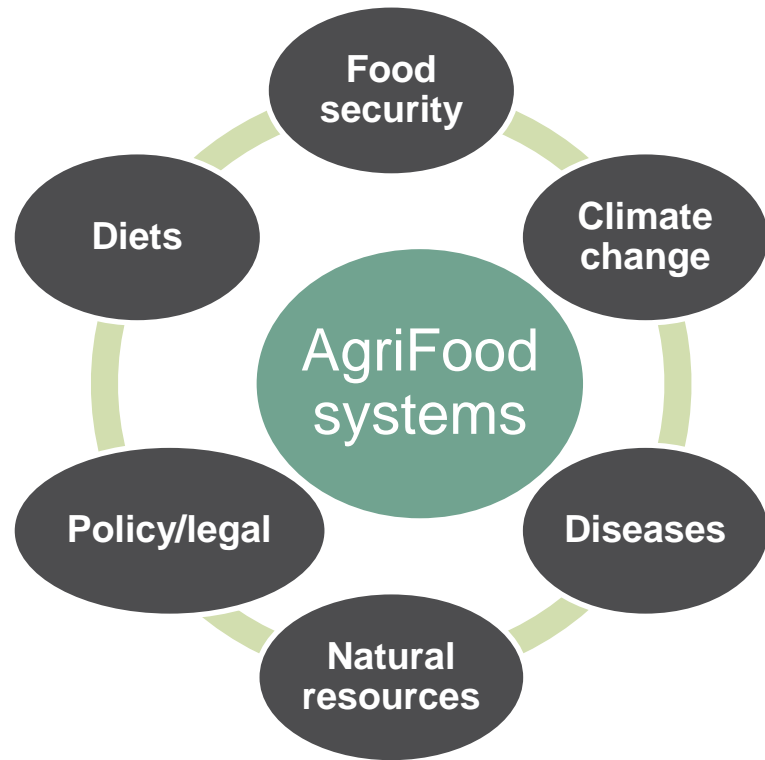


Global food security and the role of CIMMYT

Martin Kropff
Director General, CIMMYT



Challenges 2050



More



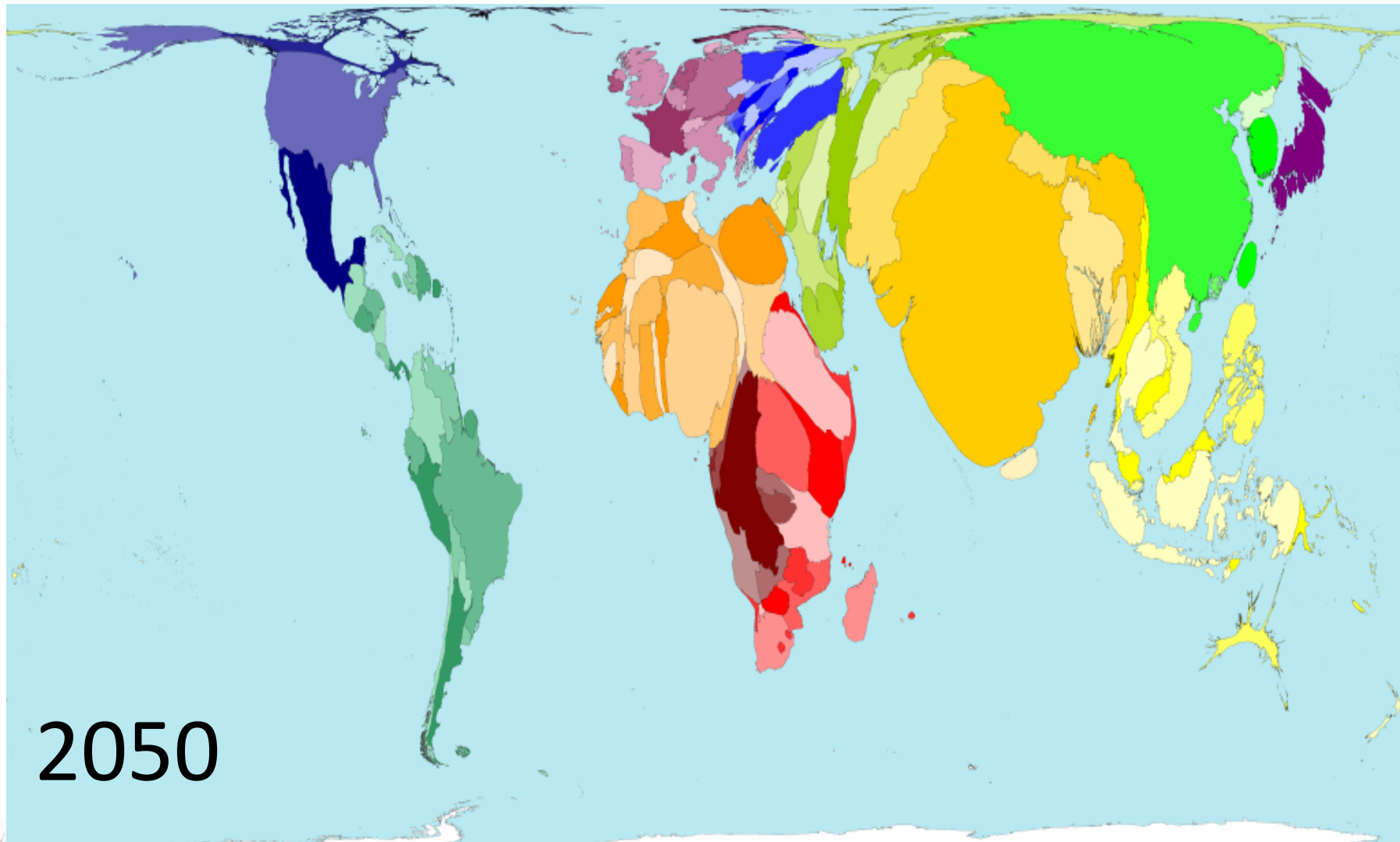
Less



Better



9.7 Billion Person Question

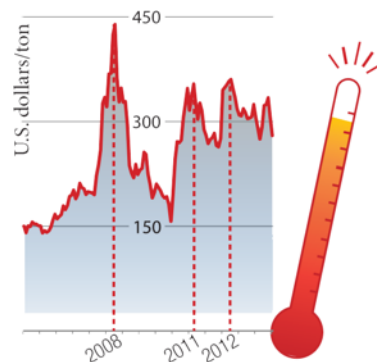


2050

Climate change

90% of CIMMYT's work **relates to climate change**

Wheat prices destabilized 3x since 2012 by extreme weather and market dynamics



Adaptation

- Prediction and analysis
- Climate-tolerant crops
- Climate-resilient agriculture

Current wheat varieties and practices will yield up to 30% less in Asia, due mainly to rising temperatures

