Floating traps help small fishers catch large fish

RIU

Validated RNRRS Output.

High-value ocean fish such as tuna have previously been difficult or impossible for Pacific, Indian Ocean and Caribbean islanders and coastal fishermen to catch. But the near-shore reef fisheries on which these fishers depend are overexploited. Now, floating traps help them catch deep-sea fish and tap into under- or less-exploited resources. The traps withstand strong ocean currents and are widely used in the South Pacific, East Africa, Seychelles, Comoros, Mauritius and Reunion. Governments in several South Pacific states and Zanzibar, and development agencies in Tanzania now include these traps in their development plans. Sport fishing and organic trade organisations have also shown interest, and the use of traps is expected to spread, potentially benefiting many more fishers and coastal communities.

Project Ref: **FMSP11:**
Topic: **3. Improving Fishers Livelihoods: Better Fishing Management & Aquaculture**
Lead Organisation: **MRAG Ltd, UK**
Source: **Fish Management Science Programme**

Document Contents:

Description

Research into Use
NR International
Park House
Bradbourne Lane
Aylesford
Kent
ME20 6SN
UK

Geographical regions included:

Comoros, Fiji, Mauritius, Reunion, Seychelles, South Africa, Tanzania, Vanuatu,

Target Audiences for this content:

Fishers,

FMSP11

A. Description of the research output(s)

1. Working title of output or cluster of outputs.
In addition, you are free to suggest a shorter more imaginative working title/acronym of 20 words or less.

Full title: Fish aggregating devices (FADs) for enhancing coastal artisanal fisheries

Short title: Fish aggregating devices (FADs)

2. Name of relevant RNRRS Programme(s) commissioning supporting research and also indicate other funding sources, if applicable.

Fisheries Management Science Programme
Secretariat of the Pacific Community funded much of the FADs work in the Pacific
Additional funding support in Tanzania: WWF, CCAfrica

3. Provide relevant R numbers (and/or programme development/dissemination reference numbers covering supporting research) along with the institutional partners (with individual contact persons (if appropriate)) involved in the project activities. As with the question above, this is primarily to allow for the legacy of the RNRRS to be acknowledged during the RIUP activities.

R4777 - The Assessment of the Interaction between Fish Aggregating Devices and Artisanal Fisheries

Marine Resources Assessment Group Ltd (Jim Anderson)
18, Queen Street, London W1J 5PN
Tel: +44 (0) 20 7255 7755; Fax: +44 (0) 20 7499 5388; Email: enquiry@mrag.co.uk

Secretariat of the Pacific Community (Lindsay Chapman)
BP D5, 98848, Noumea Cedex, 95 Promenade Roger Laroque, Anse Vata, New Caledonia
Tel.: +687 26 20 00; Fax: +687 26 38 18

R8249 – Livelihood assets required for an East Africa FADs Programme

Samaki Consultants Ltd (Matt Richmond)
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Department of Fisheries and Marine Resources, Zanzibar.
Tel: (+255) 024 2239623; Fax: (+255) 024 2233206;
Email (c/-): WWFMenai@zitec.org

R8331 - Promoting Livelihood Benefits from Fish Aggregation Devices

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Fisheries Division, Min. of Natural Resources and Tourism,
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WWF
P.O.Box 63117, Dar es Salaam, Tanzania (Jason Rubens)
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Mafia Island Marine Park Authority
Email: mafiaisland@marineparktz.com

Conservation Corporation Africa (CCA) – Mnemba Island Resort (Peter Seibert - Manager) Tel: +255 (0) 777 438 656 Email: mnemba@zitec.org

Mbegani Fisheries Development Centre
Mr Mdeme Tel +255 (0) 23 244 0038

4. Describe the RNRRS output or cluster of outputs being proposed and when was it produced? ***(max. 400 words)****. This requires a clear and concise* ***description*** *of the output(s) and the* ***problem*** *the output(s) aimed to address. Please incorporate and highlight (in bold)* ***key words*** *that would/could be used to select your output when held in a database.*

Fish Aggregating Devices (FADs) are floating apparatus that attract and aggregate pelagic fish, and can be used to target the area for fishing. This enables people involved in **small-scale fisheries** to target and catch fish species that otherwise would be difficult, if not impossible for them to catch, such as **tuna**.

