Strengthening Geospatial Collaboration for Sustainable Growth

Geospatial decision support systems for sustainable intensification: South Asia and Latin America

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International scenario

BID

Global Harvest
INITIATIVE

THE GLOBAL GOALS
For Sustainable Development

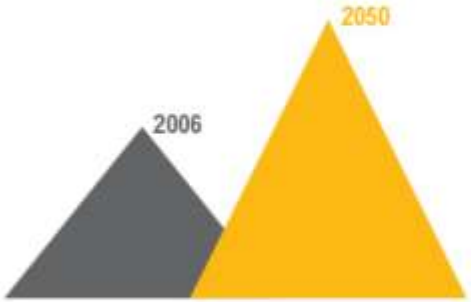
La próxima despensa global
Cómo América Latina puede alimentar al mundo

International scenario

THE GREAT BALANCING ACT

The world must achieve a "great balancing act" in order to sustainably feed 9.6 billion people by 2050.
Three needs must be met at the same time.

CLOSING THE FOOD GAP



69% Required increase in food calories to feed 9.6 billion people by 2050

SUPPORTING ECONOMIC DEVELOPMENT

28% Global population directly or indirectly employed by agriculture

REDUCING ENVIRONMENTAL IMPACT

WORLD RESOURCES INSTITUTE

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JBS

A Global Food Company

MARKET

"THE NEW CONSUMER"

LLOYD'S

Food insecurity a significant risk to "global society"

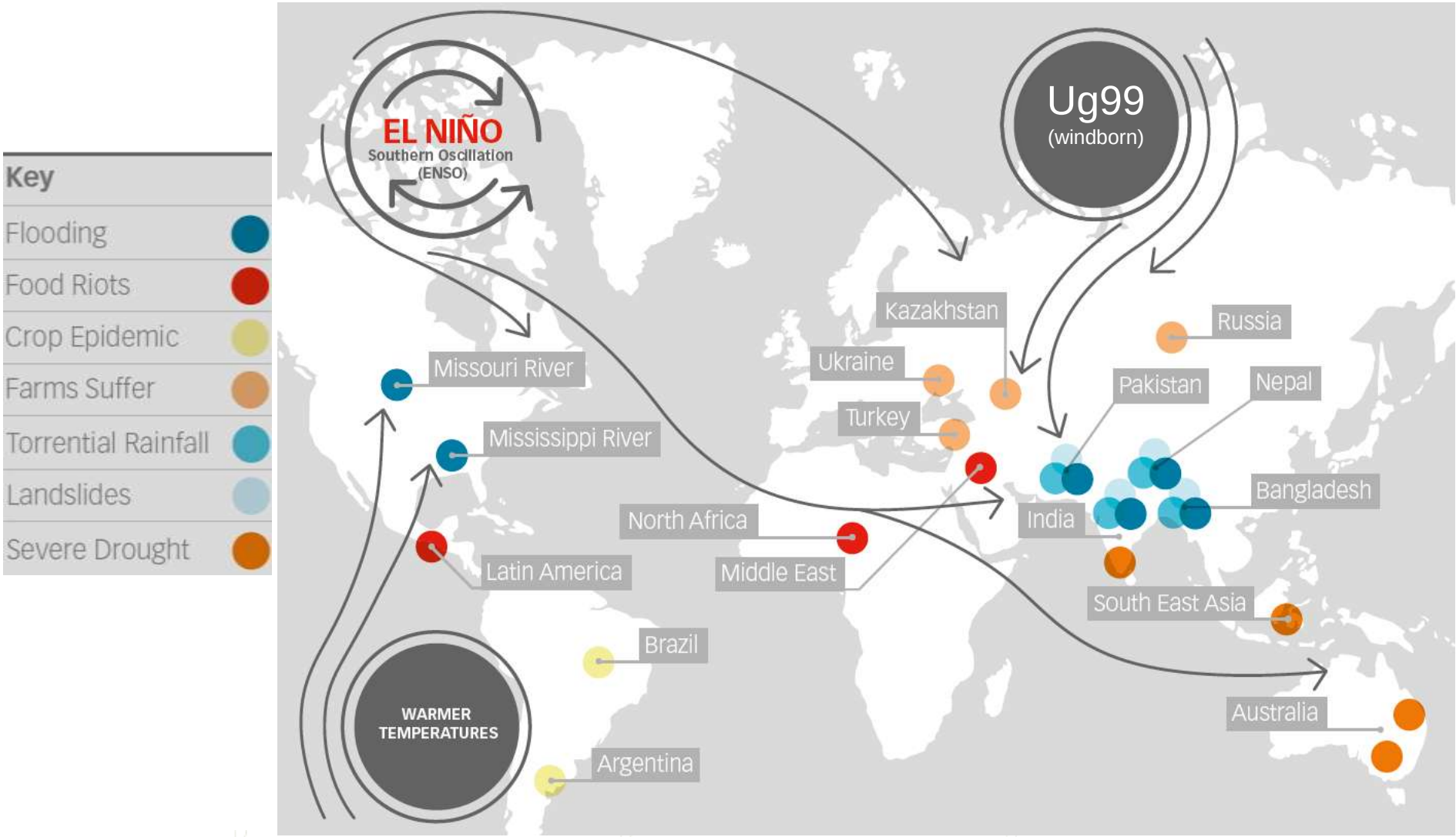
Food safety/security issues create "direct and indirect risks & opportunities for businesses"

Insurance can play a large role in risk mitigation/management as well as innovation/investmen

March, 2014

FEAST OR FAMINE

BUSINESS AND INSURANCE IMPLICATIONS OF FOOD SAFETY AND SECURITY


Key
Flooding
Food Riots
Crop Epidemic
Farms Suffer
Torrential Rainfall
Landslides
Severe Drought
EL NIÑO
Southern Oscillation
(ENSO)
Ug99
(windborn)
Kazakhstan
Russia
Ukraine
Pakistan
Nepal
Turkey
Missouri River
Mississippi River
Bangladesh
India
North Africa
Middle East
Latin America
South East Asia
Brazil
WARMER
TEMPERATURES
Australia
Argentina

