BANANA INDUSTRY STRATEGIC S&T PROGRAM

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Executive Director
PCAARRD
OUTLINE OF PRESENTATION

• PCAARRD-DOST
• ISP Framework
• Banana Industry Situationer
• Technology Chain and Interventions
• Industry Strategic S&T Program for Banana, 2013-2016
• Network of Implementers
• M&E and Feedback Mechanism
PCAARRD-DOST Industry Strategic S&T Programs (ISPs)

• PCAARRD is the lead Council that addresses the DOST Outcome 1.

• PCAARRD crafted the ISPs which use a **Convergence of Technologies Approach** to produce world-class technologies, tools, know-hows, and innovations, and to help achieve the DOST Outcome 1.
PCAARRD-DOST Industry Strategic S&T Programs (ISPs)

The ISPs are commodity-based long-term S&T plans with operational strategies for the industry.

The ISPs feature:

- Target Industry Outcomes (Baseline and Benchmark Targets)
- S&T Interventions (Banner Programs)
- Network of Implementers
## PCAARRD’S ALIGNMENT WITH DOST’S NATIONAL HARMONIZED R&D AGENDA

### POVERTY ALLEVIATION AND INCLUSIVE GROWTH

<table>
<thead>
<tr>
<th>Countryside Development (373,794,845)</th>
<th>Competitive Industries (130,635,748)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>CROPS:</strong></td>
<td><strong>CROPS:</strong></td>
</tr>
<tr>
<td>Abaca, <strong>BANANA</strong>, Cacao, Coconut, Coffee, Yellow Corn, Legumes, Root crops, Sugarcane, Other tropical fruits (durian, jackfruit, papaya, pineapple)</td>
<td>Coconut, <strong>BANANA</strong>, Abaca, Cacao, Coffee, Mango</td>
</tr>
<tr>
<td><strong>FORESTRY:</strong></td>
<td><strong>FORESTRY:</strong></td>
</tr>
<tr>
<td>Bamboo, ITP, Rubber, Sago</td>
<td>Rubber</td>
</tr>
<tr>
<td><strong>INLAND AQUATIC:</strong></td>
<td><strong>INLAND AQUATIC:</strong></td>
</tr>
<tr>
<td>Aquafeeds, Mussels</td>
<td>Milkfish, Tilapia, Shrimp, Mudcrab</td>
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<tr>
<td><strong>LIVESTOCK:</strong></td>
<td><strong>LIVESTOCK:</strong></td>
</tr>
<tr>
<td>Goat, Swine</td>
<td>Goat, Swine, Dairy Buffalo, Duck, Native Chicken</td>
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<tr>
<td><strong>MARINE:</strong></td>
<td><strong>MARINE:</strong></td>
</tr>
<tr>
<td>Abalone, Oyster, Blue Swimming crab</td>
<td>Seaweeds, Sardines, Sea Cucumber, Tuna</td>
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</tbody>
</table>
Economic Importance

• The Philippines is the 3rd largest producer of banana in the world next to India and China (FAO, 2012)

• Banana is the 4th largest agricultural produce of the Philippines in 2012 (9.23Mmt; US$ 2.34B)

• Major banana varieties produced: Cavendish (50%), Saba (30%) and Lakatan (11%)
Economic Importance/ Situationer

In 2012

• Industry provided employment to about 330,000 Filipino farmers
• 288M boxes produced generated PhP2.3B percentage tax
• Estimated total revenue of PhP74.4B
• Threatened by Fusarium wilt TR4
Economic Importance/ Situationer

- Most popular dessert banana in the Philippines
- Planted by backyard/smallhold farmers
- Very susceptible to BBTV, Sigatoka, and Fusarium wilt
Economic Importance/Situationer

• Most popular cooking-type banana in the Philippines
• Commonly planted in smallhold/backyard farms
• Takes 18-24 months from planting to initial harvest
• Raw material for banana chips
• Philippine Banana Chips Industry - $48 M export in 2011 (DA 2012)
• Export value – rising 15% annually since 2009 (www.gmanetwork.com 2012)
OUTCOMES: Reduced incidence of Foc TR4 on Cavendish in Mindanao by 90-95%; Increased average yield of Lakatan (from 21.58 mt/ha to 34.52 mt/ha); Reduced incidence of banana bunchy top virus (BBTV) in Lakatan (from 70% to 20%) by 10%; Increased production of Saba for banana chips production by 33% per cropping season.

