



USAID | GHANA
FROM THE AMERICAN PEOPLE

SUSTAINABLE FISHERIES MANAGEMENT PROJECT (SFMP)

Final Report on Ahotor Oven Market Development and Financing Outcomes and Lessons Learned



MAY, 2019

THE
UNIVERSITY
OF RHODE ISLAND
GRADUATE SCHOOL
OF OCEANOGRAPHY



resonance

This publication is available electronically in the following locations:

The Coastal Resources Center

http://www.crc.uri.edu/projects_page/ghanasfmp/

Ghanalinks.org

<https://ghanalinks.org/elibrary> search term: SFMP

USAID Development Clearing House

<https://dec.usaid.gov/dec/content/search.aspx> search term: Ghana SFMP

For more information on the Ghana Sustainable Fisheries Management Project, contact:

USAID/Ghana Sustainable Fisheries Management Project

Coastal Resources Center

Graduate School of Oceanography

University of Rhode Island

220 South Ferry Rd.

Narragansett, RI 02882 USA

Tel: 401-874-6224 Fax: 401-874-6920 Email: info@crc.uri.edu

Citation: Owusu, D. (2019). Final Report on Ahotor Oven Market Development and Financing Outcomes and Lessons Learned. The USAID/Ghana Sustainable Fisheries Management Project (SFMP). Narragansett, RI: Coastal Resources Center, Graduate School of Oceanography, University of Rhode Island and Resonance Global. GH2014_ACT242_RESONANCE. 24 pp.

Authority/Disclaimer:

Prepared for USAID/Ghana under Cooperative Agreement (AID-641-A-15-00001), awarded on October 22, 2014 to the University of Rhode Island, and entitled the USAID/Ghana Sustainable Fisheries Management Project (SFMP).

This document is made possible by the support of the American People through the United States Agency for International Development (USAID). The views expressed and opinions contained in this report are those of the SFMP team and are not intended as statements of policy of either USAID or the cooperating organizations. As such, the contents of this report are the sole responsibility of the SFMP team and do not necessarily reflect the views of USAID or the United States Government.

Cover photo: Traditional and Ahotor stoves. Credit: SNV

Detailed Partner Contact Information:

USAID/Ghana Sustainable Fisheries Management Project (SFMP)
10 Obodai St., Mempeasem, East Legon, Accra, Ghana

Telephone: +233 0302 542497 Fax: +233 0302 542498

Raymond Babanawo	Chief of Party	Email: raybabs.sfmp@rcuri.org
Enoch Appiah	Deputy Chief of Party	Email: eappiah.sfmp@rcuri.org
Kofi Agbogah	Senior Fisheries Advisor	Email: kagbogah@henmpoano.org
Perfectual Labik	Communications Officer	Email: perfectual.sfmp@rcuri.org
Mary Asare	M&E Officer	Email: mary.sfmp@rcuri.org
Brian Crawford	Project Manager, CRC	Email: bcrawford@uri.edu
Ellis Ekekpi	USAID AOR	Email: eekekpi@usaid.gov

Hen Mpoano
38 J. Cross Cole St. Windy Ridge
Takoradi, Ghana
+233 312 020 701
Kofi.Agbogah
kagbogah@henmpoano.org
Stephen Kankam
skankam@henmpoano.org

Resonance Global
(Formerly SSG Advisors)
182 Main Street
Burlington, VT 05401
+1 (802) 735-1162
Thomas Buck
tom@ssg-advisors.com

SNV Netherlands Development
Organisation
#161, 10 Maseru Road,
E. Legon, Accra, Ghana
+233 30 701 2440
Andre de Jager
adejager@snvworld.org

CEWEFIA
B342 Bronyibima Estate
Elmina, Ghana
+233 024 427 8377
Victoria C. Koomson
cewefia@gmail.com

Friends of the Nation
Parks and Gardens
Adiembra-Sekondi, Ghana
+233 312 046 180
Donkris Mevuta
Kyei Yamoah
info@fonghana.org

Development Action Association (DAA)
Darkuman Junction, Kaneshie Odokor
Highway
Accra, Ghana
+233 302 315894
Lydia Sasu
daawomen@daawomen.org

For additional information on partner activities:

CEWEFIA: <http://cewefia.weebly.com/>
CRC/URI: <http://www.crc.uri.edu>
DAA: <http://womenthrive.org/development-action-association-daa>
Friends of the Nation: <http://www.fonghana.org>
Hen Mpoano: <http://www.henmpoano.org>
Resonance Global: <https://resonanceglobal.com/>
SNV: <http://www.snvworld.org/en/countries/ghana>

