EIGHT DECADES OF GROUNDNUT RESEARCH IN UGANDA: Achievements, Challenges, and Opportunities
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OUTLINE

• Groundnuts Africa Journey
• Importance to Uganda (ROT, poverty reduction)
• Achievements
• Challenges/Production constraints
• Outlook/Future Research
Groundnut Africa Journey
Groundnut Journey to Africa

- Introduction into Africa and East Africa by Portuguese explorers (Tiley, 1972).

- Early traders and travelers introduced groundnuts in Uganda around 1862.

- This was followed by slow spread and adoption of this new crop since there was scant knowledge on its production and utilization.
HISTORY OF GROUNDNUT RESEARCH IN UGANDA

• Introduction by Portuguese explorers around 1862
• Research on groundnut in Uganda started at Serere in 1930
• Research concentrated on Germplasm Collections, introductions and agronomic studies.
• The variety grown then was *Itesot/Amasoga* (pale-kernelled spreading type) (Busolo- Bulafu, 1990).
• Most trials were conducted on Valencia type varieties
• Studies on the groundnut rosette disease research started in 1949
• Selections were carried out in the 1950s that resulted in the development of Red Beauty, a Valencia type, which was constituted as a multiline in 1958.
• In 1963, Anthony Tribe initiated the actual breeding program
Tribe’s breeding objectives were:

1. To assemble and maintain a large germplasm collection to be used as a gene bank in the breeding program.

2. To breed for high yielding and “better quality” groundnuts. Desired qualities listed included:
   
a) High oil content for crushing, b) Large plump, tan kernels for confectionery c) Early maturing varieties and d) Adaptability to a wide range of climate and edaphic conditions.

3. To develop disease and pest resistant varieties

By 1976 germplasm collections = 900 (largest in East Africa)
1990 fallen to 350

In 1990, ICRISAT established a regional center at Chitedze, Malawi. This became the source for NaSARRI Serere germplasm up to now
• Production area fell gradually during the early 1970s, followed by a dramatic collapse during the 1979 war.

• The only operating seed company – The Uganda Seed project had its stores, equipment and records looted in 1979.

• Research activities, quality control activities came to a standstill and breeder seed could not be provided to the seed project.

• Luwero Triangle War (1980 - 1985) led to the destruction of the Seed Scheme headquarters at Kawanda Research Station, abandoned in 1985.

• Gradual recovery in the 1980s, production in 1991 was just over 60% of the peak 1972 level.
Groundnut Growing Area in Uganda from 1961-2003

Harvested Area (Ha)

Groundnut Production in Uganda from 1961-2003

Production (Mt)
• SAARI introduced and released Serenuts 1-4

• Hybridizations (landraces, exotics, releases), further introductions (USDA, NMSU, India, Malawi), characterisation and selections

• Release of Serenuts 5-14

• Sizeable germplasm assembly >600; Groundnut Programme now self sustaining
IMPORTANCE OF GROUNDNUT IN THE NATIONAL ECONOMY

- 2nd most important legume after common Beans  *Phaseolus vulgaris* in Uganda
- Major Staple in Uganda
- Major growers: Eastern and Northern Uganda
- Food (good source of plant protein, vitamins and oil)
- Cash crop: Domestic and International
## Status of groundnut among grain legumes in Uganda

