

Precision agriculture, a strategy for food and feed challenges for the 21st century

Dr. Thomas Lumpkin

CIMMYT Director General

April 10th, 2013



CIMMYT's Mission



To sustainably increase the productivity of maize and wheat systems to ensure global food security and reduce poverty.

CIMMYT's Background: Key Facts

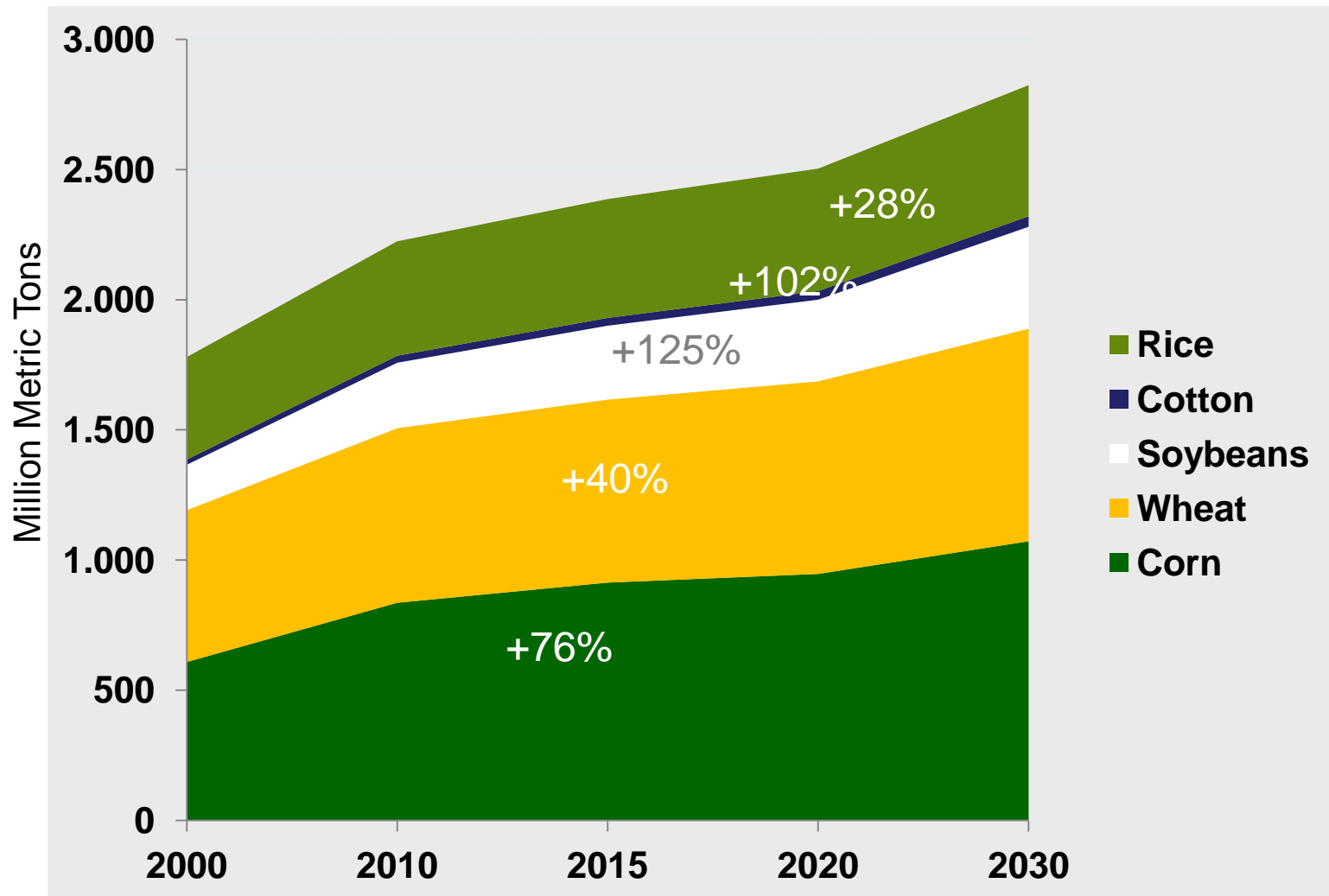
- Headquartered in Mexico, CIMMYT is an international organization with 22 offices worldwide.
- CIMMYT employs nearly 200 scientific staff.
- CIMMYT's genebank holds 27,000 accessions of maize and 150,000 accessions of wheat.



