



Nigerian Energy Support Programme (NESP)

Final Report - Clean Cooking Intervention Service contract 811897715

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List of Acronyms

CARI	Competitive African Rice Initiative
CfP	Call for Proposals
GIZ	Deutsche Gesellschaft für Internationale Zusammenarbeit
EOI	Expression of Interest
ICEED	International Centre for Energy, Environment & Development
IFAD	International Fund for Agricultural Development
JICA	Japanese International Cooperation Agency
MDA	Ministries, Departments and Agencies
MOW&I	(State) Ministry of Works and Infrastructure
NGN	Nigerian Naira
NAMDA	Niger State Agricultural and Mechanization Development Authority
NSEB	Niger State Electricity Board
NIGIS	Niger State Geographic Information System (Agency)
NSRIC	Niger State Rice Investment Consortium
NESP	Nigerian Energy Support Programme
SEDIN	Pro-poor Growth and Promotion of Employment in Nigeria
MoE	(State) Ministry of Environment
MoU	Memorandum of Understanding
SSAB	Sustainable Smallholder Agri-Business
ToR	Terms of Reference
WP	Work Package
WTP	Willingness To Pay

1. Background

The Marge-ICEED Consortium (also referred to as “the consultants”) has supported the Nigerian Energy Support Programme (NESP) and its partners, particularly the Federal Ministry of Environment and Niger State Government, main counterparts concerning this intervention, with the launch of a viable commercial market for improved cooking energy solutions for rice parboiling. NESP also expected these efforts to contribute to reduce post-harvest loss, improved product quality, reduced specific fuel consumption (and thus production costs), improved health of rice parboilers and reduced environmental impact of these activities.

This is the final report of the work carried out¹ by the consultants regarding the Clean Cooking Intervention. The general ToR (published as part of the call that led to the selection of the Marge-ICEED consortium) was broken down into 5 ToRs (Work Packages) as follows at the inception phase of the intervention:

- ToR 1: Partner/user group identification (December 10, 2015²)
- ToR 2: Technology identification, development and testing (January 26, 2016³)
- ToR 3: Capacity building for selected manufacturers (October 6, 2016)
- ToR 4: Technology promotion and business development (October 6, 2016)
- ToR 5: Establishing a GIS monitoring system (December 10, 2015)

The Consortium supported three manufacturers⁴ that were selected through a competitive process in their efforts to bring better stoves to market. They already produce stoves on a regular basis and were willing to participate in the project’s effort to sell institutional stove products on a purely commercial basis in Niger State. Their obligations and expected benefits were laid out in a signed MoU with NESP, which ended on September 30, 2017. They were trained in the development of two standard types, low-cost, high efficiency parboiling stoves: a brick/ceramic liner stove of about NGN 75,000⁵ and a brick/ceramic/metal stove of NGN 195,000⁶ with fitting metal pot. A slimmed-down stove version for NGN 30,000⁷ without pot is available as well. In addition to technical training, the consortium provided support to improve the capacity of the manufacturers through business, after sales services and marketing trainings. The consortium also facilitated the strengthening of the distribution chains through demonstration activities and assistance to the suppliers’ own marketing efforts with retailers and cooperatives.

¹ Governed by contract 811897715 between GIZ and the consultants, signed on 23 October 2015. Three budget neutral contract amendments were made in the course of implementation of this contract.

² ToR1 was amended on March 17, 2016 to allow for the participation of additional consultants in the Validation Workshop.

³ ToR 2 was also amended on September 06, 2016 for the same reason as for ToR 1

⁴ Sosai Renewable Energies Ltd, Nenu Engineering Ltd, and Roshan Global Services Ltd, three Nigerian private stove manufacturers.

⁵ 175 EUR; this includes the pot with lid, installation and mark-up.

⁶ 450 EUR

⁷ 70 EUR, no pot.

2. Introduction

The first step in promoting any new product is getting to know the target group that is supposed to use these items and identify specific problems they are facing. For the rice parboiling sector, a 100 sample baseline survey in 9 LGAs (December 2015) was carried out to describe the target group of rice parboiling cooperatives, associates and enterprises. In Niger State, about 250 – 300 of such cooperatives are known, each with some 10-50 members. A summary of the main findings from the baseline survey is given below:

- The parboiling enterprises surveyed are predominantly small⁸, owned and operated by women, about half of whom also own a rice farm, most parboilers also purchase rice from other producers to complement their own production. Parboiling is a seasonal activity that immediately follows the rice production season.
- While Niger State is a large producer of rice⁹ with an annual production of some 500,000 t per year, the contribution from informal producers is less than 4%¹⁰. Informal rice parboilers are small or very small enterprises. The baseline survey included three categories according to their production level:
 - Some 45% of the informal parboilers bring less than 10 t/yr to the market: the average quantity brought to the market is 2.1 t¹¹;
 - Another 45% of informal parboilers bring between 10-50 t/y to the market (average 24.9 t); and
 - The remaining 10% of the enterprises bring more than 50 t/y to the market (average 97 t/y).

