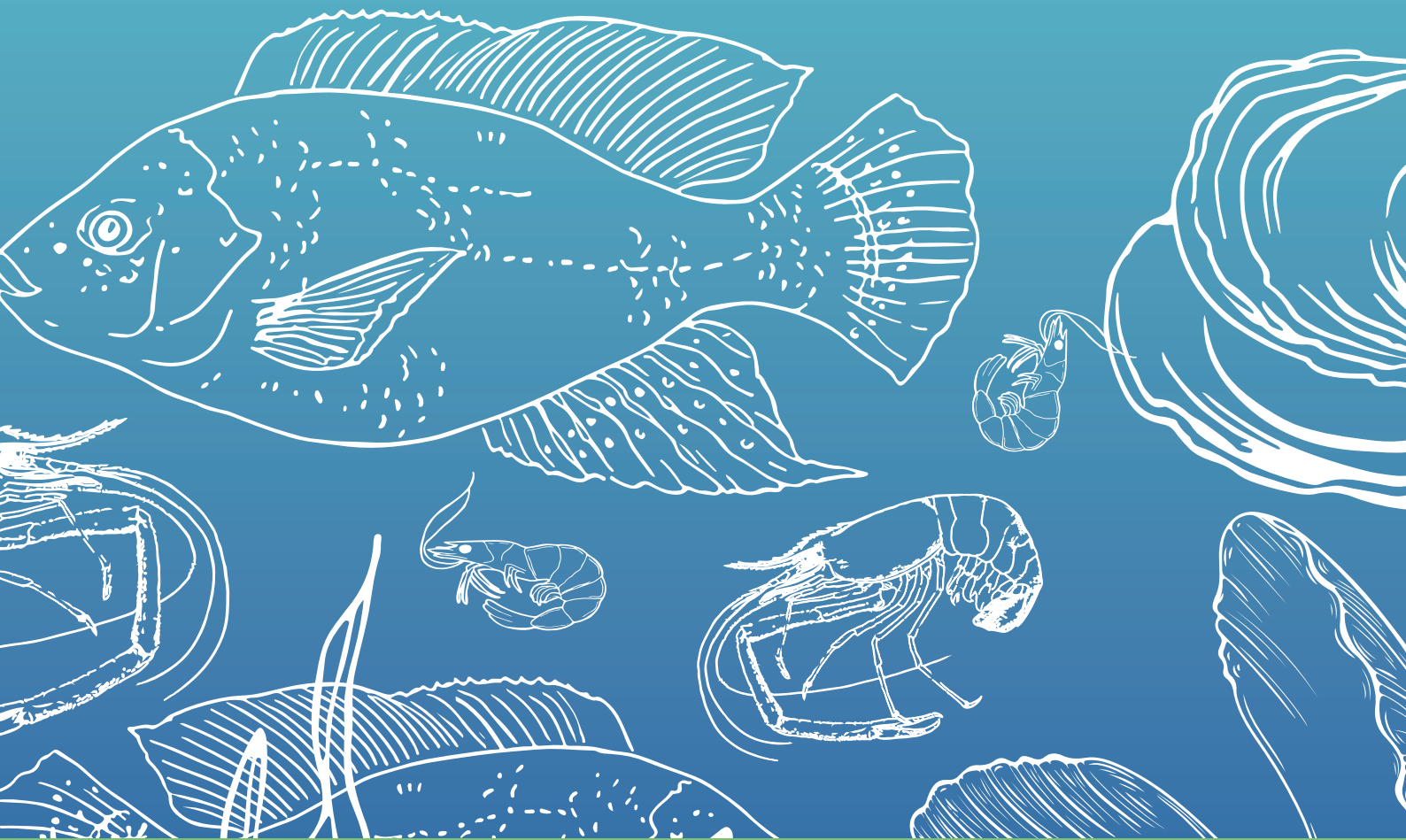




Ministry of Fisheries and Forestry
Aquaculture Division



FIJI AQUACULTURE DEVELOPMENT PLAN

2024-2028



Fiji Aquaculture Development Plan 2024-2028

This document was compiled by Esaroma Ledua (FAO), Prashneel Chandra (MOFF) and Babitu Rarawa (MOFF).

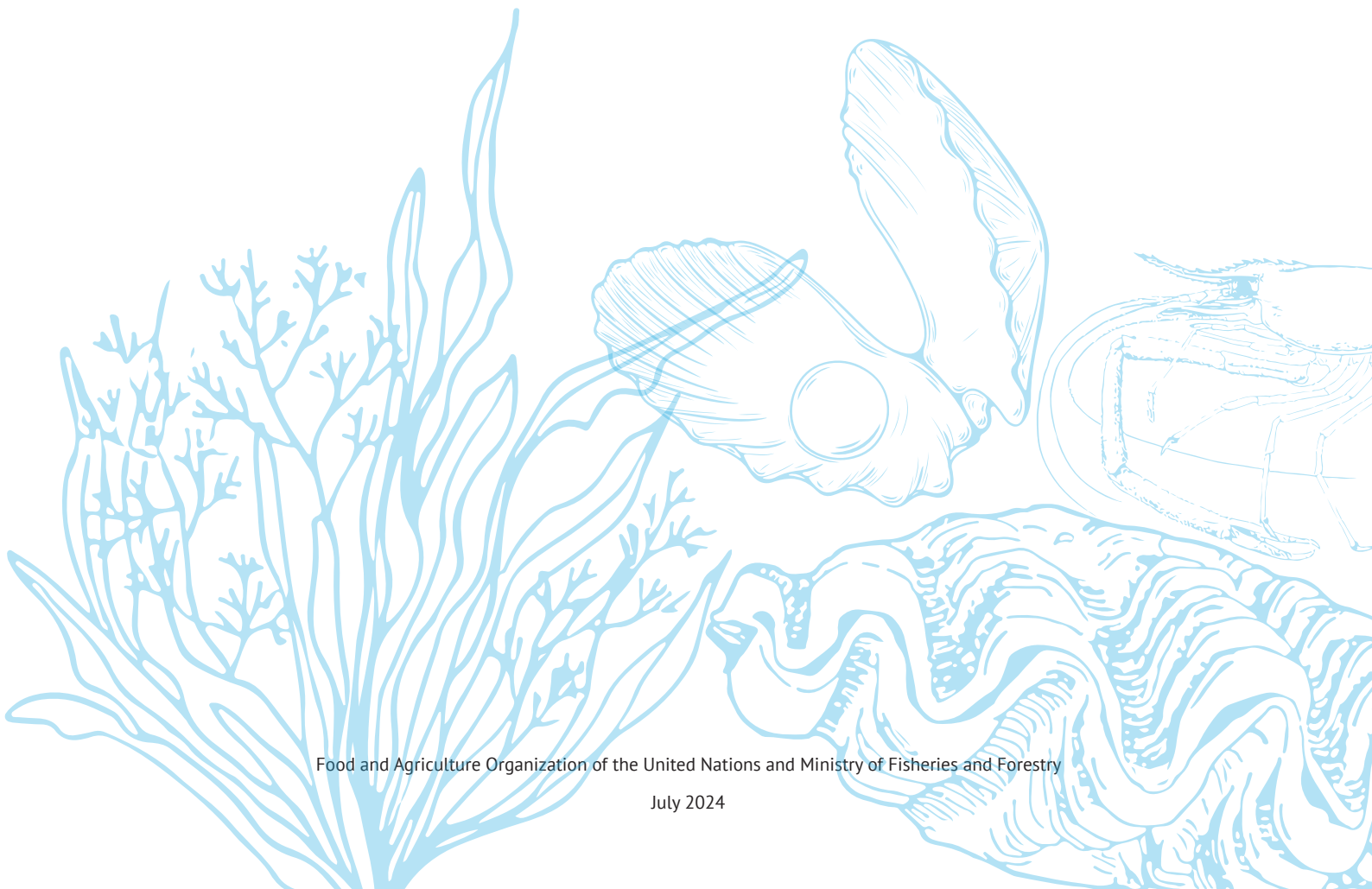
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Fiji Ministry of Fisheries and Forestry (2024) Fiji Aquaculture Development Plan 2024–2028. MOFF, Fiji

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FIJI AQUACULTURE DEVELOPMENT PLAN

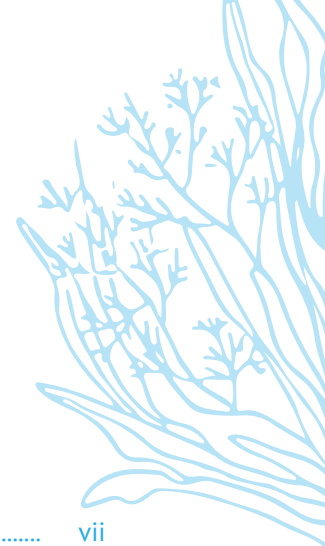
2024-2028



Food and Agriculture Organization of the United Nations and Ministry of Fisheries and Forestry

July 2024

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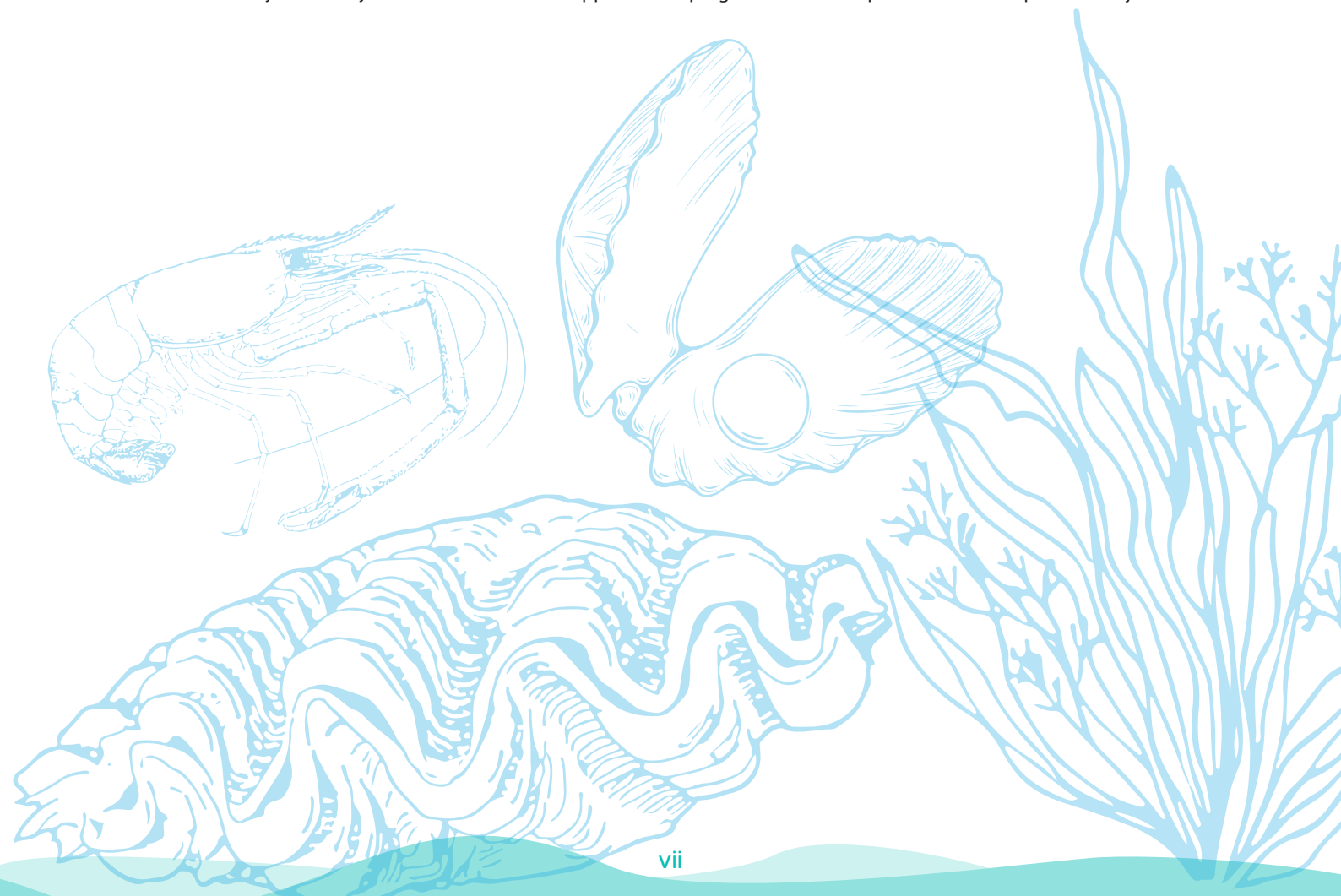
Acknowledgements

This document was compiled by Esaroma Ledua (FAO), Prashneel Chandra (MOFF) and Babitu Rarawa (MOFF).

We would like to extend our heartfelt gratitude to several individuals and organizations who have provided invaluable support over the past eight months during the design and preparation of Fiji's Aquaculture Development Plan 2024-2028. First and foremost, we would like to thank Dr. Anne-Maree Schwarz, Dr. Jeffrey Kinch, Ms. Zafiar Naaz, and Ms. Mere Vere from the Food and Agriculture Organization (FAO) for their unwavering support and guidance throughout this period. Their expertise and dedication have been instrumental in driving our project forward. We also wish to acknowledge Dr. Chinthaka Hewavitharane, the SPC Aquaculture Advisor, for his insightful advice and continuous support and the late Dr Tim Pickering for his encouragement and support during the planning of this activity.

Special thanks go to Acting Director of Fisheries Mr. Tekata Toaisi, as well as all staff members of the Ministry of Fisheries for their cooperation and assistance. Lastly, we would like to recognize the private sector representatives, Ministry of Environment, Biosecurity Authority of Fiji and iTaukei Affairs, who have participated and provided valuable input throughout this process.

Thank you all for your commitment and support in shaping the future of aquaculture development in Fiji.



Abbreviations and Acronyms

ACIAR	Australian Centre for International Agricultural Research
ADP	Aquaculture Development Plan
BAF	Biosecurity of Fiji
CDF	Commodity Development Framework
CEO	Chief Executive Officer
CITES	Convention on International Trade in Endangered Species of Wild Fauna and Flora
CPO	Central Planning Office-Fiji
EIA	Environment Impact Assessment
EU	European Union
FAO	Food and Agriculture Organization
FMC	Food Machinery Corporation Biopolymer
FSM	Federated States of Micronesia
HACCP	Hazard Analysis Critical Control Points
IFF	International Fragrance and Flavors
IMTA	Integrated Multi-Trophic Aquaculture
iTLTB	iTaukei Land Trust Board
JICA	Japan International Corporation Agency
KMI	Korea Maritime Institute
KPFL	King Prawn Fiji Limited
MAF	Ministry of Agriculture and Fisheries
MOFF	Ministry of Fisheries and Forestry
MPAs	Marine Protected Areas
NGOs	Non-Governmental Organizations
NRS	Naduruloulou Research Station
NZ	New Zealand
OFC	Oyster Farmers' Cooperative
OFMD	Offshore Fisheries Management Division
OHS	Occupational Health Safety
PPP	Public Private Partnership
PLs	Post-Larvae
PNA	Parties to the Nauru Agreement
PTWC	Pacific Tsunami Warning Centre
RAS	Recirculating Aquaculture Systems
ROFC	Rock Oyster Farmers' Cooperative
SEAFDEC	Southeast Asian Fisheries Development Centre
SDG	Sustainable Development Goals
SPC	Pacific Community (formerly Secretariat of the Pacific Community)
UNDP	United Nations Development Programme
USP	University of the South Pacific



Foreword

As the Minister for Fisheries and Forestry, I am pleased to present the Fiji Aquaculture Development Plan 2024-2028. I wish to acknowledge the United Nations Food and Agriculture Organization (UNFAO) for their ongoing support to fisheries and aquaculture development in Fiji, as well as providing the financial and technical support through CANADAPT Project (Strengthening Small-scale Fisheries in the Pacific Islands), for the development of this plan. This plan serves as a roadmap with clear objectives and strategies to guide Fiji towards a sustainable aquaculture sector.

Aquaculture stands out among fisheries activities as a proven method for climate change adaptation, ensuring food security, and enhancing community livelihoods, according to the International Food Policy Research Institute. This significance arises from our heavy reliance on natural resources, like inshore fisheries around coral reefs, coupled with limited resilience to climate change impacts. While still in its early stages in Fiji, aquaculture holds great promise for bolstering the economies of coastal and inland communities nationwide. As wild-caught fisheries production declines, aquaculture presents an opportunity to supplement local fish supply, catering to Fiji's population of approximately 0.94 million and nearly 0.93 million tourists visiting Fiji annually. Moreover, it contributes to exports and can substitute imports of high-end seafood, such as shrimp and oysters, sought after by tourists. With tourist arrivals projected to increase by 5.8% annually until 2028, the demand for aquaculture products is set to rise simultaneously.

Introduced to Fiji in 1937 for various purposes, including biological weed control and protein source for animal feed, aquaculture has evolved into a key driver of fishery

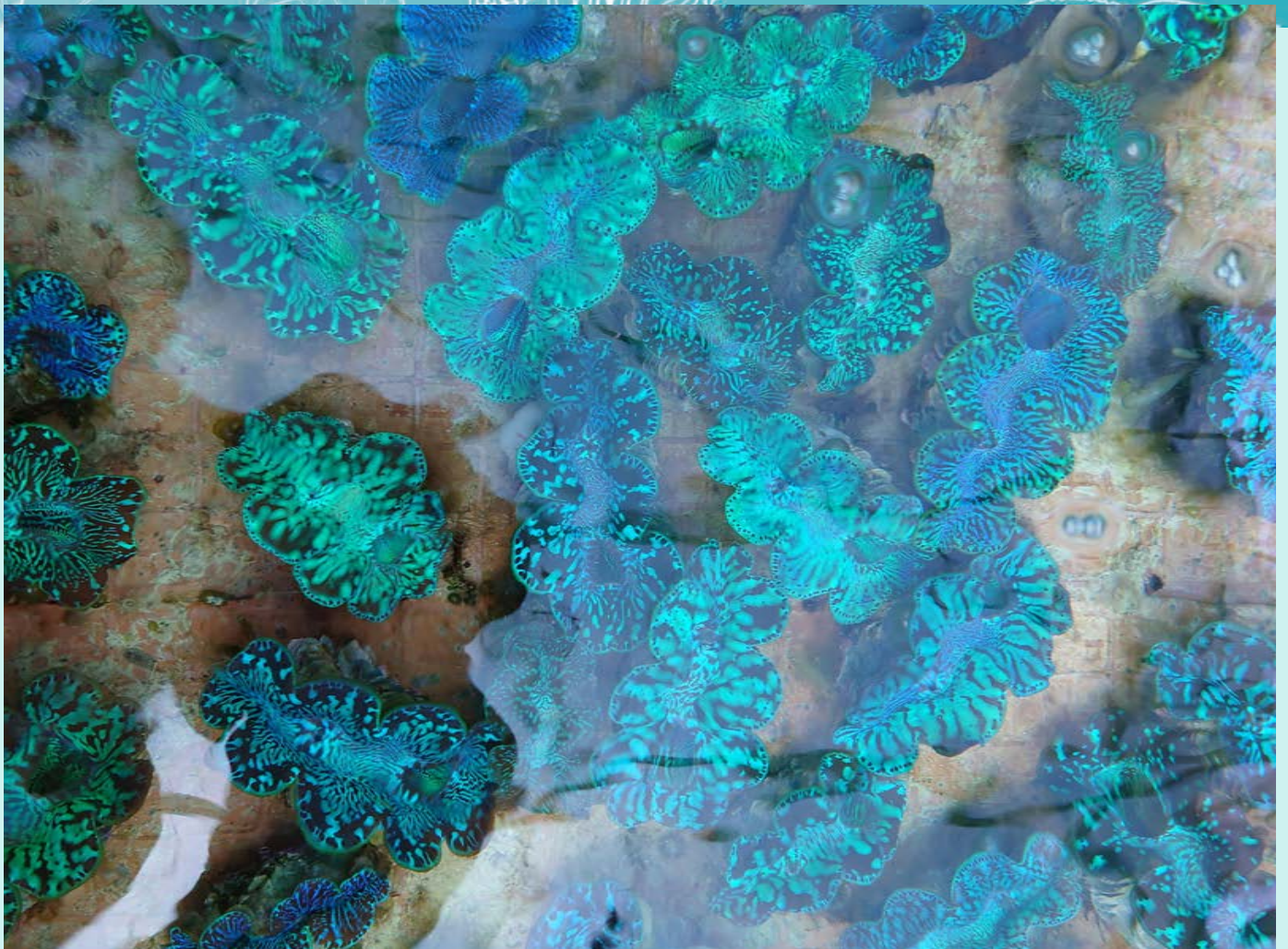
exports. Already, Fiji's aquaculture industry exports pearls, aquarium live rocks, and seaweed products. Over the past two decades, domestic aquaculture has experienced remarkable growth, with the establishment of public and private hatcheries producing high-quality, sustainable, and safe products. However, the absence of a comprehensive Aquaculture Development Plan hampers Fiji from unlocking the industry's full potential, identifying priority areas, and implementing achievable actions.

This Aquaculture Development Plan fulfills an election commitment made by the Coalition Government in 2023, providing a framework for policies supporting a competitive and sustainable fisheries sector. Key priorities include reducing regulatory burdens, investing in research and development, improving market access, strengthening biosecurity, enhancing public perception, promoting gender equity, advancing environmental performance, attracting investment, and supporting education and training. Through innovation and collaboration, the industry can enhance production techniques, explore new products and markets, and continue expanding, with government support paving the way for a brighter future for Fijian aquaculture.

Developed through eight months of consultative processes with sector stakeholders, this plan incorporates their input and serves as a guide for increasing Fiji's aquaculture production and value. It emphasizes Public-Private Partnerships (PPP) and coordinated development of selected aquaculture initiatives, aiming to overcome constraints and achieve a vision for the sector over the next five years. This plan acts as a roadmap for stakeholders, providing guidance on interventions and investments to pursue in aquaculture, with the ultimate goal of expanding and sustaining the sector. With concerted efforts, we aim to reduce seafood imports by \$35 million, increase aquaculture exports by \$80 million, create over 3,000 rural employment opportunities, and elevate the industry's value from \$11.1 million in 2023 to over \$132 million in 2028, surpassing petroleum oil re-exports and frozen tuna.

I also wish to thank my dedicated Ministry staff, stakeholders, partners, and aquaculture enthusiasts for their commitment to lifting the sector to new heights. I am confident that this plan will drive development successfully and sustainably over the next four years and beyond. I invite Cabinet and all interested parties to join me in supporting the implementation of this plan for the benefit of our people in rural areas and a prosperous aquaculture sector in Fiji.

Alitia Vakatai Bavou Cirikiyasawa Bainivalu [Mrs]
Honourable Minister for Fisheries & Forestry



Executive Summary

The Fiji Aquaculture Development Plan (2024-2028) proposes structural changes and delineates fisheries policies and guidelines in the Ministry of Fisheries and Forestry (MOFF) for the development of aquaculture. It serves as a platform for crafting policies to support a more competitive and sustainable fisheries sector, detailing programme evolution and providing a comprehensive framework for achieving MOFF goals.

Priorities in this plan include, reducing regulatory burdens, conducting research and extension activities, improving market access, strengthening biosecurity, enhancing public perception, improving environmental performance, attracting investment, promoting gender equity, and identifying education and training needs.

Before delving into the plan, the history and current status of aquaculture in Fiji is reviewed providing insights into past challenges and patterns which is crucial for understanding and effectively addressing current and future challenges. Aquaculture started in Fiji in 1937, when common carp was introduced to Fiji



from New Zealand and kept in ponds at Koronivia. In 1970, the UNDP assessed the potential of aquaculture in Fiji and stated that development was limited by the lack of expertise, experience, and suitable technology. FAO funded training and the cultivation of native shrimp species *Penaeus monodon* from 1973 to 1978 at Raviravi. When FAO funding ceased, shrimp farming continued through a joint venture between Fiji Government and France Aquaculture. Grow-out results exceeded targets and the farm expanded from 7.0 ha to 20.0 hectares, but hatchery production was below target.

Technical trainings offered over the years, particularly mentoring offered by JICA experts, improved local knowledge and expertise. This was recognized and utilized by the Rabuka Government from 1996-1999, under the Commodity Development Framework. As a result, pearl farming was established in Savusavu, 400 metric tonnes of tilapia were produced in 1998, 282 seaweed farms were established around Fiji and 879 metric tonnes of dried seaweed were exported to FMC Biopolymer, Denmark in 1998. However, the change of government in May 1999 altered the focus of the programme, slowing aquaculture development in Fiji.

Current aquaculture production is valued at around F¹\$11.11 million, with a return on investment (ROI) of approximately 80.7%. The Ministry of Fisheries receives an annual budget of approximately \$13.5 million, with only about \$1.03 million allocated to aquaculture.

Aquaculture is helping creating employment opportunities and stimulating economic development in coastal and rural communities in Fiji. Overall, aquaculture plays a critical role in addressing the complex challenges of overfishing and food security by providing a sustainable and resilient source of nutritious food for current and future generations.

Fiji imported various seafood items, including shrimp, oysters, mullet, mackerel, shrimp post-larvae, fish fillets, sardines and squid, totaling over \$95 million in 2020 and around \$53.8million in 2022. These imports could be replaced by aquaculture. With tourist arrivals in Fiji projected to increase by 6.18% annually, local seafood demand is expected to continue rising.

The objectives of this plan include:



Increasing the current value of aquaculture from \$11.1million per annum to over \$132million by 2028.



Reducing the value of imported seafood by around 70% by 2028.



Increasing export earnings of cultured marine products from around \$5million to over \$80million by 2028.



Promoting Fiji aquaculture brand and our environmentally sustainable practices.

1 Unless otherwise mentioned, \$ refers to Fiji dollars.



Fiji aims to export 400 metric tonnes of shrimp, 40,000 metric tonnes of seaweed, 3.12 million dozen of edible (black-lip) oysters, and 70,000 round pearls, valued at over \$80million annually. Globally, China imported 1.1million metric tonnes of shrimp in 2023, valued at around US\$5.1billion. Japan imported shrimps worth US\$2.2billion in 2022, constituting white legged shrimp at US\$5.1-US\$10.6 per kg and black-tiger prawn from US\$10.8-US\$15.8 per kg, from Vietnam in 2022. European Countries imported around 300,000 metric tonnes in 2023, at approximately €8.5 per kg (\$20.82 per kg). USA imported around 600,000 metric tonnes of shrimp at a price of around US\$6.6billion in 2022 (Van der Pijl, 2023).

In terms of seaweed, international company International Fragrance and Flavors (IFF) and two local companies are committed to export over 40,000 metric tonnes per year, valued at around \$60million. Apart from IFF, there are 10 other international markets around the world buying Eucheuma seaweed.

Edible (black-lip) oysters will be exported through a strategic partnership arrangement with J. Hunter Pearls Limited, exporting around 10,000-20,000 dozens of edible oysters per week to Asian markets. Wholesale price for edible oysters in Hong Kong is between US\$12-33 per kg.

Main competitors in the local markets are companies importing shrimp and fish products from China, India, Thailand, Vietnam, New Zealand and Japan. In terms of export, Philippines and Indonesia will be our competitors for seaweed export. However, the global market for Eucheuma seaweed is experiencing significant growth of around 10%, due to the increasing demand for seaweed-based products (Carrageenan) in various industries.

In addition, our Fiji brand will be our competitive edge, focusing on freshness, high quality products, grown in pristine environment, creating employment in rural communities, in particular, women and youth groups. A strong “Fiji Blue” brand is proposed to help to create a unique identity for our aquaculture products. Blue is often associated with hues of the sky and water, both of which are known to inspire feelings of serenity, openness, clarity and tranquility.



The first step in this plan is the formation of cooperatives for each commodity, not only to provide farmers with better access to much needed services but also to facilitate economic growth, more effective management of public resources, higher quality and timely provision of public services, and the implementation of investment projects without imposing unforeseen extra expenditures on the public sector. Cooperatives will run as corporate entities from the third year onwards, ensuring equal voting rights for members, encouraging member contribution and shared responsibility. Liability for members is limited, and there is no limit on the number of members.

The second step of this plan involves developing model farms for each commodity to showcase the benefits of regenerative aquaculture and inspire local communities to join the transformation. Nine out of sixteen possible species were selected during the stakeholder’s consultation workshops for this plan to be pushed to industry level.



Compliance with local, national and international regulations is important. In particular, laws enforced by the Ministry of Health, the Biosecurity Act (2008), the Environment Management Act (2005) (CITES, EIA & Waste disposal), the Ministry of Fisheries OFMD Import Certificate, iTLTB (lease terms), the Fire Authority (Safety Certificate), the Ministry of Labour (OHS) and the District Officer (rural business license). Meeting these requirements can be onerous and costly but necessary, in relation to minimizing risks.

