



Lecture 26
Cassava: *Manihot esculenta*, Euphorbiaceae



Cassava is one of the most important tropical root crops, also known as manioc, sagu, yuca (Spanish), and tapioca.

Cassava is the fastest growing crop of the 20th century, yet little has entered world trade.

However, export as a dried cattle feed is now increasing to Europe.

Cassava is a true cultigen, a crop unknown in the wild state.

It originated in western and southern Mexico, part of Guatemala and northeastern Brazil.

There is evidence that it was grown 5000 years ago in Columbia, 4000 years ago in Peru, and 2000 years ago in Mexico.

It was brought to Africa by the Portuguese and was encouraged as a famine food and reserve during locust attacks.

Cassava is the most important root crop of the lowland tropics.

It is the fourth most efficient crop plant:
Rice > sugar > maize > cassava.

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Uses

An important food and carbohydrate source
(65% for human consumption, 20% for animal feed,
15% for starch).

Eaten raw after peeling.

Sliced and dried, stored for several months.

Paste (fufu) produced by pounding and cutting up
boiled roots.

Farinha, grated dried roots (Brazilian sawdust).

Sun-dried strips ground into flour.

Latex and extracted juice may be concentrated by
boiling to produce cassareep—the ingredient of
West Indian pepper pot.

Meal is fermented in West Africa to form garri.

Leaves eaten as potherb.

Tuber fermented with *Rhizopus* or *Penicillium* to
produce a sweet banana-like product called tepi.

Alcohol production: a beer is made from the juice of
bitter cassava.

Starch, produced by grating or grinding washed peeled
tubers.

Washing out starch with repeated changes of water and
then gently heating washed starch causes it to
agglutinate into round pellets called tapioca.

The starch is used for food, manufacture of adhesives,
cosmetics, sizing textiles, laundering, paper making.

Note: it does not contain gluten so does not rise to make
ordinary bread but is used for a type of biscuit that
melts in the mouth.

Tapioca is used to make puddings and confectionery:
produced from the fine starch which settles when
juice is squeezed.

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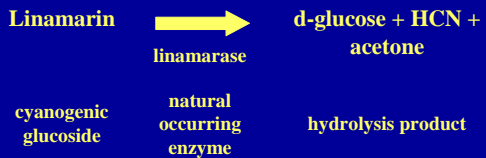
Bitter and Sweet: two classes of cassava

The bitter cassava contains a bitter cyanogenic glycoside (linamarin) that produces a toxic substance (hydrocyanic acid, HCN).

HCN is widely distributed throughout tubers and core but can be destroyed by boiling, roasting, expression, or fermentation.

HCN (cyanic acid or prussic acid) is poisonous.

The glycoside can be removed (detoxified) by juice extraction, heating, fermentation, drying, or a combination of these processing treatments.



The cyanogenic glycoside is found in the central portion and outer layers of the tuber.

These bitter types generally have dark leaves and stems are often reddish.

The bitter types are planted for starch production, alcohol, acetone.

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Sweet cassava (*M. dulcis*) contains a low percentage of the toxin and is confined to phelloderm (cortex).

Probably not a separate species.

Leaves and stems are light green.

Sweet cassava can be consumed as a starchy vegetable but is still detoxified.

It is interesting to speculate how primitive people learned how to cultivate and detoxify a poisonous plant, probably done to eliminate bitter substances.

Cassava can also be divided into two types:

Short season: matures in 6 months and must be harvested 9–11 months.

Long season: matures in 1 year and harvested at 3 to 4 years of age.

The long season types tend to be the bitter cassava.

Cassava Production (2001)

Continent	1000 tonnes	Chief countries
World	178,868	
Africa	95,239	Nigeria (33,854), Congo (15,436), Ghana (8,512)
North America	1,068	Haiti (332), Cuba (300), Costa Rica (159)
South America	32,469	Brazil (24,088), Paraguay (3,854), Colombia (1,982)
Asia	49,914	Thailand (18,283), Indonesia (16,158), India (7,000)
Oceania	178	Papua New Guinea (120), Fiji (33), Micronesia (12)

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Morphology

Plant contains 5 to 10 tuberous roots which are induced by short photoperiod.

Leaves are palmate. Plant is cross pollinated.

Ecology

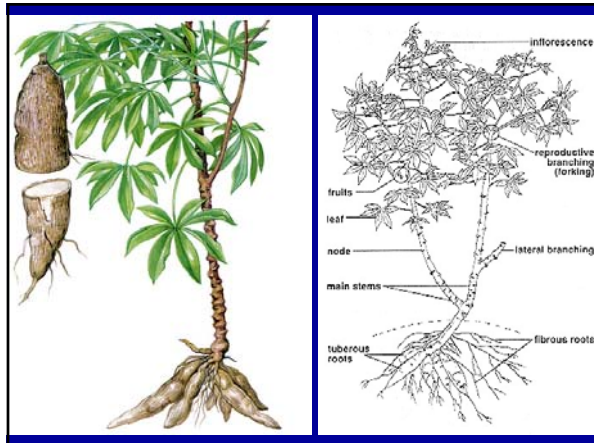
A lowland tropical crop which cannot withstand cold or frost.

