Improving the Quality of Ghanaian Parboiled Rice

Training Manual

The Role of Parboilers

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Session 3

The role of parboilers

Objective:
The objective of this session is to investigate the role parboilers play in producing good quality parboiled rice. We will look at current practices and explore ways in which they can be improved.

Parboiled rice is a manufactured product. This means that raw materials undergo certain processes to produce the final product.

The quality of any manufactured product is only as good as the quality of the raw materials and the controls exercised during processing.

The quality of parboiled rice produced in Ghana is very variable, even though the same raw materials and processes are used throughout the three northern regions of Ghana.

WHAT DOES QUALITY MEAN TO PARBOILERS?

We have already looked at the factors that affect rice quality and have examined ways in which farmers can be encouraged to produce good quality paddy. Now we will look at what parboilers do and how they can contribute to a better product.

Most parboilers are "quality conscious" because good quality parboiled rice attracts a better market price. However previous research has shown that women in the Upper East are able to

identify and exercise control over more quality attributes than women from the Northern Region. At face value the process looks the same wherever it is carried out in Ghana, however there are subtle differences in processing which have a profound influence on the quality of the final product. As we have already seen, farmers are able to influence some of the characteristics of milled rice, the same is true for parboilers.

To achieve the best market price parboilers are looking for a product which has:

• A good colour (white)	• No stones	• Properly dried
• No odour	• No husk	• No black grains
• Few broken grains	• Well milled	

We have seen that farmers can help contribute to improving quality, so can parboilers.

Quality attribute	**Intrinsic quality**	**Influenced by parboiling**
Density	4	
Size	4	
Shape	4	
Composition	4	
Colour	4	4
Aroma	4	4
Foreign matter		4
Mixed varieties		4
Maturity		
Infestation/infection		
Cracked grain		
Sprouted grain		
Moisture content		4
Broken grain		4

WHAT IS PARBOILING?

Parboiling is a hydro-thermal process (that simply means it uses water and heat) which is carried out for a number of reasons:

- **To improve the nutritional status of the product**
  During parboiling the water soluble vitamins and minerals present in the bran layer penetrate the grain thus making them available on consumption. These are largely polished-off when milling raw rice.
- **To reduce breakage on milling**
  The parboiling process effectively seals cracks in the raw rice kernel, making the grain much harder and more resilient to the milling process. This is particularly important in areas, such as northern Ghana, where the climatic conditions result in over-drying of the grain resulting in severely cracked grain.

- **To change the cooking characteristics**
  It is commonly thought that parboiled rice is quicker to cook than raw rice, this is not true. In fact it takes longer because water absorption is slower through the hardened grain. However parboiled rice is less sticky than raw-milled rice.

- **To impart different eating characteristics**
  Parboiled rice has a firmer, nuttier texture than raw rice and the grains remain separate on cooking. It also has a characteristic aroma on cooking which is preferred by most parboiled rice consumers.

THE PARBOILING PROCESS

In Ghana parboiling is carried out using simple household items; cooking pots, wood fires, baskets, oil drums/large clay pots. The resources available govern the amount of paddy parboiled. Many women can only parboil about 30 kg in each batch. The work is very time-consuming and arduous.

In order to address this problem, a recent DFID funded project in Ghana has introduced a simple parboiling vessel to enable batches of up to 100kg to be processed at a time and exercise more control over the process. Apart from making it possible to parboil more paddy at a time, the vessel also has the following additional advantages:

- Less firewood is used (about half the amount of the traditional method).
- Discoloration that results when truncated oil drums are used is avoided.
- Drudgery is reduced (there are fewer unit operations and the presence of the drain-pipe eliminates draining with baskets).
- The presence of the separating mesh ensures that no paddy is in direct contact with water during the steaming phase.
- Less water is used in the parboiling process.

The parboiler uses two raw materials, water and paddy and several different processes to achieve good quality parboiled rice. These processes are detailed below. Not all parboilers carry out the processes shown in brackets.

(Washing paddy thoroughly)

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(Removal of immature grains and organic matter)

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Covering with water and heating to almost boiling point

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Transferring to another vessel and adding water to ensure grain is completely covered

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Overnight soaking

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Draining

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Placing drained paddy in a small quantity of water, covering and steaming until grains start to split open

↓

Draining

↓

Spreading to dry on concrete or clay floor

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(Frequent) turning by hand

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(Heaping and covering)

↓

(Spreading out again and frequent turning by hand)

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Collection and bagging

↓

(Storing overnight)

↓

Milling

How current parboiling practices in Ghana affect quality

Quality defect	Current practices
• Broken grain	Grain which has not been properly soaked, steamed sufficiently or dried correctly will be susceptible to breakage.
• Organic matter (straw, weed seeds, immature grains etc)	Thorough washing is required to remove all extraneous matter. Some women are very skilled at skimming all debris from the top of the washing water.
• Inorganic matter (stones)	Some women accept stones as normal. Others go to great lengths to remove them during the washing stage and by hand picking them out through all subsequent processes, particularly drying and turning. Some stones are present when the paddy is purchased, others can be introduced during the parboiling process. The drying surface is very important – it must be swept clean before the paddy is spread to dry. Children, animals and parboilers may introduce stones from their feet when they walk on the drying paddy.
• Type admixture (mixed varieties)	Parboilers tend to buy and use one sack of paddy at a time and keep each batch separate, this problem is therefore not usually within their control.
• Immature grains	If immature grains are not removed they turn black on parboiling.
• Paddy/husk	This is usually a milling problem. We will look at milling in the next session. Some women have to winnow their parboiled rice after milling, their skill in doing so will help to remove these.
• Under-milled rice	Again a milling problem, over which the women have little control.
• Heat-damaged grains	This is a result of over-steaming when grains split open.

