The Future of Agriculture

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The Future of Agriculture – Scenarios, Concepts, Visions –

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Vision for agriculture and the food system

- Access to sufficient, healthy, affordable food by all
- Environmental resources and habitats effectively managed and conserved
- agriculture is a driver of sustainable economic growth and development

The future of agriculture
Overview

1. Change of farms
2. Mega trends driving agriculture
3. Futures and strategies

Fundamental forces of agricultural change

- **Exogenous forces** - change of farms and rural development driven by philosophy/ideology, ecology and nature, technology, markets,and location and infrastructure

- **Endogenous forces** – change driven and constrained by current and inherited institutions and structures; path dependencies
- Immagine 1910 - 2010

There will be multiple future**S** of agriculture

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Majority of the world's farms are small…

Farm size (ha)	% of all farms	Number of farms (millions)
< 2	**85**	**451**
2 – 10	**12**	**62**
10 – 100	**2.7**	**14**
➢100	**0.6**	**3**
Total	**100**	**530**

Source: FAO Agricultural World Census
Excluding farms under 0.1 hectare

How did farm size change in past 40 years (1970 – 2010)

	Change of numbers of farms (%)	Average size in (ha) from – to
China	-	0,6 - 0,4
Africa	-	1,6 (2007)
India	+ 58	2,2 - 1,2
Brazil	+ 6	59 - 68
US	- 26	374 - 418
Sweden	- 47	32 - 43

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Source: FAOSTAT, US Census Bureau, IBGE, Statistics Sweden, Eurostat

Smallholders' resilience and slow dynamic of transformation

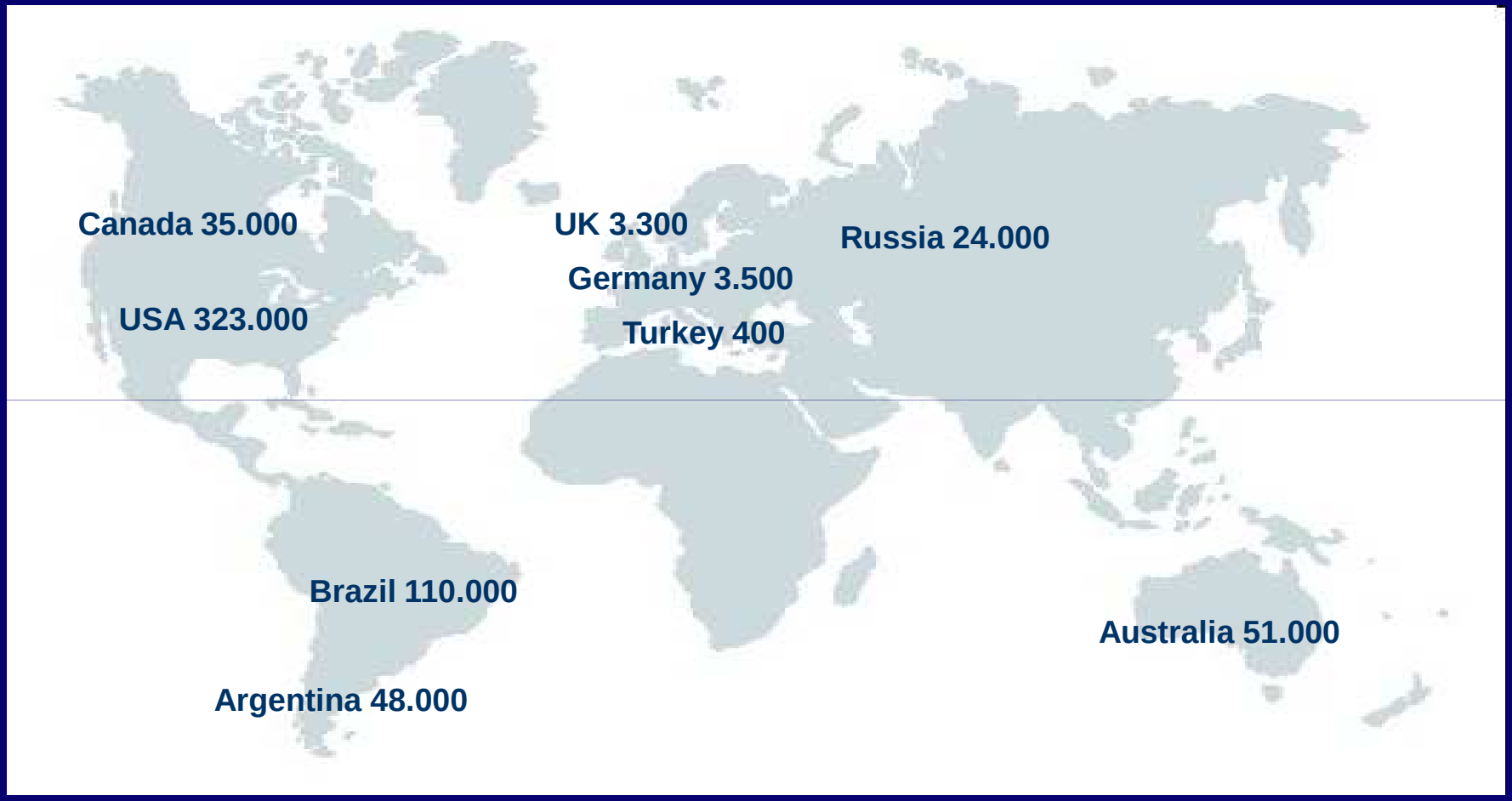
- Transition duration will take long time !

  At a 5% p.a. farm-exit rate it takes 45 years to get from a structure of 1-hectare-farms to 10-hectare-farms (note: in Europe farm-exit rates were 2-3 % p.a.)

- Peasants' resilience and come-backs!

  China, South Asia, Former Soviet Union, Africa,…

Where are the large farms and how many? - 500 ha and more



Source: USA: US department of agriculture, 2007
Russia: IAMO from Goskomstat, 2006/07
Germany: statistisches Bundesamt, 2008; world census agriculture, 1990

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Patterns of general trends

- Small farms get smaller in developing countries
- Large farms get larger in middle- and high-income countries
- Small farms do not quickly grow with economic development

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Mega trends shaping the farm economy

1. Demographics of farm populations and labor
2. Change in demand for food (volume and patterns)
3. Prices of outputs and resources
4. Information and communications technology, rural services, and infrastructure
5. Climate change
6. Agricultural science and technology
7. Changing political economy of food and farming

Sound scenario building must capture trends, breaks, and probabilities for each of 1.- 7.

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Farm Population 1981-2005

increasing numbers, decreasing shares

Region	Farm population (Mill)		Farm/total population (%)	
	1981	2005	1981	2005
Eastern Afrika	125,4	216,9	83,4	75,4
Middle Afrika	40,7	65,8	73,7	60,0
Western Afrika	88,5	126,2	64,3	47,9
Latin America/ Carribean	127,1	103,0	34,3	18,4
Eastern Asia	770,4	852,8	71,6	61,1
Southern Asia	611,8	787,2	63,8	50,7
South-Eastern Asia	216,2	258,1	59,1	46,4
USA	8,3	5,8	3,5	1,9
EU	54,4	25,8	12,5	5,2
World	**2216,1**	**2604,2**	**49,1**	**39,9**

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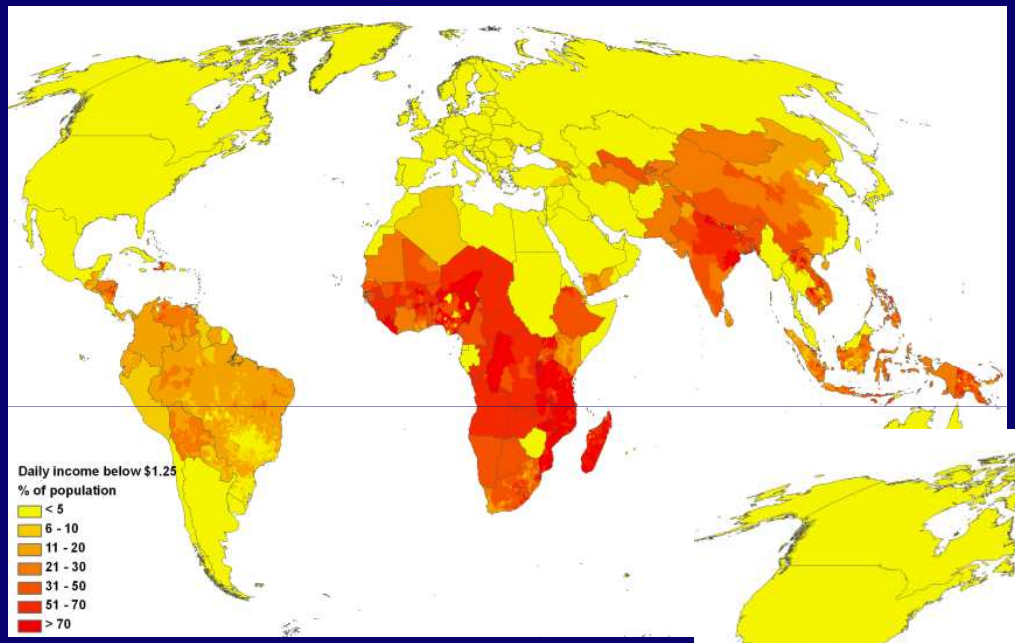
Source: FAOSTAT, Michael Lipton, Land Reform in Developing Countries, 2009

