Sources of information and further advice:

Your District Agricultural Officer

National Roots and Tubers Research Programme
Namulonge Agricultural and Animal Production Research Institute
National Agricultural Research Organisation
P.O. Box 7084
Kampala

Food Security Department
Natural Resources Institute
University of Greenwich
Central Avenue
Chatham Maritime
Kent,
United Kingdom, ME4 4TB

NARO
NATIONAL AGRICULTURAL RESEARCH ORGANISATION

NRI
Natural Resources Institute

Supported through the Crop Post-Harvest Research Programme of the United Kingdom's Department For International Development. [Code ZB0075]

Safe methods of using Bitter Cassava varieties

NRI
Natural Resources Institute

NARO
NATIONAL AGRICULTURAL RESEARCH ORGANISATION

CASSAVA FOR FOOD

The enlarged root of the cassava plant is widely eaten throughout the tropics. It is estimated that 40% of the population of sub-Saharan Africa depend on cassava as their staple food. The cassava plant is one of the most efficient converters of solar energy into starch and is able to survive and produce roots where other crops fail due to drought. Thus it has a very important role in providing a secure food supply for many people in Africa.

WHY PROCESS CASSAVA?

Cassava plants contain potentially harmful substances. These substances are beneficial to the cassava plant because they help protect it from attack by pests and diseases. Depending on the amount of harmful substances they contain, cassava varieties are classified as either 'sweet' or 'bitter'. Sweet varieties contain fewer harmful substances and in general do not need to be processed. Bitter varieties however contain more harmful substances which can cause illness and even death unless they are removed.

In Uganda, there are a several ways to process bitter cassava roots effectively, including traditional dry and wet fermentation methods. Recently, a rapid and improved method of wet fermentation, which produces a product known as 'gari', has been introduced from West Africa where it is very popular. These three methods are described in this booklet.

The key point to remember when processing cassava is that each step in the process must be followed in the correct order. Never miss out or shorten a step.

Front cover photograph: Roger Bancroft.

A FINAL REMINDER

Bitter cassava is a safe and nourishing food as long as one of these three processing methods is used:

Traditional Dry Fermentation
Traditional Wet Fermentation
Rapid Fermentation (Gari)

Do not leave out or shorten any step of any method.

Always dry cassava pulp thoroughly before storing.

Cassava does not provide all the nutrients needed for healthy living and should be eaten with beans, fish, vegetables or meat. This is particularly important for growing children.

Q Is there a machine that grates cassava?
A Yes, machines have been developed but they can be expensive and will only be found in large villages.

Q How can I tell the difference between bitter and sweet varieties of cassava.
A This is very difficult. The only way is to know the name of the variety of cassava. The names of the bitter varieties that need to be processed specially are Migyera and Tongolo.

Q Is cassava a good food for children?
A Yes. Cassava is a good food for children as it contains carbohydrates which provide energy. However, it only contains very little protein and minerals, which children need for growth, and so children should always eat cassava with beans, fish, vegetables or meat. Children who are only fed with cassava are likely to suffer from kwashiokor.

Q Do adults also need to eat beans, fish, vegetables or meat with cassava?
A Cassava contains very little protein or minerals and so it is strongly recommended that adults should not eat only cassava. In order to consume a balanced diet and remain healthy and active, everyone should eat cassava with beans, fish, vegetables or meat.

Q Are the researchers working on developing a type of cassava that can withstand the cassava virus but does not contain cyanogens?
A Yes. For at least 50 years scientists have been attempting to achieve this, not only in East Africa but also in West Africa where cassava is the most important staple crop. At last, a sweet variety of cassava that is able to tolerate the African Cassava Mosaic Disease has been developed and will soon be available to farmers.

Traditional Dry Fermentation

Photo: University of Wageningen

Dry fermentation of cassava roots is normally used in areas where there is a limited water supply. Roots are usually heaped in the shade where they are covered with dry leaves, grass or sacks. Over a period of 4 to 5 days moulds develop on the surface of the roots. These break down the structure of the root and, in so doing, ease the removal of harmful substances. When moulds have grown sufficiently to soften the roots they are removed by scraping.