Risks should be mitigated through proper planning and developing of methods and options to reduce threats. Market fluctuations are a major risk in any business. Model farm business plans include risk analysis of market fluctuations. In addition, identification and assessment of potential risks, such as disease outbreaks, environmental hazards and pandemics, are important to consider. The risk of introducing aquatic diseases and pathogens is high. Although, the Biosecurity Authority of Fiji was established in 2008 for disease control and prevention across the country, it is important that this task is controlled by the Aquaculture Division of the Ministry of Fisheries.

Monitoring and evaluating the performance of both farmers and officers, monthly, quarterly, and annually, as a formal procedure to monitor and measure work and results, based on their responsibilities, is critical. It enhances understanding of performance and its role in assessing effectiveness and efficiency, strengths, weaknesses and improving accountability.

Allocating sufficient level of funding and human resources is crucial for the successful implementation of this plan. The total financial assistance requested for this plan is \$23.5 million, with approximately 24% allocated for additional human resources and administrative needs within the Ministry. Details of the number of new staff needed and associated costs are presented in the plan.



This plan also proposes establishing an Aquaculture Training Centre, in collaboration with SPC, USP, JICA and other partners to provide training for new recruits, re-training and ongoing upskilling of existing staff. It will reduce the gaps created by high turnover rate of technical staff.

To conclude, increasing aquaculture production, relies heavily on Government investment or allocation of resources. Allocating the right level of resources to the right engagement, at the right time, will boost efficiency and cuts the risks of overrun. In addition, commitment to ongoing monitoring, evaluation, and adaptation of this plan, is required. This will ensure an increase in employment opportunities in the rural sector, increase in income of farmers, increase in the current value of aquaculture products from \$11.1million per annum to over \$132million, reduction in the value of imported seafood by around 70%, increase in export earnings of cultured marine products from around \$5million to over \$80million, and successful marketing of Fiji's aquaculture brand and our environmentally sustainable practices.



Vision

To transform commercial aquaculture into a profitable, sustainable and environmentally friendly activity for farmers, producing high quality, world-class brand aquatic products, now and into the future.

Mission

- Protection of our island nation diverse genetic resources of our tropical reefs, rivers and streams
- Sustainable utilisation of aquatic resources
- Production transparency and product disclosure
- Develop and operate farms in a socially and culturally responsible manner
- Management commitment and local law compliance
- Increase contribution to blue economy
- Removal of plastics and investment in renewables
- Production of safe, high quality and sustainable seafood and other aquatic resources through aquaculture in Fiji

Values

- **Excellence** – we will strive for high-quality outcomes and deliver excellent services in all aquaculture operations.
- **Integrity** – we will follow through on our commitments and be open and transparent in our dealings with all stakeholders.
- **Innovation** – we will continuously improve our service and take the initiative to maximize aquaculture use and value.
- **Inclusiveness** – we will be recognized for our collaborative approaches, working in partnership with communities and all stakeholders.
- **Professionalism** – we will be focused, tackle challenges directly, manage our operation efficiently and always seek to develop our people.
- **Accountability** – we recognize the critical nature of our role on behalf of the Fijian people, and we will take responsibility for our decisions and our outcomes while demonstrating leadership in all we do.

Scope

This plan is prioritizing nine out of sixteen species to be developed to industry level. In addition, it is also looking at reducing seafood trade deficit, reducing regulatory burden, pursuing research, development and extension, improving market access, strengthening biosecurity, boosting public perception, improving environmental performance, promoting gender equity, seeking investment and supporting education and training.



1. Introduction

The 2024-2028 Fiji Aquaculture Development Plan (ADP) has been developed by the Ministry of Fisheries and Forestry through consultations led by a national consultant over an eight-month period from late 2023 to 2024. The ADP was developed to address production targets provided by the Permanent Secretary of the MOFF (Appendix 1) through one-on-one consultations and a series of three workshops with more than 60 people contributing (Appendix 2).

WORKSHOP 1

At an initial workshop the following actions were addressed to provide inputs to the first draft of the ADP which was then used for further consultations.

- ▶ Determine scope, vision and mission of the ADP
- ▶ Identify draft objectives of the ADP (specific, measurable, attainable)
- ▶ Participants agree on criteria for prioritising mariculture, brackish and freshwater aquaculture commodities
- ▶ List and prioritise aquaculture commodities according to agreed criteria
- ▶ Identify risks and opportunities for priority target species
- ▶ Determine the contents page for the ADP
- ▶ Develop draft objectives (based on the scope of the ADP)

Recognizing that marine and inland fisheries, together with aquaculture, remains an important source of employment, food and nutrition, the ADP aimed to address the Coalition Governments priority criteria: Establishment of industry by 2028, where industry is defined as economic activity concerned with the processing of raw materials and manufacture of goods in factories; a distinct group of productive or profit-making enterprises; group of productive enterprises or organizations that produce or supply goods, services, or sources of income.

The following aspects of aquaculture were determined to be in scope: industry level, food security, employment creation, research; production; import substitution; employment creation, export; private sector support; reef reseedling & conservation.

The 2024-2028 Fiji Aquaculture Development Plan (ADP) proposes structural changes and delineates Ministry of Fisheries policies and guidelines for the development of aquaculture. It serves as a platform for crafting policies to support a more competitive and sustainable fisheries sector, detailing programme evolution and providing a comprehensive framework for achieving ministry goals. Priorities include reducing regulatory burdens, conducting research and extension activities, improving market access, strengthening biosecurity, enhancing public perception, improving environmental performance, attracting investment, promoting gender equity, and identifying education and training needs. Through innovation and determination, the industry can enhance production techniques for existing products, introduce new products, explore new markets, and expand further. Collaborative efforts outlined in this plan, supported by the government, can pave the way for a brighter future for Fijian aquaculture. Before delving into the plan, examining the history and current status of the three key divisions (Freshwater, Brackish-water, and Mariculture) of aquaculture managed by the Ministry of Fisheries in Fiji is essential. This analysis provides insights into past challenges and enables the identification of unnoticed patterns. Historical information is crucial for understanding and effectively addressing current and future challenges.

1.1 History of Freshwater Aquaculture in Fiji

In 1937, *Cyprinus carpio*, commonly known as common carp, was introduced to Fiji from New Zealand and kept in ponds at Koronivia (Baas Becking, 1950 “as cited in” (Uwate, 1984)). In December 1958, Adams and Titoko introduced grass carp (*Ctenopharyngodon idella*), silver carp (*Hypophthalmichthys molitrix*), and bighead carp (*Hypophthalmichthys nobilis*) from Malaysia (Villalus, 1972 “as cited in” (Uwate, 1984)). Tawes or Java carp, scientifically known as *Puntius gonionotus*, was also introduced into Fiji from Malaysia in 1968, along with common carp. These carps were introduced for biological control of water weeds (hydrilla and water hyacinth) in major rivers around Fiji.

Furthermore, in 1953, a small-scale fish farming project was established at the Sigatoka Agricultural Station (Payne et al., 1954 “as cited in” (Uwate, 1984)). The purpose of this project was to search for local animal protein sources that could be economically used as a protein source for pig feed. In 1954, *Oreochromis mossambicus*, commonly known as *Mozambique tilapia*, was introduced (Villalus, 1972 “as cited in” (Uwate, 1984)). Tilapia was farmed together with the aquatic macrophyte *Ipomoea reptans*. A major flood ravaged the Sigatoka area in 1964, scattering tilapia into the wild and resulting in the ponds being left idle. In 1948, an experimental pond was established at Naduruloulou (Hall, 1949 “as cited in” Uwate, 1984)).

Later, in 1968, construction of four ponds began at the Fisheries Division at Lami (Adams and Titoko, 1970 “as cited in” Uwate 1984). In August 1976, the construction of 12 ponds at Naduruloulou was completed (Fiji MAF, 1978), and the construction of an office, laboratory, and grass carp hatchery started (Murty and Cavuilati, 1977 “as cited in” Uwate 1984). Ten new ponds were constructed at Naduruloulou in 1977, bringing the total pond area to 2.6 hectares (Fiji MAF, 1979 “as cited in” (Uwate, 1984)). The project was considered successful under the Seventh Development Plan (1976-1980). Naduruloulou was envisioned as the hub of all inland fisheries research and development activities (Fiji MAF, 1981b “as cited in” (Uwate, 1984)). Initially, Naduruloulou’s primary function was to culture and spawn grass carp (Fiji MAF, 1978 “as cited in” (Uwate, 1984)).

Apart from spawning grass carp as biological controls for water weeds, freshwater prawn (*Macrobrachium rosenbergii* De Man) was introduced to Fiji from Hawaii in 1979 for farming (Choy, 1984 “as cited in” (Uwate, 1984)). The first permanent hatchery for *M. rosenbergii* was opened at Naduruloulou in October 1983



Figure 1. NRS Fieldman, Ruveni Cagonibure, holding a silver-carp, scientifically known as *Hypophthalmichthys nobilis*. Fisheries Officers in the background are Esaroma Ledua, Sam Mario, Tevita Taumaipau and Ms Tavenisa Vereivalu.

(Lagibalavu, 1983). Nile tilapia (Israeli strain), scientifically known as *Oreochromis niloticus*, was introduced into Fiji from Malaysia for farming in the late 1960s (Richards, 1993). Another batch of *O. niloticus* was introduced into Fiji from Israel in 1979. The most recent introduction of *O. niloticus* (Chitralada strain) was from Thailand in 1988.

In 1970, the United Nations Development Programme (UNDP) assessed the potential of aquaculture in Fiji and stated that development was limited by the lack of expertise, experience, and suitable technology. In 1982, the Japan International Cooperation Agency (JICA) provided grants for technical and financial support and helped develop local expertise in aquaculture, notably in freshwater hatcheries and feed production at the Naduruloulou Research Station (NRS). Although JICA assistance ceased in 1994, the level of local skills in freshwater aquaculture improved substantially, due to effective mentoring and hands-on training. Other international and regional organizations such as FAO and SPC continued to help in developing local skills.

Local knowledge and expertise improved greatly over the years and were recognized and utilized by the Rabuka Government from 1996-1999 to promote and expand aquaculture development activities to industry levels, under the Commodity Development Framework (CDF) programme. Key changes and strategies used under the CDF programme were prioritizing species for development into industry level, setting up pilot hatcheries to support commercial development, establishing pilot farms to attract private sector investment, and creating an environment conducive for private sector investment. Under the CDF programme, priority freshwater species were tilapia (*O. niloticus*) and freshwater prawn (*M. rosenbergii*). Hatcheries for tilapia and freshwater prawn at Naduruloulou Research Station (NRS) were upgraded to meet CDF annual targets (2,000,000 fry of tilapia; 500,000 grass carp fingerlings; and 2,000,000 freshwater prawn post larvae (PL)), and two additional tilapia hatcheries were established at Ba in the West and Dreketi on Vanua Levu to supplement the supply of tilapia fry from NRS. These changes boosted the annual production of tilapia to 425 metric tonnes and freshwater prawn to 23.64 metric tonnes in 1998.

1.2 History of Brackish-water Aquaculture in Fiji

Thirty-six years after the freshwater aquaculture programme's inception, culture experiments on brackish-water species—rabbit fish, mullet, and milkfish—were conducted at Raviravi in 1973 to demonstrate commercial viability (Fiji MAF, 1976) “as cited in” (Uwate, 1984)). Eight ponds, varying in size from 0.6 to 1.7 hectares, operated with tidal actions. Due to a lack of local skills, a fish culture expert from New Caledonia provided assistance, advice, and training to local personnel (Pillay, 1974 “as cited in” (Uwate, 1984)). Fish were grown using waste products as fertilizers. Although only three locals out of eight requested were assigned to the project for training, considerable progress was made, particularly in preliminary fry surveys along mangrove swamps, sandy shores, and creeks (Pillay, 1974 “as cited in” (Uwate, 1984))). Fish culture experiments at Raviravi in 1974 yielded promising results (Fiji MAF, 1978a “as cited in” (Uwate, 1984)). However, an economic study based on Raviravi data indicated that fish culture alone might not be economically feasible, suggesting polyculture with shrimp could be profitable (Popper, 1977 “as cited in” (Uwate, 1984)).

The native shrimp species *Penaeus monodon* was the first shrimp species commercially cultured at Raviravi in 1973 (Secretariat of the Pacific Community, 2011). Post larvae (PL) of *P. monodon* were imported from Tahiti and New Caledonia in 1973 to test commercial farming feasibility in Fiji's Ba Province. FAO funded this project from 1973 to 1978. When FAO funding ceased in 1978, government trials continued until commercialization through a joint venture between Fiji Development Bank and France Aquaculture in June 1981 (MAF, 1982 “as cited in” (Uwate, 1984) (Vereivalu, 1989)). The joint venture aimed to investigate the economic viability, develop the prawn farm to full commercial production level, and explore local and overseas markets.

The first phase (1981-1983) aimed to produce 1.0 tonne of shrimp per hectare per cycle and 7.2 million PL from the local hatchery. Challenges included poor PL quality, low pH in ponds, leaking ponds, predation, poaching and mold growth on feed pellets. Despite challenges, grow-out production exceeded targets, but the local hatchery failed to meet PL targets due to various factors prompting the introduction of *Litopenaeus stylirostris* and *Penaeus indicus* broodstock in 1984 as a remedy (Vereivalu, 1989).

Due to positive grow-out results in the first phase, the second phase (1984-1986) expanded the farm from 7.0 ha to 20.0 hectares with a target of producing 50 metric tonnes annually, 40% for export (Fiji CPO, 1980 “as cited in” (Uwate, 1984)). Grow-out production exceeded targets. However, the local hatchery continued to underperform. Ownership transferred to Prawns Fiji Ltd. in 1985, then to an Australian company in 1990. In 1998, the Department of Fisheries established the Galoa hatchery under the CDF programme to supply *P. monodon* PLs to local and regional farms. However, PL production remained inadequate, hindering commercial farming. In 2017, King Prawn (Fiji) Limited, established the first successful shrimp hatchery in Fiji.

Milkfish (*Chanos chanos*) farming and micro-algae bank initiatives were also part of the CDF Programme but ceased operations around 2017 and in 2009, respectively.



Figure 2. King Prawn (Fiji) Ltd farm at Lomawai, Nadroga.

1.3 History of Mariculture in Fiji

Kappaphycus alvarezii or *Eucheuma cottonii* seaweed farming was introduced to Fiji in 1976 with a pilot farm at Telau Island near Suva (Prakash, 1990). Unfortunately, a cyclone demolished this farm in 1980. *E. cottonii* was reintroduced in 1984 by the Fisheries Division in collaboration with Coastal Biologicals (NZ) Limited. Commercial production began in 1986 at various locations, expanding significantly in 1987 to include Moturiki, Ovalau, Bua, and other areas (Ram, 1991; South, 1993). However, challenges such as trade bans and natural disasters forced Coastal Biologicals (NZ) Ltd to cease operations in July 1988.

Seaweed farming took a new turn in 1998 under the CDF programme, with the government committed to re-establishing *E. cottonii* farming (Lala and Vuki, 2010). Assistance was provided to farmers in Kiuva, and other areas close to Suva, Nausori, and Lami in early 1998. Planting materials were distributed in various regions, and initial support included boat and engine purchases for farmers. By 1998, 282 seaweed farms were operating, producing 879 metric tonnes of dried seaweed, exported to FMC Biopolymer, Denmark.

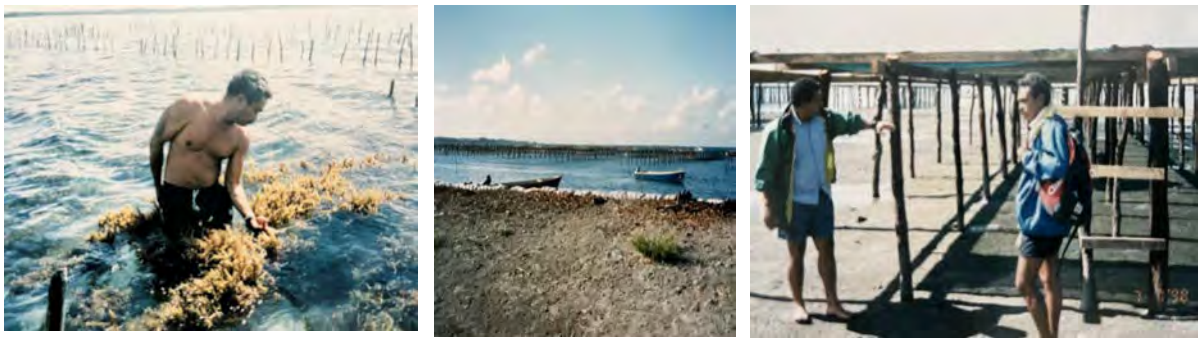


Figure 3. Fisheries Officers Sam Mario and Esaroma Ledua Inspecting Kiuva Seaweed Model Farm Drying Racks, Boats and Test Plots, in 1998.

In 1997, a black-lip oyster (*Pinctada margaritifera*) pilot farm was established in Savusavu Bay and attracted private investment. Two licensed farms cultivated round pearls, with annual production ranging from 30,000 to 350,000 pearls valued at around \$7.4 million.



Figure 4. J. Hunter Pearls micro-algae room and black-lip oyster pearl products.



Figure 5. Unique and exotic colors displayed by *Tridacna gigas* broodstock on Makogai (top) and Tavarua Island (bottom) attracts higher prices in the marine aquarium trade.

The change of government in May 1999 altered the focus of the CDF Programme, slowing aquaculture development in Fiji. Subsequent political changes further affected government-supported aquaculture activities, leading to regression in the sector over the last 20 years. Apart from seaweed and black-lip pearl oyster farming, research on mass production of giant clam juveniles started at Makogai Island in 1988.

1.4 Current Status of Aquaculture in Fiji

Currently, Fiji cultures 16 species at various development stages. The Ministry of Fisheries receives an annual budget of approximately \$13.5 million, with only about \$1.03 million allocated to aquaculture (Ministry of Fisheries, 2023). Aquaculture production is valued at around \$11.11 million, with a return on investment (ROI) of approximately 80.7%. Additionally, Fiji lacks an Aquaculture Act (only a Bill exists), making it crucial and urgent to enact one promptly. The Aquaculture Bill/Act should outline processes for designing, reviewing, and implementing plans, as well as defining contents and procedures for establishing Public Private Partnership (PPP) arrangements, corporatization, forming Aquaculture Cooperatives, and appointing a Board of Directors.

Aquaculture development activities in Fiji are managed across three divisions of the Ministry of Fisheries and Forestry: Aquaculture, Research, and Central. The Aquaculture Division oversees the Galoa hatchery, producing sandfish (*Holothuria scabra*), white-legged shrimp (*L. vannamei*), and black-tiger shrimp (*P. monodon*). Additionally, it manages the Naduruloulou Research Station (NRS) and Dreketi and Ba hatcheries, focusing on tilapia, freshwater prawn, and grass carp. The Caboni Station conducts research on milkfish, rabbit fish, and rock cod.

The Research Division controls the Makogai Mariculture hatchery, producing giant clams for reef reseeded and conservation, and manages black-lip oyster and rock oyster (referring to the introduced *Magallana bilineata*) development activities. Seaweed and mud-crab farming development activities fall under the Coastal Development Programme, managed by the Central Division.

Table 1 summarizes the annual allocation of funds (around \$1.03 million) to the Ministry of Fisheries for aquaculture research and development activities. Table 2 displays the current aquaculture production levels. In addition, data on the number of farmers are presented on Table 3. These data were sourced from the Ministry of Fisheries Annual Report of 2022/2023 and data collected during the Aquaculture Development Plan (ADP) Workshops 1 & 2.

Table 1. Summary of the Ministry of Fisheries current aquaculture activities, annual budget and annual production for 2021/2022 (MOFF annual report data).

Aquaculture Activity	Annual Budget (\$)	Division	Production
Mariculture/Giant Clams	\$300,000	Research	8,413 juveniles reseeded
Round Pearls, Mabe & Rock Oysters	\$180,000		2,552 spats
Tilapia, carps, shrimp, sandfish, freshwater prawn	\$400,000	Aquaculture	1,616,391 tilapia fry, 11,700 sandfish restocked, 83,000 shrimp PL, 166,790 prawn PL, 146,599 grass-carp, 45kg prawn.
Seaweed & mud-crab	\$150,000	Central/Coastal	29 metric tonnes (valued at \$1,200/mt)
TOTAL	\$1,030,000		

Table 2 highlights that different units of measurement were used by different divisions when reporting outputs and achievements. For instance, mariculture (mabe and black-lip oyster) production was reported in terms of pieces held at farms, without reporting weight or sizes. In contrast, freshwater and brackish-water aquaculture productions were reported in metric tonnes per year, providing a clearer picture of output value or achievement. This discrepancy underscores the need for a standardized data reporting format and the centralization of all aquaculture activities under one division to ensure more accurate and comprehensive reporting of annual aquaculture production figures.

Table 2. Current status of the aquaculture production by the private sector in Fiji in 2022/2023 period.

Division	Freshwater Aquaculture Production		Mariculture Production			Brackish-water Production	
	Tilapia (mt/yr)	Prawn (mt/yr)	Seaweed (mt)	Mabe (pcs)	Black-lip (pcs)	Shrimp (mt/yr)	Oyster (mt/yr)
Central	212.8	4.2	29			6.0	0.2
Eastern						0	
Western	3.2	0.5				16.0	
Northern	12	0.25	6.3	1,474	800,000	0	
Total	228	4.95	35.3	1,474	800,000	22.0	0.2

Table 3. Number of private aquaculture farms in Fiji.

Division	No. of Freshwater Aquaculture Farmers		No. of Mariculture Farmers			No. of Brackish-water Farmers	
	Tilapia	Prawn	S/weed	Mabe	B/Lip Oyster	Shrimp	Rock Oyster
Central	288	15	5	0	0	1	2
Eastern	10	0	0	5	0	0	2
Western	82	6	3	2	0	5	1
Northern	65	5	4	7	3	0	0
Total	440	22	12	14	3	6	5

Out of 16 species that are cultured in Fiji, only eight have reached commercial or semi-commercial levels. Table 4 shows the status of sixteen species cultured in Fiji.

Table 4. Summary of current status of species cultured in Fiji, based on the Ministry of Fisheries annual reports in 2021/2022.

Number	List of Species Cultured in Fiji	Year Started	Status in 2023
1	Grass-carp	1958	Research
2	Silver-carp	1958	Research
3	Bighead-carp	1958	Research
4	Tilapia	1953	Semi-Commercial
5	Milkfish	1973	Research
6	Rock-cod	2022	Research
7	Tiger prawn	1973	Commercial
8	Pacific white shrimp	2006	Commercial
9	Giant river prawn	1979	Commercial
10	Giant clams	1987	Research
11	Black-lip oysters	1960	Commercial
12	Mabe	2017	Semi-commercial/Research
13	Seaweed	1976	Commercial
14	Rock oyster	1976	Semi-commercial/Research
15	Rabbit fish	1973	Research
16	Sandfish	2013	Research
17	Marine ornamentals and live rock	1996	Commercial
18	Freshwater ornamentals	1980	Semi-commercial

1.5 Importance of Aquaculture in Food Security, Economic Development and Environment Sustainability

Aquaculture provides a diverse range of seafood products, including fish, shellfish and aquatic plants such as seaweed. This diversification reduces reliance on traditional wild food sources and contributes to a more balanced and resilient food supply. Seafood is a rich source of high-quality protein, essential fatty acids, such as omega-3s, essential amino acids, vitamins, and minerals, which are important for human health. Incorporating seafood into diets can help combat malnutrition, particularly in vulnerable populations such as children and pregnant women. With global demand for protein expected to rise significantly and supply from the wild declining significantly in the coming decades, aquaculture helps meet this demand and supplement short supply from the wild, by providing a sustainable source of animal protein.

Aquaculture often requires less land, water, and feed compared to traditional livestock farming, such as cattle and goat farming, making it more resource-efficient. For example, fish farming can be conducted in relatively small spaces, such as ponds or tanks, and can utilize recycled water systems to minimize water consumption.

Overfishing and habitat degradation have depleted many wild fish stocks, threatening the livelihoods of coastal communities and marine ecosystems. Aquaculture helps alleviate this pressure by providing an alternative source of seafood that does not rely on wild capture. Aquaculture can create employment opportunities and stimulate economic development in coastal and rural communities, particularly in Fiji. Small-scale fish farming operations can empower local farmers, women, youths, improve livelihoods and reduce poverty.

Aquaculture systems can be designed to withstand climate-related challenges, such as droughts, floods, and temperature fluctuations. By diversifying food production systems and enhancing resilience, aquaculture contributes to food security in the face of climate change. Aquaculture products are traded globally, providing access to nutritious seafood in regions where local fisheries are limited or depleted. International trade in aquaculture products can enhance food security by supplementing domestic production and providing access to a wider variety of seafood. Overall, aquaculture plays a critical role in addressing the complex challenges of food security by providing a sustainable and resilient source of nutritious food for current and future generations.

2. Objectives or Where We Want to Be in 2028



Increasing the current value of aquaculture from \$11.1million per annum to over \$132million by 2028.



Reducing the value of imported seafood by around 70% by 2028.



Increasing export earnings of cultured marine products from around \$5million to over \$80million by 2028.



Promoting Fiji aquaculture brand and our environmentally sustainable practices.

3. Market Analysis

3.1 Assessment of Local, Regional, and Global Demand for Selected Aquaculture Products

With a national population of more than 900,000 people (SPC Pacific data hub <https://sdd.spc.int/fj> July 2024) and a similar number of tourist arrivals each year, the local market opportunities are extensive and relatively untapped. Objective two of this plan, targets a reduction in importation of seafood by around 70% by 2028. Fiji imported various seafood items, including shrimp, rock oysters, mullet, mackerel, shrimp post-larvae, fish fillets, sardines and squid, amounting to over \$95 million in 2020 and around \$53.8million in 2022, which could be replaced by aquaculture (Ministry of Fisheries, 2023). Main destinations and products imported in 2022 are shown on Table 7 below. Secondly, this plan also targets exporting surplus. Additionally, with tourist arrivals in Fiji projected to increase by around 6.18% annually, there is going to be continuous rise in local seafood demand (Statista Market Insight, 2024).

Nine out of sixteen species listed on Table 4 have been selected to be pushed to industry level, during the ADP Stakeholders Consultation Workshops 1, 2 and 3. Tilapia and freshwater prawn were identified as high-priority freshwater species to be developed to an industry level. Despite being farmed in Fiji for over 45 years, the transition from research and subsistence farming to commercial farming has been slow and challenging over the years, mainly due to use of primitive methods of farming. Use of new farming methods is important, to boost production.

Three out of six brackish-water species cultured in Fiji were recommended for government support to advance to an industry level. This includes *P. monodon*, *L. vannamei* and *M. bilineata*.

Four out of five mariculture species recommended to transition towards an industry level, included black-lip oyster (*Pinctada margaritifera*), mabe (*Pteria penguin*), seaweed (*Kappaphycus spp*), and giant clams (*Tridacnid spp*). Table 5 outlines nine priority species, their current status, respective values, and potential earnings. Among these, seven have been cultured in Fiji for over 30 years, while mabe and Pacific white shrimp are the newest additions. The total value of fish, crustaceans and aquatic invertebrate products exported out of Fiji in 2022 was around \$89million and represented 8.44% of total export from Fiji (Trend Economy, 2024).

Table 5. Current status of aquaculture production, value and potential (in Fiji dollars).

Number	List of Priority Species	Year Started	Current Status	Value (\$)	Potential
1	Black-lip oysters	1960	2 Edible Oyster Farms x 250,000 spat. 3 round pearl farms (115,000 pearls). 3 Mabe farms (8 collection sites)	7,450,000	To reach industry level, we need to look at producing 8.12 million spats per year, setting up 17 community farms for edible oysters, branding, marketing & expanding towards export of 120,000 edibles pcs/ week or 6.2 million per year. 70,000 round pearls per year, valued around \$17.7million by 2028.
2	Seaweed	1976	16 farms (35.3 mt)	70,600	Export market demand = 40,000 metric tonnes per year by 2028. Local demand = 900 metric tonnes per year. Industry Potential Value = >\$50million by 2028
3	Black tiger shrimp	1979	1 farm (16.0 mt)	656,000	Fiji imported around 340 metric tonnes of shrimp in 2022, valued at around \$5million. Targeting to export 360 metric tonnes, \$12.6million by 2028.
4	Pacific white shrimp	2006	4 farms (6.0 mt)	246,000	Potential to increase production to 45 metric tonnes per year, valued at \$2.2million by 2028
5	Giant river prawn	1973	5 farms (4.7 mt)	192,700	Potential to increase production to 150 metric tonnes per year, with potential value of around \$5million by 2028.
6	Tilapia	1953	353 farms (228 mt)	2,280,000	Potential to increase production to 600mt/ yr. Potential value = \$6million by 2028. Fiji imported around \$45 million of frozen and fresh fish in 2022.
7	Giant clams	1987	8,413 juveniles	210,000	Potential to increase production to 160,000 juveniles/year. Potential value = \$8million per year by 2028. High demand from aquarium trade.
8	Rock oyster	1976	5 Farms (0.2 mt)	2,400	Potential to produce 2.0million/yr. Potential value = \$1-2.5million per year by 2028. Fiji imported \$2million of molluscs in 2022.
9	Mabe	2017	13 Farms (1,474 pcs)	2.600?	Potential to produce 5,000 pieces per year. Value = \$1.1million by 2028.
Total Value				\$11.1 million	\$144.2 million

In terms of the potential for export, based on global demand, China imported 1.1million metric tonnes of shrimp in 2023, valued at around US\$5.1billion and import volumes have been increasing year on year. Ecuador was the top supplier, with 679,102 metric tonnes per annum, valued at US\$3.5billion or US\$5.1 per kg. In January 2024, China imported 114,717 metric tonnes of shrimp from Ecuador and 72,484 metric tonnes from India, before the Chinese New Year (Van der Pijl, 2024). Although the Chinese demand is high, caution is urged because prices are low ranging from US\$4.36-\$5.67per kg. Other markets should also be explored that may be willing to pay a premium

In relation to seaweed, the current global market is worth US\$8billion. Seaweed import around the globe is projected to increase by US\$10billion in 2030 (World Bank, 2023). At present, three private companies have expressed interest in investing in seaweed farming in Fiji. International Flavors & Fragrance (IFF), the world's largest buyer of *E. cottonii* seaweed, intends to invest in seaweed farming in Fiji, targeting an annual production of around 30,000 metric tonnes at four different locations in partnership with local communities. Besides IFF, two other local companies are also interested in investing and are currently purchasing seaweed in Fiji. The total volume of dried seaweed demanded by these three companies amount to approximately 40,000 metric tonnes, a target deemed achievable. This is a very small amount, when compared to the Philippines, which produced 1.49 million metric tonnes of Eucheuma seaweed in 2019, valued at US\$250 million (Department of Agriculture Bureau of Fisheries and Aquatic Resources, 2022).