BANANA INDUSTRY STRATEGIC S&T PLAN

Production
- Varietal Improvement / Selection
- Production of Planting Materials
- Cultural Management Practices
- Pest Management

Post-Production and Processing
- Processing / Value Adding
- Post Harvest Handling
- Harvesting

Trade and Marketing
- Marketing

Problems / Gaps / Constraints
- S and T Interventions
- Results of Interventions
- Benefits

Legend:
- No on-going initiatives
- On going initiatives
- 2015 Initiatives
- Both On-going and 2015 initiatives

Genetics and quality planting materials
Cultural Management Practices
Processing and Machineries
Socio-economic Research & Marketing
### ISP Interventions, Deliverables, and Potential Impacts

#### Varietal Improvement/Selection - Cavendish

<table>
<thead>
<tr>
<th>Industry Problem</th>
<th>S&amp;T Gaps</th>
<th>S&amp;T Interventions</th>
<th>Deliverables</th>
<th>Potential Impact</th>
</tr>
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</table>
| Fusarium wilt tropical race 4 (Foc TR4) can wipe out Cavendish industry in Mindanao if not addressed | Lack of suitable Foc TR4 – resistant planting materials as substitute for Cavendish banana for export | • **Adaptability** trial for Foc TR4-resistant varieties (GCTCV 105, 106, 119, 215, 218, 219, and 247) under Philippine conditions  
• **Market-acceptability** study of *Foc* TR4-resistant varieties | • Giant Cavendish Tissue Culture Variant (GCTCV) somaclones resistant to Foc TR4 under Philippine conditions  
• **Market-acceptable** Foc TR4-resistant GCTCV somaclones | Reduce incidence of Foc TR4 by 95%                                           |
### Production of Planting Materials - Cavendish

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</table>
| Unavailability of Foc TR4-resistant variety for commercial production | Lack of market-acceptable Foc TR4-resistant Cavendish for commercial production | • Upgrading/improvement of existing tissue culture laboratories  
• Expand plantings of Foc TR4-resistant GCTCV somaclones in affected areas in Mindanao | • Availability of at least 1.27M GCTCV planting materials  
• Replanted at least 635 ha of Foc TR4 infected areas with market-acceptable GCTCV somaclone | Reduce incidence of Foc TR4 by 95% |
<table>
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<tbody>
<tr>
<td>Ripening stage for GCTCV somaclones not yet optimized</td>
<td>Postharvest handling/ripening of GCTCV somaclones not yet optimized</td>
<td><strong>Optimization of ripening and postharvest handling protocol for GCTCV somaclones</strong></td>
<td>Postharvest handling protocol and ripening regime for GCTCV somaclones</td>
<td>GCTCV somaclones ready for commercial market</td>
</tr>
<tr>
<td>Industry Problem</td>
<td>S&amp;T Gaps</td>
<td>S&amp;T Interventions</td>
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</table>
| High incidence of Banana Bunchy top Virus (BBTV) in Lakatan* | Difficulty in controlling BBTV in Lakatan | Multi-location trial of BBTV-resistant Lakatan in Regions 2, 4, & 11 | • Most suitable BBTV-resistant Lakatan in Regions 2, 4, & 11  
• Integrated protocol for the management of BBTV using resistant varieties | 10% reduction of BBTV infection |

*BBTV-infection in well-managed farm – 5%; medium-managed farm – 20%; traditionally-managed-farm – 75%
## ISP Interventions, Deliverables, and Potential Impacts

