

KINGDOM OF TONGA NATIONAL AQUACULTURE MANAGEMENT AND DEVELOPMENT PLAN 2024-2029



Prepared by the Ministry of Fisheries with assistance from The Pacific Community (SPC) and the
Ministry of Primary Industries, NZ

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FOREWARD

The islands of Tonga are surrounded by vast areas of ocean that serve a vital role for the environment and people. Factors such as population growth, climate change and natural disasters, have resulted in most fisheries resources, particularly coastal fisheries being under pressure and may be at some stage at a level that is unable to meet the needs of the Tongan people for their food security and livelihoods.

Aquaculture has emerged as a viable and integrated option to support sustainable fisheries by supplementing and contributing to the social and economic growth, livelihoods and food security needs of a country.

This plan draws and builds on the progress from the Tonga National Aquaculture Management and Development Plan 2018-2022. Overall, the plan maps the Kingdoms aquaculture sector development and management vision and aspirations to achieving a sustainable, meaningful and secured aquaculture sector for the people of Tonga. In doing so, the plan sets out the management objectives, management measures, development objectives and most importantly, the priority aquaculture commodities identified for Tonga for the next five years.

Lastly, I would like to take this opportunity on behalf of the Ministry of Fisheries to sincerely thank everyone involved in developing this important document. A special “thankyou” to all aquaculture players, communities and staff of the Ministry of Fisheries for all effort made in order to produce this document. Finally, I would like to convey my sincere gratitude to the Pacific Community and Ministry of Primary Industries, NZ for technical guidance throughout the whole review and development process of this plan.

Approval

Approval of the Kingdom of Tonga National Aquaculture Management and Development Plan

2024-2029.

08 / 07 / 2024



Honourable Lord. Fohe
Minister for Fisheries



1.1.1 Policy statement

The aquaculture industry will contribute to the economic and social well-being of the people of Tonga through an inclusive and transparent process supported by sound management and development that balances economic and social gains against environmental cost.



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Abbreviations and acronyms

AAC- Aquaculture Advisory Committee
ACIAR – Australian Centre for International Agricultural Research
ADL – Aquaculture Development License
CEO – Chief Executive Officer
CITES – Convention of International Trade in Endangered Species
COP - Code of Practices
DFAT – Department of Foreign Affairs and Trade
EIA – Environmental Impact Assessment
EU – European Union
FAO – Food Agriculture Organisation
FCD – Fisheries Compliance Division
FMDD – Fisheries Management and Development Division
FO – Fisheries Officer
FSD – Fisheries Science Division
HOD – Head of Divisions
ICT - Information, Communication Technology
JICA – Japan International Cooperation Association
MCCTIL – Ministry of Consumer and Commerce, Trade Innovation and Labour
MCS&E – Monitoring control, surveillance and enforcement
MFNP – Ministry of Finance and National Planning
MOF - Ministry of Fisheries
MORDI – Mainstreaming of Rural Development Innovation
M&E – Monitoring and Evaluation
MPI- Ministry of Primary Industries, NZ
PRC – People’s Republic of China
PROP – Pacific Islands Regional Oceanscape Program
R&D – Research and Development
SEAFDEC – South East Asian Fisheries Development Centre
SMA – Special Management Area
SPC – Pacific Community
TAG – Technical Advisory Group
TSDF - Tonga Strategic Development Framework
TFSP – Tonga Fisheries Sector Plan
UNDP – United Nations Development Program
WB – World Bank

Part 1: Preliminary

1.1 Purpose

The primary purpose of the Plan is to set out the guiding principles, vision and goal for the aquaculture sector. More specifically, the Plan

- Provides a roadmap for aquaculture management and development;
- Promotes and raise awareness of the aquaculture sector;
- Ensures the Act and regulations are fit for purpose.
- Promotes the commercialization of aquaculture.

1.2 Scope

This Plan covers all aquaculture¹ as defined in the Aquaculture Management Act 2003, including the import and export of farmed aquatic organisms and their products.

1.3 Goal

The goal is to develop a sustainable, resilient and integrated aquaculture sector.

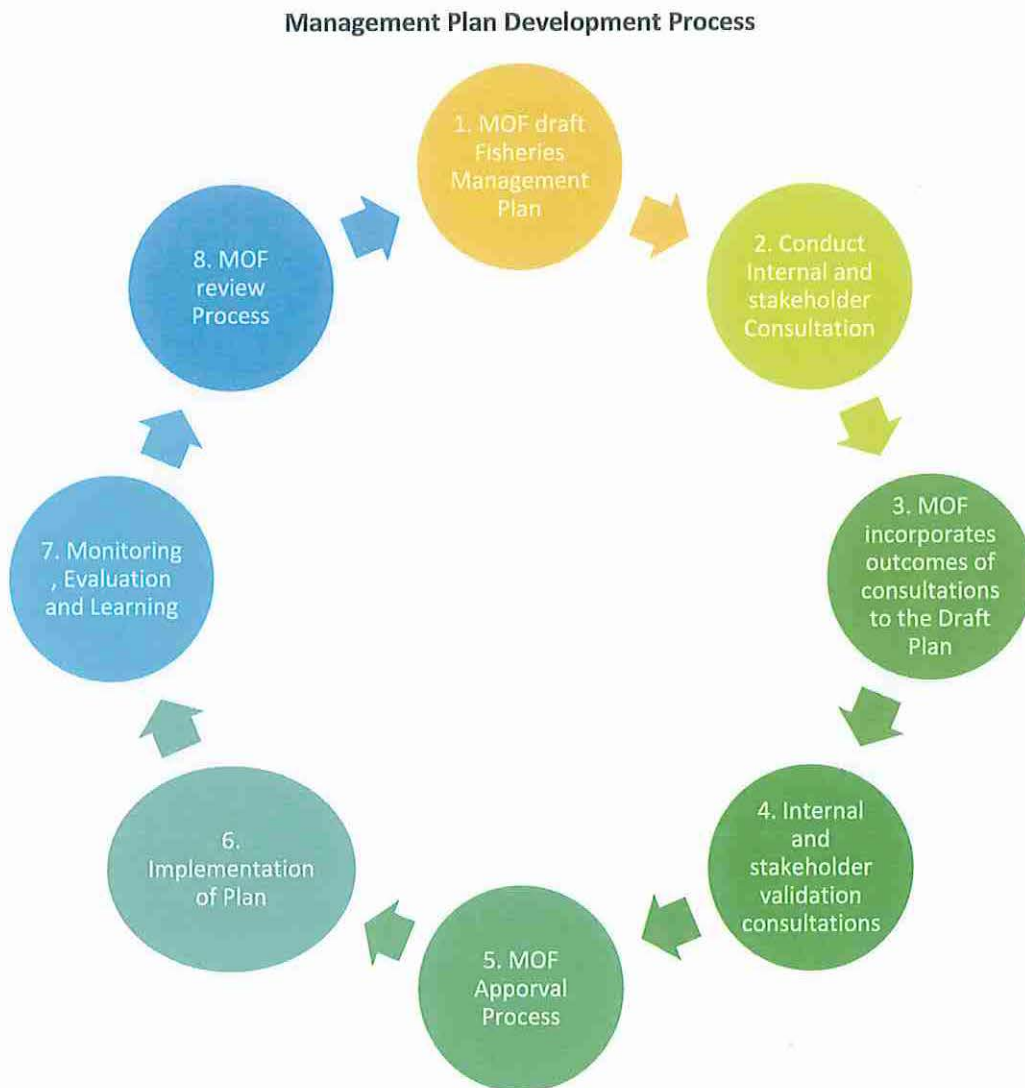
¹ Aquaculture- means any operation involving the husbandry, cultivation, propagation or farming of fish, during the whole or part of its life cycle and includes any operation in preparation for any aquaculture or other related activity.

