Flagship Project 3
RESILIENT RTB CROPS

JAMES LEGG • RTB ISC F2F MEETING
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Outline

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

Closing yield gaps arising from biotic & abiotic stresses and developing more resilient production systems

Cluster Organization

Cross-cutting

CC3.1 Pest/Disease Management

CC3.2 Crop Production Systems

Crop/Pest/Disease Specific

BA3.3 Banana Fungal & Bacterial Wilt

BA3.4 Banana Viral Diseases

CA3.5 Cassava Biological Constraints: Asia/Americas

CA3.6 Cassava Biological Threats: Africa
1. Validated methods, models and tools for enhanced pest risk assessment, more accurate prediction of out-breaks, and improved pre-emptive and integrated pest and disease management in RTB

2. Pest Risk Analysis (PRA), diagnostic and surveillance strategies

3. Predictions of risks of pathogen population evolution

4. Predictions of pest and pathogen distribution, outbreaks and risks to RTB crops

5. IPM strategies to manage pests under increased globalization, intensification and future climates

Cluster Organization

1 Cluster
5 Products
19 Outputs
287 Deliverables

Product 3.1.2
“Pest Risk Analysis (PRA)”

Output 3.1.2.1
“PRAs for invasive insect Pests improve preparedness in managing biotic threats”

Deliverable 3.1.2.1.1
“PRA for the bud midge Prodiplosis longifilis for SSA countries”
2017
## Earmarked Funded Projects in FP3

<table>
<thead>
<tr>
<th>Cluster</th>
<th>Short Title</th>
<th>Type</th>
<th>Lead Centre</th>
<th>Budget ($)</th>
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</thead>
<tbody>
<tr>
<td>CC3.1</td>
<td>Pest/disease management</td>
<td>2</td>
<td>CIP</td>
<td>670,000</td>
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<tr>
<td>CC3.1</td>
<td>Pest/disease management/gender</td>
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<td>CIP</td>
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<tr>
<td>CC3.2</td>
<td>Crop production systems</td>
<td>1</td>
<td>IITA</td>
<td>100,000</td>
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<tr>
<td>BA3.3</td>
<td>Banana fungal and bacterial wilt</td>
<td>2</td>
<td>Bioversity</td>
<td>180,000</td>
</tr>
<tr>
<td>BA3.4</td>
<td>Banana viral diseases/BBTV</td>
<td>2</td>
<td>IITA</td>
<td>380,000</td>
</tr>
</tbody>
</table>
Key Scientific Achievements
CC3.1 – Management of RTB-critical pests and diseases

Pest distribution and risk atlas published online https://cipotato.org/riskatlasforafrica/ (potato, sweetpotato, vegetables & maize)
CC3.2 – Sustainable RTB Crop Production Systems

Scaling Cassava Agronomy (ACAI)

- **Field trials.** 1000s on-farm in each target country
- **GIS modelling.** Using soil and other environmental data
- **Crop modelling.** Combining variables to predict performance
- **Decision support tool.** Target to produce a farmer-friendly app
- **Scaling.** Through videos, awareness campaigns and grassroots training events
BA3.3 – Banana Fungal & Bacterial Wilt

Ex-ante analysis of losses to Fusarium Tropical Race 4

Fusarium oxysporum f. sp. cubense (Foc or Fusarium wilt Tropical Race 4) highly destructive with a long residence time in the soil.
# Results (global, 25% spread rate)