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Wheat losses

FOOD SYSTEM SHOCK SCENARIO

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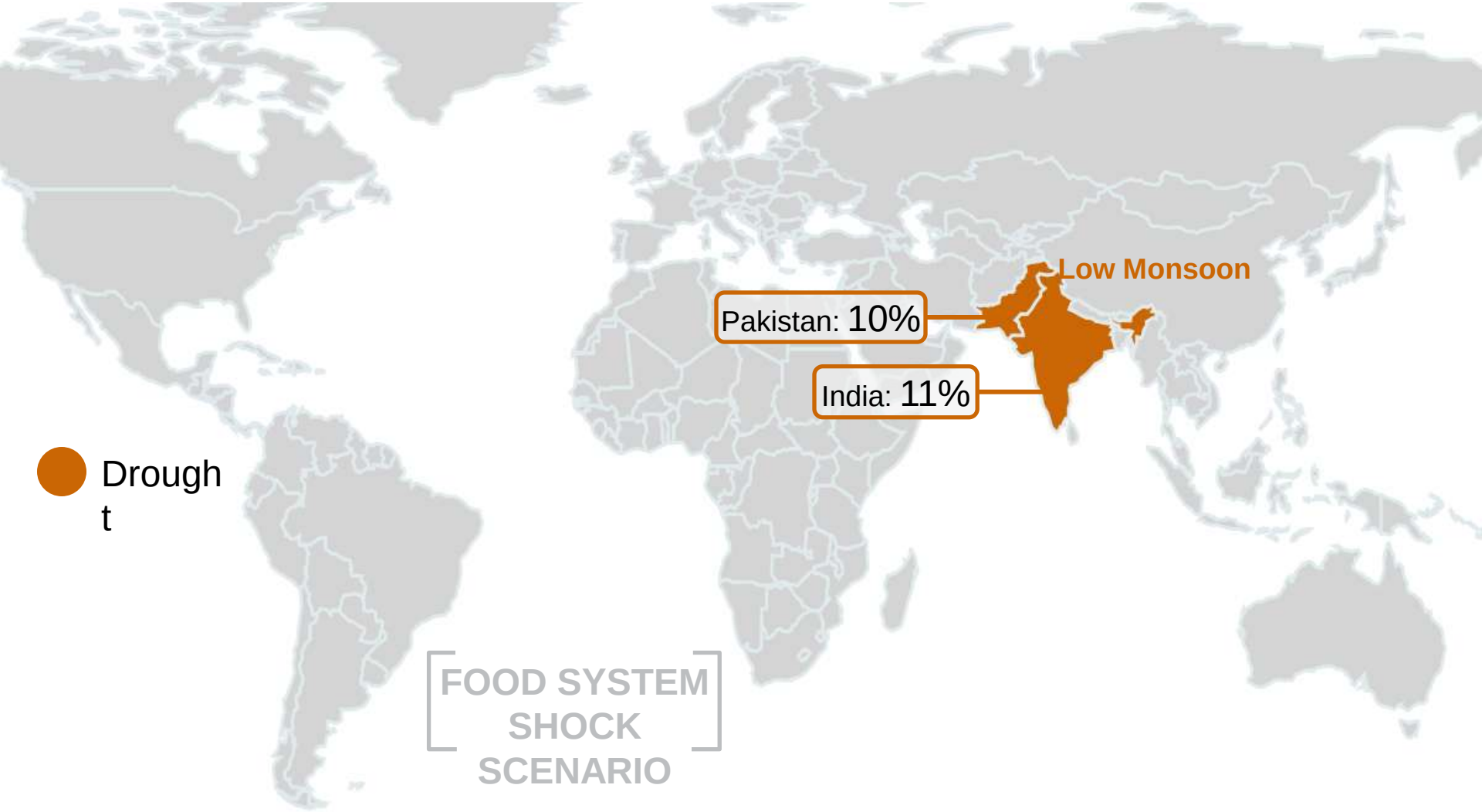
Wheat losses



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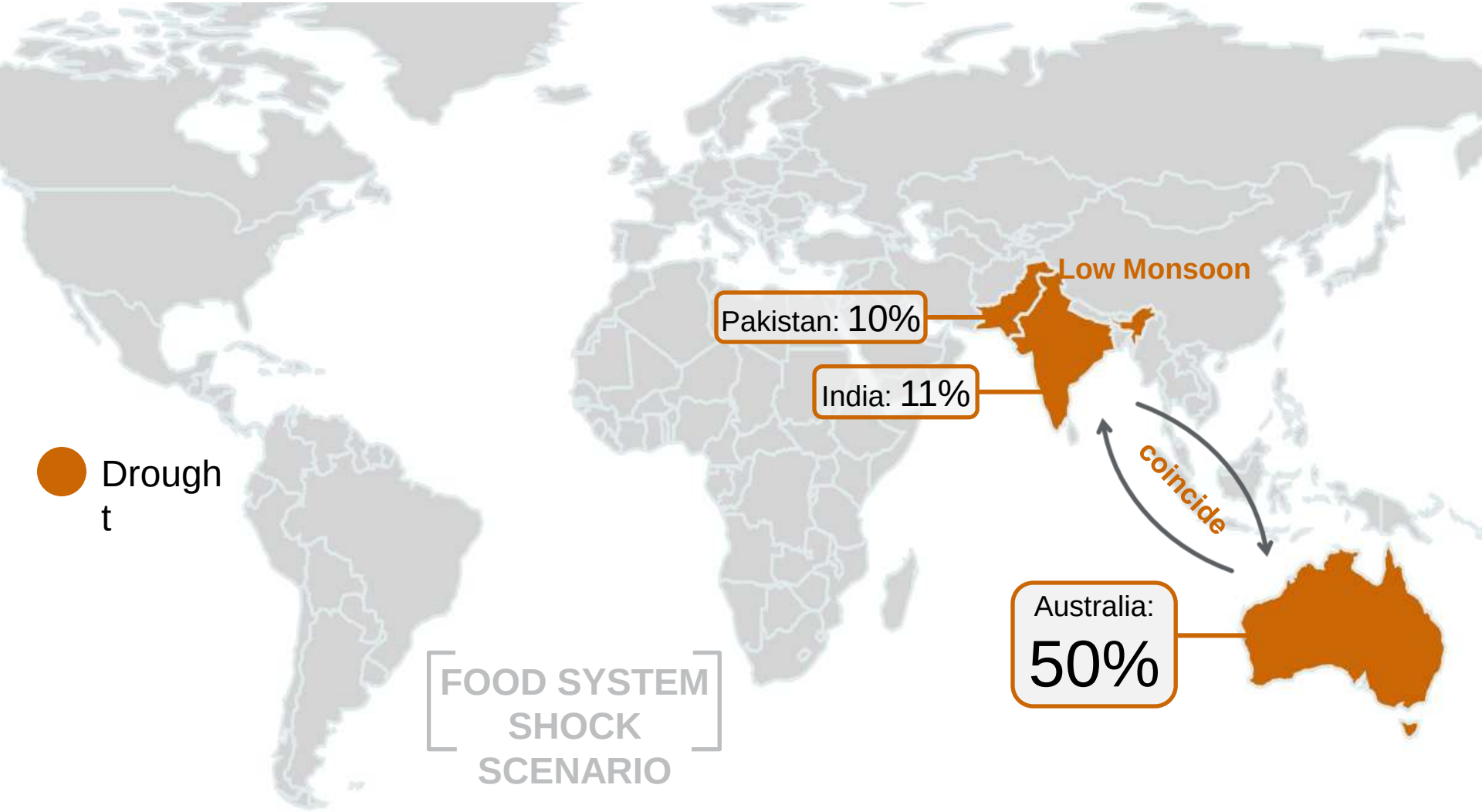
Wheat losses



