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## PILOTING SUSTAINABLE FISH VALUE CHAINS WITH EXTENDED SHELF-LIFE PRODUCTS

July 2020

SDGs:



Countries: Micronesia (Federated States of)

Project Codes: TCP/MIC/3604

FAO Contribution: USD 331 000

Duration: 22 December 2017 – 31 December 2019

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### Implementing Partners

Department of Resources and Development; Department of Health and Social Affairs.

### Beneficiaries

Government personnel from the Department of Resources and Development and the Department of Health and Social Affairs; The Farmers Association; The Island Food Community of Pohnpei; Pohnpei State coastal communities, fishers, traders, processors and retailers.

### Country Programming Framework (CPF) Outputs

Output 2.4: Strengthened capacity of private sector, households and communities to process, prepare and market nutritious and safe local food products (including fisheries products).



## BACKGROUND

Real GDP for Micronesia (Federated States of) in 2015 was just under USD 240 million, of which 12 percent was contributed by the fisheries sector. More than an important contributor to national economic activity, this sector is the main source of income for 70 percent of households dependent on small-scale fisheries. With 40 percent of the population living below the national poverty line, the need for innovative, profitable and sustainable market-based solutions around local fisheries proved urgent, especially when 84 percent of agricultural households are subsistence workers. In addition, food and nutrition insecurity trends were alarming, with the country's population ranking as one of the most obese worldwide, and thus, living with non-communicable diseases and micronutrient deficiencies. A rising dependency on imported, processed foods contributed to these public health concerns.

In this context, and with recent trends showing large amounts of tuna by-catch from commercial fisheries leading to its being thrown away, the project responded to the urgent need for local markets to develop and adopt cost-effective and replicable technologies through which to absorb, conserve and market the tuna accordingly.

A previous FAO Technical Cooperation Programme Facility (TCPf) project entitled, High quality, sustainable fish products with extended shelf life (TCP/MIC/3602/C1), served as an exploratory support to promoting sustainable fish value chains in Micronesia (Federated States of), after which it suggested this pilot project. Therefore, in coordination with Pohnpei coastal communities, farmers associations and the Departments of Resources and Development and of Health and Social Affairs, the project carried out market assessments, capacity building initiatives and piloting exercises on fish processing and fertilizer production to: (i) increase fish shelf-life, (ii) ensure safe fish food handling, (iii) test fish drying/smoking techniques based on the FAO-Thiaroye Fish Processing Kiln (FTT) technique, (iv) pilot fish silage production, and (v) foster safe use of fertilizers.

## IMPACT

In turning tuna by-catch into a driver of improved food security, nutrition, income and agricultural production, the piloting of sustainable fish value chains has produced a successful, scalable and replicable experience around fish smoking and drying that promises to decrease post-harvest losses, increase the utilization of fish products, safeguard marine ecosystems and improve access, availability and utilization of fish foods.



## ACHIEVEMENT OF RESULTS

In supporting governmental stakeholders and coastal communities build their capacities to reduce post-capture losses, safeguard resources, enhance seafood handling, promote responsible consumption and production, pilot fish processing methods and strengthen capacities in fish silage to replace expensive imported fertilizers, the project ensured an interconnected contribution to SDGs 1, 2, 8, 12, 14, and 17.

Moreover, knowledge management was a project cornerstone, with feedback from meetings, workshops and community consultations contributing to technical and reference manuals on fish processing, food loss reduction, and good hygiene practices (GHP) and good manufacturing practices (GMP) in the fisheries sector. The Government agreed to make the current English versions also available in Pohnpeian and Chukeese.

In this respect, all capacity building efforts successfully applied a training-of-trainers modality, thus empowering local community leaders and fishers to replicate the piloted techniques. Overall, 85 fishery operators and government field and extension officers were trained on GHPs and GMPs, 150 local fishers and community members directly benefited from seven seafood safety handling demonstrative events, and 18 government extension officials and community leaders and 26 fishers and retailers were trained on constructing, operating and servicing FTT fish processing kilns (of which three were constructed).

