Green Climate Fund Regional Tuna Programme:

Feasibility Study

Chapter 3

Options analysis and financial and economic analysis

Prepared by the Pacific Community and Conservation International on behalf of 14 Pacific Island countries for submission to the Green Climate Fund

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Annex 2-D of the Funding Proposal "Adapting tuna-dependent Pacific Island communities and economies to climate change"

CONSERVATION INTERNATIONAL

Pacific Community
Communauté du Pacifique

Chapter 3: Options analysis and economic and financial analysis

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3.1. Economic and Financial Analysis

This Economic and Financial Analysis (EFA) undertakes a detailed, scenario-driven analysis of Components A and B of the Programme to determine the relative benefits of each aspect of the Programme approach. The scenarios considered cover situations with and without the Programme as a whole and its individual components.

The economic analysis (EA) is conducted from the perspective of the national economies of the 14 Participating Countries. For Component A of the Programme, the EA consists of a cost-benefit analysis (CBA) to assess the feasibility of increasing access to tuna for the food security [1]of coastal and urban communities in two recognised ways.[1] The first involves strengthening national FAD programmes to meet the nutrition needs of coastal communities in the face of declining per capita availability of fish from coastal habitats due to climate-driven degradation of coral reefs and population growth. The second centres around improving the distribution of bycatch (and some higher-quality tuna) available from transhipping and unloading operations by industrial tuna fishing fleets in Pacific Island ports to increase fish supply for urban communities. The cost:benefit with and without the Programme activities is examined, together with the wider benefits to society associated with increasing access to tuna for domestic consumption.

The EA for Component B focuses on the effects of climate-driven tuna redistribution on government revenue derived by the nine tuna-dependent economies from industrial tuna fishing, and analyses the cost:benefit to these countries with and without the development of the AWS.

The financial analysis (FA) is conducted from the perspective of specific entities, considering the costs and benefits in financial terms. In the case of the Programme, the FA considers the financial implications of the ongoing activities developed under the Programme on government costs and revenue for each of the 14 Participating Countries, and the increase in costs likely to occur to maintain the activities after the end of the GFC funding period. The financial impact on the participating countries after the GFC investments is considered for the three Outputs related to strengthening national FAD programmes, improving the distribution of bycatch and developing and utilizing the AWS.

3.1.1. Economic Analysis for Component A (harness tuna for food security)

Introduction

As general background and context for this analysis, summaries of the nature, size and value of the coastal fisheries, and industrial tuna fisheries, are provided in Tables 3.1 and 3.2.[2] Of most interest to the Programme is the production of the region's coastal fisheries sector, which was 161,439 t in 2021, made up 45,449 t from the coastal commercial sector (39%) and 115,990 t (61%) from the subsistence sector (Table 3.1). PNG has the highest coastal fisheries production, followed by Fiji and Solomon Islands. Niue, Nauru and Cook Islands have the lowest production.

The overall value of the region's coastal, industrial tuna and freshwater fisheries and aquaculture combined was almost USD2.4 billion in 2021. The industrial tuna fishery dominates the fisheries sector and contributed USD2.0 billion, or 82% of the total (Table 3.2).[3]

Further information on the nature of the coastal and industrial tuna fisheries in the 14 Participating Countries is presented in Chapter 1 (Sections 5 to 10 inclusive).

[1] 'Food security' here refers mainly to the 'food availability' pillar

Table 3.1: Summary of fish catch in tonnes (t) by sector and socio-economic contributions of fisheries to the 14 Participating Countries.

Country	Annual Fishery Harvests				Fishery exports (local currency, millions) and % of total exports	Gov't revenue (local currency, millions) and % contribution of tuna to Gov't revenue	Fisheries employment (no. people in tuna industry)	Percentage of Households involved in fishing	Fisheries contribution to nutrition Kg/ capita / y
	Coastal commercial (t)	Coastal subsistence (t)	Industrial tuna, locally-based (t)	Industrial tuna, foreign (t)					
Melanesia									
Fiji	11,700	18,400	10,828	-	FJD117	FJD3.4	3,800	42%	20.7 - 62.0
PNG	6,000	40,000	170,755	161,133	K1,516	K500	12,275	23%	13.0 - 24.9
Solomon Is	5,000	25,000	50,597	62,234	SIUSD475	SIUSD346	3,356	48%	32.2-45.5
Vanuatu	1,300	3,100	1,000	2,320	VT200	VT150	560	40%	13.0 -37.0
Micronesia									
FSM	1,600	3,400	1,535,787	92,900	USD30	USD72, 26%	500	55%	69.3 - 142.0
Kiribati	8,000	11,000	2,686	349,345	AUSD12	AUSD161, 66%	1,252	44%	62.2 - 207.0
Marshall Is	1,200	3,000	91,167	42,514	USD85, 78%	USD33, 19%	500	15%	38.9-65.7
Nauru	140	100	111,821	136,893	-	AUSD58.2, 20%	85	26-50%	46.7-63.9
Palau	1,000	1,400	41	1,315	USD0.32	USD7.87, 7%	n.a.	38%	33.4-135
Polynesia									
Cook Is	150	280	100	4,621	NZUSD18.96	NZUSD9.7, 4.7%	n.a.	18%	34.9-71.0
Niue	9	160	-	-	NZUSD5,050, 0.5%	NZUSD1.3, 4.3%	0	50%	49.0-118.9
Samoa	5,500	5,500	1,001	-	STUSD12.5, 17%	STUSD2.9, 0.4%	313	10%	46.3-129.5
Tonga	3,500	3,500	290	1,759	TUSD4.66, 13.5%	STUSD2.38, 0.5%	283	13%	20.3-35.0
Tuvalu	350	1,150	-	71,817	-	AUSD43.68, 76%	125	73%	72.0-146.0
Total	**45,449**	**115,990**	**1,976073**	**926,851**			**23,049**		

Table 3.2: Value of fisheries production in the 14 Participating countries in 2021 (USD).[4]

Country	Coastal commercial	Coastal subsistence	Industrial tuna, locally based	Industrial tuna, foreign	Freshwater	Aquaculture	Total
Melanesia							
Fiji	27,358,491	37,735,849	39,905,660	0	3,301,887	2,836,792	**111,1389**
PNG	18,803,419	79,772,080	204,843,305	208,547,009	36,752,137	3,418,803	**552,136,752**
Solomon Is	9,937,888	40,372,671	79,149,193	78,483,106	4,223,602	1,956,522	**214,122,982**
Vanuatu	6,898,382	9,595,826	2,264,084	8,923,676	294,508	45,989	**28,022,464**
Micronesia							
FSM	7,000,000	10,500,000	205,600,000	121,100,000	8,000	325,000	**344,533,000**
Kiribati	22,463,768	21,739,130	12,723,775	435,798,043	0	7,246	**492,731,963**
Marshall Is	3,400,000	6,000,000	121,000,000	60,966,870	0	85,500	**191,452,370**
Nauru	1,115,942	557,971	135,303,409	165,640,530	0	725	**302,618,577**
Palau	5,510,000	5,399,800	395,250	10,968,872	10,000	89,000	**22,372,922**
Polynesia							
Cook Is	1,088,435	1,564,626	1,700,680	10,680,272	27,891	224,830	**15,286,735**
Samoa	22,393,822	15,444,015	3,976,834	0	28,378	41,506	**41,884,556**
Tonga	14,561,404	10,219,298	1,491,228	9,605,263	2,917	438,596	**36,318,706**
Niue	91,837	1,142,857	0	0	0	0	**1,234,694**
Tuvalu	1,141,304	2,041,667	0	90,341,870	1,449	0	**93,526,291**
Total	**141,764,692**	**242,085,790**	**808,353,418**	**1,201,055,511**	**44,650,769**	**9,470,509**	**2,447,380,691**

Programme description

Component A of the Programme consists of two main Activities:

1. Increasing the supply of fish for coastal communities through strengthening national FAD programmes in the 14 Participating Countries. Support for sea safety awareness and improving the storage of FAD-caught fish using post-harvest methods, are also part of this Activity.

2. Improving the supply and distribution of bycatch and tuna offloaded in regional ports by industrial fishing fleets to increase the supply of fish to urban communities.

The Outputs of these two Activities will be an increased supply of tuna and bycatch for domestic consumption, and an improvement in food security, health status and livelihood opportunities in the Participating Countries.

Programme costs and financing

The total cost of Component A is estimated to be USD49.241 million over a 7-year implementation period (expected to be spread across 8 years from mid 2025 to mid 2032). The direct costs of the FAD-related Activity and the Bycatch Activity are USD33.493 and USD15.748 million, respectively (Table 3.3). All financing is provided by GCF as a grant.

Table 3.3: Summary of costs for Programme (USD).

	OUTPUTS		Year 1	Year 2	Year 3	Year 4	Year 5	Year 6	Year 7	Year 8	Total
1	Activity 1.1 FADs	Reg	689,462	2,928,908	3,665,042	3,004,917	2,531,995	1,954,681	1,240,234	123,056	16,138,296
		Nat	228,619	4,239,040	1,965,023	2,548,388	605,769	212,573	67,111	-	9,866,523
		Total	**918,081**	**7,167,948**	**5,630,065**	**5,553,305**	**3,137,764**	**2,167,255**	**1,307,344**	**123,056**	**26,004,819**
	Activity 1.2 Sea Safety	Reg	34,062	164,643	424,888	268,292	240,470	193,899	148,608	17,880	1,492,743
		Nat	4,308	797,373	1,110,648	972,440	532,819	147,259	28,957	-	3,593,805
		Total	**38,370**	**962,017**	**1,535,537**	**1,240,732**	**773,290**	**341,158**	**177,565**	**17,880**	**5,086,548**
	Activity 1.3 Fish Processing	Reg	22,640	265,434	364,355	358,920	388,884	375,302	232,999	17,209	2,025,744
		Nat	-	-	160,825	48,825	141,555	24,455	-	-	375,660
		Total	**22,640**	**265,434**	**525,180**	**407,745**	**530,439**	**399,757**	**232,999**	**17,209**	**2,401,404**
	Total OUTPUT 1		**979,092**	**8,395,399**	**7,690,782**	**7,201,782**	**4,441,493**	**2,908,170**	**1,717,908**	**158,146**	**33,492,771**
2	Activity 2.1 Increase Bycatch	Reg	150,475	652,759	469,132	397,781	358,887	300,307	252,209	39,143	2,620,692
		Nat	201,448	1,409,195	1,370,712	1,128,736	777,647	426,312	245,020	12,000	5,571,070
		Total	**351,923**	**2,061,953**	**1,839,843**	**1,526,518**	**1,136,534**	**726,620**	**497,229**	**51,143**	**8,191,762**
	Activity 2.2 Post Harvest Support	Reg	22,354	124,839	178,626	184,934	182,938	158,919	117,213	17,155	986,979
		Nat	197,318	725,691	1,457,491	1,513,592	1,264,427	979,703	430,832	-	6,569,055
		Total	**219,672**	**850,530**	**1,636,118**	**1,698,526**	**1,447,365**	**1,138,622**	**548,045**	**17,155**	**7,556,034**
	Total OUTPUT 2		**571,595**	**2,912,483**	**3,475,961**	**3,225,044**	**2,583,899**	**1,865,242**	**1,045,274**	**68,298**	**15,747,795**
3	Activity 3.1 Develop AWS	Reg	1,704,186	3,299,880	3,732,759	3,544,391	3,620,307	3,502,854	3,591,109	95,461	23,090,947
		Nat	1,315,140	2,605,214	3,373,011	2,160,562	2,344,710	2,306,315	2,243,253	12,000	16,360,205
		Total	**3,019,326**	**5,905,094**	**7,105,771**	**5,704,953**	**5,965,017**	**5,809,169**	**5,834,362**	**107,461**	**39,451,152**
	Activity 3.2 Apply AWS	Reg	207,800	717,854	624,096	657,898	782,457	644,206	776,459	42,638	4,453,408
		Nat	209,438	465,919	526,394	538,332	531,300	513,645	429,388	-	3,214,416
		Total	**417,238**	**1,183,773**	**1,150,490**	**1,196,230**	**1,313,757**	**1,157,851**	**1,205,848**	**42,638**	**7,667,824**
	Activity 3.3 AWS Training	Reg	302,425	840,925	850,593	907,164	886,575	893,518	895,642	74,274	5,651,116
		Nat	79,738	239,093	269,484	275,610	272,254	276,142	270,512	-	1,682,834
		Total	**382,163**	**1,080,018**	**1,120,076**	**1,182,775**	**1,158,830**	**1,169,660**	**1,166,154**	**74,274**	**7,333,950**
	Total OUTPUT 3		**3,818,727**	**8,168,885**	**9,376,337**	**8,083,957**	**8,437,603**	**8,136,680**	**8,206,363**	**224,373**	**54,452,925**
	TOTAL		**5,369,414**	**19,476,767**	**20,543,079**	**18,510,784**	**15,462,995**	**12,910,092**	**10,969,545**	**450,816**	**103,693,491**

Outline of scenarios used in the analysis

This section provides an explanation of the four scenarios that are considered for the economic and financial evaluation of the FAD-related and bycatch activities. In this case the economic values are considered to be the same as the financial values because it is assumed that there are no taxes and duties on the Programme costs and the shadow price of labour is assumed to be the same as the financial price.

- Scenario 1: Future without FAD programme and improved supply of bycatch
- Scenario 2: Future with FAD programme only
- Scenario 3: Future with improved bycatch supply only
- Scenario 4: Future with FADs and improved bycatch supply

The future scenario in the absence of the Programme is referred to as the "Future without Programme" (FWOP), or business as usual situation. The future scenarios as a result of the Programme's activities are referred to as "Future with Programme" (FWP). The difference in costs and outputs between these two situations allows the incremental impact of the Programme to be measured and evaluated in economic terms. The cash flows of costs and benefits over the life of the Programme (usually 20 to 25 years) are discounted to present values, with the result measured by the Economic Internal Rate of Return (EIRR). This is the discount rate at which the present value of the costs equals the present value of the benefits. An acceptable EIRR for development projects/programmes is usually at least 9%. The net present value (NPV) of the cost and benefits at the applicable discount rate (in this case assumed to be 9%), is also calculated for the economic analysis.

3.1.2. Scenario 1: Future without FAD Programme scenario

This is the future situation in the absence of the Programme. It assumes that the current, ad hoc status of the national FAD programmes is continued into the future. Under this scenario, it is expected that there will be a reduction in the volume of FAD-caught fish available per capita for domestic fish consumption by coastal communities in the 14 PICs. Without a concerted effort to increase fish production from FADs, there will be a decrease in the availability and consumption of fish protein per capita,5 resulting in the need to consume a greater amount of other forms of nutritious protein (Section 2.3.7) at unnecessary additional cost, and at the risk of increased consumption of low-grade meat products, e.g., lamb flaps and turkey tails, that are contributing to poor health and non-communicable diseases (NCDs).

Contribution from FADs

The number of existing FADs in the 14 participating PICs, the governance structure and status of FAD Management Plans or policies, and associated FAD maintenance schedules, were recorded during the preparation of Technical Study 3 in late 2022 to early 2023.6 All 14 Participating Countries had FADs and a total of 261 FADs were recorded at that time, however, not all of these FADs were regarded as being fully functional. Re-assessment of the number of operational FADs by national fisheries agencies in early 2024 indicated that 172 were operational at that time (see below).

These data relate to artisanal FADs (which are the focus of this Programme), generally located reasonably close to shore and deployed for the use of coastal fishers. They do not include FADs located further offshore for use by the industrial tuna fishery, and which are generally not accessible for small-scale fishers.

The artisanal FADs installed for use by small-scale fishers have a relatively short operational life (typically 3-4 years) because some of the current designs are vulnerable to vandalism, and most designs are subject damage/loss from large swell during cyclones/storms, particularly in cyclone-

prone countries. This means that FADs require regular maintenance and replacement to maintain their effectiveness. To date, this has often been done on an ad hoc basis due to the irregular nature of donor support. Accurate catch data from FADs are not widely available but typically a FAD is estimated to produce 5 to 10 tonnes of fish per year (Annex 23).[7] However, variation is expected in annual catches from a FAD both within and among countries. For example, 'inshore' FADs placed relatively close to the coast (at a depth of 200 – 500 m) to provide access to tuna and other large pelagic fish for fishers in paddling canoes are not expected to be as productive as 'offshore' FADs placed several km out to sea (at depths ranging from 800 – 2500 m) used by fishers who have motorboats. The existing FADs are generally located closer inshore than those proposed for the Programme, so it is likely that their productivity will be at the lower end of the range. FAD-caught fish are typically used for both home consumption by the fisher's family and for sale in the local market. Given the uncertainty in production from FADs, the study uses values of 5 t/FAD and 10 t/FAD to estimate annual catch from FADs (Annex 23). An independent expert has confirmed that the average annual catch from a FAD is likely to be within this range in most participating countries (see Appendix 5 in Annex 23).

Number of operational FADs in coastal areas targeted by the Programme

Not all the FADs currently installed in the 14 PICs are in the target areas that will receive FADs under the proposed activities to strengthen national FAD programmes. An estimate of the number of FADs that are in the Programme's target area(s) in each country was prepared in early 2024 in consultation with all national fisheries agencies (Table 3.4).

Table 3.4: Estimated number of FADs operating in early 2024 in the areas to be targeted by the Programme in the 14 Participating Countries

Country	Target areas for installation of GCF FADs	No. of FADs
Melanesia		
Fiji	Rewa, Serua and Namosi districts; Kadavu, Lau and Lomaiviti districts	20
PNG	Manus and Bougainville Provinces	8
Solomon Is	Temotu Province and Guadalcanal Province	10
Vanuatu	Shefa and Tafea Provinces, Port Vila	10
Micronesia		
FSM	Pohnpei and Yap States	1
Kiribati	South Tarawa and other Gilbert Islands	18
Marshall Is	All of country	24
Nauru	All of country	9
Palau	All of country	8
Polynesia		
Cook Is	Rarotonga and 5 southern Cook Islands	16
Niue	All of country	9
Samoa	All of country	10
Tonga	Tongatapu, Eua and Ha'apai	23
Tuvalu	All of country	6
TOTAL		**172**

The distribution and number of FADs is used to estimate the output from the existing FADs in the FWOP situation. At an average production of 5 t/y the FADs produce a total of 860 t of fish per year. At 10 t/FAD/y the annual production would be 1,720 t/y.

Future FAD production without Programme

Existing FAD programmes in the 14 PICs are funded mostly from external sources and are reliant on donor assistance for installing and maintaining FADs, which has historically been on an ad hoc basis.[8] The worst-case situation in the future is that the existing FADs are not maintained/replaced and there is a progressive reduction in the number of functioning FADs and their associated production.

However, other donors have expressed interest in providing future support for FADs in the region, for example, the World Bank's Pacific Islands Regional Oceanscape Program (PROP) includes plans to strengthen national FAD programmes if requested to do so by countries. The second phase of PROP (known as PROPER) is now underway and involves many of the 14 countries participating in the GCF Programme. Therefore, it is possible that an as yet unquantified level of support for FADs would still be available from other sources in the absence of the GCF Programme. Nevertheless, because the donor support that has enabled FADs to be deployed to date has been ad hoc, there is no guarantee that countries will be able to replace their FADs when they are no longer functional to continue to provide a predicted level of catch for domestic consumption.

For the purposes of the economic analysis, the FWOP situation is based on the current estimated production of the 172 FADs in Table 3.5 at an output of 5 t/FAD/y. It is assumed that the productivity from existing FADs is independent from the new FADs to be deployed by the Programme (the full increased production from the new FADs is regarded as the incremental benefit from the GFC Programme).

3.1.3. Scenario 2: Future with Programme: with FADs only

The FAD-related sub-activities proposed under Activity 1 in Component A of the Programme will initially deploy 333 FADs in the 14 PICs and include funding for the provision of a further 195 FADs as replacements for the 333 new FADs, resulting in a total of 528 FADs being deployed during the Programme's 7-year implementation period (spread across 8 years). In total, therefore, there are costs associated with deploying 528 FADs. FADs will be deployed at varying depths, ranging from 200 m to up to 2,500 m. In addition, 20 FADs will be reserved in cyclone storage in Fiji, Tonga and Vanuatu as replacements for FADs lost due to cyclones (60 FADs in total). Table 3.5 provides a summary of the areas to be targeted in each country during the Programme, and the numbers of FADs to be deployed in each area.

The GCF Programme will enable countries to break free from the ad hoc donor support that they have received for deploying the use of FADs which, as indicated in the FWOP above, could otherwise see them with a much lower number of functional FADs. The Programme will start the important process of establishing FADs as a permanent feature of national infrastructure for food security by maintaining a base of 333 operating FADs, that will be replaced as needed during the implementation period to demonstrate how strengthened national FAD programmes will operate in the future, compared to unreliable numbers of functioning FADs under FWOP reliant on ad hoc support. It is important to note that, because FADs are assumed to have an average productive life of three years and will be deployed progressively during the implementation period commencing in Year 2, those deployed in Years 2-3 will need to be replaced before the end of the Programme. Thus, the funding for the additional 195 replacement FADs will ensure that the base of 333 FADs will be maintained after the deployment of the initial 333 new FADs. For Fiji, Samoa and Tonga, the Programme will provide a number of additional FADs that will be held in reserve to use in the event of a major event such as a cyclone that destroys existing FADs.

In this way, the GCF Programme will lay the foundation for strengthened sustainable national FAD programmes that will facilitate the expansion of FAD numbers post programme, for example, through national funding and with support from PROPER. Without this foundation, contributions from PROPER and other donors run the risk of simply perpetuating the existing ad hoc arrangements.

Number of people benefitting from strengthened national FAD programmes

The total number of people in coastal communities benefitting from the Programme activities to expand the use of FADs to increase access to tuna is estimated to be ~560,000 in 2030. The number of beneficiaries will vary among the 14 PICs. In some of the smaller countries, such as Niue, Nauru and Tuvalu, it is anticipated that a relatively large proportion, if not all, of the national population will benefit. In the larger countries, such as Fiji, PNG, Solomon Islands and Vanuatu, the proportion of the population benefitting from increased access to fish caught from FADs will be far less (because of practical limits to the number of FADs that can be deployed in each country during the Programme and post-harvest and distribution challenges for communities remote from the coast).

Projected production of fish from FADs

A preliminary estimate of the projected production of fish from strengthening the national FAD programmes in the 14 PICs in 2030, based on a range of annual catches per FAD of 5 t/y and 10 t/y, is shown in Table 3.7 for the 333 FADs that will be installed and maintained by the Programme. At an average of 5 t/FAD/y, total annual production would be 1,665 t and at 10 t/FAD/y annual production would be 3,330 t. Compared with the current production from the 172 FADs in the target areas at an average of 5 t/FAD/y producing 860 t/y this represents an 94% increase at the 5 t/y and a 287% increase at 10 t/y level of future productivity. The productivity of the new FADs is assumed to be maintained at the same level over the 25 years until 2050 due to establishment of the firm foundation for strengthened national FAD programmes established by the Programme.

Value of incremental FAD production

Based on the market price for locally-caught fresh tuna (often a mix of skipjack and yellowfin tuna) in each of the 14 countries obtained in early 2024 (

Table 3.8),[9] the value of the incremental production from the 333 FADs to be deployed by the Programme has been estimated at the two levels of production (5 t/FAD/y and 10 t/FAD/y). At 5 t/FAD/y, the total gross incremental value in 2032 at the completion of the GFC investment is USD10.269 million, and at 10 t/FAD/y the value is USD20.538 million (Table 3.9). It is noteworthy that the market price for fresh tuna varies substantially among countries, presumably due to the expected return on labour, boat operating costs, and the exchange rate of the local currency with USD. Local tuna prices are also volatile subject to changes in supply due to seasonal accessibility of fish, weather, etc. The domestic price is not related to the global market for tuna because none of the tuna caught by small-scale fishers operating around FADs or offloaded as bycatch is exported. The price of these fish is entirely determined by local supply and demand factors. As a result, the price of tuna has a significant effect on the gross value of fish production from FADs.

Table 3.5. Locations and numbers of FADs to be deployed in the Programme to increase tuna catches for the target population in each Participating Country.[10]

Country	Locations of FADs	Number of FADs to be Deployed			Number of FADs by Depth		
		Initial FADs	Replace-ment FADs	Total	200 - 500 m	800 - 1,400 m	1,500 - 2,500 m
Melanesia							
Fiji	Southern Central & Eastern Divisions	40	20	60	43	17	
PNG	Manus & Bougainville) Provinces	36	18	54	45	9	
Solomon Is	Temotu & Guadalcanal Provinces	20	13	33	24	9	
Vanuatu	Shefa & Tafea Provinces, with Port Vila	34	17	51		51	
Micronesia							
FSM	Pohnpei and Yap States	24	16	40	24	16	
Kiribati	Gilbert Islands Group	38	19	57	27	30	
Marshall Is	Entire country except 3 atolls with pons <100	27	13	40		40	
Nauru	All country	12	6	18	12		6
Palau	All country except Sonsorol & Hatohobei	16	16	32		16	16
Polynesia							
Cook Is	Southern Cook Islands Group	20	14	34	15	19	
Niue	All country	14	6	20	13	7	
Samoa	All country	18	15	33		15	18
Tonga	Tongatapu, Eua & Ha'apai Group	20	14	34	17	17	
14. Tuvalu	All country	14	8	22	16	6	
TOTAL		**333**	**195**	**528**	**236**	**252**	**40**

Error! Not a valid bookmark self-reference. provides a breakdown of the number of beneficiaries by country/target area within each country that will have access to the FADs for fishing, or to the fish landed from fishing around FADs.

Table 3.6. Number of expected beneficiaries (men, women and children) from FAD fishing in each Participating Country in 2030.[11]

Country	Number of beneficiaries	Estimation of beneficiaries
Melanesia		
Fiji	72,483	30% of the population in Rewa, Serua and Namosi districts and 80% of the population in Kadavu, Lau and Lomaiviti districts.
PNG	91,834	20% of the population of Manua and Bougainville provinces.
Solomon Is	62,752	90% of the population of the Temotu Province and 20% of the population of Guadalcanal Province
Vanuatu	66,850	50% the population of Shefa and Tafea provinces and 20% of the population of Port Vila
Micronesia		
FSM	38,588	80% of the population in Pohnpei State and 80% of the population in Yap State.
Kiribati	81,778	40% of the population of South Tarawa and all the population in the other 16 inhabited Gilbert Islands Group islands.
Marshall Is	26,993	50% of the population of the Marshall Islands.
Nauru	12,539	100% of the population of Nauru.
Palau	8,815	50% of the population for 14 States.
Polynesia		
Cook Is	8,792	50% of the population of Rarotonga and 100% of the population of 5 inhabited islands in the southern Cook Islands
Niue	1,393	100% of the population of Niue.
Samoa	41,874	20% of the population for Samoa.
Tonga	32,950	40% of the population for Tongatapu, Eua and Ha'apai.
Tuvalu	11,250	100% of the population of Tuvalu.
TOTAL	**558,890**	

The fish prices show a wide range from a high of USD11.29/kg in Cook Islands to a low of USD3.00/kg in Solomon Islands. The overall average price is USD6.54/kg. This fish price is assumed to apply to fish that are consumed by the fisher, and for fish that is sold in the domestic market.

Increased number of fish meals

It should be noted that although the economic value of the estimated production from the 333 FADs to be deployed by the Programme is substantial, the primary aim is to improve food security. A practical way of measuring this is in terms of the number of fish meals that the additional tuna from FADs will produce.

Table 3.7: Estimated production from strengthening national FAD programmes.[12]

Country	No. of FADs	Production per yr (5 t/FAD)	Production per yr (10 t/FAD)
Melanesia			
Fiji	40	200	400
PNG	36	180	360
Solomon Is	20	100	200
Vanuatu	34	170	340
Micronesia			
FSM	24	120	240
Kiribati	38	190	380
Marshall Is	27	135	270
Nauru	12	60	120
Palau	16	80	160
Polynesia			
Cook Is	20	100	200
Niue	14	70	140
Samoa	18	90	180
Tonga	20	100	200
Tuvalu	14	70	140
TOTAL	**333**	**1,665**	**3,330**

Table 3.8: Market prices for local fresh tuna in the 14 Participating Countries in early 2024.

Country	Currency	Unit	Low price	High price	Average price	Price (kg)	Exchange rate USD	Price USD /kg
Melanesia								
Fiji	FJD	kg	7.90	12.50	10.2	10.2	0.44	4.50
PNG	Kina	kg	18.00	21.50	19.75	19.75	0.27	5.23
Solomon Is	SBD	kg	10.00	40.00	25.00	25.00	0.12	3.00
Vanuatu	Vatu	kg	700	1200	850	850	0.0083	7.05
Micronesia								
FSM	USD	lb	2.00	3.75	2.87	6.33		6.33
Kiribati	AUD	lb	2.00	2.50	2.25	4.95	0.66	3.27
Marshall Is	USD	lb	3.25	3.85	3.55	7.82		7.82
Nauru	AUD	kg	8.00	14.00	11.00	11.00	0.66	7.26
Palau	USD	lb	3.00	4.00	3.50	7.70		7.70
Polynesia								
Cook Is	NZD	kg	7.00	30.00	18.50	18.50	0.61	11.29
Niue	NZD	kg	15.00	20.00	17.50	17.50	0.61	10.67
Samoa	WST	kg	16.15	19.40	17.77	17.77	0.36	6.40
Tonga	Pa'anga	kg	15.00	20.00	17.50	17.50	0.42	7.35
Tuvalu	AUD	kg	4.00	7.00	5.50	5.50	0.66	3.63
Average								**6.54**

The number of fish meals to be provided can be based on a 150 g portion of fish, and the typical 60% recovery of fish flesh per kg from tuna (See Annex 23 for details). Given that 1) the SPC Public Health Division recommends that fish should be used to provide 50% of dietary protein for Pacific Island people, 2) the World Health Organisation advises that daily protein requirements are 0.7 g per kg of body weight per day, and 3) tuna are 23% protein, a tuna meal of 150 g will provide more than 50% of recommended daily protein intake for the average Pacific Island man and woman, and will meet the recommended daily protein requirements of two average Pacific Island children (Annex 23).

Table 3.9: Estimated market value of tuna caught from the FADs deployed in each country by the Programme.

Country	No. of FADs	Production per year		Value per kg USD*	Value of Incremental Production (USD'000)	
		5 t/FAD/y	10 t/ FAD/y		5 t/FAD/y	10 t/ FAD/y
Melanesia						
Fiji	40	200	400	4.50	900	1800
PNG	36	180	360	5.23	941	1883
Solomon Is	20	100	200	3.00	300	600
Vanuatu	34	170	340	7.05	1199	2397
Micronesia						
FSM	24	120	240	6.33	760	1519
Kiribati	38	190	380	3.27	621	1243
Marshall Is	27	135	270	7.82	1056	2111
Nauru	12	60	120	7.26	436	871
Palau	16	80	160	7.70	616	1232
Polynesia						
Cook Is	20	100	200	11.29	1129	2258
Niue	14	70	140	10.67	747	1494
Samoa	18	90	180	6.40	576	1152
Tonga	20	100	200	7.35	735	1470
Tuvalu	14	70	140	3.63	254	508
TOTAL	**333**	**1,665**	**3,330**		**10,269**	**20,538**

*Values from Table 3.8.

Based on estimated catches from a FAD in the range of 5 to 10 t per year, the number of fish meals provided by the 333 FADs to be deployed by the Programme are given in Table 3.10. Approximately 8.9 million meals will be provided per year at the lower catch rate of 5 t/FAD/y, increasing to ~17.8 million meals at 10 t /FAD/y. This calculation assumes that the full production from the 333 FADS deployed by the Programme results in these number of meals and does not take account of the fish production from the existing FADs in each of the 14 Participating Countries.

Table 3.10: Estimated number of fish meals to be provided by the Programme (see Annex 23 for details)

Country	No. of people expected to benefit in 2030	No. of FADs	No. of tuna meals per year*		No. tuna meals per person per year*		No. tuna meals per person per month*	
			5 t per FAD/y	10 t per FAD/y	5 t per FAD/y	10 t per FAD/y	5 t per FAD/y	10 t per FAD/y
Melanesia								
Fiji	72,483	40	800,000	1,600,000	11.0	22.1	0.9	1.8
PNG	91,834	36	720,000	1,440,000	7.8	15.7	0.7	1.3
Solomon Is	62,752	20	400,000	800,000	6.4	12.7	0.5	1.1
Vanuatu	66,850	34	680,000	1,360,000	10.2	20.3	0.8	1.7
Micronesia								
FSM	38,588	24	480,000	960,000	12.4	24.9	1.0	2.1
Kiribati	81,778	38	760,000	1,520,000	9.3	18.6	0.8	1.5
Marshall Is	26,993	27	540,000	1,080,000	20.0	40.0	1.7	3.3
Nauru	12,539	12	240,000	480,000	19.1	38.3	1.6	3.2
Palau	8,815	16	320,000	640,000	36.3	72.6	3.0	6.1
Polynesia								
Cook Is	8,792	20	400,000	800,000	45.5	91.0	3.8	7.6
Niue	1,700	14	280,000	560,000	164.7	329.4	13.7	27.5
Samoa	41,874	18	360,000	720,000	8.6	17.2	0.7	1.4
Tonga	32,950	20	400,000	800,000	12.1	24.3	1.0	2.0
Tuvalu	11,250	14	280,000	560,000	24.9	49.8	2.1	4.1
TOTAL	**558,890**	**333**	**6,660,000**	**13,320,000**	**11.9**	**23.8**	**1.0**	**2.0**
TOTAL (with 2 x 75 g meals per child)			**8,877,780**	**17,755,560**	**15.9**	**31.7**	**1.3**	**2.7**

FAD-related activity costs and financing

The strengthening of all national FAD programmes (Activity 1.1) has an estimated total cost of USD26.0 million over a 7-year implementation period (spread across eight years) (Table). Support to augment safety-at-sea for the small-scale fishers to fish around FADs (Activity 1.2) will cost ~USD5.1 million, and assisting coastal communities to adopt post-harvest practices and improve market opportunities for FAD-caught fish (Activity 1.3) will cost USD2.4 million.

The total cost of Output 1, comprising Activities 1.1, 1.2, and 1.3 is USD33.5 million (Table).

Table 3.11 Total cost (USD) of Programme Activity 1.

OUTPUT 1	Budget section	Year 1	Year 2	Year 3	Year 4	Year 5	Year 6	Year 7	Year 8	Total
Activity 1.1 FAD programmes	Regional	689,462	2,928,908	3,665,042	3,004,917	2,531,995	1,954,681	1,240,234	123,056	16,138.296
	National	228,619	4,239,040	1,965,023	2,548,388	605,769	212,573	67,111	-	9,866,523
	Total	**918,081**	**7,167,948**	**5,630,065**	**5,553,305**	**3,137,764**	**2,167,255**	**1,307,344**	**123,056**	**26,004,819**
Activity 1.2 Safety at Sea	Regional	34,062	164,643	424,888	268,292	240,470	193,899	148,608	17,880	1,492,743
	National	4,308	797,373	1,110,648	972,440	532,819	147,259	28,957	-	3,593,805
	Total	**38,370**	**962,017**	**1,535,537**	**1,240,732**	**773,290**	**341,158**	**177,565**	**17,880**	**5,086,548**
Activity 1.3 Post-harvest support	Regional	22,640	265,434	364,355	358,920	388,884	375,302	232,999	17,209	2,025,744
	National	-	-	160,825	48,825	141,555	24,455	-	-	375,660
	Total	**22,640**	**265,434**	**525,180**	**407,745**	**530,439**	**399,757**	**232,999**	**17,209**	**2,401,404**
TOTAL		**979,092**	**8,395,399**	**7,690,782**	**7,201,782**	**4,441,493**	**2,908,170**	**1,717,908**	**158,146**	**33,492,771**

National programme. Based on the results of the audit of national FAD programmes and sea safety requirements in each of the 14 Participating Countries, an activity plan and indicative budget were developed for each country.[13] The budgets were developed in local currency, agreed with each national fisheries agency, and then converted to USD for inclusion in the national budget for Activity 1.1. The USD estimates were then adjusted by SPC based on revised costs for local salaries and other items, and additional requests by countries made during final regional and national validation meetings in February and March 2024. The resulting total budget for the national component of Activity 1.1. is USD9.9 million (38%) (Table). The national component costs for Activity 1.1 in each country are given in Table 3 3.12.

Regional programme. The regional support for Activity 1.1, with a budget of USD16.1 million (62%) will assist the 14 PICs to implement their national FAD programmes in a structured manner. The regional support includes a range of significant FAD-related sub-activities, such as technical and logistical services, capacity development, economic assessments, and data collection, social/gender/human rights assessments, communications and information and knowledge management. This support will be provided by SPC as the Executing Entity and the considerable costs involved are seen as an integral part of building the capacity of national fisheries agencies to lay the foundation for national FAD programmes that will be sustainable in the long term.

Table 3.12: National budgets for FAD-related activities.

Country	Activity 1.1	Activity 1.2	Activity 1.3	Total
Cook Is	941,997	85,602	7,604	**1,035,203**
Fiji	973,615	59,025	94,770	**1,127,410**
FSM	1,055,206	88,142	103,000	**1,246,348**
Kiribati	936,709	76,910	94,970	**1,108,589**
Marshall Is	1,064,753	63,300	103,200	**1,231,253**
Nauru	660,989	59,223	6,832	**727,044**
Niue	638,731	48,468	9,034	**696,233**
Palau	1,233,414	76,200	7,600	**1,317,214**
PNG	948,553	52,755	97,170	**1,098,478**
Samoa	802,041	65,205	95,624	**962,870**
Solomon Is	750,934	105,620	113,608	**970,161**
Tonga	734,740	93,584	97,020	**925,344**
Tuvalu	769,866	108,088	102,495	**980,450**
Vanuatu	1,110,569	77,786	95,390	**1,283,744**
Total	**12,622,117**	**1,059,908**	**1,028,317**	**14,710,341**

Future increase in FADs

As discussed earlier, the lasting and long-term impact of Activity 1.1 will be the institutionalisation of strengthened national FAD programmes in Participating Countries with sufficient budget appropriation to replace FADs, and deploy more FADs, as needed to meet increasing demand for this infrastructure. Support from associated donor-funded development projects can also be expected to build on the foundation of the strengthened national FAD programme. As a result, it is assumed that there will be an increase in the number of FADs in each country after the completion of the 7-year implementation period until 2050. Accordingly, a percentage increase in the number of FADs has been factored into the economic analysis until 2050 (Table 3.13).

The percentage increase in FADs until 2050 is assumed to vary according to the circumstances and demand in each county. For the larger, highly-populated countries - Fiji, PNG, Solomon Islands and Vanuatu - it is assumed that the increase in FAD numbers will be at least 75% - 100%, whereas for the countries with mid-range geographies - FSM, Kiribati, Marshall Islands and Tonga - an increase of 50% is used, with 25% for the countries with more limited geographies (Cook Islands, Palau, Samoa, Tuvalu), where the deployment of FADs during the Programme is expected to meet much of the national need. For two countries – Nauru and Niue – it is assumed that the allocation of FADs during the Programme will be sufficient to meet the future needs and no increase post Programme is anticipated. By 2050, this results in an increase to at least 511 functional FADs region wide.

Table 3.13: Conservative future increase in FAD numbers expected to be added to the national FAD programme foundation bult during the GCF Programme.

Country	No. FADs by 2030 with GCF Programme	No. FADs by 2050	No. FADs by 2050 (% increase)
Melanesia			
Fiji	40	70	75%
PNG	36	72	100%
Solomon Is	20	35	75%
Vanuatu	34	60	75%
Micronesia			
FSM	24	36	50%
Kiribati	38	57	50%
Marshall Is	27	41	50%
Nauru	12	12	0%
Palau	16	20	25%
Polynesia			
Cook Is	20	25	25%
Niue	14	14	0%
Samoa	18	23	25%
Tonga	20	30	50%
Tuvalu	14	17	25%
TOTAL	**333**	**511**	49%

In calculating the cost of operating national FAD programmes after the conclusion of the GCF Programme, it has also been assumed (as above) that a FAD has a life of approximately three years and that the costs of replacement FADs will be borne by the Participating Countries. The average cost of replacing or adding a FAD has been estimated for each of the 14 countries, allowing for the cost of deployment at the different depths and overheads specific to each country. The cost of an echo-sounder for each country is also spread across the FADs, together with the cost of progressively adding greater numbers of acoustic buoys to FADs to assist communities to determine the presence of tuna below FADs when planning fishing trips. A summary of the estimated costs of replacing a FAD each year for each country is shown in Table 3.14. The estimated annual cost of replacing ~120 FADs in 2030, when all the 195 GCF-funded replacement FADs have been used, is USD1.05 million across the region.

Table 3.14: Estimated costs of replacing FADs in each country until 2050 at 5-yearly intervals.

Country	Weighted mean cost per FAD (USD)				
	2026-2030	2031-2035	2036-2040	2041-2045	2045-2050
Melanesia					
Fiji	8,040	8,264	8,488	8,712	8,936
PNG	9,683	9,907	10,131	10,355	10,579
Solomon Is	8,568	8,792	9,016	9,240	9,464
Vanuatu	9,587	9,811	10,035	10,259	10,483
Micronesia					
FSM	9,717	9,941	10,165	10,389	10,613
Kiribati	8,178	8,402	8,626	8,850	9,074
Marshall Is	11,047	11,271	11,495	11,719	11,943
Nauru	9,349	9,573	9,797	10,021	10,245
Palau	10,166	10,390	10,614	10,838	11,062
Polynesia					
Cook Is	9,123	9,347	9,571	9,795	10,019
Niue	7,899	8,123	8,347	8,571	8,795
Samoa	9,600	9,824	10,048	10,272	10,496
Tonga	8,934	9,158	9,382	9,606	9,830
Tuvalu	10,035	10,259	10,483	10,707	10,931
Average cost	**9,280**	**9,504**	**9,728**	**9,952**	**10,176**

In addition to the direct cost of procuring and deploying replacement FADs, a cost is included for the additional staff time needed to deploy and maintain FADs by the fisheries agency in each country. These costs have been estimated to be equivalent to one full time staff member per year, even though multiple staff will need to be involved for some of the FAD-related activities for short periods. An estimate of these annual costs, based on the appropriate salary rate in each country, is given in

The additional costs to be incurred by fisheries agencies for strengthening their national FAD programme are assumed to start in the third year of the programme, when the Programme budget splits staff costs 50:50 with GCF and build up to the full staff cost in Years 5 and 6 of the implementation period.

Given that the objective of the Programme is to institutionalise regular FAD deployment and replacement into the national budget of the Participating Countries, it is envisaged that the maintenance/expansion of FADs in the 20-year post-Programme period will be less reliant on donor support than prior to commencement of GCF support. This makes the return on investment more conservative.

Table 3.15 Overall, these costs total USD368,000 per year, and are included in the economic analysis (Table 3.15).

The additional costs to be incurred by fisheries agencies for strengthening their national FAD programme are assumed to start in the third year of the programme, when the Programme budget splits staff costs 50:50 with GCF and build up to the full staff cost in Years 5 and 6 of the implementation period.

Given that the objective of the Programme is to institutionalise regular FAD deployment and replacement into the national budget of the Participating Countries, it is envisaged that the maintenance/expansion of FADs in the 20-year post-Programme period will be less reliant on donor support than prior to commencement of GCF support. This makes the return on investment more conservative.

Table 3.15: Estimated annual costs for staff time to implement national FAD programmes at the conclusion of the GCF Programme.

