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**Fiche technique n°10 - Processing Cassava into high quality**

1. **What is Gari?**

[](http://www.google.cm/imgres?imgurl=http://2.bp.blogspot.com/-9zMC3yYCsJw/TZbzCUPi2lI/AAAAAAAAADE/TpCwFS5pklQ/s1600/gari.jpg&imgrefurl=http://hausanigerian.blogspot.com/2011/04/gari-and-water-vs-gari-and-milk.html&usg=__5g2CGmNGgubYznieiiLtsp-H-5w=&h=300&w=400&sz=90&hl=en&start=4&zoom=1&tbnid=c0r_rYMwtPS6IM:&tbnh=93&tbnw=124&ei=c3-WT8ucFcODhQf_hd33DQ&prev=/search?q=gari&hl=en&sa=X&tbm=isch&prmd=imvnsl&itbs)Gari is a fermented, gelled and dehydrated food produced from fresh tubers (roots) of cassava (*Manihotesculenta*Crantz). Gari is a fine to coarse granular flour of varying texture. Cassava roots are harvested, cleaned, washed, grated, pressed to release water and starch, left to ferment and toasted with or without palm oil. It is a dry product (moisture content 8-10%), with an acidic content of pH4.3-5.0, that is high in energy (~ 335 kcal / 100g). It is either a whitish or yellowish semolina-like product, which dependson whether palm oil was used in toasting or not.

It has 8% – 10 % moisture content that permits a long conservation (up to one year) period under normal atmospheric conditions that is packaged in an air-tight bag lined with paper. About 25 kg of gari is produced from every 100 kg of cassava roots.

Gari serves as a major staple food in West and Central Africa.Gari has a high swelling capability and can absorb up to 4 times its volume in water. It is a popular diet eaten in many forms and with different sauces.

1. **HOW GARI ISCONSUMED**
2. **As a snack;**

* In cold sugared water;
* In cold water with groundnuts and sugar;
* In cold water with sugar, milk and other beverages;
* In cold water with a pinch of salt and smoked fish;
* In cold water with coconut.

1. **As a meal transformed into fufu by soaking in boiled water**

* Eaten with a variety of sauces (vegetable, meats, fish);
* In form of fried rice with prawn or smoked fish

1. **In garages**

* It is fast gaining use in the fitting of tyres on wheel drums of cars, bikes, etc

**III-NUTRIENTCONTENT**

The average nutritional content of gari is as reported below:

|  |  |
| --- | --- |
| **Nutriments Provided by 100 grams of Gari** | |
| Dry matter (g) | 99.00 | |
| Calories (Kcal) | 334-360.00 | |
| Protein (g) | 1.12 | |
| Lipids (g) | 0.61 | |
| Global glucides (g) | 87.30 | |
| Indigestible glucides (g) | 1.82 | |
| Ashe (g) | 1.03 | |
| Calcium (mg) | 30.30 | |
| Phosphorus (mg) | 54.55 | |
| Iron (mg) | 4.55 | |
| Thiamin (mg) | 54.55 | |
| Riboflavin (mg) | 45.45 | |
| Niacin (mg) | 1.00 |
| Ascorbic acid (mg) | 6.06 |
|  | |

Source: Favier 1977 - Institut Scientifique et Technique de la Nutrition et de l'Alimentation

IV-REQUIREMENTS FOR PROCESSING HIGH QUALITY GARI

* Cassava roots (plant or buy cassava roots with high fiber content);
* Access to water for washing tubers and utensils;
* Space for peeling and washing, installation of grating machine, sieving, pressing and toasting;
* Equipment (Knives, bowls, mill, sieves, press, drying surface, bags, frying pan, etc).

**NB:It might not be necessary to acquire a mill since there are mobile mills that can be hired and used within a day. Contact others involved in gari processing or your local Research and Development officer.**

**V- PROCEDURE FOR PROCESSING HIGH QUALITY GARI**

*The following stapes are required for processing cassava into gari;*

***Step 1: Rootselection***

Harvest or buy healthy, mature and firm freshly harvested cassava roots. These should have no bruises. The flesh of the roots should be white and have no cracks and few fibrous roots.

***Step 2: Peeling***

Peel the roots and remove the stalk, woody tips and any fibrous roots using a sharp knife. Failure to peel properly will result in off-colour in the final product.

**NB: Cassava peel (after drying) can be used for animal feed or composting – so do not waste it!**

***Step 3: Washing***

Wash peeled cassava roots with clean water to remove any dirt (including sand, soil, leaves or other impurities).

***[](http://www.google.cm/imgres?imgurl=http://www.agnet.org/htmlarea_graph/library/20110716221411/pt2005003f1.jpg&imgrefurl=http://www.agnet.org/library.php?func=view&id=20110716221411&type_id=7&usg=__rfhxmk5dfVXdmVk96ruRSoK-0wE=&h=430&w=294&sz=33&hl=en&start=39&zoom=1&tbnid=_AZBrwU-KI-RGM:&tbnh=126&tbnw=86&ei=3oKWT6CzEoOKhQfinqHyDQ&prev=/search?q=cassava+washing&start=20&hl=en&sa=N&tbm=isch&itbs)Step 4: Grating (see photo left)***

Use a simple perforated iron sheet or mechanical grater to grate cassava roots into a fine mash.

