



BIOLOGICAL CONTROL IN DEVELOPING COUNTRIES OPPORTUNITIES & CHALLENGES

PREM WARRIOR

Chief Business Development Officer, Valagro



GLOBAL NEEDS

- ✓ The world's population will increase to more than **9 billion by 2050**
- ✓ Almost **one billion** people suffer from chronic hunger
- ✓ More than **3.5 million** children die from undernutrition each year
- ✓ Need to feed more people with **less water and land**
- ✓ Food production will have to **increase by 60%** to feed the world



**HEALTHY PEOPLE DEPEND
ON HEALTHY FOOD SYSTEMS**
Sustainable Food Systems for Food Security and Nutrition
World Food Day - 16 October 2013

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A TALE OF TWO FARMERS

Small farmers in SSA and South Asia face a number of challenges

U.S. farmer



- Tens or hundreds of acres of land
- Tractors, GPS, precision equipment
- Readily available seeds, fertilizer, irrigation, info
- Access to global markets, land and policies
- Public safety nets

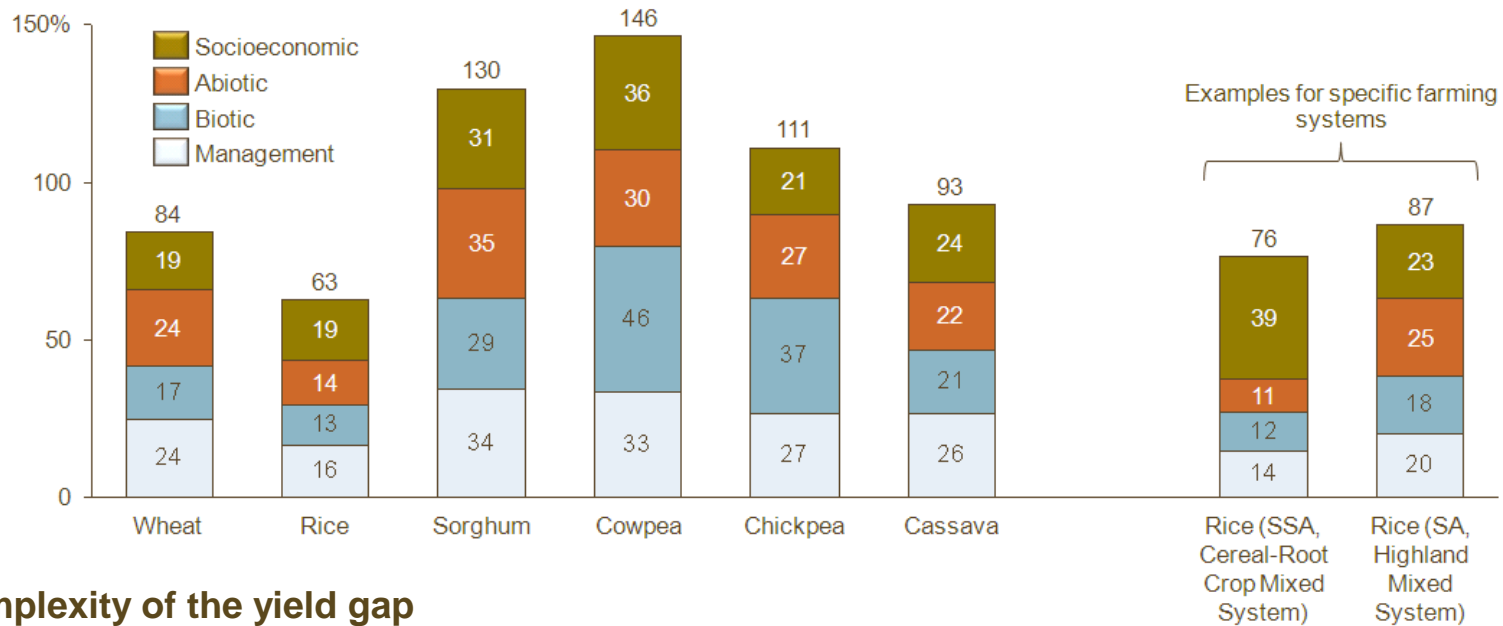
African and Asian small farmer



- A few acres of land
- Limited access to mechanization
- Reuse old seeds, little fertilizers, rainfall only, scarce info
- Lack of access to markets, land or policies
- If production fails, little or no safety net