Under this plan, Fiji is targeting to export only four key products, namely shrimp (400 metric tonnes), seaweed (40,000 metric tonnes), edible (black-lip) oysters (3.12 million dozen), and 70,000 round pearls.

3.2 Target Markets

The first target is the local market. Table 6 shows that Fiji imported around \$5million of crustaceans, \$45million fresh and frozen fish and around \$2million of molluscs in 2022. Secondly, this plan also looks at exporting surplus. The price of *P. monodon* in the world market is increasing. This plan is targeting markets in Japan, Europe and USA. Japan alone imported US\$2.2billion worth of shrimp in 2022. In terms of price, Japan imported white legged shrimp at US\$5.1-US\$10.6 per kg and black-tiger prawn from US\$10.8-US\$15.8 per kg (equivalent to around \$35.88 per kg), from Vietnam in 2022. In terms of marketing seaweed, this plan is targeting to work and form strategic partnership arrangements with International Fragrance and Flavors (IFF) and two other local companies to export around 40,000 metric tonnes per year. IFF alone has confirmed buying 36,000-40,000 metric tonnes of Eucheuma seaweed from Fiji every year. A local company is interested to buy and export 900 metric tonnes of seaweed this year and more in coming years. The Eucheuma seaweed market is experiencing significant growth due to the increasing demand for seaweed-based products (Carrageenan) in various industries. Apart from IFF, other Eucheuma international markets are CP Kelco; Cargill Incorporated; Gelymar SA; DuPont de Nemours; Fujiana Linjiana TAFCO Ltd; Gingdao Gather Great Ocean Seaweed Industry Co Ltd; Ocean Fresh Seaweed; and Gingdao GGOA Industry Group Co Ltd. Therefore, there are several options for marketing Eucheuma seaweed. Export price of seaweed ranges from US\$400-1,000/metric tonne. The current local buying price from farmers is around \$1500/metric tonnes.

Under this plan, edible (black-lip) oyster community farms, through a cooperative, will be forming a strategic partnership arrangement with J. Hunter Pearls Limited, in relation to exporting of 10,000 dozen of edible oysters per week, targeting Asian markets. Retail price for edible oysters in Hong Kong in 2024 is around US\$17.20-47.77 per kg and wholesale price is between US\$12-33 per kg.

Table 6. Imported seafood by Fiji in 2022.

Value and Destinations of Imported Fish in 2022			
Country	%	Value US\$ (millions)	FJD (millions)
China	34	8.19	18.61
Japan	25	6.05	13.75
New Zealand	11.3	2.69	6.11
FSM	6.89	1.63	3.70
India	3.44	0.816	1.85
Vietnam	2.64	0.626	1.42
Australia	2.54	0.603	1.37
Indonesia	1.85	0.439	1.00
Netherlands	1.4	0.222	0.50
Other Asian countries	6.83	1.61	3.66
Other countries	3.7	0.61	1.38
TOTAL	100	23.48	53.37

Products Imported	%	Value (US \$millions)	FJD (millions)
Frozen fish	74	17.4	39.55
Fresh fish	11	2.62	5.95
Crustaceans	9.1	2.15	4.89
Molluscs	4	0.858	1.95
Fish fillet	1.2	0.302	0.69
Dried fish	0.4	0.09	0.20
Live fish	0.025	0.065	0.15
Others			
TOTAL	100	23.485	53.38

3.3 Analysis of Competitors and Market Trend

Local farmers main competitors are companies that are importing shrimp and fish products. For example, shrimp is imported from Asian countries such as China, India, Thailand and Vietnam. Fish products are imported from New Zealand, China and Japan. In terms of export, China, India, Thailand, Vietnam, Indonesia and Ecuador will be our main competitors for shrimp. Philippines and Indonesia will be our competitors for seaweed export. However, our Fiji brand will be our competitive edge, focusing on freshness, high quality products, grown in a pristine environment, creating employment in rural communities, in particular for women and youth groups. In addition, it is important that Government increases duty and tax on imported items to protect local products and the Fiji brand. Furthermore, this plan is promoting intensive farming method, high stocking density and production of feed and PLs locally, so that we can increase production, reduce cost and be competitive in the world market.



4. Site Selection

It is important that the evaluation of potential sites take into account factors such as: lessons learned from the past, optimum water quality requirements of cultured species, accessibility, infrastructure, tide fluctuations and ground elevation, type of soil, land topography, type of vegetation, flood level, wind direction, availability of skilled labour around the site, social considerations and biosecurity and regulatory considerations.

For example, historical data shows that black-tiger shrimp grows well on the dry sides of Viti Levu and Vanua Levu and white-legged shrimp and other imported species perform better on the wet sides of Viti Levu only. In addition, since black-tiger shrimp is a local species, farming areas should be separated and protected from imported shrimp species such as white legged shrimp.

Physical and ecological site selection criteria are summarised in Table 7 below, as a guide. In addition to this guide, the Ministry of Fisheries site selection manuals produced during the SPC and JICA Aquaculture Trainings, should also be used. Furthermore, it is important that the 2007 Environmental Impact Assessment (EIA process) Regulations and processes specified under the Environment Management Act of 2005 are adhered to. The Ministry of Fisheries has also produced an Oyster Farming Site Selection Checklist which addresses both environmental and social site selection criteria (Appendix 3) and could be adapted for other community-based commodities.

The farm is said to be properly designed when site selection report and feasibility report are used as a guide and the arrangement of the pond system, water control structures, and all other facilities, complement one another to give the most efficient and productive system. Poor planning increases operational cost, reduces profit and can even lead to bankruptcy. Once constructed, the physical structures become permanent and would be expensive to correct. The design of shrimp ponds should take into account the characteristics of

the site selected (distance to brackish water source, electricity supply, water supply, prevailing winds, tidal range, outlet canal etc.). The distance of ponds to the brackish water source and elevation, dictates the cost of pumping. All activities such as construction costs, operational costs and financial analysis to determine returns on investments are embodied in the feasibility study. In addition, a survey of the site is necessary in the planning and development of the project.

Table 7. Summary of physical and ecological site selection criteria.

Site Selection Criteria							
Priority Species	Temperature (°C)	Salinity (ppt)	pH	Wind speed (cm/sec)	Dissolve Oxygen (mg/l)	Culture depth (m)	Site characteristics
Black-lip oysters	23-28	32-35	Spat tolerate wide range	15-25	4-5.5	60	Abundance of phytoplankton, mouth of bay, sheltered,
Seaweed	24-30	28-34	7-8.5	>40	4.7-5.3	0.5	50 ha of protected water area, 4.5% growth rate per day 9 months of the year, far from coral heads & eelgrass, >40cm/ mins current speed, 2metres water depth, 2.5ha of land near beach for drying. Seaweed farm water depth should be around 2-6 metres depth. Protected from large waves.
Black tiger shrimp	28-30	25-28	7.5-8.5		4-5	1-1.4	Hardness 30-400ppm, Ammonia, Turbidity,
Pacific white shrimp	26-32	15-30	7.5-8.5		>4	1-1.4	Hardness 30-400ppm, Ammonia, Turbidity,
Giant river prawn	29-31	3-4	7-8.5		>4	1-1.4	Hardness 30-400ppm, Ammonia, Turbidity,
Tilapia	28-32	0-8	7-8.5		>4	1-1.4	
Giant clams	27	30	8		>4	0.5-2	Abundance of phytoplankton
Rock oyster	24-28	27-39	6.7-8.7		>4	1-10	Abundance of phytoplankton
Mabe	23-28	32-35	N/A	15-25	4-5.5	10-60	Abundance of phytoplankton



5. Development Plan 2024-2028

The Plan initially focuses on lessons learned from our history and identifying solutions to our past weaknesses and challenges. The Plan then details a three-step process. The first step of promotes the formation of cooperatives for each commodity, not only to provide farmers with better access to much needed services but also to facilitate economic growth. The advantage of Public Private Partnership (PPP) arrangements through cooperatives, include ensuring the necessary investments into public sector, more effective management of public resources, higher quality and timely provision of public services, and the implementation of investment projects within due terms without imposing unforeseen extra expenditures on the public sector. This plan targets the creation of an environment where cooperatives will run as corporate entities from the third year onwards.

The second step involves developing model farms to showcase the benefits of regenerative aquaculture and inspire local communities to join the transformation.

The third step is the setting up of revolving funds and recruitment of human resources to support the setting up of cooperatives and community farms. In addition, facilitate purchases from local farmers, fostering collaboration and sustainability.

5.1 Key Lessons Learned

1. Since 1973, grow-out consistently yields promising results.

2. Hatchery production consistently falls short of targets from 1975 until today.

3. Importation of shrimp post-larvae commenced in 1973 until today.

4. Introducing new shrimp species for broodstock did not enhance hatchery production.

5. Lack of aquaculture skills identified as early as 1973, still persist today.

6. Hesitance of the Ministry of Fisheries management team to allocate the requested number of officers for skills enhancement training, identified in 1975, still persist today.

7. Hesitance of the Ministry of Fisheries management team to allocate the requested number of officers for skills enhancement training, identified in 1975, still persist today.

8. Promising results in grow-out in the 1970s to 1980s typically utilized larger ponds of at least 0.6 hectares, differing significantly from the promoted pond size of 600 square meters (30 x 20 m²) by the Ministry of Fisheries' Aquaculture Division Food Security Project (FSP). In 1981, annual shrimp production target was 50 metric tonnes, with forty percent intended for export. Semi-intensive shrimp production from 1981-1984 averaged around 2.7 metric tonnes per hectare per year.

9. Management of aquaculture development activities in Fiji over the last ten years appear to be loosely structured and controlled by three different divisions of MOFF, with no standardized method for reporting progress and production data.

5.2 Challenges and Proposed Solutions

Over the past 48 years, twelve key challenges were identified and proposed solutions are as follows:

1	Lack of expertise and experience at the local level: Since 1970, addressing this issue involved recruiting experts from SPC in New Caledonia to provide mentoring and hands-on training to local personnel. Significant progress was made.
2	Lack of technology: While the private sector has introduced new and successful farming and hatchery technology, the Ministry of Fisheries has been slow to adopt changes. This Plan emphasizes the need to introduce new hatchery technology and transition farming towards intensive methods.
3	Low hatchery production: Government hatcheries have consistently faced low hatchery production levels, hindering their ability to meet the demands of commercial farmers. This plan proposes close collaboration with the private sector, through PPPs as a solution.
4	Low number of trained local staff: Setting up of a local training school is proposed, to provide ongoing training and upskilling opportunities. In addition, recruitment of mentors, to provide more hands-on training at national level to address the shortage of trained local staff, is crucial.
5	Flooding: Training Fisheries Officers in site selection methods and incorporating meteorological and flooding data into farm designs are essential steps to mitigate the impact of flooding.
6	Decline in stock performance; depressed growth rates; and reduced harvest weights and sizes: While a recent genetic audit showed no major loss of genetic diversity in tilapia (Lal et al., 2021), other factors such as husbandry practices, feed quality, and water management need attention.
7	Mitigating and adapting to climate change: Promoting energy-efficient practices and optimizing feeding strategies can help reduce greenhouse gas emissions. Enhancing resilience through pond design modifications and species diversification is also crucial.
8	Lack of use of traditional knowledge in aquaculture: Encouraging the use of indigenous knowledge, such as the Fijian calendar (Table 8) and fish aggregation seasons, can contribute to successful and sustainable aquaculture development. It's time to integrate traditional and contemporary knowledge to identify potential local species for aquaculture, such as milkfish (<i>Chanos chanos</i>), mullet (<i>Mugil cephalus</i>), rabbit fish (<i>Siganus spinus</i>), yellow-striped goatfish (<i>Lipenius vittatus</i>), rock cod (<i>Anyperodon leucogrammicus</i>), coral trout (<i>Plectropomus</i> sp.), Spanish mackerel (<i>Scomberomorus commerson</i>), land crab (<i>Geograpsus crinipes</i>), tugadra (<i>Selar crumenophthalmus</i>), and salala (<i>Rastralaga brachysoma</i>). Utilizing local knowledge can help determine the peak spawning period and key areas for collecting broodstock of these species.

Table 8. Indigenous Fijian calendar and knowledge that can be utilized in aquaculture.

English Calendar	Indigenous Fijian Calendar		Special Events
January	Vulai-nuqalevu		Peak spawning aggregation of <i>Siganus spinus</i> ; Aggregation of milkfish; Aggregation of Daniva (<i>Herklotischthys quadrimaculatus</i>) closer to the shorelines.
February	Vulai-sevu		Aggregation of Spanish mackerel; Aggregation of Yellowfin tuna; Aggregation of milkfish fries; Aggregation of Daniva (<i>Herklotischthys quadrimaculatus</i>) closer to the shorelines.
March	Vulaikelikeli		Rainy & humid; Gonads of mud-crabs & mud-lobster are ripe; Aggregation of Spanish mackerel; Aggregation of Yellowfin tuna; Aggregation of milkfish fries.
April	Vulai-gasau		Gonads of mud-lobsters ripe; Aggregation of tugadra & salala; Aggregation of Spanish mackerel; Aggregation of Yellowfin tuna; Gonad of shellfish empty; Aggregation of milkfish fries.
May	Vulai-doi		Peak for milkfish fries; Season for seaweed.
June	Vulai-werewere		Peak season for seaweed; Aggregation of wahoo.
July	Vulai-cukicuki		Peak season for octopus; Aggregation of wahoo.
August	Vulai-senidrala; Vulai-kawakawa		Cold & dry; Season for octopus; Spawning season for kawakawa (rock cod) & donu (coral trout); Matu & vaya schooling along the coastline; green turtles drift on surface in pairs.
September	Vulai-vavakada		Aggregation of milkfish;
October	Vulai-balololailai		<i>Palola vernalis</i> spawning aggregation; Peak for milkfish fries; Aggregation of Spanish mackerel.
November	Vulai-balololevu		<i>Palola vernalis</i> spawning aggregation; Aggregation of milkfish; Aggregation of Spanish mackerel.
December	Vulai-nuqalailai		Starting of spawning aggregation of <i>Siganus spinus</i> ; Aggregation of milkfish; Aggregation and movement of land crabs to coastlines to release their eggs during high tide; Aggregation of Spanish mackerel.

5.3 Mandates and Responsibilities in Aquaculture of Counterpart Ministries (Environment, Lands, Biosecurity, Economy, and Trade)

Setting up of the Ministry of Fisheries Environment Management Committee to collaboration between the Ministry of Fisheries and the Ministry of Environment is crucial, particularly regarding Sections 27-34 of the Environment Management Act (EMA) of 2005, which mandates Environment Impact Assessments (EIAs) before aquaculture development. This process can be costly and cause delays. Additionally, Sections 35-39 of the EMA (2005) concerning waste management and pollution control during harvesting are important considerations. Aligning standards for aquaculture waste management with those for sewer treatment plants is essential. Furthermore, collaboration with the Biosecurity Authority of Fiji is also necessary to address delays and revenue losses caused by Part 5 of the Biosecurity Promulgation of 2008, especially regarding the clarity of Section 17 on prohibited imports of aquatic organisms and products. Furthermore, working closely with the Ministry of Land and iTLTB, is crucial. Aquaculture land use is not defined under the Agriculture Land Tenants Act, Chapter 270 and declaration of unimproved capital values of Aquaculture Land is urgently needed, to protect investment of aquaculture farmers. For example, Legal Notice No. 99 of 1982, Section 21-Agriculture Land (Declaration of Unimproved Capital Values) Order, defines all different classes of agriculture land and unimproved capital values.

5.4 Gender and Social Inclusion

Despite significant contributions by women in all levels of aquaculture, their roles are often underestimated in Fiji. In both the private and public sectors, women play key roles in pearl oyster farming, mabe, tilapia, shrimp hatcheries, rock oyster farming, post-harvest activities and marketing. However, women are underrepresented in management positions. This plan aims to devise ways of collecting and reporting information about the different ways that men and women participate in aquaculture more accurately and to promote sustainable development pathways for women in aquaculture. Practical steps, such as documenting gendered labor patterns, addressing gender in aquaculture governance, and empowering women at subsistence and semi-subsistence levels to move towards commercialization, are essential. Guidance is provided in the Pacific handbook for gender equity and social inclusion in coastal fisheries and aquaculture, Module 8 Livelihoods (Stacy and Govan, 2021). Equitable support for both women and men is crucial for sustainable aquatic food systems in Fiji.

5.5 Fiji Aquaculture Bill

Currently, there is no Aquaculture Act in Fiji, making it imperative to establish one without delay. It's crucial that this legislation, acknowledges and supports the Aquaculture Plan. The Aquaculture Bill should outline the framework for designing, reviewing, and implementing the Aquaculture Development Plan (ADP), serving as a vital link to policies aimed at achieving sustainable development goals.

Example of wording in the Aquaculture Bill:

The Director of Fisheries or Aquaculture shall be responsible for preparing and reviewing a Development and Management Plan for the sustainable management and development of each aquaculture commodity in Fiji.

The content of each Aquaculture Development and Management Plan shall:

- a. Identify the commodity or species.
- b. Specify objectives for managing and developing the commodity or species or area.
- c. Describe the status of the culture of the commodity or species.
- d. Specify management measures for the culture or aquaculture of the species or commodity and appropriate fines, penalties, and sanctions for contravention of such measures.
- e. Specify the process for allocating any aquaculture license for each commodity or species in the Aquaculture Development and Management Plan.
- f. Protect the interests of landowners, coastal communities, subsistence, and semi-subsistence aquaculture farmers.
- g. Include an assessment of risk.
- h. Identify requirements for monitoring, reporting, and assessment; and
- i. Make provisions regarding any other matter necessary for sustainable farming of fisheries resources.

Upon satisfying the criteria in subsection (4.2.2), the Director shall seek the Minister's approval to publish the Aquaculture Development and Management Plan via Regulations.

Effect of the Aquaculture Development and Management Plans:

- a. An Aquaculture Development and Management Plan has no effect to the extent it is inconsistent with the provisions of the Aquaculture Act.

Amendment or revocation of an Aquaculture Development and Management Plan:

- a. The Director, after two years and following consultation with all stakeholders, may amend or revoke an Aquaculture Development and Management Plan.

5.6 Public Private Partnership (PPP)

This Plan is promoting PPP. It's time for the government to support the private sector in taking the lead role in aquaculture development. While the Ministry of Fisheries has crucial roles to fulfill—such as, regulating activities for sustainability, ensuring a level playing field, enforcing laws, marketing, training of new farmers, supporting development, managing broodstock, fostering investment, and conducting research, it's vital to avoid duplicating the private sector's efforts. Instead, the Ministry should collaborate closely with the private sector, leveraging their strengths, sharing resources and expertise, and establishing special projects for each commodity under a PPP framework. Utilizing the private sector's advanced technical skills and technology will enhance efficiency and productivity.

5.7 Model Farm Operational Plan

The second step of this plan involves developing model farms to showcase the benefits of regenerative aquaculture and inspire local communities to join the transformation. A model farm or demonstration

farm in this plan refers to the smallest commercial sized farm that is economically feasible, to prove and accurately predict the variation in production, growth rate and development. A model farm for each commodity will be used to represent aspects that are too small, large, complex or difficult to observe or explain using other means.

Species targeted for model or demonstration farms, including current production, 2028 targets, potential value, and the funding level required from the Government is summarized in Table 9 and details are given in the implementation plan (Section 6).

Table 9. Potential value of selected species.

No	List of Priority Species	Year Started	Current Annual Production	Current Value (\$)	2028 Production Targets	Potential value (\$) by 2029
1	Pearl Oysters (Black-lip & Mabe)	1960	8 x 250,000 spats 800,000 Edible 115,000 pearls	7,450,000	17 x 360,000 edibles/yr. 200,000 round pearls /year shared by 3 farmers, (only 70,000 to be sold/year). 1,000,000 mabe pieces (50 women groups x 20,000 pieces/year)	- Edibles = \$15.6million - Round Pearls = \$5million - Mabe Pearls = \$5million - Total = \$22.6million.
2	Seaweed	1976	35.3 mt	70,600	40,000 metric tonnes	\$60million
3	Black tiger prawn	1979	16.0 mt	656,000	20 farms (total of 140 acres of pond surface) - Local market = 400mt/yr - Export market = 300mt/yr	\$29.4million
4	Pacific white shrimp	2006	6.0 mt	246,000		
5	Giant river prawn	1973	4.7 mt	192,700	Local = 150 mt/yr	\$5 million.
6	Tilapia	1953	228 mt	2,280,000	Local = 600mt/yr	\$6million.
7	Giant clams	1987	8,413 juveniles	210,000	- Local=10,000juveniles/yr - Export =150,000	\$8million
8	Rock oyster	1976	0.2 mt	2,400	2million spats/yr	\$1million
Totla value				\$11,110,300		\$132million

5.8 Marketing and Sales Strategy

5.8.1 Export Marketing and Sales Strategy

Five out of nine commodities (seaweed, edible oyster, giant clams, shrimp and mabe) selected to be developed to industry level and exported, will be subject to enormous competition from other nations producing the same products. Pricing strategy, sales projections and meeting export market product specifications is very important. For example, many export markets for seaweed prefer dried products, with a minimum moisture content of 30%. The Ministry of Fisheries must establish cooperatives and on-site product quality assurance system, to ensure export market specification of 30% moisture content is met. Joining with other producers in a cooperative, can give farmers greater power in the market place. In addition, cooperatives can give farmers more control over their products, as they make their way to consumers, by allowing them to bypass, one or more middlemen in the market channel. Cooperatives will ensure equal voting rights for members, encourages member contribution and shared responsibility, liability for members is limited, and there is no limit on the number of members.

In addition, Fiji's competitive edge such as "pristine waters" should be promoted through branding, packaging and creating marketing materials for Fiji aquaculture products. For example, a strong "**Fiji Blue**" brand, helps to create a unique identity for our aquaculture products. Blue is often associated with hues of the sky and water, both of which are known to inspire feelings of serenity, openness, clarity and tranquility.

In addition, clearly defined distribution channels and strategic partnership arrangements are also important for Fiji, in terms of marketing aquaculture products. This has been discussed earlier in this plan. For example, strategic partnership arrangement with IFF is already progressing well, in relation to exporting *E. cottonii* seaweed. IFF is interested in investing in farm development and buying all the *E. cottonii* seaweed that Fiji will produce. At least 360,000 metric tonnes of dried seaweed. Fiji can take advantage of existing IFF distribution channel, in terms of semi-processed and fully processed products. However, avoiding monopoly is also important. Therefore, allowing some shares of the market to two other companies that are already operating in Fiji, is important.

In terms of marketing edible oysters, a strategic partnership arrangement with J. Hunter Pearls and Taylor Seafood is also progressing well.

5.8.2 Local marketing strategy

As stated above, cooperatives can give farmers more control over their products, as they make their way to consumers, by allowing them to bypass one or more middlemen in the market channel. Through cooperatives, marketing outlets can be set-up at key municipal markets around the country, targeting consumers and customers within a certain radius. This should be supported by advertising product specifications on social media, email and newsletter marketing. Meeting product specifications of local markets is important. For example, local shrimp markets prefer fresh products and demand can be classified into four different categories: jumbo (>30 grams), large (>20-30 grams), medium (15-20 grams) and small (<15 grams). Markets for small shrimps are mainly individuals who prefer to buy from the farm in 1 kg bags. Markets for large and jumbo sizes prefer delivery and specific processing methods. Markets for large and jumbo sizes consists of individuals, hotels and some restaurants. Large hotels prefer delivery and require shrimps to be processed

in a HACCP certified facility. By the end of 2023 King Prawns (Fiji) Ltd. (KPFL) sold most of the products directly to consumers, eliminating most of the middlemen and hotels.



Figure 6. King Prawns (Fiji) Limited ladies grading shrimps according to the sizes demanded by the market.

5.9 Regulatory Compliance

Compliance with local, national, and international regulations governing export, marketing, aquaculture operations, environmental protection, and food safety is important. In terms of national regulations, HACCP requirements enforced by the Ministry of Health is very important, in relation to processing of aquaculture products for servicing hotels and export markets. Other national laws that aquaculture businesses have to comply with are Bio-security Act of Fiji (on imports), Environment Management Act (waste disposal and EIA), Ministry of Fisheries (OFMD Import Certificate), iTLTB (commercial lease), Fire Authority (Safety Certificate), Ministry of Labour (OHS) and District Officer (rural business license). Meeting these permitting and licensing requirements is debilitating and costly but full compliance is necessary.

5.10 Risk Management & Biosecurity

Risks should be mitigated through proper planning and developing of methods and options to reduce threats. Market fluctuations is a major risk in any business. Model farm business plans presented in the implementation plan (Section 6) includes risk analysis of market fluctuations. In addition, identification and assessment of potential risks, such as disease outbreaks, environmental hazards and pandemics, are also important to consider. Fiji continues to import live alien aquatic species, with the risk of introducing diseases and pathogens.

Although, the Biosecurity Authority of Fiji, which was established in 2008, manages disease control and prevention across the country, the quarantine period or contingency plan for aquatic species is too short. The quarantine period will need to take into account the life history of the aquatic animal.

It is important that the management, control and prevention of aquatic diseases to be controlled by the Aquaculture Division of the Ministry of Fisheries. This will ensure reduction in the level of threats and design of better management and contingency plan for aquatic species disease control and prevention. Table 10 provides a list of alien species introduced to Fiji, but absence of historical information of contingency plans is a concern.

Table 10. Status of threat posed by introduced aquatic species.

Number	List of Species Introduced Fiji	Year	Status in 2023
1	Grass-carp	1958	No reported threat
2	Silver-carp	1958	No reported threat
3	Bighead-carp	1958	No reported threat
4	Tilapia mossambicus	1953	Established population in local rivers
5	Java carp	1968	Established population in local rivers
6	Nile tilapia	1960	Farmed Commercially in ponds. Established population in local rivers and streams
7	Pacific white shrimp	2006	Farmed Commercially in ponds
8	Giant river prawn	1979	Farmed Commercially in ponds
9	Eucheuma	1976	No reported threat
10	Stylirostris	1984	No reported threat
11	Indicus	1984	No reported threat

Absence of contingency plans such as insurance cover, badly affected all aquaculture farmers during Covid-19 and cyclone Winston. The Ministry of Fisheries, in December 2023, completed and published Standard Operating Procedures for Disaster Preparedness, Response and Recovery in Fisheries (Appendix 4). The document can support the design of and be part of contingency plans, to reduce the impact of disasters on farmers.

5.11 Monitoring and Evaluation

Establishment of key performance indicators (KPIs) to track progress towards objectives, is an important task. In terms of Government funded projects, evaluating the performance of both farmers and officers is a critical component of this plan. Monitoring and evaluation help assess effectiveness and efficiency, strengths, weaknesses, improve accountability, and guides decision-making regarding resource allocation and project progress. This evaluation should be conducted monthly, quarterly, and annually as a formal procedure to monitor and measure work and results based on their responsibilities. Evaluation forms for farmers and officers are provided in Tables 11-14.

Table 11. Farmer's monthly performance evaluation and monitoring form.

