



RESEARCH  
PROGRAM ON  
Roots, Tubers  
and Bananas

# Flagship Project 3

## RESILIENT RTB CROPS

JAMES LEGG • RTB ISC F2F MEETING  
DAR ES SALAAM, TZ SEPTEMBER 06, 2017





# 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

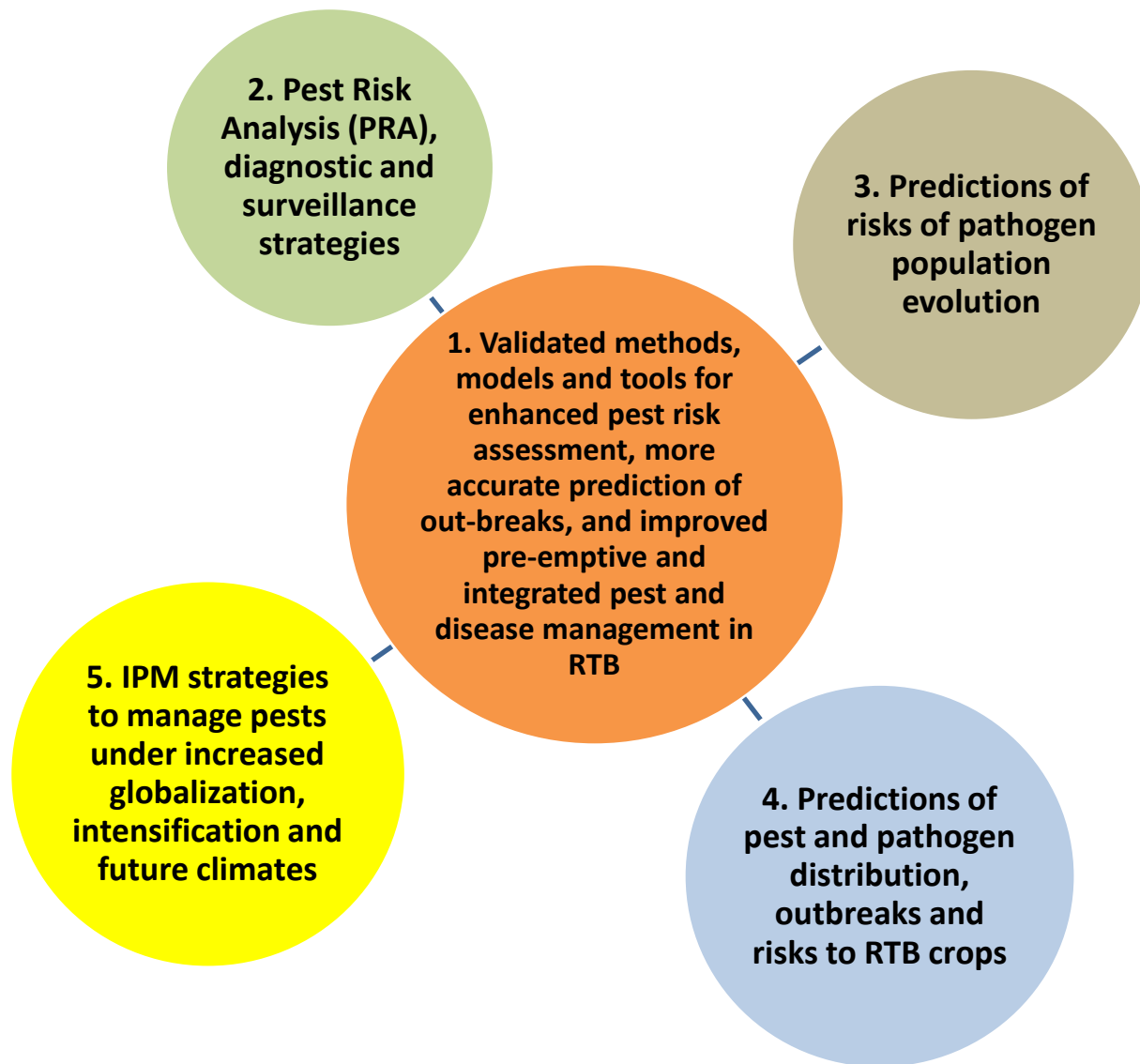
**BA3.3**  
Banana Fungal  
& Bacterial Wilt

