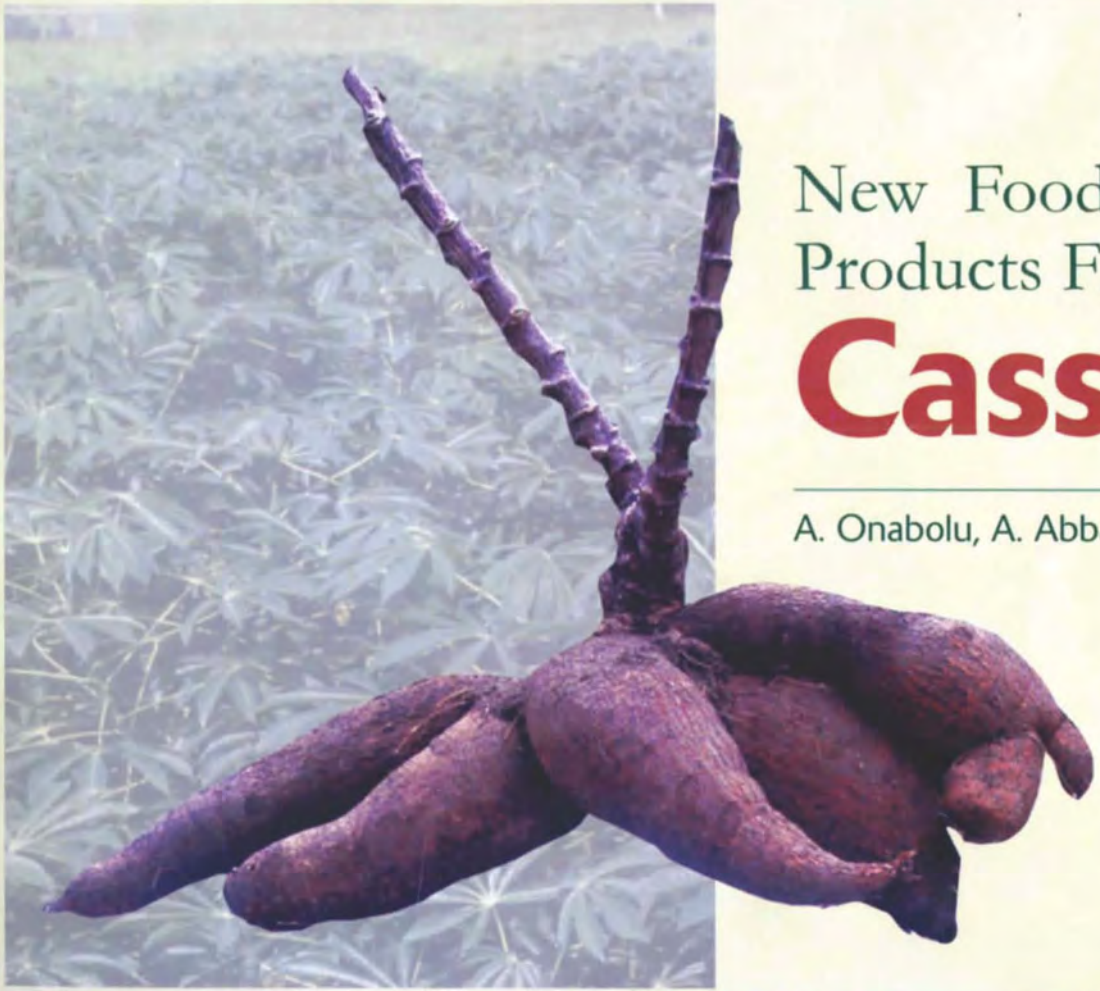


New Food Products From **Cassava**

A. Onabolu, A. Abbass, M. Bokanga

New Food Products From Cassava



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Introduction

Cassava is a mainstay of over 200 million people in tropical Africa. It is produced under various agroecological conditions, some of which are quite unsuitable for many other crops. This makes it a reliable food security crop. It is also a crop that is extensively used in trade. The Collaborative Study of Cassava in Africa (COSCA) has shown that in tropical Africa, 40% of total cassava is planted purposely for sale, and that cassava contributes more cash income to households than any other crop.