Figure 1 shows the distribution of parboilers included in the baseline survey according to their annual rice output.

⁸ The farms owned by parboilers are small: 55% own less than 1 ha (average 0.57 ha), 27% between 1-3 ha (1.83 ha) and 18% own more than 3 ha. If a size of 3 ha is taken as the cut-off point, 82% of the parboilers own less than 3 ha (on average 1ha) and 18% more than 3 ha.

⁹ Analyzing Rice Production Issues in the Niger State Area of Nigeria's Middle Belt; Food and Public Health 2017, 7(1): 7-22

¹⁰ The sample contains 100 parboilers and covers 30 cooperatives. The total production in the sample was about 2250 t/yr, which means that the 250 known cooperatives produce about 18,750 t/yr, of less than 4% of the total quantity produced in Niger State.

¹¹ This represents a value of about 700 USD/yr.

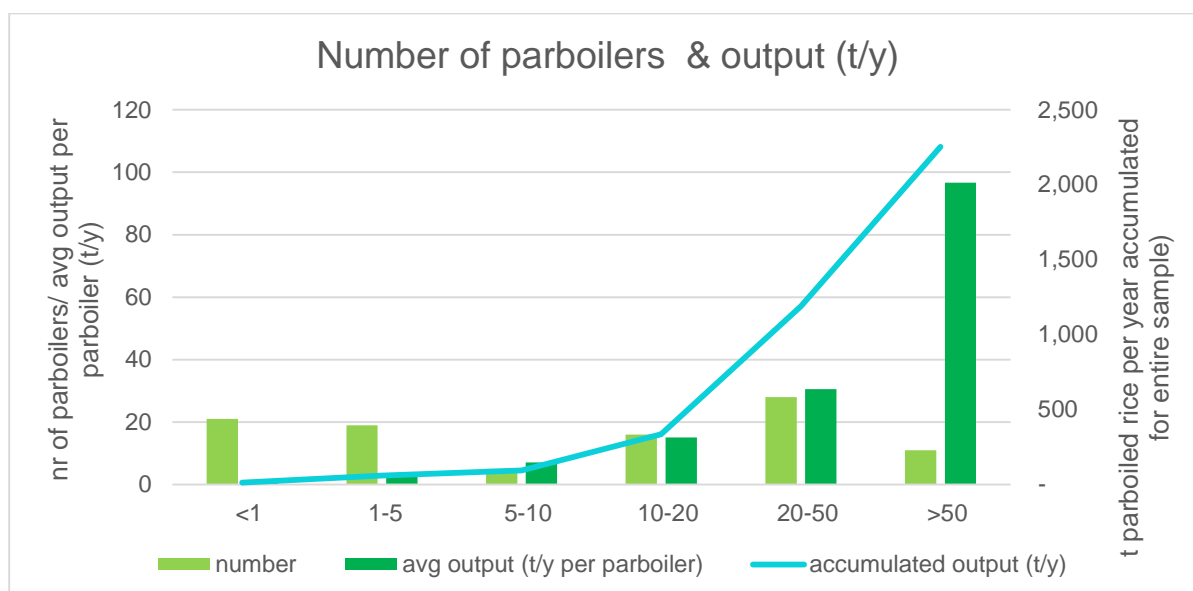


Figure 1: Number of parboilers and output (t/y)

- The three production categories have in common the use of multiple firewood stoves and pots and the application of traditional rice parboiling methods. Very few parboilers (about 5%) use the false bottom technology, which would both improve the rice quality and reduce fuel consumption. The barrier to wider scale adoption is that false bottom technology requires investments in additional equipment and know-how.
- The smallest parboilers use significantly more wood per kg of rice produced than larger informal parboilers and their energy costs are also higher as percentage of turnover (see figure 2). Thus, the smallest parboilers have in principle more to gain from new stoves than larger parboilers. However, they are also the poorest, with the lowest possibilities to invest in new equipment. The smallest establishments spent on average 80 EUR/y for firewood and the largest about 350 EUR/y, which are not huge amounts by any standard.