**BA3.4**  
Banana Viral  
Diseases

**CA3.5**  
Cassava  
Biological  
Constraints:  
Asia/Americas

**CA3.6**  
Cassava  
Biological  
Threats: Africa

# FP3 – Lead and Linked Products – CC3.1



## 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 *Prodioplosis longifila* for SSA countries”  
**2017**

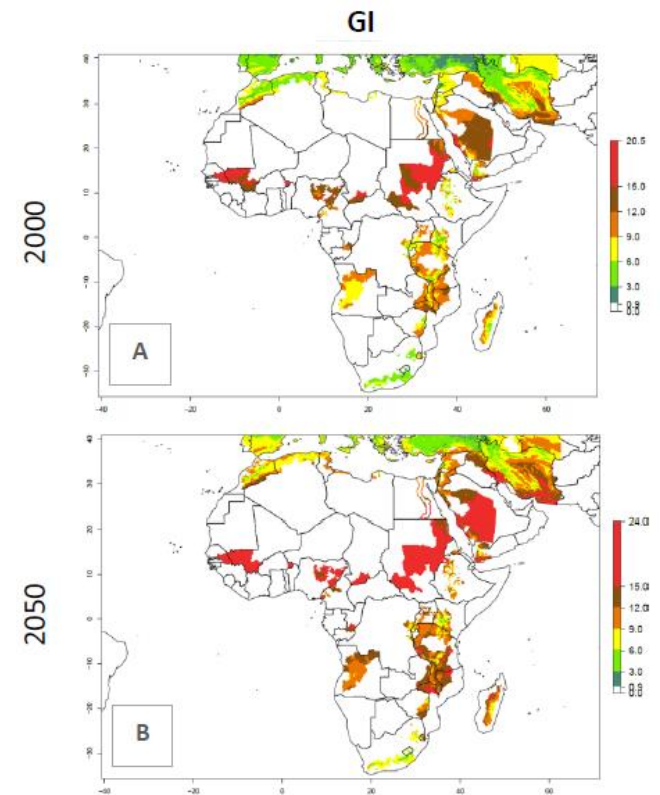
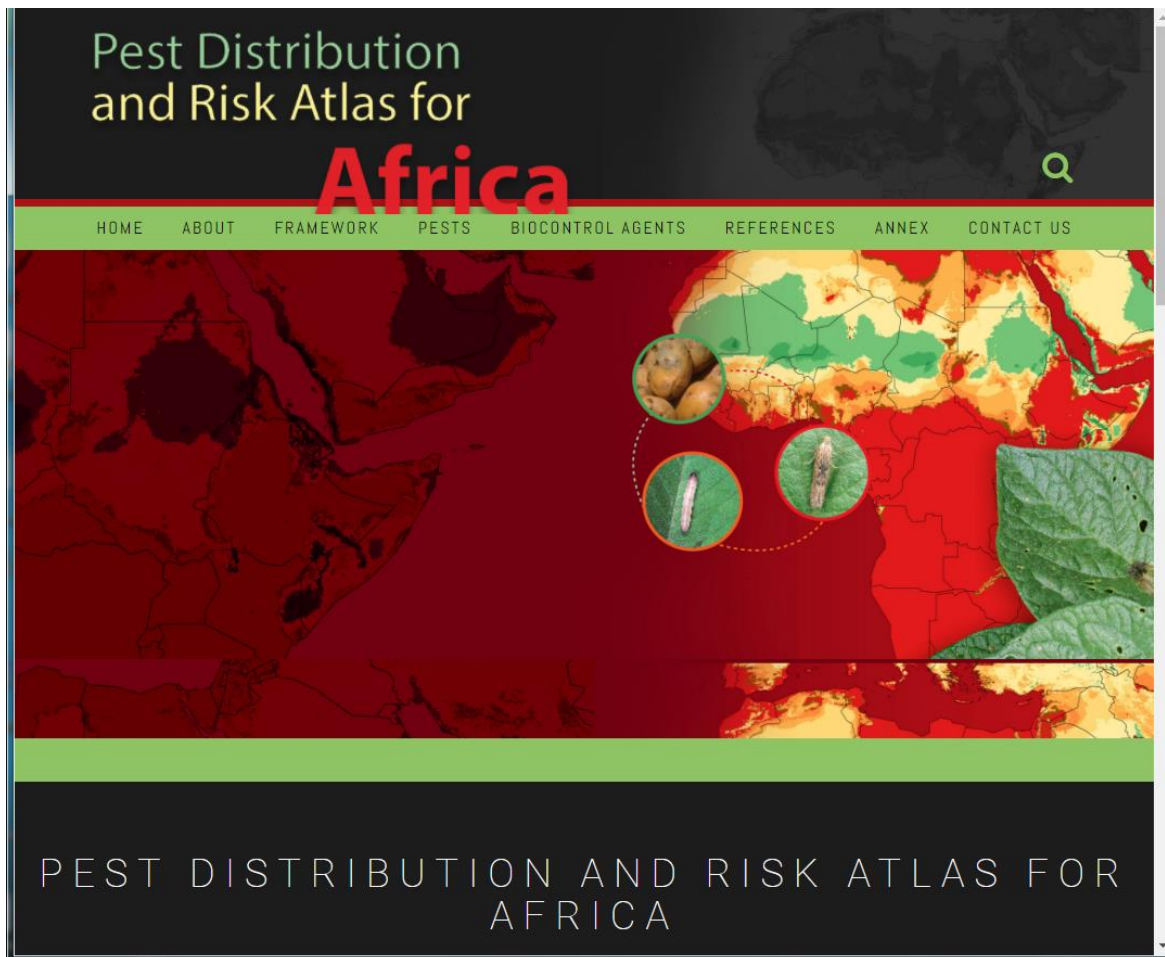
## Earmarked Funded Projects in FP3