There are numerous ways of processing and consuming cassava depending on the locality. Two broad categories of consumption are boiled roots, and processing into dry granules and flours which may or may not be fermented. Compared to Brazil and Thailand, two of the major cassava producers in the world, industrial processing of cassava in Africa is still very limited. Cassava production in Africa has increased tremendously in the last 10 years; Africa now accounts for more than half of world production, while Nigeria has become the world's largest cassava producer.

Cassava is gaining more importance as a reliable crop for farming systems that have a deteriorating resource base and an increasingly unpredictable climate. Therefore, the successes of yield increase and sustainability in Africa should be matched by maintaining the quality of cassava products and enhancing their utilization. With the increase in population and the trend towards urbanization, the need to diversify the products made from cassava and to maintain their appeal to consumers is of high priority. This calls for more investment in product development research on cassava.



In recent years, the consumption of leavened wheat bread has risen enormously in many developing countries as a result of increasing populations, urbanization, and changing food habits. However, most developing countries, for climatic reasons, cannot grow wheat suitable for bread making and rely on expensive wheat imports, paid for with scarce foreign currency. The first attempts to effectively reduce the outflow of funds towards temperate countries were aimed at the partial substitution of wheat flour with flour from indigenous crops such as cassava and yam. These efforts were spearheaded by the establishment of FAO's Composite Flour Program in 1964. Although there is now a substantial body of composite bread technology available, such breads still usually require at least 70% wheat flour to be able to rise (De Ruiter 1978; Satin 1988; Dendy and Trotter 1988) and their implementation has been limited (Crabtree and James 1982).

Attempts have also been made to produce wheatless or gluten-free breads. Most of this work was carried out in the 1960s and early 1970s, but there has been a recent revival of interest in this area (Satin 1988). The ban on wheat imports into Nigeria by the Nigerian Government in 1987 has also made the need for a marketable "alternative" wheatless bread in Nigeria more critical.

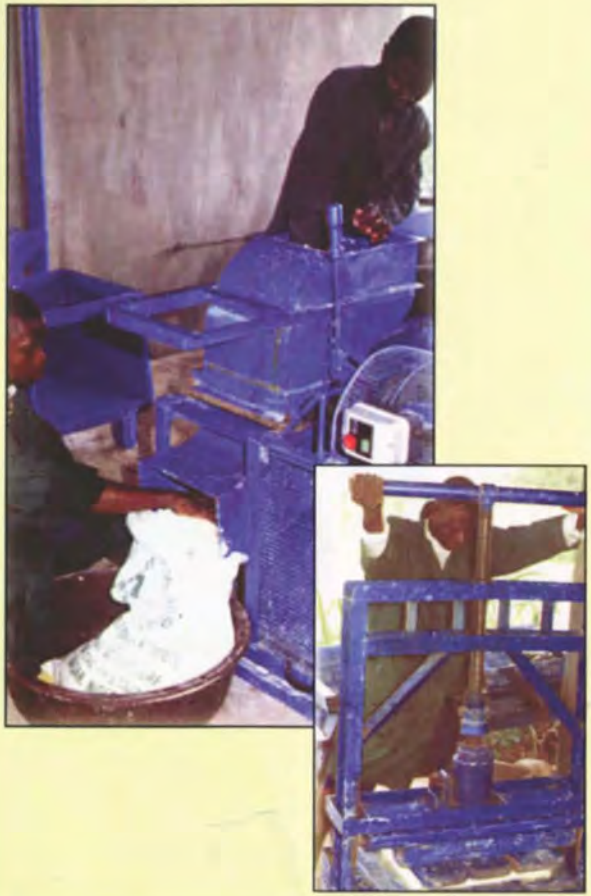
The fundamental problem in the production of wheatless or gluten-free bread is the replacement of the unique functional visco-elastic properties of the wheat protein gluten. Various gluten substitutes such as the emulsifier glycerol monostearate or GMS, pentosans from wheat or rye, gums such as methyl-cellulose and xanthan, pregelatinized or extruded flours, and starches have been tried with more or less satisfactory results. Unfortunately, there has been little or no



implementation of the available wheatless bread technology in developing countries. This is probably because most gluten substitutes are rarely available locally and have to be imported. Their importation introduces another cost element which may outweigh the savings in imported wheat flour.