<table>
<thead>
<tr>
<th>Crop</th>
<th>Area</th>
<th>Yield</th>
<th>Production</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Ha ROG (%)</td>
<td>% of total area</td>
<td>Kg/Ha</td>
</tr>
<tr>
<td>Common Bean</td>
<td>917,000</td>
<td>2.72</td>
<td>12.14</td>
</tr>
<tr>
<td><strong>Groundnut</strong></td>
<td><strong>257,667</strong></td>
<td><strong>2.85</strong></td>
<td><strong>3.41</strong></td>
</tr>
<tr>
<td>Soybean</td>
<td>151,000</td>
<td>0.77</td>
<td>2.00</td>
</tr>
<tr>
<td>Pigeonpea</td>
<td>90,000</td>
<td>1.38</td>
<td>1.19</td>
</tr>
<tr>
<td>Cowpea</td>
<td>77,000</td>
<td>2.16</td>
<td>1.02</td>
</tr>
<tr>
<td>Peas</td>
<td>26,600</td>
<td>0.15</td>
<td>0.35</td>
</tr>
<tr>
<td>Chickpea</td>
<td>8,051</td>
<td>2.51</td>
<td>0.11</td>
</tr>
<tr>
<td><strong>Total/average</strong></td>
<td><strong>1,527,318</strong></td>
<td><strong>2.37</strong></td>
<td><strong>20.22</strong></td>
</tr>
</tbody>
</table>

Source: FAOSTAT (2012); ROGs are for 2001-2010
## Projected Production and National demand

<table>
<thead>
<tr>
<th>Commodity</th>
<th>Production (1000 MT)</th>
<th>ROG (%)</th>
<th>Demand (1000 MT)</th>
<th>ROG (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Common bean</td>
<td>480</td>
<td>575</td>
<td>662</td>
<td>3.71</td>
</tr>
<tr>
<td>Soybean</td>
<td>182</td>
<td>219</td>
<td>255</td>
<td>3.35</td>
</tr>
<tr>
<td><strong>Groundnut</strong></td>
<td><strong>193</strong></td>
<td><strong>224</strong></td>
<td><strong>253</strong></td>
<td><strong>2.73</strong></td>
</tr>
<tr>
<td>Pigeonpea</td>
<td>145</td>
<td>196</td>
<td>253</td>
<td>5.65</td>
</tr>
<tr>
<td>Cowpea</td>
<td>52</td>
<td>53</td>
<td>55</td>
<td>0.68</td>
</tr>
<tr>
<td>Chickpea</td>
<td>6</td>
<td>9</td>
<td>12</td>
<td>6.08</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>1,058</strong></td>
<td><strong>1,276</strong></td>
<td><strong>1,490</strong></td>
<td><strong>3.68</strong></td>
</tr>
</tbody>
</table>

Source: Tsedeke et al., 2012. Calculated from various sources; ROG figures are for 2010 to 2020 period.
ACHIEVEMENTS

Grow new HIGH YIELDING Groundnut varieties

CHARACTERISTICS

| Varietal Name | Release date | Yield | Maturity | Seed color | Resistance to leaf spot disease | Resistance to rosette virus | Shelling percentage | Crude oil content | Crude protein | Ease of shelling | Peelability | Recommended uses | Cultivation regions |
|---------------|--------------|-------|----------|------------|-------------------------------|-----------------------------|-------------------|----------------|--------------|---------------|---------------|-------------|------------------|-------------------|
| SERENUT 8     | 2010         | Yield | Maturity | Seed color | Resistant to leaf spot disease | Resistant to rosette virus | Shelling percentage | Crude oil content | Crude protein | Ease of shelling | Peelability | recommended uses | Cultivation regions |
| SERENUT 8T    | 2010         | Yield | Maturity | Seed color | Resistant to leaf spot disease | Resistant to rosette virus | Shelling percentage | Crude oil content | Crude protein | Ease of shelling | Peelability | Recommended uses | Cultivation regions |

MANAGEMENT OF AFLATOXINS IN GROUNDNUTS

A manual for Farmers, Processors, Traders and Consumers in Uganda

For more information, contact: Groundnut Programme, NARO, P.O. Box 958, Entebbe, Uganda.
Achievements

• Yield increment from 1250 1966 to 3700 kg/ha in 2011
• Varietal releases since 1966: 24 varieties with 10 releases 2010/2011
• Germplasm base to >600
• Demand outstripping supply
• Collaborations: Global, regional, local
• Education: trainings, mentoring (6 graduate students (5MSc and 1PhD)
• Dissemination materials: All the last 14 releases commercialized
• Major **landraces improved**: Gwerinut, Erudurudu, Acholiwhite,

