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CGIAR is a global research partnership for a food secure future

Update on CGIAR Research & Results

Frank Rijsberman, CEO CGIAR Consortium, November 2, 2012

Overview

- **Food Security: the greatest challenge facing humanity in coming decades**
- **Sustainable intensification**
- **Promising science**
- **CGIAR results and impacts**

Food Insecurity and Undernutrition Remain Persistent

2012 GLOBAL HUNGER INDEX BY SEVERITY

5 JAHRE welt hunger hilfe

INTERNATIONAL FOOD POLICY RESEARCH INSTITUTE IFPRI

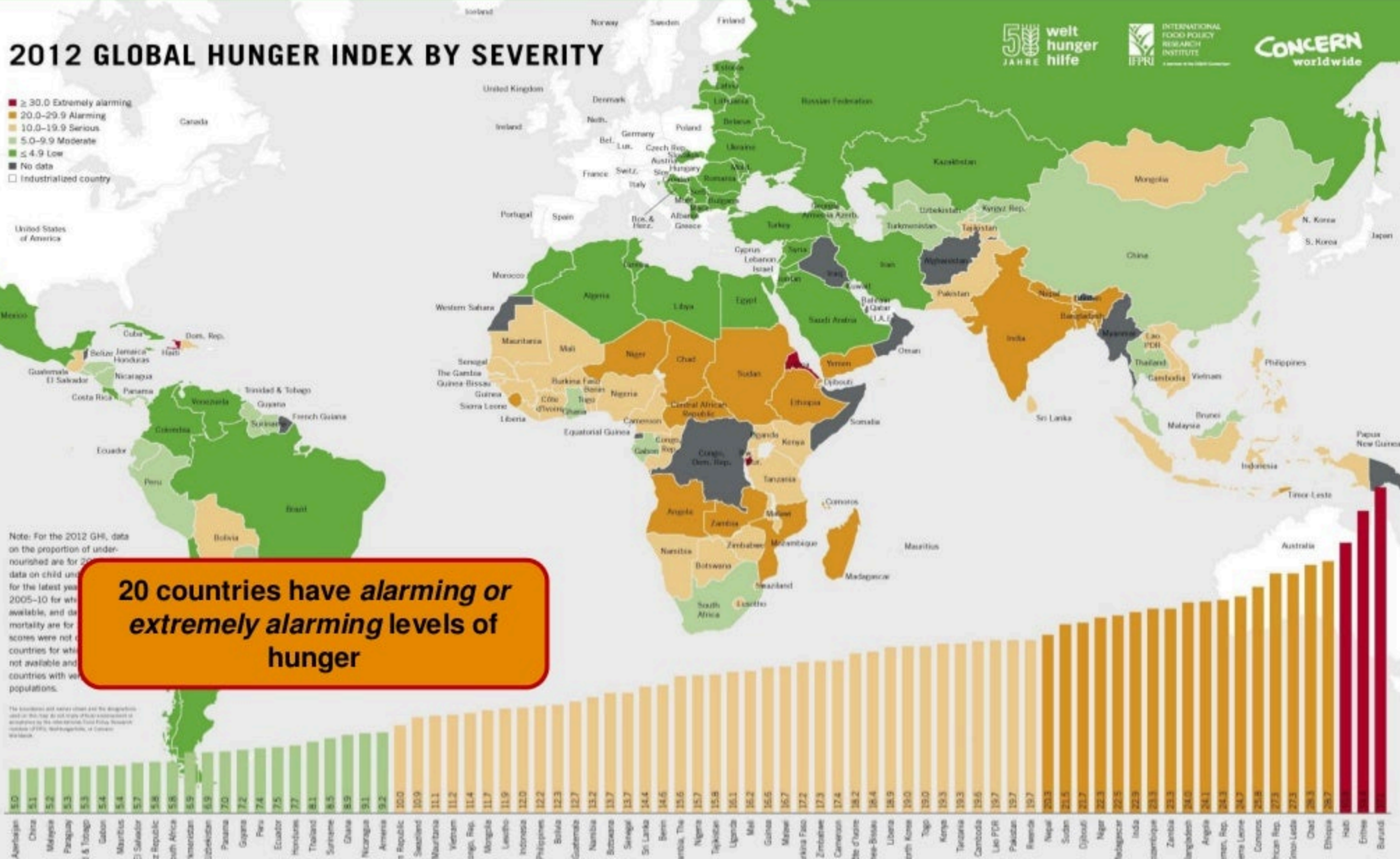
CONCERN worldwide

- ≥ 30.0 Extremely alarming
- 20.0–29.9 Alarming
- 10.0–19.9 Serious
- 5.0–9.9 Moderate
- ≤ 4.9 Low
- No data
- Industrialized country

Note: For the 2012 GHI, data on the proportion of undernourished are for 2005–10 for the latest year for which data on child underweight, stunting, and mortality are available, and for countries where scores were not available and countries with very low populations.

20 countries have alarming or extremely alarming levels of hunger

The incidence and severity of hunger and malnutrition are still high in many parts of the world. In 2012, 1 billion people were undernourished, and 2 billion people were malnourished.



