



SAMOA

Aquaculture Management and Development Plan

2013–2018

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Secretariat of the Pacific Community Aquaculture Section

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Original text: English

Secretariat of the Pacific Community Cataloguing-in-publication data

Samoa aquaculture management and development plan / Secretariat of the Pacific Community
Aquaculture Section

1. Aquaculture — management — Samoa.
2. Aquaculture – Economic aspects — Samoa.
3. Aquaculture – Law and legislation — Samoa.

I. Title. II. Secretariat of the Pacific Community.

639.8099614

AACR2

ISBN: 978-982-00-0598-3

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Prepared for publication at SPC headquarters, Noumea, New Caledonia, 2012

Printed at SPC, Noumea, New Caledonia, 2012

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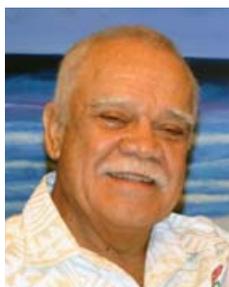




Foreword

This Aquaculture Management and Development Plan sets out a clear guide for the future expansion of the aquaculture sector in Samoa, and a comprehensive pathway for the Fisheries Division to ensure the long-term sustainability of the activity. The involvement of fisheries staff from various sections and broad, national, consultation with many stakeholders will, I hope, foster a clear commitment toward the strategies, objectives and actions of this five-year management and development plan. The Fisheries Division, in partnership with communities, farmers, and national and regional institutions, is now committed to promoting and developing the aquaculture sector in a responsible and sustainable way, as an alternative to capture fisheries, to help ensure food and nutritional security and improve rural livelihoods. I am confident that this plan can drive the development of aquaculture in Samoa and also assist the Ministry in achieving some of its Sector Plan long-term goals, in particular in the fisheries sector. I now present this Plan and commend it to the people of Samoa.

Soifua



Honourable Lemaea Ropati
Minister of Agriculture and Fisheries

1. Vision and goal for aquaculture in Samoa

1.1. Vision

Long-term benefits of socioeconomic growth for Samoa as a result of development of the aquaculture sector in a sustainable and responsible way, as an income generating activity alternative to capture fisheries.

1.2. Goal

The overall goal is to ensure food and nutritional security and improve rural and urban livelihoods through sustainable and responsible development and management of the aquaculture sector in Samoa.

1.3. Main objective of Samoa Aquaculture Management and Development Plan

The Plan's main objective is to provide comprehensive guidance to the Fisheries Division and aquaculture stakeholders on sustainable management and development of the aquaculture sector in the country by increasing the number of species being farmed, identifying species with high commercial potential, providing support to community development and management initiatives, enhancing the skills and knowledge of all those involved in the sector, and researching and promoting ways to add value to existing products, in order to improve the current status of the sector.

2. General introduction

2.1. Current status of the aquaculture sector

Samoa's diverse aquatic flora and fauna resources are readily available from its surrounding coastal environment. Most form the basis of the country's local subsistence, artisanal and commercial fisheries. The inshore fishery resources, in particular, are vital as food and income for the rural fishing communities. Although enterprise-led commercial aquaculture has not yet taken root in Samoa, aquaculture is widely recognised as a viable means of increasing fisheries production, as additional protein for the local population and as a means of generating income.

The Strategy for Development of Samoa (SDS) recognises the potential role of aquaculture, and specifies that one of the activities is to 'increase the harvestable stocks of fish and other marine resources' by developing 'fish farming to supplement natural stocks'. Aquaculture has already contributed to improvement of Samoa's resource status, through re-introduction and re-stocking of giant clam and trochus. These projects were initiated by the South Pacific Aquaculture Development Project (SPADP) and the Fisheries Division, and continued through an AusAID-funded Samoa Fisheries Project. The programme began with introductions of *Tridacna* sp. and *Hippopus hippopus* from American Samoa and Fiji for grow-out in village lagoons in the Fisheries Extension Programme. For freshwater aquaculture, the Fisheries Division is maintaining both chitridada and genetically improved farmed tilapia (GIFT) (*Oreochromis niloticus*) breeders at the public freshwater hatchery, and high quality fingerlings are being supplied from this hatchery to many small-scale/land-based farmers. Tilapia culture in earthen ponds has been quite successful in Samoa for the past five years, but the activity has also faced major constraints and limitations as a result of lack of feeds, technology and skills, and limited access to markets. To conclude, real commercial aquaculture has yet to be developed in Samoa, despite previous attempts to culture a range of species. High levels of inputs, specialised facilities and market development requirements contribute to its slow progress. Nevertheless, aquaculture is still widely recognised as a viable means of increasing fisheries production, providing additional dietary resources, and generating income for local communities.

2.2. Legal and policy framework

- Fisheries Act, 1988.

One of the purposes of the Fisheries Act is 'to promote the conservation, management and development of the fisheries in Samoa'. The Act will guide and mandate fisheries, including aquaculture. It is worth noting that a revised Fisheries Management Bill 2013, now with Cabinet, provides a more direct mandate for the development of this Plan. Section 25 paragraph 2 states that the Fisheries Division may specify conditions for the operation of aquaculture activities relating to conservation, management and sustainable use of the aquatic environment.

- Ministry of Agriculture and Fisheries Sector Plan 2012–2016.

One of the long-term objectives of the Sector Plan is to strengthen regulatory framework enforcement and compliance capacities and public-private sector collaboration. The Fisheries Sector Plan specifically calls for the development of an Aquaculture Management and Development Plan.

3. Strategies

Objective 1: To promote better aquaculture management practices

Rationale: Draft legislation on aquaculture, including regulations, permits and licensing, is required. Good aquaculture practices at all levels of the production chain should be comprehensively developed and promoted by the Fisheries Division. These practices should be made clear to all relevant key partners to ensure sound management. Specific management and development plans for high priority commodities, e.g. tilapia, giant clams, trochus and mullet, are also needed in order to provide clear guidance to all key stakeholders on the streamlined development of the sector.

