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Date
February 20, 2012

Agriculture Extension and Advisory Services under the New Normal of Climate Change

Speakers

Brent M. Simpson, *Michigan State University*

Gaye Burpee, *Catholic Relief Services*

Facilitator

Zachary Baquet, *USAID Bureau for Food Security*

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Upcoming Agrilinks Events:

- #AskAg Twitter Chat | March 8th | Int'l Women's Day
- #AskAg Twitter Chat | March 22nd | World Water Day
- Ag Sector Council | March 27th | GrainPro

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MEAS Symposium
Improving the Provision of Extension and Advisory Services
- Evidence from the Field -

June 5-7, 2013 in Washington, D.C.

The MEAS symposium will feature presentations based on case studies and other research conducted through the MEAS project over the past year. The detailed program is available at: www.meas-extension.org/workshops/.symposium-2013

Please register by May 1, 2013.

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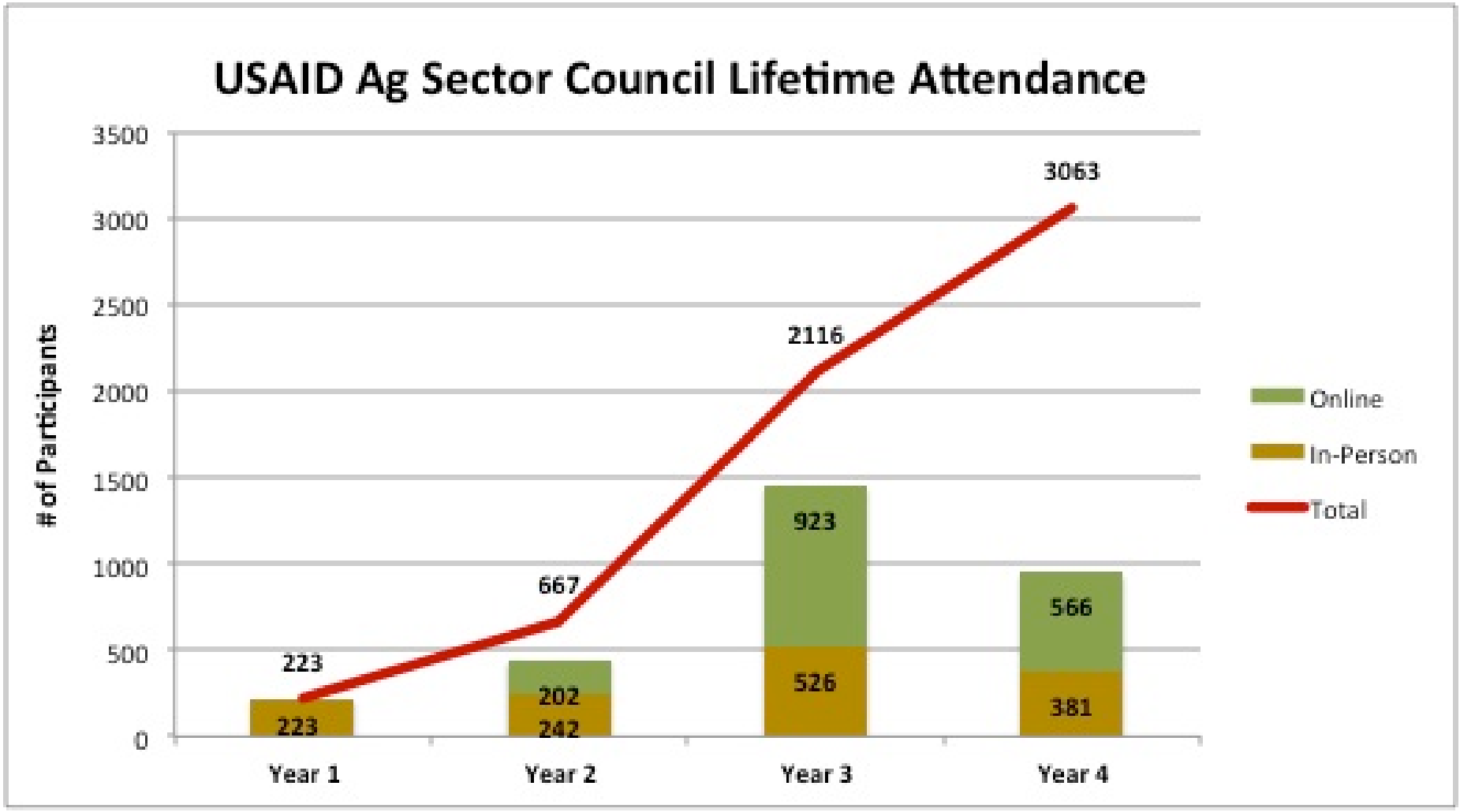

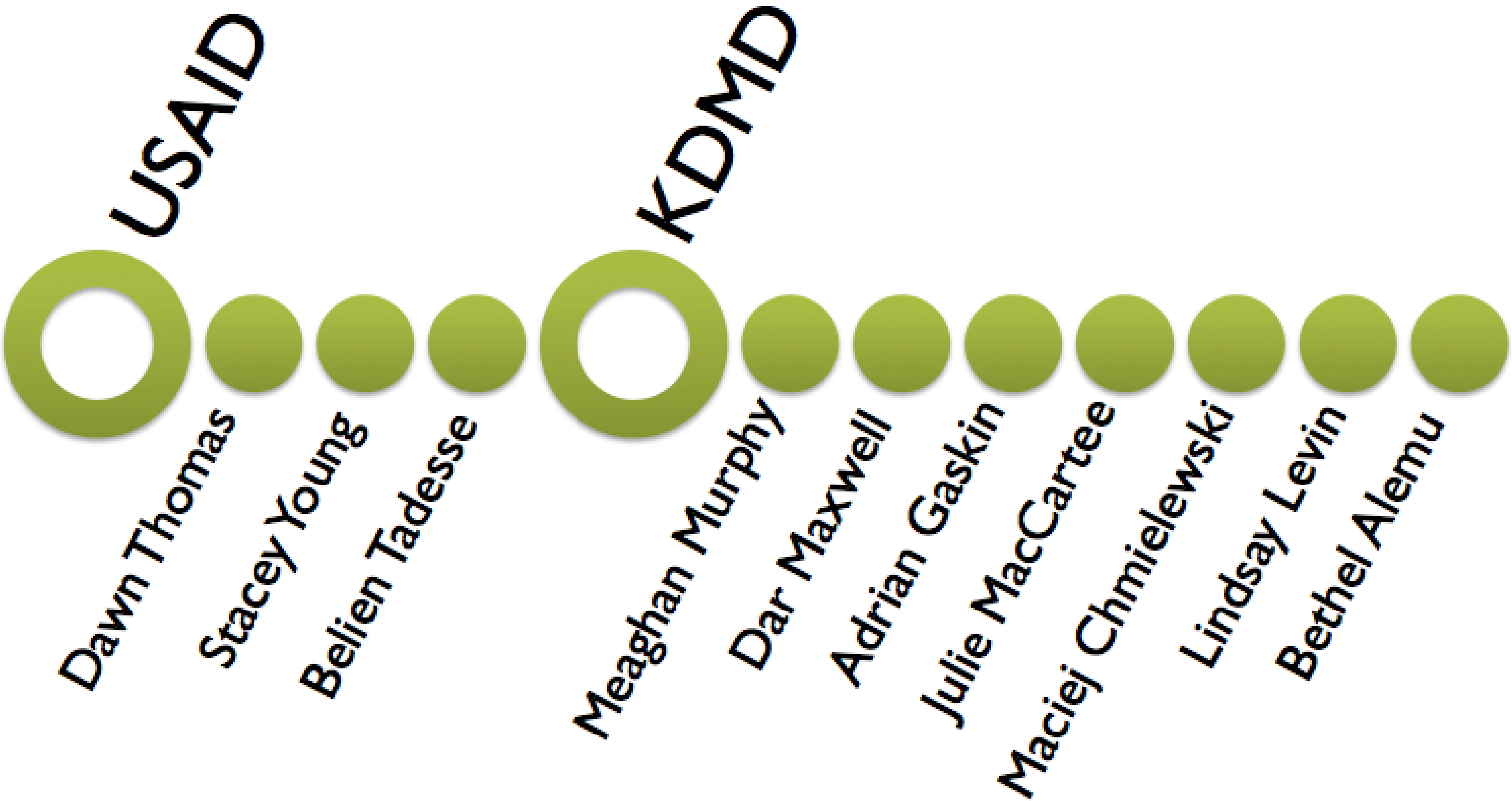
USAID
KDMD
Dawn Thomas
Stacey Young
Belien Tadesse
Meaghan Murphy
Dar Maxwell
Adrian Gaskin
Julie MacCartee
Maciej Chmielewski
Lindsay Levin
Bethel Alemu

Brent M. Simpson

Michigan State University

Brent M. Simpson is Associate Professor, International Development, in the Department of Agriculture, Food and Resource Economics at Michigan State University (MSU). Over the past 30 years he has worked in over twenty countries, primarily in Africa. Currently he serves as the Deputy Director of the USAID-funded Modernizing Extension and Advisory Service (MEAS) Project, a Feed the Future initiative, and manages MSU's involvement several international agricultural development efforts. Dr. Simpson has his M.Sc. in Agriculture Extension and Education, and Ph.D. in Resource Development, both from Michigan State University.

Gaye Burpee

Catholic Relief Services

Gaye Burpee is Catholic Relief Services' Senior Advisor on Climate Change and Rural Livelihoods for Latin America and the Caribbean. She oversees the region's work at the nexus of climate change, rural livelihoods and natural resources. Dr. Burpee studied sociology and Latin American studies at Scripps College in California and has M.S. and Ph.D. degrees in soil science and sustainable agriculture from Michigan State University.

Agriculture Extension and Advisory Services under the *New Normal* of Climate Change

Brent M. Simpson
Michigan State University
Deputy Dir. Modernizing Extension and Advisory Services (MEAS) Project

Gaye Burpee
Catholic Relief Services, Senior Advisor
Climate Change & Rural Livelihoods in the LAC

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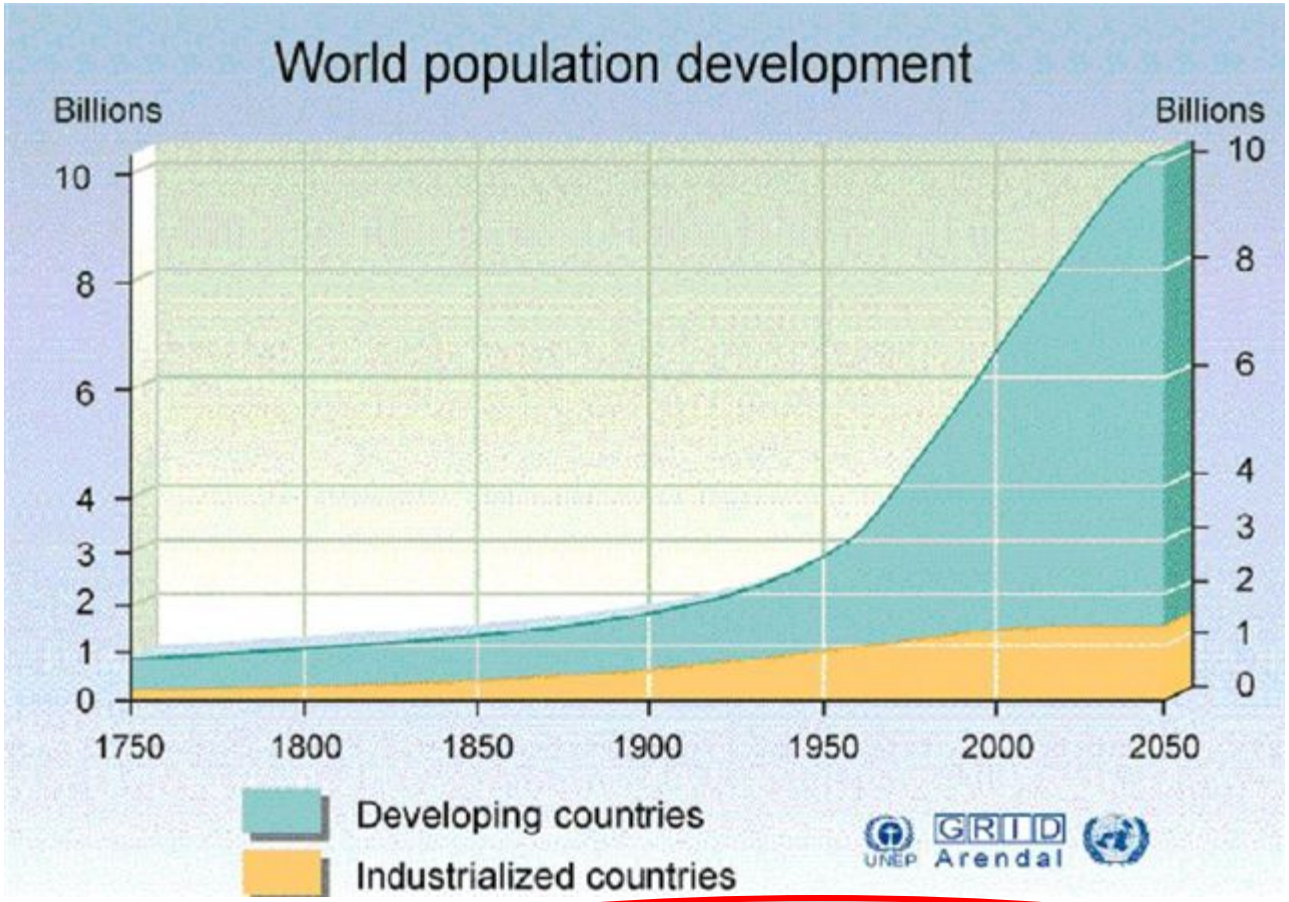
Major Themes Covered

- Context
- The *New Normal* of Climate Change
- Important Concepts & Perspectives
- Current Practices & Best Prospects

Context - World Demand for Cereals



World Bank: 100 percent increase in cereal production by 2050;

FAO: 70 percent increase in cereal production by 2050.

USAID: 60-70 percent Increase in cereal production by 2050

*A 60 – 70 % increase is equivalent to the addition of the total global cereal production in 1979/1985.

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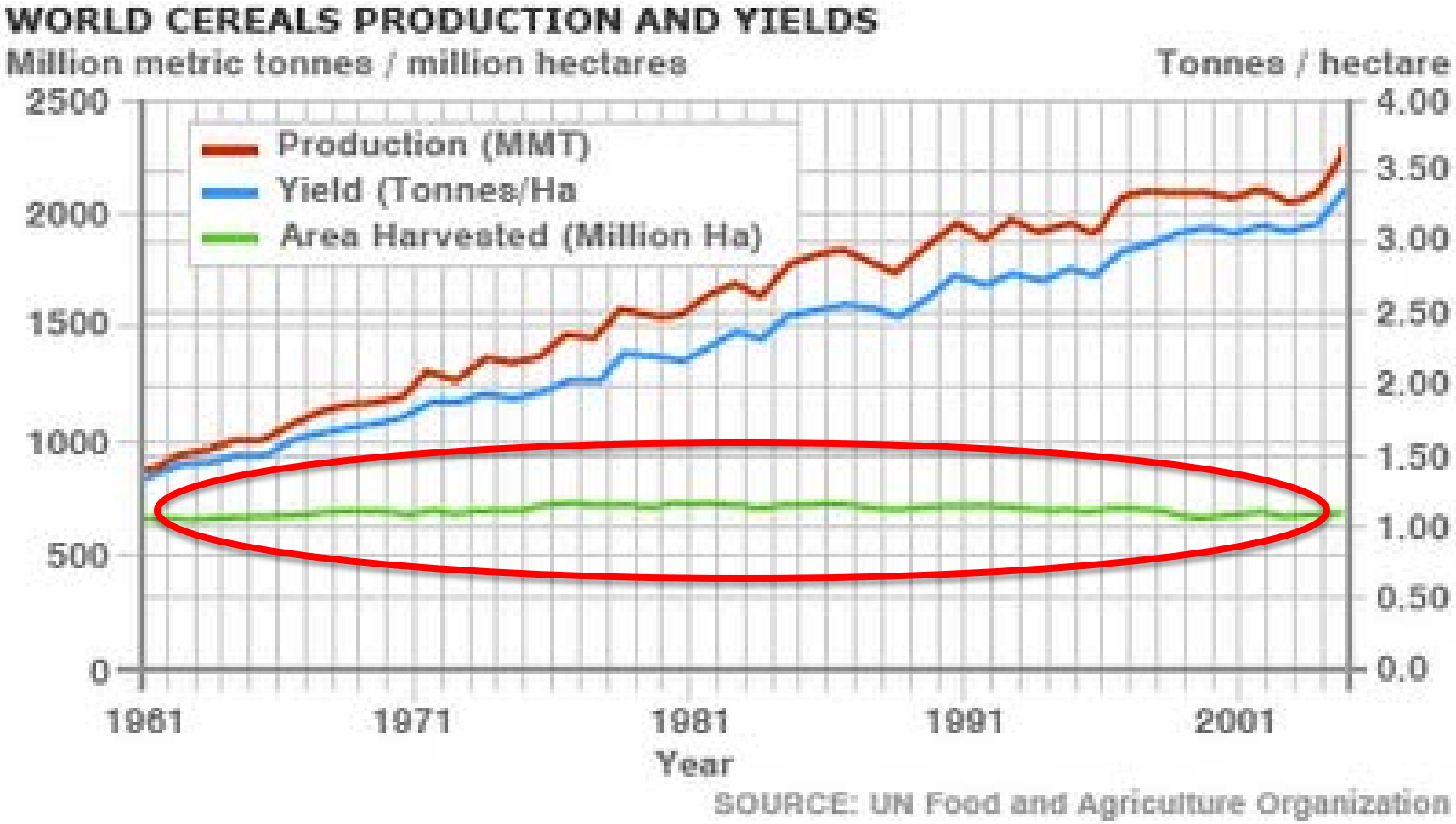
Context – Agricultural Land



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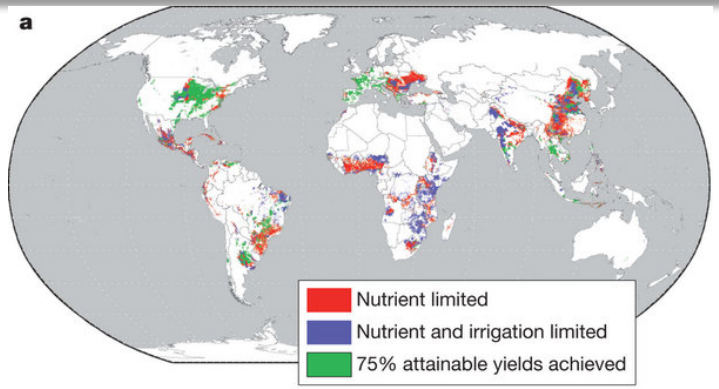
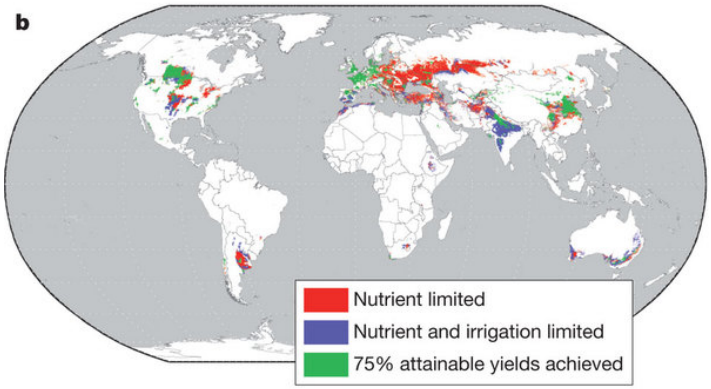
Context – Closing the Yield Gap

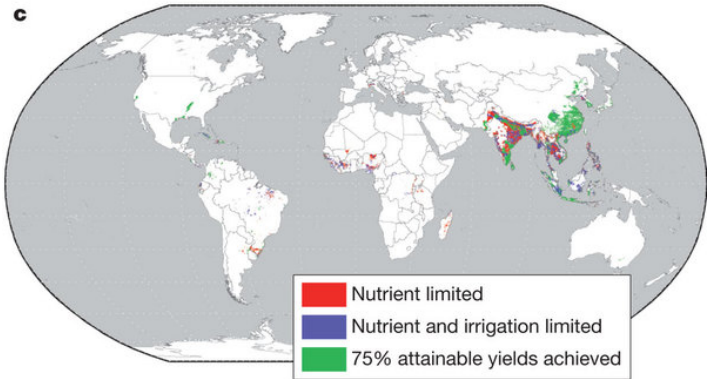
Maize



Wheat



Rice



Source: Mueller, et al. (2012). Nature 490: 254-57.

