

GRiSP: Global Rice Science Partnership

Bas Bouman, GRiSP Director

- Importance of rice and the need for GRiSP
- Science-based products and partnerships for impact at scale along well-defined impact pathway; time-line across Impact pathway
- More than genes...



Research
Program on
Rice

Global Rice
Science
Partnership

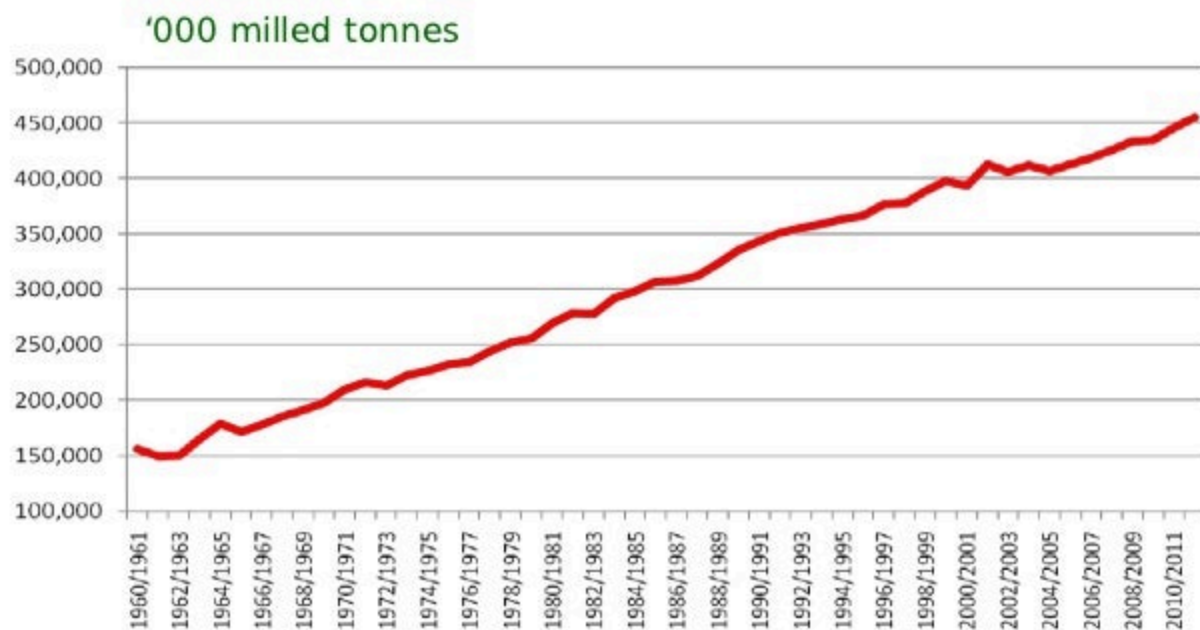


Why Rice - Why GRiSP?



Research
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- 120 million rice farmers feed 3.5 billion people
- 1 billion people extremely poor and hungry depend on rice – more coming...
- Political commodity; rice riots slowdown



