The Economics of Rice Parboiling: Assessment of training interventions in Northern Nigeria
Final Report

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ACRONYMS/ABBREVIATIONS

CARI	Competitive African Rice Initiative
FCT	Federal Capital Territory
JICA	Japan International Development Agency
M&E	Monitoring & Evaluation
₦	Naira
ODK	Open Data Kit
PPS	Probability Proportion to Size Sampling
ToC	Theory of Change
ToR	Terms of Reference

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EXECUTIVE SUMMARY

The Competitive African Rice Initiative (CARI) commissioned a study to assess the the economics of rice parboiling in Nigeria in the states of Jigawa, Kano, and Kebbi as well as the Federal Capital Territory (FCT). The goal of the survey was to determine the effectiveness of CARI parboiling training interventions following its Theory of Change (ToC). A total of 401 parboilers (398 female) were surveyed. The margin of error is 4.86% at the 95% confidence level. The study focuses on 4 key pillars: (1) perception of training, (2) adoption of good parboiling practices, (3) profitability (gross margin), and (4) parboiling as a step towards women's empowerment.

Demographic distribution and perception of training

The average age of surveyed parboiling women is 40 years; 38% of them are between the ages 18 and 35 and are thus classified as youth (by the broader concept of youth). Accordingly, the data seems to indicate that parboiling can be attractive to youth.

Overall, the parboiling training was well received by an overwhelming majority of 94% of survey participants who indicated that they were either satisfied or very satisfied. Almost all (98%) of the parboilers indicated that they did not encounter any difficulties during the training.

Adoption of good parboiling practices, better equipment, and good business practices

Overall, the self-reported adoption rates for the practices are good with an average adoption rate of 71%. The practices with the highest adoption rates are soaking, winnowing, washing, and post-drying, while the practices with the lowest adoption rate are the choosing of good quality paddy, general sorting, and visual sorting. The adoption rate for capital-intensive practices (i.e. equipment) is higher, while adoption of more labor-intensive practices such as sorting and choosing high quality paddy are rather low.

It was also assessed what the adoption depth is with regards of the number of adopted practices and who was classified as full adopter. Following a less strict approach (6 out of 12 practices), 83% of survey parboilers are classified as full adopters. When narrowing the criteria to a stricter approach (8 out of 12 practices), 67% of parboilers are classified as full adopters.

With regards to good business practices, the parboilers were trained on 3 core business practices which include (1) record keeping, (2) calculation of money-in money-out, and (3) calculation of cost of parboiling per bag of paddy. The study reveals that the adoption rate for each of these practices is low at about 33%.

Different parboiling models

There are two different parboiling models in Nigeria. Business Model 1 includes the parboiling of paddy and subsequently milling, before then selling the parboiled (and milled) rice onward. Business Model 2 includes the parboiling of paddy and then selling it directly onward to a processor for further milling (i.e. the parboilers do not mill the paddy themselves). About 96% of the parboilers adopted Business Model 1 while only 4% adopted Business Model 2.

Profitability of parboiling

The data revealed an immense variance in gross margins across the surveyed parboilers, ranging from - 49% to + 96%. The majority (56%) of parboilers have positive gross margins, while 44% have a negative one. There is accordingly a difference of 33 percentage points between the percentage of parboilers that perceive that they are making a profit (89%) and the percentage of those that actually do (56%), indicating that approximately one third of parboilers have a wrong perception about the degree of profitability of their business.

Looking across all states, the average gross margin is 2.4%, while the median is 0.9%. This average margin of 2.4% is equivalent to an average profit per parboiling cycle of ₦ 2,489 (approx. USD 6.53). On average, the sampled parboilers conducted 52 cycles in 2020, which then translates to an average profit per year of ₦ 129,428 (approx. USD 339). While parboiling may not generate much income, it nonetheless can contribute to household income and increase its resilience.

At the state level, the analysis revealed that the average gross margins for Kano and Jigawa states are positive (2.7% and 2.8% respectively) while for Kebbi state and the FCT average gross margins are negative (-1.2% and -1.0% respectively).

Cost breakdown of parboiling

The data revealed that on average the cost of paddy is the highest cost component in the parboiling business. The next highest component is the cost of labor, followed closely by milling, packing, and energy. Water represents the lowest cost to the parboilers.

When looking at the state level, it becomes evident that the cost patterns differ. In absolute terms, Kebbi parboilers generate the lowest income and have the highest loss. Similarly, FCT reports the second lowest income, but make the largest loss. Jigawa and especially Kano parboilers generate the highest incomes and accordingly also make a profit on their parboiling cycle.

Parboiling as a step towards women's empowerment

A strong majority of 83% of respondents (of the 398 female) reported that they are the ones making decisions about their parboiling business. Nevertheless, in 15% of the cases it is in fact the respondent's husband who makes the business decisions.

The majority also indicated that they reinvest at least some of the money to buy paddy for further processing, thus keeping the business running. 55% of respondents save a portion of their profits, and 36% of respondents save specifically to replace parboiling equipment in the future. Approximately 62% of respondents use profits to pay for food while 51% use profits on health care for their family members.

Conclusion

The results of the survey show that the CARI parboiling training had an overall positive impact in terms of adoption rates of better parboiling techniques (although low adoption of business practices). However, a third of all parboilers have a negative or almost neutral gross margin and can thus be classified as "survivor entrepreneurs", meaning they just barely stay afloat and survive

instead of scaling their business. There is yet a strong case to be made that parboiling can be a profitable and scalable business since a majority of the parboilers show positive gross margins. Above all, 99% indicated that they are proud to be a parboiling woman and see parboiling as an activity in the future

1. INTRODUCTION

The Competitive African Rice Initiative (CARI) is commissioned by the Bundesministerium für wirtschaftliche Zusammenarbeit und Entwicklung (BMZ) and co-financed by the Bill and Melinda Gates Foundation (BMGF). The project is implemented by the Deutsche Gesellschaft für Internationale Zusammenarbeit (GIZ) GmbH. The objective of CARI is to improve the livelihoods of rice farmers by increasing the competitiveness of domestic rice supply to meet increasing regional demand, and thus drive import substitution. CARI is implemented in Nigeria, Burkina Faso and Tanzania with the aim of reaching more than 100,000 male and female smallholder rice farmers as well as rice processors, including artisanal rice millers and parboiling women groups.

Rice is becoming one of the most important food crops on the African continent. Steep population growth, coupled with rapid urbanization and changing consumer behavior, are the main drivers behind the increasing demand for the cereal. In Nigeria, rice is demanded across all states and all socio-demographic groups. The cereal itself is predominantly produced by smallholder farmers and processed by small-, medium- and large-scale mills.

Amongst the different types of rice that are in demand, parboiled rice is particularly popular in some West African countries (mostly Nigeria and Burkina Faso and partially in Ghana and Cote d'Ivoire). The technique of rice parboiling itself refers to the partial boiling of paddy before it is milled in order to increase its nutritional value, change the texture of cooked rice, and reduce the breakage in milling. Parboiled rice takes less time to cook and is firmer and less sticky when cooked. The activity usually includes the following main steps: soaking, steaming and drying.

It can be produced either through an integrated parboiling unit that are usually attached to medium to large-scale mills, or through parboiling groups that parboil the paddy and then have the final product off-taken by smaller artisanal mills (so-called "cottage mills"). These parboiling groups usually consist of up to 99% women.