Country	**Annual cost staff time (USD)**
Cook Is	32,100
FSM	18,800
Fiji	21,300
Kiribati	21,300
Marshall Is	21,300
Nauru	25,600
Niue	29,500
Palau	52,000
PNG	26,000
Samoa	25,300
Solomon Is	11,300
Tonga	14,400
Tuvalu	40,100
Vanuatu	29,000
Total annual cost	**368,000**

Economic analysis of the FAD programme

The results of a conventional CBA for the FAD-related activities are presented in this section. As stated above, Output 1 has a total investment cost of USD33.5 million over the 7-year implementation period (spread over 8 years) made up of USD26.0 million for providing technical and logistical support to strengthen the national FAD programme in the 14 participating PICs (Activity 1.1); augmenting safety at sea USD5.1 million (Activity 1.2); and strengthening post-harvest practices and marketing for FAD-caught fish USD2.4 million (Activity 1.3) (Table 3.11). No adjustment has been made to the total cost to convert to economic prices because it is assumed that the costs do not include taxes and duties, there is no allowance for price inflation, and there is no shadow cost for unskilled labour.

Economic benefits from FADs

When considering the impact of the FAD-related activities of the Programme, two future scenarios have been modelled for the economic analysis:

1. The benefit from the full production from the new 333 FADs, assuming that the continuing production from the 172 existing FADs in the target areas is independent of the new FADs and that the production from the 333 FADs is incremental to the existing undefined level of production at risk of being sustained. This assumes that the installation and maintenance of the 333 new FADs, as well-managed national infrastructure, will overcome the uncertainty associated with the previous ad hoc support for FADs.

2. A progressive increase in the number of FADs that are deployed in the 14 countries after the completion of Activity 1.1 in recognition of the long-term impact of the Programme in strengthening national FAD programmes to ensure that they attract adequate recurrent budget expenditure for replacement of FADs and additions to FAD infrastructure over time.

The base case assumes an average FAD life of three years, with two average production levels for the 333 new FADs of 5 t/y and 10 t/y. The higher catch rate for the new FADs is considered to be realistic given the accumulation of knowledge on site selection for FADs to optimise catch rates and ease of access for fishers, and other improvements to be made during the Programme related to development of FAD-fishing skills, safety-at-sea, boat design, etc.

Incremental production. The incremental increase in fish production from the Programme allows for the increased production from the 333 new FADs in the 14 PICs.

In the FWP situation, the new FADs are assumed to have a higher average level of production than the existing FADs, which is tested at two levels – 5 t/FAD/y and 10 t/FAD/y. For the 333 new FADs, total annual production at 5 t/y is 1,665 t and at the 10 t/y level total annual production of 3,330 t.

Fish value. At an average value of fresh tuna in each country based on recent surveys in each PIC (Table 3.8), the total gross value of the incremental fish production is USD20.5 million per year from the 333 new FADs at the end of the Programme at the 10 t/FAD/y production level. At the 5 t/y level, the gross value of the incremental fish production is USD10.3 million per year.

Production cost. From this gross value, it is necessary to deduct the production cost of catching, transporting and selling the fish in the value chain, allowing for boat operating costs (capital depreciation, repairs and maintenance, fuel, bait, ice and an allowance for the opportunity cost of the fishers' time) and the selling costs, including transport, cold storage, packaging and other selling costs. The percentage of production cost of the gross value of fish varies among countries according to the retail price of fish, fuel price, fishing method (paddle canoe or outboard powered boat) transport cost, etc. In the absence of country-specific fishing value chains and upstream costs it is assumed that production cost represents 80% of the gross selling price, leaving a margin of 20% that is the economic benefit from the incremental fish production. Deducting the production costs leaves a net benefit from fish of USD2.15 million at the 5 t/y level, increasing to USD4.31 million at the 10 t/y level at the completion of Programme implementation.

Allowing for FAD replacement costs and the fisheries agency overhead costs results in a net cash flow at the end of the 7-year implementation period (spread across 8 years) of USD477,000 per year at 5 t/FAD level and USD2.63 million per year at 10 t/FAD/yr. This analysis shows the importance of selecting the most productive sites for deploying FADs.

Health benefits. The increased consumption of fish by the estimated ~560,000 direct beneficiaries of the FAD Activities is expected to result in improved health outcomes and a reduction in NCDs.[14] Based on an average health expenditure of $309 per capita across the 14 countries participating in FAD Activities (Table 3.16), a saving of just 0.5% of this expenditure is equivalent to US$863,000 per year. This amount has been included as a contribution to the economic benefits of the FAD Activities (See Table 3.18).

Table 3.16 Summary of the health expenditure in the 14 Participating Countries

		Amount (USD'000)							
Country		**Fiji**	**PNG**	**Solomons**	**Vanuatu**	**FSM**	**Kiribati**	**Marshall Is**	**Nauru**
Spending source (2022)	**Year**								
Prepaid private spending	**$/capita**	27.89	0.02	0.01	4.30	0.02	6.38	36.68	92.32
Out-of-pocket spending	**"**	42.83	6.96	4.22	10.98	10.77	52.03	89.97	186.29
Government health spending	**"**	150.96	34.92	81.60	42.19	82.01	208.15	263.63	1,032.25
Development assistance for health	**"**	62.45	41.26	72.45	105.82	5.48	113.99	77.83	-
Total (per capita)	**"**	**284.12**	**83.15**	**158.27**	**163.29**	**98.28**	**380.55**	**468.11**	**1,310.86**
Population 2021 ('000)	**'000**	924.50	10,000.50	683.60	303.00	102.60	121.20	56.30	12.50
Population 2030 (from PAC Tuna report Annex 23	**'000**	**920.98**	**n.a.**	**892.00**	**363.00**	**106.50**	**138.90**	**54.00**	**12.50**
Direct beneficiaries from FAD activities 2030	**'000**	72.48	91.83	62.75	66.85	38.59	81.78	26.99	12.54
Direct beneficiaries from Bycatch activities 2030	**'000**			169.00		10.00	74.00	29.00	
Overlap between FAD and Bycatch	**'000**					- .00	- 30.00	-	
Total beneficaries receiving additional fish meals	**'000**	**72.48**	**91.83**	**231.75**	**66.85**	**40.59**	**125.78**	**40.99**	**12.54**
Total annual health exp for beneficaries (2022 values)	**$'000**	**20,594.1**	**7,635.9**	**36,679.0**	**10,915.7**	**3,988.9**	**47,865.1**	**19,189.2**	**16,436.9**
FAD Activities (Output 1)									
Direct beneficiaries (2030)	**'000**	72.48	91.83	62.75	66.85	38.59	81.78	26.99	12.54
Health expediture per capita (2022)	**$/capita**	284.12	83.15	158.27	163.29	98.28	380.55	468.11	1,310.86
Annual health expenditure	**$'000**	20,594	7,636	9,932	10,916	3,792	31,121	12,636	16,437
Saving @ 0.5%	**"**	102.97	38.18	49.66	54.58	18.96	155.60	63.18	82.18
Bycatch Activities (Output 2)									
Direct beneficiaries (2030)	**'000**	-	-	169.00	-	10.00	74.00	29.00	-
Health expediture per capita (2022)	**$/capita**	284.12	83.15	158.27	163.29	98.28	380.55	468.11	1,310.86
Annual health expenditure	**$'000**	-	-	26,747	-	983	28,161	13,575	-
Saving @ 0.5%	**"**	-	-	133.74	-	4.91	140.80	67.88	-

Source: https://www.healthdata.org/research-analysis/health-by-location/profiles#edit-country-id https://data.unicef.org

Table 3.16 continued

		Amount (USD'000)							
Country		**Palau**	**Cook Is**	**Niue**	**Samoa**	**Tonga**	**Tuvalu**	**Total**	**Ave / capita**
Spending source (2022)	**Year**								
Prepaid private spending	**$/capita**		0.06		2.00	8.94	0.02		
Out-of-pocket spending	"		58.63		32.07	13.35	60.38		
Government health spending	"		630.38		210.05	174.68	477.61		
Development assistance for health	"		-		67.90	107.17	327.74		
Total (per capita)	"	**2,045.00**	**689.07**	**1,912.00**	**312.01**	**304.13**	**865.75**		**120**
Population 2021 ('000)	**'000**	18.00	17.70	1.40	213.60	106.30	**12.4**	**12,574**	
Population 2030 (from PAC Tuna report Annex 23	**'000**	**18.00**	**15.90**	**1.40**	**209.40**	**97.30**	**11.25**	**2,841**	
Direct beneficiaries from FAD activities 2030	**'000**	8.82	8.79	1.39	41.87	32.95	11.25	**559**	
Direct beneficiaries from Bycatch activities 2030	**'000**						7	**289**	
Overlap between FAD and Bycatch	**'000**						-7	**- 60**	
Total beneficaries receiving additional fish meals	**'000**	**8.82**	**8.79**	**1.39**	**41.87**	**32.95**	**11.25**	**788**	
Total annual health exp for beneficaries (2022 values)	**$'000**	**18,026.7**	**6,058.3**	**2,663.4**	**13,065.2**	**10,021.1**	**9,739.7**	**222,879**	**283**
FAD Activities (Output 1)									
Direct beneficiaries (2030)	**'000**	8.82	8.79	1.39	41.87	32.95	11.25	**559**	
Health expediture per capita (2022)	**$/capita**	2,045.00	689.07	1,912.00	312.01	304.13	865.75		**309**
Annual health expenditure	**$'000**	18,027	6,058	2,663	13,065	10,021	9,740	**172,637**	
Saving @ 0.5%	"	90.13	30.29	13.32	65.33	50.11	48.70	**863**	
Bycatch Activities (Output 2)									
Direct beneficiaries (2030)	**'000**	-	-	-	-	-	7.00	**289.00**	
Health expediture per capita (2022)	**$/capita**		689.07	1,912.00	312.01	304.13	865.75		**261**
Annual health expenditure	**$'000**	-	-	-	-	-	6,060	**75,526**	
Saving @ 0.5%	"	-	-	-	-	-	30.30	**378**	

Results of economic analysis for Activity 1 (strengthening national FAD programmes)

A summary of the results of the economic analysis for the FAD-related activities of the Programme is presented in Table 3.17, based on the two FAD production scenarios. A sensitivity analysis for the key parameters and other factors is also presented. Table 3.18 provides a summary of the economic analysis and the detailed cashflows are included in **Appendix 3-A.**

The results for the base case, assuming annual production of 10 t/FAD, an average FAD life of three years, and an increase in the number of functional FADs to 511 after the end of the Programme period in 2050, indicates an EIRR of 14.5%, including the associated health benefits. NThe ENPV is $8.55 million and the benefit:cost ratio (BCR) at a 9% discount rate is 1.24. The base case assumes that the tuna production from new FADs is 10 t/y and there is an increasing number of new FADs from 2030 to 2050 as a result of the Programme.

- Reducing the future production per FAD to 5 t/y, the same as is assumed for production from the existing FADs, reduces the EIRR to 1.4%.
- Testing the impact of a 2-year and 4-year average FAD life for the base case analysis results in a reduced EIRR of 11.7% for a 2-year FAD life and increases the EIRR to 15.8% of a 4-year life.
- If it is assumed that there is no further increase in FAD numbers after the conclusion of the Programme, and the number of functional FADs stays constant at 333, the EIRR only reduces slightly to 13.1% for the base case analysis.

Table 3.17 summarises the results of the economic analysis for the FAD Activities, including sensitivity analysis using a 20% change in the three main parameters – capital investment costs (capex), the ongoing maintenance costs for replacement of FADs, and fish price. This shows that the results are most sensitive to a reduction in fish price, and this factor is the main determinant of the economic return.

Overall, it is concluded that the FAD-related activities in the Programme are economically viable, considering the overall costs of the national and regional support for strengthening national FAD programme, and the economic return to all actors, and the EIRR which comfortably exceeds a hurdle rate of 9%.

Table 3.16: Results of the economic analysis of FAD-related activities

Scenario	EIRR	ENPV 9% USDm
Base case (10 t/y, 3-year life, FWP increase in FADs to 2050		
Incremental analysis	14.5%	8.55
Sensitivity		
Future production 5 t/y/FAD		
Incremental analysis	1.4%	-10.87
Different FAD life (full analysis, 10 t/FAD, FWP increase)		
FAD life 4 years	15.8%	10.87
FAD life 2 years	11.7%	3.99
No Increase in future FADs numbers		
Full analysis	13.1%	5.75
Change in key parameters (base case)		
Capex +20%	10.9%	3.62

Capex -20%	20.2%	13.48
Opex +20%	13.4%	6.76
Fish price -20%	9.5%	0.78
Fish price +20%	19.7%	16.32

Table 3.18: Summary of the economic analysis of the FAD-related activities.

Item	USD'000 Unit		Yr 1	Yr 2	Yr 3	Yr 4	Yr 5	Yr 6	Yr 7…	Yr 8	Yr 11	Yr 16…	Yr 25
1. GCF PROGRAMME INVESTMENT COSTS													
Activity 1.1: Provide technical and logistical support to strengthen National FAD programmes.	**26,005**		918.1	7167.9	5,630.1	5,553.3	3,137.8	2,167.3	1,307.3	123.1			
Activity 1.3: Augment national safety-at-sea initiatives	**5,087**		38.4	962.0	1,536.5	1,240.7	773.3	341.2	177.6	17.9			
Activity 1.3: Strengthen post-harvest practices and improve market opportunities for FAD-caught fish	**2,401**		22.6	265.4	525.2	407.7	530.4	399.8	233.0	17.2			
Total GCF investment	**33,492**		**979.1**	**8,395.4**	**7,690.8**	**7,201.8**	**4,441.5**	**2,908.2**	**1,717.9**	**158.1**	0	0	0
Fisheries agency FAD overheads						**92.0**	**184.0**	**276.0**	**368.0**	**368.0**	**368.0**	**368.0**	**368.0**
FAD Replacement & Maintenance Costs													
Number of functional FADs													
Initial deployed FADs	No./yr		0	167	333	333	333	342	351	360	386	431	511
Replacement FADs (~ life 3 yrs)	No./yr			0	2	103	120	123	127	130	141	160	197
Replacement FADs (~ life 3 yrs)	USD			**0**	**14**	**781**	**1,018**	**1,045**	**1,120**	**1,150**	**1,238**	**1,725**	**1,756**
TOTAL COSTS (over 25 years)	**70,695**		**979**	**8,395**	**7,705**	**8,075**	**5,643**	**4,230**	**1,206**	**1,676**	**1,606**	**1,755**	**2,093**

Table 3.18 continued…

Item	Catch rate	USD'000 Unit	Yr 1	Yr 2	Yr 3	Yr 4	Yr 5	Yr 6	Yr 7…	Yr 8	Yr 11	Yr 16…	Yr 25
Full Benefit Analysis													
Full Production from FADs	5t/FAD/y	t		833	1,665	1,665	1,665	1,706	1,747	1,788	1,912	2,117	2,488
Full Production from FADs	10t/FAD/y	t		1,665	3,330	3,330	3,330	3,412	3,495	3,577	3,824	4,235	4,975
Gross Value of Fish	5t/FAD/y	6.07	0	5,134.6	10,269.1	10,269.1	10,269.1	10,517.6	10,766.1	11,014.6	11,760.1	13,002.	15,239.0
	10t/FAD/y	6.07		10,269.1	20,538.2	20,538.2	20,538.2	21,035.2	21,532.2	22,029.2	22,526.1	26,005.	30,477.9
Less Production Cost 80%	5t/FAD/y	USD		-4,108	-8,215	-8,215	-8,215	-8,414	-8,613	8,812	-9,408	-10,402	-12,191
Less Production Cost 80%	10t/FAD/y	USD		-8,215	-16,431	-16,431	-16,431	-16,828	-17,226	-17,623	-18,816	-20,804	-24,382
Net Value of Incremental Production	5t/FAD/y	USD		1,027	2,054	2,054	2,054	2,104	2,153	2,203	2,352	2,601	3,048
	10t/FAD/y	USD		2,054	4,108	4,108	4,108	4,207	4,306	4,406	4,505	5,201	6,096
Health Benefits		USD	0	43	129	259	432	647	863	863	863	863	863
Net Cash Flow (full benefits)	5t/FAD/y	USD	-979	-7,325	-5,521	-5,762	-3,158	-1,528	-240	1,341	1,5460	1,659	1,768
	10t/FAD/y	USD	-979	-6,298	-3,467	-3,708	-1,104	525	1,864	3,494	3,862	4,209	4,766
			EIRR	**ENPV 9% million**									
EIRR (Full Benefit Analysis)	5t/FAD/y		**1.4%**	**-10.87**									
(~ FAD life 3 years)	10t/FAD/y		**14.5%**	**8.55**									

Individual country economic analysis

Separate economic analyses were prepared for each of the 14 Participating Countries to analyse the expected returns from FADs in the 25-year period to 2050. These analyses do not include the added effects of the projected savings in health costs. Instead, they are restricted to using the following information for comparative purposes: the specific number of FADs in their targeted FAD areas, the number of new FADs proposed under the Programme and allowance for an escalation in FADs after the end of the 7-year implementation period (spread across 8 years), the initial cost and replacement cost of FADs deployed in the country, and the local market fish price. Only the direct costs of supplying and deploying FADs and an allowance for the incremental ongoing cost for staff from the fisheries agency in each country to support FAD-related tasks, were considered. The overhead costs of the wider regional support for strengthening national FAD programmes were not included because they will no longer be incurred in the post-Programme period. The same scenarios that were applied to the overall economic analysis were used, that is, considering the incremental production from FADs represents the full production for the new FADs, etc. The results of this analysis are summarised in Table 3.19.

The economic return is very dependent on fish price. All countries achieve an acceptable EIRR at the 10 t/y production level, with a range in the EIRRs reflecting the variation in the price of tuna used for the analysis. Some countries achieve a very high EIRR linked to their much higher fish price, for example Cook Islands and Niue.

This analysis confirms the high economic returns that the Participating Countries can achieve from the Programme, which should be a worthwhile investment from their perspective. In addition, the Programme is grant funded and does not have any debt servicing obligations to the recipients. Details of the cashflows for the economic analysis of each country are provide in **Appendix 3-A**.

Influence of emission scenarios on economic analysis of FAD-related activities

Although moderate and high emissions scenarios are expected to have substantial effects on the productivity of coral reef fish available for domestic consumption in the participating countries (Chapter 2), variation in emission scenarios is not expected to have a significant effect on catch rates of tuna around FADs deployed to help fill the gap in fish supply. The reason for this is that the number of fish around FADs is largely independent of the density of fish in surrounding waters because FADs are 'fish aggregating devices'. Thus, the number of tuna associated with FADs, and the catch rates by small-scale fishers around FADs, are expected to be similar between emission scenarios, regardless of whether there is an average 1% decrease in tuna biomass across the region under RCP4.5, or an average decrease of 13% under RCP8.5, as projected by the preliminary modelling summarised in Chapter 2. In other words, the way that FADs attract fish can be expected to override any influence of climate-driven reductions in tuna biomass on the rate at which small-scale fishers catch tuna when fishing around FADs. Available catch data from FADs support this conclusion – catch rates of tuna by small-scale fishers operating around FADs in French Polynesia are high (see Table 2 in Annex 23) even though the density of skipjack tuna in the EEZ is relatively low.

In addition, changes in the biomass distribution of tuna under different emissions scenarios will not lead to an increase in competition between industrial tuna fleets and the small-scale fisheries sector because all 14 participating countries exclude industrial tuna fishing within 12 nm of the coast. This provides a significant buffer for small-scale fishers, given that FADs will rarely be deployed further than 7 km of the coast.

Table 3.19: Results of the country-specific economic analyses of the viability of national FAD programmes[15]

Summary of results for FAD-related Programme activities		Fiji	PNG	Solomon Islands	Vanuatu	FSM	Kiribati	Mashall Islands
Number of existing FADs at Programme target areas		20	8	10	10	1	18	24
Number of FADs in 2030		40	36	20	34	24	38	27
Number of FADs in 2050		70	72	35	51	36	57	41
FAD Costs	USD	482,383	522,876	282,741	488,925	388,688	466,138	441,880
Fish price	USD/kg	4.5	5.23	3.00	7.05	6.33	3.27	7.82
Economic Internal Rate of Return (EIRR)								
Full Production								
5 t/FAD/y	4-y FAD life	42%	33%	-1%	125%	53%	8%	97%
Base case	3-y FAD life	21%	19%	n.a.	92%	37%	n.a.	70%
	2-y FAD life	n.a.	n.a.	n.a.	24%	6%	n.a.	19%
10 t/FAD/y	4-y FAD life	421%	248%	78%	1325%	383%	110%	847%
Base case	3-y FAD life	408%	234%	58%	1321%	373%	90%	837%
	2-y FAD life	315%	162%	19%	1243%	331%	39%	763%

Table19 continued…

Summary of results for FAD-related Programme activities		Nauru	Palau	Cook Islands	Niue	Samoa	Tonga	Tuvalu	Total
Number existing FADs at Programme target areas		9	8	16	9	10	23	6	172
Number of FADs in 2030		12	16	20	14	18	20	14	333
Number of FADs in 2050		12	20	25	14	23	30	18	511
FAD Costs	USD	168,282	325,296	310,180	157,985	316,791	303,744	220,764	4,876,673
Fish price	USD/kg	7.26	7.70	11.29	10.67	6.40	7.35	3.63	
Economic Internal Rate of Return (EIRR)									
Full Production									
5 t/FAD/y	4-y FAD life	57%	27%	343%	354%	40%	105%	n.a	
Base case	3-y FAD life	37%	15%	332%	329%	27%	88%	n.a.	
	2-y FAD life	-14%	n.a.	287%	254%	n.a.	44%	n.a.	
10 t/FAD/y	4-y FAD life	593%	291%	2206%	1808%	339%	952%	31%	
Base case	3-y FAD life	585%	289%	2205%	1799%	335%	948%	15%	
	2-y FAD life	513%	274%	2195%	1769%	308%	921%	n.a.	

Note: n.a. denotes that the EIRR could not be computed as the cash flow is negative

Other economic benefits of the FAD Programme

Other economic benefits from the strengthening of national FAD programmes, including improved safety at sea and development of post-harvest opportunities which impact on public health, etc. but are not quantified in economic terms in the economic analysis, are listed as follow:

- **Contributions of FADs to subsistence catch**. Given that subsistence fishing is estimated to account for 50-90% of fish consumption in rural (coastal) areas in the Pacific Island region,[16] the FADs installed close to the coast that can be reached by fishers in paddling canoes or with minimum use of fuel, are expected to contribute substantially to meeting subsistence needs as coral reefs continue to degrade due to climate change. In particular, the FADs should improve the food security of subsistence households (the economic value of the increased fish catch allows for the increase in subsistence consumption and marketed fish valued at the same fish price).
- **Reduction of injury and loss of life to fishers** as a result of Activity 1.2, e.g., through promotion of improved fishing vessel designs, providing resources for boat safety equipment and training in the use of boating equipment in safety grab bags, improved meteorological forecasting, etc. Effective use of this equipment is expected to reduce the frequency and cost of mobilising search and rescue operations for small-scale fishers missing at sea.
- **Reduction in fishing costs and an increase in catch per unit of effort** (CPUE) of small-scale fishers targeting tuna through training in FAD fishing methods and access to FADs, compared with less productive trolling and less targeted fishing involving greater fuel costs and time.[17]
- **Improvement in public health,** as explained above for the economic analysis of FAD Activities, increased consumption of fish is expected to reduce national expenditure on health services (Table 3.18). However, fish consumption is expected to have other social benefits, including improved brain development in children prevention of stunting and reduced demand for nutritional-related services provided by public health facilities.[18] Improved nutrition and food security through increased consumption of more fish protein can also be expected to result in reductions in lost productivity due to poor health outcomes.
- **Increase in incomes and livelihoods from post-harvest activities** through promotion of improved fish handling and preservation methods to increase storage life and value for FAD-caught fish and promotion of market opportunities, which can be expected to improve net cash earnings for households per year. Modest increased employment generated through the manufacture, deployment and maintenance of FADs is also a positive benefit.

- **Environmental sustainability.** The increase in fish supply from FADs and the bycatch Activities will indirectly reduce the reliance on harvesting fish from coral reefs and other coastal habitats and can be expected to contribute to the resilience and conservation of coastal fisheries resources. The Programme does not include any direct funding and support to the conservation of coastal fish habitats or resources and this potential secondary benefit has not been quantified. The FAD and bycatch Activities are not expected to have any negative impact on the overall tuna resource and the global supply of tuna. The volume of tuna caught from FADs is insignificant compared to catches from the industrial tuna fishery. Similarly, the increase in bycatch supplied to the local market does not impact on fish resources because consists mainly of undersized tuna and is incorporated in the sustainable catch limits for the industrial fishery from where it is sourced. The increased supply of bycatch will come from reducing wastage and from vessels that previously took bycatch back to their home ports.

Financial analysis for Activity 1 (strengthening national FAD programmes)

The impact of the FAD-related activities of the Programme on the future budget and expenditure for the Participating Countries after the end of the 7-year implementation period (spread across 8 years) is composed of the ongoing costs of replacing FADs to maintain the number of functional FADs in the water, and the additional costs of fisheries agency staff for the management of the FADs. The annual costs of replacing FADs, based on an average 3-year life for FADs, is $1.15 million at the end of the Programme. This increases to $1.76 million per year in 2050, in line with the increased number of functional FADs over time. The annual costs for an individual country will depend on the number of FADs installed by the end of the Programme and the projected number of FADs to be added during the post-Programme period. This varies from around $30,000 for Nauru and Niue to over $100,000 per year for PNG and Vanuatu. The incremental costs of fisheries agency staff to manage national FAD-related activities is estimated to be $368,000 per year in total, and ranges from $11,300 per year for Solomon Islands to $52,000 per year for Palau. A breakdown of the ongoing costs for the Programme for the participating countries is included in **Appendix 3-B**.

As a result of the increased fish production from the FADs during the Programme, imports of alternative protein are likely to be reduced resulting in a reduction in foreign exchange expenditure on food imports.

3.1.4. Scenario 3: With Improved Access to Bycatch Only

Output 2 of the Programme is designed to promote the increased supply of bycatch (and some higher-quality tuna where appropriate, hereafter collectively 'bycatch') through transhipment or unloading of fish from industrial fishing operations. An assessment of the future needs and the scope for increasing the supply and distribution of bycatch was prepared in Technical Study 5.[19]

The two main objectives of that study were: (i) to assess the nature of present-day supply chains delivering bycatch to urban or peri-urban centres, and (ii) identify where improvements to the supply chain and to the market infrastructure used to sell the fish are needed to reduce wastage and deliver more bycatch to urban or peri-urban communities in the future.

Six of the 14 Participating Countries in the Programme are currently involved with the transshipment of tuna and the unloading of bycatch from the purse-seine industry in their ports. Transhipment at sea for purse-seine vessels operating in the Western and Central Pacific Ocean (WCPO) is not generally permitted, so the vast majority of the purse-seine catch from the region is transferred to a carrier vessel and (transhipped) for transport to a processing facility in southeast Asia or unloaded in Pacific Island ports to supply local tuna-processing facilities. A summary of the tuna transhipped by the purse-seine fleet over the 5-year period 2017-2021 is provided in Table 3.20 and shows that the average total transhipped volume of tuna in the region is 1.260 million tonnes per year.

The volume of fish transhipped in each port varies from year to year due to the influence of the El Niño Southern Oscillation (ENSO) on the distribution of tuna (see Box 1 in Chapter 2). Ports in the east are favoured during El Niño events, whereas transhipping is more frequent in the west of the region during La Niña episodes.

Table 3.20 also provides an estimate of the volume of tuna bycatch supplied to the local markets in the six Participating Countries where transhipping occurs, which is estimated to be close to 4,400 t per year. The percentage of the total purse-seine catch that is landed during transhipping operations varies from negligible for Tuvalu (where there is very low demand for brined and frozen tuna) to 1.43% for Solomon Islands, where bycatch is in high demand in Honiara.

It is recognised that bycatch available for unloading from the purse-seine fishery accounts for ~1% of the catch. However, the actual percentage of bycatch in the purse-seine catch is higher, between 3-5%, but some foreign fleet operators retain the bycatch for their own markets, and it has not generally been available to supply urban/peri-urban communities at Pacific ports. The information in Table 3.20 indicates that there is scope for increasing the supply of bycatch for the domestic market in the Participating Countries where needed.

Table 3.20: Volume of tuna transhipped in Participating Countries, together with the volume of bycatch unloaded for domestic consumption from 2017 to 2021.[20]

Country	Average volume transhipped/landed per year (t)	Average volume of bycatch unloaded for local market per year (t)	Percentage of total fish volume unloaded as bycatch for local market
FSM	192,673	135	0.07%
Kiribati	298,210	386	0.15%
Marshall Is	257,126	77	0.03%
PNG	310,076	2,739	0.88%
Solomon Is	72,204	1,036	1.43%
Tuvalu	130,832	4.4	negligible
Total	**1,261,320**	**4,378**	

Bycatch from longline vessels makes an addition to the supply from transhipment of purse-seine catch in some countries. However, data on the potential volume of bycatch from longline vessels is limited. Nevertheless, it is clear that the largest port for the unloading longline catch is Suva, due to the availability of vessel support and onshore facilities. Even so, the bulk of the longline catch taken by vessels operating from Fiji is transhipped at sea, which is permitted under the regulations.

The status of the supply chains sourcing and delivering bycatch to urban or peri-urban centres are mostly informal, with very little coordination in the collection, delivery and sale of fish. Exceptions are in Tarawa, Kiribati, (where there is a government-owned enterprise) and Noro (where the sale of bycatch is controlled by the domestic fishing company) and Honiara in Solomon Islands. Currently, the main way that bycatch enters the local market is through individuals trading or bartering with transhipping vessels for fish rejected for processing. The brined and frozen bycatch is usually sold in local markets without refrigeration or ice. Some fish are smoked or cooked to prolong their shelf life or used in small food establishments.

Technical Study 5 identified four areas where improvements to the bycatch supply chain are necessary:

1. Development of efficient fish collection through having reliable and appropriate boats for collecting fish from the transhipping vessels;
2. Ensuring there are transport networks on land and sea for the transport of fish to market;
3. Establishing facilities at the ports and markets for the preparation, handling, storage and sale of fish; and
4. Providing support for MSMEs/private sector investment in the supply chain activities, and training and capacity building in post-harvest handling.[21]

However, bycatch from purse-seine fishing, which has been kept in brine, is regarded as a low-value product that consumers find less desirable than reef fish, fresh tuna and other forms of animal protein. Its market has low margins that cannot justify large investments in the supply chain by sellers, for example, in blast freezers for storage, and sophisticated presentation and marketing. Investment strategies would need to rely on either increasing economies of scale (i.e., large volumes) or value-adding to the product itself through packaging and processing to extend shelf life and market reach.

The supply and marketing of bycatch is best serviced by MSMEs, allowing government resources to focus on facilitating a better environment to do business rather than direct intervention in the supply chain. However, it is recognised that there is a need for training and education in the processing of bycatch to increase the acceptance of the products by consumers and to create demand for higher-value products. A lack of consistency in the supply of bycatch through disruption to the frequency of transhipment operations in given ports due to the impact of ENSO[22] could be offset by governments requiring a minimum number of transhipments per year for vessels that fish within the nation's EEZ.

The increased supply of bycatch to the five countries participating in this activity is not anticipated to have a significant impact on the environment and marine ecosystems. Increased supply of bycatch comprised of undersized tuna will reduce the volume of this product that is conveyed to the ports of origin of fishing vessels and has no effect on the volume of tuna caught. In fact, regional tuna authorities have introduced regulations to mandate the retention of all tuna caught, which now prevents the discarding of small tuna. As a result, small tuna are now available to provide a source of low-cost protein for urban communities during transhipping operations. Increased supply of bycatch as an alternative for other sources of fish could help reduce the increasing fishing pressure on coastal resources at risk of overexploitation in several countries due to population growth. However, this economic benefit of the role that bycatch may play in reducing fishing pressure on coastal fish resources has not been quantified and included in the analysis. There is no direct investment in the Programme to support the sustainability and resilience of coastal fish resources. Instead, the aim of the Programme is on increasing access to tuna to fill the gap in fish supply created by population growth and reduced harvests of coastal fish due to climate-driven degradation of coral reefs and other coastal habitats.

Contribution of bycatch to the supply of fish protein

The total amounts of fish needed in 2030 to meet the protein requirements of the urban populations in the countries participating in Activities 2.1 and 2.2 of the Programme are given in Table 3.21. This analysis is based on the methodology described in Annex 23 for estimating how much protein will be needed by adults and children in urban communities where transhipping occurs by 2030. This methodology calculates how much protein is needed every day by adults and children from guidelines provided by the World Health Organisation (WHO), and follows the recommendation by the SPC Public Health Division that 50% of the daily protein requirement should be derived from fish. These calculations are converted to the number of 150 g fish meals for adults and 75 g fish meals for children needed to supply the recommended levels of dietary protein for the target urban population (Annex 23).

Note that although PNG has a large urban population, it is not included in this analysis because all available bycatch from purse-seine catches landed at canneries in Lae and Madang is already fully utilised, and the bulk of the purse-seine catch is transhipped in Rabaul, where the surrounding population is already fully supplied with bycatch (Annex 23). As a result, there is little scope for the Programme's plans to increase the availability of bycatch by 50% by 2030 to be effective in PNG.

Table 3.21 Total weight of fish required by 2030 for good nutrition of targeted urban populations in the countries where distribution of bycatch will be improved to increase access to fish for domestic consumption. Source: Annex 23.

Country	Target population 2030	No. Adults	No. Children	No. adult meals @ 150 g per year*	Child meals @ 75 g per year*	Weight of fish for adult meals (t)**	Weight of fish for child meals (t)**	Total weight fish (t)**
FSM	10,000	6,670	3,330	1,217,275	607,725	304	76	380
Kiribati	74,000	49,284	24,642	8,994,330	4,497,165	2,249	562	2,811
Marshall Is	29,000	19,314	9,657	3,524,805	1,762,403	881	220	1,102
Solomon Is	169,000	112,554	56,277	20,541,105	10,270,553	5,135	1,284	6,419
Tuvalu	7,000	4,662	2,331	850,815	425,408	213	53	266
Total	**289,000**	**192,484**	**96,237**	**35,128,330**	**17,563,253**	**8,782**	**2,195**	**10,977**

Table 3.22 summarises the amount of bycatch currently unloaded in the five countries where Activities 2.1 and 2.2 will be implemented, and the 50% increase in bycatch to be achieved during the Programme by 2030 to improve the availability of this low-cost source of protein. This table indicates the contribution of the Programme activities to the fish required for good nutrition after canned fish consumption is also taken into account (converted to live fish weight equivalent). It does not refer to the extent to which the increased access to bycatch expected to result from these activities fills the remaining gap in fish supply. This cannot be done until reliable estimates of the present supply of coastal fisheries production to urban populations is quantified so that the size of the gap to be filled can be identified.

Table 3.22 Summary of the extent to which distribution of all available bycatch by 2030 contributes to the fish supply needed for food security of the target urban populations in countries where transhipping of purse-seine catches occurs. Source: Annex 23.

Country	Target population 2030	Total weight fish needed (t)	Canned fish consumed per year (t)*	Remaining fish needed (t)**	Total bycatch available in 2030 (t)***
FSM	10,000	380	65	315	203
Kiribati	74,000	2,811	n.a.	2,811	579
Marshall Is	29,000	1,102	n.a.	1,102	116
Solomon Is	169,000	6,419	1,662	4,757	1554
Tuvalu	7,000	266	n.a.	266	7
Total	**289,000**	**10,977**	**1,727**	**9,250**	**2,459**

*Based on per capita consumption kg per year,[23] converted to live weight of fish.
**This is an over-estimate because it does not allow for the contribution of coastal fisheries production, which cannot yet be identified with confidence.
*** Based on a 50% increase in the volume compared to the present-day availability of bycatch (Table 3.21) based on Activities 2.1 and 2.2.
n.a. Data not available, but some canned fish consumption does occur

The number of fish meals to be provided to the target urban populations in the five countries from improved distribution of bycatch by 2030 are given in Table 3.23 The average number of fish meals per person per month to be derived from bycatch across the region is 3.8.

Table 3.23 Projected number of fish meals per person to be provided in 2030 from all available bycatch from transhipping operations in regional ports, based on calculations limited to a) adults only, and b) both adults and children (see Annex 23 for details).

Country	No. Beneficiaries 2030	Bycatch landings 2023 (t)	Bycatch landings 2030 (t)	Total fish meals per year in 2030	a) No. fish meals per adult per year	a) No. fish meals per adult per month	b) No. fish meals with children per year	b) No. fish meals with children per month
FSM	10,000	135	203	810,000	81.0	6.8	107.7	9.0
Kiribati	74,000	386	579	2,316,000	31.3	2.6	41.6	3.5
Marshall Is	29,000	77	116	462,000	15.9	1.3	21.2	1.8
Solomon Is	169,000	1,036	1554	6,216,000	36.8	3.1	48.9	4.1
Tuvalu	7,000	4.4	7	26,400	3.8	0.3	5.0	0.4
Total	289,000	1638.4	2458	9,830,400	34.0	2.8	45.2	3.8

Costs of facilitating distribution of bycatch

The analysis of the transhipment and landing of bycatch does not detail the costs of supporting the increase in the supply chain for bycatch to the urban and peri-urban populations in the five countries where improvements to the supply of bycatch will be made. This is because it is not envisaged that governments will invest in physical infrastructure and facilities to support the supply chain. Rather, development of the necessary infrastructure is expected to be done by partner development agencies. Government's role is more appropriately limited to regulatory reform, ensuring that there is a conducive business environment for MSMEs to make the investments needed to improve local supply chains. Government also has a role in educating the public to increase the consumption of bycatch as a healthier alternative to the low-protein, nutrient-poor imported foods implicated in the high incidence of NCDs across the region.

Investments needed by MSMEs to improve the supply chain will vary among countries and are likely include collection boats, delivery trucks, 300-litre cool boxes, ice making machines, freezers/cool rooms, fish market outlets and stalls.

Activities to increase supply of bycatch

The activities and sub-activities detailed in Output 2 "Increased supply of bycatch from industrial fishing operations for urban communities" are listed below.

Activity 2.1: Implement strategies to deliver more transhipped and unloaded bycatch to urban/peri-urban communities

2.1a Assess the supply of bycatch available for offloading at each transhipping and unloading port;

2.1 Evaluate the projected shortfalls in the supply of fish needed for the food security of urban and peri-urban communities by 2030 and in following decades;

2.1c Use the Advanced Warning System (AWS) (see Activity 3.1 below) to assess the implications of tuna biomass redistribution for transhipping and unloading activities across the region;

2.1d Build national capacity to conduct policy analysis on current and future transhipment and unloading of bycatch; and

2.1e Develop procedures and regulations to increase availability of transhipped and unloaded bycatch where needed to fill the gap in fish supply.

Activity 2.2: Strengthen/develop post-harvest practices and improve market opportunities to distribute bycatch from transhipping and unloading operations to urban/peri-urban communities

2.2a Provide training for urban communities to improve/develop post-harvest processing techniques for bycatch from transhipping and unloading operations;

2.2b Pilot alternative marketing mechanisms to support increased trade in bycatch in urban areas;

2.2c Conduct communication campaigns to raise awareness of urban/peri urban communities about the impacts of climate change on coral reef fish and the need to consume more bycatch to meet future nutrition requirements; and

2.2d Provide fish market outlet designs at various scales for countries where transhipping and unloading occurs.

The costs of implementing Activities 2.1 and 2.1 of Output 2 of the Programme over the 7-year implementation period (spread across 8 years) is USD15.748 (Table 3.24). An additional cost to the GCF investment of USD400,000 is also included to allow for the anticipated contributions of the private sector needed to improve the collection, storage and marketing of bycatch.

Table 3.17 Costs of Programme Activities for increased supply of bycatch and tuna from industrial transhipment and unloading for urban communities.

OUTPUT 2	Budget section	Year 1	Year 2	Year 3	Year 4	Year 5	Year 6	Year 7	Year 8	Total
Activity 2.1 Increase delivery of bycatch	Regional	150,475	652,759	469,132	397,781	358,887	300,307	252,209	39,143	2,620,692
	National	201,448	1,409,195	1,370,712	1,128,736	777,647	426,312	245,020	12,000	5,571,070
	Total	**351,923**	**2,061,953**	**1,839,843**	**1,526,518**	**1,136,534**	**726,620**	**497,229**	**51,143**	**8,191,762**
Activity 2.2 Post-harvest & marketing	Regional	22,354	124,839	178,626	184,934	182,938	158,919	117,213	17,155	986,979
	National	197,318	725,691	1,457,491	1,513,592	1,264,427	979,703	430,832	-	6,569,055
	Total	**219,672**	**850,530**	**1,636,118**	**1,698,526**	**1,447,365**	**1,138,622**	**548,045**	**17,155**	**7,556,034**
TOTAL		**571,595**	**2,912,483**	**3,475,961**	**3,225,044**	**2,583,899**	**1,865,242**	**1,045,274**	**68,298**	**15,747,795**

Economic analysis of activities to increase access to bycatch

The incremental economic benefit by 2030 from the increased supply of bycatch for consumption by urban and peri-urban communities in the five countries where Activities 2.1 and 2.2 will be implemented is based not only on increasing the total volume of bycatch by 50% but also on actions to help prevent the current waste of an estimated 30% of existing bycatch due to poor handling and storage, resulting in spoiled fish unfit for human consumption (Figure 0.1).

Figure 0.1 Bycatch (under-sized tuna for canning) from transhipping sold in good condition and in poor condition resulting in waste of a valuable source of low-cost dietary protein and posing a health risk (right). (Photos: Johann Bell)

Support through the Programme for improved facilities for storage, handling and marketing of the bycatch, and for training in fish handling and methods to prolong the shelf life of the fish including bottling, smoking and drying, will reduce the wastage and add to the increased availability of bycatch for human consumption.

Bycatch economic value. The net value of the bycatch that is sold to consumers is assumed to be USD 1.20 per kg, allowing for procurement cost from the fishing vessels in port and the costs of distribution and marketing. For the sensitivity analysis a higher value is used to reflect the opportunity cost of replacing more expensive local coastal fish and imported fish, and a lower value to test the impact on the economic performance.

Based on discussion with Mr David Fatai, an employee of the Ministry of Fisheries and Marine Resources in Solomon Islands, currently doing a PhD thesis on tuna bycatch at the University of Wollongong in Australia, the selling price for bycatch in Honiara is ~SBD30 per kg. Vendor costs (purchase price of fish, costs of transporting fish from vessels to market, market fees and incidentals) are estimated to be ~SBD20 per kg, providing a profit of ~SBD10 (=USD1.20) per kg for the vendor. Data from Honiara have been used for this analysis because it is the Pacific Island port where the

largest quantities of bycatch are sold (Technical Study 5; Annex 23). Bycatch prices in the other countries participating in the bycatch Activities are likely to be higher because they have more developed economies than Solomon Islands and a higher cost and wage structure.

Health impact benefit. As discussed in the earlier section of this chapter the increased supply of fish protein is expected to have a positive impact on the nutrition and health status of the estimated 289,000 people in the five countries directly benefitting from the bycatch activity. Based on an average health expenditure of $261 per capita across the five countries participating in bycatch Activities (Table 3.16), a saving of just 0.5% of this expenditure is equivalent to US$378,000 per year. This amount has been included as a contribution to the economic benefits of the bycatch Activities (See Table 3.25).

Table 3.5 Health expenditure relating to Bycatch activity.

Country		Solomons	FSM	Kiribati	Marshalls	Tuvalu	Total
Spending source (2022)	**Year**						
Prepaid private spending	**$/capita**	0.01	0.02	6.38	36.68	0.02	
Out-of-pocket spending	**"**	4.22	10.77	52.03	89.97	60.38	
Government health spending	**"**	81.60	82.01	208.15	263.63	477.61	
Development assistance for health	**"**	72.45	5.48	113.99	77.83	327.74	
Total (per capita)	**"**	**158.27**	**98.28**	**380.55**	**468.11**	**865.75**	
Population 2021 ('000)	**'000**	683.60	102.60	121.20	56.30	**12.4**	
Bycatch Programme							
Direct beneficiaries	**'000**	169.00	10.00	74.00	29.00	7.00	**289**
Health expenditure per capita (2022)	**$/capita**	158.27	98.28	380.55	468.11	865.75	**261**
Annual health expenditure	**$'000**	26,747	983	28,161	13,575	6,060	**75,526**
Saving @ 0.5%	**"**	133.74	4.91	140.80	67.88	30.30	**378**

Results for Bycatch activity economic analysis

The EIRR is estimated to be 11.1% with a ENPV of USD1.79 million at a discount rate of 9% (Table 326). The cashflow is negative for the five years of the implementation period spread across 8 years. The economic performance is relatively lower compared with the FAD and AWS activities because the investment costs are relatively high at over USD15 million, particularly through the extensive support proposed for establishing facilities at the ports and markets and for MSMEs/private sector investment in the supply chain activities, and training and capacity building in post-harvest handling.

