center: \$4,500,000**

This estimate reflects the cost of constructing a single 6,000 square foot Tier III FIC in Kosrae State, based on a benchmark rate of \$750 (US) per square foot and aligned to be FDA compliant food-grade facility standards.

The estimate accounts for imported materials, skilled labor as needed, refrigeration, sanitary systems, climate-resilient construction, and project management. We present the design this way to offer flexibility for Kosrae State and its designated lead agency to determine whether to construct on a new site or integrate elements of existing food processing and agricultural infrastructure in Tofol. Kosrae's frequent rainfall, high humidity, and vulnerability to climate change require that the facility be situated in a safe physical space and engineered for durability and safe operations under tropical conditions and adverse weather. Specific site location needs to consider access and connection to functional road and marine access and infrastructure.

## **A. Foundation and Structural Works – \$1,845,000**

This component covers civil works and vertical construction activities required to develop a fully enclosed, climate-resilient, food-safe and storm resistant structure. It reflects the realities of building in Kosrae State, where persistent rainfall, coastal exposure, soil erosion, and limited road access pose logistical and engineering challenges. Nearly all critical inputs such as gravel, sand, cement, steel, and specialized labor must be imported and coordinated through port facilities.

### **1. Site Preparation and Slab Work – \$575,000**

- **Land clearing, grading, and compacting:** Using imported equipment or locally leased heavy machinery adapted for Kosrae's volcanic soil and sloped terrain.
- **Sub-base and reinforcement:** Placement of imported gravel, sand, and geotextiles to stabilize the ground and reduce saturation risks common in high-rainfall zones.
- **Reinforced concrete slab:** Six-inch industrial-grade poured slab with rebar mesh, engineered to withstand heavy processing equipment and reduce erosion and settlement under humid conditions.
- **Drainage design:** Sub-slab slope integrated with floor drains and connections to greywater or septic systems, designed for rapid runoff management.
- **Shipping surcharges:** Includes handling costs for over 600 tons of construction-grade materials through Kosrae's main port, including demurrage, offloading, and inter-island transport as needed.

### **2. Structural Framing and Envelope – \$750,000**

- **Main steel frame and columns:** Galvanized I-beams and trusses prefabricated abroad and shipped to Kosrae for on-site assembly with corrosion-resistant coatings.
- **Roof framing and support:** Trussed rafters engineered to withstand tropical storm winds and seismic shifts typical in FSM's geophysical setting.
- **Exterior and internal framing:** Combination of steel studs and treated tropical hardwoods for non-load-bearing partitions in food-safe zones.
- **Anchoring and wind resistance:** Hurricane ties and bolted foundations to comply with Kosrae's building codes and ensure structural stability during cyclonic events.

### **3. Roofing System – \$250,000**

- **Galvanized corrugated steel panels:** Rust-resistant panels with Class A fire rating, suitable for humid, salt-laden air.
- **Radiant insulation barrier and vapor shield:** Reduces indoor heat gain and condensation, critical for equipment longevity and food safety.

- **Rainwater management and water collection system:** Guttering and downspouts integrated with large cisterns for harvesting and non-potable usage during water shortages.
- **Roof overhangs and soffits:** Designed to deflect driving rain and provide shade, reducing interior heat buildup and external wall degradation.

#### 4. Loading Bay and Exterior Finishes – \$170,000

- **Receiving and dispatch area:** Concrete apron with covered roof for safe loading/unloading of food products in a high-rain environment.
- **Driveway grading and compaction:** Engineered to ensure access by heavy-duty trucks year-round, including slope stabilization for hillside terrain.
- **Exterior wall finishes:** Insulated sandwich panel siding or rendered block, treated with mold-resistant, food-safe coatings.
- **Security features:** Includes motion-activated lighting, mesh window screens, and tamper-resistant steel doors at all access points.

#### 5. Construction Logistics and Material Handling – \$100,000

- **Crane rental and offloading services:** Required for unloading containers and positioning prefabricated structural modules.
- **Storage containers and on-site warehousing:** Secure facilities to hold equipment and building supplies for a multi-phase construction timeline.
- **Inter-island transport and labor mobilization:** Barge or aircraft charter for tools, materials, and personnel moving between islands within Kosrae lagoon, the Hall Islands, Namonuito Islands, Pattie Islands, and Mortlock Islands, and regional vendors.
- **Customs brokerage and insurance:** Necessary for importing high-value materials and ensuring coverage through Kosrae’s port and customs facilities.

#### B. Plumbing and Electrical Systems – \$715,000

This component ensures that the facility is hygienically operable, energy-resilient, and food-safety compliant. In a tropical, infrastructure-limited environment like Kosrae, plumbing and electrical systems must be both robust and adaptable to manage utility fluctuations, persistent rainfall, and sanitation-intensive operations and geared to renewable energy such as solar. The budget reflects full importation of components, skilled installation labor, and built-in allowances for logistics and contingency adjustments.

##### 1. Potable Water and Sanitation Systems – \$310,000

- **Facility-wide potable water lines:** Food-grade PEX or CPVC piping installed throughout processing zones, dry and cold storage, sanitation rooms, and administrative areas.
- **Dedicated hand-wash stations:** At least two per processing room, fitted with foot- or elbow-operated valves, splash guards, and hygienic hand-drying dispensers.
- **Triple-compartment sinks:** Installed in the community kitchen, R&D laboratory, and wash-down areas to meet safe food handling protocols.
- **Grease traps and floor drainage:** Stainless steel interceptors and epoxy-sealed drains with engineered slope, linked to the centralized graywater handling system.
- **Rainwater catchment and storage system:** Roof-integrated gutter systems feeding cisterns with first-flush filters, UV or chlorination units for non-potable use in cleaning and landscaping.

- **Septic system:** Onsite wastewater treatment designed for high-volume discharge from food-grade operations, aligned with Kosrae EPA regulations and flood-resilient engineering.

## 2. Electrical Distribution and Food-Safety Power Design – \$260,000

- **Dedicated circuits for critical equipment:** Independent power lines for cold rooms, heat sealers, and high-load processing machinery, stabilized for voltage variation.
- **Processing zone separation:** Individual electrical sub-panels per room to isolate failures and enable safe equipment maintenance.
- **Food-safe electrical finishes:** All conduits and outlets sealed against moisture intrusion, with splash protection in wet areas and compliance with international food-grade standards.
- **LED lighting:** Shatterproof, high-efficiency LED fixtures with increased lumen output in food prep areas to improve visibility and inspection quality.
- **Emergency lighting and signage:** Battery-backed lighting and illuminated exit signs strategically installed to meet Codex and IFS food facility requirements.

## 3. Generator Interface and Solar Power Integration – \$105,000

- **Backup generator system:** Diesel-powered 50–80 kW generator housed in a noise-dampened, cyclone-resistant enclosure.
- **Automatic transfer switch (ATS):** Enables seamless transition during power outages to preserve cold chain and data systems.
- **Solar-ready conduits and interface controls:** Designed for future photovoltaic integration, with rooftop and inverter panel compatibility.
- **Battery/inverter compatibility:** Wired to support lithium-ion or lead-acid battery backup installation in later phases, with surge protection and grounding.

## 4. Fire Suppression and Safety Systems – \$40,000

- **Commercial hood-integrated fire suppression:** Wet-chemical systems installed over stoves, ovens, and fryers in high-risk kitchen and meat/poultry processing areas.
- **Wall-mounted extinguishers and alarms:** Dry chemical and CO2 units installed at regulated intervals, along with training modules for staff response.
- **Electrical grounding and lightning arrestors:** Protection systems installed to minimize equipment damage and reduce outage frequency during heavy storms.
- **Safety signage and PPE storage:** Clearly designated areas for emergency response, including spill kits, eye wash stations, gloves, and evacuation maps.

This section ensures that water, energy, and sanitation systems in the Kosrae FIC are resilient to local climatic stressors and built to sustain uninterrupted operations under demanding processing conditions. All system specifications are aligned with HACCP principles and Codex Alimentarius standards for internationally compliant food safety.

## C. Interior Finishing – \$625,000

This component ensures the internal spaces of the Food Innovation Center (FIC) meet rigorous international food safety standards for hygiene, durability, cleanability, and pest exclusion. All construction materials are selected to endure heavy usage in Kosrae’s humid, salt-rich climate while complying with HACCP, USDA, and Codex food processing protocols. The budget includes full importation, skilled labor, and design modifications to accommodate moisture control and local environmental conditions.

### 1. Hygienic Wall Systems – \$225,000

- **FRP (Fiberglass Reinforced Plastic) panels:** Installed across wet processing zones such as fish, poultry, kitchen, and sanitation areas. These are chemical-resistant, mold-repellent, and easily cleaned for continuous sanitary operations.
  - **Food-safe epoxy wall coatings:** Used in dry zones including storage, admin, and training areas. Coatings include antimicrobial additives and high-gloss finishes for visual inspection and contamination control.
  - **Corner guards and coving:** Seamless transitions between walls and floors help prevent buildup of residues and allow for more effective washdowns.
- 2. Epoxy-Coated Flooring with Integrated Drainage – \$175,000**
- **High-performance epoxy coatings:** Non-slip, abrasion- and chemical-resistant flooring installed throughout the facility. Designed to withstand rolling equipment, wet cleaning, and foot traffic under constant humidity.
  - **Anti-microbial aggregates:** Embedded in epoxy for added pathogen resistance and grip, especially in slaughter and preparation areas.
  - **Drainage design:** Integrated slope directing effluent to stainless steel trench drains located in processing zones.
  - **Expansion joints and water barriers:** Incorporated to prevent structural cracking caused by tropical humidity and temperature cycling.
- 3. Pest-Sealed Ceiling Systems – \$100,000**
- **Waterproof, seamless ceiling panels:** Used in prep and storage areas, with minimized joints to discourage insect and mold infiltration.
  - **Reinforced ceiling insulation:** Includes moisture barriers to prevent condensation that could affect stored food or processing equipment.
  - **Rodent- and insect-proof seals:** Food-safe silicone and mesh gaskets applied to all ceiling penetrations, including HVAC and lighting fixtures.
  - **Access hatches for maintenance:** Fully gasketed and secure to maintain pest exclusion integrity and enable service access.
- 4. Internal Partitions, Doors, and Zoning – \$75,000**
- **Clean-to-dirty workflow zoning:** Physical partitions established to separate raw input zones from finished product areas, supporting safe food handling practices.
  - **Airtight doors with gaskets:** Heavy-duty stainless steel or food-grade PVC doors ensure hygienic isolation and temperature containment.
  - **Observation windows and light panels:** Allow for transparent training and supervision without compromising sanitary zones.
  - **Magnetic hold-open systems:** Enable hands-free access in high-traffic areas, reducing cross-contamination risks.
- 5. Fixtures, Restroom Finishes, and Food-Safe Cabinetry – \$50,000**
- **Restroom fixtures:** Low-flow toilets, urinals, foot-operated sinks, and hygienic hand dryers installed in gender-separated sanitation facilities.
  - **Stainless steel cabinetry:** Built for the kitchen, lab, and sanitation areas to store PPE, reagents, utensils, and sealed food components.
  - **Lockable storage units:** Used for hazardous materials, sensitive documentation, and regulatory compliance archives.
  - **Public area finishes:** Durable, non-toxic paints and hardware throughout offices and meeting rooms, along with insect-resistant screening and directional signage.

The interior finishing ensures that the Kosrae FIC can meet export-ready hygiene requirements while enduring tropical wear conditions. Every surface is selected for resilience, pest exclusion, and ease of sanitation—ensuring operational integrity and longevity of the facility under local environmental stressors.

#### **D. Refrigeration and Ventilation – \$940,000**

This budget line ensures the Tier III Food Innovation Center (FIC) in Kosrae maintains robust cold-chain integrity and consistent air quality across all processing and storage areas. Given Kosrae’s environment and the perishability of local crops, fish, and poultry, this investment supports the installation of energy-efficient systems that enhance food safety, climate control, and operational reliability.

##### **1. Cold Storage Systems – \$480,000**

- **Walk-in Coolers and Freezers:**

Two industrial walk-in units—one freezer and one cooler—constructed with polyurethane-insulated wall panels, heavy-duty sealing gaskets, and digital temperature regulation. Units include stainless steel shelving, hygienic floor surfaces, and internal drainage for safe and efficient product handling.

- **Hybrid CoolBot Cold Rooms:**

Two temperature-controlled rooms using CoolBot technology paired with high-BTU window air conditioning units, ideal for supplemental or emergency cold storage of fruits, vegetables, or finished goods awaiting shipment.

- **IQF (Individual Quick Freezing) System:**

A compact quick-freeze tunnel to support rapid chilling of taro, breadfruit, and other produce, helping preserve quality and extend shelf life for both domestic use and export markets.

- **Battery-Logged Temperature Monitoring:**

All cold storage areas are equipped with sensor-based temperature loggers that record data to cloud dashboards, ensuring HACCP compliance and supporting traceability audits.

##### **2. Ventilation and Odor Control Systems – \$250,000**

- **Commercial Exhaust Hoods:**

Installed over cooking and cleaning stations in poultry, livestock, and kitchen areas. Units feature high-efficiency stainless steel grease filters and integrated fire suppression where needed.

- **Cross-Ventilation Design:**

Ceiling-mounted and wall-mounted fans installed in dry storage and staple crop rooms to ensure airflow, reduce stagnant humidity, and prevent spoilage and condensation buildup.

- **Dehumidifiers and Air Scrubbers:**

Specialized dehumidification systems placed in livestock and poultry zones to control microbial growth and maintain safety. Air scrubbers with activated carbon and UV filters eliminate strong odors and improve air quality.

- **Zonal Pressure Management:**

Negative air pressure maintained in high-risk zones (e.g., poultry and livestock processing) to isolate contaminants, while packaging, administrative, and R&D areas retain positive pressure to ensure clean air integrity.

##### **3. Thermal Efficiency and Backup Systems – \$210,000**

- **Solar Integration Readiness:**  
All major refrigeration and ventilation units are pre-wired for rooftop solar photovoltaic (PV) connections and/or hybrid solar-diesel integration for future sustainability upgrades.
- **Insulation Upgrades:**  
Walls and ceilings in cold storage rooms and processing areas are fitted with high-R insulation and reflective foil barriers. Thermal seals are installed around all entry points to minimize cooling loss and reduce power consumption.
- **Backup Generators and Switchgear:**  
Includes one fixed 25–30 kVA diesel generator with an automatic transfer switch for the full cold storage load, along with a portable generator for limited backup of critical equipment during extended outages.
- **Thermal Curtains and Air Locks:**  
Installed at all entryways to walk-in freezers and coolers to limit exposure to warm ambient air during frequent door openings, preserving temperature stability and reducing operational strain on cooling systems.

