Annex 23

Expected beneficiaries and benefits of the GCF regional tuna programme

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1. Background

The purpose of this annex to the GCF Funding Proposal 'Adapting tuna-dependent Pacific Island communities and economies to climate change' is to:

- Specify the number of direct beneficiaries of the GCF Regional Tuna Programme in each participating country, i.e., those people who will benefit from the activities to be implemented under Component A of the Programme: 'Adaptations to harness tuna to improve nutritious food availability of Pacific Island communities as coral reefs are degraded by climate change';
- Calculate the number of indirect beneficiaries of the Programme from improved meteorological information under Component A of the Programme; and
- Quantify the level of nutritional benefit to be received by people within the target direct beneficiary population in each country through increasing access to tuna and other large pelagic fish (hereafter 'tuna') by strengthening national FAD programmes and improving the distribution of bycatch under Component A of the Programme.

2. Beneficiaries of Component A activities

2.1 Number of direct beneficiaries from strengthening national FAD programmes

The number of people expected to benefit directly from strengthening the FAD programme in each participating country was discussed and identified in consultation with national fisheries agencies.[1] During these discussions, national staff identified how many FADs should be installed and regularly maintained/replaced in their countries by 2030, and the priority locations for these FADs. This information was used in combination with other considerations to estimate the number of beneficiaries, using the following inputs:

1. length of coastline to be covered by the requested number of FADs to be deployed, based on SPC's recommendation that FADs are spaced 5-10 km apart;
2. percentage of the coastline of the district/province/country where FADs will be installed;
3. number of people living in the district/province/country recorded in the latest census;
4. number of people living within the percentage of the district/province/country provided with FADs according to the latest census adjusted to 2030;
5. quantity of fish likely to be caught around each FAD to determine the level of benefit per person.

The numbers of people expected to benefit directly from the increased supply of tuna[2] caught from FADs in 2030 determined through points 1-5 above, and the location(s) of these beneficiaries within each country, are given in Table 1.

[1] Technical Study 3 https://fame1.spc.int/technical-studies-support-funding-proposal-green-climate-fund-regional-tuna-programme

[2] 'Tuna' is defined here to also include 'tuna-like' species

These direct beneficiaries typically live within 1 km of the coast and ranged from 100% of the population in the smaller countries (Nauru, Niue, Tuvalu), to ~20% -30% of the population of a subset of districts/ provinces in the larger countries (Fiji, Papua New Guinea, Solomon Islands, Vanuatu).

Across the region, **~560,000 people** are expected to have improved access to tuna by 2030 as a result of the investments to be made in strengthening national FAD programmes to assist small-scale fishers to catch tuna (Table 1).

Table 1. Estimated number of direct beneficiaries of FAD-caught fish in 2030, and the location of these beneficiaries, in each country.

Country	Direct Beneficiaries		Location of beneficiaries and percentage of population in target area expected to benefit
	Census*	2030**	
Melanesia			
Fiji	69,642	72,483	Rewa, Serua and Namosi districts (30% each) and Kadavu, Lau and Lomaiviti districts (80% each)
PNG	79,000	91,834	Manus and Bougainville Provinces (20% each)
Solomon Is	50,749	62,752	Temotu Province (90%) Guadalcanal Province (20%)
Vanuatu	60,139	66,850	Shefa & Tafea Provinces (50% each) Port Vila (20%)
Micronesia			
FSM*	38,400	38,588	Pohnpei and Yap States (80%)
Kiribati	70,302	81,778	South Tarawa (40%) and other Gilbert Islands (100%)
Marshall Is	21,209	26,993	National population (50%)
Nauru	11,550	12,539	National population (100%)
Palau	8,660	8,815	14 States (50% each)
Polynesia			
Cook Is	8,489	8,792	Rarotonga (50%) and 5 southern Cook Islands (100%)
Niue	1,720	1,393	National population (100%)
Samoa	41,111	41,874	National population (20%)
Tonga	33,940	32,950	Tongatapu, Eua and Ha'apai (40%)
Tuvalu	10,645	11,250	National population (100%)
TOTAL	**494,911**	**558,890**	

*Derived from latest census (see Appendix 1); ** See Appendix 1 for method used to estimate the number of people in the target population in 2030

2.2. Monitoring direct beneficiaries from additional FAD-caught fish

There are few practical ways to track exactly which individuals within the target population in each country consume the additional fish meals expected to be produced from FADs deployed by the Programme. This is due to the remote areas where FADs will be deployed in many countries, poor internet connectivity in many of these places, and the high costs associated with independent household surveys across all participating countries.

Based on discussions with national fisheries agencies, and high levels of national per capita fish consumption[3], fish caught around FADs are expected to be well distributed and consumed across the target geography. This is supported by the fact that FADs are placed ~10 km apart so that they each attract good numbers of fish, the policies of the national fisheries agencies which ensure that FADs are for the benefit of all citizens in the target populations, and evidence that fish caught from FADs are both eaten in communities directly adjacent to FADs and distributed to small markets along the coast.

In addition, information from the Household Income and Expenditure Surveys (HIES) in each country reinforces that the fish will be consumed relatively evenly by the intended beneficiaries.[4,5] By definition, HIES are done at the household level in a way that represents the per capita acquisition of fish nationwide. (The information in Table 4, which uses data from the most recent HIES from 10 of the 14 participating countries, also shows that tuna are consumed across the region.)

There will undoubtedly be variation in tuna consumption among households, but it is reasonable to assume that most if not all individuals in the target populations will continue to eat fish, and that the additional fish meals from FADs will make the intended contribution to local food availability.

With deployment of the projected total number of FADs (333) during the Programme (as shown in Table 3 below), the full number of direct beneficiaries in each country is expected to be reached. The Programme will also assume that the number of individuals benefitting is proportional to the number of FADs deployed, e.g., if 50% of the planned FADs for a given country are operational, 50% of the beneficiary population in that country will be reached.

It is important to note that where some FADs yield less fish, e.g., 5 tonnes (t) per year, than others (e.g., 10 t), this will not affect the number of beneficiaries from strengthening national FAD programmes. Rather, as described in Section 2.3 below, lower catch rates will affect the level of benefit.

2.3 Level of benefit for beneficiaries of strengthened national FAD programmes

Determining the level of benefit per person for the target population in each country requires alternative methods to those described in the Concept Note[6]. During development of the Funding Proposal, it became apparent that utilizing HIES data, as proposed in the Concept Note, would not be suitable for ongoing measurement of access to tuna for domestic consumption through strengthening national FAD programmes.

HIES data were originally proposed for measuring the impact of increasing the number of FADs in each country because these data have been used widely throughout the region to document the

[3] Technical Study 2 https://fame1.spc.int/technical-studies-support-funding-proposal-green-climate-fund-regional-tuna-programme

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

[5] Sharp, M.K. and Andrew, N.L. (2024). Aquatic food consumption in the Pacific region. Food Systems Brief No. 22. Pacific Community.

[6] https://www.greenclimate.fund/document/adapting-tuna-dependent-pacific-island-communities-and-economies-climate-change

heavy dependence of Pacific Island people on fish for nutritious food availability, measured in kg of fish consumed per person per year.[7,8,9] However, although the Pacific Community (SPC) has assisted national offices of statistics/planning/finance and economic planning in the participating countries to incorporate questions on tuna consumption in HIES since 2012, there is no guarantee that these surveys will be suitable for measuring the level of benefit per person delivered by strengthened national FAD programmes. The reason for this is that although HIES are typically conducted every 5 to 10 years, depending on the country, there is no certainty that these surveys will:

i) be done again towards the beginning and end of the 7-year implementation period of the Programme in most countries;

ii) provide good coverage of the populations targeted by the Programme in each country; or

iii) generate the type of information necessary to assess changes in tuna consumption as a result of Component A of the Programme with confidence, i.e., HIES are unlikely to record whether the tuna consumed were caught around FADs.

There is also the problem that the two largest countries participating in the Programme, Papua New Guinea (PNG) and Fiji, have currently dis-continued the use of HIES.

Consequently, the Programme partners developed an alternative way of quantifying how much additional tuna is delivered for local consumption by strengthening national FAD programmes. This method is based on a) estimating the average annual catch of tuna from a FAD, and b) combining this information with the number of FADs to be deployed by the Programme in the country towards the end of the implementation period to calculate the total amount of tuna provided by FAD infrastructure installed for the benefit of the target populations. The estimated quantity of tuna is then converted into the number of fish meals supplied by FADs potentially available to each person in the target population per month. As explained below, the number of nutritious fish meals available per person per month is based on portions of 150 g, the typical ~60% recovery of fish flesh per kg from tuna, and the fact that tuna is ~23% protein.[10]

A tuna meal of 150 g, although smaller than the fish meals traditionally consumed in many Pacific Island countries, is of important nutritional value for the following reasons. A comprehensive study conducted by the World Health Organisation (WHO) recommends that daily protein intake for good nutrition should be 0.7 g of protein per kg of body weight per day, derived from a variety of sources to prevent micronutrient deficiencies.[11] Given the traditional reliance on fish for food and the limited

[7] Bell, J., Bright, P., Gillett, R., Keeble, G., Kronen, M., Passfield, K. and Ryan, C. 2008. Importance of household income and expenditure surveys and censuses for management of coastal and freshwater fisheries. *Secretariat of the Pacific Community Fisheries Newsletter*, *127*, pp.34-39.

[8] Gillett, R. (2016). Fisheries in the economies of Pacific Island countries and territories. Pacific Community, Forum Fisheries Agency, and Australian AID.

[9] Gillett, R. and Fong, M. (2023). Fisheries in the economies of Pacific Islands countries and territories (Benefish Study 4). Pacific Community.