Examples of CIMMYT's Global Impact

- Over 75% of wheat varieties in South America are derived from CIMMYT germplasm.
- 55% of wheat varieties in China are sourced from CIMMYT.
- 90% of all spring wheat cultivars grown in India and Pakistan originate from CIMMYT.
- Over half of the maize varieties in the developing world have been developed using CIMMYT genetic materials

Global Challenges: Increasing Demand



Converging Challenges of Global Food Security



Water

groundwater
surface water



Climate Change

heat, drought, extreme events



Nutrients-Soils

fertilizer cost
depleted soils



Energy

petroleum
biofuels



Demand

population growth, changing diets



Biodiversity

extinction
emerging pests

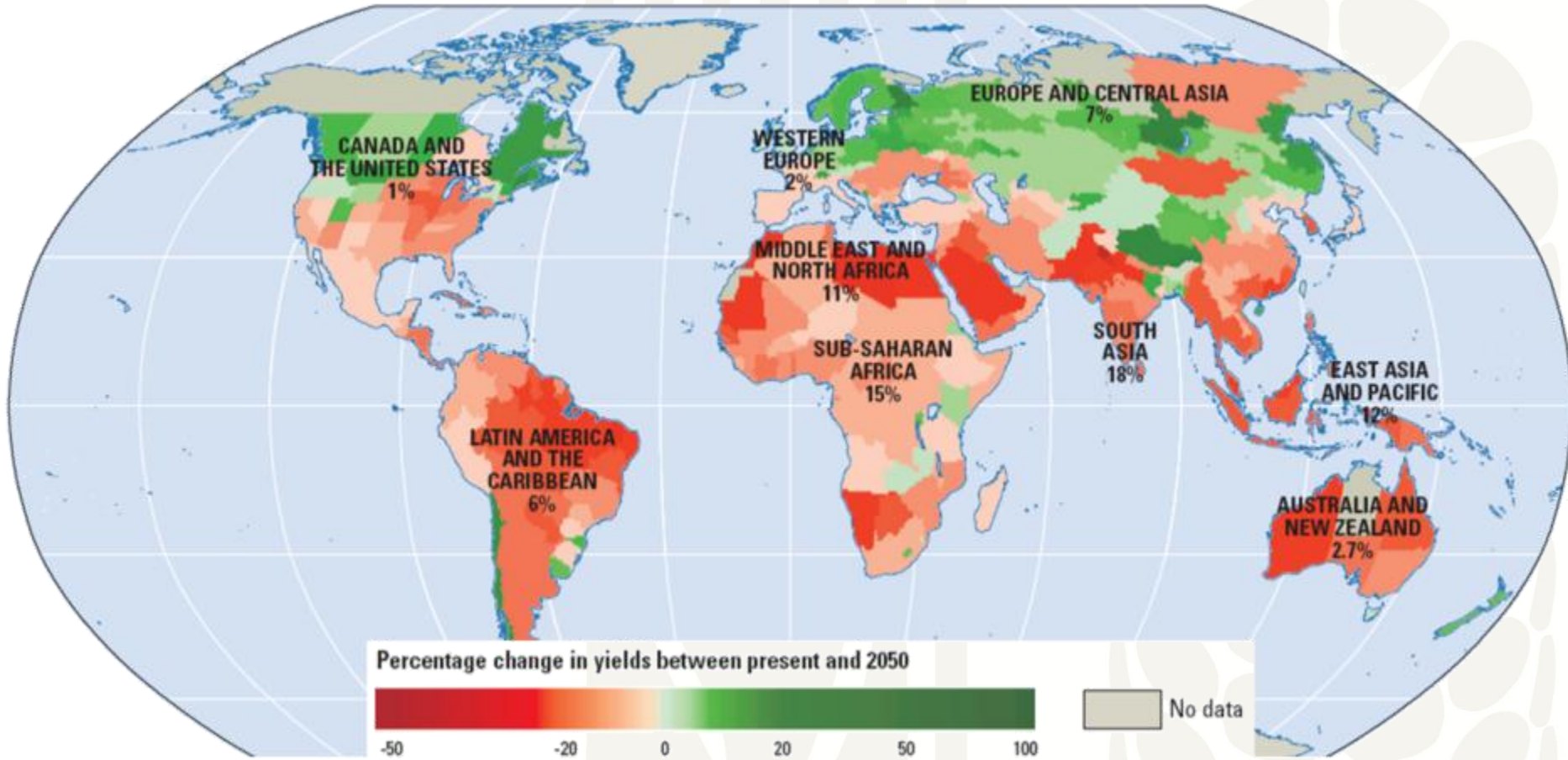


***“In the next 50 years
we will need to produce
as much food as has
been consumed over
our entire human
history.”***

Megan Clark, CEO of the
Commonwealth Scientific and
Industrial Research Organization
(CSIRO), Australia