Together, these refrigeration and ventilation systems allow the Kosrae FIC to meet international food safety requirements, maintain cold chain standards, and operate efficiently under high ambient moisture and temperature conditions. The design emphasizes modularity, redundancy, and adaptability to support uninterrupted service delivery year-round.

#### **E. On-Site Project Management and Technical Oversight – \$375,000**

This component ensures that the Food Innovation Center (FIC) in Kosrae is constructed and commissioned according to internationally recognized food facility standards, particularly those aligned with U.S. FDA requirements. It also addresses the specific implementation challenges in Kosrae, including unpredictable shipping timelines, extended wet seasons, and limited local access to specialized trades. Strong oversight will ensure the facility is completed on time, on budget, and to specification.

##### **1. Full-Time Construction Manager and staff assistant– \$200,000**

A dedicated, Kosrae-based construction manager and staff assistant will lead all phases of the build, from site mobilization through commissioning and handover.

##### **Key responsibilities include:**

- Day-to-day oversight of general contractors, subcontractors, and local labor teams
- Verifying compliance with engineering drawings, food facility safety codes, and schedule milestones
- Coordinating the arrival, offloading, and on-site storage of imported materials and equipment
- Addressing unforeseen delays related to site conditions, weather impacts, or logistics bottlenecks
- Managing sequencing of plumbing, electrical, HVAC, and finishing teams to avoid conflicts
- Delivering weekly progress reports and risk alerts to the project coordination unit

##### **Cost includes:**

- Monthly professional fees over a 12-month period
- Travel costs from a regional base or U.S. origin
- Temporary furnished housing and utilities in Kosrae
- Local per diem and ground transport for daily site access

## 2. FDA-Aligned Food Facility Technical Advisor – \$125,000

A specialized technical advisor will ensure the FIC meets hygienic design criteria including food-safe zoning, equipment layout, drainage planning, and materials compliance. The advisor will be engaged during design finalization, construction supervision, and facility commissioning.

### Key deliverables include:

- Reviews of architectural and utility drawings for HACCP and Codex compliance
- Expert guidance on facility layout, critical control points, and workflow optimization
- In-person supervision of equipment installation and sanitary finish applications
- Technical support for regulatory certifications (e.g., US FDA registration, HACCP protocols)
- Development and documentation of SOPs, sanitation plans, and staff training guidance
- Lead workshops in HACCP and food safety and engineering for all Tier III staff, as well as bringing in for trainings staff from all other FIC and FIF in Kosrae.

### Cost includes:

- Monthly advisory retainer over 9–12 months
- Three field visits including airfare, lodging, and meals in Kosrae
- Virtual coordination for plan review, document feedback, and remote training modules

## 3. Quality Assurance and Construction Audits – \$50,000

To uphold construction quality and reduce long-term rework costs, independent QA/QC audits will be conducted throughout the project lifecycle by a licensed civil engineer or architect, ideally sourced from the region.

### This includes:

- Bi-weekly site inspections with written evaluations and issue tracking
- Material verification against technical specifications and bills of quantity
- Photographic and physical validation of critical systems such as drainage, electrical layout, and flooring
- Certification checklists for milestone-based contractor payments and performance incentives

Together, this oversight package guarantees that the Kosrae FIC is constructed to specification, with high standards of safety, quality, and compliance. The combination of local management and technical expertise provides funders and stakeholders with assurance that the investment will yield a durable, fully functional, and regulation-ready food-grade facility.

### Total Construction and Infrastructure: \$4,500,000

Component	Amount (USD)
A. Foundation & Structure	\$1,845,000
B. Plumbing & Electrical	\$715,000
C. Interior Finishing	\$625,000
D. Refrigeration & Ventilation	\$940,000
E. Project Management & Oversight	\$375,000
<b>Total</b>	<b>\$4,500,000</b>

## 2. Equipment and Supplies for FIC: \$494,827.95

This equipment budget covers the procurement, shipping, and installation of specialized machinery tailored to the operational needs of a Tier III Food Innovation Center (FIC) in Kosrae. The facility will be outfitted to support a wide range of food processing functions including staple crops, poultry, fish, and community kitchen activities, as well as packaging, cold storage, and internal logistics.

The equipment is organized by functional zones to ensure smooth, hygienic workflows and support safe, efficient value-added processing of local foods such as breadfruit, taro, banana, coconut, cassava, and reef fish. Each processing room will be equipped with machinery that enables both traditional and modern food production methods in compliance with global food safety protocols.

All equipment purchases will include installation guidance, critical spare parts, and operational support features such as HACCP traceability systems. Selected tools are modular and scalable to allow future expansion or upgrades. The investment ensures that the FIC will be fully operational with sufficient capacity to support training, local entrepreneurship, product development, and potential export-readiness.

### **A. Staple Crop & Vegetable/Fruit Processing**

This zone supports the transformation of Kosrae’s local staples—including breadfruit, taro, banana, coconut, and cassava—into shelf-stable, value-added products such as flour, chips, leathers, and dried fruit. Equipment in this area enables pre-treatment, slicing, dehydration, frying, and vacuum sealing under food-safe conditions. And, this FIC is designed so that the equipment can be used for other products and processing needs. That is, its sufficiently flexible relative to space and equipment to allow for flexibility and response to opportunities that arise.

#### **Key Equipment:**

- Produce washer and precision vegetable cutters (Nilma or Sammic models)
- Solar or hybrid electric dryers designed for fruits and starchy roots
- Flour grinder for taro and cassava meal production
- Commercial deep fryer and chamber vacuum sealer for snack lines
- HACCP traceability software and spare parts kits for continuous uptime

### **B. Poultry Processing**

This dedicated space enables hygienic, small-scale poultry processing aligned with humane slaughter protocols and a linear “dirty-to-clean” workflow. The layout is optimized for chilled flow-through operations and compliance with HACCP poultry handling guidelines.

#### **Key Equipment:**

- Slaughter cone station, hot water scalding tank, and defeathering machine
- Chill tanks, evisceration benches, cutting tables, and poultry saws
- Vacuum sealing unit and barcode labeling system
- Overhead rail system for processing line flow and stainless sanitation toolkits
- Cold storage for whole birds, cuts, and fresh eggs

### C. Community Kitchen

This shared-use kitchen provides infrastructure for culinary innovation, food safety training, and small-batch entrepreneurship. It is designed to support recipe testing, cooking demonstrations, and pilot-scale production runs for new product development and use as rental for food production for catering and sale.

#### Key Equipment:

- Commercial-grade oven, countertop deep fryer, and gas cooktop with exhaust hood
- Planetary mixer, blast chiller, and either a steam kettle or tilt skillet
- Heavy-duty dishwashing station and electric warming cabinet

### D. Storage and Logistics

This zone underpins the entire facility’s cold chain and inventory system, supporting raw material intake, intermediate storage, and finished product staging. Designed for modular efficiency, it allows flexible handling of both perishable and dry goods.

#### Key Equipment:

- Walk-in cold room, upright commercial freezers, and dry storage shelving
- Food-grade ingredient bins, pallet jacks, and insulated delivery coolers
- Temperature and humidity monitoring systems with digital alerts
- Modular racking systems for vertical storage optimization and FIFO management

#### Total Equipment Investment (with Logistics Buffer):

This total includes:

- Equipment purchase based on validated vendor pricing and technical specifications
- Estimated international shipping, port clearance, and customs handling
- Installation, setup, and calibration support as required by specific equipment
- Contingency buffer to accommodate unexpected freight surcharges or delays

This comprehensive equipment suite enables the Kosrae FIC to operate efficiently across a range of product categories—including poultry, fish, root crops, and tropical fruits—while meeting international hygiene and traceability standards. Each investment is selected to support local food processing capacity, entrepreneurial activity, and workforce training, strengthening food system resilience and economic development in Kosrae.

### Equipment & Supplies for a Tier III FDA-compliant Food Innovation Center in Kosrae:

Equipment	Price per Unit	Number of Units	Total without Cost Conversion	Total with 1.5x Cost Conversion
Staple Crop Processing Items				
<a href="#">Staple Crop Slicer</a>	1,825.25	1	1,825.25	2,737.88
<a href="#">Flour Mill</a>	1,250.00	3	3,750.00	5,625.00
Coconut Processing Items				

<a href="#">Coconut Water Extractor</a>	2,200.00	1	2,200.00	3,300.00
<a href="#">Coconut Milk Extractor</a>	10,300.00	1	10,300.00	15,450.00
<a href="#">Coconut Sugar Processor</a>	3,500.00	1	3,500.00	5,250.00
General Tier-III				
<a href="#">Tabletop Impulse Sealer - 20"</a>	200.00	2	400.00	600.00
<a href="#">Vertical Band Sealer</a>	890.00	2	1,780.00	2,670.00
<a href="#">Double Chamber Vacuum Packaging Machine</a>	4,000.00	1	4,000.00	6,000.00
<a href="#">Dehydrator Dryer</a>	22,600.00	1	22,600.00	33,900.00
<a href="#">Solar powered Cold Room</a>	10,000.00	2	20,000.00	30,000.00
<a href="#">Ventilated Stack and Nest Container</a>	24.00	50	1,200.00	1,800.00
<a href="#">Flour and Sugar Sieve</a>	305.43	3	916.29	1,374.44
<a href="#">Stainless Steel Worktables</a>	575.00	5	2,875.00	4,312.50
Poultry Processing Items				
<a href="#">Mainstreet Stainless Steel Floor Fryer</a>	749.00	1	749.00	1,123.50
<a href="#">Stainless Steel Triple Basins</a>	306.15	1	306.15	459.23
<a href="#">Avantco A-49R-HC 54" Reach in Refrigerator</a>	1,949.00	1	1,949.00	2,923.50
<a href="#">Mannlake Scalding with Temp Control</a>	525.00	1	525.00	787.50
Food Safety Testing Checklist				
Food Safety Testing Supplies				98,500.00
<a href="#">Culture Plates</a>				0.00
<a href="#">Thermopen Thermometer</a>	299.00	1	299.00	448.50
<a href="#">Water Activity meter (Aquameter)</a>				0.00
<a href="#">Hygiene monitor and Management system</a>	1,000.00	1	1,000.00	1,500.00
<a href="#">High sensitivity Allergen Tester</a>	284.65	1	284.65	426.98
<a href="#">Handheld temp adjusted Refractometer</a>	260.00	4	1,040.00	1,560.00
<a href="#">Thermometer Calibrator (4 point hot/cold)</a>	1,592.12	1	1,592.12	2,388.18
Bench-top refractometer	3,000.00	1	3,000.00	4,500.00
pH meter (with calibration kit)	2,500.00	1	2,500.00	3,750.00

Thermometers (digital + infrared)	300.00	2	600.00	900.00
Water Activity Meter and Moisture Meter	3,000.00	2	6,000.00	9,000.00
<a href="#">Check-Set IV Cold/Hot Calibrator</a>	1,592.12	1	1,592.12	2,388.18
<a href="#">AP550 Flat-Surface Label Applicator</a>	2,395.00	1	2,395.00	3,592.50
<a href="#">AP380 Label Applicator</a>	1,595.00	1	1,595.00	2,392.50
<a href="#">PL400 Pouch Labeler</a>	1,595.00	1	1,595.00	2,392.50
<a href="#">Barcode Thermal Ribbons</a>	56.00	1	56.00	84.00
<a href="#">Barcode Scanner L13687</a>	1,025.00	1	1,025.00	1,537.50
<a href="#">Barcode software</a>	790.00	1	790.00	1,185.00
<a href="#">Zebra ZQ511 Mobile Receipt Printer</a>	840.00	1	840.00	1,260.00
<a href="#">Zebra ZT620 industrial Barcode Printer</a>	6,200.00	1	6,200.00	9,300.00
Safety Equipment				
<a href="#">Porta Stream II Eyewash station</a>	460.00	3	1,380.00	2,070.00
<a href="#">Saline Concentrate Refill</a>	100.00	10	1,000.00	1,500.00
<a href="#">Dust Cover</a>	52.00	3	156.00	234.00
<a href="#">S Carton Uline Industrial Latex Gloves</a>	26.00	10	260.00	390.00
<a href="#">M Carton Uline Industrial Latex Gloves</a>	14.00	10	140.00	210.00
<a href="#">L Carton Uline Industrial Latex Gloves</a>	19.00	10	190.00	285.00
<a href="#">Class A First Aid Kits</a>	67.00	5	335.00	502.50
<a href="#">Class B First Aid Kits</a>	155.00	5	775.00	1,162.50
<a href="#">Class B+ First Aid Kits</a>	395.00	5	1,975.00	2,962.50
<a href="#">Uline Ice Wraparound Fog Armor Dispenser box</a>	94.00	2	188.00	282.00
<a href="#">3M Construction Harness</a>	185.00	2	370.00	555.00
<a href="#">Carton Polyethylene Apron</a>	22.00	6	132.00	198.00
<a href="#">Multi compartment Stainless Steel Dispensers</a>	250.00	3	750.00	1,125.00
Canning and Pickling Equipment				
<a href="#">Canner Aluminum Bath water Canner</a>	269.99	2	539.98	809.97