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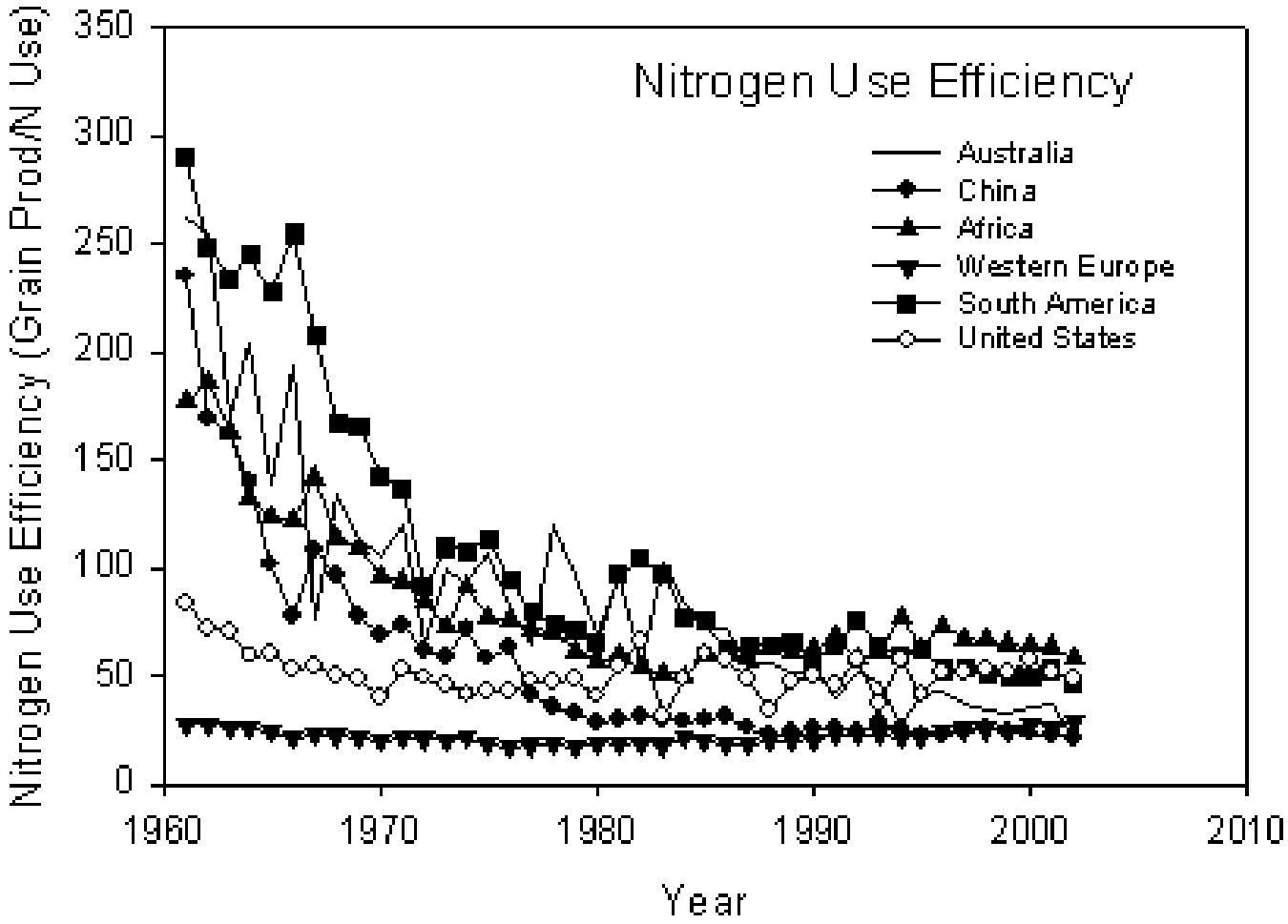
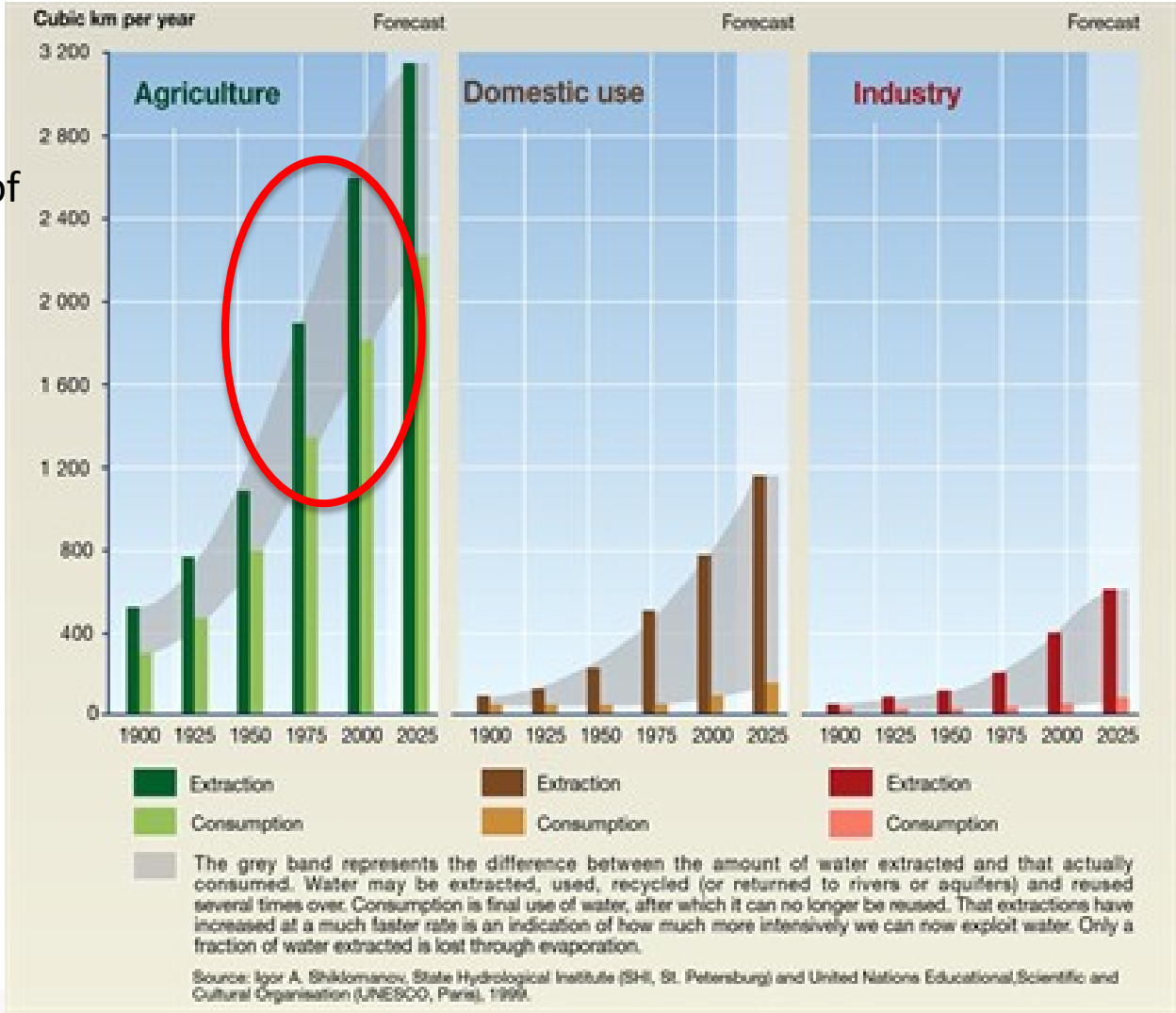
Context – Agricultural Input Usage



Source: Hatfield and Prueger, 2004.

Context – Agriculture & Water Usage

Agriculture uses 70 – 80 percent of fresh water.



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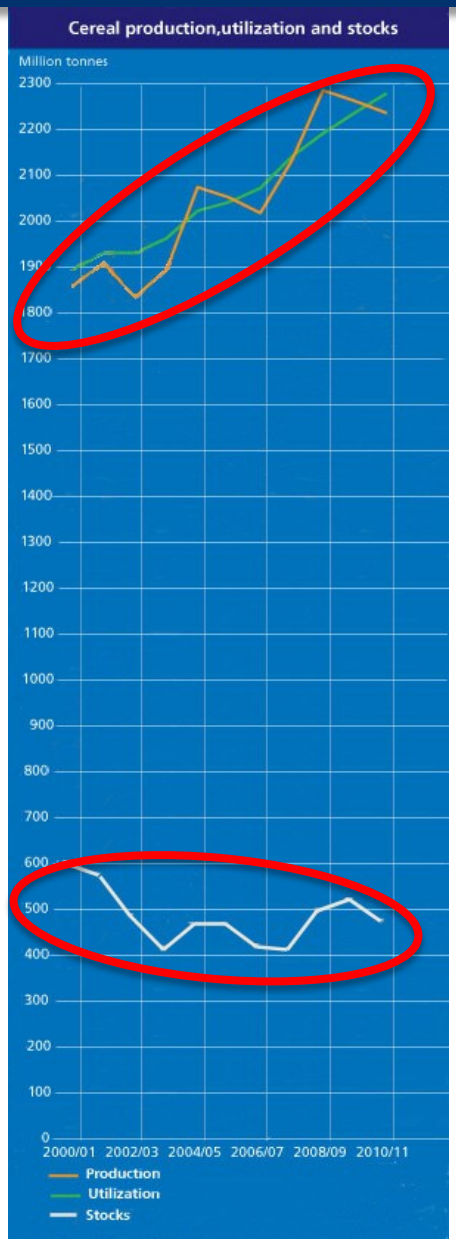
Agriculture – Big Picture



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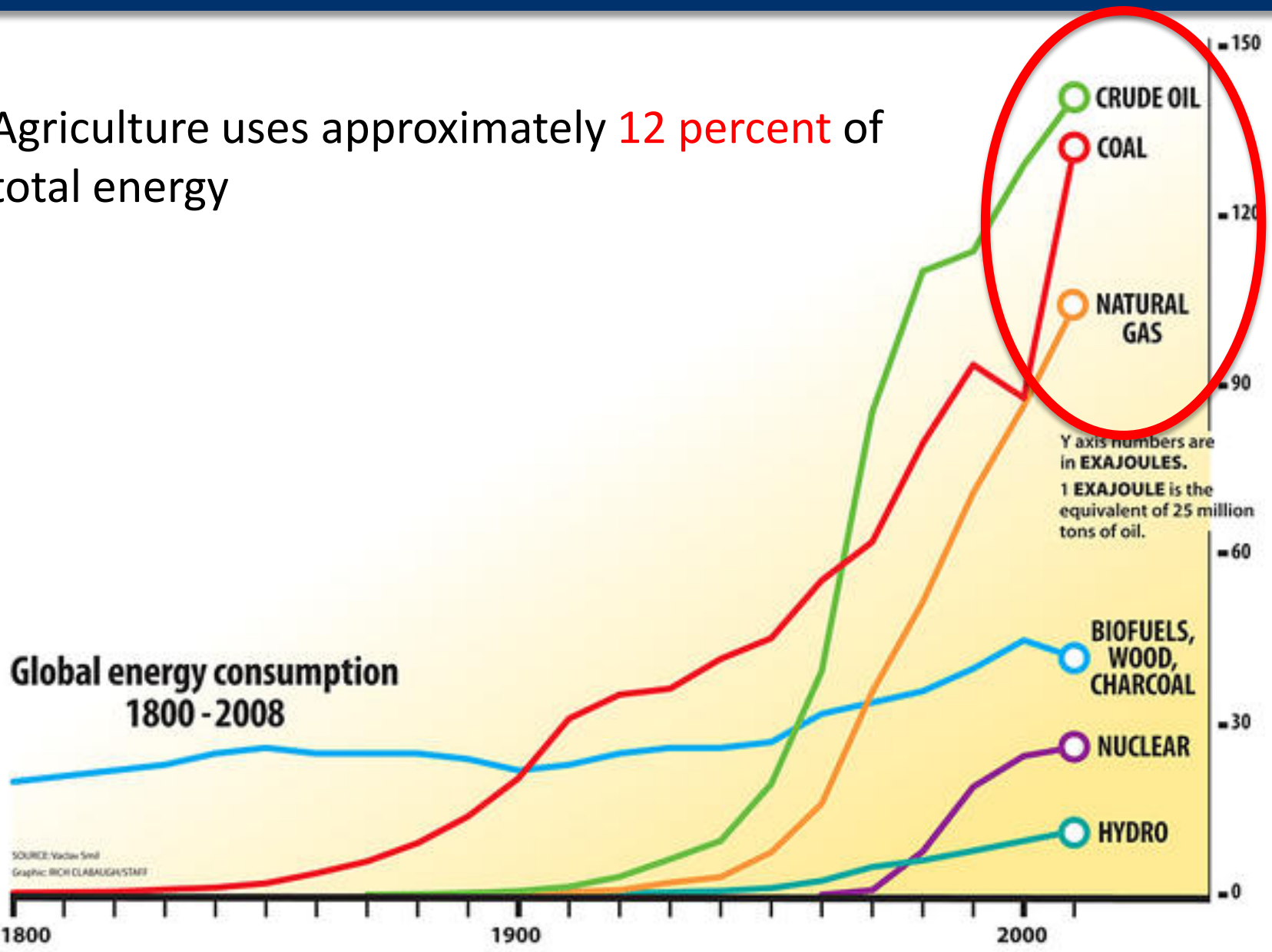
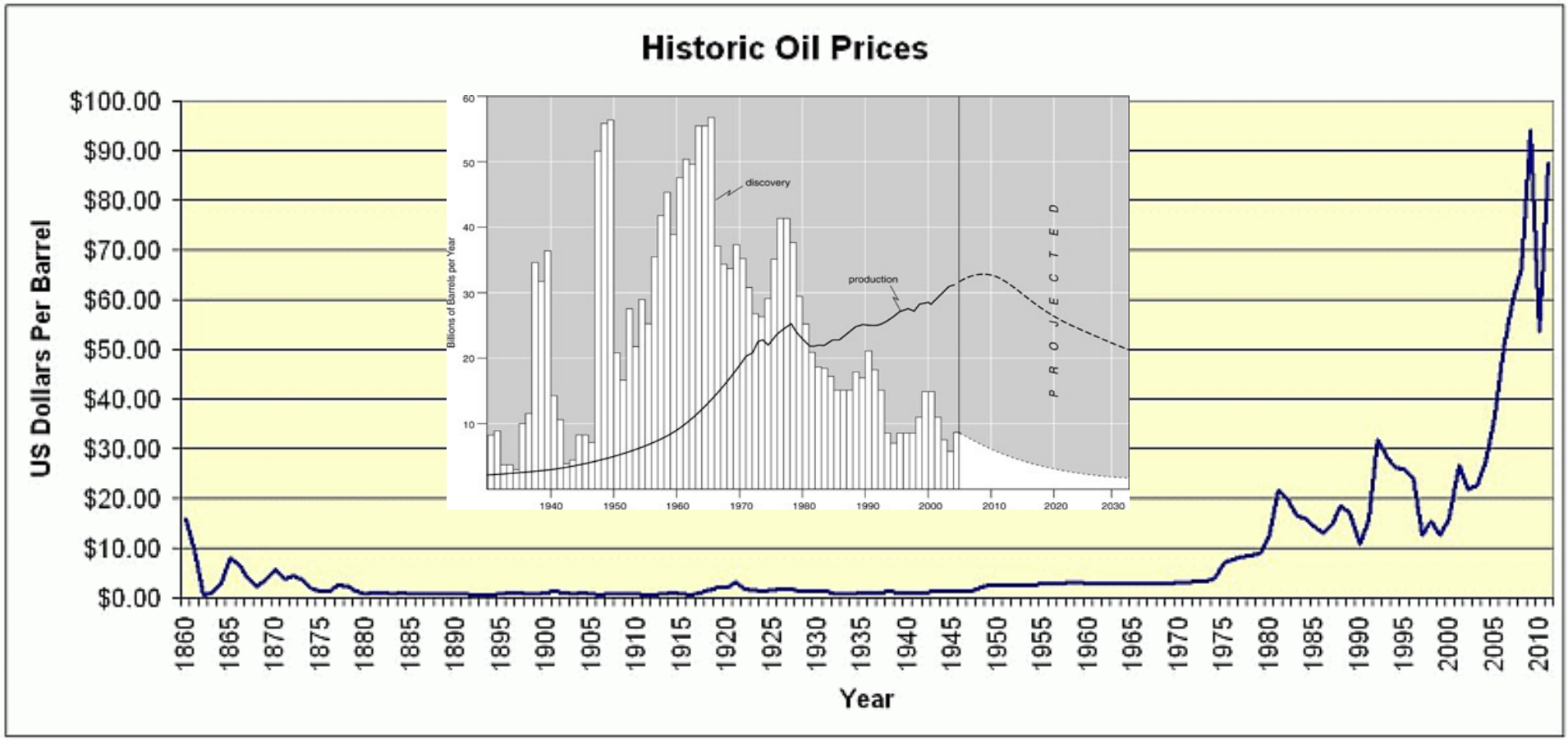
Context – Energy Usage

Agriculture uses approximately 12 percent of total energy

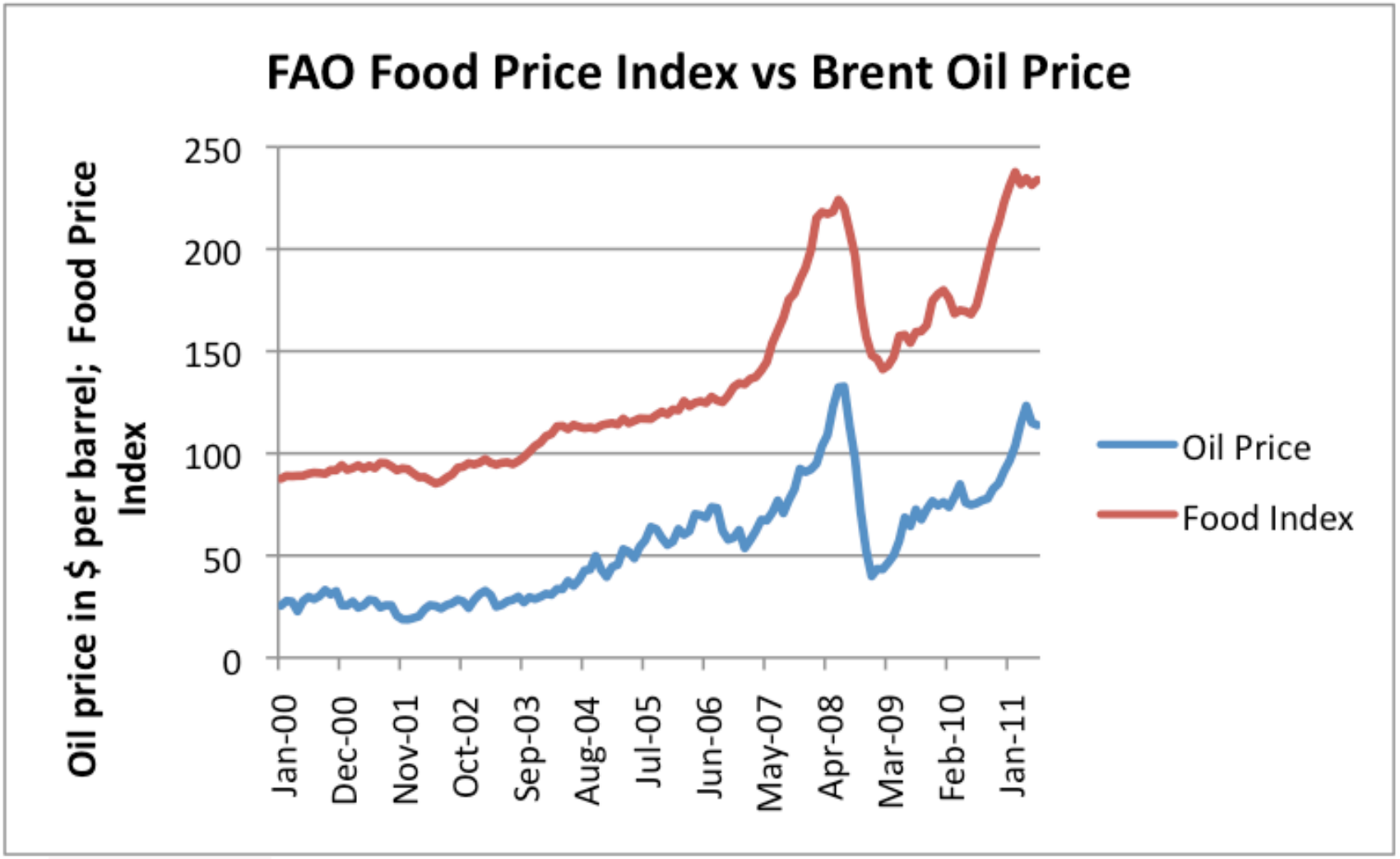


Context – Energy Prices

- Direct energy costs of fuel and fertilizers account for roughly 28% of the crop budget in industrialized agriculture;
- Transportation costs contribute 40-50% to final food costs.