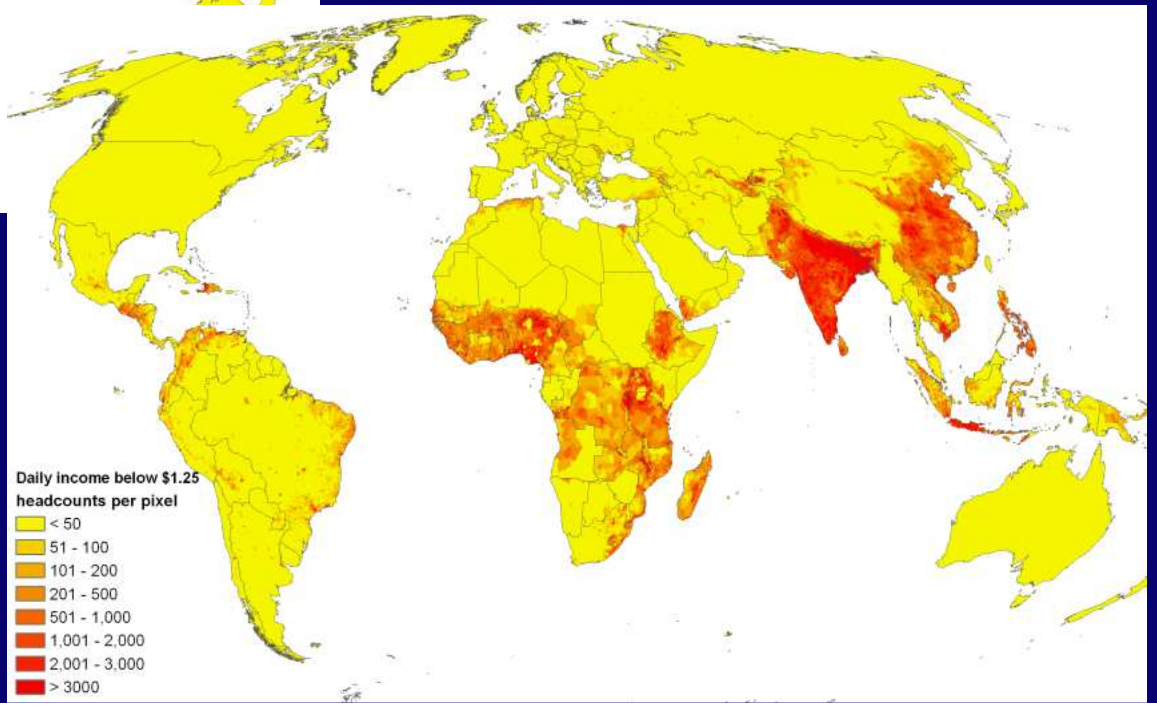
Development policy focus ? where the poor are – often small farmers

- Sub-national poverty ca. 2005 ($1.25/day) -

Prevalence



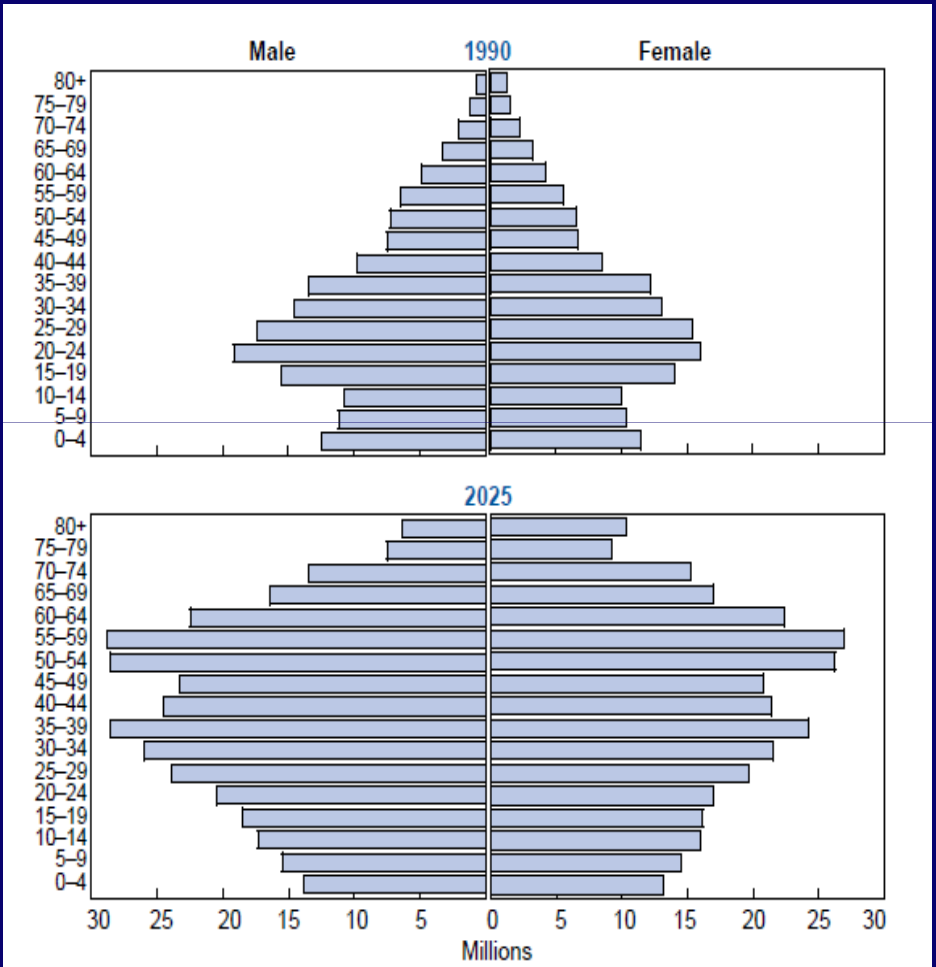
Number



Source:. J. von Braun et.al. IFPRI), 2009.
Based on Stan Wood et al

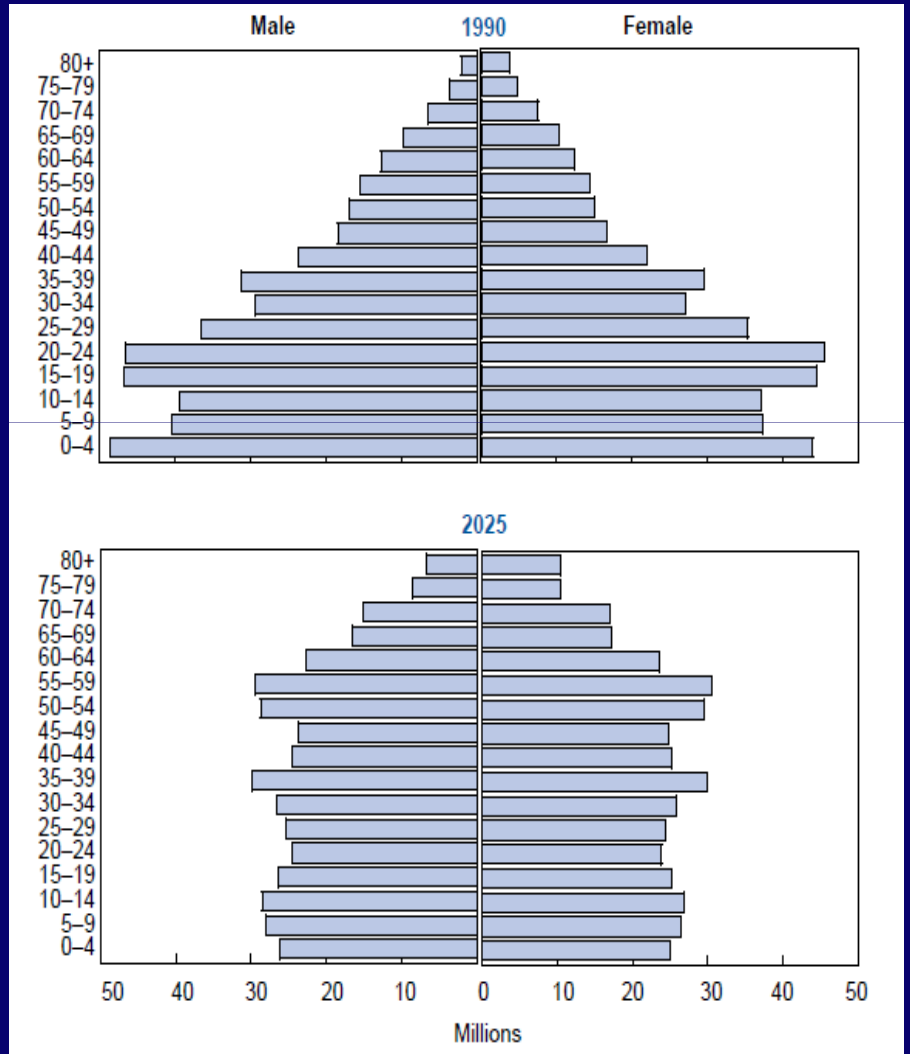
China's urban and rural population up to 2025