[10] Technical Study 2 https://fame1.spc.int/technical-studies-support-funding-proposal-green-climate-fund-regional-tuna-programme

[11] WHO (2007). Protein and Amino Acid Requirements in Human Nutrition. Report of a Joint WHO/FAO/UNU Expert Consultation. WHO Technical Report Series 935.

additional options for dietary protein, the SPC Public Health Division has recommended that fish should be used to provide 50% of the dietary protein requirement in the Pacific Island region.[12]

On this basis, a tuna meal of 150 g (@23% protein) will provide 34.5 g of protein, equivalent to 50% of the daily protein requirement of 0.7 g per kg of body weight for an adult of 98.6 kg. The average weights of men (85 kg) and women (81 kg) in the Pacific Island region (Appendix 2) are well below this level, so a 150 g tuna meal is expected to meet SPC's recommendations for the overwhelming majority of people in the region.

Using this approach, the number of fish meals expected to be available per person from the FADs deployed in each country in 2030 can be estimated by multiplying the total annual catch (kg) from all FADs by 4 to obtain the total number of meals of 150 g produced per year (based on 60% recovery of edible fish flesh per kg, i.e., 4 x 150 g meals per kg of fish live weight). The total number of 150 g meals can then be divided by the number of people in the target population in 2030 (Table 1) to estimate the number of meals per person per year, and dividing again by 12 to estimate the number of meals per person per month, i.e.,

Fish meals per person per month = [total annual FAD catch (kg) x 4/Target population]/12

For example, if the 40 FADs to be deployed in Fiji have an average annual catch per FAD of 10 mt, the total tuna catch is 400,000 kg and the total number of fish meals per year is 1,600,000. The number of fish meals per person per year for the target population in 2030 is 1,600,000 divided by of 72,483 (Table 1) = 22.1, and the number of fish meals per adult per month is 1.8.

A more nuanced way of estimating the number of meals potentially available per person per month for the target population in each country incorporates the protein needs of children, which comprise approximately a third of the population across the region (Appendix 3). A tuna meal of 150 g is expected to meet 50% of the average protein requirements of two children in the range of 5-18 years in the majority of Pacific Island countries (Appendix 4), and when children less than 5 years old are included, 150 g of tuna will provide the average recommended daily protein intake for two children in every country. In general terms, the number of meals available from FADs can be multiplied by 1.33, because every third meal of 150 g can be used to provide two children with a meal of 75g.

Fish meals per person per month = [[total annual FAD catch (kg) x 4/Target population]/12] x 1.33

A barrier to calculating the level of benefit (number of fish meals per person per month) is that data on the average annual catches from FADs are limited across the region (Table 2). **To address this lack of data, the Programme will design and execute robust monitoring of catches throughout the year from a representative subset of FADs in each country during the first three full years of the Programme**. Provided interpretation of the monitoring data also takes account of any other factors that may have influenced the catch of tuna associated with FADs, the average annual catch per FAD can be used to estimate the total catch from all FADs in the country and, thereby, the total number of tuna meals provided for the target population of men, women and children per month (as described above).

[12] SPC (2008). Fish and food security. Policy Brief 1/2008. Secretariat of the Pacific Community, Noumea.

To provide an indicative quantity of additional fish meals available through increasing the number of FADs available to supply tuna for the target population, estimated catches from a FAD in the range of **5 to 10 tonnes per year** are used (based on the catch rates presented in **Table 2**). This range was confirmed through available data and consultation with a former Master Fishermen employed by SPC to develop national FAD programmes (Appendix 5). Please note that considerable variation is expected in annual catches from a FAD both within and among countries and the estimates of the number of additional tuna meals made available for the target beneficiaries presented here must be considered as indicative until collection of comprehensive data on the average annual catch per FAD is completed during implementation of the Programme.

Based on the use of average annual FAD catches in the range of 5-10 tonnes per year, and the ~330 FADs to be deployed across all participating countries (derived from the analyses done for Technical Study 3 in Annex 26)[13], strengthening the 14 national FAD programmes could deliver up to **13.3 million 150 g tuna meals** across the region per year (**Table 3**). This increases to **17.8 million** when one third of the 150 g meals are used to provide two 75 g meals for a child.

Importantly, for five of the smaller Pacific Island countries (Cook Islands, Nauru, Niue, Palau and Tuvalu), strengthening the national FAD programme could deliver up to 3-8 fish meals per person per month (and 4-10 meals when two 75 g meals are provided for a child) for the entire population or a target population that represents a significant proportion of the total population (**Table 3**). Note that a much higher number of meals per month could be available for Niue, given that only ~1400 people are predicted to be living there by 2030, and where the number of FADs to be deployed also caters for supporting livelihoods based on fishing opportunities for tourists.

For the larger countries (PNG, Fiji, Solomon Islands and Vanuatu), Component A of the Programme needs to be managed at the provincial level because it is not possible to scale-up the number of FADs throughout all areas of the country to meet the needs of coastal communities nationwide with the resources expected to be available via the Programme. Given the relatively large population at the provincial level in these Melanesian countries, strengthening national FAD programmes is estimated to provide an average of only up to 1-2 tuna meals per person per month for the target populations in the provinces selected for support by the national fisheries agencies in these countries (**Table 3**). This is also the case for the remaining countries (FSM, Kiribati, Marshall Islands, Samoa and Tonga), where it is not practical to target the majority of the entire national population during the Programme.

[13] Technical Study 3 https://fame1.spc.int/technical-studies-support-funding-proposal-green-climate-fund-regional-tuna-programme

Table 2. Estimates of the average annual catch of tuna in kg around anchored FADs in Pacific Island countries and territories during the past 20 years (source: studies summarized in Bell et al. 2015[14], and Mainui Tanetoa for French Polynesia).

Country/ Territory	Year	Location of FADs and catch in kg				Number of FADs	Average catch per FAD (kg)
		Offshore	Inshore	Midwater	Total		
Niue	2002	6,986	2,181	881	10,048	8	1,256
	2003	12,365	1,651	1,729	15,745	8	1,968
	Average	**9,676**	**1,916**	**1,305**	**12,897**	**8**	**1,612**
Cook Is (Rarotonga)	2002	10,809	433	2,127	13,369	4	3,342
	2003	18,807	1,761	1,823	22,391	4	5,598
	Average	**14,808**	**1,097**	**1,975**	**17,880**	**4**	**4,470**
FSM (Yap)	2013		12,806		12,806	4	**3,202**
Solomon Is	2012		11,160		11,160	4	**2,790**
Nauru	2008	,	12,334		20,394	5	**4,079**
French Polynesia	2011	108,500				10	10,850
	2012	157,000				8	19,625
	2013	113,700				13	8,746
	2014	199,900				13	15,377
	2015	89,200				10	8,920
	Average	**133,660**				**10.8**	**12,704**

There are, however, good prospects for increasing the number of fish meals per person per month in several countries by harmonising the proposed FAD-related activities in the GCF Programme with the World Bank's Pacific Islands Regional Oceanscape Program (PROP) plans to strengthen national FAD programmes. The second phase of PROP (known as PROPER) is now underway and involves many of the 14 countries participating in the GCF Programme. PROPER is expected to be active throughout much of the implementation phase of the GCF Programme and preliminary talks with the World Bank PROPER team on a collaborative approach have been promising. A collaboration between the two programmes to promote synergies and avoid duplication will enable more provinces in the larger countries to receive FADs, and the number of FADs for some provinces proposed under the GCF Programme may be increased through investments by the World Bank where this is a national priority.

[14] Bell, J.D., Albert, J., Andréfouët, S., Andrew, N.L., Blanc, M., Bright, P., Brogan, D., Campbell, B., Govan, H., Hampton, J. and Hanich, Q. 2015. Optimising the use of nearshore fish aggregating devices for food security in the Pacific Islands. *Marine Policy 56*, 98-105 (see Supplementary Table 3).

Table 3. Projected number of tuna meals per person to be provided in 2030 by strengthening national FAD programmes, assuming that average FAD catches are 5 to 10 tonnes (t) per year.

Country	Direct Beneficiaries in 2030	No. of FADs	No. of tuna meals year^{-1}*		No. tuna meals person^{-1} year^{-1}*		No. tuna meals person^{-1} month^{-1}*	
			@5 t per FAD year^{-1}	@10 t per FAD year^{-1}	@5 t per FAD year^{-1}	@10 t per FAD year^{-1}	@5 t per FAD year^{-1}	@10 t per FAD year^{-1}
Melanesia								
Fiji	72,483[a]	40	800,000	1,600,000	11.0	22.1	0.9	1.8
PNG	91,834[b]	36	720,000	1,440,000	7.8	15.7	0.7	1.3
Solomon Is	62,752[c]	20	400,000	800,000	6.4	12.7	0.5	1.1
Vanuatu	66,850[d]	34	680,000	1,360,000	10.2	20.3	0.8	1.7
Micronesia								
FSM	38,588[e]	24	480,000	960,000	12.4	24.9	1.0	2.1
Kiribati	81,778[f]	38	760,000	1,520,000	9.3	18.6	0.8	1.5
Marshall Is	26,993[g]	27	540,000	1,080,000	20.0	40.0	1.7	3.3
Nauru	12,539[h]	12	240,000	480,000	19.1	38.3	1.6	3.2
Palau	8,815[i]	16	320,000	640,000	36.3	72.6	3.0	6.1
Polynesia								
Cook Is	8,792[j]	20	400,000	800,000	45.5	91.0	3.8	7.6
Niue	1,700[k]	14	280,000	560,000	164.7	329.4	13.7	27.5
Samoa	41,874[l]	18	360,000	720,000	8.6	17.2	0.7	1.4
Tonga	32,950[m]	20	400,000	800,000	12.1	24.3	1.0	2.0
Tuvalu	11,250[n]	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**

*Based on four meals of 150 g per kg of tuna, based on a recovery rate of fish flesh of ~60%; **Multiplied by 1.33 for the number of fish meals based on providing Children < 14 years with a tuna meal of 75 g; a. 30% of the population in Rewa, Serua and Namosi districts and 80% of the population in Kadavu, Lau and Lomaiviti districts; b. 20% of the population of Manus and Bougainville provinces; c. 90% of the population of the Temotu Province and 20% of the population of Guadalcanal Province; d. 50% the population of Shefa and Tafea provinces and 20% of the population of Port Vila; e. 80% of the population in Pohnpei State and 80% of the population in Yap State; f. 40% of the population of South Tarawa and all of the population in the other 16 inhabited Gilbert Islands Group islands; g. 50% of the population of the Marshall Islands; h. 100% of the population of Nauru; i. 50% of the population for 14 States; j. 50% of the population of Rarotonga and the full population of the other five inhabited islands in southern Cook Islands; k. 100% of the population of Niue in 2024, not 2030 l. 20% of the population for Samoa; m. 40% of the population for Tongatapu, Eua and Ha'apai; n. 100% of the population for Tuvalu.