Context – Food & Energy Prices



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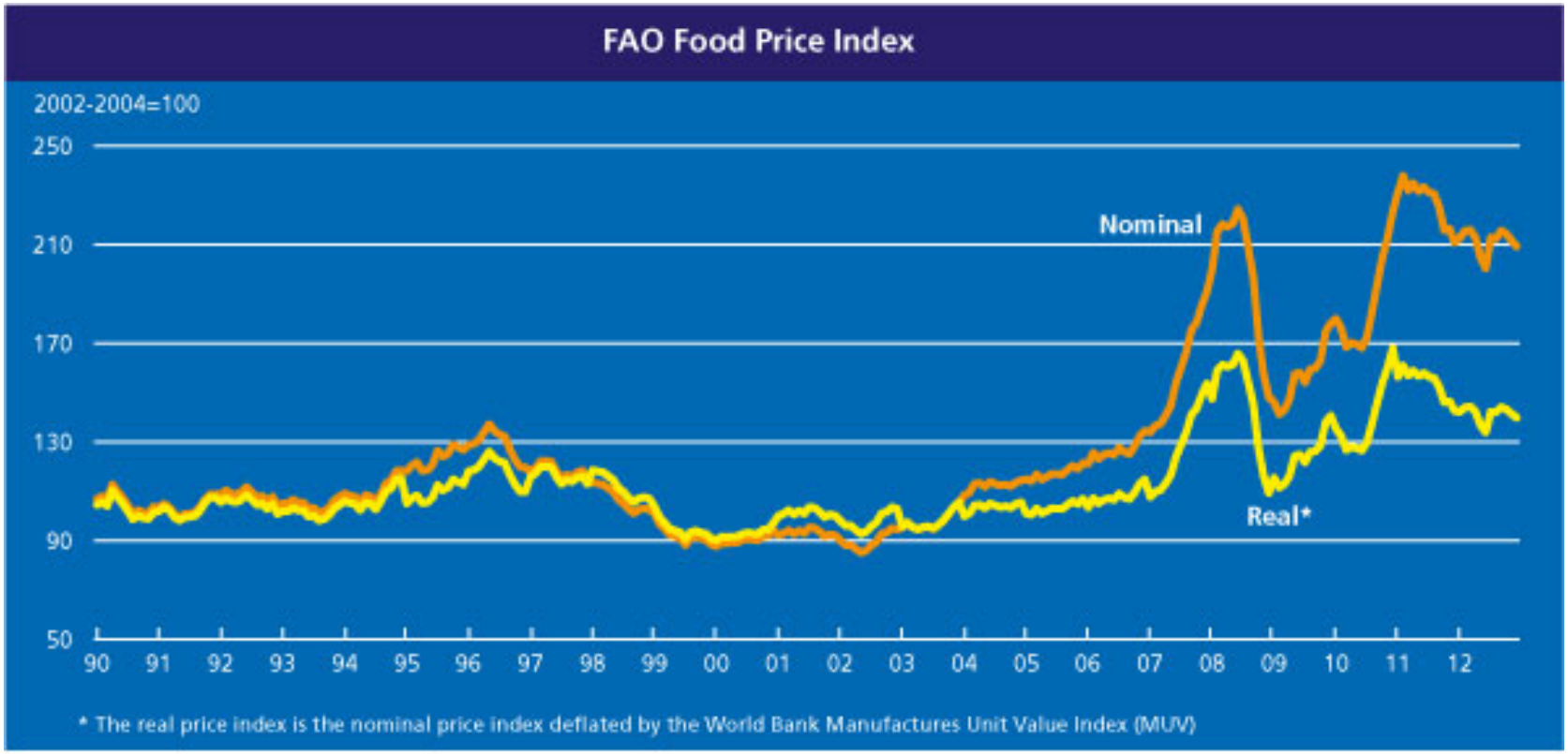
Context – Food Prices



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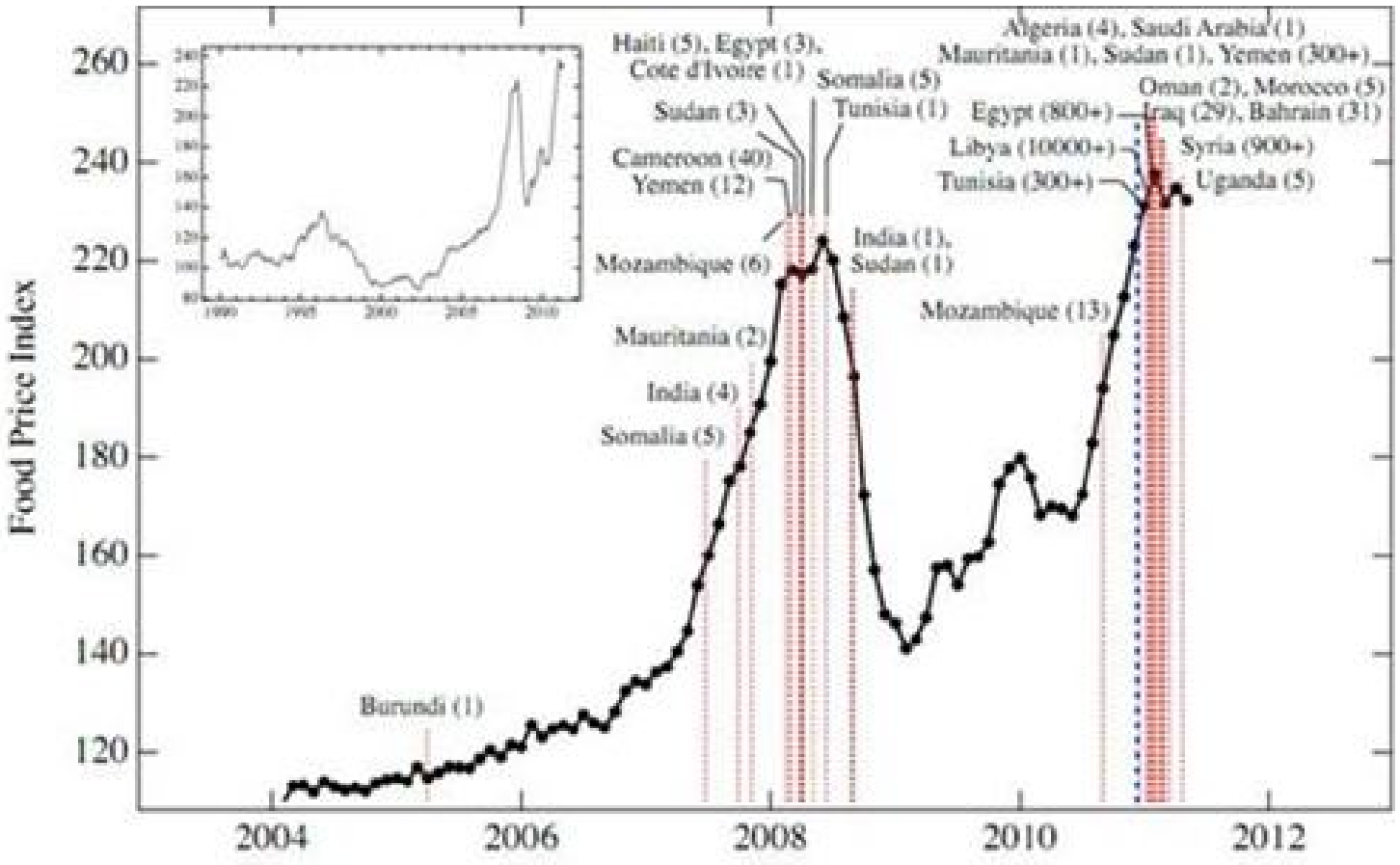
Context – Food Prices & Social Tensions



Source: Yagi, et al., 2011. New England Complex Systems Institute

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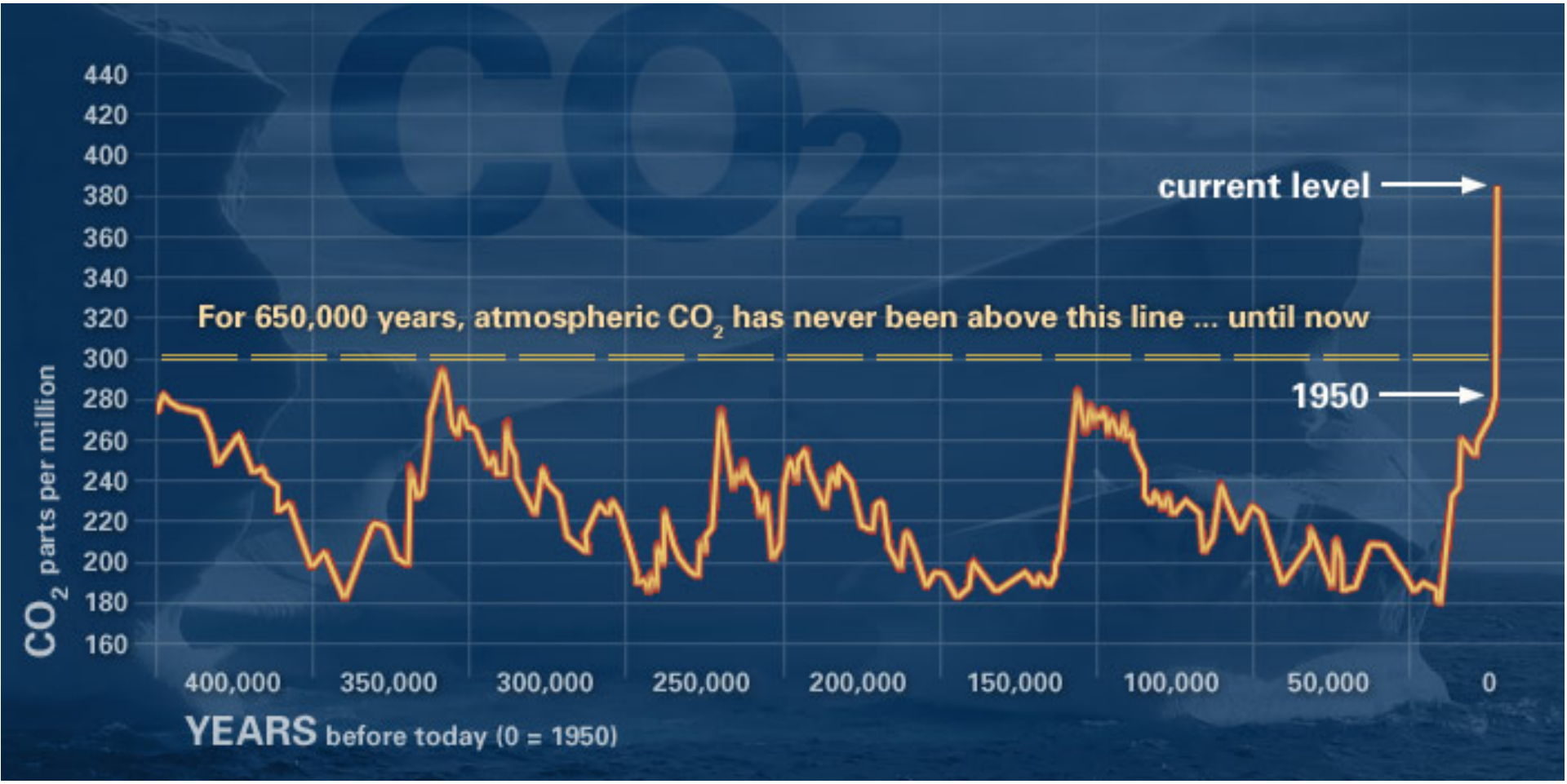
The *New Normal*

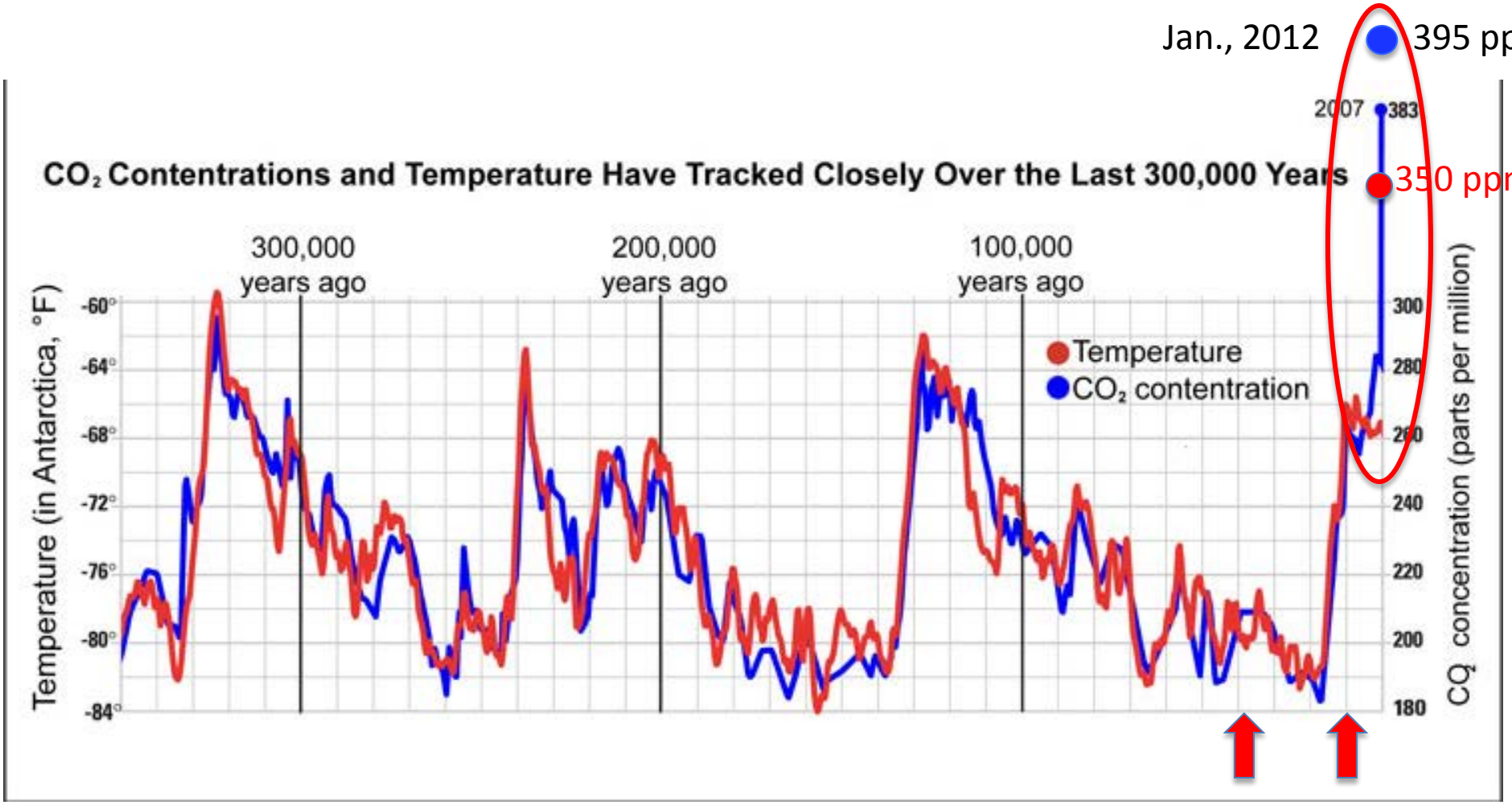
Climate Change:

- Trends
- Disruption

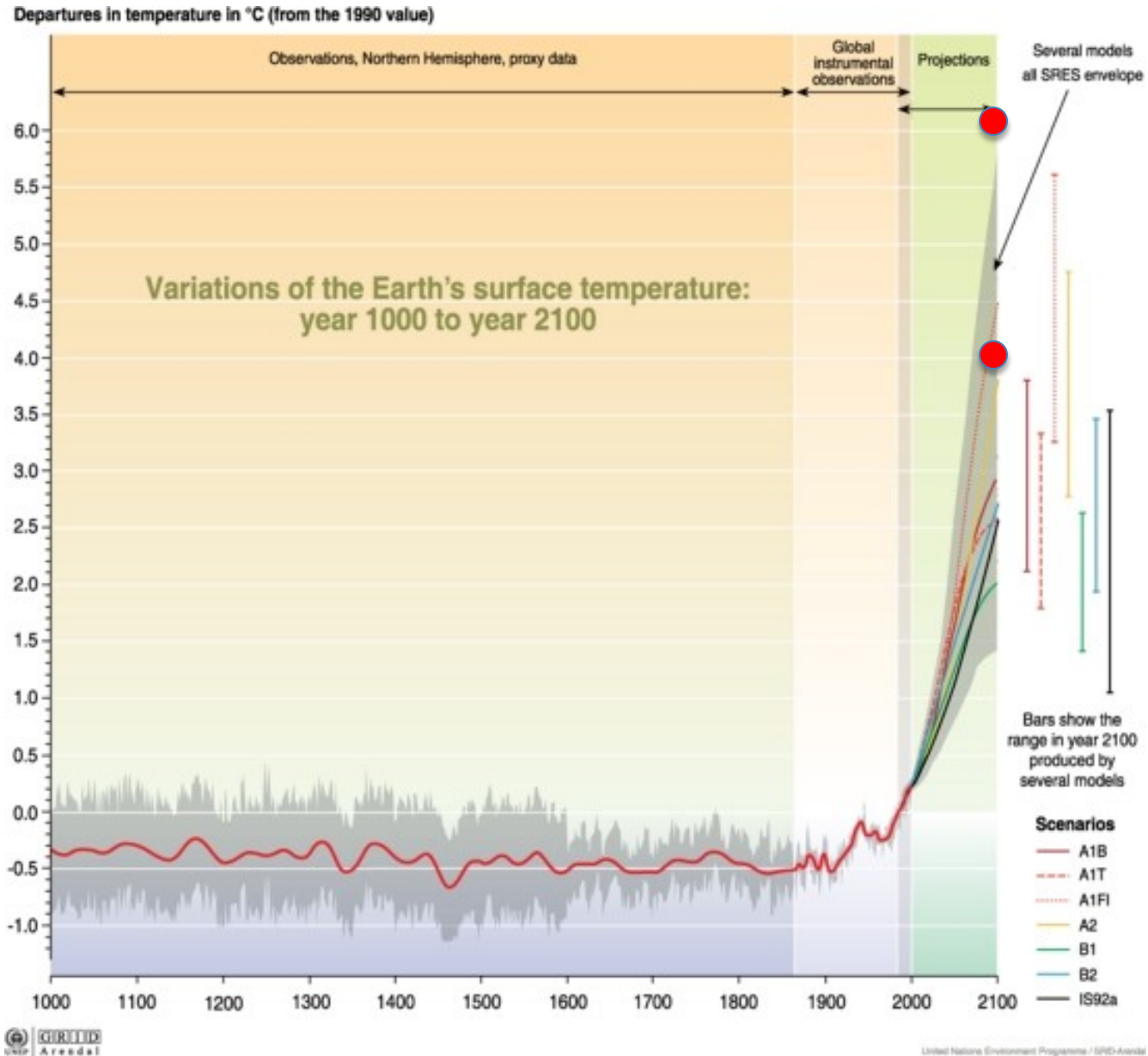
The *New Normal*



The *New Normal*

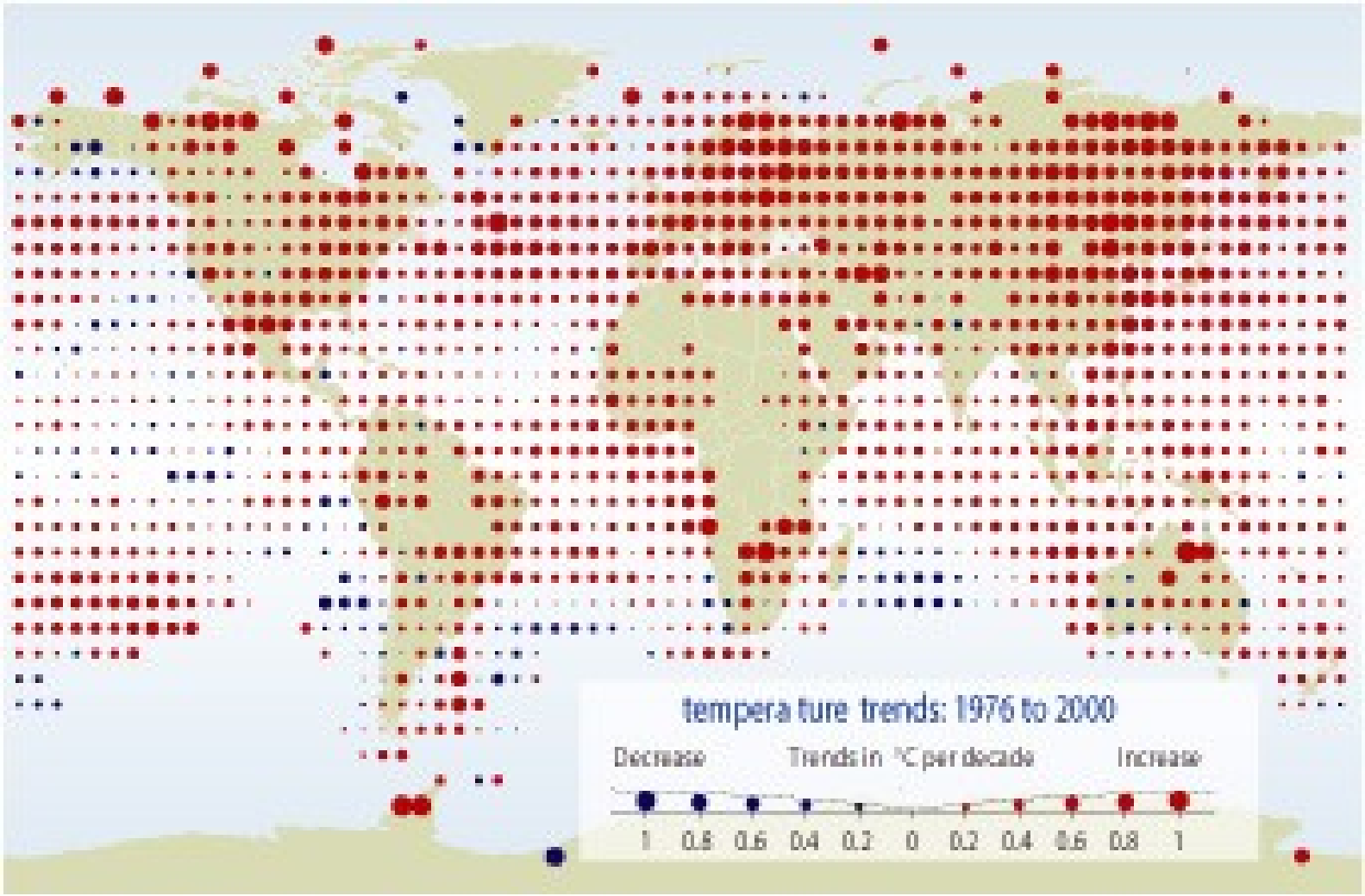


The *New Normal*

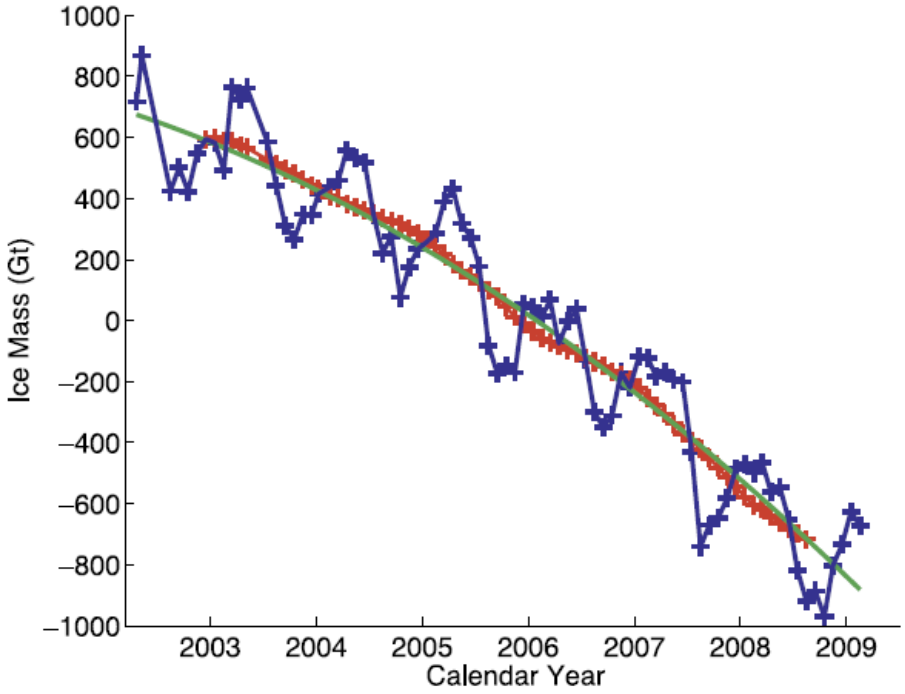


New Normal – Trends

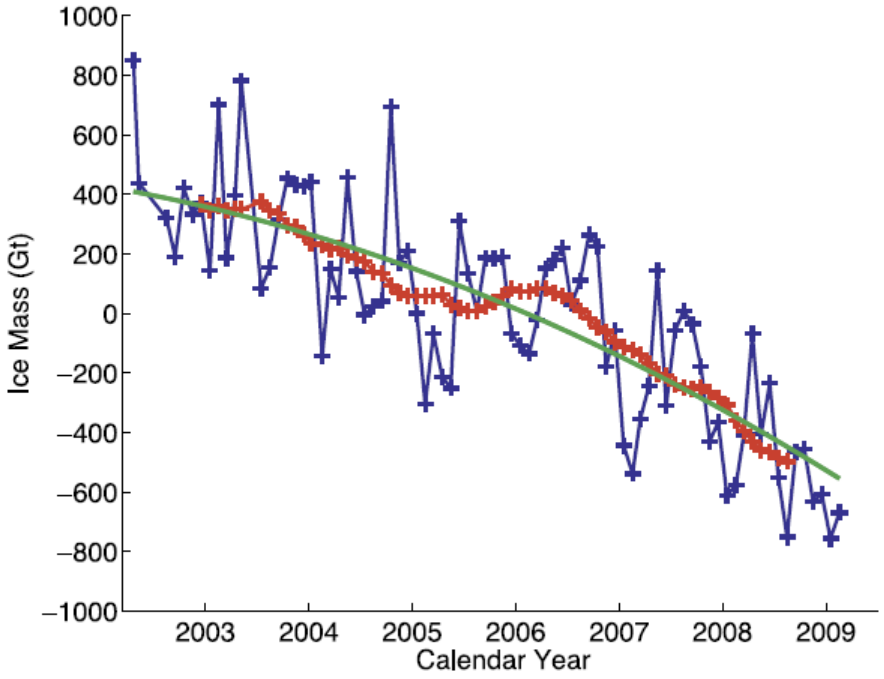
Temperature trends: 1976 - 2000



Gravity Satellite Ice Sheet Mass Measurements



Greenland Ice Sheet

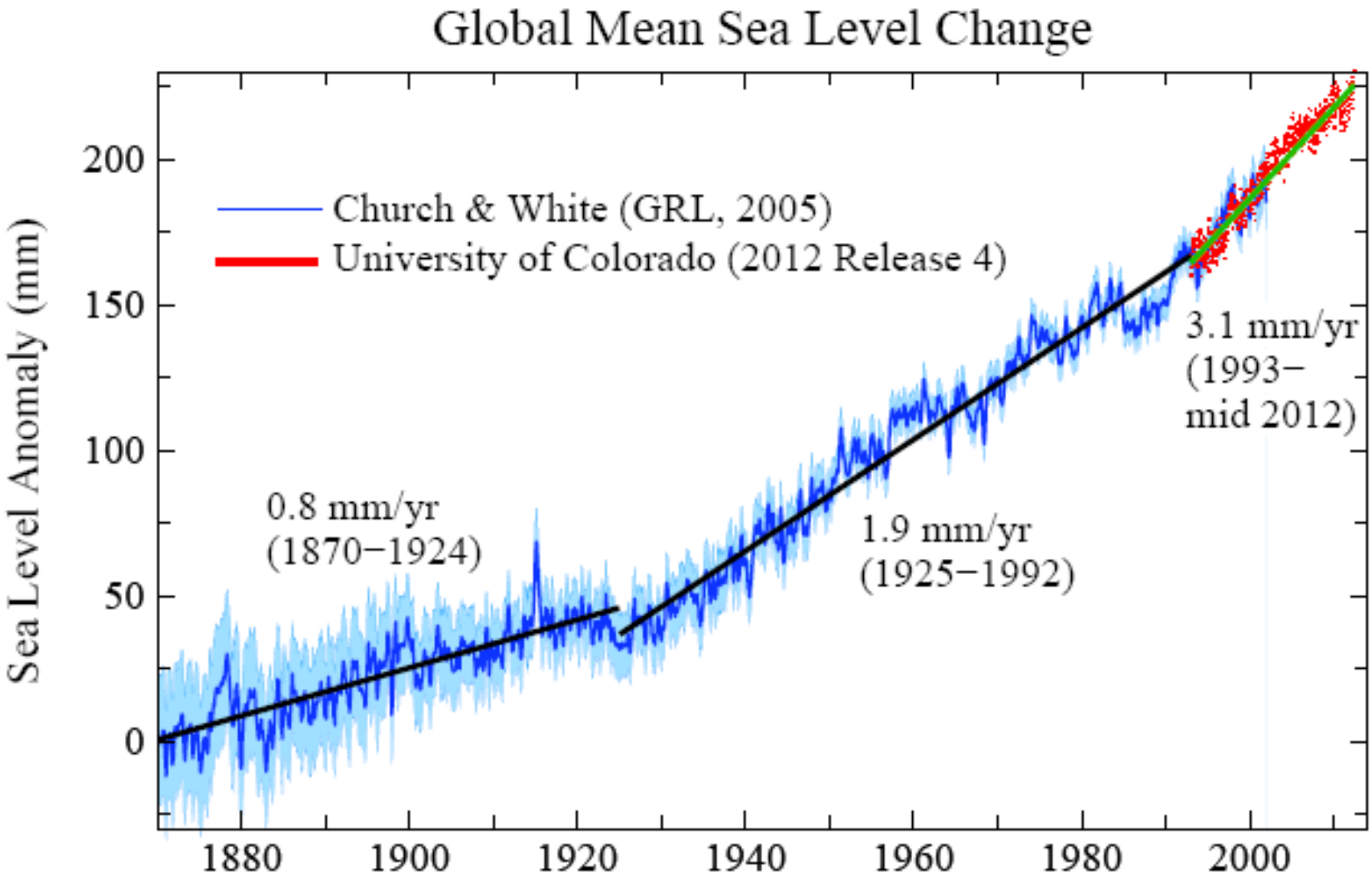


Antarctic Ice Sheet

Source: Velicogna, I. *Geophys. Res. Lett.*, **36**, L19503, doi:10.1029/2009GL040222, 2009. (from Hanson, 2012)

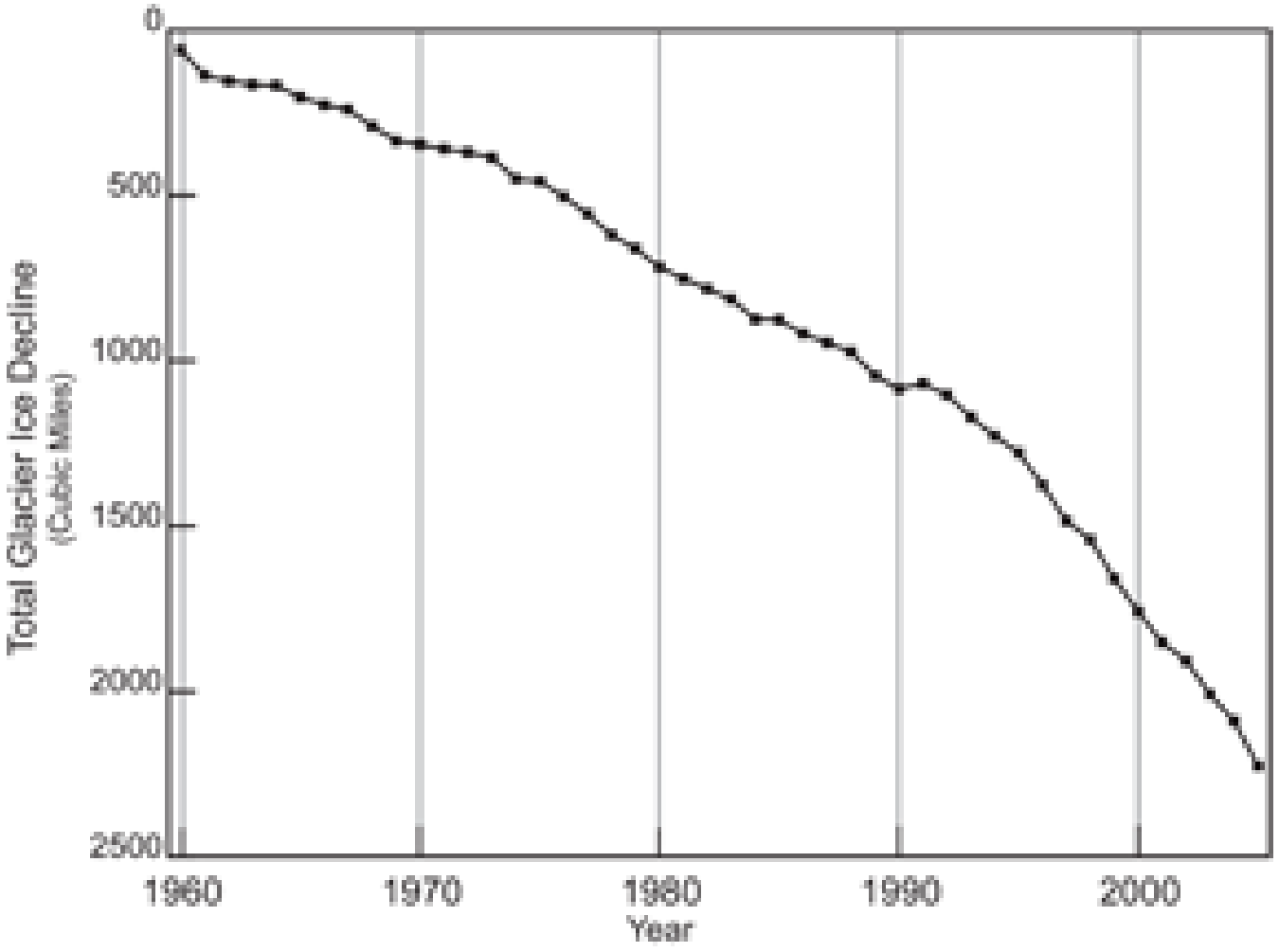
New Normal – Trends

New Normal – Trends

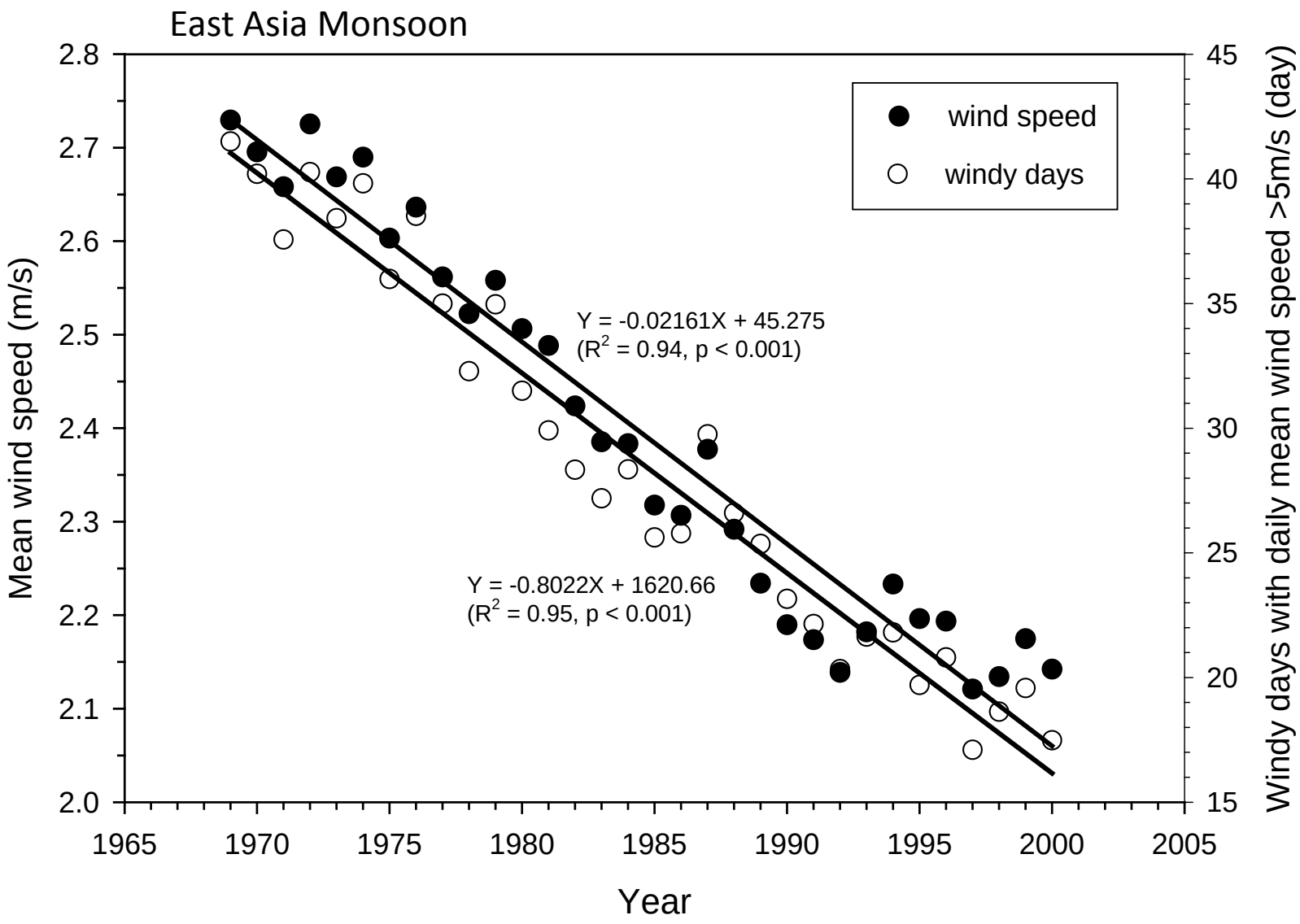


Blue: Sea level change from tide-gauge data *(Church J.A. and White N.J., Geophys. Res. Lett. 2006; 33: L01602)*
Red: Univ. Colorado sea level analyses in satellite era *(http://www.columbia.edu/~mhs119/SeaLevel/)*.