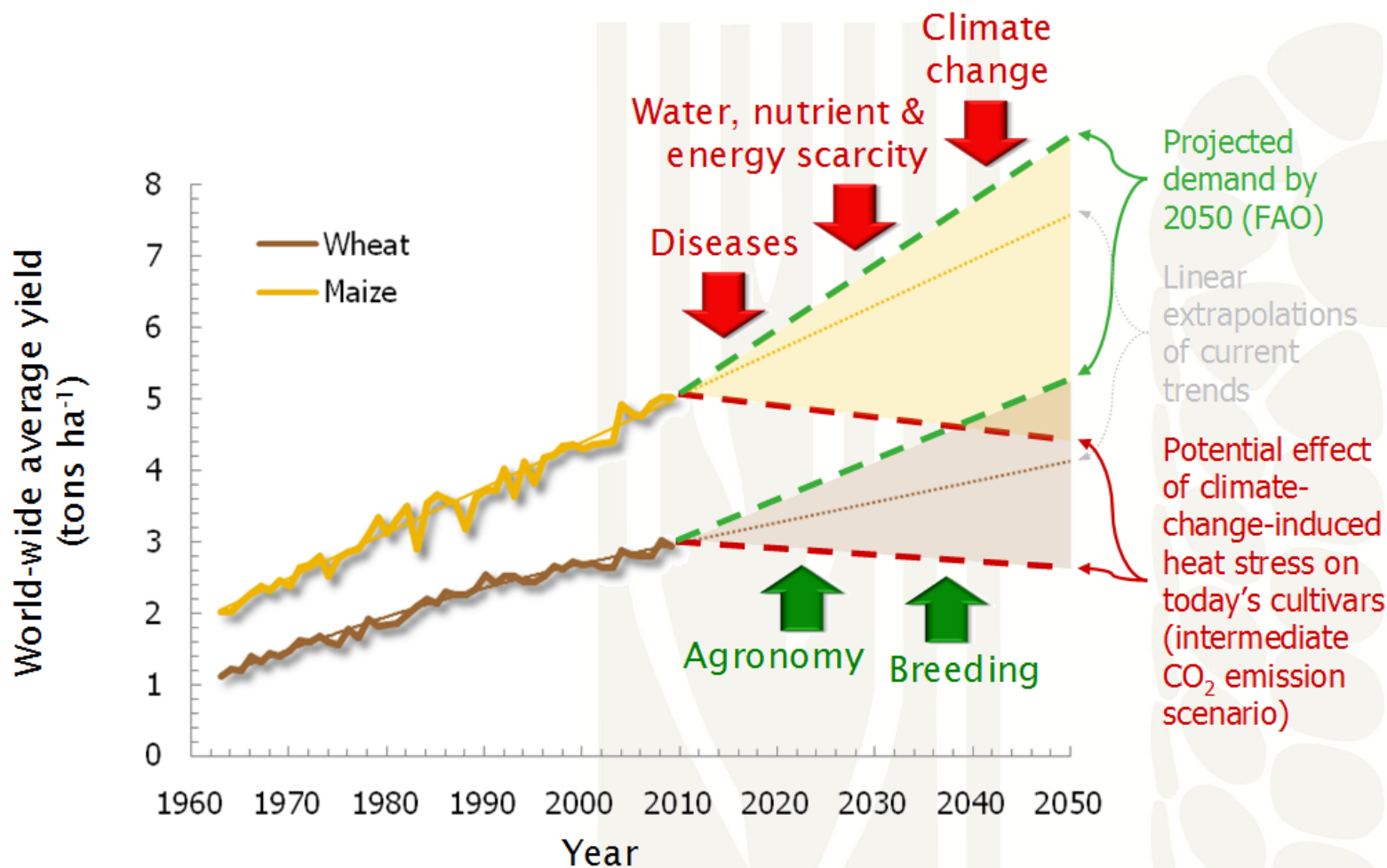
Global Challenges: Heat

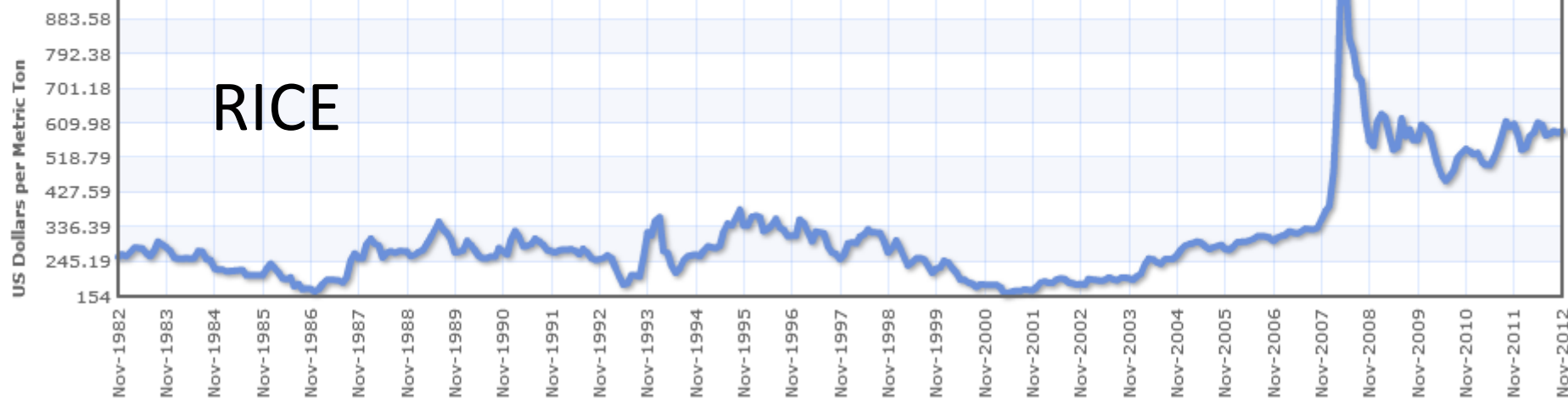
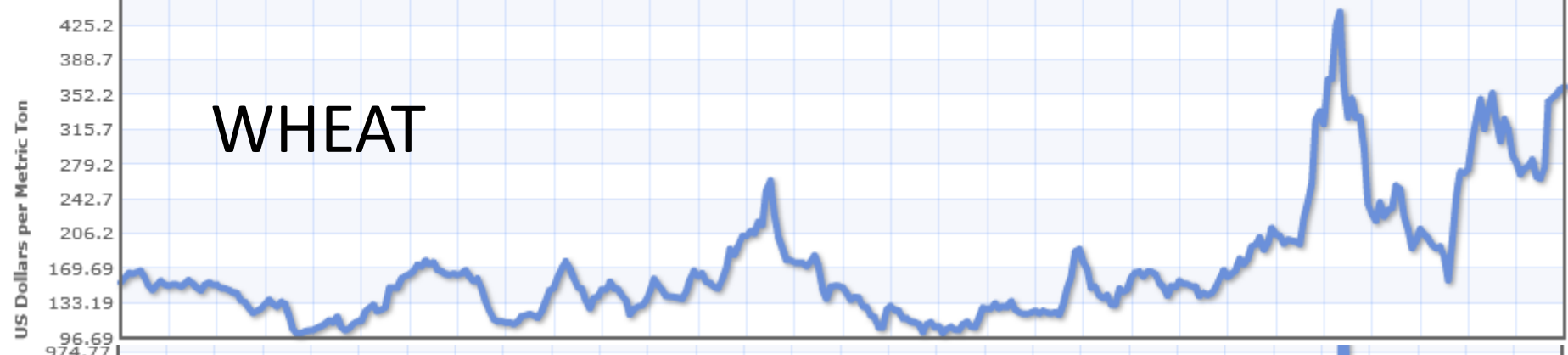
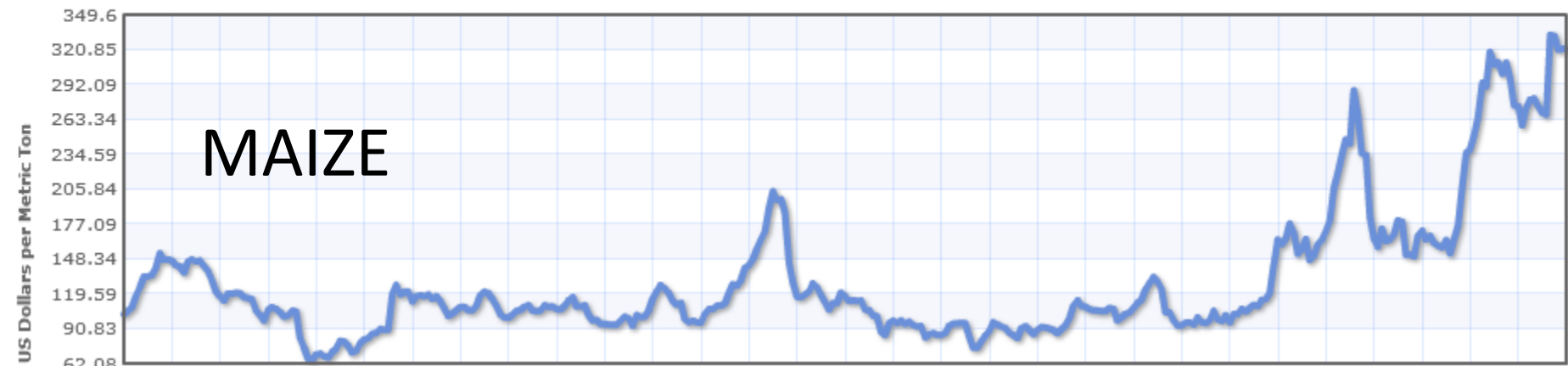
Up to 23% of South Asia's maize crop will be lost due to higher temperatures by 2050.



Krechowicz, et. al., "Weeding Risk: Financial Impacts of Climate Change and Water Scarcity on Asia' Food and Beverage Sector", World Resources Institute, 2010.