Objective 2: To improve marketability of aquaculture products in Samoa

Rationale: There is a real need to assess and better understand local and overseas markets and their potential for aquaculture products in Samoa. Trade routes, freight charges and space, demand and supply, and access requirements all need to be considered. Market access requirements must be complied with when exporting Samoan products overseas. Research on further value-adding products through post-harvest techniques, processing and labelling of commodities, such as tilapia, should be encouraged. Once a market is established, measures need to be in place to ensure that the supply chain is maintained. Research on the marketing of new and existing products, and collaboration with the Ministry of Foreign Affairs and Trade in seeking markets for Samoa's products should be encouraged.

Objective 3: To diversify the number of aquatic species that can be cultured in Samoa

Rationale: So far, there is only one freshwater public hatchery operational in Samoa to promote and develop aquaculture for commercial and restocking purposes. In order to make possible a broader range of aquaculture commodities that can be successfully produced in Samoa, this facility needs to be upgraded and a new marine hatchery should be developed. Because the Toloa marine hatchery was closed, a proposal to re-establish the facility should be submitted, identifying financial support. Furthermore, production of microalgae is needed in order to feed most high priority commodities such as giant clam, trochus and other potential species. Research on potential local species of interest for capture-based aquaculture should be conducted.

Objective 4: To improve quality and availability of lower-cost feeds for aquaculture

Rationale: There is an urgent need to establish a proper feed storage unit and develop affordable (cost-efficient) aqua-feeds with available local raw materials for species such as tilapia. The cost of local production versus imported products may cause problems. Small-scale feed processors would be ideal for small countries such as Samoa to meet the required level of production. Training for Fisheries Division staff and private sector personnel in feed formulation for hatchery and grow-out is essential. As follow-on research from the feed ingredients survey and analyses already conducted in Samoa, implementing on-farm trials should be promoted by the Fisheries Division, to test and compare the performance of fish feed made from various local ingredients in a real production system and identify the best.

Objective 5: To ensure access by farmers to the best possible genetic quality of seed stocks

Rationale: Proper broodstock management protocols and coherent selective breeding strategies for high priority species should be encouraged by the Fisheries Division. GIFT breeders and good quality giant clams broodstock should be maintained and be available to the private sector and other key stakeholders when required.

Objective 6: To promote private sector development

Rationale: 'Pilot' semi-commercial farms should be developed in order to demonstrate the feasibility of aquaculture activities in Samoa. These pilot farms should be established in partnership with the private sector to promote best management practices and foster the industry. Practical training opportunities for all key partners engaged in producing high priority commodities should be developed and promoted. Incentives for the private sector should be encouraged to ensure confidence in investing. Pilot farms will serve to assess the viability of the culture of a selected species in partnership with the private sector. Agreements between the investor and community should be arranged to ensure loyalty and consistency in supply. Funding schemes for potential fish farmers to help them establish farms should be assessed (e.g. micro-credit schemes). A proposal to the Government for duty free or reduced import tax for imported inputs (e.g. equipment, seed, feeds) for a period to kick-start industry development should be evaluated.

Objective 7: To improve human resource capacities to manage and develop aquaculture

Rationale: The current structure of the Fisheries Division for aquaculture should be reviewed and expanded, and include establishing a Principal Fisheries Officer for Aquaculture post. General technical expertise on aquaculture is limited in Samoa, even within the Aquaculture Section of the Fisheries Division. A training needs analysis (TNA) is required, in order to identify skills and knowledge gaps and prioritise training needs for further development. Short- and long-term training programmes should be promoted. Funding to implement such programmes must be secured from either Government or specific donors.

Objective 8: To improve aquaculture networking

Rationale: Local, regional and international networking should be promoted and maintained, in the provision of research, training and technical advice.



4. Action plan

4.1. In English

Strategic objectives	Actions	Performance indicators	Timeframe	Projects
	1. To promote better aquaculture management practices (BMPs)			
	1.1. Specify terms and conditions for commercial aquaculture farms.	1.1. Terms and conditions developed.	Mid 2013	1. Prepare terms and conditions for commercial aquaculture farms.
	1.2. Specify terms and conditions for hatchery establishment and operation.	1.2. Terms and conditions developed.	2013	2. Prepare terms and conditions for hatchery establishment and operation.
	1.3. Prepare import risk analysis for any proposals to introduce aquatic species.	1.3. Risk analysis prepared as required.	Ongoing	3. Prepare import risk analysis for any proposals to introduce aquatic species, as required (IRA guidelines).
	1.4. Develop commodity plans for the top priority aquatic species.	1.4. Commodity plans developed for four species.	2015	4. Develop commodity plans for the top priority aquatic species.
	1.5. Conduct a periodical review of the Aquaculture Management and Development Plan.	1.5. Consultation held and Aquaculture Management and Development Plan reviewed.	Progress review – after two years Plan review – after five years	
	2. To improve marketability of aquaculture products in Samoa			
	2.1. Assess market requirement for local and export markets.	2.1. Market requirements for local and export markets identified.	Tilapia – end 2013 Sea grape – end 2014	1. Assess market requirements for local and export markets.
	2.2. Assist producers to comply with market requirements as required.	2.2. Relevant market requirements met by producers.	Ongoing	2. Assist producers to comply with market requirements as required.
	2.3. Assist in product development such as value adding and processing.	2.3. Assistance provided for product development.	Ongoing	3. Assist in product development such as value adding and processing.
	3. To diversify the number of aquatic species that can be cultured in Samoa			
	3.1. Establish a multi-species hatchery.	3.1. Hatchery established.	2013	1. Establish a multi-species hatchery.
	3.2. Establish a micro-algal laboratory.	3.2. Algal laboratory established.	2013	2. Establish a micro-algal laboratory.
	3.3. Initiate seed production for aquaculture and coastal fisheries restocking.	3.3. Seed production initiated.	Ongoing from 2013	3. Assess potential for captured-based aquaculture.
	3.4. Assess potential for capture-based aquaculture.	3.4. Potential assessed.	Freshwater prawn – mid 2013 Other species – end 2014	
	4. To improve quality and availability of lower-cost feeds for aquaculture			
	4.1. Establish a proper feed storage unit.	4.1. Storage unit established.	End 2013	1. Establish a proper feed storage unit.
	4.2. Experimental production of aqua feeds with available raw materials (best feed identified).	4.2. Feed produced (best feed identified).	Ongoing from 2013	2. Production of aqua-feeds with available raw materials (best feed identified).
	4.3. Conduct on-farm trials of feed formulated from results of the feed ingredient inventory survey.	4.3. On-farm trials conducted.	By 2014	3. Conduct on-farm trials of feed formulated from results of the feed ingredient inventory survey.