The activity is projected to result in an increased supply of bycatch of 1,311 t in 2030 as a result of the Programme.

The results of a sensitivity analysis testing the impact of changes in the main assumption are shown in Table 3.26. An 20% increase in the investment costs or a 20% reduction in the fish price would be necessary to reduce the EIRR to below 9%.

Table 326 Bycatch economic and sensitivity analysis.

Item		EIRR	ENPV 9% USD million
Base case		11.1%	1.79
Cost + 20%		8.5%	-0.27
Costs - 20%		15%	4.27

Fish price +20%		14.6%	4.27
Fish price - 20%		8.5%	0.27

A summary of the bycatch economic analysis is provided in Table .

The net selling price of USD1.20 per kg used for the economic analysis based on the current average market price in Solomons Islands is modest compared with the retail prices of fresh tuna in the market reflecting the consumer preference for fresh fish. With wider acceptability for bycatch as the public becomes more accustomed to brined and frozen bycatch the price is likely to increase.

Furthermore, the additional associated benefits of fish consumption, as described under the FAD Activity above, adds more weight to the economic merit of the bycatch Activity that is not fully captured in the economic analysis.

Influence of emission scenarios on economic analysis of bycatch activities

The preliminary modelling reported in Chapter 2 indicates that purse-seine catch from the combined EEZs of participating countries could decrease by an average of ~3% under RCP4.5, and ~20% under RCP8.5, by 2050. However, the amount of purse-seine bycatch delivered to the participating countries where Programme activities have been designed to improve the use of the small tuna and other fish species available from transhipping operations is not expected to be vary between emission scenarios. The reason for this is that Activity 2.1 (Chapter 4) has been designed to ensure on the basis that the desired level of purse-seine catch transhipments is maintained in FSM, Kiribati, Marshall Islands, Solomon Islands and Tuvalu, regardless of the redistribution of the fish. It can also be assumed that the industrial tuna fleets will continue to strive to maintain present-day catch volume. Although a greater proportion of the future catch is likely to come from high-seas areas in the Western and Central Pacific Ocean as tuna redistribute to the east, all purse-seine catch by vessels authorised to operate in the WCPO will continue to be transhipped in Pacific Island ports under Western and Central Pacific Fisheries Commission (WCPFC) regulations. There is no indication, at this time, that historic unloading patterns by the longline sector will change under moderate to high emissions scenarios because all potential ports are already utilised by the sector providing the range of services required by this fleet across the region.

Financial implication of the bycatch programme

The impacts on government expenditure needed to improve the distribution of bycatch following the completion of the Programme are likely to be minimal because the role of government is limited to providing ongoing support for this initiative through its regulatory function. Specifically, the role of the government is to promote access to an increased volume of bycatch from transhipping and unloading operations, and to monitor and enforce food quality standards. The private sector will be responsible for the collection, distribution and selling of bycatch to consumers.

Table 3.18 Economic analysis of Activities 1 and 2 to improve availability and distribution of bycatch.

Item	USD'000	Unit	Yr 1	Yr 2	Yr 3	Yr 4	Yr 5	Yr 6	Yr 7	Yr 16	Yr 25
INVESTMENT COSTS											
1. Output 2 Increased supply of bycatch											
Activity 2.1: Implement strategies to deliver more transhipped and unloaded bycatch to urban/peri-urban communities			351.9	2,062.0	1,839.8	1,526.5	1,1136.5	726.6	497.2	0	0
Activity 2.2: Strengthen/develop post-harvest practices and improve market opportunities to distribute bycatch from transhipping and unloading operations to urban communities			219.7	850.5	1,698.5	1,447.4	1,138.6	1,138.6	548.0	0	0
Total	**15,679.5**	**USD'000**	**571.6**	**2,912.5**	**3,476.0**	**3,225.0**	**2,583.9**	**1,865.2**	**1,045.3**	**0**	**0**
Other national private sector costs											
FSM		USD'000	0	0-	10.0	10.0	5.0				
Kiribati			0	-	25.0	50.0	50.0				
Marshall Is		-	0	0	10.0	10.0	5.0				
Solomon Is			0	-	50.0	75.0	75.0				
Tuvalu			0	0	10.0	10.0	5.0				
Total private sector costs			**0**	**0**	**105.0**	**155.0**	**140.0**	**0**	**0**	**0**	**0**
TOTAL COSTS			**571.6**	**2,912.5**	**3,501.0**	**3,380.0**	**2,723.9**	**1,865.2**	**1,045.3**	**0**	**0**
BENEFITS											
Incremental supply of bycatch											
FSM		t/yr		-	17	34	51	68	68	68	68

Item	USD'000	Unit	Yr 1	Yr 2	Yr 3	Yr 4	Yr 5	Yr 6	Yr 7	Yr 16	Yr 25
Kiribati		t/yr		-	64	97	154	193	193	193	193
Marshall Is		t/yr		-	13	19	31	39	39	39	39
Solomon Is		t/yr			171	259	414	518	518	518	518
Tuvalu		t/yr			1	1	2	2	2	2	2
Total bycatch			**-**	**-**	**265**	**410**	**652**	**819**	**819**	**819**	**819**
Value of increased bycatch supply	USD/kg	1.20	**-**	**-**	**317.9**	**491.5**	**782.4**	**983.0**	**983.0**	**983.0**	**983.0**
Reduction in wastage of current bycatch supply (30%)											
FSM	t/yr				10	20	30	41	41	41	41
Kiribati	t/yr				38	58	99	116	116	116	116
Marshall Is.	t/yr				8	12	18	23	23	23	23
Solomon Is.	t/yr				103	155	249	311	311	311	311
Tuvalu	t/yr				0	1	1	1	1	1	1
Total bycatch	t/yr				**159**	**246**	**391**	**492**	**492**	**492**	**492**
Value of improved bycatch quality	**USD'000**		**0**	**0**	**190.8**	**294.9**	**469.4**	**589.8**	**589.8**	**589.8**	**589.8**
Health benefits	**""**		**0**	**0**	**0**	**97**	**150**	**300**	**301**	**378**	**378**
TOTAL BENEFITS			**-**	**-**	**507.7**	**883.6**	**1,402.1**	**1,873.4**	**1,873.4**	**1,873.4**	**1,873.4**
NET CASH FLOW	USD'000		**-571.6**	**-2,912.5**	**-3,072.3**	**-2,496.4**	**-1,321.8**	**8.2**	**828.1**	**1,950.5**	**1,950.5**
EIRR	11.1%										

3.1.5. Scenario 4: With FADs and Improvements to Availability of Bycatch

This section shows the combined impact of strengthening national FAD programmes and improving the supply of bycatch in the selected countries. The increase in access to fish for food security represents the full of production of tuna from the 333 FADs to be deployed by the Programme and the subsequent increase in FADs, and the increase in volume of bycatch from the five countries where transhipment of tuna occurs, excluding PNG where there is limited scope for increasing the use of bycatch to supply the domestic market. The projected continued increase in fish supply following the conclusion of the Programme is indicative only because the long-term future number of functional FADs and frequency of bycatch unloaded during transhipping operations cannot be predicted with any certainty.

A summary of the increased supply of fish from both sources is shown in Table 3.19. The total incremental fish supply for domestic food security is projected to increase from 4,641 t in 2030 to 6,032 t by 2050.

Table 3.19 Expected total supply of fish from FADs and bycatch by 2030, and further increases until 2050.

Source of Supply		**2030**	**2040**	**2050**
Increased FAD-caught tuna	t/yr	3,330	4,220	5,021
Increased bycatch	t/yr	1,311	1,311	1,311
Total Fish Supply	**t/yr**	**4,641**	**5,531**	**6,332**

Combined economic analysis for Activity 1 (FADs) and Activity 2 (Bycatch)

The results of the combined economic analysis of activities to strengthen national FAD programmes and improve distribution of bycatch are summarised in Table 3.20. They indicate an overall EIRR of 13.3% with a NPV of USD10.34 million at a 9% discount rate.

Table 3.20 Summary of the economic analysis for Programme Activity 1 and Activity 2 combined.

Item	**EIRR**	**ENPV USD 9% USD million**
Combined	13.3%	USD10.34
FADs	14.5%	USD8.55
Bycatch	11.1%	USD1.79

More details for the combined economic analysis are presented in Table 3.30.

Table 3.30 Summary of the combined economic analysis for FAD-related and bycatch activities in the Programme.

Item	Unit	Yr 1	Yr 2	Yr 3	Yr 4	Yr 5	Yr 6	Yr 7	Yr 8	Yr 10	Yr 15	Yr 25
INVESTMENT COSTS (USD)												
1. Activity 1 (FADs)	USD'000	979.1	8,395.4	7,690.8	7,201.8	4,441.5	2,908.2	1,717.9	158.1	0	0	0
Fisheries agency overheads	USD'000	0	0	0	92	184	368	368	368	368	368	368
FAD replacement/maintenance	USD'000	-		13.7	781.3	1,017.7	1,045.4	1,120.4	1,149.7	1,208.4	1,1358.1	1,725.3
Total FAD costs	USD'000	**979.1**	**8,395.4**	**7,704.5**	**8,075.1**	**5,643.2**	**4,229.6**	**3,206.3**	**1,675.9**	**1,576.4**	**1,726.1**	**2,093.3**
2. Activity 2 (bycatch)												
GCF Programme	USD'000	571.6	2,912.5	3,476.0	3,225.0	2,583.9	1,865.2	1,045.3	68.3	-	-	-
Private sector	USD'000	-	-	105.0	155.0	140.0	-	-	-	-		-
Total bycatch costs	USD'000	**571.6**	**2,912.5**	**3,581.0**	**3,380.0**	**2,723.9**	**1,865.2**	**1,045.3**	**68.3**			**-**
TOTAL COSTS	USD'000	**2,012**	**13,012**	**11,708**	**11,017**	**8,753**	**6,497**	**1,625**	**1,791**	**1,576.4**		**2,093.3**
BENEFITS												
FADs												
Value of incremental tuna												
Incremental value of FAD	5 t/FAD		1,070.1	2,183.3	2,312.8	2,485.4	2,701.2	2,966.7	3,016.4	3,115.8	3,364.3	3,861.3
	10 t/FAD		2,097.0	4,237.1	4,366.6	4,539.2	4,755.0	5,070.2	5,169.6	5,368.4	5,865.4	6,859.4
Reduction in health expenditure	USD'000	0	43.2	129.5	259.0	431.6	647.4	863.2	863.2	863.2	863.2	863.2
Value of bycatch (USD)												
Net value of incremental bycatch		-	-	508.7	883.6	1,402.1	1,873.4	1,873.4	1,950.5	1,950.5	1,950.5	1,950.5
Reduction in health expenditure	USD'000	0	0	0	97	150	301	301	378	378	378	378
NET CASH FLOWS (USD)												
Full FAD production + bycatch	5t/FAD	-1,551	-10238	-8,593	-8,259	-4,480	-1,520	589	3,223	3,490	3,589	3,719
	10t/FAD	**-1,551**	**-9,211**	**-6,540**	**-6,205**	**-2,426**	**534**	**2,692**	**5,376**	**5,743**	**6,090**	**6,717**

3.1.6. Economic Analysis for Component B (Development of Advanced Warning System)

Introduction

This section presents an economic analysis for Component B of the Programme (Output 3, Activities 3.1, 3.2 and 3.3), which is centred around development of an Advanced Warning System (AWS) to be used by the Participating Countries, particularly the nine tuna-dependent economies.[24] A conventional cost-benefit analysis is applied to assess the potential incremental benefits to PICs from the Programme.

The context for this CBA is framed by 1) the extraordinary dependence that the tuna-dependent economies mentioned above have on fishing access fees paid by industrial fleets for government revenue; and 2) the risks posed to future government earnings if tuna progressively become less abundant in the EEZs of these PICs, and more abundant in high-seas areas to the east, as projected by preliminary modelling.[25] Relevant background information is summarised below. Further details can be found in Chapter 2.

Tuna access fees

The fishing access fees received by Pacific Island countries are dominated by those paid by purse-seine vessels and have totalled USD400 to USD500 million per year since 2015 (Figure 0.2).

The contribution of access fees to total (non-grant) government revenue for the nine tuna-dependent countries ranged from 4% to 70% between 2015 and 2018 (Table 3.31), and averaged 32% across the nine countries.

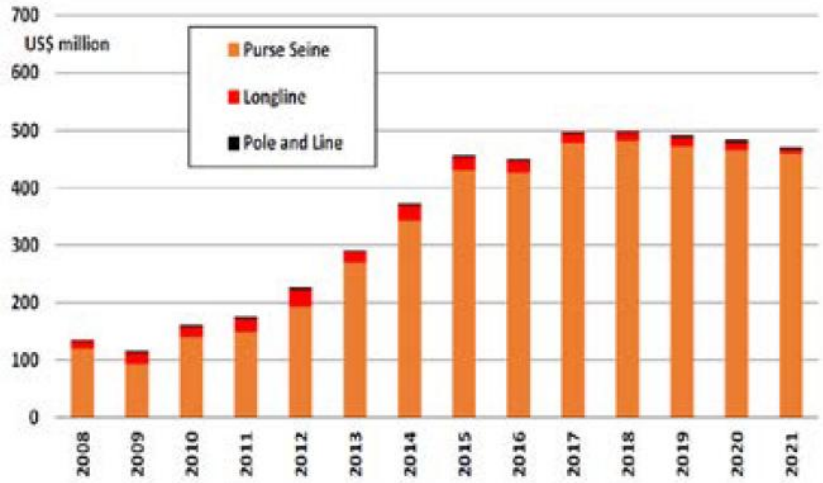

Figure 0.2 Annual fishing access fees received by Pacific Island countries between 2008 and 2021.[26]

Table 3.31 Average (range) value of tuna-fishing access fees, national government revenue (excluding grants), and percentage of government revenue derived from tuna-fishing access fees, for the nine

Country	Access fees (USD millions)		Non-aid government revenue (USD millions)		Percentage gov't revenue derived from access fees	
	Average	Range 2015-2018	Average	Range 2015-2018	Average	Range 2015-2018
Cook Is	13.5	8-15	126.1	120-130	10.6	6.7-13.6
FSM	68.4	63-73	150.6	117-215	47.6	33.6-55.7
Kiribati	128.3	107-149	181.7	156-197	70.6	64.5-78.2
Marshall Is	31.0	27-33	66.1	50-80	47.8	41.3-54.0
Nauru	29.5	22-32	98.6	58-130	31.1	24.7-37.6
Palau	7.1	6-9	75.2	71-78	9.4	6.7-11.6
PNG	134.3	111-159	3360.8	2,891-3,720	4.0	3.2-4.3
Solomon Is	41.3	34-47	429.0	338-480	9.6	8.7-10.1
Tuvalu	25.6	18-38	47.4	40-53	53.9	43.1-80.2
Total	492.4	464-546	4,550.6	3,979-5,082		

tuna-dependent economies.[27]

Effects of climate change on future tuna catches and government revenue

As described in Chapter 2, preliminary modelling indicates that ocean warming is expected to result in a shift in the distribution of the biomass of the three tuna species caught by purse-seine fishing to the east and, as a result, reductions in purse-seine catch from the EEZs of the nine PICs.[28] The preliminary modelling indicates that the projected impacts on purse-seine catch will be much stronger under continued high GHG emissions (Representative Concentration Pathway (RCP) 8.5), than under the lower RCP4.5 emissions scenario. Under RCP8.5, there will be an average decrease in catch in all EEZs of ~20% (except the Line Islands EEZ area in Kiribati), whereas under RCP4.5 decreases in catch are expected in only three of the nine countries resulting in an average of ~3% decrease (Table 3.32).

The redistribution of tuna biomass, and the associated changes in purse-seine catch, can be expected to have implications for tuna-dependent economies. In the absence of the AWS to be developed under Component B of the GCF Programme, and the bio-economic modelling it will facilitate, future access fees are assumed to be proportional to changes in purse-seine catch. This approach has been used in a publication to raise awareness of the need for an AWS.[29] The results from that publication have been used in the analysis of 'with' and 'without' the Activities within Output 3 to be implemented under the Programme (see below).

Based on the preliminary modelling of tuna biomass redistribution (Table 3.32), the knock-on effects on purse-seine catch under RCP8.5 have been estimated to reduce access fees by USD 87.8 million by 2050 (Table 3.33). Under the lower RCP4.5 emissions scenario, the loss of access fees would be reduced to USD 12.0 million (Table 3.33.

Table 3.32 Projected percentage changes in purse-seine catch in the EEZs of the nine tuna-dependent countries under a) RCP8.5 and b) RCP4.5 emissions scenario by 2050. [30]

Country	Relative abundance of tuna species (%)			Projected changes in biomass (%)			Change in purse-seine catch by 2050 (%)
	Skipjack	Yellowfin	Bigeye	Skipjack	Yellowfin	Bigeye	
a) RCP8.5							
Cook Is	85.9	10.0	4.1	-6	+11	+2	-4.0
FSM	80.8	16.4	2.8	-14	-10	-1	-13.0
Kiribati - Gilbert Is	78.3	17.7	4.1	-14	-13	-4	-13.4
Kiribati - Phoenix Is	84.5	11.7	3.9	-2	-7	-5	-2.7
Kiribati - Line Is	77.7	13.7	8.5	+14	+7	+1	+11.9
Marshall Is	81.0	14.7	4.3	+1	-10	-2	-0.7
Nauru	77.8	18.0	4.2	-24	-15	-5	-21.6
Palau	64.0	35.5	1.2	0	-1	+1	-0.3
PNG	69.0	28.2	2.8	-42	-14	-6	-33.1
Solomon Is	72.4	25.0	2.6	-32	-11	-6	-26.1
Tuvalu	87.4	9.5	3.1	-26	-5	-6	-23.4
b) **RCP4.5**							
Cook Is	85.9	10.0	4.1	+9	+10	+4	+8.9
FSM	80.8	16.4	2.8	-3	-2	+2	-2.7
Kiribati - Gilbert Is	78.3	17.7	4.1	+10	-5	-1	+6.9
Kiribati - Phoenix Is	84.5	11.7	3.9	+8	0	+1	+6.8
Kiribati - Line Is	77.7	13.7	8.5	+6	+12	+6	+6.8
Marshall Is	81.0	14.7	4.3	+3	-2	-1	+2.1
Nauru	77.8	18.0	4.2	+9	-7	-2	+5.7
Palau	64.0	35.5	1.2	+2	+5	+5	+3.1
PNG	69.0	28.2	2.8	-19	-8	-4	-15.5
Solomon Is	72.4	25.0	2.6	-10	-5	-7	-8.7
Tuvalu	87.4	9.5	3.1	+4	0	-2	+3.4

Table 3.33 Projected changes in tuna-fishing access fees, and percentage of government revenue derived from access fees, for the tuna-dependent economies by 2050 under the RCP8.5 and RCP4.5 emissions scenarios. (Based on information from a recent paper in Nature Sustainability).[31]

Country	Average 2015-2018		Change by 2050 (RCP8.5)			Change by 2050 (RCP4.5)		
	Access fees (USD million)	Gov't revenue (%)	Tuna catch (%)	Access fees (USD million)	Gov't revenue (%)	Tuna catch (%)	Access fees (USD million)	Gov't revenue (%)
Cook Is	13.5	10.6	-4.0	-0.5	-0.4	+8.9	+1.2	+1.0
FSM	68.4	47.6	-13.0	-8.9	-5.9	-2.7	-1.8	-1.2
Kiribati	128.3	70.6	-8.2	-10.5	-5.8	+6.9	+8.9	+4.9
Marshall Is	31.0	47.8	-0.7	-0.2	-0.3	+2.1	+0.7	+1.0
Nauru	29.5	31.1	-21.6	-6.4	-6.5	+5.7	+1.7	+1.7
Palau	7.1	9.4	-0.3	-0.02	-0.03	+3.1	+0.2	+0.3
PNG	134.3	4.0	-33.1	-44.4	-1.3	-15.5	-20.8	-0.6
Solomon Is	41.3	9.6	-26.1	-10.8	-2.5	-8.7	-3.6	-0.8
Tuvalu	25.6	53.9	-23.4	-6.0	-12.6	+3.4	+0.9	+1.9
Total	**479.4**			**-87.8**			**-12.0**	

Programme description

Component B Activities under Output 3

Component B includes a set of Activities to establish a region-wide AWS, through which data will be gathered and analysed to more accurately assess, forecast and project changes in the abundance and distribution of tuna stocks, and the associated purse-seine catches, due to climate change. The AWS will be developed on behalf of all 14 Participating Countries but will enable the national fisheries agencies in the nine tuna-dependent countries, and the regional fisheries organisations that support them (WCPFC, FFA, SPC and PNA), to inform the ministries of finance in these countries about the implications of projected climate-driven tuna redistribution on government revenue (through anticipated changes in earnings from tuna-fishing access fees). Where future losses of revenue are forecast and projected, the governments of the affected economies can then negotiate within the appropriate forums (WCPFC, UNFCCC) to retain the present-day socio-economic benefits received from tuna.

Development of the AWS involves three interrelated activities:

Activity 3.1: Develop and deliver an Advanced Warning System (AWS) for tuna biomass redistribution;

Activity 3.2: Assess the impact of tuna biomass redistribution identified by the AWS on national economies at all levels; and

Activity 3.3 Provide AWS-related training to national institutions to engage in regional and international negotiations relating to the impact of climate change on tuna.

The expected Output of these activities is the production of science-based forecasts and projections that reduce the uncertainty in climate-driven tuna redistribution, and the associated economic implications, for use by the Participating Countries to increase their resilience to climate change. In particular, the strengthened capacity of tuna-dependent PICs will allow them to negotiate more effectively for 'loss and damage' in the appropriate forums. A co-benefit of the information to be generated through development of the AWS will be strengthened management of industrial tuna fisheries by regional and national institutions.

Costs and financing

The total cost of Component B is USD54.5 million for the 7-year implementation period (spread across 8 years). A summary by activity is provided in Table 3.34. Activity 3.1: Develop and deliver an Advanced Warning System (AWS) for tuna redistribution contributes USD39.5 million, making up 72% of the total cost.

Table 3.34 Component B Advanced Early Warning System cost summary

OUTPUT 1	Budget section	Year 1	Year 2	Year 3	Year 4	Year 5	Year 6	Year 7	Year 8	Total
Activity 3.1 Develop AWS	Regional	1,704,186	3,299,880	3,732,759	3,544,391	3,620,307	3,502,854	3,591,109	95,461	23,090,947
	National	1,315,140	2,605,214	3,373,011	2,160,562	2,344,710	2,306,315	2,243,253	12,000	16,360,205
	Total	**3,019,326**	**5,905,094**	**7,105,771**	**5,704,953**	**5,965,017**	**5,809,169**	**5,834,362**	**107,461**	**39,451,152**
Activity 3.2 Assess economic impacts	Regional	207,800	717,854	624,096	657,898	782,457	644,206	776,459	42,638	4,453,408
	National	209,438	465,919	526,394	538,332	531,300	513,645	429,388	-	3,214,416
	Total	**417,238**	**1,183,773**	**1,150,490**	**1,196,230**	**1,313,757**	**1,157,851**	**1,205,848**	**42,638**	**7,667,824**
Activity 3.1 negotiation training	Regional	302,425	840,925	850,593	907,164	886,575	893,518	895,642	74,274	5,651,116
	National	79,738	239,093	269,484	275,610	272,254	276,142	270,512	-	1,682,834
	Total	**382,163**	**1,080,018**	**1,120,076**	**1,182,775**	**1,158,830**	**1,169,660**	**1,166,154**	**74,274**	**7,333,950**
TOTAL		**3,818,727**	**8,168,885**	**9,376,337**	**8,083,957**	**8,437,603**	**8,136,680**	**8,206,363**	**224,373**	**54,452,925**

3.1.7. Scenario 1: without *AWS* Programme

The future situation without the development and use of the AWS to enable the tuna-dependent economies to negotiate effectively to retain the present-day benefits they receive from access fees paid by industrial fishing fleets assumes that the climate-driven redistribution of tuna biomass to the east projected by the preliminary modelling will result in a reduction in fishing access fees. This scenario will increase the vulnerability of these countries to climate change because they will have less government revenue to use to support the adaptations that will need to be made by all sectors.

3.1.8. Scenario 2: with *A*dvanced Warning System

As a result of the AWS, the nine tuna-dependant countries will benefit from science-based forecasts and projections that reduce uncertainty in the climate-driven redistribution of tuna. In particular, the improved understanding of the timing and extent of tuna redistribution will enable appropriate adaptations to be made with greater confidence. The tuna-dependent countries will also have strengthened capacity to negotiate to retain the present-day benefits they receive from tuna, regardless of the redistribution of the fish. Success with such negotiations will enable the countries to obtain an equitable return from fishing access fees available from the fishing industry.

Advance information on tuna redistribution will also enable the subtropical countries to prepare to capture increased benefit from tuna if the AWS confirms that there will be more tuna in their waters in the future.

In addition, the AWS will enable national fisheries agencies, and the regional fisheries agencies that support them, to understand the effects of ocean warming on the distribution and abundance of tuna with greater certainty. This knowledge can then be used to inform the highly-effective, cooperative tuna management arrangements established in the region (see Box 2.1 in Chapter 2) about any changes to harvest strategies and other associated management measures needed to ensure that maximum sustainable yields continue to be obtained from the region's tuna resources during climate change.

It is not possible to monetise the latter two benefits. However, they can be assessed once the AWS is operational through the use of the following proxy indicators.

1. Documenting the enterprises established in the five subtropical countries created to harness any climate-driven increases in tuna biomass to enhance food security and livelihoods.
2. Recording the additional Conservation and Management Measures (CMMs) implemented by the WCPFC based on information from the AWS as the Commission continues to integrate its Resolution on Climate Change (Resolution 2019-01). This resolution aims to address the potential impacts of climate change on tuna stocks, non-target species, and species belonging to the same ecosystem, and ensure the long-term conservation and sustainable use of highly migratory fish stocks in the western and central Pacific Ocean in accordance with the 1982 Convention and the 1995 United Nations Fish Stocks Agreement (https://cmm.wcpfc.int/resolution/resolution-2019-01). Action by WCPFC on Resolution 2019-01 is demonstrated by its decision to make climate change a permanent item on its agenda.
3. Documenting new arrangements for co-operative management of tuna stocks as they are redistributed to the east by the relevant regional fisheries management organisations (RFMOs) - WCPFC and the Inter-American Tropical Tuna Commission (IATTC) - to fulfil the conservation and management responsibilities of the RFMOs under international law https://www.frontiersin.org/journals/marine-science/articles/10.3389/fmars.2022.1046018/full

These proxy indicators have now been added to Section 3.1.8.

Assumptions, parameters and limitations

The main assumptions regarding the activities to be implemented under Component B of the Programme are:

- Climate-driven tuna redistribution is expected to affect the value of tuna-fishing access fees received by governments;[32]
- Natural disasters (cyclones, tsunamis, etc.), or public health calamities (e.g., COVID-19), do not significantly disrupt the Programme activities for extended periods;
- The global economy and political situation in the Participating Countries remain stable;
- Governments continue their willingness to support and participate in the Programme;
- Data generated by the AWS will be used and applied effectively to produce required changes in policy; and Eastern Pacific Ocean (EPO) stakeholders engage with WCPO counterparts to formalize practical mechanisms to collaborate in the sustainable management of redistributed, shared tuna stocks. Economic Analysis

Benefits of AWS

The analysis of the preliminary modelling of the impact of climate change on the economies of the tuna-dependent countries summarised above shows that climate-driven tuna redistribution could result in severe economic and social impact, i.e., reduced government expenditure for important public sectors such as education, health and other social services.

The economic benefit of the Programme will be a reduction in the potential loss of government revenue obtained from fishing access fees (see Annex 27 for additional discussion). The approach taken for the economic analysis is to test the economic returns from, and performance of, the Programme activities designed to reduce the burden of lower government income. It is acknowledged that it may not be possible for the tuna-dependent countries to i) recover all the lost access fees as tuna catches in their waters decrease; or ii) capture the same level of resource rental obtained from fleets fishing in their EEZs when fishing occurs on the high seas.

The predicted loss of access fee revenue under RCP 8.5 of ~USD 88 million by 2050 is the mean of the values predicted by several models, with a range of between ~USD40 million and ~USD140 million.[33] A sensitivity analysis tests the economic model to this range of outcomes.

Under RCP 4.5, the loss of access fee revenue for the affected PICs is considerably less and is estimated to reduce access fees by $12 million by 2050.

Costs of AWS

Table 3.34 above presents the cost of the three AWS-related Activities over the 7-year implementation period (spread across 8 years), which totals USD54.5 million. No adjustment is made for the conversion of these costs to economic costs. It is assumed that the costs are exclusive of taxes and duties and there is a negligible unskilled labour component of the costs that would require a shadow value of labour. Costs are in real prices with no escalation for inflation.

The recurrent costs of maintaining the Programme after the end of the implementation period is estimated in Technical Study 9 to be $4.045 million per year, approximately 7% of the original investment costs of USD54.45 million.[34]

Economic benefits

The economic benefits are assessed as the reduction in the loss of fishing access fees over the life of the Programme until 2050 on a pro rata straight line incremental basis from Year 1 (2025).

For RCP 8.5 the economic benefit is tested at three levels in 2050: USD50 million, USD30 million and USD15 million per year, based on the assumption that the tuna-dependent countries are unlikely to recover the full potential reduction in access fees of USD88 million in 2050 under RCP8.5, and representing the range of 56% to 17% of the total loss. The USD88 million is the mean predicted value for the loss for the nine countries participating in the GCF Programme (with a range of USD40 to USD140 million). The economic benefits are amalgamated for the Programme in its entirety and are not divided into the benefits for individual countries.

The economic return for the estimated loss under RCP4.5 of $12 million per year is also tested to show the impact of a much lower projected loss of access fees.

Results of the economic analysis

The results of the economic analysis for the AWS are summarised in Table 3.21.

Table 3.215 Results of the economic analysis of Programme activities under Component B.

Saving in potential loss of access fees by 2050	**EIRR**	**NPV 9% USDm**	**Delay benefits until 2030 EIRR**
RCP 8.5:			
1. USD50 million	43%	USD117.87	18%
2. USD30 million (base case)	22%	USD48.47	12%
3. USD15 million	8%	-USD3.58	3%
4. USD88 million	182%	USD250	26%
RCP4.5 USD12 million	4%	-USD13.99	0%

The results show that the economic return on the investment in the AWS is very positive under RCP8.5 with EIRRs that comfortably exceed the hurdle rate of a 9% opportunity cost of capital, the rate that is used by some development partners such as the Asian Development Bank. At the lower benefit of USD15 million per year in 2050, the EIRR is reduced to 8%. At the full benefit of USD88 million the EIRR is 182%.

The economic return of RCP4.5, which is estimated to result in a maximum of $12 million per year in reduced access fees by 2050, has an EIRR of 4%, below the threshold for an economic return.

Delaying any benefits from the Programme until 2030 does affect the EIRRs – but they are still over 9% for USD50 million, USD30 million and USD88 million.

The payback period to recover the original investment costs of USD 54.45 million ranges from five years at USD88 million to 14 years at the USD15 million benefits level by 2050.

The economic return from the range in the predicted loss of between USD40 and USD140 million show a high EIRR, which also confirms the very high potential economic return from this Programme. However, there is a high degree of uncertainty on the predicted impact of the redistribution in the tuna resource on the catch in the EEZs of the PICs and the reduction in access fee revenue. A key objective of the AWS is to reduce such uncertainty. For this reason, the results of the economic analysis are only indicative.

A summary of the cashflows for the economic analysis of Component B AWS is shown in Table 3.37Regardless of the low economic return of the AWS under RCP4.5, it will have many important benefits for Pacific Island countries and for the sustainable management of the world's largest tuna fishery. In particular, the AWS will:

1) Enable governments of the nine tuna-dependent Pacific Island economies to understand near-term (1- to 5-year) variation in the fishing access fees that contribute so substantially to their revenue as fishing fleets respond to the changing distribution of tuna, and use this information for shorter-term economic planning;
2) Provide decadal projections of tuna biomass redistribution and patterns of fishing effort across EEZs and high-seas areas that will enable governments to develop long-term strategic plans to build resilience to potential loss of access fees/government revenue; and
3) Assist the WCPFC to understand how climate change is likely to affect the Harvest Strategies used to maximize sustainable yields from the tuna fishery in the WCPO.

See the beginning of Section 3.1.8 and Annex 27 for further details of the benefits to be delivered by the AWS.

Financial implications of AWS programme on the PICs

The nine tuna-dependant countries benefitting directly from the AWS, and the other five subtropical countries also expected to benefit in a variety of ways, will contribute to the operation and maintenance of the AWS programme after the completion of the Programme through their membership of the regional organisations that develop and use the system (see below). The ongoing annual costs associated with operating and maintaining the AWS are estimated to total $4.045 million, equating to ~USD290,000 per country for each of the 14 PICs. The administration of the AWS will be the responsibility of the regional agencies acting on behalf of the PICs, in particular FFA, WCPFC and SPC. The economic analysis indicates the high economic return expected to be generated by maintaining present-day fishing access fees through use of the information from the AWS. The financial benefits for the PICs in contributing to the maintenance of the AWS are, therefore, considerable.

Table 3.37 Summary of economic analysis cashflows for Component B of the Programme

Item	Unit		Yr 1	Yr 2	Yr 3	Yr 4	Yr 5	Yr 6	Yr 7	Yr 8	Yr 9	Yr 10	Yr 15	Yr 25
COSTS	USD000													
Activity 3.1: Develop and deliver an AWS			3,019	5,905	7,106	5,705	5,965	5,809	5,834	107				
Activity 3.2: Assess the impact of tuna biomass redistribution			417	1,184	1,150	1,196	1,314	1,158	1,206	43				
Activity 3.3: Provide AWS-related training to national institutions			382	1,080	1,120	1,183	1,159	1,170	1,166	74				
Total Component B costs	54,453		**3,819**	**8,169**	**9,376**	**8,084**	**8,438**	**8,137**	**8,206**	**224**				
Recurrent costs from Yr 9	10%										4,045	4,045	4,045	4,045
TOTAL COSTS			**4,130**	**8,316**	**9,752**	**7,795**	**8,849**	**8,255**	**8,425**	**372**	**4,045**	**4,045**	**4,045**	**4,045**
BENEFITS														
Potential reduction in access revenue														
Scenario RCP 8.5	61%		1	1.6	2.6	4.1	6.7	10.7	17.2	27.7	44.4	71.4	764.7	87,720
Level of access fee saving														
1. USD50 million by 2050			2,000	4,000	6,000	8,000	10,00	12,00	14,00	16,00	18,00	20,00	30,000	50,000
2. USD30 million by 2050			1,200	2,400	3,600	4,800	6,000	7,200	8,400	9,600	10,80	12,00	18,000	30,000
3. USD15 million by 2050			600	1,200	1,800	2,400	3,000	3,600	4,200	4,800	5,400	6,000	9,000	15,000
4. USD88 million saving by			3,520	7,040	10,560	14,08	17,60	21,12	24,64	28,16	31,36	35,20	52,800	88,000
5 RCP4.5 USD12 million by			480	960	1,440	1,920	2,400	2,880	3,360	3,840	4,320	4,800	7,200	12,000
NET CASH FLOW														
1. USD50 million saving 2050			-1,819	-4,169	-3,376	-84	1,562	3,863	5,794	15776	13,995	15,955	25,955	45,955
2. USD30 million saving 2050			-2,619	-5,769	-5,776	-3,284	-2,438	-937	194	9,376	6,755	7,955	13,955	25,955
3. USD15 million saving 2050			-3,219	-6,969	-7,576	-5,684	-5,438	-4,537	-4,006	4,576	1,355	1,955	4,955	10,955
4. USD88 million saving 2050			-299	-1,129	1,184	5,996	9,162	12,983	12,434	27,936	27,635	31,155	48,755	83,955
Scenario	**EIRR**	**NPV 9%**												
1. USD50 million	43%	$117.9												
2. USD30 million	22%	$48.52.5												
3. USD15 million	8%	-$3.6-												
4. USD88 million (RCP 8.5)	182%	$250												
"5. RCP4.5 USD12 million	4%	-$14												

3.1.9. Results of combined economic analysis for Components A and B of the Programme

The results of the combined economic analysis of Component A (FAD and bycatch Activities) and Component B (AWS activities) are summarised in Table 3., and indicate that an overall EIRR of 18.4% with a NPV of USD58.81 million at a 9% discount rate are expected. The benefit:cost ratio for the overall Programme is 1.57. The combined results for the Programme comfortably exceed the hurdle of a 9% EIRR.

Table 3.38 Summary of results for the economic analysis of the combined FAD, bycatch and AWS activities.

Activity	PV of Costs @ 9% (USD million)	PV of Benefits @ 9% (USD million)	EIRR	NPV (USD million)	Benefit:cost Ratio
FAD	35.89	44.43	14.5%	8.55	1.24
Bycatch	11.62	13.41	11.1%	1.79	1.15
AWS (RCP8.5 $30m base case)	55.63	104.10	22.3%	48.47	1.87
Total	**103.14**	**161.95**	**18.4%**	**58.81**	**1.57**

3.2. Alternatives to Promoting Accessibility to Tuna to Address Socio-economic Threats to Pacific Island Countries

PICs continue to develop their individual and collective capacity to access innovative sources of finance to instigate and sustain initiatives associated with the WCPO tuna fishery that contribute to their social and economic wellbeing. A summary of options open to PICs includes:

Hypothecation: Hypothecation offers significant long-term potential for sustaining the initiatives supported under the Programme. Hypothecation is the practice of earmarking specific revenue, such as fisheries access fee revenue, for a particular purpose. Hypothecation promotes transparency and accountability in the allocation and use of revenue. It provides opportunities for stakeholders, including the industry and the public, to understand how the funds are being utilized, tagged and tracked reducing the potential for misuse or misallocation. There is much scope for this to be considered in nine of the 14 participating countries where tuna-fishing access fees comprise 4-70 % of all (non-grant) government revenue.

Tuna as a critical national and regional asset: Hypothecation will be enhanced through the formal recognition of tuna as a key renewable resource sustaining the economic and social development of PICs. The ability of national governments to contribute to the on-going development of this sector, and to attract international partners to support them in this endeavour, will be enhanced by the acknowledgement that tuna fisheries require support through its declaration as a critical–national asset. This will elevate the prominence of tuna in Government decision-making processes recognising its essential role in supporting national and the regional economic, social, and environmental well-being.

Government matching rebates for sustainability: Governments may consider providing subsidies to industry to incentivize support to actions that may include facilitating research cooperation based on AWS contributions to sustainable adaptive fisheries management arrangements and conservation efforts. Such subsidies may be linked to compliance with regionally agreed conservation and management obligations also expected to stem from the AWS.

Bilateral and multilateral development or technical assistance: PICs have a long history of productive partnerships with a range of bilateral and multilateral development assistance agencies. Some of these are based on historical colonial ties while others have been established more recently through international institutions providing support to developing economies. These sources of technical and financial assistance will continue to be important to PICs, including in relation to sustaining initiatives implemented during the GCF Programme.

Public-Private Partnerships (PPPs): Collaborative partnerships between governments, the private sector, and NGOs have potential to provide access to diverse funding sources, advanced technology, and expertise. These collaborations leverage relative strengths of partners to achieve a common goal, such as the sustainable management and conservation of regional tuna resources.

PPPs can build trust and confidence and improve data collection and monitoring, enhance compliance with regulations and reduce IUU fishing through the establishment of cooperative agreements, and facilitate investment in down-stream infrastructure, such as port facilities and cold storage, improving the overall value chain. Care in managing potential conflicts of interest, political conveniences and transparent monitoring and reporting on partnership benefits attract significant attention in PPPs.

Examples of PPP include:

- Public-Private Partnerships in the Maldives: The Maldives issued the world's first sovereign sustainability bond in 2020, a portion of which is dedicated to blue economy projects, including sustainable fisheries development.

- Several Pacific Island nations have embarked on PPPs in the tuna fisheries sector. For instance, Papua New Guinea is in the process of partnering with private companies to create tuna processing facilities, boosting employment and economic growth.

Although the Programme does not seek to provide direct support for such initiatives, participating countries may explore options in this regard independently.

Other innovations - insurance: Other possibilities that were considered in assessing the sustainability options for the Programme included relatively new and innovative facilities such as impact or parametric insurance and blue bonds. Apart from the possibility that PICs may consider insuring against the loss of FADs due to an extreme weather event, or the loss of revenue from licensing fishing vessels under access arrangements as a result of reduced demand for access as a consequence of the redistribution of tuna, these possibilities were assessed as not offering significant potential to support the sustainability endeavours of the Programme. In addition to the relatively low value that would be assigned to FAD units for insurance purposes, insurance products generally rely on significant historical data holdings to assess risks, associated premiums and compensation scheme. These required data are generally not available.

Impacts of the redistribution of regional tuna resources as a consequence of climate change on fisheries access payments are unlikely to be instantaneous, they are forecast to evolve over a period of decades. Given significant budgetary pressures to service other national needs (health, education, sanitation, infrastructure, etc.), PICs will be challenged supporting a long-term financial commitment to pay premiums with limited possibilities of securing a benefit in the near term. Although not related to sustaining Programme outcomes, the potential of incorporating impact insurance in Pacific Islands tuna fisheries includes:

- Weather index-based insurance (WIBI) for fishing communities.[1] Pacific Island governments are often able to mobilise international funding to support post-disaster relief and recovery efforts, however, only about six per cent of rehabilitation requirements are generally met. Innovative insurance schemes could therefore help to fill this gap by protecting the livelihoods of vulnerable farmers, fishers and other value chain actors. WIBI differs from traditional indemnity-based insurance. It is a contingent claim contract for which lump sum pay-outs are made based on the occurrence of a specific weather parameter that is closely associated with yields, cost or revenue. Insurance payments are made based on pre-determined damages for a defined weather impact (e.g. rainfall, drought or wind strength) and not on losses measured and verified in the field. A major advantage is that the policies are flexible and designed to reflect exposure and risk in specific areas. Neither producers nor insurers can influence the index.

- Fisheries Compliance Insurance: Covering the costs associated with compliance with international and local fishing regulations.

- Price Insurance: Protecting against fluctuating market prices by offering compensation when prices drop below a certain threshold.

· Sustainable Practices Incentives: Offering discounts or bonuses to industry who follow sustainable fishing guidelines, encouraging responsible practices.

Although beyond the intended activities of the Programme, impact insurance has the potential to play an important role in Pacific Islands tuna fisheries by mitigating risks and providing financial security to vulnerable communities. The unique challenges faced by these fisheries, from climate change to market volatility, make them interesting candidates for impact insurance that delivers for public good. With appropriate strategies, partnerships, and regulatory support, impact insurance offers significant potential to contribute to the sustainability of regional tuna fisheries.

Loss and Damage Fund: Also beyond the remit of the Programme, the Loss and Damage Fund, initially designed to address climate change impacts, may be adapted to provide financial support for the industry in the face of losses and damages incurred due to overfishing, climate change, natural disasters, and market volatility. Defining eligibility criteria and assessing losses and damages, especially in the context of overfishing and climate change impacts, can be intricate and require detailed assessments. The AWS outputs will play a significant role in informing any negotiations related to loss and damage for PICS.