Cluster	Short Title	Type	Lead Centre	Budget (\$)
CC3.1	Pest/disease management	2	CIP	670,000
CC3.1	Pest/disease management/gender	3	CIP	128,196
CC3.2	Crop production systems	1	IITA	100,000
BA3.3	Banana fungal and bacterial wilt	2	Bioversity	180,000
BA3.4	Banana viral diseases/BBTV	2	IITA	380,000

# 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)



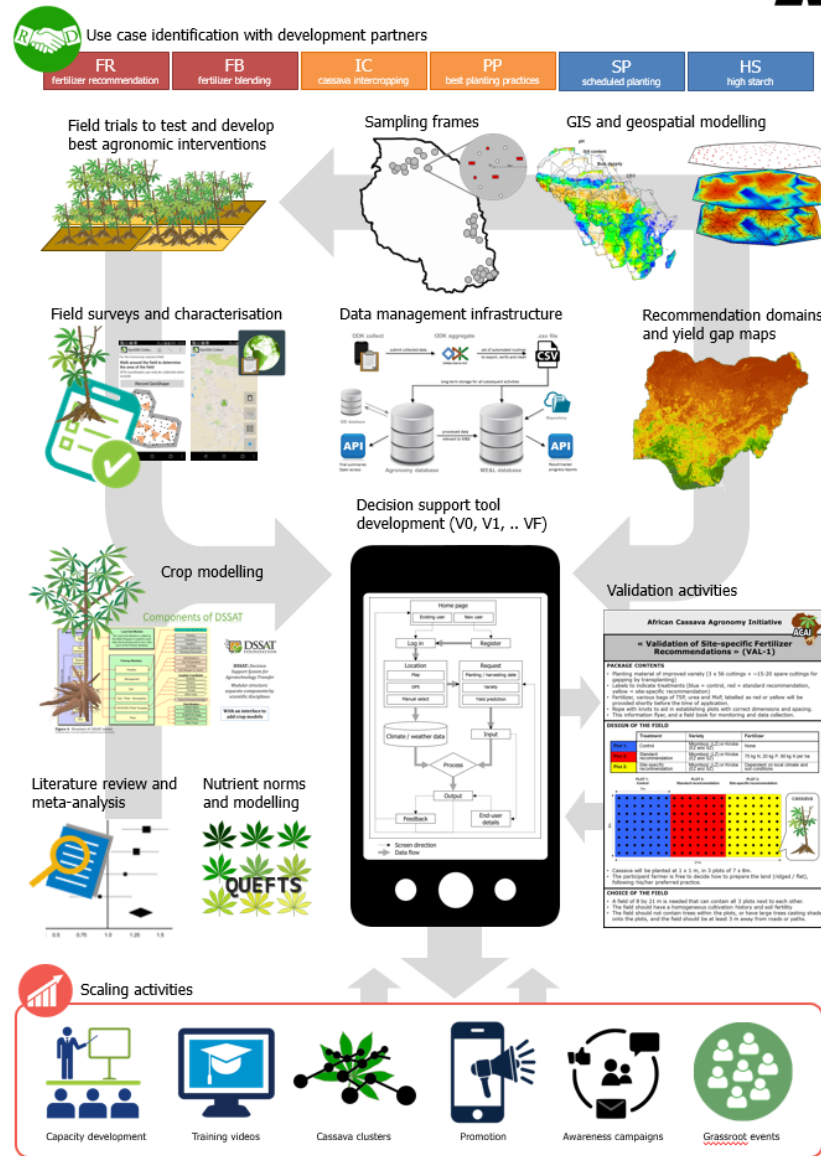




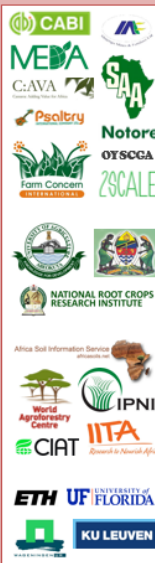
# CC3.2 – Sustainable RTB Crop Production Systems

