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SUSTAINABLE FISHERIES MANAGEMENT PROJECT (SFMP)

Documentation of the Pains and Gains of the Ahotor Oven Improvement Process

DECEMBER, 2018

THE UNIVERSITY OF RHODE ISLAND GRADUATE SCHOOL OF OCEANOGRAPHY | CRC COASTAL RESOURCES CENTER

SNV SMART DEVELOPMENT WORKS

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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

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Cover photo: A group picture on artisans training on how to construct the Ahotor oven at Elmina (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@crcuri.org
Enoch Appiah	Deputy Chief of Party	Email: eappiah.sfmp@crcuri.org
Kofi Agbogah	Senior Fisheries Advisor	Email: kagbogah@henmpoano.org
Perfectual Labik	Communications Officer	Email: perfectual.sfmp@crcuri.org
Mary Asare	M&E Officer	Email: mary.sfmp@crcuri.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:

CRC/URI:	http://www.crc.uri.edu
CEWEFIA:	http://cewefia.weebly.com/
DAA:	http://womenthrive.org/development-action-association-daa
Friends of the Nation:	http://www.fonghana.org
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ACRONYMS

CEWEFIA	Central and Western Fishmongers Improvement Association
CSIR	Centre for Scientific and Industrial Research
FAO	Food and Agriculture Organization
FC	Fisheries Commission
FRI	Food Research Institute
FtF	Feed the Future
FTT	FAO-Thiaroye Processing Technique
NAFPTA	National Fish Processors and Traders Association
PAH	Polycyclic Aromatic Hydrocarbons
SFMP	Sustainable Fisheries Management Project
SNV	Netherlands Development Organization
USAID	United States Agency for International Development

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SNV is most grateful to all partners and stakeholders who were involved in developing and promoting the Ahotor oven, and for giving their inputs during the process of gathering information for this report.

EXECUTIVE SUMMARY

Fish processing is the main economic activity for women living in and around the coastal and lake areas of Ghana. Preservation methods include salting, frying and freezing, but smoking is the most prevalent form: practically all species of fish available in the country can be smoked and it is estimated that 75% of the domestic marine and freshwater catch is smoked. In view of this, there is the need to develop appropriate technologies for smoking fish to improve the post-harvest component of the fisheries sector.

The Ahotor oven was developed as part of efforts to improve on the post-harvest fish value chain by the Sustainable Fisheries Management Project (SFMP) and to address the issues of Polycyclic aromatic hydrocarbons (PAH) on smoked fish. Before its development, the project was promoting the Morrison oven which was an improvement on the Chorkor oven. While the Morrison stove is energy efficient and convenient for the fish processors, fish smoked on it still contain high levels of PAH.

There was therefore the need to develop a new technology that is both energy efficient and produces fish with low PAH. A team of local and international consultants were engaged in the development of the Ahotor oven.

This study chronicles the development cycle of the Ahotor oven and the strategies adopted for its promotion. Some of the key findings of this study include:

- The Ahotor oven met its development objective of producing smoked fish with low PAH levels and using less fuelwood.
- The major setback in the promotion and adoption of the Ahotor oven is the cost of the oven.
- Fish processors are willing to purchase the Ahotor oven under flexible financial terms.
- A total of about 566 Ahotor ovens have been constructed nationwide with construction still ongoing. These ovens were constructed with funding from SFMP, donor agencies, organizations and individuals.
- 48 local artisans and companies were trained in the construction of the Ahotor oven
- The construction of the Ahotor oven served as a source of employment for these artisans and companies
- In promoting the Ahotor oven, the project should have engaged key influential members of the communities regardless of whether they were fishers or not.

1. BACKGROUND

The United States Agency for International Development (USAID) has committed funds to the implementation of the Sustainable Fisheries Management Project (SFMP) in Ghana for five years. The objective is to rebuild marine fisheries stocks and catches through adoption of responsible fishing practices. The project will contribute to the Government of Ghana's fisheries development objectives and USAID's Feed the Future Initiative. 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. In most fishing communities, the main economic activity of women is fish processing and marketing.

