

“Global Scarcity: A Spanish Perspective”

Alberto Garrido

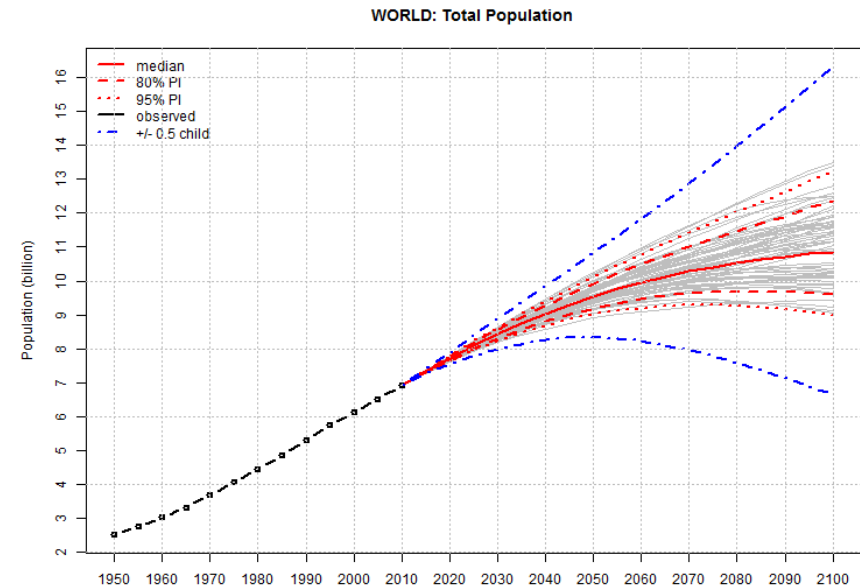
CEIGRAM (Research for the Management of Agricultural and Environmental Risks)
Universidad Politecnica de Madrid, Spain

Water Observatory, Botin Foundation

(Co-authored with Insa Flachsbarth, Ramón Llamas and Bárbara Willaarts)

Two ideas

Global water scarcity is driven by (1) world's present and future food demand



Source: UN, World Population Assessment 2014

Two ideas

and

There is (2) global water
environmental insecurity

(pollution, overabstraction at massive
scales)

Main idea

But

There are solutions for
both scarcity and
environmental insecurity
(water is a renewable resource)

Main issues

1. Global water scarcity
2. Spain: The history of water use expansion in two slides
3. Why food markets are crucial
4. Technology and development
5. Outlook

1. Global water scarcity

- ❑ Expansion of trade and globalisation
- ❑ Environmentally-driven scarcity
- ❑ Risk perceptions
- ❑ Water and food security

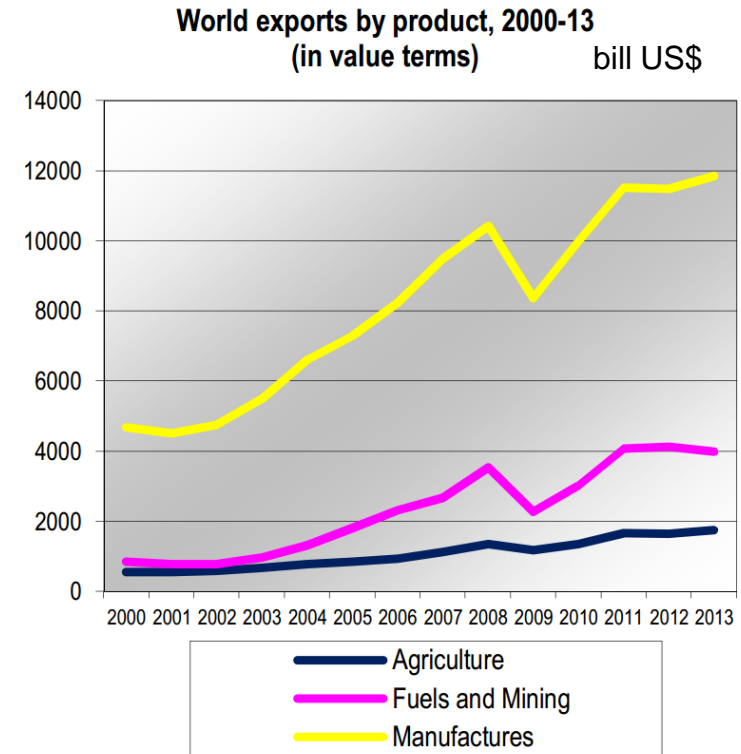
1. Global water scarcity

❑ Expansion of trade and globalisation

❑ Environmental scarcity

❑ Risk perceptions

❑ Water and food security



Source: WTO (2014)