Practical session 4

Examine the samples of parboiled rice provided to see the difference between them. All of the samples have been produced by local women and clearly show the variation in quality.
Look at all the quality defects to make sure you can recognise them, then look back at your flow chart and identify at which stage each defect is most likely to be introduced or could have been eliminated.
Again, you may like to try this exercise in the field with parboilers to help explain to them how they could improve the quality of their product.

IMPROVING THE QUALITY OF PARBOILED RICE – WHAT CAN PARBOILERS DO?

You will shortly be shown a video and will also see a practical demonstration to show you the best practices, these are summarised below:

Use good quality raw materials

- **Paddy**

  Women often have little choice in the paddy they buy, simply purchasing whatever is available locally. Wherever possible they should try to buy clean paddy with as few stones as possible and avoiding paddy that has lodged (dirty paddy). Wherever possible they should buy paddy of a single variety, which has been correctly dried and stored.

- **Water**

  In some areas clean pipe water or well-water is readily available. In other areas water is difficult to come by and can be of very

variable quality. Wherever possible water should be treated with alum or *Moringa* seeds before use.

Control Processes

- **Washing/cleaning**

  All paddy should be washed carefully to remove residual dirt and stones.

- **Removal of floating debris**

  Careful removal of floating immature grains will reduce the number of blackened grains in the final product

- **Soaking**

  Paddy should be covered in water and brought almost to boiling point and then transferred to another vessel (in the traditional method) for overnight soaking. Extra water must be added to the soaking vessel to ensure that all grains will still be covered in water the following morning. If this is to be done, the added water must be hot.

- **Steaming**

  If traditional pots are used the amount of water used needs to be carefully controlled. Too little and the pot will boil dry, too much and significant portions of the paddy grains will be boiled not steamed. The new parboiling vessel overcomes this problem by separating the grains completely from the boiling water. The surface of the paddy should be covered to ensure even steaming. Steaming is complete when 25% of the surface paddy has just split open, many women over-steam the paddy resulting in damaged kernels.

- **Drying paddy**

  The surface of the drying floor is critical, ideally it should be a concrete pad with no cracks etc. In reality the drying surface is either beaten clay or badly maintained concrete.

  It must be as well maintained as possible and swept clean before each use.

  The paddy should be spread in an even, thin layer as soon as it has been drained. Some women in the Northern region leave hot, steamed paddy in a heap for some time before spreading. This practice should be discouraged.

  Constant turning to allow even drying of the paddy is important. This is usually done by hand and the women can also pick out any stones/debris whilst they are doing this. Women in the Upper regions tend to turn the paddy very frequently whilst those in the Northern region tend to take less care at this stage.

  Drying in the middle of the day should be discouraged as the heat intensity can lead to cracking. The paddy should be heaped in a shady place and covered with sacks; then be re-spread for final drying later in the afternoon or the following morning.

  Children and animals should be discouraged from walking on drying paddy both for reasons of hygiene and to prevent further introduction of stones.

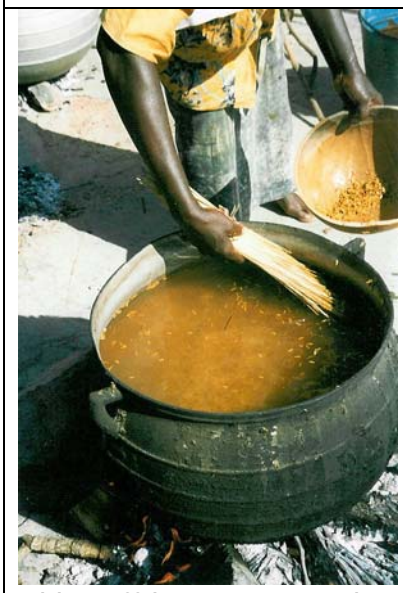
  It may be possible to construct a band of rice husk around the edge of the drying area, walking over this effectively removes dirt and stones from the soles of the feet.

- **Milling**
- The choice of mill may be critical to milled rice quality. This will be discussed more fully in the next session.

Samples of water collected from sources used by parboilers

Use good quality or treated water

Wash paddy very thoroughly



Skim off immature grains and floating debris

Heat to almost boiling before soaking

Make sure paddy is completely covered with water before soaking

Cover with a cloth whilst steaming and steam until 25% of the grains have split open

Spread on a clean surface to dry and turn very frequently

If the sun is very hot – dry the paddy in the shade

In the heat of the day, heap the paddy and cover it with sacking. Spread to finish drying when the temperature has lowered

By-products from a typical Engleberg mill

The new parboiling vessel holds 100kg paddy

Its very easy to drain the new parboiling vessel