Urban



Note: China's urban population is growing through natural population increase, in-migration, and reclassification of rural places as urban.

Rural



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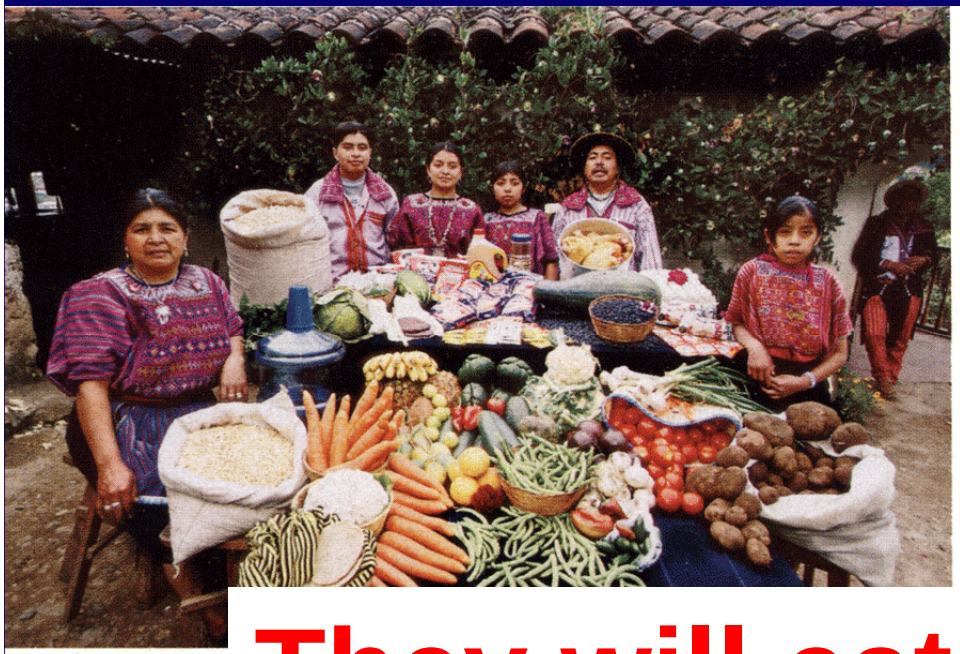
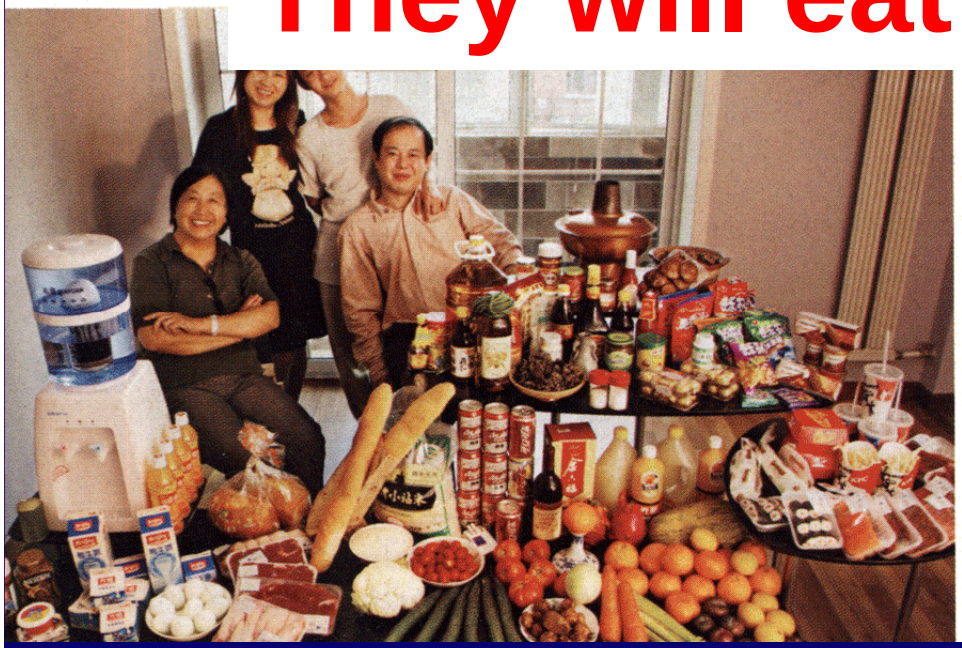
Source: U.S. Department of Commerce, 1995

Mega trends shaping the farm economy

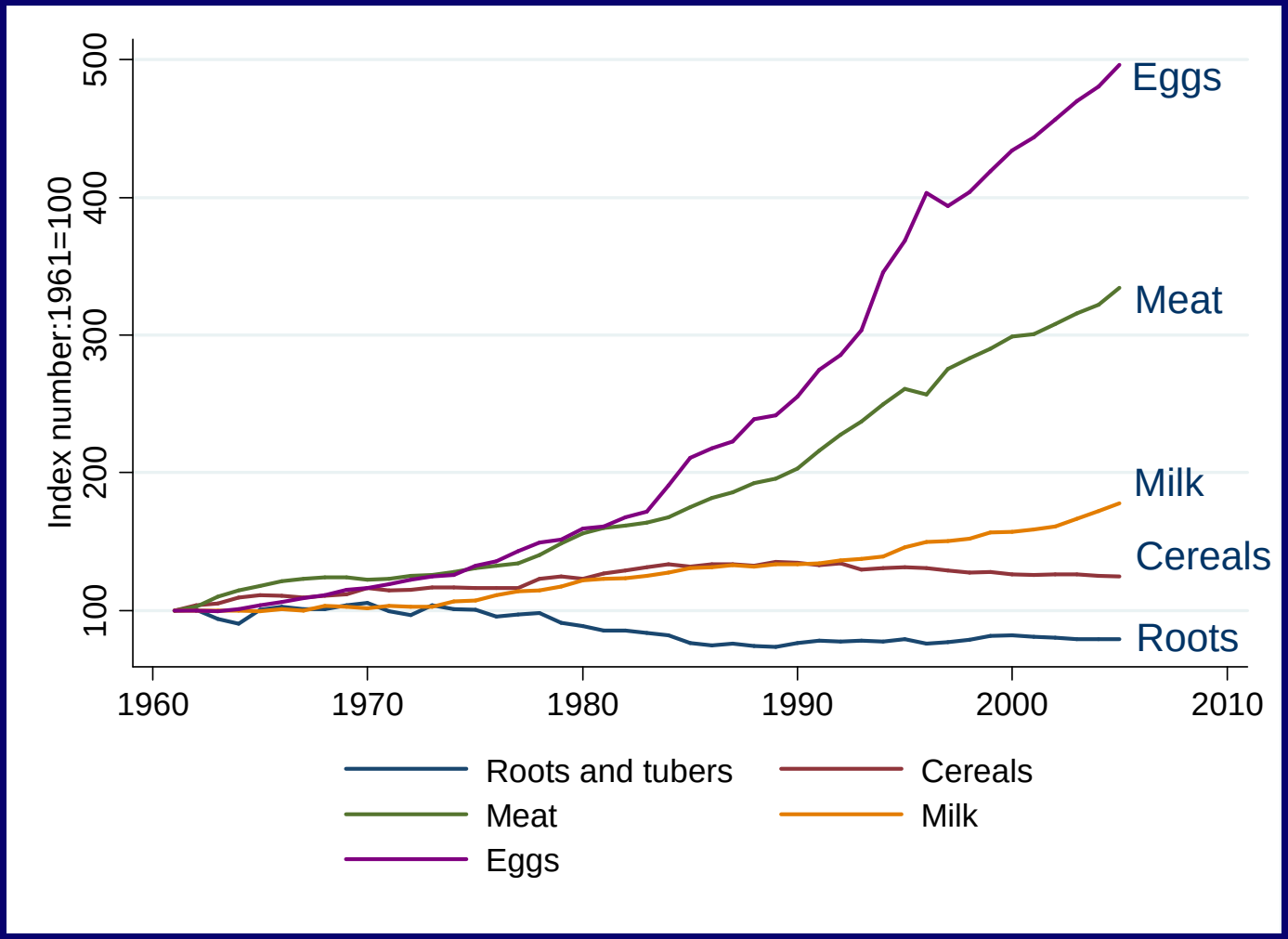
2. Change in demand for food (volume and patterns)