## 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



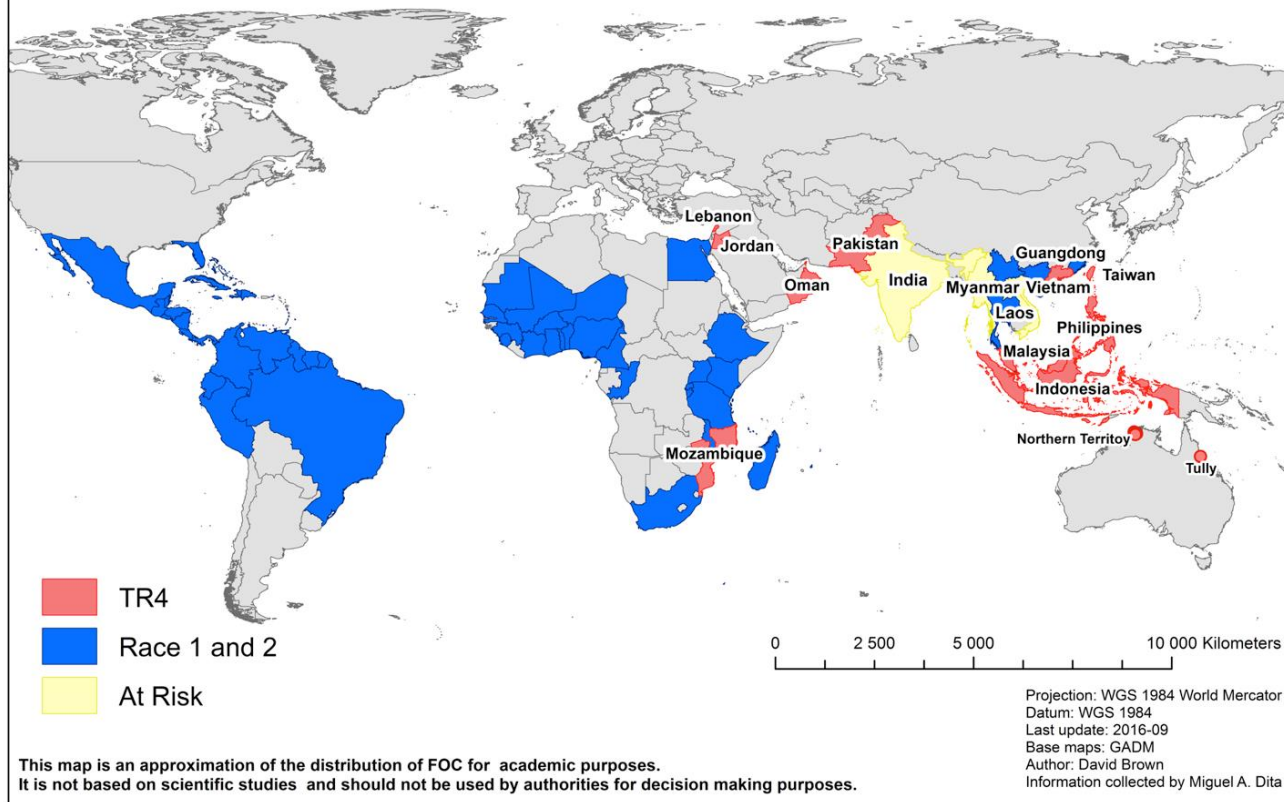
- Pieter Pypers  
Abdulai Jalloh  
Christine Kreye  
Veronica Uzokwe  
Stefan Hauser  
Theresa Ampadu-Boakyie  
Bernard Vanlauwe  
Guillaume Ezui  
Shamie Zingore  
Alex Verlinden  
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Felix Kolawole Salako  
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Geoffrey Mkamilo  
Peter Deusdeit Mlay  
Project Amos  
Wiston Mwombeki  
Grace Nwasi  
Stephen Magire  
Nancy Karanja  
Idris Saidu Garko  
Lateef Sami  
John Teri Vandi  
Oluwatoshin Oni  
Bashir Adegisan  
Thompson Ogunsamir  
Innocent Okuku  
Johan Six  
Gerrit Hooenboom  
Ken Giller  
Roel Merckx



## BA3.3 – Banana Fungal & Bacterial Wilt

### Ex-ante analysis of losses to *Fusarium* Tropical Race 4

*Fusarium oxysporum* f. sp. *ubense* (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	0	8	0	0	0	0	0	0	0	4	0	2	0	6	0	0	0	8	0	0	8	0	0	0	0	8	
6-10 yrs	0	3	3	17	0	0	0	2	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	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	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