Through a collaboration with the Japan International Development Agency (JICA), CARI developed training materials that are based on improved parboiling techniques and have been disseminated over several years in Burkina Faso, Ghana and Nigeria. Up to today, more than 44,000 parboilers (99% women) have participated in these trainings. In order to examine and assess the effectiveness of its rice parboiling training intervention in Nigeria, CARI commissioned the New Nigeria Foundation (NNF) to collect primary data in Jigawa, Kano and Kebbi states, as well as the Federal Capital Territory (FCT). The result of the survey will feed into the planning and adjustment of the future activities of the CARI project and respond the following key questions:

i. How is the CARI parboiling training perceived and what are potential weaknesses?
ii. Which parboiling practices are adopted and which ones are not?
iii. Which business models do parboilers operate?
iv. Is parboiling a profitable business for individual women and parboiling groups?
v. Does rice parboiling reach, benefit and empower women?

2. METHODOLOGICAL APPROACH

The underlying rationale of this study is the Theory of Change (ToC) of the CARI project that was used as guideline to assess the effectiveness of the training intervention amongst the parboiling communities in Northern Nigeria (see Figure 1).

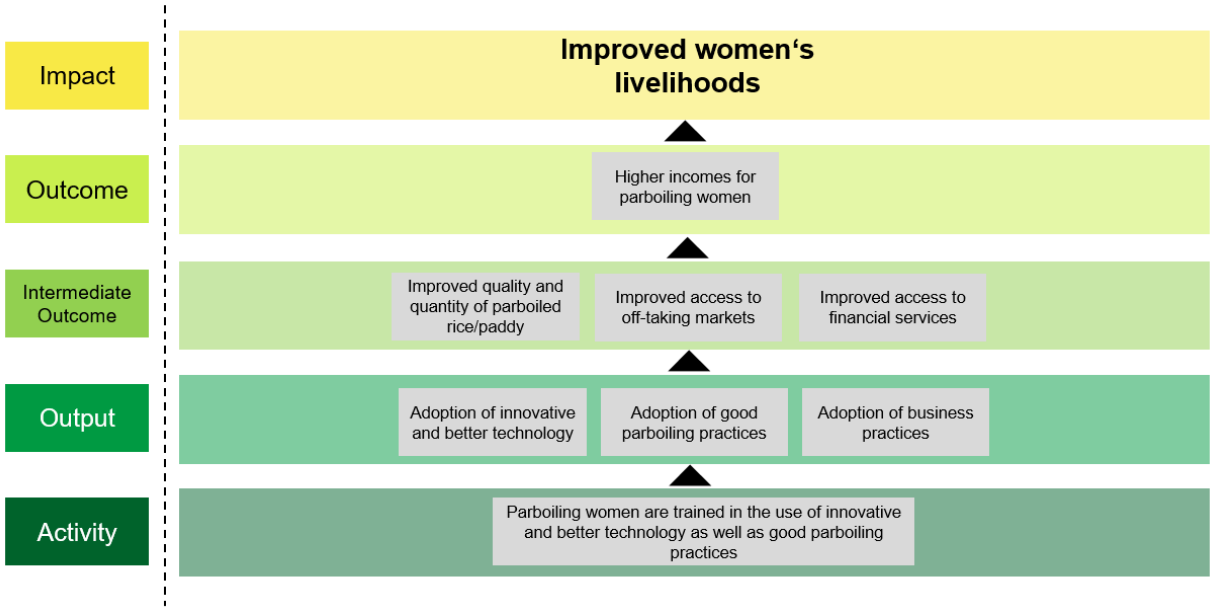


Figure 1: Theory of change

The ToC follows the assumption that the training interventions (**activity level**) for rice parboiling lead to an adoption of innovative and better technologies, good parboiling practices and good business practices (**output level**). High adoption rates lead to improved quality and quantity of rice/parboiled paddy, better access to off-taking markets and financial services as well as new employment opportunities and increased quality of work (**intermediate outcome level**). This in turn triggers improvements in incomes for parboiling women (**outcome level**) with an overall positive effect on livelihoods for parboilers who are almost exclusively women (**impact level**).

The probability proportion to size (PPS) sampling was used in order to account for adequate representation across the 5 different CARI partner organizations and the corresponding parboiling groups that these organizations have trained over the years.

A total of 85 parboiling cooperatives were randomly sampled. Out of these 85 groups, between 1-12 parboilers were randomly sampled per group (401 parboilers in total).

Table 1: Sample distribution

State	Partner	Number of Cooperatives	Sample	Average Age
FCT	SeedFirst	9	30	33
Jigawa	Atafi	42	199	43
	Green Sahel			
Kano	WOFAN	17	82	42
Kebbi	WACOT	17	90	38
	Karda			
		85	**401**	**41**

It should be noted that 4 individuals of the 401 sampled parboilers were male and 3 individuals had not attended a training. Against a total population of 33,435 parboilers trained by CARI in Nigeria and the sample size of 401, the margin of error is 4.86% at the 95% confidence level.

The survey was conducted by a team comprising a key expert, 2 supervisors and 9 enumerators. Two sub-teams comprising a supervisor and at least 4 enumerators were responsible for data collection. The supervisors and enumerators have an agricultural background and experience in carrying out scientific surveys using electronic data capture system. The enumerators are from the respective regions and fluent in English and Hausa languages as well as Pidgin English. To account for the cultural context in Nigeria, deliberate effort was made to have adequate female enumerators in order to better facilitate the interviews with the parboiling women which represented the vast majority of the sample.

A thorough literature review was conducted, and project documents were reviewed including previously conducted parboiling assessments as well as the parboiling training manual.

In addition, a field-tested questionnaire that was developed by CARI was reviewed and punctually updated. The electronic data capture method was adopted using the ODK app on Android devices. The already field-tested questionnaire was scripted to the ODK platform for data collection, integrating consent forms in alignment with data privacy regulation as per the General Data Protection Regulation of the European Union (GDPR).

An operational plan was drafted detailing strategy, activities and timelines for the execution of the survey. CARI staff provided contact details of the partners to facilitate interaction with parboiling groups.

Two manuals were developed to guide the supervisors and enumerators in data collection. A two-day training program was developed, and enumerators and supervisors were trained on the 18 and 19 January 2021 in Abuja and 20 and 21 January 2021 in Kano. COVID-19 hygiene protocols were observed during the trainings. Data was collected from 25 January to 5 February 2021.

Challenges encountered in the field included:

1. Difficulty reaching some parboilers and focal persons due to wrong contact details (phone numbers, names and cooperatives/groups)
2. Some parboilers did not know the names of the cooperatives/groups they belong to
3. Some of the listed cooperatives no longer exist

The challenges did not hinder data collection as replacement groups were randomly sampled ahead of time.

In analyzing the data, certain assumptions were made. It was assumed that the estimated quantity of parboiled rice realized after processing 75kg of paddy is 65% of the weight of the paddy (the generally accepted ratio of paddy to rice after milling). In addition, the average cost of labor obtained during data collection was used to estimate the cost of labor input for parboilers and their families that did not indicate cost of labor.

The data used to capture the gross margin relies on the recollection of the parboilers and therefore there may be a certain limit to the accuracy of their recollection (i.e. records kept by parboilers were not directly examined).

3. ANALYSIS

a. DEMOGRAPHIC DISTRIBUTION AND PERCEPTION OF TRAINING

The average age of parboiling women is 40 years. This is relatively young, but also not surprising given the demographic development in many African countries. Nevertheless, the data also revealed that 38% of parboiling women are between the ages 18 and 35 and are thus classified as youth (by the broader definition of youth). When narrowing the definition of youth to 15-25 years of age, we see that only 11% of parboiling women are considered youth (27 percentage points below the broader definition). The data seems to indicate that parboiling can be attractive to youth, but more specifically for those aged between 25 and 35.