Debt-for-nature swaps offer a multifaceted solution to address economic and environmental challenges. They involve either bilateral or multilateral arrangements to assume part of the debt of a struggling economy in return for a commitment to from the recipient Government to conserve natural resources. The global value of debt-for-nature arrangements has recently been estimated to be USD800 billion. In 2023, Ecuador struck the biggest debt-for-nature deal of its kind: refinancing USD1.6 billion of its commercial debt at a discount in exchange for a consistent revenue stream for conservation around the Galápagos Islands. Features of debt-for-finance include:

a). Conservation Finance: Debt-for-nature swaps generate funds that are channelled directly into marine conservation and sustainability initiatives, such as creating marine protected areas and investing in resource management.

b). Debt Reduction: These swaps can help alleviate the debt burden of Pacific Island nations, freeing up financial resources that can be redirected towards critical areas like fisheries management and climate adaptation.

c). Sustainable Practices Incentives: By linking debt relief to sustainable fishing practices and conservation measures, debt-for-nature swaps incentivize the adoption of eco-friendly methods and gear that protect tuna populations and the broader marine ecosystem.

d). Climate Resilience: The proceeds from these swaps can be invested in climate-resilient infrastructure for fishing fleets, enabling the industry to adapt to changing weather patterns and other climate-related challenges.

e). Market Access and Pricing: Successfully implementing debt-for-nature swaps can enhance the sustainability of Pacific Island tuna fisheries, making their products more attractive to markets that demand sustainably sourced seafood.

In addition to examples from Ecuador and Barbados, examples demonstrating the application of debt-for-nature swaps to support the Pacific Island tuna fisheries:

a). The Seychelles: In 2016, the Seychelles entered into a debt-for-nature swap agreement with The Nature Conservancy. The country converted a portion of its debt into funding for

marine conservation and sustainable fisheries management, securing financial resources for critical initiatives.

b). Indonesia: Indonesia has been involved in several debt-for-nature swaps to address environmental and conservation challenges, including marine conservation and fishery management. These agreements have supported the protection of critical marine areas and sustainable fishing practices.

Debt-for-nature swaps represent an innovative and promising solution for ensuring the sustainability of Pacific Island tuna fisheries while simultaneously supporting marine conservation and environmental protection. These financial mechanisms can generate funds for critical marine initiatives, provide debt relief to Pacific Island nations, and incentivize sustainable fishing practices. By fostering collaboration, maintaining transparency, investing in technology, and engaging local communities, the Pacific Islands can effectively harness the potential of debt-for-nature swaps to secure the future of regional tuna fisheries and promote the health of the broader marine ecosystem.

In the context of the Programme, further research on the potential for a debt swap may be beneficial. If countries committed to: 1) maintaining or expanding their FAD programmes and allocated the necessary proportions of their tuna resources needed for domestic food security; and 2) rigorously applied the results of the AWS to their role in regional tuna management arrangements, they would demonstrate an effective sustainability mechanism that might be considered in a debt-for nature deal. However, the additional research would include assessing the potential for lenders to re-consider the current purpose of debt for nature swaps to include debt swaps for 'sustainable use of natural resources to optimise socio-economic benefits'.

3.2.1. Alternatives to Component A

The barriers preventing solutions to socio-economic problems to be addressed by Component A of the GCF Regional Tuna Programme relate to limitations associated with increasing access to tuna for the food security and livelihoods of coastal and urban communities in Pacific Island countries (PICs). The Programme focuses on two streams of work to address these barriers. These are:

- providing technical and logistical support to strengthen national artisanal fish aggregating device (FAD) programmes, and
- implementing strategies to deliver more transhipped and unloaded bycatch[35] and tuna to urban/peri-urban communities.

In the face of deteriorating coastal habitats, particularly coral reef ecosystems, which have historically been a major source of sustenance for coastal communities in the Pacific Islands region, and growing populations,[36] there are few options available to Pacific peoples to address threats to national food security and provide for their nutritional wellbeing and healthy lifestyles. Improving domestic supply chains, including increasing the artisanal harvest of tuna and associated pelagic fish species (hereafter 'tuna') through increased deployment of FADs, and improving the distribution of bycatch and tuna available from industrial fishing vessels during transhipping operations, are practical and feasible vehicles for enabling increased tuna consumption.[37]

Pacific Island countries already face significant public health challenges[38], including micronutrient deficiency, and the globally highest rates of obesity and other non-communicable disease (NCD).[39] This public health burden, and associated economic cost, is partly attributable to significant dietary shifts that have occurred in recent decades,[40,41] including changing diets from locally-sourced, seasonally diverse foods towards import dependence, including processed foods high in salts, fat and sugars.[42,43] This challenge is not isolated to urban areas[44] and varies significantly across countries.

Improving nutrition outcomes, through targeting vulnerable populations, is essential to tackling the ongoing NCD challenges facing the region.

The advantages of improving the availability of tuna for local diets are expected to be evident in health statistics, reduction in the prevalence of NCDs among Pacific Island communities, and linked accumulated benefits for public health systems (budgets, personnel and facilities) required to attend to these national health challenges. In the absence of the Programme's promotion of the increased use of tuna in the diets of Pacific Island communities, and other interventions including promotion of physical exercise, already stretched health resources will be diverted to address the eminently treatable NCD threat to the wellbeing of Pacific Island communities and economies.

Plausible alternative sources of protein and calories to fill the gap in the anticipated shortfall in availability of nutritious food from reduced coastal fisheries production fall into three broad categories - increased imports, increased domestic agriculture production, or increased consumption of tuna. Tuna features prominently in this list because it is the only viable option for increasing the supply of fish to fill the gap in fish supply needed for good nutrition created the degradation of coral reefs and the rapid population growth occurring in many PICs.[45] These alternatives, including dominant foods available in each category and their advantages and disadvantages in terms of nutrition, reliability of supply and access are summarised below.[46]

Alternative imported foods are predominantly meat and cereals, both of which currently comprise a large portion of Pacific diets.[47] Increasing imports of these sources of protein places significant imposts on national budgets and the balance of payments for Pacific Island economies that are already vulnerable.[48,49] Meat imports are largely comprised of beef, pork, and chicken. Chicken imports are increasing rapidly across the Pacific Islands region and demand is expected to continue to increase. However, meat imports are highly perishable in the absence of cold supply chains, relatively expensive, and primarily available in urban areas only.

Both rice and wheat are already imported in significant quantities and, except for protein, do not have comparable nutrient profiles to fish, however, some fortification does occur. Both cereal types are comparatively affordable and relatively shelf stable. However, their contribution to broader domestic Pacific economies, including employment, is relatively limited and both are highly vulnerable to global supply shocks so are not optimal candidates as a primary solution to anticipated protein shortfall per capita. Although it is inevitable that both meat and cereal imports will remain dominant in Pacific diets, increasing their role further to address the decline in protein from coastal fisheries, would exacerbate vulnerability to food insecurity.[50]

Alternative foods to reef and coastal fish from increased domestic agricultural production (crops and livestock) are more varied and context-dependent compared to opportunities presented by possible imports. However, agricultural systems are limited in many Pacific Island countries and also threatened by climate change - their productivity will be increasingly exposed to severe and extreme weather events and rainfall variability.[51]

Of the plausible locally produced, animal-sourced food options, chicken production is the most viable due to affordability, ease of scaling, and relatively simple animal husbandry requirements, including financial outlay.[52] Chicken farming can also provide eggs, which are rich in protein.

Other feasible domestic alternatives include fish farming, primarily small-pond production of tilapia.[53] Some tilapia farming has been occurring in Melanesia for a significant period of time. Current production estimates are 500-1000 metric tonnes/year (t/yr) in Papua New Guinea (PNG), 300 t/yr in Fiji, 150 t/yr in Solomon Islands and 8 t/yr in Vanuatu.[54] However, it is highly unlikely that tilapia

farming could expand to fill expected national dietary shortfalls in protein to a significant extent, although it does have some potential to provide some increased access to protein in inland areas of Melanesia where it is not practical to develop tuna supply chains.[55] Increased domestic production of plant-based alternatives, such as nuts, vegetables, also offers some potential in the high islands of Melanesia.[56]

In considering these factors, including nutrition, reliability of supply, and cost, overlayed with broader considerations that present risks and opportunities, such as global crises that can influence both pricing and reliability of supply, increasing the availability of tuna for domestic consumption will be increasingly important as a significant contributor to national food security.

Tuna is good source of protein, omega 3 fatty acids and iron,[57] and consumption of tuna up to 50% of recommended protein intake is not expected to exceed safe levels of mercury consumption.[58] The vast majority of people live along coastal fringes in all PICs except PNG and Fiji,[59] so tuna can be relatively accessible to consumers through short supply chains once systems are strengthened to improve catch rates of small-scale fishers by scaling up the use of FADs,[60] and expand the distribution of bycatch. [61]Increasing domestic consumption of tuna will not impact the sustainability of the regional tuna catch (Chapters 1 and 2).

Access to tuna is also largely immune to global events, such as supply shocks, except in indirect ways such as potential increase in fuel costs. Importantly, even though the spatial distribution of tuna is likely to change due to climate impacts,[62,63] this is not expected to have a significant impact on the availability of tuna for domestic consumption in PICs.[64] In addition, tuna are not vulnerable to other climate-driven impacts, e.g., the effects of severe climatic events or rainfall variability, which adversely impact coastal fish habitats due to of increased runoff.[65]

Although increasing access to tuna has an important role to play in increasing food and nutritional security and food sovereignty in the region, and concurrent reduction in diet-related NCDs, it will not be able to fill the gap in protein supply (see below). These goals will also be enhanced by increasing domestic production of other nutritious foods that are resilient to the current and anticipated impacts of climate change. A diverse range of context-appropriate livestock, horticultural and aquaculture production systems will be needed for this purpose. Such investments will help to ensure resilience to climatic impacts and unanticipated global events and support healthy balanced diets. Importantly, increasing food diversity is more feasible on fertile high islands than in countries comprised entirely or mainly of coral atolls, which will inevitably be more heavily dependent on imports and aquatic resources into the future. This variability in potential for food production between island types needs to be considered when prioritising food security and nutrition interventions.

Increasing access to tuna represents the best option for diversifying and improving nutrition where population growth and the effects of climate change on reef and coastal fisheries resources significantly reduce recommended per capita availability of fish-based protein. However, the level at which tuna is needed to fill gaps in protein supply, and capable of filling the gaps, will vary among countries.

The reason for this is that some countries have small and relatively stable populations, and large areas of coral reef relative to population size. In these countries, the projected effects of climate change on reef and coastal fish production are not likely to reduce protein supply below recommended levels for rural communities simply because the area of coral reef is so large relative to population size. For these countries, even when their reefs are degraded, they will have the potential to supply the quantities of fish required.[66,67] However, economically-viable distribution of reef and coastal fish from

distant reefs to urban populations in some of these countries is logistically challenging. Expanding the use of FADs[68] within a practical fish-distribution radius of community centres and improving the distribution of bycatch in such countries where transhipping operations occur,[69] will help to ensure equitable national access to recommended levels of protein from fish. Countries in this category include Cook Islands, Federated States of Micronesia, Kiribati, Marshall Islands, Niue, Palau, Tonga and Tuvalu. In some of these countries periodic ciguatera fish poisoning impacts reef fish consumption[70,71] and in others, increasing access to tuna will also be needed to supply fish for tourists, and in creating livelihoods.

In all remaining countries (Fiji, Nauru, PNG, Samoa, Solomon Islands and Vanuatu), which collectively comprise 96% of the total population of the 14 countries participating in the GCF Regional Tuna Programme,[72] a significant gap is expected to occur between the amount of reef and coastal fish needed for good nutrition and the quantity of these fish that can be harvested sustainably from coral reefs and other coastal habitats degraded by climate change. In these countries, increasing access to tuna is essential to national plans to provide both rural and urban communities with access to adequate fish protein per capita.

Tuna will be important, not only to help meet domestic dietary requirements, but also in expanding domestic livelihood opportunities, and in managing risks associated with import dependence. Increased access to tuna should sit centrally within the general approach of diversifying local diets. Improving domestic value chains, including increased access to commercial bycatch, canned tuna, and increasing artisanal harvest through FAD deployment activities are pragmatic and feasible vehicles for enabling increased tuna consumption.[73]

The Programme will promote the integration of initiatives supporting artisanal fisheries around FADs and increased use of bycatch and tuna, either transhipped from industrial purse-seine vessels or unloaded from longliners in supported by formal government policies. Importantly, the Programme will support initiatives to promote safe fishing practices associated with fishing further offshore around FADs, which in the absence of the Programme, will remain relatively unattended resulting in a high level of risk, including loss of life, currently associated with many nearshore fisheries in the region.

In the absence of the Programme, there are limited opportunities for increasing the availability and use of tuna and bycatch for coastal and urban communities, respectively. Largely, the status quo, characterised by limited recurrent budgetary support, insufficient institutional capacity and accessing bilateral or multilateral development assistance support on an ad hoc basis, will continue. Efforts that mainstream government support for scaling-up community-based FAD fishing and implementing policy reform requiring industrial tuna fisheries to facilitate improved access to transhipped or unloaded bycatch and tuna will continue with little or no increased contributions of tuna to national food security.

3.2.2. Alternatives to Component B

The barriers constraining the development and application of solutions to scientific, social and economic problems to be addressed by Component B of the Programme relate to limitations associated with the knowledge and understanding of the redistribution of tuna resources to the high seas, and to the east, as a result of climate-related changes in the WCPO marine ecosystem and the impact of those changes on Pacific Island country economies. The Programme focuses on three streams of work to address these barriers. These are:

- developing and delivering an Advanced Warning System (AWS) for tuna redistribution;

- assessing the impact of tuna biomass redistribution identified by the AWS on national economies at all levels; and
- providing AWS-related training to national institutions to engage in regional and international negotiations relating to impacts of climate change on tuna and the associated implications for government revenue of tuna-dependent economies.

The governments of the tuna-dependent countries are acutely aware of the implications of climate-driven distribution of tuna from their EEZs to high-seas areas for their economies.[74] However, there is a fundamental barrier preventing adaptation to the economic impacts of tuna redistribution, i.e., inadequate information for governments about the timing and extent of tuna movements. This lack of information limits the ability of these PICs to maintain their jurisdiction over the historical levels of tuna catch taken in their waters. For example, the existing fishing restrictions designed to constrain operation of purse-seine vessels in high seas areas described in WCPFC's Conservation and Management Measure (CMM 2021-01[75]), could be challenged by nations from outside the region once a greater proportion of tuna occur in international waters.

To ensure that the effects of climate change are increasingly integrated into regional tuna management arrangements, the Pacific Islands Forum Fisheries Agency (FFA) succeeded in having a Climate Change Resolution adopted by the WCPFC in 2019 (See Section 2.4).[76]

However, measures to secure the benefits of tuna for PICs under a changing climate remain to be identified, developed and applied. For example, obtaining the necessary international agreements in the relevant forums, including through the WCPFC, will only be possible with improved modelling and monitoring of tuna stocks. Negotiating continued rights for PICs to the tuna that will be progressively redistributed eastwards from EEZs to the high seas as a consequence of climate change will require more accurate information on the timing and extent of tuna redistribution.

One of the main barriers to equipping PICs with the information that they need to negotiate effectively identified in the region is the lack of scientific data, and with it the authority, to raise the alarm regarding shifts in tuna populations in response to climate change. Whilst this task is part of the regional agencies' day to day work, they currently lack the capacity to make progress on these issues, even though it is now encouraged by the WCPFC Resolution.[77] This barrier will be significantly addressed with the development of the AWS, because the new information system will be deeply embedded in the regional process mandated by the WCPFC and executed by SPC, the FFA and other agencies. SPC has the authority to raise the alarm with the emerging science and FFA has the authority to lead and work on adaptive fisheries management strategies. Once the region has identified and agreed on adaptive management measures, these can be put forward for negotiation in WCPFC as the main regulatory body in the region for the management of tuna stocks and any long-term mechanisms that need to be embedded in the Commission.

In the absence of a system to provide more reliable forecasts of tuna redistribution and inform appropriate adaptations, a 'loss and damage' issue will arise. Tuna-dependent PICs that have produced negligible GHG emissions and have few other options to support their national economies will lose vital government revenue (See Section 2.3.10), resulting in an inability to provide the basic services needed by their citizens to adapt to climate change.

The subtropical PICs (Fiji, Niue, Samoa, Tonga and Vanuatu) will also benefit from development of the reliable information system. In particular, these countries, where preliminary modelling indicates that abundance of tuna could increase[78], will be able to evaluate adaptations to capitalise on opportunities,

e.g., increased industrial fishing, opportunities to host increased transhipment and unloading operations and/or tuna processing.[79] Without the Programme this capacity will be handicapped.

To provide the reliable information needed to predict the redistribution of tuna with confidence for use in management and investment decisions, the key weaknesses within existing modelling approaches need to be addressed. Essential improvements to models include: identifying responses of tuna resources to climate change at higher spatial resolution (this will require integration of information on tuna connectivity, tuna stock structures and meso-scale oceanography); improved assessment of the effects of climate change on the food webs that support tuna resources; and incorporating ocean forcings for all greenhouse gas (GHG) emission scenarios. Through development of the AWS, the Programme will support activities critical to providing the information necessary to reduce the uncertainty associated with the existing modelling.

In the absence of the Programme, the Participating Countries will continue to be constrained by the lack of detailed information to support strategies to adapt to future shifts in industrial tuna fishing and landing activities as a response to the redistribution of tuna resources due to climate change. The AWS will develop a fleet dynamics model to assess the implications of changes in fishing patterns due to tuna redistribution for future government revenue. The PICs require advance warning of these shifts to adapt their food security and investment strategies in line with future industrial fishing opportunities and patterns. One of the key risks associated with this is that industrial fishing vessels will visit ports in these countries less frequently as climate change redistributes tuna further to the east.

In addition, PICs will be constrained because they will be sub-optimally prepared or resourced to pursue high-level international negotiations through complex multilateral forums to seek appropriate 'loss and damage' payments should distant water fleets shift their operations out of their EEZs in pursuit of higher profits if an increased proportion of tuna stocks occurs in the high seas *(*where there is no need for industrial fishing fleets to pay access fees). In the absence of the Programme, the threat to sustained economic benefit from the regional tuna fishery to PIC economies is real, and the capacity for PICs to pursue adaptation and mitigation responses in the appropriate regional and international forums will be severely jeopardised.

This underscores the need for the AWS to also have strong socio-economic modelling components to identify, among other purposes, the difference between short-term nationalistic outcomes compared to the benefits to each country and the region as a whole from long-term collaboration and solidarity. The AWS provides a sound platform for these goals to be achieve. The same potential does not exist in the absence of the Programme.

The Programme will also support critical capacity-building initiatives that include the assimilation, assessment and practical application of scientific and policy-related information. These initiatives will build the capability of PICs to engage in a substantive negotiations across regional and international forums related to the implications of, and potential responses to, climate-related impacts on the WCPO tuna resource. In the absence of the Programme, this vital capacity development for PICs will be limited and inadequate to effectively respond to the impacts on climate change on the wellbeing of Pacific Island people in tuna-dependent economies.

The alternatives for developing the information needed to inform tuna-dependent economies about how best to adapt/negotiate, are poor. There is limited scope for raising the USD50 m required to do the job, and the risks likely to be incurred by PICs associated with undue delays in developing the AWS, are real and increasing.

3.3. Appendices

Appendix 3-A Details of Economic Analysis of GFC Programme

This appendix includes the Excel sheets for the economic analysis of the GFC Programme.

3-A.1 Details of the overall FAD Programme economic analysis.

3-A.2 Details of the economic analysis of the FAD programme for 14 countries.

3-A.3 Details of the economic analysis of the Bycatch programme

3-A.4 Details of the economic analysis of the Tuna Advanced Warning System

Appendix 3-A.1 Details of the overall FAD Programme Economic Analysis.

Table 3-A.1.22: FAD Programme economic analysis

ECONOMIC ANALYSIS OF FAD PROGRAMME

		USD'000																					
Item		**Unit**		**Yr 1**	**Yr 2**	**Yr 3**	**Yr 4**	**Yr 5**	**Yr 6**	**Yr 7...**	**Yr 8**	**Yr 9**	**Yr 10**	**Yr 11**	**Yr 12**	**Yr 13**	**Yr 14**	**Yr 15**	**Yr 16...**	**Yr 17**	**Yr 18**	**Yr 19**	**Yr 20**	**Yr 25**
1. GCF RTP INVESTMENT COSTS																							
Activity 1.1: Provide technical and logistical support to strengthen National FAD programmes.	**26,005**	$'000		918.1	7,167.9	5,630.1	5,553.3	3,137.8	2,167.3	1,307.3	123.1													
Activity 1.2: Augment national safety-at-sea initiatives	**5,087**	"		38.4	962.0	1,535.5	1,240.7	773.3	341.2	177.6	17.9													
Activity 1.3: Strengthen post-harvest practices and improve market opportunities for FAD-caught fish	**2,401**	"		22.6	265.4	525.2	407.7	530.4	399.8	233.0	17.2													
Total GCF RTP	**33,493**	1.00		**979.1**	**8,395.4**	**7,690.8**	**7,201.8**	**4,441.5**	**2,908.2**	**1,717.9**	**158.1**	**0**	**-**	**0**	0	0	0	**-**	0	0	0	0	**-**	**-**
2. Fisheries Dept FAD Overheads				0	0	0	**92.0**	**184.0**	**276.0**	**368.0**	**368.0**	**368.0**	**368.0**	**368.0**	**368.0**	**368.0**	**368.0**	**368.0**	**368.0**	**368.0**	**368.0**	**368.0**	**368.0**	**368.0**
3. FAD Replacement & Maintenance Costs																							
Number of GCF FAD Deployed																							
Initial Deployment plus increase (Acty 3)	No/yr			-	167	333	333	333	333	342	351	360	369	378	386	395	404	413	422	431	440	449	458	502
New Replacement FADs (ave life 3 yrs)	No/yr			-	-	2	103	120	123	127	130	134	138	141	145	149	152	156	160	164	167	171	175	193
Cost of Replacement FADs (ave life 3 yrs)	US$	1.00		**-**	**-**	**13.7**	**781.3**	**1,017.7**	**1,045.4**	**1,120.4**	**1,149.7**	**1,179.1**	**1,208.4**	**1,237.7**	**1,270.4**	**1,299.6**	**1,328.9**	**1,358.1**	**1,387.3**	**1,448.7**	**1,478.6**	**1,508.5**	**1,538.4**	**1,725.3**
TOTAL COSTS	**70,695**	$'000		**979**	**8,395**	**7,705**	**8,075**	**5,643**	**4,230**	**3,206**	**1,676**	**1,547**	**1,576**	**1,606**	**1,638**	**1,668**	**1,697**	**1,726**	**1,755**	**1,817**	**1,847**	**1,876**	**1,906**	**2,093**
BENEFITS																							
Full Incremental Benefit Analysis																							
Full Production from FADS	5t/FAD/y	t		-	833	1,665	1,665	1,665	1,665	1,710	1,754	1,799	1,843	1,888	1,932	1,977	2,021	2,066	2,110	2,155	2,199	2,244	2,288	2,511
Full Production from FADS	10t/FAD/y	t		-	1,665	3,330	3,330	3,330	3,330	3,419	3,508	3,597	3,686	3,775	3,864	3,953	4,042	4,131	4,220	4,309	4,398	4,487	4,576	5,021
Gross Value of Fish	5t/FAD/y	6.06		-	5,134.6	10,269.1	10,269.1	10,269.1	10,269.1	10,517.6	10,766.1	11,014.6	11,263.1	11,511.6	11,760.1	12,008.5	12,257.0	12,505.5	12,754.0	13,002.5	13,251.0	13,499.5	13,748.0	14,990.5
	10t/FAD/y	6.06		-	10,269.1	20,538.2	20,538.2	20,538.2	20,538.2	21,035.2	21,532.2	22,029.2	22,526.1	23,023.1	23,520.1	24,017.1	24,514.1	25,011.1	25,508.1	26,005.0	26,502.0	26,999.0	27,496.0	29,980.9
less Production Cost 80%	5t/FAD/y	$'000		-	- 4,108	- 8,215	- 8,215	- 8,215	- 8,215	- 8,414	- 8,613	- 8,812	- 9,010	- 9,209	- 9,408	- 9,607	- 9,806	- 10,004	- 10,203	- 10,402	- 10,601	- 10,800	- 10,998	- 11,992
less Production Cost 80%	10t/FAD/y	$'000		-	- 8,215	- 16,431	- 16,431	- 16,431	- 16,431	- 16,828	- 17,226	- 17,623	- 18,021	- 18,419	- 18,816	- 19,214	- 19,611	- 20,009	- 20,406	- 20,804	- 21,202	- 21,599	- 21,997	- 23,985
Net Value of Incremental Production	5t/FAD/y	$'000		-	1,027	2,054	2,054	2,054	2,054	2,104	2,153	2,203	2,253	2,302	2,352	2,402	2,451	2,501	2,551	2,601	2,650	2,700	2,750	2,998
1	10t/FAD/y	$'000'		-	2,054	4,108	4,108	4,108	4,108	4,207	4,306	4,406	4,505	4,605	4,704	4,803	4,903	5,002	5,102	5,201	5,300	5,400	5,499	5,996
Net Cash Flow from FADS (full benefits)	**5t/FAD/y**	**$'000**		**- 979**	**- 7,368**	**- 5,651**	**- 6,021**	**- 3,589**	**- 2,176**	**- 1,103**	**477**	**656**	**676**	**697**	**714**	**734**	**755**	**775**	**795**	**784**	**804**	**823**	**843**	**905**
	10t/FAD/y	**$'000**		**- 979**	**- 6,342**	**- 3,597**	**- 3,967**	**- 1,536**	**122**	**1,001**	**2,631**	**2,859**	**2,929**	**2,999**	**3,066**	**3,136**	**3,206**	**3,276**	**3,346**	**3,384**	**3,454**	**3,523**	**3,593**	**3,903**
Reduction in Health Expenditure (0.5%)				-	43	129	259	432	647	863	863	863	863	863	863	863	863	863	863	863	863	863	863	863
Net CASH FLOW	**5t/FAD/y**	**$'000**		**- 979**	**- 7,325**	**- 5,521**	**- 5,762**	**- 3,158**	**- 1,528**	**- 240**	**1,341**	**1,519**	**1,539**	**1,560**	**1,577**	**1,597**	**1,618**	**1,638**	**1,659**	**1,647**	**1,667**	**1,687**	**1,706**	**1,768**
	10t/FAD/y	**$'000**		**- 979**	**- 6,298**	**- 3,467**	**- 3,708**	**- 1,104**	**525**	**1,864**	**3,494**	**3,722**	**3,792**	**3,862**	**3,929**	**3,999**	**4,069**	**4,139**	**4,209**	**4,247**	**4,317**	**4,387**	**4,456**	**4,766**
				EIRR	**ENPV 9% million**																			
EIRR (Full Benefit Analysis)	5t/FAD/y			**1.4%**	**- 10.874**																			
(ave FAD life 3 years)	10t/FAD/y			**14.5%**	**8.547**																			

Appendix 3-A.2 Details of Economic Analysis of FAD Programme for 14 Countries

This appendix includes the Excel sheets for the FAD economic analysis for each of the 14 participating countries in the GCF FAD Programme. A summary of the cashflows for the 14 PICs in also included before the individual country sheets.

Table 3-A.2. 40: Summary of Cash Flows for Country-wise FAD Programme Economic Analysis

SUMMARY OF COUNTRY-WISE FAD PROGRAMME

Country	Cost/kg in USD	Unit	Yr 1	Yr 2	Yr 3	Yr 4	Yr 5	Yr 6	Yr 7...	Yr 8	Yr 9	Yr 10	Yr 11	Yr 12	Yr 13	Yr 14	Yr 15	Yr 16...	Yr 17	Yr 18	Yr 19	Yr 20	Yr 21	Yr 22	Yr 23	Yr 24	Yr 25
Melanesia																											
Fiji	4.50	/kg																									
No. Current FADS		No.	20	20	20	20	20	20	20	20	20	20	20	20	20	20	20	20	20	20	20	20	20	20	20	20	20
No. GFC FADs		No.	0	20	40	40	40	40	41.5	43	44.5	46	47.5	49	50.5	52	53.5	55	56.5	58	59.5	61	62.5	64	65.5	67	68.5
No. replacement FADs		3-year life	-	-	-	13.3	13.3	13.3	13.8	14.3	14.8	15.3	15.8	16.3	16.8	17.3	17.8	18.3	18.8	19.3	19.8	20.3	20.8	21.3	21.8	22.3	22.8
GFC Costs		$	8,933	192,695	70,981	131,275	67,991	10,507	0	0																	
Cost of Fisheries FAD Officers		$	-	-	21,300	21,300	21,300	21,300	21,300	21,300	21,300	21,300	21,300	21,300	21,300	21,300	21,300	21,300	21,300	21,300	21,300	21,300	21,300	21,300	21,300	21,300	21,300
FAD replacement costs	4-year	$	-	-	-	41,699	83,397	83,397	105,034	108,830	112,626	116,423	120,219	107,650	110,945	114,240	117,536	120,831	127,290	130,670	134,049	137,429	140,808	147,771	151,235	154,698	158,162
	3-year	$	-	-	-	109,863	109,863	109,863	138,662	143,673	148,685	153,697	158,709	141,899	146,243	150,587	154,931	159,275	167,837	172,293	176,749	181,205	185,661	194,895	199,463	204,031	208,599
	2-year	$	-	-	81,397	162,794	162,794	162,794	205,917	213,360	220,803	228,246	235,689	210,399	216,840	223,281	229,721	236,162	248,931	255,540	262,149	268,757	275,366	289,143	295,920	302,697	309,473
PNG	5.23	/kg																									
No. Current FADS		No.	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8
No. GFC FADs		No.	-	18	36	36	36	36	38	40	41	43	45	47	49	50	52	54	56	58	59	61	63	65	67	68	70
No. replacement FADs		3-year life	-	-	-	12.0	12.0	12.0	12.6	13.2	13.8	14.4	15.0	15.6	16.2	16.8	17.4	18.0	18.6	19.2	19.8	20.4	21.0	21.6	22.2	22.8	23.4
GFC Costs		$	13,919	233,909	102,404	118,780	52,236	1,628	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Cost of Fisheries FAD Officers			-	-	26,000	26,000	26,000	26,000	26,000	26,000	26,000	26,000	26,000	26,000	26,000	26,000	26,000	26,000	26,000	26,000	26,000	26,000	26,000	26,000	26,000	26,000	26,000
FAD replacement costs	4-year	$	-	-	-	44,923	89,846	89,846	96,455	101,048	105,641	110,234	114,828	122,041	126,735	131,429	136,123	140,817	148,636	153,430	158,225	163,020	167,815	176,238	181,134	186,029	190,925
	3-year	$	-	-	-	118,595	118,595	118,595	127,347	133,411	139,475	145,539	151,603	161,162	167,360	173,559	179,757	185,956	196,321	202,654	208,987	215,320	221,653	232,824	239,291	245,759	252,226
	2-year	$	-	-	88,046	176,092	176,092	176,092	189,130	198,136	207,143	216,149	225,155	239,403	248,611	257,818	267,026	276,234	291,691	301,101	310,510	319,920	329,329	345,996	355,607	365,218	374,829
Solomons	3.00	/kg																									
No. Current FADS		No.	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10
No. GFC FADs		No.	-	10	20	20	20	20	21	22	22	23	24	25	25	26	27	28	28	29	30	31	31	32	33	34	34
No. replacement FADs		3-year life	-	-	-	3.7	6.7	6.7	6.9	7.2	7.4	7.7	7.9	8.2	8.4	8.7	8.9	9.2	9.4	9.7	9.9	10.2	10.4	10.7	10.9	11.2	11.4
GFC Costs		$	2,613	117,315	57,584	76,833	19,530	8,866	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Cost of Fisheries FAD Officers			-	-	11,300	11,300	11,300	11,300	11,300	11,300	11,300	11,300	11,300	11,300	11,300	11,300	11,300	11,300	11,300	11,300	11,300	11,300	11,300	11,300	11,300	11,300	11,300
FAD replacement costs	4-year	$	-	-	-	-	39,906	44,340	47,164	48,869	50,574	52,278	53,983	57,060	58,807	60,553	62,300	64,047	67,376	69,164	70,953	72,742	74,531	78,111	79,942	81,773	83,603
	3-year	$	-	-	-	32,149	58,453	58,453	62,194	64,442	66,690	68,938	71,186	75,263	77,567	79,871	82,175	84,479	88,892	91,252	93,612	95,972	98,332	103,082	105,498	107,914	110,330
	2-year	$	-	-	17,336	86,679	86,679	86,679	92,254	95,588	98,922	102,257	105,591	111,670	115,088	118,507	121,925	125,344	131,926	135,429	138,931	142,434	145,936	153,023	156,609	160,195	163,782
Vanuatu	7.05	/kg																									
No. Current FADS		No.	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10
No. GFC FADs		No.	-	17	34	34	34	34	35	37	38	39	40	42	43	44	45	47	48	49	51	52	53	54	56	57	58
No. replacement FADs		3-year life	-	-	-	11.3	11.3	11.3	11.8	12.2	12.6	13.0	13.5	13.9	14.3	14.7	15.2	15.6	16.0	16.4	16.9	17.3	17.7	18.1	18.6	19.0	19.4
GFC Costs		$	6,213	178,781	73,782	193,529	33,886	2,733	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Cost of Fisheries FAD Officers			-	-	29,000	29,000	29,000	29,000	29,000	29,000	29,000	29,000	29,000	29,000	29,000	29,000	29,000	29,000	29,000	29,000	29,000	29,000	29,000	29,000	29,000	29,000	29,000
FAD replacement costs	4-year	$	-	-	-	42,019	84,038	84,038	89,164	92,387	95,610	98,833	102,056	107,611	110,905	114,199	117,493	120,788	126,771	130,137	133,502	136,868	140,234	146,646	150,083	153,520	156,957
	3-year	$	-	-	-	110,917	110,917	110,917	117,710	121,964	126,219	130,474	134,728	142,093	146,442	150,792	155,142	159,492	167,427	171,872	176,317	180,762	185,207	193,714	198,254	202,794	207,335
	2-year	$	-	-	82,338	164,675	164,675	164,675	174,801	181,119	187,437	193,755	200,074	211,056	217,517	223,978	230,439	236,900	248,740	255,344	261,947	268,551	275,155	287,851	294,598	301,344	308,091
FSM	6.33	/kg																									
No. Current FADS		No.	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
No. GFC FADs		No.	-	12	24	24	24	24	25	25	26	26	27	28	28	29	29	30	31	31	32	32	33	34	34	35	35
No. replacement FADs		3-year life	-	-	-	4.0	8.0	8.0	8.2	8.4	8.6	8.8	9.0	9.2	9.4	9.6	9.8	10.0	10.2	10.4	10.6	10.8	11.0	11.2	11.4	11.6	11.8
GFC Costs		$	8,581	156,713	120,959	54,927	31,016	16,491	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Cost of Fisheries FAD Officers			-	-	18,800	18,800	18,800	18,800	18,800	18,800	18,800	18,800	18,800	18,800	18,800	18,800	18,800	18,800	18,800	18,800	18,800	18,800	18,800	18,800	18,800	18,800	18,800
FAD replacement costs	4-year	$	-	-	-	-	50,086	60,103	62,983	64,520	66,056	67,592	69,128	72,210	73,780	75,349	76,919	78,489	81,772	83,376	84,979	86,583	88,186	91,671	93,308	94,945	96,582
	3-year	$	-	-	-	39,669	79,338	79,338	83,158	85,186	87,214	89,243	91,271	95,360	97,433	99,506	101,579	103,652	108,010	110,128	112,246	114,363	116,481	121,108	123,270	125,433	127,596
	2-year	$	-	-	19,634	117,806	117,806	117,806	123,507	126,519	129,531	132,544	135,556	141,660	144,739	147,819	150,898	153,978	160,485	163,632	166,778	169,925	173,072	179,982	183,196	186,410	189,624
Kiribati	3.27	/kg																									
No. Current FADS		No.	18	18	18	18	18	18	18	18	18	18	18	18	18	18	18	18	18	18	18	18	18	18	18	18	18
No. GFC FADs		No.	-	19	38	38	38	38	39	40	41	42	43	44	45	46	47	48	48	49	50	51	52	53	54	55	56
No. replacement FADs		3-year life	-	-	-	12.7	12.7	12.7	13.0	13.3	13.6	13.9	14.3	14.6	14.9	15.2	15.5	15.8	16.1	16.5	16.8	17.1	17.4	17.7	18.1	18.4	18.7
GFC Costs		$	9,921	216,717	78,670	119,287	27,244	14,298	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Cost of Fisheries FAD Officers			-	-	21,300	21,300	21,300	21,300	21,300	21,300	21,300	21,300	21,300	21,300	21,300	21,300	21,300	21,300	21,300	21,300	21,300	21,300	21,300	21,300	21,300	21,300	21,300
FAD replacement costs	4-year	$	-	-	-	40,270	80,540	80,540	84,734	86,801	88,868	90,934	93,001	97,515	99,635	101,755	103,875	105,995	110,828	113,001	115,174	117,347	119,520	124,672	126,899	129,125	131,351
	3-year	$	-	-	-	106,120	106,120	106,120	111,681	114,405	117,129	119,853	122,577	128,563	131,358	134,153	136,948	139,743	146,155	149,021	151,887	154,753	157,618	164,456	167,393	170,330	173,267
	2-year	$	-	-	78,640	157,279	157,279	157,279	165,574	169,612	173,650	177,689	181,727	190,660	194,805	198,950	203,094	207,239	216,810	221,062	225,313	229,564	233,815	244,025	248,382	252,740	257,097

Country	Cost/kg in USD	Unit		Yr 1	Yr 2	Yr 3	Yr 4	Yr 5	Yr 6	Yr 7...	Yr 8	Yr 9	Yr 10	Yr 11	Yr 12	Yr 13	Yr 14	Yr 15	Yr 16...	Yr 17	Yr 18	Yr 19	Yr 20	Yr 21	Yr 22	Yr 23	Yr 24	Yr 25
Marshalls	7.82	/kg																										
No. Current FADS		No.		24	24	24	24	24	24	24	24	24	24	24	24	24	24	24	24	24	24	24	24	24	24	24	24	24
No. GFC FADs		No.		-	14	27	27	27	27	28	28	29	30	30	31	32	32	33	34	34	35	36	36	37	38	38	39	40
No. replacement FADs		3-year life		-	-	0.5	9.0	9.0	9.0	9.2	9.5	9.7	9.9	10.1	10.4	10.6	10.8	11.0	11.3	11.5	11.7	11.9	12.2	12.4	12.6	12.8	13.1	13.3
GFC Costs		$		8,453	165,578	103,235	115,575	35,198	13,840	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Cost of Fisheries FAD Officers				-	-	21,300	21,300	21,300	21,300	21,300	21,300	21,300	21,300	21,300	21,300	21,300	21,300	21,300	21,300	21,300	21,300	21,300	21,300	21,300	21,300	21,300	21,300	21,300
FAD replacement costs	4-year	$	-	-	-		43,970	76,592	76,592	80,057	82,009	83,962	85,915	87,867	91,559	93,549	95,540	97,530	99,520	103,439	105,467	107,495	109,523	111,551	115,696	117,762	119,828	121,894
	3-year	$	-	-		5,624	101,223	101,223	101,223	105,820	108,401	110,982	113,563	116,144	121,043	123,675	126,306	128,937	131,569	136,771	139,452	142,134	144,816	147,498	153,002	155,734	158,466	161,198
	2-year	$	-	-		80,816	150,485	150,485	150,485	157,346	161,184	165,022	168,859	172,697	180,012	183,926	187,839	191,752	195,666	203,435	207,423	211,412	215,401	219,390	227,613	231,677	235,742	239,806
Nauru	7.26	/kg																										
No. Current FADS		No.		9	9	9	9	9	9	9	9	9	9	9	9	9	9	9	9	9	9	9	9	9	9	9	9	9
No. GFC FADs		No.		-	6	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12
No. replacement FADs		3-year life		-	-	-	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
GFC Costs		$		3,737	80,109	35,531	28,927	11,725	8,253	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Cost of Fisheries FAD Officers				-	-	25,600	25,600	25,600	25,600	25,600	25,600	25,600	25,600	25,600	25,600	25,600	25,600	25,600	25,600	25,600	25,600	25,600	25,600	25,600	25,600	25,600	25,600	25,600
FAD replacement costs	4-year	$	-	-	-		14,474	28,947	28,947	29,619	29,619	29,619	29,619	29,619	30,291	30,291	30,291	30,291	30,291	30,963	30,963	30,963	30,963	30,963	31,635	31,635	31,635	31,635
	3-year	$	-	-	-		38,196	38,196	38,196	39,092	39,092	39,092	39,092	39,092	39,988	39,988	39,988	39,988	39,988	40,884	40,884	40,884	40,884	40,884	41,780	41,780	41,780	41,780
	2-year	$	-	-		28,347	56,694	56,694	56,694	58,038	58,038	58,038	58,038	58,038	59,382	59,382	59,382	59,382	59,382	60,726	60,726	60,726	60,726	60,726	62,070	62,070	62,070	62,070
Palau	7.70	/kg																										
No. Current FADS		No.		8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8
No. GFC FADs		No.		-	8	16	16	16	16	16	16	17	17	17	17	17	18	18	18	18	18	19	19	19	19	19	20	20
No. replacement FADs		3-year life		-	-	-	-	2.7	5.3	5.4	5.5	5.5	5.6	5.7	5.7	5.8	5.9	5.9	6.0	6.1	6.1	6.2	6.3	6.3	6.4	6.5	6.5	6.6
GFC Costs		$		12,074	118,400	69,170	92,242	22,752	10,657	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Cost of Fisheries FAD Officers				-	-	52,000	52,000	52,000	52,000	52,000	52,000	52,000	52,000	52,000	52,000	52,000	52,000	52,000	52,000	52,000	52,000	52,000	52,000	52,000	52,000	52,000	52,000	52,000
FAD replacement costs	4-year	$	-	-	-	-	-	-	20,931	43,292	43,827	44,361	44,896	45,430	46,928	47,474	48,019	48,565	49,111	50,676	51,233	51,789	52,346	52,903	54,535	55,103	55,671	56,239
	3-year	$	-	-	-	-		27,641	55,283	57,183	57,889	58,595	59,301	60,007	61,997	62,718	63,439	64,160	64,881	66,961	67,697	68,433	69,168	69,904	72,074	72,824	73,575	74,326
	2-year	$	-	-	-		41,062	82,124	82,124	84,965	86,014	87,063	88,112	89,161	92,136	93,207	94,279	95,350	96,422	99,531	100,625	101,719	102,813	103,906	107,150	108,267	109,383	110,499
Cook Islands	11.29	/kg																										
No. Current FADS		No.		16	16	16	16	16	16	16	16	16	16	16	16	16	16	16	16	16	16	16	16	16	16	16	16	16
No. GFC FADs		No.		-	10	20	20	20	20	20	21	21	21	21	22	22	22	22	23	23	23	23	24	24	24	24	25	25
No. replacement FADs		3-year life		-	-	-	2.7	6.7	6.7	6.8	6.8	6.9	7.0	7.1	7.2	7.3	7.3	7.4	7.5	7.6	7.7	7.8	7.8	7.9	8.0	8.1	8.2	8.3
GFC Costs		$		4,938	128,032	63,702	85,648	17,769	10,091	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Cost of Fisheries FAD Officers				-	-	32,100	32,100	32,100	32,100	32,100	32,100	32,100	32,100	32,100	32,100	32,100	32,100	32,100	32,100	32,100	32,100	32,100	32,100	32,100	32,100	32,100	32,100	32,100
FAD replacement costs	4-year	$	-	-	-	-	-	32,980	47,115	48,838	49,441	50,044	50,646	51,249	53,056	53,673	54,290	54,907	55,524	57,415	58,046	58,677	59,308	59,939	61,914	62,559	63,204	63,848
	3-year	$	-	-	-		24,861	62,153	62,153	64,442	65,237	66,033	66,829	67,624	70,025	70,839	71,654	72,468	73,282	75,795	76,628	77,461	78,294	79,127	81,752	82,603	83,455	84,306
	2-year	$	-	-		9,223	92,229	92,229	92,229	95,650	96,831	98,012	99,193	100,374	103,963	105,171	106,380	107,589	108,798	112,555	113,792	115,029	116,266	117,502	121,427	122,692	123,957	125,222
Niue	10.67	/kg																										
No. Current FADS		No.		9	9	9	9	9	9	9	9	9	9	9	9	9	9	9	9	9	9	9	9	9	9	9	9	9
No. GFC FADs		No.		-	7	14	14	14	14	14	14	14	14	14	14	14	14	14	14	14	14	14	14	14	14	14	14	14
No. replacement FADs		3-year life		-	-	1.0	4.7	4.7	4.7	4.7	4.7	4.7	4.7	4.7	4.7	4.7	4.7	4.7	4.7	4.7	4.7	4.7	4.7	4.7	4.7	4.7	4.7	4.7
GFC Costs		$		4,366	79,232	29,885	26,190	11,148	7,163	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Cost of Fisheries FAD Officers				-	-	29,500	29,500	29,500	29,500	29,500	29,500	29,500	29,500	29,500	29,500	29,500	29,500	29,500	29,500	29,500	29,500	29,500	29,500	29,500	29,500	29,500	29,500	29,500
FAD replacement costs	4-year	$	-	-	-		22,548	28,697	28,697	29,481	29,481	29,481	29,481	29,481	30,265	30,265	30,265	30,265	30,265	31,049	31,049	31,049	31,049	31,049	31,833	31,833	31,833	31,833
	3-year	$	-	-		8,099	37,797	37,797	37,797	38,842	38,842	38,842	38,842	38,842	39,887	39,887	39,887	39,887	39,887	40,933	40,933	40,933	40,933	40,933	41,978	41,978	41,978	41,978
	2-year	$	-	-		35,997	55,995	55,995	55,995	57,563	57,563	57,563	57,563	57,563	59,131	59,131	59,131	59,131	59,131	60,699	60,699	60,699	60,699	60,699	62,267	62,267	62,267	62,267
Samoa	6.40	/kg																										
No. Current FADS		No.		10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0
No. GFC FADs		No.		-	9.0	18.0	18.0	18.0	18.0	18.2	18.5	18.7	18.9	19.1	19.4	19.6	19.8	20.0	20.3	20.5	20.7	20.9	21.2	21.4	21.6	21.8	22.1	22.3
No. replacement FADs		3-year life		-	-	-	11.3	11.3	11.3	11.8	12.2	12.6	13.0	13.5	13.9	14.3	14.7	15.2	15.6	16.0	16.4	16.9	17.3	17.7	18.1	18.6	19.0	19.4
GFC Costs		$		4,698.5	136,130.2	60,698.7	88,169.7	17,159.4	9,934.5	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Cost of Fisheries FAD Officers				-	-	25,300	25,300	25,300	25,300	25,300	25,300	25,300	25,300	25,300	25,300	25,300	25,300	25,300	25,300	25,300	25,300	25,300	25,300	25,300	25,300	25,300	25,300	25,300
FAD replacement costs	4-year	$	-	-	-	-	-	7,424.8	44,548.8	46,126.2	46,695.7	47,265.2	47,834.6	48,404.1	50,057.1	50,639.2	51,221.3	51,803.3	52,385.4	54,114.0	54,708.7	55,303.3	55,898.0	56,492.7	58,296.9	58,904.2	59,511.4	60,118.7
	3-year	$	-	-	-	-		58,798.4	58,798.4	60,894.1	61,645.9	62,397.7	63,149.5	63,901.3	66,097.8	66,866.4	67,635.0	68,403.6	69,172.2	71,469.5	72,254.9	73,040.3	73,825.7	74,611.1	77,009.2	77,811.4	78,613.6	79,415.8
	2-year	$	-	-	-		72,748.0	87,297.5	87,297.5	90,430.0	91,546.4	92,662.8	93,779.2	94,895.6	98,179.3	99,320.9	100,462.5	101,604.1	102,745.7	106,180.6	107,347.4	108,514.2	109,681.0	110,847.8	114,433.9	115,625.9	116,817.9	118,009.9
Tonga	7.35	/kg																										
No. Current FADS		No.		23	23	23	23	23	23	23	23	23	23	23	23	23	23	23	23	23	23	23	23	23	23	23	23	23
No. GFC FADs		No.		-	10	20	20	20	20	21	21	22	22	23	23	24	24	25	25	26	26	27	27	28	28	29	29	30
No. replacement FADs		3-year life		-	-	-	2.7	6.7	6.7	6.8	7.0	7.2	7.3	7.5	7.7	7.8	8.0	8.2	8.3	8.5	8.7	8.8	9.0	9.2	9.3	9.5	9.7	9.8
GFC Costs		$		3,342	135,164	54,889	85,382	15,774	9,194	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Cost of Fisheries FAD Officers				-	-	14,400	14,400	14,400	14,400	14,400	14,400	14,400	14,400	14,400	14,400	14,400	14,400	14,400	14,400	14,400	14,400	14,400	14,400	14,400	14,400	14,400	14,400	14,400
FAD replacement costs	4-year	$	-	-	-	-	-	32,318	46,168	48,470	49,653	50,835	52,017	53,199	55,669	56,880	58,090	59,300	60,510	63,149	64,387	65,625	66,863	68,101	70,908	72,174	73,440	74,706
	3-year	$	-	-	-		24,356	60,891	60,891	63,944	65,504	67,063	68,623	70,182	73,459	75,056	76,653	78,250	79,847	83,348	84,982	86,617	88,251	89,885	93,610	95,282	96,953	98,625
	2-year	$	-	-		9,034	90,336	90,336	90,336	94,891	97,205	99,520	101,834	104,149	109,039	111,409	113,780	116,150	118,521	123,747	126,173	128,600	131,026	133,453	139,015	141,497	143,980	146,462