<a href="#">30 Gallon Large Round Canner</a>	1,451.25	1	1,451.25	2,176.88
<a href="#">Case Wide Mouth Ball Glass Mason Jars 32 oz</a>	16.44	100	1,644.00	2,466.00
<a href="#">10 Gallon Fermentation Crock</a>	199.99	2	399.98	599.97
<a href="#">Fermentation Weights</a>	43.97	20	879.40	1,319.10
<a href="#">Fermentation lid cloth covers</a>	13.93	25	348.25	522.38
<a href="#">Potable Aqua Water Purification Tabs with PA plus</a>	12.99	50	649.50	974.25
<a href="#">Stainless Steel Funnel</a>	10.49	10	104.90	157.35
<a href="#">11.5 Qt Canning Rack</a>	8.49	10	84.90	127.35
Additional Equipment				
<a href="#">Nilma Veg Wash</a>	4,000.00	1	4,000.00	6,000.00
<a href="#">Floor Frier Rig</a>	1,600.00	1	1,600.00	2,400.00
<a href="#">Semi Automatic Bucket Conveyor Pouch filling and sealing machine</a>	9,599.00	1	9,599.00	14,398.50
Chicken Processing Rig (Feathering, scalding, cooling and cone)	6,000.00	1	6,000.00	9,000.00
<a href="#">Slaughtering Table</a>	425.00	2	850.00	1,275.00
<a href="#">Vertical Electric Liquid and Paste Water bottle filling machine</a>	1,750.00	1	1,750.00	2,625.00
Butchers Table	1,000.00	3	3,000.00	4,500.00
<a href="#">Poultry cutting saw</a>	2,631.00	1	2,631.00	3,946.50
<a href="#">Oven and range 72"</a>	15,293.00	1	15,293.00	22,939.50
<a href="#">176lb Floor Electric Mixer</a>	7,123.00	1	7,123.00	10,684.50
<a href="#">Heavy Duty Steel shelving 96 x 24 x 72"</a>	1,445.00	5	7,225.00	10,837.50
<a href="#">Solar Dryer or Dehumidifier Dried Fruit</a>	210.00	10	2,100.00	3,150.00
Information Hub				
Mobile Platform app				0.00
<a href="#">Samsung 4TB SSD Hard drives</a>	439.99	3	1,319.97	1,979.96
Website				0.00
<a href="#">Dell Inspiron 27' All in one cpu</a>	1,189.98	1	1,189.98	1,784.97
<a href="#">4 Person L Desk Workstation</a>	3,210.00	1	3,210.00	4,815.00

<a href="#">LG smart TV</a>	299.00	1	299.00	448.50
<a href="#">Norton Anti virus software</a>	19.99	1	19.99	29.99
<a href="#">Mesh Task Chairs</a>	165.00	6	990.00	1,485.00
<a href="#">Downtown conference tables (Powered) 192 x 48"</a>	1,560.00	1	1,560.00	2,340.00
<a href="#">Portable Projector Screen 107"</a>	525.00	1	525.00	787.50
<a href="#">Wall monitor Mount</a>	95.00	1	95.00	142.50
<b>Kitchen Supplies</b>				
<a href="#">Mobile ingredient bins</a>	343.00	3	1,029.00	1,543.50
<a href="#">Self ingredient Bin 200 cups</a>	243.00	3	729.00	1,093.50
<a href="#">Baking Pan</a>	216.00	3	648.00	972.00
<a href="#">Wire Grate</a>	168.00	3	504.00	756.00
<a href="#">Cambro Dish Racks</a>	42.00	3	126.00	189.00
<a href="#">Cambro Glass Racks</a>	80.00	3	240.00	360.00
<a href="#">Pan Dolly</a>	305.00	3	915.00	1,372.50
<a href="#">Uline Trash Cans</a>	74.00	3	222.00	333.00
<a href="#">Uline Trash can lids</a>	29.00	3	87.00	130.50
<a href="#">Biohazard Step On Waste Can</a>	131.00	3	393.00	589.50
<a href="#">Uline Thin trash can 23G</a>	45.00	3	135.00	202.50
<a href="#">Rubbermaid Slim Jim Lid Can/bottle</a>	52.00	3	156.00	234.00
<a href="#">Rubbermaid Slim Jim Lid paper</a>	52.00	3	156.00	234.00
<a href="#">Rubbermaid Slim Jim Swing top</a>	51.00	3	153.00	229.50
<a href="#">Stainless Dollie</a>	135.00	3	405.00	607.50
<a href="#">Handsfree Trash Can 55G</a>	255.00	3	765.00	1,147.50
<a href="#">Outdoor Landmark Series Trash Can Dome top 50G</a>	970.00	3	2,910.00	4,365.00
<a href="#">Fork liftable Transport tilt truck</a>	2,505.00	3	7,515.00	11,272.50
<a href="#">Hydraulic Platform Stacker</a>	2,695.00	3	8,085.00	12,127.50
<a href="#">130km low speed new energy double cab mini pick up truck</a>	9,999.00	3	29,997.00	44,995.50
<a href="#">Commercial Cutting Board</a>	152.00	5	760.00	1,140.00
<a href="#">Commercial Mixing 3qt</a>	62.00	3	186.00	279.00

<a href="#">Commercial Mixing 5qt</a>	89.00	3	267.00	400.50
<a href="#">Commercial Mixing 8qt</a>	125.00	3	375.00	562.50
<a href="#">Commercial Mixing 13qt</a>	94.00	3	282.00	423.00
<a href="#">Commercial Mixing 20qt</a>	150.00	3	450.00	675.00
<a href="#">Stainless Steel Steam Table Pans 3qt</a>	150.00	3	450.00	675.00
<a href="#">Stainless Steel Steam Table Pans 6qt</a>	250.00	3	750.00	1,125.00
<a href="#">Stainless Steel Steam Table Pans 10qt</a>	150.00	3	450.00	675.00
<a href="#">Stainless Steel Steam Table Pans 14qt</a>	175.00	3	525.00	787.50
<a href="#">Stainless Steam Table Pan Lids 1/6</a>	55.00	3	165.00	247.50
<a href="#">Stainless Steam Table Pan Lids 1/3</a>	85.00	3	255.00	382.50
<a href="#">Stainless Steam Table Pan Lids 1/2</a>	110.00	3	330.00	495.00
<a href="#">Stainless Steam Table Pan Lids Full</a>	205.00	3	615.00	922.50
<a href="#">Stainless Steel Scoops 8oz</a>	69.00	3	207.00	310.50
<a href="#">Stainless Steel Scoops 16oz</a>	75.00	3	225.00	337.50
<a href="#">Stainless Steel Scoops 32oz</a>	80.00	3	240.00	360.00
<a href="#">Stainless Steel Scoops 64oz</a>	86.00	3	258.00	387.00
<a href="#">Stainless Steel Scoops 96oz</a>	114.00	3	342.00	513.00
<a href="#">Stainless Steel Scoops 128oz</a>	122.00	3	366.00	549.00
<a href="#">Stainless Steel Scoops 160oz</a>	134.00	3	402.00	603.00
<a href="#">Stainless Steel Mixing Paddles 48"</a>	35.00	3	105.00	157.50
<a href="#">Mixing Polypropylene Paddles 40"</a>	65.00	3	195.00	292.50
<a href="#">Mixing Polypropylene Paddles 52"</a>	72.00	3	216.00	324.00
<a href="#">Hand Scraper 3 x 8"</a>	7.00	5	35.00	52.50
<a href="#">Hand Scraper 4 x 9"</a>	8.00	5	40.00	60.00
<a href="#">Stainless steel paper cutter 36"</a>	163.00	2	326.00	489.00

<a href="#">Unbleached Paper rolls 36"</a>	81.00	3	243.00	364.50
<a href="#">Handheld Induction Sealer and Caps</a>	340.00	5	1,700.00	2,550.00
<a href="#">Clear Straight-sided Glass jars with metal cap 8oz</a>	40.80	5	204.00	306.00
<a href="#">Clear Straight-sided Glass jars with metal cap 16oz</a>	54.60	5	273.00	409.50
<a href="#">Clear Straight-sided Glass jars with metal cap 32oz</a>	64.80	5	324.00	486.00
<a href="#">Amber Straight-Sided Glass Jars with Metal Cap 8oz</a>	40.80	5	204.00	306.00
<a href="#">Case Standard Glass Canning Jars 8oz</a>	14.40	5	72.00	108.00
<a href="#">Case Standard Glass Canning Jars 16oz</a>	18.00	5	90.00	135.00
<a href="#">Case Standard Glass Canning Jars 24oz</a>	20.40	5	102.00	153.00
<a href="#">Case Standard Glass Canning Jars 32oz</a>	22.80	5	114.00	171.00
<a href="#">Case Replacement Standard Canning Jar Lids</a>	81.00	5	405.00	607.50
<a href="#">Case Glass Spice Jars 2oz</a>	48.00	5	240.00	360.00
<a href="#">Case Glass Spice Jars 4oz</a>	27.60	5	138.00	207.00
<a href="#">Case Glass Spice Jars 8oz</a>	15.60	5	78.00	117.00
<a href="#">Case Glass Spice Jars 16oz</a>	18.60	5	93.00	139.50
<a href="#">Case Cubitainers</a>	60.00	5	300.00	450.00
<a href="#">Case of Square Utility Jugs</a>	34.20	3	102.60	153.90
<a href="#">Jug Pump</a>	10.50	3	31.50	47.25
<a href="#">Chemical Resistant Spray Bottles</a>	25.50	3	76.50	114.75
<a href="#">Case Replacement nozzles</a>	17.25	3	51.75	77.63
<a href="#">Bundle Egg Cartons</a>	90.00	10	900.00	1,350.00
<a href="#">Egg Filler Flat Case</a>	42.00	10	420.00	630.00
<a href="#">Williams Sonoma Prep Tools 15 Piece Gadget and Utensils Set</a>	279.95	3	839.85	1,259.78
<a href="#">Berry Basket</a>	75.00	5	375.00	562.50
Lab Ware				

<a href="#">Case Graduated Glass Dropper Bottles 1/2 oz</a>	48.00	5	240.00	360.00
<a href="#">Case Graduated Glass Dropper Bottles 1oz</a>	50.40	5	252.00	378.00
<a href="#">Case Graduated Glass Dropper Bottles 2 oz</a>	28.80	5	144.00	216.00
<a href="#">Case Graduated Glass Dropper Bottles 4oz</a>	33.60	5	168.00	252.00
<a href="#">Case Glass Beakers 100ml</a>	31.00	5	155.00	232.50
<a href="#">Case Glass Beakers 250ml</a>	40.00	5	200.00	300.00
<a href="#">Case Glass Beakers 400ml</a>	27.00	5	135.00	202.50
<a href="#">Case Glass Beakers 1,000 ml</a>	58.00	5	290.00	435.00
<a href="#">Case Test Tubes 8ml</a>	40.00	5	200.00	300.00
<a href="#">Case Test Tubes 16ml</a>	62.00	5	310.00	465.00
<a href="#">Case Test Tubes 25ml</a>	67.00	5	335.00	502.50
<a href="#">Case Test Tubes 50ml</a>	94.00	5	470.00	705.00
<a href="#">Test tube racks 13mm</a>	22.00	5	110.00	165.00
<a href="#">Test tube racks 16mm</a>	22.00	5	110.00	165.00
<a href="#">Test tube racks 20mm</a>	22.00	5	110.00	165.00
<a href="#">Test tube racks 25mm</a>	22.00	5	110.00	165.00
<a href="#">Glass Graduated Cylinders 10ml</a>	24.00	10	240.00	360.00
<a href="#">Glass Graduated Cylinders 25ml</a>	30.00	10	300.00	450.00
<a href="#">Glass Graduated Cylinders 50ml</a>	23.00	10	230.00	345.00
<a href="#">Glass Graduated Cylinders 100ml</a>	38.00	10	380.00	570.00
<a href="#">2" x 250' Parafilm M Lab Film</a>	44.00	5	220.00	330.00
<a href="#">4" x 125' Parafilm M Lab Film</a>	44.00	5	220.00	330.00
<a href="#">Case Whirl-Pak bags 2oz</a>	98.00	10	980.00	1,470.00
<a href="#">Case Whirl-Pak bags 4oz</a>	100.00	10	1,000.00	1,500.00
<a href="#">Case Whirl-Pak bags 18oz</a>	139.00	10	1,390.00	2,085.00
<a href="#">Case Whirl-Pak bags 24oz</a>	184.00	10	1,840.00	2,760.00
<a href="#">Case Whirl-Pak bags 69oz</a>	318.00	10	3,180.00	4,770.00
<a href="#">Pack Weighing Dishes (Aluminum) 20ml</a>	15.00	10	150.00	225.00

<a href="#">Pack Weighing Dishes (Aluminum) 40ml</a>	17.00	10	170.00	255.00
<a href="#">Pack Weighing Dishes (Aluminum) 80ml</a>	21.00	10	210.00	315.00
<a href="#">Safety wash bottles 500ml</a>	54.00	6	324.00	486.00
<a href="#">Safety Wash bottles 1,000ml</a>	64.00	6	384.00	576.00
<a href="#">Case Transfer Pipettes 3ml</a>	32.00	10	320.00	480.00
<a href="#">Case Transfer Pipettes 5ml</a>	32.00	10	320.00	480.00
<a href="#">Case Transfer Pipettes 7ml</a>	32.00	10	320.00	480.00
<b>Total Cost</b>				<b>494,827.95</b>

### 3. Administration, Training, and R&D: \$90,000

This component ensures that the Food Innovation Center (FIC) in Kosrae serves not only as a production facility, but also as a fully functional administrative, scientific, and educational hub. Its presence will serve as a community center. It supports reliable operations, digital traceability, quality control, and human capacity development. The budget includes costs for importing IT infrastructure, lab instruments, and training resources, which are critical but expensive to source, ship, and maintain in a remote island setting.

#### A. Administrative Office – \$22,000

A 300 square foot space will serve as the operations and coordination center for the FIC.

##### Key Components:

- Office furniture crafted locally where feasible (e.g., coconut timber desks and shelves), paired with imported ergonomic seating and storage cabinets
- One laptop and one desktop computer with extended warranties, surge protection, and wireless multifunction printer/scanner
- Dry-erase boards, secure inventory and filing cabinets, and wall-mounted visual planning aids
- Split-unit air conditioning and ceiling fans for humidity control, delivered and professionally installed

Additional cost reflects air freight of electronics, durability enhancements for the tropical climate, and backup systems to minimize disruptions.

#### B. Research and Development Laboratory – \$30,000

This 150–200 square foot lab will focus on food quality assurance, safety testing, and new product development.

##### Key Equipment:

- Stainless steel wash benches, corrosion-resistant sinks, and drainboards
- Microscopes, incubators, scales, moisture analyzers, and handheld pH testing tools
- Seal integrity testers and microbiological media for product stability analysis
- Lockable refrigeration for reagent and sample storage
- PPE sets, fire extinguisher, and eyewash station

All laboratory tools will be imported from certified suppliers and include calibration kits and startup training for local technical staff.

**C. Training Room – \$13,000**

This 12-seat training space will support food safety instruction, small business workshops, and hands-on entrepreneurship sessions.

