Maruca vitrata

Legume pod borer
Proposal development grant from BMGF
Banana Xanthomonas Wilt

Bacterial disease
BXW – affects almost all cultivars
• Over-expression of genes* from sweet pepper provide enhanced resistance
• Transgenic banana evaluated under confined field trial in Uganda

*Hypersensitive Response Assisting Protein (Hrap)
Plant Ferredoxin Like Protein (Pflp)

Tripathi et al. 2010 Molecular Plant Pathology
Namukwaya et al. 2012 Transgenic Research
Nature News 2010
Nature Biotech News 2011
Wilt-resistant banana plant now available, says Museveni

Ugandan scientists grow GM banana as disease threatens country's staple food
Ban on GM crops waived after bacterial disease causes annual banana crop losses of $500m
12 lines showed absolute resistance in field for 3 generations

<table>
<thead>
<tr>
<th>Line</th>
<th>Disease severity (0-5)</th>
<th>Resistance (%)</th>
<th>Flowering No. of Days</th>
<th>Bunch Weight (kg)</th>
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</thead>
<tbody>
<tr>
<td>INU11211-02</td>
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Confined GM field tests in Uganda
Trade-offs in perennial-based systems - Coffee in Rwanda

<table>
<thead>
<tr>
<th>Plot level functions</th>
<th>Full sun monocrop</th>
<th>Shade tree monocrop</th>
<th>Banana / food intercrop</th>
<th>Polyculture system</th>
<th>Forest system</th>
</tr>
</thead>
<tbody>
<tr>
<td>Yield quantity</td>
<td></td>
<td></td>
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<tr>
<td>Yield quality</td>
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<td>External input use</td>
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<td>Nutrient recycling</td>
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<tr>
<td>Production risks</td>
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<td>Plantation life</td>
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<td>Food security</td>
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<td>CC adaptation</td>
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<td>Carbon stock</td>
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<tr>
<td>Ecological services</td>
<td></td>
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</tr>
</tbody>
</table>

*light color = low → dark color = high*
Climate change adaptation

Policy change: Mono-coffee => banana-coffee intercropping
Africa Rising –
Research In Sustainable Intensification for the Next Generation
USAIDs flagship R4D program on sustainable agricultural intensification in SSA
Mali, Ghana, Tanzania, Malawi, Zambia, Ethiopia
2011-2016
Yearly budget: 6.4 million USD

Integrated systems for the humid tropics
<table>
<thead>
<tr>
<th>Nr</th>
<th>CRP</th>
<th>Lead by</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.1</td>
<td>Integrated production systems in dry areas</td>
<td>ICARDA</td>
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<td>1.2</td>
<td>Integrated systems for the humid tropics</td>
<td>IITA</td>
</tr>
<tr>
<td>1.3</td>
<td>Aquatic agricultural systems</td>
<td>WorldFish</td>
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<td>2</td>
<td>Policies, institutions and markets (PIM)</td>
<td>IFPRI</td>
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<tr>
<td>3.1</td>
<td>Wheat</td>
<td>CIMMYT</td>
</tr>
<tr>
<td>3.2</td>
<td>Maize</td>
<td>CIMMYT</td>
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<tr>
<td>3.3</td>
<td>GRiSP - A global rice science partnership</td>
<td>IRRI</td>
</tr>
<tr>
<td>3.4</td>
<td>Roots, tubers and bananas (RTB)</td>
<td>CIP</td>
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<tr>
<td>3.5</td>
<td>Grain legumes</td>
<td>ICRISAT</td>
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<td>3.6</td>
<td>Dryland cereals</td>
<td>ICRISAT</td>
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<tr>
<td>3.7</td>
<td>Meat, milk and fish</td>
<td>ILRI</td>
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<tr>
<td>4</td>
<td>Agriculture for nutrition and health (A4NH)</td>
<td>IFPRI</td>
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<td>5</td>
<td>Water, land and ecosystems (WLE)</td>
<td>IWMi</td>
</tr>
<tr>
<td>6</td>
<td>Forests, trees and agroforestry</td>
<td>CIFOR</td>
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<tr>
<td>7</td>
<td>Climate change, agriculture, food security (CCAFS)</td>
<td>CIAT</td>
</tr>
</tbody>
</table>
Humidtropics (30%)
MAIZE (14%)
RTB (28%)
Grain Legumes (12%)
A4NH (7%)
CCAFS (2%)
WLE (4%)
Genebanks (2%)
Total budget 2013: USD +80 million
Humidtropics