1.4 Development Process

The development of a fisheries management plan is guided by the Act.

When developing this, the Ministry conducted consultations with Aquaculture stakeholders in Tongatapu, Ha'apai, Vava'u and 'Eua.

The diagram below illustrates steps taken when this plan was revised.



1.5 Institution, Legal and policy framework

The main legal instrument for the management and development of aquaculture in the Kingdom is the Aquaculture Management Act 2003 (the Act). The Aquaculture Management Regulations 2020 provide the regulatory framework that this Plan will complement. Tonga Ministry of Fisheries (MOF) is the government agency mandated under the Act to manage and develop the aquaculture sector in Tonga.

Other relevant legislative instruments that contribute to the sustainable management and development of the aquaculture sector includes the Fisheries Management Act 2002, Environment Management Act chapter 21.03 2020 Revised Edition.

Regional and international instruments such as CITES will also play key roles in the aquaculture management and development in the Kingdom.

The plan has been prepared in accordance with Part II, Section 7(1) and 7(5) of the Fisheries Management Act 2002.

The Plan supplements, and does not in any way override, the provisions of the Act or regulations promulgated under the Act. All activities subject to the Plan will be subject to the applicable provisions of all Acts and Regulations for Tonga.

1.6 Guiding principles and values

The following Table 1 lists the key guiding principles and values that underpin the development and implementation of this plan.

Table 1. Key guiding principles and values highlighted during consultation.

Economic viability	An aquaculture sector or activity that is profitable regardless of the scale
Livelihood and food security	Achieve economic growth and answer food security challenges
Evidence based	Development of aquaculture activities based on targeted R&D
Commercialization	Development of effective pathways to commercialisation
Socially acceptable	The forms of aquaculture developed are accepted by and provide direct or flow-on benefits to the community
Technical visibility	The techniques and technologies already exist or are transferable to Tonga and can be supported over time
Environmentally friendly	An aquaculture sector or activity that poses minimal negative impacts to the environment

Ecosystem approach	The integration of aquaculture within the wider ecosystem such that it promotes sustainable development, equity, and resilience of interlinked social-ecological systems ²
Inclusiveness	Promotion of participation and empowerment of all stakeholders including women, youth and vulnerable groups in aquaculture management and development
Good governance	Promotion of transparency and accountability in decision making
Market driven	An aquaculture sector that is driven by market demand
Best practice	Aquaculture practices that are environmentally and socially aware while providing opportunities food security and livelihood.
Ambitious	Answer key challenges for different island groups
Realistic and achievable	Focus on commodities with potential

Part 2: Authority and Roles

2.1 Ministry of Fisheries

MOF is the mandated government agency through the Aquaculture Management Act 2003 as the primary regulatory institution to control and oversee aquaculture management and development in the Kingdom. Its role include:

- Implementation, compliance and enforcement of the Act;
- Implementation and compliance to the Aquaculture Management and Development plans;
- Provide secretarial assistance to AAC on aquaculture matters;
- Issuing of aquaculture license and enforcing license conditions;
- Provide guidance to AAC on the review, implementation and approval of aquaculture management and development plans; and
- Demarcation and marking of aquaculture areas and buffer zones in accordance with the act.
- An authorization is required for any land-based aquaculture activities on Crown land.
- The Minister may require an aquaculture operator to develop a COP for each aquaculture commodity they are farming

2.2 Technical Advisory Group

A license Technical Advisory Group (TAG) should be established, comprising the following individuals:

- the CEO of MOF;

² Aquaculture development. 4. Ecosystem approach to aquaculture. *FAO Technical Guidelines for Responsible Fisheries*. No. 5, Suppl. 4. Rome, FAO. 2010. 53p.

- all Deputy CEO,
- Legal Officer,
- Head of Fisheries Management Planning Section;
- the head of the Aquaculture Section; and
- the head of the Licensing Section.

The main function of this TAG is to carry out initial assessments to classify applications before making direct recommendations to Minister for Fisheries for Category A application and for AAC for Category B and Category C application.

2.2 Aquaculture Advisory Committee

The Aquaculture Management Act required the establishment of an Aquaculture Advisory Committee (AAC). The role of the AAC is to advise the Minister, as set out under section 11(1) (a)-(h) of the act. Basically, the AAC's role is to provide advice on:

- Managing, controlling and developing aquaculture
- Overseeing the implementation and review of the Aquaculture Management and Development Plan
- Overseeing outreach programmes
- Establishing aquaculture and buffer zones, and
- Any other matter that the Minister seeks advice on in relation to aquaculture.

A meeting of the AAC is not be valid and decisions cannot be made unless there is a quorum of no fewer than five members.

The composition of the AAC, as outlined in Section 11(2) of the Aquaculture Management Act and includes:

- The Chief Executive Officer for MOF who is the Chair of the Committee
- An officer from the Department of Environment
- An officer from the Ministry of Trade and Economic Development
- An officer from the Department of Marine and Ports, and
- Three representatives of the aquaculture industry

2.3 Aquaculture Operators

- Assisting MOF with aquaculture management and development
- Complying with the Aquaculture Management Act through its associated plans, strategies and guidelines
- Growing and expanding aquaculture in Tonga: and
- Complying with license conditions

Part 3: Commencement and Review

The Plan is effective for a period of five years following date of endorsement by the Minister of Fisheries. The progress of implementing the Plan shall be reported in the Ministry's annual report. A mid-term review of the Plan will take place in mid-2027 and the full review will take place in early 2029.

