

**Working Paper 10**

**Original: English**

**Increasing the value of sea cucumber harvests  
by improving postharvest processing of fishers**

**Paper prepared by Steven Purcell, Southern Cross University, Australia**





# Increasing the value of sea cucumber harvests by improving postharvest processing of fishers

## Purpose

1. The purpose of this paper is to:
  - i. describe the background and results of an ACIAR-PARDI Scoping study on current post-harvest processing and trade of sea cucumbers in Fiji, Tonga and Kiribati, conducted during 2011;
  - ii summarise a follow-on ACIAR project to help improve the quality of postharvest processing by fishers in Fiji, Tonga and Kiribati, to be conducted from 2013–2016.

## Background

2. Sea cucumbers are fished in more than 70 countries by at least 3 million fishers worldwide (Purcell et al. 2013). Sea cucumbers are worth \$20–50 million/year in exports from Pacific island countries (PICs) and wild harvests have provided income to over 300,000 small-scale fishers in the western Pacific in recent years. These fisheries have a high participation of women, who glean the animals from reef flats and are commonly involved in the postharvest processing.
3. The main issues facing sea cucumber fisheries are the poor quality of postharvest processing by fishers, management frameworks, enforcement and governance. Several recent initiatives have started to improve fisheries management but need to progress in tandem with improved processing methods if fishers are expected to harvest less yet still earn sufficient income for their families.
4. After being hand-collected, sea cucumbers are cut, gutted, salted, cooked, smoked and sun-dried to a non-perishable product called beche-de-mer, which is exported predominantly to China (Purcell et al. 2013). Different processing methods are needed for different species groups to meet Chinese market specifications. The price paid to village fishers by exporters depends on body size, species and the quality of postharvest processing (Ferdouse 2004; Brown et al. 2010). Unfortunately, much potential income is lost in Pacific island communities through poor processing methods.
5. Sea cucumber stocks have been overfished in the Pacific, forcing national moratoria in Papua New Guinea, Solomon Islands and Vanuatu (Purcell 2010). However, those fishers have few information sources on postharvest processing and currently sell unprocessed sea cucumbers to large exporting companies. In Tonga, Fiji and Kiribati, sea cucumbers are the most valuable of invertebrate marine seafood exports.
6. At the 7<sup>th</sup> Heads of Fisheries meeting, 2011, fisheries agencies nominated a priority for '*training in fish-handling to meet quality standards and in post-harvest processing for value-adding in fisheries*'.
7. Small sections on postharvest processing of sea cucumbers are found in field identification cards (SPC 2004) and in an outdated species guidebook (SPC 1994). However, neither document explains processing in great detail nor in a way that fishers could easily understand. Moreover, most fishers who processed sea cucumbers in Tonga and Kiribati had never seen published information about processing.
8. Suitable information tools (village-level manual) and training programs are needed to disseminate the best postharvest processing methods to fishers in PICs. Such investment is likely to be an effective solution to the poor revenue of fishers because the prices they get from selling processed sea cucumbers depends on product quality. The prices to fishers depended on the species, animal sizes and the quality of the processed products (colour, shape, dryness, odour, skin damage, burnt areas, cut placement).

## ACIAR-PARDI Scoping Study, 2011

### Overview

9. A Scoping Study was conducted during 2011 through the ACIAR-funded Pacific Agribusiness Research for Development Initiative (PARDI). The study title was *Improving income of Pacific island fishers through better post-harvest processing of sea cucumber: scoping study*. Its objectives were to:
  - i. assess the current value-adding (product enhancement) of sea cucumbers within the fisheries in Fiji, Tonga and Kiribati;
  - ii. investigate and describe supply chains and opportunities in the trade of sea cucumber products from fisher to retail markets in Asia;
  - iii. present information on costs and benefits of future capacity building in post-harvest processing methods in each country and best modalities for building skills of fishers in coastal communities.
10. The project was extremely successful – in the quality and quantity of data collected and the results. The findings provide a clear picture of the current postharvest processing practices and livelihood variables, giving a firm foundation for advancing to an implementation project. The data of livelihood variables (e.g. average time spent fishing, time spent processing, income gained per piece) describe the social context of the sea cucumber fisheries. Those ‘before’ data provide the means to later test the effectiveness of interventions (i.e. village-based manual, training and trade support) from further investment in an implementation project.
11. The project team conducted questionnaire-based interviews with 84 sea cucumber fishers and 21 processors in Kiribati, 134 sea cucumber fishers and 13 processors in Tonga, and 4 processors in Fiji. The surveys were spread among 5 atolls in Kiribati and 4 island groups in Tonga. Comparative findings on fishing and processing of 86 sea cucumber fishers from 3 island groups in Fiji in an MSc thesis by Ram (2008) were used to describe the situation in Fiji. We also conducted a market study in China by examining and measuring dried sea cucumbers in wholesale and retail shops in Guangzhou and Hong Kong.