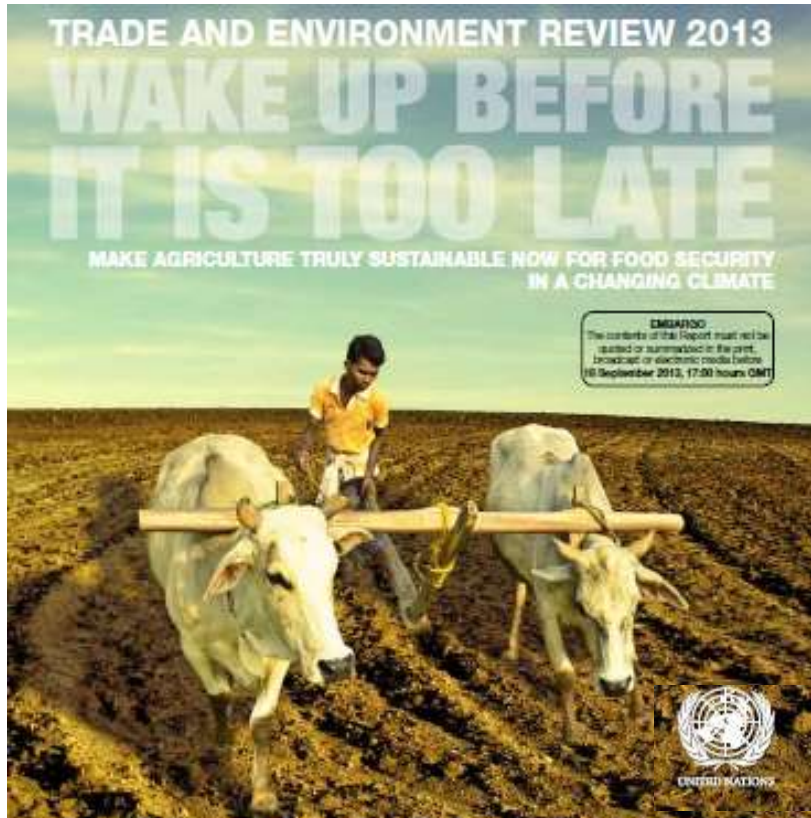
ANALYSIS OF SSA AND SA PRODUCTIVITY GAP REVEALS MULTIPLE CONSTRAINTS

Yield gap as a percent of average SHF yield, by constraint category (crop mean across farming systems)



Complexity of the yield gap

THE SOUTH ASIAN ENIGMA

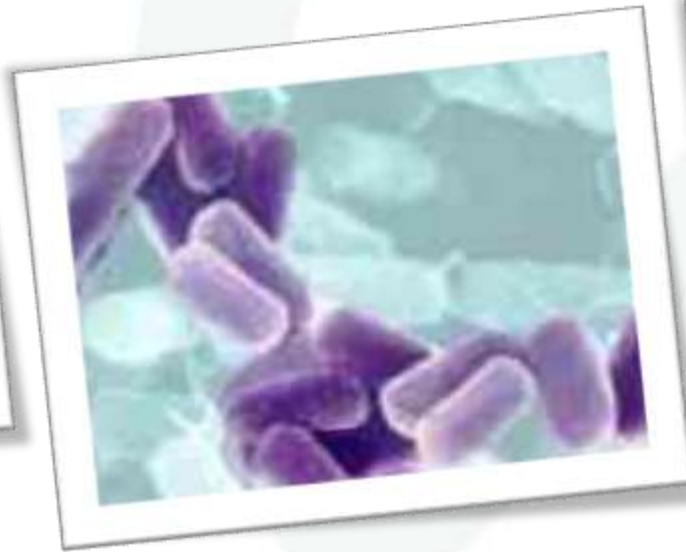


India, an “economic powerhouse and a nutritional weakling,” has one of the highest rates of child malnutrition in the world and nearly double the rate of Sub-Saharan Africa.

IDS, 2007

WHAT ARE BIOLOGICALS?