Humanity's Greatest Challenge



**Producing 70%
more food by
2050,
without
destroying the
environment**

Sustainable Intensification

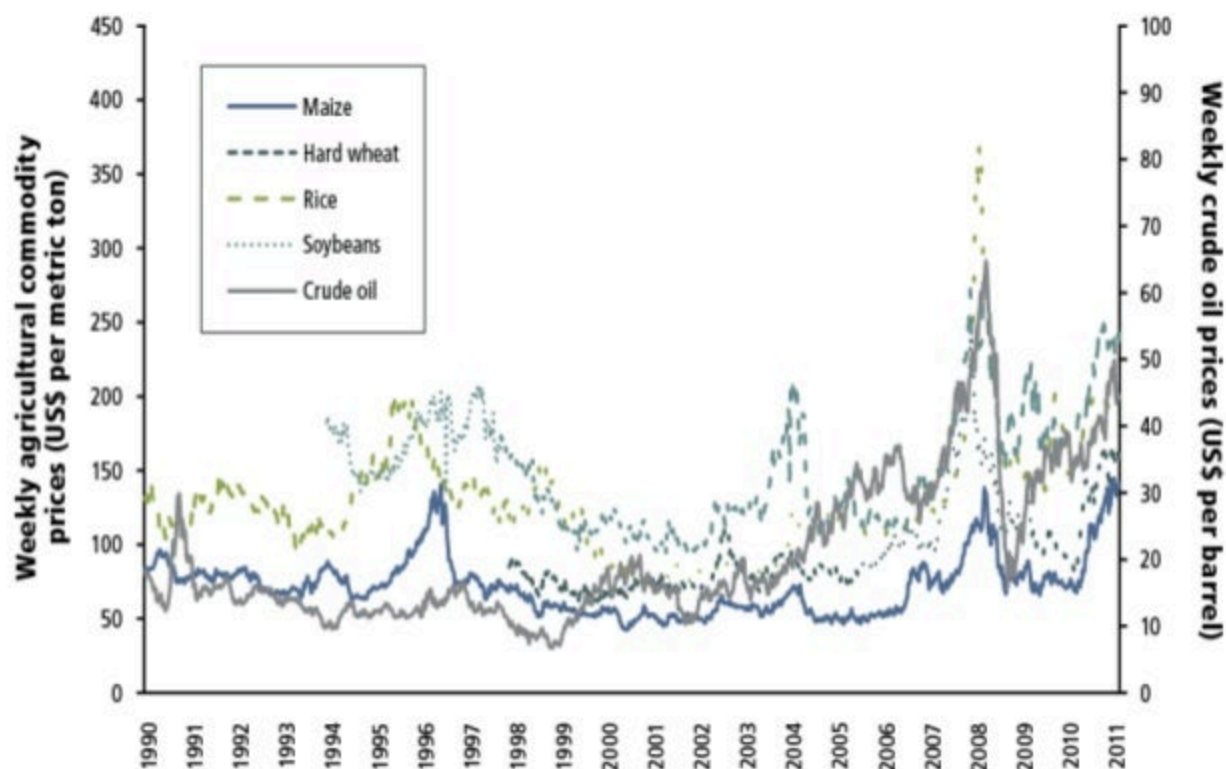
- 75% from land already in use
- By small-scale farmers, majority women
- Where the food is consumed
- In a climate smart way



CIAT, N. Palmer

Food Price Spikes put Food Security back on the agenda

Inflation-adjusted prices of maize, wheat, rice, soybeans, and oil
1990–2011



Source: IFPRI

Land Grab in Africa: 30 million ha



Credit: FoEI / ATI - Jason Taylor

**BIDCO acquires
26,500 hectares for a
palm oil plantation
in Uganda,
displacing
thousands of
smallholder farmers**

Green Revolution: Intensification in Asia

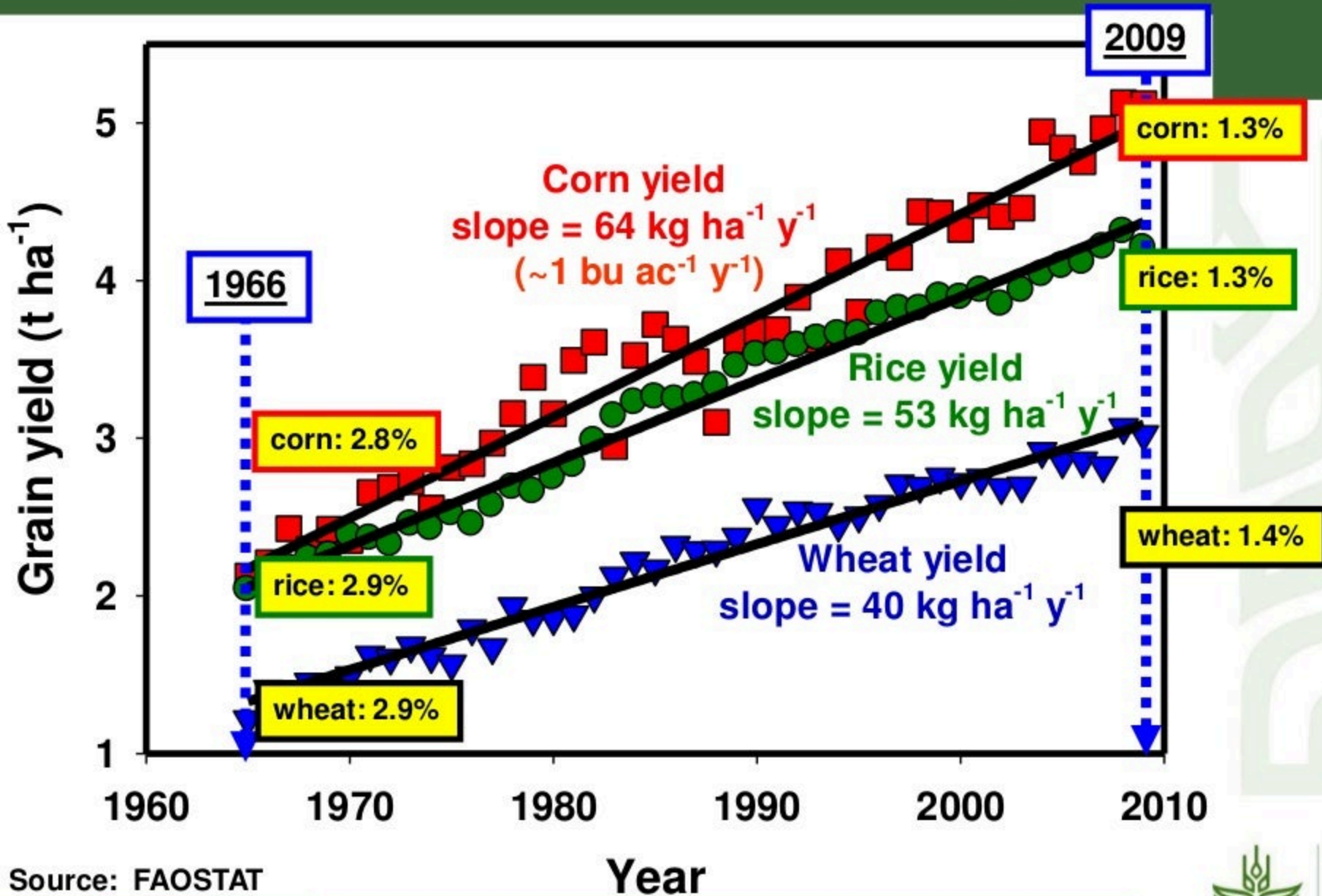
**Development of semi-dwarf, high-yield,
and disease-resistant varieties, 1960s-70s**