In Ghana, various traditional methods are employed to preserve and process fish for consumption and storage. These include smoking, drying, salting, frying, fermenting and various combinations of these. Smoking is the most widely practiced method: practically all species of fish available in the country can be smoked and it has been estimated that 70-80 percent of the domestic marine and freshwater catch is consumed in smoked form.

The Chorkor oven was introduced into Ghana in 1969 as an improved traditional fish smoking oven. This innovative model, developed by the Food and Agriculture Organization of the United Nations (FAO) and the Food Research Institute of the Council of Scientific and Industrial Research (CSIR) in Ghana, has since demonstrated the potential of traditional technologies in meeting current challenges (FAO, 1997).

However, another improved stove was later designed; the Morrison Stove. The Morrison stove was designed by Mr. Albert Kojo Morrison a stove artisan who leaves in Kasoa in the Central Region of Ghana. The stove was first piloted and used at New Takoradi in the Western Region with the support of Daasgift Quality Foundation and CHF International, in 2008.

From 2014 to 2016 the Morrison stoves were promoted in parts of the Central, Volta and Greater Accra coastal communities with the support of SNV Ghana through a DGIS funded Improved Fish Smoking Stove project and later through SFMP. The Morrison stove drastically reduces fuelwood use and gives off less smoke emissions, thus protects the women from smoke related diseases. The stove is reported to be 40% fuel wood energy efficient than the Chorkor stove.

The Morrison stove however had a major challenge of high PAH levels in fish smoked with it. PAH is *Polycyclic Aromatic Hydrocarbon* which are carcinogenic, fat soluble, non-volatile and extremely persistent, and develop especially during the incomplete combustion of organic materials. In view of the health problems associated with the Morrison stove, there was the need to develop a better oven that can address the issue of high PAH while maintaining the positive features of high energy efficiency and low smoke emission.

SNV collaborated with the Food Research Institute, the Fisheries Commission, and also engaged services of both international and national stove consultants to design and construct the Ahotor oven technology.

The Ahotor oven has enhanced the post-harvest processing activities by improving upon the quality of smoked fish whiles reducing fuelwood consumption. The technology has so far received a good acceptance with over 300 (and still counting) units of the oven constructed across the country.

As part of strategy to promote uptake of the oven, the project provided a 30% subsidy to early adopters who wanted to construct the oven. In addition to that, some financial institutions were engaged to provide loans for the remaining 70% of the cost to processors who didn't have the money to pay the amount upfront. SNV also engaged some community liaisons to promote the ovens in the Volta Region, while SFMP's implementing partners in the various regions also engaged liaisons in their intervention zones (Central and Western Regions).

1.1 Objectives

The objectives of this document are to:

- To identify the success and gaps in the Ahotor oven development,deployment and promotion
- To make recommendations on the way forward for promoting the Ahotor oven

2. METHODOLOGY

Five major groups of people were interviewed for the study. These groups are;

- Members of the technical committee that developed the technology
- SFMP partners who promoted the oven
- Community liaisons who promoted the oven in the various communities
- Financial institutions that disbursed loan facilities to beneficiaries
- Fish processors who acquired the oven

An average of 4 respondents were interviewed from each group, with the exception of the fish processors' group where 20 respondents were interviewed using a structured questionnaire. The questionnaires were designed specifically for each group. The filled-out questionnaires were analyzed using charts and tables. The total sample size for this study was 39 respondents.

3. LESSONS LEARNED

Through interactions with the various stakeholders in the development and promotion of the Ahotor oven, lessons were learned in identifying the successes and gaps in the development and promotion of the Ahotor oven.

3.1 A brief on the development and promotion of the Ahotor oven

3.1.1 Development of the Ahotor oven

The smoking of fish with traditional (metal barrel, chorkor or Morrison) stoves leads to high PAH levels, well above EU regulation limits on the end product. Most of the improved fish smoking stoves developed in the past 45 years were designed to reduce fuel consumption and to ease operating process by reducing smoke and heat released in to the working environment. Recent studies by SNV showed that some of these energy efficiency improvements produce fish with even higher levels of PAHs, most likely due to the higher processing temperature. The FAO-Thiaroye Processing Technique (FTT) oven developed by the FAO, produces smoked fish with very low levels of PAHs, however its high price limits any large-scale dissemination.