Country	Cost/kg in USD	Unit	Yr 1	Yr 2	Yr 3	Yr 4	Yr 5	Yr 6	Yr 7...	Yr 8	Yr 9	Yr 10	Yr 11	Yr 12	Yr 13	Yr 14	Yr 15	Yr 16...	Yr 17	Yr 18	Yr 19	Yr 20	Yr 21	Yr 22	Yr 23	Yr 24	Yr 25
Tuvalu	3.63	/kg																									
No. Current FADS		No.	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6
No. GFC FADs		No.	-	7	14	14	14	14	14	14	15	15	15	15	15	15	16	16	16	16	16	16	17	17	17	17	17
No. replacement FADs		3-year life	-	-	-	11.3	11.3	11.3	11.8	12.2	12.6	13.0	13.5	13.9	14.3	14.7	15.2	15.6	16.0	16.4	16.9	17.3	17.7	18.1	18.6	19.0	19.4
GFC Costs		$	5,457	97,257	54,217	39,664	15,938	8,230	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Cost of Fisheries FAD Officers			-	-	40,100	40,100	40,100	40,100	40,100	40,100	40,100	40,100	40,100	40,100	40,100	40,100	40,100	40,100	40,100	40,100	40,100	40,100	40,100	40,100	40,100	40,100	40,100
FAD replacement costs	4-year	$	-	-	-	7,751	36,172	36,172	37,417	37,879	38,341	38,803	39,265	40,570	41,042	41,513	41,985	42,457	43,821	44,302	44,784	45,265	45,747	47,169	47,660	48,152	48,643
	3-year	$	-	-	-	37,527	47,762	47,762	49,417	50,028	50,638	51,248	51,858	53,592	54,215	54,838	55,461	56,084	57,897	58,533	59,169	59,805	60,441	62,332	62,981	63,631	64,280
	2-year	$	-	-	25,337	70,943	70,943	70,943	73,417	74,324	75,230	76,137	77,043	79,635	80,561	81,487	82,413	83,339	86,049	86,994	87,940	88,885	89,831	92,658	93,623	94,588	95,554
SUMMARY																											
No. Current FADS		No.	172	172	172	172	172	172	172	172	172	172	172	172	172	172	172	172	172	172	172	172	172	172	172	172	172
No. GFC FADs		No.	-	167	333	333	333	333	342	351	360	369	378	386	395	404	413	422	431	440	449	458	467	475	484	493	502
No. replacement FADs	3-year	No.	-	-	2	103	120	123	127	130	134	138	141	145	149	152	156	160	164	167	171	175	178	182	186	189	193
GFC Costs		$	97,247	2,036,035	975,707	1,256,429	379,369	131,887	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Cost of Fisheries FAD Officers			-	-	368,000	368,000	368,000	368,000	368,000	368,000	368,000	368,000	368,000	368,000	368,000	368,000	368,000	368,000	368,000	368,000	368,000	368,000	368,000	368,000	368,000	368,000	368,000
FAD replacement costs	4-year	$	-	-	-	257,652	670,943	771,434	848,837	871,060	893,284	915,507	937,731	962,483	984,619	1,006,756	1,028,893	1,051,030	1,097,298	1,119,933	1,142,568	1,165,204	1,187,839	1,237,097	1,260,230	1,283,364	1,306,498
31,413,643	3-year	$	-	-	13,723	781,272	1,017,745	1,045,387	1,120,385	1,149,720	1,179,055	1,208,390	1,237,724	1,270,430	1,299,649	1,328,869	1,358,088	1,387,307	1,448,700	1,478,584	1,508,468	1,538,351	1,568,235	1,633,616	1,664,164	1,694,712	1,725,260
47,561,646	2-year	$	-	-	556,143	1,495,818	1,551,430	1,551,430	1,663,483	1,707,040	1,750,597	1,794,154	1,837,711	1,886,325	1,929,709	1,973,093	2,016,477	2,059,861	2,151,505	2,195,886	2,240,266	2,284,647	2,329,028	2,426,653	2,472,031	2,517,408	2,562,786
Total GFC Costs 2025 - 2033			4,876,673																								
FAD Production																											
Current FADS	5t/FAD/y	t	860	860	860	860	860	860	860	860	860	860	860	860	860	860	860	860	860	860	860	860	860	860	860	860	860
New FADS production	5t/FAD/y	t	-	833	1,665	1,665	1,665	1,665	1,710	1,754	1,799	1,843	1,888	1,932	1,977	2,021	2,066	2,110	2,155	2,199	2,244	2,288	2,333	2,377	2,422	2,466	2,511
	10t/FAD/y	t	-	1,665	3,330	3,330	3,330	3,330	3,419	3,508	3,597	3,686	3,775	3,864	3,953	4,042	4,131	4,220	4,309	4,398	4,487	4,576	4,665	4,754	4,843	4,932	5,021
Total Costs	4-year	$	97,247	2,036,035	1,343,707	1,882,081	1,418,312	1,271,321	1,216,837	1,239,060	1,261,284	1,283,507	1,305,731	1,330,483	1,352,619	1,374,756	1,396,893	1,419,030	1,465,298	1,487,933	1,510,568	1,533,204	1,555,839	1,605,097	1,628,230	1,651,364	1,674,498
(GCF + replacement)	3-year	$	97,247	2,036,035	1,357,429	2,405,701	1,765,115	1,545,274	1,488,385	1,517,720	1,547,055	1,576,390	1,605,724	1,638,430	1,667,649	1,696,869	1,726,088	1,755,307	1,816,700	1,846,584	1,876,468	1,906,351	1,936,235	2,001,616	2,032,164	2,062,712	2,093,260
	2-year	$	97,247	2,036,035	1,899,850	3,120,247	2,298,799	2,051,317	2,031,483	2,075,040	2,118,597	2,162,154	2,205,711	2,254,325	2,297,709	2,341,093	2,384,477	2,427,861	2,519,505	2,563,886	2,608,266	2,652,647	2,697,028	2,794,653	2,840,031	2,885,408	2,930,786
Gross Income																											
Full production	5t/FAD/y	$	-	5,134,550	10,269,100	10,269,100	10,269,100	10,269,100	10,517,593	10,766,085	11,014,578	11,263,070	11,511,563	11,760,055	12,008,548	12,257,040	12,505,533	12,754,025	13,002,518	13,251,010	13,499,503	13,747,995	13,996,488	14,244,980	14,493,473	14,741,965	14,990,458
	10t/FAD/y	$	-	10,269,100	20,538,200	20,538,200	20,538,200	20,538,200	21,035,185	21,532,170	22,029,155	22,526,140	23,023,125	23,520,110	24,017,095	24,514,080	25,011,065	25,508,050	26,005,035	26,502,020	26,999,005	27,495,990	27,992,975	28,489,960	28,986,945	29,483,930	29,980,915
Average Retail Price /kg	5t/FAD/y	$/kg		6.17	6.17	6.17	6.17	6.17	6.15	6.14	6.12	6.11	6.10	6.09	6.08	6.06	6.05	6.04	6.04	6.03	6.02	6.01	6.00	5.99	5.99	5.98	5.97
	10t/FAD/y	$/kg		6.17	6.17	6.17	6.17	6.17	6.15	6.14	6.12	6.11	6.10	6.09	6.08	6.06	6.05	6.04	6.04	6.03	6.02	6.01	6.00	5.99	5.99	5.98	5.97
Average Net Retail Price $/kg	5t/FAD/y	$/kg		1.23	1.23	1.23	1.23	1.23	1.23	1.23	1.22	1.22	1.22	1.22	1.22	1.21	1.21	1.21	1.21	1.21	1.20	1.20	1.20	1.20	1.20	1.20	1.19
20% of Retail Price	10t/FAD/y	$/kg		1.23	1.23	1.23	1.23	1.23	1.23	1.23	1.22	1.22	1.22	1.22	1.22	1.21	1.21	1.21	1.21	1.21	1.20	1.20	1.20	1.20	1.20	1.20	1.19
NET CASH FLOW																											
Full Incremental Production																											
"@5t/FAD/y	4-year	$	- 97,247	- 1,009,125	710,113	171,739	635,508	782,499	886,682	914,157	941,632	969,107	996,582	1,021,528	1,049,090	1,076,652	1,104,213	1,131,775	1,135,206	1,162,269	1,189,332	1,216,395	1,243,459	1,243,899	1,270,464	1,297,029	1,323,594
	3-year	$	- 97,247	- 1,009,125	696,391	- 351,881	288,705	508,546	615,133	635,497	655,861	676,224	696,588	713,581	734,060	754,539	775,019	795,498	783,803	803,618	823,433	843,248	863,062	847,380	866,531	885,681	904,831
	2-year	$	- 97,247	- 1,009,125	153,970	- 1,066,427	- 244,979	2,503	72,035	78,177	84,318	90,460	96,601	97,686	104,001	110,315	116,630	122,944	80,998	86,316	91,634	96,952	102,270	54,343	58,664	62,985	67,306
"@10t/FAD/y	4-year	$	- 97,247	17,785	2,763,933	2,225,559	2,689,328	2,836,319	2,990,200	3,067,374	3,144,547	3,221,721	3,298,894	3,373,539	3,450,800	3,528,060	3,605,320	3,682,580	3,735,709	3,812,471	3,889,233	3,965,994	4,042,756	4,092,895	4,169,159	4,245,422	4,321,685
	3-year	$	- 97,247	17,785	2,750,211	1,701,939	2,342,525	2,562,366	2,718,652	2,788,714	2,858,776	2,928,838	2,998,901	3,065,592	3,135,770	3,205,947	3,276,125	3,346,303	3,384,307	3,453,820	3,523,333	3,592,847	3,662,360	3,696,376	3,765,225	3,834,074	3,902,923
	2-year	$	- 97,247	17,785	2,207,790	987,393	1,808,841	2,056,323	2,175,554	2,231,394	2,287,234	2,343,074	2,398,914	2,449,697	2,505,710	2,561,723	2,617,736	2,673,749	2,681,502	2,736,518	2,791,535	2,846,551	2,901,567	2,903,339	2,957,358	3,011,378	3,065,397
	Inc $/ FAD	10t/FAD	#DIV/0!	107	8,259	5,111	7,035	7,695	7,952	7,950	7,948	7,946	7,944	7,934	7,933	7,932	7,931	7,930	7,854	7,853	7,852	7,852	7,851	7,775	7,775	7,774	7,773

		EIRR
Full Incremental Production	4-y FAD life	54%
5t/FAD/y	3-y FAD life	36%
	2-y FAD life	-2%
10t/FAD/y	4-y FAD life	486%
	3-y FAD life	477%
	2-y FAD life	415%

			% change from 3 yr
Replacement FAD tot costs	4-y FAD life	23,329,891	74%
	3-y FAD life	31,413,643	0%
	2-y FAD life	47,561,646	151%

Table 3-A.2. 41: Fiji Islands FAD Programme Economic Analysis

FAD PROGRAMME ECONOMIC ANALYSIS				Fiji USD																			
Item		Unit		Yr 1	Yr 2	Yr 3	Yr 4	Yr 5	Yr 6	Yr 7...	Yr 8	Yr 9	Yr 10	Yr 11	Yr 12	Yr 13	Yr 14	Yr 15	Yr 16...	Yr 17	Yr 18	Yr 19	Yr 20	Yr 25
COSTS																							
Disbursement schedule			100%	2%	40%	15%	27%	14%	2%	0%													
Number of FADS																							
Number of aFADs for 200-500m	43																						
Number of aFADs for 800-1,400m	17																						
Number of AFADs for 1,500-2,500m	0																						
Total No. FADs	**60**	Total Cost																					
Average cost per FAD	8,040	482,383		8,040	8,040	8,040	8,040	8,040	8,040	9,824	9,824	9,824	9,824	9,824	8,488	8,488	8,488	8,488	8,488	8,712	8,712	8,712	8,712	8,936
Cost per Year FADs (GCF)	482,383	$		**8,933**	**192,696**	**70,981**	**131,275**	**67,991**	**10,507**	**-**														
Cost of Fisheries FAD Officers						21,300	21,300	21,300	21,300	21,300	21,300	21,300	21,300	21,300	21,300	21,300	21,300	21,300	21,300	21,300	21,300	21,300	21,300	21,300
Current No. of FADs at Location	20			20	20	20	20	20	20	20	20	20	20	20	20	20	20	20	20	20	20	20	20	20
Deployment new FADs (GCF)																							
Initial	40	no.		0	20	20																	
Replacement	20	no.				10	10																
No. of new operating FADS		no.		0	20	40	40	40	40	42	43.00	44.50	46	48	49.00	50.50	52.00	54	55	56.50	58.00	59.50	61	69
	year																							
Replacement - average life	4	no.		-	5	10	10	10	10	10.375	10.75	11.125	11.5	11.875	12.25	12.625	13	13.375	13.75	14.125	14.5	14.875	15.25	17.125
	3	no.		-	6.67	13.33	13.33	13.33	13.33	13.83	14.33	14.83	15.33	15.83	16.33	16.83	17.33	17.83	18.33	18.83	19.33	19.83	20.33	22.83
	2	no.		-	10.00	20.00	20.00	20.00	20.00	20.75	21.50	22.25	23.00	23.75	24.50	25.25	26.00	26.75	27.50	28.25	29.00	29.75	30.50	34.25
Cumulative FAD replacement	4	no.		-	5.00	15.00	25.00	35.00	45.00	55.38	66.13	77.25	88.75	100.63	112.88									
	3	no.		-	6.67	20.00	33.33	46.67	60.00	73.83	88.17	103.00	118.33	134.17	150.50									
	2	no.		-	10.00	30.00	50.00	70.00	90.00	110.75	132.25	154.50	177.50	201.25	225.75									
Extra FADs after GCF	4	no.		-	-	-	5.0	10.0	10.0	10.4	10.8	11.1	11.5	11.9	12.3	12.6	13.0	13.4	13.8	14.1	14.5	14.9	15.3	17.1
	3	no.		-		-	13.3	13.3	13.3	13.8	14.3	14.8	15.3	15.8	16.3	16.8	17.3	17.8	18.3	18.8	19.3	19.8	20.3	22.8
	2	no.		-		10.0	20.0	20.0	20.0	20.8	21.5	22.3	23.0	23.8	24.5	25.3	26.0	26.8	27.5	28.3	29.0	29.8	30.5	34.3
Cost or Replacement FADS (after GCF)	Life yrs	$/FAD																						
(after using GCF FADs)	4	300	-	-	-		41,699	83,397	83,397	105,034	108,830	112,626	116,423	120,219	107,650	110,945	114,240	117,536	120,831	127,290	130,670	134,049	137,429	158,162
(Extra costs allows for annual maint.)	3	200	-	-	-		109,863	109,863	109,863	138,662	143,673	148,685	153,697	158,709	141,899	146,243	150,587	154,931	159,275	167,837	172,293	176,749	181,205	208,599
	2	100	-	-	-	81,397	162,794	162,794	162,794	205,917	213,360	220,803	228,246	235,689	210,399	216,840	223,281	229,721	236,162	248,931	255,540	262,149	268,757	309,473
	FAD life																							
TOTAL ANNUAL COSTS	4	$		8,933	192,695	92,281	194,274	172,688	115,205	126,334	130,130	133,926	137,723	141,519	128,950	132,245	135,540	138,836	142,131	148,590	151,970	155,349	158,729	179,462
	3	$		8,933	192,695	92,281	262,438	199,154	141,670	159,962	164,973	169,985	174,997	180,009	163,199	167,543	171,887	176,231	180,575	189,137	193,593	198,049	202,505	229,899
	2	$		8,933	192,695	173,678	315,369	252,085	194,602	227,217	234,660	242,103	249,546	256,989	231,699	238,140	244,581	251,021	257,462	270,231	276,840	283,449	290,057	330,773
FAD PRODUCTION																								
1. Incremental allowing for existing FADs																								
No of current FADS			-	-	-	-	*21,300*	*21,300*	*21,300*	*21,300*	*21,300*	*21,300*	*21,300*	*21,300*	*21,300*	*21,300*	*21,300*	*21,300*	*21,300*	*21,300*	*21,300*	*21,300*	*21,300*	*21,300*
Average production	t/yr		5	-	-	-	106,500.00	106,500.00	106,500.00	106,500.00	106,500.00	106,500.00	106,500.00	106,500.00	106,500.00	106,500.00	106,500.00	106,500.00	106,500.00	106,500.00	106,500.00	106,500.00	106,500.00	106,500.00
		t/FAD/yr																						
New FADS Production	t/y		5.00	-	100.00	200.00	200.00	200.00	200.00	207.50	215.00	222.50	230.00	237.50	245.00	252.50	260.00	267.50	275.00	282.50	290.00	297.50	305.00	342.50
	t/y		10	-	200.00	400.00	400.00	400.00	400.00	415.00	430.00	445.00	460.00	475.00	490.00	505.00	520.00	535.00	550.00	565.00	580.00	595.00	610.00	685.00
Value of Production from New FADs																								
Full Production @ 5 t/y	4.50	$			450,000	900,000	900,000	900,000	900,000	933,750	967,500	1,001,250	1,035,000	1,068,750	1,102,500	1,136,250	1,170,000	1,203,750	1,237,500	1,271,250	1,305,000	1,338,750	1,372,500	1,541,250
Full Production @ 10 t/y	4.50	$			900,000	1,800,000	1,800,000	1,800,000	1,800,000	1,867,500	1,935,000	2,002,500	2,070,000	2,137,500	2,205,000	2,272,500	2,340,000	2,407,500	2,475,000	2,542,500	2,610,000	2,677,500	2,745,000	3,082,500
Net Value of Increased Production																								
(assume costs are 80% of gross vale)																								
Incremental minus @ 5t/y	20%	$			90,000	180,000	- 95,670,000	- 95,670,000	- 95,670,000	- 95,663,250	- 95,656,500	- 95,649,750	- 95,643,000	- 95,636,250	- 95,629,500	- 95,622,750	- 95,616,000	- 95,609,250	- 95,602,500	- 95,595,750	- 95,589,000	- 95,582,250	- 95,575,500	- 95,541,750
Incremental minus @ 10 t/y	20%	$			180,000	360,000	- 95,490,000	- 95,490,000	- 95,490,000	- 95,476,500	- 95,463,000	- 95,449,500	- 95,436,000	- 95,422,500	- 95,409,000	- 95,395,500	- 95,382,000	- 95,368,500	- 95,355,000	- 95,341,500	- 95,328,000	- 95,314,500	- 95,301,000	- 95,233,500
					-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Full Production @ 5 t/y	20%	$			90,000	180,000	180,000	180,000	180,000	186,750	193,500	200,250	207,000	213,750	220,500	227,250	234,000	240,750	247,500	254,250	261,000	267,750	274,500	308,250
Full Production @ 10 t/y	20%	$			180,000	360,000	360,000	360,000	360,000	373,500	387,000	400,500	414,000	427,500	441,000	454,500	468,000	481,500	495,000	508,500	522,000	535,500	549,000	616,500
NET CASH FLOWS																								
Full Production																								
@ 5 t/FAD/y	4-year FAD life		-	8,933	- 102,695	87,719	- 14,274	7,312	64,795	60,416	63,370	66,324	69,277	72,231	91,550	95,005	98,460	101,914	105,369	105,660	109,030	112,401	115,771	128,788
	3-year FAD life		-	8,933	- 102,695	87,719	- 82,438	- 19,154	38,330	26,788	28,527	30,265	32,003	33,741	57,301	59,707	62,113	64,519	66,925	65,113	67,407	69,701	71,995	78,351
	2-year FAD life		-	8,933	- 102,695	6,322	- 135,369	- 72,085	- 14,602	- 40,467	- 41,160	- 41,853	- 42,546	- 43,239	- 11,199	- 10,890	- 10,581	- 10,271	- 9,962	- 15,981	- 15,840	- 15,699	- 15,557	- 22,523
@ 10 t/FAD/y	4-year FAD life		-	8,933	- 12,695	267,719	165,726	187,312	244,795	247,166	256,870	266,574	276,277	285,981	312,050	322,255	332,460	342,664	352,869	359,910	370,030	380,151	390,271	437,038
	3-year FAD life		-	8,933	- 12,695	267,719	97,562	160,846	218,330	213,538	222,027	230,515	239,003	247,491	277,801	286,957	296,113	305,269	314,425	319,363	328,407	337,451	346,495	386,601
	2-year FAD life		-	8,933	- 12,695	186,322	44,631	107,915	165,398	146,283	152,340	158,397	164,454	170,511	209,301	216,360	223,419	230,479	237,538	238,269	245,160	252,051	258,943	285,727

SUMMARY OF RESULTS for	**Fiji**	**EIRR**
Full Production		
@ 5t/FAD/yr.	4-year FAD life	42%
	3-year FAD life	21%
	2-year FAD life	#NUM!
@ 10t/FAD/yr	4-year FAD life	421%
	3-year FAD life	408%
	2-year FAD life	315%

Table 3-A.2. 42: Papua New Guinea FAD Programme Economic Analysis

FAD PROGRAMME ECONOMIC ANALYSIS			PNG																					
		USD																						
Item		Unit		Yr 1	Yr 2	Yr 3	Yr 4	Yr 5	Yr 6	Yr 7...	Yr 8	Yr 9	Yr 10	Yr 11	Yr 12	Yr 13	Yr 14	Yr 15	Yr 16...	Yr 17	Yr 18	Yr 19	Yr 20	Yr 25
COSTS																								
Disbursement schedule			100%	3%	45%	20%	23%	10%	0%	0%														
Number of FADS																								
Number of aFADs for 200-500m		45																						
Number of aFADs for 800-1,400m		9																						
Number of AFADs for 1,500-2,500m		0																						
Total No. FADs		**54**	Total Cost																					
Average cost per FAD		9,683	522,876	9,683	9,683	9,683	9,683	9,683	9,683	9,907	9,907	9,907	9,907	9,907	10,131	10,131	10,131	10,131	10,131	10,355	10,355	10,355	10,355	10,579
Cost per Year FADs (GCF)		522,876	$	**13,919**	**233,909**	**102,404**	**118,780**	**52,236**	**1,628**	**-**														
Cost of Fisheries FAD Officers						26,000	26,000	26,000	26,000	26,000	26,000	26,000	26,000	26,000	26,000	26,000	26,000	26,000	26,000	26,000	26,000	26,000	26,000	26,000
Current No. of FADs at Locations		8		8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8
Deployment new FADs (GCF)																								
Initial		36		0	18	18																		
Replacement		18				9	9																	
No. of operating new FADS				0	18	36	36	36	36	37.80	39.60	41.40	43	45	46.80	48.60	50.40	52	54	55.80	57.60	59.40	61	70
Replacement - average life		4	year	-	5	9	9	9	9	9.45	9.9	10.35	10.8	11.25	11.7	12.15	12.6	13.05	13.5	13.95	14.4	14.85	15.3	17.55
		3	"	-	6.00	12.00	12.00	12.00	12.00	12.60	13.20	13.80	14.40	15.00	15.60	16.20	16.80	17.40	18.00	18.60	19.20	19.80	20.40	23.40
		2	"	-	9.00	18.00	18.00	18.00	18.00	18.90	19.80	20.70	21.60	22.50	23.40	24.30	25.20	26.10	27.00	27.90	28.80	29.70	30.60	35.10
Cummulative FAD replacement		4	no.	-	4.50	13.50	22.50	31.50	40.50	49.95	59.85	70.20	81.00	92.25	103.95									
		3	no.	-	6.00	18.00	30.00	42.00	54.00	66.60	79.80	93.60	108.00	123.00	138.60									
		2	no.	-	9.00	27.00	45.00	63.00	81.00	99.90	119.70	140.40	162.00	184.50	207.90									
Extra FADs after GCF		4	no.	-	-	-	5	9.0	9.0	9.5	9.9	10.4	10.8	11.3	11.7	12.2	12.6	13.1	13.5	14.0	14.4	14.9	15.3	17.6
		3	no.	-	-	-	12.0	12.0	12.0	12.6	13.2	13.8	14.4	15.0	15.6	16.2	16.8	17.4	18.0	18.6	19.2	19.8	20.4	23.4
		2	no.	-	-	9.0	18.0	18	18	19	20	21	22	23	23	24.3	25.2	26	27	27.9	28.8	29.7	31	35
Cost or Replacement FADS (after GCF)																								
(after using GCF FADs)		4	300	-	-	-	44,923	89,846	89,846	96,455	101,048	105,641	110,234	114,828	122,041	126,735	131,429	136,123	140,817	148,636	153,430	158,225	163,020	190,925
(Extra costs allows for annual maint.)		3	200	-	-	-	118,595	118,595	118,595	127,347	133,411	139,475	145,539	151,603	161,162	167,360	173,559	179,757	185,956	196,321	202,654	208,987	215,320	252,226
		2	100	-	-	88,046	176,092	176,092	176,092	189,130	198,136	207,143	216,149	225,155	239,403	248,611	257,818	267,026	276,234	291,691	301,101	310,510	319,920	374,829
TOTAL ANNUAL COSTS		4		13,919	233,909	128,404	189,703	168,082	117,474	122,455	127,048	131,641	136,234	140,828	148,041	152,735	157,429	162,123	166,817	174,636	179,430	184,225	189,020	216,925
		3		13,919	233,909	128,404	263,375	196,831	146,223	153,347	159,411	165,475	171,539	177,603	187,162	193,360	199,559	205,757	211,956	222,321	228,654	234,987	241,320	278,226
		2		13,919	233,909	216,450	320,872	254,328	203,720	215,130	224,136	233,143	242,149	251,155	265,403	274,611	283,818	293,026	302,234	317,691	327,101	336,510	345,920	400,829
FAD PRODUCTION																								
1. Incremental allowing for existing FADs																								
No of current FADS			*8*	*8*	*8*	*8*	*8*	*8*	*8*	*8*	*8*	*8*	*8*	*8*	*8*	*8*	*8*	*8*	*8*	*8*	*8*	*8*	*8*	*8*
Average production	t/yr		5	40.00	40.00	40.00	40.00	40.00	40.00	40.00	40.00	40.00	40.00	40.00	40.00	40.00	40.00	40.00	40.00	40.00	40.00	40.00	40.00	40.00
New FADS	t/y		5	-	90.00	180.00	180.00	180.00	180.00	189.00	198.00	207.00	216.00	225.00	234.00	243.00	252.00	261.00	270.00	279.00	288.00	297.00	306.00	351.00
	t/y		10	-	180.00	360.00	360.00	360.00	360.00	378.00	396.00	414.00	432.00	450.00	468.00	486.00	504.00	522.00	540.00	558.00	576.00	594.00	612.00	702.00
New FADs																								
Full Production @ 5 t/y		5.23			470,700	941,400	941,400	941,400	941,400	988,470	1,035,540	1,082,610	1,129,680	1,176,750	1,223,820	1,270,890	1,317,960	1,365,030	1,412,100	1,459,170	1,506,240	1,553,310	1,600,380	1,835,730
Full Production @ 10 t/y		5.23			941,400	1,882,800	1,882,800	1,882,800	1,882,800	1,976,940	2,071,080	2,165,220	2,259,360	2,353,500	2,447,640	2,541,780	2,635,920	2,730,060	2,824,200	2,918,340	3,012,480	3,106,620	3,200,760	3,671,460
Net Value of Increased Production																								
(assume costs are 80% of gross vale)																								
Incremental minus @ 5T/y		20%	$		52,300	146,440	146,440	146,440	146,440	155,854	165,268	174,682	184,096	193,510	202,924	212,338	221,752	231,166	240,580	249,994	259,408	268,822	278,236	325,306
Incremental minus @ 10 t/y		20%	$		146,440	334,720	334,720	334,720	334,720	353,548	372,376	391,204	410,032	428,860	447,688	466,516	485,344	504,172	523,000	541,828	560,656	579,484	598,312	692,452
Full Production @ 5 t/y		20%	$		94,140	188,280	188,280	188,280	188,280	197,694	207,108	216,522	225,936	235,350	244,764	254,178	263,592	273,006	282,420	291,834	301,248	310,662	320,076	367,146
Full Production @ 10 t/y		20%	$		188,280	376,560	376,560	376,560	376,560	395,388	414,216	433,044	451,872	470,700	489,528	508,356	527,184	546,012	564,840	583,668	602,496	621,324	640,152	734,292
NET CASH FLOWS																								
Full Production																								
@ 5 t/FAD/y	4-year FAD life			- 13,919	- 139,769	59,876	- 1,423	20,198	70,806	75,239	80,060	84,881	89,702	94,523	96,723	101,443	106,163	110,883	115,603	117,198	121,818	126,437	131,056	150,222
	3-year FAD life			- 13,919	- 139,769	59,876	- 75,095	- 8,551	42,057	44,347	47,697	51,047	54,397	57,747	57,602	60,818	64,033	67,249	70,464	69,513	72,594	75,675	78,756	88,920
	2-year FAD life			- 13,919	- 139,769	- 28,170	- 132,592	- 66,048	- 15,440	- 17,436	- 17,028	- 16,621	- 16,213	- 15,805	- 20,639	- 20,433	- 20,226	- 20,020	- 19,814	- 25,857	- 25,853	- 25,848	- 25,844	- 33,683
@ 10 t/FAD/y	4-year FAD life			- 13,919	- 45,629	248,156	186,857	208,478	259,086	272,933	287,168	301,403	315,638	329,873	341,487	355,621	369,755	383,889	398,023	409,032	423,066	437,099	451,132	517,368
	3-year FAD life			- 13,919	- 45,629	248,156	113,185	179,729	230,337	242,041	254,805	267,569	280,333	293,097	302,366	314,996	327,625	340,255	352,884	361,347	373,842	386,337	398,832	456,066
	2-year FAD life			- 13,919	- 45,629	160,110	55,688	122,232	172,840	180,258	190,080	199,901	209,723	219,545	224,125	233,745	243,366	252,986	262,606	265,977	275,395	284,814	294,232	333,463

SUMMARY OF RESULTS for	PNG	EIRR
Full Production		
@ 5t/FAD/yry	4-year FAD life	33%
	3-year FAD life	19%
	2-year FAD life	#NUM!
@ 10t/FAD/yr	4-year FAD life	248%
	3-year FAD life	234%
	2-year FAD life	162%

Table 3-A.2. 43: Solomon Islands FAD Programme Economic Analysis

FAD PROGRAMME ECONOMIC ANALYSIS			Solomons																			
		USD																				
Item		Unit		Yr 1	Yr 2	Yr 3	Yr 4	Yr 5	Yr 6	Yr 7…	Yr 8	Yr 9	Yr 10	Yr 11	Yr 12	Yr 13	Yr 14	Yr 15	Yr 16…	Yr 17	Yr 18	Yr 19	Yr 20	Yr 25
COSTS																								
Disbursement schedule			100%	1%	41%	20%	27%	7%	3%	0%														
Number of FADS																								
Number of aFADs for 200-500m	24																							
Number of aFADs for 800-1,400m	9																							
Number of AFADs for 1,500-2,500m	0																							
Total No. FADs	**33**	Total Cost																						
Average cost per FAD	8,568		282,741	8,568	8,568	8,568	8,568	8,568	8,568	8,792	8,792	8,792	8,792	8,792	9,016	9,016	9,016	9,016	9,016	9,240	9,240	9,240	9,240	9,464
Cost per Year FADs (GCF)	282,741	$		**2,613**	**117,315**	**57,584**	**76,833**	**19,530**	**8,866**	**-**														
Cost of Fisheries FAD Officers						11,300	11,300	11300	11,300	11,300	11,300	11,300	11300	11,300	11,300	11,300	11,300	11300	11,300	11,300	11,300	11,300	11300	11300
Curent No. of FADs at Location	10			10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10
Deployment new FADs (GCF)																								
Initial	20			0	10	10																		
Replacement	13					6.5	6.5																	
No. of operating FADS				0	10	20	20	20	20	20.75	21.50	22.25	23	24	24.50	25.25	26.00	26.75	28	28.25	29.00	29.75	30.5	34.25
	FAD life																							
Replacement - average life	4	year		-	3	5	5	5.00	5	5.1875	5.375	5.5625	5.75	5.9375	6.125	6.3125	6.5	6.69	6.875	7.0625	7.25	7.4375	7.63	8.56
	3	"		-	3.33	6.67	6.67	6.67	6.67	6.92	7.17	7.42	7.67	7.92	8.17	8.42	8.67	8.92	9.17	9.42	9.67	9.92	10.17	11.42
	2	"		-	5.00	10.00	10.00	10.00	10.00	10.38	10.75	11.13	11.50	11.88	12.25	12.63	13.00	13.38	13.75	14.13	14.50	14.88	15.25	17.13
Cummulative FAD replacement	4	no.		-	2.50	7.50	12.50	17.50	22.50	27.69	33.06	38.63	44.38	50.31	56.44									
	3	no.		-	3.33	10.00	16.67	23.33	30.00	36.92	44.08	51.50	59.17	67.08	75.25									
	2	no.		-	5.00	15.00	25.00	35.00	45.00	55.38	66.13	77.25	88.75	100.63	112.88									
Extra FADs after GCF	4	no.		-	-	-	-	5	5.0	5.2	5.4	5.6	6	5.9	6.1	6.3	6.5	7	6.9	7.1	7.3	7.4	8	9
	3	no.		-	-	-	3.7	7	6.7	6.9	7.2	7.4	8	7.9	8.2	8.4	8.7	9	9.2	9.4	9.7	9.9	10	11
	2	no.		-	-	2.0	10.0	10	10.0	10.4	10.8	11.1	12	11.9	12.3	12.6	13.0	13	13.8	14.1	14.5	14.9	15	17
Cost or Replacement FADS (after GCF)																								
(after using GCF FADs)	4		300	-	-	-	-	39,906	44,340	47,164	48,869	50,574	52,278	53,983	57,060	58,807	60,553	62,300	64,047	67,376	69,164	70,953	72,742	83,603
(Extra costs allows for annual maint.)	3		200	-	-	-	32,149	58,453	58,453	62,194	64,442	66,690	68,938	71,186	75,263	77,567	79,871	82,175	84,479	88,892	91,252	93,612	95,972	110,330
	2		100	-	-	17,336	86,679	86,679	86,679	92,254	95,588	98,922	102,257	105,591	111,670	115,088	118,507	121,925	125,344	131,926	135,429	138,931	142,434	163,782
TOTAL ANNUAL COSTS	4			2,613	117,315	68,884	88,133	70,735	64,506	58,464	60,169	61,874	63,578	65,283	68,360	70,107	71,853	73,600	75,347	78,676	80,464	82,253	84,042	94,903
	3			2,613	117,315	68,884	120,282	89,282	78,619	73,494	75,742	77,990	80,238	82,486	86,563	88,867	91,171	93,475	95,779	100,192	102,552	104,912	107,272	121,630
	2			2,613	117,315	86,219	174,812	117,509	106,845	103,554	106,888	110,222	113,557	116,891	122,970	126,388	129,807	133,225	136,644	143,226	146,729	150,231	153,734	175,082
FAD PRODUCTION																								
1. Incremental allowing for existing FADs																								
No of current FADS		*no.*		*10*	*10*	*10*	*10*	*10*	*10*	*10*	*10*	*10*	*10*	*10*	*10*	*10*	*10*	*10*	*10*	*10*	*10*	*10*	*10*	*10*
Average production	t/yr		5	50.00	50.00	50.00	50.00	50.00	50.00	50.00	50.00	50.00	50.00	50.00	50.00	50.00	50.00	50.00	50.00	50.00	50.00	50.00	50.00	50.00
Production from New FADS	t/y		5	-	50	100	100	100	100	104	108	111	115	119	123	126	130	134	138	141	145	149	153	171
	t/y		10	-	100	200	200	200	200	208	215	223	230	238	245	253	260	268	275	283	290	298	305	343
Value of Production New FADs US$																								
Full Production @ 5 t/y	3.00				150,000	300,000	300,000	300000	300,000	311,250	322,500	333,750	345000	356,250	367,500	378,750	390,000	401250	412,500	423,750	435,000	446,250	457500	513750
Full Production @ 10 t/y	3.00				300,000	600,000	600,000	600000	600,000	622,500	645,000	667,500	690000	712,500	735,000	757,500	780,000	802500	825,000	847,500	870,000	892,500	915000	1027500
Net Value of Increased Production																								
Full Production @ 5 t/y	20%	$			30,000	60,000	60,000	60000	60,000	62,250	64,500	66,750	69000	71,250	73,500	75,750	78,000	80250	82,500	84,750	87,000	89,250	91500	102750
Full Production @ 10 t/y	20%	$			60,000	120,000	120,000	120000	120,000	124,500	129,000	133,500	138000	142,500	147,000	151,500	156,000	160500	165,000	169,500	174,000	178,500	183000	205500
NET CASH FLOWS																								
Full Production																								
@ 5 t/FAD/y	4-y FAD life			- 2,613	- 87,315	- 8,884	- 28,133	- 10,735	- 4,506	3,786	4,331	4,876	5,422	5,967	5,140	5,643	6,147	6,650	7,153	6,074	6,536	6,997	7,458	7,847
	3-y FAD life			- 2,613	- 87,315	- 8,884	- 60,282	- 29,282	- 18,619	- 11,244	- 11,242	- 11,240	- 11,238	- 11,236	- 13,063	- 13,117	- 13,171	- 13,225	- 13,279	- 15,442	- 15,552	- 15,662	- 15,772	- 18,880
	2-y FAD life			- 2,613	- 87,315	- 26,219	- 114,812	- 57,509	- 46,845	- 41,304	- 42,388	- 43,472	- 44,557	- 45,641	- 49,470	- 50,638	- 51,807	- 52,975	- 54,144	- 58,476	- 59,729	- 60,981	- 62,234	- 72,332
@ 10 t/FAD/y	4-y FAD life			- 2,613	- 57,315	51,116	31,867	49,265	55,494	66,036	68,831	71,626	74,422	77,217	78,640	81,393	84,147	86,900	89,653	90,824	93,536	96,247	98,958	110,597
	3-y FAD life			- 2,613	- 57,315	51,116	- 282	30,718	41,381	51,006	53,258	55,510	57,762	60,014	60,437	62,633	64,829	67,025	69,221	69,308	71,448	73,588	75,728	83,870
	2-y FAD life			- 2,613	- 57,315	33,781	- 54,812	2,491	13,155	20,946	22,112	23,278	24,443	25,609	24,030	25,112	26,193	27,275	28,356	26,274	27,271	28,269	29,266	30,418