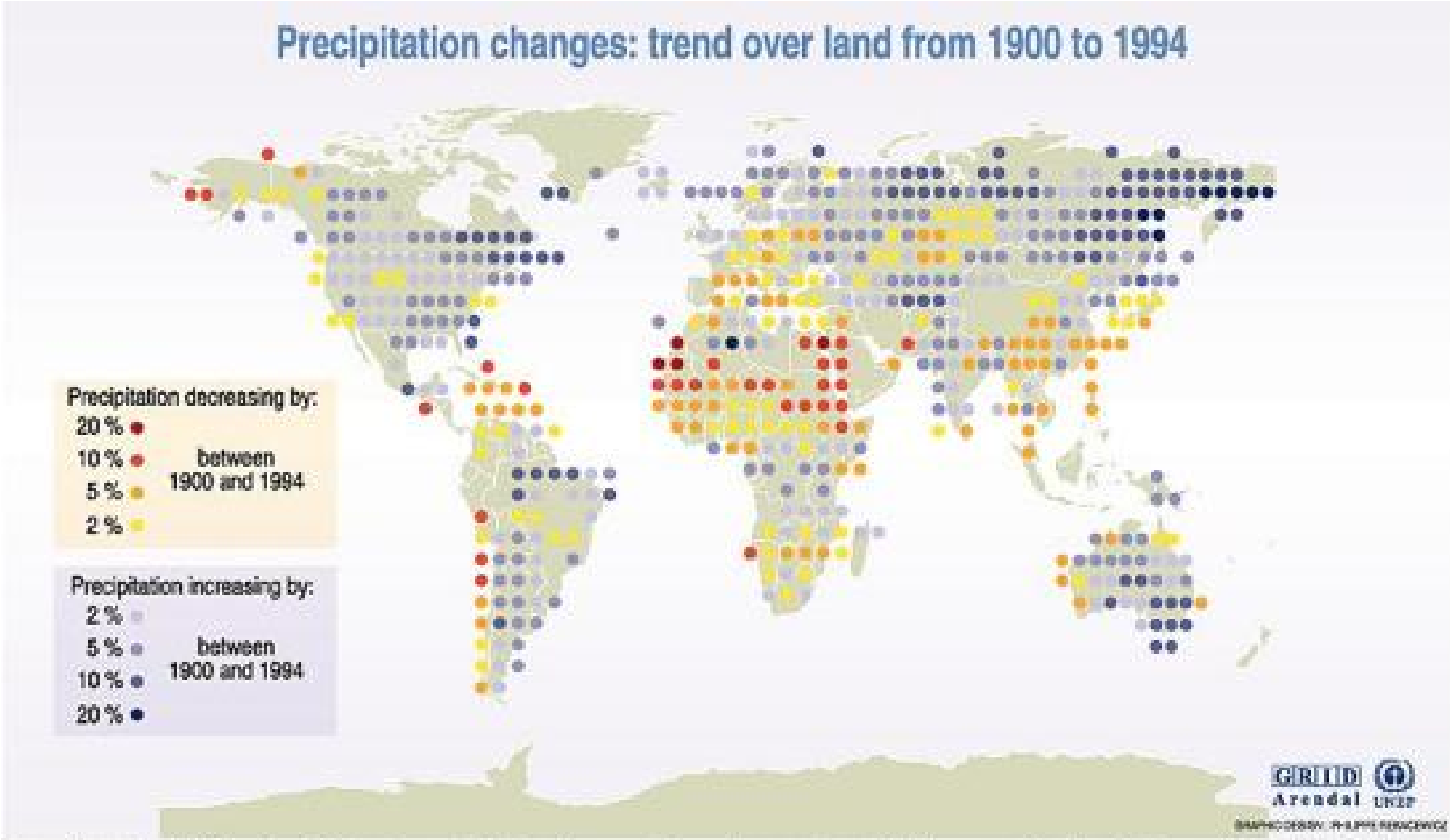
New Normal – Trends



New Normal – Trends



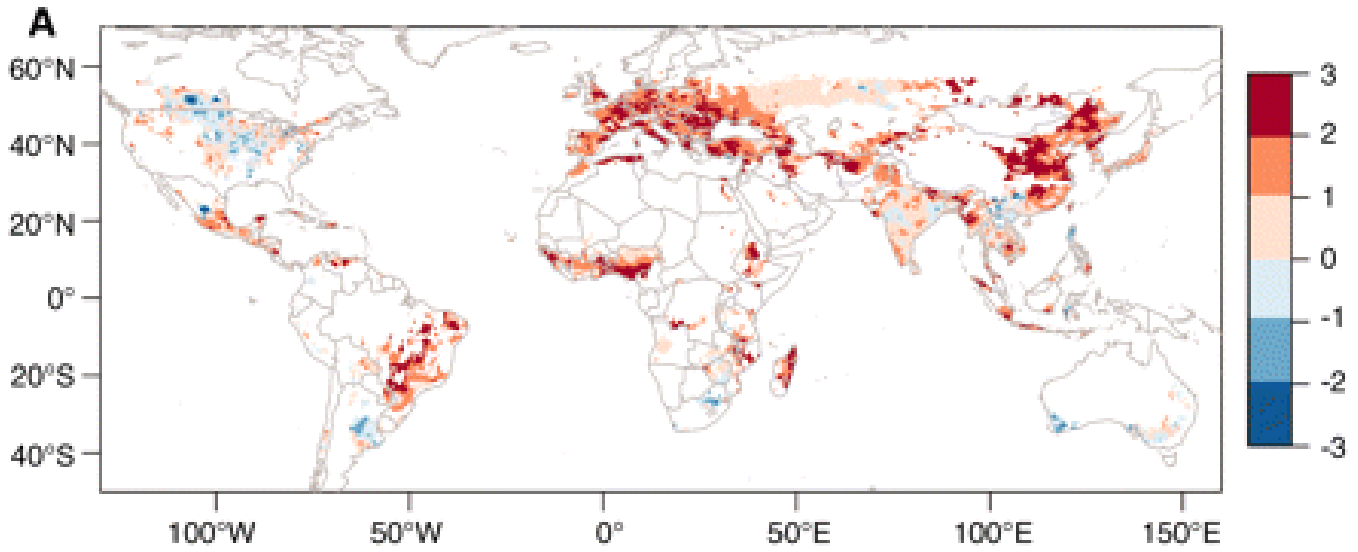
New Normal – Trends



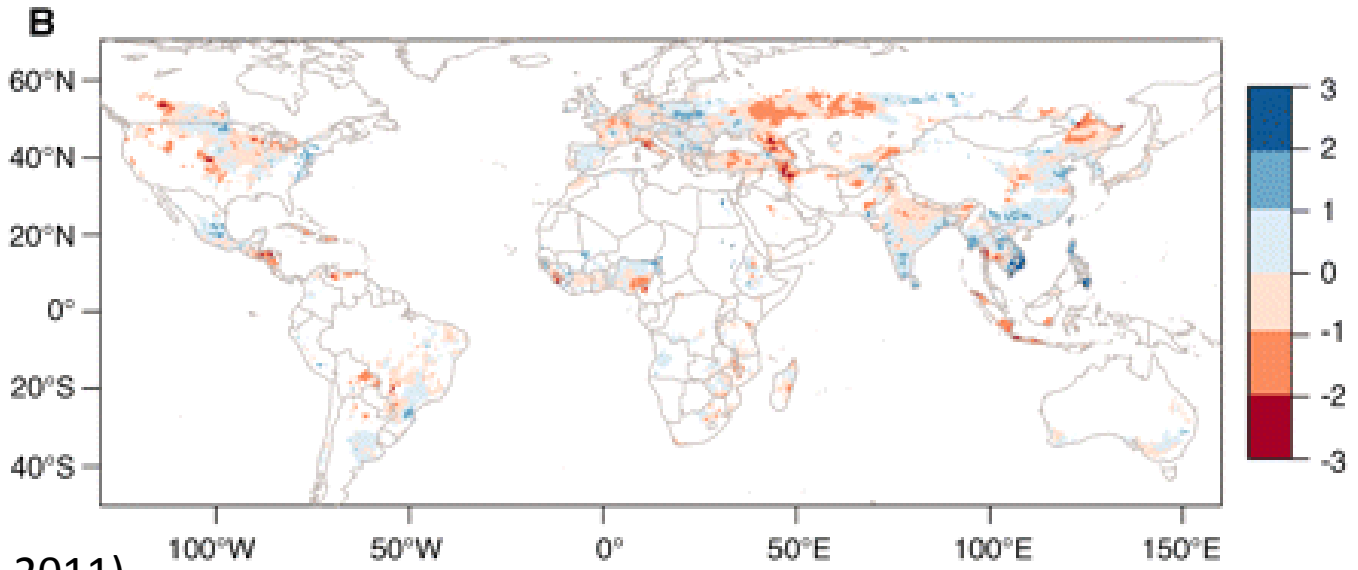
Sources: Climate change 1995, The science of climate change, contribution of working group 1 to the second assessment report of the intergovernmental panel on climate change, UNEP and WMO, Cambridge press university, 1996; Hulme et al., 1991 and 1994; Global Historical Climate Network (GHCN), Vose et al., 1995 and Eischeid et al., 1995

New Normal – Trends

Temperature trends (in standard deviations) for maize, wheat, rice and soy producing areas 1980 – 08

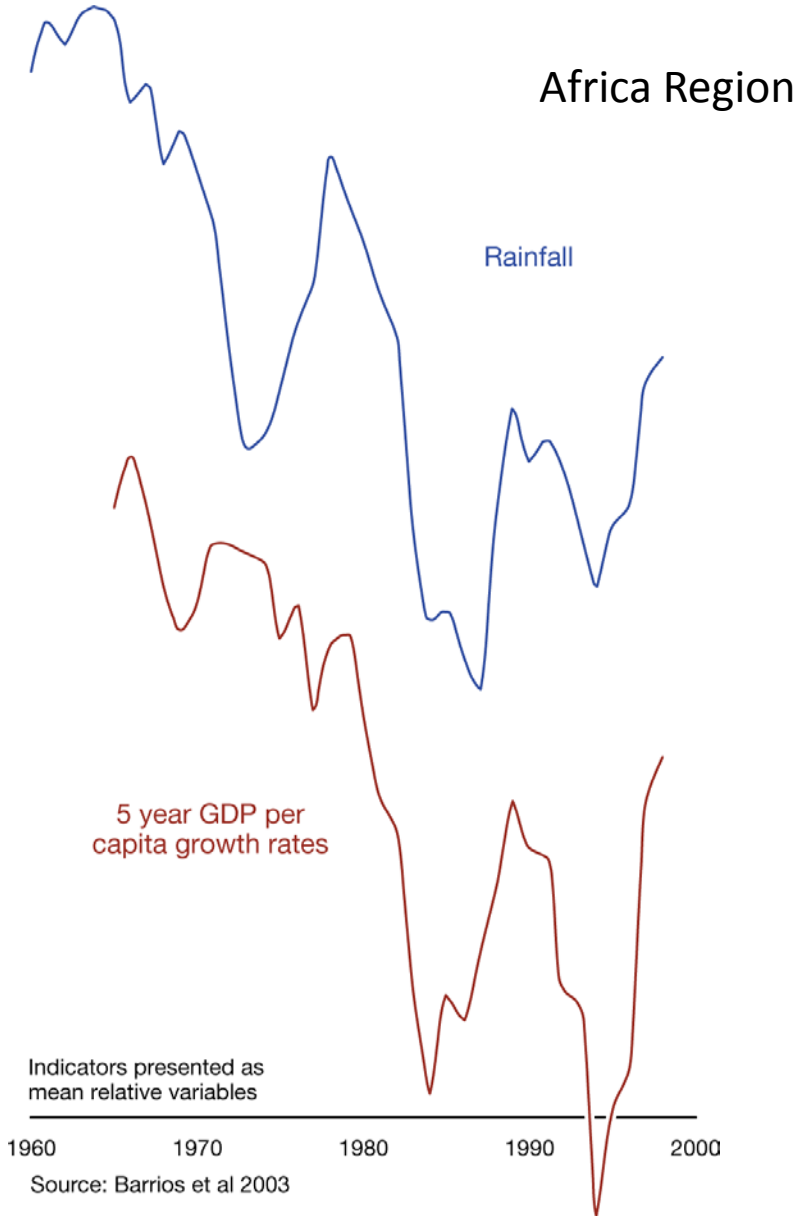


Precipitation trends (in standard deviations) for maize, wheat, rice and soy producing areas 1980 – 08



(Source: Lobell et al., 2011)

New Normal – Investment Impacts

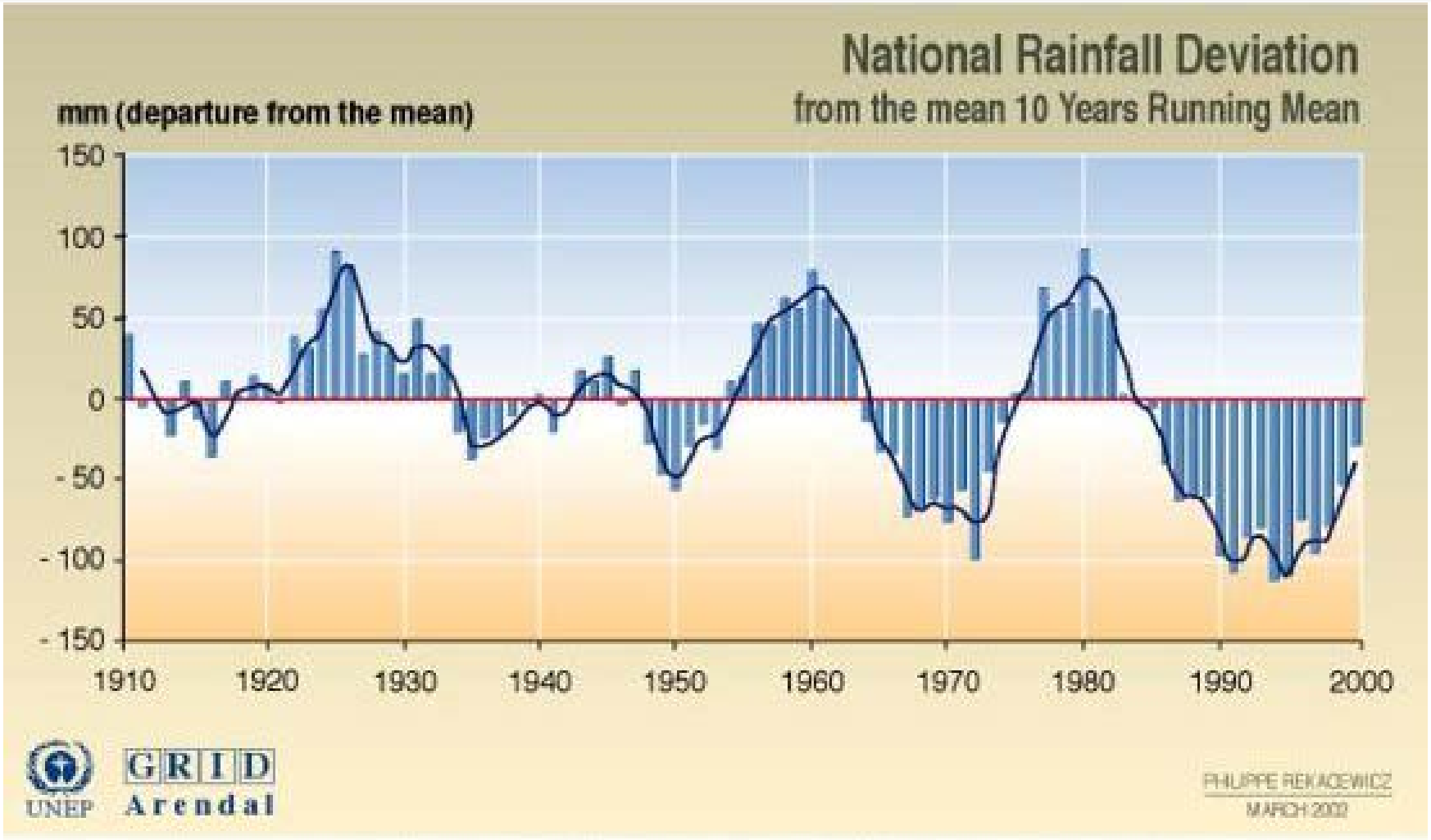


The *New Normal*

Climate Change:

- Trends
- Disruption

New Normal – Disruption



Source: Zimbabwe Department of Meteorological Service at http://weather.utande.co.zw/climate/climatechange.htm