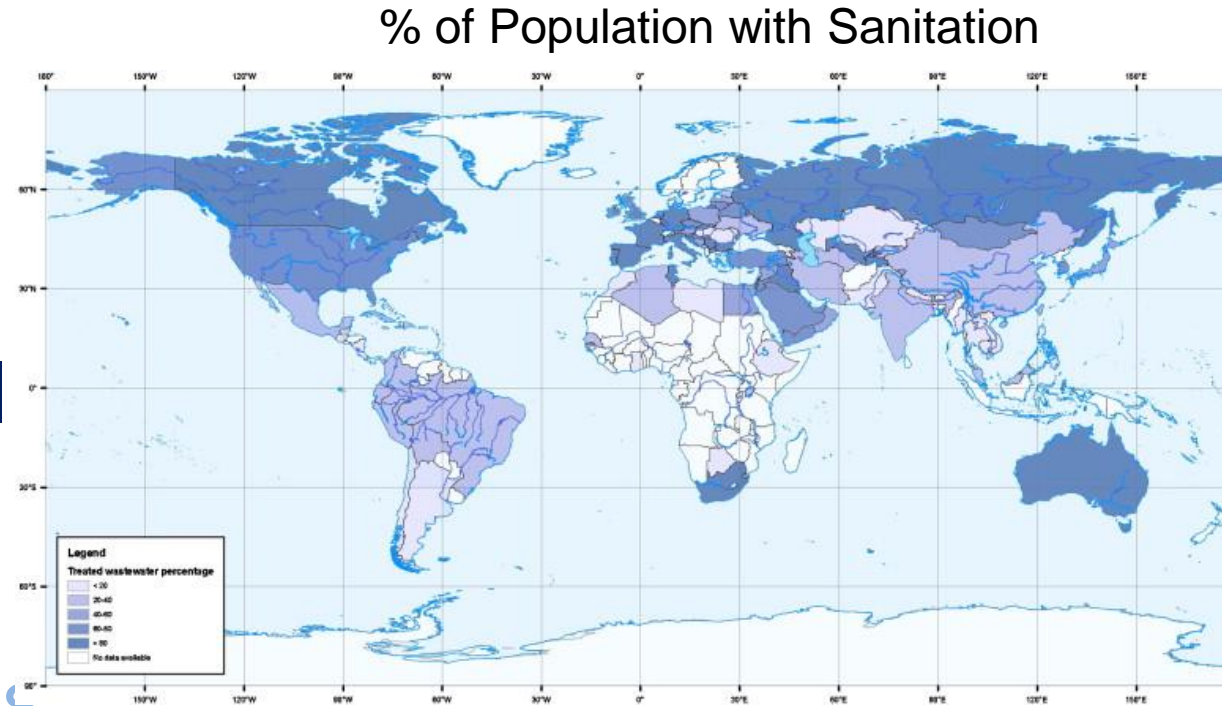
1. Global water scarcity

Expansion of trade and globalisation

Environmental scarcity

Risk perceptions

Water and food security



Source: [Sato,Qadir Yamamoto,Endo ,Zahoor \(2013\)](#)
Agricultural Water Management

1. Global water scarcity

Global Risks reports 2007-2015, World Economic Forum, Davos

	2009	2010	2011	2012	2013	2014	2015
Asset price collapse	Asset price collapse	Asset price collapse	Fiscal crises	Major systemic financial failure	Major systemic financial failure	Fiscal crises	Water crises
Retrenchment from globalization (developed)	Retrenchment from globalization (developed)	Retrenchment from globalization (developed)	Climate change	Water supply crises	Water supply crises	Climate change	Rapid and massive spread of infectious diseases
Oil and gas price spike	Oil price spikes	Oil price spikes	Geopolitical conflict	Food shortage crises	Chronic fiscal imbalances	Water crises	Weapons of mass destruction
Chronic disease	Chronic disease	Chronic disease	Asset price collapse	Chronic fiscal imbalances	Diffusion of weapons of mass destruction	Unemployment and underemployment	Interstate conflict with regional consequences
Fiscal crises	Fiscal crises	Fiscal crises	Extreme energy price volatility	Extreme volatility in energy and agriculture prices	Failure of climate change adaptation	Critical information infrastructure breakdown	Failure of climate-change adaptation