Farmers Monthly Monitoring and Evaluation Form									
Farmer's Name:				Date:			Gender:		
No. of farm hands & gender:							Farmers signature:		
Farming experience:			Formal education:				Evaluation by:		
Size of farm:		No. of ponds:			Total area of ponds:			Sizes of ponds:	
Pond depths:			Species cultured:				Stocking Date:		
No. of Days	Daily Average temp (°C)	Daily Average Salinity (ppt)	Daily Average (pH)	Daily Average DO (mg/l)	Average rainfall	Feeding frequency/day	Average weight/month	Daily FCE	Comments:
1									
2									
3									
4									
5									
6									
7									
8									
9									
10									
11									
12									
13									
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30									
31									

Table 12. Farmer's performance evaluation for each quarter of the year.

Farmers Performance Evaluation Form - Quarterly										
Farmer's Name:				Date:			Gender:			
No. of farm hands & gender:						Farmers signature:				
Farming experience:			Formal education:				Evaluation by:			
Size of farm:		No. of ponds:			Total area of ponds:			Sizes of ponds:		
Pond depths:					Farming method:					
Species cultured	Stocking Date	Average temp (°C)	Average Salinity (ppt)	Average (pH)	Average DO (mg/l)	Average rainfall	Expected harvest weight (mt)	Actual harvest weight (mt)	No/kg	Comments:
Black-lip oysters										
Seaweed										
Black tiger prawn										
Pacific white shrimp										
Giant river prawn										
Tilapia										
Giant clams										
Rock oyster										
Mabe										
Performance factors	Satisfactory	Adequate	Need Improvement	Specific areas recommended for improvement						
Dedication										
Performance										
Cooperation										
Initiative										
Communication										
Teamwork										
Character										
Responsiveness										
Personality										
Appearance										
Work habits										
Level of Aqua Skills										
Key challenges faced by farmer:										

Table 13. Farmers annual performance evaluation form.

Farmers Annual Performance Evaluation Form								
Farmer's Name:				Date:			Gender:	
No. of farm hands & gender:						Farmers signature:		
Farming experience:				Formal education:			Evaluation by:	
Size of farm:		No. of ponds:		Total area of ponds:			Sizes of ponds:	
Pond depths:				Farming method:			Financial support from MoFF:	
Species cultured	Annual Production (mt)	Production per cycle (mt)	Superior	High	Satisfactory	Low	Unsatisfactory	Challenges:
Black-lip oysters								
Seaweed								
Black tiger prawn								
Pacific white shrimp								
Giant river prawn								
Tilapia								
Giant clams								
Rock oyster								
Mabe								
Performance factors								
Management skills								
Keep me informed								
Provide good work atmosphere								
Promote team work								
Hand out clear instructions								
Welcome suggestions								
Encourage cooperation								
Contribution to cooperative								
Potential solutions to challenges:								
Total Annual Cost:								
Total Annual Income Summary:								
Return on Investment:								

Table 14. Officer's performance evaluation form.

Officers Performance Evaluation Form				
Employee Name:		DOB:		
Job Title:		Date of last evaluation:	Gender	
Evaluation				
Evaluation Factors				
			S	A
Dedication	Report to work on time			
	Uses time constructively			
Performance	Good working knowledge of job assignment			
	Organise and performs work in a timely & professional manner			
Cooperation	Willingly accepts work assignments			
	Willingly accepts changes in work assignments not directly related to job			
Initiative	Performs assigned duties with little or no supervision			
	Performs assigned duties with little or no supervision, even under pressure			
	Strive to meet deadlines			
Communication	Communicates clearly & intelligently in person and during telephone contact			
Teamwork	Works well with fellow employees without friction			
Character	Accepts constructive criticism without unfavourable responses			
Responsiveness	Handles stressful situations with tact			
Personality	Demonstrates a pleasant calm personality when dealing with customers & fellow workers			
Appearance	Well groomed, clean, neat			
	Dresses appropriately for work			
Work Habits	Maintains neat and orderly workstation			
	Maintains neat and orderly paperwork			
Legends: S = Satisfactory; A= Adequate; NI= Needs Improvements				
Comments & Recommendation:				
The performance evaluation has been reviewed with me and I understand that I may attach my comment if desired:				
Employee signature:		Date:	Evaluation by:	Date:

5.12 Financial Plan

Budgeting for startup costs, operational expenses, and capital investments is an important component of this plan. Allocating sufficient level of funding and human resources is crucial for successful implementation. The annual budget for aquaculture activities during the period 2021/2022 was around \$1.03 million, with an ROI of approximately 80.7%. This plan aims to increase the value of aquaculture production in Fiji from \$11.11 million in 2023 to \$132 million in 2028 (Table 15). The total financial assistance requested for this plan is \$23.5 million, with approximately 24% allocated for additional human resources and administrative needs within the Ministry.

Table 15. Summary of the proposed budget.

Proposed Budget						
Budget allocation						
Project	Requested Budget (\$)	2024	2025	2026	2027	2028
Black-lip edible oysters	\$4,300,000	\$1,187,158	\$1,581,158	\$1,531,684	Corporatised	
Mabe						
Seaweed	\$2,910,000	\$502,158	\$1,508,158	\$1,323,738	Corporatised	
Black tiger shrimp	\$8,457,314	\$1,091,998	\$2,470,158	\$4,195,158	Corporatised	
Pacific white shrimp						
Giant river prawn	\$1,146,000	\$543,658	\$603,158	\$775,158	Corporatised	
Tilapia	\$2,790,000	\$238,764	\$1,129,677	\$1,430,845	Corporatised	
Giant clams	\$2,883,000	\$488,158	\$921,420	\$1,473,420	Corporatised	
Rock oyster	\$500,000.00	\$64,158	\$234,158	\$201,684	Corporatised	
Amount requested to be released each year		\$4,116,052	\$8,447,887	\$10,931,687		
Total Amount =\$23,495,626						

Apart from internal funds, efforts should focus on securing contributions directly from external funding sources or through partner agencies such as ACIAR, SPC, FAO, JICA, KMI and NGOs. For example, the ACIAR is allocating approximately \$5million to support *M. bilineata* farming and will be funding two fisheries officers' positions to be engaged in the marketing of tilapia over the next five years. Additionally, the Korean Government's support for upgrading Makogai is estimated to be around \$10 million. SPC's FAME annual support, including training, development, equipment, and applied research, should also be considered. For example, SPC will be funding hands-on training of shrimp farmers in the Western Division, in the second

half of 2024. The JICA SDG14 Project, focusing on capacity building in aquaculture and fisheries for MOFF Officers, will continue until 2025. Working closely with these external funding sources and partners, will reduce Government financial burdens.

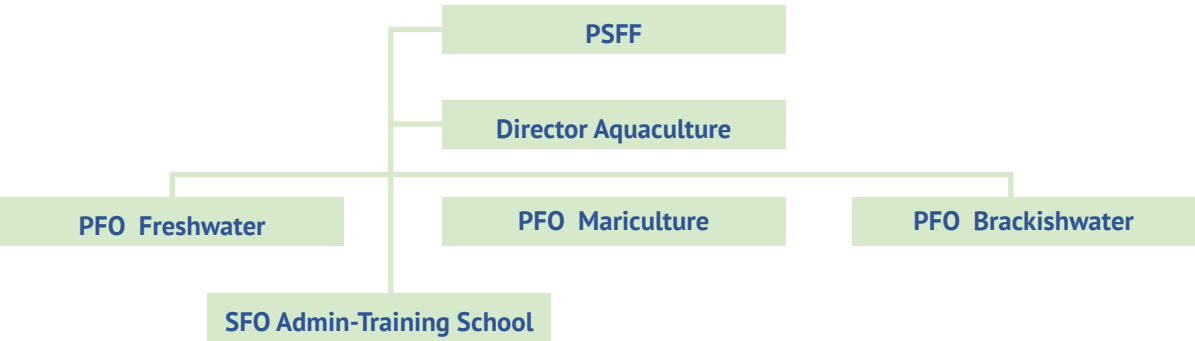
Furthermore, another important component of this financial plan is the need to set-up revolving fund accounts, for each Project listed on Table 16. Since cooperatives will be responsible for purchasing and marketing products for farmers, payback of whatever financial support given to them, the revolving fund account, will help finance the establishment of additional farms, until targets are reached.

At the end of the third year, cooperatives are expected to be transformed into corporate entities, with board of directors appointed by the Minister for Fisheries and Forests. Cooperative members and Government will be shareholders. Aquaculture cooperatives will mimic how Japanese Fisheries Cooperatives operate and will be different from existing cooperatives in Fiji. Therefore, it is important that the Aquaculture Bill defines the process to be followed in Registering and Operating Aquaculture Cooperatives.

5.13 Human Resources

According to the 2022/2023 Ministry of Fisheries Annual Report, 356 positions are filled, 31 are vacant, and only 32 are fully engaged in aquaculture. Effective implementation of the ADP 2024-2028 relies heavily on the allocation of an adequate number of staff and financial commitment from Government. Table 16 outlines the number of new staff needed and associated costs. Over five years, 84 positions will be needed, with an estimated total cost of \$5,703,000. This may require re-assignment and re-training of existing staff or creation of new positions or both. Structural changes and re-alignment of existing activities can reduce the proposed budget for human resources, avoid confusion of roles, enhance productivity and increase the number of staff that can be shifted or allocated to the Aquaculture Division. It also appears possible to get the required amount from the existing annual budget.

The establishment of the MOFF management team within the first two years, to implement the Plan prior to privatization and recruitment of Board of Directors/Office Bearers for the cooperatives, is crucial. Reporting to the Permanent Secretary Fisheries and Forests (PSFF), and the Director Aquaculture, the Principal Fisheries Officer (PFO) Mariculture requires three senior fisheries officers (SFO's) (SFO Seaweed, SFO Giant Clam and SFO Black-lip Oyster and Mabe). In addition, two SFOs are needed to support PFO Freshwater (SFO Tilapia and SFO Freshwater Prawn). Furthermore, two SFOs are needed to support PFO Brackish-water (SFO Shrimps and SFO Rock Oyster). One SFO is needed to administer the training programme and report directly to the Director of Aquaculture. The Implementation Team Structure is shown on the chart below.



In addition, this plan proposes establishing an Aquaculture Training Centre (see Appendix 5 for curriculum outline) and engagement of consultants, in collaboration with SPC, USP, JICA and other partners to provide training for new recruits, re-training and ongoing upskilling of existing staff. The training centre will reduce the gaps created by high turnover rate of technical staff.

One of the key lessons learned was that sufficient staffing is crucial for project success. The challenge of shortage of trained local staff in aquaculture has persisted since 1974. Technical training has relied heavily on sponsored overseas opportunities, often not meeting national needs. Offering mentoring and hands-on training at the national level can benefit staff and help them achieve targets. MOFF staff engaged in these projects can also be seconded to senior and middle management positions of cooperatives, to ensure smooth transition and formation of cooperatives or corporate entities.

Table 16. Summary of human resource needs and costs.

Project Number	List of Priority Species	Current No of Staff	Demand	Cost
1	Black-lip oysters	7	Board (5), CEO (1); Operation Manager (1), Fieldmen (4)	\$390,000
2	Seaweed	4	Board (5), CEO (1); Operation Managers (2), Fieldmen (8)	\$610,000
3	Black tiger shrimp	0	Board (5), CEO (1); Operation Manager (1), Hatchery Manager (2), Farm Development Manager (2)	\$480,000
4	Pacific white shrimp	3	Hatchery Manager (1), Farm Development Manager (1)	\$140,000
5	Giant river prawn	4	Hatchery Manager (1), Operation Manager (1)	\$140,000
6	Tilapia	5	Board (5), CEO (1); Operation Managers (1), Fieldmen (8)	\$490,000
7	Giant clams	6	Board (5) CEO (1); Operation Manager (1); 1 Engineers & 1 Lab Technicians; 2 Biologist/scientists; 1 Administration support staff; 5 Farm workers and laborers, 1 Environmental specialist.	\$583,000
8	Rock oyster	1	Hatchery Manager (1), Farm Manager (1), Field Officer (1)	\$170,000
9	Mabe	2	Operation Managers (1), Field Officer (1)	\$100,000
10	MOFF ADP Management team		Director Aqua (1), PFOs (3), SFOs (7); Consultant (1)	\$2,600,000.
TOTAL		32	84 new positions	\$5,703,000

6. ADP 2024-2028

Implementation Plan

The implementation plan lays out a timetable for the first three years (Table 17) by which time a corporatization stage is envisaged (2027-2028) where government funding stops and state-owned assets will be transformed, owned and fully controlled by a total of seven cooperatives (Table 18) for the nine priority commodities. The implementation plan lays out the current status, projected value and funding support needed for each of the deliverable targets for the nine priority species by 2028. Each species is then addressed individually with a model farm business plan followed by details of actions required to progress toward production targets and a farmer cooperative business plan.

6.1 Timelines

Development of a realistic timeline with milestones and deadlines for implementation, is key to success. Establishing timelines for tasks and deliverables under this plan (Table 17 on p.35), enables Team MOFF Aquaculture to prioritize work effectively, ensuring timely completion. Benefits include enhanced communication between MOFF management and the Aquaculture team, streamlined progress tracking, improved time management, prioritization of key tasks, and clear goal setting.

6.2 Deliverables

It's crucial for Aquaculture Officers to understand precisely what a deliverable entails, so their team can execute them correctly. When a project goal or target is achieved, deliverables are generated, and the project is deemed successful upon acceptance of these deliverables by the Minister and Cabinet. Table 18 (p.36) provides the list of priority species and outlines the specific project targets to be delivered by December of each year. Table 19 (p.37) summarises the current status, ADP targets, projected value and funding support needed.

Table 17. ADP 2024-2029 Timelines.

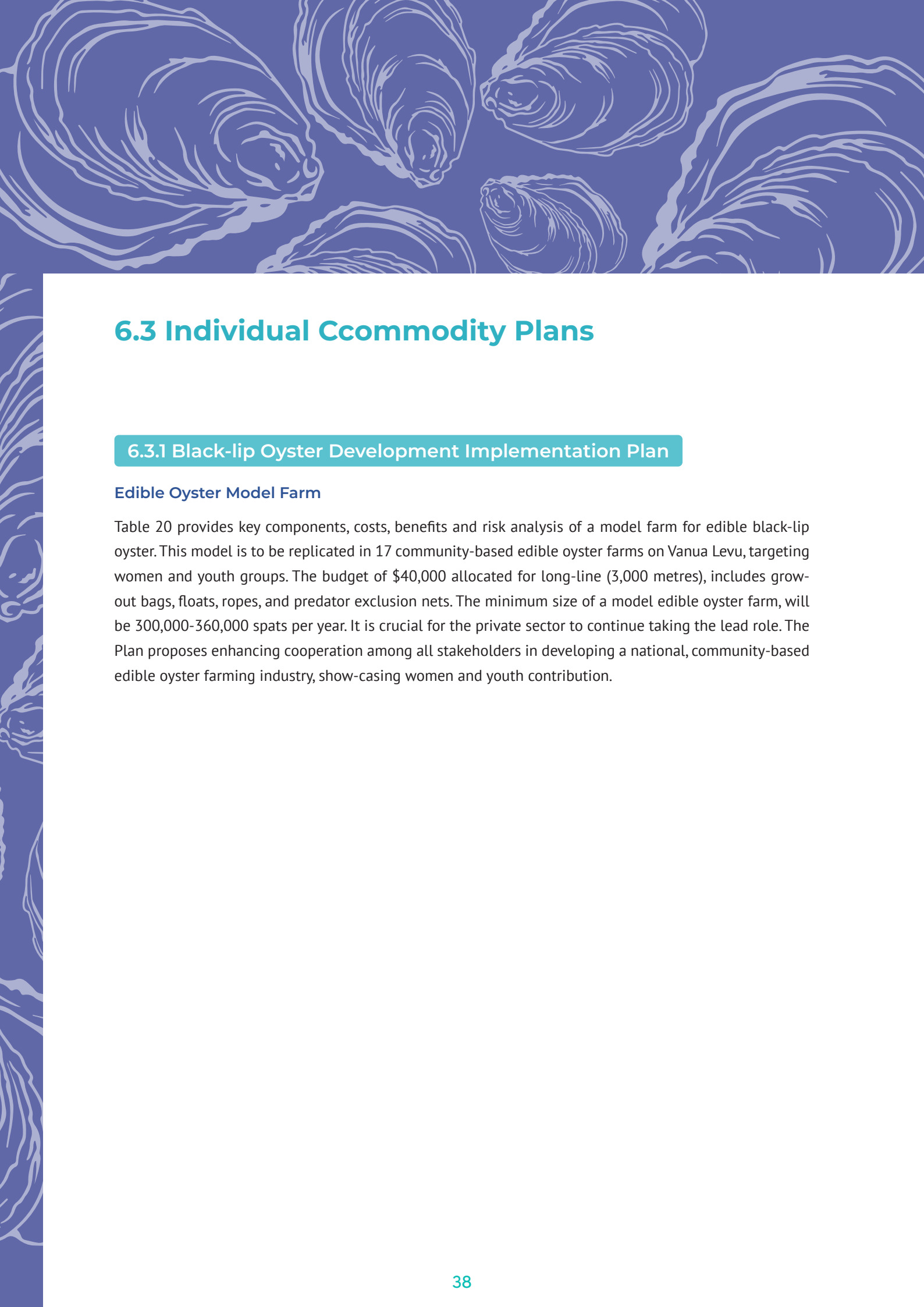
	2024								2025												2026			
	M	J	J	A	S	O	N	D	J	F	M	A	M	J	J	A	S	O	N	D	J	F	M	A
Final Copy of ADP 2024-2029 presented to MOFF, FAO & Partner Agencies																								
ADP 2024-2029 presented to Cabinet for Approval																								
Start Implementation of ADP 2024-2029																								
ADP2024-2029 Staff & Farmer Training - Implementation/ Evaluation/ Progress Reporting/ Deliverables , Identification of commercial farmers																								
Tendering																								
Monthly report on each project implementation/ Achievements/, targets (every month).																								
Quarterly Meetings on Progress of each project (4 times per year)																								
Annual report on deliverables (every January)																								
Recruitment of Director Aquaculture & MOFF Staff																								
Setting up of 6 Cooperatives																								
Setting up of Board of Directors for cooperatives																								
Assistance provided to farmers																								
Md-term Evaluation	November 2026																							
Final Evaluation	November 2028																							

Table 18. Summary of deliverables.

Cooperative	Project Number	Priority Species	Current Status of Annual Production	Deliverable targets					
				Dec 2024	Dec 2025	Dec 2026	Dec 2027	Dec 2028	2028 Target Values
Pearl Oysters	1	Black-lip oysters	▶ 8 x 250,000 spats ▶ 800,000 edible ▶ 115,000 pearls	▶ 8 community farms x 360,000 spats for edibles ▶ 3 farms x 200,000 for round pearls ▶ 2,000spats for mabe	▶ 12 community farms x 360,000 spats for edibles ▶ 3 x 200,000 spats for pearls ▶ 100,000 spat for mabe	▶ 14 farms x 360,000 spats for edibles ▶ 3 x 200,000 pearls ▶ 300,000pcs	▶ 16 community farms x 360,000 spats for edibles ▶ 3 x 200,000 spats for round pearls ▶ 400,000pcs of mabe	▶ 17 community farms x 360,000 spats for edibles/yr ▶ 200,000 spats for round pearls/year ▶ 500,000spats for 50 mabe farmers/year	▶ Edibles = \$15.6million ▶ Round Pearls = \$5.3million ▶ Mabe = \$1.1million ▶ Total = \$22million
	2	Mabe							
Seaweed	3	Seaweed	35.3 mt	70mt	500mt	10,0000mt	20,000mt	40,0000mt	\$60million
Shrimp	4	Black tiger shrimp	16.0 mt						
	5	Pacific white shrimp	6.0 mt	35mt	150mt	350mt	600mt	700mt	\$29.4million
Prawn	6	Giant river prawn	4.7 mt	15mt	30mt	50mt	80mt	Local = 150 mt/yr	\$5million
Tilapia	7	Tilapia	228 mt	300mt	350mt	400mt	500mt	600mt	\$6million
Giant Clams	8	Giant clams	8,413 juveniles	20,000 juveniles	50,000 juveniles	80,000 juveniles	125,000 juveniles	▶ Local=10,000 juveniles/yr ▶ Export =150,000	\$8million
Rock Oysters	9	Rock oyster	0.2 mt	0.3mt	0.4mt	0.8mt	1.2mt	2million spats/yr; 2.5mt	\$1million

Table 19. Summary of the current status, ADP targets, projected value and funding support needed.

Number	List of Priority Species	2022/2023 Current Production Levels	Current Values (\$)	2028 Production Targets	Targeted Value by 2028	Funding requested from Government 2024-2028(\$)
1	Black-lip oysters	▶ 8 x 250,000 spats ▶ 800,000 edible ▶ 115,000 pearls	\$7,450,000	▶ 17 community farms for edible oysters x 360,000 spats/yr ▶ 200,000 pearls/year	▶ Edibles = \$10million ▶ Pearls = \$5.3million ▶ Total = \$15.3million	\$3.8million
2	Seaweed	35.3 mt	\$70,600	36,000 metric tonnes	\$36million	\$2.91million
3	Black tiger shrimp	22.0mt	\$90,2000	▶ Local = 500mt/yr ▶ Export = 350mt/yr	\$42.5million	\$8.458million
4	Pacific white shrimp					
5	Giant river prawn	4.7 mt	\$192,700	Local = 100 mt/yr	\$5million	\$1.146million
6	Tilapia	228 mt	\$2,280,000	Local = 600mt/yr	\$6million	\$2.79million
7	Giant clams	8,413 juveniles	\$210,000	▶ Local=10,000juveniles/yr ▶ Export =150,000	\$8million	\$2.883million
8	Rock oyster	0.2 mt	\$2,400	2million spats/yr	\$1million	\$0.5million
9	Mabe	1,474 pcs	\$2.600	500,000 spats for 50 farms	\$1.1million	\$0.5million
		Total	\$11.11million		\$114.6million	\$23.5million



6.3 Individual Commodity Plans

6.3.1 Black-lip Oyster Development Implementation Plan

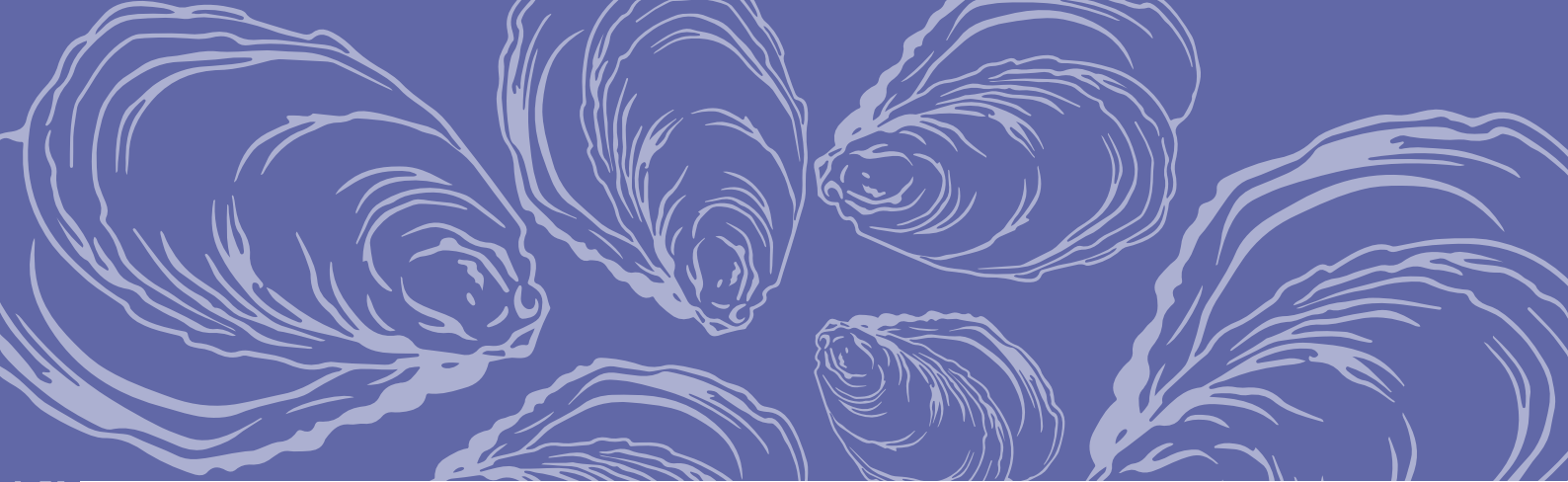
Edible Oyster Model Farm

Table 20 provides key components, costs, benefits and risk analysis of a model farm for edible black-lip oyster. This model is to be replicated in 17 community-based edible oyster farms on Vanua Levu, targeting women and youth groups. The budget of \$40,000 allocated for long-line (3,000 metres), includes grow-out bags, floats, ropes, and predator exclusion nets. The minimum size of a model edible oyster farm, will be 300,000-360,000 spats per year. It is crucial for the private sector to continue taking the lead role. The Plan proposes enhancing cooperation among all stakeholders in developing a national, community-based edible oyster farming industry, show-casing women and youth contribution.

Table 20. Edible (black-lip) oyster model farm business plan 2024-2028.

Activities & Projected Costs		Actual												Projections for 2024 to 2028				
2024 to 2028		Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total 2024	2025	2026	2027	2028
Production targets (300,000 oyster/year)													300000	300000	300000	300000	300000	300000
10,000 dozens per harvest																		
		Capital Cost																
1 x 3,000metres of longline													40000	40000	0	0	0	0
Capital Costs - Subtotal													40000	40000	0	0	0	0
		Revenue																
Sale of edible oyster														\$195,000	\$195,000	\$195,000	\$195,000	\$195,000
		Operational Costs																
Long-line repayments													40000	40000				
Coop membership fees (5,000/yr)														5000	5000	5000	5000	5000
Telephone		56.9	56.9	56.9	56.9	56.9	56.9	56.9	56.9	56.9	56.9	56.9	56.9	682.9	682.9	682.9	682.9	682.9
Travelling & Accomodation							5596.3	2798.2				10200.0		18594.5	18594.5	18594.5	18594.5	18594.5
Accounting Fees		559.3	559.3	559.3	559.3	559.3	559.3	559.3	559.3	559.3	559.3	559.3	559.3	6711.0	6711.0	6711.0	6711.0	6711.0
Bank fees		94.4	94.4	94.4	94.4	94.4	94.4	94.4	94.4	94.4	94.4	94.4	94.4	1132.2	1132.2	1132.2	1132.2	1132.2
Electricity		61.2	61.2	61.2	61.2	61.2	61.2	61.2	61.2	61.2	61.2	61.2	61.2	733.9	733.9	733.9	733.9	733.9
Rural Business License Renewal			632											632	632	632	632	632
Legal fees							1376.3							1376.8	1376.8	1376.8	1376.8	1376.8
boat Expenses		230.1	230.1	230.1	230.1	230.1	230.1	230.1	230.1	230.1	230.1	230.1	230.1	2761.3	2761.3	2761.3	2761.3	2761.3
Printing & Stationeries								40						40	40	40	40	40
Security Charges		200	200	200	200	200	200	200	200	200	200	200	200	10400	10400	10400	10400	10400
Telephone		56.9	56.9	56.9	56.9	56.9	56.9	56.9	56.9	56.9	56.9	56.9	56.9	682.9	682.9	682.9	682.9	682.9
Valuations														454.4	454.4	454.4	454.4	454.4
Wages		4125	4125	4125	4125	4125	4125	4125	4125	4125	4125	4125	4125	49500	49500	49500	49500	49500
Total Expenses														\$178,702	\$98,702	\$98,702	\$98,702	\$98,702
Total Income														\$195,000	\$195,000	\$195,000	\$195,000	\$195,000
Profit/Loss														\$16,298	\$96,298	\$96,298	\$96,298	\$96,298
		Risk Analysis																
10% Drop in sale price/kg							\$-						\$175,500	\$(3,202)	\$1,116,298	\$1,116,298	\$1,116,298	\$1,116,298
15% Drop in sale price							\$-						\$165,750	\$(12,952)	\$67,048	\$67,048	\$67,048	\$67,048
20% Drop in sale price							\$-						\$156,000	\$(22,702)	\$57,298	\$57,298	\$57,298	\$57,298





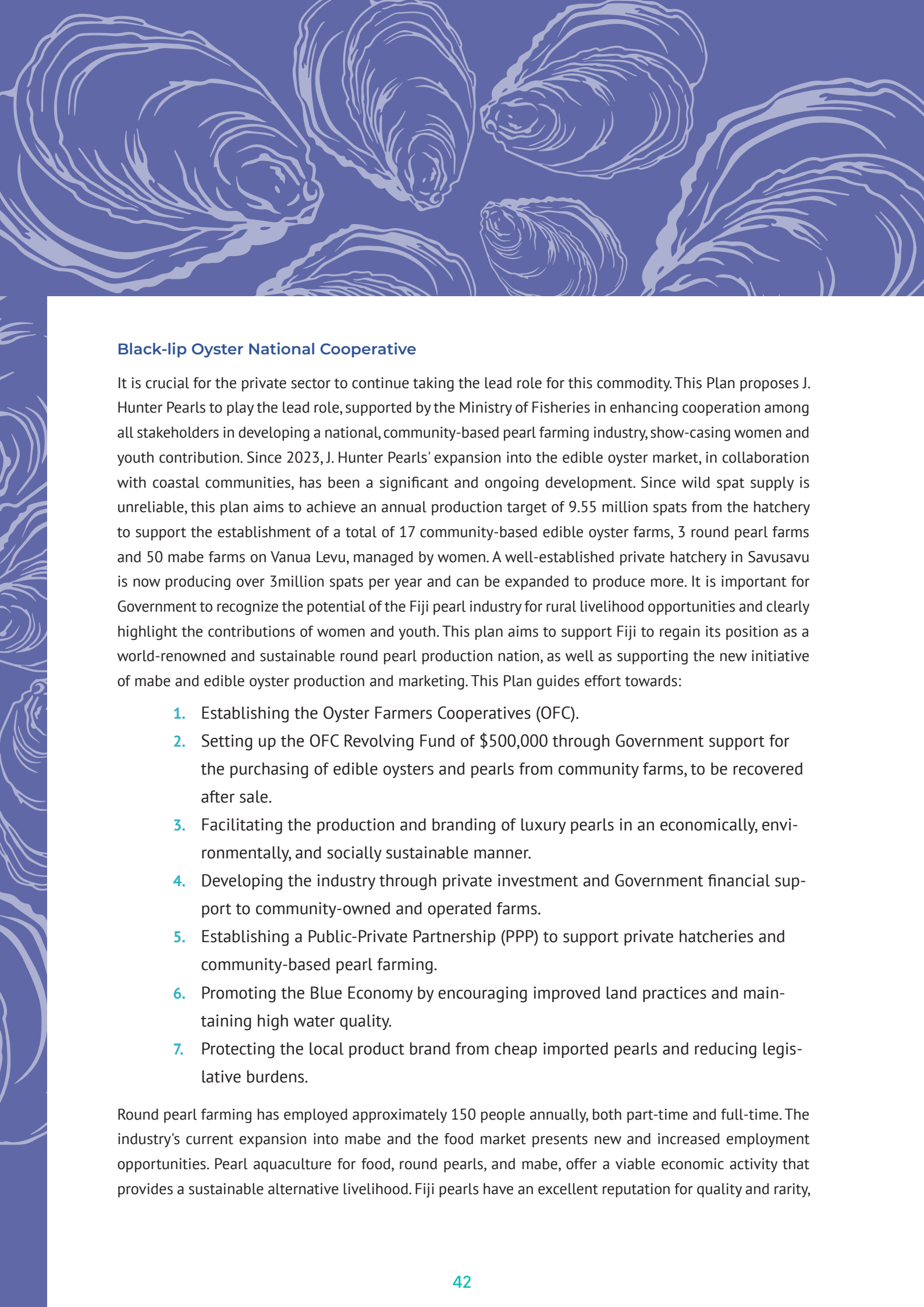
Mabe Model Farm

The mabe model farm is designed to harvest 20,000 pieces of half pearls annually and be marketed at \$4/5 per piece. Edible and mabe oyster farming is to be limited to women and youth groups. Round pearl production to be limited to 200,000 pieces (shared by 4 farms), marketing only 70,000 premium pieces annually under the Fiji brand. Selection criteria for the Fiji brand to be based on rarity, color, high surface quality, size and nacre quality. Edible oyster farmers and Mabe farmers will be part of the black-lip OFC. This cooperative will consist of 17 edible oyster community farms, 4 round pearl farms and 50 mabe pearl farms. Production targets will be relying largely on spats purchased from hatcheries, supplemented by wild supply.