SNV under the SFMP in collaboration with the Food Research Institute and the Fisheries Commission, reviewed the fish smoking technologies available in Ghana and drew recommendations on the optimal physical conditions for reducing PAH formation during the fish smoking process. It is based on the guidance provided by these recommendations that a low PAH, low cost and energy efficient fish smoking stove was designed and constructed, which delivered promising results at the first prototype stage.

The new oven is an improvement over the existing Chorkor oven to make it easier for adoption. Some fish processors from Chorkor in the Greater Accra Region supported the team throughout the development process.

The first prototype was constructed and tested by a number of processors who gave feedback and results on its performance in real time, which was incorporated into the second development phase. A beneficiary satisfaction survey was conducted to gather feedback from stove users on performance, user friendliness, energy savings etc. These findings together with existing information on energy and PAH assessment were analyzed for review. It was determined that further R&D was required to improve the state and performance of the Ahotor oven to ensure adequate end-users acceptance and adoption. The key improvement works focused on:

- Reducing the height of the stove base.
- Increasing heat intensity in the smoking chamber to reduce processing time.
- Evenly distribution of heat in the smoking chamber.
- To reduce PAH levels to meet EU standards.

A technical team (made up of representatives from the Fisheries Commission, Food Research Institute, Gratis Foundation, local artisans and some international support from Crispin Pemberton-Pigott and Christa Roth, both international stove experts) was constituted to work use this feedback to make improvements in the prototype.

Series of changes and trials were carried out on:

- The combustion chamber and on the fat-collector to enhance performance.
- Reduction in the stove height was attained by building the stove 6 inches into the ground without necessarily compromising the height of the combustion chamber.

- The size of the combustion tube was further reduced to enhance heat velocity and cooking time.
- The fat-collector was redesigned to distribute heat evenly in the smoking chamber.

One key success recorded was the introduction of ash on the fat-collector as a fat absorbent to significantly reduce smoke and PAH levels in smoked fish. This innovation reduced PAH level in the Ahotor oven to 0.6 µg/kg for BaP and 10.98 µg/kg for PAH4 which is below the EU standards for PAH. These figures have been confirmed at an internationally accredited PAH lab.

Figure 1. Excerpts of meetings held during the Ahotor oven development process

Figure 2. Fish processors supporting the development process by smoking fish per session

3.1.2 Promotion of the Ahotor oven

According to Amaning (2016), recent attention to improved stoves has focused on the "triple benefits" it provides; time savings for households, preservation of forests and associated ecosystem services, and improved health and reducing emissions that contribute to global climate change. Despite the purported economic benefits of such technologies, progress in achieving large-scale adoption and use has been remarkably slow. The main challenges to scaling up in the clean cooking sector are:

- Weaknesses in the upstream segment of the value chain, including business models, access to financing, market intelligence, consumer awareness, and regulatory frameworks.
- Declining production and distribution processes including optimal attention to R&D and product development.

To reach the desired scale, there must be a conscious paradigm shift from a socially inclined approach (free distribution of stoves and subsidizing the cost of the stoves) to a commercially viable approach. The provision of improved fish smoking stoves for fish processors in Ghana must be seen as a business rather than a social service. This is to ensure upscale through increased demand and sustainability as a result of strengthened supply chains. To achieve

this, there is the need to expand and promote private sector participation by way of strengthening the supply chains of improved fish smoking stoves through local artisans and enterprises.

It was based on this precedence that the project decided to gradually phase out the 30% subsidy and create a sustainable market system to drive the oven's uptake. The following are activities carried out to achieve this:

- Train companies interested in constructing the oven to serve as the supply pool.
- Trained artisans in the communities to support these companies.
- Train community champions and liaisons as demand aggregators.
- Engaged with three financial institutions to provide loans for processors using the dealer financing model.
- Provided incentives for demand aggregation.
- Awareness creation on the benefits of the Ahotor oven.
- Trained processors on the use and maintenance of the Ahotor oven.
- The institution of the Class 1recognition scheme.

The uptake has been slower than expected as a result of the cost of the oven and poor fish catch at the landing beaches. It was not possible for the technical team to redesign the oven, maintain its essential attributes and durability at a cheaper cost.