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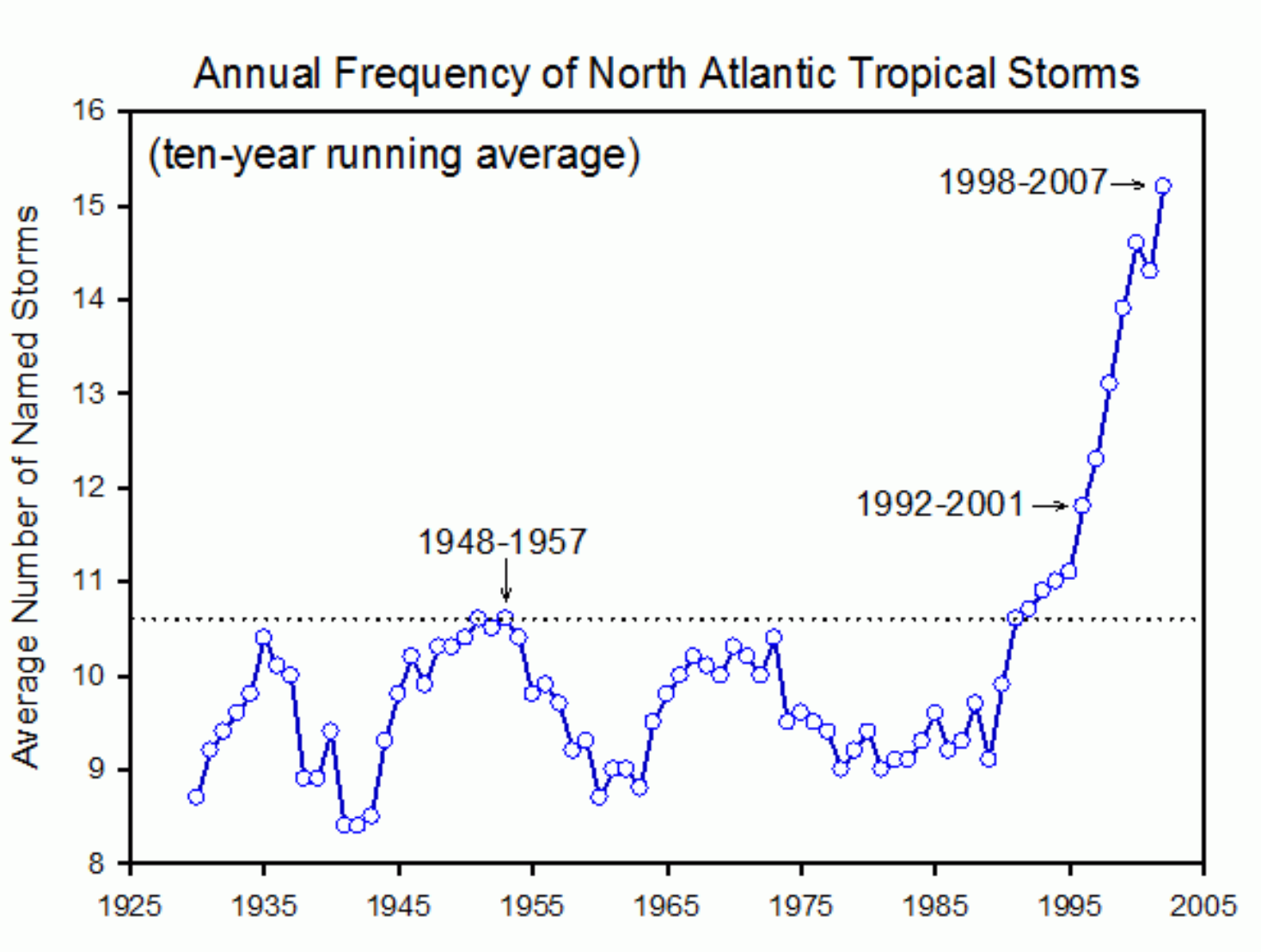
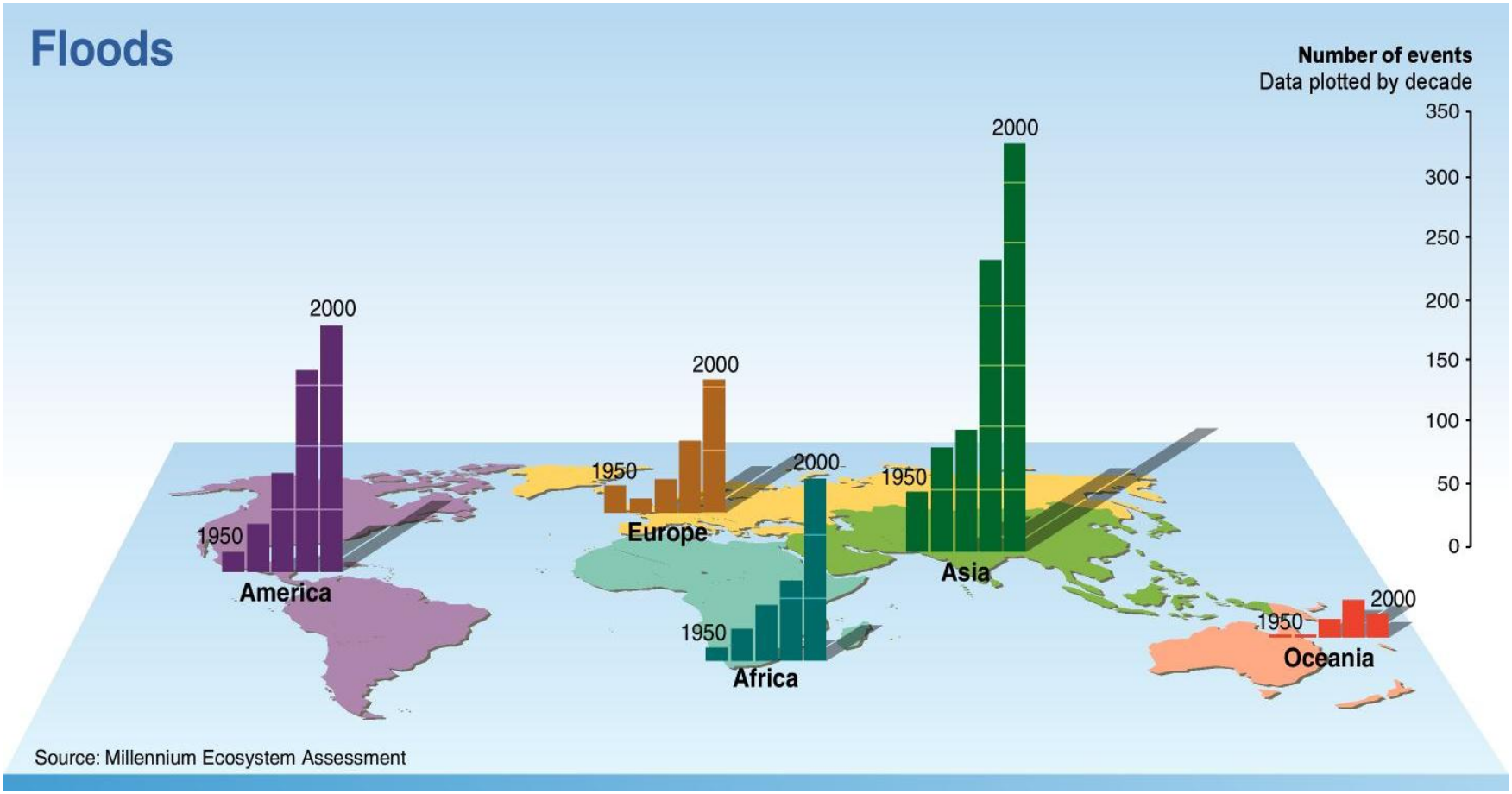
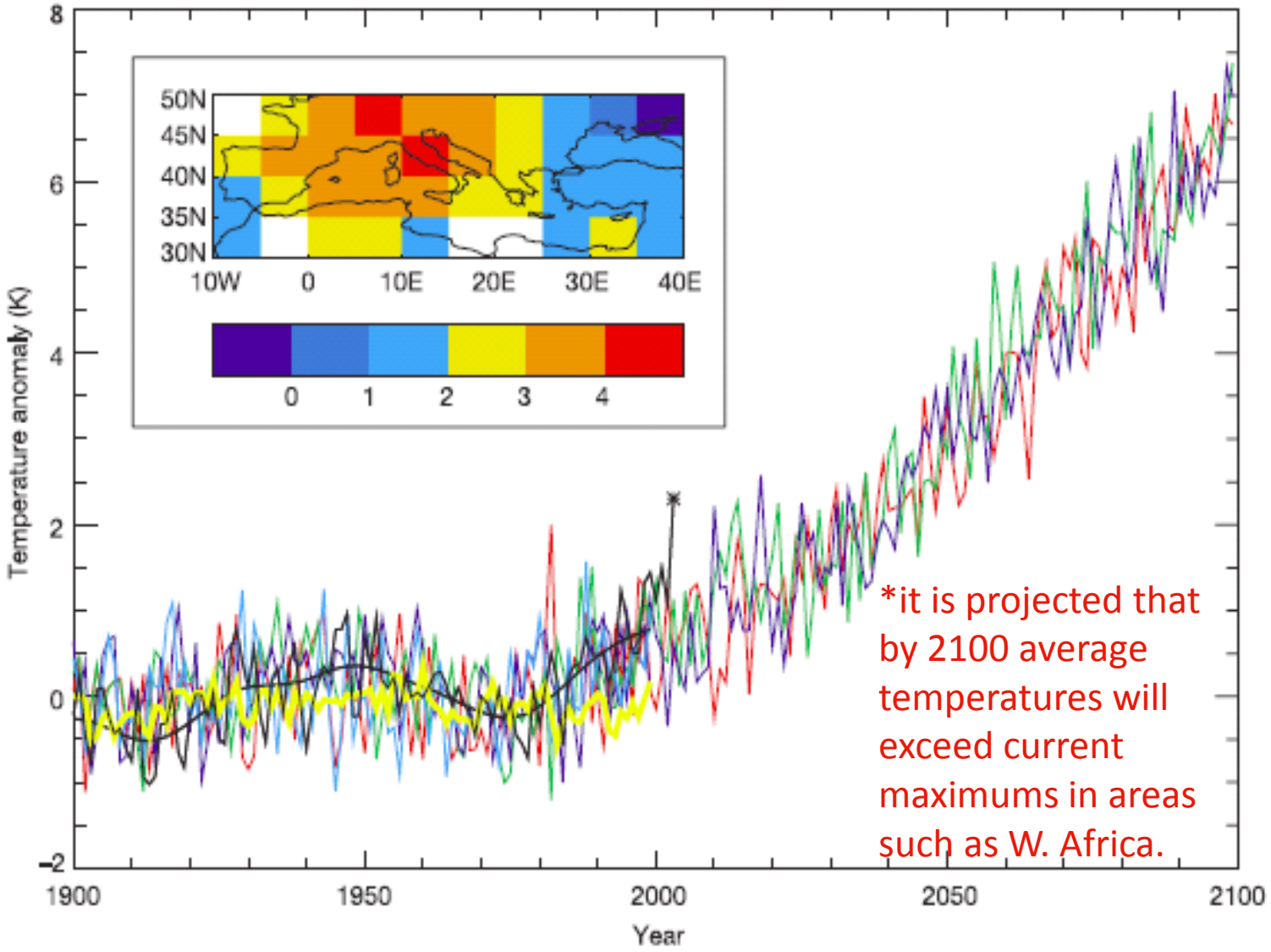
New Normal – Disruption



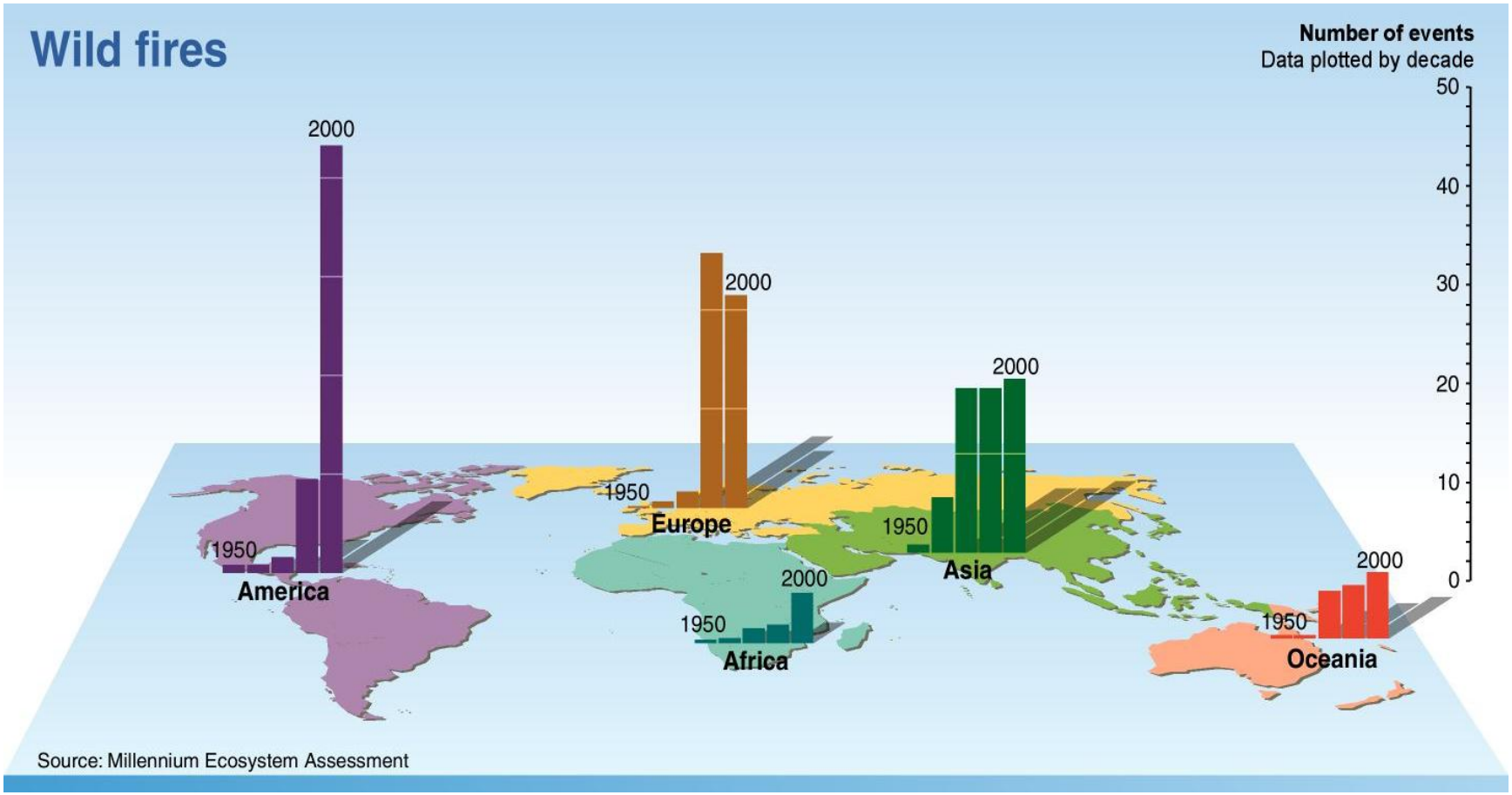
New Normal – Disruption



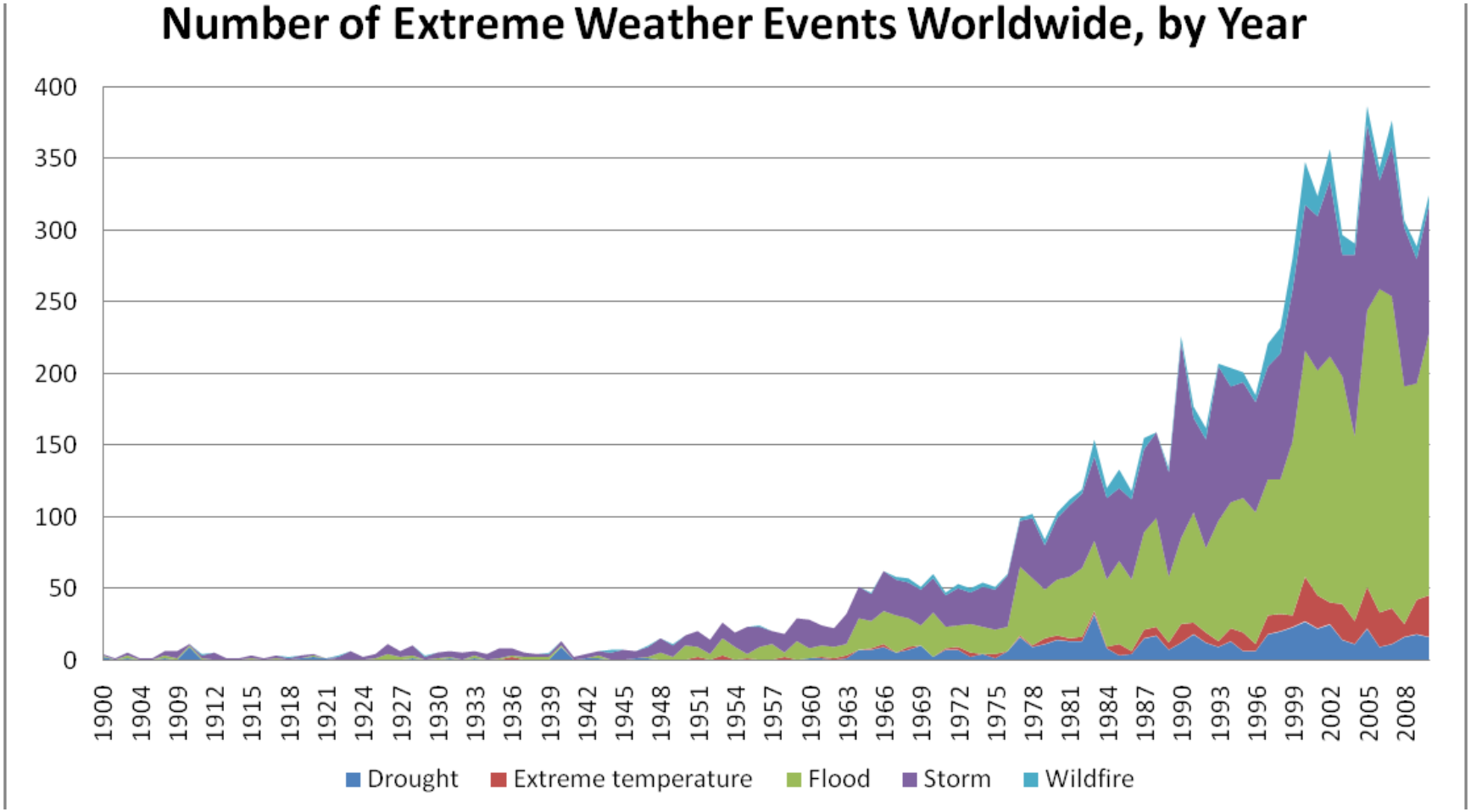
New Normal – Disruption



New Normal – Disruption

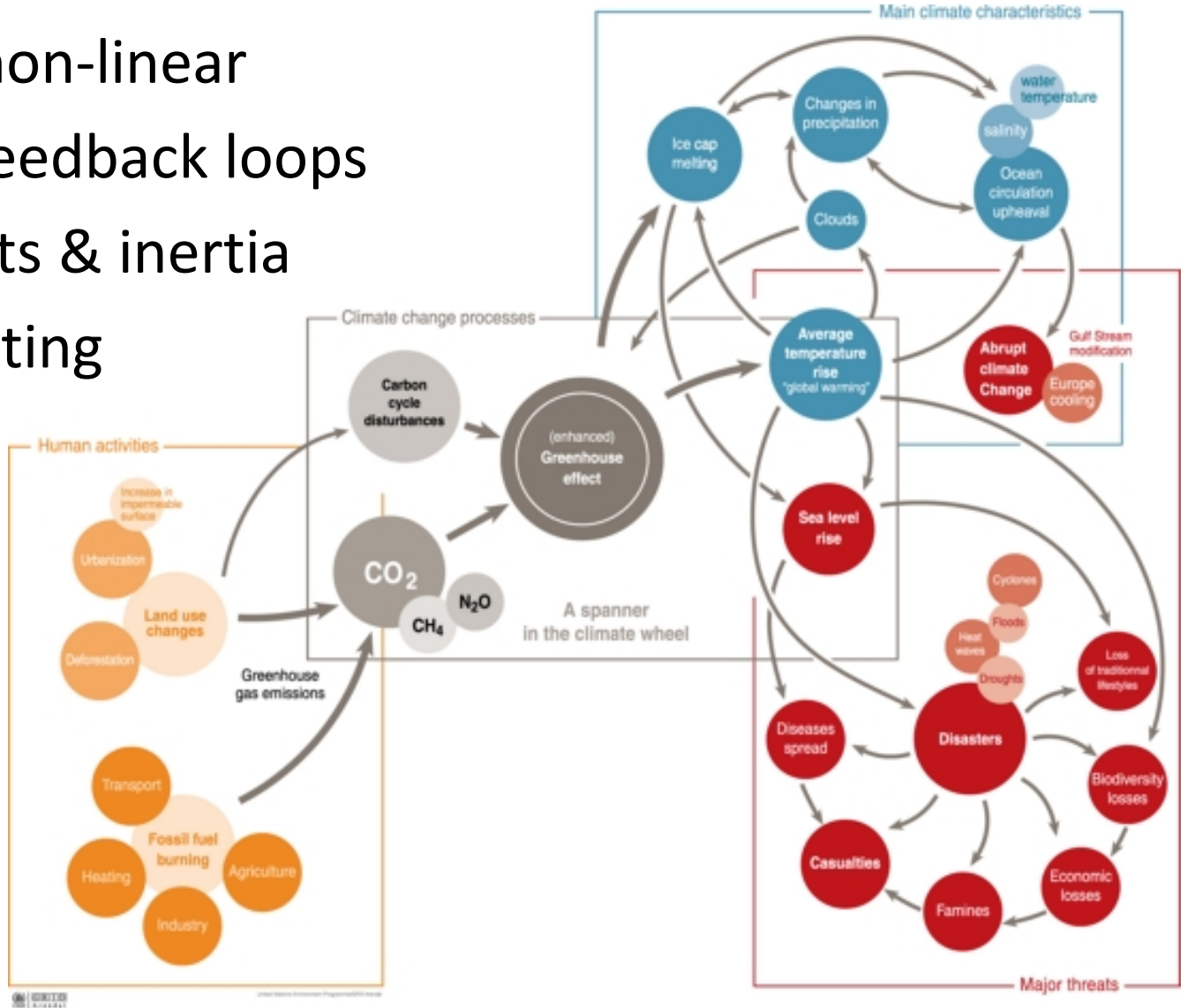


New Normal – Disruption

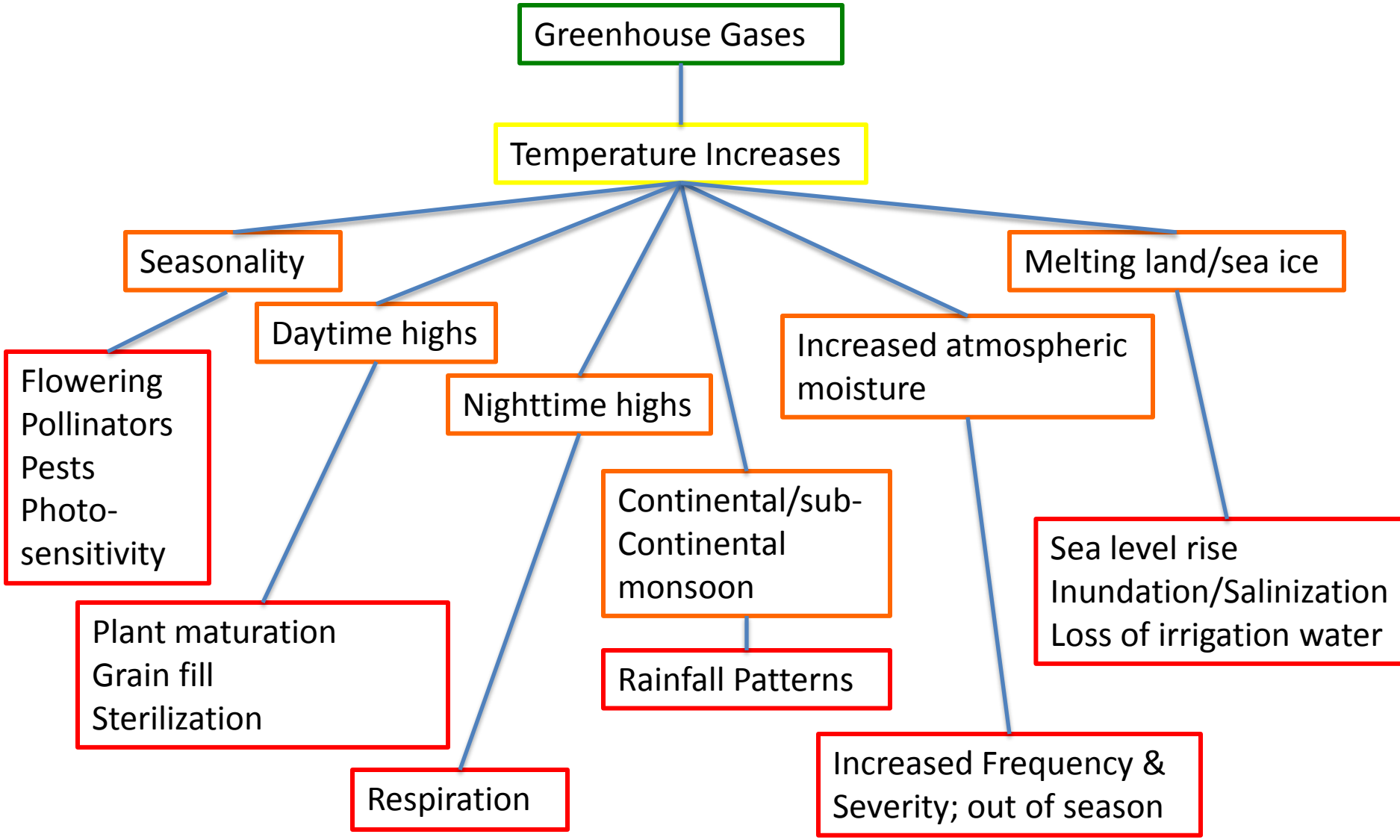


The *New Normal* -- Summary

- Climate change…
  - Complex & non-linear
  - Linkages & feedback loops
  - Tipping points & inertia
  - Very long lasting