They will eat more similar

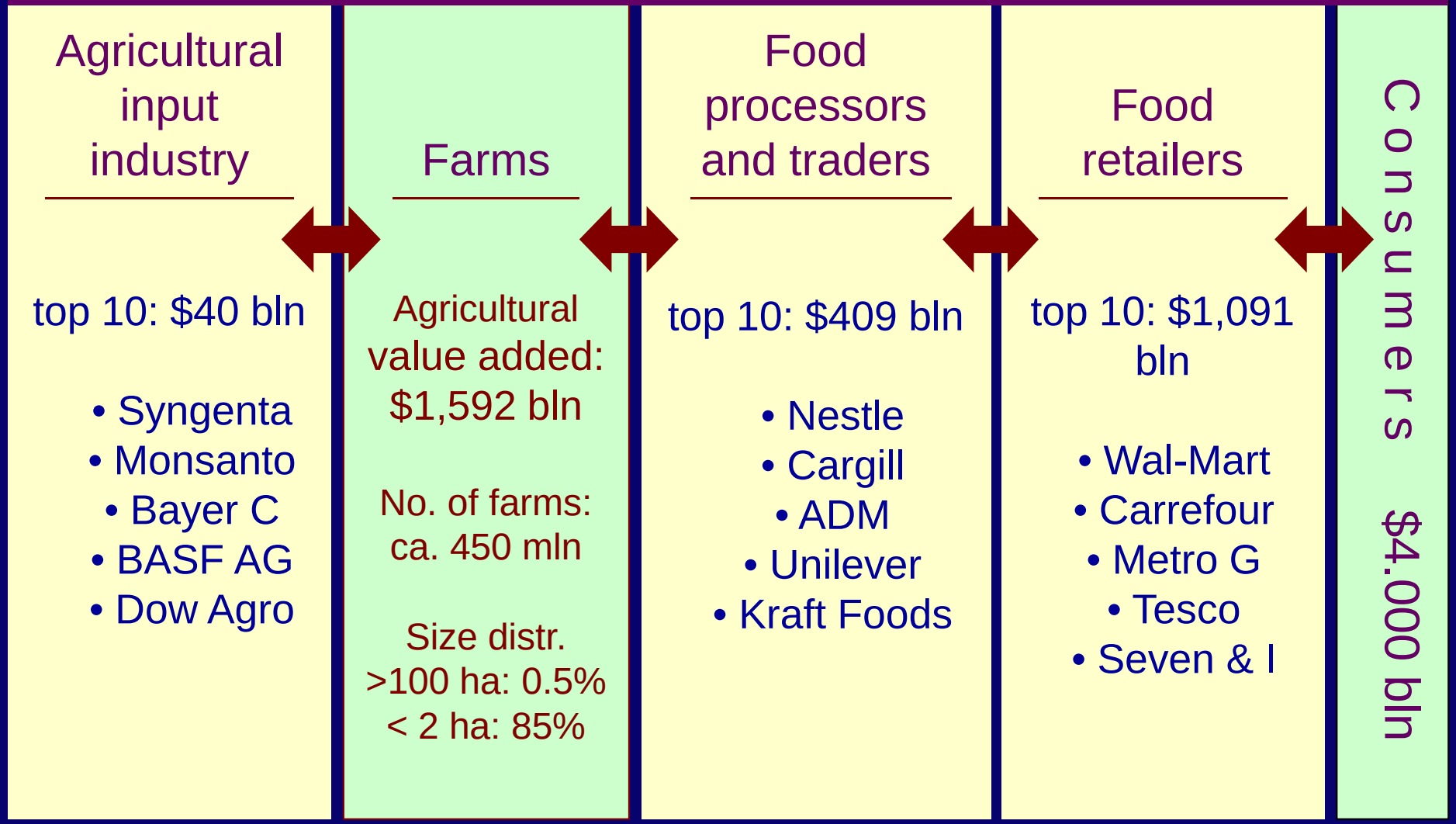


World consumption of animal products is growing (index 1961 = 100)



Source: Steinfeld, Henning. Challenges for sustainable milk production in Latin America in the context of climate change

Global and local food value chain offers opportunities for shared value

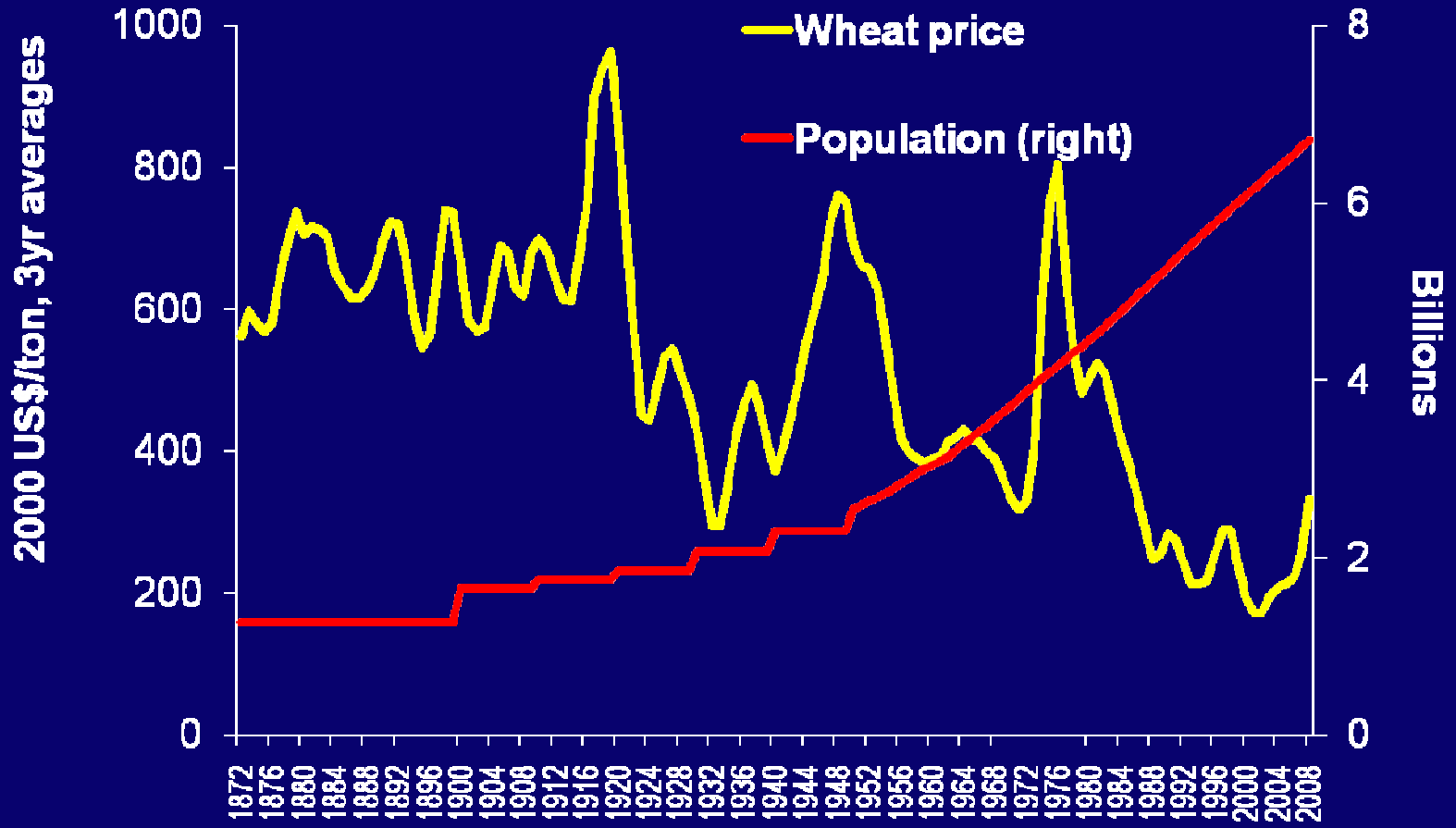


Source: von Braun 2008.