FADs enable the diversification and improvement of livelihood opportunities through allowing access to potentially high-value fishery resources. This can be particularly beneficial where **inshore fishery resources** are overexploited, and large **pelagics** are under-exploited.

The FADs and supporting documentation and training were developed in the **South Pacific** in collaboration with the Secretariat of the Pacific Community (SPC) between 1991 and 1994, and subsequently their design was adapted to suit the strong oceanic current conditions of the coast of **East Africa** in 2003 - 2005**.**

Supporting documentation and information on FADs includes a series of **Manuals** published by SPC in the mid 1990s and recently updated (2005), complemented by a manual on fishing techniques around FADs aimed at fishers. Documentation produced by the FAD Programme in **Tanzania** (R8331) includes a set of five **technical guidelines** on:

1. Equipment Import and Logistics
2. Site Surveys
3. FAD Design
4. FAD Deployment
5. FAD Fishing Gears.

Other documentation includes a 2-page theme sheet “I4 Fish Aggregating Devices” in *Managing Marine Protected Areas: A Toolkit for the Western Indian Ocean*, IUCN- EARO (2004), a section in the SADC Fisheries Observer Handbook (in press), a BBC (2005) World Earth Report (3:44 min.) of construction and deployment, entitled “Not Just a FAD” produced by Real2Reel for HandsOn and a “Notice to Mariners” published by the UK Hydrographic Office (2005).

5. What is the type of output(s) being described here?
Please tick one or more of the following options.

Product	***Technology***	***Service***	***Process or Methodology***	***Policy***	***Other Please specify***
(X)	X		(X)		

6. What is the main commodity (ies) upon which the output(s) focussed? Could this output be applied to other commodities, if so, please comment

Coastal (and deep sea) fishery resources, in particular tuna and large pelagic species.

7. What production system(s) does/could the output(s) focus upon?
Please tick one or more of the following options.
Leave blank if not applicable

Semi-Arid	***High potential***	***Hillsides***	***Forest-Agriculture***	***Peri-urban***	***Land water***	***Tropical moist forest***	***Cross-cutting***
					X		

8. What farming system(s) does the output(s) focus upon?
Please tick one or more of the following options (see Annex B for definitions).
Leave blank if not applicable

Smallholder rainfed humid	***Irrigated***	***Wetland rice based***	***Smallholder rainfed highland***	***Smallholder rainfed dry/cold***	***Dualistic***	***Coastal artisanal fishing***	***Deep sea fishing***
						X	X

*9. How could value be added to the output or additional constraints faced by poor people addressed by clustering this output with research outputs from other sources (RNRRS and non RNRRS)? (**max. 300 words**).*

Please specify what other outputs your output(s) could be clustered. At this point you should make reference to the circulated list of RNRRS outputs for which proformas are currently being prepared.

This output could benefit from being clustered with other outputs that address an understanding the context of fisheries-related livelihoods, supportive policy environments for small-scale fisheries, and effective and sustainable fisheries management. In particular, the following FMSP clusters are relevant:

- Improving policy for fisheries management; maximising potential for economic growth and poverty reduction;
- Participatory fisheries monitoring: transparency, sustainability and empowerment;
- Fisheries stock assessment and management – A collection of tools and guides for assessing fisheries and developing management plans;
- Managing fisheries with limited data: technical and participatory approaches;
- Control of Foreign Fishing to provide economic benefits to developing coastal states.