No slowdown in
global rice
consumption

Rice fastest
growing food
commodity in
SSA





**From 7 to 9 billion.... mostly in cities in
Asia and Africa => more rice**





**Future: less and more expensive resources
(water, energy, labor, fertilizers, crop protection)**

**More hostile environment (climate change):
drought, floods, salinity, heat**

Global challenge and global threats

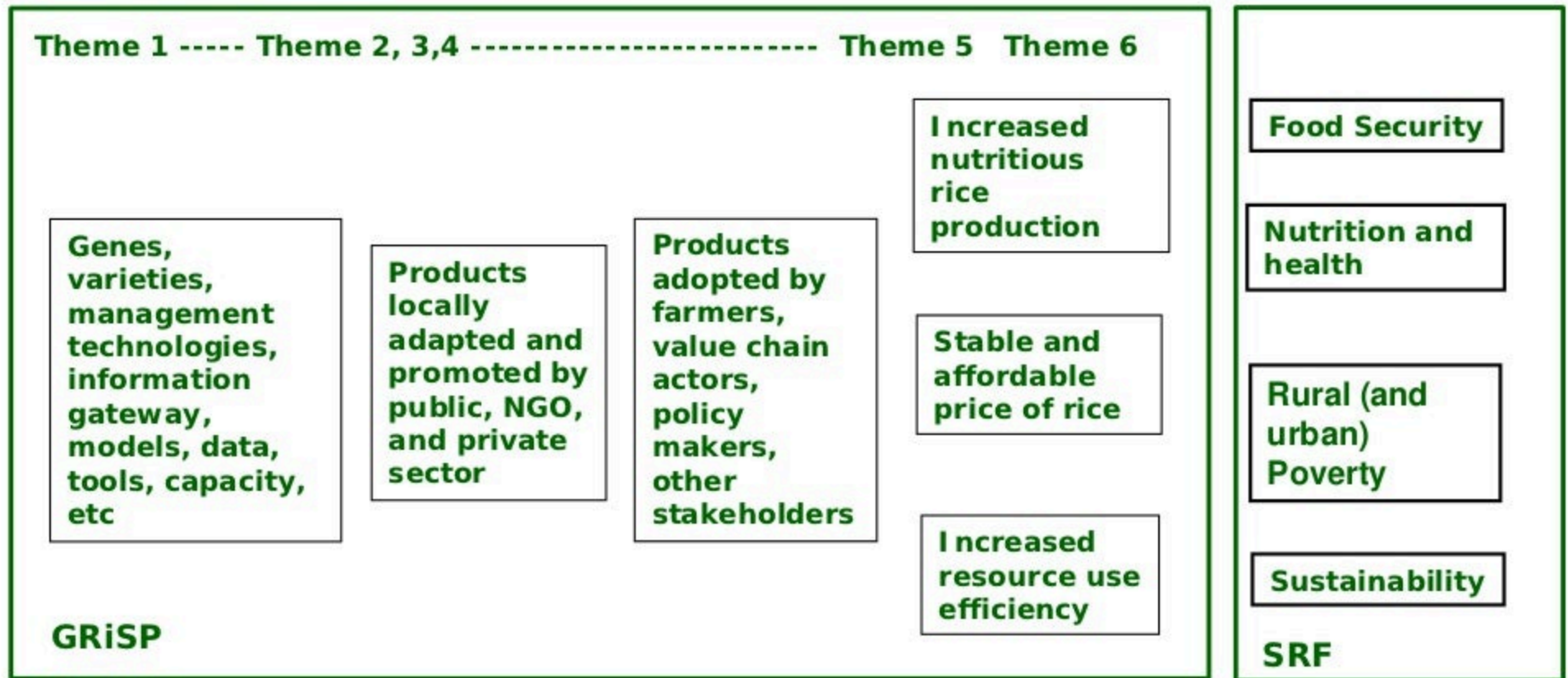
⇒ need for concerted global action

⇒ need for GRiSP



Science partnerships

Development partnerships



Timeline

Discovery - invention - innovation - bringing to market

Products

Intermediate Development Outcomes

Impact

Farmers:

1000s

10.000s

100.000s

millions



Example products: nutrient management, flood tolerance, salinity tolerance



11 M ha flood prone

Major rice granaries in deltas: climate change and sea water rise exacerbate flooding and salinity



12 M ha salt affected



Algae bloom in Shuitaozhuang reservoir (水涛庄), China

Fertilizers: sometimes too much...

sometimes too little...



Product: Nutrient-management advice

Web



Smartphone



GSM mobile



Nutrient Manager for Rice Philippines Version 2.1

Back

Name: Juan
Cellphone number:
Location: Cebu, Negros Occidental, Region III
(Using irrigation canal)
Field size: 1.5 ha
Variety: IRRI Rc222 (Palagan 18)

Rice crop per year: two
Season: dry season
Dewet month: 101-110 days from seed to harvest

From this page, you can go to the home or database screen, save data, or print out a report. You can also go to the help or about page.

The recommended fertilizer rate is:

Recommended rice yield (t/ha):

| Growth stage | DAS** | Attainable yield*** (47-100 t/ha or 50 kg/ha or 5.0 t/ha (14% N/C) |
|--------------------|-------|--|
| Early* | 12-14 | 14-14-14: 3 bags |
| Active tillering | 20-22 | area 2: 7 bags |
| Panicle initiation | 43-47 | area 2: 7 bags |

Reported current yield: 4.3 t/ha (14% N/C)

Nutrient Manager for Rice Philippines Version 2.1

Home

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Database

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IRRI

PHILRICE

Local Language real time interaction



SMS output

Web and smart phone output

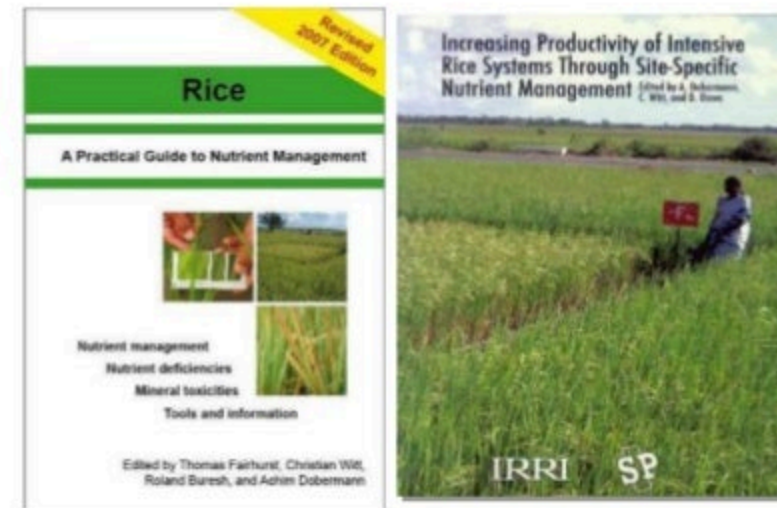
Indonesia,
Philippines: farmers
increase returns
100\$ per ha



16 years of research provides the science for 'precise' field-specific nutrient management



16-year partnerships (1996-2012)