- ✓ PRODUCTS OF BIOLOGICAL ORIGIN THAT “LIMIT POPULATION OF PESTS OR DISEASES”
- ✓ COULD RESULT IN GROWTH PROMOTION OR HAVE BIOSTIMULANT ATTRIBUTES
- ✓ OVERALL ENHANCEMENT OF YIELD



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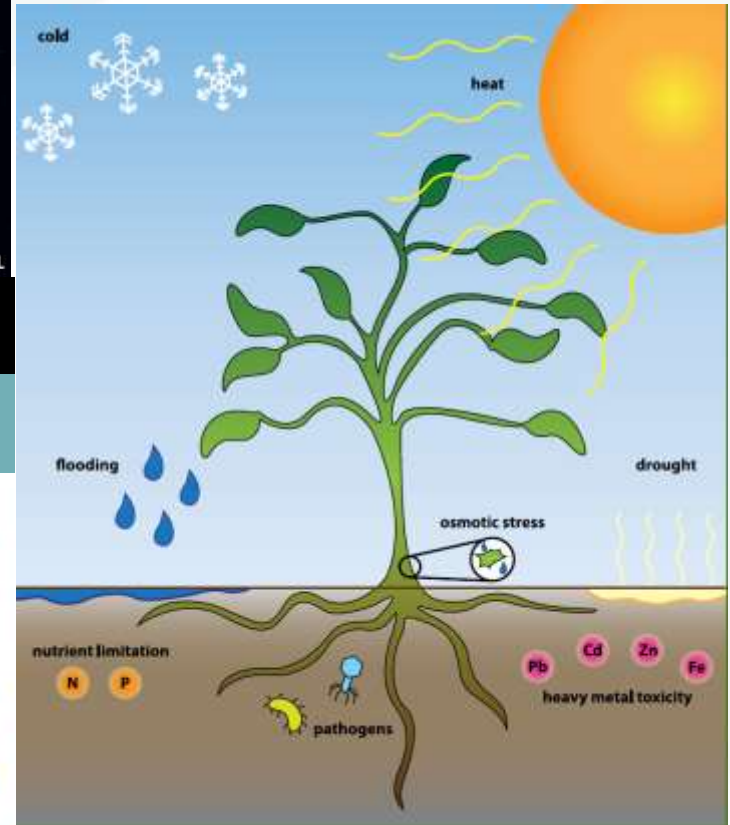


Jon Berkeley/SPL

The Economist, August 2012

“MICROBES MAKETH MAN”

THE ROLE OF BIOLOGICALS IN AGRICULTURE



AAM, Washington DC - 2012

THE WORLD'S FARMERS HAVE TRILLIONS OF POTENTIAL PARTNERS THAT CAN HELP ACHIEVE THAT AMBITIOUS GOAL. THOSE PARTNERS ARE MICROBES.



THE BUSINESS OF BIOLOGICALS IS...

- ✓ Unique – not a typical agchem business
- ✓ Maybe Expensive - requires infrastructure
- ✓ Needs commitment & unique competencies
- ✓ Value-linked – needs financial return
- ✓ Focus on “specialized” customer needs – niche opportunities
- ✓ Requires continuous innovation in Technology, Marketing and Logistics
- ✓ Manage expectations

IS THERE A PLACE FOR BIOLOGICAL CONTROL IN DEVELOPING COUNTRIES?

- Why not?
- May be even more relevant than developed countries
- Productivity needs vs. availability of options
- Need for effective inputs
- Concerns for environment, safety
- Sustainable options always existed
- Going back to nature..... for solutions

“All the pests that out of earth arise, the earth itself the antidote supplies” Lithica poem 400 BC

SUCCESSFUL EXAMPLES OF CLASSICAL BIOLOGICAL CONTROL AFRICA

| Pest species and year of first occurrence | Typical losses in yield | Biological control agent | Start of campaign | Area under economic analysis | Reduction in loss | Estimated savings in US\$ million |
|---|-------------------------|--|-------------------|------------------------------|-------------------|-----------------------------------|
| Cassava mealybug 1973 (ref. 7) | 40% | Encyrtid wasp <i>Anagyrus lopezi</i> | 1981 | 27 African nations | 90–95% | 7,971–20,226 |
| Cassava green mite 1971 II | 35% | Phytoseiid mite <i>Typhlodromalus aripo</i> | 1983 | Nigeria, Ghana, Benin | 80–95% | 2,157 |
| Mango mealybug 1980s (ref. 8) | 90% | Encyrtid wasp <i>Gyranusoidea tebygi</i> | 1987 | Benin | 90% | 531 |
| Water hyacinth 1980 (ref. 9) | 66% * | Weevil <i>Neochetina eichhorniae</i> | 1991 | Benin | 36% † | 260 |
| Red waterfern 1978 (ref. 10) | ‡ | Weevil <i>Stenopelmus rufinasus</i> | 1997 | Republic of South Africa | § | 206 |

* Damages of US\$84 million to fishing and trade at peak of infestation. † By 1999, full impact not yet achieved. ‡ Average damages of US\$533 per respondent (30 in total). § After three years the weed was not considered a problem anymore. II O. Coulibaly and R. Hannah, personal communication.