Validation

B. Validation of the research output(s)

*10**. How** were the output(s) validated and **who** validated them?*

*Please provide brief description of **method**(s) used and consider **application, replication, adaptation and/or adoption** in the context of any partner organisation and user groups involved. In addressing the "who" component detail **which group(s) did the validation** e.g. end users, intermediary organisation, government department, aid organisation, private company etc... This section should also be used to detail, if applicable, **to which social group**, gender, income category the validation was applied and any **increases in productivity observed** during validation **(max.***

500 words).

Pacific

FADs have been in use in the Pacific region since the late 1970s and a number of programmes, both donor and government funded, have supported FAD deployment. The FMSP work contributed to this process.

The FADs were validated in the Pacific by (i) testing them through case studies in Fiji and Vanuatu, (ii) carrying out analyses of the biological aspects of their functioning as well as socio-economic benefits, and (iii) developing a manual: Volume 1, Planning FAD Programmes, which was published by the Secretariat of the Pacific Community (SPC) in 1996.

In Vanuatu, a monitoring programme was established to measure the biological, social and economic consequences of the deployment of FADs. The FADs did not successfully aggregate fish or fishermen. This confirmed the importance of a number of factors for developing FAD programmes, including fishing vessels and gears available and other fishing opportunities.

Monitoring and assessment of FADs was also carried out in Fiji, where they were more successful. 42 fishermen were known to have used the FADs. Effort and landings were monitored for a total of 366 fishing trips during the survey period. Good landings of skipjack and yellowfin tuna were obtained which fetched a good price at market and some of which were sold to an export company. See questions 20 and 21 for more details.

The Secretariat of the Pacific Community (SPC) and national fisheries departments (government departments, intermediary organisations and target organisations) were involved in testing, along with small-scale fishers (end users). The SPC has recently (2005) published details of an adapted FAD design that is more resistant and lasts longer. The SPC, national fisheries departments and small-scale fishers have adopted FADs on a wide scale across the Pacific (see question 13).

East Africa

In Tanzania the validation process involved the deployment of six FADs in two locations over a twelve month period: four in Zanzibar (Unguja) and two in Mafia Island. The FADs were monitored (observations on number of buoys at the surface, current velocity, position of float section etc.) and fishing trials were carried out at each FAD. However, due to problems with the original design of the FADs, which had been adopted from the South Pacific but did not withstand the strong seasonal ocean currents in East Africa, the FADs had to be redesigned and redeployed. This resulted in the loss of a significant period of the testing and validation time available for the FADs, and therefore their effects on fish catches have not been fully assessed.

The modified FAD design, tolerant of seasonal immersion and using pressure floats, was proven to resist local sea conditions for over a twelve month period, and to attract at least two species of

large pelgic fish (but not tuna). The final component of validation, the testing of the FADs, was carried out by a range of organisations and individuals, including the Department of Fisheries and Marine Resources, Zanzibar and the Fisheries Division, Tanzania (government departments), WWF and Mafia Island Marine Park Authority (intermediary organisations), Samaki Consultants, CCAfrica and a private sport fishing operator (private companies) and fishermen (end users). The validation was applied to small-scale fishers, who are generally poor.

As a result, whilst FADs have been fully validated and confirmed as an appropriate and useful technology in the South Pacific, this validation is yet to be completed for the East Africa region, and their use in this area should be only on a trial basis and as part of a fuller validation process.

*11. **Where and when** have the output(s) been validated?*

*Please indicate the places(s) and country(ies), any particular social group targeted and also indicate in which production system and farming system, using the options provided in questions 7 and 8 respectively, above **(max 300 words)**.*

The FADs were validated in the South Pacific during 1991 to 1994 in Vanuatu and Fiji, for inshore deep-water pelagic fish resources such as tuna and albacore. The social group targeted was coastal artisanal fishers.