**Includes:**

- Digital projector with retractable screen and multiple media inputs (HDMI, USB)
- Mixed modular seating (imported and local), with provisions for cultural layouts such as pandanus mats
- HACCP training posters, whiteboards, and mobile flip charts
- Lockable cabinet for training materials and instructor supplies
- Ceiling fans and screened windows, with an optional outdoor annex for community-based sessions

Shipping costs for audiovisual and educational materials, as well as packaging for kits, are included. The adjacent outdoor area with cement flooring and a traditional roof structure will function as an extension space for training and product drop-off; its costs are accounted for under the main facility construction budget. Additionally, open outside space is planned with a roof for trainings, demonstrations and meetings.

**D. Office Supplies & IT Infrastructure – \$25,000**

This component supports digital administration, traceability, remote collaboration, and reporting.

**Inclusions:**

- Two computers (desktop and rugged laptop), color printer, and dual high-speed routers
- Satellite uplink or high-capacity mobile hotspot to ensure connectivity in remote parts of the island
- Cloud subscriptions for inventory control and HACCP compliance platforms (e.g., Google Workspace, FoodReady)
- UPS backups, power stabilizers, office supplies, document binders, laminator, and IT setup support

Cost reflects the need for enhanced networking, security features, and redundancy to operate reliably in areas where technical support is limited or unavailable.

**Total for Section 3: \$90,000**

<b>Component</b>	<b>Cost</b>
A. Administrative Office	\$22,000
B. R&D Laboratory	\$30,000
C. Training Room	\$13,000
D. Office Supplies & IT Systems	\$25,000
<b>Total</b>	<b>\$90,000</b>

**4. Operational Readiness and Sustainability: \$185,000**

This budget line ensures that the Tier III Food Innovation Center (FIC) in Kosrae is fully

functional at launch—not only constructed and equipped, but also staffed, supplied, and prepared to deliver services from day one. Costs reflect the logistical and financial realities of initiating operations in an island context, including freight-intensive procurement of materials, limited availability of local suppliers, early-stage staffing needs, and temporary utility burdens before revenue begins to stabilize.

#### **A. Initial Inventory (Raw Materials) – \$50,000**

Start-up inventory will support test runs, staff training, community outreach, and product demonstrations. These inputs provide the foundation for practical learning and enable the FIC to begin limited processing operations immediately after commissioning.

##### **Includes:**

- Bulk purchase of locally sourced fruits and staples such as breadfruit, taro, banana, yam, coconut, and cassava
- Poultry inputs for training in slaughter, evisceration, packaging, and chilling
- Reef fish and nearshore pelagic species (e.g., skipjack, tuna) for processing trials
- Food-grade packaging materials: vacuum pouches, PET containers, glass jars, labels, cartons (primarily imported)
- Oil, spices, vinegar, and salt for food preparation during pilot runs and public events
- Inventory buffer to support outreach to Kosrae’s outlying municipalities or schools

Costs reflect the need to import shelf-stable materials and packaging supplies not available on-island, as well as delivery logistics for reaching remote communities.

#### **B. Training and Staffing – \$95,000**

This component addresses the initial staffing and knowledge transfer necessary to build local capacity in food-safe operations. Given the limited pool of trained food processors in Kosrae, funds are included to recruit and retain key personnel and to engage experienced trainers for the launch phase.

##### **Includes:**

- Salaries for a core team over the first 6 to 8 months: facility manager, food safety officer, sanitation worker, maintenance technician, and administrative/training support
- HACCP onboarding and certification training led by regional or remote instructors
- Technical training from equipment vendors or partner institutions on safe operation of machinery
- Bilingual (English and Kosraese) training resources in both digital and print formats
- “Train-the-trainer” programs to build long-term local instruction capacity

Budget includes travel stipends or honoraria for expert trainers from Hawaii, Guam, the Philippines, or other regional partners, along with virtual training modules supplemented by in-person demonstrations.

#### **C. Utilities and Operating Costs (Year 1) – \$40,000**

The FIC will face elevated utility costs during its first year, due to the need for continuous cleaning, refrigeration, and basic digital infrastructure. While passive ventilation and future solar capacity may reduce some expenses, others remain high due to import dependency and service limitations.

##### **Includes:**

- Power generation (diesel fuel and backup generator maintenance), grid connection where feasible, and solar interface upkeep
- Potable water supply and wastewater management for sanitation and processing
- Weekly facility cleaning, daily replenishment of PPE, detergents, and sanitizers

- Pest management services, basic building maintenance, and consumable replacement parts
- Internet service, telephone access, and hosting for a basic outreach website

This budget ensures smooth operations and client-readiness during the critical first year of service delivery, while allowing time for the development of sustainable revenue streams through product sales, training services, or rental of shared facilities.

**Total for Section 4: \$185,000**

<b>Component</b>	<b>Cost</b>
A. Initial Inventory (Raw Materials)	\$50,000
B. Training and Staffing	\$95,000
C. Utilities and Operations (Year 1)	\$40,000
<b>Total</b>	<b>\$185,000</b>

**5. Contingency Fund: \$75,000**

To support the successful completion and uninterrupted launch of the Tier III Food Innovation Center (FIC) in Kosrae, a contingency reserve of \$75,000—approximately 6 to 7 percent of the overall project budget—has been set aside. This fund provides critical financial flexibility to manage unanticipated costs, delays, or technical challenges common to infrastructure development in remote island environments.

**Rationale and Use:**

Contingency funding is essential in Pacific Island contexts where import reliance, shipping delays, labor shortages, and extreme weather are routine variables. This reserve ensures that unforeseen circumstances do not compromise project delivery or necessitate cuts in core functionality.

**Examples of Use Cases:**

- **Construction material volatility:** Price surges in rebar, cement, or insulation due to international shipping fluctuations or port rerouting via Guam, Hawaii, or Asia
- **Logistical setbacks:** Additional charges for delayed offloading, barge rebooking, or long-term storage fees at Kosrae port caused by schedule disruptions or equipment backlogs
- **Installation mismatches or broken parts:** Modifications needed to integrate imported machinery with local layouts or power systems, requiring specialized labor or custom parts
- **Weather-induced delays:** Storms or flooding that interrupt building schedules or damage pre-positioned equipment and supplies

- **Operational bridging costs:** Short-term staffing extensions, fuel procurement, emergency repairs, or delays in cost-share contributions from partners or donors

#### **Governance and Oversight:**

Use of contingency funds will be carefully monitored by the financial oversight team and require documented justification by the facility manager, followed by review and approval from the designated project steering committee or oversight body. Should any funds remain unused after the construction and initial operating phase, they may be redirected to capacity building, food safety certifications, system upgrades, or strategic investments that strengthen long-term facility performance. Key is for fiscal transparency to ensure proper allocation and use of all funds.

## **B. Tier III Animal Feed and Fertilizer Processing Facility in Kosrae, FSM**

**Overall Budget: \$2,448,860.18**

#### **Overview**

This proposal envisions a 3,000 square foot Tier III Food Innovation Center (FIC) in Tafunsak focused on manufacturing fertilizer and animal feed using protein-rich bycatch fish waste, coconut cake, and legume biomass. The facility supports circular economic practices and enhances food and feed security in Kosrae and across the Federated States of Micronesia (FSM), reducing reliance on imported feed and creating value from underutilized local resources. The facility will also serve as a training hub for agro-entrepreneurs and support the marine industry as well as the local pig, poultry, and aquaculture sectors because of the focus on producing local feed. .

#### **Design Assumptions**

- Construction cost: \$500 per sq ft, based on food-grade, cyclone-resilient, ventilated design with hygienic zoning.
- Operating year-round with up to two daily shifts (six-day workweek).
- Estimated 80 percent operational uptime to account for maintenance, holidays, and training.
- All raw materials (bycatch, coconut cake, legume crops) are seasonally available in sufficient quantities through partnerships with commercial fishing vessels, the aquaculture center, and farmers.

#### **Production Capacity**

- Target: ~1 metric ton (1,000 kg) of feed per day.
- **Annual production (under optimal input availability): ≈260 metric tons.**
- Feed types: floating and sinking pellets for aquaculture; mash or pelletized feeds for poultry and pigs.

#### **Core Ingredients**

- **Bycatch Fish Waste:** Collected at port and processed onsite through grinding, drying, and deodorizers.

- **Coconut Cake:** Obtained from Vital coconut processing center, used as a high-fiber, protein-rich base.
- **Legume Biomass:** Derived from local pigeon pea, velvet bean, and other nitrogen-fixing crops cultivated in agroforestry systems.
- **Plant Biomass** from area and from fruit and vegetable **waste following processing in FIC.**
- Supplemented with dried root vegetables, seaweed powder, and mineral premixes where needed.

### Facility Design

- Includes raw material receiving bays, preprocessing zone (grinders, dryers), feed mixing and pelleting room, drying tunnels, quality control lab, packaging area, training room, cold storage, and administrative office.
- Integrated solar-ready electrical system and water catchment.
- Waste management through composting and wastewater filtration systems.

### Strategic Objectives

- Support local poultry and livestock feed production through value-added processing.
- Enable import substitution for feed inputs currently imported.
- Promote agro-enterprise models for fishers, processors, and youth groups.
- Ensure compliance with Codex and HACCP standards for feed production.
- Strengthen food system resilience by creating internal feed supply chains.

### Facility Specifications

- **Location:** Kosrae State, Federated States of Micronesia
- **Facility Type:** Tier III Food Innovation Center (Maritime and Animal Feed Manufacturing)
- **Size:** 3,000 square feet
- **Construction Cost:** \$500 per square foot × 3,000 sq ft = **\$1,500,000**
- **Design Standards:** The facility will be constructed in accordance with internationally recognized food and feed safety standards, including Codex Alimentarius, HACCP principles, and USDA/APHIS guidelines for hygienic design, sanitation, and biosecurity. This ensures compliance for both domestic use and export-readiness where applicable.
- **Target Production Output:** Under ideal operating conditions (two shifts/day, six days/week, with seasonal input availability), the facility aims to produce approximately 1 metric ton of feed per day, resulting in an estimated **260 metric tons per year.**
- **Core Processing Zones:**
  - Raw material receiving and preprocessing (fish waste handling, drying, and deodorization)
  - Feed milling, blending, pelleting, and drying
  - Cold and dry storage for raw materials and finished product
  - Quality assurance lab for feed composition and safety testing
  - Administrative and training spaces for operators and agri-entrepreneurs
- **Power and Utility Design:** Hybrid energy setup with diesel backup and solar-ready wiring; rainwater harvesting and greywater reuse systems will support sustainability.
- **Staffing and Operation:** The facility will employ a team including a plant manager, feed technician, machine operator, sanitation worker, and admin assistant, with specialized training supported by technical partners and regional experts.

## Estimated Budget Summary

1. **Construction and Infrastructure**
  - Size: 3,000 sq ft
  - Rate: \$500/sq ft (based on tropicalized, food-grade facility design)
  - **Total: \$1,500,000**
2. **Equipment and Installation**
  - Feed dryers, grinders, hammer mills, pelletizers, mixers, cooling conveyors, and packaging tools
  - Cold storage and odor control for fish waste intake
  - Generators and ventilation systems
  - **Estimated Total: \$223,272.68**
3. **Administration, R&D, and Training Facilities**
  - Includes an administrative office, training room, and micro-lab
  - Computers, IT equipment, and audiovisual tools
  - **Estimated Total: \$95,000**
4. **Operational Readiness and Start-Up Inventory**
  - Raw material buffer (legumes, coconut cake, fish waste)
  - Packaging, labeling, PPE, safety materials, feed supplement inputs
  - Training personnel and initial salaries
  - **Estimated Total: \$185,000**
5. **Utilities and Safety Systems**
  - Water and electrical systems
  - Generator and solar integration readiness
  - Fire suppression, pest control, sanitation systems
  - **Estimated Total: \$110,000**
6. **Project Management and Technical Oversight**
  - On-site construction management and technical audits
  - Compliance with FDA feed safety standards and Codex regulations
  - **Estimated Total: \$105,000**
7. **Contingency Fund (7%)**
  - To address freight delays, price escalations, labor shortages
  - **Estimated Total: \$230,000**

## Equipment & Supplies for a Tier III FDA-compliant Maritime Processing Center in Tofol:

Equipment	Price per Unit	Number of Units	Total without Cost Conversion	Total with 1.5x Cost Conversion
Animal Feed and Fertilizer Processing Items				
<a href="#">Fish and Produce Processing Grinder</a>	5,000.00	2	10,000.00	15,000.00

<a href="#">Chicken Feed (Streamline)</a>	2,500.00	1	2,500.00	3,750.00
<a href="#">Chicken Feed Production Line</a>	5,500.00	1	5,500.00	8,250.00
<a href="#">Feed Pellet Packager</a>	2,000.00	1	2,000.00	3,000.00
<a href="#">Robot Coupe R702VV 2 Continuous Feed Food Processor</a>	6,011.00	1	6,011.00	9,016.50
<a href="#">Bags</a>	0.07	50,000	3,500.00	5,250.00
<a href="#">Fertilizer mixer</a>	3,500.00	2	7,000.00	10,500.00
<a href="#">Bulk Storage Containers</a>	688.00	15	10,320.00	15,480.00
<a href="#">Shovels</a>	51.00	15	765.00	1,147.50
<a href="#">Pitchforks</a>	59.55	15	893.25	1,339.88
<a href="#">Stainless Steel Worktables</a>	575.00	3	1,725.00	2,587.50
<b>Food Safety Testing Checklist</b>				
<a href="#">Check-Set IV Cold/Hot Calibrator</a>	1,592.12	1	1,592.12	2,388.18
<a href="#">AP550 Flat-Surface Label Applicator</a>	2,395.00	1	2,395.00	3,592.50
<a href="#">AP380 Label Applicator</a>	1,595.00	1	1,595.00	2,392.50
<a href="#">PL400 Pouch Labeler</a>	1,595.00	1	1,595.00	2,392.50
<a href="#">Barcode Thermal Ribbons</a>	56.00	1	56.00	84.00
<a href="#">Barcode Scanner L13687</a>	1,025.00	1	1,025.00	1,537.50
<a href="#">Barcode software</a>	790.00	1	790.00	1,185.00
<a href="#">Zebra ZQ511 Mobile Receipt Printer</a>	840.00	1	840.00	1,260.00
<a href="#">Thermopen Thermometer</a>	299.00	1	299.00	448.50
<b>Safety Equipment</b>				
<a href="#">Porta Stream II Eyewash station</a>	460.00	3	1,380.00	2,070.00
<a href="#">Saline Concentrate Refill</a>	100.00	10	1,000.00	1,500.00
<a href="#">Dust Cover</a>	52.00	3	156.00	234.00
<a href="#">S Carton Uline Industrial Latex Gloves</a>	26.00	10	260.00	390.00
<a href="#">M Carton Uline Industrial Latex Gloves</a>	14.00	10	140.00	210.00
<a href="#">L Carton Uline Industrial Latex Gloves</a>	19.00	10	190.00	285.00
<a href="#">Class A First Aid Kits</a>	67.00	5	335.00	502.50
<a href="#">Class B First Aid Kits</a>	155.00	5	775.00	1,162.50
<a href="#">Class B+ First Aid Kits</a>	395.00	5	1,975.00	2,962.50