ACRONYMS

CRC	Coastal Resources Center at URI
CSIR	Council for Scientific and Industrial research
GDP	Gross Domestic Product
FAO	Food and Agriculture Organization
FC	Fisheries Commission
FI	Financial Institution
FTT	Thiaroye Processing Technique
GSA	Ghana Standards Authority
MASLOC	Microfinance and Small Loans Center
MOFAD	Ministry of Fisheries and Aquaculture Development
MOH	Ministry of Health
NAFPTA	National Fish Processors and Traders Association
PAH	Polycyclic Aromatic Hydrocarbons
PHU	Post Harvest Unit
SFMP	Sustainable Fisheries Management Project
URI	University of Rhode Island
WARFP	West Africa Regional Fisheries Project

TABLE OF CONTENTS

ACRONYMS	iii
LIST OF FIGURES	iv
EXECUTIVE SUMMARY	1
INTRODUCTION	2
OBJECTIVES	3
METHODOLOGY	4
RESULTS	5
The Oven Technology.....	5
Strategies and Outcomes.....	7
USER FEEDBACK	12
LESSONS LEARNED.....	13
RECOMMENDATIONS FOR THE FUTURE OF THE AHOTOR	14
REFERENCES	15
ANNEX 1: QUESTIONNAIRES FOR INTERVIEWS WITH THE AHOTOR TEAM, USER FOCUS GROUPS, AND STOVE COMPANIES	16
Questionnaire on Market Development and Financing Strategies for the Ahotor Oven (SFMP Partners and PHU of the Fisheries Commission).....	16
Interview Guide with Early Adopters of the Ahotor Oven (Focus Groups).....	17
Interview Guide for Discussions with Oven Construction Companies	19

LIST OF FIGURES

Figure 1. The basic fish smoking technologies used in Ghana.....	6
Figure 2. Views of the Ahotor oven.....	7

EXECUTIVE SUMMARY

The Sustainable Fisheries Management Project (SFMP) is a USAID-funded Feed the Future Initiative with the objective of supporting the Government of Ghana to rebuild marine fish stocks and catches through the adoption of responsible fishing practices.

Rebuilding marine fish stocks also demands reducing the inefficiencies in the post harvest value chain to reduce post-harvest losses and maximize incomes. SFMP's principal strategy to achieve this was to promote widespread adoption of improved fish preservation methods. Since 70% of all fish harvest is preserved through smoking, SFMP and its partner SNV collaborated with the Fisheries Commission and the Food Research Institute of the Council for Scientific and Industrial Research (CSIR) to develop and deploy the Ahotor oven, an improved smoker technology that provides economic, environmental, and health benefits for fish processors and consumers compared to existing options.

The objective of this report is to explore and review successes, challenges, and lessons learned related to SFMP's efforts to increase the Ahotor oven's adoption by fish processors and to recommend strategies to increase uptake of the Ahotor in Ghana going forward.

This report is a synthesis of data from experiences and learnings from SFMP's implementing partners, discussions with early adopters, and a desk study of existing research on fish processing in Ghana.

SFMP's efforts to increase uptake of the Ahotor included three primary pathways:

- Communications targeting behavioural change, awareness raising, and demand creation
- Developing the Ahotor supply chain, to increase oven supply, ensure oven quality, and decrease oven costs
- Providing affordable financing options (credit and savings) as well as building the business skills of fish processors, to support the purchase of the Ahotor.

Despite these efforts, uptake has been slow, with 319 ovens constructed for fish processors by SFMP, and another 214 constructed by the Fisheries Commission Post Harvest Unit with support of the World Bank WARFP project. This represents 8.9% of SFMP's original target. Ahotor purchases and construction have been adversely affected by low fish catch at the landing beaches, limited access to finance for fish processors, the high cost of the oven and key oven components, and low consumer awareness on the benefits of Ahotor smoked fish.

However, uptake could increase if the Department of Health and the Ministry of Fisheries and Aquaculture Development (MOFAD) Fisheries Commission (FC) could reinforce the campaign on the health benefits of the Ahotor oven and Ahotor smoked fish to consumers. Increased consumer awareness and demand – and a resulting price premium for Ahotor smoked fish – could help to encourage more fish processors to use the Ahotor oven.