***Step 5: Pressing (see photo right)***

Pack the grated cassava mash into a clean bag, such as a jute or sisal sack that will allow extra water to escape. Press the sack using a screw press or hydraulic jack to remove excess water until the cassava is crumbly.

Allow to stand and ferment in a bag for 2-3 days while pressing every morning and evening to continuously keep the bag tight.

**Step 6: Sieving**

Use a sieve made of rattans (cane) or a wire mesh with a regular pore size. This helps make your finished product to have the same size, separates the particles and make it easy to fry.

[](http://www.google.cm/imgres?imgurl=http://farm6.staticflickr.com/5135/5535041480_c36292765f_z.jpg&imgrefurl=http://www.flickr.com/photos/iita-media-library/5535041480/&usg=__owwMKqebViIse8aaUAgSvUoA3BQ=&h=480&w=640&sz=186&hl=en&start=10&zoom=1&tbnid=izjcbvZRXtX-0M:&tbnh=103&tbnw=137&ei=aoeWT6yrHouXhQeAprjPDQ&prev=/search?q=gari+frying&hl=en&sa=G&tbm=isch&itbs)

***Step 7: Toasting (see photo left)***

This is done in a frying pan on fire. During this stage, palm oil can be added (to prevent the gari from sticking to the pan) and this gives the gari a yellow colour. Adding palm oil is optional. The gari is toasted to reduce its moisture content to 10%-15% and during this stage there is pre-gelling of the gari.

***Step 8: Air-drying***

It is necessary to air-dry gari immediately after toasting. During this stage, the excess heat leaves the gari accompanied with some moisture. This allows the toatedgarito cool down and become crispy.

***Step 9: Sieving (Optional)***

Using a simple home-made sieve, sievethe toastedgari to remove any lumps. This might be necessary to obtain high-quality free-flowing gari.

***Step 10: Packaging and storing***

Pack sievegari in airtight 50kg moisture plastic bags lined with water proof paper. Seal the bag by sewing. If smaller quantities are to be packaged, plastic bags can be used and sealed using the flame of a burning candle or an electrically operated sealing machine if electricity is available. Label each bag with the production date and the moisture content. Usually, if the process above is followed, gari should last a minimum of six (06) months.

Store the bags or cartons in a well-ventilated, cool, dry place away from light.

The procedure for processing gari is shown in the diagramme below.

VI- Cost-Benefit Analysis for Gari Production from one ton (1000 kg) of cassava

**Fresh Cassava Tubers**

**Washed Cassava Tubers**

**Peel and Wash**

**Cassava peels**

**Cassava mash in bag**

**Press and ferment (2-3 days)**

**Water**

**Grate and bag**

**Fermented mash**

**Sieve and toast**

**Lumps and fibre**

**Gari**

**Equipment**

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| **Item** | **Unit Cost** | **Number** | **Total Cost** | **Depreciation (years)** | | **Amount per year** |
| Cassava Mill | 150 000 | 1 | 150 000 | 5 | | 30 000 |
| Wheelbarrow | 20 000 | 2 | 40 000 | 4 | | 10 000 |
| Screw press | 100 000 | 1 | 100 000 | 10 | | 10 000 |
| Sieve | 5 000 | 2 | 10 000 | 2 | | 5 000 |
| Frying pan | 15 000 | 2 | 30 000 | 5 | | 6 000 |
| Basin | 5 000 | 4 | 20 000 | 2 | | 10 000 |
| Cutlass | 5 000 | 2 | 10 000 | 2 | | 5 000 |
| Knives | 1 500 | 8 | 12 000 | 1 | | 12 000 |
| Bags (Fermentation and packaging) | 300 | 20 | 6 000 | 1 | | 6 000 |
| 20L Buckets | 1 500 | 4 | 6 000 | 1 | | 6 000 |
| **Total A** | | | | | | **100 000** |
| **Running Cost** |  |  |  |  | |  |
| **Item** | **Quantity** | **Unit Cost (FCFA)** | **Cost (FCFA)** | **Cost per year (35 weeks of production)** | | |
| Cassava | 1 000 kg | 50 | 50 000 |  | 1 750 000 | |
| Water | 1 000 L | 0.35 | 350 |  | 12 250 | |
| Palm Oil (optional) | 1L | 500 | 500 |  | 17 500 | |
| Wood | 100 kg | 25 | 2 500 |  | 87 500 | |
| Labour (peeling and washing) | 10mandays | 2 000 | 20 000 |  | 700 000 | |
| Labour (Grating) | 1 | 2 000 | 2 000 |  | 70 000 | |
| Labour (toasting and bagging) | 5mandays | 2 500 | 12 500 |  | 437 500 | |
| Fuel for grating | 12 L | 600 | 7 200 |  | 252 000 | |
| **Total b** | | | | | **2 976 750** | |
| **Total Expenditure for one year (total a + b)** | | | | | **3 076 750** | |
| **Income** (35 weeks of production | 8750 kg | 500 |  |  | **4 375 000** | |
| **Benefit for one year** |  |  |  |  | **1 298 250** | |
| **Benefit per production cycle** |  |  |  |  | **3 717 8 57** | |
| **Production cost for 1kg gari** |  |  |  |  | **351.28** | |

***References:***CTA (2007). Practical Guide: Making High-Quality Cassava Flour, Series, No. 5. pp 1-8.