Parboilers have been attending the trainings since as early as 2016 when 24% of the sample had attended. Training participation in the following years was distributed as follows: 2017 (17%), 2018 (5%), 2019 (23%), 2020 (21%), and 2021 (10%). The decrease in training participation in 2018 is easily explained by the transition between the first and second phase of the CARI project when activities tend to traditionally wind down to a certain extent.

Overall, the training was well received by an overwhelming majority of 94% of survey participants who indicated that they were either satisfied or very satisfied with the parboiling training.

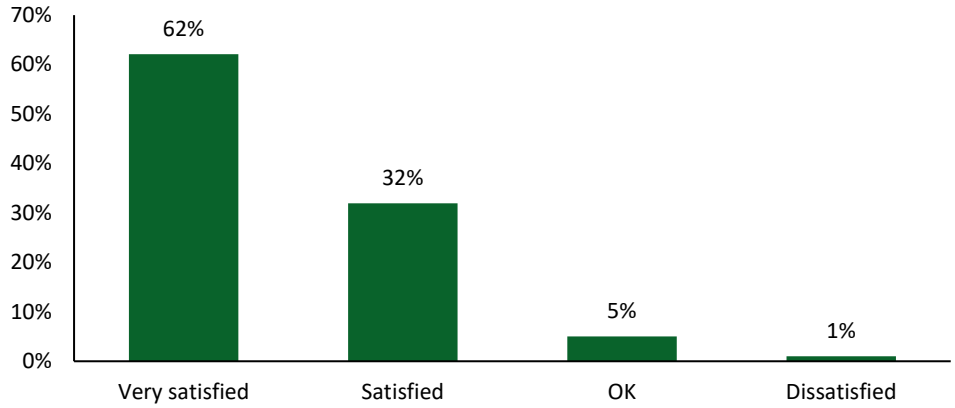


Figure 2: Satisfaction with parboiling training

Almost all (98%) of the parboilers indicated that they did not encounter any difficulties during the training. Only 2% responded that they encountered challenges during the training. Amongst the few parboilers who faced difficulties, it was indicated that the training is difficult to understand (especially the steaming method) and that the high number of people attending the training hindered individual attention. Overall though, the indicated difficulties are fairly negligible, and the training was very well-received.

In terms of training delivery, more than half (58%) of the parboilers found a combination of the practical and in-class training the most valuable. The data shows that 38% found exclusively the practical field training most valuable. Only 5% of all parboilers indicated that just the in-class training was the most useful. There is therefore clear indication that the practical training is particularly well-appreciated by the parboilers but that the in-class training plays an important role as well.

In terms of the frequency of training attendance, a plurality of 44% attended the training just once, while 24% attended twice. Interestingly, 32% indicated to have attended more than two times.

b. TRAINING ADOPTION

Adoption rates of good parboiling practices and better equipment

Adoption of good parboiling practices varies amongst the parboilers. The training intervention focused on the following practices: (1) use of better equipment, (2) maintaining hygienic conditions, (3) quality aspects when choosing paddy, (4) winnowing and sorting, (5) washing, (6) soaking, (7) re-washing and de-watering, (8) steaming, (9) drying, (10) post-drying, (11) general sorting and (12) visual sorting.

Overall, the self-reported adoption rates for the practices are good with an average adoption rate of 71% (Figure 4). The practices with the highest adoption rates are soaking, winnowing, washing, and post-drying, while the practices with the lowest adoption rate are the choosing of good quality paddy, general sorting, and visual sorting.

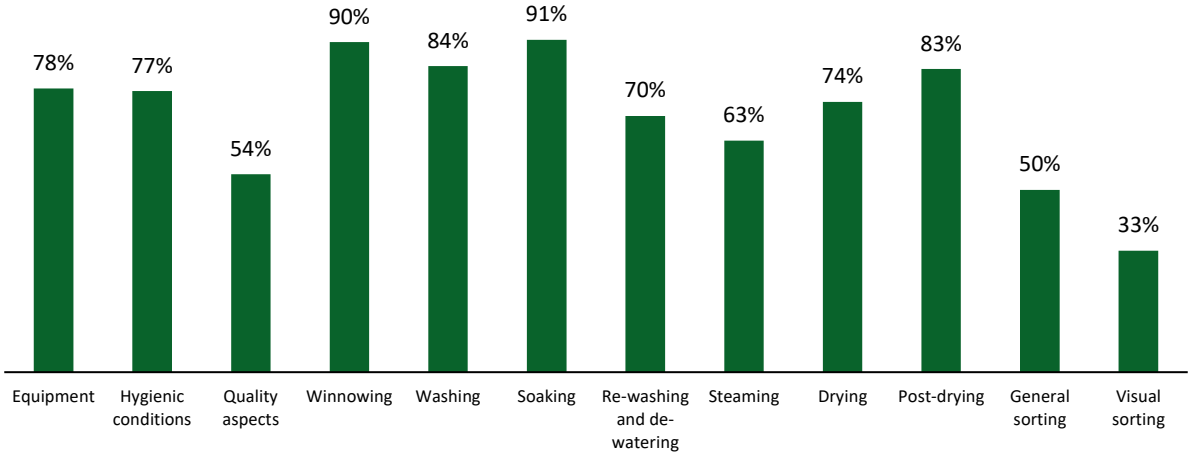


Figure 3: Adoption rates of parboiling practices

The practice of using better equipment includes 10 individual sub-practices for which adoption rates were also calculated. Overall adoption rates for individual equipment are very high. Key equipment to improve the quality of parboiled paddy include the following: (1) iron or aluminum pot, (2) rake, spatula, calabash, and bowl, (3) basin, (4) plastic or aluminum large strainer / basket, (5) metal bucket, (6) soaking and storage barrel / drum, (7) scale of 100 kg minimum capacity, (8) firewood tripod stand /rice husk improved tripod, (9) false bottom, (10) drying tarpaulin.

The average adoption rate of all 10 types of equipment of 78%. Looking at the respective individual equipment, the adoption rates are as follows:

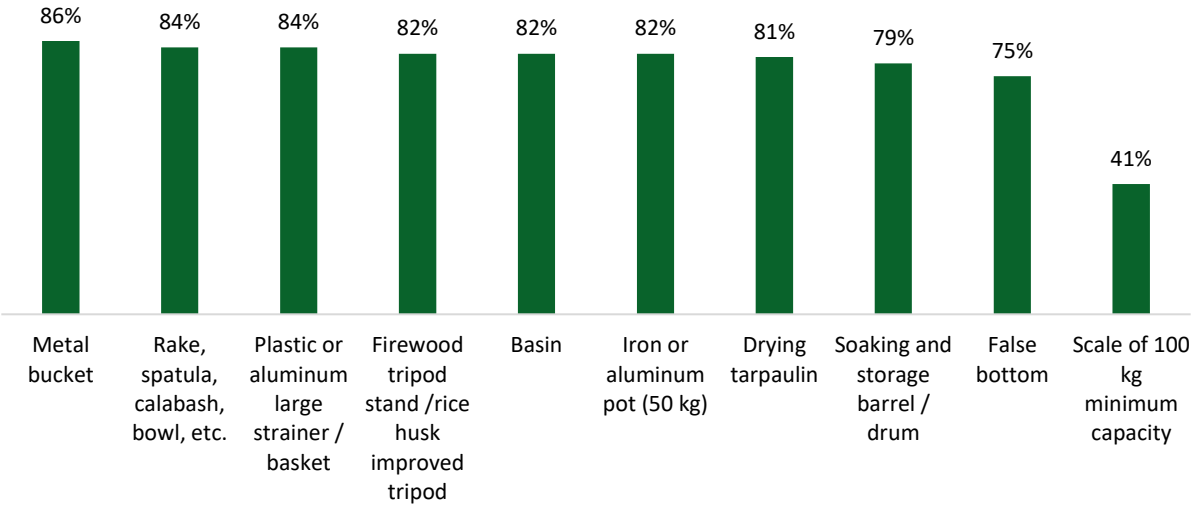


Figure 4: Adoption rates of parboiling equipment

Only a small minority (3%) rents the equipment for money, while 14% of parboilers indicated that they borrow the equipment free-of-charge. The clear majority (78%) of parboilers own the

equipment. Furthermore, 51% of parboilers also indicated that they were able to invest in new equipment since the training.