• Leafminer resistant lines identified in advanced lines

• 3 Confectionery type varieties released in 2011

• Rosette resistant varieties with superior yield, drought tolerances and with desirable attributes released

• New NPT/PVS (Elite Spanish, Val, Virg,; 3SGVs; 91707 x S1R)

• Advanced AYT onstation: 89571 x S2; Erudu x S3R

• Publications: 3 books, 2 book chapters; 7 papers, 14 factsheets, 8 posters
<table>
<thead>
<tr>
<th>Variety</th>
<th>Maturity (Days)</th>
<th>Yield (kg/ha)</th>
<th>Year of Release</th>
<th>Other Remarks</th>
</tr>
</thead>
<tbody>
<tr>
<td>Red Beauty</td>
<td>90-100</td>
<td>1900-2500</td>
<td>1966</td>
<td>Multiline of Red Valencia</td>
</tr>
<tr>
<td>Acholi white</td>
<td>80-90</td>
<td>1900-2500</td>
<td>1966</td>
<td>Valencia, off white</td>
</tr>
<tr>
<td>Roxo</td>
<td>100-110</td>
<td>2000-2700</td>
<td>1969</td>
<td>Red Manyema, Venezuela</td>
</tr>
<tr>
<td>Tatu</td>
<td>100-110</td>
<td>1900-2400</td>
<td>1969</td>
<td>Spanish</td>
</tr>
<tr>
<td>Manipintar</td>
<td>110-120</td>
<td>2600-3600</td>
<td>1969</td>
<td>Virginia</td>
</tr>
<tr>
<td>Bukene</td>
<td>90-100</td>
<td>1800-2600</td>
<td>1970</td>
<td>Spanish</td>
</tr>
<tr>
<td>Mwituuwe</td>
<td>100-110</td>
<td>2000-2400</td>
<td>1970</td>
<td>Virginia</td>
</tr>
<tr>
<td>Makulu Red</td>
<td>110-120</td>
<td>2000-2800</td>
<td>1970</td>
<td>Virginia, red seeded</td>
</tr>
<tr>
<td>Amasoga</td>
<td>110-120</td>
<td>1800-2300</td>
<td>NA</td>
<td>Local</td>
</tr>
<tr>
<td>Igola – 1</td>
<td>125-130</td>
<td>3000-3500</td>
<td>1995</td>
<td>Virginia, striped</td>
</tr>
<tr>
<td>Serenut 1R</td>
<td>100-110</td>
<td>2500-3700</td>
<td>1998</td>
<td>Virginia, Red Seeded</td>
</tr>
<tr>
<td>Serenut 2R</td>
<td>100-110</td>
<td>2500-3500</td>
<td>1998</td>
<td>Virginia, Tan</td>
</tr>
<tr>
<td>Serenut 3R</td>
<td>90-100</td>
<td>2500-2900</td>
<td>2002</td>
<td>Spanish, Red Seeded</td>
</tr>
<tr>
<td>Serenut 4T</td>
<td>90-100</td>
<td>2500-2900</td>
<td>2002</td>
<td>Spanish, Tan seeded</td>
</tr>
<tr>
<td>Serenut 5R</td>
<td>100-110</td>
<td>2500-3000</td>
<td>2010</td>
<td>Virginia, Tan seeded</td>
</tr>
<tr>
<td>Serenut 6T</td>
<td>90-100</td>
<td>2500-3000</td>
<td>2010</td>
<td>Spanish, Tan seeded</td>
</tr>
<tr>
<td>Serenut 7T</td>
<td>100-110</td>
<td>2500-3700</td>
<td>2011</td>
<td>Virginia, Tan seeded</td>
</tr>
<tr>
<td>Serenut 8R</td>
<td>100-110</td>
<td>2500-3700</td>
<td>2011</td>
<td>Virginia, Red seeded</td>
</tr>
<tr>
<td>Serenut 9T</td>
<td>100-110</td>
<td>2500-3700</td>
<td>2011</td>
<td>Virginia, Tan seeded</td>
</tr>
<tr>
<td>Serenut 10R</td>
<td>100-110</td>
<td>2500-3700</td>
<td>2011</td>
<td>Virginia, Red seeded</td>
</tr>
<tr>
<td>Serenut 11T</td>
<td>100-110</td>
<td>2500-3700</td>
<td>2011</td>
<td>Virginia, Tan seeded</td>
</tr>
<tr>
<td>Serenut 12R</td>
<td>100-110</td>
<td>2500-3700</td>
<td>2011</td>
<td>Virginia, Red seeded</td>
</tr>
<tr>
<td>Serenut 13T</td>
<td>100-110</td>
<td>2500-3700</td>
<td>2011</td>
<td>Virginia, Tan seeded</td>
</tr>
<tr>
<td>Serenut 14R</td>
<td>100-110</td>
<td>2500-3700</td>
<td>2011</td>
<td>Virginia, Red seeded</td>
</tr>
</tbody>
</table>
Contribution to poverty reduction