The MOFAD/FC should continue instituting systems at the Post Harvest Unit to ensure that the Class 1 Recognition Scheme is implemented, so that participating fish processors are able to increase their incomes by accessing formal markets with Ahotor-smoked fish.

While SFMP developed an Ahotor construction manual and user guide, a video documentary on improved fish smoking practices, use of the Ahotor oven, and an explanation of its construction should also be produced by SFMP/MOFAD/FC for use by fish smokers, extension agents, and students.

INTRODUCTION

The Sustainable Fisheries Management Project (SFMP) is a USAID-funded Feed the Future project with the objective of supporting the Government of Ghana to rebuild marine fish stocks and catches through the adoption of responsible fishing practices.

SFMP's post-harvest component aimed to improve efficiencies in the post-harvest value chain and ensure the production and trade of quality, healthy, sustainably-harvested fish in Ghana.

SFMP's principal strategy to achieve this was to promote widespread adoption of improved fish smoking technologies and practices that could provide economic, environmental, and health benefits for fish processors and consumers compared to existing options and handling practices.

SFMP set an initial target of reaching 20% of fish processors (about 6,000 people), to reach a critical mass of early adopters for the diffusion of post-harvest innovations (Rogers, 1962) that could then further scale up sustainably through social networks and market forces.

This report outlines the strategies developed and implemented by SFMP to increase uptake of the Ahotor oven, successes to date, challenges encountered, and lessons learned, based on focus group discussions with early adopters of the oven, SFMP implementing partners, and stove construction companies.

OBJECTIVES

The objective of this report is to review:

- The need for and value of an improved oven – the Ahotor – for fish processing in Ghana.
- Successes, challenges, and lessons learned related to SFMP’s efforts to increase the Ahotor oven’s adoption by fish processors.
- Market and supply chain development.
- Financing for fish processors.
- Recommend strategies to increase uptake going forward.

METHODOLOGY

This report builds on data, discussions, and observations from SFMP's field activities, including:

- The experience and learnings of the implementation team, especially SFMP's Market Development Specialist;
- Five focus groups conducted in May 2019 by the SFMP Market Development Specialist and CEWEFIA field staff, involving a total of 71 fish processors to discuss user feedback on the Ahotor oven (see interview guide included in Annex 1);
- A desk study of reports and materials related to fish processing in Ghana and the post harvest sector, drawing on SFMP reports and research from partners;
- Six interviews with SFMP post harvest partners (CEWEFIA, DAA, SNV, NAFPTA, and the Post Harvest Unit of MoFAD).

RESULTS

The Oven Technology

Along the coast and in inland fishing communities in Ghana, fish processors use various traditional methods to preserve and process fish for consumption and storage. These include smoking, drying, salting, frying, and fermenting, with smoking as the most widely practiced method.

Smoking fish helps reduce post-harvest losses during bumper harvests, prolongs the shelf life of fish for consumption, and guarantees continuous income for fish processors.

Over the years, technologies used to smoke fish in Ghana have included traditional barrel or mud ovens, the Chorkor oven introduced by the FAO in 1969, and the Morrison oven introduced by SNV in 2009. Fish smoker technologies have evolved over the years as researchers work to develop an oven that emits less smoke, is more fuel efficient, and eliminates associated health hazards for both fish processors and consumers of smoked fish products (i.e., smoke deposits left on the fish after smoking can result in high levels of Polycyclic Aromatic Hydrocarbons, or PAH).

The FAO has devised a cleaner version of the widely used Chorkor oven called the FTT (Thiaroye Processing Technique). The FTT-Thiaroye has the particular merit of overcoming the challenge linked to the polycyclic aromatic hydrocarbons (PAH). It further curbs fuel consumption while reducing the exposure of the fish processor to smoke and heat. However, feedback from fish processors through SFMP indicate that the FTT is expensive at GHS 4,000 and cumbersome to use.

Under USAID/SFMP, project partner SNV, in collaboration with the Post-Harvest Unit of the Ministry of Fisheries and Aquaculture Development (MOFAD) Fisheries Commission (FC), the Food Research Institute (FRI) of the Council for Scientific and Industrial Research (CSIR), the Ghana Standards Authority, and the Food and Drugs Authority undertook further research modeled on the Chorkor and the Morrison ovens to design an oven that is fuel efficient, generates less smoke, and produces safer PAH levels: the Ahotor oven. The Ahotor oven is constructed using local materials, and users were involved at each stage of the oven's research and development.