5. To ensure access by farmers to the best possible genetic quality of seed stocks

5.1. Maintain the brood-stock in culture.	5.1. Brood-stock maintained in culture.	Ongoing for tilapia and giant clam	1. Maintain the brood-stock in culture. 2. Prepare and implement the brood-stock management protocol to maintain genetic quality. 3. Make available quality breeders for aquaculture by stakeholders.
5.2. Prepare and implement the brood-stock management protocol to maintain genetic quality.	5.2. Brood-stock performance maintained	Ongoing for tilapia from 2013	
5.3. Make available high quality breeders for aquaculture by stakeholders.	5.3. High quality breeders available as required.	Tilapia – Ongoing from now Giant clam – Ongoing from hatchery established	

6. To promote private sector development

6.1. Establish pilot farms.	6.1. Pilot farms established	Mid 2013	1. Establish pilot farms. 2. Promote hands-on training opportunities for top priority commodities. 3. Review potential incentives to encourage investment in aquaculture.
6.2. Promote hands-on training opportunities for top priority commodities.	6.2. Hands-on training promoted.	Mid 2013	
6.3. Review potential incentives to encourage investment in aquaculture.	6.3. Incentive strategies identified as required.	Ongoing	

7. To improve human resource capacities to manage and develop aquaculture

7.1. Conduct training needs analysis for aquaculture staff.	7.1. Training needs identified.	2013	1. Conduct training needs analysis for aquaculture staff. 2. Conduct training for aquaculture staff based on the needs analysis. 3. Submit proposal for Principal Fisheries Officer Aquaculture recruitment.
7.2. Conduct training for aquaculture staff based on the needs analysis.	7.2. Training conducted.	Ongoing	
7.3. Submit proposal for Principal Fisheries Officer Aquaculture recruitment.	7.3. Principal Fisheries Officer Aquaculture recruited.	Ongoing	
7.4. Facilitate training opportunities for private sector, based on demand.	7.4. Training for private sector promoted and conducted.	Ongoing	4. Facilitate training opportunities for private sector, based on demand.

8. To improve aquaculture networking

8.1. Facilitate national level networks such as Samoa Aquaculture Farmers Association (SAFA).	8.1. Farmers strengthened through exchange and collaboration.	Ongoing	1. Facilitate national-level networks such as Samoa Aquaculture Farmers Association (SAFA). 2. Maintain regional and international networks to provide research, training and technical advice, for example with SPC, USP, SPREP, FAO and ACIAR.
8.2. Maintain regional and international networks to provide research, training and technical advice, with, e.g. the Secretariat of the Pacific Community (SPC), the University of the South Pacific (USP), the Secretariat of the Pacific Regional Environment Programme (SPREP), the United Nations Food and Agriculture Organization (FAO) and the Australian Centre for International Agricultural Research (ACIAR), among others.	8.2. Training opportunities and technical advice available to the Ministry of Agriculture and Fisheries by various stakeholders.	Ongoing	

