Vegetable Crops –PLSC 451/551
Lesson 12, Sweet Potato, Cassava

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Sweet Potato

Use and importance

"Considered a small farmer's crop, sweet potatoes grow well in many farming conditions. The crop has relatively few natural enemies-which means that pesticides are rarely used to produce it-and can be grown in poor soils with little fertilizer." CGIAR Report, 2000

Sweet Potato

Use and importance

One of the major vegetables in tropical regions

The highest producer of calories/unit area

World production 131 million mt

Sweet Potato

Table 3: Root flesh colour of sweet potato related to dietary supply of vitamin A.

		Amount (g) of fresh sweet potato roots required to supply therequirement daily requirements of pro-vitamin A			
Age/Sex	Daily Requ, (µg RE)	Araka (white)	Osukut (yellow)	Kakamega (orange)	Ejumula (deep orange)
to3 years	400	3636	265	78	35
4 -6 years	500	4545	331	97	43
7-10 years	700	6364	463	136	61
F over 10	500- 850	7273	530	156	69
M over 10	500- 600	9091	662	194	87

Source: (ISTRC Technical Manual, 2003).

Sweet Potato

Consumer use

Fresh market

boiled, baked, fried (leaves and stems are used for potherbs in subsistence cultures)

Processed

canned, frozen, dehydrated, alcohol

Sweet Potato

Consumer use

Asian uses include starch and noodle production

Sweet Potato

Top producers, 2007 **1** China **2** India **3** Islamic Rep. of Iran **4** Bangladesh **5** Turkey **6** Japan **7** Pakistan **8** Kazakhstan **9** Nepal **10** Korea DPR **11** Kyrgyzstan **12** Australia **13** Azerbaijan **14** Indonesia **24** New Zealand

Asian Production

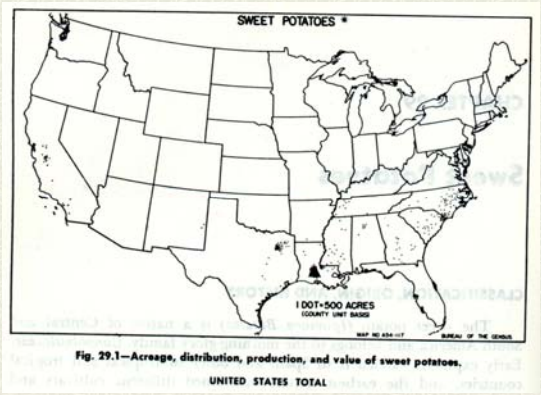


Fig. 29.1—Acreage, distribution, production, and value of sweet potatoes.

Sweet Potato

Taxonomy

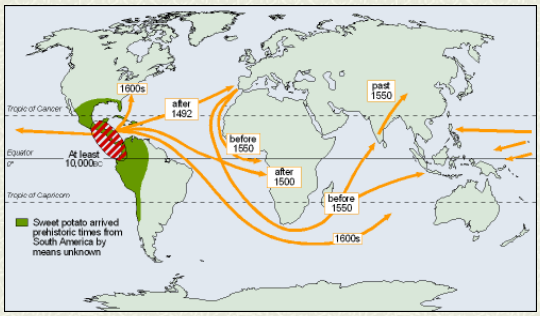
Dicotyledon
Family: Convolvulaceae
Genus and species: Ipomea batatas

Related species: field bindweed, jimson weed, dodder

Sweet Potato

Domestication

Origin – tropical Central or South America
Evidence of culture 8-10,000 years ago
Historically important in the Aztec diet
Very early use in the South Sea Islands



Distribution of sweet potato worldwide

Sweet Potato

Production – Climate and soils

Warm-season tender crop
Susceptible to chilling injury
Adapted to SE U.S. and California (can be grown in warmest areas of NW.
Optimum production at 70-90 degrees
Grows best in sandy or light soils (ph 5-6)
poor quality and thin roots in heavy or peat soils