■ Economic
 ■ Environmental
 ■ Geopolitical
 ■ Societal
 ■ Technological

1. Global water scarcity

GLOBAL TRENDS 2030: AN OVERVIEW

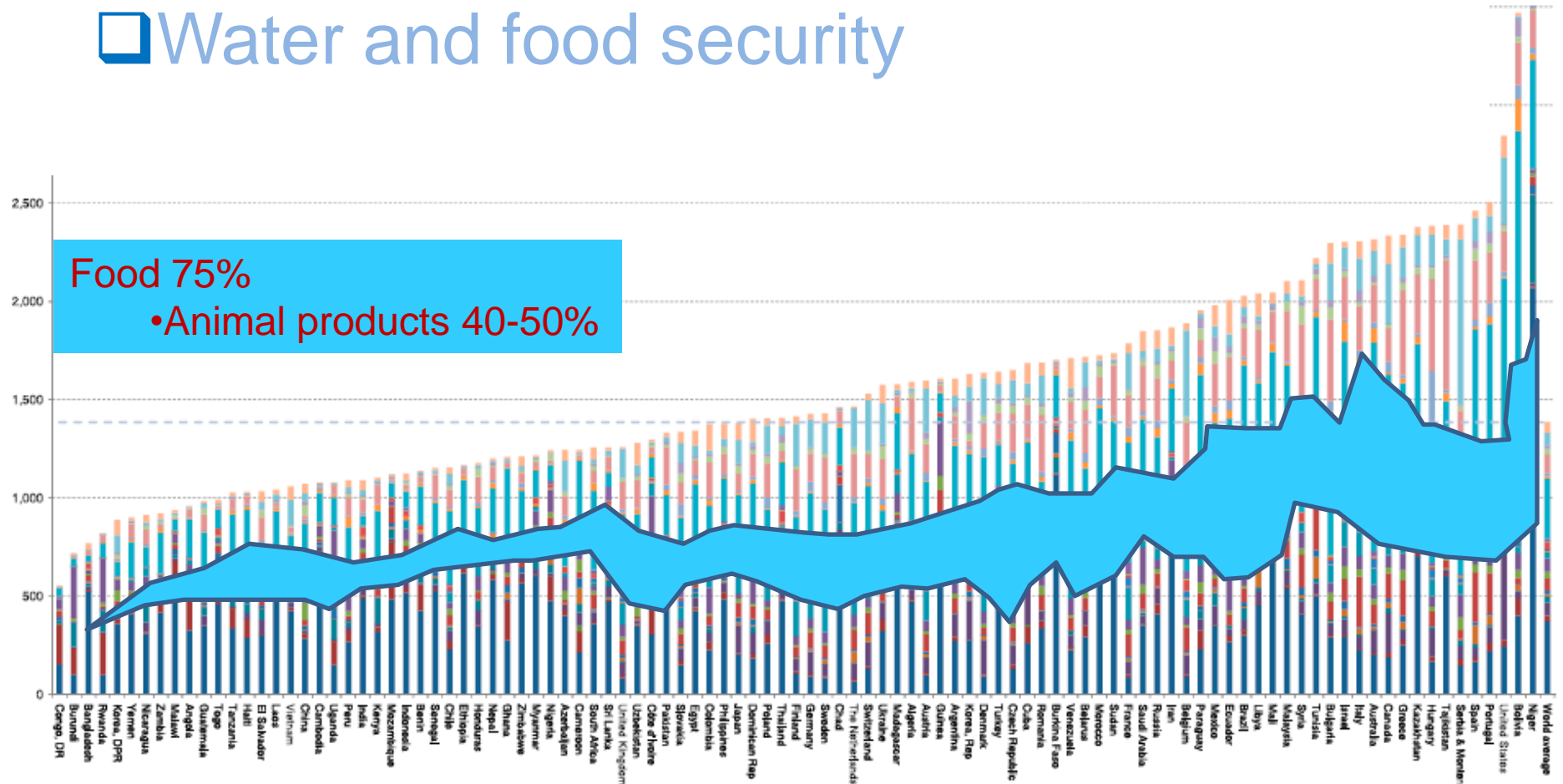
MEGATRENDS

Individual Empowerment	Individual empowerment will accelerate owing to poverty reduction, growth of the global middle class, greater educational attainment, widespread use of new communications and manufacturing technologies, and health-care advances.
Diffusion of Power	There will not be any hegemonic power. Power will shift to networks and coalitions in a multipolar world.
Demographic Patterns	The demographic arc of instability will narrow. Economic growth might decline in "aging" countries. Sixty percent of the world's population will live in urbanized areas; migration will increase.
Food, Water, Energy Nexus	Demand for these resources will grow substantially owing to an increase in the global population. Tackling problems pertaining to one commodity will be linked to supply and demand for the others.

US, National Intelligence Council, 2012

1. Global water scarcity

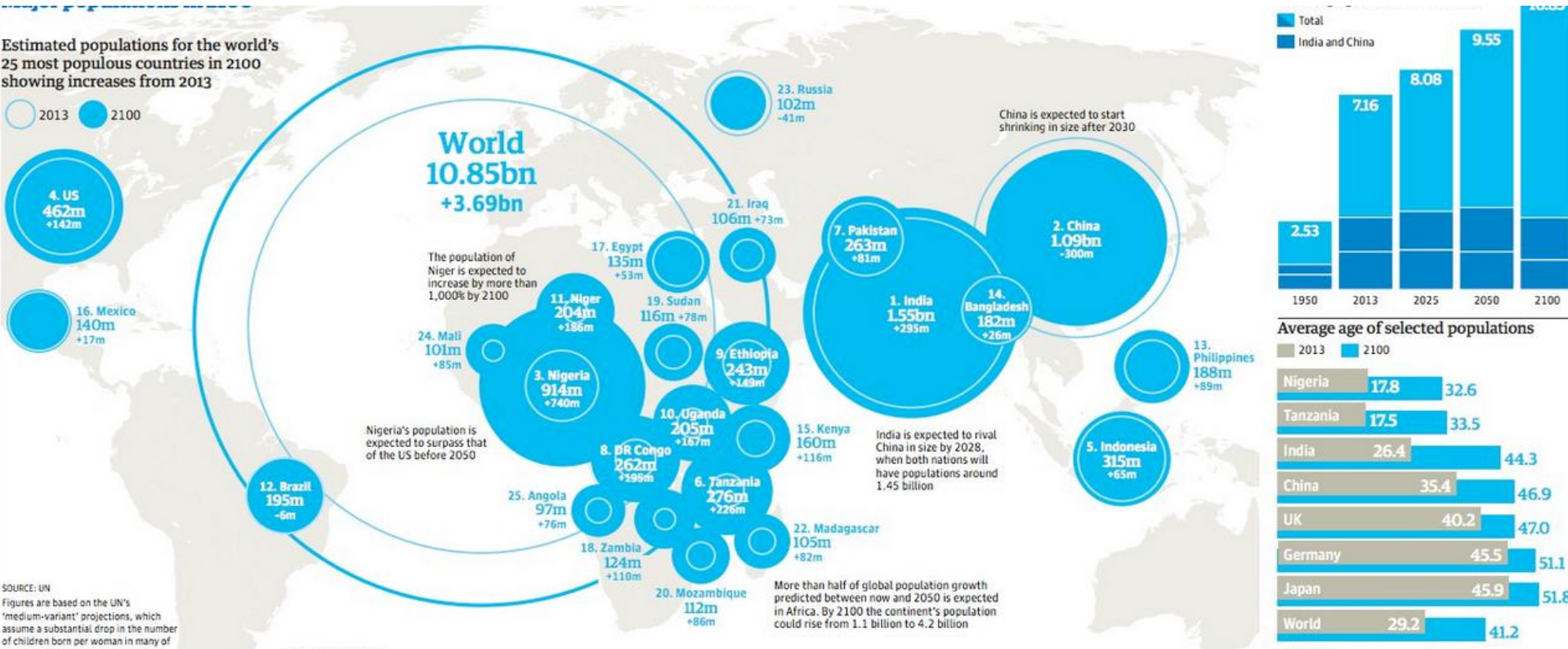
Water and food security



Source: [Hoekstra, Mekonnen, 2012.PNAS](#)