• "Adoption of groundnut varieties also significantly reduced poverty as measured by headcount index [the proportion of people below the poverty line] by 7–9 per cent." (Appiah, 2012).
Centre of excellence: Contribution to National groundnuts improvement in SSA

- 4T to be released to Ethiopia
- Serenuts 5-14 under NPT Sudan
- West Africa: Senegal, Ghana, Sierra Leone evaluating Serenut 7-14 series
- Pending seed requests for: Mozambique
- S.Africa Company to be commercialised S5 R and S6T

✓ Training requests for Sudanese and Rwandese Groundnut Breeders
✓ Trade spillover: commerce in the region
CONSTRAINTS/ CHALLENGES

- Erratic weather: Flood/Drought
- Emerging pests and diseases
- Low-yielding seed varieties (Landraces)
- Small-scale, traditional farming with little inputs
- No/low Mechanization
- Increased cultivation on marginal land
- Limited funding
- Dilapidated infrastructure: glasshouses
Challenges cont’d

- Political instability (1979, 1985, LRA)
- Unpredictable demand: impromptu
- Seed adulteration (varietal mixing)
- Seed multiplication: Low multiplication ratio; low funding from GoU and private sector, donor reliant,
- Dwindling trial sites: IkiIki, Nakabango, Kitgum ARDC
- Conservation and maintenance : cold storage; exsitu
- Extension/education: slow dissemination of info
- Lack of agricultural data: reliable weather, adoption, impact assessments
- Absence of enabling laws: IPR/PBR
FUTURE RESEARCH DIRECTION
Future Research Direction

✓ Continue with Participatory varietal development; soil health studies; density studies; IPM studies

✓ Seed systems: Seed banks, multiplication, maintenance

✓ Groundnut Aflatoxin Research

✓ Leafminer

✓ Groundnut nutritional profiling, enhancement

✓ Value addition: Diverse products

✓ Oil quality: oleic:linoleic (high oleic groundnuts)

✓ Impact assessments/Routine value chain studies
Education: training, mentoring students

Biotechnology and Molecular Biology: (MAB, transformation, Genomics and proteomics)

Genotyping, phylogenetics

Pharmaceuticals: folates, sterols, Vit A, E, Flavanoids, Arginine

Conservation and Maintenance Breeding

Mechanization: shellers, weeders, harvestors

Advocacy for enabling laws: IPR/PBR

Stronger/more Linkages: International, Regional and Local/Private sector
Strategic partnership

- MAAIF, UNBS, PARIs, ZARDIs, TVCs
- Seed companies:
  - NAADS; CBO; NGOs
- Farmer groups:
- Processors
- Media
- Universities: MAK, Gulu, Busitema, Kyambogo, UCU
- USAID: PCRSP (UGA, NMSU, UConn)
- ICRISAT: India, Malawi
- AGRA
- BM&G
- EU-IFAD
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THANK YOU ALL