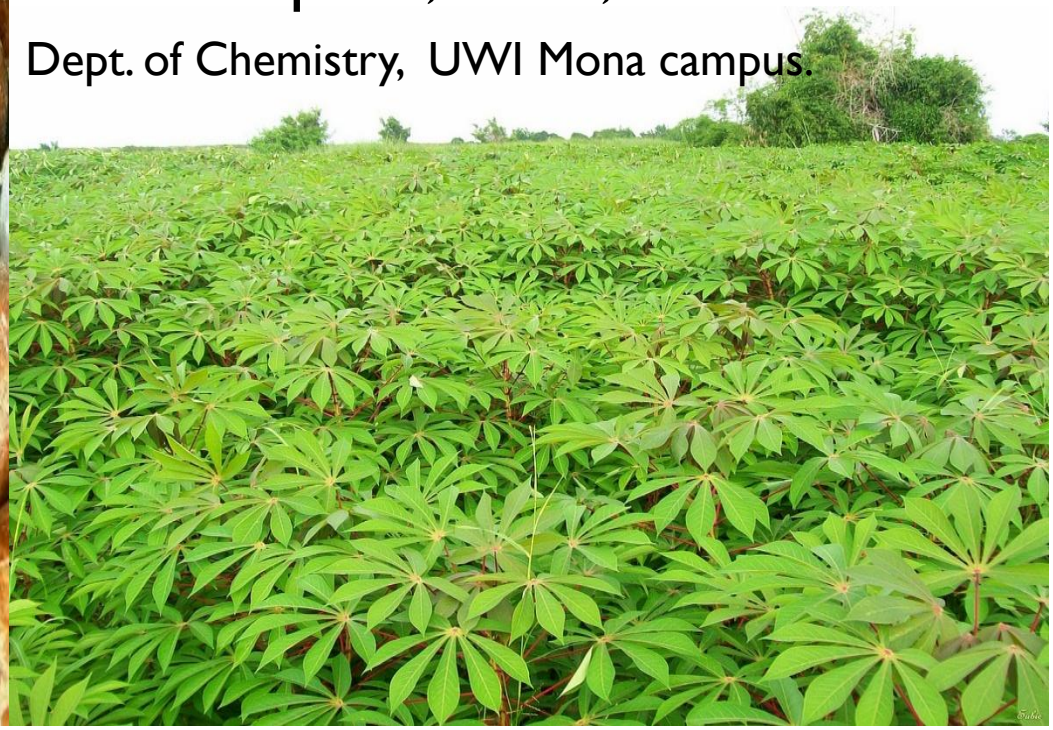
Adding Value to Local Foods for Food & Nutrition Security: Myth or Strategic Option?

An Alternative Model for a Successful Cassava Industry

Ian Thompson, Ph.D.,

Dept. of Chemistry, UWI Mona campus.



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The Cassava Plant: Overview

Nomenclature

- Scientific Name: *Manihot esculenta* Crantz

Common names:

- Yuca – Latin American countries
- Tapioca – Asian territories
- Manioc – Brazil
- Cassava – english speaking territories

Features:

- A perennial shrub
- Most popular member of the Manihot genus (which is a part of the Euphorbiaceae plant family)
- Has fibrous roots that grow into storage roots (tubers)

Data Sources

- Thompson et al., Research data – Cassava Bread project, Dept. of Chemistry (2011);
- 2009 Jamaica Statistical and Trade data – Statin;
- BSJ Presentation - UWI/BSJ Starch Conference (2011);
- RADA presentation – UWI/BSJ Starch Conference (2011);
- Dr. Bernardo Ospina - CLAYUCA

Jamaica - Food Security Issues

- Dependence on imported foods:
  - Most imported food produce to Jamaica is wheat, corn is second;
  - Wheat imports rose 20%, from 163,000 T in 2007 to 195,000 T in 2009.
  - Corn imports rose 22% from 248,702 T in 2007 to 304,129T in 2008.
- Vulnerable to fluctuating prices of foreign food imports (food for fuel crisis, 2008);
- Government Initiative / Campaign:
  - Grow what we eat, Eat what we Grow
- Solution: Cassava! (Test case)

Research Outcome: Wheat flour substitution

Initial Research Question:

Can we substitute cassava flour for wheat flour in bread without affecting consumer acceptability? And if so, what is the maximum level of substitution possible?

Findings:

Yes, Consumer Acceptability at X % cassava flour substitution(max).

Other Questions:

1. Based on a modest 10% substitution, what volume of cassava flour would be required?
2. What processes currently exist for making cassava flour?
3. Can our current production of cassava root satisfy this requirement for cassava flour production?