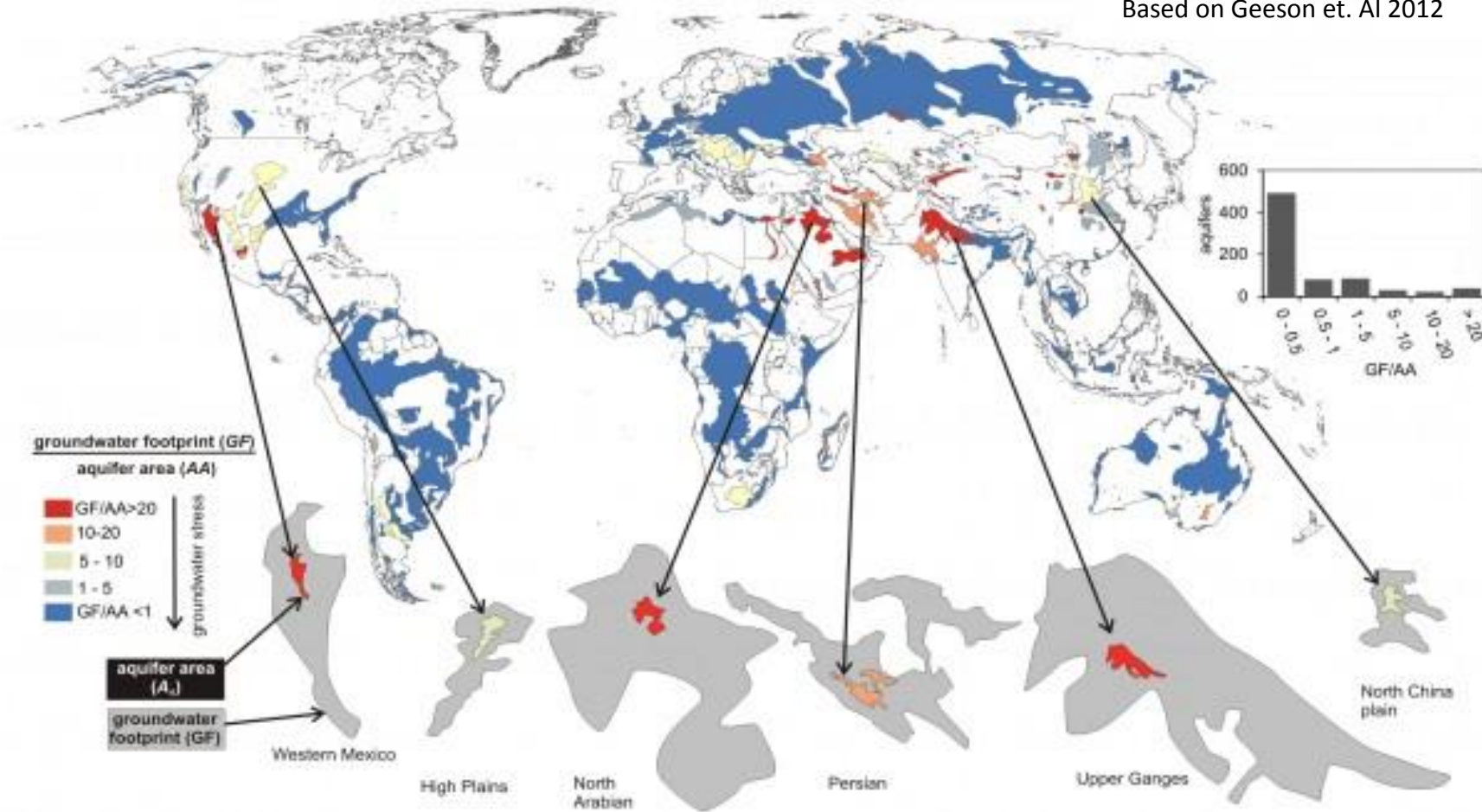


Mitigation

- Reduced and targeted use of nitrogen fertilizer

Resource shortages - water

National Geographic Magazine 2013,
Based on Geeson et. Al 2012



Footprint 54x
Aquifer!!!

Disease epidemics



Maize Lethal Necrosis

2 viruses
affect Kenya, Uganda,
Tanzania, Rwanda, D.R.
Congo, South Sudan,
and Ethiopia



Tar Spot Complex

Mexico, Colombia, El
Salvador, Guatemala,
Nicaragua



Wheat blast

Argentina, Brazil,
Bolivia, Paraguay,
South Asia



Stem Rust

Most feared!
Global



Fusarium Head Blight

China,
Caspian and Black
Sea,
Cona Sur,
North America,
Western Central and
Eastern Europe



Septoria

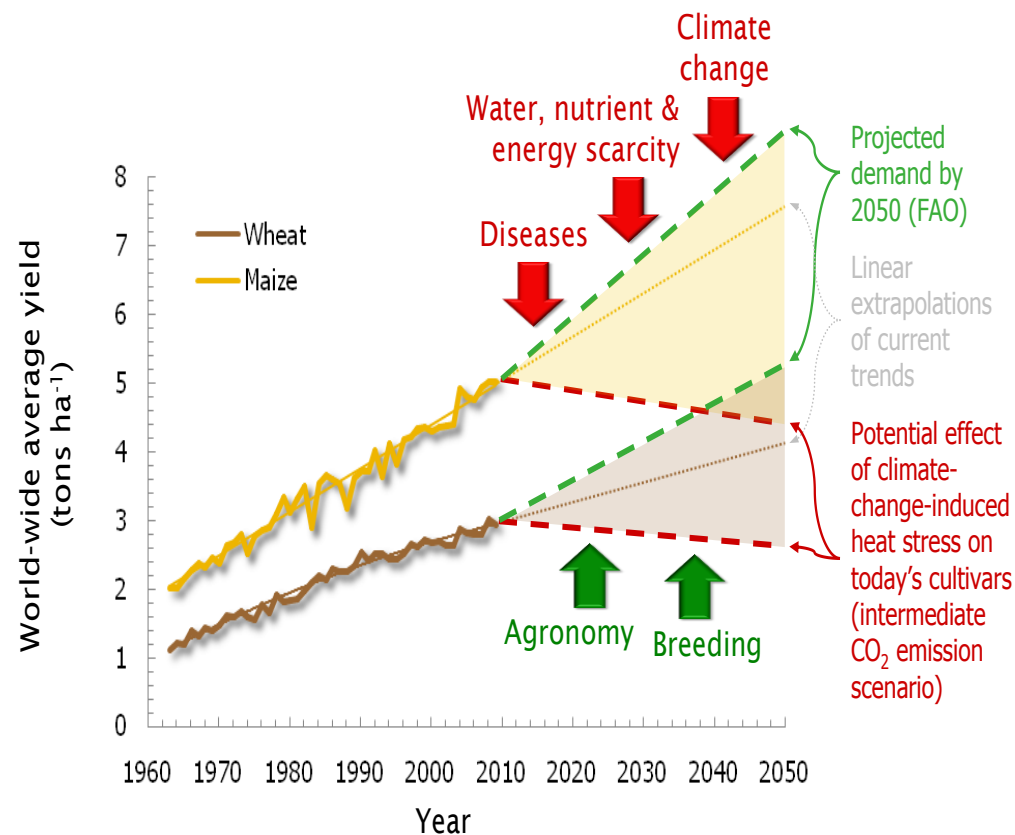
North Africa,
Ethiopia, Latin
America, Southern
and Central Europe,
Iran, Kazakhstan and
Siberia



The challenge for agronomy and breeding

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

- from 1.2% - 1.7% for maize
- from 1.1% - 1.7% for wheat





Feeding the World: Maize and Wheat



CIMMYT^{MR}

Wheat helps feed the world

WHEAT IS THE LARGEST
PRIMARY COMMODITY

GLOBAL PRODUCTION IS OVER
735 million metric tons



WHEAT PROVIDES **18%** OF OUR
TOTAL AVAILABLE CALORIES



2.5 billion people
in **89** countries



GROWN ON

220m
HECTARES



\$27.8 billion
IN TRADE EACH YEAR



CIMMYT^{MR}

Maize helps feed the world

PREFERRED
STAPLE FOOD TO
900 million
people
LIVING ON LESS THAN \$2 A DAY



MAIZE PROVIDES
15-56% OF
TOTAL CALORIE INTAKE
in Sub-Saharan Africa, Latin America and Asia