FADs have been partially validated in East Africa (Tanzania) on Zanzibar (Unguja) and Mafia Islands during 2003 – 2005, but this process has not yet reached a conclusion on their impacts on fish catch and on poverty. Delayed successful deployment prevented fishing trials for a full, offshore fishing season (the five months of the northeast monsoon). More monitoring of the behaviour of FADs under different weather and sea conditions is needed. The production system involved was inshore pelagic fish resources. The social group involved in validation as the end users was coastal artisanal fishers (poor occupational group). Also involved in the validation process were institutions supplying services to the poor (target institutions and intermediary organisations – national and district dovernment, national research institutions and NGOs), employers of the poor (fishing and processing companies) and policy makers (national governments).

FADs have been effectively deployed and used to enhance fisheries in the Indian Ocean, outside of the FMSP, for example, in Mauritius (1990-2006), Comoros (1995-2006), La Réunion (1990-2006), Seychelles (1990-2006) and South Africa (1990-2006). These were deployed under programmes outside the validation of the current outputs. In all cases the production system upon which the ouput was focused was the land-water, while the farming system was coastal artisanal fishing and deep sea pelagic fish.

The conclusion from the South Pacific Commission (SPC) in 2005 was that “vertical long-lining around FADs can be a productive and potentially lucrative activity”. As such the SPC is actively promoting FAD-based vertical longlining to draw greater benefits from their tuna resources, improve quality of food available to the population, and to divert fishing effort away from lagoon

stocks that are often overfished. This situation, and potential, may be equally applicable to much of East Africa and especially to Mafia Island.

Current Situation

C. Current situation

*12. **How and by whom** are the outputs currently being used? Please give a brief description **(max. 250 words**).*

FADs have been in use in the Pacific region since the late 1970s. The FMSP collaboration with SPC between 1991-1994 helped derive practical advice for FAD programme managers in planning and developing a FAD programme, thus helping lead to increased uptake of FADs within the region. In 2003, 18 of the 22 Pacific countries and territories had active FAD programmes, most of which are government-funded for all stakeholders to use. The inshore FADs are used by small-scale (artisanal) coastal fishers in order to target large pelagic fish species such as tuna, for which they can obtain a good price at market compared to the inshore reef fish which are overexploited in many places in the Pacific.

In the Indian Ocean, the partially-tested Tanzanian FADS are used by two sorts of fishers, local sport fishers and artisanal fishers. Despite no formal follow-up in Tanzania since the completion of the FMSP project in November 2005, mainly because access is limited until November due to the monsoon season, at least three local sport fishing companies are known to regularly visit the FADs off northeast Unguja (Zanzibar) and have successfully caught pelagic fish species there. Local artisanal fishers are also reported to visit the FADs in that area. There is potential access from 4-5 villages where about 200 fishermen are based. Interviews with the Zanzibar Department of Fisheries (March 2006) indicated that 14 boats from two villages were exploiting the FADs but nothing is known of fishing success. Therefore potential exists for exploitation by more villages and fishers, and use is expected to spread in the area. The FADs in Mafia Island are also being used by artisanal fishers there and WWF and the Fisheries Department have both indicated that they wish to pursue more fisher training and monitoring.

*13. **Where** are the outputs currently being used? As with Question 11 please indicate place(s) and countries where the outputs are being used **(max. 250 words).***

FADs are being widely used in the Pacific, where the numbers of FADs in 2003 were as follows: American Samoa, 4; Cook Islands, 17; Fiji Islands, unspecified number; French Polynesia, 21; Guam, 16; Kiribati, several; Marshall Islands, 1; Nauru, 3; New Caledonia, 4-5; Niue, 14; Northern Mariana Islands, 3; Palau, ~24; Papua New Guinea, 600-700 for purse seine fleet; Samoa, 3; Solomon Islands, ~100; Tonga, 18; Vanuatu, 2; Wallis and Futuna, 1.
From: Chapman, L 2004. Nearshore domestic fisheries development in Pacific island countries and territories. Secretariat of the Pacific Community.