2.3.1 Increases in fish protein

Based on the number of 150 g meals per person per year available to the target populations in the 10 participating countries where dietary information is available,[15] average catches of 10 tonnes per FAD per year would increase the fish protein in the diet by an average of **75% per person per year** (Table 4). At an average annual catch per FAD of 5 tonnes, the amount of the fish protein in the diet would increase by **38% per person per year** (Table 4).

2.4 Number of direct beneficiaries from improving distribution of bycatch

The number of people expected to benefit directly from improving the distribution of bycatch in the regional ports (urban centres) where transhipping occurs is summarised in Table 5.[16] It is important to note that the Programme will not work in PNG to improve the distribution of bycatch and tuna offloaded from purse-seine vessels because the proposed activity is not requested there for two reasons:

1) bycatch landed during delivery of tuna caught by purse-seine vessels for canning at Lae, Madang and Wewak is already fully utilised; and

2) an average of ca. 1,500 tonnes of bycatch and tuna comes ashore from transhipping operations in Rabaul each year, which can already provide ample tuna for the 10,000 people living there.[17]

There are considerable impracticalities involved in measurement and monitoring of which individuals within the target population consume additional fish meals as a result of Programme activities to increase the supply of bycatch. For the two countries where most bycatch from purse-seine vessels is currently offloaded, and which have the largest targeted urban populations, i.e., Solomon Islands and Kiribati (Table 5), there is evidence (from HIES surveys) that the entire urban population currently consumes offloaded bycatch, but the quantity is insufficient for good nutrition (see Annex 26, Study 5 and Study 2)[18] and this gap in fish supply will become larger with projected growth in urban and peri-urban populations.

The Programme seeks to increase the available supply of offloaded fish **by approximately 50%, thereby benefitting the entire urban / peri-urban populations** of the target country as indicated in Table 5. By increasing availability of offloaded fish, improving processing, and reducing wastage, the Programme will increase the number of fish meals available to these populations, with the level of benefit increasing over the course of Programme implementation.

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[15] Technical Study 2 https://fame1.spc.int/technical-studies-support-funding-proposal-green-climate-fund-regional-tuna-programme

[16] Bycatch is comprised of the small or damaged tuna not accepted by canneries for processing and other tuna-like species caught during purse-seine fishing, e.g., rainbow runner and mahi mahi.

[17] Technical Study 5 https://fame1.spc.int/technical-studies-support-funding-proposal-green-climate-fund-regional-tuna-programme

[18] Technical Study 5 and Technical Study 2 https://fame1.spc.int/technical-studies-support-funding-proposal-green-climate-fund-regional-tuna-programme

To measure this level of benefit, the Programme will monitor transhipment and offloading rates through reports from existing national and regional observers on fishing vessels. The level of benefit for individual beneficiaries will then be calculated by the methods described in section 2.5 below.

Please note that the total quantity of bycatch unloaded will affect the level of benefit for beneficiaries, not the total number of beneficiaries. Over the course of implementation, the Programme will report on the populations with improved access to bycatch as well as the level of benefit (quantity of bycatch available) to those populations.

It is important to note that the Programme's ambitious plans to increase the distribution of bycatch from purse-seine transhipping operations by 50% by the end of the implementation period fall well short of demand in most countries (see Table 11 below). However, it is evident that the additional fish will be used by the target urban populations and not sent to other markets – bycatch is of low value and therefore unlikely to be transported to other destinations.

Table 4. Projected increase in availability of additional fish protein (kg per person per year) derived from tuna caught at the rate of 10 tonnes (t) and 5 t per FAD per year. (Note that data for all participating countries were not available for this analysis)

Protein consumption	Country										
	Cook Is	FSM	Kiribati	Marshall Is	Palau	Samoa	Solomon Is	Tonga	Tuvalu	Vanuatu	Average
Present consumption											
Tuna protein kg person^{-1} y^{-1*}	3.71	2.37	2.05	0.78	0.83	0.16	1.42	0.27	5.16	0.34	1.7
Total protein kg person^{-1} y^{-1}	38.3	37.0	29.4	45.8	33.3	26.7	26.0	30.8	36.9	25.2	32.9
% tuna in total protein	9.7	6.4	7.0	1.7	2.5	0.6	5.5	0.9	14.0	1.3	5.2
@10 t per FAD per year											
No. tuna meals	91	25	19	40	73	17	13	24	50	20	37
Protein from new meals (kg)	3.14	0.86	0.66	1.38	2.52	0.59	0.45	0.83	1.73	0.69	1.28
% protein increase from tuna	85	36	32	177	303	367	32	307	33	203	75
Tuna protein kg person^{-1} y^{-1}	6.85	3.23	2.71	2.16	3.35	0.75	1.87	1.10	6.89	1.03	2.99
Total protein kg person^{-1} y^{-1}	41.46	37.82	30.10	47.19	35.78	27.33	26.46	31.65	38.64	25.89	34.23
% tuna in total protein	16.5	8.5	9.0	4.6	9.4	2.7	7.1	3.5	17.8	4.0	8.3
@5 t per FAD per year											
No. tuna meals	46	13	10	20	37	9	7	12	25	10	19
Protein from new meals (kg)	1.57	0.43	0.33	0.69	1.26	0.29	0.22	0.41	0.86	0.35	0.64
% protein increase from tuna	42	18	16	88	152	183	16	153	17	101	38
Tuna protein kg person^{-1} y^{-1}	5.28	2.80	2.38	1.47	2.09	0.45	1.64	0.68	6.02	0.69	2.35
Total protein kg person^{-1} y^{-1}	39.89	37.39	29.77	46.50	34.52	27.03	26.23	31.23	37.77	25.55	33.59
% tuna in total protein	13.2	7.5	8.0	3.2	6.1	1.7	6.3	2.2	15.9	2.7	6.7

*Derived from national Household Income and Expenditure Surveys as described in Technical Study 2.

Table 5. Projected number of direct beneficiaries and level of benefit (fish meals per person per month) to be provided in 2030 by improving distribution of bycatch from purse-seine transhipping operations in regional ports. Papua New Guinea has not been included in this analysis (see text).

Country	Direct Beneficiaries 2030	Bycatch landings (tonnes) 2023*	Bycatch landings (tonnes) 2030**	No. tuna meals/ year	No. tuna meals/ person/ year	No. tuna meals/ person/ month
FSM	10,000	135	203	810,000	81.0	6.8
Kiribati	74,000	386	579	2,316,000	31.3	2.6
Marshall Is	29,000	77	116	462,000	15.9	1.3
Solomon Is	169,000	1,036	1,554	6,216,000	36.8	3.1
Tuvalu	7,000	4.4	7	26,400	3.8	0.3
TOTAL	**289,000**	1,638.4	2,458	9,830,400	34.0	2.8
Total additional fish meals (with 2 x 75 g meals per child)* **				**13,100,000**	**45.3**	**3.8**

*Based on information in Annex 26,Technical Study 5; **Assumes that the GCF Programme will increase the use of bycatch and tuna from purse-seine transhipping operations by 50% by 2030; *** Based on children <14 years old comprising an average of approximately one third of the population.

2.5 Level of benefit for beneficiaries of improved distribution of bycatch

Although estimates are available for the present-day quantities of bycatch landed in transhipping ports, there is considerable uncertainty about the percentage of fish that contributes to nutritious food availability. This is because some of the fish that comes ashore has been left on the deck of purse-seine vessels in the sun for many hours during sorting, and some is handled under poor sanitary conditions during sale at marketplaces (Figure 1), making it unfit for human consumption. Such fish is only suitable for producing animal feed or crop fertilizer. Due to the unknown, but potentially significant, percentage of bycatch that is wasted, it is not possible to establish a baseline for the number of fish meals available per person per month from transhipping and unloading operations across the region.

However, through the activities of the Programme, the number of fish meals available per person per month is expected to be increased by:

1) improving the supply of bycatch by 50% by 2030 relative to present-day landings through amended policies; and

2) ensuring that supply chains deliver the fish to buyers more efficiently and in better condition, including through post-harvest practices, to reduce the existing wastage of fish significantly.

Overall, improved offloading of bycatch and tuna during purse-seine transhipping operations is projected to provide a total of ~9.8 million 150 g tuna meals per year by 2030 (Table 5). This increases to 13.1 million when one third of the 150 g meals are used to provide two 75 g meals for a child. This equates to an average of 2.8 meals per person per month, and 3.8 meals per person per month when two 75 g meals are provided per child (Table 5).