Mega trends shaping the farm economy

3. Prices of outputs and resources

Are we living in unusual times? 1872-2008 prices and population



Sources: J. von Braun, derived from data from NBER Macrohistory database, BLS CPI database, Godo 2001, OECD 2005, and FAO 2008; Population data from U.S. Census Bureau Int'l database and UN 1999.

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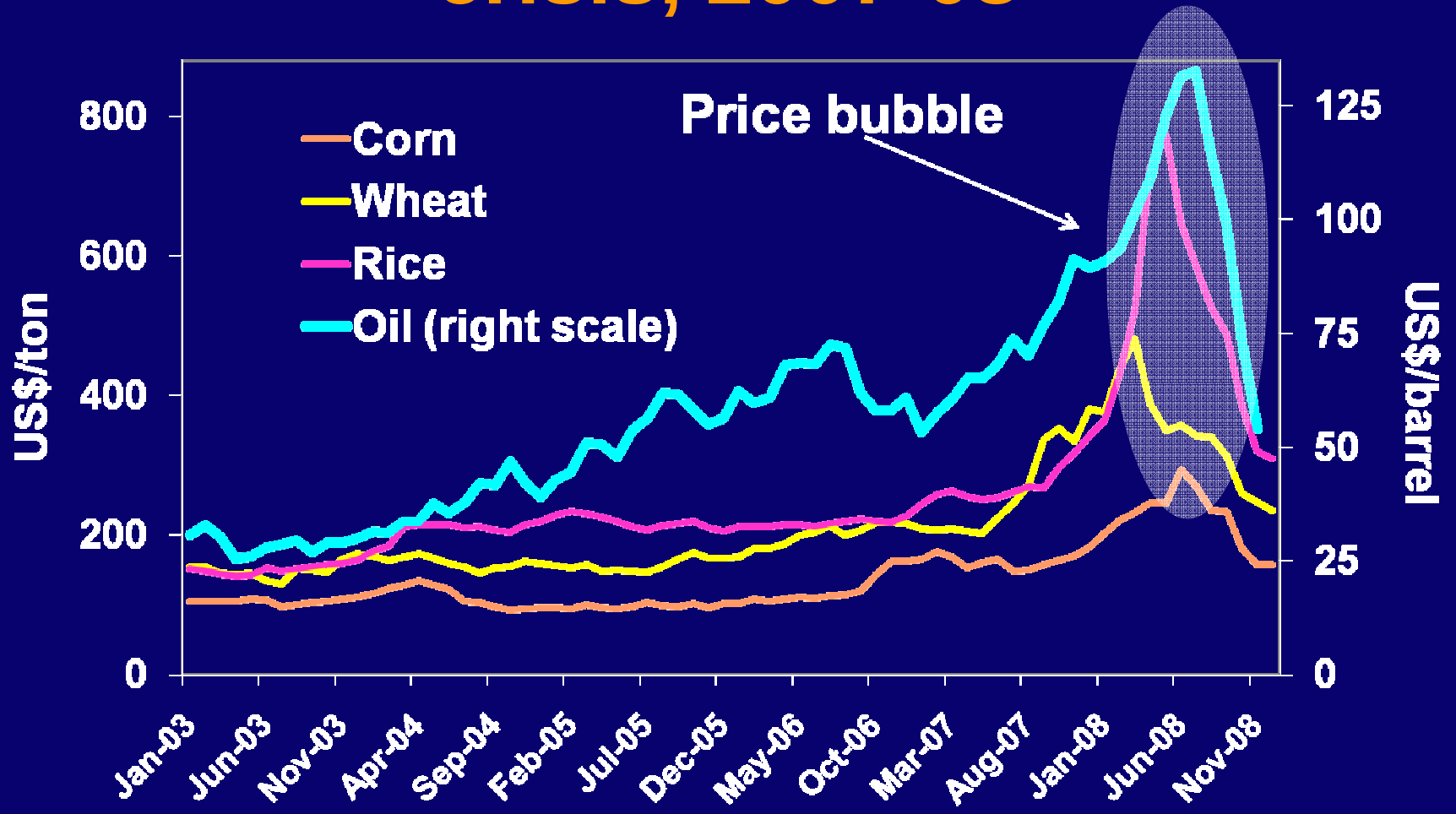
Volatility increases: Food price crisis, 2007-08



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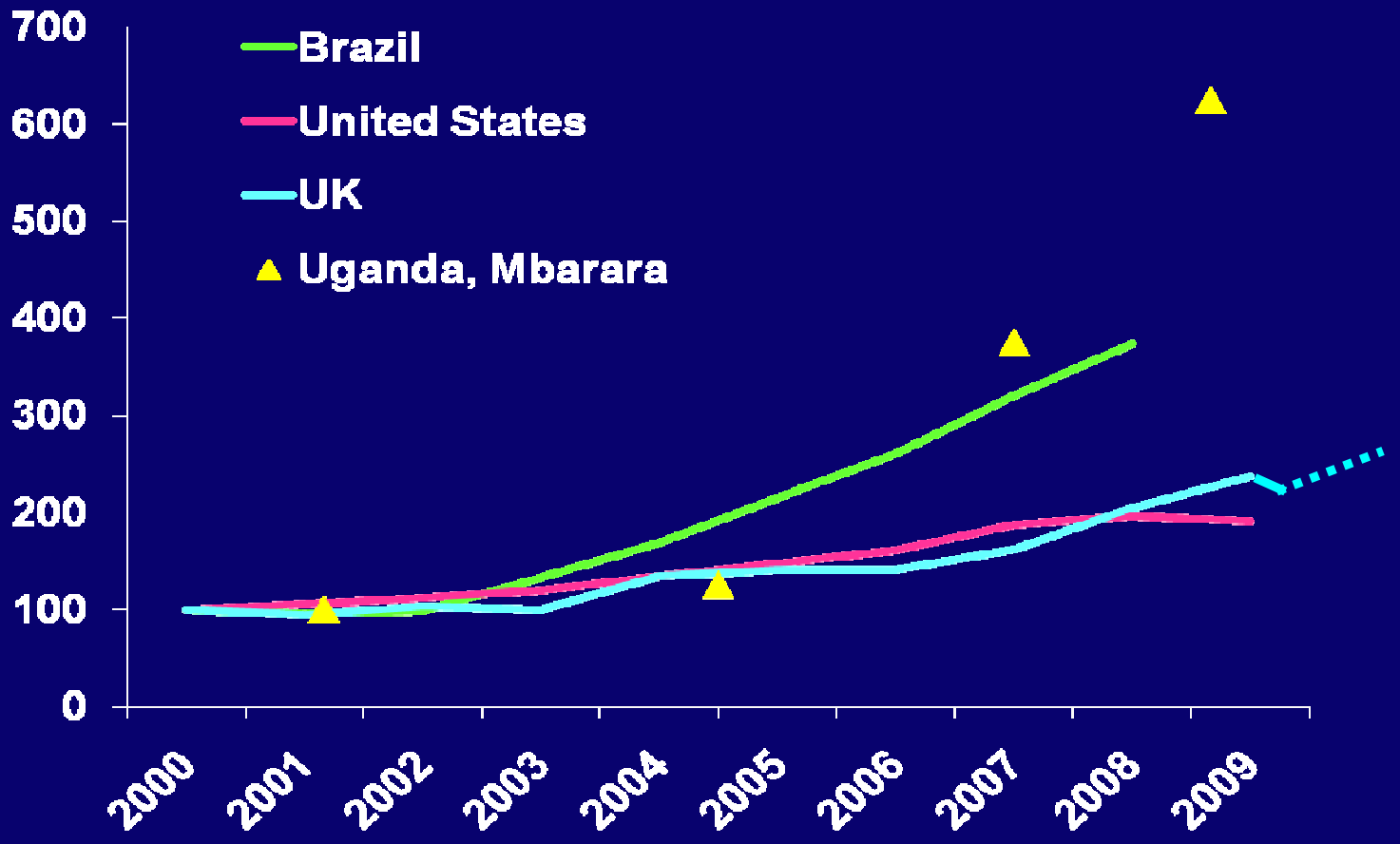
Triggeres and boosters of volatility

- Weather shocks under conditions of tight market and stock situations
- Policies (Bio-fuels subsidies, export stops and tariffs)
- “Financialization“ of food commodity markets and speculation

Higher food price (expectations) drive farmland price: index trends (2000 = 100)



Sources: IBRE 2009, Knight Frank 2010, USDA 2009, and expert survey in Uganda.