1. Global water scarcity

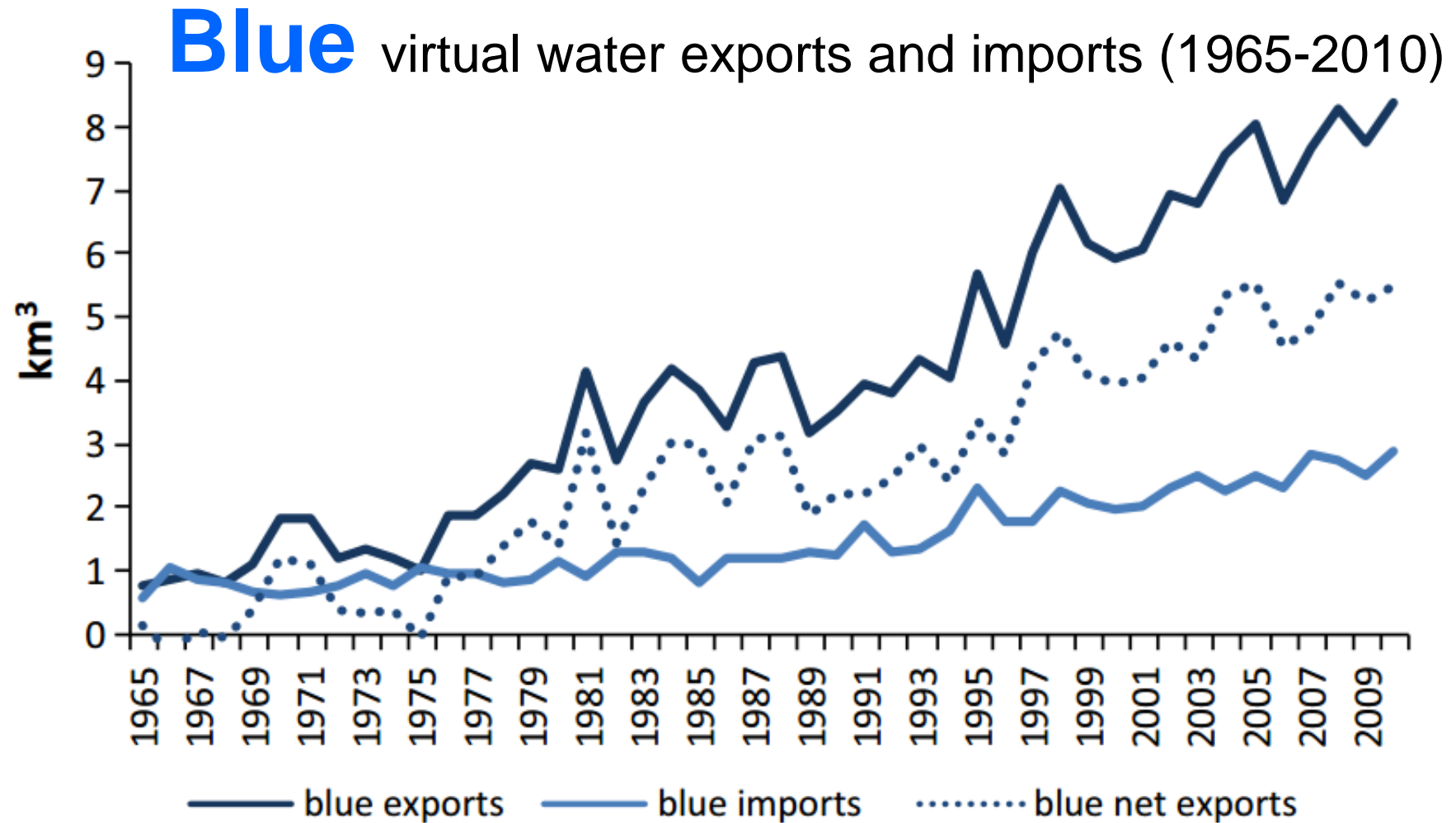
- The world population will be between 40-75% larger than today in the lifetime of many of today's children
- Sub-saharan Africa, 1bn today to between 3.5bn and 5bn in 2100



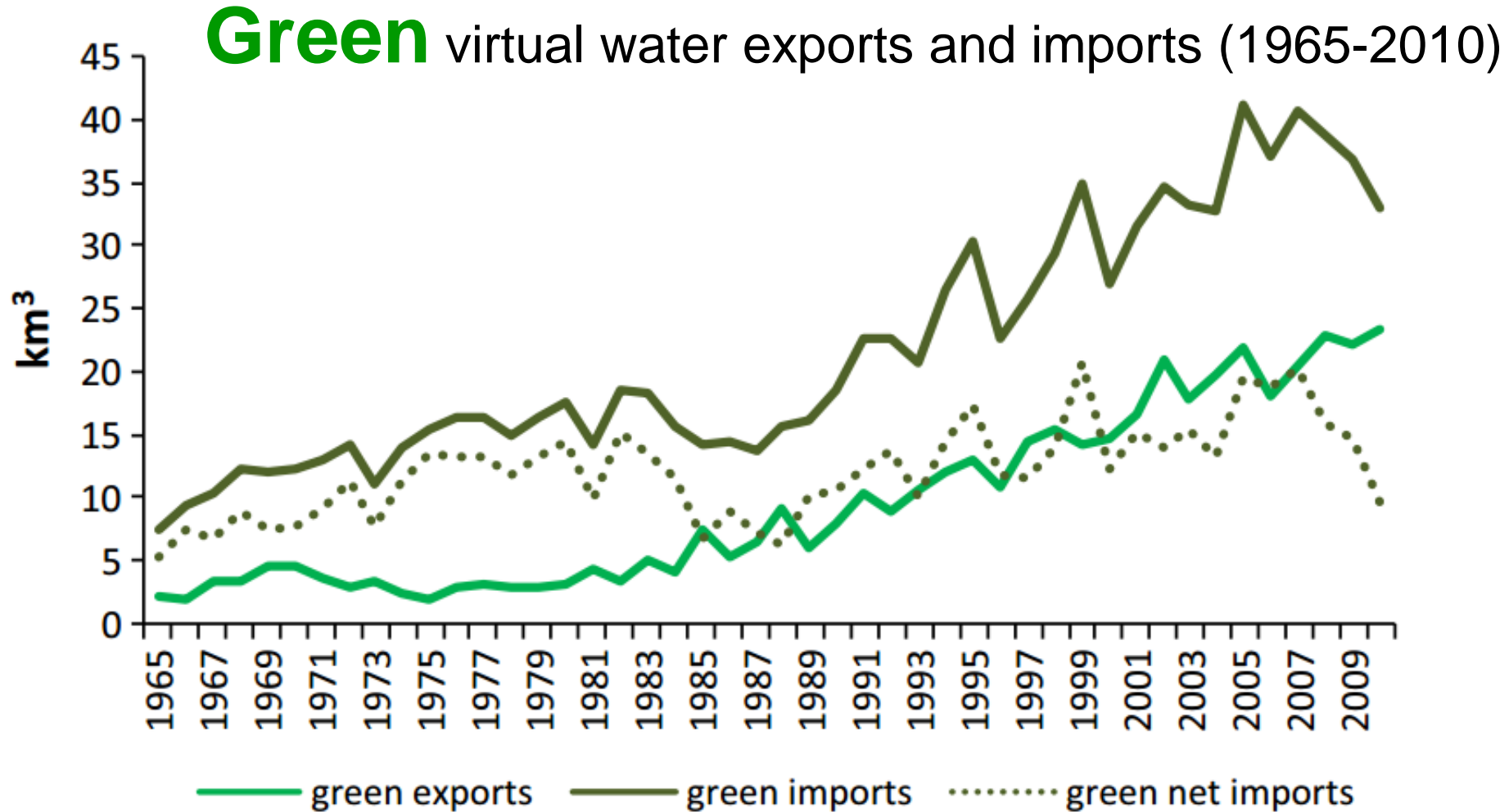
Source: UN, World Population Assessment 2014