Adoption depth of good parboiling practices and better equipment

To assess the share of parboilers that adopt a certain number of practices (designated as "adopters"), the 12 parboiling practices that are part of the training module where given equal weight and adoption thresholds (or cut off points) were determined.

In order to determine the share of adopters amongst the sample group, a less-strict and very-strict approach was taken. The less-strict approach assumes that anyone adopting at least half (6 out of 12) of the practices is considered an adopter. Following this methodology, 83% of parboilers are classified as adopters.

When taking the strict approach (8 out of 12 practices), the adopted rate drops to 67%. This in turn defined 12 different thresholds in terms of percentage of adoption depth. Figure 5 shows that at least 4 practices have been adopted by all parboilers. There is a particularly sharp drop of 17 percentage points between adopting at least 8 or 9 practices. Not a single parboiler adopted more than 10 practices.

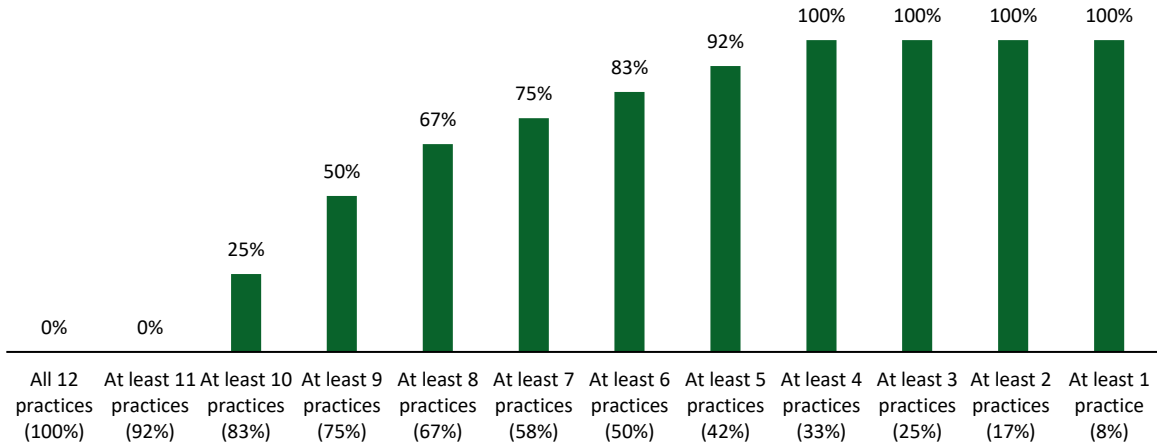


Figure 5: Adoption depth of parboiling practices (labor-intensive)

Using the same methodology for the adoption depth of equipment adoption (but weighting 10 practices instead 12), the study finds similar patterns. Amongst the surveyed parboilers, 92% adopt at least half of the equipment practices (5 out of 10 practices).

While the capital-intensive equipment adoption at the mid-point threshold is lower than for the labor-intensive practices (75% vs. 83% respectively), it is interesting to note that the adoption depth is deeper for the equipment. For the parboiling equipment, 75% of farmers adopt 75% of practices (7 out of 10 practices), while the same percentage of labor-intensive practices is only adopted by 50% of parboilers.

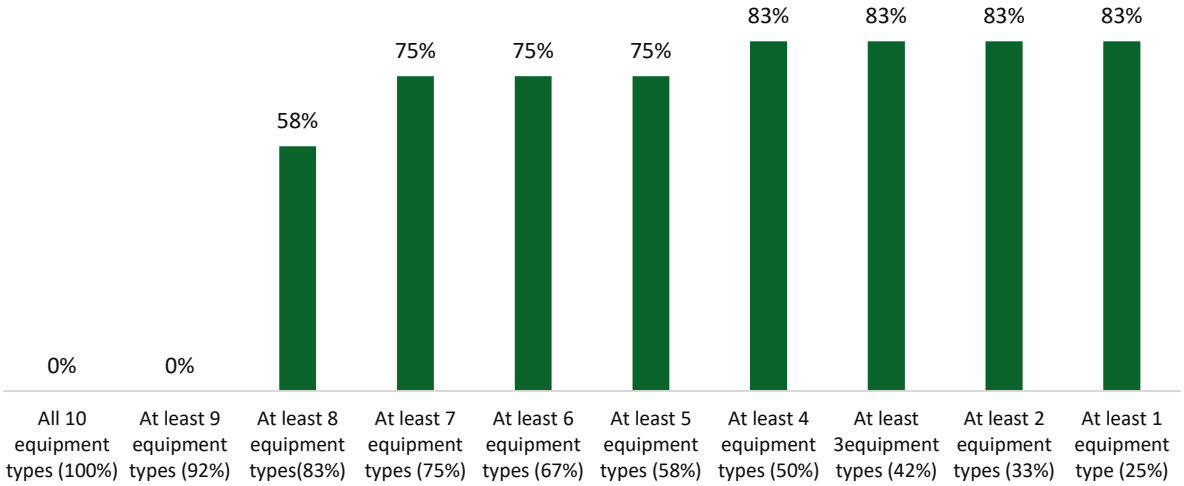


Figure 6: Adoption depth of parboiling equipment (capital-intensive)

To some extent counterintuitively, the adoption rate for capital-intensive practices (i.e. equipment) is higher, while adoption of more labor-intensive practices such as sorting and choosing high quality paddy are rather low.

Adoption of business practices

The parboilers were trained on 3 core business practices which include (1) record keeping, (2) calculation of money-in money-out, and (3) calculation of cost of parboiling per bag of paddy. The study reveals that the adoption rate for each of these practices is low at about 33% (Figure 5).

Record keeping includes recording the amount of inputs used, cost of inputs, total days of labor used, cost of labor, amount of parboiled rice sold, and sales prices. The adoption rates for these components of record keeping are generally low. Recording the cost of inputs has the highest adoption rate at 31%, closely followed by recording inputs at 29%, recording parboiled rice sold and sales prices at 28% each. Total man days of labor used, and cost of labor have the lowest adoption rates of 23% and 24% respectively. The average adoption rate for record keeping is very low at 33%.

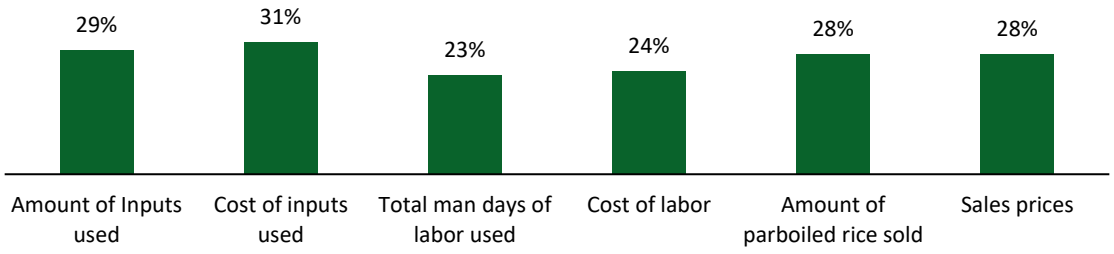


Figure 7: Adoption rates on business practices

With regards to calculating money-in and money-out, only 33% of parboilers reported doing so. Similarly, only 33% indicated that they calculate the cost of parboiling per bag of paddy.