SUMMARY OF RESULTS for	Solomons	EIRR
Full Production		
@ 5t/FAD/yry	4-year FAD life	-1%
	3-year FAD life	#NUM!
	2-year FAD life	#NUM!
@ 10t/FAD/yr	4-year FAD life	78%
	3-year FAD life	58%
	2-year FAD life	19%

Table 3-A.2. 44: Vanuatu FAD Programme Economic Analysis

FAD PROGRAMME ECONOMIC ANALYSIS **Vanuatu**

USD

Item			Unit	Yr 1	Yr 2	Yr 3	Yr 4	Yr 5	Yr 6	Yr 7…	Yr 8	Yr 9	Yr 10	Yr 11	Yr 12	Yr 13	Yr 14	Yr 15	Yr 16…	Yr 17	Yr 18	Yr 19	Yr 20	Yr 25
COSTS																								
Disbursement schedule			100%	1%	37%	15%	40%	7%	1%	0%														
Number of FADS																								
Number of aFADs for 200-500m	0																							
Number of aFADs for 800-1,400m	51																							
Number of AFADs for 1,500-2,500m	0																							
Total No. FADs	**51**	Total Cost																						
Average cost per FAD	9,587		488,925	9,587	9,587	9,587	9,587	9,587	9,587	9,811	9,811	9,811	9,811	9,811	10,035	10,035	10,035	10,035	10,035	10,259	10,259	10,259	10,259	10,483
Cost per Year FADs (GCF)	488,925	$		**6,213**	**178,781**	**73,782**	**193,529**	**33,886**	**2,733**	**-**														
Cost of Fisheries FAD Officers						29,000	29,000	29000	29,000	29,000	29,000	29,000	29000	29,000	29,000	29,000	29,000	29000	29,000	29,000	29,000	29,000	29000	29000
Curent No. of FADs at Location	10			10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10
Deployment new FADs (GCF)																								
Initial	34			0	17	17																		
Replacement	17					8.5	8.5																	
No. of operating FADS				0	17	34	34	34	34	35.27	36.55	37.82	39.1	40	41.65	42.92	44.20	45.475	47	48.02	49.30	50.57	51.85	58.225
Replacement - average life	4	year		-	4	9	8.5	8.50	8.5	8.81875	9.1375	9.45625	9.77	10.09375	10.4125	10.73125	11.05	11.37	11.6875	12.00625	12.325	12.64375	12.96	14.56
	3	"		-	5.67	11.33	11.33	11.33	11.33	11.76	12.18	12.61	13.03	13.46	13.88	14.31	14.73	15.16	15.58	16.01	16.43	16.86	17.28	19.41
	2	"		-	8.50	17.00	17.00	17.00	17.00	17.64	18.27	18.91	19.55	20.19	20.82	21.46	22.10	22.74	23.38	24.01	24.65	25.29	25.93	29.11
Extra FADs after GCF	4	no.		-	-	-	4.3	9	8.5	8.8	9.1	9.5	10	10.1	10.4	10.7	11.1	11	11.7	12.0	12.3	12.6	13	15
	3	no.		-	-	-	11.3	11	11.3	11.8	12.2	12.6	13	13.5	13.9	14.3	14.7	15	15.6	16.0	16.4	16.9	17	19
	2	no.		-	-	8.5	17.0	17	17.0	17.6	18.3	18.9	20	20.2	20.8	21.5	22.1	23	23.4	24.0	24.6	25.3	26	29
Cost or Replacement FADS (after GCF)																								
(after using GCF FADs)	4		300	-	-	-		42,019	84,038	84,038	89,164	92,387	95,610	98,833	102,056	107,611	110,905	114,199	117,493	120,788	126,771	130,137	133,502	136,868	156,957
(Extra costs allows for annual maint.)	3		200	-	-	-		110,917	110,917	110,917	117,710	121,964	126,219	130,474	134,728	142,093	146,442	150,792	155,142	159,492	167,427	171,872	176,317	180,762	207,335
	2		100	-	-		82,338	164,675	164,675	164,675	174,801	181,119	187,437	193,755	200,074	211,056	217,517	223,978	230,439	236,900	248,740	255,344	261,947	268,551	308,091
TOTAL ANNUAL COSTS	4			6,213	178,781	102,782	264,548	146,924	115,770	118,164	121,387	124,610	127,833	131,056	136,611	139,905	143,199	146,493	149,788	155,771	159,137	162,502	165,868	185,957
	3			6,213	178,781	102,782	333,446	173,803	142,650	146,710	150,964	155,219	159,474	163,728	171,093	175,442	179,792	184,142	188,492	196,427	200,872	205,317	209,762	236,335
	2			6,213	178,781	185,120	387,204	227,561	196,408	203,801	210,119	216,437	222,755	229,074	240,056	246,517	252,978	259,439	265,900	277,740	284,344	290,947	297,551	337,091
FAD PRODUCTION																								
1. Incremental allowing for existing FADs																								
No of current FADS			-	-	-	*10*	*10*	*10*	*10*	*10*	*10*	*10*	*10*	*10*	*10*	*10*	*10*	*10*	*10*	*10*	*10*	*10*	*10*	*10*
Average production	t/yr		5	-	-	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50
Production from New FADS	t/y		5.00	-	85	170	170	170	170	176	183	189	196	202	208	215	221	227	234	240	246	253	259	291
	t/y		10	-	170	340	340	340	340	353	365	378	391	404	416	429	442	455	468	480	493	506	518	582
Value of Production New FADs	$/kg																							
Full Production @ 5 t/y	7.05				599,250	1,198,500	1,198,500	1198500	1,198,500	1,243,444	1,288,387	1,333,331	1378275	1,423,219	1,468,162	1,513,106	1,558,050	1602993.75	1,647,938	1,692,881	1,737,825	1,782,769	1827712.5	2052431.25
Full Production @ 10 t/y	7.05				1,198,500	2,397,000	2,397,000	2397000	2,397,000	2,486,887	2,576,775	2,666,662	2756550	2,846,438	2,936,325	3,026,212	3,116,100	3205987.5	3,295,875	3,385,762	3,475,650	3,565,537	3655425	4104862.5
Net Value of Increased Production																								
(assume costs are 80% of gross vale)																								
Full Production @ 5 t/y	20%	$			119,850	239,700	239,700	239700	239,700	248,689	257,677	266,666	275655	284,644	293,632	302,621	311,610	320598.75	329,588	338,576	347,565	356,554	365542.5	410486.25
Full Production @ 10 t/y	20%	$			239,700	479,400	479,400	479400	479,400	497,377	515,355	533,332	551310	569,288	587,265	605,242	623,220	641197.5	659,175	677,152	695,130	713,107	731085	820972.5
NET CASH FLOWS																								
(assume 3-year FAD life)																								
Full Production																								
@ 5 t/FAD/y	4-year FAD life			- 6,213	- 58,931	136,918	- 24,848	92,776	123,930	130,524	136,290	142,056	147,822	153,588	157,022	162,716	168,411	174,105	179,800	182,805	188,428	194,051	199,675	224,530
	3-year FAD life			- 6,213	- 58,931	136,918	- 93,746	65,897	97,050	101,979	106,713	111,447	116,181	120,916	122,540	127,179	131,818	136,457	141,096	142,149	146,693	151,236	155,780	174,152
	2-year FAD life			- 6,213	- 58,931	54,580	- 147,504	12,139	43,292	44,888	47,558	50,229	52,900	55,570	53,576	56,104	58,632	61,160	63,687	60,836	63,221	65,606	67,992	73,396
@ 10 t/FAD/y	4-year FAD life			- 6,213	60,919	376,618	214,852	332,476	363,630	379,213	393,968	408,723	423,477	438,232	450,654	465,338	480,021	494,704	509,387	521,381	535,993	550,605	565,217	635,016
	3-year FAD life			- 6,213	60,919	376,618	145,954	305,597	336,750	350,668	364,391	378,113	391,836	405,559	416,172	429,800	443,428	457,056	470,683	480,725	494,258	507,790	521,323	584,638
	2-year FAD life			- 6,213	60,919	294,280	92,196	251,839	282,992	293,576	305,236	316,895	328,555	340,214	347,209	358,725	370,242	381,758	393,275	399,413	410,786	422,160	433,534	483,882

SUMMARY OF RESULTS for	**Vanuatu**	**EIRR**
Full Production		
@ 5t/FAD/yry	4-year FAD life	125%
	3-year FAD life	92%
	2-year FAD life	24%
@ 10t/FAD/yr	4-year FAD life	1325%
	3-year FAD life	1321%
	2-year FAD life	1243%

Table 3-A.2. 45: FSM FAD Programme Economic Analysis

FAD PROGRAMME ECONOMIC ANALYSIS		USD	FSM																			
Item		Unit		Yr 1	Yr 2	Yr 3	Yr 4	Yr 5	Yr 6	Yr 7...	Yr 8	Yr 9	Yr 10	Yr 11	Yr 12	Yr 13	Yr 14	Yr 15	Yr 16...	Yr 17	Yr 18	Yr 19	Yr 20	Yr 25
COSTS																							
Disbursement schedule		100%		2%	40%	31%	14%	8%	4%	0%													
Number of FADS																							
Number of aFADs for 200-500m	24																						
Number of aFADs for 800-1,400m	16																						
Number of AFADs for 1,500-2,500m	0																						
Total No. FADs	**40**	Total Cost																					
Average cost per FAD	9,717	388,688		9,717	9,717	9,717	9,717	9,717	9,717	9,941	9,941	9,941	9,941	9,941	10,165	10,165	10,165	10,165	10,165	10,389	10,389	10,389	10,389	10,613
Cost per Year FADs (GCF)	388,688	$		**8,581**	**156,713**	**120,959**	**54,927**	**31,016**	**16,491**	**-**														
Cost of Fisheries FAD Officers						18,800	18,800	18800	18,800	18,800	18,800	18,800	18800	18,800	18,800	18,800	18,800	18800	18,800	18,800	18,800	18,800	18800	18800
Current No. of FADs at Location	1			1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
Deployment new FADs (GCF)																								
Initial	24			0	12	12																		
Replacement	16					8	8																	
No. of operating FADS				-	12	24	24	24	24	24.60	25.20	25.80	26	27	27.60	28.20	28.80	29	30	30.60	31.20	31.80	32	35
Replacement - average life	4	year		-	3	6	6	6.00	6	6.15	6.3	6.45	6.60	6.75	6.9	7.05	7.2	7.35	7.5	7.65	7.8	7.95	8.10	8.85
	3	"		-	4.00	8.00	8.00	8.00	8.00	8.20	8.40	8.60	8.80	9.00	9.20	9.40	9.60	9.80	10.00	10.20	10.40	10.60	10.80	11.80
	2	"		-	6.00	12.00	12.00	12.00	12.00	12.30	12.60	12.90	13.20	13.50	13.80	14.10	14.40	14.70	15.00	15.30	15.60	15.90	16.20	17.70
Extra FADs after GCF	4	no.		-	-	-	-	5	6.0	6.1	6.3	6.4	7	6.8	6.9	7.05	7.20	7	7.5	7.65	7.80	7.95	8	9
	3	no.		-	-	-	4.0	8	8.0	8.2	8.4	8.6	9	9.0	9.2	9.40	9.60	10	10.0	10.20	10.40	10.60	11	12
	2	no.		-	-	2.0	12.0	12	12.0	12.3	12.6	12.9	13	13.5	13.8	14.10	14.40	15	15.0	15.30	15.60	15.90	16	18
Cost or Replacement FADS (after GCF)																								
(after using GCF FADs)	4	300	-	-	-	-	-	50,086	60,103	62,983	64,520	66,056	67,592	69,128	72,210	73,780	75,349	76,919	78,489	81,772	83,376	84,979	86,583	96,582
(Extra costs allows for annual maint.)	3	200	-	-	-	-	39,669	79,338	79,338	83,158	85,186	87,214	89,243	91,271	95,360	97,433	99,506	101,579	103,652	108,010	110,128	112,246	114,363	127,596
	2	100	-	-	-	19,634	117,806	117,806	117,806	123,507	126,519	129,531	132,544	135,556	141,660	144,739	147,819	150,898	153,978	160,485	163,632	166,778	169,925	189,624
TOTAL ANNUAL COSTS	4			8,581	156,713	139,759	73,727	99,902	95,395	81,783	83,320	84,856	86,392	87,928	91,010	92,580	94,149	95,719	97,289	100,572	102,176	103,779	105,383	115,382
	3			8,581	156,713	139,759	113,396	129,154	114,629	101,958	103,986	106,014	108,043	110,071	114,160	116,233	118,306	120,379	122,452	126,810	128,928	131,046	133,163	146,396
	2			8,581	156,713	159,394	191,533	167,623	153,098	142,307	145,319	148,331	151,344	154,356	160,460	163,539	166,619	169,698	172,778	179,285	182,432	185,578	188,725	208,424
FAD PRODUCTION																								
1. Incremental allowing for existing FADs																								
No of current FADS		-		*1*	*1*	*1*	*1*	*1*	*1*	*1*	*1*	*1*	*1*	*1*	*1*	*1*	*1*	*1*	*1*	*1*	*1*	*1*	*1*	*1*
Average production	t/yr	5		5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00
Production from New FADS	t/y	5		-	60	120	120	120	120	123	126	129	132	135	138	141	144	147	150	153	156	159	162	177
	t/y	10		-	120	240	240	240	240	246	252	258	264	270	276	282	288	294	300	306	312	318	324	354
Valur of Production from New FADs	$/kg																							
Full Production @ 5 t/y	6.33				379,800	759,600	759,600	759600	759,600	778,590	797,580	816,570	835560	854,550	873,540	892,530	911,520	930510	949,500	968,490	987,480	1,006,470	1025460	1120410
Full Production @ 10 t/y	6.33				759,600	1,519,200	1,519,200	1519200	1,519,200	1,557,180	1,595,160	1,633,140	1671120	1,709,100	1,747,080	1,785,060	1,823,040	1861020	1,899,000	1,936,980	1,974,960	2,012,940	2050920	2240820
Net Value of Increased Production																								
(assume costs are 80% of gross vale)																								
Full Production @ 5 t/y	20%	$			75,960	151,920	151,920	151920	151,920	155,718	159,516	163,314	167112	170,910	174,708	178,506	182,304	186102	189,900	193,698	197,496	201,294	205092	224082
Full Production @ 10 t/y	20%	$			151,920	303,840	303,840	303840	303,840	311,436	319,032	326,628	334224	341,820	349,416	357,012	364,608	372204	379,800	387,396	394,992	402,588	410184	448164
NET CASH FLOWS																								
(assume 3-year FAD life)																								
Full Production																								
@ 5 t/FAD/y	4-year FAD life		-	8,581	- 80,753	12,161	78,193	52,018	56,525	73,935	76,196	78,458	80,720	82,982	83,698	85,926	88,155	90,383	92,611	93,126	95,320	97,515	99,709	108,700
	3-year FAD life		-	8,581	- 80,753	12,161	38,524	22,766	37,291	53,760	55,530	57,300	59,069	60,839	60,548	62,273	63,998	65,723	67,448	66,888	68,568	70,248	71,929	77,686
	2-year FAD life		-	8,581	- 80,753	- 7,474	- 39,613	- 15,703	- 1,178	13,411	14,197	14,983	15,768	16,554	14,248	14,967	15,685	16,404	17,122	14,413	15,064	15,716	16,367	15,658
@ 10 t/FAD/y	4-year FAD life		-	8,581	- 4,793	164,081	230,113	203,938	208,445	229,653	235,712	241,772	247,832	253,892	258,406	264,432	270,459	276,485	282,511	286,824	292,816	298,809	304,801	332,782
	3-year FAD life		-	8,581	- 4,793	164,081	190,444	174,686	189,211	209,478	215,046	220,614	226,181	231,749	235,256	240,779	246,302	251,825	257,348	260,586	266,064	271,542	277,021	301,768
	2-year FAD life		-	8,581	- 4,793	144,446	112,307	136,217	150,742	169,129	173,713	178,297	182,880	187,464	188,956	193,473	197,989	202,506	207,022	208,111	212,560	217,010	221,459	239,740

SUMMARY OF RESULTS for	FSM	EIRR
Full Production		
@ 5t/FAD/yr.	4-year FAD life	53%
	3-year FAD life	37%
	2-year FAD life	6%
@ 10t/FAD/yr	4-year FAD life	383%
	3-year FAD life	373%
	2-year FAD life	331%

Table 3-A.2. 46: Kiribati FAD Programme Economic Analysis

FAD PROGRAMME ECONOMIC ANALYSIS		USD	Kiribati																			
Item		Unit	Yr 1	Yr 2	Yr 3	Yr 4	Yr 5	Yr 6	Yr 7...	Yr 8	Yr 9	Yr 10	Yr 11	Yr 12	Yr 13	Yr 14	Yr 15	Yr 16...	Yr 17	Yr 18	Yr 19	Yr 20	Yr 25
COSTS																							
Disbursement schedule		100%	2%	46%	17%	26%	6%	3%	0%														
Number of FADS																							
Number of aFADs for 200-500m	27																						
Number of aFADs for 800-1,400m	30																						
Number of AFADs for 1,500-2,500m	0																						
Total No. FADs	**57**	Total Cost																					
Average cost per FAD	8,178	466,138	8,178	8,178	8,178	8,178	8,178	8,178	8,402	8,402	8,402	8,402	8,402	8,626	8,626	8,626	8,626	8,626	8,850	8,850	8,850	8,850	9,074
Cost per Year FADs (GCF)	466,138	$	**9,921**	**216,717**	**78,670**	**119,287**	**27,244**	**14,298**	**-**														
Cost of Fisheries FAD Officers					21,300	21,300	21300	21,300	21,300	21,300	21,300	21300	21,300	21,300	21,300	21,300	21300	21,300	21,300	21,300	21,300	21300	21300
Current No. of FADs at Locations	18		18	18	18	18	18	18	18	18	18	18	18	18	18	18	18	18	18	18	18	18	18
Deployment new FADs (GCF)																							
Initial	38		0	19	19																		
Replacement	19				9.5	9.5																	
No. of operating FADS			0	19	38	38	38	38	38.95	39.90	40.85	41.8	43	43.70	44.65	45.60	46.55	48	48.45	49.40	50.35	51.3	56.05
Replacement - average life	4	year	-	5	10	10	9.50	9.5	9.7375	9.975	10.2125	10.45	10.6875	10.925	11.1625	11.4	11.64	11.875	12.1125	12.35	12.5875	12.83	14.01
	3	"	-	6.33	12.67	12.67	12.67	12.67	12.98	13.30	13.62	13.93	14.25	14.57	14.88	15.20	15.52	15.83	16.15	16.47	16.78	17.10	18.68
	2	"	-	9.50	19.00	19.00	19.00	19.00	19.47	19.95	20.43	20.90	21.38	21.85	22.32	22.80	23.28	23.75	24.22	24.70	25.18	25.65	28.03
Extra FADs after GCF	4	no.	-	-	-	4.75	10	9.50	9.74	9.97	10.21	10	10.69	10.93	11.2	11.4	12	11.88	12.1	12.4	12.6	13	14
	3	no.	-	-	-	12.7	13	12.7	13.0	13.3	13.6	14	14.3	14.6	14.9	15.2	16	15.8	16.1	16.5	16.8	17	19
	2	no.	-	-	9.5	19.0	19	19.0	19.5	19.9	20.4	21	21.4	21.8	22.3	22.8	23	23.8	24.2	24.7	25.2	26	28
Cost or Replacement FADS (after GCF)																							
(after using GCF FADs)	4	300	-	-	-		40,270	80,540	80,540	84,734	86,801	88,868	90,934	93,001	97,515	99,635	101,755	103,875	105,995	110,828	113,001	115,174	117,347	131,351
(Extra costs allows for annual maint.)	3	200	-	-	-	106,120	106,120	106,120	111,681	114,405	117,129	119,853	122,577	128,563	131,358	134,153	136,948	139,743	146,155	149,021	151,887	154,753	173,267
	2	100	-	-	78,640	157,279	157,279	157,279	165,574	169,612	173,650	177,689	181,727	190,660	194,805	198,950	203,094	207,239	216,810	221,062	225,313	229,564	257,097
TOTAL ANNUAL COSTS	4		9,921	216,717	99,970	180,857	129,084	116,138	106,034	108,101	110,168	112,234	114,301	118,815	120,935	123,055	125,175	127,295	132,128	134,301	136,474	138,647	152,651
	3		9,921	216,717	99,970	246,707	154,664	141,718	132,981	135,705	138,429	141,153	143,877	149,863	152,658	155,453	158,248	161,043	167,455	170,321	173,187	176,053	194,567
	2		9,921	216,717	178,609	297,867	205,824	192,878	186,874	190,912	194,950	198,989	203,027	211,960	216,105	220,250	224,394	228,539	238,110	242,362	246,613	250,864	278,397
FAD PRODUCTION																							
1. Incremental allowing for existing FADs																							
No of current FADS		-	*18*	*18*	*18*	*18*	*18*	*18*	*18*	*18*	*18*	*18*	*18*	*18*	*18*	*18*	*18*	*18*	*18*	*18*	*18*	*18*	*18*
Average production	t/yr	5	90.00	90.00	90.00	90.00	90.00	90.00	90.00	90.00	90.00	90.00	90.00	90.00	90.00	90.00	90.00	90.00	90.00	90.00	90.00	90.00	90.00
Production from New FADS	t/y	5	-	95	190	190	190	190	195	199	204	209	214	218	223	228	233	238	242	247	252	257	280
	t/y	10	-	190	380	380	380	380	389	399	408	418	428	437	446	456	466	475	484	494	503	513	561
Gross Value New FADs Production	$/kg price																						
Full Production @ 5 t/y	3.27			310,650	621,300	621,300	621300	621,300	636,832	652,365	667,897	683430	698,963	714,495	730,027	745,560	761092.5	776,625	792,157	807,690	823,222	838755	916417.5
Full Production @ 10 t/y	3.27			621,300	1,242,600	1,242,600	1242600	1,242,600	1,273,665	1,304,730	1,335,795	1366860	1,397,925	1,428,990	1,460,055	1,491,120	1522185	1,553,250	1,584,315	1,615,380	1,646,445	1677510	1832835
Net Value of Increased Production																							
(assume costs are 80% of gross vale)																							
Full Production @ 5 t/y	20%	$		62,130	124,260	124,260	124260	124,260	127,366	130,473	133,580	136686	139,793	142,899	146,006	149,112	152218.5	155,325	158,431	161,538	164,645	167751	183283.5
Full Production @ 10 t/y	20%	$		124,260	248,520	248,520	248520	248,520	254,733	260,946	267,159	273372	279,585	285,798	292,011	298,224	304437	310,650	316,863	323,076	329,289	335502	366567
NET CASH FLOWS																							
(assume 3-year FAD life)																							
Full Production																							
@ 5 t/FAD/y	4-year FAD life		- 9,921	- 154,587	24,290	- 56,597	- 4,824	8,122	21,332	22,372	23,412	24,452	25,491	24,084	25,071	26,057	27,044	28,030	26,304	27,237	28,171	29,104	30,632
	3-year FAD life		- 9,921	- 154,587	24,290	- 122,447	- 30,404	- 17,458	- 5,614	- 5,232	- 4,849	- 4,467	- 4,084	- 6,964	- 6,653	- 6,341	- 6,029	- 5,718	- 9,024	- 8,783	- 8,542	- 8,302	- 11,283
	2-year FAD life		- 9,921	- 154,587	- 54,349	- 173,607	- 81,564	- 68,618	- 59,507	- 60,439	- 61,371	- 62,303	- 63,235	- 69,061	- 70,099	- 71,138	- 72,176	- 73,214	- 79,679	- 80,824	- 81,968	- 83,113	- 95,114
@ 10 t/FAD/y	4-year FAD life		- 9,921	- 92,457	148,550	67,663	119,436	132,382	148,699	152,845	156,991	161,138	165,284	166,983	171,076	175,169	179,262	183,355	184,735	188,775	192,815	196,855	213,916
	3-year FAD life		- 9,921	- 92,457	148,550	1,813	93,856	106,802	121,752	125,241	128,730	132,219	135,709	135,935	139,353	142,771	146,189	149,607	149,408	152,755	156,102	159,449	172,000
	2-year FAD life		- 9,921	- 92,457	69,911	- 49,347	42,696	55,642	67,859	70,034	72,209	74,383	76,558	73,838	75,906	77,974	80,043	82,111	78,753	80,714	82,676	84,638	88,170

SUMMARY OF RESULTS for	Kiribati	EIRR
Full Production		
@ 5t/FAD/yr.	4-year FAD life	8%
	3-year FAD life	#NUM!
	2-year FAD life	#NUM!
@ 10t/FAD/yr	4-year FAD life	110%
	3-year FAD life	90%
	2-year FAD life	39%

Table 3-A.2.23: Marshall Islands FAD Programme Economic Analysis

FAD PROGRAMME ECONOMIC ANALYSIS		USD	Republic Marshall Islands																			
Item		**Unit**	**Yr 1**	**Yr 2**	**Yr 3**	**Yr 4**	**Yr 5**	**Yr 6**	**Yr 7…**	**Yr 8**	**Yr 9**	**Yr 10**	**Yr 11**	**Yr 12**	**Yr 13**	**Yr 14**	**Yr 15**	**Yr 16…**	**Yr 17**	**Yr 18**	**Yr 19**	**Yr 20**	**Yr 25**
COSTS																							
Disbursement schedule		100%	2%	37%	23%	26%	8%	3%	0%														
Number of FADS																							
Number of aFADs for 200-500m	0																						
Number of aFADs for 800-1,400m	40																						
Number of AFADs for 1,500-2,500m	0																						
Total No. FADs	**40**	Total Cost																					
Average cost per FAD	11,047	441,880	11,047	11,047	11,047	11,047	11,047	11,047	11,271	11,271	11,271	11,271	11,271	11,495	11,495	11,495	11,495	11,495	11,719	11,719	11,719	11,719	11,943
Cost per Year FADs (GCF)	441,880	$	**8,453**	**165,578**	**103,235**	**115,575**	**35,198**	**13,840**	**-**														
Cost of Fisheries FAD Officers					21,300	21,300	21300	21,300	21,300	21,300	21,300	21300	21,300	21,300	21,300	21,300	21300	21,300	21,300	21,300	21,300	21300	21300
Current No. of FADs at Location	24		24	24	24	24	24	24	24	24	24	24	24	24	24	24	24	24	24	24	24	24	24
Deployment new FADs (GCF)																							
Initial	27		0	14	14																		
Replacement	13				6.5	6.5																	
No. of operating FADS			0	14	27	27	27	27	27.68	28.35	29.03	29.7	30	31.05	31.73	32.40	33.075	34	34.43	35.10	35.78	36.45	39.825
Replacement - average life	4	year	-	3	7	6.75	6.75	6.75	6.91875	7.0875	7.25625	7.43	7.59375	7.7625	7.93125	8.1	8.27	8.4375	8.60625	8.775	8.94375	9.11	9.96
	3	"	-	4.50	9.00	9.00	9.00	9.00	9.23	9.45	9.68	9.90	10.13	10.35	10.58	10.80	11.03	11.25	11.48	11.70	11.93	12.15	13.28
	2	"	-	6.75	13.50	13.50	13.50	13.50	13.84	14.18	14.51	14.85	15.19	15.53	15.86	16.20	16.54	16.88	17.21	17.55	17.89	18.23	19.91
Extra FADs after GCF	4	no.	-	-	-	3.9	7	6.8	6.9	7.1	7.3	7	7.6	7.8	7.9	8.1	8	8.4	8.6	8.8	8.9	9	10
	3	no.	-	-	0.5	9.0	9	9.0	9.2	9.5	9.7	10	10.1	10.4	10.6	10.8	11	11.3	11.5	11.7	11.9	12	13
	2	no.	-	-	7.3	13.5	14	13.5	13.8	14.2	14.5	15	15.2	15.5	15.9	16.2	17	16.9	17.2	17.6	17.9	18	20
Cost or Replacement FADS (after GCF)																							
(after using GCF FADs)	4	300	-	-	-	43,970	76,592	76,592	80,057	82,009	83,962	85,915	87,867	91,559	93,549	95,540	97,530	99,520	103,439	105,467	107,495	109,523	121,894
(Extra costs allows for annual maint.)	3	200	-	-	5,624	101,223	101,223	101,223	105,820	108,401	110,982	113,563	116,144	121,043	123,675	126,306	128,937	131,569	136,771	139,452	142,134	144,816	161,198
	2	100	-	-	80,816	150,485	150,485	150,485	157,346	161,184	165,022	168,859	172,697	180,012	183,926	187,839	191,752	195,666	203,435	207,423	211,412	215,401	239,806
TOTAL ANNUAL COSTS	4		8,453	165,578	124,535	180,845	133,090	111,733	101,357	103,309	105,262	107,215	109,167	112,859	114,849	116,840	118,830	120,820	124,739	126,767	128,795	130,823	143,194
	3		8,453	165,578	130,158	238,098	157,721	136,363	127,120	129,701	132,282	134,863	137,444	142,343	144,975	147,606	150,237	152,869	158,071	160,752	163,434	166,116	182,498
	2		8,453	165,578	205,350	287,360	206,982	185,625	178,646	182,484	186,322	190,159	193,997	201,312	205,226	209,139	213,052	216,966	224,735	228,723	232,712	236,701	261,106
FAD PRODUCTION																							
1. Incremental allowing for existing FADs																							
No of current FADS		-	*24*	*24*	*24*	*24*	*24*	*24*	*24*	*24*	*24*	*24*	*24*	*24*	*24*	*24*	*24*	*24*	*24*	*24*	*24*	*24*	*24*
Average production	t/yr	5	120	120	120	120	120	120	120	120	120	120	120	120	120	120	120	120	120	120	120	120	120
Production from New FADS	t/y	5	0	68	135	135	135	135	138	142	145	149	152	155	159	162	165	169	172	176	179	182	199
	t/y	10	0	135	270	270	270	270	277	284	290	297	304	311	317	324	331	338	344	351	358	365	398
Production Value New FADS	S/kg fish price																						
Full Production @ 5 t/y	7.82			527,850	1,055,700	1,055,700	1055700	1,055,700	1,082,093	1,108,485	1,134,878	1161270	1,187,663	1,214,055	1,240,448	1,266,840	1293232.5	1,319,625	1,346,018	1,372,410	1,398,803	1425195	1557157.5
Full Production @ 10 t/y	7.82			1,055,700	2,111,400	2,111,400	2111400	2,111,400	2,164,185	2,216,970	2,269,755	2322540	2,375,325	2,428,110	2,480,895	2,533,680	2586465	2,639,250	2,692,035	2,744,820	2,797,605	2850390	3114315
Net Value of Increased Production																							
(assume costs are 80% of gross vale)																							
Full Production @ 5 t/y	20%	$		105,570	211,140	211,140	211140	211,140	216,419	221,697	226,976	232254	237,533	242,811	248,090	253,368	258646.5	263,925	269,204	274,482	279,761	285039	311431.5
Full Production @ 10 t/y	20%	$		211,140	422,280	422,280	422280	422,280	432,837	443,394	453,951	464508	475,065	485,622	496,179	506,736	517293	527,850	538,407	548,964	559,521	570078	622863
NET CASH FLOWS																							
Incremental Production New FADS																							
(assume 3-year FAD life)																							
@ 5 t/FAD/y	4-year FAD life		- 8,453	- 60,008	86,605	30,295	78,050	99,407	115,062	118,388	121,713	125,039	128,365	129,952	133,240	136,529	139,817	143,105	144,465	147,715	150,966	154,216	168,237
	3-year FAD life		- 8,453	- 60,008	80,982	- 26,958	53,419	74,777	89,299	91,996	94,694	97,391	100,089	100,468	103,115	105,762	108,409	111,056	111,133	113,730	116,326	118,923	128,933
	2-year FAD life		- 8,453	- 60,008	5,790	- 76,220	4,158	25,515	37,772	39,213	40,654	42,095	43,535	41,499	42,864	44,229	45,594	46,959	44,469	45,759	47,048	48,338	50,325
@ 10 t/FAD/y	4-year FAD life		- 8,453	45,562	297,745	241,435	289,190	310,547	331,480	340,085	348,689	357,293	365,898	372,763	381,330	389,897	398,463	407,030	413,668	422,197	430,726	439,255	479,669
	3-year FAD life		- 8,453	45,562	292,122	184,182	264,559	285,917	305,717	313,693	321,669	329,645	337,621	343,279	351,204	359,130	367,056	374,981	380,336	388,212	396,087	403,962	440,365
	2-year FAD life		- 8,453	45,562	216,930	134,920	215,298	236,655	254,191	260,910	267,629	274,349	281,068	284,310	290,953	297,597	304,241	310,884	313,672	320,241	326,809	333,377	361,757

SUMMARY OF RESULTS for	**Republic Marshall Islands**	**EIRR**
Full Production		
@ 5t/FAD/yr.	4-year FAD life	97%
	3-year FAD life	70%
	2-year FAD life	19%
@ 10t/FAD/yr	4-year FAD life	847%
	3-year FAD life	837%
	2-year FAD life	763%

Table 3-A.2. 24 Nauru FAD Programme Economic Analysis

FAD PROGRAMME ECONOMIC ANALYSIS **Nauru**

Item			Unit	Yr 1	Yr 2	Yr 3	Yr 4	Yr 5	Yr 6	Yr 7...	Yr 8	Yr 9	Yr 10	Yr 11	Yr 12	Yr 13	Yr 14	Yr 15	Yr 16...	Yr 17	Yr 18	Yr 19	Yr 20	Yr 25
COSTS																								
Disbursement schedule			100%	2%	48%	21%	17%	7%	5%	0%														
Number of FADS																								
Number of aFADs for 200-500m	12																							
Number of aFADs for 800-1,400m	0																							
Number of AFADs for 1,500-2,500m	6																							
Total No. FADs	**18**	Total Cost																						
Average cost per FAD	9,349	168,282		9,349	9,349	9,349	9,349	9,349	9,349	9,573	9,573	9,573	9,573	9,573	9,797	9,797	9,797	9,797	9,797	10,021	10,021	10,021	10,021	10,245
Cost per Year FADs (GCF)	168,282	$		**3,737**	**80,109**	**35,531**	**28,927**	**11,725**	**8,253**	**-**														
Cost of Fisheries FAD Officers						25,600	25,600	25600	25,600	25,600	25,600	25,600	25600	25,600	25,600	25,600	25,600	25600	25,600	25,600	25,600	25,600	25600	25600
Current No. of FADs at Location	9			9	9	9	9	9	9	9	9	9	9	9	9	9	9	9	9	9	9	9	9	9
Deployment new FADs (GCF)																								
Initial	12			0	6	6																		
Replacement	6					3	3																	
No. of operating FADS				0	6	12	12	12	12	12.00	12.00	12.00	12	12	12.00	12.00	12.00	12	12	12.00	12.00	12.00	12	12
Replacement - average life	4	year		-	2	3	3	3.00	3	3	3	3	3.00	3	3	3	3	3.00	3	3	3	3	3.00	3.00
	3	"		-	2.00	4.00	4.00	4.00	4.00	4.00	4.00	4.00	4.00	4.00	4.00	4.00	4.00	4.00	4.00	4.00	4.00	4.00	4.00	4.00
	2	"		-	3.00	6.00	6.00	6.00	6.00	6.00	6.00	6.00	6.00	6.00	6.00	6.00	6.00	6.00	6.00	6.00	6.00	6.00	6.00	6.00
Extra FADs after GCF	4		no.	-	-	-	1.5	3	3.0	3.0	3.0	3.0	3	3.0	3.0	3.0	3.0	3	3.0	3.0	3.0	3.0	3	3
	3		no.	-	-	-	4.0	4	4.0	4.0	4.0	4.0	4	4.0	4.0	4.0	4.0	4	4.0	4.0	4.0	4.0	4	4
	2		no.	-	-	3.0	6.0	6	6.0	6.0	6.0	6.0	6	6.0	6.0	6.0	6.0	6	6.0	6.0	6.0	6.0	6	6
Cost or Replacement FADS (after GCF)																								
(after using GCF FADs)	4		300	-	-	-		14,474	28,947	28,947	29,619	29,619	29,619	29,619	29,619	30,291	30,291	30,291	30,291	30,291	30,963	30,963	30,963	31,635
(Extra costs allows for annual maint.)	3		200	-	-	-		38,196	38,196	38,196	39,092	39,092	39,092	39,092	39,988	39,988	39,988	39,988	39,988	40,884	40,884	40,884	40,884	41,780
	2		100	-	-		28,347	56,694	56,694	56,694	58,038	58,038	58,038	58,038	58,038	59,382	59,382	59,382	59,382	59,382	60,726	60,726	60,726	62,070
TOTAL ANNUAL COSTS	4			3,737	80,109	61,131	69,000	66,272	62,800	55,219	55,219	55,219	55,219	55,219	55,891	55,891	55,891	55,891	55,891	56,563	56,563	56,563	56,563	57,235
	3			3,737	80,109	61,131	92,723	75,521	72,049	64,692	64,692	64,692	64,692	64,692	65,588	65,588	65,588	65,588	65,588	66,484	66,484	66,484	66,484	67,380
	2			3,737	80,109	89,478	111,221	94,019	90,547	83,638	83,638	83,638	83,638	83,638	84,982	84,982	84,982	84,982	84,982	86,326	86,326	86,326	86,326	87,670
FAD PRODUCTION																								
1. Incremental allowing for existing FADs																								
No of current FADS			-	*9*	*9*	*9*	*9*	*9*	*9*	*9*	*9*	*9*	*9*	*9*	*9*	*9*	*9*	*9*	*9*	*9*	*9*	*9*	*9*	*9*
Average production	t/yr		5	45	45	45	45	45	45	45	45	45	45	45	45	45	45	45	45	45	45	45	45	45
Production from New FADS	t/y		5.00	-	30	60	60	60	60	60	60	60	60	60	60	60	60	60	60	60	60	60	60	60
	t/y		10	-	60	120	120	120	120	120	120	120	120	120	120	120	120	120	120	120	120	120	120	120
Gross Value of Production New FADs	4/kg fish price																							
Full Production @ 5 t/y	7.26				217,800	435,600	435,600	435600	435,600	435,600	435,600	435,600	435600	435,600	435,600	435,600	435,600	435600	435,600	435,600	435,600	435,600	435600	435600
Full Production @ 10 t/y	7.26				435,600	871,200	871,200	871200	871,200	871,200	871,200	871,200	871200	871,200	871,200	871,200	871,200	871200	871,200	871,200	871,200	871,200	871200	871200
Net Value of Increased Production																								
(assume costs are 80% of gross vale)								-					-					-					-	-
Full Production @ 5 t/y	20%	$			43,560	87,120	87,120	87120	87,120	87,120	87,120	87,120	87120	87,120	87,120	87,120	87,120	87120	87,120	87,120	87,120	87,120	87120	87120
Full Production @ 10 t/y	20%	$			87,120	174,240	174,240	174240	174,240	174,240	174,240	174,240	174240	174,240	174,240	174,240	174,240	174240	174,240	174,240	174,240	174,240	174240	174240
NET CASH FLOWS																								
Incremental Production																								
(assume 3-year FAD life)																								
@ 5 t/FAD/y	4-year FAD life		-	3,737	- 36,549	25,989	18,120	20,848	24,320	31,901	31,901	31,901	31,901	31,901	31,229	31,229	31,229	31,229	31,229	30,557	30,557	30,557	30,557	29,885
	3-year FAD life		-	3,737	- 36,549	25,989	- 5,603	11,599	15,071	22,428	22,428	22,428	22,428	22,428	21,532	21,532	21,532	21,532	21,532	20,636	20,636	20,636	20,636	19,740
	2-year FAD life		-	3,737	- 36,549	- 2,358	- 24,101	- 6,899	- 3,427	3,482	3,482	3,482	3,482	3,482	2,138	2,138	2,138	2,138	2,138	794	794	794	794	- 550
@ 10 t/FAD/y	4-year FAD life		-	3,737	7,011	113,109	105,240	107,968	111,440	119,021	119,021	119,021	119,021	119,021	118,349	118,349	118,349	118,349	118,349	117,677	117,677	117,677	117,677	117,005
	3-year FAD life		-	3,737	7,011	113,109	81,517	98,719	102,191	109,548	109,548	109,548	109,548	109,548	108,652	108,652	108,652	108,652	108,652	107,756	107,756	107,756	107,756	106,860
	2-year FAD life		-	3,737	7,011	84,762	63,019	80,221	83,693	90,602	90,602	90,602	90,602	90,602	89,258	89,258	89,258	89,258	89,258	87,914	87,914	87,914	87,914	86,570

SUMMARY OF RESULTS for Full Production	**Nauru**	**EIRR**
@ 5t/FAD/yr.	4-year FAD life	57%
	3-year FAD life	37%
	2-year FAD life	-14%
@ 10t/FAD/yr	4-year FAD life	593%
	3-year FAD life	585%
	2-year FAD life	513%