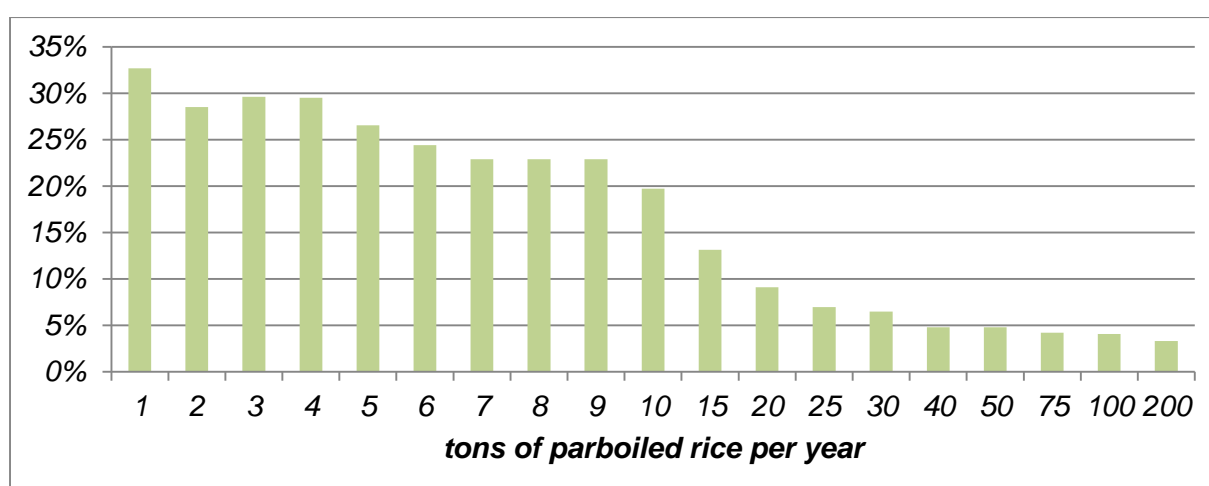


Figure 2: Firewood costs as % of total revenue

- The number of stoves and pots used are almost the same for all sizes of establishments. All parboilers have 2 pots and most have 2 stoves, except the largest operations that have 3 stoves and pots. The volume of all pots combined increases with the size of the operation (See Figure 3). Irrespective of the size of the establishment, at least half of the users use the 3-stone open fire stove.

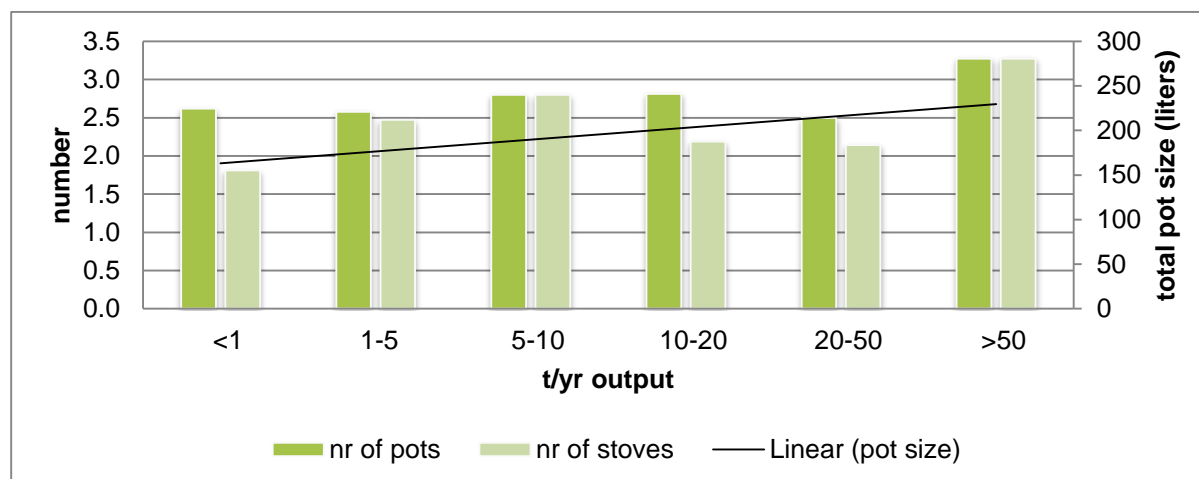


Figure 3: Pots and stoves used by size of parboiling operation

- Most parboilers are not unhappy with their current stoves. In fact they do not know the alternatives available, therefore the willingness to pay for new stoves therefore is not very high, despite the potentially substantial benefits. The smallest parboilers indicated that they are willing to pay NGN 5-10,000 for a better stove and the larger ones willing to pay NGN 10-20,000 (See Figure 4). As firewood is readily available, whether gathered or bought from retailers for reasonable prices (25 EUR/t)¹², parboilers, in fact, do not see the justification to reduce fuel costs.