Science is well documented

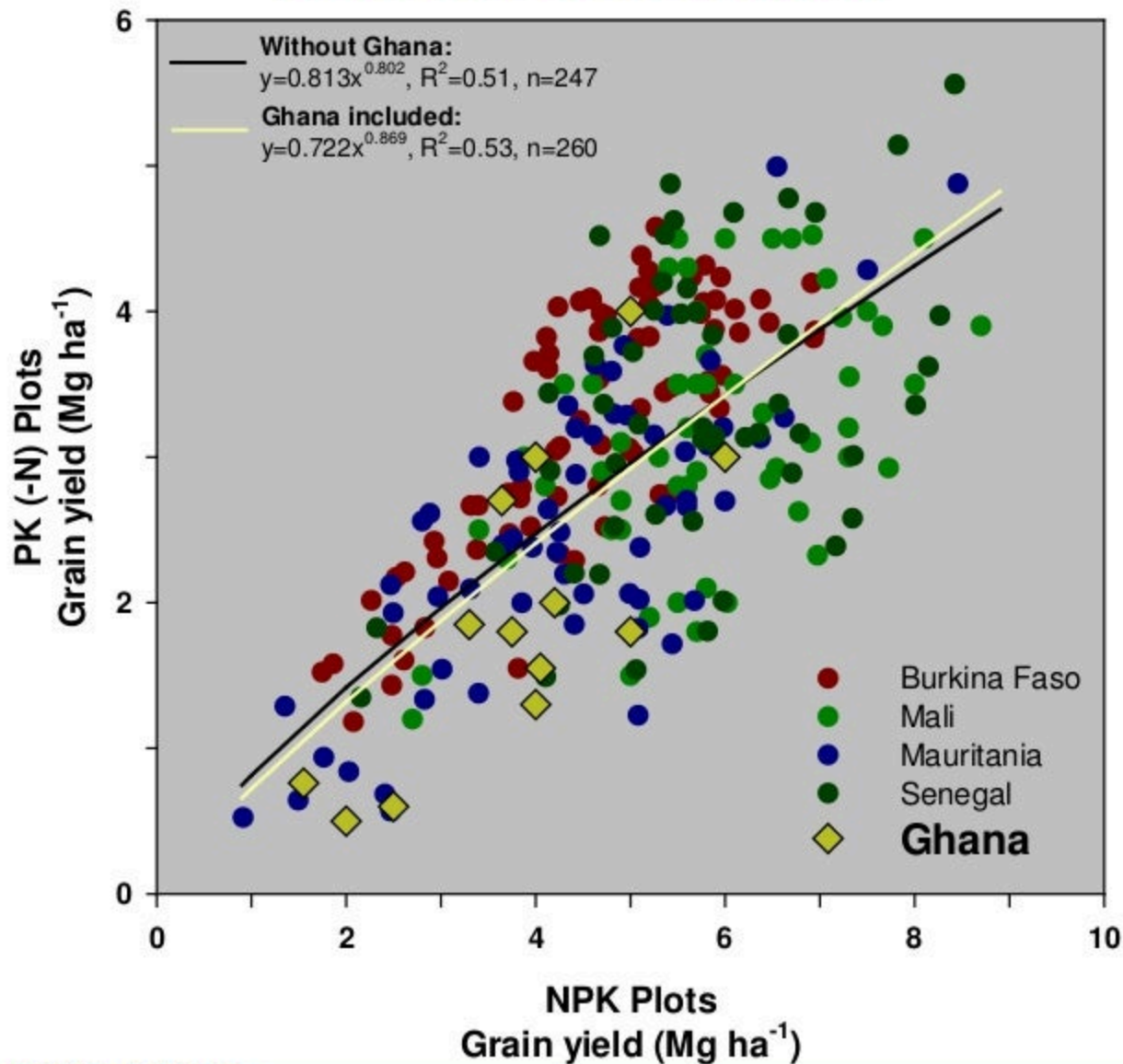


| | 1990 | 1995 | 2000 | 2005 | 2010 | 2015 | 2020 |
|--|--|--|--|--|--|--|--|
| Conceptual framework | Conceptual framework based on QUEFTS for maize | Conceptual framework of QUEFTS adapted for rice | Principles of SSNM developed for rice | Principles of SSNM developed for maize | Mobile phone & Web-based SSNM decision tools | SSNM tools integrated into value chain | SSNM & crop management integrated across value chain |
| Key research partners | | China, India, Indonesia, Philippines, Thailand, Vietnam for rice | Mauritania, Senegal for rice | Bangladesh, Myanmar for rice | SE Asia for maize | SE & S Asia, W & E Africa for rice | Indo-Gangetic Plains for rice/wheat |
| Key delivery partners | | | NARES, NGOs, private sector in 8 Asian countries | | Bangladesh, India, SE Asia, Africa for maize | NARES, local government, private sector, NGOs in Bangladesh, China, India, Indonesia, Nepal, Myanmar, Philippines, Vietnam; W, E, and S Africa | |
| Delivery strategies/ milestones | | | Printed regional guidelines for rice: 40 for 7 Asian countries | CD decision tool for rice: Philippines & Indonesia | IT-based SSNM decision tools for rice, maize, and wheat: 2015: >20 for >15 countries | IT-based crop management tools for systems: 2020: national use in >10 countries | |
| Adoption levels achieved | | | SSNM principles used in fertilizer recommendations for rice in 7 Asian countries | | 2015: SSNM-based practices used by >3 million farmers | 2020: SSNM with improved crop management used by >10 million farmers | |



Moving into Africa (2011-...)