Fish Smoking Technologies in Ghana

<p>The Barrel Traditional Oven</p>  <p>BaP 15 PAH4 72 Price: GHS 100</p>	<p>The Chorkor Oven</p>  <p>BaP 22 PAH4 84 Price: GHS 400</p>
<p>The Morrison Oven</p>  <p>BaP 30 PAH4 110 Price: GHS 800</p>	<p>The FAO Thiaroye Technology (FTT)</p>  <p>Below EU limits of BaP 2 PAH 12 Price: GHS 4,000</p>

Figure 1. The basic fish smoking technologies used in Ghana

The Ahotor Oven

The partners developed the Ahotor oven to offer fish processors a fish smoker that is user friendly, hygienic, and that solves key health and energy inefficiency challenges of traditional ovens – most importantly, by producing fish with low PAH levels. Test results from the Ghana Standards Authority (GSA) laboratory indicated that the PAH level in fish smoked with the Ahotor oven is 10.93 μ g/kg, while that of Chorkor is 84 μ g/kg. These low levels of PAH were attained by sprinkling smooth ash on the fat-collector before each smoking session. This absorbs the fluids that drip from the fish during the smoking session, thereby leaving nothing to be burnt and deposited on the fish. Examples of Ahotor ovens in use are shown below.



Figure 2. Views of the Ahotor oven

Components of the Ahotor Oven

The Ahotor oven is constructed as a single or double unit, and includes:

- Outer shell – sandcrete blocks and sand (joined together with cement mortar).
- Combustion chamber – burnt red bricks and ensures efficient combustion of fuel wood (joined with anthill sand and ash).
- Fat collector – fabricated with galvanized iron, and shaped to redistribute heat evenly to the trays.
- Metal grate – iron rods shaped to elevate the fuelwood at an angle of 90° for better circulation of heat.
- Smoking trays – made with wawa wood and wire mesh.

Strategies and Outcomes

In August 2016, a survey by SNV on consumer attitudes on processed fish showed that Ghanaian consumers preferred smoked dried fish to fresh fish. For fish processors, smoking remains the predominant mode of preserving fish, and consumers find smoked fish tastier, with more varied uses than fried or salted fish. The development of a clean fish smoker that is fuel efficient and produces healthier fish was therefore assumed to be in line with consumer preferences.

SFMP and partners' efforts to increase uptake of the Ahotor included three primary pathways:

- Communications targeting behavioral change, awareness raising, and demand creation
- Developing the Ahotor supply chain, to increase oven supply, ensure oven quality, and decrease oven costs
- Providing affordable financing options (credit and savings) as well as building the business skills of fish processors, to support the purchase of the Ahotor.

Demand Creation

The Ahotor oven was first developed and made available to fish processors in Ghana in August 2017. To support uptake of the Ahotor oven, SFMP worked with the Post-Harvest Unit of the Fisheries Commission and local partners DAA, CEWEFIA, and the National Fish Processors and Traders Association (NAFPTA) to expose fish processors to the technology through demonstrations during the development, design, and testing stages. Fifty-eight ovens were constructed in communities in the four coastal regions for demonstration to 300 fish processors. Women fish processors gave key feedback to improve the performance of the

oven, including to cut out an extra hole with a diameter of 66mm in the center of the fat collector to enable efficient heat circulation. Though this feedback and subsequent adjustments helped to improve the performance of the oven, some processors who had not heard about these minor defects refused to acquire the oven. So, while these demonstrations helped the team to solicit and incorporate valuable user feedback, they also – in some cases – negatively impacted user adoption, by cementing initial negative impressions of the stove’s performance with new customers.

In addition to the demonstrations described above, SFMP engaged in a range of approaches to raise awareness and generate consumer demand for the Ahotor. These approaches were implemented and continuously adapted over time:

- **Trained community champions and liaisons as demand aggregators and peer educators.** In total SFMP trained 18 community champions and liaisons in 10 communities across the four regional intervention zones. The community champions were early adopters who were engaged by SFMP to locally promote the oven, not for financial rewards but because they believed in the product and had a sense of shared commitment to educate their peers on the oven’s benefits. The community champions took part in radio panel discussions and educated listeners on the benefits of the oven while the liaisons became the link between the Ahotor oven artisans (who construct the oven and its parts) and fish processor clients while providing quality assurance for all ovens constructed.
- **Conducted promotional activities on TV and radio, in print, and at community durbars.** In total SFMP supported two TV spots, several radio spots, and discussed the Ahotor at all community meetings. SFMP also organised a promotional tour for its partners to the Volta, Central and Western Regions in March 2018 and engaged 684 members of NAFPTA on the benefits of the Ahotor oven.
- In collaboration with Adesa Productions Ltd., **SFMP produced two cooking shows featuring two early adopters of the Ahotor oven** in Elmina and Winneba on the popular TV3 Edziban show. The objective of these shows was to advertise to the general public the availability of the ahotor oven and the benefits it presents. The show generated six requests from fresh water fish producers (mudfish and Tilapia). One of these companies constructed three double unit ovens and fielded six artisans to be trained.
- **Developed a recognition scheme for smoked fish (Class 1 Recognition Scheme)** with the ownership and use of the Ahotor oven as a prerequisite. The objective of the scheme is to promote the production and trade of quality of fish through adherence to basic food safety protocols. Through SFMP’s partners (CEWEFIA, DAA and NAFPTA), interested processors were given the opportunity to choose between having the ahotor oven constructed for them or receiving funds (up to GHS 2,500) to upgrade their processing sites. (The needed upgrades for Class I Recognition include: a concrete floor for the processing facility; a fence to prevent entry by pests; proper disposal of waste and effluent; and the demarcation of the processing floor into receiving, processing, and storage chambers). Thirty-two fish processors applied to the scheme, out of which 13 were selected for the recognition after an initial audit. The other 19 who failed the audit received feedback on corrective measures to implement after which they would be audited again. SFMP funded construction and installation for 15 Ahotor ovens under the Class 1 Recognition scheme.
- **Offered a 30% grant – to cover Ahotor costs – for the first 200 adopters.** To benefit, the processor had to pay the artisan 70% of the cost of oven construction, while

SFMP paid the 30% grant after a quality assurance audit. [See more on financing below.]

- Granted ovens to 16 households vulnerable to child labor and trafficking.
- **Gave processors clear, actionable information on how to contact an artisan for Ahotor construction** by introducing the artisans to the fish processors during community engagements. SFMP also introduced processors to possible self-financing options for Ahotor purchase, such as own savings, layaways, or loans.

Supply Chain Development

SFMP encouraged production of ovens by trained entrepreneur-artisans. Increasing the adoption of the Ahotor oven required a sufficient network of artisans in key regions of Ghana to construct the ovens when required, at prices the processors can afford. As of June 2018, SFMP had trained 11 stove companies employing 48 community artisans.

However, five of the ovens constructed in the Central Region in 2017 were poorly constructed and in some cases, ovens had developed cracks or the fat collectors were not properly installed. So, to ensure quality assurance and boost confidence in the Ahotor, these artisans and 27 new artisans were provided additional training by SFMP in June 2018 and equipped with copies of a new Ahotor construction manual. SFMP also trained the artisans on business management to enable them to devise strategies to increase adoption and to maximize Ahotor expansion opportunities. The 75 trained artisans have since formed a network and set up a knowledge sharing platform. The five defective ovens were reconstructed at a cost to SFMP.

However, poor customer adoption has impeded the growth of the oven construction companies. The rising cost of key construction materials such as cement, bricks, galvanised iron, and transportation also means the artisans will have to increase the cost of construction correspondingly to make optimum margins.

Final Ahotor Construction & Installation Numbers

As a result of the efforts enumerated above, to date (as of May 1, 2019), 319 ovens have been constructed under the SFMP project:

- Fifty-eight (58) were built with the full cost paid by SFMP during initial R&D and rollout of demonstration and training ovens.
- Forty-two (42) were built with a 30% discount for the first 200 early adopters and/or with credit obtained from one of the three partner financial institutions (see more in the Financing section below).
- Thirty-four (34) were built with 50% discount to replace Morrison stoves that were built during the early stages of the SFMP project. Processors constructed the Morrison stoves with 100% funding through credit from financial institutions. Upon the development of the Ahotor ovens, the project replaced these Morrison stoves with Ahotor ovens.
- Fifteen (15) were constructed with a 100% subsidy from SFMP for processors who enrolled in the Class 1 Recognition Scheme.
- Thirteen (13) were paid for in full by fish processors.
- 141 were built in August 2018, with 88% subsidy from SFMP.
- And 16 were constructed with a 100% subsidy from SFMP for selected households classified as vulnerable to child labour and trafficking.