This plan aims to procure 2 million spats annually, supplemented by hatchery sources to support the establishment of 50 community-based farms on Vanua Levu. Private sector leadership and involvement remains crucial, particularly in spat production from the hatchery. The strategy promotes cooperation among stakeholders, acknowledging mabe's potential within Fiji's pearl industry for rural livelihoods, especially for women and youth. To maintain Fiji's reputation for quality pearls, commitment to quality over quantity is essential. Transparency, traceability, and stringent regulations are necessary to uphold luxury standards. Table 21 provides a business plan for a mabe model farm. Including key components, costs, benefits and risk analysis.

Table 21. Mabe model farm business plan 2024–2028.

Activities & Projected Costs		Actual												Projections for 2024 to 2028				
2024 to 2028		Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total 2024	2025	2026	2027	2028
Model Farm target (24,000 spats/ year)													24000	24000	24000	24000	24000	24000
Mabe pearls (20,000/farm/year)													2000	2000	20000	20000	20000	20000
		Capital Cost																
1 x 1,000 meters of longline													12000	\$12,000.0				
Capital Cost- Subtotal													12000	\$12,000.0				
		Revenue																
Sale of mabe pearls													14000	\$14,000.0	\$140,000.0	\$140,000.0	\$140,000.0	\$140,000.0
		Operational Costs																
Long-line repayments													12000	\$12,000.0				
Coop membership fees (5,000/y)														\$5,000.0	\$5,000.0	\$5,000.0	\$5,000.0	\$5,000.0
Telephone		56.9	56.9	56.9	56.9	56.9	56.9	56.9	56.9	56.9	56.9	56.9	56.9	\$682.9	\$682.9	\$682.9	\$682.9	\$682.9
Travelling & Accomodation														\$18,594.5	\$18,594.5	\$18,594.5	\$18,594.5	\$18,594.5
Accounting Fees		599.3	599.3	599.3	599.3	599.3	599.3	599.3	599.3	599.3	599.3	599.3	599.3	\$6,711.0	\$6,711.0	\$6,711.0	\$6,711.0	\$6,711.0
Bank Fees		94.4	94.4	94.4	94.4	94.4	94.4	94.4	94.4	94.4	94.4	94.4	94.4	\$1,132.2	\$1,132.2	\$1,132.2	\$1,132.2	\$1,132.2
Electricity		61.2	61.2	61.2	61.2	61.2	61.2	61.2	61.2	61.2	61.2	61.2	61.2	\$733.9	\$733.9	\$733.9	\$733.9	\$733.9
Rural Business Licensse Renewal														\$632.0	\$632.0	\$632.0	\$632.0	\$632.0
Legal Fees														\$1,376.8	\$1,376.8	\$1,376.8	\$1,376.8	\$1,376.8
Boat Expense		230.1	230.1	230.1	230.1	230.1	230.1	230.1	230.1	230.1	230.1	230.1	230.1	\$2,761.3	\$2,761.3	\$2,761.3	\$2,761.3	\$2,761.3
Printing & Stationaires														40	40	40	40	40
Security Changes		200	200	200	200	200	200	200	200	200	200	200	200	\$10,400.0	\$10,400.0	\$10,400.0	\$10,400.0	\$10,400.0
Telephone		56.9	56.9	56.9	56.9	56.9	56.9	56.9	56.9	56.9	56.9	56.9	56.9	\$682.9	\$682.9	\$682.9	\$682.9	\$682.9
Valuations														\$454.4	\$454.4	\$454.4	\$454.4	\$454.4
Wages		4125	4125	4125	4125	4125	4125	4125	4125	4125	4125	4125	4125	\$49,500.0	\$49,500.0	\$49,500.0	\$49,500.0	\$49,500.0
Total Expenses														\$122,701.8	\$98,701.8	\$98,701.8	\$98,701.8	\$98,701.8
Total Income														\$14,000.0	\$140,000.0	\$140,000.0	\$140,000.0	\$140,000.0
Profit/Loss														\$(108,701.8)	\$41,298.2	\$41,298.2	\$41,298.2	\$41,298.2
		Risk Analysis																
10% Drop in Sale Price/kg														-\$110,101.8	\$27,298.2	\$27,298.2	\$27,298.2	\$27,298.2
15% Drop in Sale price														-\$106,396.6	\$20,298.2	\$20,298.2	\$20,298.2	\$20,298.2
20% Drop in Sale price														-\$111,501.8	\$13,298.2	\$13,298.2	\$13,298.2	\$13,298.2

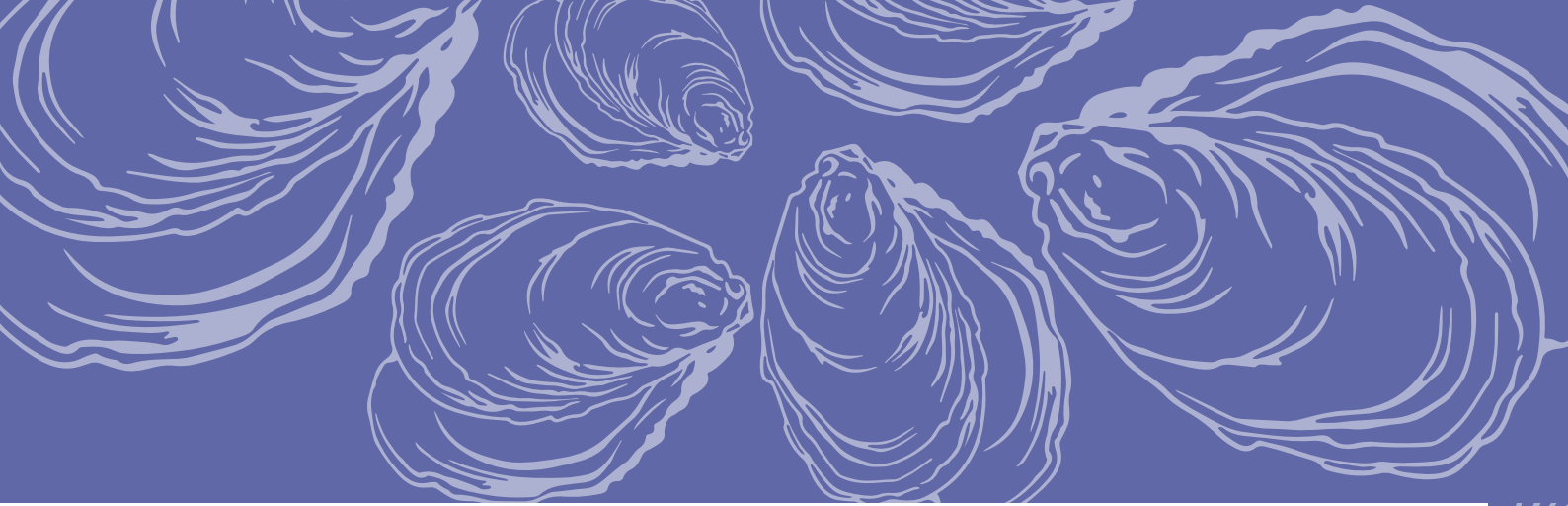


Black-lip Oyster National Cooperative

It is crucial for the private sector to continue taking the lead role for this commodity. This Plan proposes J. Hunter Pearls to play the lead role, supported by the Ministry of Fisheries in enhancing cooperation among all stakeholders in developing a national, community-based pearl farming industry, show-casing women and youth contribution. Since 2023, J. Hunter Pearls' expansion into the edible oyster market, in collaboration with coastal communities, has been a significant and ongoing development. Since wild spat supply is unreliable, this plan aims to achieve an annual production target of 9.55 million spats from the hatchery to support the establishment of a total of 17 community-based edible oyster farms, 3 round pearl farms and 50 mabe farms on Vanua Levu, managed by women. A well-established private hatchery in Savusavu is now producing over 3million spats per year and can be expanded to produce more. It is important for Government to recognize the potential of the Fiji pearl industry for rural livelihood opportunities and clearly highlight the contributions of women and youth. This plan aims to support Fiji to regain its position as a world-renowned and sustainable round pearl production nation, as well as supporting the new initiative of mabe and edible oyster production and marketing. This Plan guides effort towards:

1. Establishing the Oyster Farmers Cooperatives (OFC).
2. Setting up the OFC Revolving Fund of \$500,000 through Government support for the purchasing of edible oysters and pearls from community farms, to be recovered after sale.
3. Facilitating the production and branding of luxury pearls in an economically, environmentally, and socially sustainable manner.
4. Developing the industry through private investment and Government financial support to community-owned and operated farms.
5. Establishing a Public-Private Partnership (PPP) to support private hatcheries and community-based pearl farming.
6. Promoting the Blue Economy by encouraging improved land practices and maintaining high water quality.
7. Protecting the local product brand from cheap imported pearls and reducing legislative burdens.

Round pearl farming has employed approximately 150 people annually, both part-time and full-time. The industry's current expansion into mabe and the food market presents new and increased employment opportunities. Pearl aquaculture for food, round pearls, and mabe, offer a viable economic activity that provides a sustainable alternative livelihood. Fiji pearls have an excellent reputation for quality and rarity,



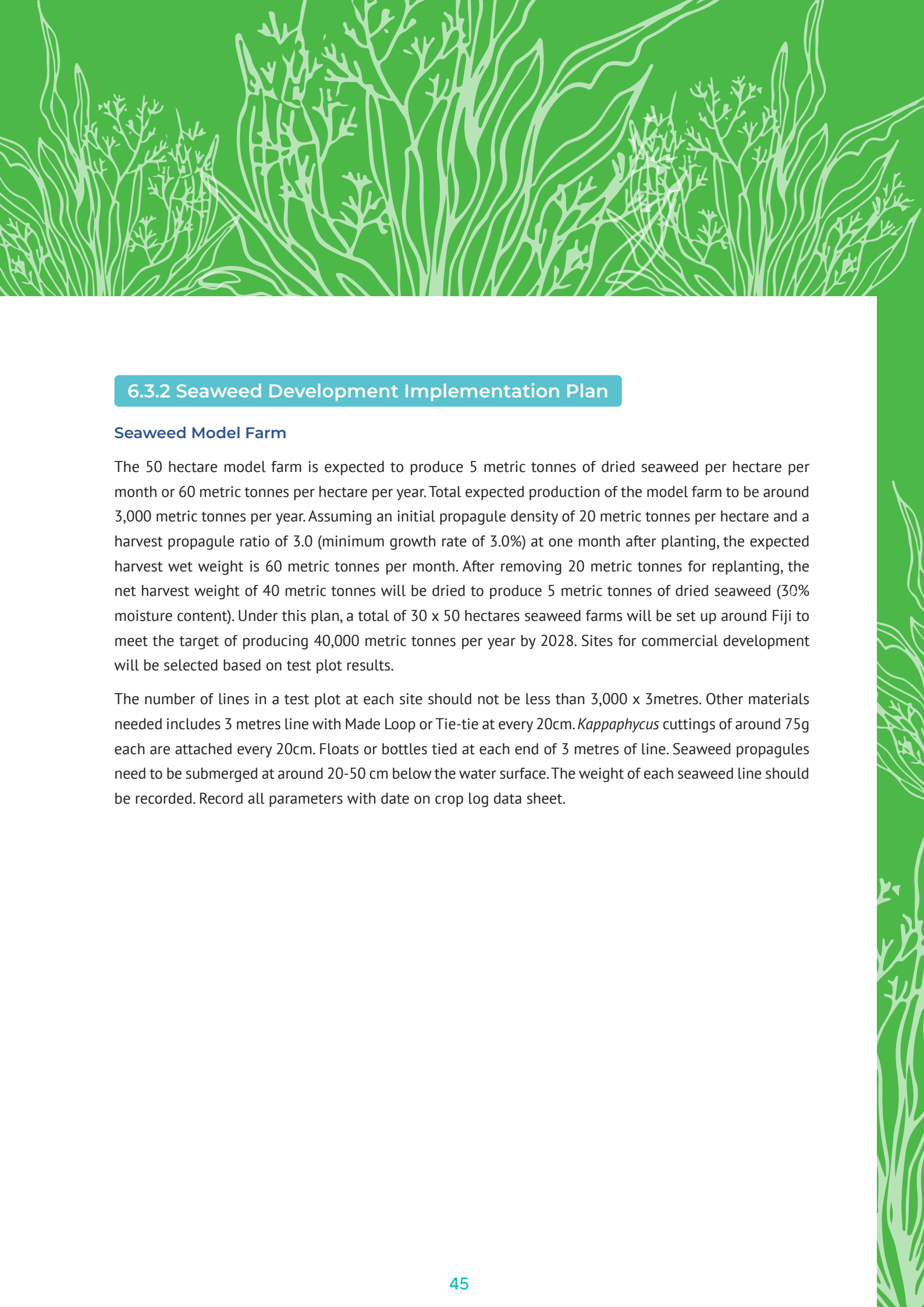
commanding comparatively high prices. Ongoing commitment to quality over quantity is essential to maintain this reputation. Practices such as mass production methods and unfair trade practices must be avoided. Transparency, product disclosure, and full chain of custody are necessary to preserve the luxury status of Fiji pearls. The success of pearl farming in Fiji depends on a pristine marine environment. Transparency and accountability in value chains and traceability of pearl origins are essential to promote confidence and trust within the industry. Pearl farming should be promoted as a community-based blue economy activity, resulting in high-quality edibles and world-class pearl quality with unique rarity and luxury. Furthermore, black-lip oyster farming as an edible and export commodity should also be promoted as a community-based blue economy activity.

To support these initiatives, the Ministry of Fisheries must revise the Fiji Aquaculture Bill to provide the necessary framework for implementation. The bill should protect local products and describe processes for establishing cooperatives and governing boards. Additionally, the Ministry should allocate funding to the black-lip OFC Board of Directors and support training programmes for local farmers. By implementing these measures, Fiji can strengthen its pearl industry and contribute to sustainable economic development.

Currently, community farms rely on wild spat collection. Unfortunately, wild spatfalls and supply are inconsistent and cannot meet the demands of farmers. A private hatchery at Savusavu has been producing reliable numbers of spats annually and has the capacity to supply 8.12 million spats to 17 community edible oyster farms and 50 mabe farms. Under this plan, the Ministry of Fisheries is responsible for bridging the gap between community farms and the private hatchery. Through a PPP arrangement and the seven activities outlined above, Fiji can regain its position as a world-renowned sustainable round pearl production nation, as well as internationally recognised edible oyster production nation.

Table 22. Pearl oyster farmers' cooperative business plan 2024-2028.

Activities & Projected Costs		Actual							Projections for 2024 to 2028									
2024 to 2028		Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total 2024	2025	2026	2027	2028
Production targets																		
Number of spats (spats) x 3,000metre line							-					1800000	-	1,800,000	2,700,000	6,760,000	7,300,000	8,550,000
Number of edible oysters (120,000pcs/week)												480000	480000	960,000	5,760,000	8,160,000	8,160,000	8,160,000
Number of round pearls (pcs)														40,000	100,000	120,000	150,000	200,000
Number mabe pearls (pcs)														2,000	400,000	600,000	800,000	1,000,000
Number of Community Edible farms														8	12	14	16	17
Number of Mabe farms														12	20	30	40	50
Capital Cost																		
Hatchery construction materials (1)											50,000			50,000	50,000	-	-	-
Procurement of equipments & farm materials													50000	50,000	50,000	-	-	-
Setting up of 17 community farm for edibles													800,000	800,000	400,000	200,000	200,000	100,000
Setting up of 38 community farm for mabe													15,000	15,000	228,000			
OFC Board establishment cost														-	-	490,000		-
Capital Costs - Subtotal														915,000	728,000	690,000	200,000	100,000
Farmgate price of Products																		
Edible oysters (12/dozen)														960,000	5,760,000	8,160,000	8,160,000	8,160,000
Mabe4/5(pcs)														8,000	1,600,000	2,400,000	3,200,000	4,000,000
Round pearls (25/pcs)														1,000,000	2,500,000	3,000,000	3,750,000	5,000,000
Export price for edibles (24/dozen)														2,880,000	4,320,000	5,040,000	5,760,000	6,120,000
Revenue & Revolving Fund																		
Recovery of cost of edibles bought from farmers							-							960,000	1,440,000	1,680,000	1,920,000	2,040,000
Farming materials supplied														3,600,000	5,400,000	6,300,000	7,200,000	7,650,000
OFC membership fees (5000/each/year)														40,000.0	60,000.0	70,000.0	80,000.0	85,000.0
Revenue Total														4,600,000	6,900,000	8,050,000	9,200,000	9,775,000
Operational Costs																		
Marketing							-			50,000		50,000		100,000	100,000	100,000	100,000	100,000
Rent & Rates		1,200	1,200	1,200	1,200	1,200	1,200	1,200	1,200	1,200	1,200	1,200	1,200	11,881	11,881	11,881	11,881	11,881
Telephone		56.9	56.9	56.9	56.9	56.9	56.9	56.9	56.9	57	57	57	57	683	683	683	683	683
Travelling & Accomodation							2,596.3	2,798.2				2,200		7,594	18,594	18,594	18,594	18,594
Depuration									10,000	10,000	10,000	10,000	10,000	50,000	120,000	120,000	120,000	120,000
OFC Board Expenses																55,000	55,000	55,000
Community Training								7,000						7,000.0	7,000	7,000	7,000	7,000
Staff Wages & salary											12,000	12,000	59,000	83,000.0	583,000	583,000	490,000	490,000
Staff Training									12,000					12,000.0	12,000.0	12,000.0	12,000.0	12,000.0
Total Operational Cost														272,158	853,158	908,158	815,158	815,158
Total Expenses														1,187,158	1,581,158	1,598,158	1,015,158	915,158
Total Income														4,600,000	6,900,000	8,050,000	9,200,000	9,775,000



6.3.2 Seaweed Development Implementation Plan

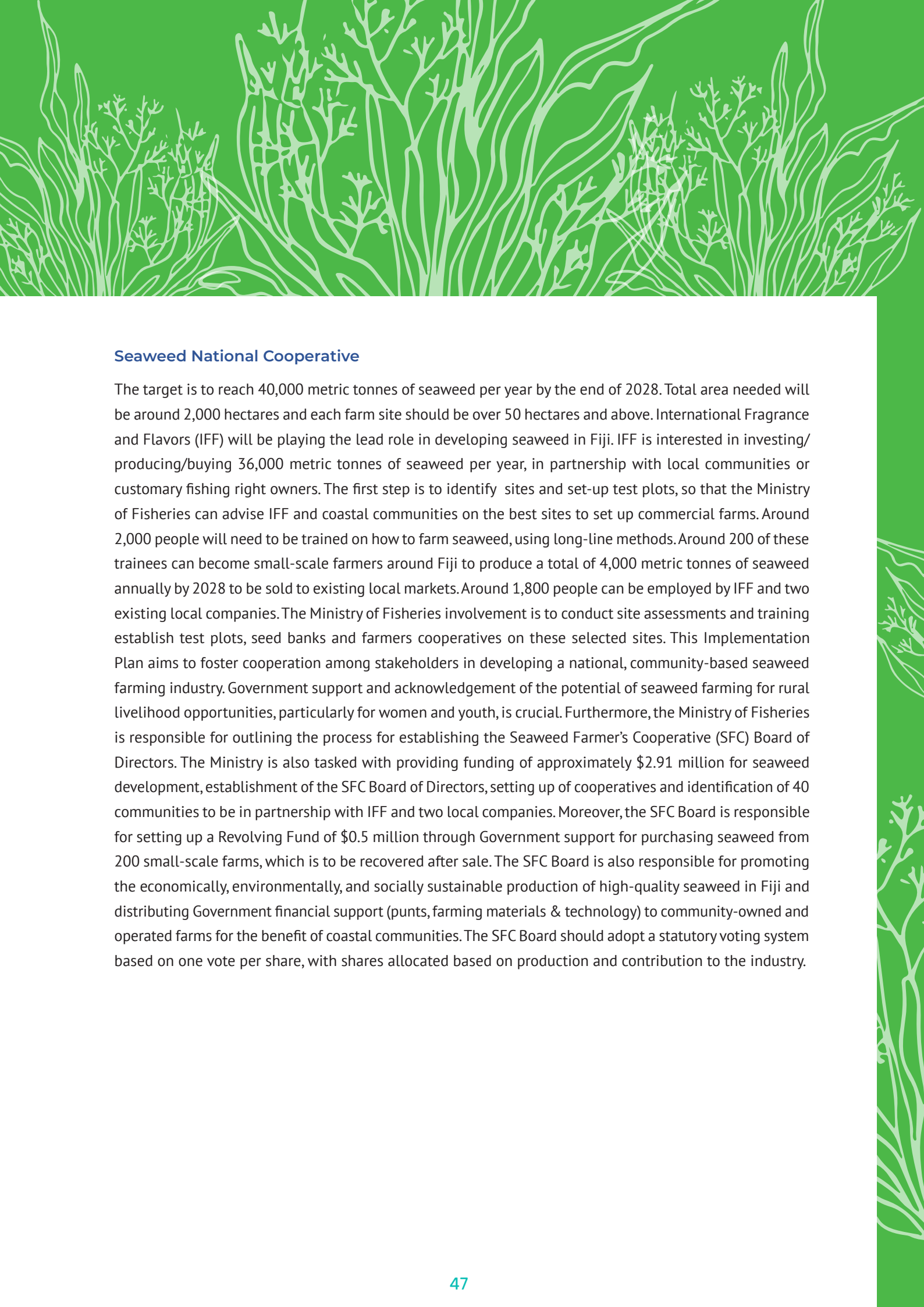
Seaweed Model Farm

The 50 hectare model farm is expected to produce 5 metric tonnes of dried seaweed per hectare per month or 60 metric tonnes per hectare per year. Total expected production of the model farm to be around 3,000 metric tonnes per year. Assuming an initial propagule density of 20 metric tonnes per hectare and a harvest propagule ratio of 3.0 (minimum growth rate of 3.0%) at one month after planting, the expected harvest wet weight is 60 metric tonnes per month. After removing 20 metric tonnes for replanting, the net harvest weight of 40 metric tonnes will be dried to produce 5 metric tonnes of dried seaweed (30% moisture content). Under this plan, a total of 30 x 50 hectares seaweed farms will be set up around Fiji to meet the target of producing 40,000 metric tonnes per year by 2028. Sites for commercial development will be selected based on test plot results.

The number of lines in a test plot at each site should not be less than 3,000 x 3metres. Other materials needed includes 3 metres line with Made Loop or Tie-tie at every 20cm. *Kappaphycus* cuttings of around 75g each are attached every 20cm. Floats or bottles tied at each end of 3 metres of line. Seaweed propagules need to be submerged at around 20-50 cm below the water surface. The weight of each seaweed line should be recorded. Record all parameters with date on crop log data sheet.

Table 23. Commercial seaweed model farm business plan.

Activities & Projected Costs			Actual												Projections for 2024 to 2028					
2024 to 2028			Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total 2024	2025	2026	2027	2028	
Production targets																				
Dry seaweed (mt)								-			35			35	-	70	500	1,000	2,000	3,000
Farm expansion (ha)																0.5	8	17	34	50
Capital Cost																				
Setting up of test plots															2,000	2,000	10,000			
Procurement of equipments & farm materials														6000	6,000	6,000	\$-	-	\$-	\$-
SFC Board membership cost															-	-	\$10,000.0			\$-
Capital Costs - Subtotal															\$8,000	\$16,000	\$10,000	\$-		\$-
Income of SFC																				
Dry seaweed (\$\$1.5/kg)															\$70,000	\$500,000	\$1,000,000	\$2,000,000		\$3,000,000
Revenue																				
Marketing of seaweed								\$-							70,000	500,000	1,000,000	2,000,000		3,000,000
Revenue Total															\$70,000	500,000	1,000,000	2,000,000		3,000,000
Operational Costs																				
Supply of farming materials								\$-						\$5,000		10,000	10,000	10,000	10,000	10,000
Rent & Rates			\$400	\$400	\$400	\$400	\$400	\$400	\$400	\$400	\$400	\$400	\$400	\$400	\$400	\$4,800.0	\$4,800.0	\$4,800.0	\$4,800.0	\$4,800.0
Telephone			\$56.9	\$56.9	\$56.9	\$56.9	\$56.9	\$56.9	\$56.9	\$56.9	\$56.9	\$56.9	\$56.9	\$56.9	\$56.9	\$682.9	\$682.9	\$682.9	\$682.9	\$682.9
Travelling & Accomodation								\$2,596.3	\$2,798.2					\$2,200	\$7,594.5	\$18,594.5	\$18,594.5	\$18,594.5	\$18,594.5	\$18,594.5
Extension services costs										\$10,000	\$10,000	\$10,000	\$10,000	\$10,000	\$50,000.0	\$120,000	\$120,000.0	\$120,000.0	\$120,000.0	
Staff Wages & salary (5 people)												\$8,000	\$8,000	\$8,000	\$24,000.0	\$96,000	\$96,000	\$96,000	\$96,000	
Staff Training										\$1,000					\$1,000.0	\$1,000	\$1,000	\$1,000	\$1,000	
Total Operational Cost															\$98,077	251,077	251,077	251,077	251,077	\$251,077.4
Total Expenses															\$106,077	267,077	251,077	251,077	251,077	\$251,077.4
Total Income															\$70,000	500,000	1,000,000	2,000,000	3,000,000	
Profit margin															\$(36,077)	\$232,923	\$748,923	\$1,748,923		\$2,748,923
Risk Analysis																				
10% Drop in sale price/kg															\$(43,077)	\$182,923	\$648,923	\$1,548,923		\$2,448,923
15% Drop in sale price															\$(46,577)	\$157,923	\$598,923	\$1,448,923		\$2,298,923
20% Drop in sale price															\$(50,077)	\$132,923	\$548,923	\$1,348,923		\$2,148,923



Seaweed National Cooperative

The target is to reach 40,000 metric tonnes of seaweed per year by the end of 2028. Total area needed will be around 2,000 hectares and each farm site should be over 50 hectares and above. International Fragrance and Flavors (IFF) will be playing the lead role in developing seaweed in Fiji. IFF is interested in investing/producing/buying 36,000 metric tonnes of seaweed per year, in partnership with local communities or customary fishing right owners. The first step is to identify sites and set-up test plots, so that the Ministry of Fisheries can advise IFF and coastal communities on the best sites to set up commercial farms. Around 2,000 people will need to be trained on how to farm seaweed, using long-line methods. Around 200 of these trainees can become small-scale farmers around Fiji to produce a total of 4,000 metric tonnes of seaweed annually by 2028 to be sold to existing local markets. Around 1,800 people can be employed by IFF and two existing local companies. The Ministry of Fisheries involvement is to conduct site assessments and training establish test plots, seed banks and farmers cooperatives on these selected sites. This Implementation Plan aims to foster cooperation among stakeholders in developing a national, community-based seaweed farming industry. Government support and acknowledgement of the potential of seaweed farming for rural livelihood opportunities, particularly for women and youth, is crucial. Furthermore, the Ministry of Fisheries is responsible for outlining the process for establishing the Seaweed Farmer's Cooperative (SFC) Board of Directors. The Ministry is also tasked with providing funding of approximately \$2.91 million for seaweed development, establishment of the SFC Board of Directors, setting up of cooperatives and identification of 40 communities to be in partnership with IFF and two local companies. Moreover, the SFC Board is responsible for setting up a Revolving Fund of \$0.5 million through Government support for purchasing seaweed from 200 small-scale farms, which is to be recovered after sale. The SFC Board is also responsible for promoting the economically, environmentally, and socially sustainable production of high-quality seaweed in Fiji and distributing Government financial support (punts, farming materials & technology) to community-owned and operated farms for the benefit of coastal communities. The SFC Board should adopt a statutory voting system based on one vote per share, with shares allocated based on production and contribution to the industry.

