

# Agricultural Biotechnology Support Project II

*Supporting agricultural development through biotechnology*

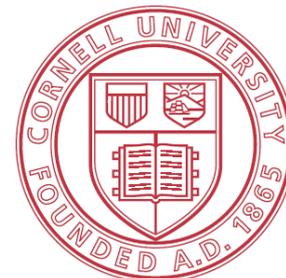
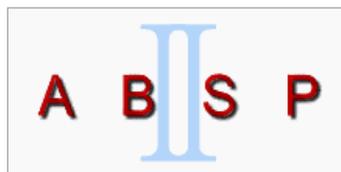
Banana improvement project in Uganda: Supporting agricultural research through Feed the Future and strong Mission involvement

**ABSP II and Product-Driven Capacity Building for Emerging Markets  
June 5, 2012, Washington, DC**

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Banana Improvement Programme

Uganda National Agricultural Research Organization



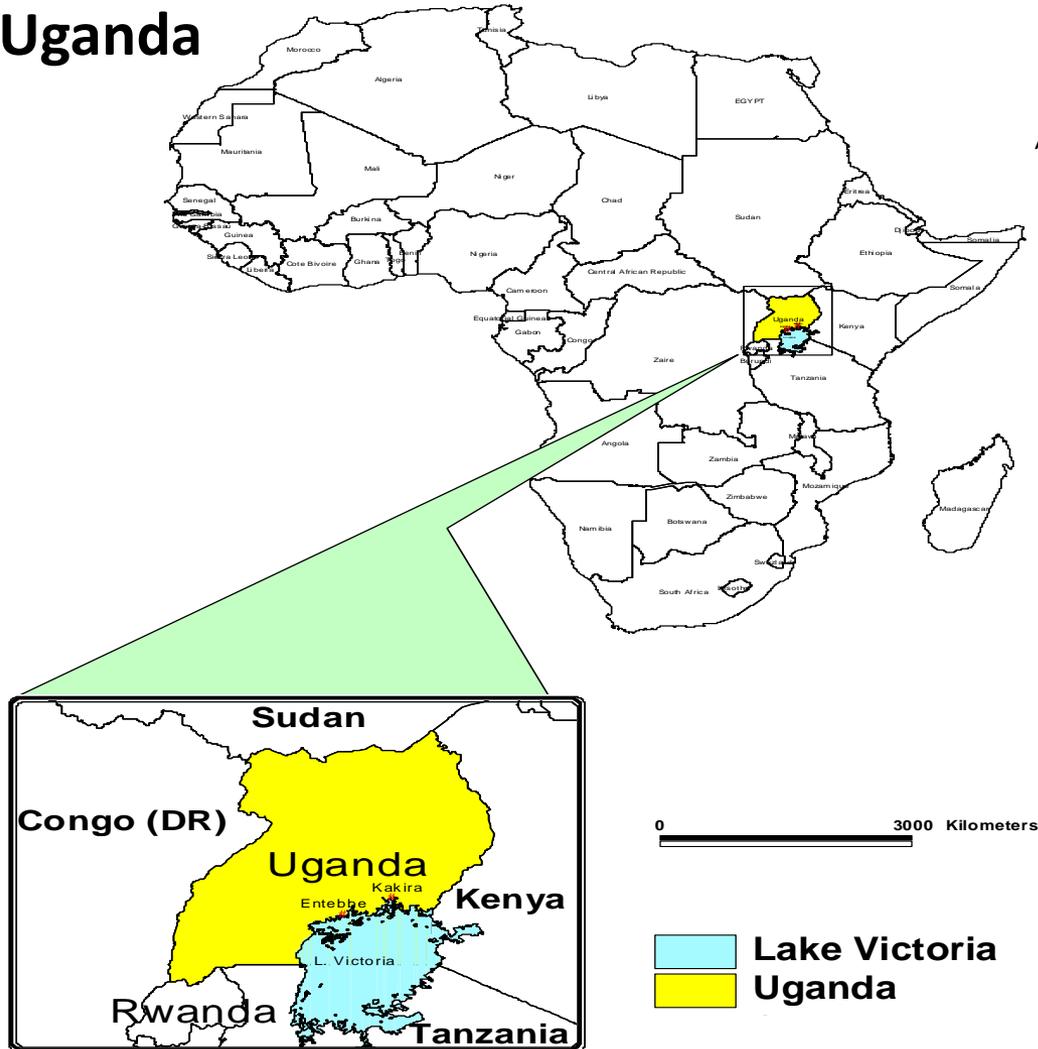
# Introduction

- Since 2002, Uganda has benefited from USAID support, through the Agricultural Biotechnology Support (ABSPII) **Leader Award** and the Uganda USAID Mission **associate award in support of biotechnology.**
- The Program is now highly successful with world class facilities and executing world class research in banana biotechnology.



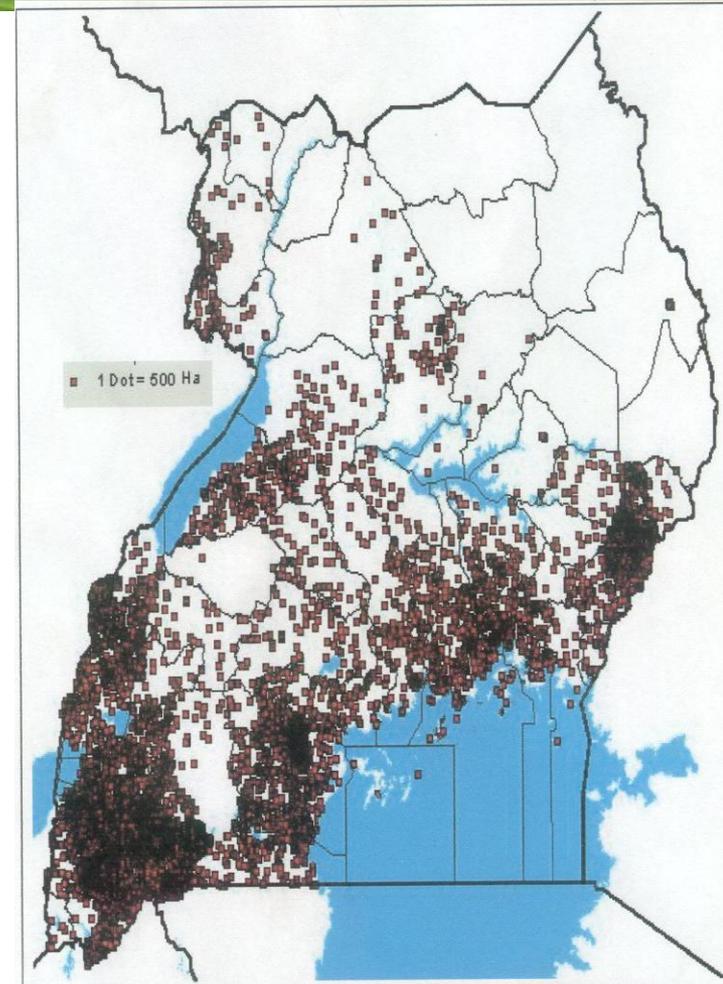
# Background

## Location of Uganda



# General Information about Uganda

- Size: Land locked east African country with land area of 241, 548 km<sup>2</sup>
- Population: About 32 Million People
- Population Growth: 3.2 % per annum
- Contribution of agriculture: 20% to GDP and 48% to exports
- Export crops: Coffee, tea, cotton and flowers
- Priority food security crops: **Banana**, maize, beans, rice, cassava, potatoes and assorted fruits and vegetables
- Bananas grown mostly in southern Uganda



# Importance of Banana in Uganda

- Most important food security crop
- Perennial ratooning crop that fruits any time of the year (unlike other fruits crops)
- Food crop least disturbed by erratic rains, a result of climate change in East Africa
- All year round provision of food and family income; growers never get famine
- Production: About 10 m MT produced annually, mostly from small holdings of about 2 acres.
- Per capita consumption: about 250kg/person/year



# Banana Diversity

East African cooking bananas account for 80% of production; plantains for 1%.