It should be noted that some of these FADs (particularly Papua New Guinea, Solomon Islands and Palau) are of the floating/drifting type that are used by industrial fleets for fishing tuna, and are not targeted by coastal artisanal fishers.

In Tanzania, four FADs funded by FMSP research are in use to the north-east of Zanzibar (Unguja) and two more are in use at Mafia Island. In the wider Western Indian Ocean, a review in 1995 indicated that there were 21 FADs in Mauritius and other FADs in Seychelles, Comoros and Reunion. In the wider Western Indian Ocean, Mauritius and Reunion also have active fisheries FADs. Seychelles has been conducting experimental studies on FADs over the past three years.

Knowledge about FADs from FMSP research has been incorporated into SPC development strategies and FADs installed in several South Pacific countries. Knowledge about FADs has been incorporated into government policy in Zanzibar and in NGO development strategies in Tanzania.

14. What is the scale of current use? Indicating how quickly use was established and whether usage is still spreading ***(max 250 words).***

The use of FADs in the Pacific is widespread and there appears to be some use of them across the Western Indian Ocean. In the Pacific, FAD programmes are not spreading, but their use is ongoing as funding is found. Use of FADs in West Africa currently is usually of the drifting type linked to the industrial fishing fleets. There may be potential for their use to be extended to artisanal fisheries in the region, by adapting and testing the East Africa FAD design.

In Eastern Africa, FAD usage has been established over the year since their deployment, and is localised rather than widespread, reflecting the number of FADs deployed. There is interest in their use in Tanzania beyond their current locations, indicating the potential for usage to continue to spread, as and when evidence of their effectiveness is identified:

- Export Promotion of Organic Products from Africa (EPOPA) expressed interest in the development of FAD fisheries towards the end of 2005 and have submitted a proposal for funding that included a FAD component.
- The Ruvuma Corridor Project has recently (2006) completed a comprehensive proposal for economic development of the region in the south of Tanzania near Mtwara that includes a FADs component as an activity to diversify and boost local fisheries.
- The World Bank-funded Marine and Coastal Environment Management Project (MACEMP) has also expressed interest in the use of FADs in cross-border intiatives in the south and north of Tanzania.

The South West Indian Ocean Fisheries Project (SWIOFP), a five-year multinational programme to improve understanding and management of marine resources, includes a component on FADs. Seychelles and Tanzania are both applying for funding from SWIOFP to continue to develop their FAD programmes. Through SWIOFP, there is potential for the use of FADs to spread in the South West Indian Ocean.

15. In your experience what programmes, platforms, policy, institutional structures exist that have assisted with the promotion and/or adoption of the output(s) proposed here and in terms of capacity strengthening what do you see as the key facts of success? ***(max 350 words).***

Adaptation of the FAD design to withstand the strong, seasonal, ocean currents in East Africa has been important for their uptake and adoption in Tanzania, and it is thought that this design will serve for the whole East African coast and Western Indian Ocean and probably other regions as well. The SPC also has recently developed an improved FAD design that is more resistant.

Training and sensitisation of fishers in the use of fishing gears specific for FADs is an important part of FAD adoption, for those areas where fishers do not already use appropriate gears. The participation of fishers and communities in the planning and implementation of FAD programmes is also important to ensure that they are effective and the full benefits can be realised. Positioning of the FADs is also key: both so that they are placed in areas which are likely to aggregate pelagic fish, and also so that they are accessible to small-scale fishers. It is important to build the capacity and understanding of end users about the merits and potential benefits of adopting the technology. In Zanzibar, until fishers gained a full understanding of how they worked and what the potential benefits were, they were reluctant to accept their use.

Institutional support e.g. from private companies, NGOs or government departments, has helped provide funding for the purchase and deployment of FAD equipment, and for training of fishers in use of appropriate gears. In some cases, vessel upgrading may be helpful to enable small-scale fishers to reach the FADs which are usually anchored 3-10 nautical miles from the shore.