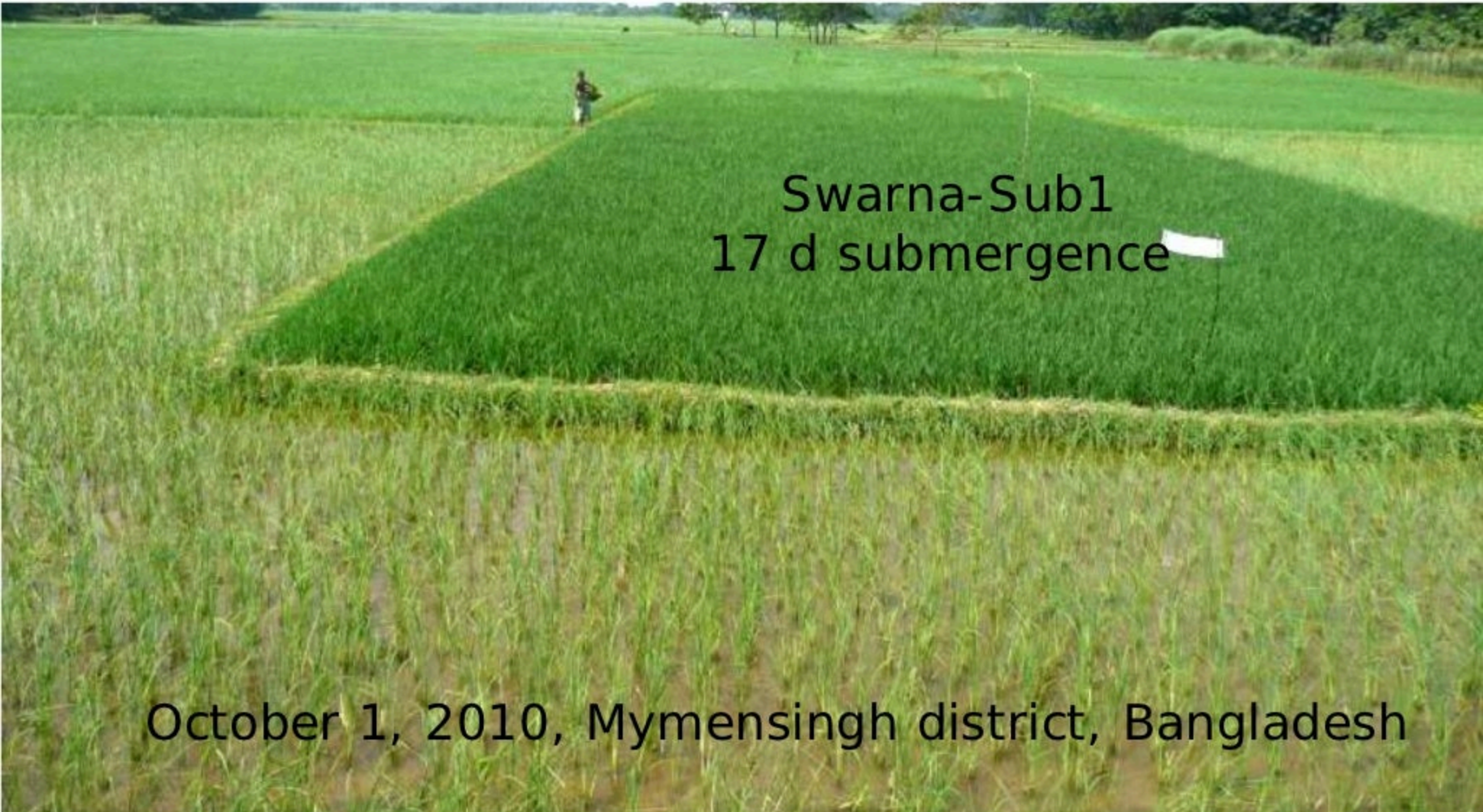
Local model calibration



Kano State,
Nigeria

Target Domains

Product: Submergence-tolerant rice



Swarna-Sub1
17 d submergence

October 1, 2010, Mymensingh district, Bangladesh

> 25 years of 'discovery science': gene, markers,...