184 million
hectares
WORLDWIDE

Global
production
in 2016 | **1026 million**
metric tons



\$21 billion
IN TRADE EACH YEAR



Food security = Nutrition security

Calorie
undernutrition

800
million
people

Micronutrient
deficiency

2 billion
people

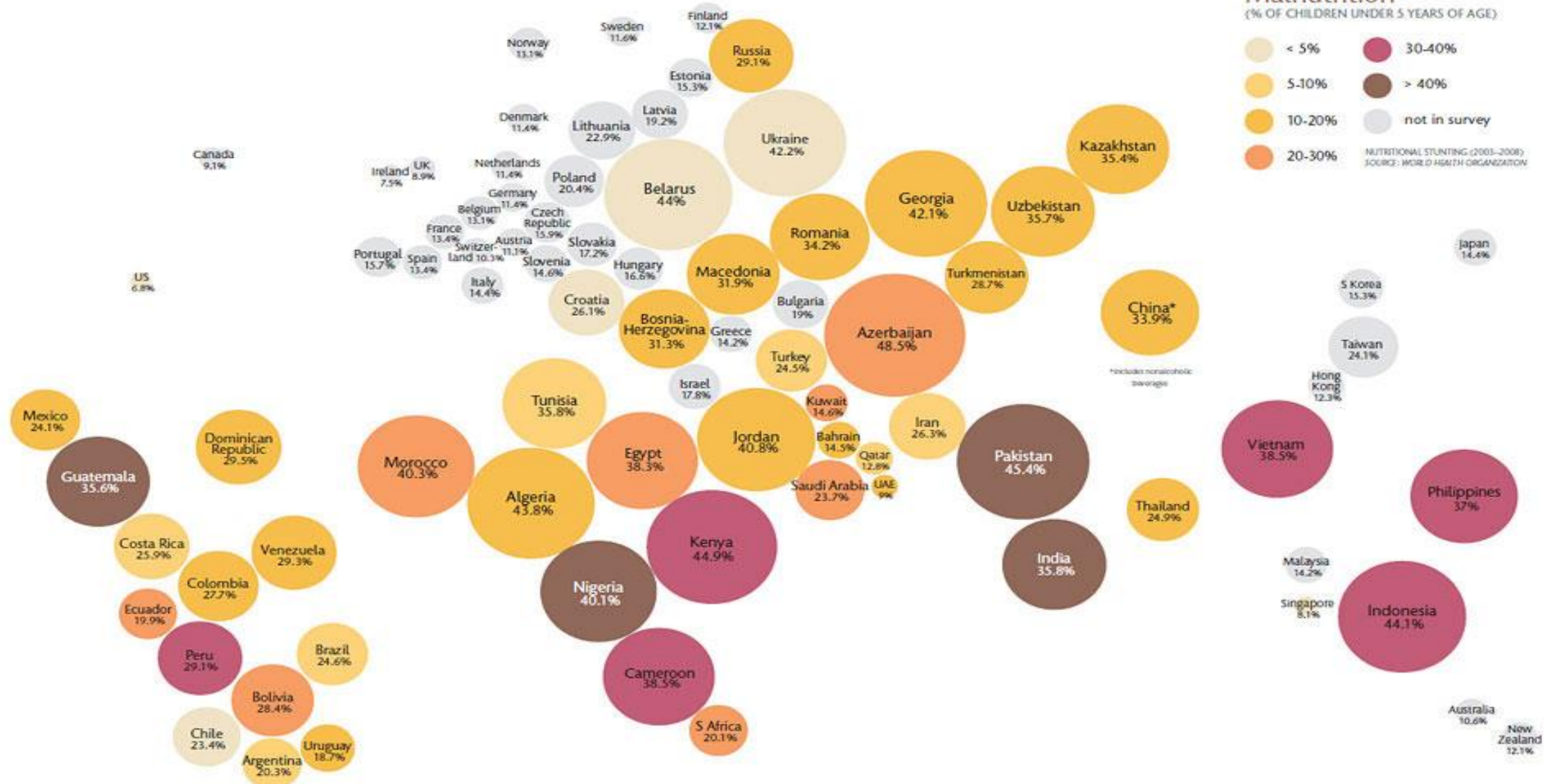
Obesity

650
million
people

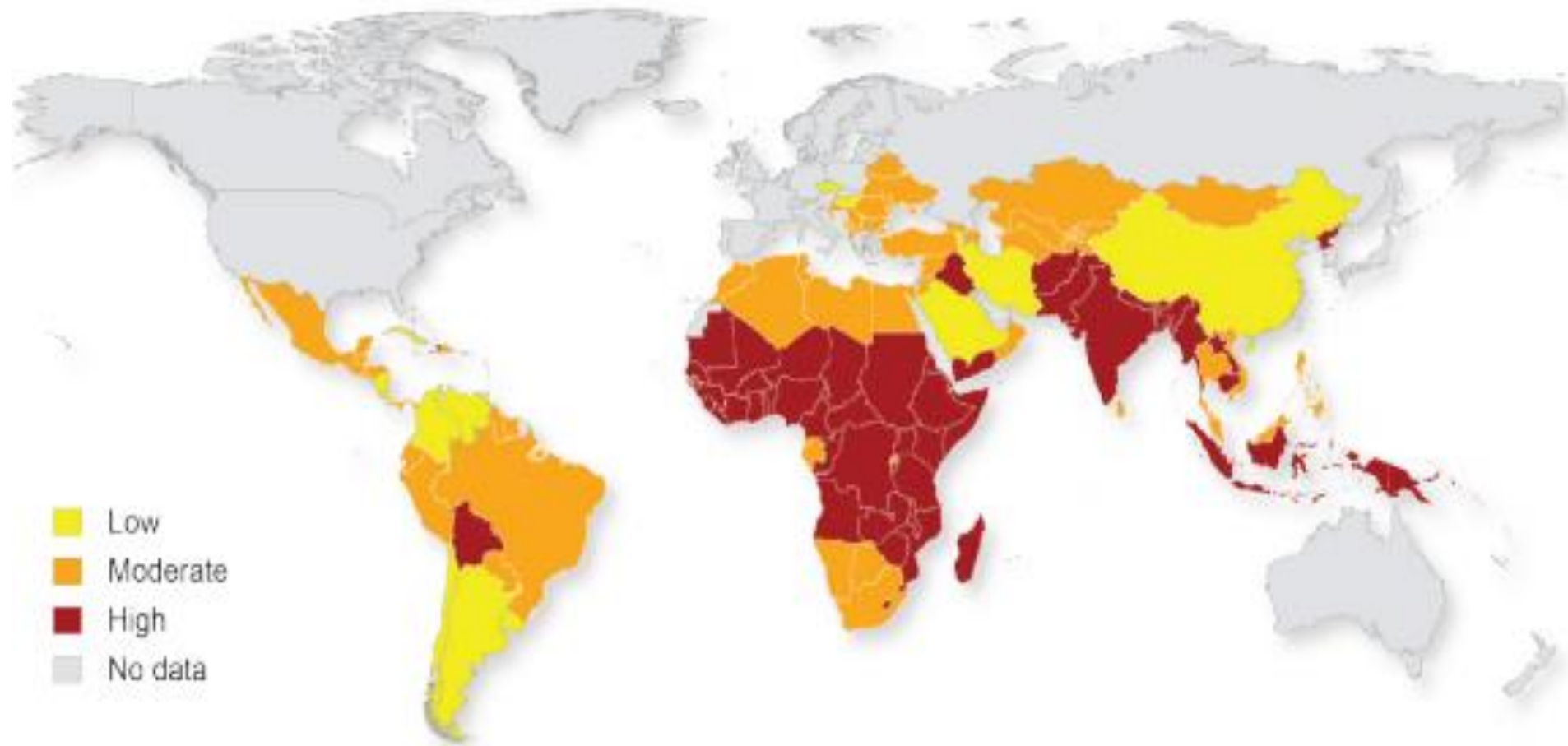
Malnutrition

Malnutrition

(% OF CHILDREN UNDER 5 YEARS OF AGE)