<a href="#">Uline Ice Wraparound Fog Armor Dispenser box</a>	94.00	2	188.00	282.00
<a href="#">3M Construction Harness</a>	185.00	2	370.00	555.00
<a href="#">Carton Polyethylene Apron</a>	22.00	6	132.00	198.00
<a href="#">Multi compartment Stainless Steel Dispensers</a>	250.00	3	750.00	1,125.00
Additional Equipment				
<a href="#">Slaughtering Table</a>	425.00	2	850.00	1,275.00
<a href="#">Butchers Table</a>	1,000.00	3	3,000.00	4,500.00
<a href="#">Cookshack SM360 Smoker Oven</a>	13,490.00	1	13,490.00	20,235.00
<a href="#">Heavy Duty Steel shelving 96 x 24 x 72"</a>	1,445.00	5	7,225.00	10,837.50
<a href="#">Hose</a>	50.00	1	50.00	75.00
Information Hub				
<a href="#">Samsung 4TB SSD Hard drives</a>	439.99	2	879.98	1,319.97
<a href="#">Dell Inspiron 27' All in one cpu</a>	1,189.98	1	1,189.98	1,784.97
<a href="#">4 Person L Desk Workstation</a>	3,210.00	1	3,210.00	4,815.00
<a href="#">LG smart TV</a>	299.00	1	299.00	448.50
<a href="#">Norton Anti virus software</a>	19.99	1	19.99	29.99
<a href="#">Mesh Task Chairs</a>	165.00	6	990.00	1,485.00
<a href="#">Downtown conference tables (Powered) 192 x 48"</a>	1,560.00	1	1,560.00	2,340.00
<a href="#">Portable Projector Screen 107"</a>	525.00	1	525.00	787.50
<a href="#">Wall monitor Mount</a>	95.00	1	95.00	142.50
Kitchen Supplies				
<a href="#">Mobile ingredient bins</a>	343.00	2	686.00	1,029.00
<a href="#">Self ingredient Bin 200 cups</a>	243.00	2	486.00	729.00
<a href="#">Baking Pan</a>	216.00	2	432.00	648.00
<a href="#">Wire Grate</a>	168.00	2	336.00	504.00
<a href="#">Cambro Dish Racks</a>	42.00	2	84.00	126.00
<a href="#">Cambro Glass Racks</a>	80.00	2	160.00	240.00
<a href="#">Pan Dolly</a>	305.00	2	610.00	915.00
<a href="#">Uline Trash Cans</a>	74.00	2	148.00	222.00

<a href="#">Uline Trash can lids</a>	29.00	2	58.00	87.00
<a href="#">Biohazard Step On Waste Can</a>	131.00	3	393.00	589.50
<a href="#">Uline Thin trash can 23G</a>	45.00	3	135.00	202.50
<a href="#">Rubbermaid Slim Jim Lid Can/bottle</a>	52.00	2	104.00	156.00
<a href="#">Rubbermaid Slim Jim Lid paper</a>	52.00	2	104.00	156.00
<a href="#">Rubbermaid Slim Jim Swing top</a>	51.00	2	102.00	153.00
<a href="#">Stainless Dollie</a>	135.00	2	270.00	405.00
<a href="#">Handsfree Trash Can 55G</a>	255.00	3	765.00	1,147.50
<a href="#">Outdoor Landmark Series Trash Can Dome top 50G</a>	970.00	3	2,910.00	4,365.00
<a href="#">Fork liftable Transport tilt truck</a>	2,505.00	2	5,010.00	7,515.00
<a href="#">Hydraulic Platform Stacker</a>	2,695.00	2	5,390.00	8,085.00
<a href="#">130km low speed new energy double cab mini pick up truck</a>	9,999.00	2	19,998.00	29,997.00
<a href="#">Commercial Cutting Board</a>	152.00	5	760.00	1,140.00
<a href="#">Commercial Mixing 3qt</a>	62.00	3	186.00	279.00
<a href="#">Commercial Mixing 5qt</a>	89.00	3	267.00	400.50
<a href="#">Commercial Mixing 8qt</a>	125.00	3	375.00	562.50
<a href="#">Commercial Mixing 13qt</a>	94.00	3	282.00	423.00
<a href="#">Commercial Mixing 20qt</a>	150.00	3	450.00	675.00
<a href="#">Stainless Steel Steam Table Pans 3qt</a>	150.00	3	450.00	675.00
<a href="#">Stainless Steel Steam Table Pans 6qt</a>	250.00	3	750.00	1,125.00
<a href="#">Stainless Steel Steam Table Pans 10qt</a>	150.00	3	450.00	675.00
<a href="#">Stainless Steel Steam Table Pans 14qt</a>	175.00	3	525.00	787.50
<a href="#">Stainless Steam Table Pan Lids 1/6</a>	55.00	3	165.00	247.50
<a href="#">Stainless Steam Table Pan Lids 1/3</a>	85.00	3	255.00	382.50
<a href="#">Stainless Steam Table Pan Lids 1/2</a>	110.00	3	330.00	495.00

<a href="#">Stainless Steam Table Pan Lids Full</a>	205.00	3	615.00	922.50
<a href="#">Stainless Steel Scoops 8oz</a>	69.00	3	207.00	310.50
<a href="#">Stainless Steel Scoops 16oz</a>	75.00	3	225.00	337.50
<a href="#">Stainless Steel Scoops 32oz</a>	80.00	3	240.00	360.00
<a href="#">Stainless Steel Scoops 64oz</a>	86.00	3	258.00	387.00
<a href="#">Stainless Steel Scoops 96oz</a>	114.00	3	342.00	513.00
<a href="#">Stainless Steel Scoops 128oz</a>	122.00	3	366.00	549.00
<a href="#">Stainless Steel Scoops 160oz</a>	134.00	3	402.00	603.00
<a href="#">Stainless Steel Mixing Paddles 48"</a>	35.00	2	70.00	105.00
<a href="#">Mixing Polypropylene Paddles 40"</a>	65.00	2	130.00	195.00
<a href="#">Mixing Polypropylene Paddles 52"</a>	72.00	2	144.00	216.00
<a href="#">Hand Scraper 3 x 8"</a>	7.00	5	35.00	52.50
<a href="#">Hand Scraper 4 x 9"</a>	8.00	5	40.00	60.00
<a href="#">Stainless steel paper cutter 36"</a>	163.00	2	326.00	489.00
<a href="#">Unbleached Paper rolls 36"</a>	81.00	3	243.00	364.50
<a href="#">Case of Square Utility Jugs</a>	34.20	2	68.40	102.60
<a href="#">Jug Pump</a>	10.50	2	21.00	31.50
<a href="#">Chemical Resistant Spray Bottles</a>	25.50	2	51.00	76.50
<a href="#">Case Replacement nozzles</a>	17.25	2	34.50	51.75
<a href="#">Williams Sonoma Prep Tools 15 Piece Gadget and Utensils Set</a>	279.95	2	559.90	839.85
<b>Total Cost</b>				<b>223,860.18</b>

### Grand Total (All-Inclusive)

Category	Amount (USD)
Construction and Infrastructure	\$1,500,000
Equipment and Installation	\$223,860.18
Admin, Training, and R&D	\$95,000
Operational Readiness & Start-Up Inputs	\$185,000
Utilities and Safety Systems	\$110,000
Project Management and Oversight	\$105,000
Contingency Fund	\$230,000

<b>Total Estimated Budget</b>	<b>\$2,448,860.618</b>
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### Key Outputs and Outcomes

- Daily feed production capacity of approx. 1 metric ton
- Utilization of underused marine and agricultural waste
- Training hub for youth and agro-entrepreneurs
- Reduction of animal feed imports to FSM
- Resilient food and livestock systems through circular resource flows

## C. Kosrae State Tier II Food Innovation Facilities (FIF)

**FIFs two Tier II: \$2,692,560.76** (2,250,000 + 320,060.76 + 30,000 + 92,500)

Kosrae State proposes the establishment of two regional Tier II Food Innovation Facilities (FIFs), each designed at approximately 2,500 square feet, based on an estimated cost of \$450 per square foot. The total cost for each facility is projected at **\$1,125,000**, yielding a combined construction cost of \$2,250,000 for all FIFs.

The two proposed Tier II FIFs will serve distinct agricultural value chains critical to Kosrae’s economy and food security strategy. These Tier II facilities will be dedicated to solar-powered, low level processing of staple crops such as coconut, breadfruit, taro, yams and coconuts, along with other fruits and green vegetables, with the intent to develop dried, pureed, fermented, or packaged forms for local consumption and small-scale trade. Each FIF will serve as a semi-centralized hub supporting aggregation, processing, training, and storage in alignment with HACCP standards and Codex Alimentarius food safety protocols. The facilities are envisioned as modular and replicable, designed to provide geographic and thematic coverage across Kosrae’s major agro-ecological zones while enhancing community-level value addition and market access. And, each will serve as training and community food production and processing centers for education on nutrition, cooking, product development, food preservation and more to support food security and access to healthy and nutritious local foods.

### Budget Narrative:

#### 1. Construction and Infrastructure: \$1,125,000 per Tier II FIF

This estimate reflects the cost of constructing a 2,500 square foot Tier II Food Innovation Facility (FIF) in Kosrae, based on a benchmark rate of \$450 per square foot. The design is aligned with FDA-compliant food-grade facility standards and adapted for island-specific environmental and logistical realities. The estimate includes imported building materials, skilled labor, refrigeration and sanitation systems, climate-resilient features, and project management oversight.

#### A. Foundation and Structural Works – \$461,250

This component encompasses all civil works and vertical construction required to deliver a fully enclosed, durable, food-safe structure. As with many Pacific Island environments, nearly all

construction inputs in Kosrae—such as cement, rebar, roofing, and steel—must be imported, and transportation logistics remain complex and high-cost.

#### **1. Site Preparation and Slab Work – \$143,750**

- Land clearing, grading, and compacting: Executed with leased local machinery or imported equipment as available
- Sub-base and reinforcement: Stabilized with imported gravel, sand, and geotextiles to prevent erosion and water intrusion
- Reinforced concrete slab: Six-inch thick, industrial-grade poured slab with embedded rebar mesh, designed to endure heavy machinery and high humidity
- Drainage integration: Slope-engineered flooring linked to subsurface graywater or septic handling
- Shipping surcharges: Includes freight charges for bulk aggregate and cement delivery to Kosrae port, plus demurrage and local stevedoring

#### **2. Structural Framing and Envelope – \$187,500**

- Galvanized steel beams and structural columns: Fabricated off-island and assembled on site
- Roof and rafter framing: Designed to meet Pacific cyclone codes, with trussed systems for weather resilience
- Partition framing: Interior non-load bearing walls built using treated local timber or steel studs where available
- Anchoring system: Engineered foundations with hurricane straps and wind-load compliance

#### **3. Roofing System – \$62,500**

- Galvanized corrugated panels: Rust-resistant and Class A fire-rated for tropical climates
- Thermal barrier and vapor seal: Prevents heat ingress and condensation around processing equipment
- Rainwater harvesting: Includes gutters, downspouts, and cistern-compatible outflows
- Overhangs and soffits: Designed for passive cooling and protection from driving rain

#### **4. Loading Bay and Exterior Finishes – \$42,500**

- Covered receiving and dispatch platform: Concrete apron to accommodate supply vehicles and packaged product flow
- Graded access paths: Driveways with slope-stabilized surfaces for delivery truck use
- Exterior wall treatments: Mold-resistant finishes with food-safe paint or sandwich panel facades
- Security enhancements: Includes motion-sensitive exterior lighting, reinforced entry doors, and screened windows

#### **5. Construction Logistics and Material Handling – \$25,000**

- Crane and hoisting support: Required for steel frame placement, refrigeration units, and HVAC equipment
- Storage and warehousing: On-site containers for safeguarding imported materials over an extended build period
- Mobilization: Includes inter-island transport, barge shipments, and contractor deployment
- Customs clearance and risk management: Covers insurance, broker fees, and handling of sensitive or high-value imports

This construction package provides the structural foundation needed to implement high-functioning, food-grade processing facilities tailored to Kosrae’s conditions. Each FIF will

adhere to international food safety design standards while maintaining the resilience and adaptability needed in the FSM context.

## **B. Plumbing and Electrical Systems – \$178,750**

This component ensures that the facility is hygienically operable, energy-resilient, and food-safety compliant. In Kosrae’s tropical, infrastructure-limited setting, plumbing and electrical systems must be durable, adaptable, and optimized for water-intensive processing and intermittent power access. The budget reflects the need for full importation of components, skilled installation labor, and contingency allowances for climate and supply chain variability.