4.2. In Samoan (Fuafuluga o Galuega Fa'atino)

Fuafuluga Alualu Mamao	Fa'amaoniga	Galuega Fa'atino	Matafetuina o Galuega Fa'atino	Taimi Faatulagaina mo Galuega Fa'atino	Poloketi
<p>1. la unai le pulea tatauina o le faafaatoagaina o i'a ma figota</p>					
<p>E tatau ona manino lelei aiaiga o le fa'afa'atoagaina o i'a ma figota i totonu o le Tulafono Artu ma Tulafono Faatonutonu a le Vaega o Faigafaiva. Ia fa'atino lelei galuega o fa'atoaga i'a ma figota i ala tatau ma le puipuga o le si'osi'omaga e amata mai i le Vaega o Faigafaiva ma fa'alauiloa i ana paaga fai fa'atoaga. Ia manino foi le ta'iala mo le puipuga lelei o le si'osi'omaga mai fa'atoaga i'a ma figota i totonu o tusi ta'iala mo le atia'e o i'a ma figota ina ia usitaia e faifa'atoaga uma.</p>	<p>1.1. Fausia ta'iala mo le fa'atino o fa'atoaga i'a ma figota fa'apisinisi. 1.2. Fausia ta'iala mo le fa'atino o fale fa'afuaga i'a ma figota. 1.3. Fa'atino sutesuega mo a'afiaga o le si'osi'omaga i'a ma figota e fa'alulufale mai i totonu o Samoa mo le fa'afaatoagaina. 1.4. Fausia le tusi ta'iala mo le atina'e o meaola mo le fa'afa'atoagaina. 1.5. Fa'atinoaina le iloilo o le Tusi Taiala mo le Puleaina tatau ma le Atina'eina o Fa'afa'atoagaina o i'a ma figota.</p>	<p>Aiaiga mo fa'atoaga fa'apisinisi. Aiaiga mo fale fa'afuaga i'a ma figota. Mautu sutesuega o a'afiaga o le si'osi'omaga i'a ma figota e fa'alulufale mai i totonu o Samoa. Tusi ta'iala mo i'a ma figota filifilifa. Iloiloga o le Tusi Taiala. Iloiloga o le iloiloga-pe a maea le 2 tausaga. Toe iloilo lenei Fuafuluga fa'atitia pe a maea le 5 tausaga.</p>	<p>Ogototonu o le 2013 2013 Fa'auau 2015</p>	<p>1. Tapena aiaiga mo le taiala o fa'atoaga fa'apisinisi. 2. Tapena aiaiga mo le taiala o fale fa'afuaga o i'a ma figota 3. Tapenapena mo sutesuega o a'afiaga o i'a ma figota e ono fa'aulu mai i totonu o Samoa mo fa'atoaga. 4. Fausia ta'iala mo i'a ma figota ua filifilifa mo le atina'eina.</p>	
<p>2. la fa'aleleia fefa'atauiga o i'a ma figota fa'afaatoagaina i Samoa ma atunuu i fafo</p>					
<p>E moomia le sutesueina o maketi i Samoa ma atunuu i fafo ina ia malamalama i taimi o femalagaiga o vaalele ma va'a i le sami, tau o uta ma avanoa o uta feavea'i i vaalele ma vaa, manaoga o loo iai mo oloa fa'afa'atoaga ma aiaiga o maketi i atunuu i fafo. A fa'amautu mai se maketi mai fafo mo i'a, e tatau foi ona iloilo fa'atoaga i Samoa po'o lava le i'a ma figota maua aua lona fa'atauina atu.</p>	<p>2.1. Fa'atino sutesuega mo maketi i Samoa ma atunuu i fafo. 2.2. Fesoasoani i le au faifa'atoaga i le ausiaina o aiaiga o maketi i fafo. 2.3. Fesoasoani i le atina'eina o oloa gaosia mai i'a ma figota.</p>	<p>Ta'iala mo maketi i Samoa ma fafo mo le au faifa'atoaga. Ta'iala ia mafai ona ausia ele au faifa'atoaga. Fesoasoani mo le atina'e o oloa faosia mai i'a ma figota.</p>	<p>Tilapia – fa'aiuga 2013 Limu fuafua – fa'aiuga 2014 Fa'auau Fa'auau</p>	<p>1. Sutesue aiaiga o maketi mo le fefa'atauiga o i'a ma figota. 2. Fa'amalosia le galulue a faifa'atoaga ia ausia aiaiga a maketi. 3. Auilili le talafeauga o oloa gaosia mai i'a ma figota mo fefa'atauiga.</p>	
<p>3. la faateleina le aofaiga ma ituiga o i'a ma figota mo le fa-fa'atoagaina</p>					
<p>Talu ai ona ole leai o se fale e fa'afuaga ai i'a ma figota o le sami i Samoa, ua alagatau ai ona fausia se fale mo leni fa'amoemoe. Ua tatau foi ona toe fa'aleleia nofoaga o lo'o fa'afuaga ai meaola vai o lo'o iai nei. Ua mana'omia foi le fausia o se fale mo le fa'aulaina ma tausua ai le limu aua meaa i i'a ma figota o le a fa'afuaga. Ia fa'atinoaina sailiiliga mo meaola e talafeagai e tapu'e mai i o latou si'osi'omaga mo le fa'afa'atoagaina.</p>	<p>3.1. Fausiaina o le fale fa'afuaga mo i'a ma figota mai le sami ma vaimagalo. 3.2. Fausiaina o le fale e fa'aula ma tausua ai limu mo le fafagaina o i'a ma figota fa'afuaga. 3.3. Fa'atinoaina le fa'afuaga o i'a ma figota mo le toe fa'ateleina o nei meaola i gataifale. 3.4. Fa'atino sutesuega i le talafeagai o le fa'afa'atoagaina o i'a ma figota mai i'a tapu'e.</p>	<p>Fa'atino le fale fa'afuaga i'a ma figota. Fa'atino le fale e fa'afuaga ma tausua ai limu. Fa'atino galuega fa'afuaga o i'a ma figota. Sutesuega mo i'a ma figota talafeagai ia fa'atinoaina.</p>	<p>2013 2013 Fa'auau mai le 2013 Ulavai – 2013 Isi meaola – fa'aiuga 2014</p>	<p>1. Fausia fale fa'afuaga mo i'a ma figota ma le fale fa'afuaga mo le limu. 2. Fa'atino galuega fa'afuaga o i'a ma figota. 3. Sutesuega mo i'a ma figota talafeagai ia fa'atinoaina.</p>	
<p>4. la faaleleia le gaosiaina o meaai mo i'a ma figota fa-fa'atoagaina</p>					
<p>O le tasi o vaega taua tele mo le fa'afa'atoagaina o i'a ma figota, o meaai aua le fafagaina i fa'atoaga. O fa'atoaga nei e aofia ai tilapia, ulavai ma isi. O meaai lelei mo meaola o se tasi o vaega o loo mo'omia tele le fa'aleleia e le Vaega o Faigafaiva. O lea e mo'omia ai le lelei ma mautu o se fale, masini ma meaifaluga mo le gaosia ma le teuina malu o meaai.</p>	<p>4.1. Fausiaina o le fale e teuina ai meaai mo i'a. 4.2. Fa'atita'i le gaosia o meaai i'a mai i mea o lo'o maua io tatou laulafanua. 4.3. Fa'atino se fa'atita'i'iga e sutesue ai le ola o i'a mai i meaai o lo'o gaosia i mea o lo'o maua io tatou laulafanua.</p>	<p>Fausia le fale mo le teu maluina o meaai i'a. Gaosia meaai i'a. Fa'atino Fa'atita'i'iga mo fa'atoaga.</p>	<p>Fa'aiuga o le 2013 Fa'auau i le 2013 I le 2014</p>	<p>1. Fausia se nofoaga e teu malu ai meaai i'a. 2. Sutesuega o le ola o i'a mai meaai gaosi i totonu o Samoa. 3. Fa'atino fa'atita'i'iga o meaai gaosia mo fa'atoaga.</p>	