Micronutrient Deficiencies: Vitamin A, Iron, and Zinc



World Health Organization (WHO) children
under 5 prevalence data

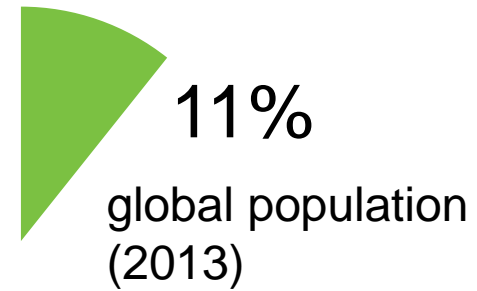
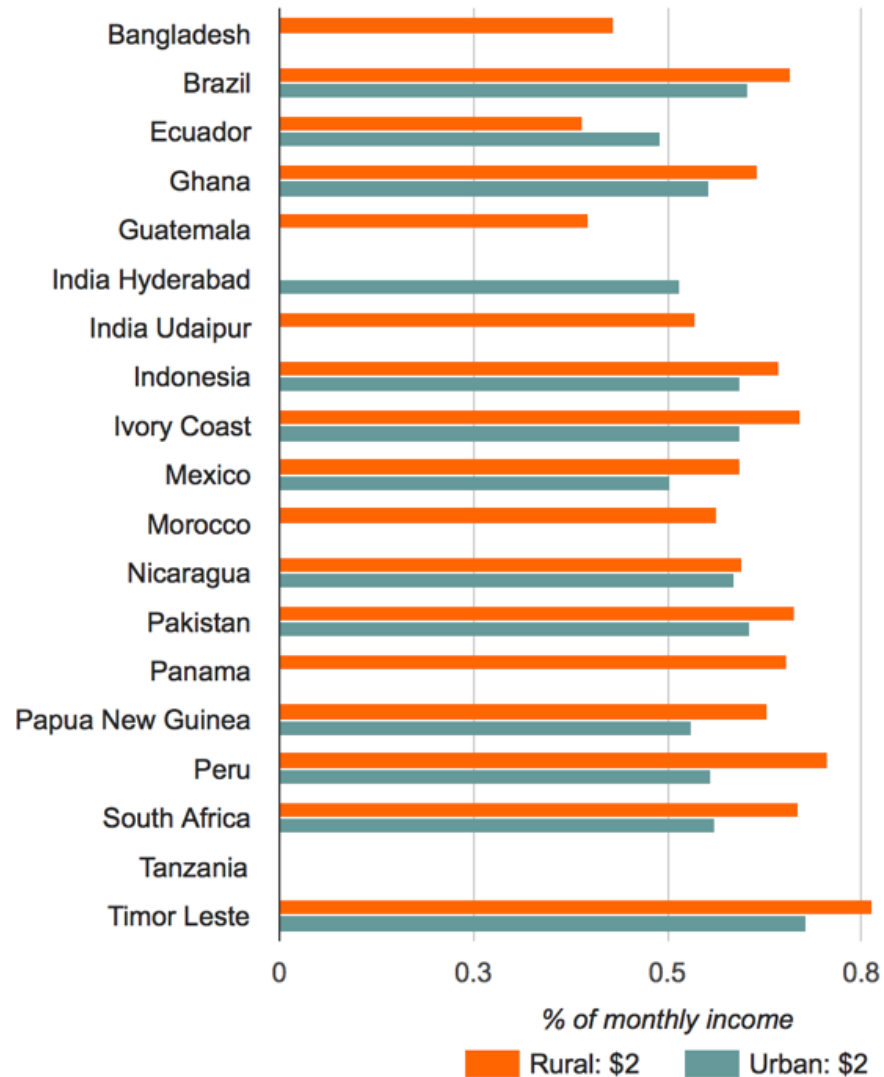
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Promoting healthy diets



- Food availability & accessibility a vital consideration
- Cropping diversity a good option for smallholder farmers to improve household diet, improve income and achieve better agronomy
- Consumer education: For most people, whole grains are an important part of a healthy diet!

\$2/day household food expenditure

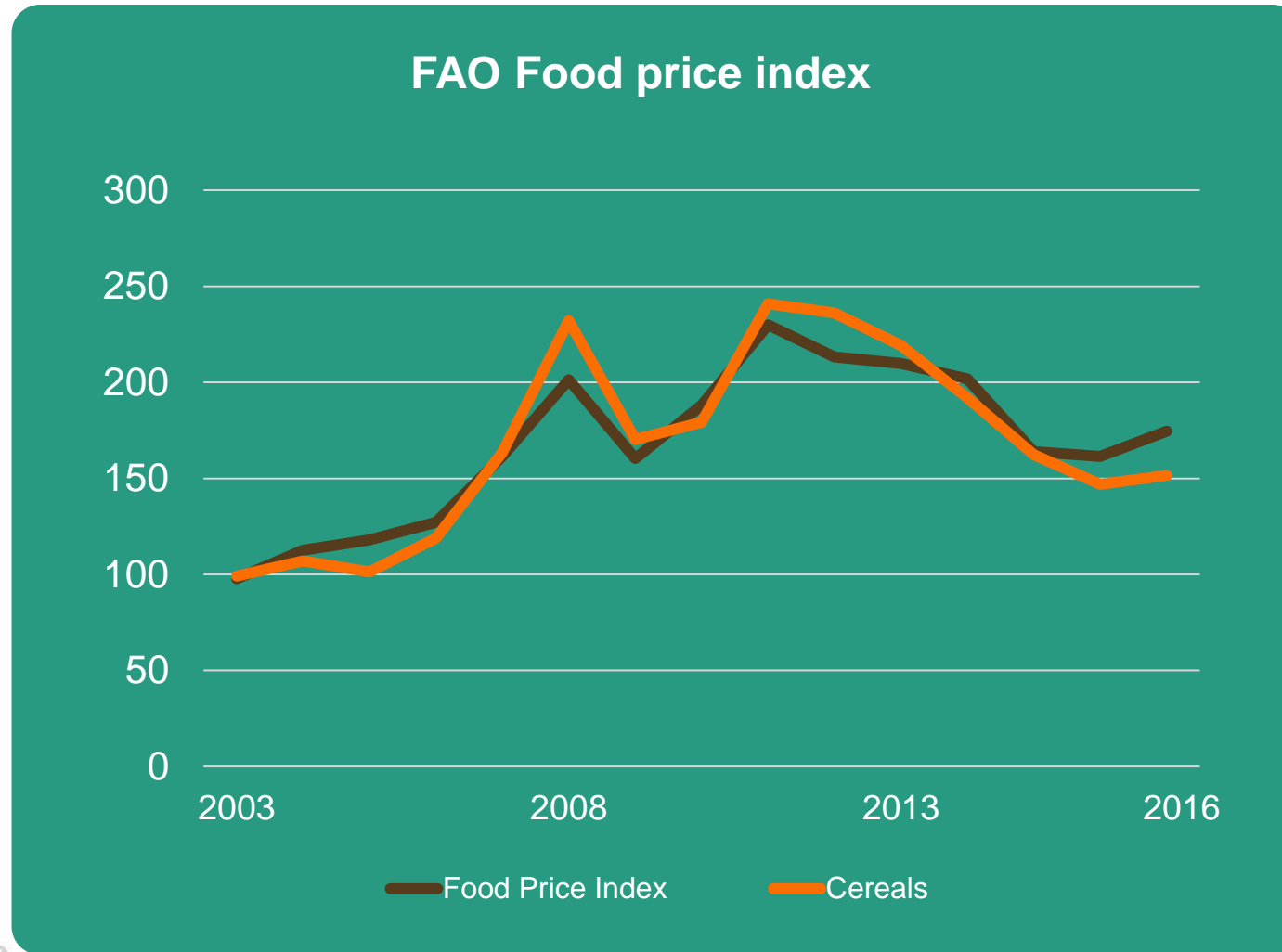


From Banerjee and Duflo, *Pooreconomics.com*



CIMMYT^{MR}

\$2/day household food expenditure



Biofortification of staples

QPM: Full range of amino acids in the grain; grown on 1.2 million hectares

25% of daily vitamin A; 100,000 households reached

Up to 50% of daily zinc needs

PROVITAMIN A MAIZE

QUALITY PROTEIN
MAIZE (QPM)