The analysis revealed that a little over half of the parboilers (56%) do not have bank accounts while 44% said they have a bank account. Only a portion (31%) of those that have bank accounts actively save money.

With regards to accessing financial resources for their parboiling business, 96% indicated that they have not taken out or obtained a loan since they received the training. Similarly, less than 1% indicated that they had taken out a loan for the last parboiling cycle.

More than three-fifths of parboilers (66%) indicated they do not have a regular supply agreement with suppliers while just a little over a third (34%) have a regular supply agreement (Figure 17). These regular supply agreements are oral agreements, as none of the parboilers have a written agreement with suppliers.

Overall, the data seems to indicate that parboilers have poor adoption rates of business practices. Access to finance continues to remain a major bottleneck and the training intervention does not appear to alleviate that.

Changes in quantity processed

Regarding the effect of the training on the processed quantity of paddy, 86% indicated that the total volume of paddy parboiled has changed positively since they participated in the training (and only 1% experienced a negative change). Overall, 26% indicated that the quantity processed has less than doubled, 56% indicated that it has doubled, and 4% indicated that it has more than doubled (Figure 8).

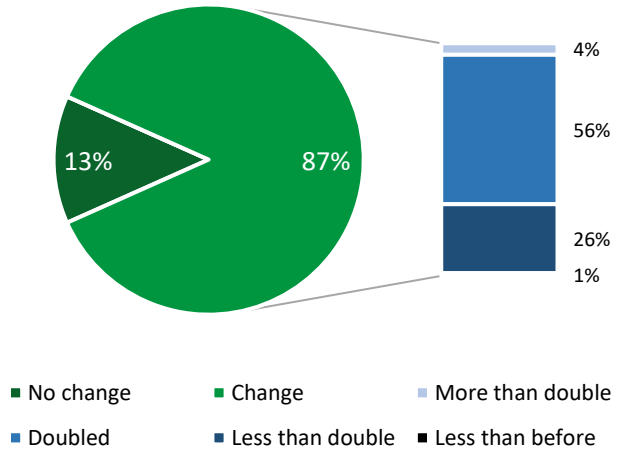


Figure 8:Changes in quantity of paddy parboiled

The reasons for why the parboilers can process more paddy varied and can be categorized into endogenous and exogenous factors. With regard to endogenous factors, 29% said that they are

able to reinvest profits gradually into their business which thus enables them to grow it. Unfortunately, less than 2% reported that they were able to take out a loan and grow the business as a result. With regard to exogenous factors, 24% indicated that the market price increased while 15% said that the cost of labor had decreased.

A plurality (39%) of women indicated that they exclusively sold the surplus product while 25% used the surplus product for both home consumption and selling it to others – of which 22% said they exclusively used it for home consumption. Thus, approximately 47% of the parboiling women enabled a positive nutritional impact at the household level given the higher nutritional value of parboiled rice.

In addition, 96% of parboiling women also reported that it was easier to sell parboiled rice after the training because there was less rejection from buyers as a result of improved quality. Consequently, 89% of parboiling women reported tht they receive a higher price for parboiled rice after the training.

c. PROFITABILITY

Different parboiling business models (BM)

From anecdotal evidence and field experience it is well-known that different business models for rice parboiling exist across West Africa. However, the actual distribution of these models was unknown until now. The conducted survey reveals that there are two business models that are most common amongst parboilers in Nigeria:

- Business Model 1: In this model individuals parboil the paddy and subsequently mill it either by using their own mill or by paying a milling fee, before then selling the parboiled (and milled) rice onward.
- Business Model 2: In this model individuals parboil the paddy and then selling it directly onward to a processor for further milling (i.e. the parboilers do not mill the paddy themselves).

About 96% of the parboilers adopted Business Model 1 while only 4% adopted Business Model 2 (Figure 9). Business Model 1 is hence by far the most predominant business model for rice parboiling in the Nigerian states that were assessed and can be classified as more integrated than business model 2.

Profitability of parboilers and parboiling groups

A clear majority (89%) of the parboilers indicate that they know whether they are making a profit or loss. When asked whether parboilers thought that their income had increased since the training intervention, 81% of the parboilers responded with a “yes”, while 18% indicated that their income remained the same as before the training. Only 1% indicated that their income in fact decreased since receiving the training intervention (Figure 8).

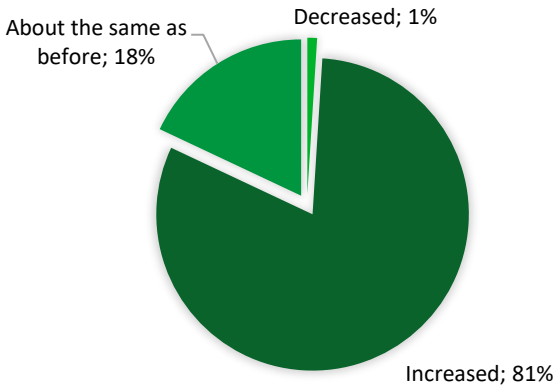


Figure 9: Change in income after training

In order to assess the degree to which perception matches reality on the ground, gross margins (GMs) were calculated for each of the surveyed parboilers. The gross margin (expressed in percentage) was calculated by dividing the profit/loss by the total revenue. The profit/loss was calculated by subtracting the total cost incurred from processing paddy from the earned income at the sale of milled rice or parboiled paddy. The income from the sale of milled rice was calculated by multiplying the price of milled rice with the total number of bags of processed milled rice sold. The number of bags of processed milled rice was estimated by multiplying the number of bags of paddy processed by 65% which is assumed to be the yield of milled rice from paddy. For parboilers who sold parboiled paddy, income was calculated as the price of parboiled paddy multiplied by the amount of parboiled paddy sold.

The data revealed an immense variance in GMs across the surveyed parboilers (across both BMs), ranging from - 49% to + 92%. According to the calculations, the majority (56%) of parboilers have positive GMs, while 44% have a negative one. There is accordingly a difference of 33 percentage points between the percentage of parboilers that perceive that they are making a profit (89%) and the percentage of those that actually do (56%), indicating that approximately one third of parboilers have a wrong perception about the degree of profitability of their business. It must be noted, though, that parboilers tend to not consider their or their family's labor as a cost and may hence overestimate their profits. Family labor is usually figured into calculations as an opportunity cost of labor.

Looking across all states, the average GM is 1.8%, while the median is 0.9%. The difference between the average and median values implies a strong presence of several outliers toward the positive direction.

This average margin of 1.8% is equivalent to an average profit per parboiling cycle of ₦ 2,098 (approx. USD 5.50). On average, the sampled parboilers conducted 52 cycles in 2020, which then translates to an average profit per year of ₦ 109,567 (approx. USD 288).

When dividing the annual profit by 365 days, the available financial resources that the parboilers would dispose of per day are ₦ 300 (USD 0.8), which is substantially below the poverty line of

USD 1.9 a day. Parboiling does accordingly not appear to be sufficient for a self-standing income-generating activity to lift people out of poverty. When taking the median value of 0.9%, that number is even lower and parboilers profit substantially less.