Figure 1. Current conditions for selling some bycatch, leading to wastage of fish – Solomon Islands, 2023.

Note that this analysis does not take into account the bycatch available from the unloading of longline catches, targeting larger tuna, that also occur in the countries listed in Table 5, and in Fiji, PNG, Samoa, Tonga and Vanuatu. The reason for this is that there are currently no reliable data on the bycatch available and coming ashore from unloading operations by longline vessels. However, the quantities of bycatch are likely to be relatively low compared to those available from the transhipping of purse-seine catches because the volumes of longline catch are much lower (ca. only 10% of purse-seine catch by weight across the region, and much lower in terms of number of fish due to the much larger size of fish caught by longline).[19] In addition, it is possible to sell many of the non-target species caught by longline at good prices. Even so, the volumes of bycatch available from the unloading of longline catches needs to be monitored during the implementation phase of the Programme and added to the number of fish meals available for urban communities.

2.5.1 Increase in dietary protein

Based on the number of 150 g meals per person per year available to the target populations in the five countries where transhipping occurs, a 50% increase in the volume of bycatch offloaded for the benefit of urban and peri-urban communities would increase the fish protein in the diet by an average of 50% per person per year (Table 6).

[19] Williams and Ruaia 2021 WCPFC SC

Table 6. Projected increase in availability of additional fish protein (kg per person per year) derived from improved distribution of tuna bycatch from purse-seine transhipping operations.

Protein consumption	Country					
	FSM	Kiribati	Marshall Is	Solomon Is	Tuvalu	Average
Present consumption						
Tuna protein kg person^{-1} y^{-1}	2.37	2.05	0.78	1.42	5.16	2.4
Total protein kg person^{-1} y^{-1}	36.96	29.44	45.81	26.01	36.91	35.0
% tuna in total protein	6.4	7.0	1.7	5.5	14.0	6.7
Improved bycatch						
No. tuna meals	81	31.3	15.9	36.8	3.8	34
Protein from new meals (kg)	2.79	1.08	0.55	1.27	0.13	1.16
% protein increase from tuna	118	53	70	89	3	49
Tuna protein kg person^{-1} y^{-1}	5.16	3.13	1.33	2.69	5.29	3.52
Total protein kg person^{-1} y^{-1}	39.75	30.52	46.36	27.28	37.04	36.19
% tuna in total protein	13.0	10.3	2.9	9.9	14.3	10.1

2.6 Summary of beneficiaries and the extent of food availability benefits

Collectively, the activities to be implemented under Component A of the Programme have the potential to benefit up to ~850,000 people across the 14 countries by 2030, ~560,000 people through strengthening of national FAD programmes (Table 3) and ~290,000 people through improved delivery of bycatch from purse-seine transhipping operations (Table 5). Increased access to tuna is expected to be realised by the great majority of the potential beneficiaries due to limited spatial overlap in the locations of target coastal and urban populations. In Solomon Islands, the new FADs to be deployed in Guadalcanal Province will be installed for the benefit of coastal communities, whereas the improvements to distribution of bycatch will benefit the urban population of Honiara, resulting in essentially little or no overlap in beneficiaries from the two ways of increasing access to tuna for local consumption. The extent of the overlap in beneficiaries in the other four countries where both interventions occur is summarised below.

In Marshall Islands, strengthened FAD programmes are designed to benefit 50% of the population across the entire country by 2030 and improvements to transhipping operations have the potential to increase access to tuna for the entire population of Majuro. Therefore, there is an overlap in beneficiaries equivalent to half the population of Majuro, i.e., ~15,000 people. In Kiribati, there is expected to be an overlap in beneficiaries in South Tarawa. The entire population of South Tarawa in 2030 (74,000 people) is expected to benefit from the improved supply of bycatch from transhipping operations but ~40% of this population (~30,000 people) are also included in the target population for strengthened national FAD programmes. In FSM, where 80% of the population in Pohnpei and Yap States are expected to benefit from the expanded FAD programme, an estimated 8,000 people from the 10,000 in Pohnpei expected to benefit from improved transhipping operations are therefore likely

to be double beneficiaries. In Tuvalu, there is an overlap of ~7,000 people, because the entire population of Funafuti in 2030, where the transhipping of purse-seine catches occurs, are also targeted beneficiaries of enhanced FAD programmes. **Thus, the total number of 'overlapping beneficiaries' from all activities to increase access to tuna under Component A of the Programme among the 850,000 people is estimated to be ~60,000 – so the net number of direct beneficiaries with improved food availability is ~790,000.**

The expected level of benefit per capita is measured as the number of fish meals available per person per month. Although it is not possible to guarantee that every one of the targeted beneficiaries in each country will make use of the additional tuna available from strengthened national FAD programmes, the FAD-caught fish could provide between 1 and 8 fish meals per person per month, depending on the country (Table 7) (excluding Niue for the reasons mentioned above). This increases to 2 to 10 meals per month when the smaller meal size for children (75 g) is taken into account (Table 7).

The volume of fish to be made available from the activities to improve distribution of bycatch and tuna from purse-seine transhipping operations would enable the urban target populations to have between 1 and 7 fish meals per month (except for Tuvalu) (Table 7). This increases to 2 to 9 meals per month when the smaller meal size for children (75 g) is considered (Table 7).

The higher level of benefits for people in the target populations in the five countries with access to both FAD-caught fish and bycatch is given in Table 7 under 'overlapping beneficiaries'. This has been calculated to avoid any 'double counting' of adaptation beneficiaries.

To optimise the nutritional benefits available from tuna supplied by FADs and purse-seine transhipping operations, the education campaigns to be undertaken during Programme implementation need to include raising awareness of the importance of the size of fish meals consumed.[20] In particular, the benefits of limiting the size of fish meals to 150 g for an adult and 75 g for a child to provide protein and micronutrients to as many people as possible, as frequently as possible, need to be explained.

The way in which iodine (essential for the production of thyroid hormones that control metabolism and to ensure proper bone and brain development during pregnancy and infancy) is processed by the body illustrates why eating fish meals larger than required limits the nutritional benefits potentially available from a given amount of fish. Daily consumption of foods with iodine is needed to meet the requirements for this micronutrient because excess iodine intake cannot be stored in the body in quantities that exceed that held in the thyroid gland. In short, eating more fish than the body needs each day is not as beneficial as spreading out consumption over as many days as possible @ 150 g per day for an adult and 75 g per day for a child.

The Programme's sub-activities to extend the cold chain and increase the uptake of post-harvest practices should also help communities and households to maximise the number nutritious meals to be derived from FAD-caught fish and bycatch.

[20] Technical Study 6 https://fame1.spc.int/technical-studies-support-funding-proposal-green-climate-fund-regional-tuna-programme

Table 7. The number of people benefitting from increased access to FAD-caught fish through strengthened national FAD programmes or from bycatch from improved distribution of fish from purse-seine transhipping operations by 2030, together with the number of people benefitting from both these activities in the countries where the target populations for the two activities overlap. The extent of benefits received is shown in terms of number of fish meals per person per month at an average annual catch of 10 tonnes per FAD, derived from Tables 3 and 5, and the number of meals available when a 150 g tuna is used to provide 2 x 75 g meals per child.

Country	FAD-caught fish beneficiaries			Bycatch beneficiaries			Overlapping beneficiaries		
	No. people	150 g meals/ person	With 2 x 75 g meals/ child	No. people	150 g meals/ person	With 2 x 75 g meals/ child	No. people	150 g meals/ person	With 2 x 75 g meals/ child
Melanesia									
Fiji	72,483	1.8	2.4						
PNG	91,834	1.3	1.7						
Solomon Is	62,752	1.1	1.5	169,000	3.1	4.1			
Vanuatu	66,850	1.7	2.3						
Micronesia									
FSM	38,588	2.1	2.8	10,000	6.8	9.0	8,000	8.9	11.8
Kiribati	81,778	1.5	2.0	74,000	2.6	3.5	30,000	4.1	5.5
Marshall Is	26,993	3.3	4.4	29,000	1.3	1.7	15,000	4.6	6.1
Nauru	12,539	3.2	4.3						
Palau	8,815	6.1	8.1						
Polynesia									
Cook Is	8,792	7.6	10.1						
Niue	1,393	33.5	44.7						
Samoa	41,874	1.4	1.9						
Tonga	32,950	2.0	2.7						
Tuvalu	11,250	4.1	5.5	7,000	0.3	0.4	7,000	4.4	5.9
Total	**558,891**			**289,000**			**60,000**		

2.7 Contribution of Component A to filling the gap in fish supply in participating countries

2.7.1 Gap in fish supply for coastal populations to be filled with FAD-caught fish

The extent to which strengthening national FAD programmes will fill the gap in fish supply needed for good nutrition of the targeted coastal populations in 2030 (Table 8) depends on determining how much of the fish required is already supplied by coastal fisheries production and canned fish. There is still much uncertainty about the levels of coastal fish production in the 14 participating countries due to the difficulties in collecting catch data from remote locations, where many communities engage heavily in subsistence fishing. However, estimates of coastal fisheries production in each

country have been assembled in the Benefish Study 4[21] and have been used for this purpose, on the understanding that there is considerable uncertainty associated with these estimates. Reasonable data on canned fish consumption are available for all countries.[22,23] The effects of continued high greenhouse gas emissions on coastal fisheries production have been projected based on the information in Benefish 4, and these projections have been used to produce estimates of coastal fisheries production for all participating countries by 2030.