HIGH ZINC MAIZE

HIGH ZINC WHEAT

First high-zinc maize for
Latin America just released



CIMMYT^{MR}

Biofortification: Challenges

- Greater investment needed to maintain yield and key trait gains
- Consumer preferences (i.e. white vs yellow maize)
- Maintaining genetic diversity
- Targeting regional nutrition needs



After the farm



Durum pasta



Chapati



Flat breads



Couscous

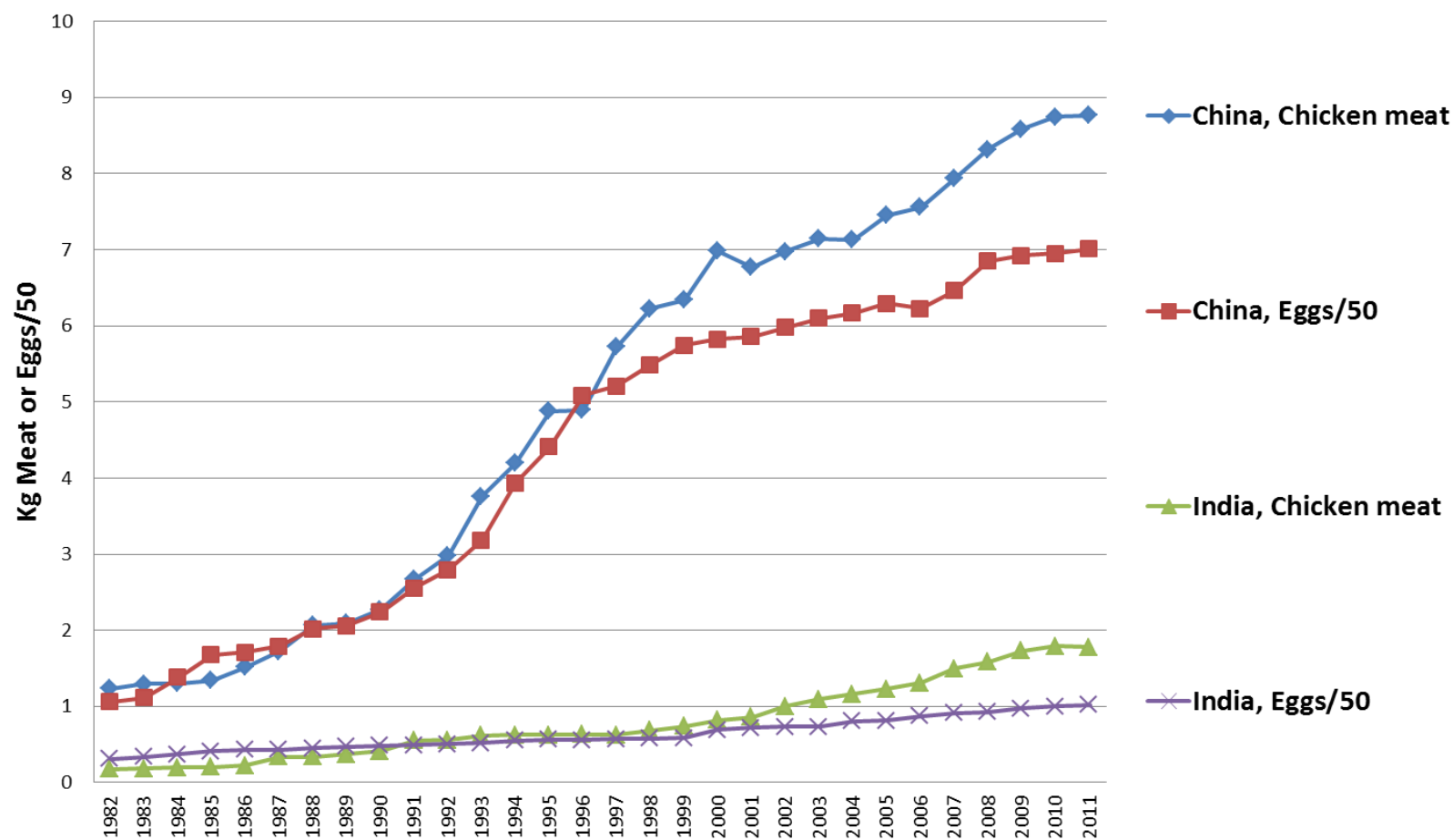


Fresh noodles

- End-use quality
- Processing
- Storage
 - Maize stored 6 months under traditional conditions in Zambia loses 65 % vitamin A content
 - Aflatoxins cost Africa \$750 million each year in lost exports



Changing diets and increased demand for feed



Source: FAOSTAT, 2012

CIMMYT^{MR}

The CIMMYT strategy for food security



Mission

Maize and wheat science for improved livelihoods.

Vision

A world with healthier and more prosperous people – free from global food crises – and more resilient agri-food systems.

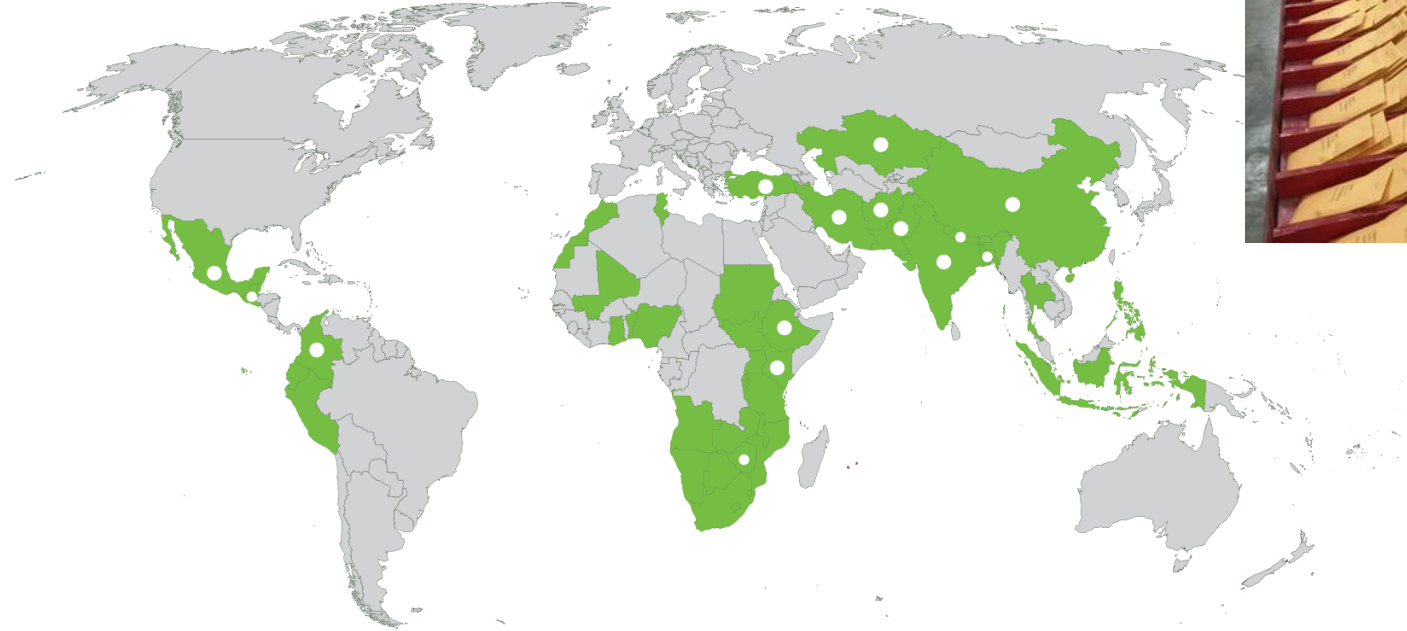


CIMMYT around the world

1,200 staff from over 50 countries!

