Flagship project 2
Adapted productive varieties and quality seeds

ELMAR SCHULTE-GELDERMANN • RTB ANNUAL MEETING
Outline

1. Flagship overview
2. Key scientific achievements 2017
3. Looking ahead: opportunities and challenges
Objectives

• Implement strategies to accelerate genetic gains, improve efficiency of RTB breeding pipelines, and shorten the breeding cycle so as to accelerate farmers’ access to new varieties exhibiting genetic gains.

• Develop varieties with user-preferred traits through PVS, drawing on gender-differentiated assessments of varietal preferences.

• Reduce bottlenecks in seed quality and distribution, using rapid multiplication and integrative systems-oriented, gender-equitable, and evidence-based seed interventions.

• Improve key seed system services focused on farm-level quality management, enabling regulation, basic diagnostics focused on breeder seed, and business and marketing skills for RTB out-growers.
Clusters

Making available good-quality planting materials of a diverse set of high-yielding RTB varieties that are adapted to the needs and preferences of different stakeholders in the value chain.

CC2.1: Improving smallholder access to healthy RTB planting material and new varieties (Jorge A.)

BA 2.2 User-preferred banana cultivars / hybrids (Inge v.d. B. & Rony S.)

PO 2.4 Seed Potato for Africa (Monica.P)

SW2.6 User-preferred sweetpotato varieties (Wolfgang G.)

CA 2.3 Added-value cassava varieties (Peter K., Hernan C.)

PO2.5 Agile Potato for Asia (Jürgen K., TBC)

YA2.7 Quality seed yam (David DeK.)
CC2.1 – Improving smallholder access to healthy RTB planting material and new varieties

Workshop WUR May, 2017: Launch phase 2 and develop RTB CC 2.1. toolbox

Collaboration with PIM: RTB seed systems and policies
- First stakeholder case study Kenya, July 2017 -
CC2.1 – Improving smallholder access to healthy RTB planting material and new varieties

Seed system map: Research question and tools

- Sources and flows
- Farmers choices
- Seed degeneration
- Specialized & DSM multipliers and their business

Two awarded proposals on gender and RTB seed systems:
- Integrating gender into Kenya’s evolving seed policies and regulations
- Gender and the moral economy of sweet potato vines. A study in Tanzania
BA2.2 – User-preferred banana cultivars / hybrids

- Genomic selection model for Matoke bananas developed -

1. Genotyping at tissue culture or nursery level
   - 3-6 months
   - ~2-3 years confirm phenotype
   - 1-1.5 years

2. MAS/Genomic Prediction
   - New hybrid

3. Cross pollination
   - Embryo rescue
   - In-vitro multiplication of genotypes
   - 5 years

4. Early Evaluation Trial
   - 3-4 years <10% selected

5. Preliminary Yield Trial
   - 3-4 years <5% selected

6. Advanced Yield Trial / Multi-location Trial
   - 3-4 years <1% selected

7. On-Farm Trials / Farmer Participatory Selection

* A member of CGIAR consortium
Multi-locational testing of NARITA hybrids

Baselines study conducted

Mobile data collection initiated

Field data collected in the 5 testing sites
Release of three new cassava varieties for the Caribe Region of Colombia

CA2.3 – Added-value cassava varieties

Cassava Breeding I: The Value of Breeding Value

Hernán Caballitos 1, Juan C. Pérez 1, 3, Orlando Joaqui Barandica 1, Jorge I. Lenis 1, Nelson Morante 1, Fernando Calle 1, Lizbeth Pino 1 and Clair H. Hershey 1

1 International Center for Tropical Agriculture, Santiago de Cali, Colombia, 2 Corporación Colombiana de Investigación Agropecuaria, Santa Marta, Colombia

Cassava Breeding II: Phenotypic Correlations through the Different Stages of Selection

Orlando Joaqui Barandica 1, Juan C. Pérez 1, 3, Jorge I. Lenis 1, Fernando Calle 1, Nelson Morante 1, Lizbeth Pino 1, Clair H. Hershey 1 and Hernán Caballos 1

1 International Center for Tropical Agriculture, Apartado Aéreo 6713, Cali, Colombia, 2 Corporación Colombiana de Investigación Agropecuaria, Santa Marta, Colombia
Development of new protocols for the induction of flowering in cassava

1. By grafting

Goal: To produce larger number of flowers/seed in a shorter period of time

- Grafting success highly depend on genotype
- use of plant growth regulators and or photoperiod lengthening in combination with grafting most promising.

