

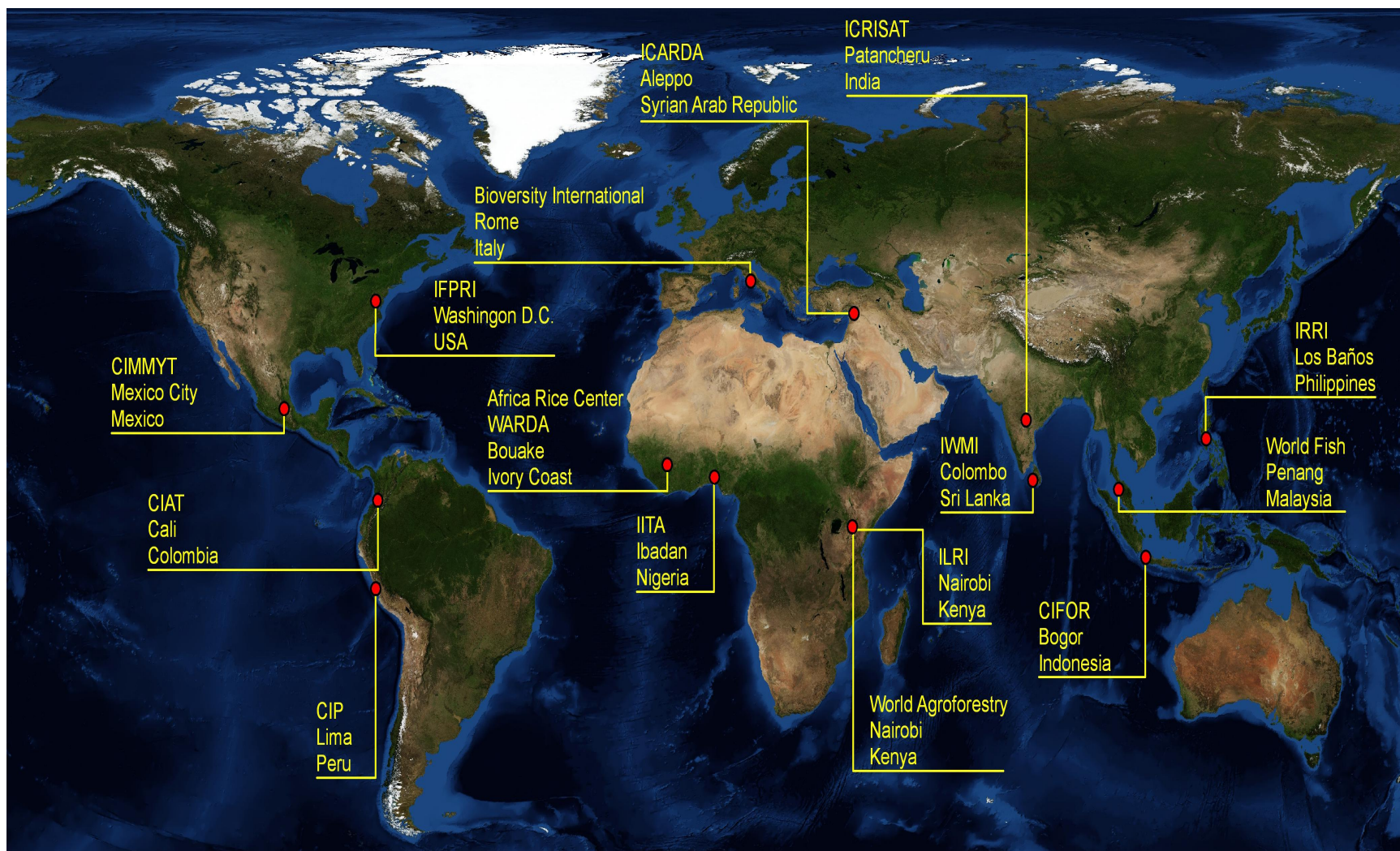


Alliance
of the CGIAR Centers

CGIAR Best-Bets to Boost Crop Yields in sub- Saharan Africa

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Why CGIAR Best Bets?