On the other hand, fish processors will rather use any extra saving to buy more fish than construct a new oven, especially as they could not guarantee that consumers will pay a premium. Thus, the way forward was to emphasize the benefits of the Ahotor oven – far less smoke emission, savings on fuel and above all reduction in PAH values.

Figure 3. Training of artisans at Elmina on how to construct the Ahotor oven

Figure 4. Training session on the use of the oven for fish processors

3.1.3 The Dealer Financing Model

This intervention involves the installation of improved stoves to interested fish processors (smokers) at a cost subsidy of 30% for the first 200 early adopters after which all adopters are expected to pay the market price.. The main stakeholders involved in this partnership was SNV and the project's partners who carried out awareness creation campaigns, and served as link between the financial institutions, the stove companies and the beneficiaries (Fish processor). By this financing arrangement, the processor contributes an initial deposit of 20% and the bank contributes the additional 50% (a loan) towards the construction of the oven. Three financial institutions in the Central Region signed contracts with SNV to implement this model.

Even though over 100 fish processors were initially interested and had started saving with the banks, most of them redirected their savings to other competing needs after a while. This was also attributed to the fact that, the first few ovens that were poorly constructed. This sent a wrong signal to the processors and some of them lost interest. Similar financing arrangements could not be made with financial institutions in the Volta Region, so it was difficult for processors in the Volta Region to acquire funds for the oven.

SNV relied on the support of the project's partners to promote to create awareness and generate demand for the oven. These partners were however saddled with their own deliverables on the project and so could not support much. The main bottleneck however, is the high cost of the oven, which most of the processors cannot afford.

3.2 Successes and Gaps associated with the Development and Promotion of the Ahotor Oven

3.2.1 Successes in the Ahotor oven development

The development of the Ahotor oven brought together both local and foreign experts in oven/stove development. The team worked to develop an efficient product. The initial product was tested with some fish processors, who gave feedback. The team met periodically

to review these feedbacks and incorporated them to improve the performance of the oven. One significant input from the fish processors was the need to cut out an extra hole with a diameter of 66mm in the center of the fat-collector to enable efficient heat circulation. Though feedbacks helped to improve the performance of the oven, some processors who heard about them did not believe improvements have been made, and so have refused to acquire an oven.

The main objective of developing the Ahotor oven, was to develop a fish smoking technology that would produce fish with low PAH levels and use less fuelwood. Results obtained from members of the technical committee indicated that this objective has been achieved.

Tests results from the Ghana Standards Authority (GSA) laboratory indicted that the PAH levels in fish smoked with the Ahotor oven is 10.93µg/kg, while that of Chorkor is 84µg/kg. These low levels of PAH were attained by sprinkling fine ash on the fat-collector before smoking. This absorbs the fluids that drip from the fish during the smoking session and prevents it from burning and settling on the fish as PAH.

In terms of fuelwood consumption, 100% of the fish processors responded that the Ahotor oven uses less fuelwood. This confirms that the second object of developing the oven to use less fuelwood was obtained. The processors explained that the quantity of fuelwood used to smoke a volume of fish on the Chorkor is reduced by a third on the Ahotor oven.