The relative economic costs (e.g. time to reach the FADs, fuel costs) and benefits (catch and its market value) of fishing on FADs compared to other types of fishing (e.g. on inshore reefs) or other available economic activities plays a role in their successful adoption.

Policy in Tanzania and Zanzibar is generally supportive of the development of FAD fisheries, and FADs are explicitly included in fisheries legislation in Zanzibar. The expansion of fishing into the deep sea is strongly encouraged by the Government of both Zanzibar and the mainland. An important aspect of the FADs' potential to contribute to poverty reduction in Tanzania is the Government policy that has recently legalised the export of marine fish. One of the key features of Fisheries Division policy in relation to the development of the export fishery and alleviating poverty is that the commercial processing industry will *not* be allowed to develop their own fishing capacity but will have to buy directly from *independent* artisanal fishers.

Current Promotion

D. Current promotion/uptake pathways

16. ***Where*** *is promotion currently taking place? Please indicate for each country specified detail*

what promotion is taking place, by whom and indicate the scale of current promotion ***(max 200 words).***

In Tanzania and Zanzibar, briefings about FADs that were distributed under the FMSP project are still being used to promote them. WWF is also promoting FADs at the Mafia Island site through their continued testing and use.

In wider East Africa and Western Indian Ocean, the IUCN Marine Protected Area (MPA) Toolkit, promoted by WIOMSA, includes a two-page briefing about FADs and their use.

In the South Pacific, their FAD experience is well promoted through SPC manuals, guidelines and newsletters, avaiable on the SPC website www.spc.org.nc.

17. What are the current barriers preventing or slowing the adoption of the output(s)? Cover here institutional issues, those relating to policy, marketing, infrastructure, social exclusion etc. ***(max 200 words)****.*

Technical – Training is needed for fishers and institutions in FAD fishing techniques with likely introduction of new gears for exploiting pelagic species. Training is also needed in FAD design, site surveys for deployment. Technical input is needed to more fully understand the behaviour of FADs with respect to offshore current regimes, in order to better target fishing activities.

Funding – Funds are needed from organisations or private sector for purchase (and import) and installation of FADs that includes physical assessment of trial sites with respect to the bathymetry, currents and accessibility by potential users.

Infrastructure and equipment – Fishing vessels are needed that have the capacity to reach the FADs, and are safe in rough sea conditions. In Tanzania, the local vessels are capable of safely accessing and fishing around the FADs but are limited to the calmer season. Ice availability is a problem in some areas and will have a negative impact on the quality (and thus the marketability) of FAD-caught tuna.

Suitable bait – Good-quality bait is needed, ideally squid but also Indian Mackerel or sardine can be used. If bait is not available, fishing is less likely to be successful on the FADs. Experience showed however, that mechanisms can be developed or adapted to provide bait at most locations.

Awareness – Lack of communication or awareness of the products and capacity to exploit the technology were identified by the Department of Fisheries, Zanzibar, as obstacles to further adoption of FAD technology by target beneficiaries.

Institutional – in Tanzania, the use of FADs has been embedded in the fisheries institutions but successfully proven FAD fishing would strengthen the.committment towards FADS.

18. What changes are needed to remove/reduce these barriers to adoption? This section could be

used to identify perceived capacity related issues ***(max 200 words).***

There is the need to improve knowledge and understanding of the technology and how to take advantage of it. Technical constraints to adoption need to be removed (access, vessels) and greater involvement of the community in planning and implementation of FADs to ensure the full benefits are realised and ownership encouraged. The building of capacity and understanding among target beneficiaries of the merits and benefits of FADs should be on-going. Training for fishers and for fisheries department staff is an important aspect of this, as is sharing experiences amongst fishers and different fisher communities.