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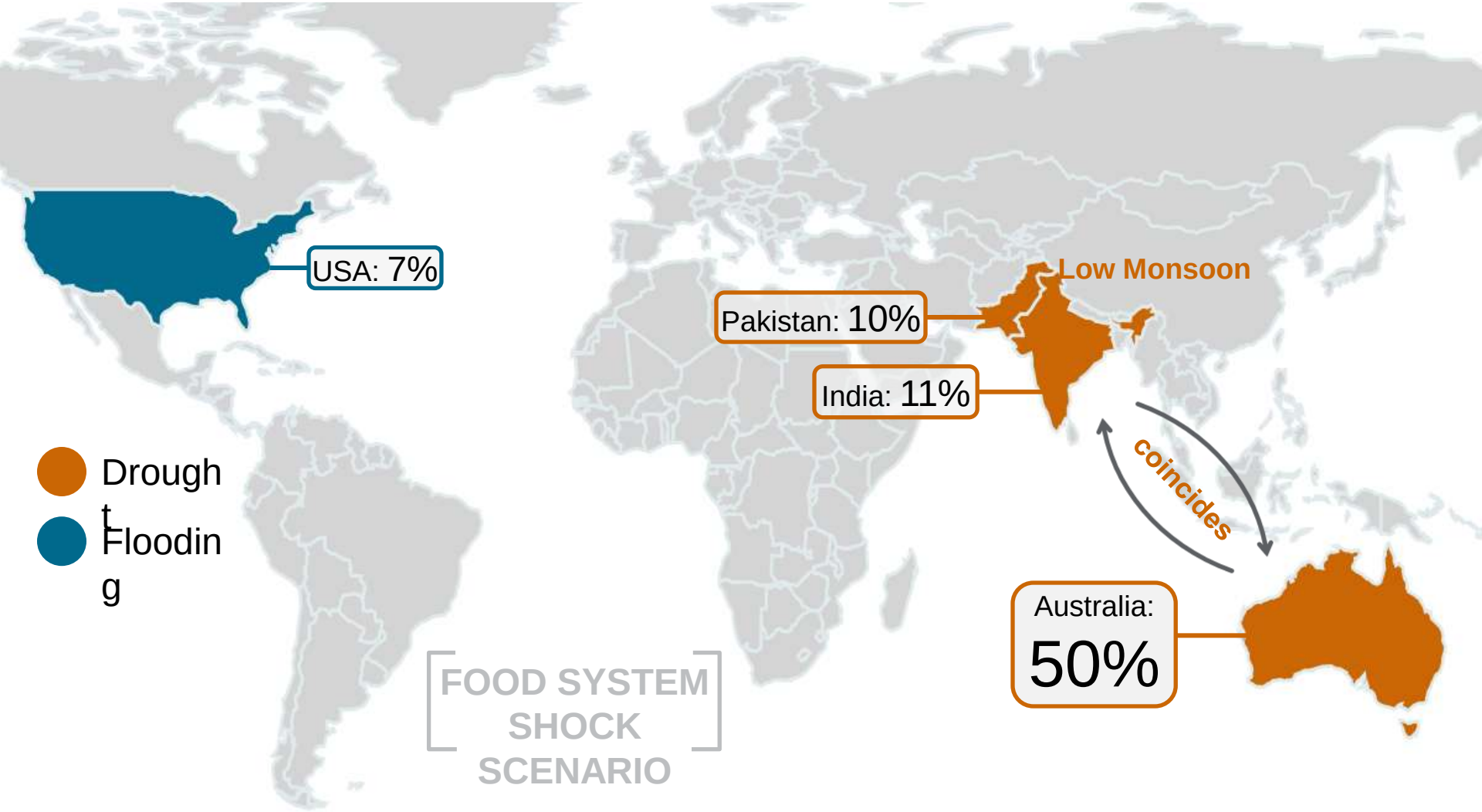
Wheat losses



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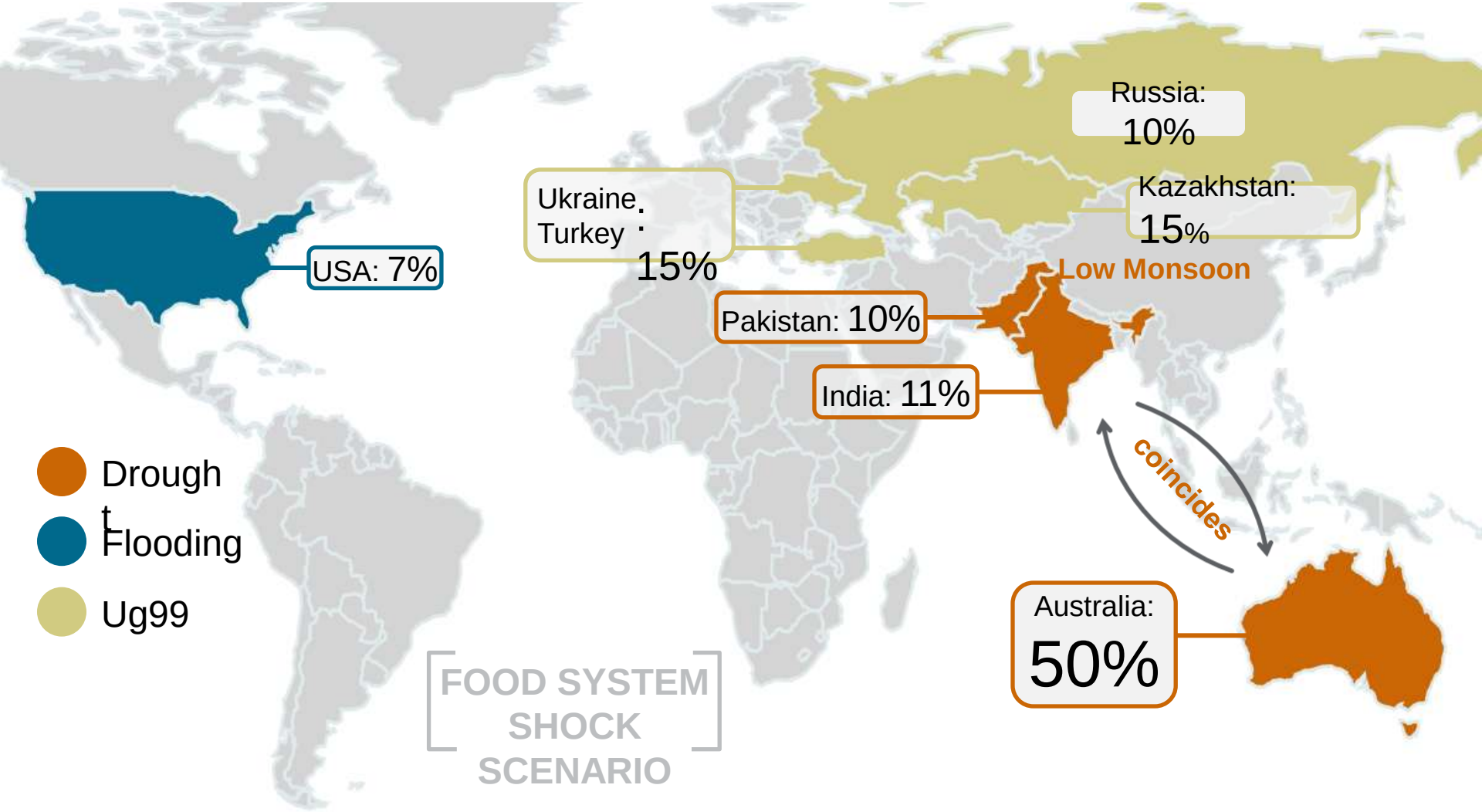
Wheat losses