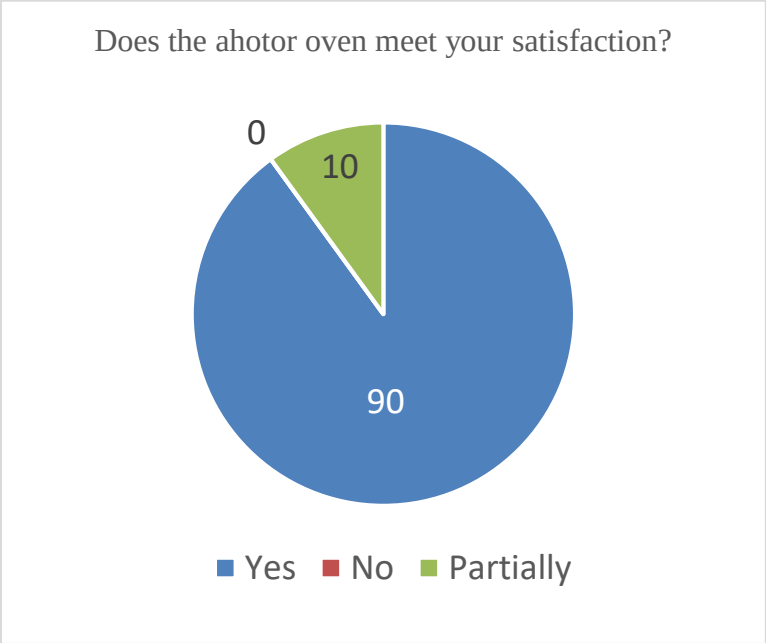

Figure 5. Respondents satisfaction with the Ahotor oven use

According to the technical committee members, the introduction of the grate and a brick combustion chamber helps to improve the energy efficiency of the oven. The elevated grate allows for fresh air to be delivered to the base of the fire to allow supply of oxygen to enhance efficient burning of fuelwood. The spaces between the grate allows for complete combustion of the fuelwood to produce fine ash after the fish smoking session.

3.2.2 Challenges in the Ahotor oven development

All the member s of the technical committee and 42% of the fish processors interviewed agreed that the Ahotor oven can be further improved. While 58% of fish processors said they were satisfied with the current performance of the Ahotor oven and didn't see the need for further improvement.

The main concern of the Ahotor oven raised by both the processors and technical committee respondents is the cooking time of the Ahotor oven. The Chorkor oven cooks faster than the Ahotor oven, however the relatively slow cook time of the Ahotor oven also plays a significant role in reducing the PAH on the processed fish. The difference in the cook time is as a result of:

1. The installation of a fat-collector which serves as both a heat distributor and preventing fluids from the fish getting into the fire,
2. The secondary air in-let of the oven which allows fresh air to mix with the hot air to regulate the heat that gets unto the fish.

The fat collector and the secondary air in-let are both very essential in reducing the PAH on the smoked fish, therefore any attempt to improve the cook time of the Ahotor oven should also consider a reduction of the PAH generated.

Though one of the major challenges of the technology is its relative slow cook time, 92% of processors interviewed still said they would choose Ahotor oven over the other traditional fish smoking ovens, while only 8% still they preferred the Chorkor .They said their reasons for choosing Ahotor oven regardless of the cook time are the health benefits of the oven and its fuelwood efficiency. All the fish processor respondents said they would recommend the Ahotor oven to other processors.

Figure 6. Respondents willingness to recommend Ahotor oven to other fish processors

3.2.3 Successes in the Ahotor oven promotion

The major activity after developing a product is its promotion and uptake. After developing the technology there was the need to promote it to generate visibility and adoption. The project employed a number of strategies in promoting this new technology such as;

1. Meeting processors groups to educate them on the benefits and functions of the technology.
2. Producing IEC materials to educate the general public.
3. Hosting radio programs in selected fishing communities.
4. Partnering with banks to provide loan facilities for interested processors who didn't have the money to pay upfront.
5. Engaging community liaisons to help in promoting the oven.

6. TV discussions on the Ahotor oven to sensitize the viewing public on the benefits of the technology.

During the promotion, consumers and processors were educated on the health implications of using and consuming fish from the Chorkor oven, as well as the health implications of using and consuming fish from the Ahotor oven. The consumers and processors engaged, appreciated the technology and need to switch from to the Ahotor oven for health reasons.

A study conducted in August 2016 indicated that 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. In that study, 6% of processors said they were not interested in changing the traditional ovens for an improved technology. In that same study, 78% of consumers indicated that they were willing to pay more for the same size of fish if it is a healthier fish because of the health implications of smoked fish, while 22% said they wouldn't pay more for the same size of fish regardless of the health implications.