Part 4: Overview of the Fishery

General Introduction

Tonga is blessed with a vast ocean where people rely on the marine resources for commercial and subsistence purposes. As such, due to population growth, climate change and natural disasters, most fisheries resources, particularly coastal fisheries are under pressure and may be at some stage at a level that is unable to meet the needs of the Tongan people for their food security and livelihoods.

Aquaculture has emerged as a viable and integrated option to support sustainable fisheries by supplementing and contributing to the social and economic growth, livelihoods and food security needs of a country.

Tonga's marine environment offers some of the most suitable conditions for farming of various aquaculture products. Despite this, a number of challenges were highlighted that continue to hinder the expansion of the sector in the Kingdom which include lack of capital, skilled labour, access to markets and finance to name a few.

Aquaculture is one of the top development priorities of the Government through the Ministry of Fisheries (MOF). The Aquaculture management plan is a working document that links management with development and provides the practical and coherent platform for regulation, management, technical development and investment to grow together in a coordinated manner.

The plan was developed in close consultation with staff members of the Ministry of Fisheries and stakeholders and in accordance with section 4 of the Aquaculture Management Act (2003), sets out a five-year vision and development aspiration for the management and development of the aquaculture sector in Tonga. It is foreseen that the effective and participatory implementation of the objectives and strategies in this plan will contribute to addressing the challenges identified and lead to a viable and secured aquaculture sector for Tonga.

Current status of aquaculture

Aquaculture operations in the Kingdom occur in three island groups namely Tongatapu, Vava'u and Ha'apai. Aquacultural commodities that are currently being farmed are Mabe Pearl Oyster, Giant Clam, Mozuku Seaweed and Sea Cucumber.

Mabe Pearl Oyster

Mabe Pearl Oyster farming is a well-established aquacultural activity in Vava'u where it first started, and more recently around Tongatapu and Ha'apai. The Mabe sector is well structured with an on-going research programme funded by the Australian Centre for International Aquacultural Research, seed supply from the Ministry of Fisheries' Sopa hatchery, and the establishment of the Pearl Farmers Association.

There is a total of 52 License holders. Before Covid 19, Mabe Pearl Oysters were exported to Hawaii. Following the lifting of Covid restrictions in 2022, the sector has faced difficulties to secure export market arrangements overseas. As a consequence, farmers continue to sell their products in local markets.

Giant Clams

Giant clams were exported overseas for the lucrative aquarium trade market until 2022 when the export of giant clam was banned. Prior to this, a total of 9 tonnes was exported. Whilst export of giant clam remain prohibited, the Ministry of Fisheries continues to culture giant clams for the purpose of restocking in Special Management Areas(SMAs) for future wild harvesting for local consumption.

Mozuku Seaweed

Mozuku Farmer initially collect Mozuku seaweed from the wild for subsequent on growing on lines in coastal areas. One company is involved in the collection, processing and export of this product. The major export market for Mozuku seaweed is Japan. Mozuku Seaweed has been in operation for over 10 years and approximately 800tonnes have been exported.

Sea Cucumber

Sea cucumber is an important export fishery in Tonga providing both economic and social benefits in terms of bringing in much needed foreign exchange and creating jobs for the people of Tonga. From 2008 to 2014, it was recorded that the export value was just below TOP1.7million.

Since the development of the fishery in 1980's, the fishery has been under a lot of fishing pressure and has been characterised by boom and bust with two moratorium periods as a result of overfishing.

In 2018, the Ministry of Fisheries issued a single license to enable farming of sea cucumber.

Part 5: Objectives and Strategies

This Plan contains of six objectives supported by 23 strategies to guide the Ministry of Fisheries with the successful implementation of the plan.

Objective 1: To strengthen the management and sustainable development of the aquaculture sector.

- 1.1 Ensure aquaculture management legislation and regulations are up to date.
- 1.2 Ensure aquaculture operators comply with management measures, regulations and license conditions.
- 1.3 Ensure Aquaculture license conditions are up to date
- 1.4 Ensure completion of Code of Practice for aquaculture operations
- 1.5 Ensure the AAC regularly convenes to support the Aquaculture sector.
- 1.6 Review and update the Tonga National Strategy on Aquatic Biosecurity 2018-2022.

Objective 2: To encourage and promote a resilient aquaculture sector

- 2.1 Develop and improve methods of collection of broodstock and spat from the wild.
- 2.2 Strengthen existing activities, such as grow-out, husbandry and cage culture systems to build better resilience.
- 2.1 Investigate new potential species and strains for aquaculture.
- 2.2 Support and strengthen community related aquaculture activities.

Objective 3: To improve and strengthen livelihood and economic growth through aquaculture.

- 3.1 Increasing Aquaculture productivity through revitalisation and modelling of Aquaculture system
- 3.2 Improve knowledge of the potential markets as well as better understanding of market requirements
- 3.3 Conduct research on the economic performance of the sector.
- 3.4 Strengthen restocking initiatives to improve food security and livelihoods.
- 3.5 Investigate feasibility of a financial scheme to support aquaculture growth.

Objective 4: To promote and strengthen awareness, partnership, collaboration and networking in aquaculture

- 4.1 Increase awareness on aquaculture programs and its contribution to food security, social and economic livelihoods in Tonga.
- 4.2 Encourage community participation in aquaculture programs.
- 4.3 Strengthen networking amongst aquaculture stakeholders.

Objective 5: To strengthen capacity and capability in the aquaculture sector.

- 5.1 Ensure effective delivery of trainings and capacity building activities for Ministry of Fisheries staff and stakeholders.
- 5.2 Investigate opportunities for partnerships and exchange programs with overseas institutions in the public and private sector.
- 5.3 Conduct capacity trainings for aquaculture development license holders to promote better aquaculture practices

Objective 6: To promote gender equity and social inclusion in aquaculture.

- 6.1 Promote women and youth participation in trainings and programs.
- 6.2 Encourage women and youth participation in decision-making and planning processes.

Part 6: Management Measures

The following management measures are used in this Plan as specific controls to manage and develop the Aquaculture sector.

6.1 Licenses and Authorisations

- All persons must apply for and hold an Aquaculture Development License (license) before undertaking any aquaculture or related activity.
- This license shall be issued by the Minister following advice from the TAG after consideration of Category A application and AAC for Category B and C application
- An environmental impact assessment must be submitted with any license application upon request by the Ministry.
- All licensed holders must comply fully with all license conditions.
- Each license shall not exceed a term of no longer than 10 years and is subject to an annual review and payment of an annual license fees (as prescribed in appendix schedule 2)
- All license fees must be paid in full before a license is issued or any aquaculture or related activity commences. The prescribed fees are provided in Appendix 3.
- The application form, criteria for assessment, license format, license conditions and fee payable for the ADL license are found in the Ministry's official website and also available in hard copies from the Ministry headquarters and regional offices.