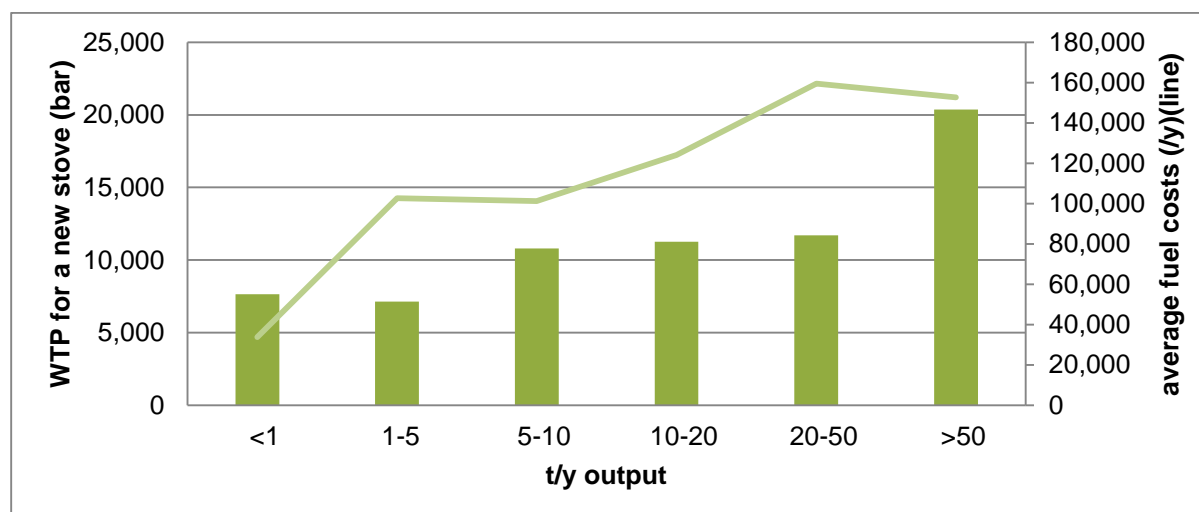


Figure 4: WTP for a new stove & annual fuel costs

¹² Some 8800 Naira to 15000 Naira per ton

Thus, any supported technological solutions designed to assist parboilers under NESP therefore had to take into account the fact that the sector is dominated by very small businesses, owned by women and generally unable to invest, even in short payback interventions. This is due to the low cost of firewood.

To lead to successful commercial market development, (very) low-cost solutions that have track record of improvements in fuel consumption, speed of boiling and reduced smoke emissions had to be promoted. In this context, financial support options, such as payment plans, soft credit or subsidies were essential, at least for kicking off the market development.

3. Timing of main activities

Below a description of the activities that took place under the framework of this contract per every half year:

Table 1: Details of activities carried out

	2 nd half 2015	1 st half 2016	2 nd half 2016	1 st half 2017	2 nd half 2017
Appraisal mission (November 11 - 12, 2015, Minna) ¹³ to identify institutional stakeholders and discuss the programme with them. Identified among others were Niger State Agricultural and Mechanization Development Authority (NAMDA) and Niger State Rice Investment Consortium (NSRIC), Competitive African Rice Initiative (CARI), Pro-poor Growth and Promotion of Employment in Nigeria (SEDIN) and International Fund for Agricultural Development (IFAD) ¹⁴ . These stakeholders were identified as the key in supporting the promotion of the new stoves. These organizations were consulted at several occasions during the implementation of the project. Although the consultants also touched base with the State House of Assembly in Niger State, which claimed interest in supporting the intervention by providing 100% capital subsidies using their constituency funds, this was not pursued due to potential political implications.					
Baseline survey of rice parboiling enterprises in Niger State (Dec 2015 - January 2016, Niger State) using a					

¹³ The appraisal mission resulted in the extension of the already existing collaboration between NESP and Niger State Government on electrification so that it also covered clean cooking. Bilateral collaborations have been established with NAMDA and NSRIC and international programmes such as SEDIN, CARI, IFAD and JICA due to their important role in promoting the development of the rice value chain in Niger State.

¹⁴ CARI and SEDIN are GIZ implemented programmes.

questionnaire developed by the consultants.					
In February 2016, a Call for Expressions of Interest (EOI) was launched by NESP to select local stove manufacturers. A total of 30 applications were received with 15 pre-qualifying for the next stage in the competition process.					
Validation workshop ¹⁵ for the report of the baseline survey of rice parboiling enterprises in Niger State (March 11 - 12, 2016, Minna).					
An additional meeting was held during the Validation Workshop with the 15 pre-selected companies to present different stove options for rice parboiling, explain procedures for the next round of the competitive process and answer any questions they still had. They were invited to submit a written proposal in-line with the requirements as laid out in the Call for Proposals. Out of the 15, eventually 7 submitted a written proposal and were then invited to send their stove models for testing to the IRECA testing facility in Ebonyi.					
Elaboration of list of rice parboiler groups for testing the stove technology in April 2016 ¹⁶ .					
Development of a preliminary concept for a GIS monitoring system for rice parboilers in Niger State, enabling geo-referencing of sampled beneficiary groups of rice parboiling farmers and the presence of agro-processing in selected LGA's in April 2016. Jointly with NIGIS (Niger State Geographic Information System) Agency, the protocols for georeferenced monitoring of parboiling activities were developed and training in the use of the software was organized for NIGIS, NAMDA, NISRC, Niger State Ministries of Environment and Lands & Housing, Survey department, Information and Ministry of Works and Transport.					
In May 2016, a report was issued presenting the technological research on rice parboiling stoves. It also addressed a limited number of alternative rice husk-based fuels, such as dust and briquettes.					
In May 2016, the stoves from the 5 suppliers that had submitted a stove were tested. In June 2016, stove suppliers were informed of the test results: the test					

¹⁵ Referred to as Stakeholder Forum in ToR1.