The contributions of coastal fish catch and canned fish to the quantity of fish needed for good nutrition of the target populations in each country are shown in Table 9. This analysis shows that there is a gap to be filled by FAD-caught fish in eight of the 14 countries. In these countries, the proposed investment in FADs will fill a minor to substantial percentage of the gap (6-65% @ 5 tonnes per FAD, and 12-100% @ 10 tonnes per FAD) depending on the country (Table 9). For the other six countries (FSM, Kiribati, Marshall Islands, Niue, Palau and Tuvalu) the coastal fish catch, supplemented by continued per capita consumption of canned fish, could in theory meet the need of the target population for fish in 2030, even when the effects of continued high greenhouse gas emissions on subsistence catch are taken into account (Study 1). However, there are important reasons why FADs are still required in these six countries (see notes to Table 9 for details).

2.7.2 Gap in fish supply for urban populations to be filled with bycatch

The amount of fish needed to meet the nutritional requirements of the urban populations in the ports where transhipping occurs can also be identified based on the WHO and SPC recommendations for daily protein intake (Table 10). However, there is much greater uncertainty about the present contribution of coastal fisheries production to the supply of fish needed for good nutrition of these populations. The reason for this uncertainty is that it is not at all clear what percentage of the coastal fisheries catch in the Benefish Study 4 is sold in these ports and it can be assumed that subsistence coastal fish catch makes only a minor contribution to fish supply in urban areas due to the high ratio of population to nearby coastal fish habitat (with the exception of Tuvalu). The only contribution to the fish required for good nutrition of these urban populations that can be usefully estimated currently is the bycatch expected to be offloaded by 2030 (Table 5), and the amount of canned fish consumed per capita per year converted to whole fish weight (as done in Table 9).

Table 11 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 by 2030 to improve the availability of this low-cost source of protein. This table indicates that the contribution of Output 2 (Activities 2.1 and 2.2) of the Programme to the fish required for good nutrition of urban communities after the contribution of canned fish consumption is also taken into account (converted to live fish weight equivalent). However, the table does not specify 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.

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

[22] Bell, J.D. et al. (2019). Realising the food security benefits of canned fish for Pacific Island countries. Marine Policy 100, 183-191.

[23] Technical Study 2 https://fame1.spc.int/technical-studies-support-funding-proposal-green-climate-fund-regional-tuna-programme

Table 8. Whole weight in tonnes (t) of fish required in 2030 for good nutrition of the targeted populations in the 14 participating countries where national FAD programmes will be strengthened to increase access to tuna.

Country	National population 2030	Fish needed by national population 2030 (t) *	Target population 2030	Target population as % of national population	Fish required by target population 2030 (t)
Melanesia					
Fiji	920,980	59,253	72,483	7.9	4,663
PNG**	2,273,165	118,015	91,834	4.0	4,768
Solomon Is	892,093	45,807	62,752	7.0	3,222
Vanuatu	363,200	20,321	66,850	18.4	3,740
Micronesia					
FSM	106,507	6,817	38,588	36.0	2,470
Kiribati	138,935	9,074	81,778	59.0	5,341
Marshall Is	53,983	3,222	26,993	50.0	1,611
Nauru	12,588	839	12,539	100.0	836
Palau	17,930	1,227	8,815	49.0	603
Polynesia					
Cook Is	15,889	1,303	8,792	55.0	721
Niue	1,393	111	1,393	100.0	111
Samoa	209,369	14,621	41,874	20.0	2,924
Tonga	97,257	7,161	32,950	34.0	2,426
Tuvalu	11,250	766	11,250	100.0	766
Total	**5,114,539**	**288,537**	**558,890**		**34,203**

*Based on recommended daily protein intake from WHO and SPC and 60% recovery of edible flesh per kg of fish (see Technical Study 2 for details).**Population within 5 km of the coast.

The greatest identified need is in Solomon Islands. In the absence of substantial other sources of fish it may be challenging to plan to increase the contribution of bycatch further because although the demand for bycatch is highest in Honiara, the volume of tuna transhipped there is lower than in the other countries.[24] Meeting the need for fish may well need to depend on offloading of higher-quality tuna, and this will be explored during Programme implementation.

2.8 Number of individuals with improved livelihoods (co-benefits)

In the absence of small vessel registration schemes in most of the participating countries, the number of small-scale fishers expected to have improved earnings from selling fish caught around the 333 FADs to be deployed during the Programme is difficult to determine. However, it has been estimated that at least 3,000 such fishers are likely to operate around the 333 deployed FADs. When the average number of people (5) per household for the 3,000 fishers are included, the total (co-benefit) livelihood beneficiaries from deploying 333 FADs is estimated to be 15,000.

[24] Technical Study 5 https://fame1.spc.int/technical-studies-support-funding-proposal-green-climate-fund-regional-tuna-programme

The number of people fishing around FADs will be determined more accurately during the Programme through the monitoring to be done to assess the average annual catch per FAD. This assessment will identify the number of boats (and number of people per boat) fishing around a subset of FADs in each country, which can then be extrapolated to the number of people fishing around all FADs deployed by the Programme in the country. All fishers who operate around FADs deployed by the Programme, and their households, will have improved livelihoods due to the increased quantity of fish caught. These individuals will also have improved food availability because a portion of the catch will undoubtedly be consumed at home.

The plans to increase the volume of bycatch available from purse-seine transhipping operations by 50% is expected to result in a proportional increase in the number of people (mainly women) presently selling bycatch. The number of bycatch vendors already operating has been easiest to estimate for Solomon Islands and Kiribati, where it currently totals ~230 people. Thus, another 115 livelihoods are expected to be created in these two countries. Expert advice also indicates that a total of ~15 new livelihoods are likely to be created in FSM, Marshall Islands and Tuvalu combined, resulting in an overall total of 130 new livelihoods. When the average number of people (5) in the households of the people with the new livelihoods are included, the total livelihood beneficiaries (co-benefit) from increasing the volume of bycatch supplied to urban/peri-urban communities is estimated to be 650.

The main purpose of the training in post-harvest of FAD-caught fish under **Output 1** is to assist households who catch tuna, or purchase it directly from small-scale fishers in the communities or from local marketplaces, to extend the shelf-life of the fish for domestic consumption. Representatives from 32 communities in the target areas within each country will be trained in post-harvest methods, through two training courses with each course providing training for 16 people (except for Niue where representatives of 16 communities will be trained due to the small population size), on the understanding that the techniques will then be disseminated more broadly within those communities through peer-to-peer learning. At a minimum, the number of beneficiaries of post-harvest training will be ~400 individuals, with an estimated average of 5 people per household, i.e. 2,000 people. Where catches of FAD-caught tuna exceed the needs of the target beneficiaries, and are consistently great enough to support MSMEs, training in post-harvest methods will also be provided for these MSMEs. It is not possible to predict how many of these MSMEs there may be or the number of livelihood opportunities they may support.

The post-harvest training under **Output 2** has a different purpose. It will be done to strengthen/create MSMEs capable of making products from the bycatch available from purse-seine vessels which is stored in brine, and bycatch unloaded from longline vessels which is frozen, for sale to urban communities. MSMEs in this context are defined as enterprises run by an individual or group of individuals. The estimated number of MSMEs to be supported by the end of the implementation period through improving the distribution of bycatch is given in Table 12. This work will be completed by FFA through a consultancy, and will likely engage with existing NGO/CSO institutions. The post-harvest processing will contribute to both fish for human consumption as well as for use in the production of fertilizers and animal feeds. The Programme has assessed that each MSME is likely to employ at least two full-time individuals, each from a household of 5 people. This gives a total number of MSME livelihoods beneficiaries (co-benefit) of 100.

Table 9. Summary of the extent to which the proposed investments in strengthening national FAD programmes will fill the gap in fish supply for the target population in each of the 14 countries participating in the Programme by 2030. Note that although there is no gap in estimated fish supply in some countries (marked in grey, with N/A), the notes provide the reasons why the number of FADs requested by the national fisheries agency are required.

Country	National population 2030	Coastal fish catch per year (t) 2030 *	Coastal fish catch per capita per year (kg) 2030	Canned fish per capita converted to whole weight (kg)**	Total fish available per capita per year (kg)	Target population 2030	Fish needed for good nutrition of target popn (t)***	Fish available for target population (t)	Gap in fish supply for good nutrition of target population (t)	FAD-caught fish @ 10 t per FAD	% of gap filled @ 10 t per FAD	FAD-caught fish @ 5 t per FAD	% of gap filled @ 5 t per FAD	Expected outcome @ 10 t per FAD	Expected outcome @ 5 t per FAD
Melanesia															
Fiji (a)	920,980	26,289	28.5	13	41.5	72,483	4,663	3,011	1,652	400	24	200	12		
PNG (b)	2,273,165	35,192	15.5	3	18.5	91,834	4,768	1,697	3,070	360	12	180	6		
Solomon Is c)	892,093	17,938	20.1	6	26.1	62,752	3,222	1,638	1,584	200	13	100	6		
Vanuatu (d)	363,200	3,307	9.1	9	18.1	66,850	3,740	1,210	2,530	340	13	170	7		
Micronesia															
FSM e)	106,507	12,380	116.2	4	120.2	38,588	2,470	4,640	- 2,170	240	N/A	120	N/A		
Kiribati (f)	138,935	20,172	145.2	5	150.2	81,778	5,341	12,282	- 6,941	380	N/A	190	N/A		
Marshall Is (g)	53,983	3,665	67.9	9	76.9	26,993	1,611	2,076	- 465	270	N/A	135	N/A		
Nauru (h)	12,588	639	50.8	2	52.8	12,539	836	662	174	120	69	60	34		
Palau (i)	17,930	2,082	116.1	7	123.1	8,815	603	1,085	- 482	160	N/A	80	N/A		
Polynesia															
Cook Is (j)	15,889	395	24.9	4	28.9	8,792	721	254	467	200	43	100	21		
Niue (k)	1,393	148	106.1	14	120.1	1,393	111	167	- 56	140	N/A	70	N/A		
Samoa (l)	209,369	8,469	40.5	13	53.5	41,874	2,924	2,238	686	180	26	90	13		
Tonga (m)	97,257	6,316	64.9	4	68.9	32,950	2,426	2,272	154	200	130	100	65		
Tuvalu (n)	11,250	1,186	105.4	6	111.4	11,250	766	1,253	- 487	140	N/A	70	N/A		

No gap to be filled | Gap partially filled (see notes) | Gap filled

Notes for Table 9

* Projected fish catch in 2030 under SSP5-8.5 emissions scenrio from Technical Study 1

** From values in Technical Study 2 (Table 6) converted to whole fish weight,and/or Bell et al. (2019) Marine Policy 100, 183-191.