### **1. Potable Water and Sanitation Systems – \$77,500**

- Facility-wide potable water lines: Food-grade PEX or CPVC piping throughout processing, sanitation, and admin areas
- Hand-wash stations: Two per processing zone, with foot- or elbow-activated faucets and hands-free towel dispensers
- Triple-compartment sinks: Installed in community kitchen, sanitation stations, and oil/coconut processing zones
- Grease traps and drainage: Integrated system using stainless steel interceptors and epoxy-coated floor drains
- Rainwater catchment and storage: Cisterns fed by roof guttering, with sediment filtration and UV/chlorine treatment for non-potable reuse
- Septic system: On-site wastewater disposal capacity tailored to peak food processing volumes

### **2. Electrical Distribution and Food-Safety Power Design – \$65,000**

- Dedicated circuits for essential processing equipment: Separate feeds for coolers, fryers, dryers, and vacuum units, with surge protection
- Room-based sub-panels: Each production zone on independent load circuits to manage maintenance and safety
- Food-grade electrical finish: Moisture-sealed conduits and outlets, splash zones protected by guards and elevated cable runs
- Shatterproof LED lighting: High-lumen, food-safe LED fixtures throughout, with enhanced visibility in production and inspection rooms
- Emergency lighting and signage: Battery backup lights and compliant exit signs to meet international food facility protocols

### **3. Generator Interface and Solar Integration – \$26,250**

- Backup generator: One 50–80 kW diesel unit housed in a ventilated, weatherproof enclosure
- Automatic Transfer Switch (ATS): Enables continuous power supply for refrigeration, IT, and sanitation systems during outages
- Solar-ready wiring: Pre-installed conduits and switchgear for Phase II PV integration or donor-funded solar expansion
- Battery/inverter readiness: Compatible electrical layout for lithium-ion or lead-acid battery storage systems in the future

### **4. Fire Suppression and Safety Systems – \$10,000**

- Kitchen hood fire suppression: Commercial-grade automatic discharge systems in processing and cooking areas
- Extinguishers and alarm placement: CO2 and dry chemical units positioned every 75 feet, with fire alert systems

- Grounding and lightning protection: Island-appropriate surge suppression and grounding rods to reduce outage risk
- PPE storage and signage: Clearly marked storage for safety gear, chemical spill kits, and emergency response tools

This package ensures that all water, sanitation, and energy systems meet global food safety norms and can function reliably despite utility instability, frequent rainfall, or operational peaks. It aligns with Codex Alimentarius and HACCP guidelines and anticipates future upgrades to improve sustainability and resiliency in the Kosrae context.

### **C. Interior Finishing – \$156,250**

This component ensures that the interior spaces of the Tier II Food Innovation Facilities (FIFs) in Kosrae meet rigorous global food safety standards for hygiene, durability, cleanability, and pest exclusion. All surfaces and materials are designed to withstand high humidity, salt exposure, and intensive use in food processing environments. The budget includes imported finish materials, tropical-grade sealing, and specialized labor consistent with HACCP, USDA, and Codex guidelines.

#### **1. Hygienic Wall Systems – \$56,250**

- FRP (Fiberglass Reinforced Plastic) panels: Installed in wet processing zones such as coconut, root crop, and sanitation rooms. Panels are mold- and corrosion-resistant, smooth-surfaced, and easily sanitized.
- Epoxy wall coatings: Applied in dry zones, offices, and storage rooms. Coatings include antimicrobial additives and are high-gloss for better visibility of contaminants.
- Wall-floor coving and corner guards: Rounded, seamless joints to eliminate harborage points for bacteria or pests and simplify cleaning in corners and transitions.

#### **2. Epoxy-Coated Flooring with Integrated Drainage – \$43,750**

- Epoxy flooring system: Slip-resistant, food-grade coatings across all rooms, reinforced for heavy equipment and daily wet cleaning.
- Antimicrobial finishes: Granular additives for microbial resistance and staff safety in high-traffic zones.
- Integrated trench drainage: Strategically sloped floors with stainless steel trench drains in processing and sanitation zones to minimize pooling.
- Moisture protection: Waterstop expansion joints and thermal sealing barriers to prevent subfloor degradation.

#### **3. Pest-Sealed Ceiling Systems – \$25,000**

- Seamless, washable ceiling panels: Water-resistant and joint-minimized surfaces in all food prep and storage rooms.
- Moisture-barrier insulation: Installed above ceilings to prevent condensation from forming and dripping onto work surfaces.
- Pest-proofing: Insect- and rodent-sealed light fixtures, vent penetrations, and cabling channels using silicone and mesh.
- Secure maintenance hatches: Locked and gasketed access panels prevent ceiling void contamination.

#### **4. Internal Partitions, Doors, and Zoning – \$18,750**

- Hygienic zoning: Internal partitions designed to maintain clean-to-dirty product flow and staff movement.
- Airtight food-grade doors: Insulated, gasketed doors for processing rooms, fitted with antimicrobial handles.

- Visual monitoring windows: Tempered glass observation panels installed in training and demonstration areas.
- Hands-free door systems: Magnetic door holders and kick plates installed at high-traffic transitions for hygienic access.

#### **5. Fixtures, Restroom Finishes, and Food-Safe Cabinetry – \$12,500**

- Restroom infrastructure: Eco-flush toilets, foot-operated sinks, hand dryers, and changing space for sanitation workers.
- Stainless steel storage: Corrosion-proof cabinets for tools, PPE, and ingredients in R&D and kitchen zones.
- Chemical and compliance storage: Lockable units for detergents, SOP binders, and safety documentation.
- Finishes for shared areas: Mold-resistant paints, window insect screens, and durable signage in administrative spaces.

This interior finishing investment ensures that both Tier II FIFs in Kosrae are food-safe, resilient, and compliant with export-quality standards. Each surface and fixture is selected for maximum longevity and sanitation performance in Micronesia’s humid, high-wear environment.

#### **D. Refrigeration and Ventilation – \$235,000**

This budget line ensures that the Tier II Food Innovation Facilities (FIFs) in Kosrae maintain consistent cold-chain reliability and effective air circulation throughout the facilities. Given the island’s tropical climate and the perishability of products like coconut derivatives, taro, banana, and leafy greens, this investment supports climate-resilient, energy-efficient systems designed to uphold food safety, reduce spoilage, and ensure continuous operations.

##### **1. Cold Storage Systems – \$120,000**

- **Walk-in Coolers and Freezers:** Two commercial-grade insulated cold rooms (one cooler and one freezer), constructed with polyurethane paneling, sealed gaskets, and food-grade flooring. Systems are equipped with temperature controls and humidity-resistant shelving for safe storage of processed coconut, root crops, and fresh produce.
- **CoolBot Hybrid Cold Rooms:** Two rooms integrated with CoolBot controllers and high-capacity air conditioners for flexible, energy-conscious cooling, ideal for overflow inventory, community co-packing, or R&D trials.
- **Entry-Level IQF System:** Compact Individual Quick Freezing unit for rapid chilling of products like coconut cubes, banana slices, or taro, extending product shelf life for both local and export markets.
- **Remote Temperature Monitoring:** Battery-logged, cloud-connected temperature tracking systems for all refrigerated zones, ensuring full HACCP-aligned traceability.

##### **2. Ventilation and Odor Control Systems – \$62,500**

- **Exhaust Hoods and Filters:** Heavy-duty stainless steel hoods installed over frying and boiling stations in coconut and root processing rooms, equipped with grease filters and integrated fire suppression.
- **Airflow Systems:** Wall-mounted and overhead fans ensure continuous ventilation across processing and storage zones, minimizing moisture buildup and reducing microbial risks.
- **Humidity and Odor Management:** Dehumidifiers, UV air purifiers, and activated carbon scrubbers control environmental conditions in food prep and storage zones, especially important in high-moisture coconut and fermented food applications.

- **Zonal Pressure Control:** Negative pressure zones in high-risk areas (e.g., grating and fermentation rooms), with positive pressure maintained in packaging and admin areas to prevent air contamination.

### **3. Thermal Efficiency and Backup Systems – \$52,500**

- **Solar Compatibility:** All cold chain and ventilation infrastructure pre-configured for solar system installation. Roof structures are engineered to support future photovoltaic modules.
- **Enhanced Insulation:** All storage and processing areas include reflective thermal barriers, high-R value insulation, and vapor-resistant sealing to reduce heat gain and cut operating costs.
- **Backup Generator and Transfer Switches:** Dedicated 25–30 kVA diesel generator with automatic transfer switch to protect refrigeration operations during grid outages. A portable generator provides redundancy for critical zones.
- **Thermal Barriers and Air Locks:** PVC curtains and door airlocks installed at cold room entry points to minimize temperature fluctuation during product transfer.

Together, these refrigeration and ventilation investments ensure that the Kosrae Tier II FIFs maintain the cold-chain integrity required for safe food storage, preparation, and packaging. Designed with redundancy and energy awareness, these systems allow uninterrupted operation and compliance with export and domestic food safety standards, even in Kosrae’s challenging tropical setting.

### **E. On-Site Project Management and Technical Oversight – \$93,750**

This component ensures that the Tier II Food Innovation Facilities (FIFs) in Kosrae are constructed and commissioned to meet internationally recognized food facility standards—particularly those aligned with U.S. FDA, HACCP, and Codex Alimentarius requirements—while addressing logistical and infrastructural challenges specific to the Federated States of Micronesia (FSM).

#### **1. Full-Time Construction Manager – \$50,000**

A dedicated on-site construction manager will oversee the full implementation of each facility, from groundbreaking through final commissioning.

##### **Responsibilities include:**

- Daily supervision of construction teams and subcontractors
- Ensuring adherence to architectural plans, engineering designs, and safety regulations
- Overseeing scheduling, procurement, and on-site logistics for imported building materials and systems
- Troubleshooting delays due to weather, shipping, or infrastructure constraints
- Coordinating plumbing, electrical, finishing, and refrigeration subcontractors to streamline workflows
- Delivering weekly updates and compliance documentation to project leads and funders

##### **Cost includes:**

- Monthly fee for 9 to 12 months of site engagement
- Travel and relocation from a regional hub (e.g., Guam, Hawaii, or mainland U.S.)
- Housing stipend, per diem, and in-country transport support

#### **2. FDA-Aligned Food Facility Technical Advisor – \$31,250**

A specialized food facility consultant will provide ongoing guidance to ensure hygienic layout, food-safe material use, drainage logic, and processing zone standards meet international benchmarks.

**Key deliverables include:**

- Pre-construction review of design and utility schematics for compliance with HACCP, GMP, and zoning best practices
- Real-time feedback during construction and pre-commissioning walkthroughs
- Guidance on equipment placement, sanitation zones, and raw-to-finished product segregation
- Drafting SOP templates and cleaning protocols for operations readiness
- Support for food safety training, audit preparation, and possible certification pursuits

**Cost includes:**

- Consulting retainer over 9–12 months
- Three site visits (including airfare, housing, and meals)
- Remote working sessions, document reviews, and training sessions

**3. Quality Assurance and Construction Audits – \$12,500**

To reduce costly rework and maintain accountability during construction, the project will engage an independent civil engineer or architect to conduct ongoing inspections and reporting.

**Scope includes:**

- Bi-weekly site visits and progress verification reports
- Cross-checking of actual materials and quantities against procurement records
- In-field testing of electrical, plumbing, and finish work (e.g., epoxy floors, drainage)
- Structured milestone validation to authorize staged contractor payments

This oversight and technical support package will ensure that both Kosrae Tier II FIFs are delivered with high construction integrity, in compliance with global food processing standards, and with clear documentation for funders and local stakeholders. It builds in institutional knowledge, minimizes construction risk, and positions the facilities for long-term success.

**Total Construction and Infrastructure or Remodeling for Tier II:**

<b>Component</b>	<b>Amount (USD) for each Tier II FIF</b>	<b>Amount (USD) for two Tier II FIFs</b>
<b>A. Foundation &amp; Structure</b>	<b>\$461,250</b>	<b>\$922,500</b>
<b>B. Plumbing &amp; Electrical</b>	<b>\$178,750</b>	<b>\$357,500</b>
<b>C. Interior Finishing</b>	<b>\$156,250</b>	<b>\$312,500</b>
<b>D. Refrigeration &amp; Ventilation</b>	<b>\$235,000</b>	<b>\$470,000</b>
<b>E. Project Management &amp; Oversight</b>	<b>\$93,750</b>	<b>\$4187,500</b>
<b>Total</b>	<b>\$1,125,000</b>	<b>\$2,250,000</b>

## 2. Equipment & Supplies for the Tier II FIFs: \$320,060.76

Equipment	Price per Unit	Number of Units	Total without Cost Conversion	Total with 1.5x Cost Conversion
Coconut Processing Items				
<a href="#">Machine Coconut Opener</a>	300.00	10	3,000.00	4,500.00
<a href="#">Oven/range</a>	1,000.00	5	5,000.00	7,500.00
<a href="#">Wok</a>	17.00	10	170.00	255.00
<a href="#">Burner</a>	4.30	10	43.00	64.50
<a href="#">Steel Tray</a>	10.00	100	1,000.00	1,500.00
<a href="#">Tray Rack</a>	90.00	10	900.00	1,350.00
<a href="#">Flesh tool</a>	3.00	10	30.00	45.00
<a href="#">Industrial Juicer</a>	600.00	2	1,200.00	1,800.00
<a href="#">Oil Extractor</a>	800.00	2	1,600.00	2,400.00
<a href="#">Machete</a>	28.00	20	560.00	840.00
<a href="#">Coconut Flour Machine</a>	800.00	2	1,600.00	2,400.00
<a href="#">Liberty Stainless Steel Taps</a>	84.00	20	1,680.00	2,520.00
<a href="#">Sugaring Bucket</a>	51.94	40	2,077.60	3,116.40
<a href="#">28' Fiberglass Extension Ladder</a>	460.00	4	1,840.00	2,760.00
<a href="#">Winco 12 in Sieve Baking Sheet</a>	24.01	20	480.20	720.30
<a href="#">Lakshmi Coconut Milk Extractor</a>	210.80	2	421.60	632.40
<a href="#">Coconut Packager</a>	1,650.00	2	3,300.00	4,950.00
<a href="#">Coconut Oil press</a>	168.75	2	337.50	506.25
<a href="#">Manual Coconut Milk press</a>	90.00	2	180.00	270.00
<a href="#">Dehydrator</a>	239.00	1	239.00	358.50
<a href="#">Solar Dryer or Dehumidifier Dried Fruit</a>	210.00	10	2,100.00	3,150.00
<a href="#">Stainless Steel Worktables</a>	575.00	10	5,750.00	8,625.00
Fish & Poultry Processing Items				
<a href="#">Mainstreet Stainless Steel Floor Fryer</a>	749.00	2	1,498.00	2,247.00
<a href="#">Stainless Steel Triple Basins</a>	306.15	1	306.15	459.23