Countries with offices:

Afghanistan
Bangladesh
China
Colombia
Ethiopia
Guatemala
India
Iran
Kazakhstan
Kenya
Mexico
Nepal
Pakistan
Turkey
Zimbabwe


Projects in over 40 countries

CIMMYT_{MR}

Strategic focus

Key global challenges

- Population growth
- Food and nutritional insecurity
- Environmental degradation
- Economic development
- Climate change



The big impact



Annual benefits of \$3.5-4 billion



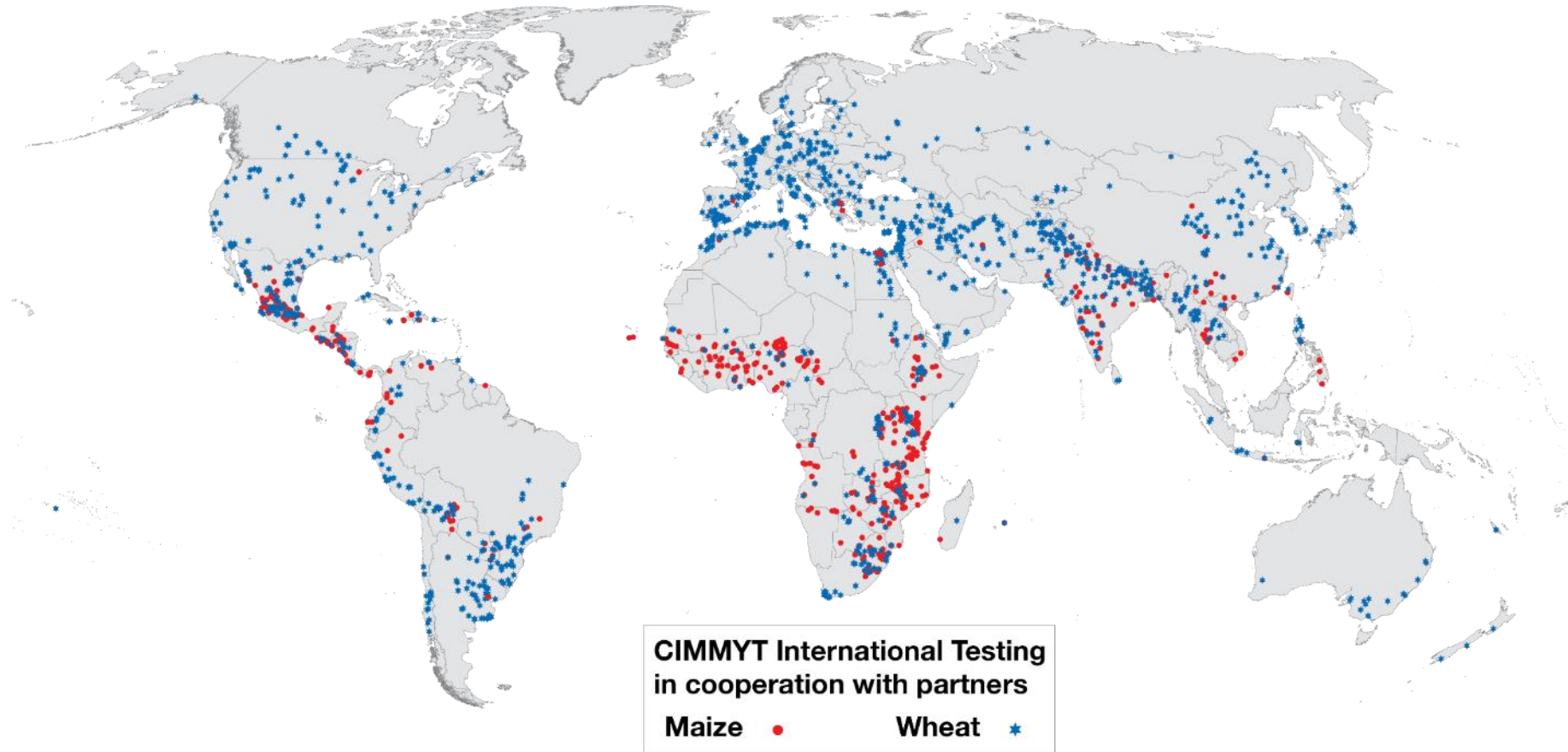
50% of maize and wheat in the developing world carries contributions from CIMMYT research



More than 10,000 agricultural experts and scientists have benefitted from CIMMYT training



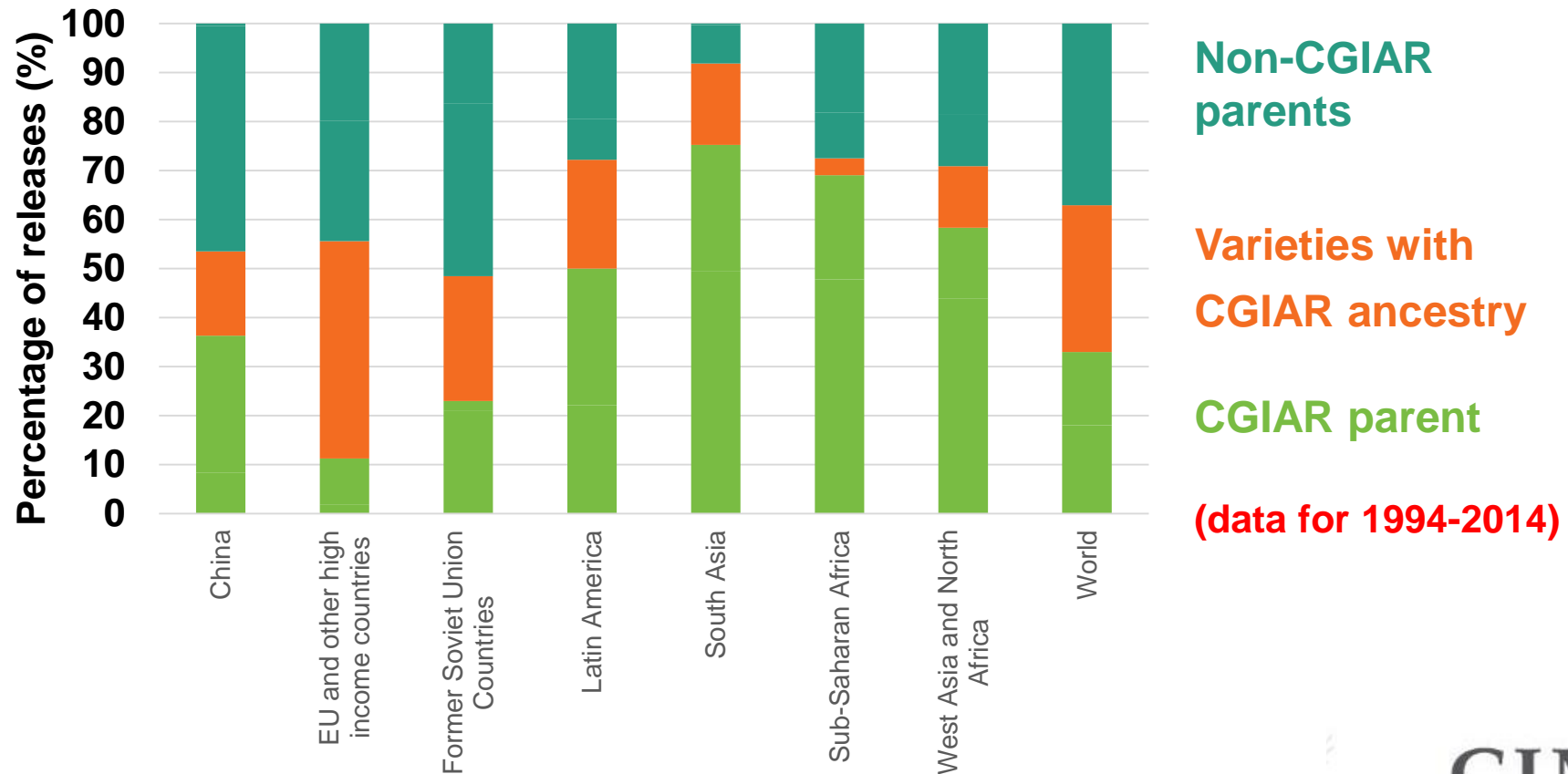
Global seed distribution network



The **CGIAR** provides **80%** of **germplasm** to the world.