***Based on analysis in Table 8

a. The relatively large size of the target population (Table 3) means that the 40 FADs requested by Fiji to are likely to make only a modest contribution 12-24 (%) to filling the gap in fish supply. Fiji plans to use its own resources and support from other donors, e.g. World Bank, to increase the number of FADs.

b. The large size of the target population, which is only 20% of the population of two provinces in PNG (Table 3) means that the 36 FADs requested by PNG are likely to make only a modest contribution (6-12%) to filling the gap in fish supply. PNG plans to use its own resources and support from other donors, e.g. World Bank, to increase the number of FADs. Note that 'national' population for PNG is the

c. The size of the target population includes only 20% of the Guadalcanal Province (Table 3) means that the 20 FADs requested by Solomon Islands are likely to make only a modest contribution (6-13%) to filling the gap in fish supply. Solomon Islands plans to use its own resources and support from other donors, e.g. World Bank, to increase the number of FADs

d. The low productivity of coastal fisheries in Vanuatu means that the gap in fish supply to be filled is unusually high and that the 34 FADs requested by the Department of Fisheries are likely to make only a modest contribution (7-13%) to filling the gap. Vanuatu plans to use its own resources and support from other donors, e.g. World Bank, to increase the number of FADs.

e. The relatively high coastal fish catch in FSM means that in theory there is no gap in fish supply. However, this catch is taken throughout the country and is not necessarily distributed to meet the needs for fish in the population in Pohnpei. Several of the 24 FADs requested by FSM will be deployed to supply fish to Pohnpei.

f. The relatively high coastal fish catch in Kiribati means that in theory there is no gap in fish supply. However, this catch is taken throughout the country and is not necessarily distributed to meet the needs for fish in the dense population inhabiting South Tarawa. Many of the 38 FADs requested by Kiribati will be deployed to supply fish to South Tarawa.

g. Although the coastal fish catch in Marshall Islands is large enough to meet the national need for fish in theory, it is not necessarily distributed to meet the needs of the dense populations on Majuro and Ebeye. Many of the 27 FADs requested by MIMRA will be deployed to supply fish to these islands.

h. High population density relative to coral reef area, and low coastal fish catch, means that the 12 FADs requested by Nauru will make only a modest contribution (34-69%) to filling the gap in fish supply. Given the limited potential for deploying more FADs due to the small size of the island, the scope for unloading bycatch at the new port in Nauru can be explored to fill the gap.

i. The relatively high coastal fish catch in Palau means that there is no gap in fish supply. However, the 16 FADs requested by the Bureau of Fisheries will be used to help provide tuna and other pelagic fish for the large number of tourists visiting the island as swell as residents, ensuring that coastal fish resources remain sufficient to meet local preferences for fish consumption.

j. The size of the target population, which includes more than 50% of the national population (Table 3) means that the 20 FADs requested by Cook Islands are likely to make only a modest- substantial contribution (21-43%) to filling the gap in fish supply. Cook Islands plans to use its own resources and support from other donors, e.g. World Bank, to increase the number of FADs

k. A high coastal fish catch means that there is no fish supply gap in Niue. However, the 14 FADs requested by Niue will help provide tuna and other pelagic fish for sport fishing opportunities for tourists as well as food for residents, ensuring that coastal fish resources remain sufficient to meet local preferences for fish consumption.

l. The size of the target population, which includes ~40% of the national population (Table 3) means that the 18 FADs requested by Samoa are likely to make only a modest contribution (13-26%) to filling the gap in fish supply. Cook Islands plans to use its own resources and support from other donors, e.g. World Bank, to increase the number of FADs

m. The 20 FADs requested by Tonga will fill the gap in fish supply at average catch rates of 10 t per FAD, and make a substantial contribtuion to filling the gap at average catch rates of 5 t per FAD.

n. Although coastal fisheries production can meet the national need for fish in theory, the 14 FADs requested by Tuvalu will help ensure that there is sufficient fish available in Funafuti, where >50% of the population lives, due to the difficulties involved in transporting fish there from the outer islands.

Table 10. Whole weight of fish in tonnes (t) 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.

Country	Target population 2030	No. Adults	No. Children	No. adult meals @ 150 g per year*	No. 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**

* Based on recommendations from WHO and SPC; **Based on 60% recovery of edible fish flesh per kg of fish live weight

Table 11. Summary of the extent to which improved distribution of bycatch by 2030 can contribute to the fish supply needed by the target urban populations in countries where transhipping of purse-seine catches occurs.

Country	Target population 2030	Fish needed per person per year for good nutrition (kg)*	Fish needed for target population in whole weight per year (t)	Total bycatch available in 2030 (t)	Canned fish consumed per person per year (kg)**	Total canned fish consumed by target population (t)***	Remaining fish required (t)****
FSM	10,000	63	630	203	4	67	360
Kiribati	74,000	65	4,810	579	5	617	3,614
Marshall Is	29,000	60	1,740	116	9	435	1,189
Solomon Is	169,000	52	8,788	1,554	6	1,690	5,544
Tuvalu	7,000	68	476	7	6	70	399
Total	**289,000**		**16,444**	**2,459**	**1,727**	**2,878**	**11,107**

*Source: Technical Study 2 (Table 17), whole fish; ** from Technical Study 2 (Table 6) converted to whole fish weight, and/or Bell et al. (2019) Marine Policy 100, 183-191; *** Estimated as total canned fish consumed per country divided by 0.6 due to 60% recovery to estimate whole weight; ****An over-estimate because it does not allow for contribution of coastal fish catch, which cannot yet be identified with confidence

Table 12. Number of MSMEs based on post-harvest processing of bycatch to be supported by the Programme in 2030.

Country	Cook Is	FSM	Fiji	Kiribati	Marshall Is	Nauru	Niue	Palau	PNG	Samoa	Solomon Is	Tonga	Tuvalu	Vanuatu	Total
No. of MSMEs	**0**	**1**	**1**	**1**	**1**	**0**	**0**	**0**	**1**	**1**	**1**	**1**	**1**	**1**	**10**

2.9 Beneficiaries of information campaigns on the need to diversify fish consumption

The campaigns designed to i) raise awareness of the effects of climate-driven coral reef degradation and population growth on the per capita availability of reef fish; and ii) result in the behavioural change required by communities to ensure that they consume more tuna to continue to obtain the nutritional benefits of fish, were designed for the seven countries where tuna consumption is presently at relatively low levels. These countries are FSM, Fiji, Kiribati, PNG, Samoa, Solomon Islands and Vanuatu. The target beneficiaries to be reached in each of these countries through a combination of culturally appropriate campaigns based on information and dialogue,[25] are the same as the populations targeted by strengthened national FAD programmes and improvements to bycatch distribution in those countries. The total target population for these campaigns is estimated to be ~670,000 (Table 13) (double counting is avoided where coastal and urban populations overlap).

Table 13. Estimated beneficiaries of behavioural change activities in the targeted coastal and urban populations in the seven countries where tuna consumption is relatively low, minus the overlap in the two types of targeted populations in the two countries where they both occur (from Table 7).

Country	Coastal target popn. 2030	Urban target popn. 2030	Overlap in coastal & urban popns. 2030	Total beneficiaries
Melanesia				
Fiji	72,483			72,483
PNG	91,834			91,834
Solomon Is	62,752	169,000		231,752
Vanuatu	66,850			66,850
Micronesia				
FSM	38,588	10,000	-8,000	40,588
Kiribati	81,778	74,000	-30,000	125,778
Polynesia				
Samoa	41,874			41,874
TOTAL	**456,159**	**253,000**	**-38,000**	**671,159**

[25] Annex 27, Technical Study 6

2.10 Beneficiaries of improved meteorological and natural disaster information

The improved meteorological and natural disaster forecasts to be developed during the Programme will enable the estimated 3,000 small-scale fishers identified above to plan safer fishing trips to operate around the 333 deployed FADs.

Improved meteorological forecasts will also 1) enable all other fishers in the participating countries venturing offshore to avoid hazardous sea conditions when planning fishing trips; and 2) provide timely warnings of impending dangerous weather conditions via radio and other media for all coastal communities, enabling them to take measures to reduce damage to dwellings and food crops.

This information is expected to benefit ~ **2.5 million people predicted to be living within 1 km of the coast** by 2030 in the 14 participating countries (Table 14). These individuals are indirect beneficiaries of the Programme.

Table 14. Total number of people projected to be living within 1 km of the coast in the 14 participating countries in 2030 expected to benefit from improved meteorological information.