1- PERFECT AFLATOXIN STORM IN SUB-SAHARAN AFRICA

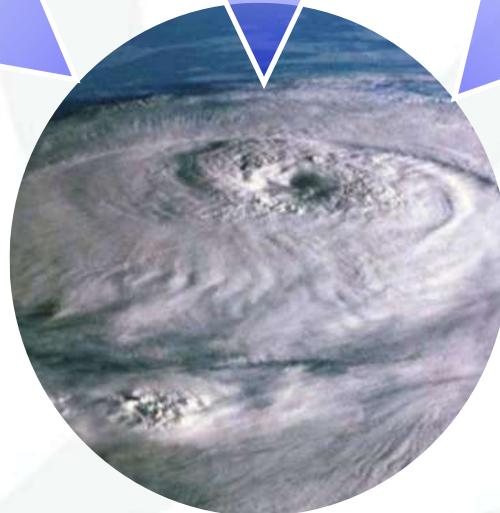
SUSCEPTIBLE CROPS



SUSCEPTIBLE CLIMATE



SUBOPTIMAL PRODUCTION SYSTEMS



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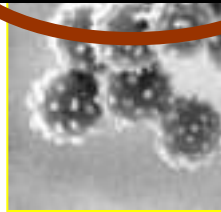
AFLATOXIN MANAGEMENT – THEORY OF CHANGE

BREEDING VARIETIES



CHEMICAL CONTROL

PREHARVEST BIOCONTROL



STORAGE INFRASTRUCTURE



POSTHARVEST DRYING



AFLATOXIN

DATA ANALYSIS
COORDINATION/LINKAGE
GOVERNMENTAL POLICIES/REGULATORY
COMMERCIALIZATION/VALUE PROPOSITION
TECHNOLOGY TRANSFER
Public Awareness/Training & monitoring

DIAGNOSTICS



FARM RADIO



TRAINING



REDUCTION OF AFLATOXINS

ACCEPTABLE FOOD GRAIN

VALUE CHAIN & TRADE

IMPROVED HEALTH

FOOD SECURITY

INCOME



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2 - BIOCONTROL FOR *Striga hermonthica*

Degraded soil increases *Striga* infestation

Soil suppression reduces *Striga*

But if soil pasteurised suppression lost:
BIOTIC mechanism

F. oxysporum strains recovered and
infects all weed development stages

“Fos” host specific to weed and does not
produce mycotoxins

Field validation in progress



Fos = *Fusarium oxysporum* f.sp. *strigae*

3. GREEN MUSCLE® - A MYCOINSECTICIDE

- *Metarhizium anisopliae* var. *acridum*
- Naturally occurring fungus for control of locusts
- Developed by the LUBILOSA Programme, a collaboration between CAB International, IITA, CILSS/AGRHYMET and GTZ
- Non-targets not at risk
- Ultra-low volume application
- Compatible with standard pesticide application equipment
- Proven efficacy under hot arid conditions



Courtesy: CABI



4- N2AFRICA - PUTTING NITROGEN FIXATION TO WORK IN AFRICA

USE OF RHIZOBIUM – EFFECTIVE, IN NEED OF SCALE UP

Phase I - \$ 19.2 MM



WAGENINGEN
UNIVERSITY
PLANT SCIENCES



Research to Nourish Africa

PARTNERS

- NARS
- NGO
- PVT sector

BILL & MELINDA
GATES foundation



5. A NEW *BEAUVERIA* ISOLATE FOR GRAIN PESTS

- Isolated from pests in UK grain stores
- Adapted to cool, dry conditions
- Maintains viability and efficacy on target species
- Product development initiated 2005
- Grant to Exosect from BMGF



CHALLENGES FOR BIOLOGICALS

- Very few examples of wide spread, cross-country use of “non-seed” technologies
- Technologies that do not fit the “context”
- Most R&D in public sector – CGIAR centers; few NARS, Academia
- Diverse agroecologies (not customized)
- Influx of “products” that DO NOT WORK
 - In general “Suspicious of private sector”
- Lack of regulatory policies; awareness/support
- Economic incentives are missing, so are financing mechanisms
- Overall weakness in infrastructure, manufacturing, quality
- Human capacity is lacking

Can we achieve scale? How?