2. Spain: history of water use expansion

2. Spain: history of water use expansion in two slides



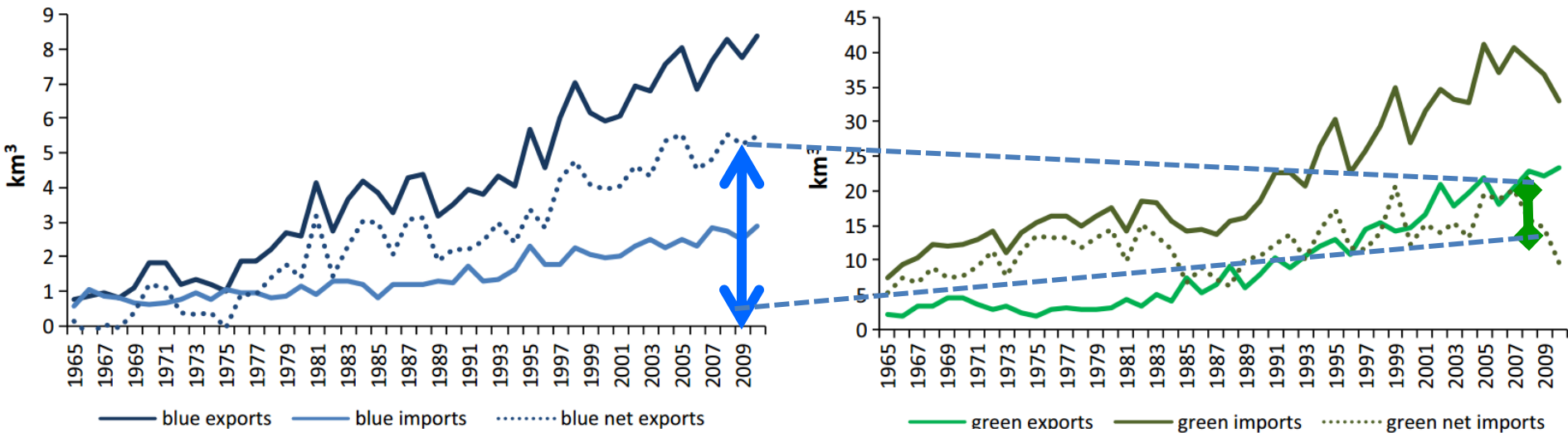
2. Spain: history of water use expansion in two slides



Source: Duarte, Pinilla, Serrano (2014)., Reg Environ Change

2. Spain: history of water use expansion in two slides

Green and Blue virtual water exports and imports (1965-2010)



Reg Environ Change
DOI 10.1007/s10113-014-0752-3

ORIGINAL ARTICLE

Globalization and natural resources: the expansion of the Spanish agrifood trade and its impact on water consumption, 1965–2010

Rosa Duarte · Vicente Pinilla · Ana Serrano

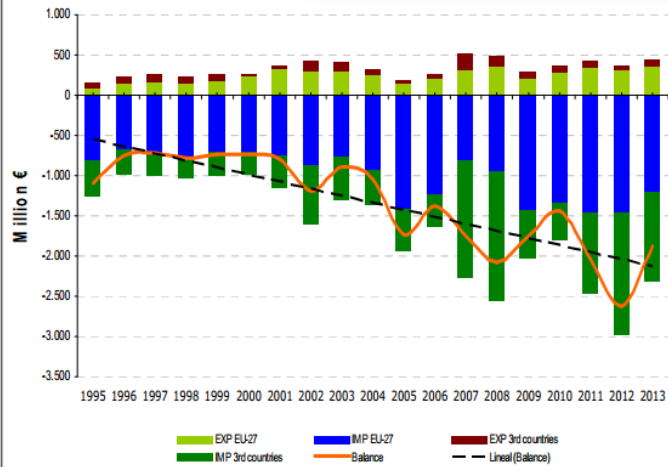
2. Spain: history of water use expansion in two slides

Year	Grains Production (mill t.)	Annual Precipt (mm)
2012	17	535
2013	25	717

$25 - 17 = 8$ mill t. ~ 8 km³

2. Spain: history of water use expansion in two slides

Cereals (10)



Some commodities

Net Trade (2013)

Cereals ~ - € 2 bill

Oil seeds ~ - € 1.8 bill

Livestock ~ + € 4 bill

Total int'al trade (2013):