¹⁶ A preliminary list of potential rice parboiler groups was prepared by the consultants. NESP validated the list jointly with development partners and selected the specific locations for intervention.

results showed two categories of stoves: (i) advanced, very expensive ¹⁷ and (ii) improved traditional, low-cost ¹⁸ . Although the technology proposed by the first category of manufacturers was more efficient, it was out of range for end-users. The technology proposed by the second category of manufacturers was affordable and its efficiency could be improved with some assistance. Thus, the second category of manufacturers was selected and invited to sign a MoU with NESP. As part of its contribution to the collaboration, NESP would provide support on stove production improvement, business plan development, business management, marketing, and awareness raising.					
In August and September, two high efficient/low cost new stove models (1 brick/ceramics, 1 bricks/ceramics/metal) were developed by the consultants, in consultation with the selected stove manufacturers and other partners, based on feedback from potential users and the performance of the tested stoves. Rather than redesigning the individual stoves proposed by the 3 selected stove manufacturers, new models were developed with superior performance for similar costs. A stove construction manual was also produced during the stove development process. The 3 stove manufacturers received training in the production and operation of these stoves at the end of September 2016.					
Jointly with Niger State Government, a list of 15 rice parboiling groups (in 15 LGAs) were selected in October 2016 for technology testing. Each of these groups received 1 brick and 1 metal parboiling stove.					
In October 2016, further assistance was given to NIGIS to prepare for the roll-out of the GIS monitoring system.					
To support the manufacturers in disseminating and selling stoves to the rice parboiling groups, a business development training was conducted in December 2016 for them.					
In order to enhance the capacity of stove manufacturers to disseminate stoves, after-sales services training was conducted in April 2017.					
To further enhance the concept and deployment of the GIS monitoring system, a capacity building programme					

¹⁷ Envirofit International Nigeria Ltd, Quintas Renewable Energy Solutions Ltd.

¹⁸ Roshan Global Services Ltd, SOSAI Renewable Energies Company Ltd, Nenu Engineering Ltd.

for staff of NIGIS and other Niger State MDAs was conducted in May 2017. The training session focused on the use of Quantum GIS for monitoring and evaluating of stoves delivered by the project. The consultants, on behalf of NESP, also procured some monitoring equipment for NIGIS. The equipment procured for the GIS monitoring included 5 GPS devices and a laptop computer, which were handed over to the management of NIGIS after the training.					
Between March and September 2017, the project launched the public awareness creation campaigns. The first stage in the campaigns was the production of awareness creation materials including posters, banners, radio jingles and programme flyers/material all in English and local languages. Awareness campaign t-shirts were also produced. The actual production of the promotional materials started in March 2017. The second stage was the outlining of awareness creation entry points based on a marketing strategy. The third and last stage, was the implementation of the campaigns, which started with parboiling demonstrations for development partners and members of Niger State House of Assembly in March and May 2017 respectively. 105 promotional stoves were provided in 105 locations with high concentration of rice processing cooperatives from June to August 2017. Between July and August 2017, the manufacturers with support from NESP conducted demonstrations in the locations where they installed the promotional stoves. For this purpose, one sales consultant and several agents from across 12 of the target LGAs were recruited to assist in the campaigns. Radio jingles and programmes were aired in 4 radio stations between July and August 2017. Finally, the marketing team held series of advocacy meetings with development partners and rice processing cooperatives during the marketing campaigns.					
Monitoring of installed stoves was carried out side by side with the marketing campaigns using the GIS monitoring system between June and August 2017. The procured GIS units were deployed to track the positions of all stoves installed under the project.					

4. Outputs produced¹⁹

Table 2: Outputs delivered by the project

	WP1	WP2	WP3	WP4	WP5
Report on Appraisal Mission - NESP Clean Cooking Intervention – December, 2015					
Market Development For Clean Cooking Energy Solutions For Rice Parboiling In Niger State - Agro Processing Wood Use Survey Questionnaire, December 2015					
Market Development for Clean Cooking Energy Solutions for Rice Parboiling in Niger State - Cookstoves Enterprise Survey - Metal Workshops, December 2015					
Call for Expressions of Interest – Assistance to Local Stove Manufacturers - February 2016					
Report of Baseline Survey of Rice Parboiling Enterprises in 9 L.G.As in Niger State, February 2016					
Call for Proposals – Assistance to Local Stove Manufacturers – March 2016					
Report on Validation Workshop of Rice Parboilers' Baseline Survey - March 2016					
Inception GIS monitoring report – April 2016					
Second step of call for proposals; Clean Cooking Intervention - Assistance to Local Manufacturers - April 2016					
Report on possible stove technologies for rice parboiling - May 2016					
Results of stove performance tests; Clean Cooking Intervention - Assistance to Local Manufacturers - May 2016					
Summary of competition process; Clean Cooking Intervention - Assistance to Local Manufacturers - July 2016					
In-house stove performance improvement; Clean Cooking Intervention - Assistance to Local Manufacturers - November 2016					
Construction manual for efficient institutional metal/bricks and clay/bricks stoves using local round bottomed pots; Clean Cooking Intervention - Assistance to Local Manufacturers - November 2016					
Technical training for selected manufacturers on stove design and production; Clean Cooking Intervention - Assistance to Local Manufacturers - November 2016					
Report of training on business development, basic					

¹⁹ All documents are available on request, if needed.