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COMPRO

Regulating what is sold in the market

- Institutionalization of quality control procedures
- Building capacity locally
- Defining effective policies



compro
Sustainable growth,
improved livelihoods

COMPRO II PROJECT

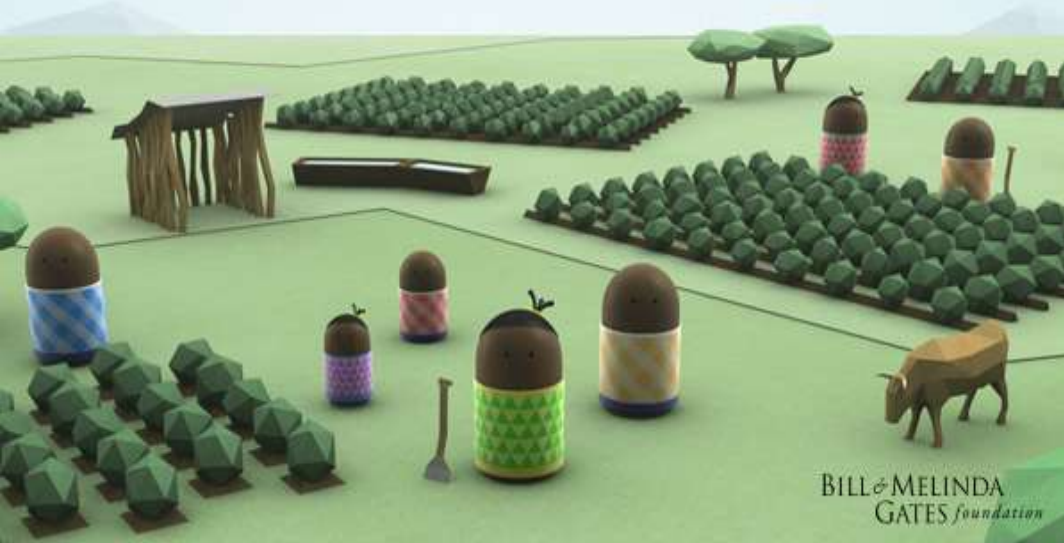
Quality & Yield

Supporting smallholder farmers' decisions on top quality commercial products

- 3 - Farmer-led soybean demonstrations
- 6 - Building laboratory skills and capacity
- 8 - Raising banana income in Western Kenya
- 10 - COMPRO activities in Ethiopia

WOMEN IN AGRICULTURE

IF WE INVEST IN WOMEN, THEY CAN FEED THE WORLD



WHAT DO WOMEN WANT?

- Women know what they want (e.g. seed traits) – be inclusive!
- Technologies must be woman-friendly
- Varieties that are easier to cook
- Nutrition for her family
- Tools that she can use
- Access to information
- Access to financial tools

- > 60% of farmers are women, but **mostly excluded from decision-making** with less access to resources

- More likely to spend money on children, household, than men





WE NEED.....

- **New technologies**
- **New business models**
- **New partnerships**
- **New investments**
- **New ways of thinking**

“Since people face multiple, interconnected challenges, we need to offer multiple, interconnected solutions.”



Melinda Gates, September 2012

African Green Revolution Forum Keynote Address



BUT, WHY WOULD YOU INVEST?

(1) New challenges – new pests, diseases, crops

(2) New opportunities – new genes, new products, new pathways

(3) Technologies that work in minimal environment – imagine what it can do in the “developed” context?