### Cultural Management Practices - Lakatan

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<thead>
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<th>Potential Impact</th>
</tr>
</thead>
</table>
| Available technologies for Lakatan production not utilized by farmers | Low adoption of technologies for banana production | **Application and documentation of best package of technology (POT) for Lakatan banana** | • Increased yield of Lakatan & Saba by 12% in Region 12  
• Established techno-demo plots for Lakatan & Saba in Aurora province  
• 100% increase in yield & increased area planted to Lakatan in Cavite | Increase in yield in selected areas: Region 12 - 12%  
Regions 3 and 4 - 100% |
# ISP Interventions, Deliverables, and Potential Impacts

## Postharvest Handling: Lakatan

<table>
<thead>
<tr>
<th>Industry Problem</th>
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<tbody>
<tr>
<td>Lack of alternative biocontrol for postharvest diseases</td>
<td>Lack of biological control against postharvest diseases in fruits</td>
<td><strong>Yeast application to control postharvest pathogens</strong></td>
<td>Formulated yeast biocontrol agent against postharvest pathogen in fruits</td>
<td>Alternative biological control against postharvest diseases.</td>
</tr>
</tbody>
</table>
## ISP Interventions, Deliverables, and Potential Impacts

### Varietal Improvement/ Selection: Saba

<table>
<thead>
<tr>
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<th>S&amp;T Interventions</th>
<th>Deliverables</th>
<th>Potential Impact</th>
</tr>
</thead>
<tbody>
<tr>
<td>Difficulty harvesting Saba/ Cardaba due to its height and heavy bunch</td>
<td>Lack of short stature Saba/ Cardaba which are easier to harvest and could better withstand effects of typhoon</td>
<td><strong>Field characterization and multi-location performance testing of putative dwarf Saba/ Cardaba</strong></td>
<td>Identified at least 2 best performing dwarf Saba in Regions 2, 4, &amp; 11</td>
<td>Increase in yield by 33% per cropping season due to use of dwarf Saba that is early maturing and easy to harvest</td>
</tr>
</tbody>
</table>
Banana ISP 2013-2014: PCAARRD Outcome-based ISPs

Looking Forward: 2015
DOST OUTCOME 1: Science-based know-how and tools that enable agriculture sector to raise productivity to world-class standards

OUTCOME: BANANA

- Up to 100% increase in yield of Lakatan in selected areas in Aurora and Cavite; 95% reduction in Fusarium wilt Tropical Race 4 infection in Davao and Compostela Valley
- Reduction in banana bunchy top disease incidence from 70 to 20% in selected areas in Quirino, Cavite, Laguna, Quezon and Davao City