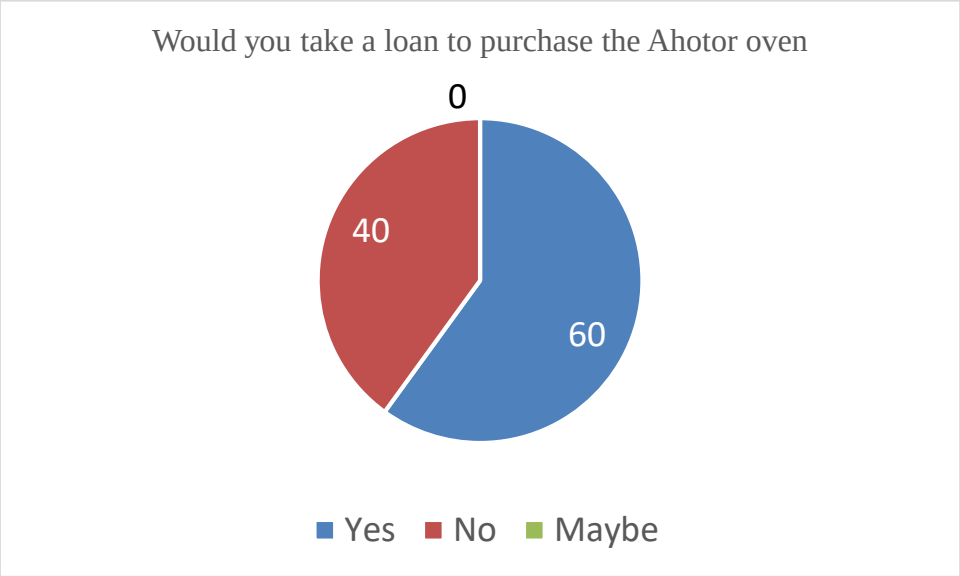

Figure 7. Respondents willingness to acquire the Ahotor oven through a loan facility

During the promotion, consumers accepted the Ahotor oven because of the healthier fish produced, while processors accepted the Ahotor oven based on the reduced smoke emitted and its fuel efficiency. Though the cost of the oven deterred most processors from acquiring it, it has gained more acceptance from the fresh water farmers who are more willing to purchase them, because they had already invested so much in their fish farms and wanted to sell to premium markets at higher price.

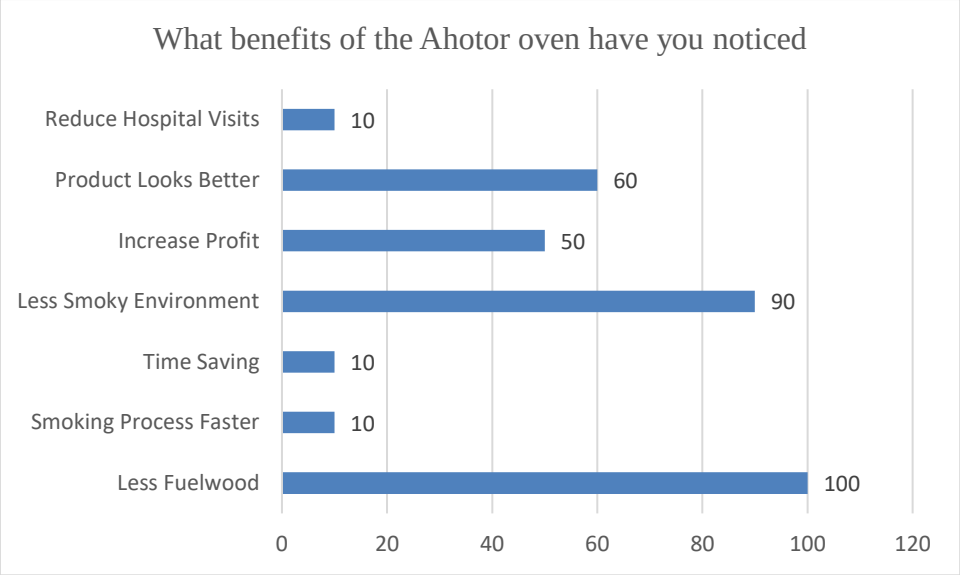

Figure 8. Benefits identified by respondents after they started using the Ahotor oven

Currently, there are over 566 Ahotor ovens constructed nationwide, with constructions still ongoing. The construction of these ovens were finance by ovens were SFMP, the Fisheries Commission (FC) through the WARFP, individuals and private organizations like Techno Serve who constructed the ovens to provide alternative livelihoods for some communities in the Western region that have been affected by the exploration of oil and gas.

As part of promoting the Ahotor oven, 48 local artisans and stove construction companies were trained in the construction of the Ahotor oven. The construction of the ovens also served as source of employment for these builders.