In supporting community-wide extension services, the National Project Coordinator and consultants were actively involved with community members to provide programmatic guidance and ensure the full participation of women and youth in all trainings. These efforts helped operationalize the project's four core streams of technical assistance.

- Strengthening fish handling and processing practices;
- Constructing safe and locally adaptable fish drier-smokers, based on the FTT technology;
- Piloting small-scale fish silage production using by-catch and FTT processing kiln waste for fertilizer production; and
- Carrying out market and consumer preference assessments on dried/smoked fish products.



## IMPLEMENTATION OF WORK PLAN

Several activities and the intended outcome – increase fish processing capacities for human consumption and agricultural production – were not completed due to procurement and recruitment-related delays. Nonetheless, all implemented activities were delivered within the original project budget and the extended timeline, given a revised end date from 21 September to 31 December 2019 that allowed for the completion of two remaining FTT fish processing kilns and their handover to the stakeholders concerned.

In this respect, the programmatic constraints ranged from the recruitment of sufficiently specialized experts in fish processing to the procurement of essential equipment for fish fertilizer. As part of the project's risk management strategy, a project inception workshop, the identification of an acting focal point in the line ministries concerned, the recruitment of international experts and strong community outreach efforts were ensured. However, two unanticipated constraints were particularly disruptive to the work plan: (i) the inability to recruit a suitable national consultant to carry out surveys and market assessments on smoked and dried fish varieties and delays in recruiting an international expert familiar with the FTT technique, and (ii) the unavailability of formic acid in Pohnpei to decompose fish silage, leading to the procurement of a bone grinder (as a substitute) from abroad and whose delivery extended beyond the project's end date. As a follow-up action, the federal and state governments agreed to complete the fish silage activity after the project's conclusion.

In addition, the project did not work as closely as planned with development partners, especially the World Bank Pacific Regional Oceanscape Programme (PROP), in order to secure funding to scale up key results. This is largely because of the failure to deliver the fish silage component of the project, combined with the reported constraints related to human resources.

## FOLLOW-UP FOR GOVERNMENT ATTENTION

Given the successful piloting of the FTT technique and the interest generated around it, government authorities have committed to promote and replicate this experience. Likewise, in light of the government's commitment to complete the fish silage component of the project – notably Activities 3.3, 3.4 and 3.5 – and promote the construction, operation and servicing of driers-smokers, FAO personnel and government authorities are invited to share the project results with resource partners in order to identify funding for these follow-up tasks. Moreover, government extension personnel are encouraged to use and share the following technical training manuals, which have already been validated by government authorities.

- Processing Seafood with Good Manufacturing Practices (GMP) Manual;
- Basic Good Manufacturing Practices (GMP) and Good Hygiene Practices (GHP) Manual; and
- GMP and Sanitation Standard Operating Procedure Manual.

Along these lines, the Departments of Resources and Development and of Health and Social Affairs are reminded to complete any pending translations into Chuukese and Pohnpeian of these and any other manuals and outreach products and distribute among stakeholders.

## SUSTAINABILITY

### 1. Capacity development

In light of active federal and state government involvement, the project sought to embed the pilot initiatives within existing organizational strategies and priorities. To this end, the first FTT fish processing kiln was built in a government-managed botanical garden that houses a women-led fish processing organization. These efforts fed into the project's broader vision of training and empowering fish operators, retailers, governmental extension personnel and a wide array of actors along the fish value chain who would benefit from improved GHP and GMP.

Furthermore, the project successfully strengthened a partnership between the federal and state governments and community organizations to help steer the replicability and scalability of the piloted activities. Similarly, the close collaboration with the College of Micronesia, the Pacific Community (SPC) and the University of Wollongong ensured the alignment of all capacity building trainings and workshops with regional best practices and recent national food safety trainings.

As such, 85 fishery operators and government field and extension officers were trained on GHP and GMP, 150 local fishers benefited from seafood safety handling demonstrative events, 18 extension officers and community leaders and 26 fishers and retailers were trained on the FTT technique and three pilot FTT fish processing kilns were built.