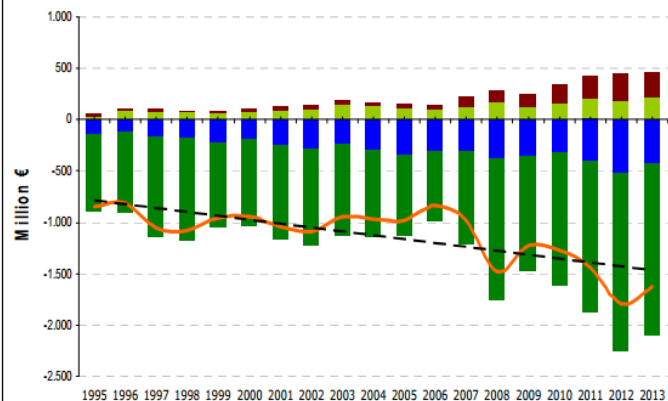
Imports € 252 bill

Exports € 224 bill

Ballance: -€28

Oil seeds Gr

Oil seeds (12)

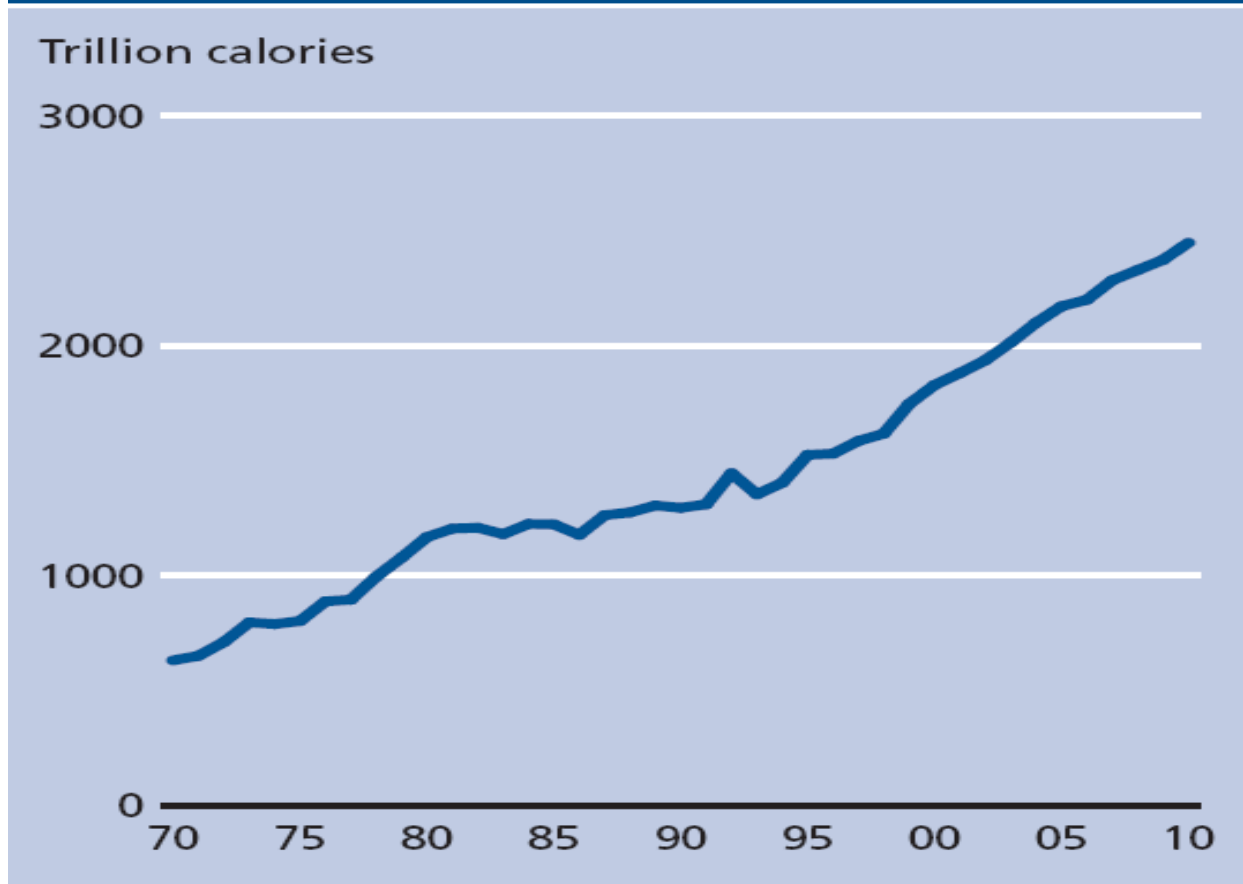


Source: S.G. Analysis, Prospective and Coordination —
Subsecretary's office — MAGRAMA email: sgapc@magrama.es
Reproduction is authorised provided the source is acknowledged.
Document must be referenced like "International Trade Analysis.
February 2013"

3. Why international food trade is so important

3. Why food markets are crucial

Figure 3.2: Global food trade (trillion calories): 1970-2010



Source: Prakash and Christopher L. Gilbert. Chap. 3., FAO (2010)