19. What lessons have you learnt about the best ways to get the outputs used by the largest number of poor people? ***(max 300 words).***

The best way to generate interest and use by the largest number of fishers is to demonstrate that FADs can generate significant catches of high quality fish that is retailed at the best prices. This has not been achieved so far in Tanzania. Sharing the positive experiences of the Seychelles, and the South Pacific in particular, is useful in gaining the confidence of the local fishers and institutions, though ultimately the proof that FADs work in the Eastern African situation depends on the cost-effective catch of quality tuna and other pelagic fish.

Training for fishermen in skills for fishing around FADs is necessary in those areas where fishermen do not have experience of mid-water fishing methods (vertical longlines, drop-stone or single-hook drifting lines (Pacific). SPC have produced a manual on fishing methods around FADs. Also, providing improved fishing vessels to promote safety at sea and enable easier access to the FADs will help their adoption.

Impacts On Poverty

E. Impacts on poverty to date

20. Where have impact studies on poverty in relation to this output or cluster of outputs taken place? This should include any formal poverty impact studies (and it is appreciated that these will not be commonplace) and any less formal studies including any poverty mapping-type or monitoring work which allow for some analysis on impact on poverty to be made. Details of any cost-benefit analyses may also be detailed at this point. Please list studies here.

FFA (1993) Cook Islands Fisheries Resources Profile. FFA Report no. 93/25
Assessed the catches and their value from FAD-caught and non-FAD-caught tuna.

The Secretariat of the Pacific Community (SPC) conducted a 3 year FAD research project from 2001 to 2004 in **Niue and the Cook Islands**, including a cost-benefit analysis from the catch and effort data collected from fishermen during this time. A more cost-effective FAD design

was also developed. Results are presented in the SPC Fisheries Newsletter, Nos. 105, 106, 112 & 113.

IFAD (1999) Report and Recommendation of the President to the Executive Board on a Proposed Loan to the Republic of Mauritius for the Rural Diversification Programme. IFAD Executive Board. Sixty-Sixth Session, Rome, April 28-29, 1999
Includes a review of previous FAD experience in Mauritius and Reunion.

Venkatasami, A. & Sheik Mamode, A. 1995. Fish Aggregating Devices (FADs) as a tool to enhance production of the artisanal fishermen: Problems and Perspectives. Albion Fisheries Research Centre, Mauritius.
Assessed catch rates around FADs and in the traditional fishery.

21. Based on the evidence in the studies listed above, for each country detail how the poor have benefited from the application and/or adoption of the output(s) ***(max. 500 words):***

- *What positive impacts on livelihoods have been recorded and over what time period have these impacts been observed? These impacts should be recorded against the capital assets (human, social, natural, physical and, financial) of the livelihoods framework;*
- *For whom i.e. which type of person (gender, poverty group (see glossary for definitions) has there been a positive impact;*
- *Indicate the number of people who have realised a positive impact on their livelihood;*
- *Using whatever appropriate indicator was used detail what was the average percentage increase recorded*

Pacific:
Many small-scale operators rely on fishing around FADs, when these are available, as they increase catches, or at least the chance of getting a good catch, and cut operating costs as fishermen can go to set locations to fish. Where inshore fishery resources (reef flats and lagoons) are overexploited and there is a lack of fish for people to feed their families, FADs can help provide access to other fish resources such as tuna and contribute to food security. Vertical longlining around FADs has been shown to be a potentially productive and lucrative activity for the local population. Another advantage of fishing around FADs is that because they are in set locations, so if a fishermen's boat breaks down, there is a much better chance of being found. Studies from specific islands are detailed below.

Cook Islands:
Catch data from FADs in the Cook Islands showed that although FADs produced larger numbers of fish, the fish caught off the reef zone were generally of a larger size (average weight of individual yellowfin tuna 9.5kg in the reef zone and 7.2kg from FADs). However, the higher catch per unit effort from FADs generated NZ$0.91 per line-hour more than trolling in reef areas.

