Surveillance and control of cassava diseases in Africa: Cassava Needs for Africa

Emmanuel Okogbenin

International workshop, La Reunion, June 10-13, 2014
Key issues

• What needs?
• What priorities?
• What gaps?
• Potentialities vs. realities
• Future direction
Control of cassava diseases
Cassava Diseases

- Most challenging are viruses
Breeding issues

- Science, art, and chance
- Key strategies – conventional and molecular (MAS, MABC, MARS, GS), Transgene technology
- Genetic variation
- Selection
- Complementation
- Genotyping and diagnostic labs
- Capacity building
- Low resistance for CBSD
Pyramiding Multiple Sources of CMD Resistance Genes

At least 3 different CMD Resistance genes have been mapped

- Identifying more sources of resistance for CMD
- Multiple resistance is a priority for stable and CMD durable resistance
Resistance to Whiteflies in BC₁ Derivatives of FLA444-7

- CW67-130 x MTAI8 (BC₁ mapping population with 276 progenies at CIAT)

- Introgress with virus resistance
Schemes of genomic selection (GS) (left) and traditional MAS for the selection of quantitative traits (right).

Breeding by design:
Knowledge of the map positions of all loci of interest, the allelic variation at those loci, and their contribution to the phenotype should enable the breeder to design superior genotypes comprising a combination of favorable alleles at all loci.

How easily applied to GS?

Nakaya A, and Isobe S N Ann Bot 2012;aob.mcs109

© The Author 2012. Published by Oxford University Press on behalf of the Annals of Botany Company.
Trait introgression (CMD)

- Flowering
- Desirable genetic background
- Clonally propagated crop
- No DH
- Transgenic
- Crossing facility for introduced unadapted germplasm
# Regulatory Landscape in Africa

<table>
<thead>
<tr>
<th>Country</th>
<th>Policy</th>
<th>Legislation</th>
<th>Administrative System</th>
<th>Critical Issues</th>
</tr>
</thead>
<tbody>
<tr>
<td>MW</td>
<td>Policy on Biotechnology</td>
<td>Biosafety Act 2002; revised in 2007 Biosafety Regulations</td>
<td>NCST - Biotechnology MENR - Biosafety</td>
<td>1. Precautionary approach</td>
</tr>
<tr>
<td>NG</td>
<td>Policy on modern biotechnology</td>
<td>Regulations &amp; Guidelines* Biosafety Bill yet to be passed into Law</td>
<td>NABDA - Biotech FMENR - NBC (IBC)</td>
<td>1. Law still awaits presidential assent 2. Need for new regulations to allow commercial release*</td>
</tr>
</tbody>
</table>
IPM Utilizes all suitable pest management tactics.............

- Pesticides
- Cultural
- Mechanical
- Sanitary
- Natural
- Biological
- Host Plant Resistance

Some tactics fall into several categories.
Controlling spread of cassava viral diseases

- Vegetatively propagated
- TC - cleaning
- Healthy planting materials
- Sustainable seed system
- Best cultural and agronomic practices
Challenges for a clean seed system

• Lack of appropriate policies to enable clean seed certification process and enforcement of quarantine measures

• Lack of standards / thresholds to guide and enhance the certification process

• Lack of awareness of implication of using infected material versus clean material
Seed Multiplication

Immersion bioreactor:

Temporary immersion bioreactor set up at NACGRAB.
Dissemination of resistant varieties

- Efficient seed system to support multiplication
- Incentivism
- Re-use of planting materials – Time limit?
Adoption of Improved varieties

• Mixture of improved and local varieties are still being grown in Africa (Abdoulaye et al 2014)

• Adoption Rates
  – Not just yield
  – Culinary attributes
  – Starch content

• Low rates in most of SSA
  – 35% in Kenya (Njineet al, 2011)
  – 37% in Ghana (Owusu and Donkor 2012)
  – 27% in Tanzania (Kavia et al., 2007)
Extension services

Challenges

- Training
- Technical support
- Mentoring
- Monitoring
- Evaluation
Bringing benefits of resistant varieties to farmers

- Commercialization
- Added value
- Creating enabling environment
- AATF’s role
How we do it along the Value Chain

1. **Identify**
   - A constraint
   - How to solve

2. **Broker**
   - Technology, royalty free
   - Testing (researchers & farmers)
   - Regulatory controls

3. **Adapt**
   - Agri-businesses
   - Smallholders

4. **Deliver**
   - Best practices
   - Sustainable use

5. **Steward**
The cassava production to consumption system in sub-Saharan Africa
Through partnership
Conclusion

• No single approach will control cassava diseases

• A holistic functional system based on integrated strategies will be required

• Creating human and physical structures to support control strategies is critical

• Building global partnership to strengthen R&D impacts on farmer’s field is inevitable