Research done at the International Institute of Tropical Agriculture (IITA) and the Katholieke Universiteit Leuven (KUL) has demonstrated the possibility of baking bread using cassava flour and all locally available ingredients. A method for producing high-quality cassava flour suitable for baking has also been developed. The method is described in this book, along with 19 recipes for baked or fried cassava-based products.

Cassava growing countries should use what they have to produce what they want



Cassava Flour

How to prepare cassava flour

1. Peel and wash fresh cassava roots.
2. Grate the roots into a mash.
3. Dewater the mash by pressing inside a clean bag.
4. Break the pressed mash (cake) into fine granules.
5. Spread thinly on clean trays (or black polyethylene sheets) on a raised platform (to prevent contamination by dust, stones, etc.) and allow to dry.
6. When dry, mill finely and sift if necessary.
7. Package in polyethylene bags or any other airtight containers.

Note: *It is important for the drying to be completed in one day so that the flour will be of good quality for baking. Production of cassava flour from harvesting of cassava roots to final drying should, ideally, not exceed 24 h. For good results, cassava flour should pass through a fine sieve.*



Fresh cassava roots

↓

Peeling

↓

Washing

↓

Grating

↓

Cassava mash

↓

Dewatering by pressing in a clean bag

↓

Cake breaking

↓

Sun drying

↓

Dried cassava granules

↓

Milling

↓

High-quality cassava flour

Figure 1. Production of high quality cassava flour.



Cassava Starch

How to prepare cassava starch

1. Peel and wash fresh cassava roots.
2. Grate, or chip and grind smoothly.
3. Mix with a lot of clean water (about 10 times the weight of the roots).
4. Filter through a fine mesh sieve or through muslin cloth.
5. Allow the filtrate to settle. Decant the supernatant.
6. Wash off the starch residue several times with water to get white, odorless, and tasteless starch.
7. Put in a clean bag and press to dewater.
8. Spread thinly on a tray and sun dry.
9. Mill the dried cake finely and sift if necessary.
10. Package in airtight containers.

Grated Cassava

How to prepare grated cassava

1. Peel and wash fresh cassava roots.
2. Grate finely.
3. Remove lumps and fibers.
4. To dewater (if required), pour mixture into a clean white muslin or a light cotton cloth and squeeze.
5. Break the resulting cake into fine granules.



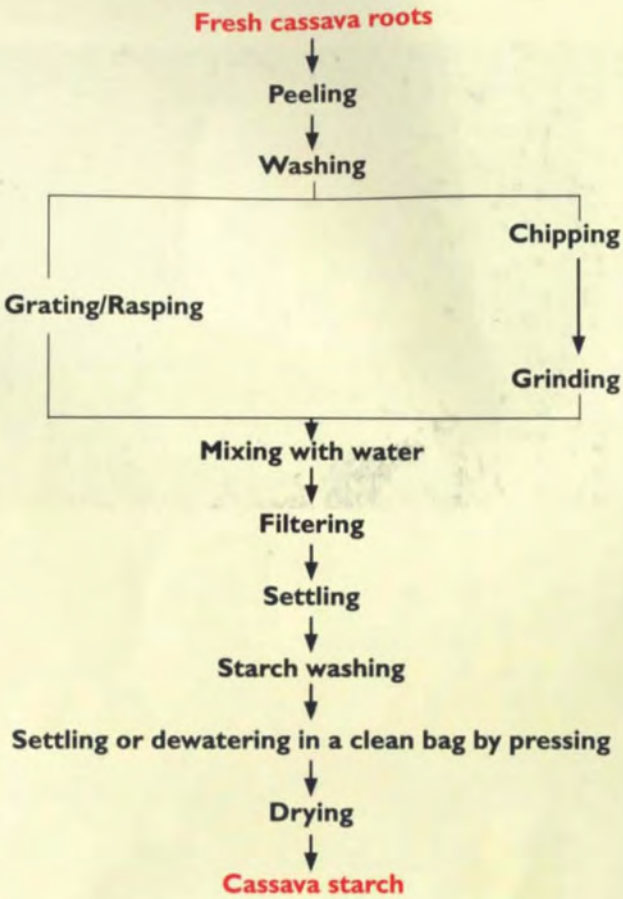
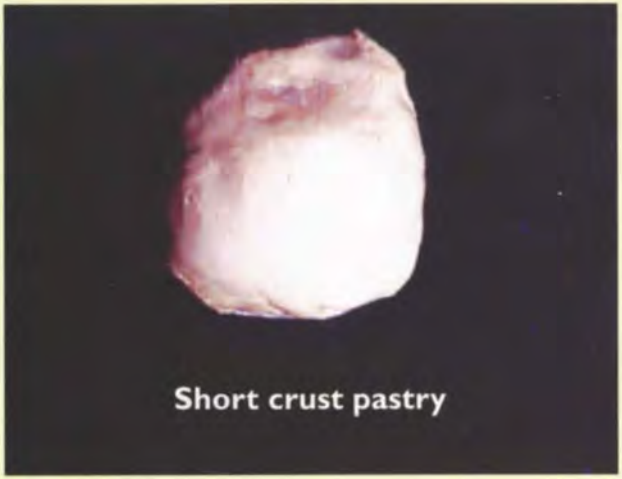