Source: own illustration

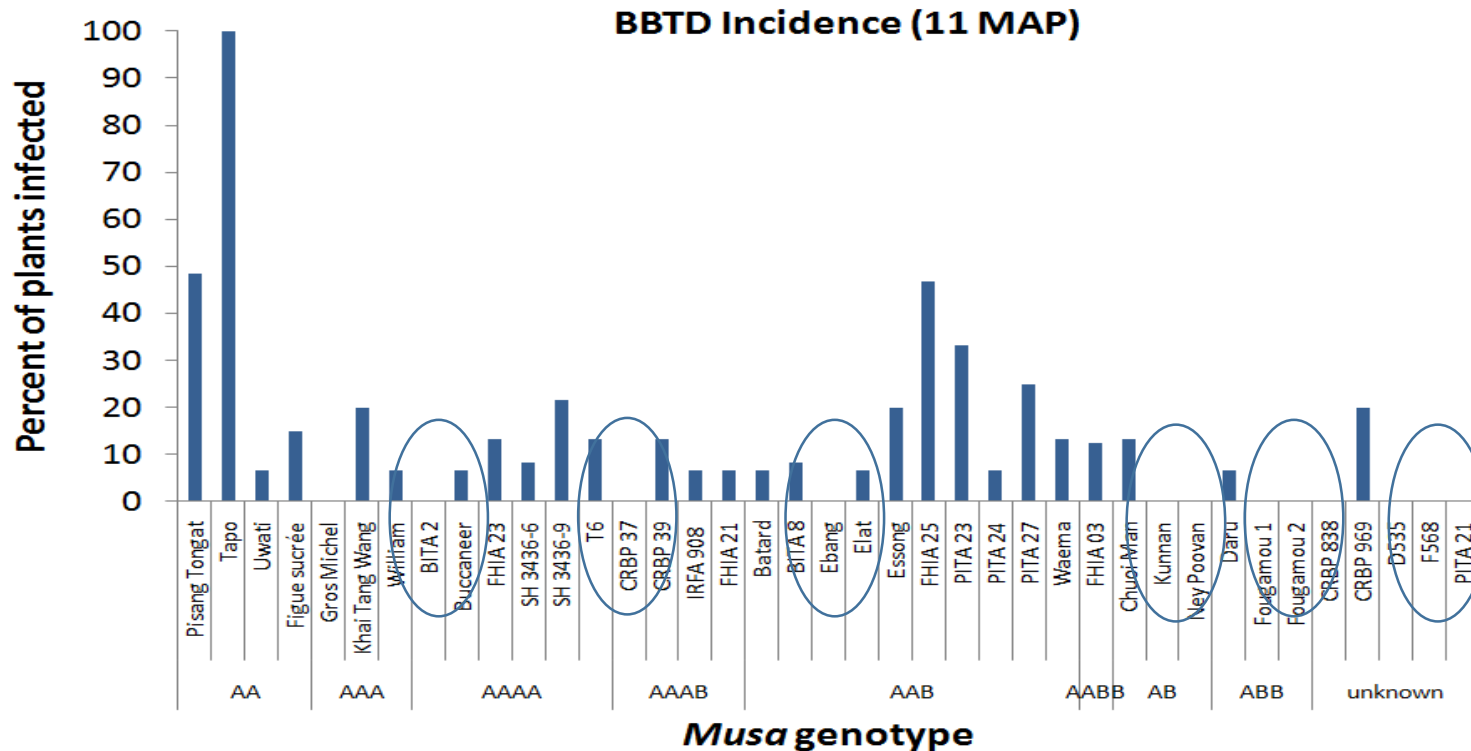
Foc not present
  Foc present

**25% increase of spread every five years**

## BA3.4 – Banana Viral Diseases

### 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 Raising



BBTV Awareness and Training NAQS inspectors on use of CDS tool for BBTv reporting and surveillance; 23 Aug 2017, Nigeria