Country	Census Year	Total population for census year	Estimated total population 2030*	% of population within 1 km of coast**	Estimated population within 1 km of coast 2030
Melanesia					
Fiji	2017	884,887	920,980	27	248,665
PNG	2022	9,311,874	10,824,596	8	865,968
Solomon Is	2019	721,455	892,093	65	579,860
Vanuatu	2020	326,740	363,200	64	232,448
Micronesia					
FSM	2022	105,987	106,507	89	94,791
Kiribati	2020	119,438	138,935	100	138,935
Marshall Is	2021	41,652	53,983	100	53,983
Nauru	2019	11,550	12,588	93	11,707
Palau	2020	17,614	17,930	93	16,675
Polynesia					
Cook Is	2021	15,342	15,889	91	14,459
Niue	2017	1,719	1,393	25	348
Samoa	2021	205,556	209,369	61	127,715
Tonga	2021	100,179	97,257	84	81,696
Tuvalu	2017	10,645	11,250	100	11,250
TOTAL		**11,874,638**	**13,665,970**		**2,478,500**

* SPC's Statistics for Development Division https://purl.org/spc/digilib/doc/z8n4m;

** Source: Andrew et al. (2019) http://dx.doi.org/10.1371/journal.pone.0223249

3. Beneficiaries of Component B activities

3.1 Beneficiaries of the Advanced Warning System

The Advanced Warning System (AWS) to be developed under Component B of the Programme will benefit citizens in the tuna-dependent Pacific Island countries by informing the respective ministries about the implications of projected climate-driven tuna redistribution on national economic development, and enabling them to adapt accordingly to preserve critical government revenue that supports the population of the country. For example, by making investments based on projected locations of tuna stocks, being better able to negotiate for fishing license revenue within their EEZs (including through trading in the Vessel Day Scheme), and negotiating within the appropriate forums (WCPFC, UNFCCC) to retain the historical socio-economic benefits received from tuna. However, because these benefits are expected to accrue in the long term after the AWS has been developed and operationalised the indirect beneficiaries of the AWS are not included in this analysis.

4. Summary of direct and indirect beneficiaries

4.1 Direct beneficiaries

Component A of the Programme will confer direct benefits to people in seven categories:

1) 560,000 people (men, women and children) from coastal communities in the 14 participating countries expected to have access to an average of 2.7 additional fish meals per month if the ~330 FADs deployed yield an average catch of 10 tonnes of tuna per FAD per year, with each meal providing at least 50% of the daily protein intake recommended by WHO; and access to 1.3 additional fish meals per month if the average annual catch per FAD is 5 tonnes.

2) 290,000 people (men, women and children) in urban and peri-urban areas expected to have access to an average of 3.8 additional fish meals per month from improved distribution of bycatch offloaded during transhipping operations by purse-seine vessels, and unloading operations by longline vessels, in ports across the Pacific Island region, with each meal providing at least 50% of the recommended daily protein intake.

3) Approximately 670,000 people (men, women and children) from a range of coastal and urban communities in seven of the participating countries where consumption of tuna is still relatively modest, who will receive information about the decreasing availability of coral reef fish per person due to climate change and human population growth, and the need to consume more tuna to continue to receive the nutritional benefits available from fish. **These individuals are a subset of the combined food availability beneficiaries listed in 1 and 2 above** (no double counting).

4) The 3,000 small-scale fishers from the 14 participating countries expected to be fishing around the 333 FADs deployed by the Programme, and the members of their households, totalling 15,000 people, who will benefit from improved livelihoods (co-benefit). These 15,000 people are also included in the 560,000 people described within 1) above, given their direct access to the tuna they catch for household consumption, so are not double counted as direct adaptation beneficiaries. The 3,000 small-scale fishers will also be direct beneficiaries

of improved meteorological information because they will be able to plan fishing trips to FADs with greater safety.

5) The 400 people trained in post-harvest methods for FAD-caught fish, and the members of their households, totalling 2,000 people, in coastal communities who have improved food availability via extending the shelf-life of FAD-caught fish to provide access to nutritious dietary protein at times when it is not possible to fish due to dangerous sea conditions. These people are also included in the direct beneficiaries who will have improved food availability from Component A of the Programme.

6) The additional 130 people who derive livelihoods from selling the increased volume of bycatch, and the members of their households, totalling 650 people, in urban communities who will benefit from improved livelihoods (co-benefit). These 650 people are also included within the 290,000 people described in 2) above, given their direct access to bycatch for household consumption, and have not been double counted as direct adaptation beneficiaries.

7) 100 individuals in the households of the 20 employees expected to be supported by the 10 MSMEs involved in post-harvest of bycatch (co-benefit). These individuals are also direct beneficiaries who will have improved food availability and are included in the 290,000 people described under 2) above, and have not been double counted.

There is an overlap of 60,000 people in the first two categories of direct beneficiaries. This is because in four of the smaller countries where transhipping occurs (FSM, Kiribati, Marshall Islands and Tuvalu), some residents will receive additional fish meals from both FADs and improved distribution of bycatch. Thus, the total number of people receiving additional fish meals as a result of Outputs 1 and 2 of the Programme is **790,000** (direct beneficiaries of the Programme).

The relationships between the various direct beneficiaries of the Programme are shown in Figure 2.

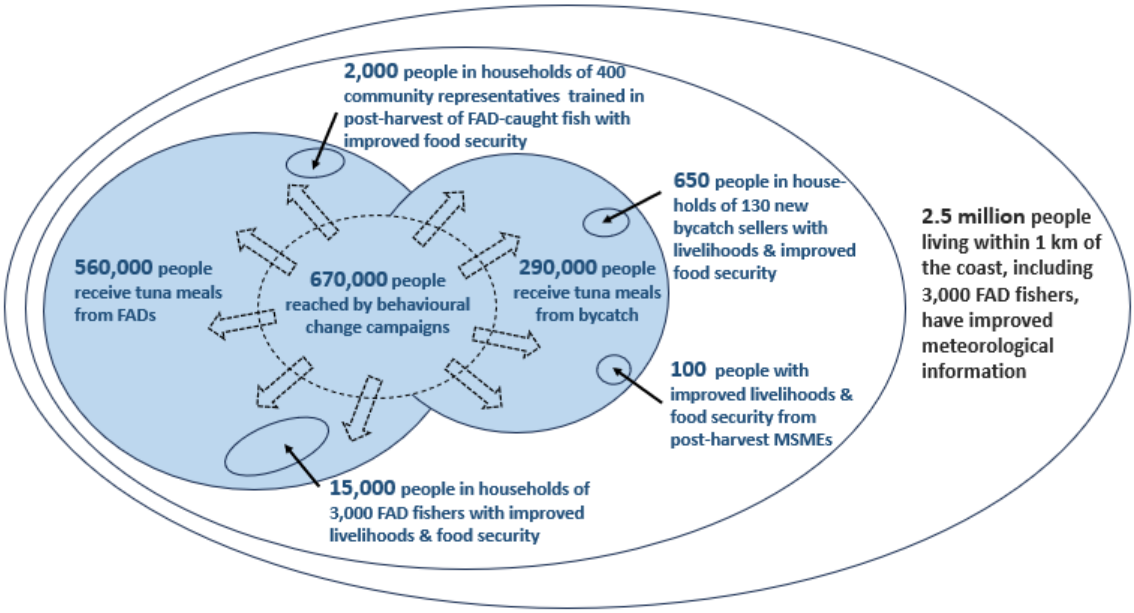

Figure 2. Overlap within and among the direct (blue text) and indirect (black text) beneficiaries of the GCF regional tuna programme.

4.2 Indirect beneficiaries

The indirect beneficiaries of the Programme are limited to the ~**2.5 million** people living within 1 km of the coast of all 14 participating countries, who will benefit from the Programme's facilitation of improved meteorological forecasts. These benefits include improved safety at sea for fishers, as well as improved disaster preparedness / risk reduction for coastal populations (primarily the risk of storms / cyclones). The indirect beneficiary population has significant overlap with the direct beneficiary population because most direct beneficiaries also live within 1 km of the coast in participating countries.

Appendices

Appendix 1. Information used to estimate direct beneficiaries of strengthening national FAD programmes in 2030.

Country	Targeted no. people based on Census	Census Year	Total popn for Census year	Estimated total popn 2030**	Multi-plier	Targeted no. people in 2030	Notes on the way the original number of beneficiaries was determined
Melanesia							
Fiji	69,642	2017	884,887	920,980	1.04	72,483	30% of Rewa (108,074), Serua (20,010) and Namosi (7,885) districts in Central Division and 80% of Kadavu (10,869), Lau (9,539) and Lomaiviti (15,657) districts in Eastern Division
PNG*	79,000	2022	9,311,874	10,824,596	1.16	91,834	20% of Manus and A.R. Bougainville provinces (395,000)
Solomon Is	50,749	2019	721,455	892,093	1.24	62,752	90% Temotu (22,132) & 20% Guadalcanal Province (154,150)
Vanuatu	60,139	2020	326,740	363,200	1.11	66,850	50% of Shefa (54,953) and Tafea (45,714) Provinces and 20% Port Vila (49,034)
Micronesia							
FSM*	38,400	2022	105,987	106,507	1.00	38,588	80% of Pohnpei (36,500) and Yap States (11,500)
Kiribati	70,302	2020	119,438	138,935	1.16	81,778	40% of South Tarawa (63,072) and 100% of other Gilbert Islands Group (45,073)
Marshall Is	20,827	2021	41,652	53,983	1.30	26,993	50% of Marshall Islands (41652)
Nauru	11,505	2019	11,550	12,588	1.09	12,539	100% of national population
Palau	8,660	2020	17,614	17,930	1.02	8,815	50% of 14 States (17,321)
Polynesia							
Cook Is	8,489	2021	15,342	15,889	1.04	8,792	50% of Rarotonga (10,898) and 100% of other 5 inhabited southern Cook Islands (3,040)
Niue	1,719	2017	1,719	1,393	0.81	1,393	100% of national population
Samoa	41,111	2021	205,556	209,369	1.02	41,874	20% of Samoa (205,556)
Tonga	33,940	2021	100,179	97,257	0.97	32,950	40% of Tongatapu, Eua and Ha'apai (84,849)
Tuvalu	10,645	2017	10,645	11,250	1.06	11,250	100% of population
TOTAL	**494,483**		**11,874,638**	**13,665,970**		**558,890**	