Table 24. Seaweed farmers' cooperative business plan 2024-2028.

Activities & Projected Costs				Actual												Projections for 2024 to 2028					
				Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total 2024	2025	2026	2027	2028	
				Production targets																	
Dry seaweed (mt)									-			35			35	-	70	500	10,000	20,000	40,000
Number of commercial community farms																3	10	20	30	40	
Number of individual farms																20	500	1,500	2,000	2,500	
				Capital Cost																	
Setting up of test plots														50,000			50,000	150,000	\$-	-	\$-
Procurement of equipments & farm materials																150000		140,000	\$-	-	\$-
Setting up of 30 community farm (50 hectares eah)																30,000		360,000			
OFC Board establishment cost																-	-	\$610,000.0			\$-
Capital Costs - Subtotal																	\$230,000	\$650,000	\$610,000	\$-	\$-
				Income of SFC																	
Dry seaweed (\$\$1.5/kg)																	\$105,000	\$750,000	\$150,000,000	\$30,000,000	\$60,000,000
				Revenue & Revolving Fund																	
Marketing of seaweed purchased from small farmers									\$-								105,000	750,000	2,250,000	3,750,000	6,000,000
Recovery of costs of farming materials supplied																	\$30,000	\$100,000	\$100,000	\$100,000	\$100,000
SFC commercial farms membership fees (\$5000/each/year)																	\$15,000	\$50,000	\$100,000	\$150,000	\$200,000
Revenue Total																	\$150,000	900,000	2,450,000	4,000,000	6,300,000
				Operational Costs																	
Supply of farming materials									\$-				\$50,000				\$100,000	100,000	100,000	100,000	100,000
Rent & Rates				\$1,200	\$1,200	\$1,200	\$1,200	\$1,200	\$1,200	\$1,200	\$1,200	\$1,200	\$1,200	\$1,200	\$1,200	\$1,200	\$11,881	\$11,881	\$11,881	\$11,881	\$11,881
Telephone				\$56.9	\$56.9	\$56.9	\$56.9	\$56.9	\$56.9	\$56.9	\$56.9	\$56.9	\$56.9	\$56.9	\$56.9	\$56.9	\$683	\$683	\$683	\$683	\$683
Travelling & Accomodation									\$2,596	\$2,798					\$2,200		\$7,594	\$18,594	\$18,594	\$18,594	\$18,594
Extension services costs											\$10,000	\$10,000	\$10,000	\$10,000	\$10,000	\$10,000	\$50,000	\$120,000	\$120,000	\$120,000	\$120,000
SFC Board Expenses																		\$55,000	\$55,000	\$55,000	\$55,000
Community Training										\$7,000							\$7,000.0	\$7,000	\$7,000	\$7,000	\$7,000
Staff Wages & salary																	\$83,000.0	\$583,000	\$583,000	\$490,000	\$490,000
Staff Training											\$12,000						\$12,000.0	\$12,000.0	\$12,000.0	\$12,000.0	\$12,000.0
Total Operational Cost																	\$272,158	853,158	908,158	815,158	\$815,158.0
Total Expenses																	\$502,158	1,503,158	908,158	815,158	\$815,158.0
Total Income																	\$150,000	900,000	2,450,000	4,000,000	6,300,000
Profit																	\$(352,158)	\$(603,158)	\$1,541,842	\$3,184,842	\$5,484,842

6.3.3 Shrimp Farming Implementation Plan

Shrimp Model Farm

This Plan is promoting a minimum farm size of 7 x 1-acre ponds. To minimize operational costs in shrimp farming, it is important that proper control system is used when conducting site selection and constructing shrimp ponds. Heavy equipment needed in constructing shrimp ponds include: digger (for dyke construction, canal digging and deepening), bulldozer (for levelling provided the load bearing capacity of the soil can support the weight) and dump truck (effectively where soil conditions permit).



Figure 7. Measuring, marking and pegging pond bottom, dyke slope and top ready for construction.

Clearing of thick vegetation is expensive and the cost depends on the site locality and density of vegetative cover. After constructing the pond, it is important that soil pH analysis is conducted to determine lime and fertilizer requirement. King Prawn (Fiji) Limited shrimp farm will be used as a model in this plan.



Figure 8. Construction of pond bottom and dyke supervised by Thushan Gunasena, Director KPFL.



Figure 9. King Prawn (Fiji) Ltd shrimp farm design.

Draining of pond water should be controlled through a sluice gate, which is constructed of concrete. Opening or door of sluice gate are around 1.0 to 1.2 meter wide so that it is easy to manage.



Figure 10. Pictures of the inner, middle and outer sections of a concrete sluice gate at KPFL farm.

The main canal bed should be at least 3 meters wide and 1.6 meters high. Fiji's average tidal range is about 1.2 meters, and this will allow a free board of 0.4 meters. Such width is enough to supply 10–15 hectares. The slope of the main canal dykes should have a ratio of 1:1 slope. Mechanical levelling is cheaper and faster than manual levelling if the soil condition will support the equipment.

Table 25 provides key components of a shrimp model farm business plan. This model farm for shrimp focuses on intensive farming method, with high stocking density, targeting to produce a minimum of 2.5 metric tonnes per acre per cycle or 5 metric tonnes per acre per year. Out of 7 ponds, a total of 35 metric tonnes of shrimp will be produced in a year. Based on this model, a total area of 140 acres and at least 20 commercial farms should be established to produce 700 metric tonnes of shrimp in a year.

Table 25. Shrimp model farm business plan 2024-2028.

Activities & Projected Costs 2024 to 2028	Actual												Projections for 2024 to 2028				
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total 2024	2025	2026	2027	2028
Production targets (7 x 1 acre ponds)																	
Large Shrimp (mt) by 2 cycles per year						15						15	30	35	35	35	35
Capital Cost																	
Construction of 7 x 1 acre ponds												40000	40000	0	0	0	0
Procurement of Farm Equipments (30) farms)												10000	10000	2000	2000	2000	2000
Capital Costs - Subtotal												350000	450000	110000	2000	2000	2000
Revenue																	
Sale of large shrimps (45/kg)						675000						675000	1350000	1575000	1575000	1575000	1575000
Operational Costs																	
PLs repayments (1,011,500*0.09/cycle)						91035						91035	182070	182027	182027	182027	182027
Coop membership fees (5,000/yr)						126750						126750	253500	5000	5000	5000	5000
Feed repayment (\$6.50/kg)						7000	7000	7000	7000	7000	7000	7000	84000	253500	253500	253500	253500
Loan Reyments	7000	7000	7000	7000	7000	1200	1200	1200	1200	1200	1200	1200	84000	84000	84000	84000	84000
Rent & Rates	1200	1200	1200	1200	1200	56.9	56.9	56.9	56.9	56.9	56.9	56.9	11880.6	11880.6	11880.6	11880.6	11880.6
Telephone	56.9	56.9	56.9	56.9	56.9	5596.3	2798.2						682.9	682.9	682.9	682.9	682.9
Travelling & Accomodation						12500	12500	12500	12500	12500	12500	10200	18594.5	18594.5	18594.5	18594.5	18594.5
Wages	12500	12500	12500	12500	12500	1500	1500	1500	1500	1500	1500	12500	150000	150000	150000	150000	150000
Electricity	1500	1500	1500	1500	1500	559.3	559.3	559.3	559.3	559.3	559.3	559.3	18000	18000	18000	18000	18000
Accounting Fees	559.3	559.3	559.3	559.3	559.3	94.4	94.4	94.4	94.4	94.4	94.4	94.4	6711.0	6711.0	6711.0	6711.0	6711.0
Bank fees	94.4	94.4	94.4	94.4	94.4	4167	4167	4167	4167	4167	4167	4167	50000	50000	50000	50000	50000
Directors Wages	4166.7	4167	4167	4167	4167	61.2	61.2	61.2	61.2	61.2	61.2	61.2	733.9	733.9	733.9	733.9	733.9
Electricity	61.2	61.2	61.2	61.2	61.2	1376.3							632	632	632	632	632
Rural Business License Renewal						230.1	230.1	230.1	230.1	230.1	230.1	230.1	1376.8	1376.8	1376.8	1376.8	1376.8
Legal fees	230.1	230.1	230.1	230.1	230.1	40	40	40	40	40	40	40	2761.3	2761.3	2761.3	2761.3	2761.3
Motor Vehicle Expenses	200	200	200	200	200	56.9	56.9	56.9	56.9	56.9	56.9	56.9	10400	10400	10400	10400	10400
Printing & Stationeries	56.9	56.9	56.9	56.9	56.9	200	200	200	200	200	200	200	682.9	682.9	682.9	682.9	682.9
Security Charges						18594.5	2798.2				10200		18594.5	18594.5	18594.5	18594.5	18594.5
Telephone						454.4	454.4	454.4	454.4	454.4	454.4	454.4	49500	49500	49500	49500	49500
Travelling & Accomodation	4125	4125	4125	4125	4125	75000							150000	150000	150000	150000	150000
Valuations													\$1,466,747	\$1,016,704	\$1,018,704	\$1,018,704	\$1,018,704
Wages													\$1,350,000	\$1,575,000	\$1,575,000	\$1,575,000	\$1,575,000
Shrimp Feed													\$(116,747)	\$558,296	\$556,296	\$556,296	\$556,296
Total Expenses																	
Total Income																	
Profit/Loss																	
Risk Analysis																	
10% Drop in sale price/kg						\$607,500							\$607,500	\$198,296	\$196,296	\$196,296	\$196,296
15% Drop in sale price						\$573,750							\$573,750	\$130,796	\$128,796	\$128,796	\$128,796
20% Drop in sale price						\$540,000							\$540,000	\$63,296	\$61,296	\$61,296	\$61,296



Shrimp Farmers National Cooperative

King Prawn (Fiji) Ltd will be the model farm for *P. monodon* and Seapac Limited, for *L. vannamei* shrimp. This Plan reflects the Ministry of Fisheries' recognition of the trade deficit in shrimp or marine prawns and the potential of shrimp farming as a rural livelihood opportunity, especially for women and youth. The goal is to help local farmers produce a minimum of 700 metric tonnes of marine shrimps per year by 2028, to halt importation and export surplus. Currently, Fiji imports around 300 metric tonnes of shrimp products annually, valued at around \$12.6 million. The main challenges are consistent supply of PLs to farmers and the high level of investment needed to start a shrimp farm. Presently, only three companies are farming shrimp commercially in Fiji: Seapac Ltd and Tide Aquaculture Ltd farm Pacific white prawn, while King Prawn (Fiji) Ltd farms black-tiger prawn.

King Prawn (Fiji) Ltd, the sole local PL producer, generated approximately 16 metric tonnes of shrimp in three ponds covering three acres in a four-month cycle in 2023. In addition, King Prawns (Fiji) Limited, has the capacity to supply 12million PLs per year to farmers, from their hatchery. Following this model, at least five (5) hatcheries and 20 more commercial farms are required, covering a total area of 140 acres, to produce the target 700 metric tonnes.

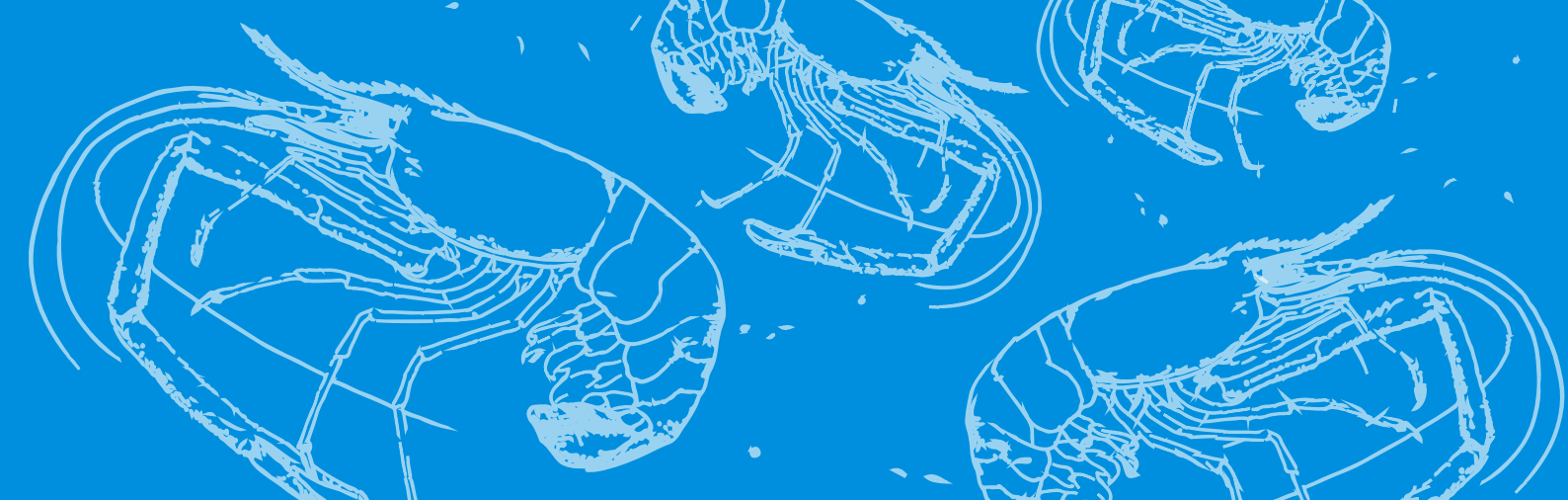
Over the years, the Ministry of Fisheries has identified local interest in investing in black-tiger prawn farming on the dry-side of Fiji, and Pacific white prawn or vannamei farming on the wet-side. Over 50% of interested farmers are indigenous communities or groups. Enhancing cooperation among stakeholders is crucial for developing a national, community-based shrimp farming industry in Fiji.

Government involvement in this plan is crucial. The Ministry of Fisheries will be responsible for developing and distributing government financial support (PLs, feed, farming materials, equipment, machinery, construction of ponds, and hatcheries) to individuals or community-owned farms in the initial three years. Site assessments will be conducted to identify suitable sites on Vanua Levu and Viti Levu, and farmers will be trained accordingly. Five local hatcheries will be set up to produce 51 million PLs per year by 2028. The total cost of implementing this project is around \$8.458 million over five years. A revolving fund will be established for supplying feed and PLs, purchasing shrimp from community farms, and recovering costs after sale. By the end of the third year, the operation will be corporatized, and management transferred to the Shrimp Farmer's Cooperative (SFC) Board of Directors to elevate the project to an industry level. The SFC Board will be responsible for production, marketing, and ensuring sustainability.

Table 26. Shrimp farmers' cooperative business plan 2024-2028.

Activities & Projected Costs		Actual												Projections for 2024 to 2028				
2024 to 2028		Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total 2024	2025	2026	2027	2028
Production targets																		
Number of commercial shrimp farms														3	6	12	15	20
Post-larvae (pcs)											900000			900,000	7,500,000	17,500,000	30,000,000	42,500,000
Large Shrimp (mt)						17							18	35	150	350	600	700
Feed (mt)						22.1							23.4	45.5	180	420	720	840
Capital Cost																		
Rehabilitation of 1 40 x 1acre ponds												\$-		\$-	\$110,000.0			
Hatchery onstruction materials (1 set)											\$100,000.0			\$100,000.0		\$-	\$-	\$-
Procurement of Farm Equipments (20) farms)													350000	\$350,000.0	\$-	\$-	\$-	\$-
Estalishment of Shrimp Farmers Coop Board														\$-	\$-	\$480,000.0		\$-
Capital Costs - Subtotal													\$350,000.0	\$450,000.0	\$110,000.0	\$480,000.0		\$-
Sale of large shrimp by farmers																		
											\$450,000			\$1,575,000.0	\$6,750,000.0	\$15,750,000.0	\$27,000,000.0	\$35,000,000.0
Revenue & Revolving Fund																		
Feed repayment						\$-					\$-			\$325,325.0	\$1,287,000.0	\$3,003,000.0	\$5,148,000.0	\$6,006,000.0
PLs repayments						\$108,000.0					\$81,000.0			\$89,100.0	\$742,500.0	\$1,732,500.0	\$2,970,000.0	\$4,207,500.0
Coop membership fees (5,000/yr)														\$100,000.0	\$100,000.0	\$100,000.0	\$100,000.0	\$100,000.0
Revenue Total														\$514,425.0	\$2,129,500.0	\$4,835,500.0	\$8,218,000.0	\$10,313,500.0
Operational Costs																		
Feed supply to farmers													45.5	\$295,750.0	\$1,170,000.0	\$2,730,000.0	\$4,680,000.0	\$5,460,000.0
Construction of 84 x 1acre ponds (20 x 7 acre farms)													\$60,000.0	\$60,000.0	\$420,000.0	\$15,000.0	\$15,000.0	\$15,000.0
PLs supply to farmers							\$108,000.0				\$81,000.0			\$189,000.0	\$675,000.0	\$1,575,000.0	\$2,700,000.0	\$3,825,000.0
Rent & Rates		\$1,200	\$1,200	\$1,200	\$1,200	\$1,200	\$1,200	\$1,200	\$1,200	\$1,200	\$1,200	\$1,200		\$11,880.6	\$11,880.6	\$11,880.6	\$11,880.6	\$11,880.6
Telephone		\$56.9	\$56.9	\$56.9	\$56.9	\$56.9	\$56.9	\$56.9	\$56.9	\$56.9	\$56.9	\$56.9		\$682.9	\$682.9	\$682.9	\$682.9	\$682.9
Travelling & Accomodation						\$5,596.3	\$2,798.2					\$10,200		\$18,594.5	\$18,594.5	\$18,594.5	\$18,594.5	\$18,594.5
Community Farm Training							\$14,000							\$14,000.0	\$14,000	\$14,000	\$34,000	\$14,000
Staff Training								\$40,000					\$12,000.0	\$52,000.0	\$50,000.0	\$40,000.0	\$40,000	\$40,000
Total Operational Cost														\$641,908.0	\$2,360,158.0	\$4,405,158.0	\$7,500,158.0	\$9,385,158.0
Total Expenses														\$1,091,908.0	\$2,470,158.0	\$4,885,158.0	\$7,980,158.0	\$9,385,158.0
Total Income														\$514,425.0	\$2,129,500.0	\$4,835,500.0	\$8,218,000.0	\$10,313,500.0
Profit														\$(577,483.0)	\$(340,658.0)	\$(49,658.0)	\$237,842.0	\$928,342.0





6.3.4 Giant River Prawn Development Implementation Plan

Freshwater Prawn Model Farm

The size of the model farm specified on Table 27 is 7 x 1acre ponds. Intensive farming and biofloc system will be used. Correctly engineered, constructed and well managed pond, with a minimum stocking density of 50 PLs per square metre, is expected to produce a minimum of 1.5 metric tonnes of prawns per acre. In addition, PLs will be raised in hapas (nurseries) for around 20 days before being released into ponds.

This Plan is supported by previous studies, which stated that stocking density significantly influence the survival and growth of freshwater prawn larvae in nursery culture (Marques *et al.*, 2000; Thomas & Kurup, 2011). In a more recent study, biomass of *M. rosenbergii* increased significantly higher at densities of 400, 600 and 800 PLs per square metres in nursery, when compared to densities of 100 and 200 per square metres, whereas survival differences were not significant (Tien Hai Ly *et al.*, 2024).

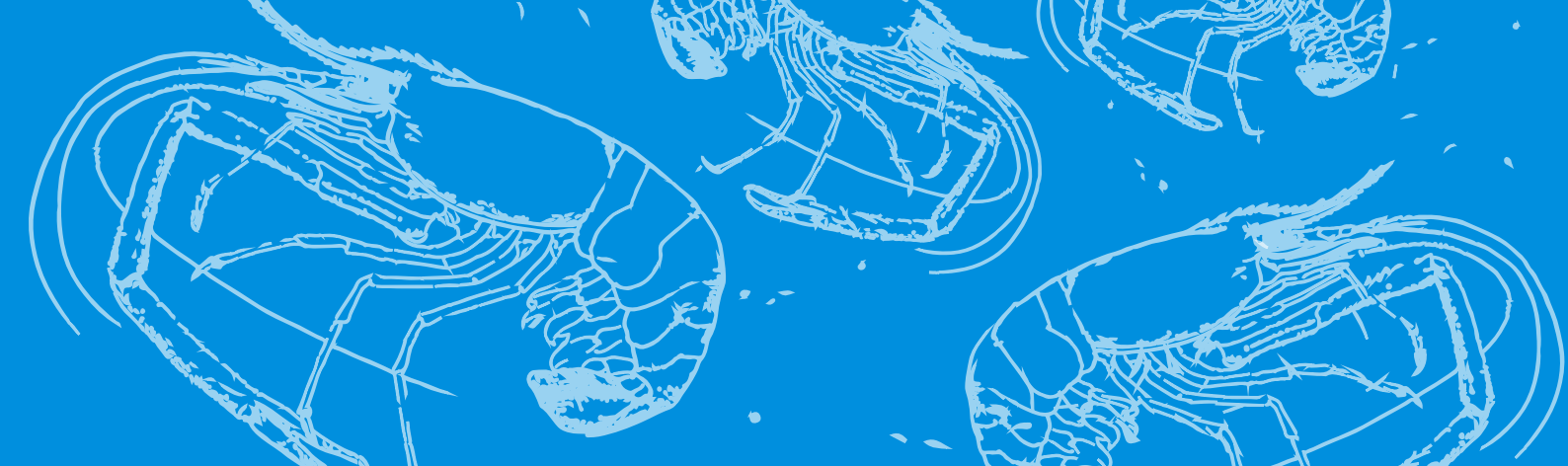
In another study, nursery rearing of *M. rosenbergii* post-larvae in hapa-nets, as high as 300PLs per square metre, for around 20 days, may offer benefits of rearing of sufficient numbers to grow to desirable size before stocking in the ponds (Alam et al., 1997). In a more recent study, nursery rearing of prawn PL at a density of 1,500 individuals/m³ in a biofloc system, integrated with red seaweed, offers optimal growth and feed efficiency, while maintaining good water quality and conserving water resources (Tien Hai Ly et al., 2024).

A stocking density of 50PLs per square metre and production of 1.5 metric tonnes per acre is economically viable.

Table 27. Freshwater prawn model farm business plan 2024-2028.

Actual												Projections for 2024 to 2028				
Activities & Projected Costs												2024 to 2028	2027	2026	2025	Total 2024
2024 to 2028	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Production targets (7 x 1 acre ponds)			
Large prawns (mt) by 2 cycles per year						10						10	20	20	20	20
Capital Cost																
Construction of 7 x 1acre ponds												40000	0	0	0	0
Procurement of Farm Equipments												10000	2000	2000	2000	2000
Capital Costs - Subtotal												50000	2000	2000	2000	2000
Revenue																
Sale of large shrimps (45/kg)						450000						450000	900000	900000	900000	900000
Operational Costs																
PLs repayments (1005480+0.15/cycle)						75450						75450	150900	150900	150900	150900
Coop membership fees (5,000/yr)													5000	5000	5000	5000
Feed repayment (\$6.50/kg)						84500						84500	169000	169000	169000	169000
Rent & Rates	1200	1200	1200	1200	1200	1200	1200	1200	1200	1200	1200	1200	11880.6	11880.6	11880.6	11880.6
Telephone	56.9	56.9	56.9	56.9	56.9	56.9	56.9	56.9	56.9	56.9	56.9	56.9	682.9	682.9	682.9	682.9
Travelling & Accomodation						5596.3	2798.2				10200		18594.5	18594.5	18594.5	18594.5
Wages	12500	12500	12500	12500	12500	12500	12500	12500	12500	12500	12500	12500	150000	150000	150000	150000
Electricity	1500	1500	1500	1500	1500	1500	1500	1500	1500	1500	1500	1500	18000	18000	18000	18000
Accounting Fees	559.3	559.3	559.3	559.3	559.3	559.3	559.3	559.3	559.3	559.3	559.3	559.3	6711.0	6711.0	6711.0	6711.0
Bank fees	94.4	94.4	94.4	94.4	94.4	94.4	94.4	94.4	94.4	94.4	94.4	94.4	1132.2	1132.2	1132.2	1132.2
Rural Business License Renewal		632											632	632	632	632
Legal fees						1376.3							1376.8	1376.8	1376.8	1376.8
Motor Vehicle Expenses	230.1	230.1	230.1	230.1	230.1	230.1	230.1	230.1	230.1	230.1	230.1	230.1	2761.3	2761.3	2761.3	2761.3
Printing & Stationeries							40						40	40	40	40
Security Charges	200	200	200	200	200	200	200	200	200	200	200	200	10400	10400	10400	10400
Telephone	56.9	56.9	56.9	56.9	56.9	56.9	56.9	56.9	56.9	56.9	56.9	56.9	682.9	682.9	682.9	682.9
Travelling & Accomodation						5596.3	2798.2				10200		18594.5	18594.5	18594.5	18594.5
Valuations													454.4	454.4	454.4	454.4
Total Expenses													\$616,843	\$568,843	\$568,843	\$568,843
Total Income													\$900,000	\$900,000	\$900,000	\$900,000
Profit/Loss													\$283,157	\$333,157	\$333,157	\$333,157
Risk Analysis																
10% Drop in sale price/kg													\$193,157	\$243,157	\$241,157	\$241,157
15% Drop in sale price													\$148,157	\$198,157	\$196,157	\$196,157
20% Drop in sale price													\$103,157	\$153,157	\$151,157	\$151,157





Prawn Farmers National Cooperative

Prawn Farmers National Cooperative Growa Fiji will be the model farm for freshwater prawn. Growa (Fiji) Ltd targets to produce around 14 metric tonnes per year in 2024. This Plan aims to produce a minimum of 150 metric tonnes of giant river prawn annually by 2028, to meet local demand. Size of farm recommended in this plan is 7 x 1 acre ponds. Stocking density recommended is 15PLs per square metre. Minimum size recommended for stocking is PL15. Total pond area needed will be 140 acres. Similar to marine shrimp, freshwater prawn aquaculture offers a sustainable alternative livelihood for rural dwellers. Currently, three companies have invested in freshwater prawn farming in Fiji, producing around 4.7 metric tonnes in 2023, using semi-intensive method. Many local individuals engaged in tilapia farming are also interested in diversifying into freshwater prawn farming.