Figure 2. Production of cassava starch.



Short crust pastry

Short Crust Pastry

Ingredients

Cassava flour	200 g	2 cups
Margarine	50 g	¼ cup
Egg	1	
Salt	5 g	1 level teaspoon

Method

1. Weigh out 150 g sifted cassava flour, margarine, and salt into a bowl and mix.
2. Put 50 g cassava flour in ¼ cup of boiling water and fold in gently four times.
3. Pour the cooked flour into the remaining weighed out ingredients.
4. Mix thoroughly with finger tips, until the mixture resembles breadcrumbs.
5. Whisk the egg, add to the mixture.
6. Mix to obtain a stiff dough which leaves the sides of the bowl clean.
7. Use for any recipe which calls for short crust pastry such as



Meat filling

Meat Filling

Ingredients

Cassava flour	10 g	1 tablespoon
Minced meat (cooked)	750 g	3 cups
Finely chopped onion	20 g	2 tablespoons
Finely chopped garlic	3 g	1 teaspoon
Soy sauce	16 g	1 tablespoon
Salt to taste		
Black pepper to taste		
White pepper to taste		

Method

1. Fry finely chopped onion and garlic in a little oil.
2. When onion starts to get brown, add minced meat and continue stirring.
3. Season with black and white pepper and soy sauce, add salt to taste.
4. Mix cassava flour with a little water and add to the mixture.
5. Continue frying until the cassava flour becomes jellylike.

Note: *Fish can replace meat for fish filling and chicken can replace meat for chicken filling.*



Recipes From Cassava Flour



Cassava bread

Cassava Bread

Ingredients

Cassava flour	200 g	2 cups
Sugar	12 g	2 heaped teaspoons
Salt	3 g	⅔ level teaspoon
Yeast	3 g	1 level teaspoon
Margarine	20 g	4 level teaspoons
Egg	2	
Water	70–100 ml	⅕ cup

Method

1. Weigh all dry ingredients into a mixing bowl.
2. Add margarine and mix until thoroughly mixed (about one minute).
3. Whisk the egg thoroughly.
4. Add the egg and water (70–100 ml depending on the cassava flour) and mix for about 10 minutes at high speed. (Add the water a little at a time).
5. Pour the batter into a greased baking pan and allow to ferment for 60 minutes in a proofing pan or in a warm, covered box in which a small container containing warm water is placed (temperature of 30 °C and 80–95% relative humidity are optimum).
6. Bake the fermented batter at 200 °C (395 °F) for 30 minutes or more depending on size of the baking pan.
7. After baking allow the bread to cool before slicing.

Note: *Cassava soy bread can be obtained by using 80 g of cassava flour and 20 g of soy flour. The process is identical to the cassava bread process. The cassava soy bread needs to be left several hours after baking before slicing.*



Cassava wheat bread
(20% cassava + 80% wheat)

Cassava/Wheat Bread

Ingredients

Cassava flour	120 g	1¼ cups
Wheat flour	480 g	3¾ cups
Sugar	38 g	4 tablespoons
Margarine	35 g	1¾ tablespoons
Yeast (instant)	20 g	6 teaspoons
Salt	2.5 g	½ level teaspoon
Water	As required	

Method

1. Weigh all ingredients except water into mixing bowl.
2. Mix thoroughly.
3. Add water. Mix until a soft dough which can easily be handled is produced.
4. Put into a bowl and leave in a warm place to rise for 30 minutes. (Should be three times the initial size).
5. Knead until smooth.
6. Cut into 4 parts, shape, and place each part into a well-greased bread pan.
7. Allow to rise until size doubles.
8. Bake in an oven set at 200 °C (400 °F) for 15–20 minutes.
9. Remove, allow to cool, and wrap.