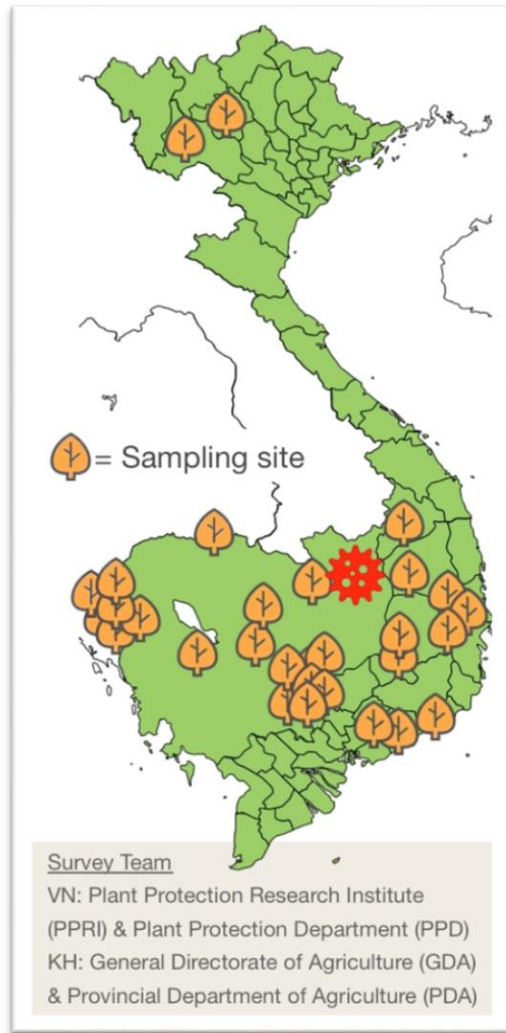


## CA3.5 – Cassava Biological Constraints: Asia/Americas

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

#### Tackling cross-boundary diseases

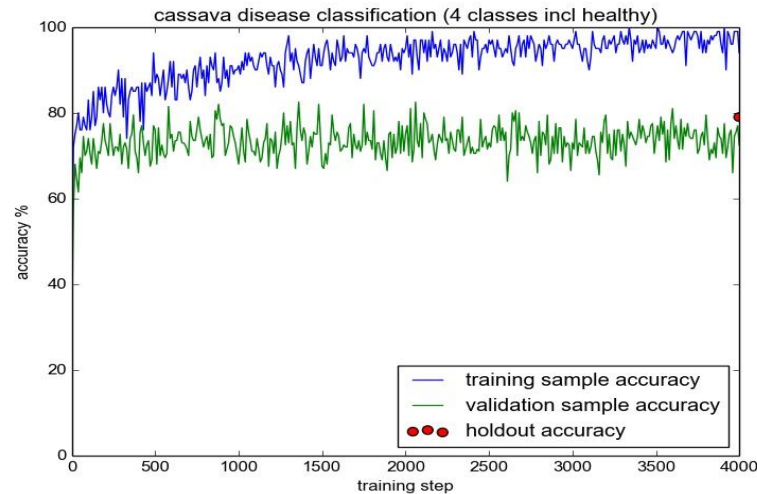
- **Response modules**
  1. **Immediate eradication**
  2. **Containment & targeted quarantine**
  3. **Rapid *in-situ* diagnostics**
  4. **Fine-resolution monitoring and surveillance**
  5. **Vector management & resilience-building**
  6. **Clean seed systems / varietal resistance**
  7. **Awareness-raising & farmer education**



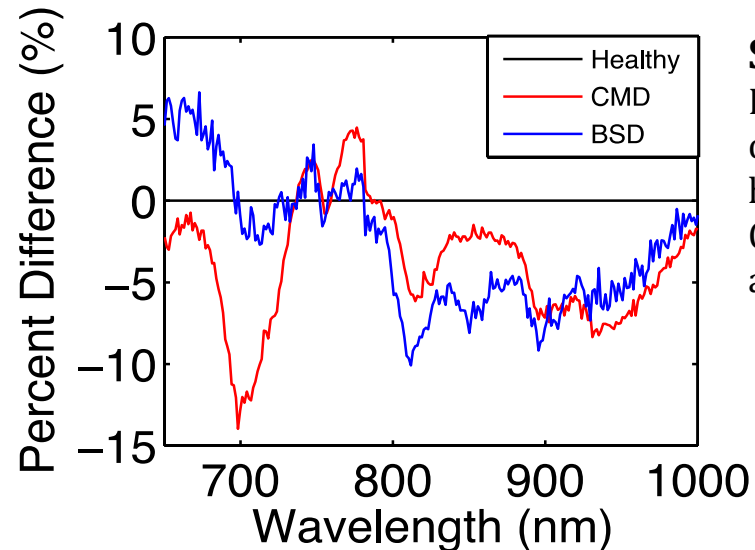
# CA3.6 – Cassava Biological Threats: Africa



## IITA, Penn State Uni. and Google



**Digital Photos**  
Google Deep Learning Model classify cassava leaves into one of four categories (healthy, CMD, CBSD and fungal infected).



**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