Increased fertilizer use

Massive investment in irrigation



Global Cereals Yield Trends, 1966-2009



Source: FAOSTAT

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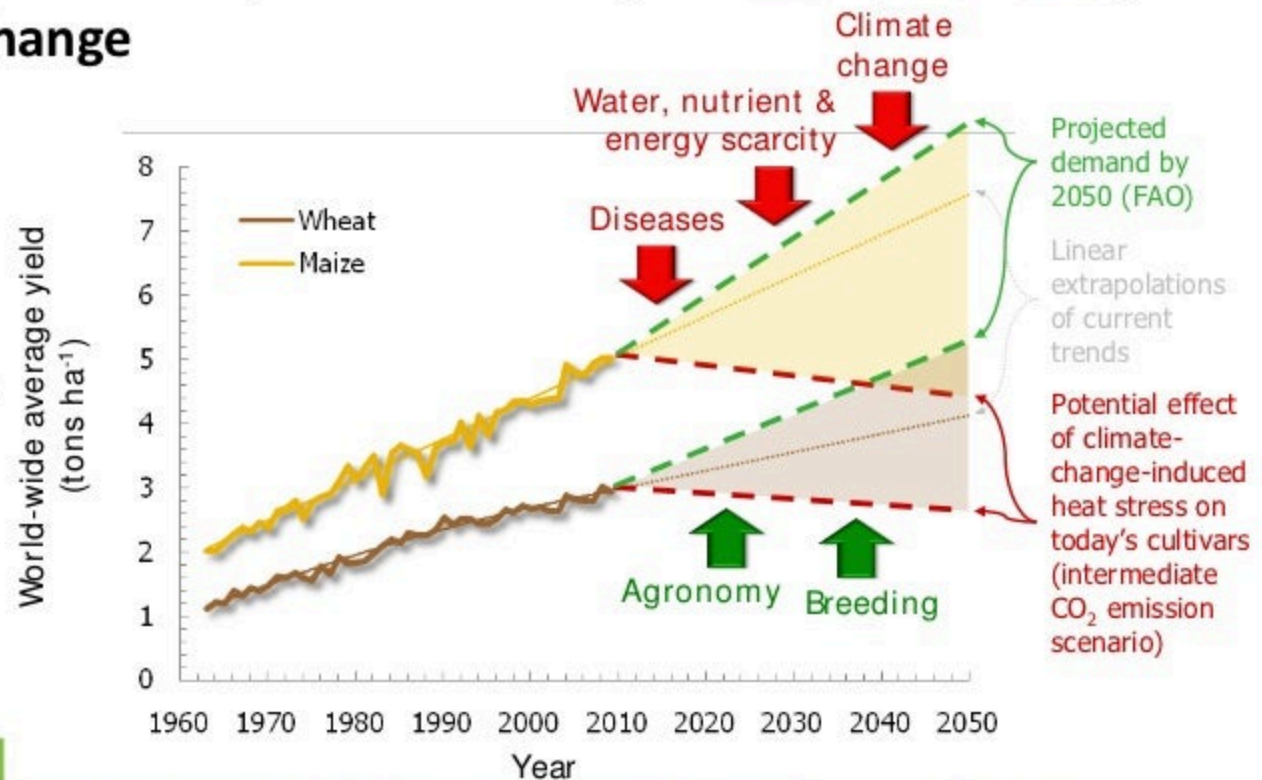


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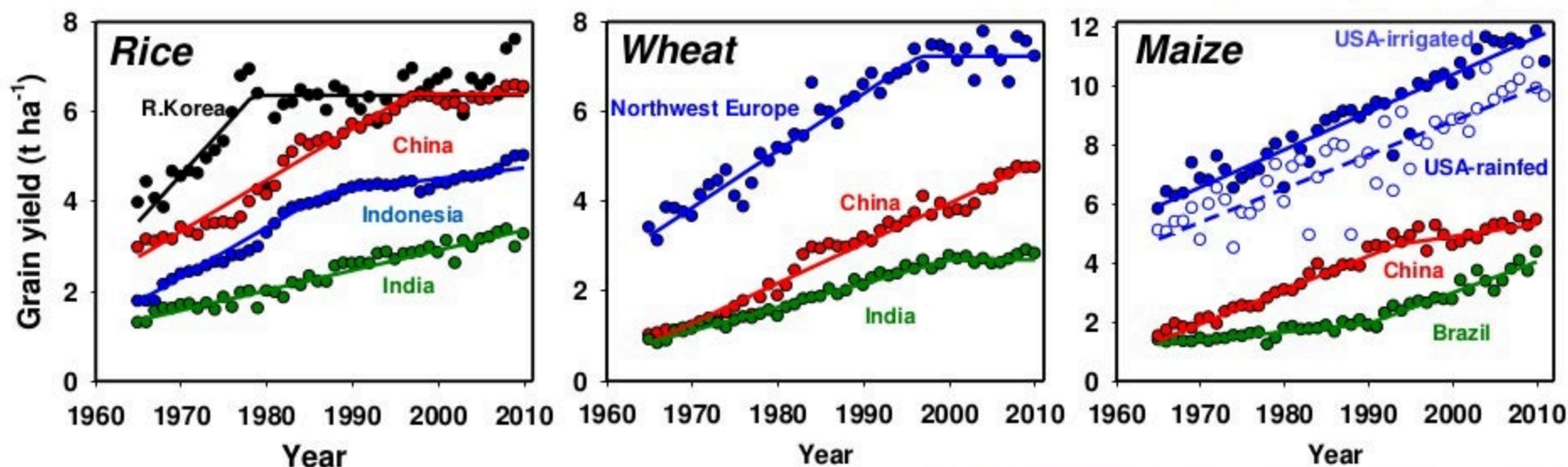
For food prices to remain constant, annual yield gains would have to increase

- From 1.6% to 2.4% for maize
- From 0.9% to 1.5% for rice
- From 1.1% to 2.3% for wheat
- On essentially the same land area, with less water, nutrients, fossil fuel, labor and as climates change

- First concerns: late 1990s
- The more we delay investments, the steeper the challenge



Plateau in Yields of Major Grains



Stagnating yields for:

- rice in Korea, Japan, California and China
- wheat in northwest Europe, Great Plains USA
- maize in China, France, Italy and irrigated maize in the USA

Crop yield gap - Rice

- **IRRI, ideal conditions**

3 crops of 7 t/ha:

21t/ha/yr

- **Philippines, irrigated:**

2 crops of 4 t/ha:

8 t/ha/yr

- **Africa, upland rice:**

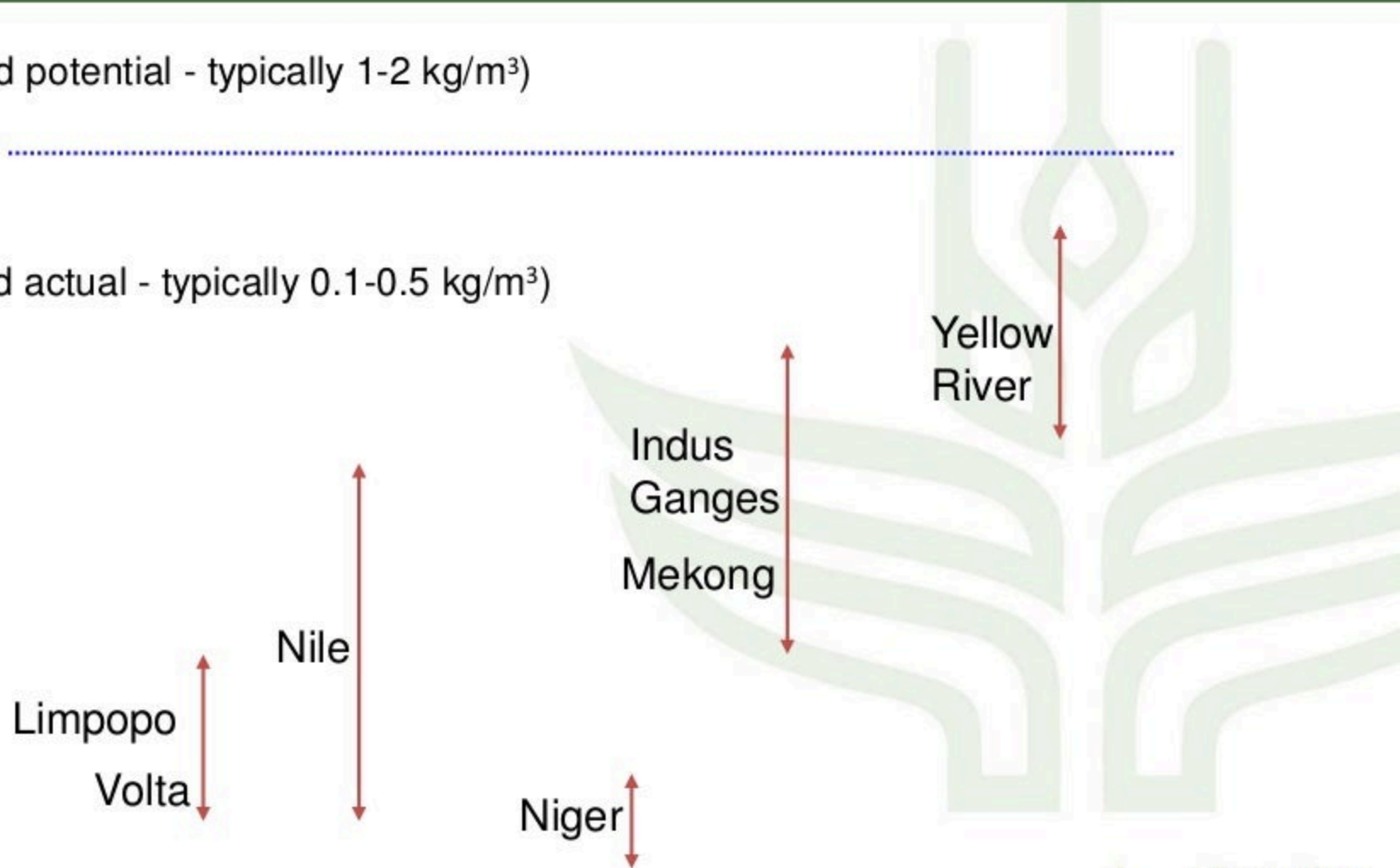
1 crop of 2 t/ha

2 t/ha/yr

Water Productivity remains very low over most areas

WP (estimated potential - typically 1-2 kg/m³)

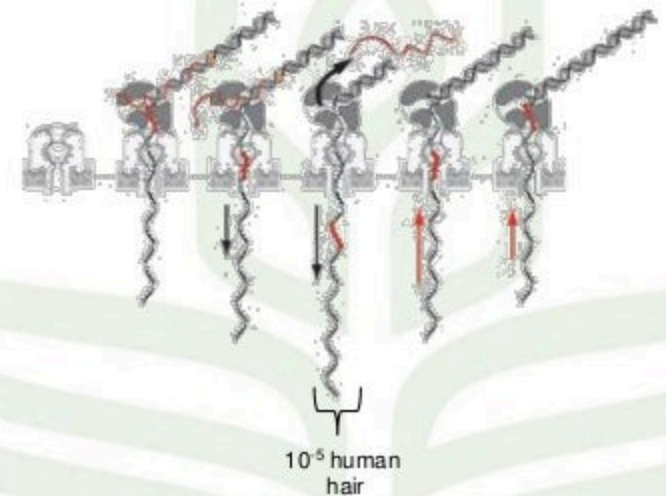
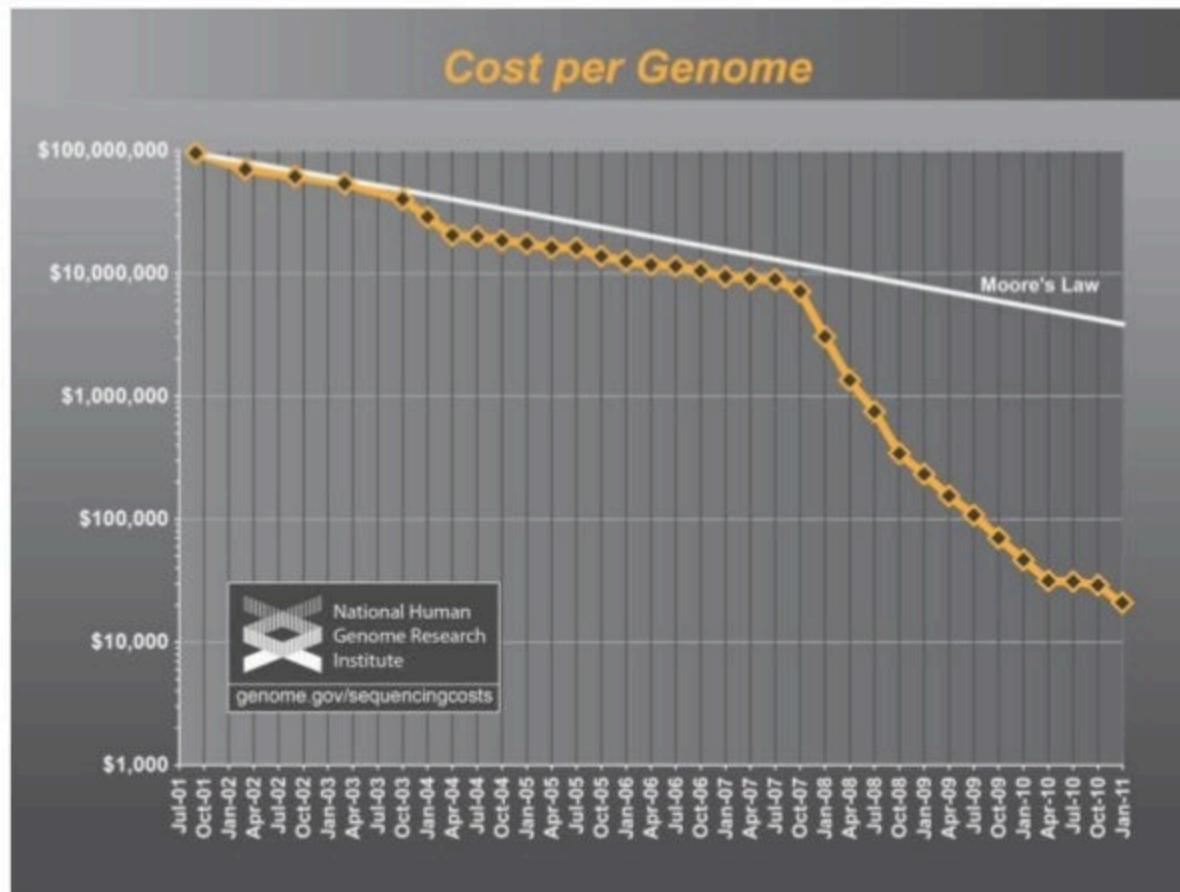
WP (estimated actual - typically 0.1-0.5 kg/m³)



