

The long-term outlook for food and agriculture

Expert Meeting 5 Bioenergy policy, markets and trade and food security

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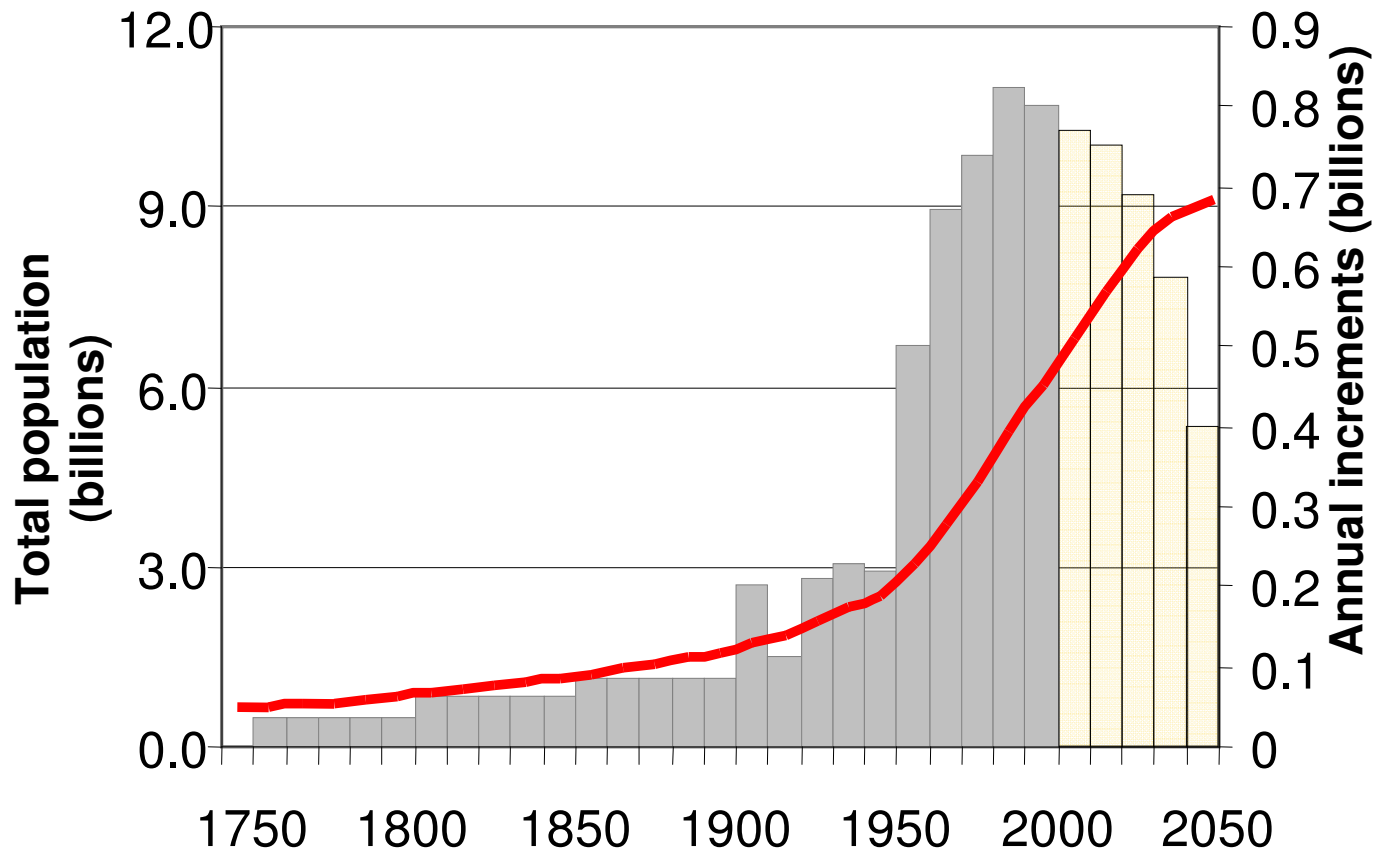
Overview

1. The driving forces of the outlook
 - Continuous population growth, but at a slower pace; rapid urbanization, aging, robust income growth
 - Growing, but increasingly saturated food markets; high productivity growth, falling real prices
2. The outlook for the **food** markets
3. How does **non-food** (bioenergy) use affect the outlook for food and agriculture?
 - The relative size of food and fuel markets
 - Possible price impacts and quantity shifts
4. Impacts on food security