## Estimated total production area lost due to Foc per country (\%) 

| Years from now | Country        | Brazil | Burundi | Cameroon | China | Colombia | Congo, D.R. | Costa Rica | Côte d'Ivoire | Ecuador | Ghana | Guatemala | India | Indonesia | Kenya | Malaysia | Mexico | Mozambique | Myanmar | Nicaragua | Nigeria | Pakistan | Papua New Guinea | Peru | Philippines | Rwanda | Tanzania | Thailand | Uganda | Vietnam |
|---------------|----------------|--------|---------|----------|-------|----------|------------|------------|--------------|----------|--------|-----------|-------|-----------|-------|----------|--------|------------|--------|-----------|---------|----------|-----------|-------|----------|
| 1-5 yrs       |                | 0      | 0       | 8        | 0     | 0        | 0          | 0          | 0            | 0        | 0      | 0         | 0     | 0         | 0     | 0        | 0      | 0          | 0      | 0         | 0       | 0         | 0        | 0      | 0        | 0     | 0        | 8       | 0      | 0       | 8     | 0        |
| 6-10 yrs      |                | 0      | 3       | 3        | 17    | 0        | 0          | 0          | 2            | 0        | 0      | 0         | 0     | 0         | 9     | 1        | 4      | 0          | 13     | 8         | 0       | 0         | 17      | 4       | 0        | 17    | 0        | 4       | 8      | 0       | 17    |
| 11-15 yrs     |                | 0      | 6       | 6        | 28    | 1        | 4          | 1          | 5            | 1        | 4      | 0         | 2     | 0         | 14    | 3        | 7      | 0          | 20     | 17        | 0       | 1         | 27      | 9       | 0        | 28    | 1        | 9       | 17     | 1       | 28    |
| 16-20 yrs     |                | 1      | 10      | 10       | 39    | 2        | 9          | 2          | 8            | 2        | 8      | 2         | 2     | 4         | 21    | 5        | 11     | 0          | 29     | 27        | 0       | 2         | 39      | 14      | 1        | 39    | 3        | 15      | 27     | 2        | 39    |
| 21-25 yrs     |                | 2      | 15      | 15       | 51    | 4        | 15         | 4          | 12           | 4        | 13     | 4         | 7     | 29        | 8      | 15       | 2      | 38         | 38     | 1         | 4       | 50        | 21      | 2        | 51      | 5       | 21       | 38     | 4       | 51     |

- **Foc not present**: Dark gray
- **Foc present**: Beige

*Source: own illustration*

25% increase of spread every five years
3.4.4.1 Performance of at least 50 Musa hybrids against BBTV and banana aphid documented

On-farm evaluation of *Musa* cultivars for BBTV and banana aphid resistance, and selection of promising genotypes for 2018 testing in endemic areas for BBTD control.
BBTV Awareness and Training NAQS inspectors on use of CDS tool for BBTV reporting and surveillance; 23 Aug 2017, Nigeria
CA3.5 – Cassava Biological Constraints: Asia/Americas

3.5.1.2 Multi-country mitigation plan for CMD in the Greater Mekong Sub-region (GMS)

Tackling cross-boundary diseases

- **Response modules**
  1. Immediate eradication
  2. Containment & targeted quarantine
  3. Rapid *in-situ* diagnostics
  4. Fine-resolution monitoring and surveillance
  5. Vector management & resilience-building
  6. Clean seed systems / varietal resistance
  7. Awareness-raising & farmer education
Google Deep Learning Model classify cassava leaves into one of four categories (healthy, CMD, CBSD and fungal infected).

Digital Photos

Spectral Images
Infra-red imaging of cassava leaves: healthy, CMD and CBSD. > 90% accurate
Looking ahead: opportunities and challenges

Opportunities

• New RTB scaling fund

• DfID Global Challenges Research Fund (links with Imperial College CABI, RTB and NARS partners)

• Icipe-CABI-IITA plan for an African Invasive Pest Initiative. High-level workshop planned for October 30-31

• CGIAR-INSPIRE. Proposal submitted for harnessing BigData to monitoring pests and diseases of RTB crops

Challenges

• Funding? Surprisingly not. Stronger donor support in 2017

• FP structure. Two changes in Cluster Leadership in 2017
A game-changing vision of the future of pest and disease management in RTB crops?

Proof of Concept for Digital Diagnostics

https://youtu.be/479p-PEubZk
THANKS