However it can stand prolonged drought and survives by shedding leaves.

Can be grown on sandy, poor soils.

Grows best with 150 inches of rainfall, Yield is sensitive to drought or standing water.

It requires short days to tuberize.



Propagation

Vegetative propagation by stem cuttings (8 inches long).

Harvest

Plant is harvested at 10 to 18 months to produce 3 to 11 tons roots/acre.

Tender leaves are edible and good for livestock feed.

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Diseases

Although susceptible to some viruses, generally very resistant to pests.

Some problems with wild pig, rats, hippopotami!

Yield

Average world yield is about 4 t/acre (10 t/ha) and good commercial yield is 30–50 t/acre but some think potential is 40–90 t/acre.

Thus crop has a tremendous future.

Cassava (tapioca)

A South American root crop consumed by about 600 million people in the tropics

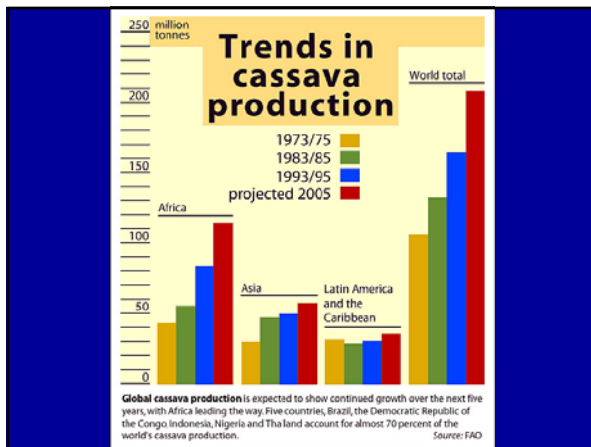
Fourth largest source of calories among all crops grown in the tropics

Can be grown on poor soil, withstands moderate drought conditions, and requires little labor input.

The edible root can remain under ground up to 3 years providing food security

Vegetatively propagated (stems)

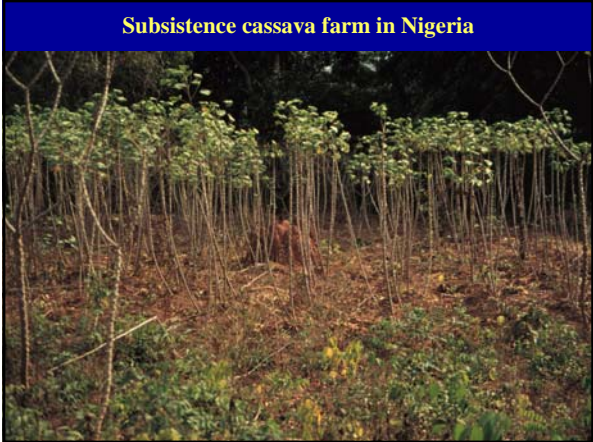




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To remove cyanogens cassava may be; fried, dried, soaked, washed, ground, fermented or processed by some combination of these procedures




D


The cassava flour, farofa, was mixed with water to form a batter.

This is baked on the griddle to form a large, rather tough, flat bread.

Like a pancake, when one side is roasted, the flat bread is flipped to finish cooking the top side.

This flat bread and the roasted farofa form the dietary staple for these Caribe people.

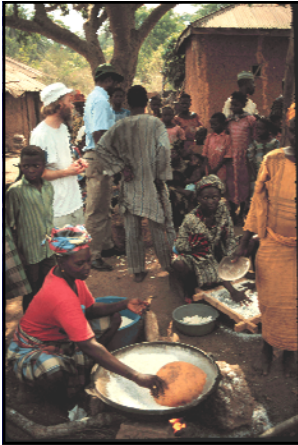




Although the same griddle is used, here the shredded, dried, and ground cassava is being heated and lightly roasted to produce a flour, farofa.



Fermenting cassava roots in Nigeria



Sieving and cooking cassava for Gari production in Nigeria

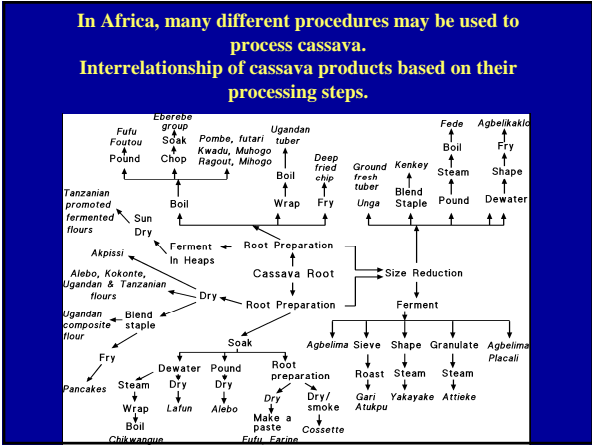


Sun-dried cassava chip production in Nigeria

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Mother preparing staple diet, cassava bread





Tepi
Java, Indonesia

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