Sweet Potato

Propagation

2 methods

- Cuttings from the previous crop
- Rooted slips from sprouted roots
  - Bed sprouted
  - Cut and sorted
  - Transplanted

Irrigation can be important for establishment

Sweet Potato

Production – Fertilization

Fertilizer requirements relatively low

Manures and composts as nutrient sources

N-P-K at ratios of 1-1-1, or 1-2-2

Nitrogen requirement 50-100 units/A

Fertilizer usually applied all preplant or half of N sidedressed before row closure

Sweet Potato

Production – Pruning and turning vines

Vine turning:

Practiced in commercial production to prevent nodal root production

Not practiced where long-season production and availability are desired

Sweet Potato

Production – Weed Control

Critical early before row closure

Competitive as large plants

Methods:

- Preemergent herbicides
- Cultivation
- Hoeing

Sweet Potato

Production – Important pests and diseases

- Black rot
- Sweet potato virus
- Sweet potato weevil

Sweet Potato

Production - Harvest

Worldwide, most are hand harvested

In the U.S. machine harvesting is becoming common

Harvest before soil temperatures fall below 50

Sweet Potato

Post-harvest handling

Careful handling is critical to avoid water loss and rot problems in storage

Cure at 80-85 degrees, 95% RH

Sweet Potato

Storage

Storage required in temperate production

Store at 55 degrees, 85-90% RH for up to 7 months

Avoid chilling injury (temps below 50 degrees)

Store with good air flow

Sweet Potato

Root Quality

Based on size and appearance

Sugar levels rise and starch declines during storage

Sweet Potato

Subsistence Production

Constant production
- Relay planting
- Ground storage

Sweet Potato

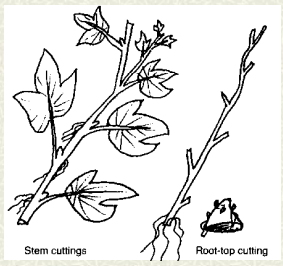
Subsistence Production

Used as an element in intercropping

Sweet Potato

Subsistence Production

Propagated from previous crop using cuttings from healthy plants



Sweet Potato

Subsistence Production

Sweet potato weevil control:
- Deep hilling
- Deep-rooted varieties
- Timing harvest

Sweet Potato

Organic/Market Garden Production

Propagation:
- Certified organic slips
- Slips from organic crop

Partially mechanized

Sweet Potato

Organic/Market Garden Production

Fertility:
- Green manures
- Suppression of legume nodulation after sweet potato crop

Sweet Potato

Organic/Market Garden Production

Storage:

- Long-term storage or organic sweet potatoes is difficult
- Direct marketing after harvest

Sweet Potato

Modern Intensive Production

Large-scale
Highly mechanized

Sweet Potato

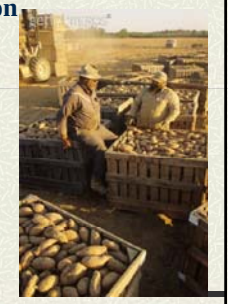
Modern Intensive Production

Slips produced from certified roots

Sweet potato transplanter

Sweet Potato

Modern Intensive Production



Long-term storage
up to 7 months

No CA storage

Cassava (Manioc)

Taxonomy

Dicotyledon
Family: Euphorbiaceae
Genus and species: Manihot esculenta
Related species: poinsettia, castor bean, spurge, rubber tree

Cassava plant

Cassava root

Cassava

Domestication

- Originated in tropical Brazil
- Cultivated by the natives for an undetermined but long historical period
- Transported worldwide to other tropical regions after 1600
- Taken to Africa by the Portuguese around 1700

Cassava

Use and importance

- Ranks sixth among food crops in production
- Ranks as the fourth most important source of calories
- Most important subsistence crop for 300 million people, especially in Africa

Cassava

Use and importance

Major producing countries

Brazil	21.7 million mt
Thailand	19.6
Indonesia	16.4
Nigeria	21.0
Zaire	20.8

(Very little or no production in the US.)