Land price implication: land grabbing or re-vitalized land reform?

Strengthen collective and individual ownership rights

=====Types of reforms ======

- Classic: transfer land from big to small farmers
- Tenancy rules/laws: incl. tenancy restrictions and titling of ownership
- Cooperative farming
- Other paths: consolidation, settlement, tax reform

Scope for development cooperation

Subsidy policies revisited - Malawi

Large scale disbursement of heavily subsidised fertilisers and maize seed to very large numbers of beneficiaries across the country represents a significant logistical achievement and

led to significant increases in national maize production and productivity, and this has contributed to increased food availability, higher real wages and wider economic growth and poverty reduction.

Estimated economic returns to the programme have been modest.

Any application of Malawis subsidy experience to other countries needs to take account of special characteristics of the Malawian maize economy

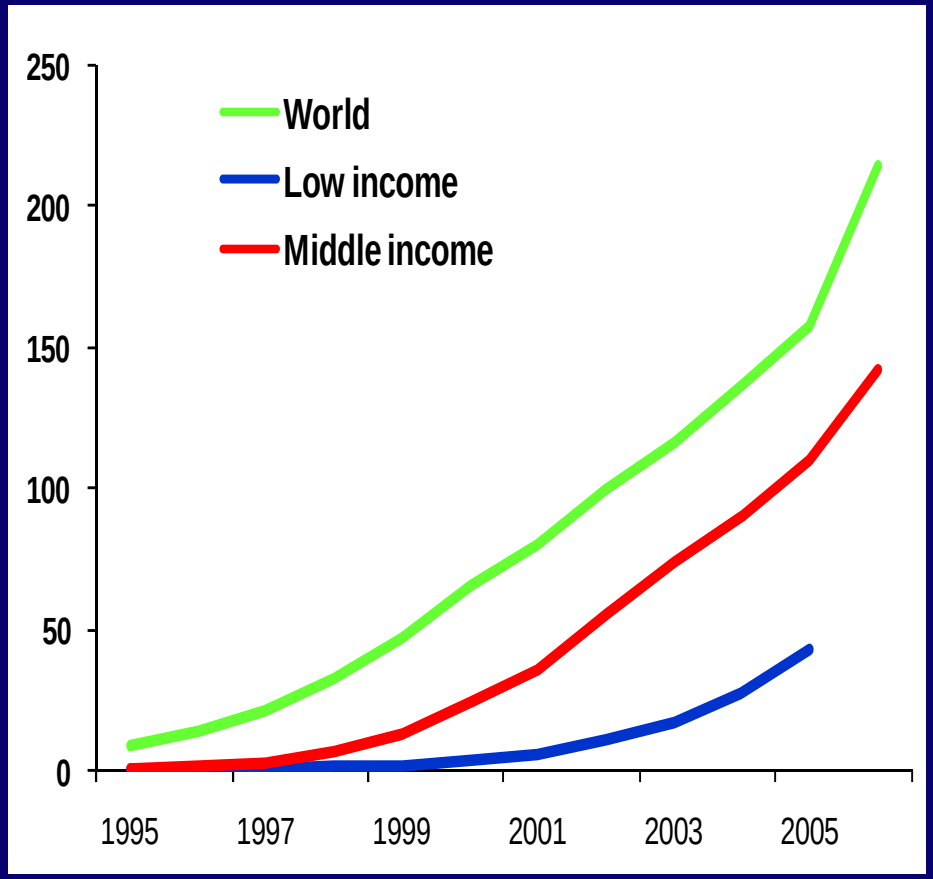
Source: Dorward and Chirwa (2010)

Mega trends shaping the farm economy

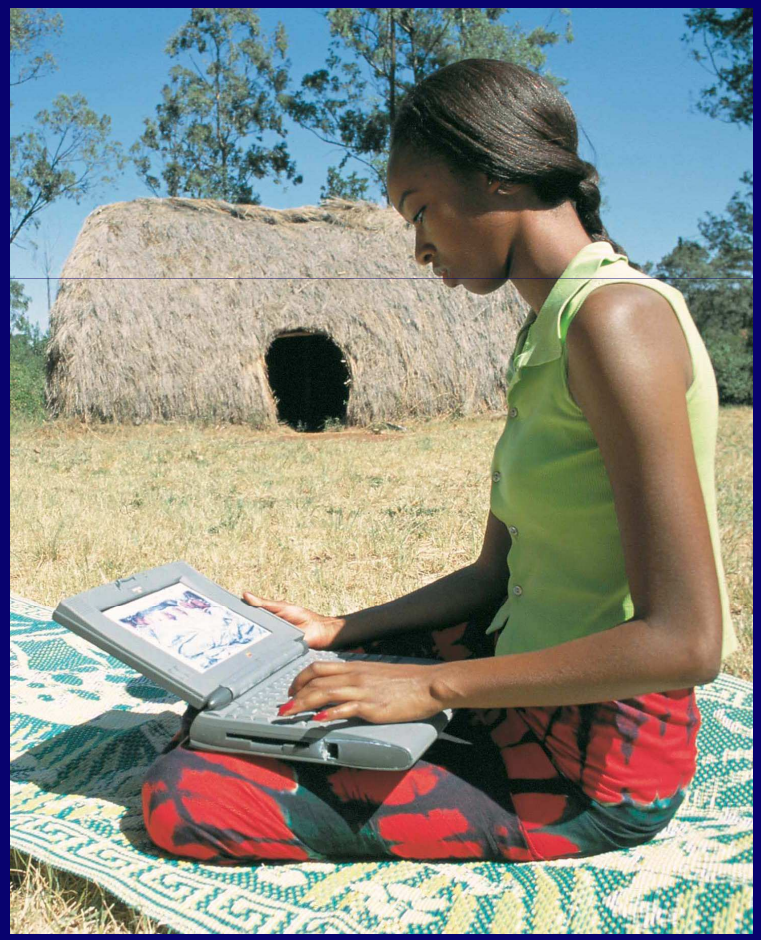
4. Information and communications technology, rural services, and infrastructure

ICT and farmers

ICT adoption (per 1,000 people) 1995-2007



Source: ITU 2009



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The cable is coming: For instance in Rwanda July 2010