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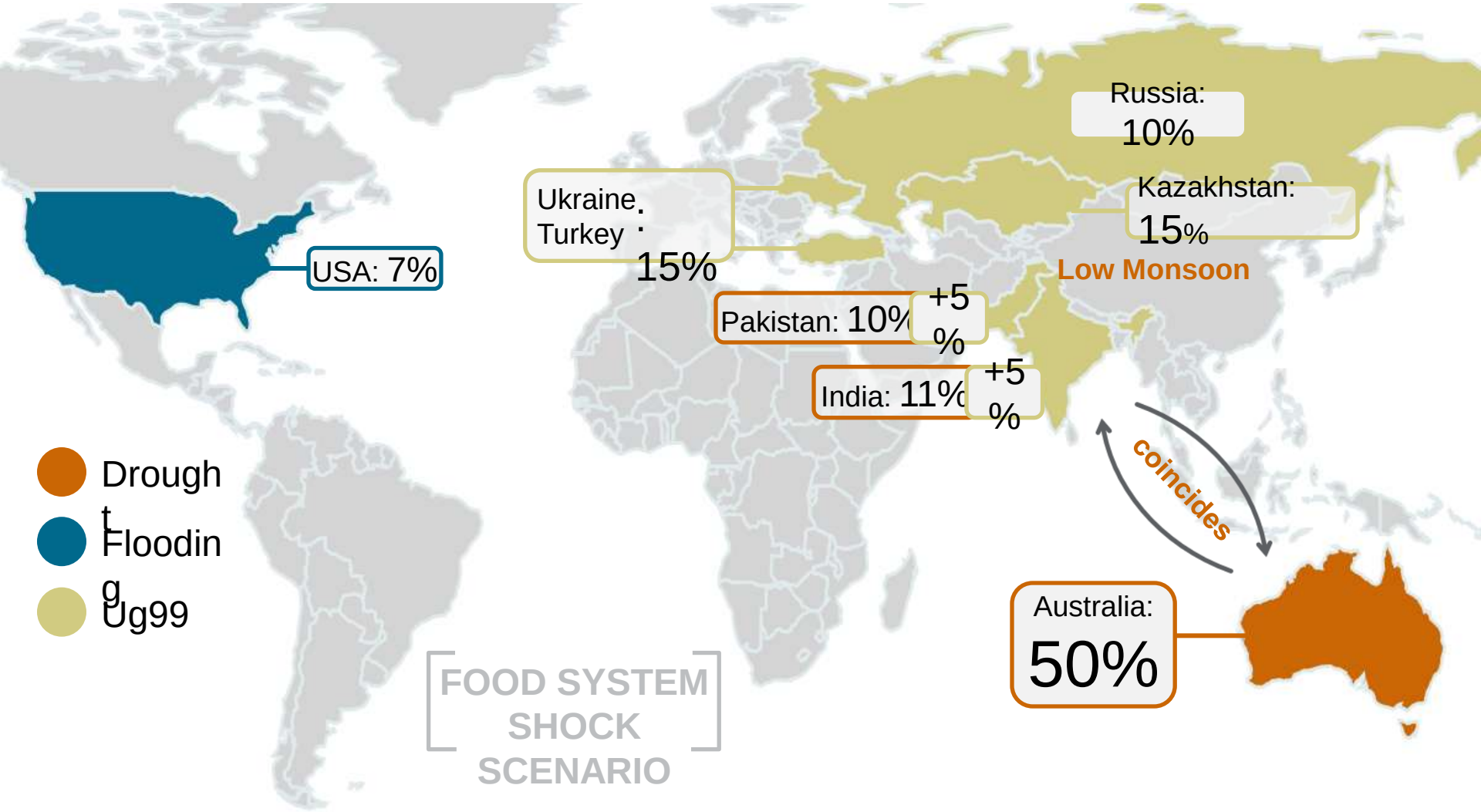
Wheat losses



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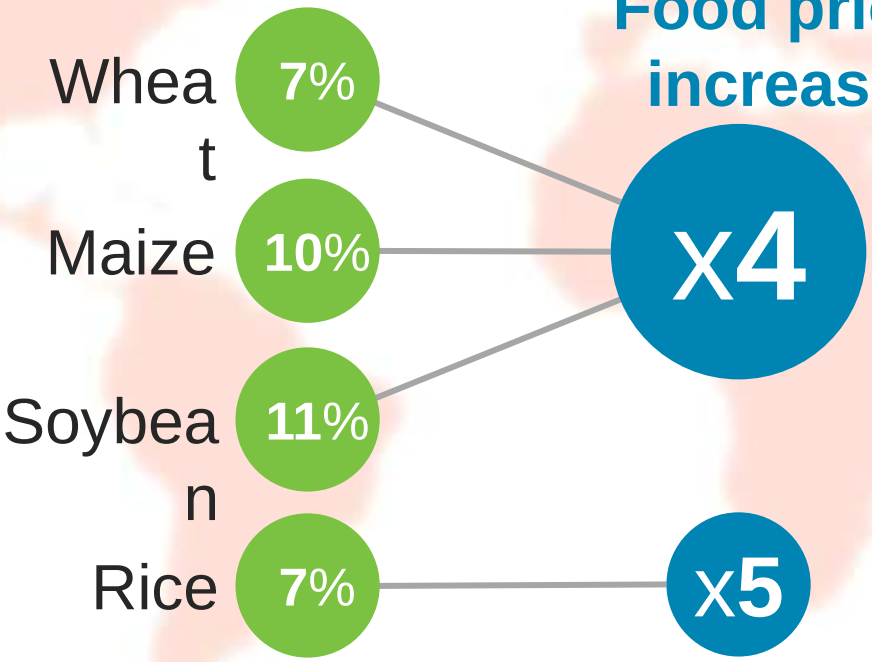
Impacts