Fiji:
In FMSP Project R4777, FADs yielded estimated landings of 29.3 mt of skipjack tuna and 5.7mt of

yellowfin tuna which were sold at market at F$63,933 giving an approximate benefit to cost ratio of 4:1. In particular, sashimi-quality tuna were sold to a local export company, worth an estimated F$15,780. Average yield for industrial fishing vessels fishing around FADs that were established in 1981 in Fiji was 6mt to 10mt per set; an improvement on the poor catch rates that the company achieved fishing free-swimming schools in 1980.

Nauru:
Nauru suffered serious economic difficulties following the exhaustion of its phosphate resources. The islanders are heavily dependent on marine resources yet the reef flat has been over-gleaned and little remains for the local fishers. The SPC has helped Nauru to deploy two FADs to assist local small-scale fishers in catching fish as food security has become a major concern. Fish are already starting to show up at the FADs and several good catches by local fishers have been recorded.

Western Indian Ocean

Mauritius:
In 1999, about 175 fishermen were engaged in FAD fishing, with an estimated total catch of 400 t annually and an average income of about MUR 100 000, which was twice that of the average fisherman. Catch rates (CPUE) were higher around FADs than in the traditional fishery. CPUE for the traditional fishery was an average of 5.5-6.8 kg/day; for the FAD fishery it was between 10-20 kg/day.

Tanzania:
FADs have provided opportunities for livelihood diversification through fishing opportunities for pelagic species for small-scale fishers, reducing their dependency on inshore reef resources. This can help make livelihoods more resilient in the face of uncertainty and fluctuations due to climate change.

Under FMSP project R8331,five fishers on Zanzibar and 11 fishers from Mafia were involved in deployment and monitoring of FADs plus additional fishers from Zanzibar (33) and Mafia (37) were trained in fishing gear use around FADs. On Mafia, the target beneficiaries comprise 100-200 fishers (1000 households) from three villages.

Fishers and fishery officers in Tanzania have benefited from training and capacity buildingin the deployment and use of FADs, but testing and validation has not been completed to be able to quantitatively judge any increase in fish catch or increase in incomes as a result of the FADs.

Environmental Impact

H. Environmental impact

24. What are the direct and indirect environmental benefits related to the output(s) and their outcome

(s)? ***(max 300 words)***

This could include direct benefits from the application of the technology or policy action with local governments or multinational agencies to create environmentally sound policies or programmes. Any supporting and appropriate evidence can be provided in the form of an annex.

Environmental benefits of successful FAD programmes may accrue from the reduction of fishing pressure on inshore marine habitats such as coral reefs and mangroves. An indirect benefit may also result from the continued presence of local fishers further out to sea (3-6 nautical miles) serving to report on illegal fishing by industrial vessels within the territorial seas.

25. Are there any adverse environmental impacts related to the output(s) and their outcome(s)? ***(max 100 words)***

FAD deployment and use does not normally include any adverse environmental impacts, although FAD programmes that introduce vertical long-lining without training and adequate monitoring of fishing effort are potentially open to mis-use of fishing gears for the targeting of demersal fish stocks that may be vulnerable to over-fishing. If pelagic fish stocks are over-exploited, fishing around FADs may exacerbate this. However, the impact the small-scale fishers targeting pelagic species around FADs is likely to be relatively insignificant compared to the fishing pressure exerted by industrial and commercial longliners and purse seiners that target pelagic species in the same waters.

26. Do the outputs increase the capacity of poor people to cope with the effects of climate change, reduce the risks of natural disasters and increase their resilience? ***(max 200 words)***

The use of successful FAD programmes by local poor fishers can help diversify their fishing opportunities thus increasing the resilience of livelihoods and greater capacity to cope with the unpredictable effects of climate change on artisanal fisheries. In other situations, such as severe tropical storms, FADs may be destroyed and thus provide no contribution towards the ability of the poor to cope with climate change unless there is a programme of replacement of lost FADs.