However, there is an argument to be made that despite parboiling not generating much income, it nonetheless can contribute to household income and increase its resilience. For rural Nigeria, an aspirational living household income in 2020 is estimated at ₦ 1,664,136[1] per year (approx. USD 4,365). Thus, when taking the profits generated from parboiling into account, it becomes evident that parboiling on average can hypothetically contribute 7% to such an aspirational household income. This becomes particularly relevant when seeing parboiling as a vehicle to empower women and to generate income for key aspects such as school fees, healthy nutrition and medical expenses.

Amongst the parboiling groups, there is variance in terms of profitability (between -36% to +33%). The GM of a group was determined by taking the group averages of profit/loss and dividing by the average total income of the group (of the interviewed members of this group).

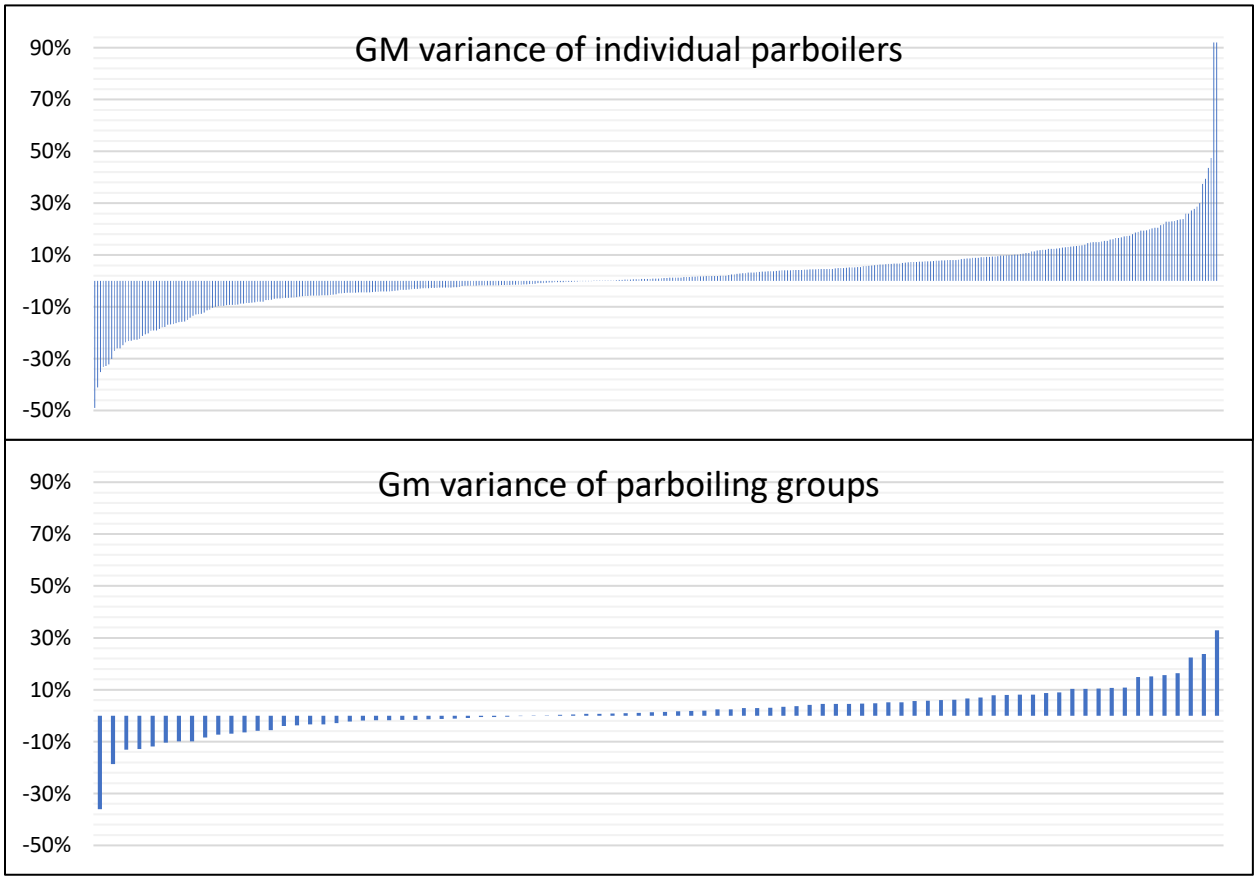


Figure 10: Outliers amongst parboilers' and parboiling groups'GMs

[1] Global Living Wage Coalition: https://www.globallivingwage.org/resource-library/?fwp_resource_type=reference-value

Some parboiling groups are more profitable in their business than others. Dangara Group has the highest GM at 33%, followed by Dorayi Women Multipurpose Parboilers Group A with 24% and Sachiba with 22%. Some other parboiling groups have a negative GM. Sheidu Rice Farming Association has the highest negative GMs (-36%), followed by Value Chain Cooperative with -19% and Tudun Wada Women Rice Cooperative with -13%. A majority of parboiling groups (62%), however, is indeed recording positive GMs during the last cycle.

At the state level, the analysis revealed that the average GMs for Kano, Jigawa states and the FCT are positive (2.7%, 2.9% and 1% respectively) while for Kebbi state the average GM is negative (-1.4%).

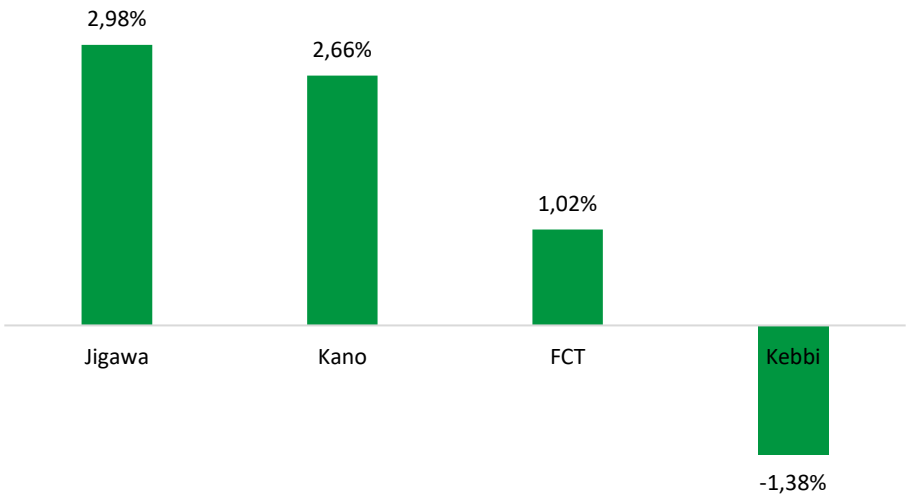


Figure 11:GMs at state level

When comparing the GM of both BMs, it becomes evident that BM 2 (12.4% on average) is by far more profitable than BM 1 (1.4% on average). It must be noted though that the sample size for BM 2 is substantially lower than for BM 1 and thus not really representative.

Cost drivers of parboiling

Figure 12 indicates that on average the cost of paddy is the highest cost component in the parboiling business. The next highest component is the cost of labor, followed closely by milling, packing, and energy. Water represents the lowest cost to the parboilers.