### 2. Gender equality

The project advanced the government's agenda of building capacities around higher value-added fish products geared to women and youth producers. Consequently, the Department of Health and Social Affairs advised on the active participation of women, youth and other vulnerable groups, which in turn facilitated participatory consultations with local governments, farmers associations and coastal community leadership. This ensured that all trainings and workshops responded to gender-specific limitations, such as unpaid work and care burdens among women.

### 3. Environmental sustainability

The project successfully piloted market-based solutions to reduce food loss, encourage healthier eating and minimize tuna by-catch as an externality from commercial fishing. In addition, the FTT technique, as piloted throughout the project, used leftover coconut husks as a sustainable source of energy that also reduces food loss reduction and finds positive uses for by-products. Therefore, by processing by-catch species into valuable products, and with the FTT technique using up to 50 percent less fuel than traditional fish drying and smoking methods, the project contributed to safeguarding marine ecosystems and promoting new sources of income for fishers. Likewise, by producing fish silage as a fertilizer ingredient, using molasses and bone grinders to decompose the silage, the project provided alternatives to expensive and imported fertilizers that may affect marine ecosystems.

#### 4. Human Rights-based Approach (HRBA) – including Right to Food and Decent Work

The piloting of the FTT technique opened up opportunities for gainful employment, entrepreneurial activity and improved food security and nutrition among Pohnpei coastal communities. In this respect, the assessment and dissemination of new conservation, packaging and marketing modalities for fish foods exceeded the project's expectations, which could contribute to the progressive realization of the Right to Food from a variety of social, economic, environmental and human rights-based perspectives.

What's more, the FTT technique promises fishers a new source of income through a less labour-intensive fish conservation method, thereby reducing the burden of manual labour, especially among women.

#### 5. Technological sustainability

By piloting a new approach to reducing food loss, improving diets and creating employment opportunities, the project demonstrated its potential to inform sectoral policies and programmes, especially if local government authorities can identify resources to ensure a wider scalability. The demonstration sessions and trainings on FTT technologies proved to be safe, user-friendly and adaptable to other communities. The FTT technique also proved flexible in terms of its positive ecological impact, as it can make use of leftover coconut husks as its source of energy. Fishers have thus integrated the advantages of fish drying and smoking into their local knowhow and all stakeholders and beneficiaries have expressed interest in adopting and replicating the experience.

#### 6. Economic sustainability

The FTT technologies, in aiming to improve seafood shelf life and reduce food loss, were deemed affordable and suitable to the needs of Pohnpei State fishers, with participants at the trial sessions voicing their willingness and ability to replicate this experience. Moreover, while the Government of Micronesia (Federated States of) has expressed its disposition to completing the pending project activities, the required funding has not yet been identified. In addition, the project initially aimed to work closely with the World Bank's PROP Programme, which operated until 2020 on coastal and oceanic fishery resource management, in order to share information and encourage the integration of lessons learnt into World Bank planning on fisheries and natural resource management.