<a href="#">Avantco A-49R-HC 54" Reach in Refrigerator</a>	1,949.00	2	3,898.00	5,847.00
Food Safety Testing Checklist				
<a href="#">Benchtop Ph Meter</a>	1,035.00	1	1,035.00	1,552.50
<a href="#">Thermopen Thermometer</a>	299.00	1	299.00	448.50
<a href="#">Hand held temp adjusted Refractometer</a>	260.00	4	1,040.00	1,560.00
<a href="#">Thermometer Calibrator (4 point hot/cold)</a>	1,592.12	2	3,184.24	4,776.36
Thermometers (digital + infrared)	300.00	10	3,000.00	4,500.00
Safety Equipment				
<a href="#">Half Face respirator</a>	43.00	4	172.00	258.00
<a href="#">Porta Stream II Eyewash station</a>	460.00	2	920.00	1,380.00
<a href="#">Goggles</a>	22.00	20	440.00	660.00
<a href="#">S Carton Uline Industrial Latex Gloves</a>	26.00	20	520.00	780.00
<a href="#">M Carton Uline Industrial Latex Gloves</a>	14.00	20	280.00	420.00
<a href="#">L Carton Uline Industrial Latex Gloves</a>	19.00	20	380.00	570.00
<a href="#">Class A First Aid Kits</a>	67.00	4	268.00	402.00
<a href="#">Class B First Aid Kits</a>	155.00	4	620.00	930.00
<a href="#">Class B+ First Aid Kits</a>	395.00	4	1,580.00	2,370.00
<a href="#">Uline Ice Wraparound Fog Armor Dispenser box</a>	94.00	4	376.00	564.00
<a href="#">Carton Polyethylene Apron</a>	22.00	10	220.00	330.00
Canning and Pickling Equipment				
<a href="#">Canner Aluminum Bath water Canner</a>	269.99	4	1,079.96	1,619.94
<a href="https://www.allamericancanner.com/41-Quart-Pressure-Canning-Kit.htm">https://www.allamericancanner.com/41-Quart-Pressure-Canning-Kit.htm</a>	677.99	2	1,355.98	2,033.97
<a href="#">Wide Mouth Ball Glass Mason Jars 32 oz</a>	1.37	400	548.00	822.00
<a href="#">Fermentation Crock</a>	85.49	2	170.98	256.47
<a href="#">Fermentation Weights</a>	43.97	50	2,198.50	3,297.75
<a href="#">Fermentation lid cloth covers</a>	13.93	50	696.50	1,044.75
<a href="#">Potable Aqua Water Purification Tabs with PA plus</a>	12.99	200	2,598.00	3,897.00
<a href="#">Stainless Steel Funnel</a>	10.49	25	262.25	393.38

<a href="#">11.5 Qt Canning Rack</a>	8.49	100	849.00	1,273.50
<a href="#">Canning Labels</a>	6.49	10	64.90	97.35
<a href="#">1000 sheets of 4 rectangular labels</a>	109.99	1	109.99	164.99
Hatchery Equipment				
<a href="#">2560 Egg Incubator Kit</a>	6,119.99	2	12,239.98	18,359.97
<a href="#">Chick Brooder 3 Layer H: 15"</a>	799.99	4	3,199.96	4,799.94
<a href="#">Grow out Pen 5 Layer H: 9.5"</a>	699.99	4	2,799.96	4,199.94
<a href="#">Walk in 15ft Chicken run</a>	1,999.99	2	3,999.98	5,999.97
<a href="#">Over Ez Tarp for walk in 8 foot chicken run</a>	199.99	6	1,199.94	1,799.91
<a href="#">Over Ez Chicken Coop Jumbo</a>	3,999.00	2	7,998.00	11,997.00
<a href="#">Nesting Pads</a>	39.99	10	399.90	599.85
<a href="#">Eaton Natural Hemp Bedding 8lb</a>	24.99	10	249.90	374.85
<a href="#">Silo Feeder (40LB) 3 pack</a>	699.99	10	6,999.90	10,499.85
<a href="#">High Country Plastics 270lbs feed bin with stand</a>	312.99	4	1,251.96	1,877.94
<a href="#">3 section breeding pen</a>	239.99	4	959.96	1,439.94
<a href="#">Heater &amp; Thermostat for Box Brooder 110V</a>	114.99	4	459.96	689.94
<a href="#">Chick Brooder heating Plate Temperature Controller</a>	19.99	4	79.96	119.94
<a href="#">Thermo-Chicken 12.5 in. x 18.5 in 40-Watt Heated Pad</a>	71.98	4	287.92	431.88
<a href="#">Solar Powered Automatic Chicken Coop Door with remote</a>	89.99	4	359.96	539.94
<a href="#">Wise mountable feeder 22lbs poultry &amp; Game feeder</a>	59.99	6	359.94	539.91
<a href="#">Wise mountable drinker 3 Gallon poultry and game waterer</a>	69.99	6	419.94	629.91
<a href="#">Pencron Expandable portable power station 1920WH</a>	679.00	2	1,358.00	2,037.00
<a href="#">24000 Watt Dual Fuel Air cooled Standby Generator</a>	6,398.10	2	12,796.20	19,194.30
<a href="#">Global Industrial Stainless Steel Veterinary Scale</a>	515.00	2	1,030.00	1,545.00
<a href="#">Global industrial replacement AC adapter</a>	19.75	4	79.00	118.50

<a href="#">Global Industrial Stainless steel cleaner &amp; Polish</a>	68.95	12	827.40	1,241.10
<a href="#">Rayovac AAA 24 Battery Contractor Pack</a>	12.24	25	306.00	459.00
<a href="#">Electronic Weighing Poultry Scale, Chicken weighing Bag with sling</a>	23.99	4	95.96	143.94
<a href="#">Poultry First Aid Kit</a>	104.99	10	1,049.90	1,574.85
<a href="#">Chicken Ointments Best of show by Manna Pro</a>	43.99	10	439.90	659.85
<a href="#">Coop Cleaning Supply Kit</a>	59.99	20	1,199.80	1,799.70
<a href="#">OverEZ Chicken Waterer 12 Gallon</a>	79.99	4	319.96	479.94
<a href="#">Case of 250 cartons for eggs</a>	169.99	12	2,039.88	3,059.82
Tier-II Information Hub				
<a href="#">Samsung 4TB SSD Hard drives</a>	439.99	2	879.98	1,319.97
<a href="#">Dell Inspiron 27' All in one cpu</a>	1,189.98	2	2,379.96	3,569.94
<a href="#">LG smart TV</a>	299.00	2	598.00	897.00
<a href="#">Norton Anti virus software</a>	19.99	2	39.98	59.97
<a href="#">Mesh Task Chairs</a>	165.00	4	660.00	990.00
<a href="#">Downtown conference tables (Powered) 192 x 48"</a>	1,560.00	2	3,120.00	4,680.00
<a href="#">Wall monitor Mount</a>	95.00	2	190.00	285.00
Kitchen Supplies				
<a href="#">Self ingredient Bin 200 cups</a>	243.00	4	972.00	1,458.00
<a href="#">Baking Pan</a>	216.00	4	864.00	1,296.00
<a href="#">Wire Grate</a>	168.00	4	672.00	1,008.00
<a href="#">Cambro Dish Racks</a>	42.00	4	168.00	252.00
<a href="#">Cambro Glass Racks</a>	80.00	4	320.00	480.00
<a href="#">Pan Dolly</a>	305.00	2	610.00	915.00
<a href="#">Uline Trash Cans</a>	74.00	4	296.00	444.00
<a href="#">Uline Trash can lids</a>	29.00	4	116.00	174.00
<a href="#">Biohazard Step On Waste Can</a>	131.00	4	524.00	786.00
<a href="#">Uline Thin trash can 23G</a>	45.00	4	180.00	270.00
<a href="#">Rubbermaid Slim Jim Lid Can/bottle</a>	52.00	4	208.00	312.00

<a href="#">Rubbermaid Slim Jim Lid paper</a>	52.00	4	208.00	312.00
<a href="#">Rubbermaid Slim Jim Swing top</a>	51.00	4	204.00	306.00
<a href="#">Stainless Dollie</a>	135.00	4	540.00	810.00
<a href="#">Handsfree Trash Can 55G</a>	255.00	4	1,020.00	1,530.00
<a href="#">Outdoor Landmark Series Trash Can Dome top 50G</a>	970.00	4	3,880.00	5,820.00
<a href="#">Fork liftable Transport tilt truck</a>	2,505.00	2	5,010.00	7,515.00
<a href="#">Hydraulic Platform Stacker</a>	2,695.00	2	5,390.00	8,085.00
<a href="#">130km low speed new energy double cab mini pick up truck</a>	9,999.00	2	19,998.00	29,997.00
<a href="#">Commercial Cutting Board</a>	152.00	4	608.00	912.00
<a href="#">Commercial Mixing 3qt</a>	62.00	4	248.00	372.00
<a href="#">Commercial Mixing 5qt</a>	89.00	4	356.00	534.00
<a href="#">Commercial Mixing 8qt</a>	125.00	4	500.00	750.00
<a href="#">Commercial Mixing 13qt</a>	94.00	4	376.00	564.00
<a href="#">Commercial Mixing 20qt</a>	150.00	4	600.00	900.00
<a href="#">Stainless Steel Steam Table Pans 3qt</a>	150.00	4	600.00	900.00
<a href="#">Stainless Steel Steam Table Pans 6qt</a>	250.00	4	1,000.00	1,500.00
<a href="#">Stainless Steel Steam Table Pans 10qt</a>	150.00	4	600.00	900.00
<a href="#">Stainless Steel Steam Table Pans 14qt</a>	175.00	4	700.00	1,050.00
<a href="#">Stainless Steam Table Pan Lids 1/6</a>	55.00	4	220.00	330.00
<a href="#">Stainless Steam Table Pan Lids 1/3</a>	85.00	4	340.00	510.00
<a href="#">Stainless Steam Table Pan Lids 1/2</a>	110.00	4	440.00	660.00
<a href="#">Stainless Steam Table Pan Lids Full</a>	205.00	4	820.00	1,230.00
<a href="#">Stainless Steel Scoops 8oz</a>	69.00	4	276.00	414.00
<a href="#">Stainless Steel Scoops 16oz</a>	75.00	4	300.00	450.00
<a href="#">Stainless Steel Scoops 32oz</a>	80.00	4	320.00	480.00
<a href="#">Stainless Steel Scoops 64oz</a>	86.00	4	344.00	516.00

<a href="#">Stainless Steel Scoops 96oz</a>	114.00	4	456.00	684.00
<a href="#">Stainless Steel Scoops 128oz</a>	122.00	4	488.00	732.00
<a href="#">Stainless Steel Scoops 160oz</a>	134.00	4	536.00	804.00
<a href="#">Stainless Steel Mixing Paddles 48"</a>	35.00	2	70.00	105.00
<a href="#">Mixing Polypropylene Paddles 40"</a>	65.00	2	130.00	195.00
<a href="#">Mixing Polypropylene Paddles 52"</a>	72.00	2	144.00	216.00
<a href="#">Hand Scraper 3 x 8"</a>	7.00	2	14.00	21.00
<a href="#">Hand Scraper 4 x 9"</a>	8.00	2	16.00	24.00
<a href="#">Stainless steel paper cutter 36"</a>	163.00	2	326.00	489.00
<a href="#">Unbleached Paper rolls 36"</a>	81.00	4	324.00	486.00
<a href="#">Handheld Induction Sealer and Caps</a>	340.00	4	1,360.00	2,040.00
<a href="#">Clear Straight-sided Glass jars with metal cap 8oz</a>	40.80	2	81.60	122.40
<a href="#">Clear Straight-sided Glass jars with metal cap 16oz</a>	54.60	2	109.20	163.80
<a href="#">Clear Straight-sided Glass jars with metal cap 32oz</a>	64.80	2	129.60	194.40
<a href="#">Amber Straight-Sided Glass Jars with Metal Cap 8oz</a>	40.80	2	81.60	122.40
<a href="#">Case Standard Glass Canning Jars 8oz</a>	14.40	2	28.80	43.20
<a href="#">Case Standard Glass Canning Jars 16oz</a>	18.00	2	36.00	54.00
<a href="#">Case Standard Glass Canning Jars 24oz</a>	20.40	2	40.80	61.20
<a href="#">Case Standard Glass Canning Jars 32oz</a>	22.80	2	45.60	68.40
<a href="#">Case Replacement Standard Canning Jar Lids</a>	81.00	2	162.00	243.00
<a href="#">Case Glass Spice Jars 2oz</a>	48.00	2	96.00	144.00
<a href="#">Case Glass Spice Jars 4oz</a>	27.60	2	55.20	82.80
<a href="#">Case Glass Spice Jars 8oz</a>	15.60	2	31.20	46.80
<a href="#">Case Glass Spice Jars 16oz</a>	18.60	2	37.20	55.80
<a href="#">Case Cubitainers</a>	60.00	2	120.00	180.00

<a href="#">Case of Square Utility Jugs</a>	34.20	2	68.40	102.60
<a href="#">Jug Pump</a>	10.50	2	21.00	31.50
<a href="#">Chemical Resistant Spray Bottles</a>	25.50	2	51.00	76.50
<a href="#">Case Replacement nozzles</a>	17.25	2	34.50	51.75
<a href="#">Bundle Egg Cartons</a>	90.00	2	180.00	270.00
<a href="#">Egg Filler Flat Case</a>	42.00	2	84.00	126.00
<a href="#">Williams Sonoma Prep Tools 15 Piece Gadget and Utensils Set</a>	279.95	2	559.90	839.85
<a href="#">Berry Basket</a>	75.00	2	150.00	225.00
Fish Processing Items				
<a href="#">Mannlake Scalding with Temp Control</a>	525.00	2	1,050.00	1,575.00
<a href="#">Fish Fillet Cutter</a>	2,000.00	2	4,000.00	6,000.00
<a href="#">Fish Cleaning, Scaling, Gutting</a>	1,600.00	2	3,200.00	4,800.00
<a href="#">Mainstreet Stainless Steel Floor Fryer</a>	749.00	2	1,498.00	2,247.00
<a href="#">Stainless Steel Triple Basins</a>	306.15	2	612.30	918.45
<a href="#">Avantco A-49R-HC 54" Reach in Refrigerator</a>	1,949.00	2	3,898.00	5,847.00
Fishing Equipment				
<a href="#">Powerpro Braided Fishing Line</a>	16.99	20	339.80	509.70
<a href="#">Promar Hook Resist Fishing nets</a>	21.99	20	439.80	659.70
<a href="#">Gamakatsu Baitholder Fishing Hook</a>	11.49	100	1,149.00	1,723.50
3 Gallon <a href="#">Tamco Fabricated HDPE Rectangular Tank with cover</a>	226.99	5	1,134.95	1,702.43
Misc Supplies for Village Tier I cross commodity	2,000.00	2	4,000.00	6,000.00
<b>Total Cost</b>				<b>320,060.76</b>

### 3. Administration, Training, and R&D: \$15,000 per Tier II FIF

This budget category ensures that each Tier II Food Innovation Facility (FIF) in Kosrae operates not only as a processing unit but also as an administrative and training hub. It supports critical back-office functions, technical coordination, food safety compliance, and staff development. The budget accounts for equipment shipping and installation in a remote island context where ICT and scientific tools are costly to import and maintain.