Plantain (AAB)



Apple banana (AAB)

A B S P



EA-cooking banana (AAA)



Pisang awak (ABB)



Gros Michel (AAA)

# Challenges to Banana Production

Short plantation life and low productivity due to:

- Pests (weevils, nematodes)
- Diseases( bacterial wilt, black Sigatoka, fusarium wilt, viruses)
- Soil fertility decline and long droughts
- Limited genetic diversity

# Priority Pests

## 1. Banana weevil



## 2. Banana nematodes



# Priority Banana Diseases

## 1. Banana Xanthomonas Wilt



## 2. Black Sigatoka



## 3. Fusarium wilt



# Interventions with Support from Various Donors

- 1991 -1992: Diagnosis and quantification of production problems
- Since 1993: Development of coping technologies for management of the problems (sanitation and better agronomy)
- Since 1994: Development of banana hybrids with resistance to pests and diseases through conventional breeding
- Since 2000: Development of transgenic banana genotypes with resistance to pests and better fruit quality (molecular breeding)

# The Biotechnology Program

- **In 1999:** Ugandan presidential directive to NARO to acquire and apply modern cutting-edge scientific techniques in agricultural research.
- NARO identified applying genetic engineering (molecular breeding) in crop improvement.
- **2000:** A biotechnology capacity development and research program focusing on the banana as a start up created .
- **2002:** USAID and The Rockefeller Foundation approached and start supporting the struggling program
- **2003:** A biotechnology lab established at Kawanda

# President Museveni inaugurating the biotech lab at Kawada, Kampala, in August 2003



# ABSP II in Uganda

- **2004:** USAID gave more support through the Agricultural Biotechnology Support (ABSP II) **Leader Award**
- The USAID Mission to Uganda supplemented it with **an associate award.**
- The project was designed to offer comprehensive capacity building integrated with research in biotechnology.
- The growing team attracted other projects (such as biofortification supported by the B&M Foundation) that had synergistic effect to use the created capacity

# Banana biotechnology activities supported by the ABSPII since 2004

- Development of biotechnology infrastructure (equipment, greenhouses, etc.)
- Development of human capacity and capability for molecular breeding (In service and post-graduate training)
- Development of transgenic bananas with resistance to black Sigatoka, nematodes, bacterial wilt and fusarium wilt
- Development of product communication and dissemination modules



# Progress Highlights

# Summary of Progress in capacity development

## January 2004

- No functional NBC and IBC
- No Biosafety Management structure
- Molecular lab in place but not well equipped
- Cell and tissue culture lab in place but too small for additional work
- No tech transfer capability
- No transformation capacity and capability
- No containment green house

## 2012 with USAID/ABSPII input

- Strong biosafety regulatory system (NBC & IBC) in place
- Biosafety Desk Office at the Science and Technology Council (UNCST)
- Fully equipped molecular and transformation labs
- Full capability and capacity for tech transfer and application
- Transformation capability in place and currently routine
- Containment greenhouse (Level II) in place
- Biotech lab one of the best in the world for banana transformation and the only one for the EA cooking bananas

**The capacity acquired gave the research team confidence to invite and convince President Museveni and his government to support biotechnology**



# Human capacity for molecular breeding: Developed by ABSPII and other partners

- 6 scientists fully trained to PhD
- 9 PhD students
- 4 M.SC
- 7 M.Sc students
- 11 On-job trained scientists