Cassava meat pie

Cassava Meat Pie

Ingredients

Short crust pastry
Meat filling

Method

1. Make short crust pastry (p. 12).
2. Roll out to about ¼ inch thickness.
3. Cut into rounds with a big biscuit cutter.
4. Put a tablespoonful of meat filling onto one side, fold the other side over and press edges to close firmly with a fork.
5. Brush with beaten egg and bake in a hot oven (350 °F) for 30 min.

Note: *The meat pie may also be deep fried.*
The filling can be varied —fish filling for fish pie; chicken filling for chicken pie.



Cassava sausage rolls

Cassava Sausage Rolls

Ingredients

Short crust pastry	120 g
Sausagemeat	240 g

Method

1. Make short crust pastry (p. 12).
2. Roll pastry into an oblong shape.
3. Season sausage meat with white pepper, black pepper, curry, and salt.
4. Divide into 8 pieces and shape into long strips.
5. Put the sausage into the pastry.
6. Fold the pastry over the sausage meat.
7. Moisten the ends and seal by pressing the edges together.
8. Trim off the pastry leaving about 1 cm of pastry at the edges.
9. Make diagonal slits at the top to allow steam to escape.
10. Brush pastry with beaten egg to give a glazed finish.
11. Bake in a hot oven at 175 °C (350 °F) until evenly browned.



Cassava strips

Cassava Strips

Ingredients

Cassava flour	100 g	1 cup
Cowpea paste	225 g	1 cup
Onion	90 g	1 (large)
Salt to taste		
Vegetable oil	800 ml	3¼ cups

Method

1. Soak cowpeas, dehull, and grind into a smooth paste.
2. Beat cowpea paste with wooden spoon to incorporate air.
3. Add grated onion, salt, and flour; mix well. Allow to stand for 10 minutes.
4. Heat the oil. Push the mixture through a cake decorator into the hot oil.
5. Fry until golden and crisp.
6. Serve for cocktails or as a snack.



Cassava cocktail titbits

Cassava Cocktail Titbits

Ingredients

Cassava flour	100 g	1 cup
Cowpea flour	100 g	1 cup
Egg whites	2	
Baking powder	5 g	1 teaspoon
Salt to taste		
Onion (ground)	30 g	1 (small)
Vegetable oil	700 ml	3 cups

Method

1. Wash cowpea seeds, remove husks.
2. Dry and mill finely.
3. Add onion and salt to cowpea flour.
4. Beat egg whites until fluffy and add to the mixture.
5. Mix well with cassava flour and baking powder.
6. Add enough water to make a stiff dough.
7. Roll out thinly and cut into shapes.
8. Deep fry and serve with drinks.

Note: *200 g cowpea paste may be used in place of cowpea flour.*



Cassava queen cakes

Cassava Queen Cakes

Ingredients

Cassava flour	400 g	4 cups
Sugar	200 g	1 cup
Margarine	200 g	1 cup
Baking powder	20 g	4 teaspoons
Vanilla essence	5 ml	1 teaspoon
Milk	120–200 ml	½–1 cup evaporated milk or 16 level teaspoons powdered milk in 1 cup of water
Mixed fruit (optional)	100 g	1 cup
Eggs	2	

Method

1. Cream sugar and margarine until light and fluffy.
2. Beat eggs until light and fluffy.
3. Sift flour and baking powder.
4. Fold the flour and beaten eggs into the cream. When the mixture is becoming stiff, add a little milk.
5. Repeat (4) until all the flour and eggs have been used up.
6. Add vanilla essence, and mixed fruit if used.
7. Grease queen cake tins and fill ⅔ full with mixture.
8. Bake in a moderately hot oven at 175 °C (360 °F) for 20–25 minutes or until lightly, but evenly brown.