6.2 Aquaculture Fish Processing Establishment Licence

- All persons must apply for and hold an aquaculture fish processing establishment license before operating any such establishment.
- The license is to be issued by the Ministry of Fisheries
- A payable fee is applicable for this license
- The Minister shall set conditions for this license
- A farmed fish processing establishment license shall only be granted to a person, persons or company that holds a valid aquaculture development licence.
- All farmed fish processing establishment licenses issued under these Regulations, shall, unless revoked earlier, be valid for a period of twelve (12) months from the date of issue
- The CEO may revoke or suspend an Aquaculture fish processing licence if there is no activity carried out within one year from the issuance of the licence.
- All terms and conditions of the license must be strictly adhered to.

6.3 Aquaculture Fish Export Licence and Permits

- All persons must apply for and hold an aquaculture fish export license before exporting any aquaculture fish or aquaculture fish products.
- A payable fee is applicable for this license
- The Minister shall set conditions for this licence
- Every farmed fish export license holder is required to obtain an export permit from the CEO for every export of farmed fish or farmed fish product.

- A farmed fish export license shall only be granted to a person, persons or company that holds a valid aquaculture development licence.
- All farmed fish export licenses issued under these Regulations shall, unless revoked earlier, be valid for a period of twelve (12) months from the date of issue.
- The CEO may revoke or suspend an export licence where there has not been exporting of aquaculture resources for a continuous period of at least nine (9) months.
- All terms and conditions of the license and permit must be strictly adhered to.

6.4 Farming Strategies

- The CEO may adopt a code of practice specifying farming standards and best practices for the management of an aquaculture farm, of a specific aquaculture commodity or of aquaculture activities, based on international standards and practices.

6.5 Spacing between the aquaculture operations

- Spacing shall be set in accordance with the type of activity or license category and the outcome of an environmental impact assessment, and included in the license terms and conditions

6.6 Transferability

- In the event of the death of a license holder who is natural person, heirs of that person may apply for a new license to continue the aquaculture operation (Part X, section 35 Aquaculture Management Regulations 2020)
- A licence transfer should only be permitted when the associated form of tenure is also transferred.
- Conditions required in the original aquaculture development licence (including the business development plan) should be maintained when the licence is transferred.

6.7 Subleasing

- Subleasing of any area licensed for aquaculture area is prohibited.

6.8 Reporting

- License holders must submit a Monthly Production Return that includes information on production, standing stock, mortalities and number of employees. (Appendix X)

6.9 Aquaculture Areas and buffer zones

- The Ministry can allocate aquaculture areas and buffer zones
- All Aquaculture activities are restricted to within Declared Aquaculture Areas
- All application for land-based aquaculture must have a proposal accompanied with a copy of the applicant's lease of the land where aquaculture will take place.
- The proposal must also include a statement from the Ministry of Lands confirming that applicants can demonstrate the suitability of that land for aquaculture activities.

6.10 *Import and Introduction of Exotic Fish*

- A person intending to import into the Kingdom or introduce in the aquatic environment any exotic fish must submit an application to the CEO
- The Minister may adopt biosecurity guidelines for the introduction of exotic aquatic species, in consultation with the competent authority in charge of quarantine and biosecurity.
- Any license, permit, approval or authorisation given under the regulations which relates to a fish that is living modified organism shall be subject to any applicable provision of the Biosafety Act.
- The CEO may revoke or suspend an import permit where there has not been import of aquaculture resources for a continuous period of at least nine (9) months

6.11 *Aquaculture Areas and Development Buffer Zones.*

- The Minister may declare any area to be an Aquaculture Area and/or Development Buffer Zone.
- The CEO may use any method of identification, demarcation and marking of Aquaculture areas or Buffer Zones.
- Consideration will be given to the Ministry of Infrastructure (Marine and Ports Division) who may include particular requirements for signage in areas where there is substantial boat traffic.
- Markers that identify the location of aquaculture areas must be positioned accurately in order that the aquaculture operation occurs where it has been authorised to operate.
- It is prohibited to place markers and signage outside the boundaries of the area(s) authorised for aquaculture and the improper maintenance of such signs.
- The Minister may designate any local community or a community which has been designated as a coastal community under the Fisheries Management Act, to be Designated Community for the purpose of the act.

6.12 *Monitor disease and establish biosecurity measures*

- MOF shall work in close collaboration with the aquaculture private sector to develop a disease surveillance program and establish biosecurity best practice according to the guidelines provided in the National Aquatic Biosecurity Plan.

6.13 *Quality certification*

- The Ministry shall be the certification body for aquaculture operations and Aquaculture fish processing establishments, unless otherwise provided by the Minister
- Without prejudice to sub-regulation (1), internationally-recognized certification bodies may certify aquaculture operations and Aquaculture fish processing establishments, as applicable
- All costs related to quality certification of Aquaculture fish products shall be borne by the requesting aquaculture operator or Aquaculture fish processor.

6.14 Traceability

- Aquaculture operators and Aquaculture fish processors and exporters must keep all information including production, processing and export records for a minimum period of five years for traceability purposes. This information is prescribed under Regulations 9, 19(b) and 24(c) and includes the following:
 - (a) Annual production volume
 - (b) Annual production value
 - (c) Annual mortality
 - (d) Annual feed consumption
 - (e) Annual processing volume and value
 - (f) Annual export volume and value, including market of destination
- Records must be available for monitoring by the Ministry, when and if requested.
- All aquaculture products originating from a Aquaculture fish processing establishment must be appropriately coded for traceability purposes.

Part 7: Compliance

Monitoring, control, surveillance and enforcement (MCS&E) is an important part for the management and development of aquaculture. In the Kingdom, the following MCS&E activities shall be implemented.

Theft

During consultations, theft was reported as an issue. It is a challenge in aquaculture development and could be address by law. However, practical options like choosing farm sites close to homes and communities and hiring of security guards to protect farms could help address theft. From a regulatory perspective, the licensing for trading of pearl implying the reporting of trades, would act as a deterrent to theft by promoting transparency as to the origin of pearls being sold on the market place.

Penalties

All persons undertaking aquaculture and related activities, including farmers, processors and exporters, must comply with this Plan, as well as relevant regulations and Act.