### **A. Administrative Office – \$5,500**

Each facility includes a 300 square foot office to support day-to-day management, documentation, and coordination activities.

#### **Key Features:**

- Desks, chairs, and cabinets sourced locally when possible (e.g., coconut timber), supplemented with imported ergonomic seating and secure filing systems
- One laptop and one desktop computer with surge protectors and extended warranties
- Wireless printer/scanner and router for document handling and communication
- Dry-erase boards, planning boards, storage shelves, and secured records cabinets
- One split-unit air conditioner and fans for cooling and humidity control

**Cost drivers include** the need for furniture and electronics that can withstand tropical humidity, backup components to reduce downtime, and air-freight of sensitive devices.

### **B. Research and Development Laboratory – \$7,500**

A 150–200 square foot R&D lab is included in each facility to support quality assurance and small-batch product development.

#### **Key Equipment:**

- Stainless steel benches and sealed sinks with corrosion-resistant fittings
- Basic lab equipment including microscope, pH meters, incubators, moisture analyzers
- Seal testers, microbial media, and refrigerated storage for samples and reagents
- Personal protective equipment (PPE), fire extinguishers, and eyewash station

These items are expected to be imported with necessary calibration and user training provided. Lab support is vital for innovation and hygiene compliance.

### **C. Training Room – \$3,250**

Each FIF includes a 12-person training space for workshops on food safety, entrepreneurship, and equipment use.

#### **Features:**

- Digital projector with screen and multimedia inputs
- Flexible seating arrangements: mix of modular chairs and traditional pandanus mats
- HACCP posters, flip charts, instructor workstation, and display boards
- Ceiling fans, screened windows, and provisions for an adjacent open-air annex for overflow training or staging

**Shipping costs** reflect specialized AV and educational tools. The outdoor annex area with cement flooring and thatched roof will be incorporated into the core building design.

### **D. Office Supplies & IT Infrastructure – \$6,250**

Supports communication, documentation, and cloud-based management of food safety protocols.

#### **Inclusions:**

- Rugged laptop, desktop computer, color printer, wireless routers
- Connectivity infrastructure such as mobile hotspot or satellite uplink
- Subscriptions to secure cloud platforms for inventory, traceability, and reporting (e.g., Google Workspace, FoodReady)
- Office supplies including binders, laminators, UPS backup, and IT support

The budget includes redundancy measures to address connectivity gaps and reduce operational disruptions in Kosrae's more isolated areas.

**Total for Section 3: \$75,000**

<b>Component</b>	<b>Amount (USD) for each Tier II FIF</b>	<b>Amount (USD) for two Tier II FIFs</b>
A. Administrative Office	\$5,500	\$11,000
B. Training Room	\$3,250	\$6,500
C. Office Supplies and IT Infrastructure	\$6,250	\$12,500
<b>Total</b>	<b>\$15,000</b>	<b>\$30,000</b>

**4. Operational Readiness and Sustainability: \$46,250 per Tier II FIF**

This budget line ensures that each Kosrae Tier II Food Innovation Facility (FIF) is not only constructed and outfitted with equipment, but also fully functional, staffed, and ready to begin operations from day one. It addresses the costs of procuring initial inventory, training personnel, covering startup utilities, and maintaining basic operations in the early phase, especially while the facility transitions to self-sustaining revenue generation.

**A. Initial Inventory (Raw Materials) – \$12,500**

Each FIF requires sufficient start-up inventory to conduct processing trials, staff training, product demonstrations, and early-stage market testing.

**Included Inputs:**

- Bulk local crops such as taro, banana, breadfruit, coconut, and sweet potato for processing into flour, chips, milk, oil, and other products
- Purchased poultry and eggs for the facility focused on coconut and animal-based processing
- Imported or locally sourced packaging materials including vacuum bags, PET bottles, laminated pouches, labels, and shipping cartons
- Supplemental ingredients like oil, salt, spices, and sugar for recipe trials and training modules

The budget reflects freight costs for packaging and food-grade supplies not available locally and allows flexibility to source perishables from nearby islands if needed.

**B. Training and Staffing – \$23,750**

Initial operating success depends on building a team trained in hygienic processing, traceability, and equipment operation. These funds support hiring and upskilling staff and engaging qualified trainers.

**Covered Costs:**

- Staff salaries for 6 to 8 months for roles such as operations lead, sanitation and quality staff, maintenance support, and training assistant
- HACCP and SOP training delivered via remote instruction or short-term regional visits

- Technical training from equipment vendors on proper operation of cold storage units, sealers, fryers, or coconut processing tools
- Custom training materials in English and adapted to Kosrae’s languages and cultural context
- Travel support for regional or national trainers, and remote Zoom-based modules with hybrid in-person days

This budget ensures that once operational, each facility can maintain food safety standards, operate machinery correctly, and build local institutional capacity for future scaling.

**C. Utilities and Operating Costs (Year 1) – \$10,000**

While some energy savings are achieved via solar design and CoolBot refrigeration, significant utility and operating costs persist during the first year of launch.

**Inclusions:**

- Generator fuel, solar integration maintenance, and electrical usage
- Water for sanitation and cleaning, plus wastewater management and treatment
- Cleaning agents, PPE, sanitizers, gloves, and weekly deep cleaning
- Pest control, minor repairs, and routine upkeep for facility hygiene
- Connectivity costs including mobile hotspot plans, domain hosting, and phone service for outreach or coordination

These funds ensure the FIF can maintain safe, consistent operations while it builds clientele, contracts, or government-supported processing programs.

<b>Component</b>	<b>Amount (USD) for each Tier II FIF</b>	<b>Amount (USD) for all Tier II FIFs</b>
A. Initial Inventory (Raw Materials)	\$12,500	\$25,000
B. Training and Staffing	\$23,750	\$47,500
C. Utilities and Operating Costs	\$10,000	\$20,000
<b>Total</b>	<b>\$46,250</b>	<b>\$92,500</b>

**D. Kosrae State Tier I Food Innovation Facilities (FIFs)**

**FIFs Tier I Total Cost: \$22,689.22 (4 centers)**

Kosrae State proposes the establishment of 4 **Tier I Food Innovation Facilities (FIFs)**, distributed across the entire state. Each municipality in Kosrae will have a Tier-I facility to ensure local accessibility and engagement at the community level. These micro-scale facilities are intended to serve as decentralized nodes for pre-processing, aggregation, farmer training, and basic value addition of local crops and marine resources.

Each Tier I center will serve multiple purposes including:

- Providing space for sorting, washing, and drying produce
- Supporting basic equipment for coconut grating, taro slicing, and fruit dehydration using solar dryers
- Hosting community trainings on food hygiene, nutrition, and agro-processing
- Serving as staging areas for municipal-level aggregation and cold chain integration with higher-tier facilities

**The total estimated cost per Tier I facility is \$5,672.31**, which includes construction-ready kits, local materials, starter tools, water access solutions, and transport costs to each island or interior site. In more remote locations such as Nukuoro and Kapingamarangi, additional logistics costs have been averaged into the per-unit figure to reflect barge chartering, weather contingencies, and offloading needs. The facilities will be co-designed with municipal stakeholders to ensure cultural appropriateness, community ownership, and alignment with local land availability.

## 1. Construction and Infrastructure: \$4,000

This cost covers the basic construction or renovation of spaces to establish Tier I collection and pre-processing facilities across Kosrae. A total of 4 facilities will be developed: one in each municipality. Each Tier I facility will feature a simple, functional structure consisting of a raised cement floor, open-air walls for ventilation, and a durable, weather-resistant roof. Locally available materials such as hardwood posts, bamboo framing, woven palm panels, and corrugated tin or thatch roofing will be prioritized to reduce costs and foster community participation. The spaces are intended to support basic agricultural activities such as sorting, peeling, grating, sun-drying, and temporary storage.

At an average cost of \$1,000 per facility within Kosrae, the budget reflects minimal yet essential investments in infrastructure, including:

- Site preparation and slab foundation
- Roof construction using locally sourced or donated labor
- Basic water drainage and sanitation considerations
- Adaptations for island-specific site conditions (e.g., elevation in flood-prone areas)

This decentralized infrastructure model is critical for supporting early-stage food processing, household engagement, and farm-to-market linkages across both the main island and outer island communities of Kosrae.

## 2. Equipment & Supplies for Tier I Village Food Innovation Facilities in Kosrae: \$18,689.22.

Equipment	Price per Unit	Number of Units	Total without Cost Conversion	Total with 1.5x Cost Conversion
General Processing Item				

<a href="#">Manual Veg Slicer</a>	90.00	4	360.00	540.00
<a href="#">Stainless Steel Commercial Work Table</a>	674.18	4	2,696.72	4,045.08
<a href="#">Manual Taro</a>	50.00	4	200.00	300.00
<a href="#">Hand Grinder</a>	20.00	4	80.00	120.00
<a href="#">Knives</a>	30.00	12	360.00	540.00
<a href="#">Pedal Generator Stationary</a>	255.00	4	1,020.00	1,530.00
<a href="#">Coconut Mesh Bag</a>	35.00	4	140.00	210.00
<a href="#">Portable Solar generator</a>	200.00	4	800.00	1,200.00
<a href="#">Compostable Gallon Resealable Bag</a>	16.00	4	64.00	96.00
Coconut Processing Items				
<a href="#">Flesh tool</a>	3.00	12	36.00	54.00
<a href="#">Machete 20 pieces</a>	559.80	4	2,239.20	3,358.80
<a href="#">Coconut Flour Machine</a>	800.00	1	800.00	1,200.00
<a href="#">Liberty Stainless Steel Taps</a>	84.00	8	672.00	1,008.00
<a href="#">Sugaring Bucket</a>	51.94	8	415.52	623.28
<a href="#">28' Fiberglass Extension Ladder</a>	460.00	2	920.00	1,380.00
<a href="#">Winco 12 in Sieve Baking Sheet</a>	24.01	4	96.04	144.06
<a href="#">Manual Coconut Milk press</a>	90.00	4	360.00	540.00
Misc Supplies for Village Tier I cross commodity	300.00	4	1,200.00	1,800.00
<b>Total Cost</b>				<b>18,689.22</b>

## Grand Total: \$10,508,938 USD

The total estimated investment for the first Tier III Food Innovation Center (FIC) plus all the equipment and supplies for Tier I and Tier II Food Innovation Facilities (FIF) in the Federated States of Micronesia shown above. This figure reflects a comprehensive, procurement-ready cost that includes design, construction, equipping, staffing, operational launch, and contingency allowances. It is based on a realistic per-square-foot estimate of \$750 for a 6,000 sq ft FDA-aligned food-grade facility, factoring in FSM's geographic, logistical, and infrastructural constraints. The total estimated cost of this facility is \$5,344,827.95.

The total estimated investment for the second Tier III Food Innovation Center (FIC) in Kosrae, focused on manufacturing animal feed from locally sourced byproducts, is \$2,448,860.18

. This cost reflects a fully developed, procurement-ready budget that incorporates design, construction, equipment procurement, staffing, start-up operations, utilities, and contingency provisions. The construction component is based on a \$500 per square foot estimate for a 3,000 square foot feed-grade facility, aligned with Codex, HACCP, and USDA/APHIS animal feed safety standards. All estimates take into account the logistical, environmental, and infrastructural realities of the Federated States of Micronesia and are designed to ensure reliable, sustainable, and compliant production of locally formulated animal feed. This facility complements the broader food systems strategy by valorizing bycatch and agro-waste, reducing feed imports, and enhancing food and livestock security across the islands.

With two regional Tier II Food Innovation Facilities (FIFs) proposed for Kosrae—each designed at 2,500 square feet and estimated at a construction cost of \$450 per square foot—the base construction cost per facility is \$1,125,000. Together, these two regional FIFs represent a total construction cost of \$2,250,000. However, the full investment extends beyond construction alone. Including equipment procurement, installation, facility administration, training infrastructure, utility systems, and a contingency allocation for freight, delays, and cost escalation, the **total estimated investment for all Tier II facilities is \$2,692,560.76**. These mid-scale processing hubs will support product lines such as coconut milk, oil, sugar, and dried produce, as well as taro, banana, breadfruit, and other indigenous crops—creating new pathways for value addition, enterprise incubation, and farmer-market linkages across Kosrae.

The total estimated investment for the 4 Tier I Food Innovation Facilities (FIFs) across Kosrae State is \$22,689.22. This figure reflects a decentralized strategy to establish low-cost, community-embedded processing units in all four municipalities, budgeted at \$5,672.31, designed to support pre-processing, aggregation, and basic value addition of local agricultural and marine products. They also serve as vital entry points for farmer training, food safety awareness, and rural economic empowerment, ensuring inclusive food system engagement from the village level up.

All equipment and supplies included above. Grand total for two Tier III FICs, two regional Tier II FIFs, and 4 Tier I FIFs is **\$10,508,938**.

### **Strategic Justification:**

This investment creates a **fully compliant and climate-resilient processing facility** designed for value addition, hygiene, and long-term resilience. It also builds **local capacity** by pairing modern technology with Pacific Island processing traditions. The FIC is:

- **Scalable** – It serves as a national model for replication in other states and Pacific nations.
- **Community-rooted** – It is integrated with local farming, fishing, and small enterprise development.
- **Regulatory-ready** – Designed to meet FDA, HACCP, and Codex food facility standards.
- **Climate-smart** – Incorporates solar readiness, passive ventilation, and efficient refrigeration to reduce carbon footprint and operating costs.

This \$10.5 million investment is not just a single facility—but a network of strategically designed food processing and innovation centers across Kosrae. These include Tier I, Tier II, and Tier III facilities that serve as aggregation hubs, processing centers, training sites, and

manufacturing platforms to strengthen Kosrae State's food system. The initiative is central to advancing FSM's goals for food security, rural development, economic diversification, and import substitution through value addition and local enterprise development.

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