Addressing the food crisis in Africa

- **New high-yielding bred-germplasm (i.e., resilient to pests and tolerant to abiotic stresses)**
- **Improved agronomic and natural resource management options**
- **Improved food systems and value-chains**

Consultative Process

1. **April 2008: World Bank asked CGIAR Centers to provide info on tech to boost crop yields in Africa**
2. **CGIAR Secretariat and World Bank organized a telecom that led to a best-bet framework matrix**
3. **May 2008: Feedback given to preliminary best-bets during NEPAD/AU workshop held in Johannesburg**
4. **June 2008: Further exchanges on 2nd telecom led to best-bets data-entry sheets**
http://www.worldagroforestrycentre.org/downloads/CGIAR_boosting_yields_ssa.pdf
5. **Nov. 2008: Alliance Office issued a printed copy of this database for CGIAR AGM08 held at Maputo, when further exchanges with FARA were held**

Best-bet Framework Matrix

	Critical questions	Supporting know-how	Supportive policies	Available infrastructure	Capacity needed
Technology	What are cost effective crop tech?	Needs-driven tech development	Public R4D investment	Research facilities	NARES [broad], CGIAR Centers
Released	...	Approval process			
In country input availability					
Farm-level input availability		Demand estimates			
Information availability		Simple messages			
Output markets		Market info systems			

Best-bets Data-entry Sheets

1. Acronym lead Center
2. Keywords
3. Short description
4. Full description
5. Intended agro-ecozone
6. Average (**not potential**)
on-farm yield gains
7. Location specificity?
8. Up to 10 most
promising countries
for adopting
9. Timeframe for
deployment if sufficient
resources provided
10. Most effective delivery
mode (incl. partnerships)
11. Development and
financial resources
12. Research efforts
13. Any other information
14. CGIAR Center key
contact e-mail(s)

Inventory of Best-Bet Types

	Bred crops	Seeds	NRM & IPM
Africa Rice - IRRI	(1)	-	(1)
Bioversity Intl.	-	1	2
CIAT	4	-	4
CIMMYT	5	1	2
CIP	-	2	-
ICARDA	5	1	2
ICRISAT	4	-	5
IITA	5	1	4
IWMI	-	-	5
SP-IPM	-	-	1

Some Best-Bets Flavors ...

1. ***Vitro*plants and macro-propagated banana plants free of BBTv: ↑ 80% on-farm yield vs. available local tech in 1st cycle; after ratooning?**
2. **Dual purpose legume-maize rotations with targeted inputs of fertilizer: ↑ 10 % legume yield; ↑ 50% maize yield**
3. **Stabilize and increase maize production under drought: ↑ 20% yield**
4. **Accelerated pathogen-free sweetpotato vine multiplication: ↑ 50% yield**
5. **Productive feed-legumes and best practices for boosting fodder and livestock production: ↑ 40% yield**

... Best Bet Flavors

6. Micro-dosing in planting basins to increase crop nutrient response: **↑ 150% yield**
7. Provision of new improved cassava cultivars to replace current farmers stock: **↑ 80% yield**
8. Management of aflatoxin contamination in maize and groundnut: **↑ 10% on product value**
9. Produce low cost, eco-friendly bio-pesticides locally: **↑ 25% yield**
10. Rice production enhanced through improved crop and post-harvest management, cultivar selection and small-scale mechanization: **↑ 30% yield**
11. On-site soil water management and rainwater harvesting: **↑ 30% yield**

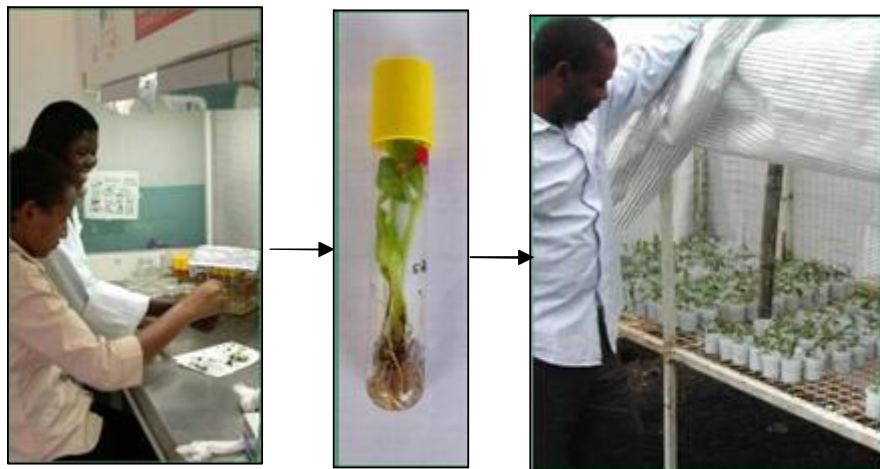
Best-Bet Fair: NERICA - A new rice technology for Africa from Africa