Preliminary findings:

1. What volume of cassava flour would be required?

   10% of 195,000 T Wheat Flour = 19,500 T Cassava Flour.

2. Existing processes for making cassava flour?

   Manual, batch process – highly labour intensive (not efficient) and high cost.

3. Can our current production of cassava root satisfy this requirement for cassava flour production?

   No!

   In 2009, 13,995 T cassava tuber was produced. At a conversion rate of (3.5:1), estimated yield of 4,000 T cassava flour (about 20% of 19,500 T) * bammy/cassava chip .

Paper at 9th FPAS Conference (2012)

An Evaluation of the Economic Viability of Cassava Production in Jamaica:

A Comparative Case Using Current Practices From LAC and Asia

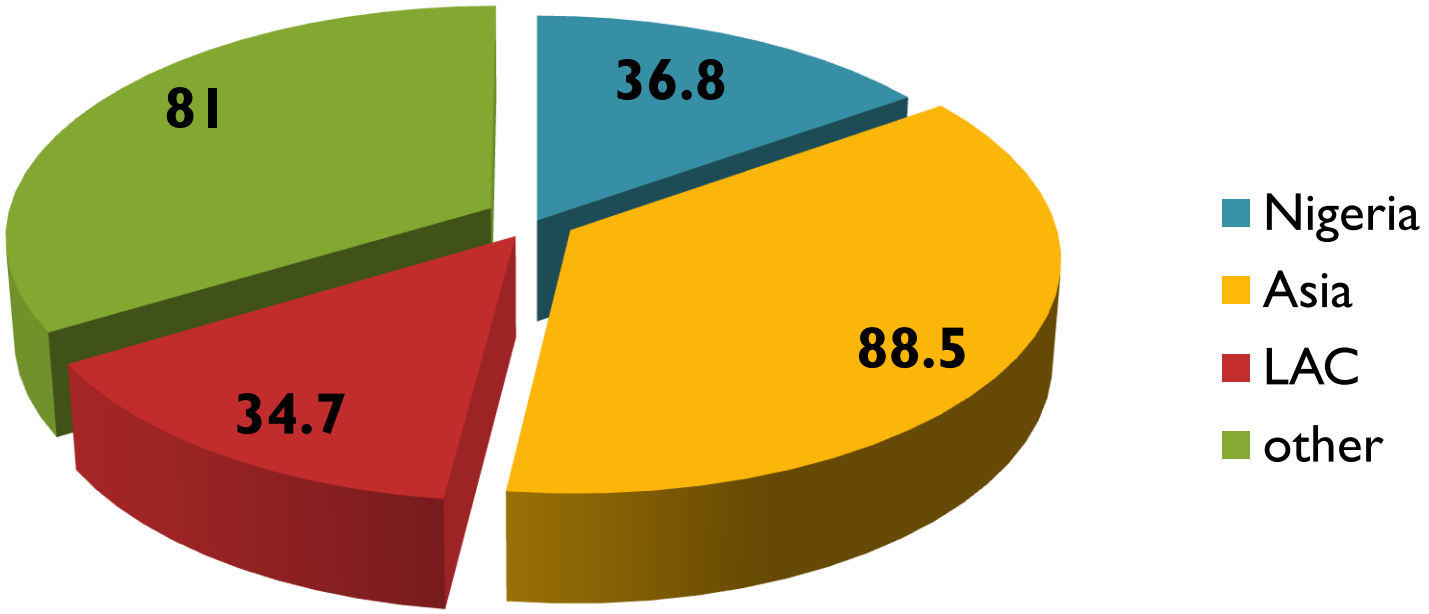
Contextual Framework:

1. Food Security;
2. Provide employment (jobs) & secure the future of farmers;
3. Stimulate economic activity and development, commerce and trade;

Objectives:

1. Determine level of Cassava root production to support 10% substitution of wheat flour;
2. Evaluate current agronomic practices (planting density, yield/acre, variety selection, etc.) and recommend areas for improvement;
3. Evaluate available processing technology and recommend adoption of alternate technology, where applicable;
4. Determine cost estimate for cassava root (farm gate) and cassava flour (retail) - for it to be a viable "substitute" for wheat flour;

Global Cassava Root Production (2009, 241 million tonnes)



- Jamaica produced a mere 0.013 million T
- Brazil accounts for 26 million T
- Thailand accounts for 30.1 million T

Product Options - Jamaica

From Root:

1. Fresh Tubers (local & export);
2. Tubers → Chips (snack food);
3. Cassava Meal → Bammy;
4. Flour → Baked products;
5. Starch;
6. Bio-ethanol