Agriculture under *New Normal* -- Summary



Important Concepts & Perspectives

Risk, Vulnerability, Resiliency

Locating, Scaling, Phasing and Pairing of Interventions

- Spatially appropriate for the need/opportunity (plot vs landscape)
- Temporal phasing to maximize benefits during window of opportunity
- Pairing technical and infrastructure investments with those strengthening social capacity to match the needs/opportunities

Systems Thinking

- Responding to and anticipating linkages between system components
- Applying broad principles that achieve multiple objectives

Technology Transfer

- Lessons from the past, and from other places
  - Practices from areas that are already drier/wetter, hotter, more risk prone (this will buy time for research to address anticipated needs)

Innate Adaptive Capacities

- Relying on farmer's abilities to adapt new tools to their local context
  - When to apply new practices/tools

Agriculture under the *New Normal*

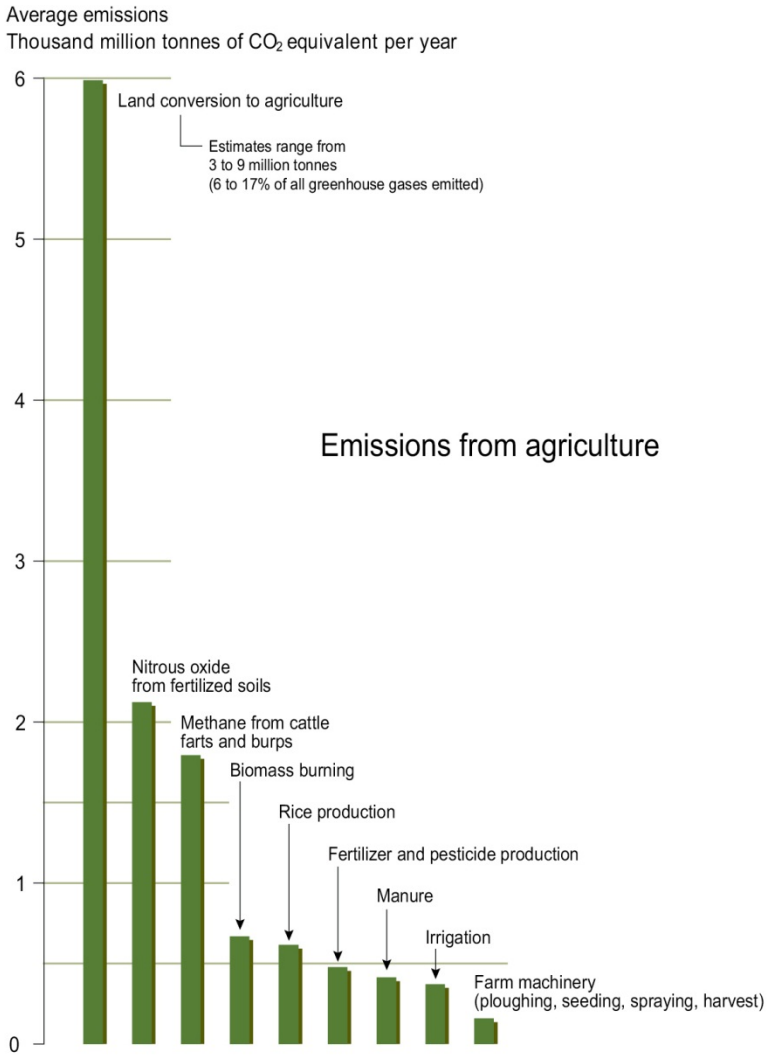
Agricultural Extension and Advisory Services:

- Mitigation
- Adaptation
- Vulnerability & Resiliency

Agriculture -- Mitigation

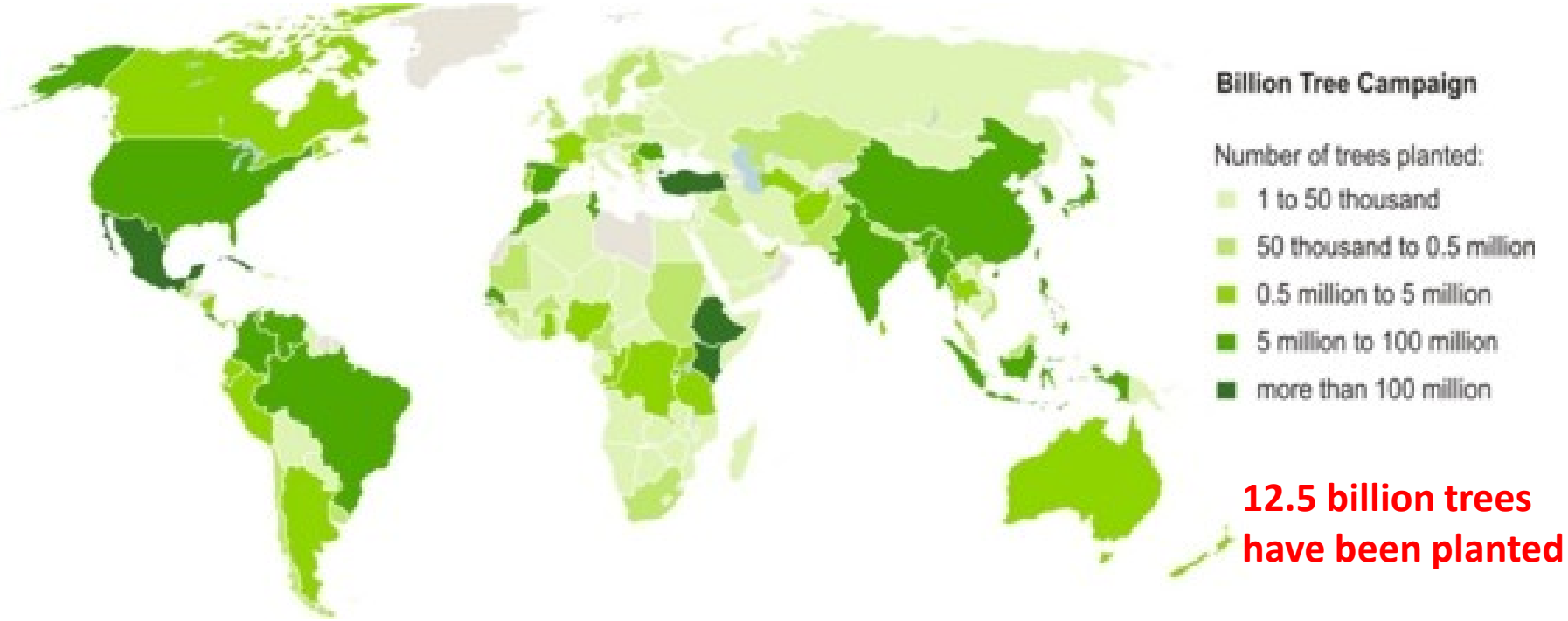
Agriculture is responsible for up to one-third of all GHG emissions -- the very act of feeding ourselves is a major part of the problem.

By necessity, extension and advisory services will need to become involved in mitigation efforts.



Source: Greenpeace, *Cool farming: Climate impacts of agriculture and mitigation potential*, January 2008 (data for 2005).

Agriculture -- Mitigation



12.5 billion trees have been planted

There are approximately 1.8 billion small-holders managing 22.2 million sq. km of the earth's surface that have tremendous potential in sequestering carbon in soils and woody biomass.

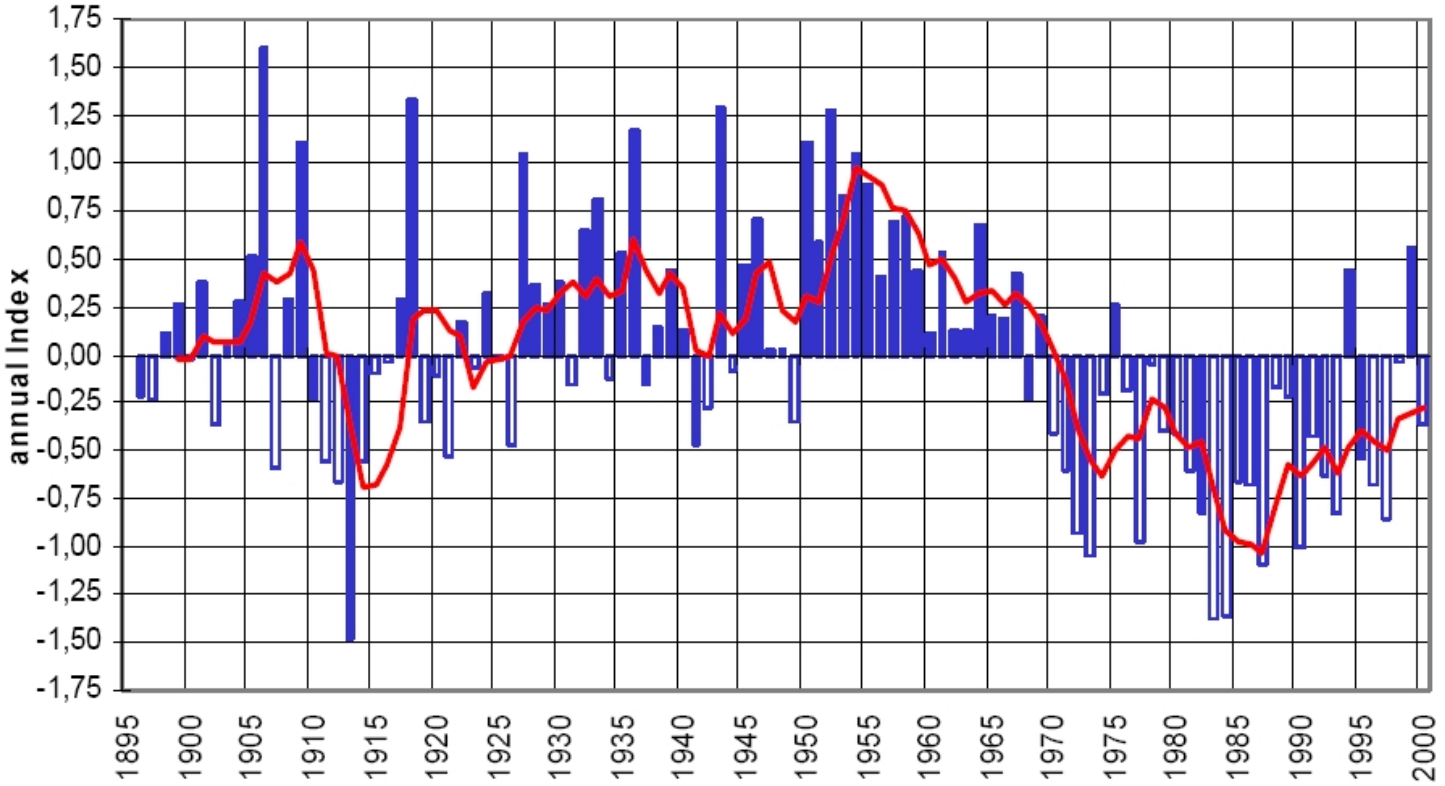
Agriculture under the *New Normal*

Agricultural Extension and Advisory Services:

- Mitigation
- Adaptation
- Vulnerability & Resiliency

Agriculture -- Adaptation

Downward trend in Seasonal Rainfall (Y. L'Hôte, B. Somé, J.P. Triboulet and G. Mahé, 2000)



Agriculture -- Adaptation

How did farmers' adapt?

-changed location of where crops were planted;

-acquired new varieties of existing crops;

-adopted or expanded cultivation of new crops;

-changed land use

*EAS did not respond – the assumption was that things would return to "normal."

Agriculture under the *New Normal*

Agricultural Extension and Advisory Services:

- Mitigation
- Adaptation
- Vulnerability & Resiliency

Agriculture – Vulnerability & Resiliency

1998 Hurricane Mitch & Honduras

- 1998: 200-yr. hurricane
- 180 mph winds
- 1270 mm (50 in.) rain
- HN - 22,000 deaths
- HN -500,000 lost homes
- CA -- economic losses of US$7 billion
- Agricultural losses-$2.3b
- HN-32% farmers total crop losses
- HN -10,000 ha – topsoil stripped

(World Neighbors, 2000)

Agriculture – Vulnerability & Resiliency

Post-event analysis (1)

- Conservation agriculture plots (permanent veg. cover, rotations), SWC - contour hedges, vetiver, rock barriers, etc.
  - 58-99% less damage than conventional
  - 28-38% more topsoil
  - 2-3 times less surface erosion
- Gullies, landslides above – same damage to conservation and conventional plots

(World Neighbors, 2000)

Trends in Agriculture – Vulnerability & Resiliency

Post-event analysis (2)

- Increased demand for, adoption of NRM extension
- Lessons:
  - EAS needs to support and seek behavior change at HH, plot and watershed management levels
  - Crisis as a catalyst for change

Trends in Agriculture - Investments

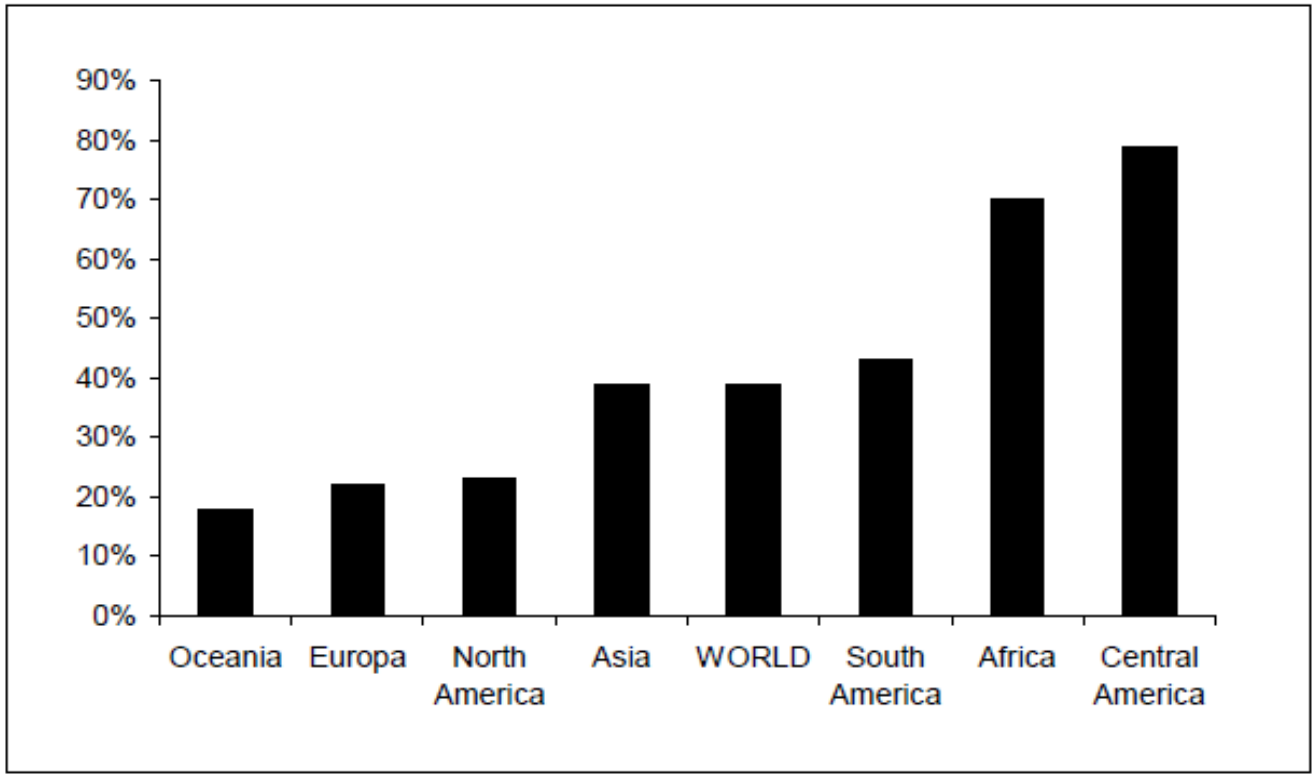
Proportion of Aid to Agriculture				
Year	Global Foreign Aid (%)	US Foreign Aid (%)	World Bank Aid (%)	Latin America Budgets (% to Agric.)
1978-80	17	25	30	8
1988-90		6	16	
2002-6	3		8	2.5
2011		1		

Source: M. Piñeiro, 2005; R.L. Thompson, 2012.