<p>5. La fa'atumauiina le tulaga lelei o le i'a mo faifa'atoaga</p> <p>O le lelei o le ituaiga i'a (genetic) o se tasi o vaega taua e ao ona fa'atumauiina. O le Vaega o Faigafaiava o lo'o iai le tilapia lelei (best genetic) o lo'o teuina ai ma fa'asolosolo le fa'afifoaina aua le i'a lelei lona ituaiga mo faifa'atoaga.</p>	<p>5.1. La fa'atumauiina le lelei o meaola e fa'aaogaina i fa'afifoaga.</p> <p>5.2. La fa'atinoina ta'iala manino ma lelei mo le vaavaia o nei meaola.</p> <p>5.3. La fa'atumauiina le maua o meaola lelei mo fa'afifoaga pe a mana'omia e faifa'atoaga.</p>	<p>la malu pui puia meaola e faaogaina i fa'afifoaga.</p> <p>Fa'atumauiina lelei talafeagai o nei meaola mo galuega fa'afifoaga.</p> <p>Mautinoa le iai o meaola lelei mo fa'afifoaga pe a mana'omia.</p>	<p>Fa'aaauu mo tilapia ma faisua</p> <p>Fa'aaauu mo tilapia mai le 2013</p> <p>Fa'aaauu mo tilapia – Fa'aaauu mo faisua pe a maea fausia le fale faafofoa</p>	<p>1. Malu pui puia meaola e faaogaina i fa'afifoaga.</p> <p>2. La fa'atinoina ta'iala manino mo le vaavaia lelei o nei meaola.</p> <p>3. La fa'atumauiina le maua o meaola lelei ma talafeagai mo fa'afifoaga pe a mana'omia e faifa'atoaga.</p>
<p>6. la fa'amalosia le aufaifa'atoaga ma pisisi tumaoti e fa'a-fa'atoagaina i'a ma figota</p> <p>la atiae ni fa'atoaga fa'alauiloo e fa'ailo ai e mafai ona fa'atino le fa'afatoagaina o i'a ma figota i Samoa..</p> <p>O le tasi lenei o vaega e tatau ona agai iai le Vaega o Faigafaiava ina ia fa'atino ituaiga o fa'atoaga fa'apenei, e fa'atino ai a'oaoga a le aufaifa'atoaga, aoga ma isi e fia malamalama i le fa'atinoga o lenei atina'e.</p>				
<p>7. la fa'aleleia le auunaga a le Vaega o Faigafaiava i le unaia o galuega atiae mo le fa'a-fa'atoagaina o i'a ma figota</p> <p>la iloilo ina fa'atulagana mo le au faigaluega ina ia mafai ona fa'afailuega se Ofisa Ta'ita'i Sinia mo le Vaega e fa'afatoagaina i'a ma figota. O le tomai fa'apitoa i le fa'atinoga o galuega e patino ile fa'afatoagaina o i'a ma figota i totonu o Samoa aemaise le Ofisa o Faigava e matua utiuti lava. O lo'o mana'omia se ua iai le tomai e sailiilila ai ituaiga o a'oaoga fa'apitoa e talafeagai mo nei tomai ma agava'a eseese, ia fa'amuamua i nei a'oaoga aua lona fa'alauteleina. O a'oaoga fa'avaitaimi ma a'oaoga mo taimi umi ua tatau ona unaia. O le fa'atupaina o nei ituaiga o a'oaoga e tatau ona ma'ioio pe mai i le malo po'o se fesoasoani mai faifo.</p>				
<p>8. la fa'aleleia feso'otaiga mo le fa'afatoagaina o i'a ma figota</p> <p>la fa'alauiloo ma fa'atumauiina ala o feso'otaiga fa'alotoifale, fa'aitulagi aemaise le fa'ava-o-malo, i ala o sailiiliga, a'oaoga ma fautuuga fa'apitoa mo le fa'atoagaina o i'a ma figota.</p>				



5. Species prioritisation

5.1. Priority commodities for aquaculture in Samoa

Many species have already been the subject of experimental aquaculture trials or pilot projects in Samoa, and more species are being added to the list. With limited staff resources and a limited operating budget, one benefit of this Aquaculture Management and Development Plan is to set priorities and focus development efforts on top priorities. To condense the long list of potential aquaculture commodities down to a short list of manageable size, and to rank these, the feasibility of each potential commodity was assessed, including availability of seeds, feeds, technical knowledge, required infrastructure, marketability, local versus exotic species, and use in restocking/stock enhancement programmes. The potential economic, social, and environmental benefits of each commodity were also assessed.

The Priority Matrix is presented in the table below:

BENEFITS	HIGH	Exotic seaweed (<i>Kappaphycus alvarezii</i>) Marine ornamental fish + PCC Mud crab	Local fresh water prawn	Giant Clams Sea grapes (<i>Caulerpa racemosa</i>) Tilapia Mullet Trochus Malaysian fresh water prawn
	MEDIUM	Lobster Barramundi Green snail Milkfish Seaweeds (local spp.)	Reef fish (grouper, red snapper...) Sea urchins (local spp.) Rabbitfish	Sea cucumber
	LOW	Fresh water eel		
		LOW	MEDIUM	HIGH
		FEASIBILITY		

The top six commodities that emerged from the national consultation were: **giant clam**, sea grapes (*Caulerpa racemosa*), **tilapia**, **mullet**, **trochus** and **Malaysian freshwater prawn**, followed by local sea cucumber and local freshwater prawns. Taking into account the limited human and financial resources in Samoa to work on all top priorities at once, the highest ranked commodities were further regrouped in order to identify the **top four commodities** to be focused on during the next five years, namely: 1) giant clam; 2) mullet; 3) tilapia and 4) *Caulerpa*.