New opportunities for improved livelihoods in a sustainable environment
The humid tropics

3 billion hectares of land
2.9 billion people
High proportion of poor smallholder farmers
High potential
High risk
A member of CGIAR consortium

www.iita.org

discovering / human potential
GAP
productivity / livelihood standards
ecological / human potential

↑  ↑  ↑  ↑  ↑

productivity / livelihood standards
Unlocking the potential
- Humidtropics as key

Integrated systems approach...
People
Partnerships
Production systems
Innovation
Policies
Markets
Crops & livestock
Livelihoods
Food system
Institutions...
Provide opportunities for improved livelihoods in a sustainable environment for smallholders in the humid tropics

**SOS**
- Livelihoods Improvement
- Sustainable Intensification
- Women & Youth Empowerment
- Systems Innovation

**IDOS**
- Income
- Nutrition
- Productivity
- Environment
- Gender
- Innovation
Programmatic Framework

Provide opportunities for improved livelihoods in a sustainable environment for smallholders in the humid tropics

SOs
- Livelihoods Improvement
- Sustainable Intensification
- Women & Youth Empowerment
- Systems Innovation

IDOs
- Income
- Nutrition
- Productivity
- Environment
- Gender
- Innovation

Flagship Projects
- Tier 1
  - West Africa humid lowlands
  - East and Central Africa humid highlands
  - Central Mekong
  - Central America and Caribbean
  - Cross-cutting Themes

- Tier 2
  - West Africa Moist Savanna
  - Southern Africa Moist Savanna
  - Northern Andes Transect
  - Indonesian Humid Lowlands
Representative and capture diversity
Urgent need for large-scale impacts
Advance earlier investments/projects
Build on existing and potential partnerships

1: 2012
2: 2017
3: 2020
System innovation trajectories

Livelihood status

wealthy

destitute

degraded

Ecosystem sustainability

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High systems productivity
Low NR integrity
effective institutions

Humid tropics Goals
SLOs 1-4
high NR integrity
effective institutions

Systems interventions

A: Low systems productivity
Low NR integrity
ineffective institutions

B: High systems productivity
Low NR integrity
effective institutions

C: Low systems productivity
High NR integrity
ineffective institutions

Systems interventions
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Systems Innovations

Landscape Developments

Mainstream Socio-technical regime

Innovations / Niches spawned by incubators

Landscape developments influence regime and create opportunities for change

D. New regime influences landscape

C. Dominant innovation design mainstreams and makes adjustments in the regime

B. Most promising interventions stabilize into a dominant innovation design

A. Multiple systems interventions are introduced into the system and have complex interactions (e.g. competition)

Time

(Geels, 2004)
Humidtropics – in practice

• Situation analysis => entry points (crop, farming system, market, policy…)
• People => partnerships, R4D/innovation platforms
• Integrated systems thinking => trade offs, interactions
• Multi disciplinary & multi institutional => communication & joint learning
  => synergies
• 78 million people, mainly smallholder farmers
• 29 million hectares
• Population average 263 persons/km²
• Potential in terms of water, soils, and human resources
• High poverty levels: 36% earning less than US $1.25 / day
• Food insecurity
• High levels of child malnutrition
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Agricultural components

Diversity – crops, livestock, NRM status, etc

Food security and cash crops

Banana Beans Cassava Maize Coffee

Natural resource status

Rwanda East-DR Congo

Livestock
Market functions

Socio-technical regime

Diversity – services, policy, markets, etc

Service delivery

DR Congo

Kenya

Policy environment

Website of MoA Rwanda
Coffee-banana system

Prov. Min. of Agric., Sud-Kivu, DR Congo
Entry points for system improvement
Bukavu Action Site
- Integrated management of soil and water
- Diversification of crops for improved nutrition
- Multi-purpose agroforestry
- Crop-livestock integration

Kenya Action Site
- Striga elimination
- Cassava intensification and diversification
- Legume integration
- Animal enterprises

Entry points for system improvement

Action Area meeting, Bukavu, May 2013
Collaborations and partnerships

– CGIAR Centers
  – IITA, ICRAF, ILRI, CIAT, Bioversity, IWMI
– Non-CGIAR partners
  – AVRDC, Wageningen University, icipe, FARA
– Advanced Research Institutes
  – Cirad, CSIRO, SLU…
– National research institutions
– Development organizations
– Farmer organizations