3. Why food markets are crucial

The World in 2030

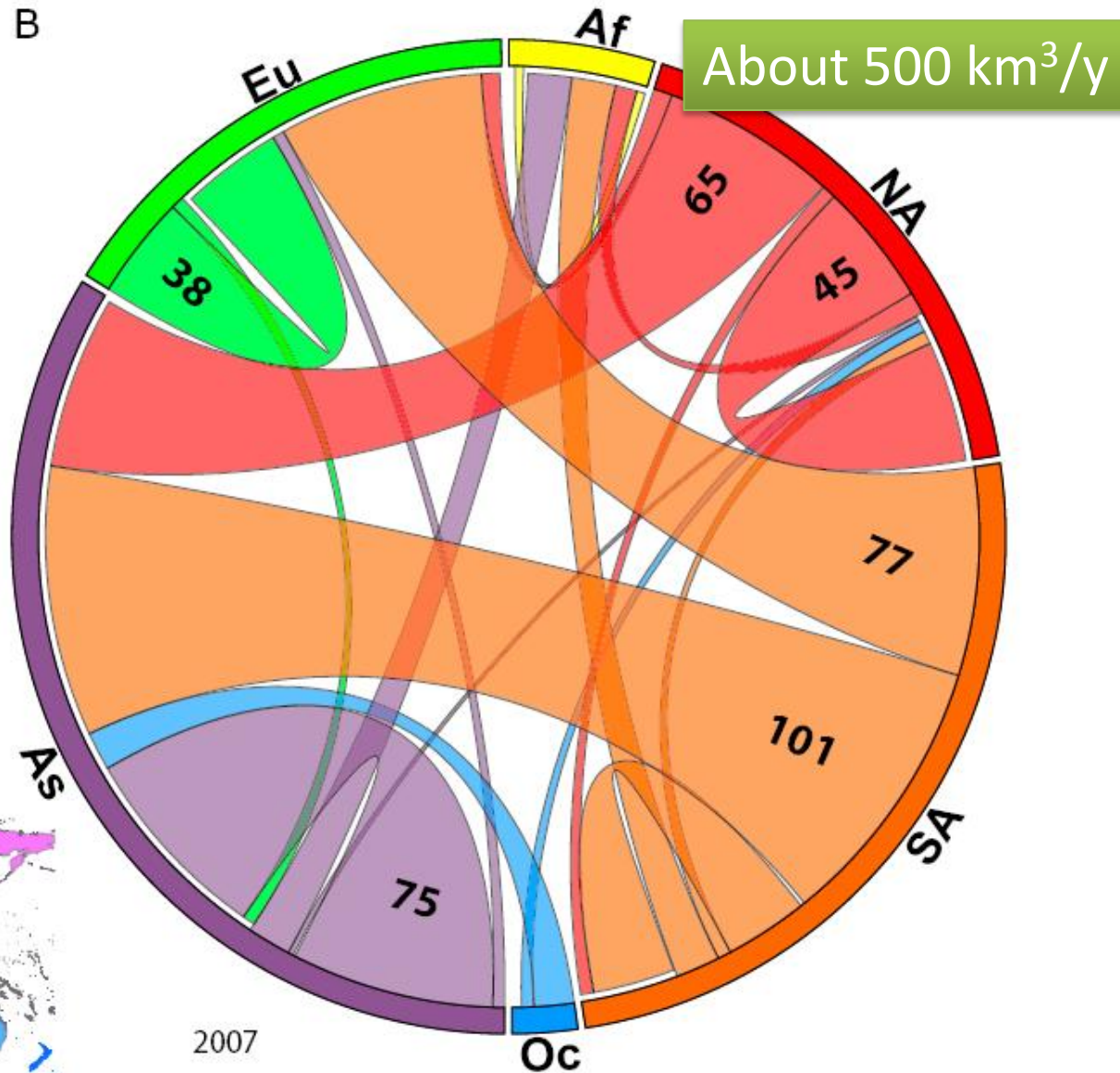
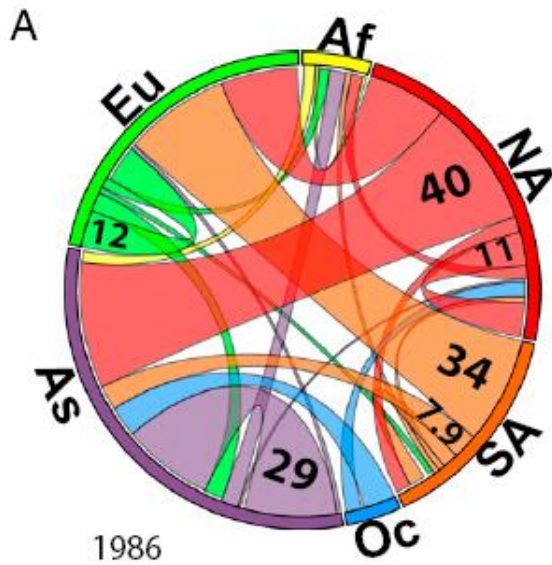
(Susan Glasser; <http://www.politico.com/>, Jan 22, 2015)

- Genes as commerce (*Alec Ross*)
- The democratization of media to fight rights abuses (*Kenneth Roth*)
- Women controlling their fertility (*Nancy Birdsall*)
- Digital ID cards (*Edward Lucas*)
- A second food revolution (*John Norris*)
- More open borders (*Charles Kenn*)
- High-tech classrooms (*Neera Tanden*)
- Recognizing the rights of the poor (*William Easterly*)
- Real civic engagement (*Ralph Nader*)
- Closing the gender gap (*Melanne Vermeer*)
- Setting few—but smart—targets (*Bjorn Lomborg*)
- Technology for the good (*Vivek Wadhwa*)
- Investing in childhood education and health (*Esther Dyson*)

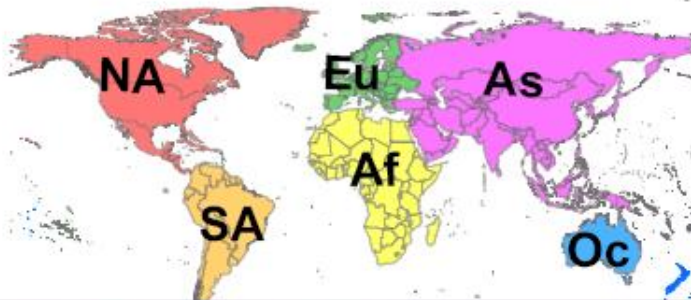
30 percent of all food is lost between field and fork

The Doha round of global trade negotiations will make the world \$11 trillion better off by 2030

3. Why food markets are crucial



Source: Dalin y et al
(PNAS, 109:16, 2012)



4. Technology, habits and agricultural development

4. Technology, habits and agricultural development

- ❑ Focus on **yield gaps and intensification** (better than expansion)
- ❑ Reducing **Food waste**
- ❑ The meat challenge, change of **diets** (a **question of tastes and prices**)

4. Technology, habits and agricultural development

Gains in Agricultural Productivity

Global and regional growth annual rates of selected crops (1961-2010)