1 Wash and peel the cassava roots.

2 Heap the roots in a shady position and cover with banana leaves, dry grass or jute sacks for 4 days in order to allow moulds to grow.

Your Questions Answered

Q What exactly are these 'harmful substances' and why does cassava have them?

A The harmful substances found in bitter varieties of cassava are called cyanogens, which are some of the most poisonous substances known to man. The cyanogens are not only poisonous to people and animals but also to insects and consequently they protect cassava roots from attack by insects. Bitter varieties of cassava contain high levels of cyanogens and it is thought that they protect cassava plants against African Cassava Mosaic Virus which has destroyed cassava plants throughout East and West Africa

Q Are these cyanogens present in all parts of the cassava plant or just in the roots?

A Cyanogens are found throughout cassava plants including the leaves. The leaves need to be rinsed several times during cooking in order to get rid of the cyanogens and make them safe to eat. If this is done properly then cassava leaves are very nutritious.

Q If I just dry cassava pieces in the sun will that destroy the cyanogens?

A No. This will destroy none of the poisons and the cassava pieces will still be harmful.

Q If I pound fresh cassava roots into flour and cook it, is that enough to destroy the cyanogens?

A No. Although this method is used for the preparation of sweet varieties of cassava merely pounding and cooking will not destroy all the cyanogens present in bitter varieties. Therefore one of the three methods of processing must be used for these varieties.

Q Graters are not available in our village. Can I make one myself?

A Graters can be made quite easily by making holes in tin sheets with a large nail and nailing the sheet, rough side outwards, to a simple wooden frame.

8 Pack the sieved gari into polythene bags, jute sacks or paper bags. Well-prepared gari can be stored for at least 12 months.

9 Cooking

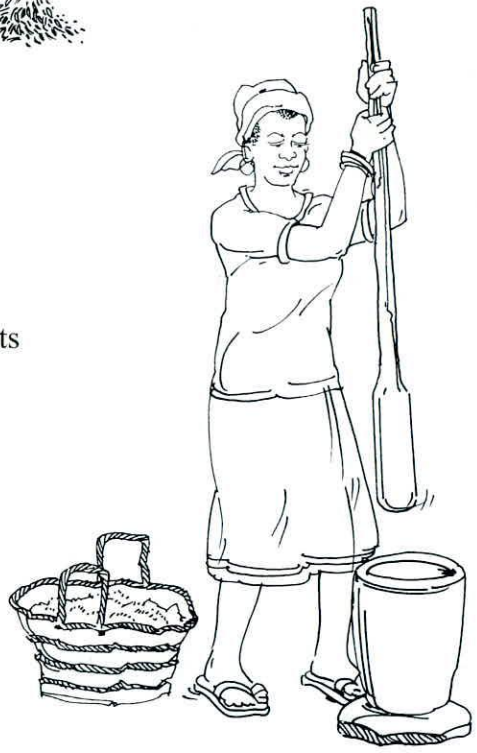
Gari

Gari is sometimes eaten in the dry state but more commonly it is soaked in hot water to produce ugali.

In some localities a small amount of palm oil is used during roasting to add flavour and a yellow colour.

3 When the moulds have grown sufficiently, uncover the roots and scrape them off with a knife. The moulds have grown sufficiently when the roots have become soft.

4 Pound the cleaned roots into a coarse pulp.



5 Spread the pounded pulp out on a raised platform, mat or large rock and leave it in the sun to dry. This will take between 1 and 3 days depending on the weather. The pulp is sufficiently dry when it snaps between the fingers easily.

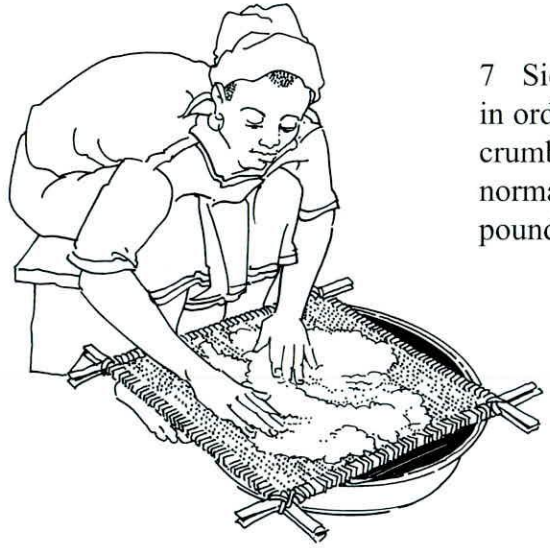
The dried pulp can be kept in this form for up to a year in dry conditions.