#### DOCUMENTS AND OUTREACH PRODUCTS

- ❑ Back to Office Report. Y. Beyens. 2018. 59 pp.
- ❑ Back to Office Report. J. Nyemah. 2018. 12 pp.
- ❑ Back to Office Report. J. Nyemah. 2019. 13 pp.
- ❑ Critical Control Point Decision Tree. Table. G.D.S.K. Rajapakse. 2019. 1 pp.
- ❑ Field Visit to Kolona. Report. Y. Beyens. 2019. 4 pp.
- ❑ Food Safety Rapid Risk Analysis on the Fish Chain in Pohnpei. Technical Report. Y. Beyens. 2019. 25 pp.
- ❑ GMP and SSOP Practices and Programs. Leaflet back page. G.D.S.K. Rajapakse. 2019. 1 pp.
- ❑ GMP and SSOP Practices and Programs. Leaflet front page. G.D.S.K. Rajapakse. 2019. 1 pp.
- ❑ GMP and SSOP Practices and Program SOPs. G.D.S.K. Rajapakse. 2019. 3 pp.
- ❑ Minutes from Partner/CSP Meeting. Y. Beyens. 2019. 1 pp.
- ❑ Minutes from Partner/EPA Meeting. Y. Beyens. 2019. 2 pp.
- ❑ Minutes from Partner/NORMA Meeting. Y. Beyens. 2019. 1 pp.
- ❑ Minutes of FAO Meeting. Y. Beyens. 2019. 1 pp.
- ❑ Mission Report. G.D.S.K. Rajapakse. 2019. 22 pp.
- ❑ Mission Report. B. Rotawewa. 2019. 31 pp.
- ❑ FTT Site Selection Decision-making Process. Internal Technical Note for File. J. Nyemah. 2019. 8 pp.
- ❑ Processing Seafood. Manual. G.D.S.K. Rajapakse. 2019. 2 pp.
- ❑ Processing Seafood with Good Manufacturing Practices. Manual. G.D.S.K. Rajapakse. 2019. 1 pp.



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## ACHIEVEMENT OF RESULTS - LOGICAL FRAMEWORK

<b>Expected Impact</b>	<b>Decreased post-harvest losses to ensure availability, access and appropriate use of nutritious food in Micronesia (Federated States of)</b>		
<b>Outcome</b>	Increased capacities to process fish products for human consumption and agricultural production		
	<b>Indicator</b>	<ol style="list-style-type: none"> <li>1. Increased awareness of key stakeholders in seafood safety best handling practices.</li> <li>2. Increased number of food products with extended shelf life trialled for human consumption.</li> <li>3. Fish by-products and waste from kiln production are converted to fertilizer for plants.</li> <li>4. Reduction in food loss and waste in fish evaluated.</li> </ol>	
	<b>Baseline</b>	<ol style="list-style-type: none"> <li>1. 0</li> <li>2. 2</li> <li>3. 0</li> <li>4. 0</li> </ol>	
	<b>End Target</b>	<ol style="list-style-type: none"> <li>1. At least 164 persons trained in GHP/GMP.</li> <li>2. At least 1 new food product trialled.</li> <li>3. At least 1 new plant feed product trialled.</li> <li>4. A viability study on reduction of food loss and waste in fish-based activities.</li> </ol>	
	<b>Comments and follow-up action to be taken</b>	<p>The project outcome was only partially achieved and, out of the three outputs contributing to this broader outcome, Output 1 and Output 3 were partially completed, while Output 2 was fully completed despite some contributing activities not being fully achieved as planned.</p> <p>The project trained 85 stakeholders in GMP and GHP (falling short of the intended target of 164), trialled smoked fish, pork, taro and breadfruit, built three FTT fish processing kilns and completed a study on reduction of food loss and waste.</p> <p>The fish silage component was not implemented because the initial approach of using formic acid was revised, as the use of this substance is not permissible in the country.</p>	
<b>Output 1</b>	At least 164 fish operators and government field officers with improved capacities in seafood safety handling practices		
	<b>Indicators</b>	<b>Target</b>	<b>Achieved</b>
			<b>Partially</b>
<b>Baseline</b>			
<b>Comments</b>	A total of 150 fishers and community members benefited from improved food handling measures, while 85 fish operators and government field officers in seafood safety handling practices were trained on GHP/GMP. The target of 164 could not be achieved due to delays in constructing the FTT fish processing kilns and time constraints among project personnel organizing several cohorts of fish operators for multiple trainings.		
<b>Activity 1.1</b>	<b>Assess the risk of fish handling along the value chain and set risk management measures</b>		
	<b>Achieved</b>	Yes	
	<b>Comments</b>	<p>In August 2019, a fish safety expert assessed the risks of fish handling along the value chain, reporting limited basic GHP due to limited resources.</p> <p>Consequently, measures (e.g. appropriate icing, use of cooler boxes, and packaging) were recommended for managing the identified risks, but their implementation depends on the identification of additional resources.</p>	
<b>Activity 1.2</b>	<b>Build capacity in good handling and manufacturing practices</b>		
	<b>Achieved</b>	Yes	
	<b>Comments</b>	<p>Workshops on GHP and GMP were delivered to 15 participants, including government extension officers and community leaders in December 2019. All feedback from the trainings contributed to the training and reference manuals developed.</p> <p>As part of the revised project timeline, the development of a manual on GHP and GHP for smoked fish processing was added to this activity.</p>	