Food markets: drivers of the long-term outlook

Continuous global population growth, but at a drastically slower pace



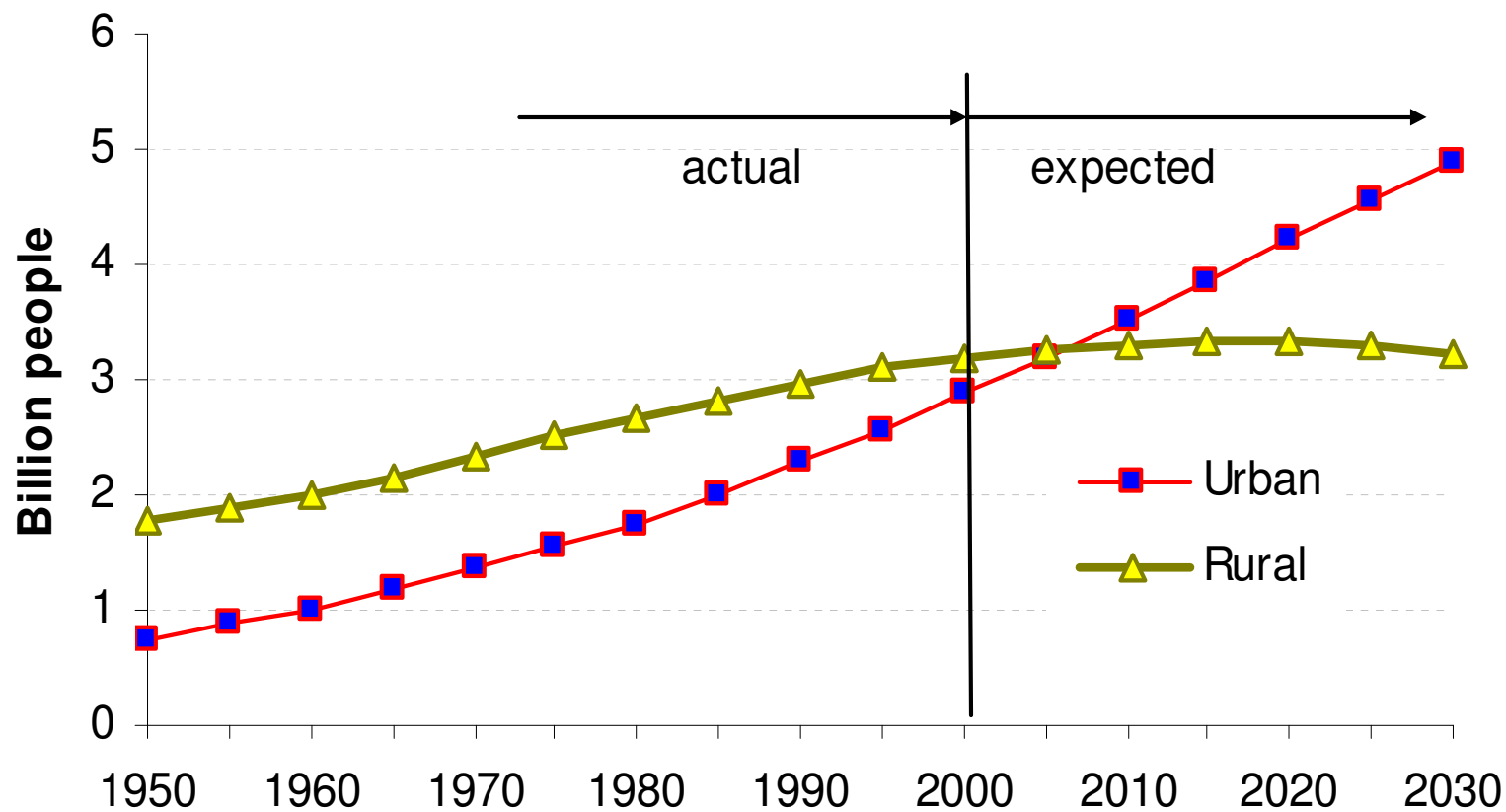
Source: UN, World Population Assessment 2006