6 When it is required, pound the cassava pieces to a fine flour.

7 Cooking

ALWAYS DRY CASSAVA PULP COMPLETELY BEFORE STORING

6 Cool the gari crumbs by spreading them out on a raised platform, mat or rock.



7 Sieve the gari crumbs in order to remove large crumbs which should normally be milled or pounded and re-sieved.

4. When the cassava pulp has stopped losing water, take it out of the sack and sieve it to separate the crumbs and remove fibre and poorly grated material.

5 Roast the crumbs in a wide shallow pan over a fire. During roasting, use a spoon to toss the crumbs. Stir the crumbs continuously until they become light and dry.

Roasting is important as it dries the cassava pulp rapidly and removes any remaining harmful substances.

DO NOT ROAST UNGRATED BITTER CASSAVA. THIS WILL NOT REMOVE THE HARMFUL SUBSTANCES IN THE ROOTS.

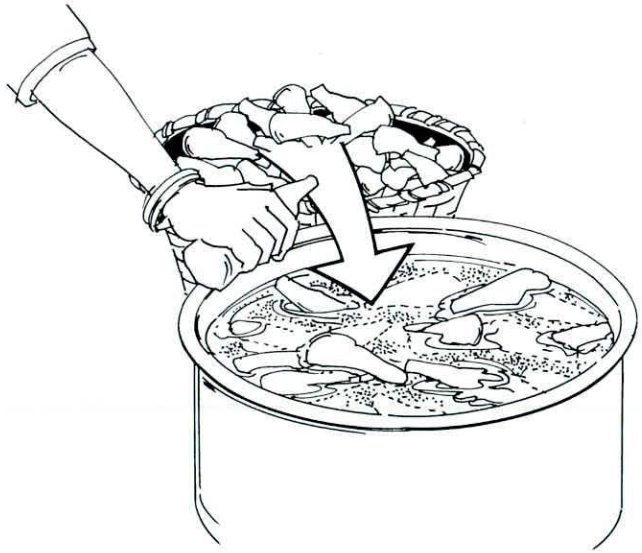
Traditional Wet Fermentation

Photo: Roger Bancroft

This process is mainly carried out in areas where water is readily available. In this method peeled cassava roots are soaked in water which allows them to soften and a type of fermentation to take place which gives the flour an acidic taste. After the roots are removed from the water, liquid is squeezed from them and they are pounded to form a pulp which is then dried in the sun. Once the pieces are completely dry they can be pounded into flour.

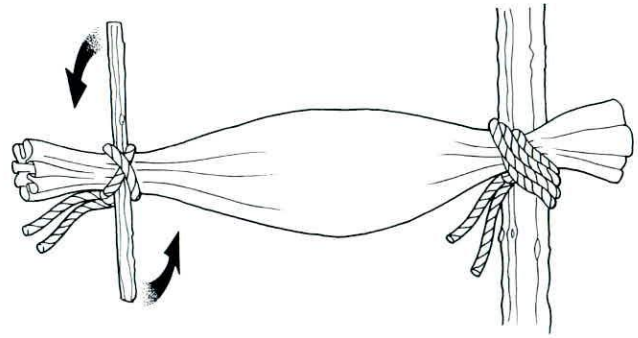
1 Wash and peel the roots.

3 Soak the roots in water in drums, in pots or in ponds. The roots should be soaked for at least 3 days or until they are very soft. During this step fermentation occurs..



3 Put the grated cassava pulp in a cloth bag, jute sack or clean woven polypropylene bag and tie the top securely. The cassava pulp will ferment in the bag.