Global losses



Food price increase

x4

x5

Social cost

- Humanitarian crisis
- Revolts
- Market losses

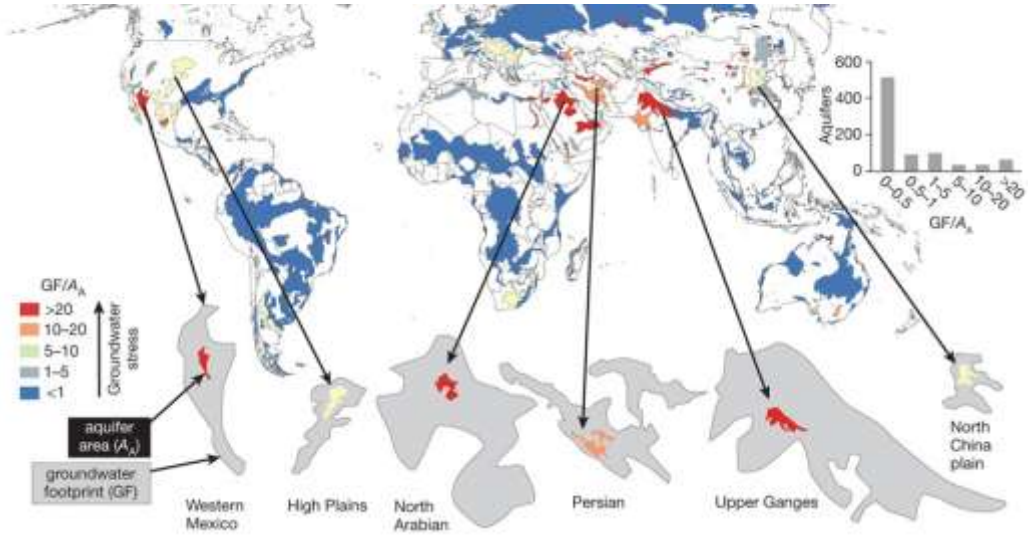
10% in EU
5% in US

… CIMMYT exists to deliver the best seed, agronomy, and agricultural research to farmers in the developing world. As each farm is unique, CIMMYT has created a mix of products and services, or tools, for farmers …

South Asia

A. Development of an irrigation Scheduling Advisory System for the Delta Region of Bangladesh

- Ground water levels are being depleted at an alarming rate. Most of the water is being used for irrigation.
- Ground water footprint of aquifers that are important to agriculture are significantly larger than their geographic areas.



T Gleeson *et al. Nature* **488**, 197-200 (2012) doi:10.1038/nature11295 nature

OBJECTIVES

- ✓ Use of surface water to increase land use intensity in the delta region of Bangladesh
- ✓ Analysis at the macro- (regional watershed) and meso- (sub-regional watershed) scales to determine safe operation space and best bet areas for technology targeting.
- ✓ Development of an irrigation scheduling service for 4 major crops: Maize, Wheat, (Rice), Mungbean

STARS | SPURRING A TRANSFORMATION FOR AGRICULTURE THROUGH REMOTE SENSING

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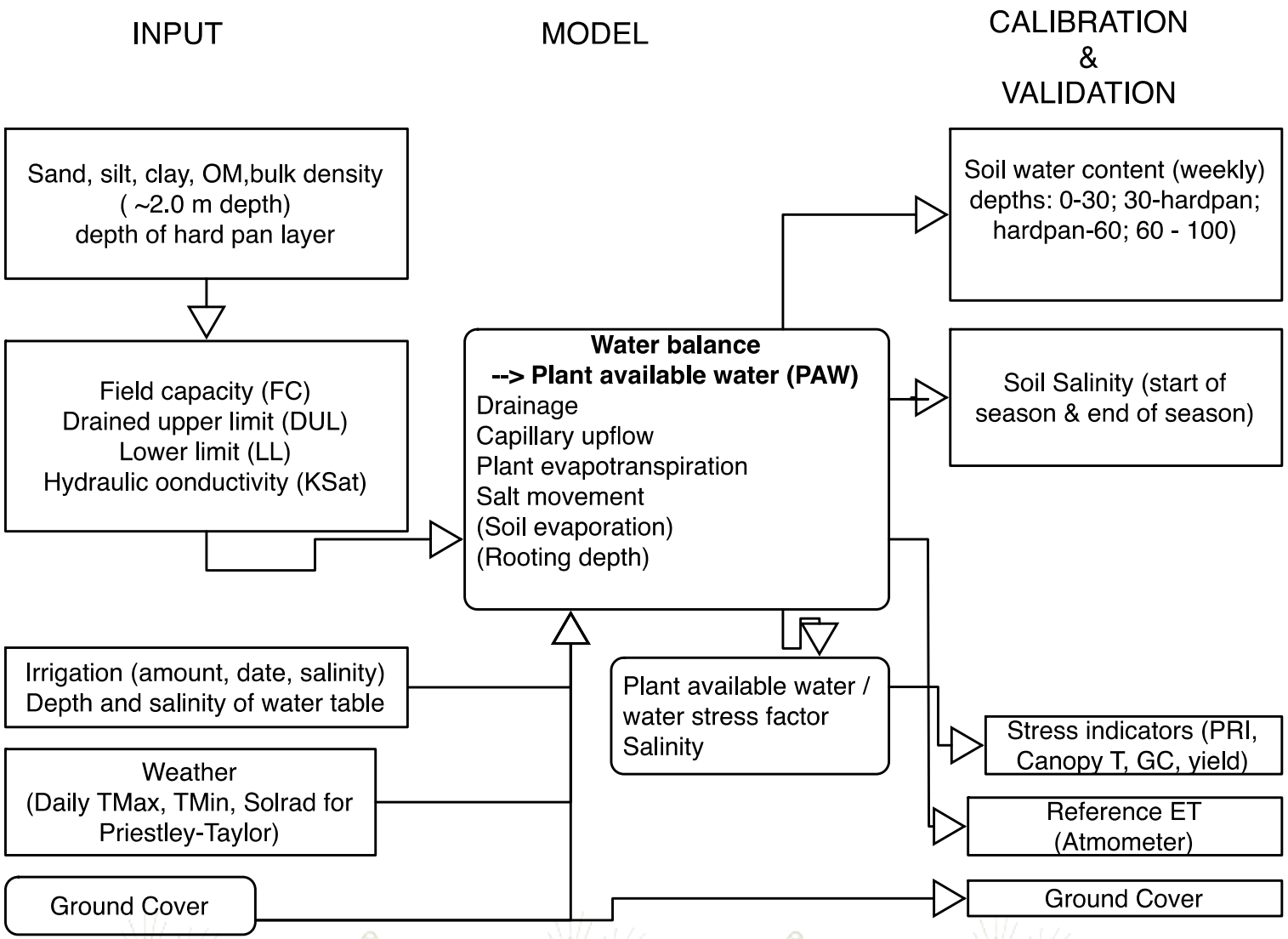
Irrigation scheduling

Input parameters collected under field conditions to predict plant available



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B. Landscape Crop Assessment Tool (LCAT)

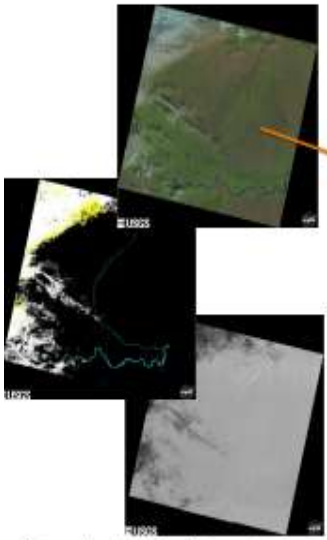
Purpose:

The Landscape-scale Crop Assessment Tool (LCAT) will provide support for accessing and analyzing large amounts of crop data for south Asia. Satellite images will be used in combination with ground truth data to identify croplands, crop type, phenology, and assess vegetation health. This information can then be used in algorithms to help predict future crop yields.