The NERICA Advantage

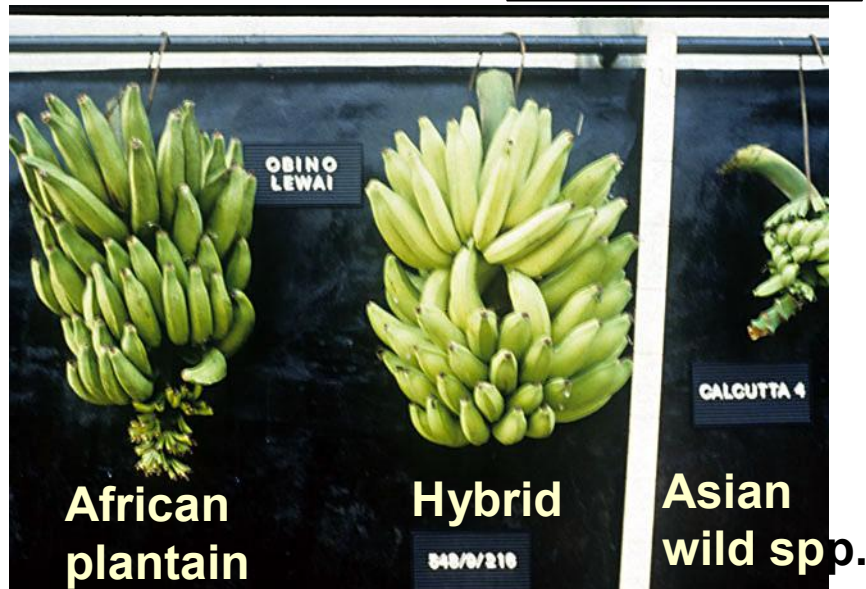
- **Higher yields** by 50% without fertilizer and by more than 200% with fertilizer
- **Earlier maturity** by 30–50 days).
- **Host-plant resistance** to local stresses
- **Higher protein content** by 2%



Micro-propagation of *Musa* cultivars and resistant bred-hybrids



Increasing demand for **clean banana and plantain planting material** led to a number of African public and private tissue culture labs to provide pathogen-tested propagules



Black Sigatoka resistant bred-hybrids have been distributed to African farmers since 1990. Farmers are **earning net incomes of up to US\$ 200 per season** from the sale of suckers in addition to around **US\$ 5,000 per hectare** from fruit gross sales

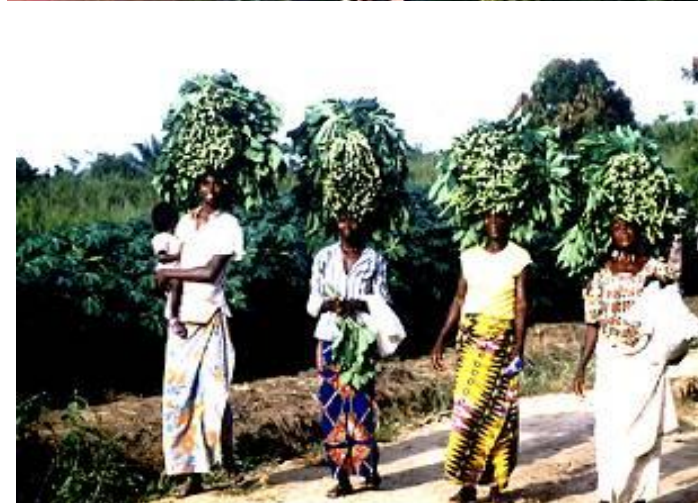
Cassava setting the pace of African rural development



Cassava provides a basic daily source of dietary energy to millions of African people

The roots are processed into a wide variety of products such as chips and flour, or are consumed boiled or raw

Leaves can be consumed as a green vegetable, which provides protein and vitamins A and B