- Globally, public investment in agriculture and extension decreased from 1980 to the 2000s.
- ≤70% drop in $ to LAC extension over 3 decades. Yet agriculture = 15 - 30% of national economies. (IFPRI, 2009)

Trends in Natural Resources

Agricultural land (%) affected by human induced soil degradation

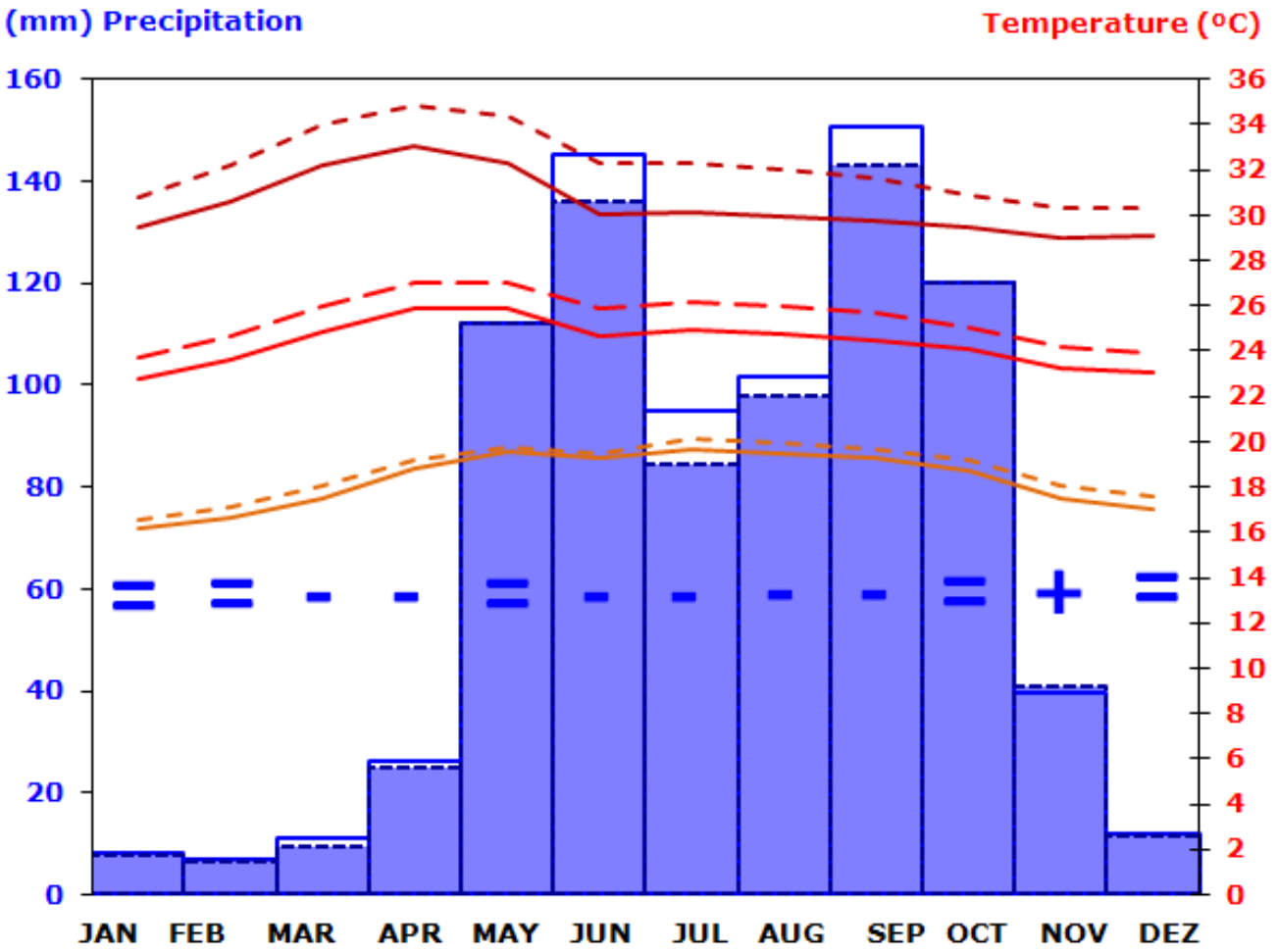


Source: ISRIC/UNEP 1991

- 70+% of soils in Africa and 80% soils in Central America are degraded
- Soils research virtually stopped in 1990s (Lutz, 1994) and has not been a priority since.

Trends in climate - Honduras

Predicted temperature & precipitation changes by 2020, Honduras



Current precipitation
2020 precipitation
2020 maximum temperature
Current maximum temperature
2020 mean temperature
Current mean temperature
2020 minimum temperature
Current minimum temperature

These results are based on the 2020 (2010-2039) and 2050 (2040-2069) climate compared with the 1960-2000 climate (worldClim). Future climate data is derived from 19 GCM models from the 4th (2007) IPCC assessment, run under the A2 scenario (business as usual). For further information please visit the following websites:
http://www.ipcc-data.org
http://gisweb.ciat.cgiar.org/GCMPage

Source: CRS, CIAT, CIMMYT; 2012. Tortillas on the Roaster study.

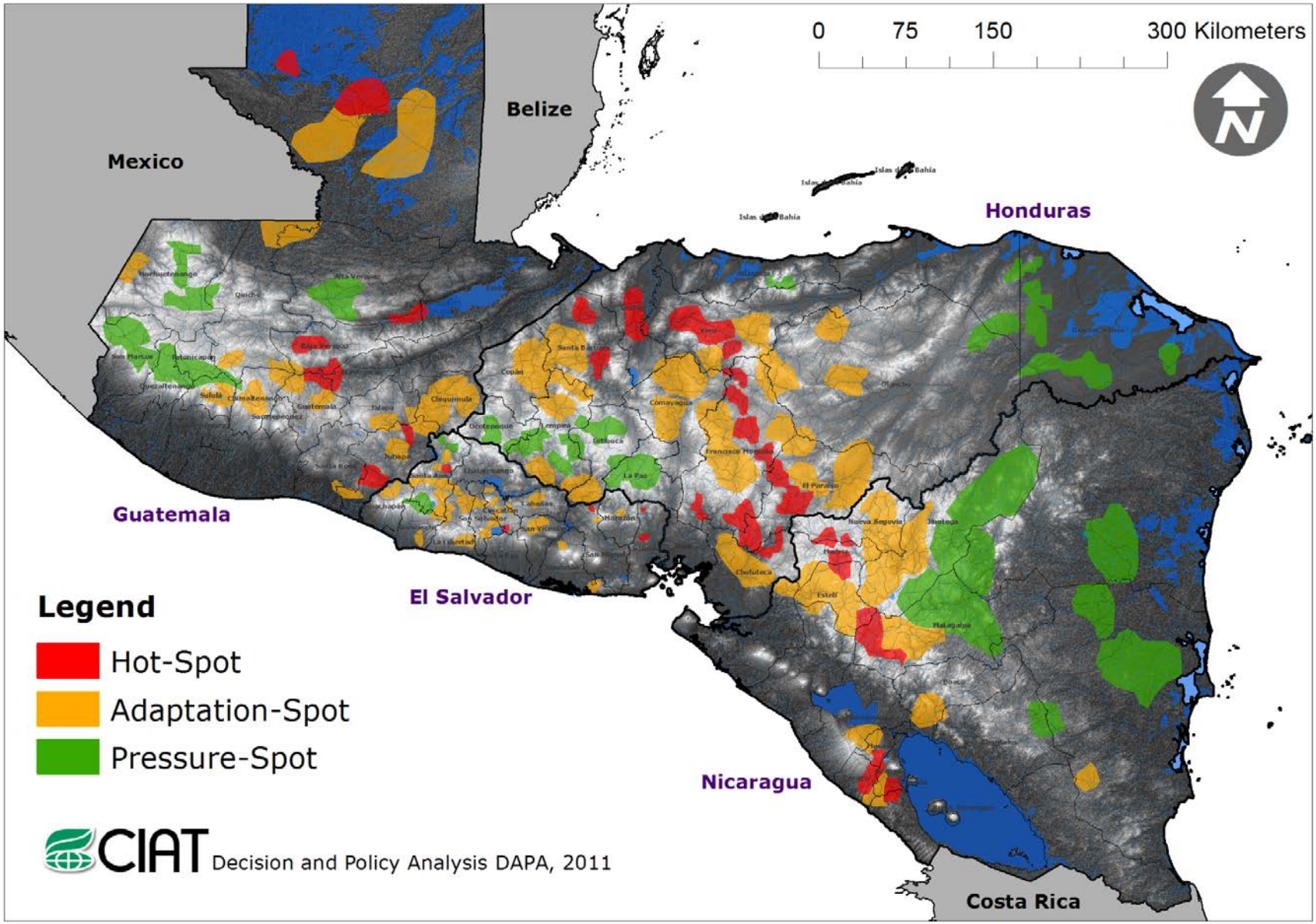
Methodology: traffic light mapping

Mapping changes in bean production, 2020s & 2050s

- **Adaptation Spots:**
  25-50% yield losses of maize, beans
- Focus on adaptation of production systems

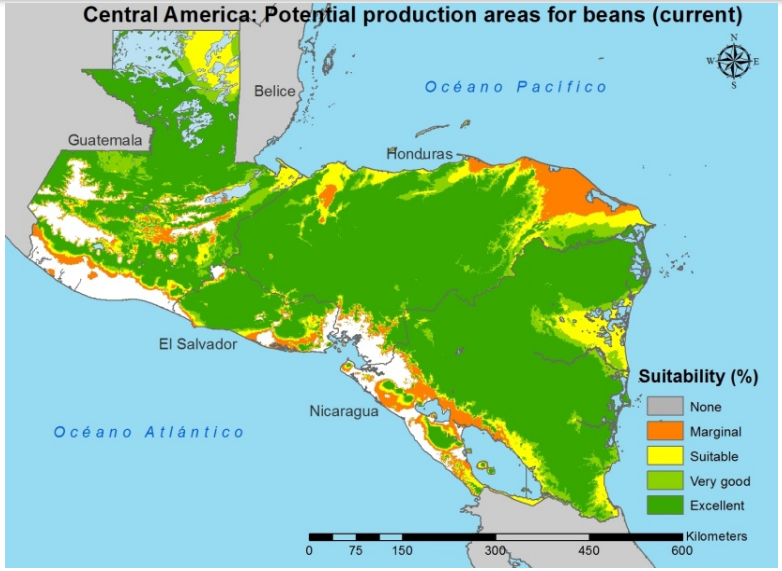
- **Hot Spots: > 50% yield losses**
- Maize-beans, no longer an option. Transition out of current livelihoods.

- **Pressure Spots: > 25% yield gains**
- High risk of agricultural incursion and deforestation

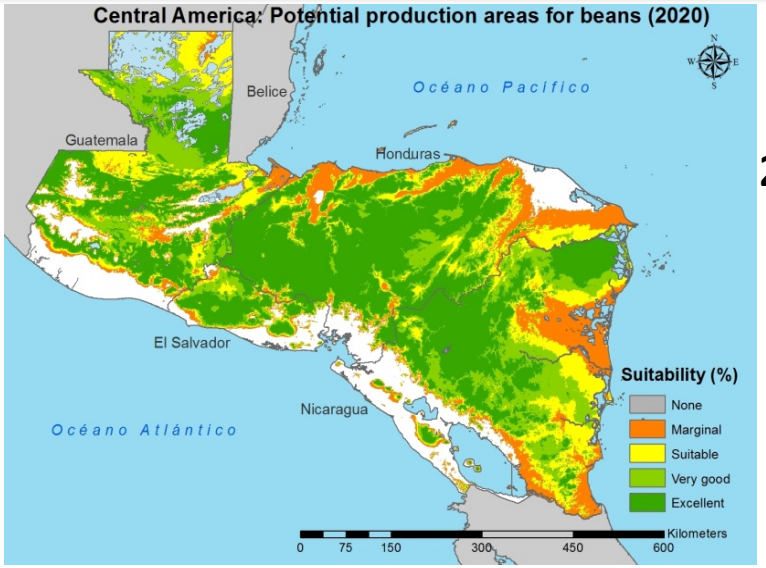


Managing uncertainty: Hot spots for bean production

Bean Production Areas: Current, Future

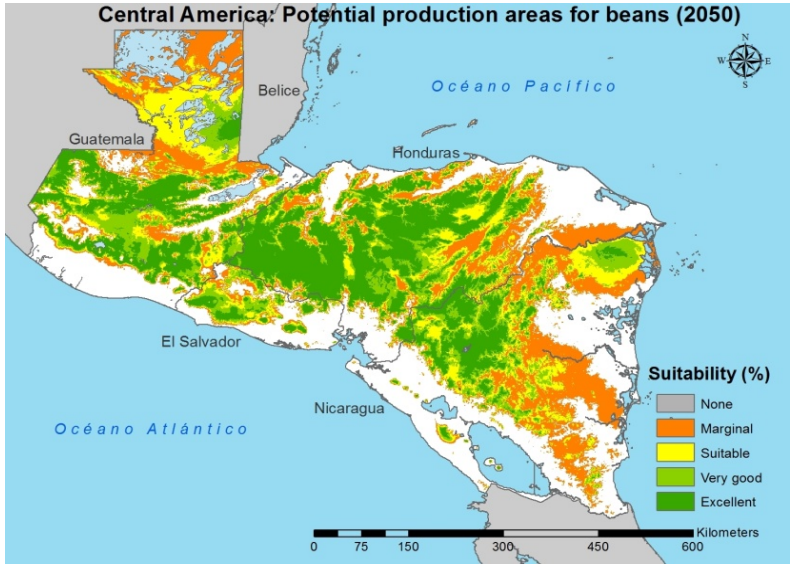


Today



2020s

Source: CRS, CIAT, CIMMYT; 2012.



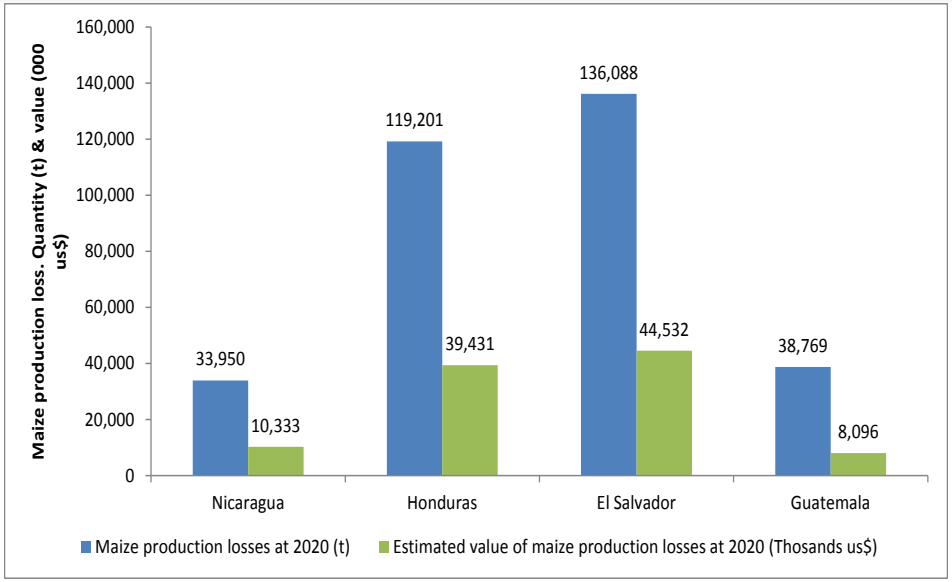
2050s

- Estimated CA maize & bean losses - $122m annually (conservative)
- Soil health – critical for maize resilience

Maize Losses by 2029 – Central America

DECADE	POOR SOIL (% yield loss)	GOOD SOIL (% yield loss)
2020s	32.2	1.1
2050s	33.5	1.8

Source: CRS, CIAT, CIMMYT; 2012.



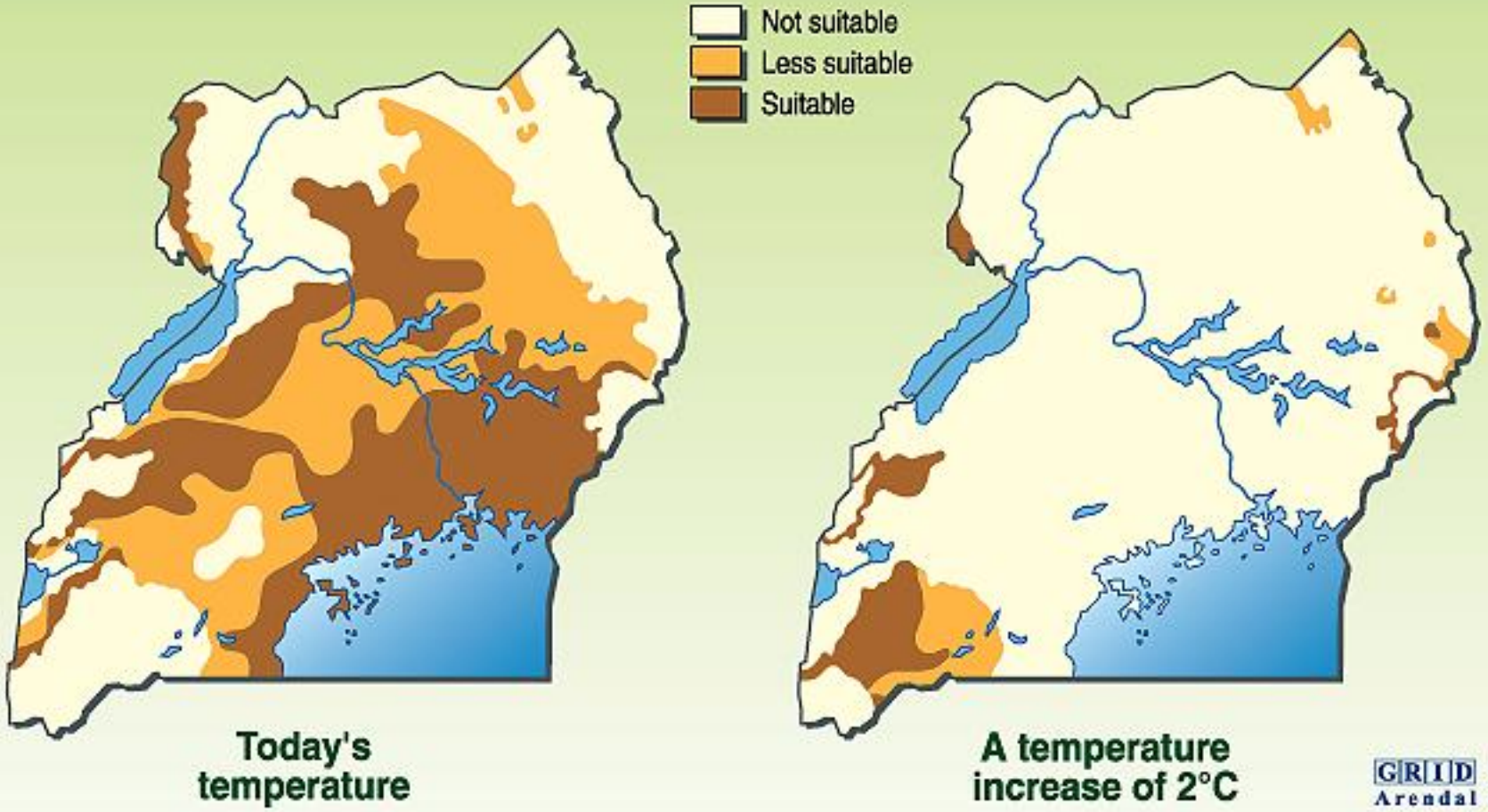
- Maize losses by soil quality, El Salvador
- 30-33% on poor soils vs. 1-2% on good soils

- Central America: Maize losses by 2029
- Production losses -328,000 tons
- Economic losses-$102,400/year

The migration of coffee, Nicaragua (CUP, 2011)

Optimal altitudes for coffee production + quality

Impact of temperature rise on robusta coffee in Uganda



Source: Otto Simonett, Potential impacts of global warming, GRID-Geneva, case studies on climatic change. Geneva, 1989.

Best Prospects/Recommendations (1)

- **Establish close working relations with research programs to identify:**
  - Risk & profile of impacts
  - Location and geographic extent of threats & opportunities
  - Likely timing of impact
  - Vulnerability and resilience of human populations & natural resource systems

Best Prospects/Recommendations (2)

- **Seek interventions that capitalize on multi-win, no regret options:**
  - Technologies to improve well-being (productive/profitable/secure) and improve mitigation/adaptation/resiliencies
  - Address both technical and social organization aspects to reduce vulnerability and enhance resiliency
  - Identify potential market and non-market incentives

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Best Prospects/Recommendations (3)

- **Enhance technology transfer capabilities:**
  - Aggressively develop/refine new technical and social management options
  - Establish national platforms for networking and exchange of experience
  - Participate in regional fora; become skilled at prospecting cross-regional and global resources
  - Streamline procedures for technology release

Best Prospects/Recommendations (4)

- **Identify different ICT applications for different target audiences:**
  - Forecasting and early warning systems for policy-makers
  - weather information for farmers
  - warning systems for at risk populations, floods for example

Best Prospects/Recommendations (5)

- **Upgrade pre-service education and in-service training programs:**
  - climate change dynamics
  - a broad systems orientation on issues of scale, multi-benefits and biophysical relations
  - technical competencies in areas relevant to adaptation, mitigation and the strengthening local resiliencies
  - Learn to communicate the essential character of climate change to farmers

Best Prospects/Recommendations (6)

- **Conduct organizational reviews on core roles and responsibilities:**
  - identify and remove programmatic barriers
  - capitalize on potential operational synergies between separate EAS programs (e.g., crops, forestry, livestock, etc.)
  - bring coordination and coherency to public and donor funded EAS efforts
  - help orientate private sector interests to emerging climate change challenges and opportunities

Best Prospects/Recommendations (7)

- **Balance policies and investments:**
  - scales that matters
  - harmonize conflicting policies
  - plan for building-up accompanying EAS capacities (starting with investments in education and training programs)

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#AskAg Twitter Chat | March 22nd | World Water Day

Ag Sector Council | March 27th | GrainPro

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