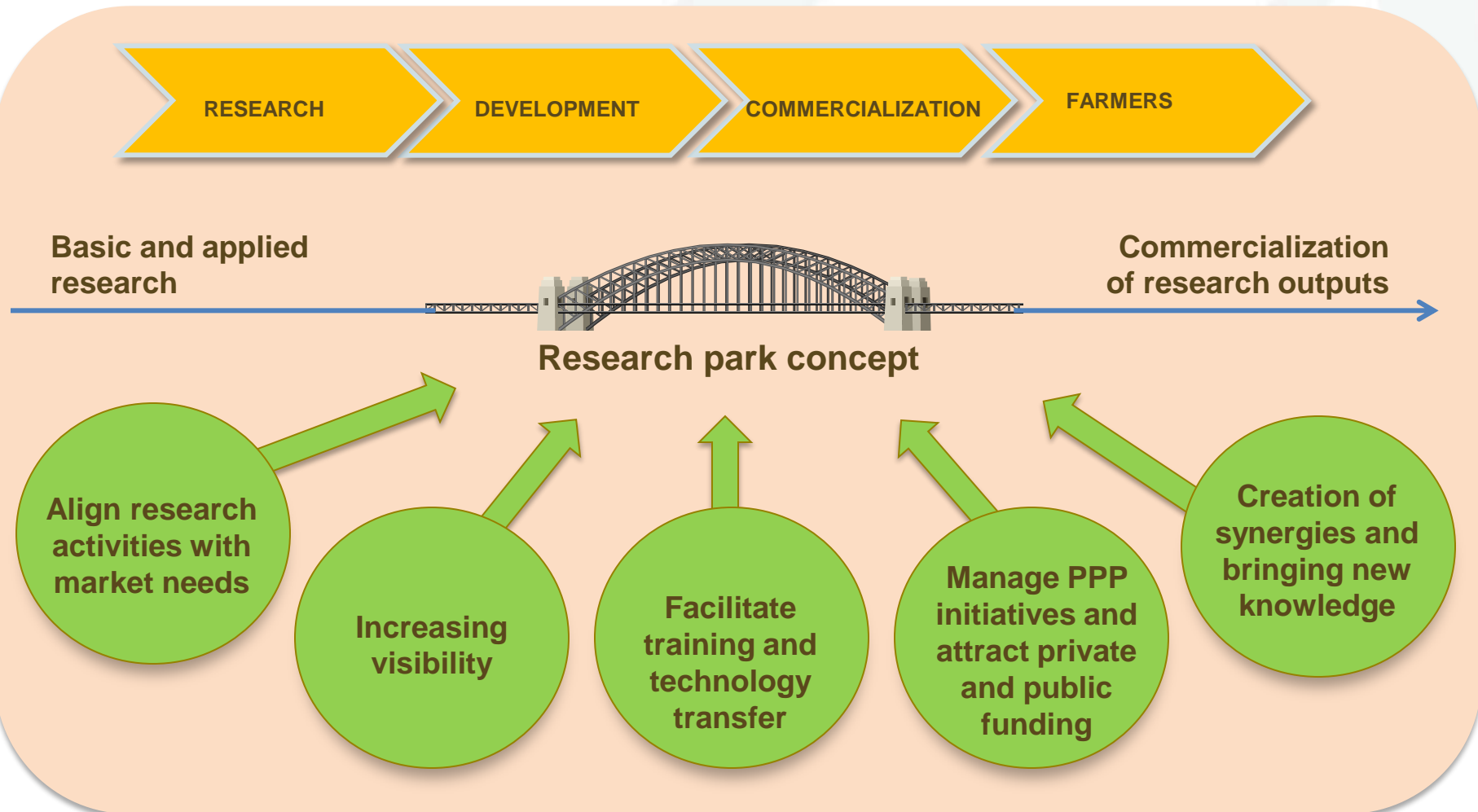
- Paul Polak – creating products with “radical affordability”
- Fortune at the “Bottom of the Pyramid” (C.K. Prahlad)

(4) Scale up models, business models – “pay for performance” – World Bank

- “Pull” vs. “Push” to create demand and pay when specific outcomes are delivered – (safer pest control, new fertilizers)
- Advance Market Commitments
- G20 AgResults initiative prizes
- Business Incubators for product serving smallholder farmers

EXAMPLE: BUSINESS INNOVATION PLATFORM AT IITA (International Institute of Tropical Agriculture)

The business innovation platform bridges the gap between research and its impact delivery