Penalties will apply to any non-compliance in accordance with the Aquaculture Management Act 2003, Part IV, Section (3) and the Aquaculture Regulations 2020, Part IX, Section (33).

Part 8: Implementation Plan

The Ministry of Fisheries has developed an implementation plan following stakeholder consultations. It is subject to regular review to ensure the necessary attention and reallocation of resources for effective implementation.

Part 9: Monitoring, evaluation and learning

Monitoring and evaluation (M&E) is an important part of the successful implementation of this plan. It provides the opportunity to ensure that activities implemented are achieving the expected outcomes (monitoring) and answering the question of “are we doing the right things (evaluation).

A M&E framework shall be developed based on the implementation table and to be used for the monitoring and evaluation of the progress in implementing the plan. The M&E framework is a separate working document to be made public on the Ministry of Fisheries website.

Part 10: Review and amendment

This Plan applies for a period of five years. A mid-term review will take place in 2027 and a final review will be undertaken before the Plan concludes in 2029. The Minister retains the authority to amend this Plan as required.

Part 11: Commodities and concepts and prioritisation

Through the initial consultation process with government and private stakeholders, it was agreed that the process of prioritisation for the next development plan was not to come up with a list of commodities and assign activities for each of those commodities. Rather, the prioritisation process should be a decision-making tool that not only enables the government to choose appropriate commodities and methods of farming them (i.e. concepts), but also provides a diagnostic for those proposed commodities and concepts so that development funds can be directed toward areas needing improvement. Specifically, the diagnostic and prioritisation matrix will assist in:

- assessing the relevance of current commodities under development through a structured method of ranking commodities and concepts, and producing a list of areas where improvement is required;
- identifying suitable new commodities and concepts for diversification through the ranking obtained;
- identifying areas to develop and improve to allow for the exploration of new commodities and concepts from the diagnostic obtained; and
- assessing the suitability of new proposals from investors using the same matrix developed for this plan.

The prioritisation matrix was applied to existing and potential commodities and proposed concepts (e.g. giant calm aquaculture for the aquarium trade or food security; sea cucumber aquaculture for farming or stock enhancement/sea ranching) in order to guide decision-making process on the species to farm and the models of farming.

The diagnostic and ranking of commodities for their suitability to farming and their benefits to Tonga was carried out through an analysis of benefits against feasibility. Feasibility is

considered from the perspective of the farmer investing his resources in a new venture. From consultations with government and private stakeholders, it was possible to identify:

- the factors of feasibility (i.e. opportunities and constraints), using mabe and seaweed as contextual case study commodities; and
- the areas of benefit that are contained in the guiding principles and values identified with stakeholders (section 3.1.6).

Some feasibility factors and benefits were added to the list following a group discussion in order to provide a realistic assessment that is specific to the context of Tonga. Factors of feasibility and benefits are listed by category in Table 4 and Table 5, respectively.

During consultations, several potential aquaculture commodities were considered for prioritisation. For each commodity, a score was given to each factor of feasibility (Table 4) and benefit (Table 5). Criteria were scored as 0 (absent or none), 1 (low), 2 (fair) or 3 (high or good). The sum of benefits is plotted against the sum of the feasibility factors in order to compare commodities against one another (Fig. 1). Note that the scores obtained reflect the current state of development of the aquaculture sector in Tonga. Consequently, future planning will need to update this analysis to account for developments and changes of circumstances.

Table 4: Factors of feasibility for the development of aquaculture commodities in Tonga

Factors of feasibility	Description
Economic feasibility	
Local market	Can the product be sold locally (e.g town or village market)?
Domestic market	Can the product be sold nationally?
Export market	Can the product be exported
Technical feasibility	
Site availability	Are sites available for farming the commodity using current farming techniques?
Access to technology	Is in-country technology available?
Access to inputs	Are seeds, feed, materials and equipment easily accessible?
State of advancement	
Technical expertise	Does Tonga have the technical expertise to produce this commodity?
Existing government assets	Does MOF possess assets (eg. Hatchery, farms, feed mill) to assist in the development of the sector?
Existing private assets	Are there existing assets in the private sector?
Biological feasibility	
Production efficiency	IS the commodity known to be efficient (eg low, food conversion ratio, low input)?

Presence of species or strain in country	Is the proposed commodity present in the country, and is it managed for the control of spread and impact?
Favourable climatic and environmental condition	Is the water temperature (and salinity) and productivity adequate for farming the proposed commodity?)
Social Feasibility	
Culturally acceptable	Is the commodity accepted from a cultural perspective?
Acceptable under customary laws	Can the farming system be easily developed under customary law?
Governance	
Favourable regulation	Are national regulations favourable to this type of development?
Existing industry representative bodies	Is the commodity supported by an industry development and advocacy representative body?
Risk	
Low risk with natural disasters	Is this type of commodity and/or development susceptible to natural disaster?
Low risk of disease	Is the commodity robust or is it susceptible to disease?
Low market risk	Is the market for the commodity volatile?

Table 5: Areas of benefits that would result from the development of aquaculture commodities in Tonga

Areas of benefit	Description
Economic Benefits	
Increase fisheries productivity	Aquaculture of commodity will increase productivity compared with effective fisheries management.
Increase value of production	The value of fisheries production is increased
Increase export	Aquaculture of the commodity will improve the country's balance of trade
Livelihood opportunity	The commodity provides the opportunity for cash income
Scale	The scale refers to the total size of production, whether it is the sum of many small farmers or a few large operations
Socioeconomic Benefits	
Flow-on benefits to communities	This includes the creation of employment as part of associated activities (e.g. handicrafts, processing)
Provides equal opportunity	Provides opportunities for gender balanced activities
Regional employment	Through the increase in the number of farmers
Employment	Engagement of people in economic activities
Reach	About the uptake of farming of the proposed commodity across a country (adopted to several island groups) and/or across socioeconomic groups
Integrate with others	The activities associated with aquaculture of a commodity integrate with existing activities.

Conclusions from the prioritisation process:

1. Commodities that are currently being developed (mabe and kappaphycus) are highly relevant to Tonga in the current state of advancement.
2. It is important to consider different models for the same commodity. For instance, growing giant clams for both food and the aquarium trade provides more benefits than for aquarium only and it is also more feasible than for food only.
3. Depending on the development need (e.g. livelihood or food security), the prioritisation graph (Fig. 1) provides a simple way to identify a suitable commodity for diversification. For instance, if Tonga wanted to diversify for food security it would have several options: giant clams (for food and aquarium trade), mullet or Anadara. While not as feasible now, mullet and Anadara would provide greater benefits than giant clams.

