Translated Research:
Flood and Drought Resilient Agriculture in Bihar, India

Tony Castleman
Catholic Relief Services
Improved Rainfed Rice-Based Agricultural Systems (IRRAS)

- Flood-prone and drought-prone areas
- Smallholders (< 0.5 ha) w/rainfed land
- Two phases
  - 2012-2016: Adaptive research pipeline and knowledge exchange
  - 2016-2019: Disseminating and scaling technologies and practices
- Carried out by CRS, IRRI, local research institutions and implementing partners with BMGF funding (first phase)
Phase 1 Objectives

1. Develop and refine agricultural technologies and practices for smallholder farmers in stress-prone, rainfed rice based systems using an adaptive research pipeline

2. Foster a knowledge exchange platform to share and disseminate technologies and practices developed through the research pipeline
Phase 2 Objectives

1. Strengthen and expand **dissemination mechanisms** for specific IRRAS technologies and practices

2. Enhance productivity of smallholder farmers in stress prone areas through **widescale adoption** of IRRAS technologies and practices
Delivering practical, research-driven solutions to global development challenges

Research for Development Conference (R4D), May 2019, Uganda

Adaptive Research Pipeline

Year 1

On-station trial → Data

Collaborative Screening

Year 2

On-farm trial

Something didn’t work out well.

Modify and try again

Untested technology

= Scientists

• The TAC

• IRRI, CRS, BMGF

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Data
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Adaptive Research Pipeline

Year 1
- On-station trial
- Untested technology

Year 2
- On-farm trial
- Promising, tested technology

Year 3
- Village demo
- Well-tested technology
- Data

Screen =
- KVK
- Farmers
- Scientists
- TAC
- IRRI, CRS, BMGF

Supporting institutions:
- USAID
- Purdue University
- CRS
- University of Notre Dame
- Indiana University
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Adaptive Research Pipeline

Year 1
- On-station trial

Year 2
- On-farm trial
- Promising, tested technology

Year 3
- Village demo
- Well-tested technology

Final Screening:
- Demo and observer farmers
- NGO partner staff
- TAC, CRS, IRRI

Roll-out to 175,000 farmers via Knowledge Exchange platform

Untested technology

Promising, tested technology
Knowledge Exchange Platform

Knowledge Exchange Actors

Large Traders
Input Supply Companies
NGOs
DoA
KVKs
Universities
Print Media
ATMA
BAMETI
BRLBN
Farm Radio
Local Input Vendors
Progressive farmers
Jeevika
ICAR

Adaptive Research Pipeline

Interaction
Awareness
Valuing
Uptake
Sharing

Kharif, Year 1
On-station trial
Promising, tested technology

Kharif, Year 2
On-farm trial
Well-tested technology

Kharif, Year 3
Village demo

Technologies and Practices Developed/Refined

- Stress tolerant crop varieties - flood and drought resilient rice varieties and improved varieties for rainfed dry season crops like wheat, lentils, chick peas
- Package of practices, e.g. zero tillage, line sowing, and direct seeding
- Customized chemical weed control
- Rice Wheat Crop Manager (RWCM) ICT application for site specific crop management recommendations (adapting IRRI application)
- Customized fertilizer application for drought and flood areas
- Seed treatment for rice, wheat and pulses
- Improved seed storage to reduce losses to pests and increase germination
## Impacts of Technologies

<table>
<thead>
<tr>
<th>IRRAS Technologies</th>
<th>Yield Increase</th>
<th>Increase in B:C Ratio</th>
</tr>
</thead>
<tbody>
<tr>
<td>Stress Tolerant Rice Varieties (STRVs)</td>
<td>20-47%</td>
<td>5-22%</td>
</tr>
<tr>
<td>STRVs + Best Management Practices</td>
<td>30-103%</td>
<td>15-20%</td>
</tr>
<tr>
<td>Improved Varieties of Dry Season crops</td>
<td>17-19%</td>
<td>22-38%</td>
</tr>
<tr>
<td>Dry Season Varieties + Best Management Practices</td>
<td>17-67%</td>
<td>12-20%</td>
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</tbody>
</table>
Direct Seeded Rice
Translation Vehicles

- User-friendly materials for range of users – farmers, input dealers, PSPs, extension agents
- Trainings and curricula for PSPs, others
- Radio spots
- Community events (crop-cutting, observations, sharing)
- Cost and cost-benefit data
  - Technologies
  - PSP approach to scaling
  - Adaptive research pipeline
Materials

PROTECT YOURSELF!

PESTICIDE EXPOSURE via SKIN ABSORPTION

SWARNA-SUBI (SSI)

Day 1: Planting to preparation of seedling
Day 2: Planting to preparation of earthen pot
Day 3: Planting to planting in the field
Day 4: Planting to final thinning
Day 5: Planting to installation of irrigation
Day 6: Planting to planting in the field
Day 7: Planting to final thinning
Day 8: Planting to installation of irrigation

Parasites

<table>
<thead>
<tr>
<th>Pesticide</th>
<th>Type</th>
<th>Rate</th>
<th>Hazard Class</th>
<th>Pesticide PER (kg)</th>
<th>Toxicity</th>
</tr>
</thead>
<tbody>
<tr>
<td>Endosulfan</td>
<td>Insecticide</td>
<td>100g</td>
<td>C</td>
<td>10</td>
<td>Low</td>
</tr>
<tr>
<td>DDT</td>
<td>Insecticide</td>
<td>25g</td>
<td>D</td>
<td>5</td>
<td>Medium</td>
</tr>
<tr>
<td>Carbaryl</td>
<td>Insecticide</td>
<td>50g</td>
<td>B</td>
<td>2</td>
<td>High</td>
</tr>
</tbody>
</table>

USAID
FROM THE AMERICAN PEOPLE

PURDUE UNIVERSITY

CRS

UNIVERSITY OF NOTRE DAME
Dissemination Platforms

- Private service providers (PSPs) – farmers, laborers, entrepreneurs
- State government extension services
- State government disaster management authority (disaster risk reduction)
- National Bank for Agriculture and Rural Development
- Jeevika: State rural livelihoods mission
- Local partners, other NGOs, integration in other projects
- Communication campaigns – radio, materials, mobile units
A Few Lessons

• Involve government extension services early and throughout
• Local NGOs play important dual role – farmer feedback and ground-truthing, and supporting translation, implementation
• Costing data help translation and application
• Adaptive research and translation takes time, especially when need to wait for next season to refine technology
• Link to other initiatives – research and practice
Thank You