<table>
<thead>
<tr>
<th>Strategy/Action Plan</th>
<th>TARGETS</th>
<th>2013-2014 Resource Req’ts (PhpM)</th>
<th>Supporting Entities</th>
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<tbody>
<tr>
<td></td>
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<tr>
<td>Cavendish</td>
<td></td>
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<tr>
<td>1 S&amp;T Management Approaches against Fusarium wilt on Cavendish in Mindanao</td>
<td>Established 10 private grower farms showcasing performance of 7 GCTCV somaclones; Enhanced 3 greenhouse facilities; PCR Laboratory; Distribution map of Fusarium wilt in Mindanao</td>
<td>Performance of 7 GCTCV somaclones in private-grower farms in Mindanao; Biocontrol-agent combinations against Foc TR4</td>
<td>13.796</td>
</tr>
<tr>
<td>2 Boosting the Cavendish Banana Industry thru Mass Propagation and Improvement of Postharvest Handling of Foc TR4- resistant GCTCV Somaclones</td>
<td></td>
<td>25</td>
<td>TBRI, Bioversity International, SMARRDEC, Private growers, BPI-DNCRDC, UPLB, UP Mindanao,</td>
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<tr>
<td>3 Gene marker association of economically important traits in banana (proposed)</td>
<td></td>
<td></td>
<td>20</td>
</tr>
<tr>
<td>Lakatan</td>
<td></td>
<td></td>
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<tr>
<td>4 Multi-location performance evaluation of a new banana bunchy top virus (BBTV)-resistant Lakatan cultivar (ongoing)</td>
<td>Mass-produced BBTV- resistant lakatan lines for distribution to identified farmer-cooperators</td>
<td>Established at least 5 farmer-cooperator and demonstration farms using BBTV-resistant lakatan</td>
<td>5.93</td>
</tr>
<tr>
<td>5 Enhanced Productivity of Lakatan and saba/Cardaba in Region 12 (ongoing)</td>
<td>Established at least 12 ha. of small-hold banana farms showcasing banana production w/ various interventions for lakatan and saba/cardaba</td>
<td>Established at least a total of 24 ha. of small-hold banana farms showcasing banana production w/ various interventions for lakatan and saba/cardaba</td>
<td>2.491</td>
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<tr>
<td>6. Promotion and Commercialization of selected technologies to improve banana (Lakatan &amp; Saba) production in Aurora province (ongoing)</td>
<td>Enhanced tissue culture lab and nursery</td>
<td>0.521</td>
<td>ASCOT</td>
</tr>
<tr>
<td>7. Yeast application for biocontrol of postharvest pathogens of fruits (ongoing)</td>
<td>Identified potential yeast cultures, potential carriers &amp; mode of application in fruits to control postharvest pathogens</td>
<td>Effective yeast biocontrol agent against banana fruit rot; Cost-benefit analysis of the product</td>
<td>UPLB</td>
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<tr>
<td>Ex-Ante Analysis of the ISPs on Crops (ongoing)</td>
<td>Collected info and relevant data; Conducted FGD and survey for the analysis of the Banana ISP</td>
<td></td>
<td>UPLB</td>
</tr>
<tr>
<td></td>
<td>Information on more appropriate, effective and efficient set of S&amp;T interventions to improve the various commodity-industries/information on economic value of ISP; Recommendations on how to improve the Banana ISP</td>
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<tr>
<td>Saba</td>
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<tr>
<td>Multi-location performance evaluation of Saba strains w/ short stature and field evaluation of irradiated Saba and cardaba (new)</td>
<td></td>
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</tr>
<tr>
<td></td>
<td>Mass-produced dwarf Saba for distribution to selected farmer-cooperators; Enhanced tissue culture lab</td>
<td>8.199</td>
<td>UPLB</td>
</tr>
</tbody>
</table>
ACCOMPLISHMENTS

Identified top 3 performing microbial agents against FW

Highlight of Accomplishments

BANANA

- Farmer-selected, market-acceptable Giant Cavendish Tissue Culture Variants (GCTCV) suited under Philippine condition were already identified
- Assisted 88 farmer cooperators in the establishment of banana and coconut integrated farming systems in Compostela Valley and Davao Oriental
- Produced 7,509 plantlets and 120,505 meriplants of Lakatan and Cardaba for distribution to interested growers in Southern Mindanao
- Produced and distributed 138,512 meriplants and 92,287 plantlets in Regions 3, 11, and 12
- Identified top 3 performing microbial agents against FW
Network of Implementers
Banana (2013-2016)

Region 4A
(CALABARZON)
UPLB, CvSU,
Bioversity
International

Region 11
SMARRDEC, BPI-
DNCRDC, USeP,
SPAMAST, Lapanday
Foods Corp., UP
Mindanao

Region 2
ISU, QSU,
NVSU

Region 12
USM, SKSU,
CCSPC

Most Immediate Activities

- Upgrading of virus indexing facilities of selected laboratories
- Promotion in managing Foc TR4
  a) Use of resistant variety with integrated management
  b) Fertilizer management to improve finger formation
  c) Ripening technology
- Training
  a) Organic fertilizer + microbes resistant to Foc TR4
  b) Resilience strategies; banana + coconut production

Our partner: Taiwan Banana Research Institute
M&E and Feedback Mechanism

Stakeholders
- Commercial banana growers
- MBFEA and small independent farmers/progressive growers
- Small-hold farmers

Partners
- Bioversity International
- BPI
- Lapanday Foods Corp.
- LGUs
- PBGEA
- SCUs
- TBRI
- UP (Los Banos, Mindanao)
Thank you for your attention!

Philippine Council for Agriculture, Aquatic and Natural Resources Research and Development (PCAARRD)

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