5.2. High priority commodities

1. Giant clam (*Hippopus* spp. and *Tridacna* spp.)

These are flagged as species that should continue being a priority for the Fisheries Division, both for aquaculture and restocking activities. At present, spawning and larvae rearing techniques are known, and grow-out husbandry practices have been developed. Restocking and stock enhancement programmes through community involvement have been relatively successful in several locations. Giant clams are a high value species, prized on the marine aquarium market and considered a delicacy in Samoa. A new hatchery facility will be established soon near Apia, in order to ensure a reliable supply of spat for culture and restocking. The establishment of this clam hatchery will support the re-introduction of clams to villages with reserves established under the Fisheries Division extension programme.

FEASIBILITY = 8 / BENEFITS = 9

Advantages	Disadvantages
<ul style="list-style-type: none"> ‣ high value; ‣ positive impact in rural communities; ‣ farming technology is available; ‣ high local and export demand; ‣ relevant for restocking and stock enhancement programmes; ‣ cultural and social importance; and ‣ indigenous species. 	<ul style="list-style-type: none"> ‣ lack of facilities; and ‣ lack of expertise in artificial breeding and spawning.





2. Flat grey mullet (*Mugil cephalus*)

Mullet is considered a high value species in the Samoan local market, although it is seen as low value marine finfish in the rest of the world. It has good potential as a euryhaline finfish species, and wild seed-stock can easily be found in certain locations. Fingerlings could also be produced by artificial breeding in the planned marine hatchery. Breeding protocols are undemanding. Larvae rearing techniques and grow-out strategies have been developed in other regions of the world, such as Southeast Asia and North Africa, with great success. These technologies could easily be transferred to Samoa.

FEASIBILITY = 7 / BENEFITS = 8

Advantages	Disadvantages
<ul style="list-style-type: none"> ‣ high value in Samoa; ‣ indigenous species; ‣ low in food chain; ‣ broodstock are locally available; and ‣ grow-out strategies are well known. 	<ul style="list-style-type: none"> ‣ lack of technical knowledge for breeding in Samoa; ‣ lack of hatchery facilities; and ‣ no export market.

3. Tilapia (*Oreochromis niloticus*)

Nile tilapia (*Oreochromis niloticus*) is viewed as the key freshwater species for developing a family or community-based aquaculture industry in Samoa. It plays a relevant role in ensuring food and nutritional security in rural and isolated communities, generates income from market sales, and is affordable and available locally throughout the year. It needs no complicated techniques or skills and feeds low in the food chain. Several farmer networks already in place can ensure the long-term sustainability of the activity. Furthermore, the Fisheries Division is currently maintaining and producing two lines of high quality GIFT and chitridada tilapia fingerlings, which are being distributed to farmers. To conclude, Nile tilapia has excellent potential, since propagation and distribution are being carried out under several Samoan Fisheries Projects.

FEASIBILITY = 7 / BENEFITS = 8	
Advantages	Disadvantages
<ul style="list-style-type: none"> ‣ easy to culture; ‣ easy to breed; ‣ moderate local demand; ‣ broodstock, facilities and capacities are available in Samoa; and ‣ strong, positive impact in rural communities. 	<ul style="list-style-type: none"> ‣ lack of feeds; ‣ lack of inbreeding control strategies at farm level; ‣ lack of marketability (demand/supply) knowledge; and ‣ lack of business plans at farm level.





4. Sea grapes (*Caulerpa racemosa*); local name: *limu fuafua*

Caulerpa racemosa is a bright green alga that forms carpets in coral reef lagoons. *C. racemosa* is the species commonly harvested and sold fresh in Samoa. Its distinctive feature is its 'bunch of grapes' appearance. There is a strong local market for fresh seaweed. Attempts to transport fresh *C. racemosa* have been unsuccessful due to rapid reduction in turgor once picked and hence lack of quality in transported product, although it can be exported as a lower-value salted product. While there are plenty of sites ostensibly suitable for growth of *C. racemosa*, most sea grapes species exhibit substantial temporal and spatial variability in growth rates. This inherent variability in growth limits the use of this species in aquaculture and further research is needed. The best option with *C. racemosa* seems to be to promote additional transplantation to support the local demand for edible seaweed. In the past two years, several trials focused on sea grape culture have been implemented in various locations of Samoa, with varying degrees of success. The aim of the Fisheries Division is to continue with these trials, improving and adapting existing techniques in order to overcome most of the challenges presented by the species.

FEASIBILITY = 8 / BENEFITS = 8

Advantages	Disadvantages
<ul style="list-style-type: none"> ‣ local market; ‣ high value; ‣ easy to culture; ‣ no need for a hatchery; ‣ positive impact in rural communities; ‣ expertise is available in the country (trials ongoing); ‣ environmentally friendly; ‣ indigenous species; ‣ culturally important locally, and to Pacific Islanders in Australia and New Zealand; ‣ high potential for restocking; and ‣ staff already trained in farming techniques. 	<ul style="list-style-type: none"> ‣ highly vulnerable to predators (fish grazing); and ‣ extremely perishable with short shelf-life (unless salted).

5. Trochus (*Trochus niloticus*)

Breeding and larvae rearing techniques are well developed technically and are not technically demanding; trochus larvae are lecithotrophic and do not need to be fed during the short larval phase. Hatchery procedures are relatively simple and the future giant clam hatchery could also be used to rear trochus. Although the value of the trochus fisheries is not large, compared with the industrial fisheries of the region, the impact of this species, through either culture or restocking programmes, on rural communities, is quite substantial. Because it is one of the few resources from which cash income in rural locations may be derived, it is worthy of special attention by the Fisheries Division.