Global Challenges: Wheat and Maize





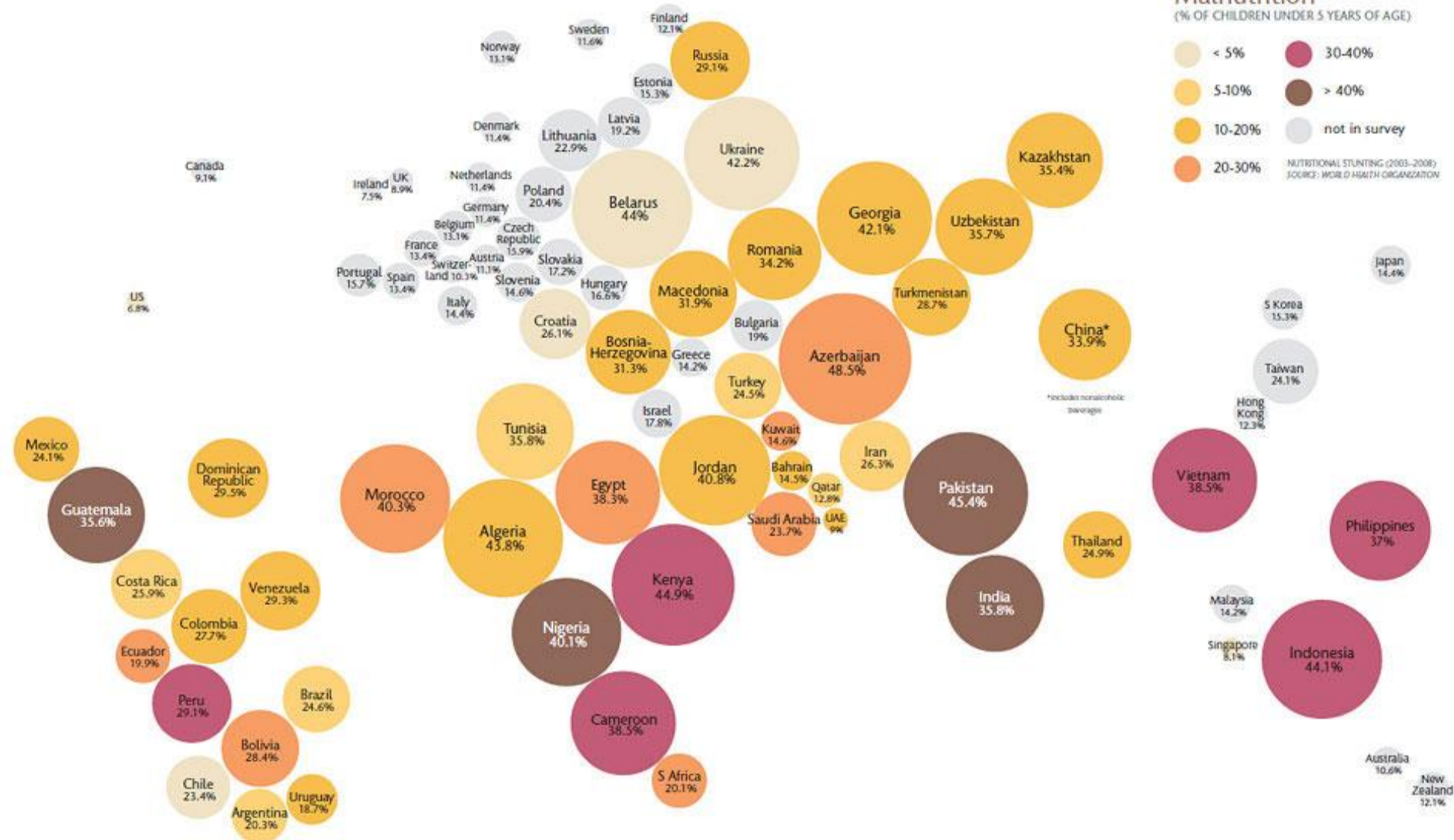
Percentage of Annual Income Used to Purchase Food + Malnutrition Rates

Malnutrition

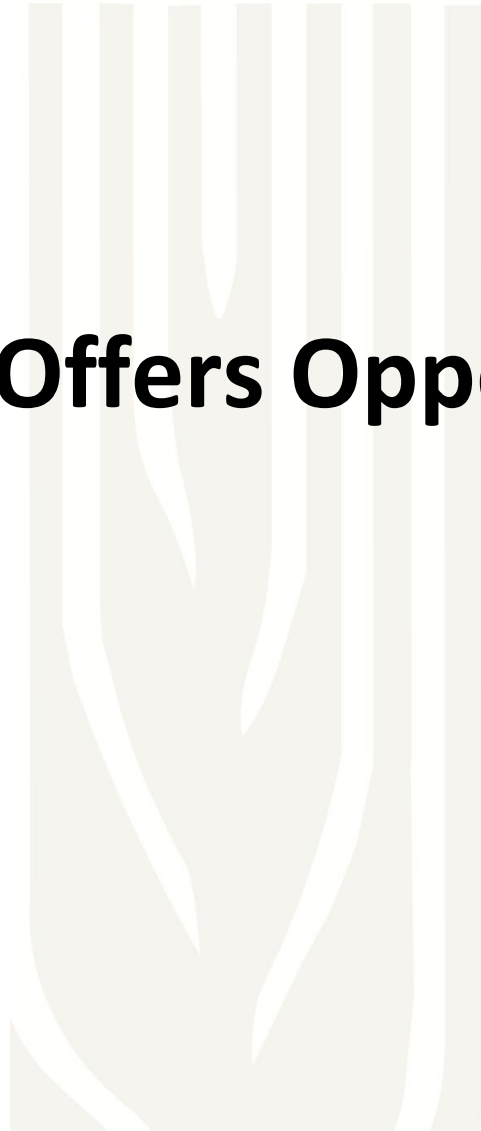
(% OF CHILDREN UNDER 5 YEARS OF AGE)