CIMMYT^{MR}

CIMMYT and ICARDA: Major contributions to the pedigrees of new wheat varieties



Integrated research agenda



Genetic diversity

- Conserve and use diverse maize and wheat collections
- Seed health
- Unlocking genetic potential



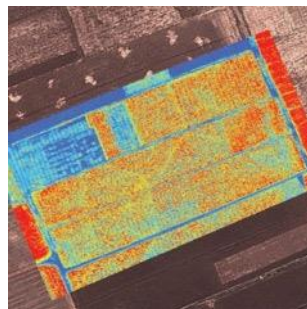
Develop and improve access to varieties

- Stress, disease and pest resilience breeding
- Molecular tools
- Developing seed sectors
- Nutritional and end-use quality



Farming systems

- Crop management practices
- Mechanization
- Participatory research

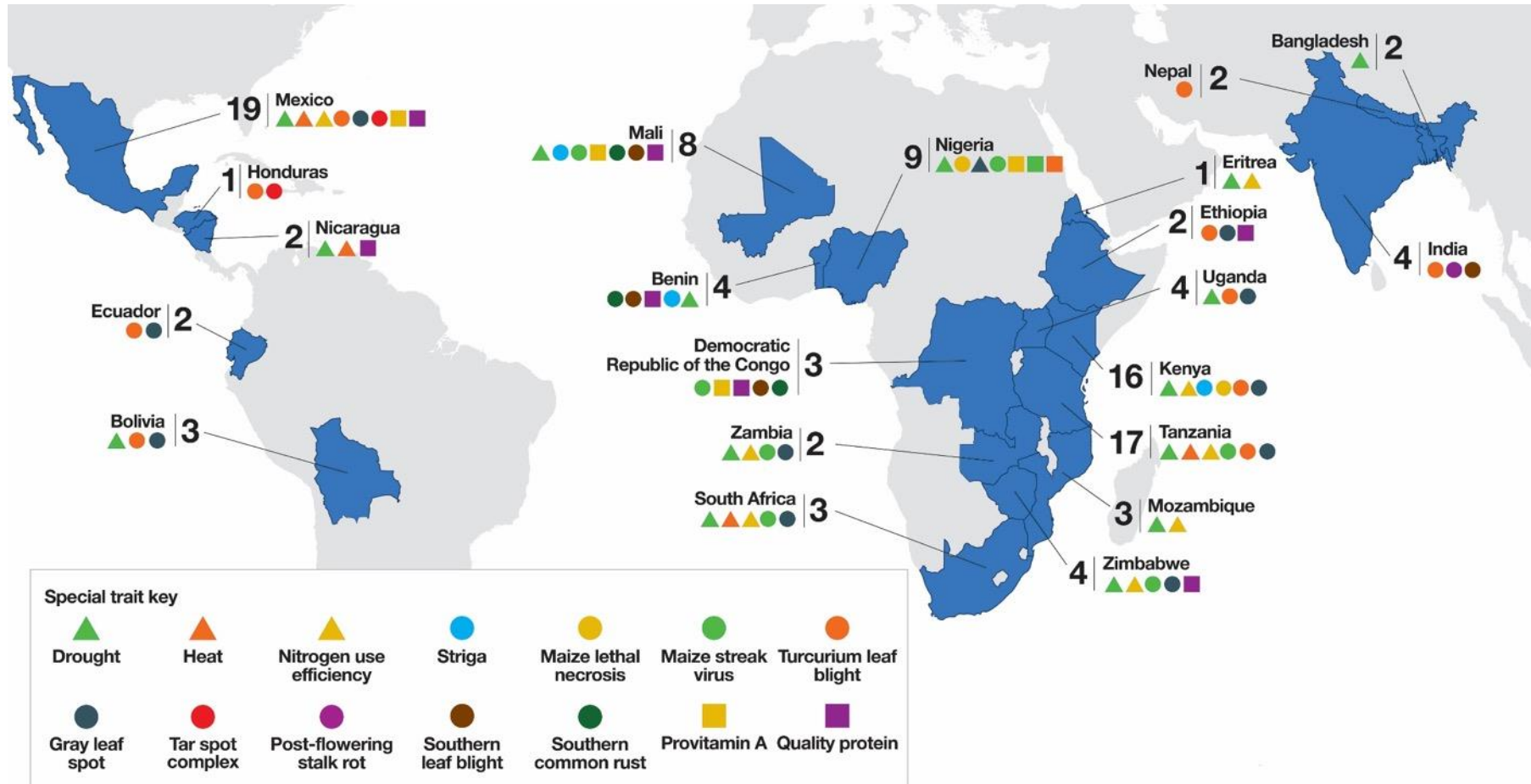


Increasing impact

- Social sciences
- Big data
- Gender and youth
- Foresight and impact assessments