Importantly, the diagnostic and prioritisation matrix is not an exclusive process. The decision of which commodities and concepts are being developed should be based primarily on livelihood needs, food security and export commodities, and should take advantage of the tourism trade. Once the need is defined, the matrix can be used to select a suitable commodity candidate. Suitable candidates are found in either the top left or the top right square of the graph. The top right square contains the commodities and concepts with higher feasibility and higher benefits. In the top left square are the commodities and concepts with high potential benefits but low feasibility, thus requiring greater research and development investment in order for the farming of the commodity to come to fruition. Table 6 provides examples of commodities and concepts of high benefit and high feasibility, and those with high potential benefits requiring greater research and development investment

Table 6: List commodities with benefits and feasibility for Tonga in terms of livelihood or food security

Highest benefit and feasibility	High benefit but requiring greater research and development
Livelihood	
Mabe Pearl	Kappaphycus
Giant clams for food and aquarium trade	Sea cucumber (sea ranching)
Mozuku	
Food security	
Giant clams for food and aquarium trade	Anadara(galao) from hatchery seed
Mullet and milkfish (from wild seed)	Sea grapes
Giant clams for food	Tilapia

Based in this analysis, MOF is choosing to develop high feasibility commodities such as mabe pearl, and to continue long term research and development within and beyond the timeframe of this current development plan, to improve the feasibility of high benefit commodities such as:

- 6.14.1 Sea Cucumber for sea ranching
- 6.14.2 Seaweed (Kappaphycus, Mozuku and sea grapes)
- 6.14.3 Giant clam
- 6.14.4 Finfish (tilapia, mullet and milkfish)

APPENDIX

Appendix 1. Implementation plan.

Strategies	Action	Indicators	Responsible	Resources	Timeline	Funding	Risks/Delays
Objective 1: To strengthen the management and sustainable development of the aquaculture sector.							
1.1 Ensure aquaculture management legislation and regulations are up to date.	1.1 Follow- up on the ongoing review of legislation and regulations.	1.1 Progress report on review	Legal	Ministry's Legal Officer			
	1.2 Develop an aquaculture register database.	1.2 Database created with relevant components and data to be captured	IT Section / HOD Science Division	Staff of Aquaculture			
	1.3 Conduct consultations on the proposed new amendments on legislation and regulations	1.3 Number of consultations conducted	Legal / FMDD/ Aquaculture Section				
	1.4 Assist with approval Processes	1.4 New amendments to the legislation and regulations	FMDD Division /Legal				

and management.	Implement new Code of Practice Disseminate copies of Code of Practice to all aquaculture operators and relevant stakeholders Conduct trainings with aquaculture operators to familiarize with the Code of Practice	1.2 Number of copies printed and disseminated Number of trainings conducted annually	Aquaculture Section						
Ensure Aquaculture License conditions are up to date	Conduct review on license conditions Conduct quarterly updates with Compliance division (License section) on license conditions	Number of updates	Compliance Division and FMDD						
Continue to ensure that the Aquaculture Advisory Committee undertakes its role effectively.	1.1. Conduct meetings with the Aquaculture Advisory Committee	1.1 Numbers of meetings held	FMDD FMDD						
Review and update the Tonga National Strategy on	1.1 Conduct review on the Tonga National Strategy Aquatic Biosecurity	1.1 Review of Strategy completed	Science Division / Aquaculture Section						

Aquatic Biosecurity 2018-2022.	1.2 Conduct consultation with aquaculture section on the review and update of the National Aquatic Biosecurity Strategy	1.2 Number of consultations	Science Division / Aquaculture Section						
	1.3 Assist and support the approval of the National Aquatic Biosecurity Strategy	1.3 Assistance provided in the process of the approval of the National Biosecurity Strategy	Science Division/ Aquatic Biosecurity Section						
	1.4 Implement the Tonga National Aquatic Biosecurity Strategy	1.4 Implementation of the Tonga National Aquatic Biosecurity strategy.	Aquaculture Section / Aquatic Biosecurity						
2. To encourage and promote a resilient aquaculture sector(refer to comments on plan)									
2.1 Develop and improve methods of collection of broodstock and spat from the wild.	- Develop and trial spat collector program to collect spat from wild - Analyze spat trial data and compare against the hatchery production	Number of spat collector programs developed Data analysed	Science Division						

2.3 Investigate new potential species and strains for aquaculture.	Conduct research and survey for resistance marine species • Identify new potential species for small scale farming • Develop community small scale farming on new potential species • Implement and trial small scale farming on new potential species • Monitor small scale farm on new potential species • Report on the outcome of small scale farming on new potential species	Number of researched undertake Number of new potential species identified Number of small scale farms developed Number of trialed new potential species Number of monitors conducted Number of reports submitted to CEO	Science Division				
2.4 Support and strengthen community related aquaculture activities.	• Conduct aquaculture research, trainings and development to support fish farmers and SMA communities • Conduct ongoing spawning activities twice a years Note: confirm with team	Number aquaculture operators (activities) operated Number of farming spats, seedlings or juveniles of aquaculture species provided	Science Division				

	● Collect and enter farm production information from aquaculture operators into database ● Analyze farm production information and provide quarterly reports ● Restock giant clams into the Special Management Areas. ● Restock juvenile sea cucumber into the Special Management Areas. ● Deploy new farm lines and distribute spat to pearl farm operators. ● Conduct training workshops on farm management with aquaculture operators ● Organize farm visits to established farmer in the region or aboard - notice to remove	Database updated and analyzed Report developed Number of giant clams transferred to the Special Management Areas. Number of juvenile sea cucumbers transferred to Special Management Areas. Numbers of spat distributed and new lines deployed Number of workshops conducted					
3. To improve and strengthen livelihood and economic growth through aquaculture.							