### Snapshot of results

12. In Tonga, many sea cucumber fishers found for interviews were women (19%), and the average age of fishers was 40 years. In Fiji, women comprised 32–66% of fishers surveyed in island groups by Ram (2008). Although 99% of the fishers in Kiribati were men, their spouses did, or helped in, the postharvest processing of the catch in 66% of cases.
13. In Kiribati, sea cucumbers were a primary source of income for 28% of the fishers and a secondary source of income for 46%. In Tonga, sea cucumbers were a primary and secondary source of income for 95% and 4% of fishers, respectively.
14. The fishing intensity was surprisingly high. Depending on the atoll in Kiribati, the fishers spend, on average, 3.9–4.5 days/week and 3.6–4.9 hours/day in the water fishing for sea cucumbers. Sea cucumber fishers in Tonga spent on average 2.7 days/week and 5.9 hours/day in the water fishing for sea cucumbers. In Fiji, Ram (2008) found that fishers spent an average of 4.6 hours/day fishing sea cucumbers.
15. In all, 66% of fishers in Kiribati and 47% in Tonga responded that they were ‘not very’ or ‘not at all’ satisfied with the income they make from fishing and processing sea cucumbers.
16. Many fishers are not getting fair prices for sea cucumbers. The buying prices of fresh animals reported by the processors varied 2-fold to 6-fold, depending on the species. In other words, some processors offer prices 6 times higher than other processors within the same country.

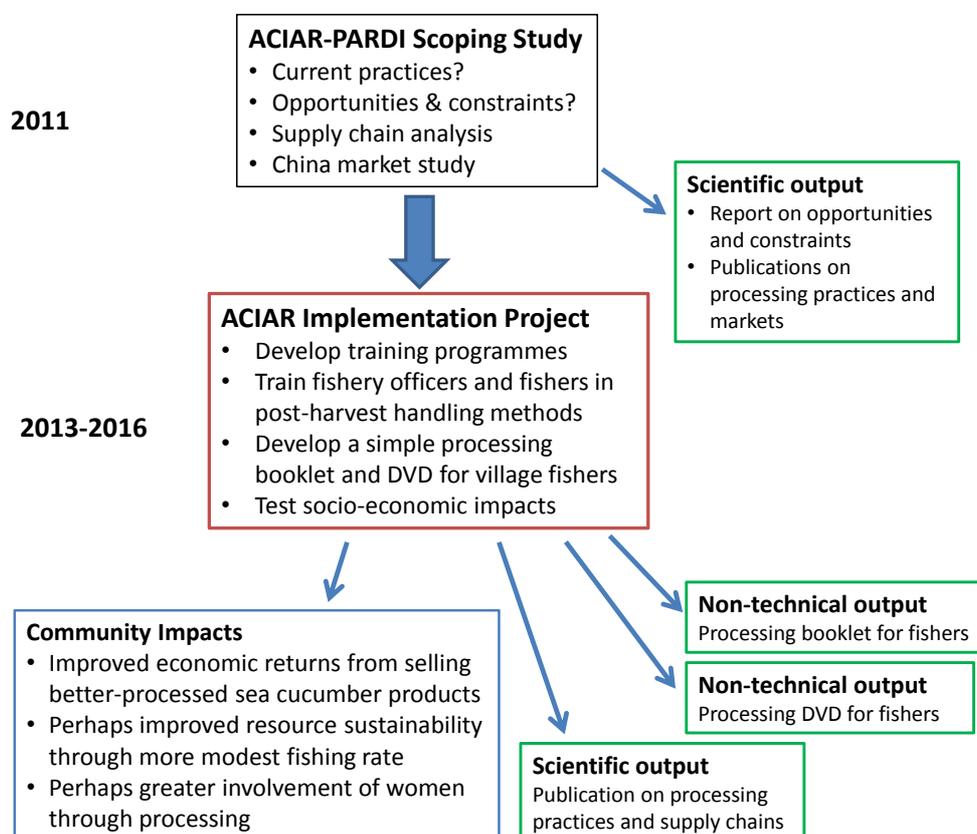
17. Most fishers (56% in Kiribati, 68% in Tonga) said that if they could no longer fish for sea cucumbers, their main income source would be fishing for other marine resources, often including shark fin, lobster and giant clam. The findings highlight that closing sea cucumber fishing will impact strongly on other fisheries resources, including those in decline.
18. Many fishers do their own processing (especially in Kiribati; 76% of fishers) and they commonly cut, salt, cook, dry and/or smoke the animals incorrectly. Some used freshwater for cooking instead of saltwater, which appears best. Some burnt the product by trying to dry too fast over fire. Animals were often broken or poorly handled before processing.
19. Processing methods vary greatly among the countries. For example, in Kiribati, fishers and processors smoke the product, but this is not done by processors in Tonga.
20. A substantial proportion of fishers in Tonga (45%) and Kiribati (73%) said they had problems selling their catch. In Tonga, fishers were angry that they were given different prices than told, that processors were not using standardised sizes for medium and high prices, and that processors sometimes refused to buy due to oversupply. In Kiribati, common issues were transporting their product, buyers not visiting frequently enough (in remote atolls) and not enough buyers.
21. Most of the product from Tonga, Kiribati and Fiji is shipped to Hong Kong and small shipments of some species go to USA and Korea. None of the product is shipped to Taiwan or Singapore.
22. Some new product forms have entered the market in China; frozen whole animals and cooked but undried animals.
23. Species and body size were the most significant factors affecting price in the Chinese marketplace. However, prices for some species varied independent of differences in body size, and in those cases, the cut, colour, odour and shape of the animals were more important. A light smoky smell is acceptable. Dark colours are preferred by Chinese consumers for many species. Salt residue diminishes the price, and can be avoided by re-cooking.
24. Prices are most affected by:
  - i. *most important*: species and body size;
  - ii. *important*: placement of the cut (more important for some species than others), whether the product has a foul smell, the colour, and whether it is fully dried;
  - iii. *least important*: salt content, smoky smell.
25. An attempt to estimate the economic benefits from future investment in the three target countries was made using purchase prices and export prices. Economic benefits were calculated under a number of specified realistic conditions. The potential gain from investment in postharvest processing and supply chains in the three countries is as follows:

Country	Potential gain
Kiribati	\$326,000 p.a.
Tonga	\$275,000 p.a.
Fiji	\$184,000 p.a.
<b>Total</b>	<b>\$785,000 p.a.</b>

## ACIAR Implementation project, 2013

### Overview

26. The overall aim of the project is to improve the income of village fishers in Kiribati, Tonga and Fiji through support to improve the quality of post-harvest processing of sea cucumbers.
27. The project objectives are to:
  - i. assess current processing, sale prices and fishing practices of sea cucumber fishers in Fiji;
  - ii. improve postharvest processing methods of fishers in Kiribati, Tonga and Fiji;
  - iii. evaluate the socioeconomic benefits of the project's interventions.
28. The project will take 4 years to complete. The primary outputs comprise:
  - i. a village-level manual and training DVD on processing methods, which will be translated into local languages;
  - ii. training workshops for fisheries officers and village fishers in postharvest processing;
  - iii. a quantitative analysis of economic and livelihood impacts.



### Adoption pathways and dissemination of outputs

29. Scientific outputs will be disseminated largely through scientific journal publications and oral presentations at key fora.

30. The project will collaborate with a taskforce coordinated through the Secretariat of the Pacific Community (SPC) to improve trade and governance of sea cucumber fisheries in the Pacific.
31. The manual and DVD will be lasting information sources for fishers. They can be translated and applied in other fisheries in the Indo-Pacific region since the sea cucumber species are similar. The village-based training workshops will bolster uptake of the processing methods advocated in the manual.

### **Project benefits**

32. The research will provide proof-of-concept of impacts for future investments in similar interventions in PICs and other countries. The impact testing will also show whether such support to fishers results in them spending more time on value-adding of wild captures and less time fishing – thus, indirect benefits on resource sustainability.
33. At least 3,000 households are expected to be financially boosted by the project as a primary impact. A greater involvement of women in the fishery through postharvest processing is expected. Community impacts should commence in Year 3 of the project and the impact lifespan is at least 10 years.

### **Partnerships**

34. Southern Cross University will be the commissioned organisation and is in a strong position to implement the project through the National Marine Science Centre. The project leader will be Dr Steven Purcell, who is an expert on sea cucumber fisheries and has experience in sociological research on sea cucumber fisheries.
35. The project will be conducted in collaboration with fisheries departments in Kiribati, Tonga and Fiji. James Cook University (JCU) will provide supervision of a PhD student who will examine nutritional composition of sea cucumbers under different processing methods. A JCU anthropologist, Dr Simon Foale, will support the implementation of the project's interventions, and the research and analysis on socio-economic benefits to fishers. The SPC will provide advice on implementation strategies and directly support the production of the processing manual. We will partner with expert processors in Fiji to train fisheries officers to be processing trainers.

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