Farmers in Bangladesh(left), Women farmers in Nepal (right). Images courtesy of CIMMYT.

B. Landscape Crop Assessment Tool: Process (2)

Researchers collect ground truth data of crop classification which is then used to make polygons for shapefiles. These will be the training tool for new images to determine information such as crop classification where there is no ground truth.



Natural color, quality, and thermal images. January 1, 2015.
Landsat images provided by the U. S. Geological Survey.

These Landsat images are from the same tile in the Landsat Worldwide Reference System (WRS-2). For cataloging, the world is divided into tiles, and this particular tile is identified as Path 140, Row 42. These numbers correspond to the tile in India where the ground truth data was recorded.
From these images and correlated ground truth, algorithms will be made to analyze crop phenology at locations where there is limited information.
One issue with this region is the intense cloud cover often blocks the land out of picture. To combat this, a filter was used to exclude images that contain >60% cloud cover.

Analysis:

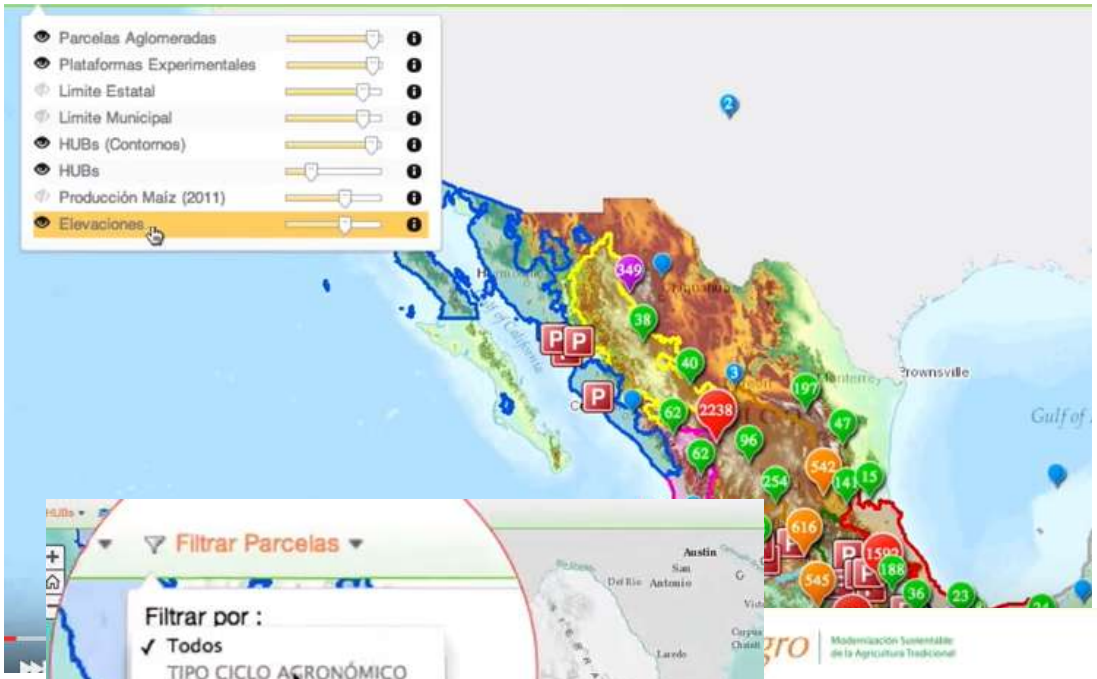
Crop phenology data will be correlated with ground truth and weather data to understand what is affecting crop health

Results:

Scientists will develop algorithms that utilize this data to forecast future crop productivity. Farmers will determine how much fertilizer to use, how drought resistant a crop is, and sustainably increase the productivity of their crops.

Latin America

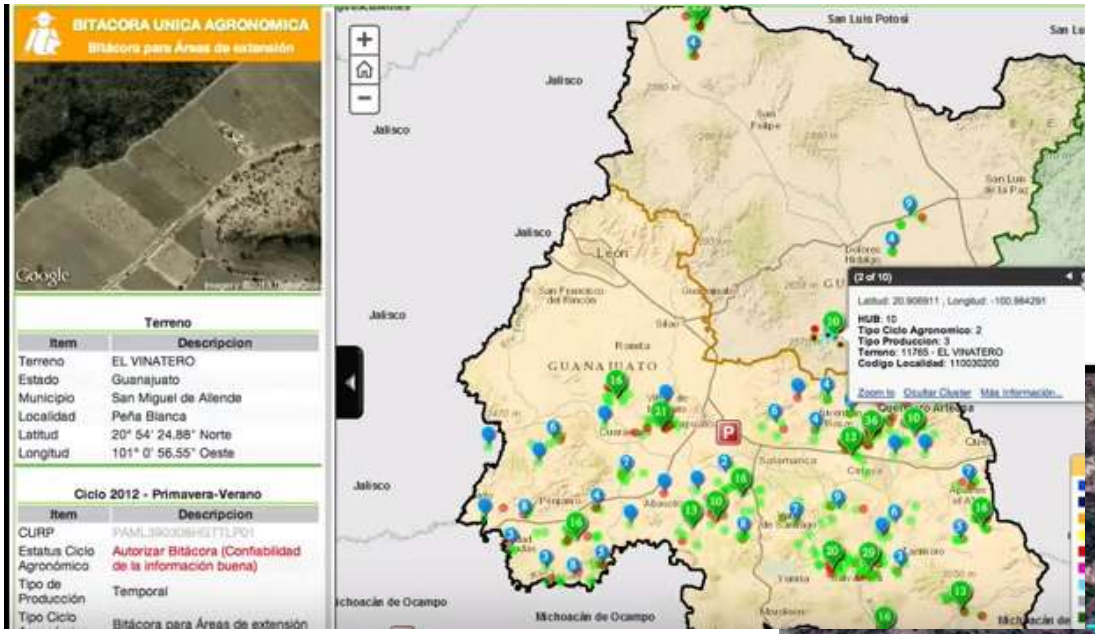
A. Conservation Earth: Online Geographical Information Platform



FEATURES:

- ✓ Geospatial information layers management
- ✓ Base cartography data
- ✓ Fast information filtering system (per plot, water regime)

A. Conservation Earth: Online Geographical Information Platform (2)



FEATURES:

- ✓ Specific information per plot and HUB (agro-ecological region)

http://gismaps.cimmyt.org/
http://gismaps.cimmyt.org/CE/MasAgro/GTO/

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B. GreenSat

Current situation in the Yaqui Valley and many irrigated wheat production regions in Mexico:

- Almost all N fertilizer is applied before sowing
  - High N loss (50 – 70%)
  - Problems with grain quality (yellow berry)