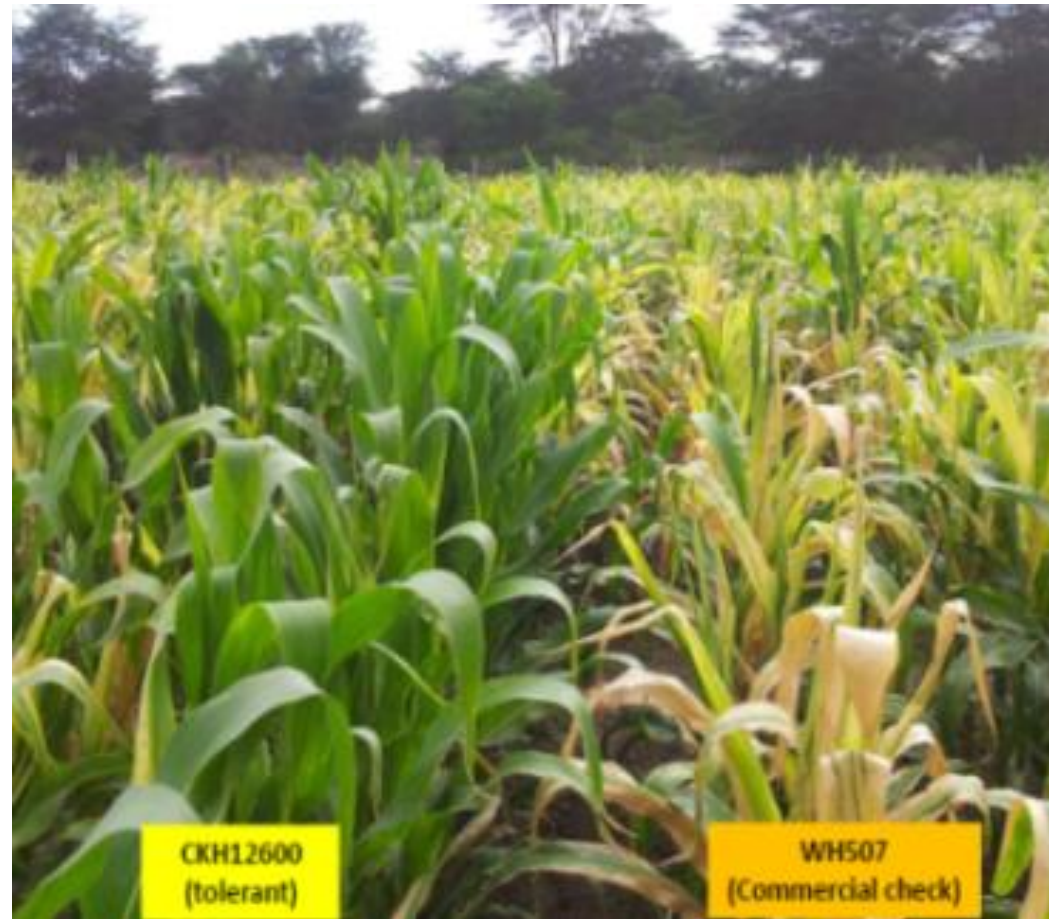
2016 maize releases



Varieties commercialized by CIMMYT partners with traits preferred by smallholder farmers

Maize Lethal Necrosis (MLN): a success story

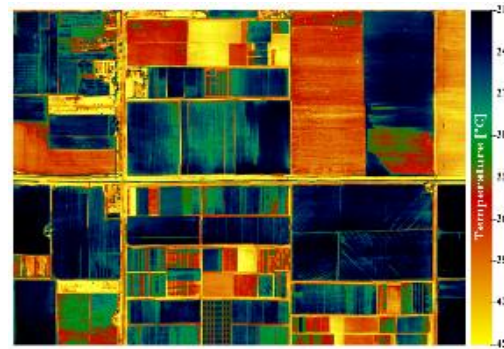
- CIMMYT-KALRO team identified MLN in Kenya in 2011
- CIMMYT socioeconomics study estimates 23% of Kenya maize production lost to MLN in 2014



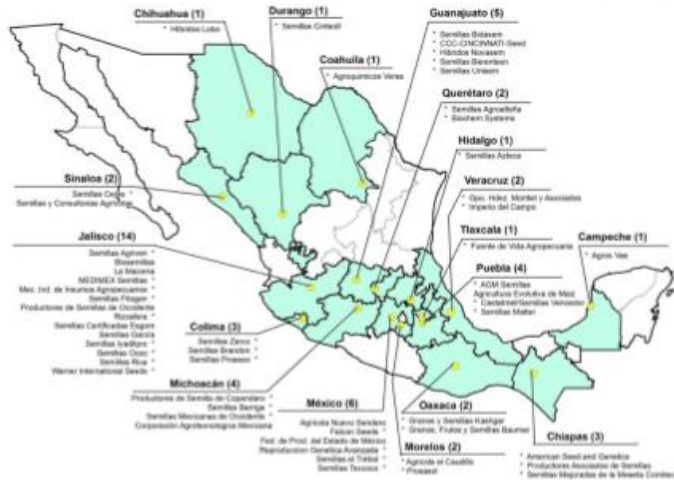
2014: resistant varieties



Sustainable intensification: Technological Breakthroughs



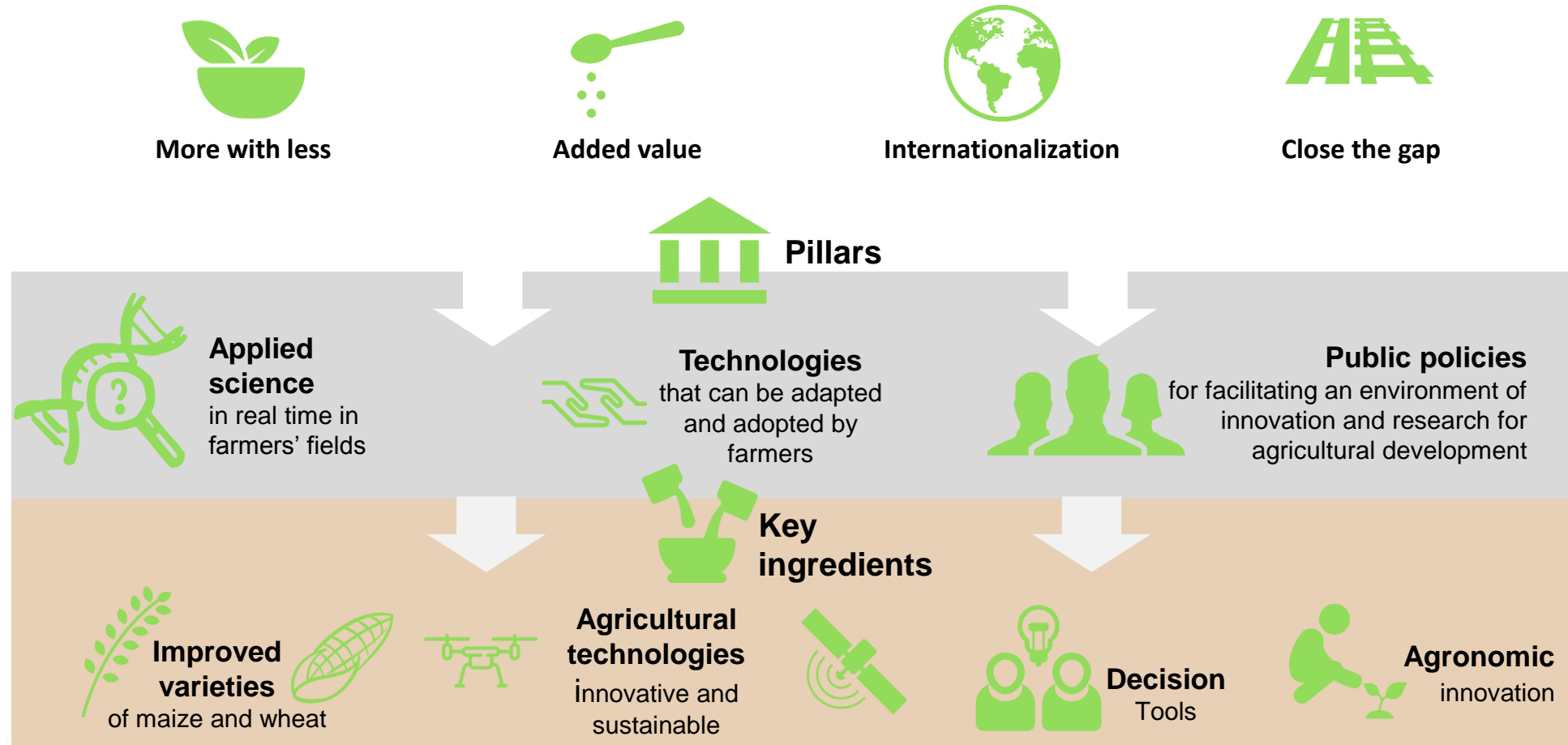
Private sector partnerships



- Agri-food industry a key partner
- Support for national seed sector
- Tools, support and business strategies for local service providers



Integrated innovation strategy



Rethinking the global food system

1. Invest in agri-food R&D for innovation, more with less and global systems approaches (breeding, SI, SE, Food Technology)
2. Transform smallholder agriculture and empower women in agriculture
Fix the fundamentals: e.g. markets, infrastructure and trade
3. Strengthen partnerships for co-innovation, esp. with new players
4. Policies for the right incentives e.g. subsidies and insurances



Diego Rivera Tlatelolco Market Mural





CIMMYT^{MR}

Thank you!