In promoting the oven and ensuring that only wholesome fish are sold in the Ghanaian market, the project introduced the Class 1 Recognition Scheme where processors who use the Ahotor oven and process the fish under hygienic conditions would be certified and their products to be sold at higher markets.

3.2.4 Challenges in the Ahotor oven promotion

A major setback in the promotion of the Ahotor oven was the inability of the project to launch the technology nationally. There was supposed to be a national launch of the Ahotor oven to educate the nation on the health implication of the traditional ovens and the need to switch to the new technology. This event would have brought together all the major stakeholders in the fisheries sector, including the sector minister, to talk about the new technology and its benefits to both the processors and the consumers. The launch would've educated consumers on the health implications of the fish they consume and could have been the springboard for the oven's uptake

The second major challenge of the Ahotor oven promotion and adoption was its price. During this survey, all the respondents stated the cost of the oven was a major challenge with its uptake

During the education and promotion, most fish processors were willing to switch from their traditional smoking methods to the Ahotor oven, but at the mention of its cost, they got discouraged. To overcome this challenge, the project engaged the services of some Financial Institutions (FIs) to provide loan facilities for processors who wanted the Ahotor oven but didn't have the money for upfront payments.

The third challenge of promoting the Ahotor oven was the perception processors the oven could not smoke fish properly. As stated earlier in this report, Ahotor ovens were given to some processors during the early stage of the technology development to be tested. Though both positive and negative feedbacks were gotten and addressed, most processors held on to the negatives, though they were repeatedly informed that the defects had been corrected. Unfortunately, processors who were spreading the he negativity 'bad news' had either not used the Ahotor oven or even seen it before.

To compound this problem, some stove companies constructed some ovens poorly during the initial constructions and some of those ovens had to be reconstructed. This affected the promotion of the oven, especially for those who wanted to access the loan facility, since they did not want to access a loan to purchase a product that had defects.

3.3 Recommendations for future implementation

Bases on the interviews conducted, respondents made some recommendations on how future interventions can be improved for better results. These recommendations include:

- The cost of the oven should be reduced to make the oven accessible to most processors.
- Providing grants that would absorb some of the cost of the oven to make it more accessible.
- The project should involve key individuals and opinion leaders in the implementing communities, regardless of whether they are fish processors or not.
- In accessing loan facilities, financial institutions could also add working capital to the loan facility to make it more attractive to the beneficiaries.
- Improving the cook time of the oven without compromising the PAH limits.
- More TV and radio programs should be carried out to educate the general public.
- There should be greater support from FC and the Department of Health in carrying out media campaigns on the Ahotor oven.

4. CONCLUSIONS

In conclusion, the development and promotion of the Ahotor oven under the Sustainable Fisheries Management Project (SFMP) according to respondents was widely accepted by beneficiaries. They appreciated the benefits of the Ahotor oven and look forward to projects that could support more of them to acquire the oven.

At the end of the survey, 100% of respondents from all the respondent groups said they would recommend the Ahotor oven to other processors.

With regards to promotion, respondents indicated that the project could've done more during the promotion of the Ahotor oven by engaging prominent stakeholders in the communities regardless of whether they were fishers or not. It was also noted that a little more support and collaboration from FC could've gone a long way to ensure the acceptability by consumers, which would've driven the demand for healthy fish, thereby causing fish processors to go for the Ahotor oven.

APPENDIX A. QUESTIONNAIRES

AHOTOR OVEN DEVELOPMENT AND PROMOTION

QUESTIONNAIRE – FINANCIAL INSTITUTIONS

PART 1:

1. Name of respondent……
2. What organization do you work with? ……
3. What is your designation?.....
4. Gender: Male…….. Female……

PART 2:

1. What do you know about the Ahotor oven? .....

   ……
2. What is your assessment of the Ahotor promotion program SNV had with your organization? …….

   ……
3. With respect to your internal organizational policies, is renewable energy unit financing allowable and was our program acceptable to your organization?

   Yes No Explain your answer: ……

   ……..
4. What challenges in general did the program face, during the implementation period?

   ……

   ……
5. What successes in general did the program achieve? ……

   ……
6. Which benefits of using the oven was appealing to consumers? ……..