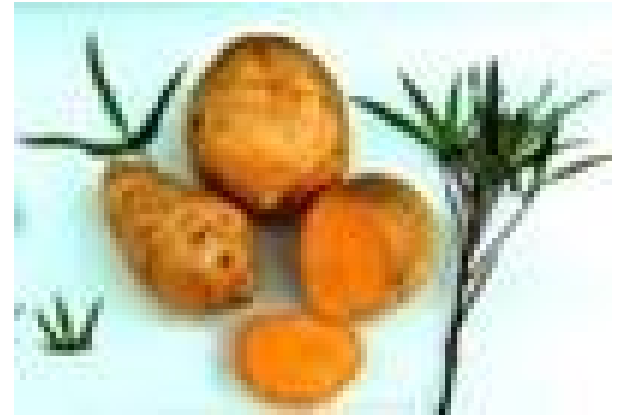
Orange-fleshed sweetpotato (OFSP): “o doce que dá saúde”

About 43 million African children under 5 years of age are still at risk of vitamin A deficiency

Only 125 grams of most OFSP cultivars can supply the recommended daily allowance of vitamin A for children and non-lactating women (300-700 µg retinol activity equivalents)

Even at low yield levels (e.g. 5 t ha⁻¹), a family of five could generate an adequate annual supply of vitamin A from a 500 m² (0.05 ha) plot

Impact in Mozambique: significant improvements in vitamin A intake and serum retinol concentrations (a proxy for vitamin A status) were obtained from a quasi-experimental study of an OFSP-based integrated agriculture-nutrition-market intervention in a very resource poor setting



High hopes for new sorghum hybrids

Hybrids have a greater potential to increase yield and impact farmers' livelihoods than open-pollinated cultivars (OPV): **sorghum hybrids displayed a 20 to 60% yield advantage versus bred-OPV and local landraces** in southern Africa. To increase cultivation and adoption of sorghum hybrids, inadequacies in the **seed systems** must be addressed and functional markets should be closely linked with industry



Cultivar type	Normal season	Dry season
Hybrid	3.8 t ha ⁻¹	2.5 t ha ⁻¹
OPV	2.9 t ha ⁻¹	1.3 t ha ⁻¹

IR-maize: an economical system to control the parasitic weed *Striga*

Striga spp. affect 3.6 million hectares causing > 30% yield loss. This highly prolific parasitic weed with seed longevity remains difficult to control on poor-fertility soils

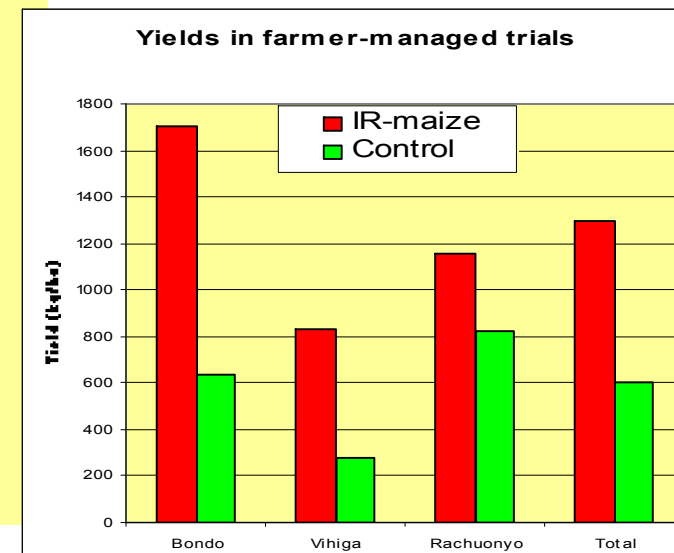
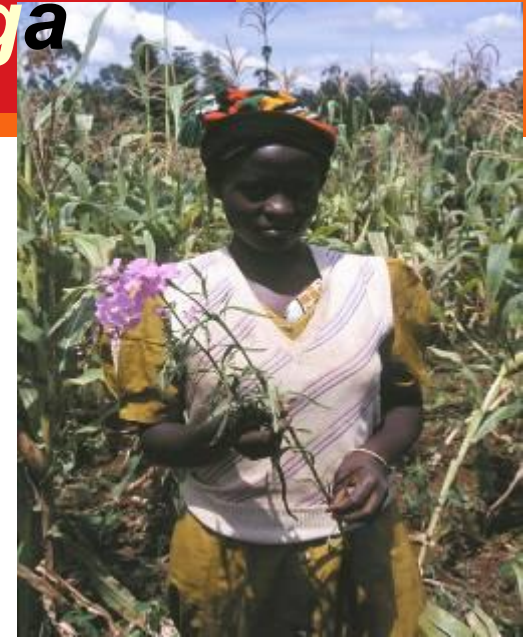
Imazidalinone resistant (IR)-maize: a herbicide resistant cultivar seed coated with the herbicide imazapyr