FEASIBILITY = 8 / BENEFITS = 8	
Advantages	Disadvantages
<ul style="list-style-type: none"> ‣ high value for both shell and meat; ‣ very relevant for restocking programmes; ‣ local expertise/knowledge is available (project ongoing); ‣ low mortality during translocation; and ‣ easy to breed. 	<ul style="list-style-type: none"> ‣ motile shellfish; ‣ slow-growing; and ‣ cannot be grown intensively in enclosed spaces.





6. Fresh water prawn (*Macrobrachium rosenbergii*)

There is strong local demand, and potential for import substitution, which can be met by farming prawns locally. The most efficient freshwater prawn species for aquaculture is the giant river prawn *Macrobrachium rosenbergii*, which is not a local prawn, so would need to be introduced. This species was previously introduced to Samoa from Tahiti during the late 1970s and early 1980s, but is not now present in Samoa. Local markets include restaurants, hotels and supermarkets.

FEASIBILITY = 7 / BENEFITS = 7

Advantages	Disadvantages
<ul style="list-style-type: none"> ‣ local and export market; ‣ high value; ‣ positive impact in rural communities; ‣ hatchery and grow-out technology is available within the region; and ‣ very similar product to indigenous freshwater prawn <i>ula vai</i>. 	<ul style="list-style-type: none"> ‣ lack of expertise; ‣ lack of specific facilities; ‣ lack of aqua-feeds; and ‣ limited social and cultural relevance.

5.3. Low priority commodities

1. Local fresh water prawn (*Machrobrachium lar*); local name: *ula vai*

FEASIBILITY = 4 / BENEFITS = 7	
Advantages	Disadvantages
<ul style="list-style-type: none"> ‣ local markets available; ‣ high value; ‣ traditional knowledge on spawning and fishing grounds; ‣ small-scale capture-based culture is possible in some locations; and ‣ low in food chain. 	<ul style="list-style-type: none"> ‣ lack of technical knowledge (cannot be reared in hatchery); ‣ needs special ponds with plastic-sheet fences (they climb out); and ‣ size of industry limited by availability of captured juveniles.

2. Sea cucumber (Local species): black teatfish (*Holothuria whitmaei*), white teatfish (*Holothuria fuscogilva*), curry fish (*Stichopus hermanni*), pink fish (*Holothuria edulis*) and lollyfish (*Holothuria atra*)

FEASIBILITY = 7 / BENEFITS = 6	
Advantages	Disadvantages
<ul style="list-style-type: none"> ‣ broodstock is locally available; ‣ quite significant local market; ‣ positive impact in local communities; ‣ high export value (only some species); and ‣ breeding and grow-out technologies are known within the region. 	<ul style="list-style-type: none"> ‣ lack of facilities; and ‣ lack of experienced staff.

3. Green snail (*Turbo marmoratus*)

FEASIBILITY = 2 / BENEFITS = 4	
Advantages	Disadvantages
<ul style="list-style-type: none"> ‣ easy to culture; ‣ overseas markets available for shell; ‣ technical knowledge available in the region (Tonga, SPC); and ‣ positive impact in local communities. 	<ul style="list-style-type: none"> ‣ exotic species (no broodstock available); ‣ limited technical knowledge locally; ‣ no hatchery; and ‣ low value.

4. Spiny lobster (*Panulirus spp.*)

FEASIBILITY = 3 / BENEFITS = 6	
Advantages	Disadvantages
<ul style="list-style-type: none"> ‣ local market available; ‣ high value; ‣ wild stock are in danger; ‣ demand is higher than supply; and ‣ export market exists. 	<ul style="list-style-type: none"> ‣ lack of technical knowledge; ‣ low impact in rural communities; ‣ no aqua-feeds available; and ‣ no hatchery.

5. Reef fish: groupers (Family *Serranidae*, Sub-family *Epinephelinae*, e.g. *Epinephelus fuscoguttatus*, *Cromileptes altivelis*), red snapper (*Lutjanus campechanus*), etc

FEASIBILITY = 6 / BENEFITS = 6	
Advantages	Disadvantages
<ul style="list-style-type: none"> ‣ high value for export (Asian market); ‣ can create income and employment; ‣ popular in local market; and ‣ local species. 	<ul style="list-style-type: none"> ‣ limited staff capacity; ‣ limited facilities and resources; and ‣ lack of feeds.

6. Sea urchin (Class *Echinoidea*)

FEASIBILITY = 4 / BENEFITS = 4	
Advantages	Disadvantages
<ul style="list-style-type: none"> ‣ consumed locally; ‣ indigenous species; and ‣ local knowledge is available. 	<ul style="list-style-type: none"> ‣ low value; ‣ lack of facilities; and ‣ lack of staff experience.

7. Local seaweeds (*Corynecystis* spp., *Halymenia* spp.)

FEASIBILITY = 3 / BENEFITS = 4	
Advantages	Disadvantages
<ul style="list-style-type: none"> ‣ indigenous species. 	<ul style="list-style-type: none"> ‣ lack of awareness; and ‣ lack of technical knowledge.

8. Rabbitfish (*Siganus* spp.)

FEASIBILITY = 4 / BENEFITS = 6	
Advantages	Disadvantages
<ul style="list-style-type: none"> ‣ well-known fish that is locally consumed. 	<ul style="list-style-type: none"> ‣ moderate value only; ‣ hard to breed; ‣ lack of expert knowledge; and ‣ can be fed with vegetables, but good feed conversion ratio (FCR) is found when fed on formulated pellet feeds.

9. Mud crab (*Scylla serrata*)

FEASIBILITY = 3 / BENEFITS = 8	
Advantages	Disadvantages
<ul style="list-style-type: none"> ‣ high value; ‣ high market demand; ‣ broodstock is locally available; and ‣ can be fed on tuna waste. 	<ul style="list-style-type: none"> ‣ hard to breed and rear; and ‣ no artificial feed is available.