What is the science potential ?

- **Life Science Revolution – molecular biology**
 - Molecular markers for marker aided selection
 - Characterizing genetic diversity
 - Creating new gene pools
- **IT revolution – crop management, precision agriculture**
 - Satellite information to predict crop growth
 - Cheap sensors from soil moisture to weather
 - Mobile phones for extension and market info
- **Holistic approach – ecological intensification**
 - Landscape approach
 - Farming systems and livelihood strategies
 - Access to markets, value chains, nutrition, food safety

DNA Sequencing Costs Plummeting: Life sciences more dynamic than IT



**Nanopore Technology
Will Lower Costs Even More**

CGIAR Research Agenda

Overarching themes

Gender
Capacity Strengthening
Partnerships/Stakeholder Engagement



Improve productivity and profit for crops, fish and livestock



Improve sustainability of natural resource base, climate change adaptation and mitigation



Improve productivity, profitability, sustainability and resilience of farming systems



Improve policies and markets



Improve nutrition and health

Reducing Rural Poverty, Improving Food Security, Improving Nutrition and Health, Sustainably Managing Natural Resources

Progress on Mainstreaming Gender Research



- **A CGIAR-wide Gender Research Strategy approved**
- **Gender and Agriculture Network established**
- **Almost all CRPs have initiated Gender Strategies**
- **Proposal developed for Gender Performance Fund to incentivize mainstreamed implementation of Gender Strategies**



Reducing the Vulnerability of Farming Communities to Drought and Climate Change

WHY? 41% of the world's land area, home to 2.5 billion people ; widespread poverty, food insecurity, and environmental degradation

EXPECTED IMPACTS

- In six years, 20–30% increase in agricultural productivity in high-potential target areas; 10–20% in low potential areas
- Out-scaling of technologies will have wider impact, improving standard of living for many more people
- 87 million people living in dryland systems will have improved and more secure incomes

Action sites cover 11 thousand million hectares



Integrated Systems for the Humid Tropics

WHY? The humid and subhumid tropics – with 2.9 billion people on about 3 billion hectares of land – are critical to global food supplies, central to the maintenance of global biodiversity, and vital to the mitigation of greenhouse gases.

EXPECTED IMPACT in 15 years

- Increasing staple food yields by 60%
- Increasing average farm income by 50%
- Lifting 25% of poor households above the poverty line
- Reducing the number of malnourished children by 30%
- Restoring 40% of degraded farms to sustainable resource management



With communities, changing lives

WHY? Reach the 400 million people - 50% living on less than USD 1.25/day - left behind by the Green Revolution

EXPECTED OUTCOMES

The Program will improve the lives of 10 million poor and vulnerable users of aquatic agricultural systems by 2016 - 50 million by 2022

AAS

Impact at scale through innovation



RESEARCH
PROGRAM ON
Aquatic
Agricultural
Systems

Gender Transformative Research: gender integration + supporting change to gender norms that increase development effectiveness



Building Coalitions, Creating Change
An Agenda for Gender Transformative Research In Development

Compendium

Workshop | 3-5 October, 2012 | Penang, Malaysia

Monitoring, Evaluation and Impact Assessment:
developing tools fit for purpose





Policies, Institutions and Markets

WHY? Policies that end hunger and reduce poverty

Governance models and institutions that ensure sustainable, positive change – especially for those who need it most such as women and children

Long-term benefits along the agricultural value chain, from farmer to consumer

EXPECTED IMPACT by 2025

7–10% reduction poverty due to improvements on market access

Diversification of nonfarm income and reduced risks

Global crop, livestock, and fish production increased by 10–15 %

Reduced child malnutrition by 3–5 %

Global coordination to reduce price volatility

- **Create global and regional grain reserves**
 - Located in poor food importing countries e.g. Horn of Africa
- **Support transparent and free global trade**
 - Eliminate harmful trade restrictions and prevent new ones
- **Minimize food-fuel competition**
 - Halt grain-based biofuel production
- **Monitor global food prices**
 - G-20's information system (AMIS) / IFPRI's Excessive Food Price Variability Early Warning System



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PROGRAM ON
Maize



MAIZE - Global alliance for improved food security and livelihoods

WHY? By 2025, maize will have the greatest production in the developing world, and the greatest demand growth worldwide of any crop.