2. By extension of photoperiod.

Extended photoperiod: Three branching levels (e.g. the plant flowered three times before harvest).

Surprisingly, there was also changes in total biomass.
Rapid multiplication with private sector partners

- Apical cuttings and aeroponics - high multiplication rate and highly productive
- Technologies compatible with large-scale private sector, and small and medium-scale seed multipliers

<table>
<thead>
<tr>
<th>Method</th>
<th>Screenhouse production (G1)</th>
<th>Pre-basic Seed (G2)</th>
<th>Basic Seed (G3)</th>
<th>Certified Seed (G4)</th>
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</thead>
<tbody>
<tr>
<td></td>
<td>per in-vitro plant</td>
<td># seed tubers</td>
<td># seed tubers</td>
<td># seed tubers</td>
</tr>
<tr>
<td>Cuttings</td>
<td>120 rooted cuttings</td>
<td>5</td>
<td>912c</td>
<td>9,120</td>
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<tr>
<td>Aeroponics</td>
<td>35 minitubers</td>
<td>8^a</td>
<td>280d</td>
<td>2,800</td>
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<tr>
<td>Conventional</td>
<td>6 minitubers</td>
<td>8^a</td>
<td>48d</td>
<td>480</td>
</tr>
</tbody>
</table>
**Seed production**

- Rooted apical cuttings underway to being officially recognized in seed certification protocol in Kenya
- 2 PPPs to support investment in rooted cuttings
- 125 additional DSM’s in ET, KE, MW, UG, CM

**Impact of quality seed**

Farmers’ **increased yields by 50 -280% (av.112%)** after using quality seed produced by local seed multipliers in Kenya, Ethiopia and Malawi

*Farmers Betty M. quality seed (left) and saved seed (right)*

*Productivity and food security effects of using of certified seed potato: the case of Kenya’s potato farmers*

Julius Juma Okello, Yuan Zhou, Norman Kwiriza, Sylvester Ogutu, Ian Barker, Elmar Schulte-Geldermann, Elly Atieno and Justin Taj Ahmed

*Agriculture & Food Security* 2017 6:25 | [https://doi.org/10.1186/s40066-017-0101-0] © The Author(s) 2017
PO2.5 – Agile Potato for Asia

RTB Seed Security Framework: Seed potato systems in Maharashtra and Karnataka

Crissman et al., 2017

Potato variety adoption study in Asia

Hareau et al., under preparation
Parent-offspring Analysis for Improvement of Breeding Populations

- Genetic variation among families and within families for yield trait 1 : 3.5 to 5 and for quality traits 1 : 2.5 to 3.5
- Selection possible from small number of progenies

Analysis of effectiveness of resources in breeding stages

- 2-stage (instead of 3) selection similar success with 30% less costs
- Single trait yield selection and index selection very similar recourse allocation efficiency
Real-time data collection method for determining the cost of pre-basic sweetpotato seed.

- Goal is to have 10 NARIs operating revolving funds that ensure that core amounts of pre-basic seed are available.

Revised net tunnel brochure produced in 2017 which provides 3 distinct construction options for the user to choose from.

CIP Ag. economist working with TC technician for accurate costing.

Strategies for the development of the sweetpotato early generation seed sector in eastern and southern Africa.
• Yam Community of Practice (YCoP) realized at ISTRC-AB workshop.
2017 Achievements in Population Development

Applied predictive breeding to choice parents for crossing (breeding value)

Crossing blocks established both at Abuja and Ibadan

More than 20,000 seedling progenies of two species transplanted

-53 *D. rotundata* tuber families comprising 1756 progenies established at Abuja for evaluation and selection

-35 *D. alata* tuber families comprising 1539 progenies established for evaluation

- More than 6400 true (botanical) seed distributed to five NARS in four countries in West Africa
Looking ahead: Opportunities and challenges

• Many advanced in use of breeding methods and tools allows for accelerated selection processes – however capacity with many NARS partners still low

• Seed supply of RTB crops increased in many countries significantly, but still at a low level compared with eg maize

• Private sector engagement crucial for scaling seed production has been successful – technologies for cost reduction and market demand (creation) important

• Tools and methods developed under CC 2.1. ready to be used at larger scale in the crop specific clusters

• More time and effort need to be committed by FP and CoA leaders in communication and knowledge exchange

• Cross cutting cluster needs to be supported with fundraising at flagship level
Thanks