10. Sea cucumber (*Holothuria scabra*)

FEASIBILITY = 5 / BENEFITS = 5

Advantages	Disadvantages
<ul style="list-style-type: none"> ‣ export market; ‣ high value; ‣ knowledge available within the region; and ‣ positive impact in local communities. 	<ul style="list-style-type: none"> ‣ lack of expertise; ‣ lack of facilities; ‣ sandfish are not present in Samoa; and ‣ only a few species have hatchery technology available.

11. Barramundi (*Lates calcarifer*)

FEASIBILITY = 2 / BENEFITS = 4

Advantages	Disadvantages
<ul style="list-style-type: none"> ‣ overseas market; ‣ fingerlings available within the region (Australia); ‣ high value; and ‣ knowledge available within the region (Australia, Papua New Guinea). 	<ul style="list-style-type: none"> ‣ lack of expertise; ‣ lack of facilities (hatchery); ‣ lack of feeds; ‣ introduced species; ‣ unknown in Samoa; and ‣ low impact in rural communities.

12. Milkfish (*Chanos chanos*)

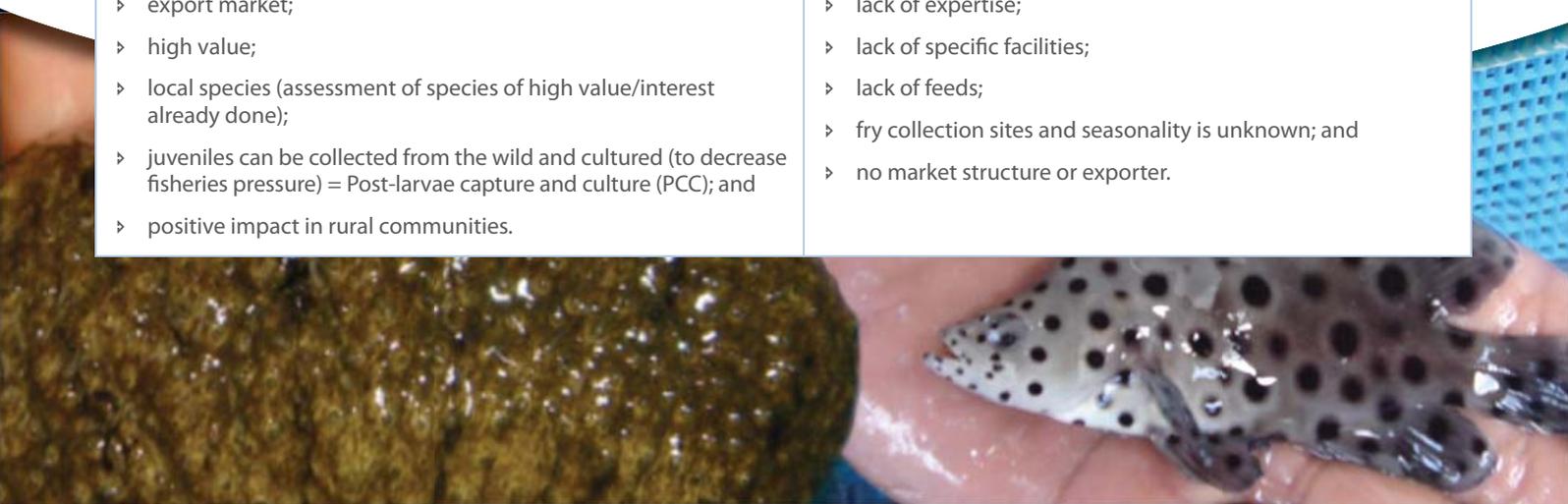
FEASIBILITY = 2 / BENEFITS = 6

Advantages	Disadvantages
<ul style="list-style-type: none"> ‣ local market (human consumption and bait); ‣ moderate value; ‣ easy to culture (no need for a hatchery); ‣ fry can be captured from the wild; and ‣ positive impact in rural communities. 	<ul style="list-style-type: none"> ‣ lack of expertise; ‣ lack of specific facilities; ‣ lack of feeds; and ‣ fry collection sites and seasonality are unknown.

13. Marine ornamental finfish (*Chaetodon* spp., *Chelmon* spp., *Amphiprion* spp.), cultured and capture-based farming

FEASIBILITY = 3 / BENEFITS = 7

Advantages	Disadvantages
<ul style="list-style-type: none"> ‣ export market; ‣ high value; ‣ local species (assessment of species of high value/interest already done); ‣ juveniles can be collected from the wild and cultured (to decrease fisheries pressure) = Post-larvae capture and culture (PCC); and ‣ positive impact in rural communities. 	<ul style="list-style-type: none"> ‣ lack of expertise; ‣ lack of specific facilities; ‣ lack of feeds; ‣ fry collection sites and seasonality is unknown; and ‣ no market structure or exporter.





14. Seaweed (*Kappaphycus alvarezii*)

FEASIBILITY = 3 / BENEFITS = 7

Advantages	Disadvantages
<ul style="list-style-type: none"> ‣ export market; ‣ low value, but world price has increased recently; ‣ easy to culture/no need for a hatchery; and ‣ positive impact in rural communities. 	<ul style="list-style-type: none"> ‣ lack of expertise; ‣ exotic species; ‣ highly affected by fish grazing (rabbitfish) and ice-ice disease; and ‣ no market structure.

15. Fresh water eel (*Anguila spp.*)

FEASIBILITY = 3 / BENEFITS = 2

Advantages	Disadvantages
<ul style="list-style-type: none"> ‣ high value; and ‣ positive impact in rural communities. 	<ul style="list-style-type: none"> ‣ lack of expertise; ‣ lack of facilities; ‣ lack of feeds; ‣ has no social/cultural relevance; ‣ no local demand; and ‣ no local interest in this species.

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