EXPECTED OUTCOMES

- Maize productivity growth of 33% by 2030.
- Enough maize for 600 million more maize consumers by 2030.
- More productive, resilient and sustainable farming systems.

EXPECTED REACH 640 million maize-dependent poor living on less than \$2 per day, including 120 million malnourished children.

MAIZE- Accomplishments



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Maize

PARTNER ENGAGEMENT

- Systematic priority-setting with 300 partner organizations.
- 28% of all MAIZE funding goes to partners outside the CGIAR.

RESULTS

- Systems intensification research engages farmers on 3 continents/in 13 countries.
- Climate ready maize varieties available in 13 countries in Africa.
- Maize improvement consortia formed among Asian and Latin American seed companies.
- Africa increases efforts to reduce post-harvest losses from pests and mycotoxins.
- Most comprehensive maize diversity analysis delivers first avalanche of data.





RESEARCH
PROGRAM ON
Wheat



WHEAT - Global alliance for improved food security and livelihoods

WHY? Wheat provides 21% of food calories and 20% of protein for more than 4.5 billion in 94 countries, sustains 1.2 billion wheat dependent poor (< USD 2 per day); wheat demand will grow 60% by 2050; rising temperatures will reduce yields.

EXPECTED OUTCOMES

- Raise yield growth to 1.6% per year, to keep pace with demand.
- Boost the genetic yield potential of the wheat plant 50% or more.
- Wheat grain for an additional 397 million consumers by 2030.

EXPECTED REACH 800 million (84%) wheat dependent poor living on less than \$2 per day.

WHEAT- Impact



RESEARCH
PROGRAM ON
Wheat

Wheat can - and must! - compete in Africa

- Recent 12-country analysis: wheat production in eight African nations can and should increase.
- Africa will spend US\$12 billion to import 40 million tons of wheat in 2012.
- 250 international, African wheat experts & policymakers met in Addis Ababa during 08-12 October; Organized by CRP WHEAT, Ethiopian Institute of Agricultural Research (EIAR) & the African Union (link to CAADP); resulting “Addis Declaration” will shape policy directions

New kinds of partnership

- 31 global partner Wheat Yield Consortium: Funder Meet 13th Nov led by BBSRC, USAID
- \$2.4mn WHEAT competitive partner grants
- Genetic resource analysis: most extensive search ever for heat tolerance in wheat = Basis for new Heat & Drought Consortium in 2013

The Potential for Wheat Production in Sub-Saharan Africa: Analysis of Biophysical Suitability and Economic Profitability

Asfaw Negassa, Jawoo Koo, Kai Sonder, Bekele Shiferaw, Melinda Smale, Hans Joachim Braun, Dave Hodson, Sika Gbegbelegbe, Zhe Guo, Stanley Wood, Thomas Payne, Bekele Abeyo



Pre-print galley for circulation at the conference “Wheat for food security in Africa: Science and policy dialogue about the future of wheat in Africa,” Addis Ababa, Ethiopia, 08-12 October 2012.



CIMMYT
International Maize and Wheat
Improvement Center



INTERNATIONAL
FOOD POLICY
RESEARCH
INSTITUTE
IFPRI
A member of the CGIAR Consortium



Roots, Tubers and Bananas

WHY? Roots, Tubers and Bananas (RTBs) major food security staples, cheap sources of energy and key nutrients; 14-60% of daily calories of many of the world's poor; great potential for higher yields and increased system productivity; relatively insulated from global price fluctuations; often grown by women, and among the poorest of the poor in marginal areas; significant cross crop synergies with highly heterozygote materials, vegetative propagation and bulky and perishable products

EXPECTED OUTCOMES by 2021

- Play an enhanced role within a diversified global food security system
- Reduce risks of food shortages and nutritional shortfalls
- Improve incomes and livelihoods benefiting 200 million women, men and children



Gender: from rhetoric to reality

- **Context:** Women play a significant role in post-harvest activities and processing of RTB crops
- **Progress:** RTB gender strategy identified key areas for gender research, eg sustaining women's presence in marketing and processing as value chain upgrading takes place



Grain Legumes

WHY? Legumes are the cheapest option to improve the nutrition of poor people who often rely on inexpensive but nutritionally-imbalanced starchy diets

EXPECTED IMPACT in 10 years

- 300 million people in smallholder farm households benefit from an average 20% increase in yields
- USD 4.5 billion saved over the decade as cumulative benefits of increased food production and saved nitrogen fertilizer
- Food supplies increased by 7.1 million tons and an additional 415,000 tons of atmospheric nitrogen fixed



Dryland Cereals

WHY? More than a billion of the Earth's poorest inhabitants live in harsh dryland environments. Dryland cereals are often the only possible crops. About 70–80% of the grain produced is consumed by the poor as food, with the remainder used for feed and other non-food uses. Nearly all smallholder farmers use dryland cereals as fodder in integrated crop–livestock systems.

EXPECTED IMPACT in 10 years:

- Sustainable 16% increase in dryland cereal farm-level production on at least 11.8 million hectares in Africa and Asia
- Improved technologies made available to 5.8 million smallholder households – 34.0 million total beneficiaries in target regions



More meat, milk and fish, by and for the poor

WHY?

- Animal-source foods provide critical inputs to the health of women and children
- Nearly 1 billion (70%) of the world's 1.4 billion extremely poor people depend on livestock.
- 400 million people in Africa and South Asia depend on fish for most of their animal protein
- 156 million landless people keep livestock
- Two-thirds of the world's livestock keepers are rural women

EXPECTED OUTCOMES

- Dairy and pigs: double productivity and incomes in target value chains
- Aquaculture: increase fish consumption by 20% in target value chains
- Goats and sheep: increase productivity to double incomes in target value chains

Livestock and Fish – Progress & Results



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PROGRAM ON
Livestock and Fish



- Multi-stakeholder Dairy Development Forum established in Tanzania to identify systemic dairy industry bottlenecks and co-create solutions.
- Rapid value chain assessment toolkit and associated participatory feed resource methods developed and tested in Ethiopia, India, Tanzania and Uganda.
- 'Abbassa' improved line of Nile tilapia showing 28 per cent greater harvest weight than the 'best' commercial strain currently in use in Egypt.
- Thermostable vaccine for peste des petits ruminants (PPR) developed and under production.