1. The main determinants

Urbanization to accelerate



Source: UN, World Population Assessment 2006

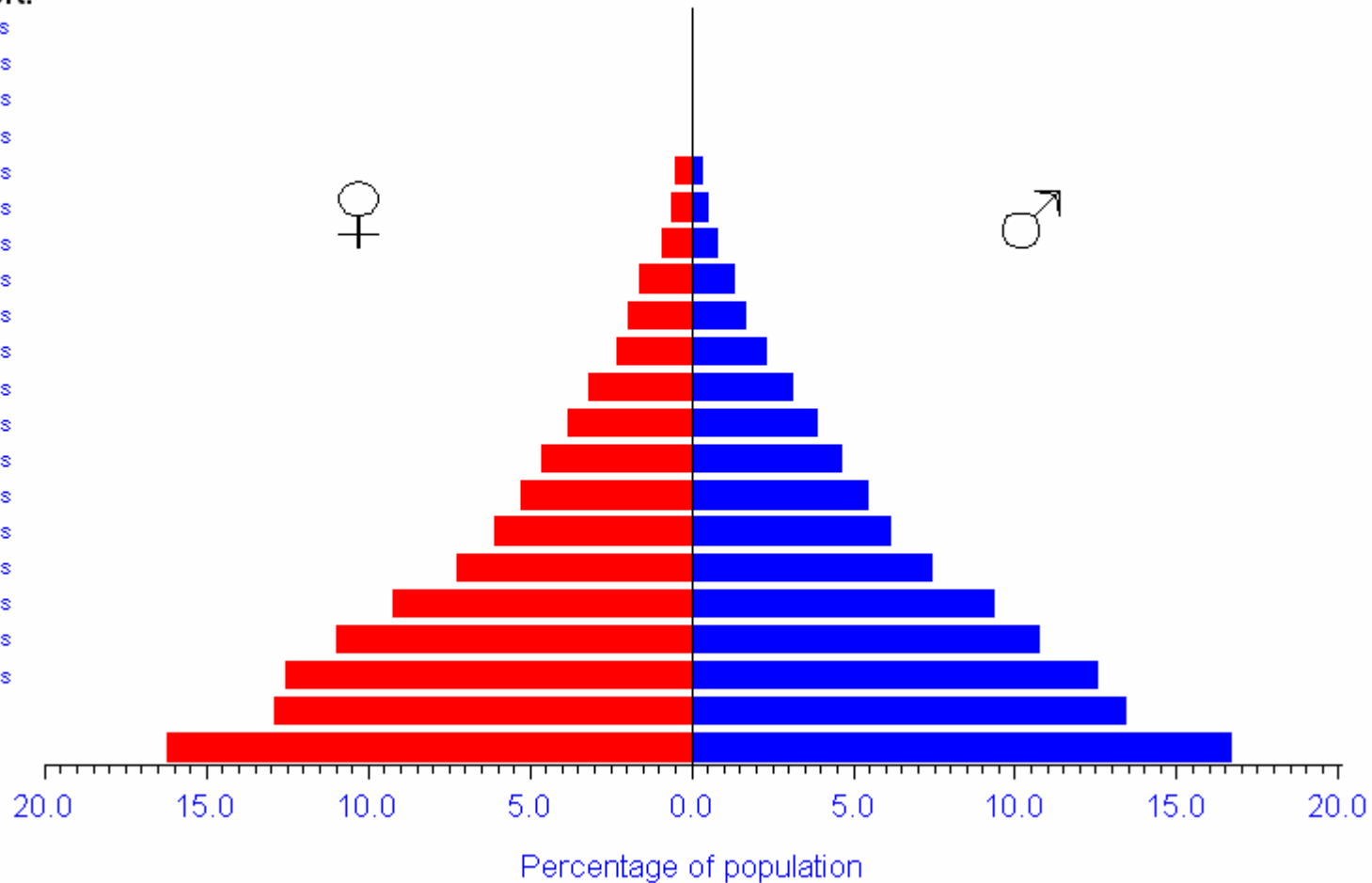
Food markets: drivers of the long-term outlook

Thailand: Population Structure, Changes from 1950 to 2050

1950

Age cohort:

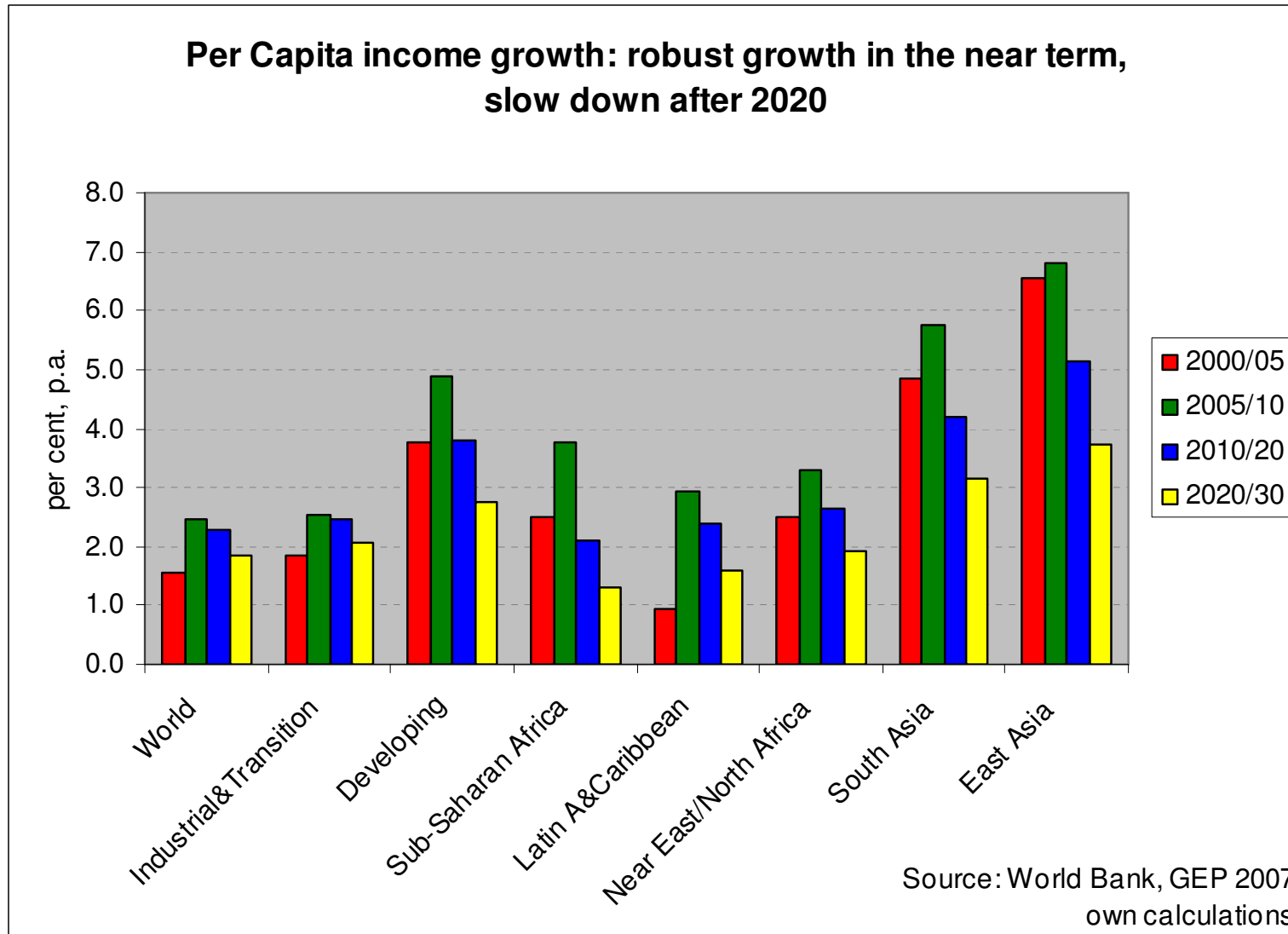
- 100 + years
- 95-99 years
- 90-94 years
- 85-89 years
- 80-84 years
- 75-79 years
- 70-74 years
- 65-69 years
- 60-64 years
- 55-59 years
- 50-54 years
- 45-49 years
- 40-44 years
- 35-39 years
- 30-34 years
- 25-29 years
- 20-24 years
- 15-19 years
- 10-14 years
- 5-9 years
- 0-4 years