From Leaves:

1. Animal feed (leaf combined with milled tuber)

Current Bammy Processing (Jamaica)

Fresh Cassava tubers

↓

Manual Washing

↓

Manual Peeling

↓

Grinding (Mechanical)

↓

Dewatering

(Centrifuge & Screw press)

↓

Current Bammy Processing (Jamaica)

Air Drying

↓

Sieving

↓

Frying

(Bammy Production, Manual)

↓

Cooling & Packaging

Cassava Processing (LAC & Thailand)

Video:

Factors Identified by RADA

Agronomics:

- Suitability of varieties to local condition (+);
- Praedial larceny resistant (+);
- Persistent low yields (-);
- No economies of scale (-);
- Mechanization absent (-);
- Environmental challenges (-);
- High cost of labour and transportation (-);
- Low returns (-);
- Cultural issues (-);

Yield from Varieties:

(ex: Bodles Research Station)

- CM849 – 36.9 MT/ha;
- CM516 – 45.4 MT/ha;
- MColl22 – 45.4 MT/ha;

Scale of cultivation:

- Aver. land area/parish – 54 ha;
- Min. area (St. Andrew) – 4 ha;
- Max area (St. Eliz.) – 175.6 ha;
- Total area (in Cassava)–709.8 ha;

Cassava Economics: Assumptions

A. Estimation of Demand:

1. A Viable Cassava Industry in Jamaica will be able to substitute wheat flour at 10% of imports = 10% x 195,000 Tonnes (T) = 19,500 T flour;
2. At a conversion rate of 3.5 kg root = 1 kg flour, then 19,500 T cassava flour = 55,700 T cassava root;
3. Current demand for bammys, chips maintained at 8,000 T cassava root;
4. Total future Demand for Cassava Root (2+3) = 63,700 T cassava root.

B. Agronomic Practices:

1. Existing varieties and best agronomic practices are to be used;
2. Current Average yield (per hectare) = 13.1 T cassava root;
3. Total land currently in Cassava = 710 hectares;
4. Planting density (for root production) = 12,100 per hectare (max);
5. Increase land use (by factor of 5.6) to 4,862 hectares;

Cassava Economics: Assumptions

C. Processing Technologies:

1. Newer technologies adopted ex: CLAYUCA/CIAT;
2. Cassava flour produced to meet specifications for quality & safety;

D. Competitive Markets & Substitutes: (April 2012)

1. As wheat flour substitute, $ (cassava flour) ≤ $(wheat flour);
2. Wheat Flour (Baking, Retail): J$76.33 / kg flour;

E. Target Cost of Production:

1. Cassava flour (retail) price: J$76.33 / kg flour;
2. Processing cost (FOB ex: factory): J$10.90/kg root → $38.16/kg flour;
3. Cassava Root (farm gate): J$10.90/kg root
4. Current cost of Root (farm gate): J$29/kg root;
5. Projected retail cost of flour (based on E#4 alone): J$101.50/kg flour

Decision Model (Root to Flour)

	Root - $/kg (Farm gate)	Processing cost - $/kg (ex: factory – FOB)	Cassava Flour - $/kg (retail price)	Comments
Current Situation	29.00	0	101.50	
Targeted	21.80	0	76.33*	* (ideal situation = wheat flour cost)
Integrated	10.90	10.90	76.33	

Further Assumption:
Based on volume transactions, distribution and retail margins on flour at point of sale minimal on per kg root basis.