Table 3-A.2. 259: Palau FAD Programme Economic Analysis

FAD PROGRAMME ECONOMIC ANALYSIS				Palau																			
			USD																				
Item			Unit		Yr 1	Yr 2	Yr 3	Yr 4	Yr 5	Yr 6	Yr 7...	Yr 8	Yr 9	Yr 10	Yr 11	Yr 12	Yr 13	Yr 14	Yr 15	Yr 16...	Yr 17	Yr 18	Yr 19	Yr 20	Yr 25
COSTS																							
Disbursement schedule					4%	36%	21%	28%	7%	3%	0%													
Number of FADS																							
Number of aFADs for 200-500m	0																						
Number of aFADs for 800-1,400m	16																						
Number of AFADs for 1,500-2,500m	16																						
Total No. FADs	**32**	Total Cost																					
Average cost per FAD	10,166	325,296		10,166	10,166	10,166	10,166	10,166	10,166	10,390	10,390	10,390	10,390	10,390	10,614	10,614	10,614	10,614	10,614	10,838	10,838	10,838	10,838	11,062
Cost per Year FADs (GCF)	325,296	$		**12,074**	**118,400**	**69,170**	**92,242**	**22,752**	**10,657**	**-**														
Cost of Fisheries FAD Officers						52,000	52,000	52000	52,000	52,000	52,000	52,000	52000	52,000	52,000	52,000	52,000	52000	52,000	52,000	52,000	52,000	52000	52000
Current No. of FADs in Location	8			8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8
Deployment new FADs (GCF)																							
Initial	16			0	8	8																	
Replacement	16						8	8															
No. of operating FADS				-	8	16	16	16	16	16.20	16.40	16.60	17	17	17.20	17.40	17.60	18	18	18.20	18.40	18.60	19	20
Replacement - average life	4	year		-	2	4	4	4.00	4	4.05	4.1	4.15	4.20	4.25	4.3	4.35	4.4	4.45	4.5	4.55	4.6	4.65	4.70	4.95
	3	"		-	2.67	5.33	5.33	5.33	5.33	5.40	5.47	5.53	5.60	5.67	5.73	5.80	5.87	5.93	6.00	6.07	6.13	6.20	6.27	6.60
	2	"		-	4.00	8.00	8.00	8.00	8.00	8.10	8.20	8.30	8.40	8.50	8.60	8.70	8.80	8.90	9.00	9.10	9.20	9.30	9.40	9.90
Extra FADs after GCF	4		0.00	0.00	0.00	0.00	0.00	0.00	0.00	2.00	4.05	4.10	4.15	4.20	4.25	4.30	4.35	4.40	4.45	4.50	4.55	4.60	4.65	4.70	4.95
	3		0.00	0.00	0.00	0.00	0.00	2.67	5.33	5.40	5.47	5.53	5.60	5.67	5.73	5.80	5.87	5.93	6.00	6.07	6.13	6.20	6.27	6.60
	2		0.00	0.00	0.00	0.00	4.00	8.00	8.00	8.10	8.20	8.30	8.40	8.50	8.60	8.70	8.80	8.90	9.00	9.10	9.20	9.30	9.40	9.90
Cost or Replacement FADS (after GCF)		$																						
(after using GCF FADs)	4		300	-	-	-	-	-		20,931	43,292	43,827	44,361	44,896	45,430	46,928	47,474	48,019	48,565	49,111	50,676	51,233	51,789	52,346	56,239
(Extra costs allows for annual maint.)	3		200	-	-	-	-	-	27,641	55,283	57,183	57,889	58,595	59,301	60,007	61,997	62,718	63,439	64,160	64,881	66,961	67,697	68,433	69,168	74,326
	2		100	-	-	-		41,062	82,124	82,124	84,965	86,014	87,063	88,112	89,161	92,136	93,207	94,279	95,350	96,422	99,531	100,625	101,719	102,813	110,499
TOTAL ANNUAL COSTS	4	$		12,074	118,400	121,170	144,242	74,752	83,588	95,292	95,827	96,361	96,896	97,430	98,928	99,474	100,019	100,565	101,111	102,676	103,233	103,789	104,346	108,239
	3	$		12,074	118,400	121,170	144,242	102,394	117,940	109,183	109,889	110,595	111,301	112,007	113,997	114,718	115,439	116,160	116,881	118,961	119,697	120,433	121,168	126,326
	2	$		12,074	118,400	121,170	185,304	156,876	144,781	136,965	138,014	139,063	140,112	141,161	144,136	145,207	146,279	147,350	148,422	151,531	152,625	153,719	154,813	162,499
FAD PRODUCTION																								
1. Incremental allowing for existing FADs																								
No of current FADS			-	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8
Average production	t/yr		5	40	40	40	40	40	40	40	40	40	40	40	40	40	40	40	40	40	40	40	40	40
Production from New FADS	t/y		5	-	40	80	80	80	80	81	82	83	84	85	86	87	88	89	90	91	92	93	94	99
	t/y		10	-	80	160	160	160	160	162	164	166	168	170	172	174	176	178	180	182	184	186	188	198
Gross Value of Increased production	$/kg																							
New FADs																								
Full Production @ 5 t/y	7.7				308,000	616,000	616,000	616000	616,000	623,700	631,400	639,100	646800	654,500	662,200	669,900	677,600	685300	693,000	700,700	708,400	716,100	723800	762300
Full Production @ 10 t/y	7.7				616,000	1,232,000	1,232,000	1232000	1,232,000	1,247,400	1,262,800	1,278,200	1293600	1,309,000	1,324,400	1,339,800	1,355,200	1370600	1,386,000	1,401,400	1,416,800	1,432,200	1447600	1524600
Net Value of Increased Production																								
(assume costs are 80% of gross vale)																								
Full Production @ 5 t/y	20%	$			61,600	123,200	123,200	123200	123,200	124,740	126,280	127,820	129360	130,900	132,440	133,980	135,520	137060	138,600	140,140	141,680	143,220	144760	152460
Full Production @ 10 t/y	20%	$			123,200	246,400	246,400	246400	246,400	249,480	252,560	255,640	258720	261,800	264,880	267,960	271,040	274120	277,200	280,280	283,360	286,440	289520	304920
NET CASH FLOWS																								
Incremental Production																								
(assume 3-year FAD life)																								
@ 5 t/FAD/y	4-year FAD life	$	-	12,074	- 56,800	2,030	- 21,042	48,448	39,612	29,448	30,453	31,459	32,464	33,470	33,512	34,506	35,501	36,495	37,489	37,464	38,448	39,431	40,414	44,221
	3-year FAD life	$	-	12,074	- 56,800	2,030	- 21,042	20,806	5,260	15,557	16,391	17,225	18,059	18,893	18,443	19,262	20,081	20,900	21,719	21,179	21,983	22,788	23,592	26,134
	2-year FAD life	$	-	12,074	- 56,800	2,030	- 62,104	- 33,676	- 21,581	- 12,225	- 11,734	- 11,243	- 10,752	- 10,261	- 11,696	- 11,227	- 10,759	- 10,290	- 9,822	- 11,391	- 10,945	- 10,499	- 10,053	- 10,039
@ 10 t/FAD/y	4-year FAD life	$	-	12,074	4,800	125,230	102,158	171,648	162,812	154,188	156,733	159,279	161,824	164,370	165,952	168,486	171,021	173,555	176,089	177,604	180,128	182,651	185,174	196,681
	3-year FAD life	$	-	12,074	4,800	125,230	102,158	144,006	128,460	140,297	142,671	145,045	147,419	149,793	150,883	153,242	155,601	157,960	160,319	161,319	163,663	166,008	168,352	178,594
	2-year FAD life	$	-	12,074	4,800	125,230	61,096	89,524	101,619	112,515	114,546	116,577	118,608	120,639	120,744	122,753	124,761	126,770	128,779	128,749	130,735	132,721	134,708	142,421

SUMMARY OF RESULTS for	Palau	EIRR
Full Production		
@ 5t/FAD/yr.	4-year FAD life	27%
	3-year FAD life	15%
	2-year FAD life	#NUM!
@ 10t/FAD/yr	4-year FAD life	291%
	3-year FAD life	289%
	2-year FAD life	274%

Table 3-A2. 50: Cook Islands FAD Programme Economic Analysis

FAD PROGRAMME ECONOMIC ANALYSIS **Cook Islands**

Item		USD Unit		Yr 1	Yr 2	Yr 3	Yr 4	Yr 5	Yr 6	Yr 7…	Yr 8	Yr 9	Yr 10	Yr 11	Yr 12	Yr 13	Yr 14	Yr 15	Yr 16…	Yr 17	Yr 18	Yr 19	Yr 20	Yr 25
COSTS																								
Disbursement schedule			100%	2%	41%	21%	28%	6%	3%	0%														
Number of FADS																								
Number of aFADs for 200-500m		15																						
Number of aFADs for 800-1,400m		19																						
Number of AFADs for 1,500-2,500m		0																						
Total No. FADs		**34**	Total Cost																					
Average cost per FAD	9,123		310,180	9,123	9,123	9,123	9,123	9,123	9,123	9,347	9,347	9,347	9,347	9,347	9,571	9,571	9,571	9,571	9,571	9,795	9,795	9,795	9,795	10,019
Cost per Year FADs (GCF)	310,180	$		**4,938**	**128,032**	**63,702**	**85,648**	**17,769**	**10,091**	**-**														
Cost of Fisheries FAD Officers						32,100	32,100	32100	32,100	32,100	32,100	32,100	32100	32,100	32,100	32,100	32,100	32100	32,100	32,100	32,100	32,100	32100	32100
Current No. of FADs at Location		16		16	16	16	16	16	16	16	16	16	16	16	16	16	16	16	16	16	16	16	16	16
Deployment new FADs (GCF)																								
Initial		20		0	10	10																		
Replacement		14				7	7																	
No. of operating FADS				0	10	20	20	20	20	20	21	21	21	21	22	22	22	22	23	23	23	23	24	25
Replacement - average life		4	year	-	3	5	5	5	5	5	5	5	5	5	5	5	6	6	6	6	6	6	6	6
		3	"	-	3	7	7	7	7	7	7	7	7	7	7	7	7	7	8	8	8	8	8	8
		2	"	-	5	10	10	10	10	10	10	10	11	11	11	11	11	11	11	11	12	12	12	12
Extra FADs after GCF		4	no.	-	-	-	-	4	5	5	5	5	5	5	5	5	6	6	6	6	6	6	6	6
		3	no.	-	-	-	3	7	7	7	7	7	7	7	7	7	7	7	8	8	8	8	8	8
		2	no.	-	-	1	10	10	10	10	10	10	11	11	11	11	11	11	11	11	12	12	12	12
Cost or Replacement FADS (after GCF)																								
(after using GCF FADs)		4	300	-	-	-	-	32,980	47,115	48,838	49,441	50,044	50,646	51,249	53,056	53,673	54,290	54,907	55,524	57,415	58,046	58,677	59,308	63,848
(Extra costs allows for annual maint.)		3	200	-	-	-	24,861	62,153	62,153	64,442	65,237	66,033	66,829	67,624	70,025	70,839	71,654	72,468	73,282	75,795	76,628	77,461	78,294	84,306
		2	100	-	-	9,223	92,229	92,229	92,229	95,650	96,831	98,012	99,193	100,374	103,963	105,171	106,380	107,589	108,798	112,555	113,792	115,029	116,266	125,222
TOTAL ANNUAL COSTS		4		4,938	128,032	95,802	117,748	82,850	89,306	80,938	81,541	82,144	82,746	83,349	85,156	85,773	86,390	87,007	87,624	89,515	90,146	90,777	91,408	95,948
		3		4,938	128,032	95,802	142,609	112,022	104,344	96,542	97,337	98,133	98,929	99,724	102,125	102,939	103,754	104,568	105,382	107,895	108,728	109,561	110,394	116,406
		2		4,938	128,032	105,025	209,977	142,099	134,420	127,750	128,931	130,112	131,293	132,474	136,063	137,271	138,480	139,689	140,898	144,655	145,892	147,129	148,366	157,322
FAD PRODUCTION																								
No of current FADS			-	*16*	*16*	*16*	*16*	*16*	*16*	*16*	*16*	*16*	*16*	*16*	*16*	*16*	*16*	*16*	*16*	*16*	*16*	*16*	*16*	*16*
Average production	t/yr	5		80	80	80	80	80	80	80	80	80	80	80	80	80	80	80	80	80	80	80	80	80
Production from New FADS	t/y	5		0	50	100	100	100	100	101	103	104	105	106	108	109	110	111	113	114	115	116	118	124
	t/y	10		0	100	200	200	200	200	203	205	208	210	213	215	218	220	223	225	228	230	233	235	248
Value of Production New FADs	Fish Price $/kg																							
Full Production @ 5 t/y	11.29		$		564,500	1,129,000	1,129,000	1129000	1,129,000	1,143,113	1,157,225	1,171,338	1185450	1,199,563	1,213,675	1,227,788	1,241,900	1256012.5	1,270,125	1,284,238	1,298,350	1,312,463	1326575	1397137.5
Full Production @ 10 t/y	11.29		$		1,129,000	2,258,000	2,258,000	2258000	2,258,000	2,286,225	2,314,450	2,342,675	2370900	2,399,125	2,427,350	2,455,575	2,483,800	2512025	2,540,250	2,568,475	2,596,700	2,624,925	2653150	2794275
Net Value of Increased Production																								
(assume costs are 80% of gross vale)																								
Full Production @ 5 t/y	20%		$		112,900	225,800	225,800	225800	225,800	228,623	231,445	234,268	237090	239,913	242,735	245,558	248,380	251202.5	254,025	256,848	259,670	262,493	265315	279427.5
Full Production @ 10 t/y	20%		$		225,800	451,600	451,600	451600	451,600	457,245	462,890	468,535	474180	479,825	485,470	491,115	496,760	502405	508,050	513,695	519,340	524,985	530630	558855
NET CASH FLOWS																								
Incremental Production																								
@ 5 t/FAD/y	4-year FAD lif		$	- 4,938	- 15,132	129,998	108,052	142,950	136,494	147,685	149,904	152,124	154,344	156,563	157,579	159,784	161,990	164,195	166,401	167,333	169,524	171,716	173,907	183,479
	3-year FAD lif		$	- 4,938	- 15,132	129,998	83,191	113,778	121,456	132,081	134,108	136,134	138,161	140,188	140,610	142,618	144,626	146,635	148,643	148,953	150,942	152,932	154,921	163,021
	2-year FAD lif		$	- 4,938	- 15,132	120,775	15,823	83,701	91,380	100,872	102,514	104,155	105,797	107,439	106,672	108,286	109,900	111,513	113,127	112,193	113,778	115,364	116,949	122,106
@ 10 t/FAD/y	4-year FAD lif		$	- 4,938	97,768	355,798	333,852	368,750	362,294	376,307	381,349	386,391	391,434	396,476	400,314	405,342	410,370	415,398	420,426	424,180	429,194	434,208	439,222	462,907
	3-year FAD lif		$	- 4,938	97,768	355,798	308,991	339,578	347,256	360,703	365,553	370,402	375,251	380,101	383,345	388,176	393,006	397,837	402,668	405,800	410,612	415,424	420,236	442,449
	2-year FAD lif		$	- 4,938	97,768	346,575	241,623	309,501	317,180	329,495	333,959	338,423	342,887	347,351	349,407	353,844	358,280	362,716	367,152	369,040	373,448	377,856	382,264	401,533

SUMMARY OF RESULTS for	**Cook Islands**		**EIRR**
Incremental	5	t/FAD/yr	#NUM!
	10	t/FAD/yr	169%
Full Production			
@ 5t/FAD/yr.	4-year FAD life		343%
	3-year FAD life		332%
	2-year FAD life		287%
@ 10t/FAD/yr	4-year FAD life		2206%
	3-year FAD life		2205%
	2-year FAD life		2195%

Table 3-A.2. 51: Niue FAD Programme Economic Analysis

FAD PROGRAMME ECONOMIC ANALYSIS				Niue																			
		USD																					
Item		Unit		Yr 1	Yr 2	Yr 3	Yr 4	Yr 5	Yr 6	Yr 7...	Yr 8	Yr 9	Yr 10	Yr 11	Yr 12	Yr 13	Yr 14	Yr 15	Yr 16...	Yr 17	Yr 18	Yr 19	Yr 20	Yr 25
COSTS																								
Disbursement schedule			100%	3%	50%	19%	17%	7%	5%	0%														
Number of FADS																								
Number of aFADs for 200-500m	13																							
Number of aFADs for 800-1,400m	7																							
Number of AFADs for 1,500-2,500m	0																							
Total No. FADs	**20**	Total Cost																						
Average cost per FAD	7,899		157,985	7,899	7,899	7,899	7,899	7,899	7,899	8,123	8,123	8,123	8,123	8,123	8,347	8,347	8,347	8,347	8,347	8,571	8,571	8,571	8,571	8,795
Cost per Year FADs (GCF)	157,985	$		**4,366**	**79,232**	**29,885**	**26,190**	**11,148**	**7,163**	**-**														
Cost of Fisheries FAD Officers						29,500	29,500	29500	29,500	29,500	29,500	29,500	29500	29,500	29,500	29,500	29,500	29500	29,500	29,500	29,500	29,500	29500	29500
Current No. of FADs at Location	9			9	9	9	9	9	9	9	9	9	9	9	9	9	9	9	9	9	9	9	9	9
Deployment new FADs (GCF)																								
Initial	14			0	7	7																		
Replacement	6					3	3																	
No. of operating FADS				0	7	14	14	14	14	14.00	14.00	14.00	14	14	14.00	14.00	14.00	14	14	14.00	14.00	14.00	14	14
Replacement - average life	4	year		-	2	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4
	3	"		-	2	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5
	2	"		-	4	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7
Extra FADs after GCF	4	no.		-	-	-	3	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4
	3	no.		-	-	1	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5
	2	no.		-	-	5	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7
Cost or Replacement FADS (after GCF)																								
(after using GCF FADs)	4		300	-	-	-	22,548	28,697	28,697	29,481	29,481	29,481	29,481	29,481	30,265	30,265	30,265	30,265	30,265	31,049	31,049	31,049	31,833	31,833
(Extra costs allows for annual maint.)	3		200	-	-	8,099	37,797	37,797	37,797	38,842	38,842	38,842	38,842	38,842	39,887	39,887	39,887	39,887	39,887	40,933	40,933	40,933	40,933	41,978
	2		100	-	-	35,997	55,995	55,995	55,995	57,563	57,563	57,563	57,563	57,563	59,131	59,131	59,131	59,131	59,131	60,699	60,699	60,699	60,699	62,267
TOTAL ANNUAL COSTS	4			4,366	79,232	59,385	78,238	69,346	65,360	58,981	58,981	58,981	58,981	58,981	59,765	59,765	59,765	59,765	59,765	60,549	60,549	60,549	60,549	61,333
	3			4,366	79,232	67,484	93,487	78,445	74,459	68,342	68,342	68,342	68,342	68,342	69,387	69,387	69,387	69,387	69,387	70,433	70,433	70,433	70,433	71,478
	2			4,366	79,232	95,382	111,685	96,643	92,657	87,063	87,063	87,063	87,063	87,063	88,631	88,631	88,631	88,631	88,631	90,199	90,199	90,199	90,199	91,767
FAD PRODUCTION																								
1. Incremental allowing for existing FADs																								
No of current FADS			-	*9*	*9*	*9*	*9*	*9*	*9*	*9*	*9*	*9*	*9*	*9*	*9*	*9*	*9*	*9*	*9*	*9*	*9*	*9*	*9*	*9*
Average production	t/yr		5	45	45	45	45	45	45	45	45	45	45	45	45	45	45	45	45	45	45	45	45	45
Production from New FADS	t/y		5	-	35	70	70	70	70	70	70	70	70	70	70	70	70	70	70	70	70	70	70	70
	t/y		10	-	70	140	140	140	140	140	140	140	140	140	140	140	140	140	140	140	140	140	140	140
Gros Value Producton from New FADs	Fish price $/kg																							
Full Production @ 5 t/y	10.67	$			373,450	746,900	746,900	746900	746,900	746,900	746,900	746,900	746900	746,900	746,900	746,900	746,900	746900	746,900	746,900	746,900	746,900	746900	746900
Full Production @ 10 t/y	10.67	$			746,900	1,493,800	1,493,800	1493800	1,493,800	1,493,800	1,493,800	1,493,800	1493800	1,493,800	1,493,800	1,493,800	1,493,800	1493800	1,493,800	1,493,800	1,493,800	1,493,800	1493800	1493800
Net Value of Increased Production																								
(assume costs are 80% of gross vale)																								
Full Production @ 5 t/y	20%	$			74,690	149,380	149,380	149380	149,380	149,380	149,380	149,380	149380	149,380	149,380	149,380	149,380	149380	149,380	149,380	149,380	149,380	149380	149380
Full Production @ 10 t/y	20%	$			149,380	298,760	298,760	298760	298,760	298,760	298,760	298,760	298760	298,760	298,760	298,760	298,760	298760	298,760	298,760	298,760	298,760	298760	298760
NET CASH FLOWS																								
Incremental Production																								
@ 5 t/FAD/y	4-year FAD li	$	-	4,366	- 4,542	89,995	71,142	80,034	84,020	90,399	90,399	90,399	90,399	90,399	89,615	89,615	89,615	89,615	89,615	88,831	88,831	88,831	88,831	88,047
	3-year FAD li	$	-	4,366	- 4,542	81,896	55,893	70,935	74,921	81,038	81,038	81,038	81,038	81,038	79,993	79,993	79,993	79,993	79,993	78,948	78,948	78,948	78,948	77,902
	2-year FAD li	$	-	4,366	- 4,542	53,998	37,695	52,737	56,723	62,317	62,317	62,317	62,317	62,317	60,749	60,749	60,749	60,749	60,749	59,181	59,181	59,181	59,181	57,613
@ 10 t/FAD/y	4-year FAD li	$	-	4,366	70,148	239,375	220,522	229,414	233,400	239,779	239,779	239,779	239,779	239,779	238,995	238,995	238,995	238,995	238,995	238,211	238,211	238,211	238,211	237,427
	3-year FAD li	$	-	4,366	70,148	231,276	205,273	220,315	224,301	230,418	230,418	230,418	230,418	230,418	229,373	229,373	229,373	229,373	229,373	228,328	228,328	228,328	228,328	227,282
	2-year FAD li	$	-	4,366	70,148	203,378	187,075	202,117	206,103	211,697	211,697	211,697	211,697	211,697	210,129	210,129	210,129	210,129	210,129	208,561	208,561	208,561	208,561	206,993

SUMMARY OF RESULTS for	Niue	EIRR
Full Production		
@ 5t/FAD/yrs	4-year FAD life	354%
	3-year FAD life	329%
	2-year FAD life	254%
@ 10t/FAD/yr	4-year FAD life	1808%
	3-year FAD life	1799%
	2-year FAD life	1769%

Table 3-A.2. 52: Samoa FAD Programme Economic Analysis

FAD PROGRAMME ECONOMIC ANALYSIS			Samoa																			
		USD																				
Item		Unit		Yr 1	Yr 2	Yr 3	Yr 4	Yr 5	Yr 6	Yr 7...	Yr 8	Yr 9	Yr 10	Yr 11	Yr 12	Yr 13	Yr 14	Yr 15	Yr 16...	Yr 17	Yr 18	Yr 19	Yr 20	Yr 25
COSTS																								
Disbursement schedule			100%	1%	43%	19%	28%	5%	3%	0%														
Number of FADS																								
Number of aFADs for 200-500m	0																							
Number of aFADs for 800-1,400m	15																							
Number of AFADs for 1,500-2,500m	18																							
Total No. FADs	**33**	Total Cost																						
Average cost per FAD	9,600		316,791	9,600	9,600	9,600	9,600	9,600	9,600	9,824	9,824	9,824	9,824	9,824	10,048	10,048	10,048	10,048	10,048	10,272	10,272	10,272	10,272	10,496
Cost per Year FADs (GCF)	316,791	$		**4,699**	**136,130**	**60,699**	**88,170**	**17,159**	**9,935**	**-**														
Cost of Fisheries FAD Officers						25,300	25,300	25,300	25,300	25,300	25,300	25,300	25,300	25,300	25,300	25,300	25,300	25,300	25,300	25,300	25,300	25,300	25,300	25,300
Current No. of FADs at Location	10			10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10
Deployment new FADs (GCF)																								
Initial	18			-	9	9																		
Replacement	15					8	8																	
No. of operating FADS				-	9	18	18	18	18	18	18	19	19	19	19	20	20	20	20	20	21	21	21	22
Replacement - average life	4	year		-	2	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	6
	3	"		-	3	6	6	6	6	6	6	6	6	6	6	7	7	7	7	7	7	7	7	7
	2	"		-	5	9	9	9	9	9	9	9	10	10	10	10	10	10	10	10	10	10	11	11
Extra FADs after GCF	4	no.		-	-	-	-	1	4.5	4.6	4.6	4.7	5	4.8	4.8	4.9	5.0	5	5.1	5.1	5.2	5.2	5	6
	3	no.		-	-	-	-	6	6.0	6.1	6.2	6.2	6	6.4	6.5	6.5	6.6	7	6.8	6.8	6.9	7.0	7	7
	2	no.		-	-	-	7.5	9	9.0	9.1	9.2	9.3	9	9.6	9.7	9.8	9.9	10	10.1	10.2	10.4	10.5	11	11
Cost or Replacement FADS (after GCF)																								
(after using GCF FADs)	4		300	-	-	-	-	7,425	44,549	46,126	46,696	47,265	47,835	48,404	50,057	50,639	51,221	51,803	52,385	54,114	54,709	55,303	55,898	60,119
(Extra costs allows for annual maint.)	3		200	-	-	-	-	58,798	58,798	60,894	61,646	62,398	63,149	63,901	66,098	66,866	67,635	68,404	69,172	71,470	72,255	73,040	73,826	79,416
	2		100	-	-	-	72,748	87,298	87,298	90,430	91,546	92,663	93,779	94,896	98,179	99,321	100,463	101,604	102,746	106,181	107,347	108,514	109,681	118,010
TOTAL ANNUAL COSTS	4			4,699	136,130	85,999	113,470	49,884	79,783	71,426	71,996	72,565	73,135	73,704	75,357	75,939	76,521	77,103	77,685	79,414	80,009	80,603	81,198	85,419
	3			4,699	136,130	85,999	113,470	101,258	94,033	86,194	86,946	87,698	88,449	89,201	91,398	92,166	92,935	93,704	94,472	96,770	97,555	98,340	99,126	104,716
	2			4,699	136,130	85,999	186,218	129,757	122,532	115,730	116,846	117,963	119,079	120,196	123,479	124,621	125,763	126,904	128,046	131,481	132,647	133,814	134,981	143,310
FAD PRODUCTION																								
1. Incremental allowing for existing FADs																								
No of current FADS			-	*10*	*10*	*10*	*10*	*10*	*10*	*10*	*10*	*10*	*10*	*10*	*10*	*10*	*10*	*10*	*10*	*10*	*10*	*10*	*10*	*10*
Average production	t/yr		5	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50
Production from New FADS	t/y		5	-	45	90	90	90	90	91	92	93	95	96	97	98	99	100	101	102	104	105	106	111
	t/y		10	-	90	180	180	180	180	182	185	187	189	191	194	196	198	200	203	205	207	209	212	223
Value of Production from New FADs	Fish price $/kg																							
Full Production @ 5 t/y	6.40	$			288,000	576,000	576,000	576000	576,000	583,200	590,400	597,600	604800	612,000	619,200	626,400	633,600	640800	648,000	655,200	662,400	669,600	676800	712800
Full Production @ 10 t/y	6.40	$			576,000	1,152,000	1,152,000	1152000	1,152,000	1,166,400	1,180,800	1,195,200	1209600	1,224,000	1,238,400	1,252,800	1,267,200	1281600	1,296,000	1,310,400	1,324,800	1,339,200	1353600	1425600
Net Value of Increased Production																								
(assume costs are 80% of gross vale)																								
Full Production @ 5 t/y	20%	$			57,600	115,200	115,200	115200	115,200	116,640	118,080	119,520	120960	122,400	123,840	125,280	126,720	128160	129,600	131,040	132,480	133,920	135360	142560
Full Production @ 10 t/y	20%	$			115,200	230,400	230,400	230400	230,400	233,280	236,160	239,040	241920	244,800	247,680	250,560	253,440	256320	259,200	262,080	264,960	267,840	270720	285120
NET CASH FLOWS																								
Incremental Production																								
(assume 3-year FAD life)																								
@ 5 t/FAD/y	4-year FAD life	$	-	4,699	- 78,530	29,201	1,730	65,316	35,417	45,214	46,084	46,955	47,825	48,696	48,483	49,341	50,199	51,057	51,915	51,626	52,471	53,317	54,162	57,141
	3-year FAD life	$	-	4,699	- 78,530	29,201	1,730	13,942	21,167	30,446	31,134	31,822	32,511	33,199	32,442	33,114	33,785	34,456	35,128	34,270	34,925	35,580	36,234	37,844
	2-year FAD life	$	-	4,699	- 78,530	29,201	- 71,018	- 14,557	- 7,332	910	1,234	1,557	1,881	2,204	361	659	958	1,256	1,554	- 441	- 167	106	379	- 750
@ 10 t/FAD/y	4-year FAD life	$	-	4,699	- 20,930	144,401	116,930	180,516	150,617	161,854	164,164	166,475	168,785	171,096	172,323	174,621	176,919	179,217	181,515	182,666	184,951	187,237	189,522	199,701
	3-year FAD life	$	-	4,699	- 20,930	144,401	116,930	129,142	136,367	147,086	149,214	151,342	153,471	155,599	156,282	158,394	160,505	162,616	164,728	165,310	167,405	169,500	171,594	180,404
	2-year FAD life	$	-	4,699	- 20,930	144,401	44,182	100,643	107,868	117,550	119,314	121,077	122,841	124,604	124,201	125,939	127,678	129,416	131,154	130,599	132,313	134,026	135,739	141,810

SUMMARY OF RESULTS for	Samoa		EIRR
Incremental	5.00	t/FAD/yr	#NUM!
	10.00	t/FAD/yr	77%
Full Production			
@ 5t/FAD/yr.	4-year FAD life		40%
	3-year FAD life		27%
	2-year FAD life		#NUM!
@ 10t/FAD/yr	4-year FAD life		339%
	3-year FAD life		335%
	2-year FAD life		308%

Table 3-A.2. 53: Tonga FAD Programme Economic Analysis

FAD PROGRAMME ECONOMIC ANALYSIS				Tonga																					
			USD																						
Item			Unit	Yr 1	Yr 2	Yr 3	Yr 4	Yr 5	Yr 6	Yr 7...	Yr 8	Yr 9	Yr 10	Yr 11	Yr 12	Yr 13	Yr 14	Yr 15	Yr 16...	Yr 17	Yr 18	Yr 19	Yr 20	Yr 25
COSTS																									
Disbursement schedule			100%	1%	44%	18%	28%	5%	3%	0%															
Number of FADS																									
Number of aFADs for 200-500m	17																								
Number of aFADs for 800-1,400m	17																								
Number of AFADs for 1,500-2,500m	0																								
Total No. FADs	**34**	Total Cost																							
Average cost per FAD	8,934		303,744	8,934	8,934	8,934	8,934	8,934	8,934	9,158	9,158	9,158	9,158	9,158	9,382	9,382	9,382	9,382	9,382	9,606	9,606	9,606	9,606	9,830	
Cost per Year FADs (GCF)	303,744	$		**3,342**	**135,164**	**54,889**	**85,382**	**15,774**	**9,194**	**-**															
Cost of Fisheries FAD Officers						14,400	14,400	14400	14,400	14,400	14,400	14,400	14,400	14,400	14,400	14,400	14,400	14,400	14,400	14,400	14,400	14,400	14,400	14,400	14,400
Curent No. of FADs at Location	23			23	23	23	23	23	23	23	23	23	23	23	23	23	23	23	23	23	23	23	23	23	23
Deployment new FADs (GCF)																									
Initial	20			-	10	10																			
Replacement	14					7	7																		
No. of operating FADS				-	10	20	20	20	20	21	21	22	22	23	23	24	24	25	25	26	26	27	27	30	
Replacement - average life	4	year		-	3	5	5	5	5	5	5	5	6	6	6	6	6	6	6	6	7	7	7	7	
	3	"		-	3	7	7	7	7	7	7	7	7	8	8	8	8	8	8	9	9	9	9	10	
	2	"		-	5	10	10	10	10	10	11	11	11	11	12	12	12	12	13	13	13	13	14	15	
Extra FADs after GCF	4	no.		-		-	-	4	5	5	5	5	6	6	6	6	6	6	6	6	7	7	7	7	
	3	no.		-		-	3	7	7	7	7	7	7	8	8	8	8	8	8	9	9	9	9	10	
	2	no.		-		1	10	10	10	10	11	11	11	11	12	12	12	12	13	13	13	13	14	15	
Cost or Replacement FADS (after GCF)																									
(after using GCF FADs)	4		300	-	-	-	-	32,318	46,168	48,470	49,653	50,835	52,017	53,199	55,669	56,880	58,090	59,300	60,510	63,149	64,387	65,625	66,863	74,706	
(Extra costs allows for annual maint.)	3		200	-	-	-	24,356	60,891	60,891	63,944	65,504	67,063	68,623	70,182	73,459	75,056	76,653	78,250	79,847	83,348	84,982	86,617	88,251	98,625	
	2		100	-	-	9,034	90,336	90,336	90,336	94,891	97,205	99,520	101,834	104,149	109,039	111,409	113,780	116,150	118,521	123,747	126,173	128,600	131,026	146,462	
TOTAL ANNUAL COSTS	4	$		3,342	135,164	69,289	99,782	62,492	69,762	62,870	64,053	65,235	66,417	67,599	70,069	71,280	72,490	73,700	74,910	77,549	78,787	80,025	81,263	89,106	
	3	$		3,342	135,164	69,289	124,138	91,065	84,485	78,344	79,904	81,463	83,023	84,582	87,859	89,456	91,053	92,650	94,247	97,748	99,382	101,017	102,651	113,025	
	2	$		3,342	135,164	78,322	190,118	120,511	113,930	109,291	111,605	113,920	116,234	118,549	123,439	125,809	128,180	130,550	132,921	138,147	140,573	143,000	145,426	160,862	
FAD PRODUCTION																									
1. Incremental allowing for existing FADs																									
No of current FADS			-	*23*	*23*	*23*	*23*	*23*	*23*	*23*	*23*	*23*	*23*	*23*	*23*	*23*	*23*	*23*	*23*	*23*	*23*	*23*	*23*	*23*	*23*
Average production	t/yr		5	115	115	115	115	115	115	115	115	115	115	115	115	115	115	115	115	115	115	115	115	115	115
Production from New FADS	t/y		5	-	50	100	100	100	100	103	105	108	110	113	115	118	120	123	125	128	130	133	135	148	
	t/y		10	-	100	200	200	200	200	205	210	215	220	225	230	235	240	245	250	255	260	265	270	295	
Gross Value of Increased production																									
New FADs	Fish Price $/kg																								
Full Production @ 5 t/y	7.35	$			367,500	735,000	735,000	735000	735,000	753,375	771,750	790,125	808,500	826,875	845,250	863,625	882,000	900,375	918,750	937,125	955,500	973,875	992,250	1,084,125	
Full Production @ 10 t/y	7.35	$			735,000	1,470,000	1,470,000	1470000	1,470,000	1,506,750	1,543,500	1,580,250	1,617,000	1,653,750	1,690,500	1,727,250	1,764,000	1,800,750	1,837,500	1,874,250	1,911,000	1,947,750	1,984,500	2,168,250	
Net Value of Increased Production																									
(assume costs are 80% of gross vale)																									
Full Production @ 5 t/y	20%	$			73,500	147,000	147,000	147000	147,000	150,675	154,350	158,025	161,700	165,375	169,050	172,725	176,400	180,075	183,750	187,425	191,100	194,775	198,450	216,825	
Full Production @ 10 t/y	20%	$			147,000	294,000	294,000	294000	294,000	301,350	308,700	316,050	323,400	330,750	338,100	345,450	352,800	360,150	367,500	374,850	382,200	389,550	396,900	433,650	
NET CASH FLOWS																									
Incremental Production																									
@ 5 t/FAD/y	4-year FAD life	$	-	3,342	- 61,664	77,711	47,218	84,508	77,238	87,805	90,297	92,790	95,283	97,776	98,981	101,445	103,910	106,375	108,840	109,877	112,313	114,750	117,187	127,719	
	3-year FAD life	$	-	3,342	- 61,664	77,711	22,862	55,935	62,515	72,331	74,446	76,562	78,677	80,793	81,191	83,269	85,347	87,425	89,503	89,677	91,718	93,758	95,799	103,800	
	2-year FAD life	$	-	3,342	- 61,664	68,678	- 43,118	26,489	33,070	41,384	42,745	44,105	45,466	46,826	45,611	46,916	48,220	49,525	50,829	49,278	50,527	51,775	53,024	55,963	
@ 10 t/FAD/y	4-year FAD life	$	-	3,342	11,836	224,711	194,218	231,508	224,238	238,480	244,647	250,815	256,983	263,151	268,031	274,170	280,310	286,450	292,590	297,302	303,413	309,525	315,637	344,544	
	3-year FAD life	$	-	3,342	11,836	224,711	169,862	202,935	209,515	223,006	228,796	234,587	240,377	246,168	250,241	255,994	261,747	267,500	273,253	277,102	282,818	288,533	294,249	320,625	
	2-year FAD life	$	-	3,342	11,836	215,678	103,882	173,489	180,070	192,059	197,095	202,130	207,166	212,201	214,661	219,641	224,620	229,600	234,579	236,703	241,627	246,550	251,474	272,788	

SUMMARY OF RESULTS for	Tonga	EIRR
Full Production		
@ 5t/FAD/yry	4-year FAD life	105%
	3-year FAD life	88%
	2-year FAD life	44%
@ 10t/FAD/yr	4-year FAD life	952%
	3-year FAD life	948%
	2-year FAD life	921%

Table 3-A.2. 54: Tuvalu FAD Programme Economic Analysis

FAD PROGRAMME ECONOMIC ANALYSIS			Tuvalu																				
		USD																					
Item		Unit		Yr 1	Yr 2	Yr 3	Yr 4	Yr 5	Yr 6	Yr 7...	Yr 8	Yr 9	Yr 10	Yr 11	Yr 12	Yr 13	Yr 14	Yr 15	Yr 16...	Yr 17	Yr 18	Yr 19	Yr 20	Yr 25
COSTS																							
Disbursement schedule			100%	2%	44%	25%	18%	7%	4%	0%													
Number of FADS																							
Number of aFADs for 200-500m	16																						
Number of aFADs for 800-1,400m	6																						
Number of AFADs for 1,500-2,500m	0																						
Total No. FADs	**22**	Total Cost																					
Average cost per FAD	10,035	220,764		10,035	10,035	10,035	10,035	10,035	10,035	10,259	10,259	10,259	10,259	10,259	10,483	10,483	10,483	10,483	10,483	10,707	10,707	10,707	10,707	10,931
Cost per Year FADs (GCF)	220,764	$		**5,457**	**97,257**	**54,217**	**39,664**	**15,938**	**8,230**	**-**														
Cost of Fisheries FAD Officers						40,100	40,100	40100	40,100	40,100	40,100	40,100	40100	40,100	40,100	40,100	40,100	40100	40,100	40,100	40,100	40,100	40100	40100
Curent No. of FADs	6			6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6
Deployment new FADs (GCF)																								
Initial	14			-	7	7																		
Replacement	8					4	4																	
No. of operating FADS				-	7	14	14	14	14	14	14	15	15	15	15	15	15	16	16	16	16	16	16	17
Replacement - average life	4	year		-	2	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4
	3	"		-	2	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	6
	2	"		-	4	7	7	7	7	7	7	7	7	7	8	8	8	8	8	8	8	8	8	9
Extra FADs after GCF	4	-		-	-	-	1	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4
	3	-		-	-	-	4	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	6
	2	-		-	-	3	7	7	7	7	7	7	7	7	8	8	8	8	8	8	8	8	8	9
Cost or Replacement FADS (after GCF)		$/FAD																						
(after using GCF FADs)	4	300	-	-	-		7,751	36,172	36,172	37,417	37,879	38,341	38,803	39,265	40,570	41,042	41,513	41,985	42,457	43,821	44,302	44,784	45,265	48,643
(Extra costs allows for annual maint.)	3	200	-	-	-		37,527	47,762	47,762	49,417	50,028	50,638	51,248	51,858	53,592	54,215	54,838	55,461	56,084	57,897	58,533	59,169	59,805	64,280
	2	100	-	-	-	25,337	70,943	70,943	70,943	73,417	74,324	75,230	76,137	77,043	79,635	80,561	81,487	82,413	83,339	86,049	86,994	87,940	88,885	95,554
TOTAL ANNUAL COSTS	4	$		5,457	97,257	94,317	87,515	92,210	84,502	77,517	77,979	78,441	78,903	79,365	80,670	81,142	81,613	82,085	82,557	83,921	84,402	84,884	85,365	88,743
	3	$		5,457	97,257	94,317	117,291	103,800	96,092	89,517	90,128	90,738	91,348	91,958	93,692	94,315	94,938	95,561	96,184	97,997	98,633	99,269	99,905	104,380
	2	$		5,457	97,257	119,654	150,707	126,981	119,273	113,517	114,424	115,330	116,237	117,143	119,735	120,661	121,587	122,513	123,439	126,149	127,094	128,040	128,985	135,654
FAD PRODUCTION																								
1. Incremental allowing for existing FADs																								
No of current FADS			-	*6*	*6*	*6*	*6*	*6*	*6*	*6*	*6*	*6*	*6*	*6*	*6*	*6*	*6*	*6*	*6*	*6*	*6*	*6*	*6*	*6*
Average production	t/yr		5	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30
Production from New FADS	t/y		5	-	35	70	70	70	70	71	72	73	73	74	75	76	77	78	79	80	80	81	82	87
	t/y		10	-	70	140	140	140	140	142	144	145	147	149	151	152	154	156	158	159	161	163	165	173
Gross Value of Increased production	ish price	$/kg																						
Full Production @ 5 t/y	3.63	$			127,050	254,100	254,100	254100	254,100	257,276	260,452	263,629	266805	269,981	273,157	276,334	279,510	282686.25	285,863	289,039	292,215	295,391	298567.5	314448.75
Full Production @ 10 t/y	3.63	$			254,100	508,200	508,200	508200	508,200	514,552	520,905	527,257	533610	539,963	546,315	552,667	559,020	565372.5	571,725	578,077	584,430	590,782	597135	628897.5
Net Value of Increased Production																								
(assume costs are 80% of gross vale)								-					-					-					-	-
Full Production @ 5 t/y	20%	$			25,410	50,820	50,820	50820	50,820	51,455	52,090	52,726	53361	53,996	54,631	55,267	55,902	56537.25	57,173	57,808	58,443	59,078	59713.5	62889.75
Full Production @ 10 t/y	20%	$			50,820	101,640	101,640	101640	101,640	102,911	104,181	105,452	106722	107,993	109,263	110,534	111,804	113074.5	114,345	115,616	116,886	118,157	119427	125779.5
NET CASH FLOWS																								
Incremental Production																								
@ 5 t FAD/y	4-year FAD lif	$	-	5,457	- 71,847	- 43,497	- 36,695	- 41,390	- 33,682	- 26,062	- 25,889	- 25,716	- 25,542	- 25,369	- 26,039	- 25,875	- 25,712	- 25,548	- 25,384	- 26,113	- 25,959	- 25,805	- 25,652	- 25,853
	3-year FAD lif	$	-	5,457	- 71,847	- 43,497	- 66,471	- 52,980	- 45,272	- 38,062	- 38,037	- 38,012	- 37,987	- 37,962	- 39,060	- 39,048	- 39,036	- 39,024	- 39,012	- 40,189	- 40,190	- 40,191	- 40,192	- 41,490
	2-year FAD lif	$	-	5,457	- 71,847	- 68,834	- 99,887	- 76,161	- 68,453	- 62,062	- 62,333	- 62,605	- 62,876	- 63,147	- 65,104	- 65,394	- 65,685	- 65,976	- 66,266	- 68,341	- 68,651	- 68,961	- 69,272	- 72,764
@ 10 t FAD/y	4-year FAD lif	$	-	5,457	- 46,437	7,323	14,125	9,430	17,138	25,393	26,202	27,010	27,819	28,627	28,593	29,392	30,190	30,989	31,788	31,695	32,484	33,273	34,062	37,036
	3-year FAD lif	$	-	5,457	- 46,437	7,323	- 15,651	- 2,160	5,548	13,393	14,053	14,714	15,374	16,035	15,571	16,219	16,866	17,513	18,161	17,619	18,253	18,888	19,522	21,400
	2-year FAD lif	$	-	5,457	- 46,437	- 18,014	- 49,067	- 25,341	- 17,633	- 10,607	- 10,243	- 9,879	- 9,515	- 9,151	- 10,472	- 10,128	- 9,783	- 9,438	- 9,094	- 10,533	- 10,208	- 9,883	- 9,558	- 9,874

SUMMARY OF RESULTS for	Tuvalu	EIRR
Full Production		
@ 5t/FAD/yry	4-year FAD life	#NUM!
	3-year FAD life	#NUM!
	2-year FAD life	#NUM!
@ 10t/FAD/yr	4-year FAD life	31%
	3-year FAD life	15%
	2-year FAD life	#NUM!

Appendix 3-A.3 Details of Economic Analysis of Bycatch Programme

This appendix included the Excel sheets for the economic analysis of the Bycatch and Transhipment Programme and the economic analysis of FAD and Bycatch combined.