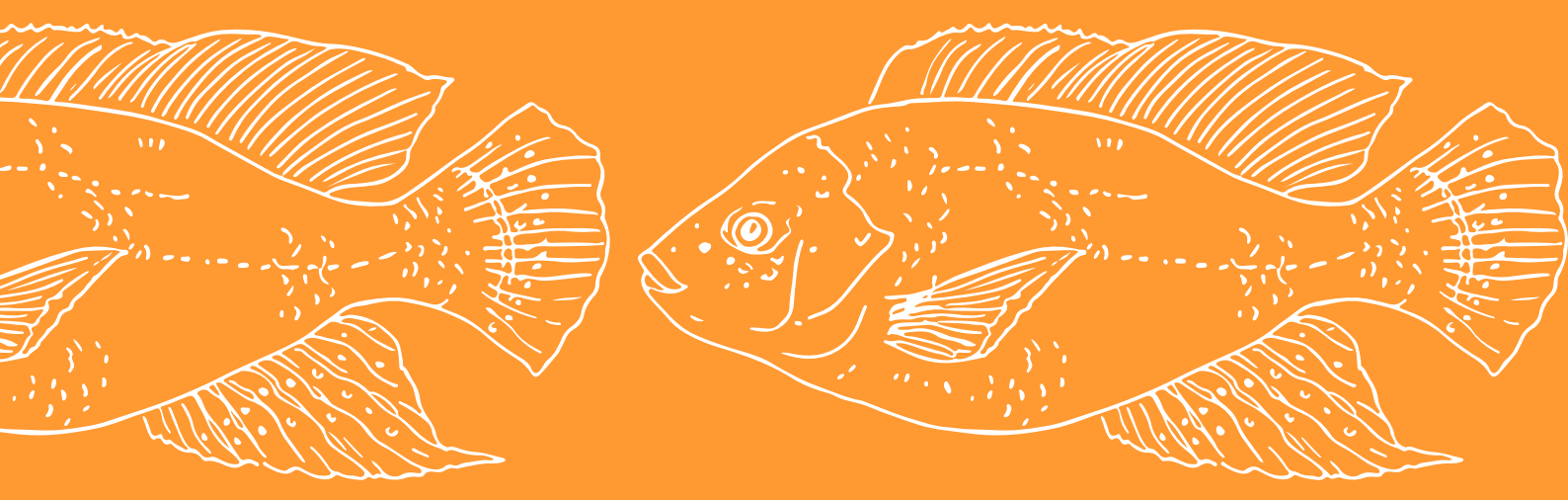
To increase production to meet demand, 20 existing semi-commercial farms with a total area of 140 acres need to be identified and upgraded to commercial level, using intensive farming method. Government input and investment of \$1.146 million are crucial. The Ministry of Fisheries will develop and distribute government financial support (PLs, feed, farming materials, equipment, machinery, electricity supply, digger and rehabilitation of 140 acres of pond area) to individuals or community-owned farms in the first three years. The Ministry will also conduct site assessments and train 11 selected farmers on Vanua Levu and Viti Levu. Additionally, five local hatcheries will be established to produce 9 million PLs per year by 2028.

Under this funding, the Ministry will manage a revolving fund for supplying feed and PLs, purchasing prawns from community farms, and recovering costs after sale. By the end of the third year, the operation will be corporatized and managed by the Shrimp Farmer's Cooperative (SFC) Board of Directors. The Aquaculture Act will outline the process for freshwater prawn farmers to join the SFC, which will be responsible for production and marketing.

Table 28. Freshwater prawn cooperative business plan 2024-2028.

Activities & Projected Costs		Actual												Projections for 2024 to 2028				
2024 to 2028		Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total 2024	2025	2026	2027	2028
Production targets																		
Post-larvae (pcs)							70500						618000	900,000	1,800,000	3,000,000	4,800,000	9,000,000
Large Prawns(mt)							4.7						10.3	15	30	50	80	150
Feed (mt)							22.1						13.4	19.5	39	65	104	195
Capital Cost																		
Rehabilitation of 60 acres of pond area												\$100,000.0		\$100,000.0	\$68,000.0			
Hatchery onstruction materials (2 sets)											\$50,000.0			\$50,000.0	\$50,000.0	\$-	\$-	\$-
Procurement of Farm Equipments													110000	\$110,000.0	\$-	\$-	\$-	\$-
Shrimp Farmers Coop Board														\$-	\$-		\$140,000.0	\$-
Capital Costs - Subtotal													\$110,000.0	\$260,000.0	\$118,000.0	\$-	\$140,000.0	\$-
Sale of large prawns by farmers													675000	\$675,000.0	\$1,350,000.0	\$2,250,000.0	\$3,600,000.0	\$6,750,000.0
Revenue & Revolving Fund																		
Feed repayment							\$-							\$143,325.0	\$286,650.0	\$477,750.0	\$764,400.0	\$1,433,250.0
PLs repayments							\$10,575.0				\$-			\$155,250.0	\$297,000.0	\$495,000.0	\$792,000.0	\$1,485,000.0
Coop membership fees (5,000/yr)														\$55,000.0	\$55,000.0	\$55,000.0	\$55,000.0	\$55,000.0
Revenue Total														\$353,575.0	\$638,650.0	\$1,027,750.0	\$1,611,400.0	\$2,973,250.0
Operational Costs																		
Feed supply to farmers							\$42,770.0				\$93,730.0			\$136,500.0	\$273,000.0	\$455,000.0	\$728,000.0	\$1,365,000.0
PLs supply to farmers							\$108,000.0				\$-			\$108,000.0	\$162,000.0	\$270,000.0	\$432,000.0	\$810,000.0
Rent & Rates		\$1,200	\$1,200	\$1,200	\$1,200	\$1,200	\$1,200	\$1,200	\$1,200	\$1,200	\$1,200	\$1,200	\$1,200	\$11,880.6	\$11,880.6	\$11,880.6	\$11,880.6	\$11,880.6
Telephone		\$56.9	\$56.9	\$56.9	\$56.9	\$56.9	\$56.9	\$56.9	\$56.9	\$56.9	\$56.9	\$56.9	\$56.9	\$682.9	\$682.9	\$682.9	\$682.9	\$682.9
Travelling & Accomodation							\$2,596.3	\$2,798.2				\$2,200		\$7,594.5	\$18,594.5	\$18,594.5	\$18,594.5	\$18,594.5
Shrimp Farmers Coop Board Expenses																	\$55,000.0	
Community Farm Training								\$7,000						\$7,000.0	\$7,000	\$7,000	\$7,000	\$7,000
Staff Training									\$12,000					\$12,000.0	\$12,000.0	\$12,000.0	\$12,000.0	\$12,000.0
Total Operational Cost														\$283,658.0	\$485,158.0	\$775,158.0	\$1,265,158.0	\$2,225,158.0
Total Expenses														\$543,658.0	\$603,158.0	\$775,158.0	\$1,405,158.0	\$2,225,158.0
Total Income														\$353,575.0	\$638,650.0	\$1,027,750.0	\$1,611,400.0	\$2,973,250.0
Profit														\$ (190,083)	\$35,492	\$252,592	\$206,242	\$748,092





6.3.5 Tilapia Development Implementation Plan

Tilapia Model Farm

Tilapia is an easy fish to culture. It is tolerant to a wide range of salinity and temperature levels. Moreover, farming tilapia requires minimal inputs. This Plan is based on intensive farming method, with stocking density of a minimum of 7 fry/s' per square metre (SEAFDEC Aquaculture Department, 2016). Minimum size of ponds should be 1 acre and minimum number of ponds should be seven (7) ponds per farm.

Production target for each pond is 4 metric tonnes per acre per cycle. Two cycles per year will produce 8 metric tonnes per acre and 56 metric tonnes in 7 acres. Tilapia model farm business plan on Table 29, shows that, decreasing the price of tilapia from \$10/kg to \$8/kg is uneconomical. To overcome this risk, it is important to produce more than 4 metric tonnes per cycle and maintain the selling price above \$8.50/kg or increase stocking density above 7 fry/s' per square metre or decrease cost of operation.



Table 29. Tilapia model farm business plan 2024-2028.

Activities & Projected Costs		Actual												Projections for 2024 to 2028					
		2024 to 2028	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total 2024	2025	2026	2027	2028
Production targets																			
Tilapia frys													168000		336,000	336000	336000	336000	336000
Large tilapia (mt)													28		56	56		56	56
Feed (mt)													28		56	56		56	56
Capital Cost																			
Rehabilitation of 7 x 1 acre ponds														14,000	14,000				
Hatchery onstruction materials (2 sets)											-				-		\$-	-	\$-
Procurement of Farm Equipments (11) farms)														35000	35,000	5,000		-	\$-
Tilapia Farmers Coop Membership fee															-		5,000		\$-
Capital Costs - Subtotal														\$49,000	49,000	19,000	\$5,000	-	\$-
Sale of large tilapia by farmers															560,000	560,000	560,000	560,000	560,000
Operational Costs																			
Feed													\$168,000		\$336,000.0	\$336,000	\$336,000	\$336,000	\$336,000
Fry												\$-	\$3,360		\$6,720.0	\$6,720	\$6,720	\$6,720	\$6,720
Rent & Rates												\$1,200	\$1,200	\$1,200	\$11,880.6	\$14,400	\$14,400	\$14,400	\$14,400
Telephone												\$56.9	\$56.9	\$56.9	\$682.9	\$682.9	\$682.9	\$682.9	\$682.9
Travelling & Accomodation													\$2,200		\$2,200.0	\$18,594.5	\$18,594.5	\$18,594.5	\$18,594.5
Tilapia Farmers Coop fees																	\$5,000.0		
Wages (2 people)															\$72,000.0	\$72,000.0	\$72,000.0	\$72,000.0	\$72,000.0
Staff Training														\$2,000	\$2,000	\$2,000	\$4,000	\$8,000	\$16,000
Total Operational Cost															\$431,483.5	450,397	452,397	461,397	\$464,397
Total Expenses															\$480,483.5	469,397	457,397	461,397	\$464,397
Total Income															\$560,000.0	\$560,000.0	\$560,000.0	\$560,000.0	\$560,000.0
Risk Analysis																			
10% Drop in sale price/kg															\$23,516	\$34,603	\$46,603	\$42,603	\$39,603
15% Drop in sale price															\$(4,484)	\$6,603	\$18,603	\$14,603	\$11,603
20% Drop in sale price															\$(32,484)	\$(21,397)	\$(9,397)	\$(13,397)	\$(16,397)





Tilapia Farmers National Cooperative

The model farm for tilapia to be established at Naduruloulou Research Station. This Plan targets a minimum annual production of 600 metric tonnes of tilapia starting by 2028 and beyond. Recognized as a viable economic activity offering sustainable livelihoods, tilapia aquaculture currently engages 353 families in Fiji at a subsistence level, yielding around 228 metric tonnes per year valued at \$2.28 million in 2022/2023 period. There is considerable interest among local farmers to transition towards mechanized commercial tilapia farming. To increase annual production from 228 to 600 metric tonnes, the plan proposes establishing a total of 30 intensive commercial farms spanning 4 acres each, amounting to a total area of 120 acres to drive the industry. Government intervention and support, play a crucial role in tilapia production, necessitating an investment of \$2.79 million. The Ministry of Fisheries is tasked with developing and distributing government financial support for fry, feed, farming materials, equipment, machinery, and the rehabilitation of 120 ponds to individuals or community-owned farms over the first three years. Under this plan, the Ministry will conduct site assessments to identify suitable ponds for rehabilitation or construction on Vanua Levu and Viti Levu. Additionally, 30 selected farmers on these islands will receive training.

The plan also aims to establish three local hatcheries capable of producing 4.8 million fry per year by 2028. Another significant aim of this plan is to foster cooperation among relevant stakeholders in developing a national, community-based tilapia farming industry, particularly for women and youth. The Ministry will seek approval to set up and manage a revolving fund for supplying feed and fry to farmers, purchasing tilapia from community farms, and recovering costs after sale. By the end of the third year, the Ministry aims to corporatize the operation and transfer management to the Tilapia Farmers' Cooperative (TFC) Board of Directors. This transition will elevate the project to an industry level, with the TFC Board responsible for production and marketing of high-quality tilapia in an economically, environmentally, and socially sustainable manner. Please refer to the Tilapia Business Plan 2024-2028 provided in the table below as a guide.



Table 30. Tilapia farmers' cooperative business plan 2024-2028.

Actual												Projections for 2024 to 2028										
Activities & Projected Costs												2024 to 2028	Total 2024	2025	2026	2027	2028					
Production targets																						
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec										
Frys (pcs)						1824000					576000		2,400,000	2,800,000	3,500,000	4,200,000	4,200,000					
Large tilapia(mt)						228					72		300	400	500	600	600					
Feed (mt)						228					72		300	440	550	550	660					
Number of commercil farms (30)													1	10	20	25	30					
Capital Cost																						
Rehabilitation of 120 x 1acre ponds												20,000	20,000	\$240,000								
Hatchery construction materials (2 sets)										50,000			50,000	50,000	\$-	-	\$-					
Procurement of Farm Equipments (11) farms)												55000	55,000	40,000	\$-	-	\$-					
Feed processing machines (3)												80000	80,000	90,000								
Tilapia Farmers Coop Board												-	-	-	490,000		\$-					
Capital Costs - Subtotal												\$155,000	205,000	420,000	\$490,000	-	\$-					
Sale of large tilapia by farmers																	675000	3,000,000	4,000,000	5,000,000	6,000,000	6,000,000
Revenue & Revolving Fund																						
Feed repayment						\$-			\$-				\$1,680,000	\$2,464,000	\$3,080,000	\$3,080,000	\$3,696,000					
Frys repayments						\$273,600.0				\$-			\$120,000	\$140,000	\$175,000	\$210,000	\$210,000					
Coop membership fees (3,000/yr)													\$3,000	\$30,000	\$60,000	\$75,000	\$90,000					
Revenue Total													\$1,803,000	\$2,634,000	\$3,315,000	\$3,365,000	\$3,996,000					
Operational Costs																						
Feed supply to farmers						\$570,000.0			\$-				\$1,680,000	\$2,464,000	\$3,080,000	\$3,080,000	\$3,696,000					
Fry supply to farmers						\$273,600.0				\$-			\$120,000	\$140,000	\$175,000	\$210,000	\$210,000					
Rent & Rates										\$1,200	\$1,200	\$1,200	\$11,881	\$14,400	\$14,400	\$14,000	\$14,000					
Telephone										\$56.9	\$56.9	\$56.9	\$683	\$683	\$683	\$683	\$683					
Travelling & Accomodation											\$2,200		\$2,200	\$18,594	\$18,594	\$18,594	\$18,594					
Tilapia Farmers Coop Board Expenses																\$55,000.0						
Community Farm Training							\$7,000						\$7,000.0	\$7,000	\$7,000	\$7,000	\$7,000					
Staff Training								\$12,000					\$12,000.0	\$12,000.0	\$12,000.0	\$12,000.0	\$12,000.0					
Total Operational Cost													\$1,833,763.5	2,656,677	3,307,677	3,397,277	\$3,958,277.4					
Total Expenses													\$2,038,763.5	3,076,677	3,797,677	3,397,277	\$3,958,277.4					
Total Income													\$1,803,000.0	2,634,000	3,315,000	3,365,000	3,996,000					
Profit													\$(235,764)	\$(442,677)	\$(482,677)	\$(32,277)	\$37,723					





6.3.6 Giant Clam Development Implementation Plan

Giant Clam Model Farm

Based on the Ministry of Fisheries data for the year 2021/2022, Makogai was allocated \$300,000 and produced only 8,413 juveniles. This indicated a production cost of approximately \$24 per juvenile. Assuming, these juveniles were two-year old and if sold at \$50 each, return on investment (ROI) will be \$420,260 or 40.2%. The current status of Makogai hatchery infrastructure, has the capacity to produce up to 1.5 million two-year-old juvenile clams annually. This Plan is targeting to turn Makogai giant clam hatchery into a corporate entity by producing only 160,000 two-year-old juvenile clams per year for export and conservation purposes. This is sufficient and economically sustainable (Table 31).

Giant Clams National Cooperative

Under this plan, the minimum annual target of 160,000 giant clam juveniles, aged two years and above, will be sold for a minimum price of \$50 per piece, generating minimum annual income of \$8 million from the third year onwards. To achieve the annual production target of 160,000 juveniles, 2 hectares of land and an ocean farming area of 10 hectares are required. This aims to provide a replicable model across the four divisions of Fiji.

In addition to exporting to aquarium and sushi markets, restocking giant clams on our reefs will add value to our tourism industry, Marine Protected Areas (MPAs), Qoliqolis, and enhance cooperation among relevant stakeholders in the development of a national, rural-based giant clam farming industry. Table 15 provides a summary of key components of the model farm.

It is time to advance giant clam aquaculture on Makogai Island towards commercial development through corporatization. In this plan, the Government of Fiji acknowledges the potential of the Fijian giant clam in the aquarium and ornamental trade and for conservation purposes. Giant clam farming presents a viable economic opportunity, offering a sustainable alternative livelihood. Research and studies on giant clam aquaculture have been conducted at the Makogai Research Station for the past 35 years. Currently, two hatcheries in Fiji produce giant clam juveniles for conservation and reef reseedling programmes. Giant clams can be exported in various forms, including ornamental products, food, shells for cultural use, and conservation purposes. The Makogai hatchery has the capacity to produce up to 1.5 million (two-year-old juvenile) clams annually. However, for economic viability, producing only 160,000 two-year-old juvenile clams per year for export and conservation purposes, is sufficient to meet the target. Under this plan, an annual target of 160,000 juveniles aged two years and above will be sold for a minimum price of \$50 per piece, generating an annual income of \$8 million from the second year onwards. Based on production data for the year 2021/2022, only 8,413 juveniles were produced, indicating a production cost of approximately \$24

Table 31. Giant clam model farm business plan 2024-2028.

Activities & Projected Costs		Actual												Projections for 2024 to 2028				
2024 to 2028		Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total 2024	2025	2026	2027	2028
Production targets																		
6 months old juveniles (thousand pcs)														49,000	490,000	490,000	490,000	490,000
2year old clams (pieces)														5000	10000	160000	160000	160000
Capital Cost																		
Procurement of Equipments													50000	50,000	50,000	\$-	-	\$-
Giant Clam Coop Board Revolving Fund														-		583,000.0		-
Capital Costs - Subtotal														50,000.0	50,000.0	583,000.0	-	-
Revenue																		
Sale of 2year old clams at \$50 per piece														\$250,000.0	\$500,000	\$8,000,000	\$8,000,000	\$8,000,000
Operational Costs																		
Transportation of clams to markets							\$-							0	20,000	20,000	20,000	20,000
Ocean nursery materials							\$-			\$50,000		\$100,000		\$150,000.0	73,500	73,500	73,500	73,500
Rent & Rates		\$1,200	\$1,200	\$1,200	\$1,200	\$1,200	\$1,200	\$1,200	\$1,200	\$1,200	\$1,200	\$1,200	\$1,200	\$11,880.6	\$11,880.6	\$11,880.6	\$11,880.6	\$11,880.6
Telephone		\$56.9	\$56.9	\$56.9	\$56.9	\$56.9	\$56.9	\$56.9	\$56.9	\$56.9	\$56.9	\$56.9	\$56.9	\$682.9	\$682.9	\$682.9	\$682.9	\$682.9
Travelling & Accomodation							\$2,596.3	\$2,798.2				\$2,200		\$7,594.5	\$18,594.5	\$18,594.5	\$18,594.5	\$18,594.5
Boat Expenses									\$10,000	\$10,000	\$10,000	\$10,000	\$10,000	\$50,000.0	\$120,000.0	\$120,000.0	\$120,000.0	\$120,000.0
Diesel for generator										\$4,000	\$4,000	\$4,000	\$4,000	\$16,000	\$48,000.0	\$48,000.0	\$48,000.0	\$48,000.0
Fiji Giant Clam Coop Board Expenses																\$55,000.0	\$55,000.0	\$55,000.0
Community Training								\$7,000						\$7,000.0	\$7,000	\$7,000	\$7,000	\$7,000
Staff Wages & salary											\$12,000	\$12,000	\$59,000	\$83,000.0	\$583,000	\$583,000	\$703,000	\$703,000
Staff Training									\$12,000					\$12,000.0	\$12,000.0	\$12,000.0	\$12,000.0	\$12,000.0
Total Operational Cost														\$338,158.0	\$894,658.0	\$949,658.0	\$1,069,658.0	\$1,069,658.0
Total Expenses														\$388,158.0	\$944,658.0	\$1,532,658.0	\$1,069,658.0	\$1,069,658.0
Total Income														\$250,000.0	\$500,000.0	\$8,000,000.0	\$8,000,000.0	\$8,000,000.0
Profit Margin														\$ (138,158.0)	\$ (444,658)	\$6,467,342	\$6,930,342	\$6,930,342
Risk Analysis																		
10% Drop in sale price/kg														\$ (163,158)	\$ (494,658)	\$5,667,342	\$6,130,342	\$6,130,342
15% Drop in sale price														\$ (175,658)	\$ (519,658)	\$5,267,342	\$5,730,342	\$5,730,342
20% Drop in sale price														\$ (188,158)	\$ (544,658)	\$4,867,342	\$5,330,342	\$5,330,342





per juvenile. To achieve the annual production target of 160,000 juveniles, a total of 2 hectares of land and an ocean farming area of 10 hectares are required. This aims to provide a replicable model across the four divisions of Fiji. In addition to exporting to aquarium and sushi markets, restocking giant clams on our reefs will add value to our tourism industry, Marine Protected Areas (MPAs), Qoliqolis, and enhance cooperation among relevant stakeholders in the development of a national, rural-based giant clam farming industry.

This corporate entity can be named the Fiji Giant Clam Cooperative (FGCC), to be managed by a Board of Directors appointed by the Minister. Government involvement and role in giant clam production are crucial, requiring an investment of \$2.883 million. The Ministry of Fisheries is tasked with the initial phase of corporatization and setting up the FGCC. Under this plan, the FGCC Board, will be responsible for marketing, production setup, and branding of giant clams in an economically, environmentally, and socially sustainable manner. Additionally, the FGCC Board will handle the procurement of farming tools and materials (slabs, long-lines, & collectors). Before the appointment of the FGCC Board, the Ministry of Fisheries will seek approval for the establishment of a Revolving Fund for the entire operation. By the end of the third year, the Ministry aims to corporatize the operation and transfer management to the FGCC Board of Directors. This transition will elevate the giant clam project to an industry level. Please refer to the Giant Clam Business Plan 2024-2028 provided in the table below as a guide.

Table 32. Giant clam cooperative business plan 2024-2028.

Activities & Projected Costs		Actual												Projections for 2024 to 2028				
2024 to 2028		Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total 2024	2025	2026	2027	2028
Production targets																		
Wid Juveniles (pcs)							-	2552						2,552	10,000	2,000,000	2,000,000	2,000,000
Hatchery produced juveniles (pcs)													100,000	100,000	2,000,000	2,000,000	2,000,000	2,000,000
Capital Cost																		
Revolving Fund for purchasing 2million pcs @ 0.70 per piece											100,000			\$100,000	\$140,000	\$140,000	\$140,000	\$140,000
Procurement of Equipments													\$50,000	\$50,000	\$50,000	\$-	\$-	\$-
Giant Clam Coop Board Revolving Fund														\$-		\$583,000		\$-
Capital Costs - Subtotal														\$150,000	\$190,000	\$723,000	\$140,000	\$140,000
Sale of 2year old clams at \$50 per piece														\$5,000,000	\$100,000,000	\$100,000,000	\$100,000,000	\$100,000,000
Revenue & Revolving Fund																		
Sale of 2-year old clams							\$-			\$-				\$5,000,000	\$100,000,000	\$100,000,000	\$100,000,000	\$100,000,000
Revenue Total														\$5,000,000	\$100,000,000	\$100,000,000	\$100,000,000	\$100,000,000
Operational Costs																		
Transportation of clams to markets							\$-							0	20,000	20,000	20,000	20,000
Ocean nursery materials							\$-			\$50,000.0	\$100,000			\$150,000.0	300,000	300,000	300,000	300,000
Rent & Rates	\$1,200	\$1,200	\$1,200	\$1,200	\$1,200	\$1,200	\$1,200	\$1,200	\$1,200	\$1,200	\$1,200	\$1,200	\$1,200	\$11,880.6	\$11,880.6	\$11,880.6	\$11,880.6	\$11,880.6
Telephone	\$56.9	\$56.9	\$56.9	\$56.9	\$56.9	\$56.9	\$56.9	\$56.9	\$56.9	\$56.9	\$56.9	\$56.9	\$56.9	\$682.9	\$682.9	\$682.9	\$682.9	\$682.9
Travelling & Accomodation							\$2,596.3	\$2,798.2			\$2,200			\$7,594.5	\$18,594.5	\$18,594.5	\$18,594.5	\$18,594.5
Boat Expenses									\$10,000	\$10,000	\$10,000	\$10,000	\$10,000	\$50,000.0	\$120,000.0	\$120,000.0	\$120,000.0	\$120,000.0
Diesel for generator									\$4,000	\$4,000	\$4,000	\$4,000	\$4,000	\$16,000	\$48,000.0	\$48,000.0	\$48,000.0	\$48,000.0
Fiji Giant Clam Coop Board Expenses																\$55,000.0	\$55,000.0	\$55,000.0
Community Training								\$7,000						\$7,000.0	\$7,000	\$7,000	\$7,000	\$7,000
Staff Wages & salary											\$12,000	\$12,000	\$59,000	\$83,000	\$583,000	\$583,000	\$703,000	\$703,000
Staff Training									\$12,000					\$12,000.0	\$12,000.0	\$12,000.0	\$12,000.0	\$12,000.0
Total Operational Cost														\$338,158.0	1,121,158	1,176,158	1,296,158	\$1,296,158.0
Total Expenses														\$488,158.0	1,311,158	1,899,158	1,436,158	\$1,436,158.0
Total Income														\$5,000,000	100,000,000	100,000,000	100,000,000	100,000,000



6.3.7 Rock/Mangrove Oyster Implementation Plan

Rock Oyster Model Farm

The Rock Oyster Farming Implementation Plan outlines how to achieve an annual production target of 5 million spats to support the establishment of 20 community-based farms on Vanua Levu and Viti Levu. Since the wild population cannot supply 5million spats in year, it is important that hatchery production be established. Through the supply of spats from the hatchery², each farm is expected to produce and sell 250,000 oysters per year. Rock oysters wholesale price will be \$12/dozen or \$1/each.

Table 33 provides the summary of key components and costs involved in rock oyster farming.

2 Expected to be at the Galoa hatchery.

Table 33. Rock oyster model farm business plan 2024-2028.

Activities & Projected Costs		Actual												Projections for 2024 to 2028				
2024 to 2028		Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total 2024	2025	2026	2027	2028
Production targets																		
Number of spats (pcs)							-					20000	-	20,000	100,000	250,000	250,000	250,000
Dozens of Edible rock oysters (kg)														1,666.7	8,333.3	20,833.3	20,833.3	20,833.3
Capital Cost																		
Procurement of equipments & farm materials													10000	10,000		\$-	-	\$-
Capital Costs - Subtotal														\$10,000	\$-	\$-	\$-	\$-
Income																		
Sale of Rock oysters (\$12/dozen)														\$20,000	\$100,000	\$250,000	\$250,000	\$250,000
Operational Costs																		
Marketing							\$-					\$2,000		\$4,000	5,000	5,000	5,000	5,000
Telephone			\$56.9	\$56.9	\$56.9	\$56.9	\$56.9	\$56.9	\$56.9	\$56.9	\$56.9	\$56.9	\$56.9	\$682.9	\$682.9	\$682.9	\$682.9	\$682.9
Travelling & Accomodation							\$2,596.3	\$2,798.2						\$5,394.5	\$5,000.0	\$5,000.0	\$5,000.0	\$5,000.0
Depuration											\$100	\$100	\$100	\$300.0	\$3,000.0	\$3,000.0	\$3,000.0	\$3,000.0
Repayment of capital cost														\$1,000.0	\$2,000.0	\$2,000.0	\$5,000.0	\$-
ROFC Board Expenses														\$5,000.0	\$5,000.0	\$5,000.0	\$5,000.0	\$5,000.0
Community Training								\$1,000						\$1,000.0	\$4,000	\$4,000	\$4,000	\$4,000
Staff Wages & salary													\$12,000	\$12,000.0	\$40,000	\$40,000	\$40,000	\$40,000
Staff Training									\$1,000					\$1,000.0	\$1,000.0	\$1,000.0	\$1,000.0	\$1,000.0
Repayment of 250,000 rock oyster spats														3,450.0	17,250.0	43,125.0	43,125.0	43,125.0
Total Operational Cost														\$30,377	65,683	65,683	68,683	\$63,682.9
Total Expenses														\$74,205	\$148,616	\$174,491	\$180,491	\$170,491
Total Income														\$20,000	\$100,000	\$250,000	\$250,000	\$250,000
Profit														\$(54,205)	\$(48,616)	\$75,509	\$69,509	\$79,509
Risk Analysis																		
10% Drop in sale price/kg														\$(56,205)	\$(58,616)	\$50,509	\$44,509	\$54,509
15% Drop in sale price														\$(57,205)	\$(63,616)	\$38,009	\$32,009	\$42,009
20% Drop in sale price														\$(58,205)	\$(68,616)	\$25,509	\$19,509	\$29,509



Rock Oyster Cooperative

This Plan offers a sustainable alternative livelihood and a viable economic activity. Enhancing cooperation among all relevant stakeholders through a cooperative, to help them overcome common challenges, is important. Individual farmers will be members of the Rock Oyster Farmers' Cooperative, which will become a corporate entity after three years. The Government of Fiji, recognizes the potential of rock oyster farming, as a food industry, that offers rural livelihood opportunities, especially for women and youth, and pledges special support to the industry in collaboration with ACIAR and SPC towards:

- Establishing a rock oyster hatchery on Galoa.
- Setting up of a depuration system.
- Establishing the Rock Oyster Farmer's Cooperative (ROFC).
- Setting up the ROFC Revolving Fund of \$200,000 to support purchasing of rock oysters from community farms and recovering funds after sale.
- Setting the stage for the production and branding of rock oysters for sushi in an economically, environmentally, and socially sustainable manner.
- Developing the industry through private investment, as well as government financial support (long-lines & collectors) to community-owned and operated farms, providing tangible economic benefits for coastal communities.
- Establishing Public-Private Partnerships (PPPs) aimed at supporting and developing a community-based rock oyster farming industry to enhance the effectiveness of locally-managed marine areas.
- Promoting the Blue Economy by encouraging improved land practices and maintaining high-water quality to contribute to ecosystem health and marine biodiversity.
- Protecting the local rock oyster food product brand from cheap imported oysters.
- Reducing legislative burdens.