LINKING BUSINESS PLATFORMS TO R&D

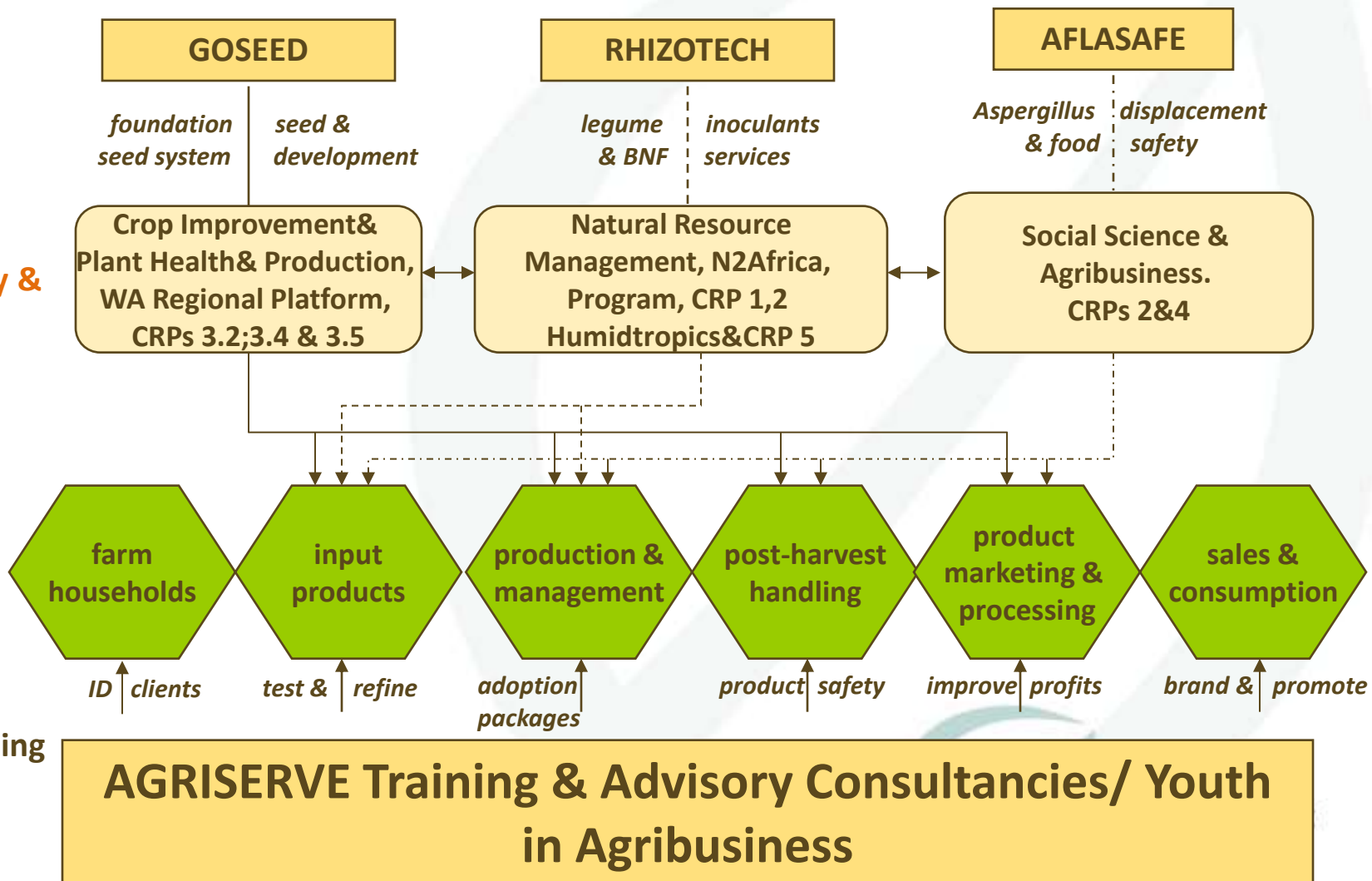
BIP Phase 1 incubation

mechanisms

IITA Core Competency & initiatives

crop value chain

training & back-stopping



NEW BUSINESS – NEW OPPORTUNITIES

- Export markets
- High value and niche markets
- Public health
- IPM as component of smallholder farming
- “Organic” agriculture (non-chemical)
- Resistance management

realIPM

RECENT ACTIVITIES MAY BE INDICATIVE OF INCREASED DEMAND AND FUTURE GROWTH

- ✓ Agraquest – Bayer AG
- ✓ Pasteuria Biosciences – Syngenta
- ✓ Becker Underwood – BASF
- ✓ Natural Industries – Novozyme
- ✓ Marrone Bio Innovations
- ✓ Several irons in the fire



THE CASE FOR SMALLHOLDER FARMERS



“Poor farmers are not a problem to be solved; they are the best answer for a world that is fighting hunger and poverty, and trying to feed a growing population.”

-Bill Gates



We have also learned that smallholder farmers, many of whom are also poor and food insecure, can be enabled to benefit from higher food prices and become part of the solution by reducing price spikes and improving overall food security. “

-Joint statement from FAO, IFAD and WFP on international food prices, Sept. 04, 2012,

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How can biologicals help Abigail?