Based on: UN 2004 (<http://www.un.org/esa/population/unpop.htm>)
 Josef Schmidhuber (2006)



Food markets: drivers of the long-term outlook



Overview

1. The driving forces of the outlook

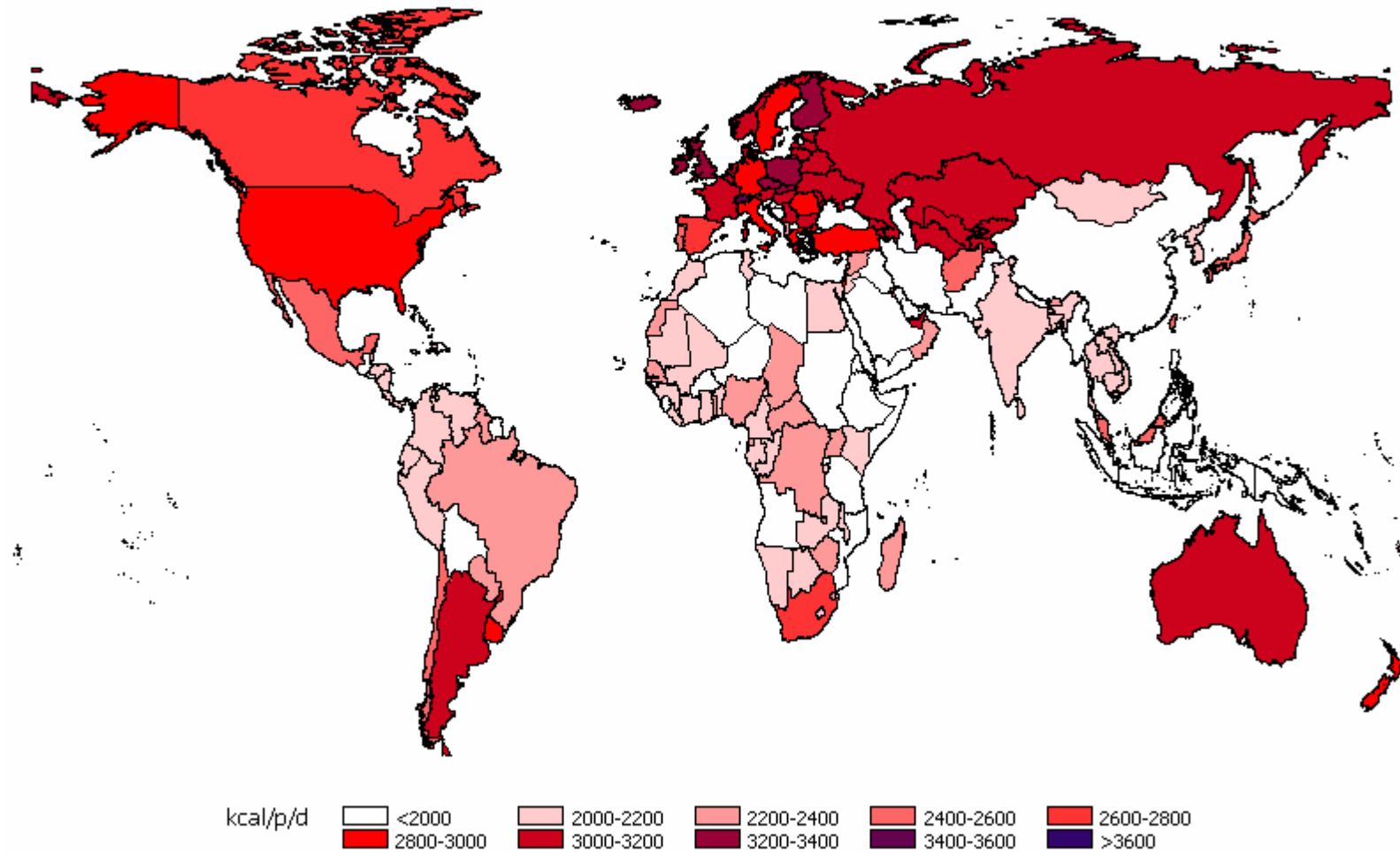
- Continuous population growth, but at a slower pace; rapid urbanization, aging, robust income growth
- Growing, but increasingly saturated food markets; high productivity growth, falling real prices