Farmers' submergence tolerant landraces collected; FR13A

Gene bank screened; FR13A identified

Semi-dwarf & submergence tol. combined

First high-yielding dwarf varieties

1950

1978

1990

2000

2010

1995: Sub1 mapped to Chr. 9
Fine mapping & marker development initiated

2002: Swarna crossed with IR49830-7 (Sub1)

2006: Sub1-A gene conferring submergence tolerance

2006: Swarna-Sub1 developed by marker assisted backcrossing

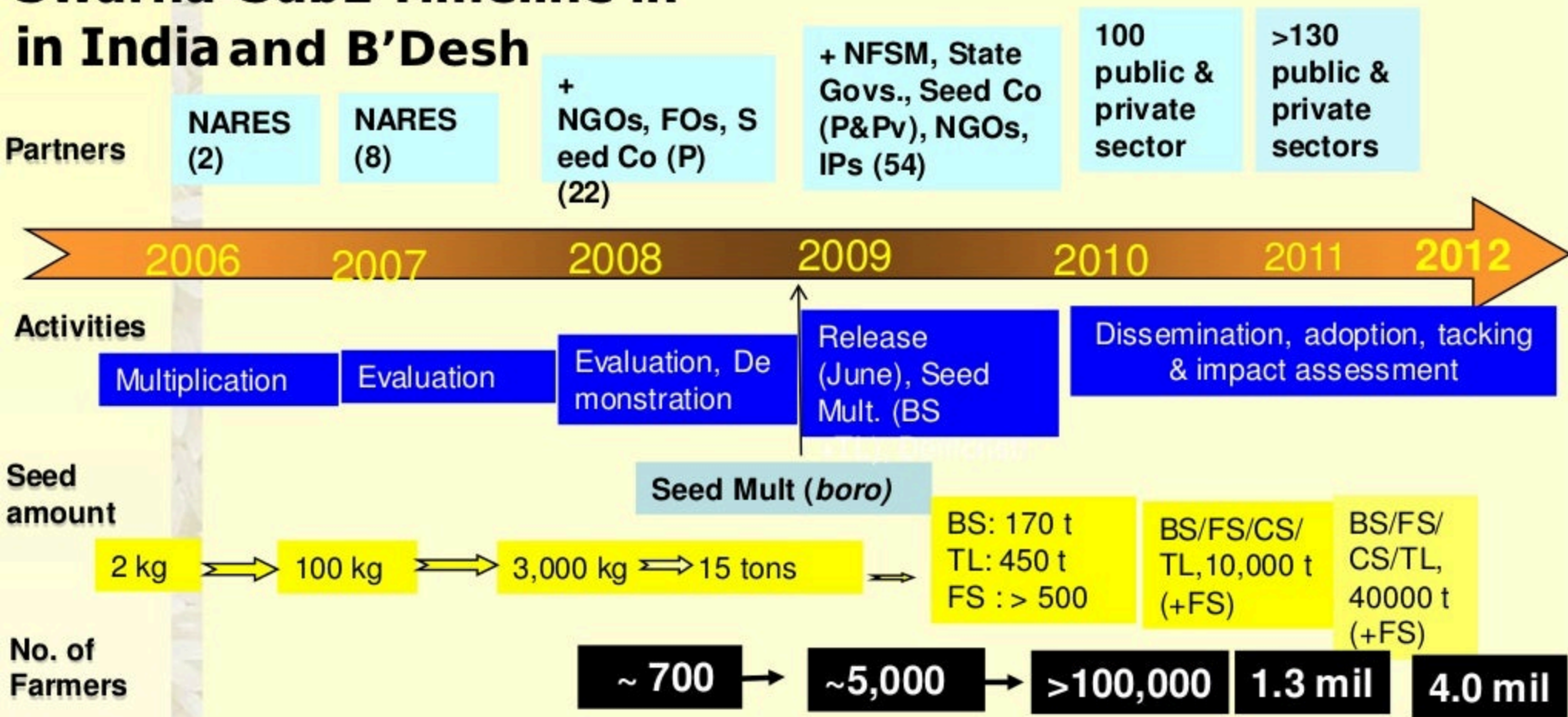
2008: Sub1-A mode of action: inhibit response to GA

2009: Swarna-Sub1 released in Indian, Indonesia, IR64-Sub1 in Indonesia, Philippines

2010: Two Sub1 varieties released in Bangladesh



Swarna-Sub1 Timeline in India and B'Desh



Swarna-Sub1 reached about 3 million farmers in India and 0.5 million in Bangladesh by 2012

New Products: 2 in 1, Submergence + salinity tolerance

Combined tolerance of salinity and submergence is now being evaluated in target sites in Asia.