Cassava cookies

Cassava Cookies

Ingredients

Cassava flour	200 g	2 cups
Margarine	100 g	½ cup
Sugar	100 g	½ cup
Baking powder	10 g	2 teaspoons
Salt	0.3 g	pinch
Grated nutmeg	1.5 g	¼ teaspoon
Water	As appropriate	

Method

1. Sift flour and baking powder into a dry bowl. Add sugar, salt, and grated nutmeg.
2. Mix thoroughly.
3. Mix the margarine into the flour.
4. Add enough water to make a stiff dough. (Should not stick to the sides of the bowl.)
5. Roll out on a board covered with flour and cut into shapes with biscuit cutters, make holes in it.
6. Bake in a hot oven until light brown all over. (Takes about 15 minutes at 175 °C [350 °F].)



Coconut biscuits

Coconut Biscuits

Ingredients

Cassava flour	100 g	1 cup
Margarine	50 g	¼ cup
Sugar	50 g	¼ cup
Grated coconut	50 g	¾ cup
Egg	1	
Baking powder	5 g	1 teaspoon
		Water (enough to make a stiff dough)

Method

1. Cream sugar and margarine until light and fluffy.
2. Add cassava flour, baking powder, and the grated coconut.
3. Mix to a stiff paste.
4. If too stiff, add some water.
5. Roll out on a floured board.
6. Cut into shapes and arrange on a greased cookie tray.
7. Prick with a fork to prevent the dough from rising.
8. Bake for 15 minutes at 175 °C (350 °F) or until evenly brown.



Orange drop cookies

Orange Drop Cookies

Ingredients

Cassava flour	350 g	3½ cups
Margarine	150 g	¾ cup
Brown sugar	300 g	1½ cups
Orange juice	50 ml	¼ cup
Vanilla essence	5 ml	1 teaspoon
Baking powder	10 g	2 teaspoons
Baking soda	5 g	1 teaspoon
Salt	1.2 g	¼ teaspoon
Milk	100 ml	½ cup
Eggs (beaten)	2	
Grated orange peel	10 g	2 tablespoons
Chopped nuts (optional)	100 g	1 cup

Method

1. Cream together margarine and sugar.
2. Beat in eggs, orange peel, juice, vanilla, and milk.
3. Sift together the dry ingredients and add to the creamed mixture.
4. Add the nuts if desired.
5. Drop from teaspoon onto greased baking tin or cookie sheets, flatten.
6. Bake for 15 minutes at 175 °C (350 °F).

Note: *This quantity makes about 72 cookies.*



Cassava flour doughnuts

Cassava Flour Doughnuts

Ingredients

Cassava flour	200 g	2 cups
Sugar	50 g	¼ cup
Margarine	20 g	1 rounded tablespoon
Egg	1	
Baking powder	10 g	2 level teaspoons
Grated nutmeg	1.5 g	½ teaspoon

Method

1. Put ½ cup (50 g) cassava flour into ½ cup of boiling water, remove from fire, and turn 4–5 times.
2. Mix the remaining flour with sugar, margarine, baking powder, and nutmeg.
3. Add the cooked cassava flour and mix together until mixture resembles breadcrumbs.
4. Whisk eggs until light, and add to the mixture. Mix into a stiff dough which leaves the sides of the bowl clean.
5. Mold into doughnut shapes and fry in oil (127 °C) until golden.
6. Drain and serve warm.

Note: *The doughnuts may also be baked.*
Before baking, brush with beaten egg to give a good crust.



Cassava chinchin

Cassava Chinchin

Ingredients

Cassava flour	400 g	4 cups
Margarine	40 g	2 tablespoons
Sugar	150 g	¾ cup
Egg	2	
Baking powder	10 g	2 teaspoons
Grated nutmeg	3 g	1 teaspoon

Method

1. Put 1 cup (100 g) cassava flour into 1 cup of boiling water, remove from fire, and turn 4–5 times immediately.
2. Mix the remaining flour with sugar, margarine, baking powder, and nutmeg.
3. Add the cooked cassava flour and mix together until mixture resembles breadcrumbs.
4. Whisk eggs until light, and add to the mixture. Mix into a stiff dough which leaves the sides of the bowl clean.
5. Knead lightly until smooth.
6. Roll evenly on a floured board.
7. Cut into bits.
8. Fry in deep or shallow fat (127 °C) until attractively brown.
9. Drain to remove excess oil.