Table 3-A.3. 26 Bycatch Programme Economic Analysis

	USD'000		2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036	2037	2038	2039	2040	2041	2042	2043	2044	2049
Item		**Unit**	**Yr 1**	**Yr 2**	**Yr 3**	**Yr 4**	**Yr 5**	**Yr 6**	**Yr 7**	**Yr 8**	**Yr 9**	**Yr 10....**	**Yr 11**	**Yr 12**	**Yr 13**	**Yr 14**	**Yr 15**	**Yr 16**	**Yr 17**	**Yr 18**	**Yr 19**	**Yr 20**	**Yr 25**
INVESTMENT COSTS																							
1. Output 2 Increased Supply of Bycatch																							
Activity 2.1: Implement strategies to deliver more transshipped and unloaded bycatch and tuna to urban/peri-urban			351.9	2,062.0	1,839.8	1,526.5	1,136.5	726.6	497.2	51.1													
Activity 2.2: Strengthen/develop post-harvest practices and improve market opportunities to distribute bycatch and tuna from transhipping and unloading operations to urban communities			219.7	850.5	1,636.1	1,698.5	1,447.4	1,138.6	548.0	17.2													
Total	**15,747.8**	1	**571.6**	**2,912.5**	**3,476.0**	**3,225.0**	**2,583.9**	**1,865.2**	**1,045.3**	**68.3**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**
Other National Private Sector Capital Costs																							
FSM	$'000		-	-	10.0	10.0	5.0																
Kiribati	"		-	-	25.0	50.0	50.0																
Marshall Is	"		-	-	10.0	10.0	5.0																
Solomon Is	"		-	-	50.0	75.0	75.0																
Tuvalu	"		-	-	10.0	10.0	5.0																
Total Private Sector Costs	400.0		**-**	**-**	**105.0**	**155.0**	**140.0**	**0**	**0**	**0**	**0**	**-**	**0**	**0**	**0**	**0**	**-**	**0**	**0**	**0**	**0**	**-**	**-**
TOTAL COSTS			**571.6**	**2,912.5**	**3,581.0**	**3,380.0**	**2,723.9**	**1,865.2**	**1,045.3**	**68.3**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**
BENEFITS																							
Incremental FishSupply of Bycatch		Yr inflin %																					
FSM	ton/yr	0%		-	17	34	51	68	68	68	68	68	68	68	68	68	68	68	68	68	68	68	68
Kiribati	ton/yr	0%		-	64	97	154	193	193	193	193	193	193	193	193	193	193	193	193	193	193	193	193
Marshall Is	ton/yr	0%		-	13	19	31	39	39	39	39	39	39	39	39	39	39	39	39	39	39	39	39
Solomon Is	ton/yr	0%			171	259	414	518	518	518	518	518	518	518	518	518	518	518	518	518	518	518	518
Tuvalu	ton/yr	0%			1	1	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2
Total Bycatch			**-**	**-**	**265**	**410**	**652**	**819**	**819**	**819**	**819**	**819**	**819**	**819**	**819**	**819**	**819**	**819**	**819**	**819**	**819**	**819**	**819**
Value of Bycatch	$/kg	$'000	1.20	**-**	**317.9**	**491.5**	**782.4**	**983.0**	**983.0**	**983.0**	**983.0**	**983.0**	**983.0**	**983.0**	**983.0**	**983.0**	**983.0**	**983.0**	**983.0**	**983.0**	**983.0**	**983.0**	**983.0**
Net selling price less cost of procurement of Bycatch																							
Reduction of wasteage in existing Supply of Bycatch (30% Existing Bycatch supply								*30%*															
FSM	ton/yr	135		-	10	20	30	41	41	41	41	41	41	41	41	41	41	41	41	41	41	41	41
Kiribati	ton/yr	386		-	38	58	93	116	116	116	116	116	116	116	116	116	116	116	116	116	116	116	116
Marshall Is	ton/yr	77		-	8	12	18	23	23	23	23	23	23	23	23	23	23	23	23	23	23	23	23
Solomon Is	ton/yr	1,036			103	155	249	311	311	311	311	311	311	311	311	311	311	311	311	311	311	311	311
Tuvalu	ton/yr	4			0	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
Total Bycatch		1,638	**-**	**-**	**159**	**246**	**391**	**492**	**492**	**492**	**492**	**492**	**492**	**492**	**492**	**492**	**492**	**492**	**492**	**492**	**492**	**492**	**492**
Value of Improve Bycatch Quality	$1.20/kg	$'000	**-**	**-**	**190.8**	**294.9**	**469.4**	**589.8**	**589.8**	**589.8**	**589.8**	**589.8**	**589.8**	**589.8**	**589.8**	**589.8**	**589.8**	**589.8**	**589.8**	**589.8**	**589.8**	**589.8**	**589.8**
Net selling price less cost of procurement of Bycatch																							
Reduction in Health Expenditure (0.5%)	0.5%/yr	$'000			**-**	**97**	**150**	**300.5**	**301**	**378**	**378**	**378**	**378**	**378**	**378**	**378**	**378**	**378**	**378**	**378**	**378**	**378**	**378**
TOTAL BYCATCH BENEFITS			**-**	**-**	**508.7**	**883.6**	**1,402.1**	**1,873.4**	**1,873.4**	**1,950.5**	**1,950.5**	**1,950.5**	**1,950.5**	**1,950.5**	**1,950.5**	**1,950.5**	**1,950.5**	**1,950.5**	**1,950.5**	**1,950.5**	**1,950.5**	**1,950.5**	**1,950.5**
NET CASH FLOW		$'000	**- 571.6**	**- 2,912.5**	**- 3,072.3**	**- 2,496.4**	**- 1,321.8**	**8.2**	**828.1**	**1,882.2**	**1,950.5**	**1,950.5**	**1,950.5**	**1,950.5**	**1,950.5**	**1,950.5**	**1,950.5**	**1,950.5**	**1,950.5**	**1,950.5**	**1,950.5**	**1,950.5**	**1,950.5**

EIRR	11.1%				1950.5
ENPV@ 9%	$1.79 million		1,790		0.00
Sensitivity					
Cost +20%	8.5%	-$0.27 million			
Cost -20%	15%	$4.27 million			
Fish value +20%	8.5%	-$0.27 million			
Fish value -20%	14.6%	$4.27 million			
PV Costs @ 9%	$11.62				
PV Benefiots @ 9%	$13.41				
NPV	$1.79				
BC ratio	1.15				

Table 3-A.3.56: FAD and Bycatch Programme Economic Analysis

ECONOMIC ANALYSIS OF FAD AND BYCATCH PROGRAMMES COMBINED

		USD'000																				
Item		**4.3$**	**Yr 1**	**Yr 2**	**Yr 3**	**Yr 4**	**Yr 5**	**Yr 6**	**Yr 7**	**Yr 8**	**Yr 9**	**Yr 10**	**Yr 11**	**Yr 12**	**Yr 13**	**Yr 14**	**Yr 15**	**Yr 16**	**Yr 17**	**Yr 18**	**Yr 19**	**Yr 20**	**Yr 25**
INVESTMENT COSTS																						
A. FAD Programme																						
1. GCF FAD Programme		**33,493**	979.1	8,395.4	7,690.8	7,201.8	4,441.5	2,908.2	1,717.9	158.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
2. Fisheries Dept FAD Overheads		**7,544**	0.0	0.0	0.0	92.0	184.0	276.0	368.0	368.0	368.0	368.0	368.0	368.0	368.0	368.0	368.0	368.0	368.0	368.0	368.0	368.0	368.0
3. FAD Replacement & Maintenance Costs		**29,658**	0.0	0.0	13.7	781.3	1,017.7	1,045.4	1,120.4	1,149.7	1,179.1	1,208.4	1,237.7	1,270.4	1,299.6	1,328.9	1,358.1	1,387.3	1,448.7	1,478.6	1,508.5	1,538.4	1,725.3
Total FAD Programme costs		**70,695**	**979.1**	**8,395.4**	**7,704.5**	**8,075.1**	**5,643.2**	**4,229.6**	**3,206.3**	**1,675.9**	**1,547.1**	**1,576.4**	**1,605.7**	**1,638.4**	**1,667.6**	**1,696.9**	**1,726.1**	**1,755.3**	**1,816.7**	**1,846.6**	**1,876.5**	**1,906.4**	**2,093.3**
B. GCF Bycatch/ Transhippment Programme																						
1. GFC Regional Tuna Programme		**15,748**	571.6	2,912.5	3,476.0	3,225.0	2,583.9	1,865.2	1,045.3	68.3	-	-	-	-	-	-	-	-	-	-	-	-	-
2. Private sector		**400**	-	-	105.0	155.0	140.0	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Total Bycatch costs		**16,148**	**571.6**	**2,912.5**	**3,581.0**	**3,380.0**	**2,723.9**	**1,865.2**	**1,045.3**	**68.3**	**-**	-	**-**	**-**	**-**	**-**	-	**-**	**-**	**-**	**-**	-	-
TOTAL COSTS		**86,842**	**1,550.7**	**11,307.9**	**11,285.5**	**11,455.1**	**8,367.1**	**6,094.8**	**4,251.6**	**1,744.2**	**1,547.1**	**1,576.4**	**1,605.7**	**1,638.4**	**1,667.6**	**1,696.9**	**1,726.1**	**1,755.3**	**1,816.7**	**1,846.6**	**1,876.5**	**1,906.4**	**2,093.3**
BENEFITS																						
FADS																						
Full Fish Production from FADS	ton/yr																					
Net Value of Full FAD Production	5t/FAD	US$'000	-	1,026.9	2,053.8	2,053.8	2,053.8	2,053.8	2,103.5	2,153.2	2,202.9	2,252.6	2,302.3	2,352.0	2,401.7	2,451.4	2,501.1	2,550.8	2,600.5	2,650.2	2,699.9	2,749.6	2,998.1
Net Value of Full FAD Production	10t/FAD	US$'000	-	2,053.8	4,107.6	4,107.6	4,107.6	4,107.6	4,207.0	4,306.4	4,405.8	4,505.2	4,604.6	4,704.0	4,803.4	4,902.8	5,002.2	5,101.6	5,201.0	5,300.4	5,399.8	5,499.2	5,996.2
Reduction in Health Expenditure (0.5%)		US$'000	-	43.2	129.5	259.0	431.6	647.4	863.2	863.2	863.2	863.2	863.2	863.2	863.2	863.2	863.2	863.2	863.2	863.2	863.2	863.2	863.2
BYCATCH																						
Incremental Bycatch Fish Supply	ton/yr		-	-	265	410	652	819	819	819	819	819	819	819	819	819	819	819	819	819	819	819	819
Net Value of Incremental Bycatch	US$	US$'000	1.2	-	508.7	786.4	1,251.8	1,572.9	1,572.9	1,572.9	1,572.9	1,572.9	1,572.9	1,572.9	1,572.9	1,572.9	1,572.9	1,572.9	1,572.9	1,572.9	1,572.9	1,572.9	1,572.9
Reduction in Health Expenditure (0.5%)	US$	US$'000	-	-	-	97	150	301	301	378	378	378	378	378	378	378	378	378	378	378	378	378	378
NET CASH FLOWS																							
Full FAD production + Bycatch	5t/FAD	US$'000	- 1,549	- 10,238	- 8,593	- 8,259	- 4,480	- 1,520	589	3,223	3,470	3,490	3,510	3,527	3,548	3,568	3,589	3,609	3,597	3,617	3,637	3,657	3,719
	10t/FAD	**US$'000**	**- 1,549**	**- 9,211**	**- 6,540**	**- 6,205**	**- 2,426**	**534**	**2,692**	**5,376**	**5,672**	**5,743**	**5,813**	**5,879**	**5,949**	**6,020**	**6,090**	**6,160**	**6,198**	**6,268**	**6,337**	**6,407**	**6,717**

EIRRs		**EIRR**	**ENPV million @ 9%**
FAD production + Bycatch	5t/FAD	5.1%	-$9.08
	10t/FAD	**13.3%**	**$10.34**

Appendix 3-A.4 Details of Economic Analysis of Tuna Advanced Warning System Programme

This appendix included the Excel sheets for the economic analysis of the AWS Programme.

Table 3-A.4 277: Tuna Advanced Warning System Programme Economic Analysis

COMPONENT B : Adaptation to Reduce Risks to Pacific Islands economies from climate-change driven tuna redistribution.

	US$'000		Constant prices																			
Item	**Unit**		**Yr 1**	**Yr 2**	**Yr 3**	**Yr 4**	**Yr 5**	**Yr 6**	**Yr 7**	**Yr 8**	**Yr 9**	**Yr 10**	**Yr 11**	**Yr 12**	**Yr 13**	**Yr 14**	**Yr 15**	**Yr 16**	**Yr 17**	**Yr 18**	**Yr 19**	**Yr 20**	**Yr 25**
COSTS																							
Activity 3.1: Develop and deliver an Advanced Warning System (AWS)	39,451		3,019	5,905	7,106	5,705	5,965	5,809	5,834	107													
Activity 3.2: Assess the impact of tuna biomass redistribution	7,668		417	1,184	1,150	1,196	1,314	1,158	1,206	43													
Activity 3.3: Provide AWS-related training to national institutions	7,334		382	1,080	1,120	1,183	1,159	1,170	1,166	74													
Total GCF Programme Costs	**54,453**		**3,819**	**8,169**	**9,376**	**8,084**	**8,438**	**8,137**	**8,206**	**224**													
Recurrent costs from Yr 9	7.4%										4,045	4,045	4,045	4,045	4,045	4,045	4,045	4,045	4,045	4,045	4,045	4,045	4,045
TOTAL COSTS			**3,819**	**8,169**	**9,376**	**8,084**	**8,438**	**8,137**	**8,206**	**224**	**4,045**	**4,045**	**4,045**	**4,045**	**4,045**	**4,045**	**4,045**	**4,045**	**4,045**	**4,045**	**4,045**	**4,045**	**4,045**
BENEFITS																							
Saving of Potential Reduction in Access Revenue																							
Level of Access fee saving	slope	Y intercept																					
RCP8.5:																							
1. $50 million by 2050	2,000	-4050000	2,000	4,000	6,000	8,000	10,000	12,000	14,000	16,000	18,000	20,000	22,000	24,000	26,000	28,000	30,000	32,000	34,000	36,000	38,000	40,000	50,000
2. $30 million by 2050	1,200	-2430000	1,200	2,400	3,600	4,800	6,000	7,200	8,400	9,600	10,800	12,000	13,200	14,400	15,600	16,800	18,000	19,200	20,400	21,600	22,800	24,000	30,000
3. $15 million by 2050	600	-1215000	600	1,200	1,800	2,400	3,000	3,600	4,200	4,800	5,400	6,000	6,600	7,200	7,800	8,400	9,000	9,600	10,200	10,800	11,400	12,000	15,000
4. $88 million saving by 2050 (RCP 8.5)	3,520	-7128000	3,520	7,040	10,560	14,080	17,600	21,120	24,640	28,160	31,680	35,200	38,720	42,240	45,760	49,280	52,800	56,320	59,840	63,360	66,880	70,400	88,000
RP4.5 $12 million saving by 2050	480	-972000	480	960	1,440	1,920	2,400	2,880	3,360	3,840	4,320	4,800	5,280	5,760	6,240	6,720	7,200	7,680	8,160	8,640	9,120	9,600	12,000
NET CASH FLOW																							
RCP8.5:																							
1. $50 million saving by 2050			- 1,819	- 4,169	- 3,376	- 84	1,562	3,863	5,794	15,776	13,955	15,955	17,955	19,955	21,955	23,955	25,955	27,955	29,955	31,955	33,955	35,955	45,955
2. $30 million saving by 2050			- 2,619	- 5,769	- 5,776	- 3,284	- 2,438	- 937	194	9,376	6,755	7,955	9,155	10,355	11,555	12,755	13,955	15,155	16,355	17,555	18,755	19,955	25,955
3. $15 million saving by 2050			- 3,219	- 6,969	- 7,576	- 5,684	- 5,438	- 4,537	- 4,006	4,576	1,355	1,955	2,555	3,155	3,755	4,355	4,955	5,555	6,155	6,755	7,355	7,955	10,955
4. $88 million saving by 2050 (RCP 8.5)			- 299	- 1,129	1,184	5,996	9,162	12,983	16,434	27,936	27,635	31,155	34,675	38,195	41,715	45,235	48,755	52,275	55,795	59,315	62,835	66,355	83,955
RP4.5 $12 million saving by 2050			- 3,339	- 7,209	- 7,936	- 6,164	- 6,038	- 5,257	- 4,846	3,616	275	755	1,235	1,715	2,195	2,675	3,155	3,635	4,115	4,595	5,075	5,555	7,955

Scenario	**EIRR**	**NPV 9%**	**PV Costs**	**PV Benefits**	**NPV**	**B C Ratio**
RCP8.5:						
1. $50 million	43%	$117.87				
2. $30 million (base case)	22.3%	$48.47	$55.63	$104.10	$48.47	1.87
3. $15 million	8%	-$3.58				
4. $88 million (RCP 8.5)	182%	$249.73				
RCP4.5 $12 million	4%	-$13.99				

Appendix 3-B: Additional Recurrent Costs for Participating Countries

1. Financial analysis for Activity 1 (strengthening national FAD programmes)

The impact of the FAD-related activities of the Programme on the future budget and expenditure for the Participating Countries after the end of the 7-year implementation period (spread across 8 years) is composed of the ongoing costs of replacing FADs to maintain the number of functional FADs in the water, and the additional costs of fisheries agency staff for the management of the FADs. The total annual costs of replacing FADs, based on an average 3-year life for FADs, is $1.15 million at the end of the Programme. This increases to $1.76 million per year in 2050, in line with the increased number of functional FADs over time. The annual costs for an individual country will depend on the number of FADs installed by the end of the Programme and the projected number of FADs to be added during the post-Programme period. This varies from around $30,000 for Nauru and Niue to over $100,000 per year for PNG and Vanautu.

The incremental costs of fisheries agency staff to manage national FAD-related activities is estimated to be $368,000 per year in total, and ranges from $11,300 per year for Solomon Islands to $52,000 per year for Palau

2. Financial implication of the bycatch programme

The impacts on government expenditure needed to improve the distribution of bycatch following the completion of the Programme are likely to be minimal because the role of government is limited to providing ongoing support for this initiative through its regulatory function. Specifically, the role of the government is to promote access to an increased volume of bycatch from transhipping and unloading operations, and to monitor and enforce food quality standards. The private sector will be responsible for the collection, distribution and selling of bycatch to consumers. A nominal amount of US$15,000 per year is allowed for the five countries that will participate in the Bycatch activity.

3. Financial implications of AWS programme on the PICs

The nine tuna-dependant countries benefitting directly from the AWS, and the other five subtropical countries also expected to benefit in a variety of ways, will contribute to the operation and maintenance of the AWS programme after the completion of the Programme through their membership of the regional organisations that develop and use the system (see below). The ongoing annual costs associated with operating and maintaining the AWS are estimated by SPC to total $4.045 million, equating to ~USD290,000 per country for each of the 14 PICs.

The table below presents a summary of the ongoing costs resulting from the Programme (FADs, Bycatch and AWS) for each of the 14 participating countries. The total recurrent costs are in the order of US$6.0 million per year with the recurrent costs of the AWS contributing the bulk of the costs per year.

Table 3-B. 288: Summary of Ongoing Recurrent Costs for 14 Participating Countries

SUMMARY OF COUNTRY-WISE RECURRENT COSTS

Country		Yr 1	Yr 2	Yr 3	Yr 4	Yr 5	Yr 6	Yr 7	Yr 8	Yr 9	Yr 10	Yr 11	Yr 12	Yr 13	Yr 14	Yr 15	Yr 16	Yr 17	Yr 18	Yr 19	Yr 20	Yr 21	Yr 22	Yr 23	Yr 24	Yr 25
FIJI																										
Cost of Fisheries FAD Officers		-	-	21,300	21,300	21,300	21,300	21,300	21,300	21,300	21,300	21,300	21,300	21,300	21,300	21,300	21,300	21,300	21,300	21,300	21,300	21,300	21,300	21,300	21,300	21,300
FAD replacement costs	3-year	-	-	-							153,697	158,709	141,899	146,243	150,587	154,931	159,275	167,837	172,293	176,749	181,205	185,661	194,895	199,463	204,031	208,599
Bycatch recurent costs																										
AWS recurrent costs											290,000	290,000	290,000	290,000	290,000	290,000	290,000	290,000	290,000	290,000	290,000	290,000	290,000	290,000	290,000	290,000
TOTAL Recurrent Costs	USD	**-**	**-**	**21,300**	**21,300**	**21,300**	**21,300**	**21,300**	**21,300**	**21,300**	**464,997**	**470,009**	**453,199**	**457,543**	**461,887**	**466,231**	**470,575**	**479,137**	**483,593**	**488,049**	**492,505**	**496,961**	**506,195**	**510,763**	**515,331**	**519,899**
PNG																										
Cost of Fisheries FAD Officers		-	-	26,000	26,000	26,000	26,000	26,000	26,000	26,000	26,000	26,000	26,000	26,000	26,000	26,000	26,000	26,000	26,000	26,000	26,000	26,000	26,000	26,000	26,000	26,000
FAD replacement costs	3-year	-	-	-							145,539	151,603	161,162	167,360	173,559	179,757	185,956	196,321	202,654	208,987	215,320	221,653	232,824	239,291	245,759	252,226
Bycatch recurent costs																										
AWS recurrent costs											290,000	290,000	290,000	290,000	290,000	290,000	290,000	290,000	290,000	290,000	290,000	290,000	290,000	290,000	290,000	290,000
TOTAL Recurrent Costs	USD	**-**	**-**	**26,000**	**26,000**	**26,000**	**26,000**	**26,000**	**26,000**	**26,000**	**461,539**	**467,603**	**477,162**	**483,360**	**489,559**	**495,757**	**501,956**	**512,321**	**518,654**	**524,987**	**531,320**	**537,653**	**548,824**	**555,291**	**561,759**	**568,226**
Solomons																										
Cost of Fisheries FAD Officers		-	-	11,300	11,300	11,300	11,300	11,300	11,300	11,300	11,300	11,300	11,300	11,300	11,300	11,300	11,300	11,300	11,300	11,300	11,300	11,300	11,300	11,300	11,300	11,300
FAD replacement costs	3-year	-	-	-							68,938	71,186	75,263	77,567	79,871	82,175	84,479	88,892	91,252	93,612	95,972	98,332	103,082	105,498	107,914	110,330
Bycatch recurent costs											15,000	15,000	15,000	15,000	15,000	15,000	15,000	15,000	15,000	15,000	15,000	15,000	15,000	15,000	15,000	15,000
AWS recurrent costs											290,000	290,000	290,000	290,000	290,000	290,000	290,000	290,000	290,000	290,000	290,000	290,000	290,000	290,000	290,000	290,000
TOTAL Recurrent Costs	USD	**-**	**-**	**11,300**	**11,300**	**11,300**	**11,300**	**11,300**	**11,300**	**11,300**	**385,238**	**387,486**	**391,563**	**393,867**	**396,171**	**398,475**	**400,779**	**405,192**	**407,552**	**409,912**	**412,272**	**414,632**	**419,382**	**421,798**	**424,214**	**426,630**
Vanuatu																										
Cost of Fisheries FAD Officers		-	-	29,000	29,000	29,000	29,000	29,000	29,000	29,000	29,000	29,000	29,000	29,000	29,000	29,000	29,000	29,000	29,000	29,000	29,000	29,000	29,000	29,000	29,000	29,000
FAD replacement costs	3-year	-	-	-							130,474	134,728	142,093	146,442	150,792	155,142	159,492	167,427	171,872	176,317	180,762	185,207	193,714	198,254	202,794	207,335
Bycatch recurent costs																										
AWS recurrent costs											290,000	290,000	290,000	290,000	290,000	290,000	290,000	290,000	290,000	290,000	290,000	290,000	290,000	290,000	290,000	290,000
TOTAL Recurrent Costs	USD	**-**	**-**	**29,000**	**29,000**	**29,000**	**29,000**	**29,000**	**29,000**	**29,000**	**449,474**	**453,728**	**461,093**	**465,442**	**469,792**	**474,142**	**478,492**	**486,427**	**490,872**	**495,317**	**499,762**	**504,207**	**512,714**	**517,254**	**521,794**	**526,335**
FSM																										
Cost of Fisheries FAD Officers		-	-	18,800	18,800	18,800	18,800	18,800	18,800	18,800	18,800	18,800	18,800	18,800	18,800	18,800	18,800	18,800	18,800	18,800	18,800	18,800	18,800	18,800	18,800	18,800
FAD replacement costs	3-year	-	-	-							89,243	91,271	95,360	97,433	99,506	101,579	103,652	108,010	110,128	112,246	114,363	116,481	121,108	123,270	125,433	127,596
Bycatch recurent costs											15,000	15,000	15,000	15,000	15,000	15,000	15,000	15,000	15,000	15,000	15,000	15,000	15,000	15,000	15,000	15,000
AWS recurrent costs											290,000	290,000	290,000	290,000	290,000	290,000	290,000	290,000	290,000	290,000	290,000	290,000	290,000	290,000	290,000	290,000
TOTAL Recurrent Costs	USD	**-**	**-**	**18,800**	**18,800**	**18,800**	**18,800**	**18,800**	**18,800**	**18,800**	**413,043**	**415,071**	**419,160**	**421,233**	**423,306**	**425,379**	**427,452**	**431,810**	**433,928**	**436,046**	**438,163**	**440,281**	**444,908**	**447,070**	**449,233**	**451,396**
Kiribati																										
Cost of Fisheries FAD Officers		-	-	21,300	21,300	21,300	21,300	21,300	21,300	21,300	21,300	21,300	21,300	21,300	21,300	21,300	21,300	21,300	21,300	21,300	21,300	21,300	21,300	21,300	21,300	21,300
FAD replacement costs	3-year	-	-	-							119,853	122,577	128,563	131,358	134,153	136,948	139,743	146,155	149,021	151,887	154,753	157,618	164,456	167,393	170,330	173,267
Bycatch recurent costs											15,000	15,000	15,000	15,000	15,000	15,000	15,000	15,000	15,000	15,000	15,000	15,000	15,000	15,000	15,000	15,000
AWS recurrent costs											290,000	290,000	290,000	290,000	290,000	290,000	290,000	290,000	290,000	290,000	290,000	290,000	290,000	290,000	290,000	290,000
TOTAL Recurrent Costs	USD	**-**	**-**	**21,300**	**21,300**	**21,300**	**21,300**	**21,300**	**21,300**	**21,300**	**446,153**	**448,877**	**454,863**	**457,658**	**460,453**	**463,248**	**466,043**	**472,455**	**475,321**	**478,187**	**481,053**	**483,918**	**490,756**	**493,693**	**496,630**	**499,567**

Country		Yr 1	Yr 2	Yr 3	Yr 4	Yr 5	Yr 6	Yr 7	Yr 8	Yr 9	Yr 10	Yr 11	Yr 12	Yr 13	Yr 14	Yr 15	Yr 16	Yr 17	Yr 18	Yr 19	Yr 20	Yr 21	Yr 22	Yr 23	Yr 24	Yr 25
Marshalls																										
Cost of Fisheries FAD Officers		-	-	21,300	21,300	21,300	21,300	21,300	21,300	21,300	21,300	21,300	21,300	21,300	21,300	21,300	21,300	21,300	21,300	21,300	21,300	21,300	21,300	21,300	21,300	21,300
FAD replacement costs	3-year	-	-								113,563	116,144	121,043	123,675	126,306	128,937	131,569	136,771	139,452	142,134	144,816	147,498	153,002	155,734	158,466	161,198
Bycatch recurent costs											15,000	15,000	15,000	15,000	15,000	15,000	15,000	15,000	15,000	15,000	15,000	15,000	15,000	15,000	15,000	15,000
AWS recurrent costs											290,000	290,000	290,000	290,000	290,000	290,000	290,000	290,000	290,000	290,000	290,000	290,000	290,000	290,000	290,000	290,000
TOTAL Recurrent Costs	USD	**-**	**-**	**21,300**	**21,300**	**21,300**	**21,300**	**21,300**	**21,300**	**21,300**	**439,863**	**442,444**	**447,343**	**449,975**	**452,606**	**455,237**	**457,869**	**463,071**	**465,752**	**468,434**	**471,116**	**473,798**	**479,302**	**482,034**	**484,766**	**487,498**
Nauru																										
Cost of Fisheries FAD Officers		-	-	25,600	25,600	25,600	25,600	25,600	25,600	25,600	25,600	25,600	25,600	25,600	25,600	25,600	25,600	25,600	25,600	25,600	25,600	25,600	25,600	25,600	25,600	25,600
FAD replacement costs	3-year	-	-	-							39,092	39,092	39,988	39,988	39,988	39,988	39,988	40,884	40,884	40,884	40,884	40,884	41,780	41,780	41,780	41,780
Bycatch recurent costs																										
AWS recurrent costs											290,000	290,000	290,000	290,000	290,000	290,000	290,000	290,000	290,000	290,000	290,000	290,000	290,000	290,000	290,000	290,000
TOTAL Recurrent Costs	USD	**-**	**-**	**25,600**	**25,600**	**25,600**	**25,600**	**25,600**	**25,600**	**25,600**	**354,692**	**354,692**	**355,588**	**355,588**	**355,588**	**355,588**	**355,588**	**356,484**	**356,484**	**356,484**	**356,484**	**356,484**	**357,380**	**357,380**	**357,380**	**357,380**
Palau																										
Cost of Fisheries FAD Officers		-	-	52,000	52,000	52,000	52,000	52,000	52,000	52,000	52,000	52,000	52,000	52,000	52,000	52,000	52,000	52,000	52,000	52,000	52,000	52,000	52,000	52,000	52,000	52,000
FAD replacement costs	3-year	-	-	-	-						59,301	60,007	61,997	62,718	63,439	64,160	64,881	66,961	67,697	68,433	69,168	69,904	72,074	72,824	73,575	74,326
Bycatch recurent costs																										
AWS recurrent costs											290,000	290,000	290,000	290,000	290,000	290,000	290,000	290,000	290,000	290,000	290,000	290,000	290,000	290,000	290,000	290,000
TOTAL Recurrent Costs	USD	**-**	**-**	**52,000**	**52,000**	**52,000**	**52,000**	**52,000**	**52,000**	**52,000**	**401,301**	**402,007**	**403,997**	**404,718**	**405,439**	**406,160**	**406,881**	**408,961**	**409,697**	**410,433**	**411,168**	**411,904**	**414,074**	**414,824**	**415,575**	**416,326**
Cook Islands																										
Cost of Fisheries FAD Officers		-	-	32,100	32,100	32,100	32,100	32,100	32,100	32,100	32,100	32,100	32,100	32,100	32,100	32,100	32,100	32,100	32,100	32,100	32,100	32,100	32,100	32,100	32,100	32,100
FAD replacement costs	3-year	-	-	-							66,829	67,624	70,025	70,839	71,654	72,468	73,282	75,795	76,628	77,461	78,294	79,127	81,752	82,603	83,455	84,306
Bycatch recurent costs																										
AWS recurrent costs											290,000	290,000	290,000	290,000	290,000	290,000	290,000	290,000	290,000	290,000	290,000	290,000	290,000	290,000	290,000	290,000
TOTAL Recurrent Costs	USD	**-**	**-**	**32,100**	**32,100**	**32,100**	**32,100**	**32,100**	**32,100**	**32,100**	**388,929**	**389,724**	**392,125**	**392,939**	**393,754**	**394,568**	**395,382**	**397,895**	**398,728**	**399,561**	**400,394**	**401,227**	**403,852**	**404,703**	**405,555**	**406,406**
Niue																										
Cost of Fisheries FAD Officers		-	-	29,500	29,500	29,500	29,500	29,500	29,500	29,500	29,500	29,500	29,500	29,500	29,500	29,500	29,500	29,500	29,500	29,500	29,500	29,500	29,500	29,500	29,500	29,500
FAD replacement costs	3-year	-	-								38,842	38,842	39,887	39,887	39,887	39,887	39,887	40,933	40,933	40,933	40,933	40,933	41,978	41,978	41,978	41,978
Bycatch recurent costs																										
AWS recurrent costs											290,000	290,000	290,000	290,000	290,000	290,000	290,000	290,000	290,000	290,000	290,000	290,000	290,000	290,000	290,000	290,000
TOTAL Recurrent Costs	USD	**-**	**-**	**29,500**	**29,500**	**29,500**	**29,500**	**29,500**	**29,500**	**29,500**	**358,342**	**358,342**	**359,387**	**359,387**	**359,387**	**359,387**	**359,387**	**360,433**	**360,433**	**360,433**	**360,433**	**360,433**	**361,478**	**361,478**	**361,478**	**361,478**
Samoa																										
Cost of Fisheries FAD Officers		-	-	25,300	25,300	25,300	25,300	25,300	25,300	25,300	25,300	25,300	25,300	25,300	25,300	25,300	25,300	25,300	25,300	25,300	25,300	25,300	25,300	25,300	25,300	25,300
FAD replacement costs	3-year	-	-	-							63,149.5	63,901.3	66,097.8	66,866.4	67,635.0	68,403.6	69,172.2	71,469.5	72,254.9	73,040.3	73,825.7	74,611.1	77,009.2	77,811.4	78,613.6	79,415.8
Bycatch recurent costs																										
AWS recurrent costs											290,000	290,000	290,000	290,000	290,000	290,000	290,000	290,000	290,000	290,000	290,000	290,000	290,000	290,000	290,000	290,000
TOTAL Recurrent Costs	USD	**-**	**-**	**25,300**	**25,300**	**25,300**	**25,300**	**25,300**	**25,300**	**25,300**	**378,449**	**379,201**	**381,398**	**382,166**	**382,935**	**383,704**	**384,472**	**386,770**	**387,555**	**388,340**	**389,126**	**389,911**	**392,309**	**393,111**	**393,914**	**394,716**
Tonga																										
Cost of Fisheries FAD Officers		-	-	14,400	14,400	14,400	14,400	14,400	14,400	14,400	14,400	14,400	14,400	14,400	14,400	14,400	14,400	14,400	14,400	14,400	14,400	14,400	14,400	14,400	14,400	14,400
FAD replacement costs	3-year	-	-								68,623	70,182	73,459	75,056	76,653	78,250	79,847	83,348	84,982	86,617	88,251	89,885	93,610	95,282	96,953	98,625
Bycatch recurent costs																										
AWS recurrent costs											290,000	290,000	290,000	290,000	290,000	290,000	290,000	290,000	290,000	290,000	290,000	290,000	290,000	290,000	290,000	290,000
TOTAL Recurrent Costs	USD	**-**	**-**	**14,400**	**14,400**	**14,400**	**14,400**	**14,400**	**14,400**	**14,400**	**373,023**	**374,582**	**377,859**	**379,456**	**381,053**	**382,650**	**384,247**	**387,748**	**389,382**	**391,017**	**392,651**	**394,285**	**398,010**	**399,682**	**401,353**	**403,025**
Tuvalu																										
Cost of Fisheries FAD Officers		-	-	40,100	40,100	40,100	40,100	40,100	40,100	40,100	40,100	40,100	40,100	40,100	40,100	40,100	40,100	40,100	40,100	40,100	40,100	40,100	40,100	40,100	40,100	40,100
FAD replacement costs	3-year	-	-								51,248	51,858	53,592	54,215	54,838	55,461	56,084	57,897	58,533	59,169	59,805	60,441	62,332	62,981	63,631	64,280
Bycatch recurent costs											15,000	15,000	15,000	15,000	15,000	15,000	15,000	15,000	15,000	15,000	15,000	15,000	15,000	15,000	15,000	15,000
AWS recurrent costs											290,000	290,000	290,000	290,000	290,000	290,000	290,000	290,000	290,000	290,000	290,000	290,000	290,000	290,000	290,000	290,000
TOTAL Recurrent Costs	USD	**-**	**-**	**40,100**	**40,100**	**40,100**	**40,100**	**40,100**	**40,100**	**40,100**	**398,348**	**398,958**	**398,692**	**399,315**	**399,938**	**400,561**	**401,184**	**402,997**	**403,633**	**404,269**	**404,905**	**405,541**	**407,432**	**408,081**	**408,731**	**409,380**
SUMMARY																										
Cost of Fisheries FAD Officers		-	-	368,000	368,000	368,000	368,000	368,000	368,000	368,000	368,000	368,000	368,000	368,000	368,000	368,000	368,000	368,000	368,000	368,000	368,000	368,000	368,000	368,000	368,000	368,000
FAD replacement costs	3-year	-	-	-	-	-	-	-	-	-	1,208,390	1,237,724	1,270,430	1,299,649	1,328,869	1,358,088	1,387,307	1,448,700	1,478,584	1,508,468	1,538,351	1,568,235	1,633,616	1,664,164	1,694,712	1,725,260
Bycatch recurent costs				-							75,000	75,000	75,000	75,000	75,000	75,000	75,000	75,000	75,000	75,000	75,000	75,000	75,000	75,000	75,000	75,000
AWS recurrent costs				-							4,060,000	4,060,000	4,060,000	4,060,000	4,060,000	4,060,000	4,060,000	4,060,000	4,060,000	4,060,000	4,060,000	4,060,000	4,060,000	4,060,000	4,060,000	4,060,000
TOTAL Recurrent Costs	USD	**-**	**-**	**368,000**	**368,000**	**368,000**	**368,000**	**368,000**	**368,000**	**368,000**	**5,711,390**	**5,740,724**	**5,773,430**	**5,802,649**	**5,831,869**	**5,861,088**	**5,890,307**	**5,951,700**	**5,981,584**	**6,011,468**	**6,041,351**	**6,071,235**	**6,136,616**	**6,167,164**	**6,197,712**	**6,228,260**

Annual recurent costs for the AWS from year 9 is $4.045 million, an average of ~$290,000 per year for the 14 particiapting countries

Endnotes

[1] Bell, J. D., Allain, V., Allison, E.H., Andréfouët, S., Andrew, N.L., Batty, M.J., Blanc, M., Dambacher, J.M., Hampton, J. and Q. Hanich, Q. 2015. Diversifying the use of tuna to improve food security and public health in Pacific Island countries and territories. *Marine Policy* **51**: 584-591.

[2] Gillett R, and Fong M. 2023. Fisheries in the economies of Pacific Island countries and territories (Benefish Study 4). Noumea, New Caledonia: Pacific Community 704 p. https://purl.org/spc/digilib/doc/ppizh

[3] Gillett R, and Fong M. 2023. Fisheries in the economies of Pacific Island countries and territories (Benefish Study 4). Noumea, New Caledonia: Pacific Community 704 p. https://purl.org/spc/digilib/doc/ppizh

[4] Gillett R, and Fong M. 2023. Fisheries in the economies of Pacific Island countries and territories (Benefish Study 4). Noumea, New Caledonia: Pacific Community 704 p. https://purl.org/spc/digilib/doc/ppizh

[5] Brewer T., Kottage H., Andrew N. *in prep*. Options for supplying dietary protein for growing Pacific Island populations. Report prepared for the Pacific Community. 93 p. https://purl.org/spc/digilib/doc/4aszp

[6] Chapman L. *in prep*. Regional Report: Feasibility of scaling-up National Fish Aggregating Device (FAD) Programmes in all 14 participating countries. Technical Study prepared for the Pacific Community as a contribution to a funding proposal being prepared for submission to the Green Climate Fund (GCF). October 2023. Lindsay Chapman Consulting Pty Ltd, Brisbane, Australia. 92 p. https://purl.org/spc/digilib/doc/au6vm

[7] The Programme design includes activities to monitor catches from a sample of FADs to establish a baseline and provide more accurate information on the productivity of FADs

[8] The key objective of the project is to institutionalise the FAD program within the government's budgetary system to ensure that FADs are installed and maintained

[9] The recent market price of fresh tuna was provided by national fisheries staff in each country in March 2024.

[10] Chapman L. *in prep*. Regional Report: Feasibility of scaling-up National Fish Aggregating Device (FAD) Programmes in all 14 participating countries. Technical Study prepared for the Pacific Community as a contribution to a funding proposal being prepared for submission to the Green Climate Fund (GCF). October 2023. Lindsay Chapman Consulting Pty Ltd, Brisbane, Australia. 92 p. https://purl.org/spc/digilib/doc/au6vm

[11] Chapman L. *in prep*. Regional Report: Feasibility of scaling-up National Fish Aggregating Device (FAD) Programmes in all 14 participating countries. Technical Study prepared for the Pacific Community as a contribution to a funding proposal being prepared for submission to the Green Climate Fund (GCF). October 2023. Lindsay Chapman Consulting Pty Ltd, Brisbane, Australia. 92 p. https://purl.org/spc/digilib/doc/au6vm

[12] Chapman L. *in prep*. Regional Report: Feasibility of scaling-up National Fish Aggregating Device (FAD) Programmes in all 14 participating countries. Technical Study prepared for the Pacific Community as a contribution to a funding proposal being prepared for submission to the Green Climate Fund (GCF). October 2023. Lindsay Chapman Consulting Pty Ltd, Brisbane, Australia. 92 p. https://purl.org/spc/digilib/doc/au6vm

[13] Chapman L. *in prep*. Regional Report: Feasibility of scaling-up National Fish Aggregating Device (FAD) Programmes in all 14 participating countries. Technical Study prepared for the Pacific Community as a contribution to a funding proposal being prepared for submission to the Green Climate Fund (GCF). October 2023. Lindsay Chapman Consulting Pty Ltd, Brisbane, Australia. 92 p. https://purl.org/spc/digilib/doc/au6vm

[14] A recent paper produced by FAO in 2023 "The role of fish and other aquatic foods for nutrition and health in Pacific food systems" documents the role of the ocean ecosystem in the cultures, livelihoods, food and income of Pacific Islands nations. Available at https://digitalarchive.worldfishcenter.org/handle/20.500.12348/5545

[15] This is a summary of the results of the economic analysis of the FAD-related Programme activities for the individual countries. Details are in Appendix 3-A. The analysis uses the number of FADs funded by the Programme and allows for an increasing number of FADs over the 25-year project life. Costs are the direct costs of procuring and deploying FADs and replacement FADs and allow for the extra cost of Fisheries Officers involved with deploying FADs in each country.

[16] Bell, J.D. et al. 2009. Planning the use of fish for food security in the Pacific. Marine Policy 33, 64-76.

[17] A study of the benefits of fish aggregating devices in the Pacific by Michael Sharp and published by SPC in 2011 detailed the benefits of FADs and documented the results of a case study of FADs in Niue from 2001 to 2008 showed the positive improvement in CPUE from FAD fishing compared with open water with off-shore FADs having the greatest impact..

[18] A recent paper produced by FAO in 2023 "The role of fish and other aquatic foods for nutrition and health in Pacific food systems" documents the role of the ocean ecosystem in the cultures, livelihoods, food and income of Pacific Islands nations.
[19] MRAG Asian Pacific (21023). Existing and future needs and conditions for distributing bycatch to urban and peri-urban areas. Report prepared for the Pacific Community 49 p.
[20] MRAG Asia Pacific. *in prep*. Adapting tuna dependent Pacific Island communities and economies to climate change: Existing and future needs and conditions for distributing tuna bycatch to urban and peri-urban areas (GCF Study 5). Report prepared for the Pacific Community. 44 p. https://purl.org/spc/digilib/doc/5t6n9
[21] MRAG Asia Pacific. *in prep*. Adapting tuna dependent Pacific Island communities and economies to climate change: Existing and future needs and conditions for distributing tuna bycatch to urban and peri-urban areas (GCF Study 5). Report prepared for the Pacific Community. 44 p. https://purl.org/spc/digilib/doc/5t6n9
[22] The El Niño-Southern Oscillation (ENSO) is a recurring climate pattern involving changes in the temperature of waters in the central and eastern tropical Pacific Ocean. * Based on recommendations from WHO and SPC
**Based on 60% recovery of edible fish flesh per kg of fish live weight

[23] Bell, J.D. et al. 2019. Realising the benefits of canned fish for food security for Pacific Island countries. Marine Policy 100, 183-191.
[24] Cook Islands, FSM, Kiribati, Marshall Islands, Nauru, Palau, PNG, Solomon Islands and Tuvalu
[25]Bell, J.D., Senina, I., Adams, T., Aumont, O., Calmettes, B., Clark, S et al. 2021. Pathways to sustaining tuna-dependent Pacific Island economies during climate change. *Nature Sustainability* 4, 900-910.
[26] Ruaia, T., Gu'urau, S. and Wheatley, L. 2023. Economic and Development Indicators and Statistics: Tuna Fisheries of the Western and Central Pacific Ocean 2022. Pacific Islands Forum Fisheries Agency, Honiara, Solomon Islands. 74 pages.
[27] Ruaia, T., Steve Gu'urau, S. and Reid, C. 2020. Economic and Development Indicators and Statistics: Tuna Fisheries of the Western and Central Pacific Ocean 2020. Pacific Islands Forum Fisheries Agency, Honiara, Solomon Islands

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