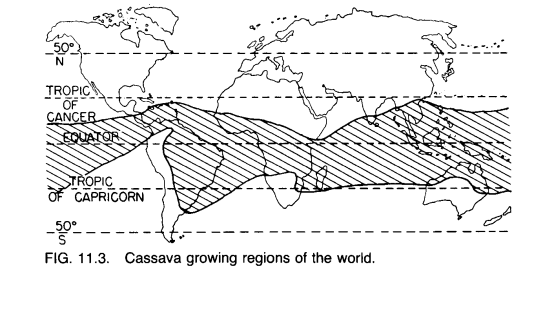


FIG. 11.3. Cassava growing regions of the world.

Cassava

Consumer use – Toxin management

- Natural presence of cyanogenic glucosides
  - linamarin and lotaustralin
  - These compounds are toxic and bitter
- Reduction of bitterness and risk by growing cultivars with low content and by processing

Cassava

Consumer use – Toxin management

- Two types of cultivars produced
- Bitter
  - Contain high levels of cyanide and must be processed or used for animal feed
- Sweet
  - Contain low levels and are safe to consume with minimal processing

Cassava

Gari

Consumer use – methods of preparation

- Fresh
  - Boiled, baked, or toasted
- Processed
  - Farinha (includes tapioca) – ground and dried
  - Gari – ground, fermented, dried
  - Fufu – fermented, wet ground, and pressed
- Also used to prepare alcohol, macaroni, and starch

Cassava

Production – Climate and soils

Warm season, very tender crop

Produced only in tropical regions

Prefers sandy or sandy loam soil but can grow in very poor soils (pH 5-8)

Tolerates high levels of aluminum and manganese

Can tolerate long periods of drought

One crop cycle can take up to 3 years

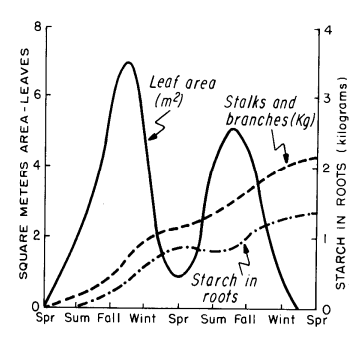


FIG. 11.4. Growth of cassava through two seasons.
Redrawn from Jones, 1959.

Cassava

Production – General

Cassava is considered a "famine" crop because it will produce under almost any conditions and will be available when other crops may not

Will grow in very poor soils, with little fertilizer, and under extended drought conditions, but does grow better when provided with optimal conditions

Cassava

Propagation

New plantings made from 8-12 in cuttings from a previous crop

Cuttings taken from older, mature plants

Cassava

Production – Stand Establishment

Cuttings are planted upright 3-4 in deep directly into the production field

Early irrigation may be required for healthy new growth

Cassava

Production – Disease Control

Cassava mosaic – use certified or disease-free propagation stocks

Cassava

Production – Harvest

Tops cut
Soil loosened
Pulled from soil

Very difficult
Labor intensive

Cassava

Post-harvest handling

Cured at 80-100 degrees for 3-5 days
Often waxed if long storage is anticipated

Cassava

Storage

Stored in ambient conditions
Short shelf-life, 1-2 months
Ground or clamp storage is common

Processed products have long storage lives

Cassava

Quality

- Based on root size, woodiness, and cyanide content
- Shorter, thicker roots are preferred
- Over-maturity results in fibrous, woody roots
- Cyanide content is a result of genetics and handling

Cassava

Marketing

- Fresh
  - Most used for local consumption or trading
- Processed
  - Open sale to local small processing companies
  - Contract for regional processors

Cassava

Production Systems

- Similar systems used for production worldwide
- Brazil is home to most large-scale production

Cassava

Brazil

Larger fields
High labor needs
Some mechanization

Cassava

Brazil

Planting

Cassava

Brazil

Harvest