Rock oysters, being filter feeders, do not require feed inputs, and farming them has limited potential negative impacts on the environment. Therefore, promoting rock oyster farming as a community-based blue economy activity and high-quality food, is paramount.

Government input and role in rock oyster production are pivotal, necessitating an investment of \$0.5 million. The Ministry of Fisheries is responsible for the initial phase, particularly setting up the Rock Oyster Farmer's Cooperative (ROFC). Under this plan, the Minister of Fisheries will appoint the ROFC Board, which will be responsible for marketing, setting the stage for production, and branding of rock oysters in an economically, environmentally, and socially sustainable manner. Additionally, the ROFC Board will be responsible for marketing and purchasing of farming tools and materials (collectors, long-lines, & anchors). By the end of the third year, the Ministry aims to corporatize the operation and transfer management to the ROFC Board of Directors. This will elevate rock oyster farming to an industry level. Please refer to the summary of costs of establishing the ROFC, in the table below, as a guide.

Table 34. Rock oyster cooperative business plan 2024-2028.

Activities & Projected Costs		Actual												Projections for 2024 to 2028				
2024 to 2028		Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total 2024	2025	2026	2027	2028
Production targets																		
Number of spats (pcs)						-							-	2,400	1,500,000	3,000,000	5,000,000	5,000,000
Edible rock oysters (pieces)											2400			2,400	1,500,000	3,000,000	5,000,000	5,000,000
Number of Community Edible farms											1	1		2	6	12	20	20
Capital Cost																		
Hatchery construction materials (1)											50,000			50,000	50,000	\$-	-	\$-
Procurement of equipments & farm materials													50000	50,000	50,000	\$-	-	\$-
Setting up of 20 community rock oyster farm														20,000	60,000	200,000		
ROFC Board establishment cost														-	-	\$170,000.0		\$-
Capital Costs - Subtotal														120,000	\$160,000	\$370,000	\$-	\$-
Revenue & Revolving Fund of ROFC																		
Recovery of Rock oysters purchasing cost (\$12/dozen)														\$2,400	\$1,500,000	\$3,000,000	\$5,000,000	\$5,000,000
Recovery of cost of farming materials supplied														\$10,000	\$30,000	\$60,000	\$100,000	\$100,000
OFC membership fees (\$5000/each/year)														\$10,000	\$120,000.0	\$240,000.0	\$400,000.0	\$400,000.0
Revenue Total														\$22,400	\$1,650,000	\$3,300,000	\$5,500,000	\$5,500,000
ROFC Operational Costs																		
Marketing							\$-			\$2,000		\$2,000		\$4,000	5,000	5,000	5,000	5,000
Rent & Rates		\$1,200	\$1,200	\$1,200	\$1,200	\$1,200	\$1,200	\$1,200	\$1,200	\$1,200	\$1,200	\$1,200	\$1,200	\$11,880.6	\$11,880.6	\$11,880.6	\$11,880.6	\$11,880.6
Telephone		\$56.9	\$56.9	\$56.9	\$56.9	\$56.9	\$56.9	\$56.9	\$56.9	\$56.9	\$56.9	\$56.9	\$56.9	\$682.9	\$682.9	\$682.9	\$682.9	\$682.9
Travelling & Accomodation							\$2,596.3	\$2,798.2			\$2,200			\$7,594.5	\$18,594.5	\$18,594.5	\$18,594.5	\$18,594.5
Depuration											\$5,000	\$5,000	\$5,000	\$15,000.0	\$15,000.0	\$15,000.0	\$15,000.0	\$15,000.0
ROFC Board Expenses															\$550,000.0	\$550,000.0	\$550,000.0	\$550,000.0
Community Training								\$7,000						\$7,000.0	\$7,000	\$7,000	\$7,000	\$7,000
Staff Wages & salary													\$12,000	\$12,000.0	\$170,000	\$170,000	\$170,000	\$170,000
Staff Training									\$6,000					\$6,000.0	\$6,000.0	\$6,000.0	\$6,000.0	\$6,000.0
Total Operational Cost														\$64,158	\$234,158	\$784,158	\$784,158	\$784,158
Total Expenses														\$184,158	\$394,158	\$1,154,158	\$784,158	\$784,158
Total Income														\$22,400	\$1,650,000	\$3,300,000	\$5,500,000	\$5,500,000
Profin Margin														\$(161,758)	\$1,255,842	\$2,145,842	\$4,715,842	\$4,715,842
Risk Analysis																		
10% Drop in sale price/kg														\$(163,998)	\$1,090,842	\$1,815,842	\$4,165,842	\$4,165,842
15% Drop in sale price														\$(165,118)	\$1,008,342	\$1,650,842	\$3,890,842	\$3,890,842
20% Drop in sale price														\$(166,238)	\$925,842	\$1,485,842	\$3,615,842	\$3,615,842



7. List of References

- Alam, M. J., Hoq, M. E., Jahan, D. A., & Mazid, M. A. (1997). Nursery rearing of *Macrobrachium rosenbergii* (de Man) using hapa-nets : effects of stocking density *Aqua Docs*(Aquaculture of *M. rosenbergii*), 9. Retrieved 20/5/2024, from
- Department of Agriculture Bureau of Fisheries and Aquatic Resources. (2022). *National Seaweed (Kappaphycus) Industry Road Map 2022-2026* (ISSN: 2945-4417).
- Froese, R. and D. Pauly. Editors. (2024). FishBase. World Wide Web electronic publication. www.fishbase.org (02/2024)
- Lal, M.M. Waqairatu, S.s. Zenger, K.R. Nayfa, M.G. Pickering, T.D, Singh, A. & Southgate., P. C. (2021). The GIFT that keeps on giving? A genetic audit of the Fijian Genetically Improved Farmed Tilapia (GIFT) broodstock nucleus 20 years after introduction [Genetic audit.]. ELSEVIER, 537(Aquaculture). <https://doi.org/10.1016/j.aquaculture.2021.736524>
- Lala, A. and Vuki, V. (2010). The historical development of seaweed farming, including roles of men and women, and prospects for its future development in Fiji. 5. Retrieved 1/5/2024, from
- Marques, H., Lombardi, J., & Boock, M. (2000). Stocking densities for nursery phase culture of the freshwater prawn *Macrobrachium rosenbergii* in cages. *Aquaculture*, 187, 127-132. [https://doi.org/10.1016/S0044-8486\(00\)00304-5](https://doi.org/10.1016/S0044-8486(00)00304-5)
- Ministry of Fisheries. (2022). *Annual Report 2020-2021: Parliamentary paper No.90 of 2022*. P. o. Fiji. <https://www.parliament.gov.fj/wp-content/uploads/2023/02/Ministry-of-Fisheries-Annual-Report-2020%E2%80%932021.pdf>
- Ministry of Fisheries. (2023). Ministry of Fisheries Annual Report 2021/2022.
- Prakash, J. (1990). *Fiji seaweed culture country report: Proceedings of the regional workshop on seaweed culture and marketing*. Suva. F. a. A. Organisation. <https://www.fao.org/4/AC283E/AC283E00.htm>
- Ram, V. (1991). The seaweed industry in Fiji, with special reference to *Eucheuma* (Rhodophyta).
- Richards, A. (1993). *Fiji Fisheries Resources Profile*. F. F. Agency.
- Stacey N., Govan H. 2021. Module 8: Livelihoods. In: Barclay K., Mangubhai S., Leduc B., Donato-Hunt C., Makhoul N., Kinch J. and Kalsuak J. (eds). Pacific handbook for gender and social inclusion in smallscale fisheries and aquaculture. Second edition. Noumea, New Caledonia: Pacific Community. 28 pp.
- SEAFDEC Aquaculture Department. (2016). *Tilapia hatchery and growout brochure*. () [Brochure]. <https://www.seafdec.org.ph/tilapia/>
- Secretariat of the Pacific Community. (2011). *Secretariat of the Pacific Community Aquaculture Portal* https://aquaculture.spc.int/index.php?option=com_countries&view=country&id=5
- South, R. (1993). Seaweeds. In A. R. a. L. Hill (Ed.), *Nearshore marine resources of the South Pacific* (pp. 685-690). Institute of Pacific Studies.

- Statista Market Insight. (2024). *Travel & Tourism Fiji* <https://www.statista.com/outlook/mmo/travel-tourism/fiji#revenue>
- Thomas, S., & Kurup, M. (2011). Standardisation of stocking density in the larviculture of *Macrobrachium rosenbergii* (De Man 1879) using modified static green water system. *Indian Journal of Fisheries*, 58, 73-78.
- Tien Hai Ly, Le Hoang Vu, Ly Van Khanh, & Anh., N. T. N. (2024). Nursery rearing freshwater prawn, *Macrobrachium rosenbergii*, in biofloc system integrated with red seaweed, *Gracilaria tenuistipitata*, at different stocking densities under zero water exchan. *Vietnam Journal of Science, Technology and Engineering*, 66(1), 7. [https://doi.org/https://doi.org/10.31276/VJSTE.66\(1\).77-83](https://doi.org/https://doi.org/10.31276/VJSTE.66(1).77-83)
- Trend Economy. (2024). *Annual International Trade Statistics by Country-Fiji* <https://trendeconomy.com/data/h2/Fiji/03>
- Uwate, R. P. K., Tenakanai, C. (1984). A review of aquaculture activities in the Pacific region: General overview by political entity. E.-W. Centre.
- Van der Pijl, W.. (2023). Shrimp Insight-2023 Mid-year Trade Data Review: Imports. <https://shrimpinsights.com/blog/2023-mid-year-trade-data-review-imports>
- Van der Pijl, W. (2024). Mid-year Trade Data Review: China Imports Record Volume, But Average Value Remains Worrisome. <https://shrimpinsights.com/byte/china-imports-record-volume-average-values-remain-worrisome>
- Vereivalu, T. (1989). Aquaculture activities in Fiji. [Technical paper]. *Aquacorp IFREMER*, 31-36, Article 3. <https://archimer.ifremer.fr/doc/00000/1498/1132.pdf>
- World Bank. (2023). Global Seaweed-New and Emerging Market Reports 2023. 208. Retrieved 9th May 2024, from <https://documents1.worldbank.org/curated/en/099081423104548226/pdf/P175786073c14c01609fe409c202ddf12d0.pdf>

8. Appendices

Appendix 1. Introduction targets of the Ministry of Fisheries and Forestry - Aquaculture Division, given to the consultant by the Permanent Secretary



Ministry of Fisheries and Forestry
Aquaculture Division

Mission: Our mission is to grow into a sustainable aquaculture and ensuring supply sufficiency, high quality of farming and production operations, and protection of the environment and natural resources.

Vision: Our vision is to partner with community in realizing the strategic food security programme, ensuring long-term growth and sustainability for the community while in parallel growing commercial activities.

Values:

Transparency - Ensuring openness, communication and accountability in our various engagements.

Social Responsibility - Giving back to the community.

Service Excellence - Building an organizational culture based on service & operational excellence in thought and in execution.

Integrity - Building trust with customer, communities, investors, suppliers and one another by doing what is right.

Aquaculture Division Goals

Freshwater Aquaculture Commodities

Tilapia

No.	Timeline	Target Production	Target fry production	+20% mortality
		Average grow-out (200g)		
1.	2028/2029	1,000mt	5,000,000	6,000,000
2.	2027/2028	900mt	4,500,000	5,400,000
3.	2026/2027	800mt	4,000,000	4,800,000
4.	2025/2026	700mt	3,500,000	4,200,000
5.	2024/2025	600mt	3,000,000	3,600,000
6.	2023/2024	500mt	2,500,000	3,000,000
7.	2022/2023	400mt	2,000,000	2,400,000
8.	2021/2022	300mt	1,500,000	1,800,000
9.	2020/2021	200mt	1,000,000	1,200,000
10.	2019/2020	100mt	500,000	600,000

Freshwater Prawns

No.	Timeline	Target Production	Target fry production	+20% mortality
		Average grow-out (35g)		
1.	2028/2029	1,000mt	25 million	30 million
2.	2027/2028	900mt	22.5 million	27 million
3.	2026/2027	800mt	20 million	24 million
4.	2025/2026	700mt	17.5 million	21 million
5.	2024/2025	600mt	15 million	18 million
6.	2023/2024	500mt	12.5 million	15 million
7.	2022/2023	400mt	10 million	12 million
8.	2021/2022	300mt	7.5 million	9 million
9.	2020/2021	200mt	5 million	6 million
10.	2019/2020	100mt	2.5 million	3 million

Shrimp

No.	Timeline	Target Production (mt)	Target pl production	+20% mortality
		Average grow-out (40g)	(Pl)	
1.	2028/2029	1,000mt	40 million	48 million
2.	2027/2028	900mt	36 million	43.2 million
3.	2026/2027	800mt	32 million	38.4 million
4.	2025/2026	700mt	28 million	33.6 million
5.	2024/2025	600mt	24 million	28.8 million
6.	2023/2024	500mt	20 million	24 million
7.	2022/2023	400mt	16 million	19.2 million
8.	2021/2022	300mt	12 million	14.4 million
9.	2020/2021	200mt	8 million	9.6 million
10.	2019/2020	100mt	4 million	4.8 million

Appendix 2. List of people consulted and participating in workshops

No.	NAMES	Designation
WORKSHOP ATTENDEES		
1	Pretika Kumar	MOFF
2	Iva Meo	MOFF
3	Mere Namudu	MOFF
4	Teresia Verekaute	MOFF
5	John Rawaqa	MOFF
6	Dr. Allok Kalla	PFO-Aquaculture
7	Kolinio Naivalu	APFO-North
8	Miriama Delai	MOFF
9	Salome Tuwaci	MOFF
10	Kaliova Caginibure	MOFF
11	Makelesi Danford	MOFF
12	Babitu Rarawa	MOFF
13	Viliame Ciri	MOFF
14	Moape Yabakiva	MOFF
15	Meliki Rakuro	MOFF
16	Mere Matila	MOFF
17	Silivia Vakaseleyasi	MOFF
18	Joeli Tupou	MOFF
19	Maraia Underwood	MOFF
20	Suliasi Vatulawa Delana	MOFF
21	Prashneel Chandra	MOFF
22	Asela Navucu	MOFF
23	Stanley Gulbin	SEAPAC
24	Laisiasa Cavakilagi	Impact Pacific
25	Dr. Apenisa Maracava	PIL/Raviravi Prawn Farm
26	Walt Smith	Blue Ocean Designs Director
27	Jude Dermando	King Prawn (Fiji) Limited
28	Thushan Gunasena	King Prawn (Fiji) Limited
29	Dr. Chinthaka Hewavitharane	Inland Aquaculture Specialist - SPC
30	Tekata Toaisi	Director Fisheries- MOFF
31	Nanise Kuridrani	PFO West- MOFF
32	Shalendra Singh	PFO Central- MOFF
33	Keresi Lomata	Biosecurity Authority of Fiji
34	Bale Kuruwale	iTaukei Land Trust Board
35	Mere Vukialau	UNFAO
36	Teari Kaure	Aquaculture technical Officer-SPC

One-on-one consultations		
37	Vilitati Rayale	Lomawai Aquaculture Cooperative
38	Justin Hunter	Director - J. Hunter Pearls (Fiji) Limited
39	Erick Ask	Manager Seaweed Development - International Flavors & Fragrance (USA)
40	Debra Smith	Director -Walt Smith International
41	Avinash Singh	Director – Growa Fish Fiji Limited
42	Atelaite Rokosuka	Permanent Secretary - MOFF
43	Kevin Ellard	Biosecurity Specialist - Secretariat of the Pacific Community
44	Ratu Lote Lewaivuna	Fiji Police Force-Headquarters
45	Ilaisa Kama	Research Officer-MOFF
46	Prakash Renu	University of the South Pacific
47	Mizuno Shota	Japan International Cooperation Industry
48	Ben Parker	Chief Executive Officer - ASA Aquaculture
49	Dr. Rajesh Prasad	University of the South Pacific
50	Associate Professor Joeli Veitayaki	Marine Conservation Consultant
51	Dr. Satalaka Petaia	Sustainable Fisheries Consultant - Tuvalu
52	Ratu Iliaseri Vosailagi	Chairman- Lomawai Aquaculture Cooperative
53	Richard Du	Director – Gold Hold Limited
54	Jovesa Naceva	Manager- Gold Hold Limited
55	Maciu Lagibalavu	Director – Pacific Fishing Company Board of Directors
56	Ratu Semi Vosailagi	Lomawai Aquaculture Cooperative
57	Eshwin Kant	Ministry of Environment-West
58	Thushara Sumpat	King Prawn (Fiji) Limited
59	Honourable Kaleveti Vodo	Member of Parliament - Fiji
60	Honourable Sakiusa Tubuna	Assistant Minister-Prime Minister Office
61	Nikil Singh	Tilapia/Freshwater Prawn Farmer
62	Aporosa Kairuma	Officer In-charge Makogai Research Station MOFF
63	Viliame Bainivesi	Acting Fisheries Technical Officer-Makogai Research Station MOFF
64	Richard Veeran	Fisheries Scientist – SPC
65	Neomai Ravitu	Former Director of Fisheries

Appendix 3. Oyster Farming Site Selection Checklist

This checklist is taken from a longer document developed by MOFF in partnership with FAO and Talanoa Consulting in 2023 titled **Checklist of environmental and social site selection criteria for prioritisation and optimisation of mangrove oyster farming**. Consult the full document for more information on how to use this checklist.

The checklist has been divided into factors that are *essential* vs. *preferable*. If all essential (E) factors are satisfied, then assess factors that are highly preferred (P). If there are factors that are 'unknown', further research may be required or information gathered before partnering with a community and investing in a site. For each factor, assess if your site is 'highly suited', 'moderately suited', or 'poorly suited'. Select 'unknown' if there is insufficient information to make a reasonable assessment or judgement.

Overall ranking on site suitability

Suitability	Risk level	Actions or next steps
▶ Highly suited ▶ Moderately suited ▶ Poorly suited ▶ Not sure	▶ Low ▶ Medium ▶ High	

Essential factors

1. Are there wild mangrove oysters at the site?

Justification:

Highly suited	Moderately suited	Poorly suited	Unknown
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2. Is the abundance or density of wild mangrove oysters at the site sufficient for farming?

Justification:

Highly suited	Moderately suited	Poorly suited	Unknown
---------------	-------------------	---------------	---------

3. Is the farm easily accessible for the local community and farmers that will be involved? Consider: (a) distance from the village to the farm; (b) if the farm will be accessible by boat without an outboard motor; (c) if a boat and outboard motor are required, is the distance close (<10 minutes) or further away (>10 minutes).

Justification:

Highly suited	Moderately suited	Poorly suited	Unknown
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4. What is the road accessibility to the village like? Consider: (a) is there a road, in relatively good condition that exists to the village; (b) if there is no road access to the village, is there access by boat and if so, is it close (<10 minutes) or further away (>10 minutes).

Justification:

Highly suited	Moderately suited	Poorly suited	Unknown
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5. Is the site within proximity to markets to sell the product. Consider if road and transport are accessible under all weather conditions, and distance to major commercial centres (e.g. Suva, Nadi, Lautoka)?

Justification:

Highly suited	Moderately suited	Poorly suited	Unknown
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6. Is the site likely to be financially feasible? Consider whether the farm will generate sufficient revenue to cover the costs of maintenance and repairs, as well as labour costs, and make sufficient profit. A subjective judgement may have to be made until a financial feasibility study is conducted.

Justification:

Highly suited	Moderately suited	Poorly suited	Unknown
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7. Do any of the environmental factors fall seriously outside the preferred ranges for our oyster species (3.1-3.10).

Justification:

Highly suited	Moderately suited	Poorly suited	Unknown
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Preferred factors

8. Will the mangrove oyster farm unfairly restrict access to marine resources within customary fishing grounds (*qoliqoli*)?

Justification:

Highly suited	Moderately suited	Poorly suited	Unknown
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9. Does the community or farmers that will have the farm have good relationships with neighboring villages?

Justification:

Highly suited	Moderately suited	Poorly suited	Unknown
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10. Are there good community structures and processes for decision-making processes in place?

Justification:

Highly suited	Moderately suited	Poorly suited	Unknown
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11. Is there a community enterprise structure already in place (e.g. for other livelihoods) or is planned to be put in place. These can include structures for dealing with community projects, community trust, individual family farmers, or a limited liability company.

Justification:

Highly suited	Moderately suited	Poorly suited	Unknown
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12. Is the site close enough to the community or the farmers to prevent vandalism or poaching of oysters?

Justification:

Highly suited	Moderately suited	Poorly suited	Unknown
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13. Do people have traditional knowledge about mangrove oysters?

Justification:

Highly suited	Moderately suited	Poorly suited	Unknown
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14. Do people have skills and knowledge of mangrove oyster farming?

Justification:

Highly suited	Moderately suited	Poorly suited	Unknown
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15. Are the social and gender norms flexible enough to allow key target groups from engaging in mangrove oyster farming?

Justification:

Highly suited	Moderately suited	Poorly suited	Unknown
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Appendix 4. DRM SOP summary

In December 2023 with the support of FAO, the MOFF finalized Standard Operating Procedures (SOP) for Disaster Preparedness, Response and Recovery in Fisheries.

In summary the SOP covers the following areas, including aquaculture.

- The Ministry of Fisheries and Forestry (MOFF) Emergency Preparedness and Response Standard Operation Procedures (SOPs) sets out the detailed arrangement and coordination for disaster risk management (DRM) at the national, divisional and district levels.
- The SOPs provide a guide for the MOFF to be better prepared and able to respond to the impact of both natural and human induced hazards in Fiji.
- It outlines roles and responsibilities of MOFF units for preparedness, response and recovery. Longer-term risk-informed development, disaster risk reduction (DRR) and climate change adaptation (CCA) measures. A glossary of terms is provided in Annex 1.
- These SOPs also provide tools to be used by MOFF. Specifically, these include:
 - Preparedness checklists
 - Early warning messages
 - Coordination structure
 - IDA/DDA assessment questionnaires
 - Resource Coordination – 3/5W
 - SITREPS
 - Response plan templates
 - Contact lists.
- These SOPs relate principally to preparedness, response and recovery for inshore fisheries and aquaculture and less to offshore fisheries which is principally driven by links to industry. Offshore concerns related to safety concerns for observers, economic measures such as fee waivers or delayed payments as well as ensuring boat safety and compliance can be added as an annex.
- The SOPs provide guidelines on the operational linkages between MOFF, the Food Security and Livelihoods Cluster and NDMO including the National Disaster Controller (Permanent Secretary MRMDDM), National Disaster Coordinator (Director Disaster Management, NDMO) and the Emergency Operations Centre at national level, Divisional Commissioners at divisional level and District Officers at district level.

The SOPs are to be read in conjunction with the **Natural Disaster Management Act (NDMA)**, enacted by the Parliament of Fiji on the 15th of June 1998, the **Fiji National Disaster Management Plan (NDMP)** prepared by NDMO in 1995 in close consultation with National Disaster Management Council, Government Agencies and the National Emergency Operations Centre SOP. References to the Food Security and Livelihood Cluster are taken from the **2017 National Humanitarian Policy on Disaster Risk Management**. Longer term risk management including initiatives addressing adaptation to climate change will be covered by the **2019 National Disaster Risk Reduction Policy** and the **2017 National Adaptation Plan**.

The NDMA (1998) is currently under review to include the following aspects: the cluster system (which defines/clarifies the relationship between clusters, line ministries and Disaster Service Liaison Officers (DSLOs) as well as integration of DRR, DRM and CCA in national planning to include climate change aspects in the revised National Disaster Management Plan.

Appendix 5. Aquaculture Training School Programme

Designing an aquaculture training school programme for Fiji involves a comprehensive approach to address gaps in various aspects of aquaculture, in the private sector and Government. A detailed outline for an aquaculture training school programme is as follows:

Programme Structure

A. Introduction to Aquaculture
<i>Overview of Aquaculture:</i> History, current trends, and future prospects.
<i>Types of Aquaculture:</i> Freshwater, Brackish-water, and Marine aquaculture.
<i>Importance of Aquaculture:</i> Economic, social, and environmental benefits.
B. Biology and Ecology
<i>Basics of Fish Biology:</i> Anatomy, physiology, and lifecycle.
<i>Aquatic Ecology:</i> Ecosystems, water quality parameters, and environmental impact.
<i>Species Selection:</i> Criteria for choosing species, understanding local and global species, traditional knowledge.
C. Aquaculture Systems
Extensive, Semi-Intensive, and Intensive Systems.
Recirculating Aquaculture Systems (RAS).
Pond, Tank, and Cage Culture Systems.
Integrated Multi-Trophic Aquaculture (IMTA).
D. Water Quality Management
<i>Water Chemistry:</i> pH, dissolved oxygen, nitrogen cycle.
<i>Monitoring and Control:</i> Testing and maintaining water quality parameters.
<i>Waste Management:</i> Strategies for managing waste and effluent.
E. Nutrition and Feeding
<i>Fish Nutrition:</i> Dietary needs, feed formulation, and ingredients.
<i>Feeding Techniques:</i> Feeding schedules, methods, and equipment.
<i>Growth Monitoring:</i> Assessing and optimizing growth rates.
F. Health and Disease Management
<i>Common Diseases:</i> Identification, prevention, and treatment.
<i>Biosecurity Measures:</i> Preventing the introduction and spread of pathogens.
<i>Health Monitoring:</i> Regular health checks and diagnostic methods.
G. Breeding and Hatchery Management
Broodstock Selection and Management
<i>Hatchery Techniques:</i> Spawning, larval rearing, and juvenile production.
<i>Genetic Improvement:</i> Selective breeding and hybridization.
H. Business and Economics
<i>Business Planning:</i> Developing business plans and financial projections.
<i>Marketing and Sales:</i> Market analysis, marketing strategies, and sales channels.
<i>Regulatory and Legal Aspects:</i> Understanding local and international regulations.

I. Sustainability and Environmental Impact
<i>Sustainable Practices:</i> Eco-friendly techniques and certifications.
<i>Environmental Impact Assessment:</i> Evaluating and mitigating environmental effects.
<i>Community Engagement:</i> Working with local communities and stakeholders.
J. Hands-On Training and Field Visits
<i>Practical Sessions:</i> Hands-on training in various aquaculture systems.
<i>Field Visits:</i> Visits to commercial aquaculture farms and research institutions.
<i>Internships:</i> Opportunities for real-world experience.
K. Course Duration and Format
<i>Duration:</i> 6 to 12 months, depending on the depth of the curriculum.
<i>Format:</i> Combination of classroom lectures, practical sessions, and field visits.
<i>Modules:</i> Divided into weekly or monthly modules with assessments at the end of each module.
L. Assessment and Certification
<i>Assessments:</i> Regular quizzes, practical exams, and project work.
<i>Certification:</i> Certificate of Completion for participants who successfully complete the programme.
<i>Advanced Certification:</i> Additional certification for those who complete an extended internship or research project.
M. Resources and Infrastructure
<i>Classrooms:</i> Equipped with audio-visual aids for lectures.
<i>Laboratories:</i> For water quality testing, disease diagnosis, and feed formulation.
<i>Aquaculture Systems:</i> On-site ponds, tanks, and RAS setups for hands-on training.
<i>Library:</i> Access to books, journals, and online resources on aquaculture.
N. Faculty and Staff
<i>Instructors:</i> Experienced aquaculture professionals and researchers.
<i>Guest Lecturers:</i> Experts from the industry and academia.
<i>Support Staff:</i> Technicians, lab assistants, and administrative personnel.
O. Partnerships and Collaborations
<i>Industry Partnerships:</i> Collaborations with aquaculture farms and companies for field visits and internships.
<i>Academic Collaborations:</i> Partnerships with universities and research institutions for guest lectures and research opportunities.
<i>Government and NGOs:</i> Collaboration for funding, policy guidance, and community projects
P. Additional Considerations
<i>Funding and Scholarships:</i> Opportunities for scholarships and financial aid for students.
<i>Online Resources:</i> Development of online modules for remote learning.
<i>Alumni Network:</i> Establishing a network for alumni to support and mentor new students.

This comprehensive programme will provide trainees with the knowledge, skills, and experience needed to succeed in the aquaculture industry.