Economic Analysis

IR-maize is effective in reducing *Striga* and increases yields in farmers field by 500 kg ha⁻¹ (US\$100 ha⁻¹):

- Due to improved maize germplasm: 370 kg ha⁻¹
- Due to the herbicide and reduced *Striga*: 130 kg ha⁻¹

Some African farmers say “most effective *Striga* control measure available”



Global up scaling of CGIAR Best-Bets

Aim: A more productive and sustainable food-agricultural system

Approach: Accelerate investments in agriculture and in related, research-based innovations

Funding needed: Doubling public ag. research to US\$ 9.3 billion (incl. US\$ 1 billion for CGIAR)

Potential impact scenarios: Ag. output growth from 0.5 to 1.5 (maximizing total output) or 1.1 (maximizing poverty reduction) percentage points a year, thereby reducing poverty by 204 or 282 million people in 2020, respectively

Details at <http://www.ifpri.org/pubs/books/oc58.asp>

Best-bet examples: Food for People

CGIAR global best-bets	People reached	Investment (US \$ million)
Revitalizing yield growth in intensive Asian cereal systems	3 billion	150
Ensuring productive and resilient small-scale fisheries	32 million	73.5
Controlling wheat rust	2.9 billion	37.5
Dev'ing and disseminating East Coast Fever vaccine in cattle	20 million	10.5
Breeding and sharing seeds of drought-tolerant maize in Africa	320 million	100
Scaling up biofortification	672 million	125

Best-bet examples: Environment for People

CGIAR global best-bets	People reached	Investment (US \$ million)
Increasing C sequestration and the livelihoods of forest people	48 million	45
Conducting climate change and adaptation research	1.2 billion	127.5
Combining organic and inorganic nutrients to increase crop productivity	400 million	55
Promoting sustainable groundwater use in agriculture	261 million	24

Best-bet examples: Innovation for People

CGIAR global best-bets	People reached	Investment (US\$ million)
Enhancing germplasm exchange	Global impact	15
Improving market information and value chain	45 million	10.5
Ensuring women's full participation in agric. innovation	200 million	30
Reducing the adverse effects of agriculture on health and improving the health benefits of agriculture for the poor	Global	75

Best-bets and the innovation paradigm in agriculture

Impacts =

[Info, Knowledge, Technology] * Agro-

Ecosystems *

Management * Policy * Institutions *

People

* indicates multiplicative interactions

Opportunities for sub-Saharan Africa

- **Create enabling policy and institutional environment for increased crop production**
 - Market-smart fertilizer subsidy or vouchers
 - Access to fertilizer is essential
- **Promote proven best-bets for heterogeneous contexts**
 - Improved crop cultivars
 - Agronomic and management approaches
 - Integrated farming systems approaches
 - Food system and participatory value-chains approaches

Priority actions for sub-Saharan Africa

- **Capacity-building**
 - Training of farmers and extension workers
 - Promote farmer participatory approaches

- **CGIAR technological backstopping of agricultural development**
 - Seeking CGIAR experts in relevant meetings of development organizations dealing with agriculture
 - Organizing a CGIAR website with best bets database and linking to other platforms, e.g. DONATA, TICAD

Other needed investments in sub-Saharan Africa

- **Build infrastructure for roads, markets and irrigation**
- **Strengthen agricultural R4D and extension**
 - **Demonstrate technologies and build awareness**
 - **Build appropriate field level guidance and support**
- **Promote farmer groups and cooperatives**
- **Support small-medium agro-enterprises**

Research for development ...

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Health
Livelihoods
Dreams