NUTRITIONAL STUNTING (2003-2008)
SOURCE: WORLD HEALTH ORGANIZATION



Science Offers Opportunities

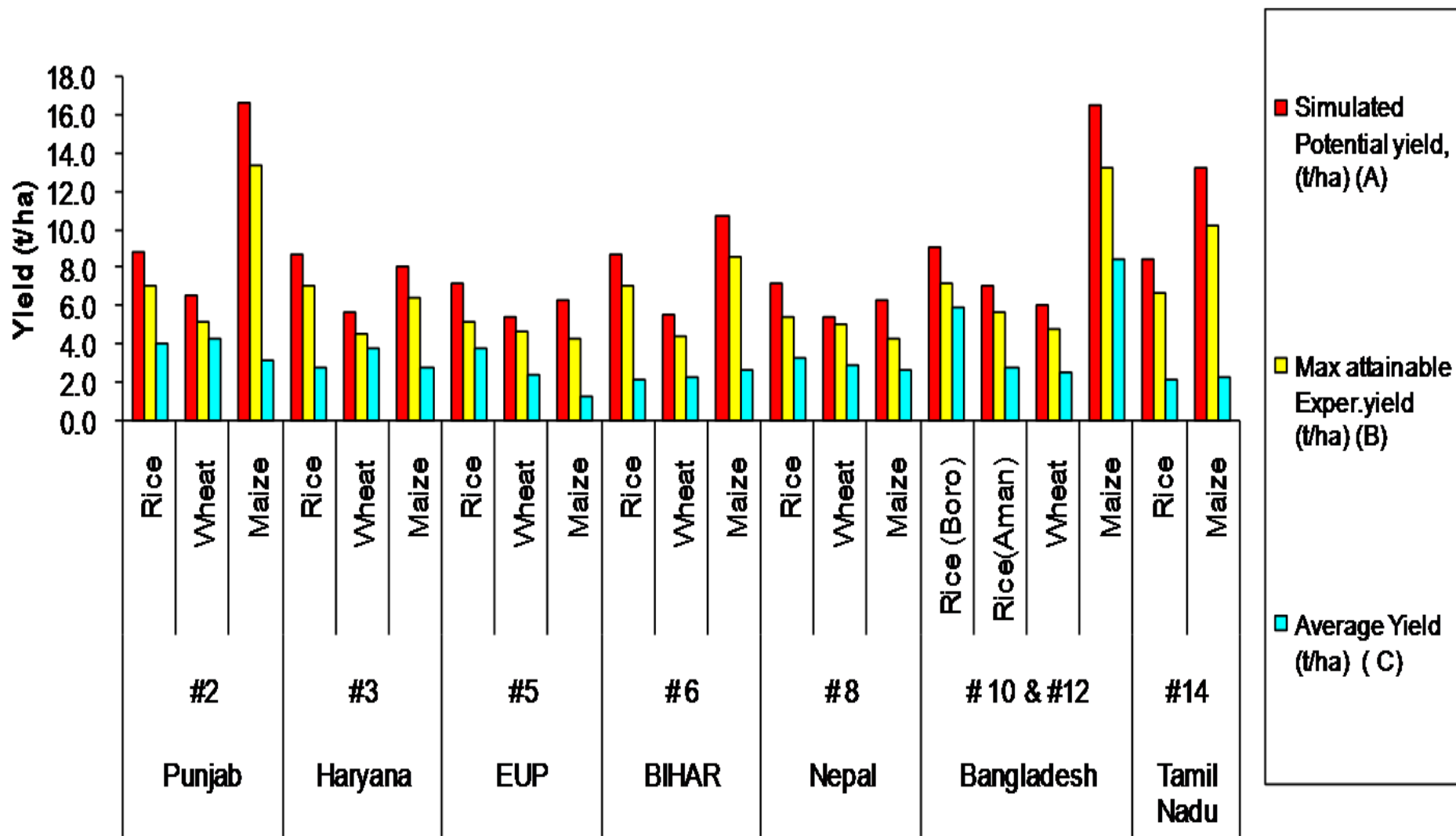


Opportunities to Feed the Future

CIMMYT's Strategic Initiatives

1. Integrated programs, i.e. MasAgro, CSISA, SIMLESA
2. *Seeds of Discovery*
3. Precision nutrient management
4. Conservation Tillage
5. Marker assisted breeding
6. Hybrid wheat
7. Photosynthetic efficiency
8. Cellphone / internet decision support tools
9. Borlaug Institute for South Asia

Opportunity – The Yield Gap



1. Opportunity: integrated programs like MasAgro

Sustainable Modernization of Traditional Agriculture

- **General objectives:**
 - Boost corn and wheat productivity.*
 - Increase returns on grain harvested.
 - Reduce agriculture's climate footprint.
- Targets low-income farmers, small- and medium-sized seed companies, national researchers.

