Cassava Cultivars for Gari Production

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Overview

1. Cassava breeding objectives
2. Cassava variety release and adoption in Nigeria
3. Progress in 50 year of cassava breeding
4. New tools to increase genetic gains
5. Commercial cassava seed systems
Cassava Markets in Nigeria

Boil and eat – fresh consumption

Gari

Other Food Products (fufu, lafun and others)

Industry

1 Source: Context Network analysis based on field research, farmer interviews, and published source analysis
2 Garri: “CTA Presentation”, October 2014
3 Industrial and Other Processed Food: “Sahel Rapid Appraisal of Nigerian Markets for Cassava”, August 2013
Current Priority Cassava Breeding Objectives

Yield

1. High yield of 20 t/ha under stress conditions and 60 t/ha in excellent conditions – determined by variety, management and environment
2. Dry matter content above – 35%
3. Resistance to Cassava Mosaic Disease and Cassava Brown Streak Disease
4. Resistance to Cassava Bacterial Blight
5. Drought tolerance

Quality – Regional and Market Specific

1. White roots – high starch
2. Yellow roots with at least 15 μg/g fresh weight total carotenoids
3. Low cyanogenic potential
4. Poundable year round for boil and eat
5. Suitable for garri, fufu, starch, flour, chips
Additional cassava traits

*Many have important gender and equity dimensions*

- **Maturity:** Early maturity for harvest beginning at 7 to 10 months
- **In-ground storage** for harvest flexibility from 15 to 24 months
- **Shelf Life:** Roots that can be stored more than 3 days
- **Ease of peeling** by hand or machine
- **Suitability for leaf harvest** with minimal impact on root yield
- **Stem quality** for storage and high germination
- **Suitability mechanization:** planting and harvesting
- **Friendly for Weed Control:** Tolerance to herbicides or plant type
- **Suitability of peels as livestock feed:** Conversion of waste to valued added product produced primarily by women is a gender relevant characteristic
Released cassava varieties in Nigeria

<table>
<thead>
<tr>
<th>S/N</th>
<th>Official clone name</th>
<th>Common clone name</th>
<th>Unuccass no</th>
<th>Release year</th>
<th>Featured traits</th>
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<tr>
<td>1</td>
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<td>TMD-3035</td>
<td>UMUCAS010</td>
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</tbody>
</table>

- **46 Released Cassava Varieties in Nigeria**
- **All are suitable for gari production – as tested in on-farm trials**
- **6 varieties of biofortified cassava – Vitamin A cassava**
Adoption of improved varieties in Nigeria

• Cassava Monitoring Study in Nigeria (IITA, NRCRI)
• 2500 households in 16 major cassava producing states
• Employed DNA fingerprinting to identify each accession by matching them to library of known improved clones and landraces

• Sample size:
  – 7411 samples
  – 3891 Reference Library
  – **Total of 11578** accessions
• Supported by BMGF and RTB
Number of samples matching released varieties – region-wise

- Predominant adopted varieties were released prior to 1988
- Newer varieties are visible but need greater dissemination through cassava seed systems
Estimating Progress in IITA Breeding Program

Typical Cassava Breeding Cycle
3-6 years

Rapid Breeding Cycle
1-2 years

Crossing Blocks →
Seedling nursery (SN) (no replication)

Year 1

Clonal evaluation (CE) (no replication)

Year 2

Preliminary yield trial (PYT) (2 replications)

Year 3

Advanced yield trial (AYT) (4 replications)

Year 4

Multi-location Uniform yield trial (UYT) (4 replications)

Years 5 & 6

National or Regional Variety Testing and On-Farm Trials

Years 7 & 8

Multiplication and Release

IITA Genetic Gain Population

Rapid Multiplication

GS - annual
BREEDING POPULATION IMPROVEMENT

• Genetic Gain population composed of > 800 clones
• 36,867 plots from 6 locations and 15 years
• Model :
  – \( Y = \text{CLONE} + \text{LOC.YEAR} + \text{REP} \%\text{in}\% \text{LOC.YEAR} + \text{Error} \)
Phenotypic variation within breeding germplasm key traits

Large number of clones that are high-yielding, resistant to CMD, high dry matter content are coming through breeding pipeline.

These include unreleased varieties from previous decades and newer cultivars from recent years.
Population improvement: resistance to CMD and increase in yield

Mean CMD severity decrease

- Increase in yield (RTWT).
- Note local germplasm performs poorly compared to improved varieties.
Breakthrough in breeding Vitamin A Cassava levels of total carotenoids > 20 µg/g fresh weight

Best biofortified Cassava variety in Nigeria
12 µg/g fr. wt.
New populations from Genomic Selection breeding (NextGen Cassava)

- Four cycles of genomic selection recombination completed (2013-2016)
- Field phenotyping of the consecutive cycles ongoing
- The first Uniform Yield Trial coming GS project have been established in the current growing season at four locations.
Genomic Selection-based population improvement

Boxplots showing realized selection gain (shifts in population mean) for key traits in selection index.
BREAD PHENO: High-throughput phenotyping with smart phones
#phenoApp

Kansas State University, Cornell University, Texas A&M University, Makerere University, CIMMYT, IITA
PI: Jesse Poland

Field Book 1KK

Objectives:
- Advance electronic data collection through smartphone apps
- Develop novel algorithms for feature extraction and modeling plant phenotypes
The purpose the BASICS project is to develop a sustainable cassava seed value chain in Nigeria, characterized by the commercial production and dissemination of cassava planting material. The project envisages benefits to farmers and the industry through higher returns from the use of clean planting material of superior stem quality that are made accessible to farmers at the right time and at an appropriate price.
Variety Recommendations

White – High Starch and gari varieties
TME419
TMS-IBA980505
TMS-IBA980581
TMS-IBA010040
TMS-IBA961632
TMS-IBA30572

Vitamin A Cassava for gari and other products.
TMS-IBA070593
Cassava Seed Value Chain

Seed Quality & Protocols

Prebasic Seed → Basic seed → Commercial and Village Seed Entrepreneurs → Farmers / Seed Users

Consumer Demand & Money

Seed & Information

Monitoring and evaluation
Thank You