Objectives

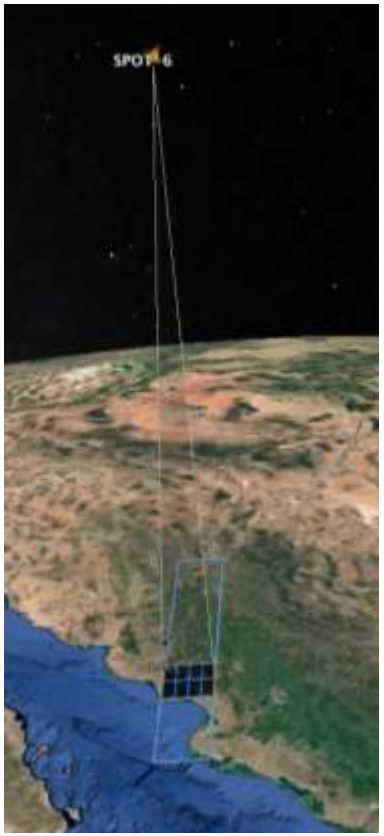
Regular monitoring of the development of the plant stand with remote sensing

→ Visualization of the variability within fields

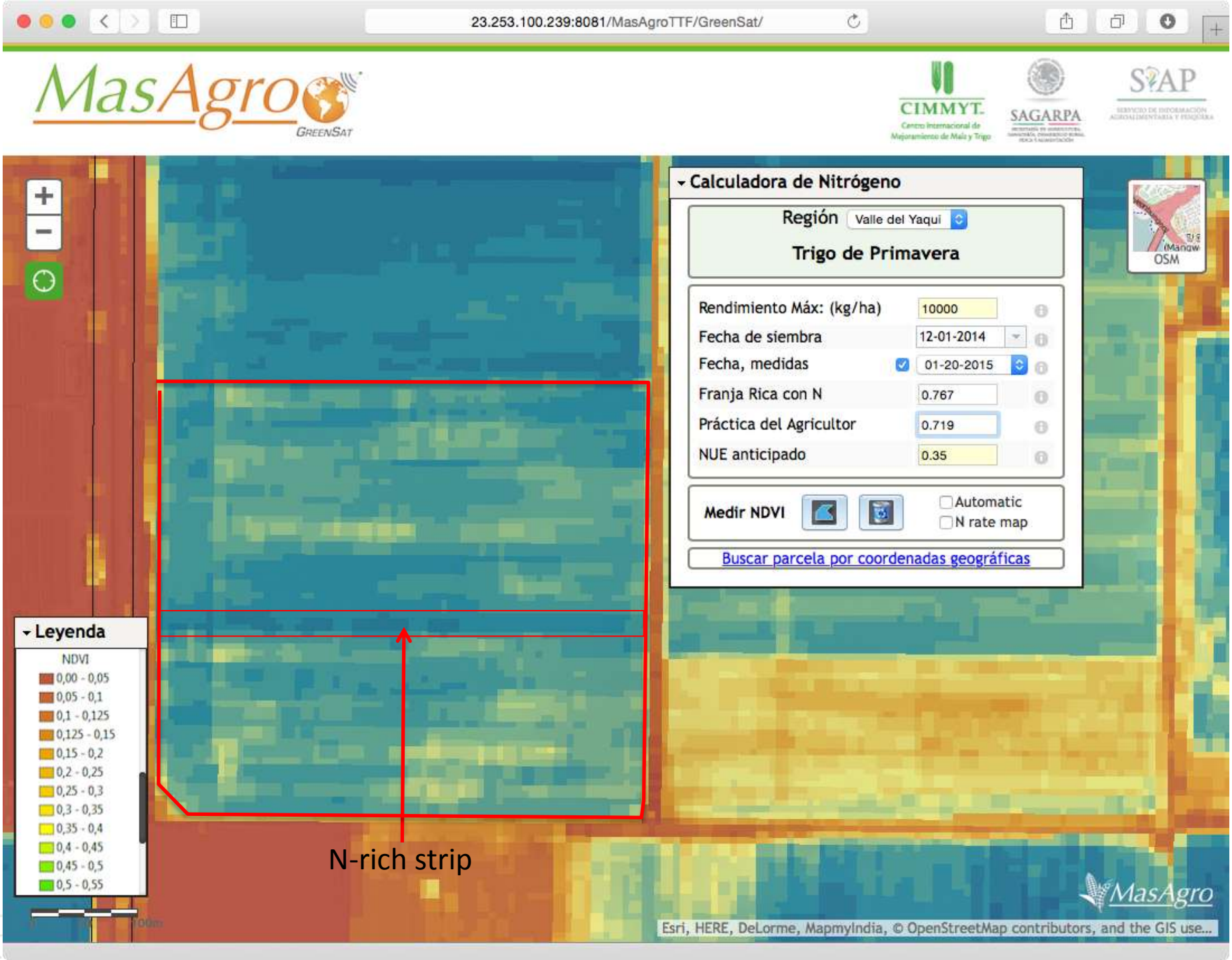
→ Better N management decisions

- **Increase N use efficiency**
- **Less pollution**
- **Better grain quality**
- **Higher profits**

Close Collaboration between SIAP and CIMMYT



SIAP tasks 2 SPOT satellites to acquire images during the winter seasons. It also does the image processing and hosts the GreenSat website: http://www.cmgs.gob.mx/GreenSat


23.253.100.239:8081/MasAgroTTF/GreenSat/
MasAgro
GreenSat
CIMMYT
Centro Internacional de Mejoramiento de Maíz y Trigo
SAGARPA
SIAP
Calculadora de Nitrógeno
Región
Valle del Yaqui
Trigo de Primavera
Rendimiento Máx: (kg/ha)
10000
Fecha de siembra
12-01-2014
Fecha, medidas
01-20-2015
Franja Rica con N
0.767
Práctica del Agricultor
0.719
NUE anticipado
0.35
Medir NDVI
Automatic
N rate map
Buscar parcela por coordenadas geográficas
OSM
Leyenda
NDVI
0,00 - 0,05
0,05 - 0,1
0,1 - 0,125
0,125 - 0,15
0,15 - 0,2
0,2 - 0,25
0,25 - 0,3
0,3 - 0,35
0,35 - 0,4
0,4 - 0,45
0,45 - 0,5
0,5 - 0,55
N-rich strip
MasAgro
Esri, HERE, DeLorme, MapmyIndia, © OpenStreetMap contributors, and the GIS use...

Knowledge Systems for Sustainabil

To equip humanity with the ability to manage the complex risks emerging from mounting pressures on Earth's food, water, and energy systems, by mobilizing science and technology across multiple disciplines and across public, private and civil sectors to provide system-oriented, scale-appropriate, actionable solutions.