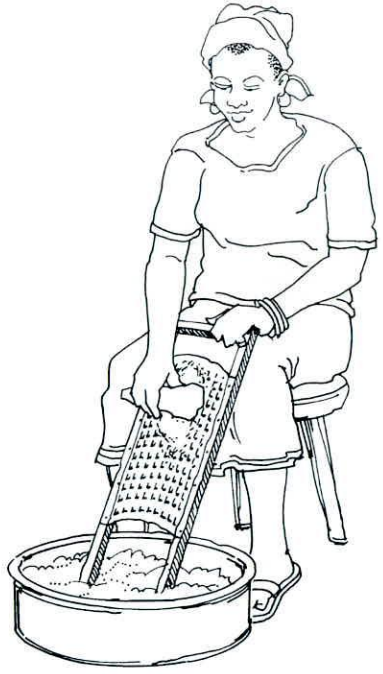
Water should be removed from the pulp during fermentation. It can be removed in either of two ways: (a) by placing logs or stones on top of the sacks in order to squeeze water from the cassava pulp or (b) by putting pressure on the pulp by twisting and tightening the container.



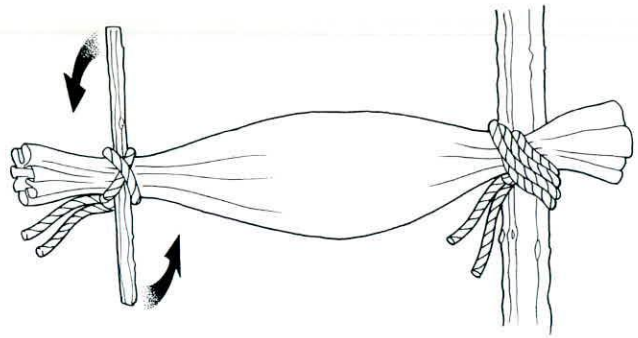
Fermentation and de-watering can be completed in 1 day if a mild tasting ugali is required. If a more acidic taste is required the cassava pulp can be fermented for up to 4 or 5 days.

1 Wash and peel the roots.

2 Grate the washed and peeled roots to form a pulp. This is usually done with hand graters which consist of perforated tin sheets set in a frame.



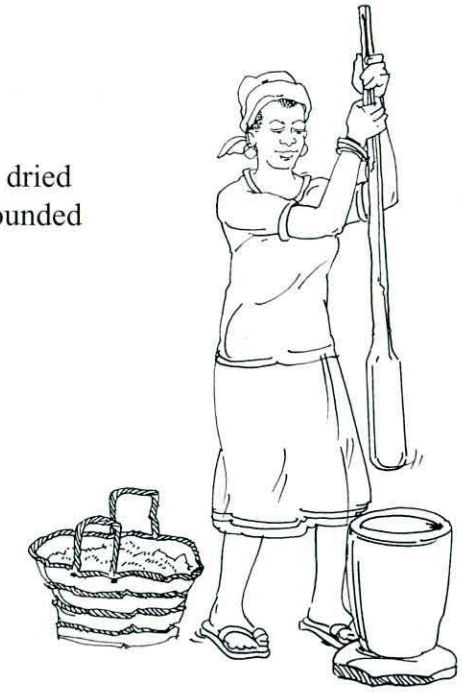
4 Remove the cassava roots from the water and pound them into a coarse pulp. Place the pulp into a clean sack and squeeze out as much water as possible.



5 Dry in thin layers in the sun either on raised platforms, mats or large rocks. Drying the pulp on rocks has the advantage of allowing drying to continue overnight because the rocks absorb heat during the day and release it at night. Drying takes between 1 and 3 days, depending on the weather.

7 Store the dried pieces in sacks and keep it in a dry place until it is required. In this form it can be kept for up to a year in dry conditions.

8 When required, the dried cassava pulp can be pounded into flour.



9 Cooking

Rapid Fermentation (Gari)

Photo: Roger Bancroft

'Gari' is a very popular cassava food in West Africa and is prepared from fermented cassava. It is popular because i) it can be produced in as little as one day and ii) it is pre-cooked and so needs very little time to prepare as the main dish. Rapid production is made possible by grating the cassava roots before fermenting. Grating considerably improves and quickens the removal of harmful substances and water during fermentation. After fermentation the pulp is roasted which rapidly dries and cooks it.