marketing for stove manufacturers and retailers identification; Clean Cooking Intervention - Assistance to Local Manufacturers - December 2016					
Report of consumer acceptance testing among 15 rice processing groups; Clean Cooking Intervention - March 2017					
Report on establishment of GIS datasets; Clean Cooking Intervention - April 2017					
Report of after sales service training; Clean Cooking Intervention - Assistance to Local Manufacturers - May 2017					
Report of GIS training; Clean Cooking Intervention - May 2017					
Report of marketing campaigns; Clean Cooking Intervention - August 2017					
Final report on GIS monitoring; Clean Cooking Intervention - September 2017					

5. Staff

Table 3: Team of consultants involved in the project

	WP1	WP2	WP3	WP4	WP5
Ahmed Hood					
Charles Gitundu					
Robert van der Plas					
Anaba Allwell					
Ewah Eleri ²⁰					
Folake Salawu					
Hadiza Babayaro					
John Shalma					
Kolawole Omole					
Okechukwu Ugwu					
Onochie Anwara					
Precious Onuvae					
Segun Adaju					
Uduka Iregbu					
Victor Sunday					

²⁰ Naceur Hammami was replaced with Ewah Eleri during the first contract amendment.

6. Discussion

The team reflected on the main steps undertaken to implement the project as well as on applied procedures with a view to identifying lessons learnt. Chapter 6 explores these lessons learnt, which could be incorporated when launching any eventual follow-up activity in the near future. Chapter 7 specifically looks forward at implementing these lessons.

Six essential steps in the process to select and disseminate stoves are analyzed:

- Baseline survey;
- Selection of producers and stove models;
- Support to producers;
- Marketing and outreach support;
- Financial support; and
- M&E.

6.1 Baseline survey

A baseline survey is crucial for describing the target group and identifying potentially acceptable solutions. While the field work was undertaken relatively quickly, the decision to conduct the baseline survey took some time. However, it is essential to have deep understanding of the target group and their main issues. All too often, technological solutions are imposed on beneficiaries. Chapter 2 (Introduction) presents the main findings of the baseline survey, which forms the basis for all further intervention: *any supported technological solutions designed to assist informal parboilers under NESP should take into account that the sector is dominated by very small businesses, owned by women, and, generally, incapable of investing in short payback interventions.*

The baseline survey found that parboilers are willing to invest about 10% of their annual fuel costs in more efficient stoves (with a maximum of NGN 20,000), while this is slightly higher for parboilers with the highest and the lowest output²¹. Since fuel savings can be larger than 50%, as reported by users of the demonstration stoves, one would expect a higher willingness to pay for new stoves. Three possible explanations for this are that parboilers do not perceive the costs of fuel to be very high²², they effectively are cash constrained and cannot provide upfront payments for any investment; even if this leads to a relatively short payback time and/or they do not believe that new stoves are better. However, after being exposed to the new stoves in their own village during the demonstration phase, the WTP increased amongst parboilers, particularly for the metal clad stove, as shown in Table 4.

²¹ Parboilers with the lowest output pay relatively the most for firewood (as % of revenue) and parboilers with the highest output pay the lowest, but in absolute terms their firewood costs are the highest. Both have an incentive to use new stoves: small parboilers to improve the price structure of their output, and the largest parboilers to spend less on wood.

²² At 25 EUR/t on average, firewood costs are low indeed.

This shows the positive impact that a proper demonstration intervention has in increasing the acceptance of the new technology.

Table 4: Interest among rice processors before and after demonstrations

	Baseline survey	After demonstration	
Up to NGN 20,000	100%	40%	27%
Up to NGN 50,000		40%	33%
Up to NGN 100,000		20%	27%
More than NGN 100,000			13%

Despite the increased WTP, only 13% of the groups that participated in the demonstration phase were ready to pay for the stove in cash, 47% preferred a deferred payment plan and 40% indicated the need for financial assistance. This is good news and bad news at the same time: yes, a market may after all exist for improved parboiling stoves, but this can only be developed if some form of financial assistance is available.

6.2 Selection of stove models and producers

In order to identify all possible stove suppliers and stove models and to give each of them a fair chance of being involved, a two-step process was conceived and followed.

Expressions of interest were collected from any potential supplier of improved parboiling stoves (or institutional stoves) interested in participating (30 expressions of interest received)²³, wherein certain base information was requested (i.e., filling out forms and writing a short summary of their operations). Only those suppliers who satisfied certain technical criteria were requested to submit a short proposal on how they would market and sell their stoves if selected for the NESP support (15 invited). Out of these, 7 were requested to submit their stove for laboratory testing and only 5 did so. Only 3 were selected for further assistance, although stoves from all 5 were expected to be promoted during the marketing campaign²⁴.

At the end of the laboratory testing, it was found that the stoves were either far too expensive compared to the WTP for new stoves of the rice parboiler groups²⁵ or should be modified to better match expectations of parboilers, particularly in terms of convenience and price. It was then decided to quickly develop new stove models that would better match user criteria for usage and price.