- Revive biological R&D and local capacity
- Innovate to address persistent problems (e. g., plant breeding coupled with biotech) and proven crop management practices for pest/disease control – reduce crop risk
- Institutional reforms that promote farmer investments in land, water and forest resources
- Incentivize and promote private sector engagement; new market mechanisms
- Inclusive approaches empowering rural communities, especially women

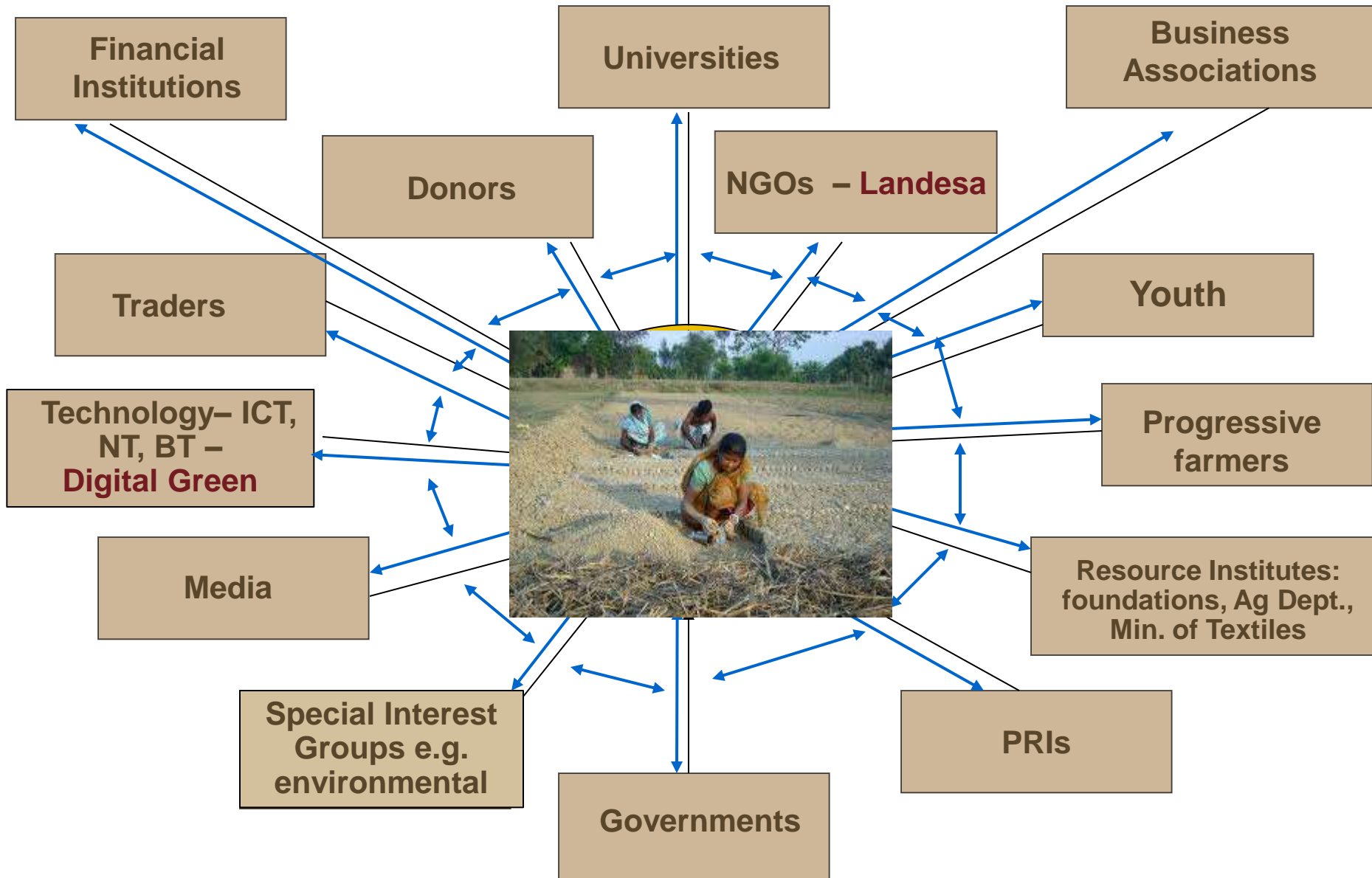


INNOVATIVE PARTNERSHIPS FOR “CATALYTIC” CHANGE

We won't succeed on our own.

- **From developed and non-developed worlds**
- **From public, private and nonprofit sectors**
- **Ensuring a Farmer-centric approach oriented to “developing solutions for the smallholder farmer” is key to our success**
- **Inclusive business models with strong accountability metrics**

NGOs such as PRADAN, in INDIA build on existing NETWORK to engage key stakeholders and expand PARTNERSHIPS to scale up



**“If you want to go fast, go alone.
If you want to go far, go
together.” – an African proverb**



THANK YOU