**10 days submerged
in saline water**

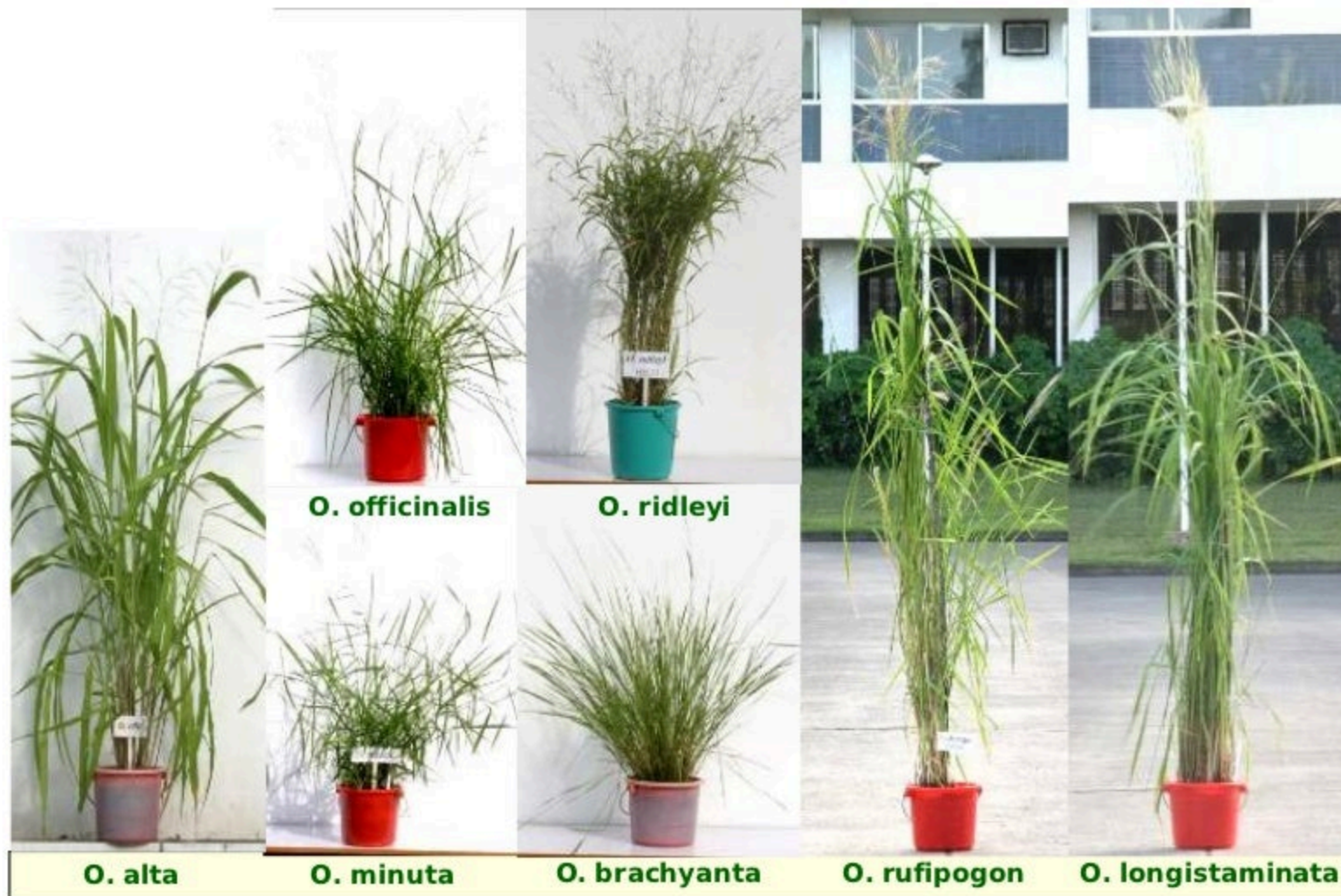


Sub1 only

SalTol+ Sub1



New Products “Rebooting evolution”



Useful Traits

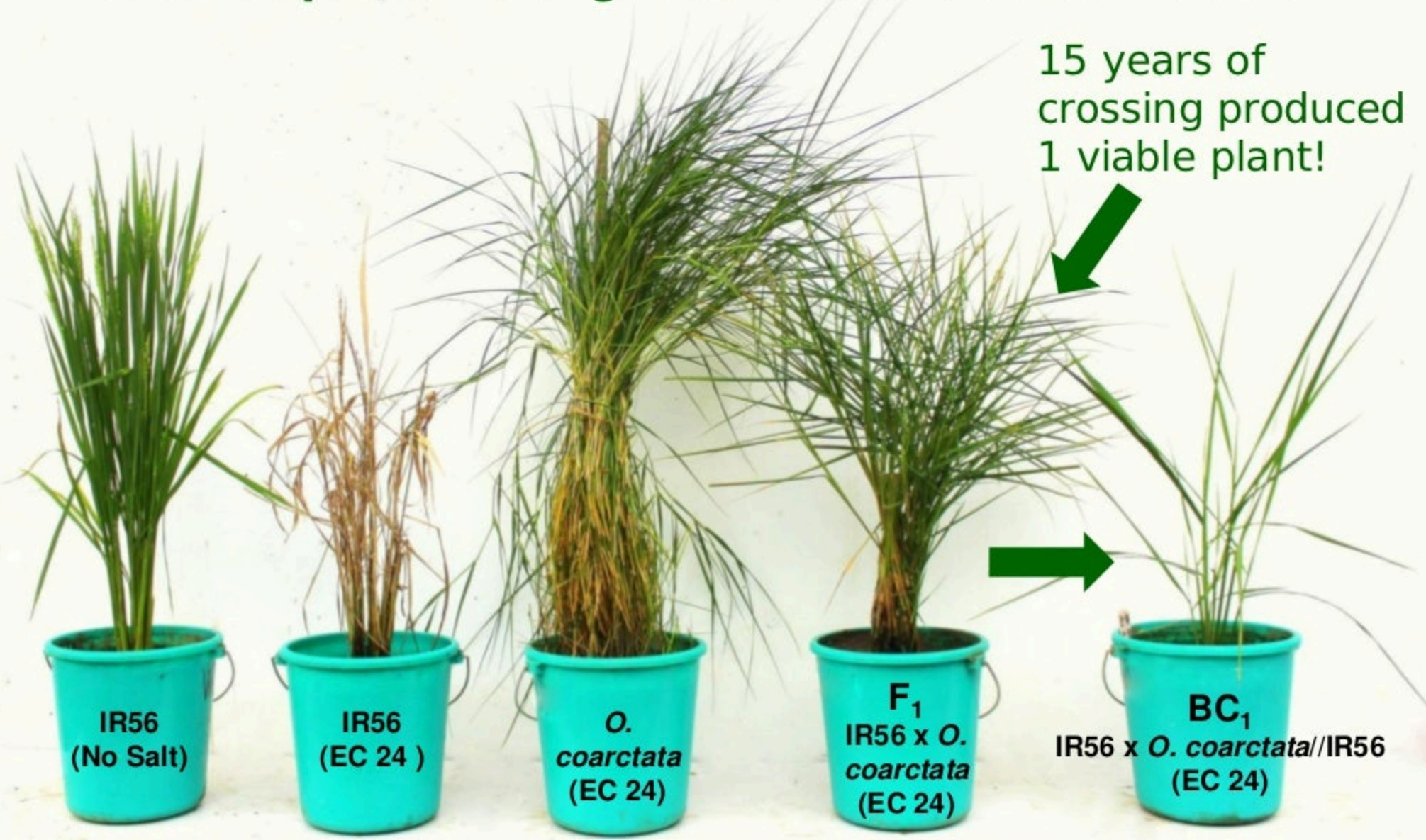
- Insect resistance
- Disease resistance
- Tolerance of abiotic stresses
- QTLs for yield
- Nutrition?
- *Industrial uses?*