Water, Land and Ecosystems

THE CHALLENGE: How to lift millions of farming families out of poverty and improve how land and water resources are managed while maintaining vibrant ecosystems

EXPECTED OUTCOMES by 2020

- 15 million smallholder farmers in sub-Saharan Africa have sustained food security because yield gaps are reduced while maintaining ecosystem functions in rainfed landscapes
- Enhance food security and household income for about 20 million rural people in the Eastern Gangetic Plains by improving access to irrigation
- Minimize the health risks associated with the use of wastewater and excreta in agriculture which can benefit an estimated 21 million vegetable farmers and 175 million consumers currently exposed to contaminated food in South Asia and sub-Saharan Africa

Success Story: Ground Water Policy change

- Agricultural growth in West Bengal had slumped by more than half.
- Research identified that a major hindrance to agricultural productivity was getting access to groundwater.
- New policies recommended by IWMI were adopted to improve groundwater access for smallholder farmers.
- The policy change could benefit more than 5.6 million smallholders.



Aditi Mukerjhi
2012 Borlaug Award
Winner



Under previous groundwater regulations, many poor farmers in West Bengal were forced to water by hand. The reformed policy should open up new opportunities.



Forest, Trees and Agroforestry

WHY? Responds to a call for an urgent, strong and sustained effort focused on forest management and governance, given the crucial role of forests in confronting some of the most important challenges of our time: climate change, poverty, and food security

EXPECTED IMPACT in 10 years:

- 0.5–1.7 million hectares of forest saved annually from deforestation
- 0.16–0.68 billion tonnes of carbon dioxide emissions reduced per year = 29–123 million cars off the road annually
- 3 million producers and traders and their families benefit from ecologically and socially sustainable production and management practices
- Double income from forest and agroforestry products for target households

Success Story: Capacity building

Increased focus among partners on raising capacity in forestry sector

Highlight: Survey in 2005 found less than 10 active researchers in DRC – a country that represent 60% of the Congo Basin's forests. Project at the University of Kisangani: 53 MSc students trained (22 about to start); 6 PhDs completed & 13 PhDs ongoing. Separate project in Congo Basin on climate change adaptation trained 40 MSc students





Agriculture for Nutrition and Health

WHY?

- More than 2 billion people worldwide are micronutrient deficient
- 180 million children under the age of 5 are stunted
- 13 zoonoses are responsible for 2.4 billion human illnesses and 2.2 million deaths per year

For these reasons, and many more, progress in improving the nutrition and health of poor farmers and consumers (especially women and young children) is vital and urgent

- Improve nutrition quality and food safety in **value chains** for nutrient-rich foods
- Via **biofortified staple crops**—5 biofortified crops have been released since 2007; approx. 4 million households will be growing those crops by end of 2015
- **Recent releases:**
 - Vitamin A cassava released in December 2011
 - Vitamin A maize released in 2012 in Nigeria and Zambia
 - Iron beans released in Rwanda in 2012
 - Iron pearl millet commercialized in India in 2012 by private company
- Via **diet diversity**
- Through **linking agriculture** with **nutrition** and **health** programs, **policies**, and **investments**



A4NH Micronutrient Crops



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PROGRAM ON
Agriculture for
Nutrition
and Health



Cassava
Provitamin A
DR Congo, Nigeria



Pearl Millet
Iron (Zinc)
India



Beans
Iron (Zinc)
DR Congo, Rwanda



Rice
Zinc
Bangladesh, India



Maize
Provitamin A
Zambia



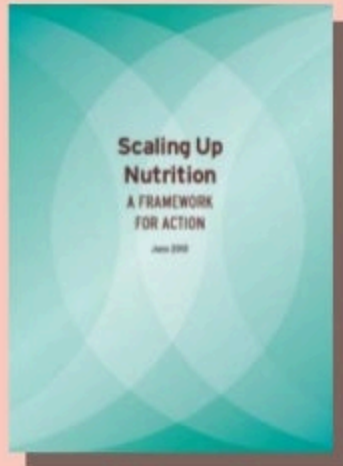
Wheat
Zinc
India, Pakistan

2014-2018 Delivery-at-scale: 40 million people from 8 target countries

A4NH Evidence - Nutrition Outcomes



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PROGRAM ON
Agriculture for
Nutrition
and Health



Direct
Nutrition
Interventions

Agriculture &
Food Chains



Gender



Social
Protection



Randomized nutrition trials:

- Homestead food production
- Integrated agriculture and health programs
- Biofortified crops
- Food assistance, food vouchers, cash transfers

National baseline surveys:

- Household nutrition and agriculture in Bangladesh

The Dublin Process

Enhancing CAADP and CGIAR Alignment and Partnership



CGIAR

Science for a food secure future

- Strong demand for CGIAR engagement from African partners
- Efforts underway:
 - MoU African Union - CGIAR
 - African Science Agenda
 - Regional Productivity Workshops
 - Mapping & Alignment Tool
- Shared leadership among CAADP, CGIAR and development partners
- Political momentum through the G8 and G20 in support of this process, will include Technology Innovation Platform
- Involves joint planning and priority setting

GCP's Integrated Breeding Platform: major public launch Dec '12

Marker-assisted breeding can cut 3-5 years from breeding cycle, with estimated benefits in order of hundreds of millions of US\$ for cassava alone

www.integratedbreeding.net

The screenshot shows the Integrated Breeding Platform (IBP) website. At the top left is the IBP logo, a stylized 'iB' with a green leaf, followed by the text 'Integrated Breeding Platform' and the tagline 'Accessible cutting-edge crop breeding tools and services'. To the right of the logo, there is a user login area showing 'You are logged in as aokono' with 'My links' and 'Log out' options, and a search bar labeled 'Search IBP'. Below the header is a navigation menu with the following items: Home, Crop information, Genomics, Breeding, Capacity building, Community, News & Events, and Help. The main content area features four large circular icons representing different platform functions: 1. 'CROP INFORMATION' with sub-points: ACCESS TO DATA, DATA MANAGEMENT, TRAIT DICTIONARIES. 2. 'BREEDING ACTIVITIES' with sub-points: IMPROVED GERMPLASM, TOOLS, SERVICES. 3. 'CAPACITY BUILDING' with sub-points: LEARNING & DEVELOPMENT, SUPPORT SERVICES, INFORMATION & RESOURCES. 4. 'CROP COMMUNITIES' with sub-points: SHARED SOLUTIONS, COMMUNITIES OF PRACTICE, KNOWLEDGE SHARING.