3.1 Increasing Aquaculture productivity through revitalization and modelling of Aquaculture system	Increase productivity for sea cucumber, pearl oyster, seaweed, tilapia and prawns.	Report on productivity of commodities on a 6 month basis	Science Division/Aquaculture Section						
3.2 Conduct capacity trainings for aquaculture development license holders to promote better aquaculture practices	Seek technical assistance for capacity building trainings Conduct training and workshops with aquaculture operators on better aquaculture practices, including farm management and maintenance	Number of technical assistance requests sent Number of trainings conducted	Science Division/Aquaculture Section Science Division/Aquaculture Section						Regional Organisations that technical assistance was sent to.
3.2 Improve knowledge of the potential markets as well as market requirements	Conduct market analysis survey(both international and local markets) International market visit Develop a report on market analysis	Number of market analysis surveys conducted Number of international market visits made. Report developed	FMDD/Marketing Section						Ministry Recurrent Budget, Tongafish Project, assistance from regional organisation Funds to cater for travel expenses

3.3 Conduct research on the economic performance of the sector.	Collect economic data on aquaculture Analyze economic data on the performance of the sector Prepare report and submit to CEO	Number of report prepared and submitted	FMDD/Economics Section			Technical Assistance to assist Economist conduct research	
3.4 Strengthen restocking initiatives to improve food security and livelihoods.	Conduct site selection on potential areas for restocking activities Conduct restocking activities in Special Management Areas. Monitor restocking activities	Number sites selected for restocking activities Number of sites restocked Number of monitors conducted	Science Division / Aquaculture Section			Ministry of Fisheries	
3.5 Investigate feasibility of a financial scheme to support aquaculture growth.	Seek assistance from Ministry of Finance and National Planning on possible scheme for farmers	Available scheme for farmers	Science/Aquaculture Section, FMDD/Economics Section			Available funds from the Ministry of Finance, Tongafish Pathways Project	
4. To promote and strengthen awareness, partnership, collaboration and networking in aquaculture.							
4.1 Increase awareness on aquaculture programs and its contribution	Develop Aquaculture Awareness tools such as: posters & pamphlets, newsletters, social media	Numbers of public announcements and media releases	FMDD/Science Division & CEO Office (Media Section)			Available funds from the Ministry of Finance	

to food security, social and economic livelihoods in Tonga.	platforms for public awareness	Number copies sent				
	Circulate copies of drafted tools to HODs for finalization		FMDD/Science Division & CEO Office (Media Section)			
	Disseminate final copies to CEO for approval	Number of posters, pamphlets, newsletters, social media platforms developed and drafted	FMDD/Science Division & CEO Office (Media Section)			
	Publish and disseminate to public					
	Conduct public announcement and media release on aquaculture programs.	Number of copies circulated	Science Division & CEO Office (Media Section)			
	Disseminate copies of the approved Plan all aquaculture relevant stakeholders	Number of copies approved	Science Division			
		Number of awareness tools published	CEO and Science Division			
			Science Division & CEO Office (Media Section)			

4.2 Encourage community participation in aquaculture in decision-making and planning processes.	Conduct consultation with communities on aquaculture activities Note: Committees are included in the Roles & Authorities table on the Plan Report on consultation minutes	Number of consultation held in communities Number of meeting & minutes	Science Division - Aquaculture Section			Available funds from the Ministry of Finance, Tongafish Pathways Project & ACIAR Project	
4.3 Strengthen networking amongst aquaculture stakeholders.	Exchange programs for aquaculture farmers and communities Encourage farmers to participate in other Ministry's awareness programs: Trade show, world food day and RAFFT Ongoing review of training plan to include exchange & networking programs amongst stakeholders Submit training plan to CEO for approval	Number of programs Number of farmers participation in awareness programs Number of trainings developed in the training plan Number of trainings approved by the CEO	Science Division - Aquaculture Section CEO and Science Division			Available funds from the Ministry of Finance, Tongafish Pathways Project & ACIAR Project	

	Implement training programs to relevant stakeholders Note: actions to be moved to Objective 5	Number of trainings successfully conducted to relevant stakeholders							
5. To strengthen capacity and capability in the aquaculture sector.									
5.1 Ensure effective delivery of training and capacity building activities for Ministry of Fisheries staff and stakeholders.	Conduct a training needs analysis (TNA) Review of training plan to fit for purpose on relevant training for Fisheries staff and stakeholders Submit final training plan to CEO for approval Implement training plan Request for external (regional and international) expert assistance for any aquaculture commodity development for fisheries staff	Training needs analysis conducted Number of trainings for fisheries staff Number of trainings for stakeholders Approved training plan Number of trainings conducted Number of assistance provided to Ministry of Fisheries	Science Division CEO and Science Division Science Division					Available funds from the Ministry of Finance, Tongafish Pathways Project & ACIAR Project	

5.2 Investigate opportunities for partnerships and exchange programs with overseas institutions in the public and private sector.	Develop network with Institution involve in aquaculture development as well as private sectors Attend regional meetings to scope out opportunities	Number of MOUs renewed and partnerships developed	Science Division					Ministry of Fisheries recurrent budget, assistance from Regional organizations	
6. To promote gender equity and social inclusion in aquaculture									
6.1 Promote women and youth participation in aquaculture trainings and programs.	Conduct aquaculture trainings in Tongatapu, vava'u and Ha'apai	Number of trainings conducted in each island group	FMDD, Science					Ministry of Fisheries recurrent budget, assistance from Regional organisations, Tongafish Pathways Project	
6.2 Encourage women and youth participation in aquaculture in decision-making and planning processes.	Invite women and youth for aquaculture consultations and workshops Invite women and youth during decision-making and planning process to participate Note: School visits, social inclusion - gender, disability Capture information on farming operations and activities -	Number of women and youth participate in consultations Number of women and youth participated in the process	Science/Aquaculture and FMDD					Ministry of Fisheries recurrent budget, assistance from Regional organisations, Tongafish Pathways Project	

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Appendix 2. License Categories.

Licence applications should initially be classified into three categories.

Category A. Classification includes proposals that involve little risk to the environment and minimal risk of adverse social or economic impacts to communities in the immediate vicinity of the proposed aquaculture operation. This category is designed to cover largely self-contained operations.

Category B. Classification includes proposals that involve some impact on the social or economic welfare of adjacent communities, and may have some environmentally adverse consequences. The risks about the operation causing long-term environmental perturbations should be low.

Category C. Classification involves proposals that involve some impact on the social or economic welfare of adjacent or regional communities, and / or may have some environmentally adverse consequences. The risks about the operation causing long-term environmental perturbations may be uncertain or moderate.

All applications for a new aquaculture development licence are required to supply an Environmental Impact Assessment (s. 13 (4), Aquaculture Management Act). The level of information required for each Environmental Impact Assessment should vary with the potential environmental consequences of each aquaculture proposal. Broad prescriptions and guidelines for Environmental Impact Assessments (**Appendix 4**) should be given to applicants once the classification of their application has been determined. Aquaculture proposals that involve the establishment of a freshwater or marine hatchery, or are deemed to be major projects by the Minister for Lands, Environment, Climate Change and Natural Resources will trigger the requirement for an Environmental Impact Assessment under Environmental Impact Assessment Act 2003. Staff from the Fisheries Division and Department of Environment should work together to ensure that common terms of reference are developed for proposals that trigger the need for Environmental Impact assessments under both the Aquaculture Management Act and the Environmental Impact Assessment Act.