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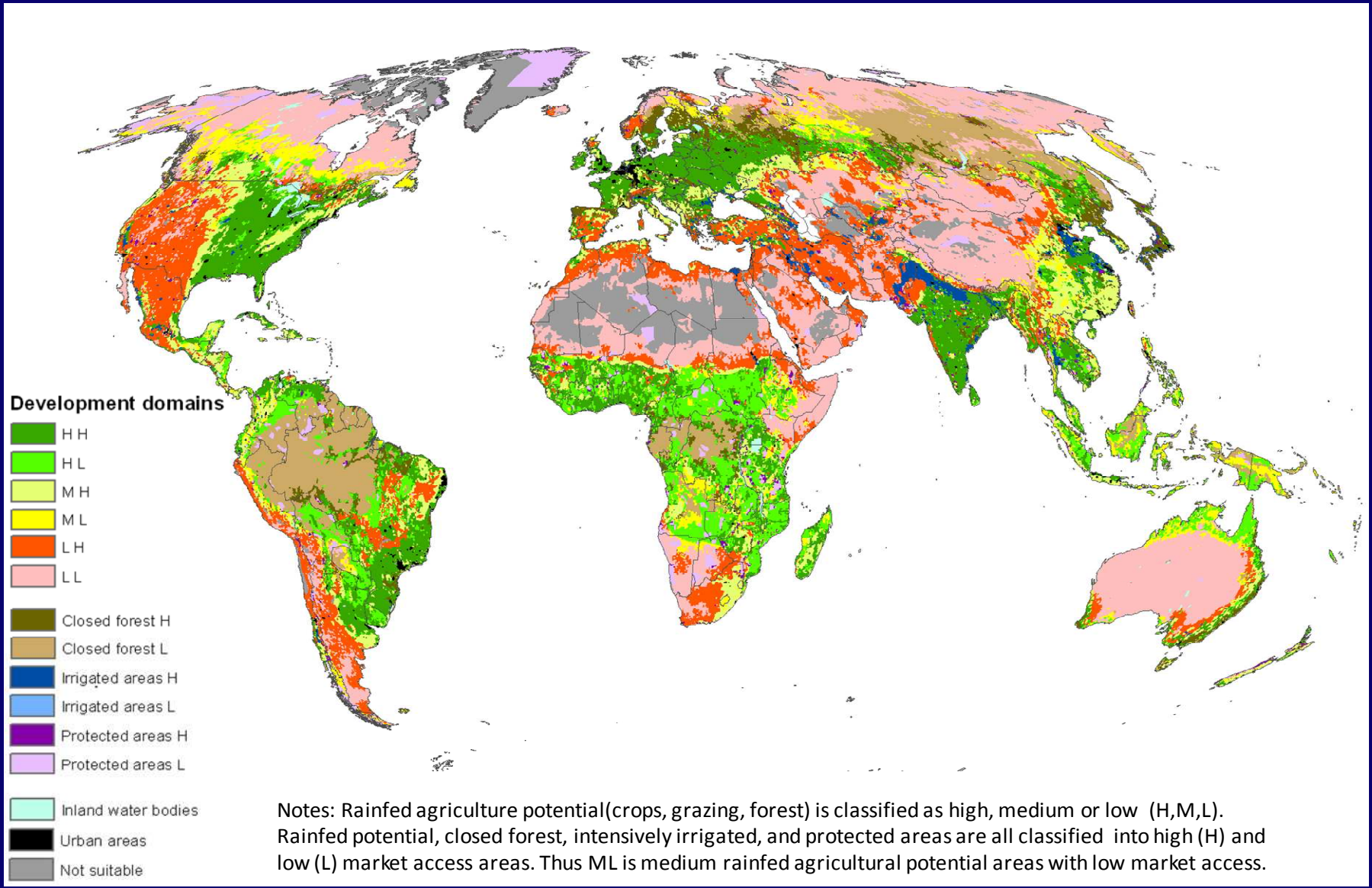
Development Domains: Combining Agricultural Systems with Infrastructure



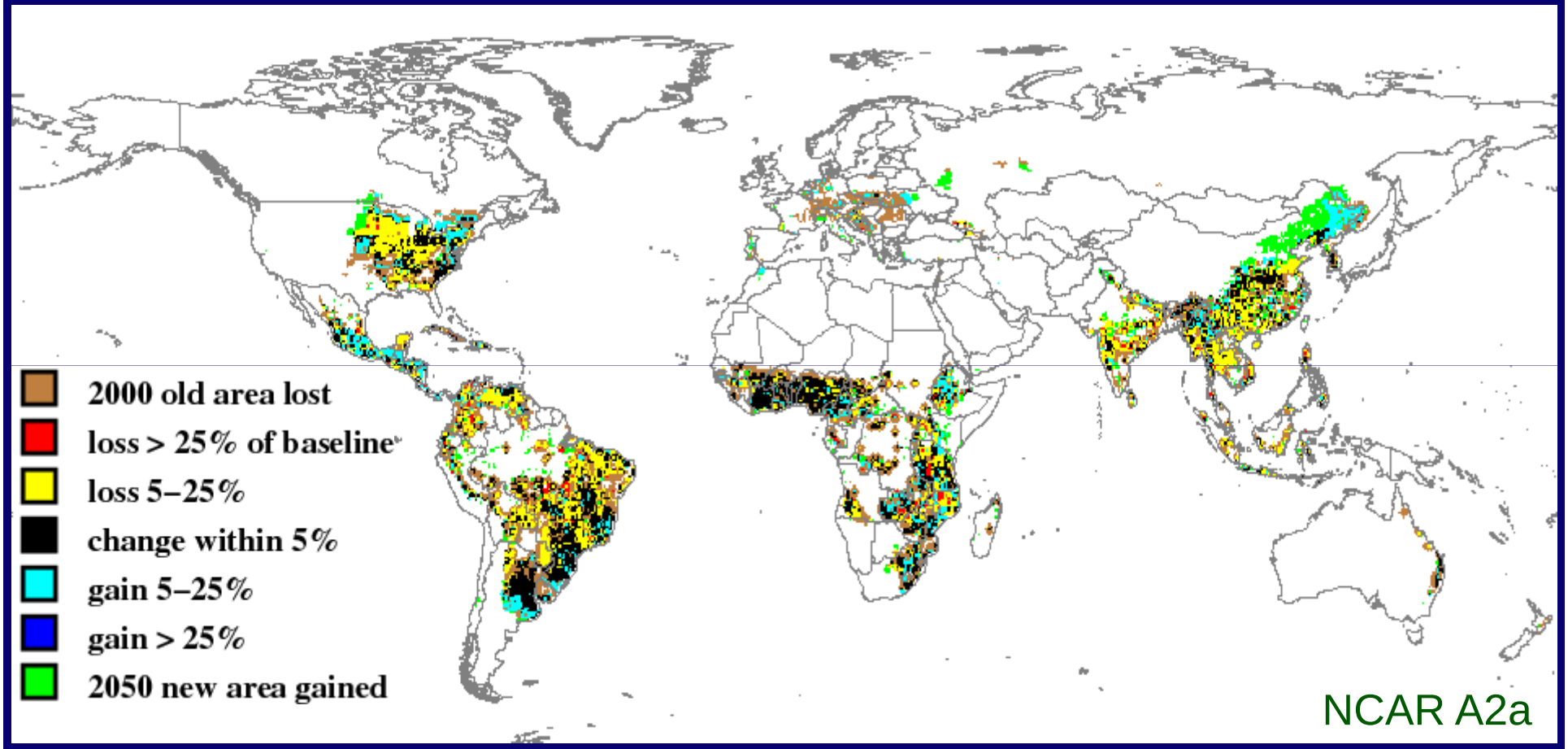
Notes: Rainfed agriculture potential(crops, grazing, forest) is classified as high, medium or low (H,M,L). Rainfed potential, closed forest, intensively irrigated, and protected areas are all classified into high (H) and low (L) market access areas. Thus ML is medium rainfed agricultural potential areas with low market access.

Source: Stan Wood et al. (IFPRI) 2009.

Mega trends shaping the farm economy

5. Climate change

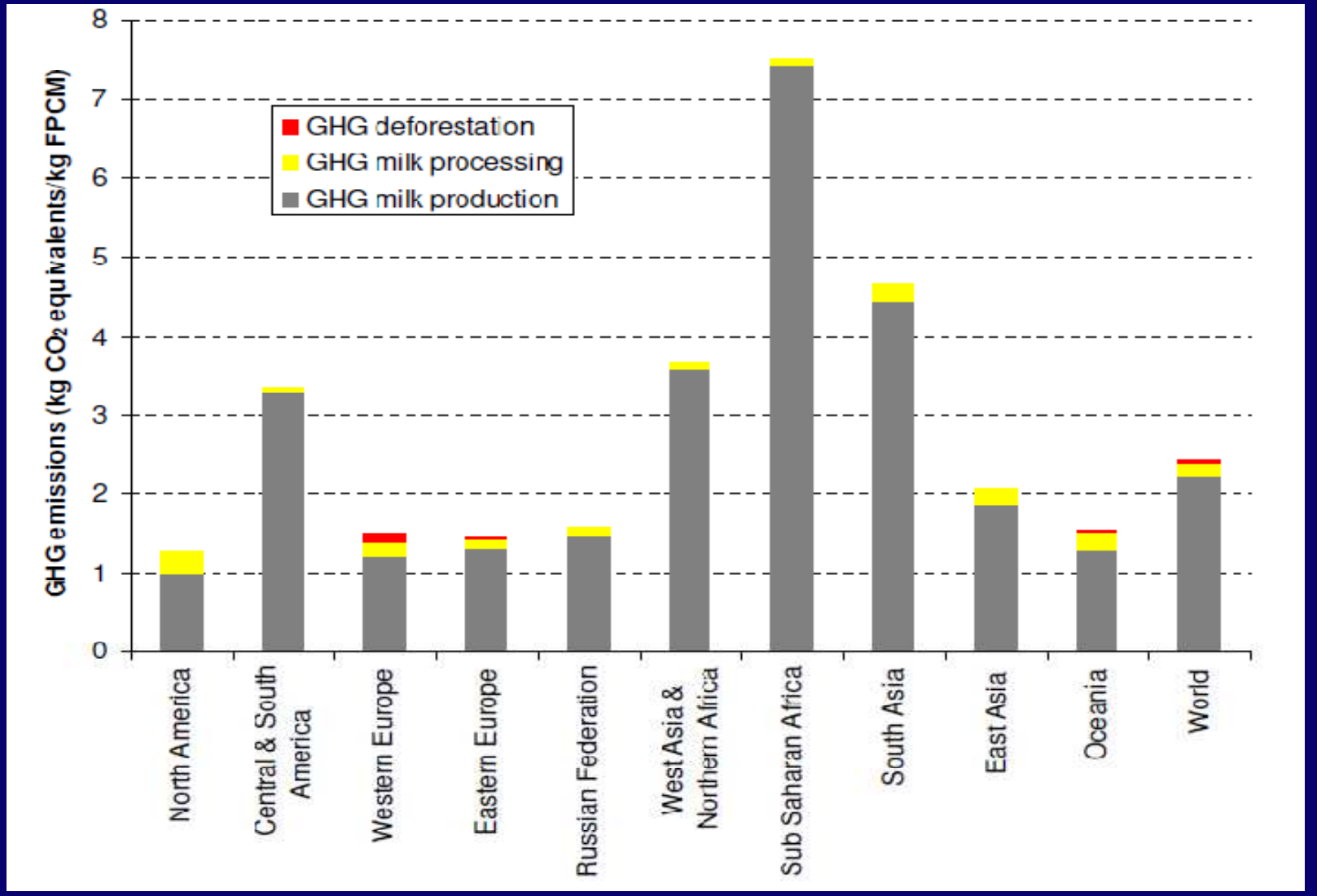
Climate change threats – urgency for adaptation through innovation