Activity 1.3	Develop GHP and GMP extension material		
	Achieved	Yes	
	Comments	<p>Based on feedback from federal food safety authorities and retailers (from Activity 1.2), three training manuals were produced and validated by the Government to support extension services.</p> <ul style="list-style-type: none"> <li>– Processing Seafood with Good Manufacturing Practices (GMP) Manual;</li> <li>– Basic Good Manufacturing Practices (GMP) and Good Hygiene Practices (GHP) Manual; and</li> <li>– GMP and Sanitation Standard Operating Procedure Manual.</li> </ul> <p>Government authorities will translate them into Chuukese and Pohnpeian and share with stakeholders.</p>	
Activity 1.4	Organize safe fish handling awareness and training sessions		
	Achieved	Yes	
	Comments	<p>In collaboration with the 15 trained government officials, seven fish handling awareness sessions were organized in Pohnpei during December 2019. These sessions benefited 150 participants, including municipal stakeholders and fish operators, and facilitated knowledge transfer using the didactic and reference materials produced. Two GMP and GHP workshops were also organized in Pohnpei during this month.</p>	
Output 2	Technologies to improve shelf life of seafood products and to reduce food loss and waste in the fisheries sector are evaluated		
	Indicators	Target	Achieved
			Yes
Baseline			
Comments	<p>Three FTT fish processing kilns were built in Pohnpei State, and several trials were conducted, including for smoked small fish and tuna. The beneficiary communities also successfully experimented drying breadfruit and smoking pork meat, which confirmed the drier as a multi-purpose device.</p> <p>However, the assessment and dissemination of findings on the marketability of smoked/dried fish was not completed, as a suitable national consultant for this task was not identified.</p>		
Activity 2.1	Consumer preference study		
	Achieved	Yes	
	Comments	<p>An analysis on the availability and characteristics of raw and/or processed materials on remote islands and consumer preferences for dried and smoked fish was completed. The analysis concluded that fish from by-catch was available, and although local communities were not widely processing it, there was interest in smoked fish, hence a market for it.</p>	
Activity 2.2	Analyze current fish smoking methods and appropriateness of the FTT fish processing kiln		
	Achieved	Yes	
	Comments	<p>Analyses were conducted on current fish drying/smoking methods and on the suitability of the FTT fish processing kiln, which was deemed suitable and adaptable to local contexts.</p> <p>A design of the fish processing kiln was shared with government stakeholders, and a video from Ghana's fish processing experience was used to help the stakeholders visualize the fish processing kiln and decide on the site selection. As part of these efforts, a study on food loss and waste reduction was completed.</p>	
Activity 2.3	Select communities to participate in product development		
	Achieved	Yes	
	Comments	<p>Endorsed by federal and state government officials, the botanical garden, a private fish market and the fisherman community of Kapinga were selected to develop the fish processing kiln.</p> <p>In addition, a training-of-trainers workshop on fish packaging and on the construction, operation and servicing of fish drier-smokers was delivered in April 2019 for 18 government extension officials and coastal community leaders. A second workshop on using the fish processing kiln for fish smoking was conducted in April 2019 for 26 fishers.</p>	
Activity 2.4	Build and equip Micronesia (Federated States of) high-performance fish drier-smokers		
	Achieved	Yes	
	Comments	<p>An operational manual was not deemed necessary due to the practical nature of building, operating and servicing FTT fish processing kilns, two of which were built following the April 2019 training workshops.</p> <p>The project provided the drier-smokers with fish processing utensils, while FAO and the Pohnpei State Government supplied the fish. Based on the trials completed, FAO concluded that the use of coconut husks was the most environmentally conscious and cost-efficient energy source for the driers-smokers.</p> <p>As part of the project's revised timeline, facilitation efforts for community ownership of the FTT technique were added to this activity.</p>	