Recipes From Cassava Starch



Cassava starch bread buns

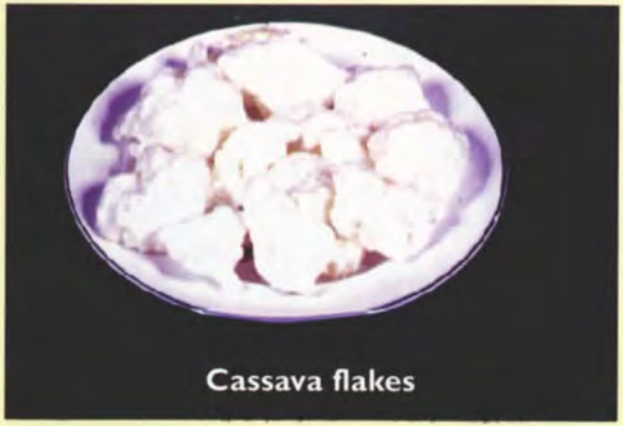
Cassava Starch Bread Buns

Ingredients

Margarine or vegetable oil	50 g
Water	100 ml
Salt	1.5 g
Cassava starch	100 g
Egg	1

Method

1. Heat the margarine in a saucepan until it melts completely. (Alternatively 50 g of vegetable oil may be used).
2. Add 100 ml of water and 1.5 g salt and allow the mixture to boil while stirring to form an emulsion.
3. Pour the hot emulsion into 100 g of cassava starch and stir at low speed.
4. Add the whisked egg and continue mixing at high speed until a uniform viscous dough is obtained. Divide the dough and shape into round balls of any desired size with greased palms. Bake at 200 °C for 20 minutes.



Cassava flakes

Cassava Flakes

Ingredients

Cassava starch	100 g	1 cup
Water	900 ml	4 ½ cups
Flavoring	Garlic, onion, pepper	
Salt to taste		

Method

1. Mix together starch and water in a pot until very smooth.
2. Add flavoring and salt to taste.
3. Put on medium heat, stirring all the time until thick.
4. Drop by teaspoonful on a lined tray to dry at 50–55 °C in a drying oven or in sun.
5. Fry in hot oil for about 2 seconds. Drain, serve as snacks.

To prepare flavoring

Garlic:	Ground whole garlic or use half a teaspoon of garlic salt
Onion:	Same as garlic
Pepper:	One teaspoon of ground pepper



Salad cream

Salad Cream

Ingredients

Cassava starch	154 g	16 level tablespoons
Mustard	20 g	2 heaped teaspoons
Sugar	90 g	6 level tablespoons
Salt	36 g	8 level teaspoons
Vinegar	350 ml	1½ cups
Water	1100 ml	4½ cups
Corn or sunflower oil	600 ml	2½ cups
2 Egg yolks	25 g	

Method

1. Measure together into a pot: starch, mustard, sugar, salt, vinegar, and water, and mix throughly.
2. Put on fire and cook until thick.
3. Cool to refrigeration temperature.
4. Pour mixture into a mixer. Mix for 1 minute.
5. Separate egg yolk and weigh out 25 g.
6. Add into starch mixture, mix for 1 minute.
7. Gently pour oil into mixture while mixing at speed 2 for 2 minutes.
8. Cover blender, increase mixer's speed, and mix for 5 minutes.
9. Pour into a clean jar, cover tighly, and store in refrigerator.

Note: *If a mixer is not available, a manual egg beater can be used.*



Recipes From Fresh Cassava Roots



Cassava fritters

Cassava Fritters

Ingredients

Crated cassava roots	450 g	2 cups
Onions (grated)	30 g	1 small
Eggs	2	
Salt to taste		
Cooking oil	489 ml	2 cups

Method

1. Add the grated onion and beaten eggs into the grated cassava roots.
2. Mix thoroughly.
3. Salt to taste.
4. Drop into hot oil by teaspoonful.
5. Fry until golden.