	Maize		Wheat		Rice	
	1961-1990	1991-2010	1961-1990	1991-2010	1961-1990	1991-2010
World	2.33	1.82	2.73	1.03	2.14	1.09
North America	2.19	1.75	1.38	0.98	1.22	1.33
West Europe	3.73	1.32	3.21	0.83	0.62	0.7
Eastern Europe	2.54	1.93	3.19	0.18	0.51	3.49
Asia & Pacific (exc-China)	1.96	2.88	2.96	1.39	1.83	1.49
China	4.39	0.81	5.76	2.05	3.06	0.64
Lat Am& Caribbean	2.01	3.22	1.67	1.52	1.39	3.1
Sub-Saharan Africa	1.3	1.7	2.88	1.84	0.83	1.03

Source: Alston, Martin & Pardey (2014)

In Chavas, Hummels and Wright. "The economics of food price volatility. NBER

4. Technology and development

Gains in Agricultural Productivity

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In 20 years, slowed productivity growth **missed**

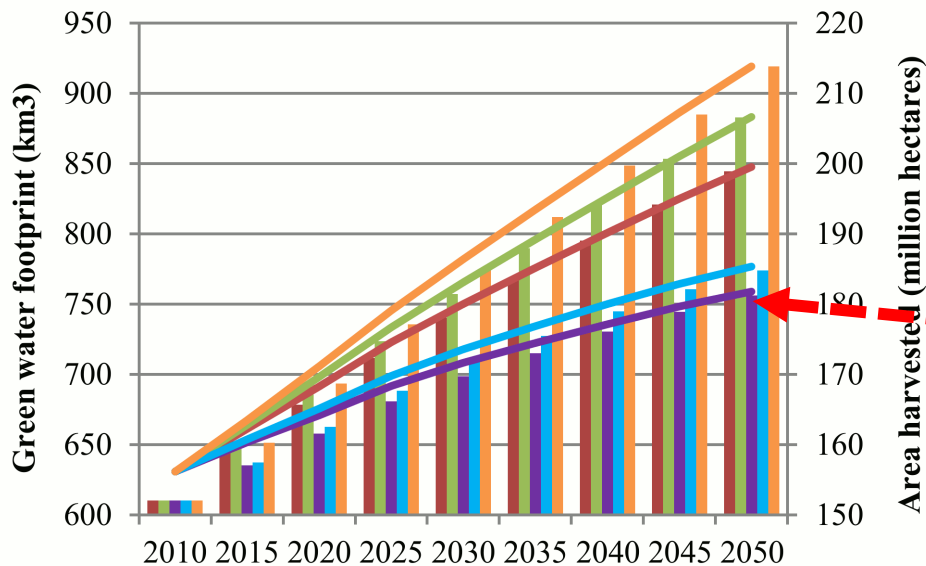
yield gains of maize: 10%
of wheat: 48%
of rice: 22%

Huge water and land-use savings have been missed

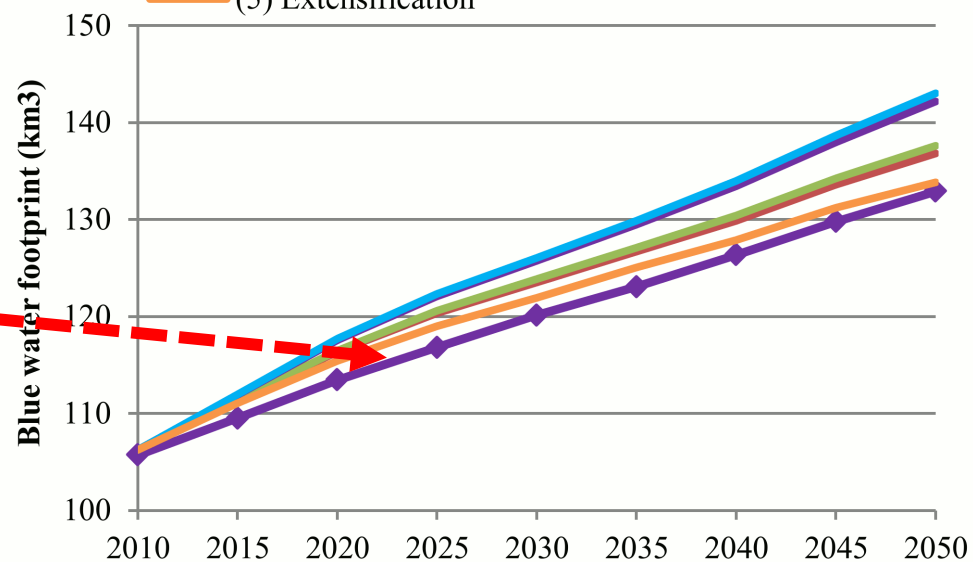
4. Technology, habits and ag development

Scenarios for South America agriculture

- a)
- (1) BAU
 - (1a) BAU liberal
 - (2) Intensification / (3) Sustainable intensification
 - (4) Yield gaps closed
 - (5) Extensification



- b)
- (1) BAU
 - (1a) BAU liberal
 - (2) Intensification
 - (3) Sustainable intensification
 - (4) Yield gaps closed
 - (5) Extensification



Source: Flachsbad, I., Willaarts, B., Xie, G., Pitois, G., Mueller, N.D., Ringler, C., Garrido, A. (2015). The role of Latin America's land and water resources for global food security: Environmental trade-offs of future food production pathways. *PLOS ONE in press*

4. Technology and development

□ The Urban water challenge

Population	Number of Cities
Cities with Population of 1,000,000 +	457
Cities with Population of 500,000 +	1,063
Cities with Population of 150,000 +	2,896

Source: <http://www.statisticbrain.com/>

5. Outlook

5. Outlook

- Semi-arid countries' water economy is closely related to world's markets and affected by its megatrends
- Drought risks can be mitigated by strategic trade of agricultural production and wise allocation mechanisms
- Irrigated agriculture, even if it's large, can help manage water scarcity

5. Outlook

- Water and food security is crucial in the MENA region, and strategic for Spain
- Spanish water companies supply water to 100 million people abroad (solid scientific and training base)

Gracias - Thank you
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www.fundacionbotin.org