* Total population based on SPC SDD mid-year estimates, not census
**Information provided by SPC SDD

Appendix 2. Mean height, body mass index, and weight of men, women & children in Pacific Island countries (source: Study 2)

Country	Men			Women			Children (5-18 years) average		
	Height (cm)	Body mass index	Weight (kg)	Height (cm)	Body mass index	Weight (kg)	Height (cm)	Body mass index	Weight (kg)
Cook Is	178	33	104	167	33	93	150	24	53
Fiji	174	27	81	164	29	78	146	19	41
Kiribati	170	29	84	161	31	81	144	22	45
Marshall Is	165	29	79	155	31	73	139	21	41
FSM	170	28	81	160	32	80	142	21	42
Nauru	170	32	93	158	33	82	142	24	47
Niue	177	32	99	167	34	93	149	24	52
Palau	171	30	86	160	30	76	144	23	47
PNG	163	25	68	157	26	64	139	21	40
Samoa	174	31	93	164	34	92	143	22	45
Solomon Is	163	26	69	157	27	67	138	19	36
Tonga	175	31	94	166	34	94	148	23	50
Tuvalu	171	30	89	164	32	85	146	23	48
Vanuatu	168	26	73	160	27	69	142	20	40
Average	**171**	**29**	**85**	**161**	**31**	**81**	**144**	**22**	**45**

Appendix 3. Projected male, female, and child populations in Pacific Island countries in 2030 (source: Technical Study 2).

Country	Population	Percentage of population		
		Adult male	Adult female	Children (<14 yrs.)
Cook Is	15,889	39	39	21
FSM	106,507	36	36	29
Fiji	920,980	38	38	25
Kiribati	138,935	35	35	31
Marshall Is	53,983	34	34	32
Nauru	12,588	31	31	37
Niue	1,393	39	39	21
Palau	17,930	41	41	19
PNG	2,273,165*	32	32	36
Samoa	209,369	33	33	35
Solomon Is	892,093	31	31	37
Tonga	97,257	35	35	31
Tuvalu	11,250	34	34	33
Vanuatu	363,200	34	34	33
Average		**35**	**35**	**30**

* People living within 5 km of the coast, estimated to be 21% of the total population.

Appendix 4. Average weight of children aged between 5 and 18 years in Pacific Island countries and the size of tuna meals needed to provide 50% of daily protein requirements.

Country	Height (cm)*	Body mass index*	Weight (kg)*	Protein needed g/kg/day	Average daily protein need (g)	50% Average daily protein need (g)	Size of tuna meal @23% protein (g)
Cook Is	149.8	23.7	53.2	0.724	38.5	19.3	84
FSM	142.0	21.0	42.3	0.724	30.7	15.3	67
Fiji	146.1	19.3	41.3	0.724	29.9	15.0	65
Kiribati	144.4	21.7	45.3	0.724	32.8	16.4	71
Marshall Is	139.4	21.0	40.8	0.724	29.5	14.8	64
Nauru	141.5	23.7	47.4	0.724	34.3	17.2	75
Niue	148.6	23.5	52.0	0.724	37.6	18.8	82
Palau	144.2	22.8	47.5	0.724	34.4	17.2	75
PNG	139.3	20.7	40.2	0.724	29.1	14.5	63
Samoa	143.1	22.1	45.3	0.724	32.8	16.4	71
Solomon Is	137.8	19.0	36.1	0.724	26.2	13.1	57
Tonga	148.0	22.6	49.6	0.724	35.9	17.9	78
Tuvalu	145.9	22.7	48.3	0.724	34.9	17.5	76
Vanuatu	141.8	20.1	40.3	0.724	29.2	14.6	63

*Source: Technical Study 2; ** WHO (2007)

Appendix 5. Assessment of range of annual catches per FAD

This assessment is based on an interview with Mr Lindsay Chapman, a former Master Fisherman with SPC training coastal communities how to fish around FADs, and subsequently Manager of SPC's Coastal Fisheries Programme. During the interview, Mr Chapman was asked to estimate 1) the total number of fish likely to be caught around a FAD in one day, 2) the size of fish likely to be caught (kg), and 3) the number of days per year that it should be possible to fish around a FAD each year for FADs deployed at three different depths/distances from shore: 200-500 m/ ~1 km; 800-1400 m/3-6 km; and 1500-2500 m/6-9 km.

The range in number of fish likely to be caught each day, and the range in the size of fish likely to be caught, provided by Mr Chapman are given in Table 1. He also estimated that it would be possible/productive to fish around the shallowest and mid-depth FADs for only 6 months a year (ca. 175 days), due to adverse sea conditions and/or seasonality in the presence/abundance of tuna . In the case of the FADs furthest from shore, this was reduced to 120 days per year due to the greater difficulties in travelling longer distances under adverse sea conditions.

Using these numbers, the average annual catch per type of FAD from the various combinations of number of fish caught, size of fish, and number of days fished are:

- FADs close to shore: 2,800 tonnes p.a.
- FADs at 3-6 km: 10,600 tonnes p.a.
- FADs up to 9 km offshore: 8,100 tonnes p.a.

This information was combined with the numbers of FADs to be deployed at different distances from the shore requested by countries during consultations, to calculate the weighted mean catch per FAD for each country (Table 2). The estimated average catch per FAD varied from approximately 5 tonnes to 10 tonnes among countries, with the exceptions of PNG, where it averaged 4 tonnes per FAD, and Nauru where it was 4.5 tonnes.

When the distribution of FADs in countries where the majority of them were close to shore is adjusted to provide equal numbers close to shore and at mid distance, the annual average catch for all countries is within the range of 5 to 10 tonnes per year (Table 3).

This analysis demonstrates how increases in total estimated production from all FADs in each country are likely to be possible by changing the locations of FADs. It also demonstrates that countries wishing to maintain good numbers of FADs close to shore for subsistence fishers, should also consider increasing the total number of FADs to provide a greater supply of fish for the target population, given the relatively low catch rates for FADs closest to shore.

Table 1. Average annual catches made around FADs placed at three depths/distances from the shore, based on expert opinion.

Depth (m)	Distance from shore (km)	No. fish per day	Weight of fish (kg)	Days per year	Total annual catch (kg)
200-500	**1 km**	3	3	175	1,575
		3	4	175	2,100
		3	5	175	2,625
		4	3	175	2,100
		4	4	175	2,800
		4	5	175	3,500
		5	3	175	2,625
		5	4	175	3,500
		5	5	175	4,375
Average					**2,800**
800-1400	**3 to 6 km**	10	5	175	8,750
		10	6	175	10,500
		11	5	175	9,625
		11	6	175	11,550
		12	5	175	10,500
		12	6	175	12,600
Average					**10,588**
1500-2500	**6-9 km**	8	6	120	5,760
		8	7	120	6,720
		8	8	120	7,680
		8	9	120	8,640
		9	6	120	6,480
		9	7	120	7,560
		9	8	120	8,640
		9	9	120	9,720
		10	6	120	7,200
		10	7	120	8,400
		10	8	120	9,600
		10	9	120	10,800
Average					**8,100**

Table 2. Weighted mean catch (kg) per FAD per year for each country, based on the number of FADs placed at different distances from shore and the average annual catch per FAD type (From Table 1).

Region	Country	Total number of FADs	No. FADs @ 2,800 kg per year	No. FADs @10,588 kg per year	No. FADs @8,100 kg per year	Weighted mean catch per year kg
Melanesia	Fiji	40	28	12	0	5,136
	PNG	36	30	6	0	4,098
	Solomon Is	20	14	6	0	5,136
	Vanuatu	34	0	34	0	10,588
Micronesia	FSM	26	16	10	0	5,795
	Kiribati	38	18	20	0	6,899
	Marshall Is	27	0	27	0	10,588
	Nauru	12	8	0	4	4,567
	Palau	16	0	8	8	9,344
Polynesia	Cook Is	20	9	11	0	7,083
	Niue	14	9	5	0	5,581
	Samoa	18	0	8	10	9,206
	Tonga	20	10	10	0	6,694
	Tuvalu	14	10	4	0	5,025
Average		**335**	**152**	**161**	**22**	**6,891**

Table 3. Weighted mean catch (kg) per FAD per year for each country, adjusted for those countries that requested that the majority of FADs are placed close to shore (see Table 2). The redistribution of FADs numbers for each type of FAD relative to Table 2 is highlighted in grey.

Region	Country	Total number of FADs	No. FADs @ 2,800 kg per year	No. FADs @10,588 kg per year	No. FADs @8,100 kg per year	Weighted mean catch per year kg
Melanesia	Fiji	40	20	20	0	6,694
	PNG	36	18	18	0	6,694
	Solomon Is	20	10	10	0	6,694
	Vanuatu	34	0	34	0	10,588
Micronesia	FSM	26	13	13	0	6,694
	Kiribati	38	18	20	0	6,899
	Marshall Is	27	0	27	0	10,588
	Nauru	12	4	4	4	7,163
	Palau	16	0	8	8	9,344
Polynesia	Cook Is	20	9	11	0	7,083
	Niue	14	9	5	0	5,581
	Samoa	18	0	8	10	9,206
	Tonga	20	10	10	0	6,694
	Tuvalu	14	7	7	0	6,694
Average		**335**	**118**	**195**	**22**	**7,681**