Cassava Economics: Root - to - Flour

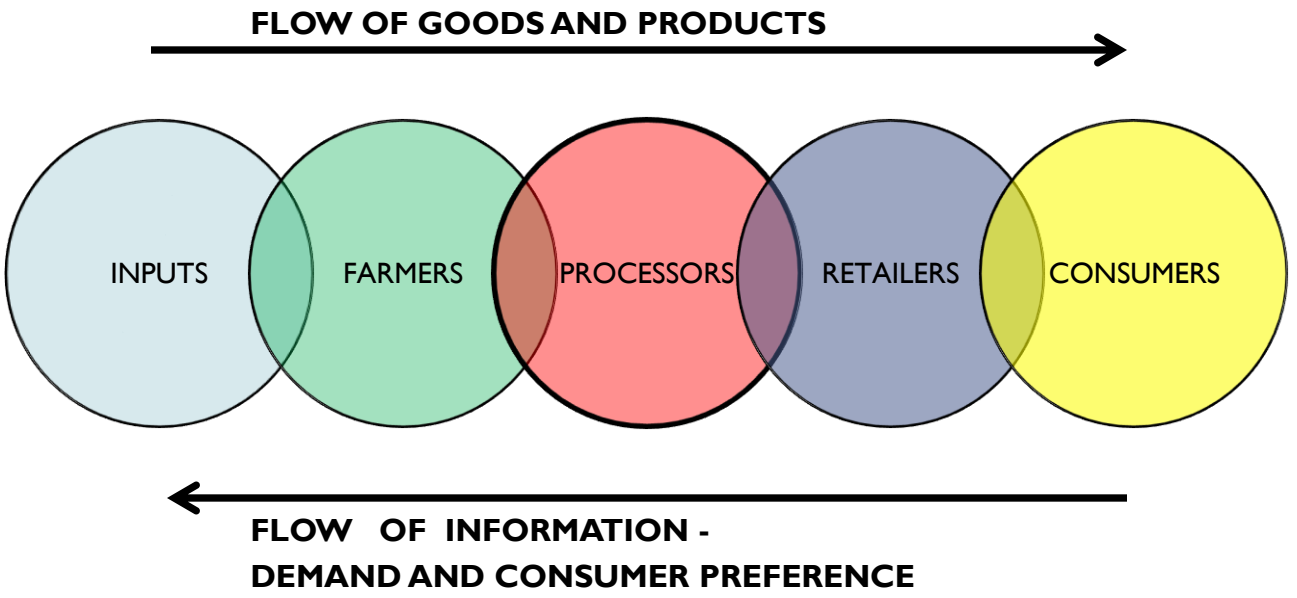
PROJECTED DEMAND	Root Required	At J$29/kg	At J$21.80/kg
1. For Bammy	8,000,000 kg	J$232 million	J$175 million
2. For Flour	55,700,000 kg	- nil -	J$1,177 million
Total	**63,700,000 kg**	J$232 million	J$1,352 million
AGRONOMICS	Current	Target	Difference
1. Yield/ha	13,100 kg	30,000 kg	16,900 kg
2. Land Use (current)	710 ha	4,862 ha	4,152 ha
3. Plant Density	12,100 / ha	10,000 / ha	(2,100) / ha
4. Average area in use	54 ha/parish	200 ha/farm	
PROCESSING Technology	Current	Target	
	Batch, Manual	Semi-continuous, mechanised.	

Integrated Approach (Farm – Processing Centre nexus)

- Establish larger farms (eg. 20 farms @ 200 hectares each);
  - Improved economies of scale;
  - Mechanisation justified
- Establish at least four (4) processing centres across island;
  - Natural geography of island suggest that two (2) should be on the northern corridor (coast), and two (2) along the southern corridor (coast);
  - This should reduce transportation cost (farm to factory) if situated within an economic range;
  - Proximity of farm to factory will reduce post-harvest losses since cassava root is highly perishable and should be processed within 48 hours of harvesting;

Integrated Approach
(Market Driven - Pull strategy)

1. Stimulate Consumer demand by developing value added consumer products – ready for market:
   - Cassava Bread is a low hanging fruit;
   - Other products to be developed;



Integrate 1° & 2° production stages

2. Adopt newer processing technologies which will allow for improved processing efficiency;
   - Technology available through CLAYUCA recommends itself;
   - Lower production costs & greater efficiency will render pre-existing facilities obsolete;

3. Select variety & improve agronomic practices to increase crop productivity (yield per hectare);
   - Bodles Research Station reported yields of > 30 MT/ha for exisiting varieties;

Integrated Approach (Institutional)

- Identify key stakeholders to include:
  - Raw material (Inputs) and technology transfer;
  - Farmers, processors;
  - Marketers & distributors;
  - Technical/support services;
  - Government Ministries & Policy makers;

AND

  - **You – the consumer!**

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- RADA
- CLAYUCA
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THANK YOU !


Cassava
HB
gene
starch
expression
quality
conservation
parameters
transgenic
culture
drought
rural
chain
leaves
soil
farm
stability
potential
yield
KU
flour
vitro
diseaseresistance
esculenta
gari
Starch
Change
farmers
Biscuiterie
Boulangerie
Cassava-based
postharvest
improved
toxicological
peels
acceptability
Challenges
Processing
embryogenic
production
biosynthesis
radiosensitivity
chips
microarray
library
cassava-based
performance
economical
genotypes
grass
fermented
irrigation
Varieties
utilization
modified
amino
insect
Colour
cultivar
Fish
ROS
TME
High
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mature
gamma
Gari
irradiation
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industry
tolerance
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Manioc
Carotene
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Droppings
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Transaction
Utilisation
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Actors
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Residual
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