A word on thermal efficiency, which is usually taken as the main metric for comparing the performance of stoves. The thermal efficiencies of the more expensive stoves were indeed slightly higher than those of the cheaper stove models. However, it is the combination of maximum power output of the stove, thermal efficiency and ease of use that really matters to the user. The consumer acceptance testing carried out in 15 locations truly brought the last

²³ Based on advertised invitation to submit an EoI and contacting known stove producers.

²⁴ Subsequently, in view of the low WTP and considering that the technologies from the 4th and 5th selected manufacturer were relatively very expensive, it was decided not to invite the latter for the marketing campaign.

²⁵ EUR 1000 or more compared to EUR 30-40 for a traditional stove, or 0 EUR if a 3 stone fire is used.

point to light. All the same thermal efficiency is the most globally acceptable parameter for comparing performance of stoves.

6.3 Support to stove manufacturers

The stove manufacturers were selected based on technical criteria, on the basis of the stove models they produce, their production capacity and evidence of proper documentation of their operations. One criterion which was given enough weight during the selection process was presence in the target state. This became very pronounced during trainings and marketing campaigns in the target areas when the manufacturers struggled to be present. Future interventions should ensure that, in addition to technical and financial capacity, the manufacturer should have strong presence in the target state.

6.4 Marketing and outreach

The marketing plan was not only focused on selling stoves, but also pursuing institutional support for the roll-out to continue when the project support ends. A marketing strategy with 5 major angles was put in place:

- Awareness raising, as parboilers generally are not aware that better performing stoves exist. This was realized by *in-situ* demonstrations in 15 LGA and supporting the marketing campaigns for each of the three stove manufacturers;
- Ensure the supply of better stoves, which was done by incorporating the selected manufacturers in the outreach campaigns. In fact, the manufacturers were supposed to lead the marketing campaigns, but 2 out of 3 failed to do so mainly for reasons of not being located in the target areas.
- Reduce the costs of the stoves through further innovation and improvement, which was done by focusing on the lowest-cost stove that was developed;
- Develop a financing mechanism to make stoves more affordable to parboilers with low cash availability (see next chapter 6.5); and
- Obtain institutional support, from organizations interested in including support to parboilers in their normal work programme (see next chapter 6.5).

Marketing and outreach was carried out as follows: prior to any marketing and outreach demonstration, activities were scheduled to take place in 15 selected LGA. This demonstration consisted of the following steps:

- 30 consumer acceptance test stoves were installed in 15 rice processing clusters across 15 LGA (2 of each model: a brick stove with metal cladding, and a brick stove for pots of 200 liters);
- An additional round of demonstrations took place by installing a further 105 promotional stoves (35 by each supplier) at 105 locations with high concentration of rice processing groups (brick stove without pot); and

- Supporting the marketing campaigns of the three suppliers by accompanying them in the field work as well as supplying marketing materials.

As a result of the consumer acceptance tests carried out, some lessons were learnt in terms of stove model selection and willingness to pay. While the main preference was for metal clad stoves, ability to pay existed only for the clay/bricks stove without a pot. Nevertheless, parboilers increased their WTP for new stoves after having seen and used them for some time. The demonstration models at the 15 user acceptance test sites led to 3 confirmed orders (paid in cash) and 59 conditional orders, if some sort of financial assistance would be offered²⁶. The acceptance of the slimmed-down version appears good, although the consultants fear for reduced life times of these stoves, as parboilers insist on installing the stoves in the open air²⁷, just like they do with their traditional stoves. Installing a roof or shed would involve additional investments, which have a longer-term payback than acceptable for most parboilers.

The consultants led the first step demonstrations in 15 LGA (30 stoves), which were also used to survey the user acceptance levels regarding the new stoves. The second step demonstrations (105 stoves) and the marketing that followed were led by the manufacturers²⁸.

As already mentioned, there were capacity challenges among the stove manufacturers that limited their presence in the target areas. NESP responded to this by providing logistics support to the manufacturers. As a result of this intervention, the manufacturers fully mobilized, but it was only a couple of weeks to the end of the contract and not much stove sales could be achieved.

6.5 Financial support

It has become more than clear that financial support is essential, whether directly through NESP (or successor) or through project partners such as NAMDA, IFAD, CARI, SEDIN, etc.

A first option, also suggested by most parboilers, would have been staggered and scheduled payment options (Payment in installments). This would require the participation of stove manufacturers. The latter may experience fee collection problems (i.e., high collection costs) if they are not represented in the target areas. Peer pressure among cooperative members could however, in principle, be used to ensure timely payments.

Another option would have been to use rice parboiler groups/cooperatives to organize traditional savings schemes, but there was not enough time under the project to pursue this

²⁶ This represents a leveraging factor of 4.

²⁷ The stoves are made of bricks and mud with selected parts in metal. Outdoor operation is not a problem *per se*, as long as owners maintain the stove and repair cracks as these appear. The fear is that owners do NOT maintain their stoves regularly and blame the suppliers for the short life of the stoves.