* By 2020: Annual rainfed corn production increased by 5-9 million tons.

SAGARPA

SECRETARÍA DE AGRICULTURA,
GANADERÍA, DESARROLLO RURAL,
PESCA Y ALIMENTACIÓN



MasAgro research components



Take it to the Farmer (TTF) / Desarrollo Sustentable con el Productor to integrate agri-food chain actors, with emphasis on small scale farmers, extension agents, input suppliers and market agents, to promote solutions to sustainable maize and wheat production.



International Maize Improvement Consortium (IMIC) / Estrategia Internacional para Aumentar el Rendimiento de Maíz, to increase the competitiveness of the country's seed industry in a PPP.



Seeds of Discovery (SeeD) / Descubriendo la Diversidad Genética de la Semilla to use cutting edge technologies to unlock the black box of genetic diversity in maize and wheat.



**Precision Agriculture ongoing efforts &
future plans
The MasAgro experience**

April, 2013

Strengthening smart small scale farmers

- 500 million small farmers feed 1/3 of the world's population, basically using their hands, with limited access to information and education for making decisions.
- MasAgro has tailor-made versions of technologies and farming systems to strengthen small farmers
- These are conducive to a **favorable context for change** in the areas of machinery, information-communications and agricultural marketing.

Precision Agriculture and public – private partnerships for increasing crop productivity and enabling sustainable farming systems.



**Smart
Nutrition**

**Smart
Mechanization**

**Smart
Resource
Management**

**Smart
Communication**

Smart NUTRITION

- Lack of access to credit blocks access to fertilizers.
- Imbalanced doses of fertilizers destabilize production and harm soils.
- CIMMYT aims is to offer farmers a service that provides them with personalized, tailor-made recommendations in a timely manner to optimize nutrient use.

Smart MECHANIZATION

- Lack of access to machinery and inefficient use of land results in **low yields and income**.
- CIMMYT works with partners in Mexico and Asia to improve 2WT tractors, and to **develop 4WT multi-functional machines** that are ideal for CA.
- The aim is to facilitate access for small farmers to affordable machinery especially designed for local needs.

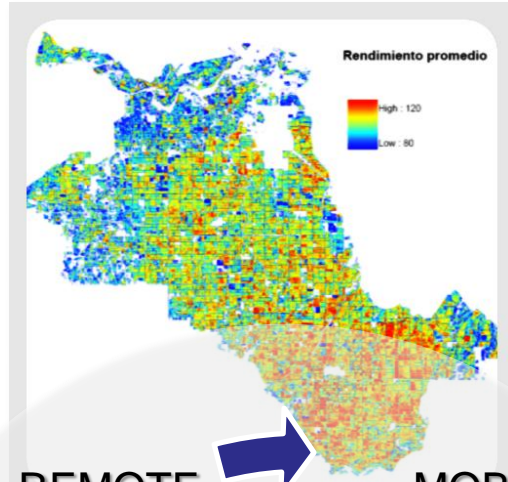
Smart Resource **MANAGEMENT**

- **Climate change** has a strong impact in rainfed agriculture; smart resource management and optimal use of water mitigates this impact.
- CIMMYT and its partners promote an efficient and improved resource management system based on: the adoption of **irrigation systems, productivity planning** and monitoring, and precise **weather information**.

Smart **COMMUNICATION**

- Communications is the key for promoting the productivity of small scale smart farmers. We combine sensors and cellphones **with more traditional tools** (T.V., radio, comics, plays, etc.)
- Innovative business models using ICTs facilitates **fair access to information, technology, networks and finance**.
- CIMMYT adapts its messages and tools to the needs of the different users of its **learning and support platforms**.

Global Technological Platform



REMOTE
SENSORS

MOBILE
TELEPHONES

SUPPORT
FOR
DECISION
MAKING

N&P
FERTILIZATION

PRODUCTION
ESTIMATIONS

Electronic Information - e-MasAgro - Mexico

- ✦ **A system for the electronic recording of field data** developed in collaboration with Impulsora Agrícola, PROMAF, PESA, Chapingo and INIFAP