   ……
7. In your opinion, how willing were the processors to access the loan facility to purchase the Ahotor oven on a scale of 1 to 10? ……..
8. What do you see as the major challenge(s) of promoting the oven

   ……..
9. In your opinion how can these challenges be overcome? ……...

   .....
10. What is your recommendation for designing a better promotion plan for the Ahotor oven? ……..…….

AHOTOR OVEN DEVELOPMENT AND PROMOTION

QUESTIONNAIRE – SFMP PROJECT PARTNERS

PART 1:

1. Name of respondent……
2. What organization do you work with? ……
3. What is your designation …….
4. How long have you been promoting the Ahotor oven under the project?.....
5. Gender: Male…… Female……

PART 2:

1. Are you involved in the oven promotion program? Yes No
2. What is your candid opinion on how the promotion program was designed and implemented? ……

   ……
3. What gaps did you identify in design and implementation of the Ahotor promotion program? ……

   .....
4. Kindly share any successes achieved by the program. …….

   ……
5. Which benefits of using the oven is appealing to consumers?

   ……..
6. How many processors put down their names for the oven?.....
7. How many processors actually purchased the oven?.....
8. What do you think accounts for the difference (if any) between questions 3 and 4?

   …….
9. What do you see as the major challenge(s) of promoting the oven

   ……..
10. In your opinion how can these challenges be overcome?

    …….
11. What is your recommendation for designing a better promotion plan for the Ahotor oven? ……..……

AHOTOR OVEN DEVELOPMENT AND PROMOTION

QUESTIONNAIRE – TECHNICAL COMMITTEE

PART 1:

1. Name of respondent……
2. What organization do you work with? ……
3. What is your designation?.....
4. How long have you worked on cook stove development ……
5. Gender: Male…….. Female……

PART 2:

1. Were you part of the team that developed the Ahotor oven? Yes No
2. If yes, what was the main objective(s) for developing this oven?
   .....

   ……
3. In your opinion, were the objective(s) met? Yes No

   Explain your answer: …….

   ……
4. What was the major challenge(s) in developing the oven?
   ……

   ……
5. Do you see the need for further improvement to be made to the current oven design? Yes No kindly explain?

   …….
6. If yes to question 5, what modifications do you recommend
   ……
7. Are there other improved fish smoking ovens you will like to recommend?

   …….

AHOTOR OVEN DEVELOPMENT AND PROMOTION

QUESTIONNAIRE – FISH PROCESSORS

PART 1:

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

PART 2:

1. How did you acquire your Ahotor oven?

   (a) Loan (b) Outright purchase (c) Free

2. How long have you been using the Ahotor oven?.....
3. Which fish smoking technology were you using earlier?

   Chorkor: mud/metal round oven: FTT: Other:

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

   Explain your answer:

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

   ……

6. Would you say the Ahotor oven meets your processing need to your satisfaction? Yes No Partly

   Explain: …….

7. What benefits does the old stove have that you wish the improved will have?…….

   ……
   ……..

8. Have you noticed any improvement in your resources use with the use of the Ahotor oven? Yes No
9. If yes, what are some of the improvements? (a) Less fuelwood (b) Smoking process faster (c) time saving (d)less smoky environment (e) Increased profit (f) others……..
10. Would you recommend the Ahotor oven to other processors? Yes No

    Why…….

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

    ……

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

    Why? …….

13. If you took a loan for the oven, what is your assessment of the financial institution's internal systems for loan processing: ……

AHOTOR OVEN DEVELOPMENT AND PROMOTION

QUESTIONNAIRE – COMMUNITY LIAISON

PART 1:

1. Name of respondent: ……
2. Community: ……. District: …….
3. Which organization supported you? …….
4. Gender: Male …….. Female ……..

PART 2:

1. Are you involved in the oven promotion? Yes No
2. Which benefits of using the oven is appealing to consumers?
   ……..
3. How many processors put down their names for the oven?.....
4. How many processors actually purchased the oven?.....
5. What do you think accounts for the difference (if any) between questions 3 and 4?
   …….
6. What do you see as the major challenge(s) of promoting the oven
   ……..
7. In your opinion how can these challenges be overcome?
   …….
8. What is your recommendation for designing a better promotion plan for the Ahotor oven? ……..……