International Institute for Applied Systems Analysis
IIASA

The Earth Institute
Columbia University

Oak Ridge National Laboratory

CSIRO

Battelle
The Business of Innovation

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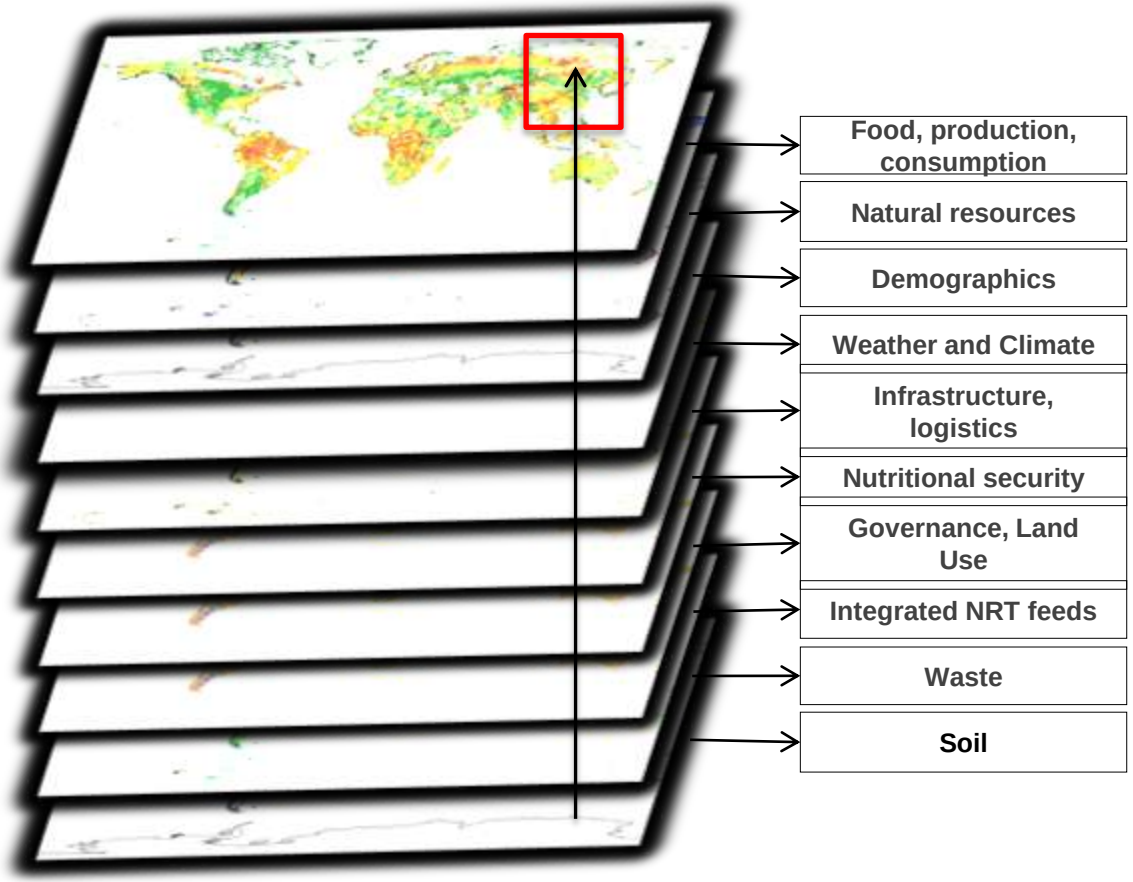
WISCONSIN
UNIVERSITY OF WISCONSIN-MADISON

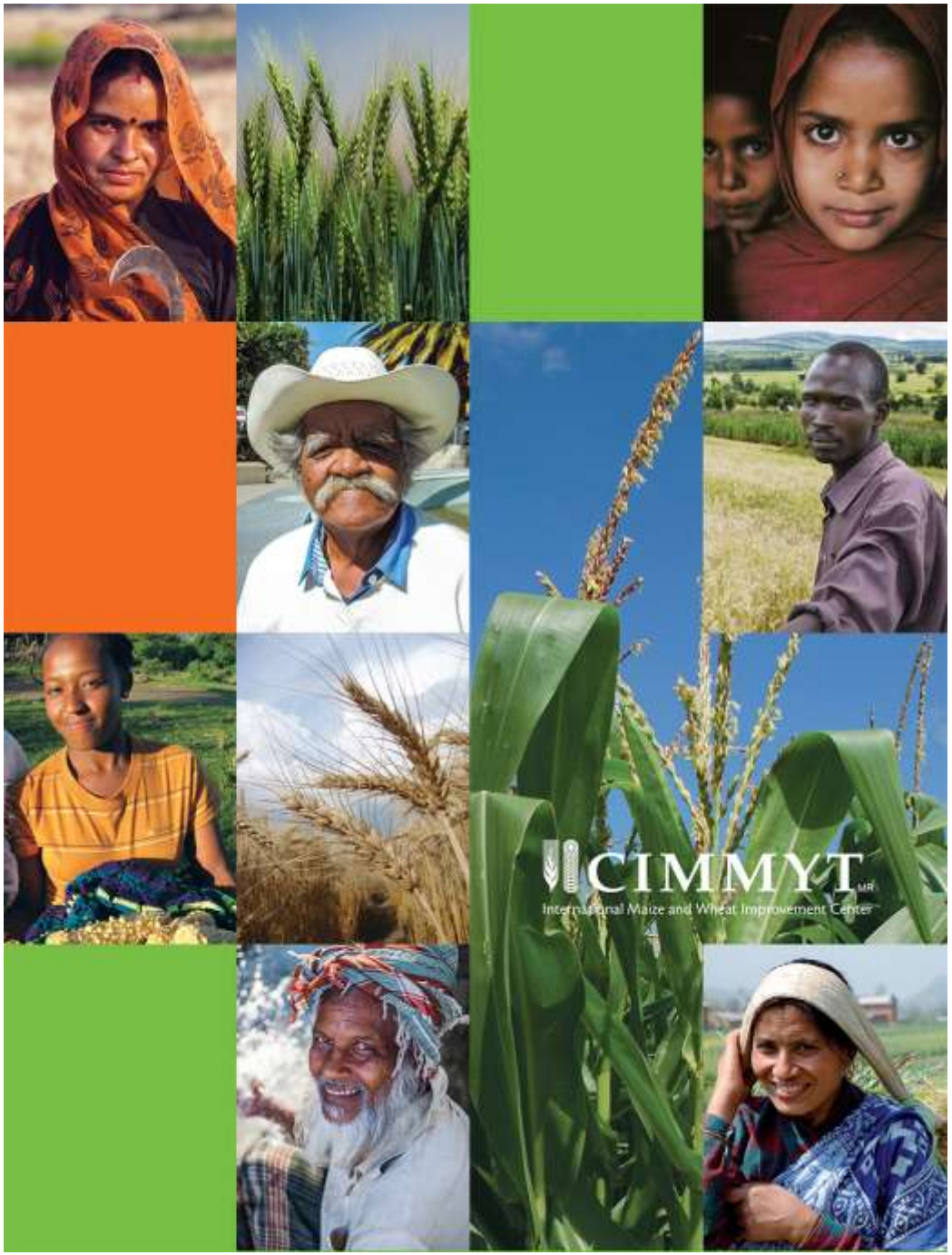
Photos: Yann Arthus-Bertran

Core Product: Knowledge systems that allow us to scan for patterns, zero in on places, learn from our actions at scale

- *Data, information, and knowledge* assets
- *Modeling* of complex systems
- *Learning systems*
- *Decisions* about management that advance securities



Importable and exportable actionable insights shared between critical decision makers such that scalable, repeatable actions can be replicated



Thank you for your interest!