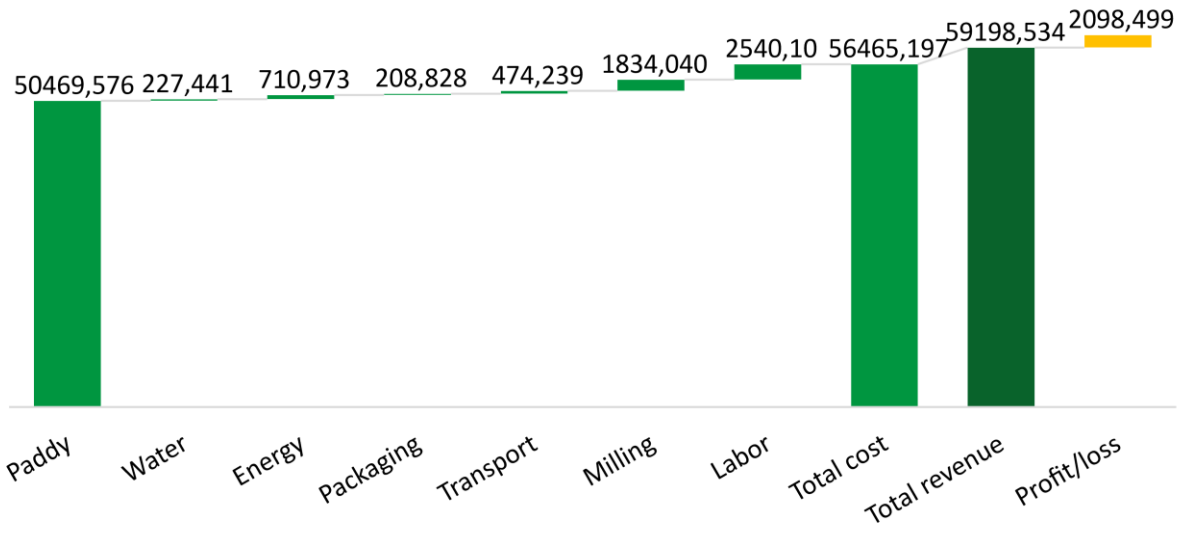
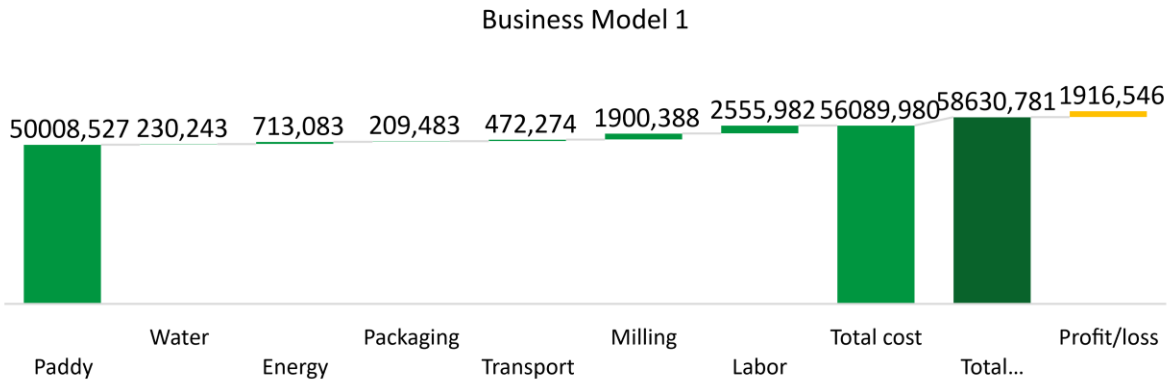


Figure 12: Average cost breakdown across both BMs (in ₦)

When comparing both BMs, the cost patterns do not appear to differ. Yet, BM 1 records substantially lower total profits. Per parboiling cycle, BM 2 generates on average ₦ 5,212 additional profit. Multiplied by the average number of parboiling cycles per year of 43, this is then equivalent to ₦ 224,103 that BM 2 generates more than BM 1. As mentioned above though, the representativeness of the sample needs to be considered here.



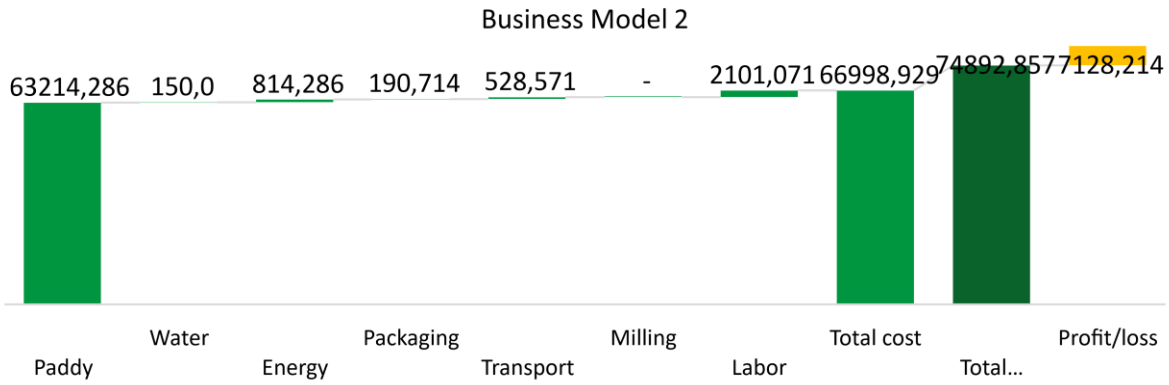


Figure 13: Comparing cost breakdown by BM (in ₦)

When looking at the state level, it becomes evident that the cost patterns differ to some extent. In absolute terms, Kebbi parboilers generate the lowest income and have the highest loss. Similarly, FCT reports the second lowest income, but make the largest loss. Jigawa and especially Kano parboilers generate the highest incomes and accordingly also make a profit on their parboiling cycle. Kano in particular reports the highest income of all states. The data suggest that there is a correlation between the absolute income that is generated and whether parboilers make a profit or a loss (Table 2).

Table 2: Cost breakdown by cost components and by states

Cost breakdown by components by state (on average)										
States	**Income**	**Paddy**	**Water**	**Energy**	**Packaging**	**Transport**	**Milling**	**Labor**	**Total cost**	**Profit/ Loss**
FCT	47,195	44,037	268	827	488	487	1,190	1,968	49,265	-2,070
Jigawa	51,015	43,157	154	629	591	448	1,548	2,118	48,645	2,370
Kano	96,145	81,402	370	752	1,957	509	3,443	3,979	92,412	3,733
Kebbi	45,595	40,071	246	817	499	496	1,284	2,304	45,717	-122

When looking at the proportional share of the respective components, it becomes evident that most costs are negligible, with the exception of milling fees, labor and paddy. Paddy in particular represents close to 90% of all cost during the parboiling process. There also appears to be a slight correlation between the share of paddy costs in total income and GMs, suggesting that the lower that share, the higher the GM.

Table 3: Proportional share of total cost by components and by states

	Proportional share of total cost by components by state (on average)									
States	**Share paddy cost of income**	**Total cost**	**Paddy**	**Water**	**Energy**	**Packaging**	**Transport**	**Milling**	**Labor**	**GM**
FCT	93%	100%	89%	1%	2%	1%	1%	2%	4%	-1.02%
Jigawa	85%	100%	89%	0%	1%	1%	1%	3%	4%	2.79%

Kano	85%	100%	88%	0%	1%	2%	1%	4%	4%	2.66%
Kebbi	88%	100%	88%	1%	2%	1%	1%	3%	5%	-1.23%

Challenges encountered

Parboilers were asked if they encountered any challenges during the parboiling cycle. Access to finance was indicated as a challenge by 73% of respondents, meaning that approximately 3 out of 4 parboilers face bottlenecks with regards to accessing sufficient funds to grow their business. This complements the finding on low take-up rates of parboiling loans as discussed earlier in the report. Besides accessing finance, access to better equipment (39%), poor quality of paddy (32%), and paddy price fluctuations (32%) were mentioned as common challenges. High costs of packaging material, accessing clean water and the seasonal nature of paddy supply are less common challenges. Almost all surveyed parboilers (99%) indicated that the demand for their final product is not an issue.