Wild Species of Oryza: truly global resource

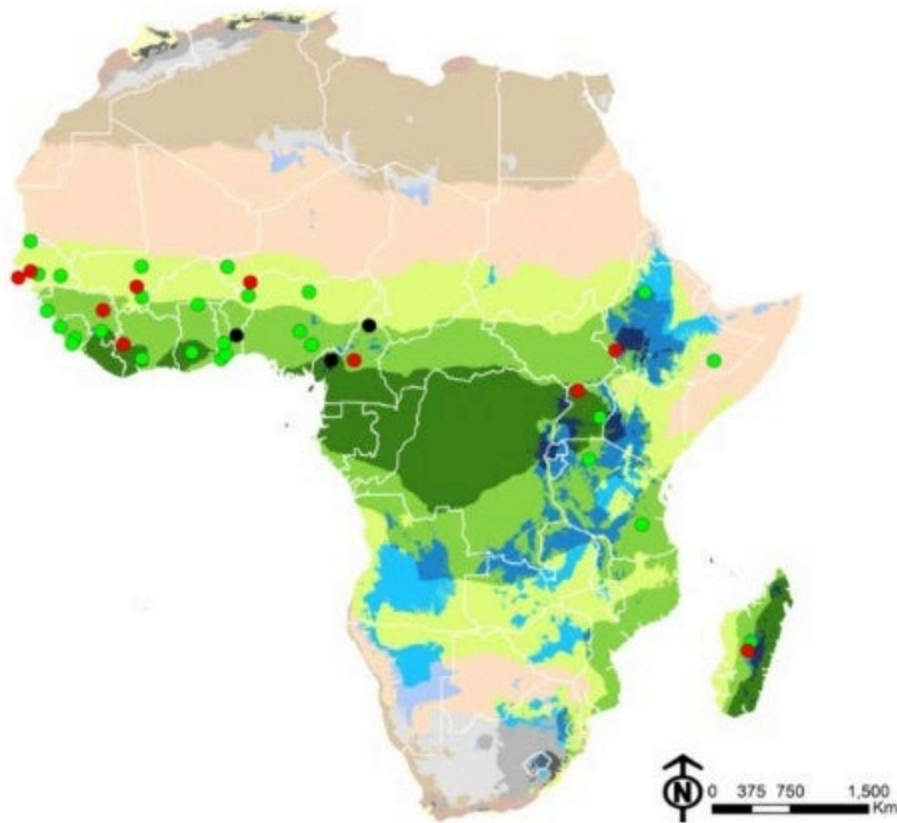


Transfer of natural salt tolerance from *Oryza coarctata* a wild species that grows well in brackish water

15 years of
crossing produced
1 viable plant!



Development outcomes: more than genes...