Guideline for a Business Development Plan for Aquaculture is shown in **Appendix 4**. The depth and complexity of the business plan should reflect the complexity and extent of the proposed aquaculture operation. The business development plan should be used as the basis for evaluating social and economic values of the proposed aquaculture venture and for monitoring development performance against planned development.

All proposals that involve the introduction of introduced (non-endemic) species should be considered and assessed on the basis of the SPC guidelines about introduction of non-endemic species (**Appendix 1**). Assessment procedures should give regard to guidelines about responsible aquaculture development given in the FAO Technical Guidelines for Responsible Fisheries 5 (Aquaculture Development) and the “Regional Guidelines for Responsible Aquaculture” (SEAFDEC, 2002), and be bound by any other international treaty or convention to which Tonga is a signatory.

The Technical Assessment Group from the Fisheries Division, when initially assess applications for aquaculture development licences should consider the following information when dealing with an application. All applications should supply this information to the relevant level of detail, according to the nature of the application.

- 1) Does the applicant have proven tenure over the land / water in which the proposed aquaculture operation is to operate?
- 2) Does or could the proposed aquaculture operation impact on existing industries or activities? If so, what are they? What is the nature of the risks and consequences to those activities?
- 3) Does the applicant have support of the relevant Designated Community group when relevant?
- 4) What are the potential environmental impacts, in terms of nutrient discharge, use of chemicals for control of parasites, disease and competitors, uncontrollable release of exotics, disease transfer risk, salination of land areas and loss of structures due to mechanical failure?
- 5) What considerations for disease monitoring and management requirements are given in the application?
- 6) Does the proposal involve the introduction of a non-endemic species? If so, have the applicants undergone a detailed examination of the risks involved and has broodstock been quarantined and examined for disease and pathogens by a competent and qualified veterinarian pathologist?
- 7) What are the potential social and economic benefits? Is there a scoping study, business risk evaluation and business plan?
- 8) Is the application consistent with the Objectives of the Management Plan?
- 9) Does the applicant have the technical competence, financial backup and experience to successfully develop the proposed aquaculture venture.

The Technical Advisory Group should then assign each application for an aquaculture development licence into categories A-C.

As a broad principle, applications for aquaculture development licences classified in **Category A** should be assessed within the Fisheries Division. Applications classified in **Category B and C** should be referred to the Ministry of Lands, Environment, Climate Change and Natural Resources (Department of Environment and Climate Change), and the Ministry of Infrastructure (Marine and Ports Division). Comments from these agents must be received by the Fisheries Division of MAFFF within one calendar month of the application being sent from the Fisheries Division. Failure to return any comments about the proposed aquaculture operation within the specified time period will be deemed as a statement that the relevant agency expresses no concern about the application under consideration.

Proposals classified into **Category A** should then be assessed and recommended for approved / rejected by the Technical Advisory Group before the application is forwarded to the Minister responsible for Fisheries for final approval or rejection. Proposals classified into **Categories B and C** should be referred to the Aquaculture Advisory Committee for review and comment before recommendations are forwarded to the Minister responsible for Fisheries for acceptance or refusal of the application.

Appendix 3. Schedule of Fees

- 1 Fee for application for an aquaculture development licence for a business or company: \$300
- 2 Fee for application for an aquaculture development licence for a Designated Community: \$100
- 3 Fee for application for a permit to occupy in inter-tidal and sub-tidal waters: T\$100 per hectare for intensive aquaculture, \$100 per km² for extensive aquaculture.
- 4 Licence fee for Category A form of aquaculture – \$100 per year
- 5 Licence fee for Category B form of aquaculture – \$400 per year
- 6 Licence fee for Category C form of aquaculture – \$1,000 per year
- 7 Transfer fee for an aquaculture development licence: \$50
- 8 'Permit to occupy' – \$500 per hectare per year for first three years of the licence life of an intensive operation.
- 9 'Permit to occupy' – \$500 per km² per year for first three years of the licence life of an extensive operation.
- 10 After completion of the third year of the life of each Permit to Occupy, the annual fee structure should be adjusted to reflect production and economic rent of the venture. The basic fee structure should be retained, but the annual fee for the permit to occupy should be increased to capture 5% of the audited net profit of the aquaculture operation each year.

Appendix 4. Creation of aquaculture areas and buffer areas

There are to be *three broad options* for the creation of aquaculture areas and buffer zones in inter-tidal and sub-tidal waters:

The first option is to develop equivalent provisions to s. 24 of the Fisheries (Conservation and Management) Regulation 1994. This Regulation gives the Registrar (defined in the Fisheries Act (1989) as the Principal Fisheries Officer) the discretion to authorise erection and use of a fish fence. This power of authorisation is virtually unconstrained in terms of limiting location and access rights for such fences. There is no requirement to refer application for construction of fish fences to any other agency.

The second option is the application for a direct approval for an aquaculture area and buffer zone in inter-tidal and sub-tidal zones. This option offers the advantage of administrative simplicity, but has the disadvantages of:

1. being actually or potentially in conflict with planning schemes developed by government agencies, and existing marine area usage such as port areas and fishing operations,
2. creating the potential for of legal action between the principals of an authorised aquaculture area and any vessel user or other person involved in a collision or other accident involving aquaculture equipment used on the aquaculture area,
3. being seen as a weak form of tenure by financial institutions as to reduce or negate the possibility of aquaculture proponents obtaining venture capital.

The present Lands Act has no head of power to grant leases for the purpose of aquaculture in inter-tidal and marine areas.

The third and preferred option called 'granting tenureship' gives head of power under the Aquaculture Management Act 2003 and Aquaculture Regulations 2008 enabling the Minister responsible for Fisheries to give leases (in the form of Permits to Occupy) for aquaculture areas in manner equivalent and parallel to that allowed for terrestrial areas under provisions of the Land Act. This option has the advantages of:

1. potentially being tailored to give the precise needs and flexibility required of an Aquaculture Area / Buffer Area,
2. ensuring the intent of the Aquaculture Management Act is maintained,
3. allowing for rapid assessment of applications once the system has been developed,
4. Ensuring administrative consistency.

Disadvantages include:

1. possibly taking some time to develop which could be a deterrent to the development of an aquaculture industry,
2. generating potential overlap between management and planning arrangements between the Fisheries Division of MAFFF and Ministry of Lands, Environment, Climate Change and Natural Resources.
3. Possibly being judicially uncertain, depending on the provisions and requirements of the Lands Act 1927.