rainfed maize in 2050: Global production = -16%

Source: M. Rosegrant (IFPRI) 2009.

GHG-emissions per kg of milk
- higher productivity is ecological -



Source: Henning Steinfeld, FAO, Belo Horizonte 2010

Agriculture must be on the climate change agenda

1. Investment: agriculture-related investments, as part of a Global Climate Change Fund for technology to adapt

2. Incentives: C&T and carbon market may conflict with food security; phase in incentives first to reduce emissions, support technol. change

3. Information: Establish comprehensive information and monitoring services of land use and soils for verification base

Mega trends shaping the farm economy

6. Agricultural science and technology

Agricultural productivity growth in developing countries: too low!

Annual total factor productivity growth, 1992-2003

	%
East Asia	2.7
South Asia	1.0
East Africa	0.4
West Africa	1.6
Southern Africa	1.3
Latin America	2.7
North Africa & West Asia	1.4
All regions	2.1

Small farms can be very productive

Source: von Braun et al. 2008.

Support of crop bio-technology where appropriate

1. Farmers (higher productivity, small farmers can be major beneficiaries; e.g. BT cotton)
2. Consumers (improved health outcomes; VitA rice is now effective)
3. Environmental benefits (e.g. phytase maize, BT rice reducing pollution)

Mega trends shaping the farm economy

7. Changing political economy of food and farming

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Global and national food governance

- Most farm policy issues are national and local, focused on services
- Some farm issues need global action
- Institutions and farmers‘ political power may change (land rights)
- Policy will shape the future of farms

In sum:
Bright future of agriculture requires attention to each of the 7 mega trends

1. Demographics of farm populations and labor
2. Change in demand for food and value chains
3. Prices of outputs and resources
4. ICT, rural services, and infrastructure
5. Climate change
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Strategies of Smallholders to grow out of poverty

1. Grow in farming: with expansion and commercialization; and specialization or diversification

2. Go part-time: Seek additional off-farm rural income

3. Go out: exit farming (incl. migration)

Reality: combinations of 1 - 3 in a household context

calls for rural development support

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Great diversity of types of farms
- with change - will be for the long run

1. Types of peasant farms
   1. Semi-Subsistence
   2. Commercial / specialized
   3. Small part time
2. Commercial/medium size farm
3. Large family business farm
4. Large diary and poultry farm
5. Aquaculture
6. Industrialized / corporate farm (poultry, etc.)

with regional diversity

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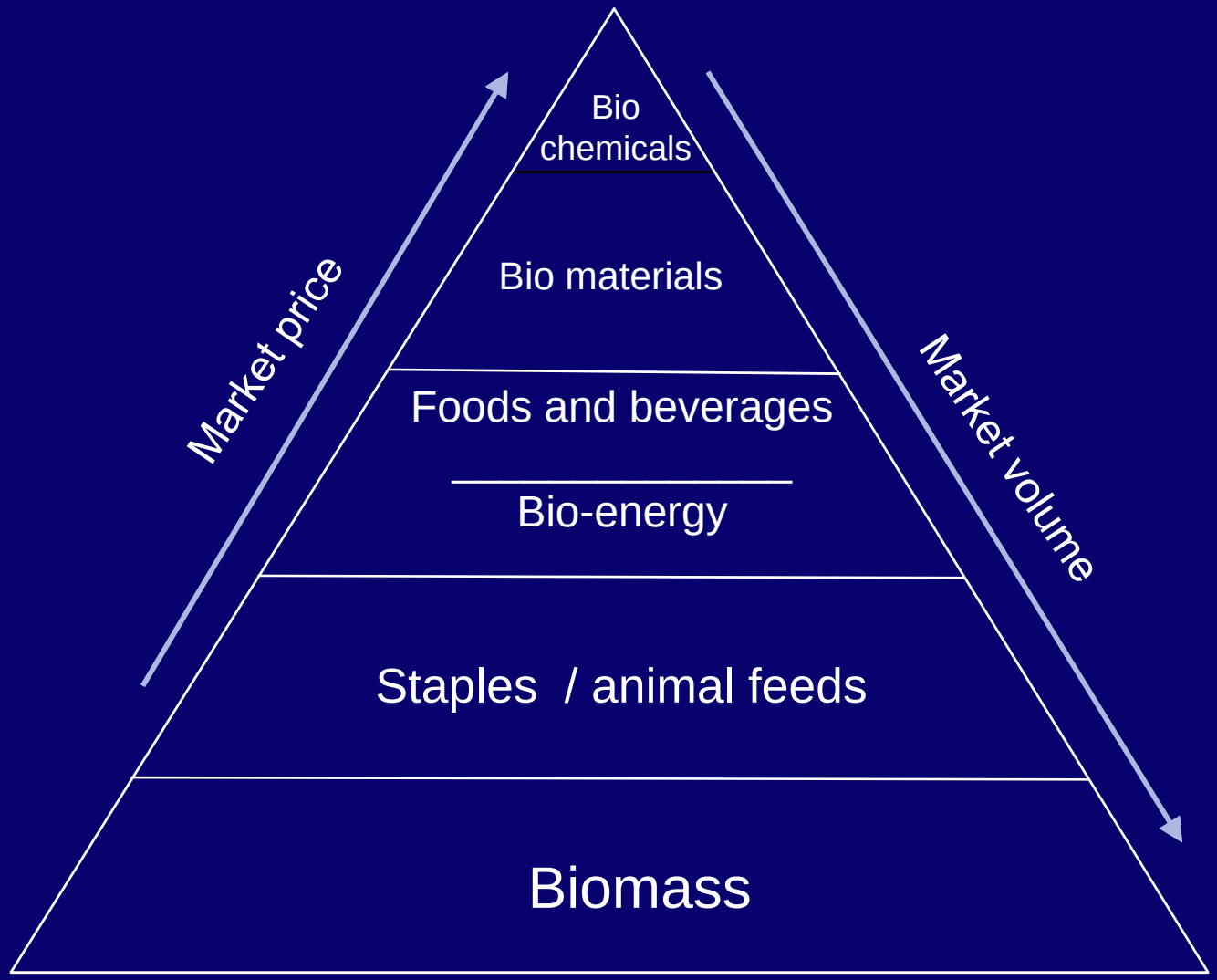
Strategy for agriculture

- Re- defining agriculture for the long run
- *Not just one value chain but many linked systems of value chains*
- New products, raw materials, bio-refineries… towards a knowledge based ***bio-economy***

The emerging bio-economy with interlinked value chains



Farmers' and their families' futures depend on …

1. Agriculture growth with technology and institutional innovations around small farms
2. Sustainable resource management
3. Open trade, reduced market volatility and migration options
4. Improved rural education, nutrition and health policy
5. Strengthened rights and political voice

…and the respective development cooperation agenda needs to become ever more science and knowledge intensive with a focus on farm and rural services