Rice development hubs: co-owned testing grounds for development and delivery of new rice technologies



Labor shortage: small tillers introduced



Labor shortage and yield increase: weeding tools introduced



Local market needs: improved rice processing and packaging



Burundi: ex-combatant women trained in novel rice farming technologies



The group leaders say:

“We are able to buy soap, nice cloths, we wash cloths, ... and

we also have more food now: in my family for example, we were eating only once a day, in the morning or at noon. Now we eat twice a day”



GRiSP key take-home messages

- Tremendous importance of rice for global food security and poverty alleviation; global challenges require globally concerted action => GRiSP
- GRiSP develops and delivers science-based products (more than genes), along with partnerships, that make a change through well-defined Impact-Pathways
- Development of new products takes time: continuous and long-term investment is needed to 'harvest' the impacts



To Paraphrase an Ancient Chinese Proverb:

There are two best times to plant a tree:

“The first is twenty years ago
and the second is today”



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What's new?

- First-time ever globally concerted action
- Well-defined Impact-Pathway
- Alignment of major R4AD international institutions and their partners spanning the 'science-development' continuum; reduced redundancy, gap filling, capturing and synthesizing global efforts – enhanced value added
- Exchange of knowledge, information, tools, germplasm, genes, methods, data,...
- Collaborative efforts (eg global phenotyping platform)
- Weighty impact/policy influence because of global scope
- Bringing together partnerships, networks, consortia



Special/unique features

- Competitive New Frontier projects and new initiatives
- Competitive Scholarships (GRISS)
- Global Forum
- High-level advisory panel
- Multi-institutional scientific teams across globe
- Partnership development fund
- Asian leadership training for women
- Enhanced capacity building

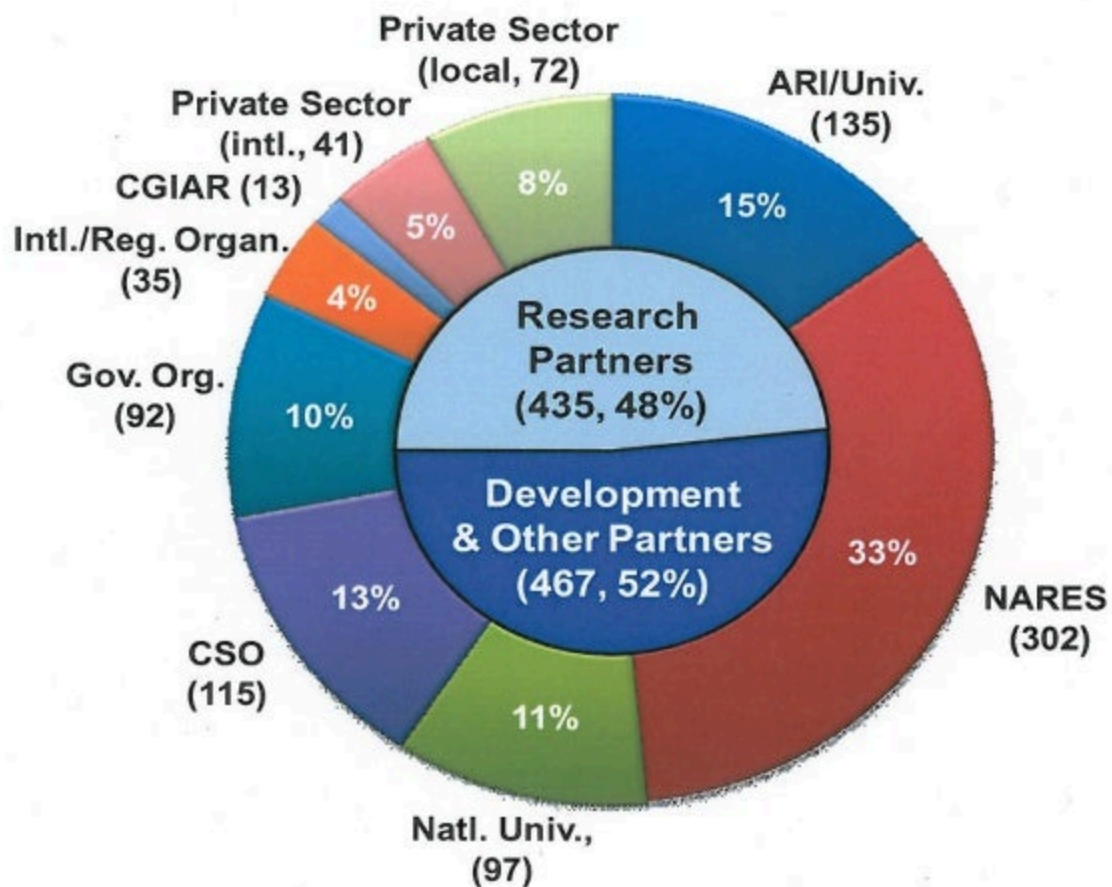


Objectives of GRiSP

- To increase rice productivity through development of improved varieties and other technologies along the value chain
- To foster more sustainable rice-based production systems that use resources more efficiently
- To improve the efficiency and equity of the rice sector through better and more accessible information and strengthened delivery mechanisms



A Global Rice Science Partnership



AfricaRice





International Rice Research
Institute's contribution to rice
varietal yield improvement in
South-East Asia

- **ACIAR 2011 impact assessment of IRRI's rice breeding in Vietnam, Indonesia, Philippines**
- **Benefits: \$1.46 billion per year from 1985 - 2009**