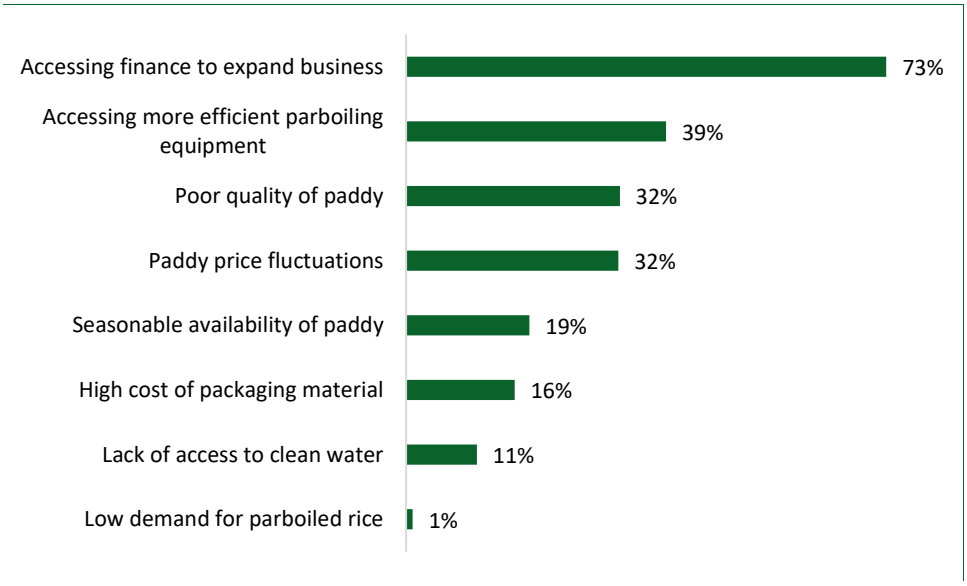


Figure 14: Challenges encountered during parboiling cycle

e. PARBOILING AS A STEP TOWARDS WOMEN'S EMPOWERMENT

A common and effective framework to work with female beneficiaries is the concept of reach-benefit-empower[2]. Reaching women primarily entails the inclusion of them into specific activities and interventions (e.g. trainings), while benefitting women mostly focuses on tangible outputs such as improved income, food security or better health. Empowering women, however, goes a step further and seeks to strengthen women's ability to make strategic life choices and act upon them independently, and in this way addressing power imbalances at the household and community level.

Over the years CARI has reached many thousands of parboilers through its training interventions, of which more than 99% are female. While the main objective of this study is to assess if and how

[2] https://www.ifpri.org/blog/reach-benefit-or-empower-clarifying-gender-strategies-development-projects

these reached parboiling women economically benefit from the trainings, initial attempts are also made at understanding the degree to which these women are empowered beyond mere economic benefits.

A key question in the survey tackled the aspect of decision-making power. A strong majority of 83% of respondents reported that they are the ones making decisions about their parboiling business. Nevertheless, in 15% of the cases it is in fact the respondent's husband who makes the business decisions. Similar patterns are seen with regard to who decides on how to spend the money that is earned from parboiling. Amongst the surveyed women, 85% have ownership and thus decision-making power over the money they earn from parboiling, while 12% have their husband decide for them. A few instances were reported in which the son, daughter or other family members decide on behalf of the parboiling woman.

79% of parboiling women reported that their business and investment decision-making power has improved since the training. Reasons given for why they feel that their decision-making power has improved was the fact that they contribute more income to the household (63%) and that they in general feel more confident (59%). Overall, the data suggests that the parboiling women have a strong say in and ownership of the profits that are generated through rice parboiling.

When asked what they use the profits from parboiling for, the majority indicated that they reinvest at least some of the money to buy paddy for further processing, thus keeping the business running and contributing to its commercial viability in the long run. Interestingly, 55% of respondents save a portion of their profits, and 36% of respondents save specifically to replace parboiling equipment in the future. Approximately 62% of respondents use profits to pay for food while 51% use profits on health care for their family members. The variance of different uses of the profits indicates that parboiling has economic, health and educational benefits for the women and their families.

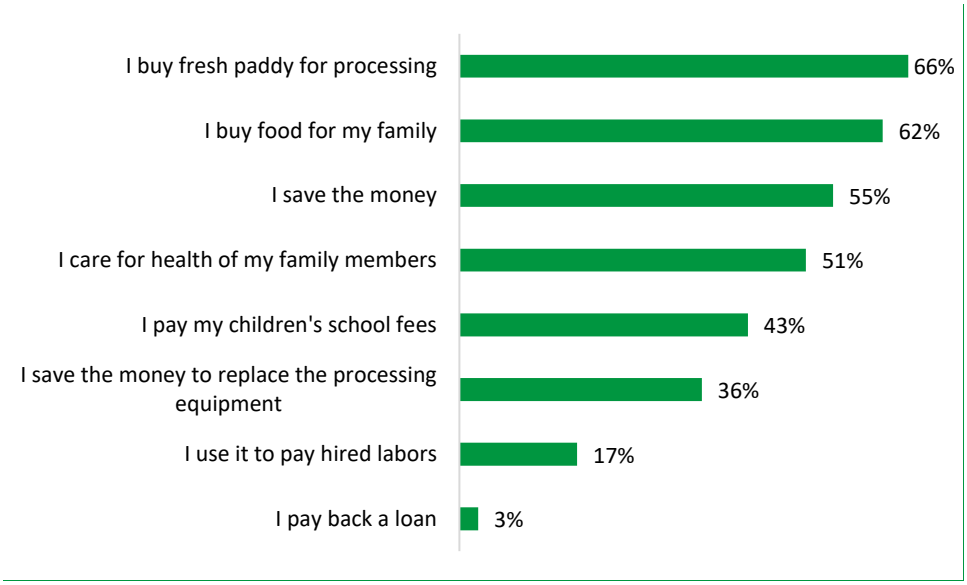


Figure 15: Categories parboiling profits are used for

Together with the mostly positive recorded gross margins, it shows that women are indeed benefitting from the intervention, both economically and beyond (especially considering often limited employment opportunities in rural Africa). Above all, 99% indicated that they are proud to be a parboiling woman and see parboiling as an activity in the future. Promoting relevant income generating activities for women will enhance the economic buoyancy of women and consequently also increase access to good health, nutrition and education for members of their households, especially children.

4. CONCLUSION

The results of the survey show that the CARI parboiling training had an overall positive impact in terms of adoption rates of better parboiling techniques. However, adoption of business practices is low and may explain the limited access to financial services that was reported by the surveyed parboilers.

Most importantly, gross margins vary substantially across states, individuals and parboiling groups. 44% of all parboilers have a negative GM and can thus be classified as “survivor entrepreneurs”, meaning they just barely stay afloat and survive instead of scaling their business. However, there is a strong case to be made that parboiling can be a profitable and scalable business since a majority of the individual parboilers and groups show positive gross margins. While BM 2 has the higher margins, specially through BM 1, a substantial number of women can be reached and accordingly livelihoods improved at scale. Nevertheless, when looking at what is needed for a living income at the household level, parboiling only has the capacity to contribute in a complementary way to the household income and other sources of income are also needed.

While the parboiling income can only account for a fraction of what a household needs, parboiling women feel empowered through the training and their entrepreneurial activity. Rice parboiling can thus play a key part in paving the way for women and especially female youth empowerment in Nigeria.