- ✦ **Launched 11th March**

Last update 27th March

Modules 2,229

Extension plots 7,611

Women 2,205

Men 7,465

- ✦ In collaboration with INCA and SAGARPA



MasAgro
BITÁCORA ELECTRÓNICA



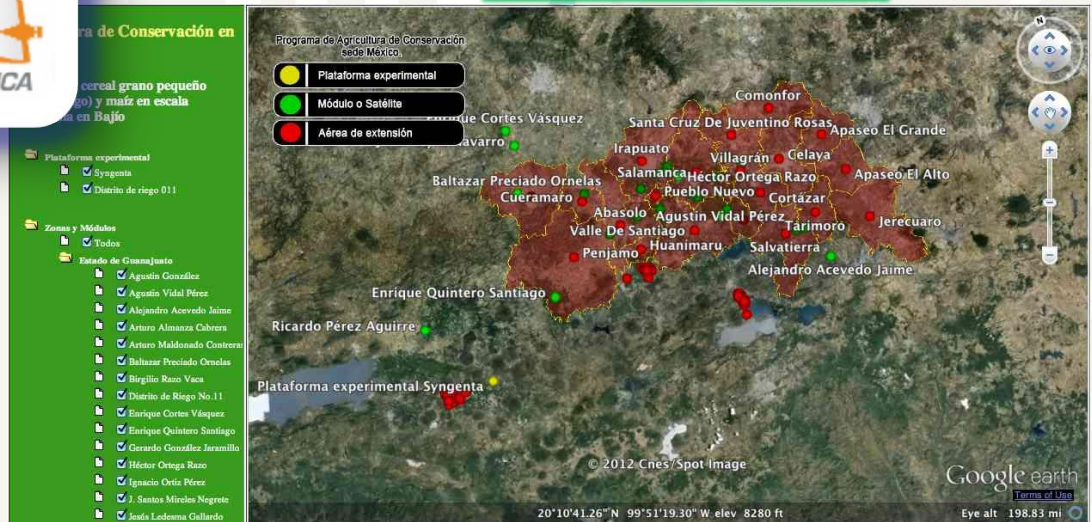
Link with GIS and Conservation Earth (under construction)

- Geographic coordinates
- Crop management data



MasAgro 
BITÁCORA ELECTRÓNICA

- Inputs from field logbook



Electronic Information - e-MasAgro

- ✦ **A system for the electronic recording of field data** developed in collaboration with Impulsora Agrícola, PROMAF, PESA, Chapingo and INIFAP
- ✦ **Conservation Earth**
- ✦ A platform of interactive digital maps from SAGARPA's center for geo-spatial control
- ✦ GreenSeeker remote sensing
- ✦ MasAgro GreenSat => SIAP and AOASS



MasAgro
BITÁCORA ELECTRÓNICA

The logo features the word "MasAgro" in a stylized font with "Mas" in green and "Agro" in orange. To the right is an icon of a green plant growing from a white book with a red bookmark. Below the main text, "BITÁCORA ELECTRÓNICA" is written in a smaller, grey font.

MasAgro
GREENSAT

The logo features the word "MasAgro" in a stylized font with "Mas" in green and "Agro" in orange. To the right is an icon of a globe with a satellite dish and signal waves. Below the main text, "GREENSAT" is written in a smaller, grey font.



MasAgro

BETA

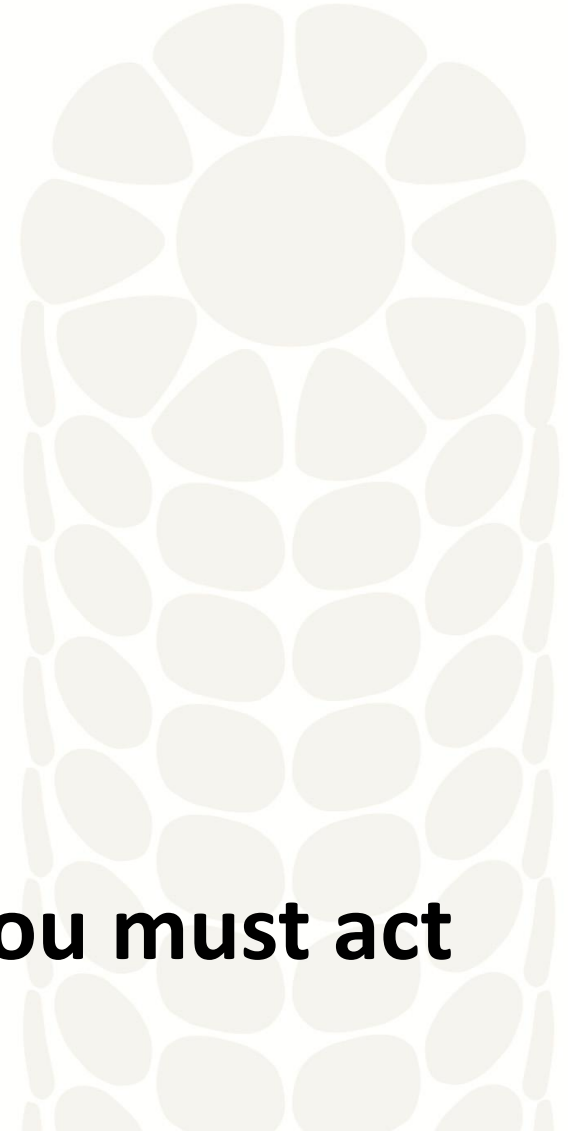


MÓVIL

CIMMYT scientists make the difference



**Food security faces tremendous challenges
But science offers amazing opportunities**



However leaders must act – You must act