# Specialized greenhouse Level II for handling transgenic materials and CFTs: built by ABSPII



# Minister Of Agriculture meets USAID Mission Director at Biotech Center (Official opening of CGH Level II, August 2008)



# Technical Achievements with ABSPII Partnership

- Banana cell suspension system for EA coking bananas established
- Transformation system for banana established
- Conducted the first confined field trial of any crop in Uganda
- 65 transgenic lines of BBW resistant lines generated now under evaluation in a CFT at NARL-Kawanda; 11 resistant lines selected for multilocal and stability evaluation
- A CFT for evaluating new lines with nematode resistance genes has been approved by the NBC
- Over 1000 transgenic lines of assorted traits at various levels of characterization in Lab and greenhouses
- Over 200 transgenic lines developed by NBRP under evaluation for biofortification in a CFT at Kawanda (NARO/QUT in facility jointly supported with ABSPII)

# Confined Field Trials (CFTs)

- First confined field trial of GM bananas with genes of resistance to black Sigatoka planted in Dec. 2007.
- First CFT of any kind in Uganda
- Helped to test and establish the biosafety regulatory framework in Uganda
- Gave research team capacity to make applications for CFTs to regulators and run trials
- Team has since passed the capacity to other NARO teams (cotton, cassava, maize) and IITA



# Current Confined Field Trial Supported by USAID

Banana bacterial wilt resistance evaluation; a partnership project between NARO/IITA/AATF and ABSP-Cornell; 11 lines selected for multilocation evaluation.



# The President of Uganda strongly supports development of wilt resistant GM banana. In a recent letter to farmers he wrote:

“Experts infused genes of pepper into the banana in order to make it resistant. They are now trying it in different situations to see how it will behave. We hope we shall soon have a variety which cannot be attacked by the banana wilt.”

6 NEW VISION, Thursday, November 17, 2011

## Leaders urged to sensitise farmers on banana wilt

PICTURE BY DONALD KIIRYA

By DONALD KIIRYA

President Yoweri Museveni has urged leaders in Busoga sub-region to sensitise farmers on control measures for the Banana Bacterial Wilt (BBW) disease that has affected banana growing in the region.

Museveni cited one of the most effective measures as ensuring that garden tools used on affected plants are not used on other plants unless disinfected.

He was speaking during the opening a two-day meeting for leaders from Busoga region on the fight against BBW at Crested Crane Hotel in Jinja on Tuesday.

The meeting organised by the Office of the President under the Presidential Initiative to fight BBW was attended by chief administrative officers, Members of Parliament, district chairpersons, LC3 chairpersons, NAADS co-ordinators, district internal security officers and resident district



President Museveni (right) explains to local leaders on how to fight banana wilt

districts of Busoga. “Do not move cutting tools and infected plant parts to other gardens. Cut, heap or bury infected plants in the same plantation. Flame farm tools in fire or clean them using Jik,” Museveni said.

returned from a state visit to Israel, urged farmers to remove male buds immediately after the last cluster has formed to avoid insect visits and also use a forked stick to avoid spreading banana wilt using tools.

utilise the swamps in Busoga and engage in fish farming to earn more money. Museveni later departed for Bulambuli district to attend the burial of the late Prof. Dani Nabudere, a veteran politician, who died

# Transgenic Bananas in Greenhouse

- Over 600 transgenic banana lines with nematode resistance genes under evaluation in a green house: supported by the ABSPII
- CFT approved by the National Biosafety Committee (NBC)



# Conclusion

The project has created significant impact and made NARO a leader in advancing Africa's capacity to conduct biotech research and development. This success is attributable to:

- The innovation of two USAID awards (Leader and associate) that complemented each other to create the impact
- The synergy created by the partnership between a well facilitated NARO and International /advanced institutions.
- Strong support for biotechnology in Uganda by political leaders
- Comprehensive capacity building integrated with research
- Strong government commitment
- Long term International partnerships
- Sustained long term funding
- Empowered local institutions

# Acknowledgements

- **Funding partners**

Uganda Government,  
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- **Others**

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- **Research partners**

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- **Others**

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*Thank you*