(Fund Council: W1&2 – 65% to CGIAR partners, 35% to non-CGIAR partners)
Approach for impact

• Quality of research
• Research for development (R4D)
• Close collaboration with partners
  – National Agricultural Research Systems (NARS)
  – Regional organisations (CORAF, ASARECA, FARA)
  – Farmers and farmers’ organisations
  – Private companies
  – Universities and research institutes
  – Donors
  – Development organisations
• Capacity development
• Gender mainstreaming
Improved status of gender equity
Better control over inputs (time, money, land) and benefits

Management, Leadership and Participation Equity

Research Implementation Issues
- Gender Sensitive Interventions
- Female Farmers Activities
- Gender Disaggregated Data
- Gender in Society

Gender Awareness Action

Mainstreaming Gender in R4D

Gender Equity Strategy Development

Weak current status of gender equity
Collecting gender disaggregated data
Goal: Self employment based on R4D training at IITA
What we do

- Maize seed
- Soybean
- Plantain and Banana suckers multiplication
- Cassava root and stems

The selected crops were chosen because of their high demand and current market values
• Nigeria produces only 6% of the seeds we consume

• In a bid to bridge this gap, we are involved in the production of high yielding and good quality planting materials:
  • Bio-fortified Pro-vitamin A cassava
  • Pro-vitamin A maize
  • Banana and plantain
  • Soybean
Future plan

• To expand our production
• Creation of agribusiness in Nigeria and other African countries
• To be trainer of trainers
• To become independent and self employed in agriculture (e.g. as consultants collaborating with private sectors interested, both processing and seed)
Capacity development
Graduate training undertaken in 2012

Graduate students carried over from 2011

<table>
<thead>
<tr>
<th>Level</th>
<th>M</th>
<th>F</th>
<th>Total</th>
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<tbody>
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<td>BSc</td>
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<td>2</td>
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<tr>
<td><strong>Total</strong></td>
<td><strong>67</strong></td>
<td><strong>21</strong></td>
<td><strong>88</strong></td>
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Capacity development

Graduate training undertaken in 2012

Graduate students recruited

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<th></th>
<th>M</th>
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<tbody>
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<td>PhD</td>
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<tr>
<td>BSc</td>
<td>19</td>
<td>9</td>
<td>28</td>
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<tr>
<td><strong>Total</strong></td>
<td><strong>64</strong></td>
<td><strong>35</strong></td>
<td><strong>99</strong></td>
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</tbody>
</table>
Group training activities in 2012

161 courses
131 locations
2731 females
7380 males
By dealing with the research to commercialization gap, IITA strengthens its impact delivery.

- Research
- Development
- Commercialization
- Farmers

Basic and applied research → Commercialization of research outputs

1. Align research activities with market needs
2. Increasing visibility
3. Facilitate training and technology transfer
4. Manage PPP initiatives and attract private and public funding
5. Creation of synergies and bringing new knowledge

Research park concept
Bridge between research and dissemination
Aflasafe factory under construction

Capacity: 5 tons/hour or 4 000 ha/shift
### MAIZE: Aflatoxin reduction (%)

<table>
<thead>
<tr>
<th>Stage</th>
<th>2009</th>
<th>2010</th>
<th>2011</th>
</tr>
</thead>
<tbody>
<tr>
<td>Harvest</td>
<td>82</td>
<td>94</td>
<td>83</td>
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<tr>
<td>Storage</td>
<td>92</td>
<td>93</td>
<td>x</td>
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</table>

71% and 52% carry-over of inoculum 1 & 2 years after application.

### PEANUT: Aflatoxin reduction (%)

<table>
<thead>
<tr>
<th>Stage</th>
<th>2009</th>
<th>2010</th>
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<tbody>
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<tr>
<td>Storage</td>
<td>100</td>
<td>80</td>
<td>x</td>
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</table>

Results from 382 on-farm trials.
Vision of success - 2020

11 million Africans out of poverty
7.5 million hectares of land into sustainable use
Vision of success - 2020

11 million Africans out of poverty
7.5 million hectares of land into sustainable use

Strategy for measuring progress is being developed
- Poverty reduction – Social science team
- Sustainable land use – NRM team
Thank you
Thank you