²⁸ In preparation of commercial operations, stove manufacturers are responsible for marketing - this cannot be done by a project unless to kick-start. In fact, only one company reacted quickly and started a marketing campaign (SOSAI), the other stove manufacturers needed more time to produce stoves and transport them to the locations.

fully. In fact, most rice parboiler groups do not use user fees to strengthen their capacity as cooperatives, but use these only to arrange for the purchase of rice paddy.

A third option could have been to establish a subsidy scheme. The Niger State House of Assembly initially intended to purchase stoves for parboiling groups, but this option was discarded due to the political nature of the funds that the State House of Assembly intended to use. Nevertheless, such procurement would have been an excellent kick start of the market whereby suppliers obtained some funds to sustain their production. Other organizations such as NAMDA and IFAD, appeared interested, but had budget constraints. Both NAMDA and IFAD indicated that they would consider reserving budget in their next fiscal year to support cooperatives in purchasing efficient stoves. NESP could not give capital subsidies under this project, as this need had not been foreseen in the beginning.

Another possibility would have been that the project had provided interest free loans to the stove manufacturers for a specified number of stoves. In practice this would operate as a revolving fund. This requires a transparent accounting system and an audit at the end of the project, which was not possible to establish under this project. Moreover NESP is not mandated to provide credit and would have had to organize a revolving fund with a third party. This was not possible because it had not been foreseen in the beginning of the intervention.

The last option could have been microfinance. While financial institutions typically charge (very) high interest rates, the stoves do save at least 50% of the fuel consumption which lead to a certain payback time. However, it is a matter of conjecture whether the savings would be put to good use to offset credit facilities.

To put things in perspective, while the rice parboilers' contribution to the State's economy is not very large, the 250-300 known cooperatives probably have 5000 to 7000 parboiling groups each with 5-10 laborers. This, in terms of employment, is not negligible. Assistance to make this sector more profitable would be justified for this reason in the opinion of the consultants. However, setting up a sustainable financing mechanism for less than 10,000 stoves may be more difficult to justify and providing a one-time subsidy so that all cooperatives can buy a replacement stove at once appears a better idea. This brings us to a crucial question: can a sustainable commercial market for parboiling stoves exist at all? Combining all observations gathered under the project to answer this question, such as the limited financial capacity of parboilers and their cooperatives, the low cost and easy availability of firewood and the small number of parboilers and cooperatives, suggest that such a market may not take off without a well designed financial intermediation.

6.6 Monitoring & Evaluation (M&E)

M&E is crucial to document progress and fine-tune the approach followed under a project. Much capacity building and training was realized in collaboration with local counterparts and development partners to set up the institutional capacity for proper M&E. The NIGIS is able and ready to carry out the geo-referenced monitoring and update the national database. As a result of the late start of the marketing campaign and the slow sale/adoption of stoves, data collection has however been minimal. Data collection has been limited to the user

acceptability test and demonstrations stoves and the 3 additional ones sold during the marketing campaigns.

7. Lessons learnt

A first lesson is adequate understanding of the target groups and their specific issues prior to designing the intervention and developing solutions. A project intervention assessment is imperative, unless sufficient information is known at project start - which was definitely not the case for rice parboiling groups. With the baseline assessment, changes in technical solutions according to end-user needs were possible. Evidence from the assessment also led to the introduction of new support measures that were consistent with the target group's expectations in terms of price and willingness to pay.

The capacity of the supported enterprises to build a sustainable supply chain for stoves in Niger State remained an issue. Two of the three selected suppliers are not present in Niger State and all three are not present in the rice producing areas. In addition, their capacity to initiate and maintain a sustainable stove supply in such a wide project area is limited. Given the modifications to the type of preferred stove, for sustainability reasons it would have been far better in hind sight to work more closely with local stove manufacturers in rice production areas. Established agricultural and other equipment manufacturers could also have been eligible for project support.

Potential support from local and international agro-organizations was not pursued more rigorously mostly because of the budget constraints on their part. Whilst NAMDA and IFAD showed initial willingness of support and participated in project implementation, lack of budgetary provisions prevented deeper engagements and follow-up. The cooperatives' lack of investment capacity, even for their own support and growth, let alone for energy efficient equipment requires external support that these organizations can supply. Moreover, the total financing required for a complete overhaul of rice parboiling technology in all cooperatives is minimal compared to the budgets of these organizations, particularly if the sector's conversion is implemented over a few years: it costs a cooperative about 70 – 350 EUR per 2-5 parboilers to replace their existing stove with a much better stove and financial assistance can be structured to cover only part of this due to a high willingness (but low ability) to pay.

Finally, the project philosophy required a fully commercial market to be developed and set up. This is a challenging target given the cooperatives' low ability to invest and the potential financial gains due to firewood savings. While savings in terms of volume of wood are substantial, in terms of money they are not very substantial. To address this, keeping in mind a strong economic justification in terms of employment and reduced wood resource use, a financial support mechanism should have been part and parcel of the project design. The firm of consultants towards the end of the project pursued staggered payment solutions, which were found to be acceptable to cooperatives and require very little financial support.

Any follow up project should take the above recommendations into account, and further explore a capital grants based financial support mechanism.