Further, the FC Post Harvest Unit (PHU) with support of the WARFP project provided 214 ovens with a 100% subsidy for fish processors along the four coastal regions.

All of these ovens are individually owned, as communal ownership of ovens is not a traditionally acceptable practice. These results represent 8.9 % achievement of the original 6,000 improved ovens and 53.3% achievement of the revised target of 1,000 improved ovens installed (adjusted down to a more realistic level in Year 4 based on progress and lessons learned).

Financing for Fish Processors

In a study conducted on the Smoked Fish Value Chain in Ghana in August 2016 by SNV, 94% of fish processors were willing to switch from their traditional ovens to a healthier option to improve their health and also produce healthy fish for consumers. The main determinate for uptake has, however, been limited access to finance.

Fish smoking is done at the artisanal level by women in coastal towns and villages and in areas along rivers and the shores of Lake Volta. These women travel along the coast “following” the fish. Their high mobility rates, low literacy levels, and limited interaction with financial institutions often mean fish processors have limited access to financial tools (savings/credit).

SFMP’s early attempts to scale up the Ahotor oven were not delivering the expected results. In response, in April 2018, the project developed and implemented additional activities to help fish processors access credit and build their savings while progressively increasing the project’s subsidies for fish processors purchasing the Ahotor.

The Ahotor costs GHS 1,768 for a double unit and GHS 903 for a single unit without trays (the traditional Chorkor oven is GHS 400). For this reason, financing solutions were required for the oven to be accessible to the target users. SFMP first deployed a dealer financing model. This involved the installation of improved stoves to interested fish processors (smokers) with a subsidy of 30% for the first 200 early adopters, after which all other adopters were expected to acquire the oven at the market price. By this model, the processor contributes an initial 20% of the construction cost and a bank contributes the final 50%. Three financial institutions in the Central Region (Gomoa Rural Bank, Microfin Rural Bank, and Akatakyiman Rural Bank) signed contracts to carry out the model. Unfortunately, even though over 100 fish processors were interested and had started saving with the banks, most of them redirected their savings to other competing needs. This was largely due to poor construction in the first few ovens, which reduced demand from other potential clients. SFMP responded to this feedback by retraining the initial cohort of Ahotor oven artisans (see section above).

After SFMP retrained and expanded the stove artisan network, it offered 141 processors across four regions grants to cover 88% of the oven’s construction cost. The subsidy covered construction of a double unit oven base, one fat collector, two grates, and 20 trays at GHS 2,200. Each beneficiary had to sign an agreement to pay GHS 300 for the second fat collector, receive training on oven use and maintenance, and keep records to document the value of the ahotor oven to their business. 47 out of the 141 processors are currently using their ovens, while the rest have yet to use the Ahotor because there is no fish to buy at the landing beaches and frozen fish is expensive. The 47 fish processors are located in communities in the Volta region and Ada in the Greater region and smoke shrimps and anchovies.

Fish processors were also introduced to microsavings groups in the Central and Volta Regions, so they could mobilize their own savings to construct the oven. SFMP supported the creation of 12 Village Savings and Loan Associations (VSLAs) serving a total of 300 women. SFMP supported initial training and establishment of the groups, and has periodically

checked in on their progress. As of March 2019, the groups had saved on average GHS 15,000 per group. However, the groups have yet to use their savings to purchase the Ahotor oven, as the current low fish catch has demanded that savings be used to purchase more expensive frozen fish or used for other household expenditures.

While efforts have been made to facilitate credit from the Microfinance and Small Loans Centre (MASLOC), a quasi-government agency, the process has been slow and the amounts offered small. 194 fish processors had requested GHS 2,500 to construct the oven, but MASLOC will only give GHS 1,000 per fish processor.

USER FEEDBACK

During five focus groups conducted in May 2019, fish smokers reported the following views on the performance of the Ahotor technology:

- Fish smoked with the Ahotor oven looks good. The Ahotor uses less fuel wood and is more comfortable to use.
- The Ahotor reduces smoke and heat emitted during smoking, which greatly improves comfort for the processors and therefore household cooking can be done during processing. This helps the women to save time for other activities.
- Fish processors should be involved in the Ahotor promotional activities on TV and radio to increase confidence of their peers and other consumers in the Ahotor.
- The cost of the oven is high compared to the metal barrel, Chorkor, or Morrison.
- The oven is slower in cooking than the Chorkor.
- The galvanised iron used to fabricate the fat collector should be rust proof.
- Fewer trays can be stacked on the Ahotor than on the Chorkor at a time as the heat from the oven does not “travel far.”
- Consumer awareness on the health benefits of fish smoked on the ahotor oven is still low, so customers do not differentiate between Ahotor smoked fish and fish smoked on traditional technologies.
- Prices offered for Ahotor smoked fish do not compensate for the investment in the oven. This is why none of the processors interviewed said they would not borrow funds to finance the construction of the oven, as there will be no extra revenue to compensate for investing in the oven.
- The Ahotor oven shrinks the fish during smoking, reducing the price at which it can be sold. This is very critical as though the shelf life of the fish may have increased, because fish is priced in the market by size instead of weight, processors claim they lose out.

LESSONS LEARNED

The following are lessons learned related to efforts to promote the Ahotor, build a sustainable supply chain, and advance affordable financing for fish processors, as described by SFMP and its key partners (DAA, CEWEFIA and NAFPTA):

- Unlike the Chorkor, the ahotor oven is not easy to build, as specialized technical skills are required. This has demanded a network of trained artisans qualified to construct the Ahotor. It also leaves greater room for error in construction, and a higher risk for quality control issues – as seen in some of the early Ahotor installations. This has been the most successful of all the market development strategies.
- Demand creation and uptake of the Ahotor was negatively affected by early quality control issues. Poor construction of early Ahotor ovens led to lower consumer confidence. This was an unintended effect of some initial demonstration ovens. Thus, rigorous quality assurance is needed – especially for a difficult-to-construct technology such as the Ahotor, and especially in initial roll out and introduction of the technology to potential consumers.
- The cost of the oven – which is already deemed expensive by fish processors – is exacerbated by the ever-increasing cost of some construction materials such as wawa board, wire mesh, burnt bricks, and the fat collector. This makes it very difficult for most fish processors to invest in the oven.
- Although there are strong advantages of the Ahotor smoker, many fish processors are not able to invest because of a lack of working capital.
- Low fish catch in the last couple years has meant that processors rely on more expensive, imported frozen fish bought on a cash basis, while before fish could be bought on credit at the landing beach and paid off after sales. In addition, most processors do not have access to organized credit.
- Recent poor and intermittent fresh fish catches in Ghana have made it difficult for fish processors to use the ahotor ovens built for them under the 88% grant scheme at full capacity.
- Women fish processors quickly grasped the advantages of VSLAs and worked collectively to amass impressive savings per group. VSLAs proved to be a low-investment intervention to support women fish processors in saving for business investments and household needs. However, despite the success of the VSLAs, low fish catch in Ghana compelled the women to invest in more basic needs than acquiring the Ahotor.
- Stove companies complain of low profit margins as the price of materials for some of the Ahotor's key components (e.g., red bricks and cement) keep increasing. The three-day training provided by SFMP for the artisans was also not sufficient as the artisans were only trained on the construction of the Ahotor base and not on installation of the fat collector or the making of the trays and hood.
- Financial institutions are reluctant to finance the Ahotor oven because it is perceived as an unproven market, especially as fish processors have little or no relationships with formal banks.

RECOMMENDATIONS FOR THE FUTURE OF THE AHOTOR

- The Ahotor technology has critical advantages in terms of efficiency and health. However, high unit cost has proven to be a significant barrier to adoption. If possible, an evaluation of and limited changes to the Ahotor's design – to address user feedback (above) and to allow construction with less expensive materials – could greatly benefit uptake.
- The uptake of the Ahotor oven could increase if fish processors could attract a premium price commensurate with their additional investment to cover the Ahotor's costs.
 - Fish consumers should be sensitized by the Department of Health through the FC on the art of processing fish hygienically and the use of the oven so that the average consumer can better appreciate the process. This may better contribute to consumer demand for Ahotor-smoked products.
 - Ahotor advocates might create a tripartite relationship between (1) fish processors, (2) formal markets such as Max Mart, Citydia, Shoprite, or exporters, and (3) financial institutions, in which offtakers of smoked fish guarantee credit to processors in exchange for fish. This would only work if fish processors are formally recognized for hygienic practices by the Class 1 Recognition Scheme yet to be inaugurated by the MOFAD/FC.
- The MOFAD/FC should continue instituting systems at the Post Harvest Unit to ensure that the Class 1 Recognition Scheme is implemented, so that participating fish processors are able to increase their income by accessing formal markets with Ahotor-smoked fish. If they are successful, others will be encouraged to adopt the oven.
- While SFMP developed an Ahotor construction manual and user guide, a video documentary on improved fish smoking practices, use of the Ahotor smoker, and an explanation of its construction should also be produced by SFMP/ MOFAD/FC for use by fish smokers, extension agents, and students.