Genebanks approved

March 2012: >\$100M over 5 years



The genetic diversity treasure chest

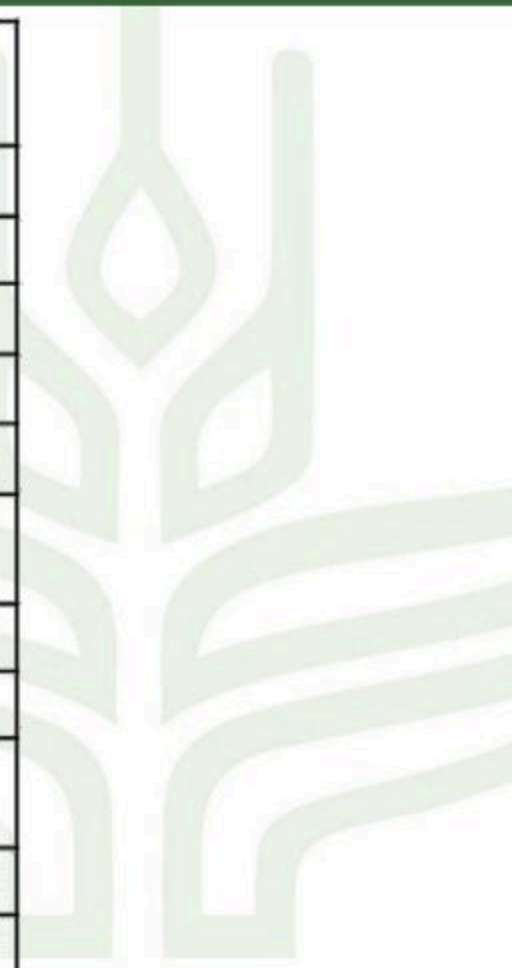
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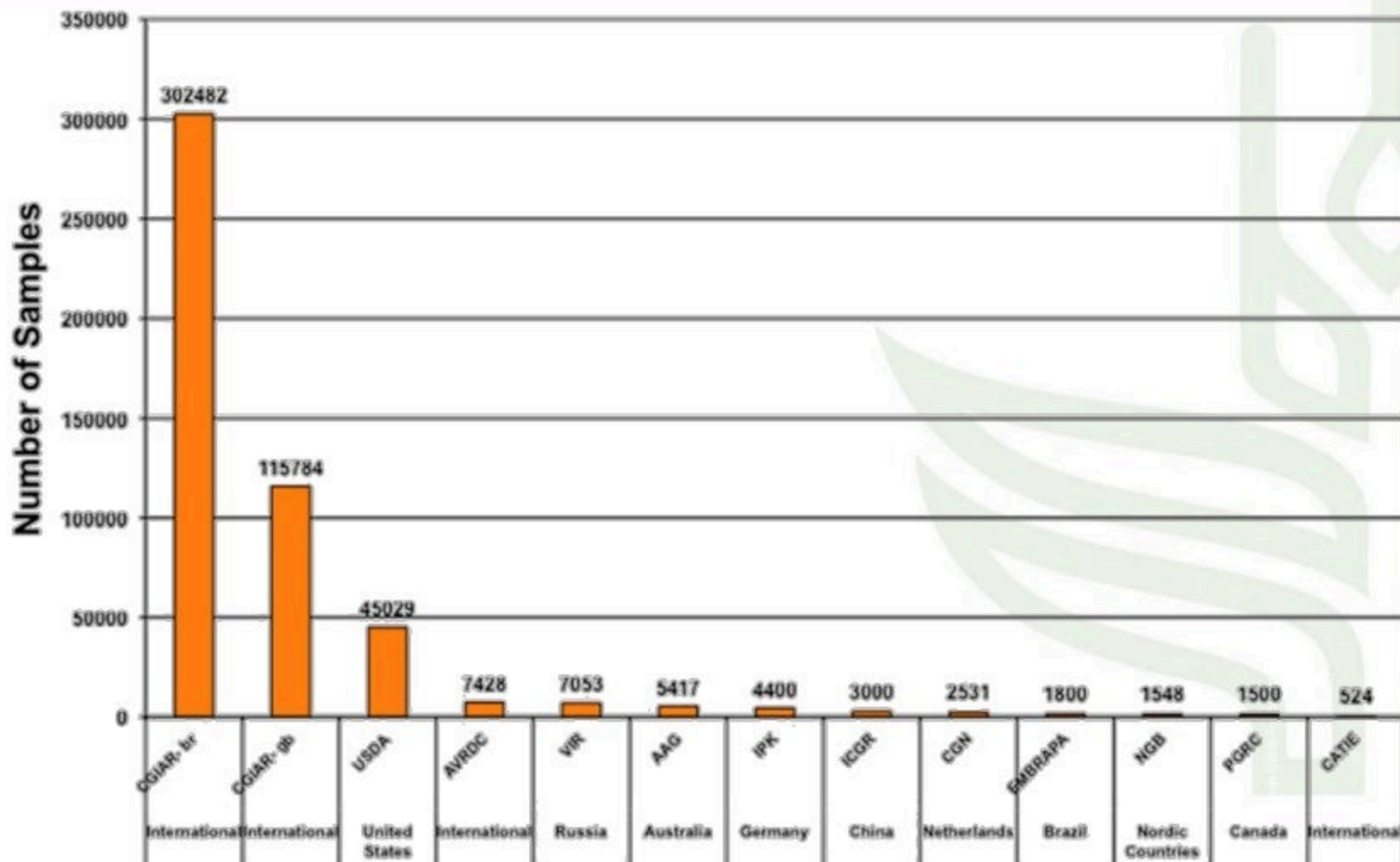
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International collections

		Accessions
AfricaRice	Rice	20,000
Bioversity	Banana, Plantain	1,298
CIAT	Beans, Cassava, Tropical forages	65,635
CIMMYT	Maize, Wheat	155,129
CIP	Potato, Sweet potato, Andean Roots & Tubers	16,495
ICARDA	Grain legumes, Wheat, Barley, Forage & range crops	134,160
ICRAF	Trees	5,144
ICRISAT	Dryland cereals, Grain legumes	156,313
IITA	Banana, Plantain, Maize, Cowpea, Cassava, Yam	28,286
ILRI	Tropical forages	18,291
IRRI	Rice	110,817
Total		711,568



Genebank Samples Distributed per Year



Source: Collections online databases, publications, and personal communications between Trust and Genebank Managers, 2008,-2010

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ACIAR Impact Assessment of CGIAR

 Australian Government
Australian Centre for
International Agricultural Research



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

ACIAR IMPACT ASSESSMENT SERIES

74

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

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THANK YOU