Activity 2.5	Trial value added products		
	Achieved	Yes	
	Comments	The FTT fish processing kilns were successfully tested with fish, pork, taro and breadfruit, the latter three added by the community who believed the processing kiln should serve various purposes. During the seven awareness sessions organized under Activity 1.4, trials were also conducted on smoking/drying small and tuna fish, followed by workshops on marketing dried/smoked fish. Fish operators, community members, government officials, potential commercial investors and staff and students from the College of Micronesia praised the easiness of the process and quality and taste of the final product.	
Activity 2.6	Assess and disseminate findings		
	Achieved	Partially	
	Comments	A survey assessing the marketability of smoked fish was not conducted, as a suitable consultant could not be identified. Results from the outreach sessions from Activity 1.4 were shared with the government and community leaders and contributed to assessing and disseminating findings from the FTT technique and the marketability of dried/smoked fish.	
Output 3	Technologies to convert waste products from Micronesia (Federated States of) high-performance fish drier-smokers into fish fertilizer are evaluated		
	Indicators	Target	Achieved
			Partially
Baseline			
Comments	<p>Technical consultations with farmers, livestock owners, fishers and national and local government officials were conducted to identify the most cost-effective and environmentally beneficial technologies to convert waste products into fish fertilizer.</p> <p>The project team decided to use molasses and a bone grinder to create the fish fertilizer and contribute to the decomposition of the silage, based on successful practices from a Japanese company in Pohnpei. However, the bone grinder was procured from abroad and its delivery delayed, thus affecting Activities 3.3, 3.4 and 3.5. Upon arrival of the bone grinder to Pohnpei, the Federal and State governments shall support these activities with the help of the Farmers Association. However, due to the ongoing COVID-19 pandemic and the travel and shipment disruptions observed as a result, it is not possible to identify a tentative date of arrival of the bone grinder for the Government to complete these activities.</p>		
Activity 3.1	Select an operational team for the fish fertilizer production		
	Achieved	Yes	
	Comments	FAO collaborated with the government and community to successfully establish an operational team for the fish fertilizer production, in close coordination with government agriculture extension workers, farmers and fish retailers.	
Activity 3.2	Design and implement fish fertilizer production process (links with activity 3.4)		
	Achieved	Yes	
	Comments	<p>In collaboration with the Departments of Resources and Development and of Health and Social Affairs, the project engaged with community leaders to assess the viability and added value of fish fertilizer production. Since the original approach planned to use formic acid – whose use in Micronesia (Federated States of) is not permitted – the project opted for molasses and bone grinders to decompose the silage and create fertilizer.</p> <p>The bone grinder, however, was not locally available, was procured from abroad and is pending delivery, at which point the government authorities shall complete these activities.</p>	
Activity 3.3	Conduct fertilizers trial on the compost		
	Achieved	No	
	Comments	Fertilizer compost trials were not conducted due to delays in procuring the necessary equipment that would replace the use of formic acid, as initially planned. However, the government authorities concerned agreed to complete this activity.	
Activity 3.4	Train operational team and beneficiaries on fish silage production and utilization		
	Achieved	No	
	Comments	This capacity building activity on fish silage production and utilization could not be implemented, as it was linked to Activity 3.3. However, government authorities agreed to conduct the activity beyond the project's end date.	
Activity 3.5	Assess and disseminate findings		
	Achieved	No	
	Comments	This activity could not be implemented as it was linked to Activities 3.3 and 3.4. Government authorities have agreed to conduct these pending assessments and dissemination of findings, lessons learned and opportunities for replicability and scalability.	



**Partnerships and Outreach**

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