REFERENCES

McCarty et.al. (2010). Climate change in cities due to global warming and urban effects.

Adkins et.al. (2010). Field testing and survey evaluation of household biomass cook ovens in rural sub-Saharan Africa.

MOFAD/FC. (2015). Fisheries Management Plan of Ghana, 2015-2019.

Global Alliance for Clean Cookstoves, Pilot Innovation Fund. Synthesis of Lessons Learned, 2012.

Documents provided by SNV Ghana:

- Performance Evaluation Survey of Ahotor Oven, January 2016.
- Understanding the socio-economic conditions under which fish processors work; Segmentation Study Report, May 2016.
- Low PAH Improved Fish Smoking Oven Design Development Report, September 2016.

ANNEX 1: QUESTIONNAIRES FOR INTERVIEWS WITH THE AHOTOR TEAM, USER FOCUS GROUPS, AND STOVE COMPANIES

Questionnaire on Market Development and Financing Strategies for the Ahotor Oven (SFMP Partners and PHU of the Fisheries Commission)

PART 1:

1. Name of Respondent.....
2. Name of Organization
3. What is your designationGenderMale/Female.
4. How long have you been promoting the Ahotor oven under the project?.....

PART 2:

1. Are you involved in the oven promotion program? Yes No
2. What gaps did you identify in

 A. The Market development for the ahotor oven
 B. The Supply Chain
 C. Financing

3. Which of the above was most successful?
4. What lessons can be drawn from implementing A, B & C
5. If we could do things differently, what would you recommend, specifically in relation to the three areas above?

Interview Guide with Early Adopters of the Ahotor Oven (Focus Groups)

PART 1:

1. Name of respondent:
2. Community:
3. District:
4. Gender: Male..... Female

PART 2:

1. How did you hear of the Ahotor oven in your community?
2. How did you acquire your Ahotor oven?
(a) Loan (b) Outright purchase (c) Free

3. How long have you been using the Ahotor oven?.....

4. Which fish smoking technology were you using earlier?

Chorkor Mud/metal round oven FTT Other:

How long have you used it?

5. Are you still using the old stove? Yes No

Explain your answer:

6. Comparing the Ahotor oven to the old stove which would you prefer and why?

.....

7. Would you say the Ahotor oven meets your processing needs to your satisfaction?

Yes No Partly

Explain:

8. What benefits does the old stove have that you wish the ahotor could have?

.....
.....

9. Has there been any improvement in your business with the use of the Ahotor oven?

Yes / No

10. If yes, what are some of the improvements? (a) Less fuelwood (b) Smoking process is faster (c) time saving (d) less smoky environment (e) Increased profit (f) Other

.....

If no why?

11. Would you recommend the Ahotor oven to other processors? Yes /No

Why.....

12. What is your assessment of the Ahotor promotional program (including financing program)

.....

13. How did you finance your purchase of the ahotor oven?

14. Would you take a loan to acquire the Ahotor oven? Yes / No

If Yes/No Why?

.....

15. If you took a loan from an FI for the oven, what is your assessment of the financial institution's internal systems for loan processing:

.....

.....

Interview Guide for Discussions with Oven Construction Companies

PART 1:

1. Name of respondent.....
2. Name of Organization
3. What is your designationGenderMale/Female.
4. How long have you been constructing the Ahotor oven under the project?.....

PART 2:

5. In your view what are the main challenges with the uptake of the ahotor oven under the SFMP?
.....

6. Do you think the approaches adopted by the project to promote the oven were successful? Yes /No

If Yes/No, why?

7. Do you think the training provided by SFMP to the artisans was sufficient? Yes/ No

If Yes/ No why?.....

8. Do you think the Ahotor oven is a good fish smoker? Yes/ No

If Yes/ No why?

9. Do you think the materials used for constructing the oven can be better and cheaper? Yes/No?

If yes/No why?
.....
.....

10. Is constructing the Ahotor oven good business for your company? Yes/No

If Yes/ No why?

11. What lessons can be learned in the promotion of the Ahotor oven?.....
.....

12. If we could do things differently, what would you recommend?