Cassava croquettes

Cassava Croquettes

Ingredients

Finely grated cassava	1125 g	5 cups
Finely grated coconut (optional)	150 g	2½ cups
Salt to taste		
Meat filling	As required	
Vegetable oil	700 ml	3 cups

Methods

1. Mix grated cassava and grated coconut.
2. Salt to taste.
3. Take a tablespoon of the cassava–coconut mixture, flatten on the palm of the hand and put a teaspoon of meat filling in the center (meat filling is made as in p. 13).
4. Cover with mixture so that the meat does not come out during frying.
5. Shape well.
6. Deep fry in oil until golden.



Cassava doughnuts

Cassava Doughnuts

Ingredients

Grated cassava roots	2 kg	9 cups
Mashed ripe banana	250 g	2 cups
Granulated sugar	200 g	1 cup
Yeast	15 g	1 tablespoon
Vegetable oil for frying	700 ml	3 cups

Method

1. Add sugar, yeast, and mashed banana to dewatered grated cassava.
2. Mix together.
3. Cover and set aside for 1 hour.
4. Heat vegetable oil, mold mixture into ball (2–4 cm in diameter).
5. Deep fry until evenly brown.
6. Serve hot.



Recipe From Cassava Leaves



Cassava leaves

Cassava Leaves

Ingredients

Fresh cassava leaves	1 kg	
Salt to taste		
Pepper to taste		
Palm oil	150 ml	¾ cup
Onions (optional)	60 g	2 (small)
Leek (optional)	2 stalks	
Smoked or salted fish (optional) to taste		
Groundnut paste (optional) to taste		
Water	1 liter	4⅛ cups

Method

1. Select young and tender cassava leaves.
2. Remove leaves from stalks.
3. Wash in cold water.
4. Pound in a mortar until all the leaves are broken into tiny pieces.
5. Put pounded leaves into a pot with 1 liter of clean water. Cook for 15 to 30 minutes from the time it starts to boil.
6. Sauté the onions, add to the cassava leaves with salt, pepper, fish, leek, and groundnut paste if used.
7. Put palm oil or peanut butter if preferred as a substitute for palm oil.
8. Cover pot and continue to cook for another 15 minutes.
9. Serve with rice, fufu, eba, or pounded yam.

Note: *The consistency of the cassava leaves is a matter of choice. It may be dry, i.e., with very little water, with oil seeping out of the vegetable (as preferred in the Democratic Republic of Congo) or very wet, with vegetable suspended in a water-in-all emulsion (as preferred in Sierra Leone).*







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Appendix

Volume, Weight, and Measure

Measure	Volume (ml)	Measure	Volume (ml)
1 cup (level)	200	1 tablespoon	15
½ cup	100	½ tablespoon	10
⅓ cup	80	1 teaspoon	5
¼ cup	60	½ teaspoon	2.5
⅛ cup	30	¼ teaspoon	1.2
		⅛ teaspoon	0.6

Measure	Weight (g)			
	Cassava flour	Wheat flour	Sugar	Margarine
1 cup (level)	100	120	170	160
½ cup	50	60	80	90
⅓ cup	35	40	60	65
¼ cup	20	30	35	40
⅛ cup	15	20	25	25

Note: *Equivalent measures are approximate.*



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About IITA

THE International Institute of Tropical Agriculture (IITA) was founded in 1967 as an international agricultural research institute with a mandate for improving food production in the humid tropics and to develop sustainable production systems. It became the first African link in the worldwide network of agricultural research centers known as the Consultative Group on International Agricultural Research (CGIAR), formed in 1971.

IITA's mission is to enhance the food security, income, and well-being of resource-poor people primarily in the humid and subhumid zones of sub-Saharan Africa, by conducting research and related activities to increase agricultural production, improve food systems, and sustainably manage natural resources, in partnership with national and international stakeholders.To this end, IITA conducts research, germplasm conservation, training, and information exchange activities in partnership with regional bodies and national programs including universities, NGOs, and the private sector. The research agenda addresses crop improvement, plant health, and resource and crop management within a food systems framework and targetted at the identified needs of three major agroecological zones: the savannas, the humid forests, and the midaltitudes. Research focuses on smallholder cropping and postharvest systems and on the following food crops: cassava, cowpea, maize, plantain and banana, soybean, and yam.

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