2. The outlook for the *food* markets



Food markets: Growing saturation of demand (calories)

Dietary Energy Supply (DES) 1961

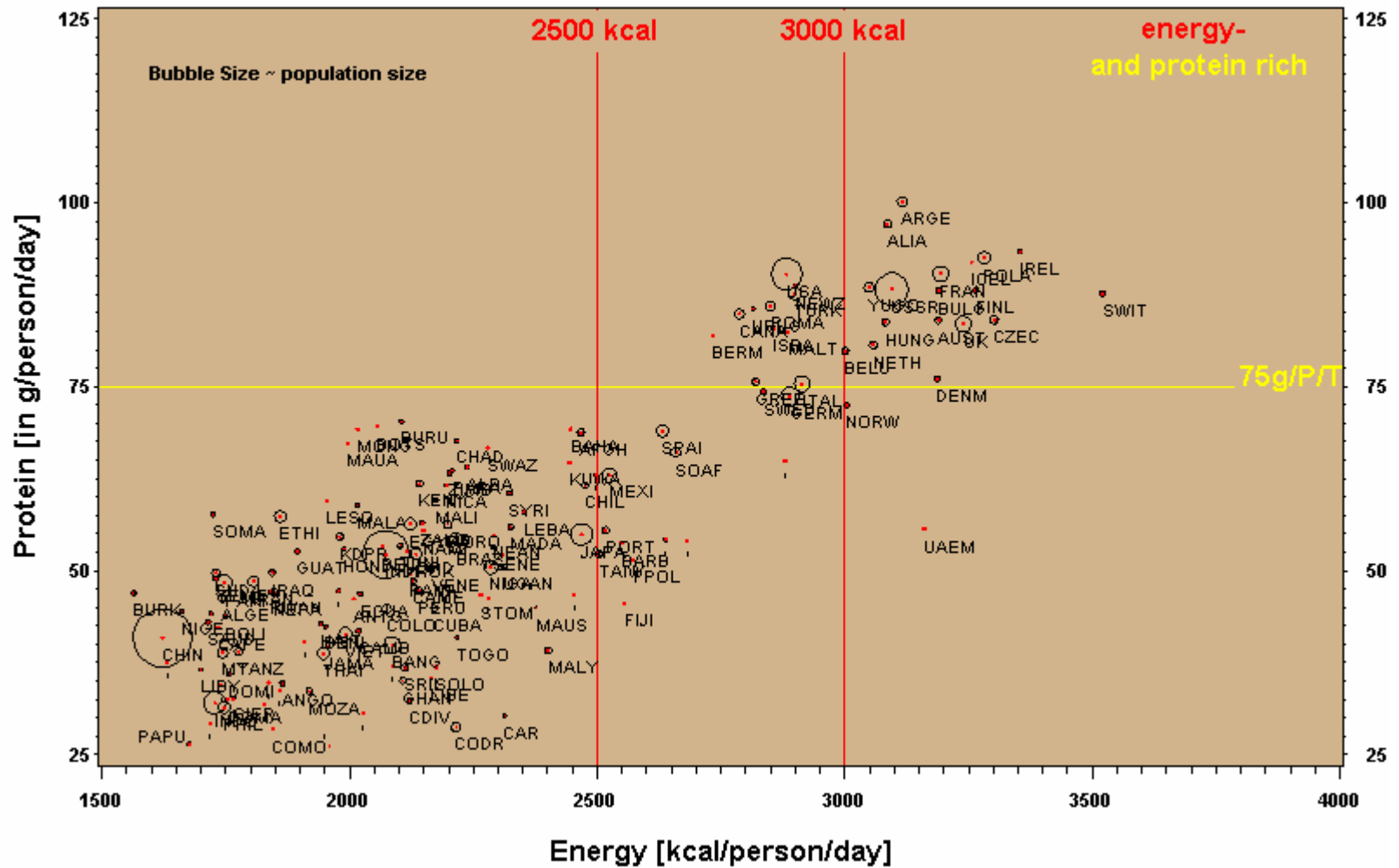


Source: FAOSTAT and World agriculture: towards 2015/30
Josef Schmidhuber, 2004



Food markets: Review and outlook to 2030

Energy- and Protein Content of the Diet, Total Availability
1961

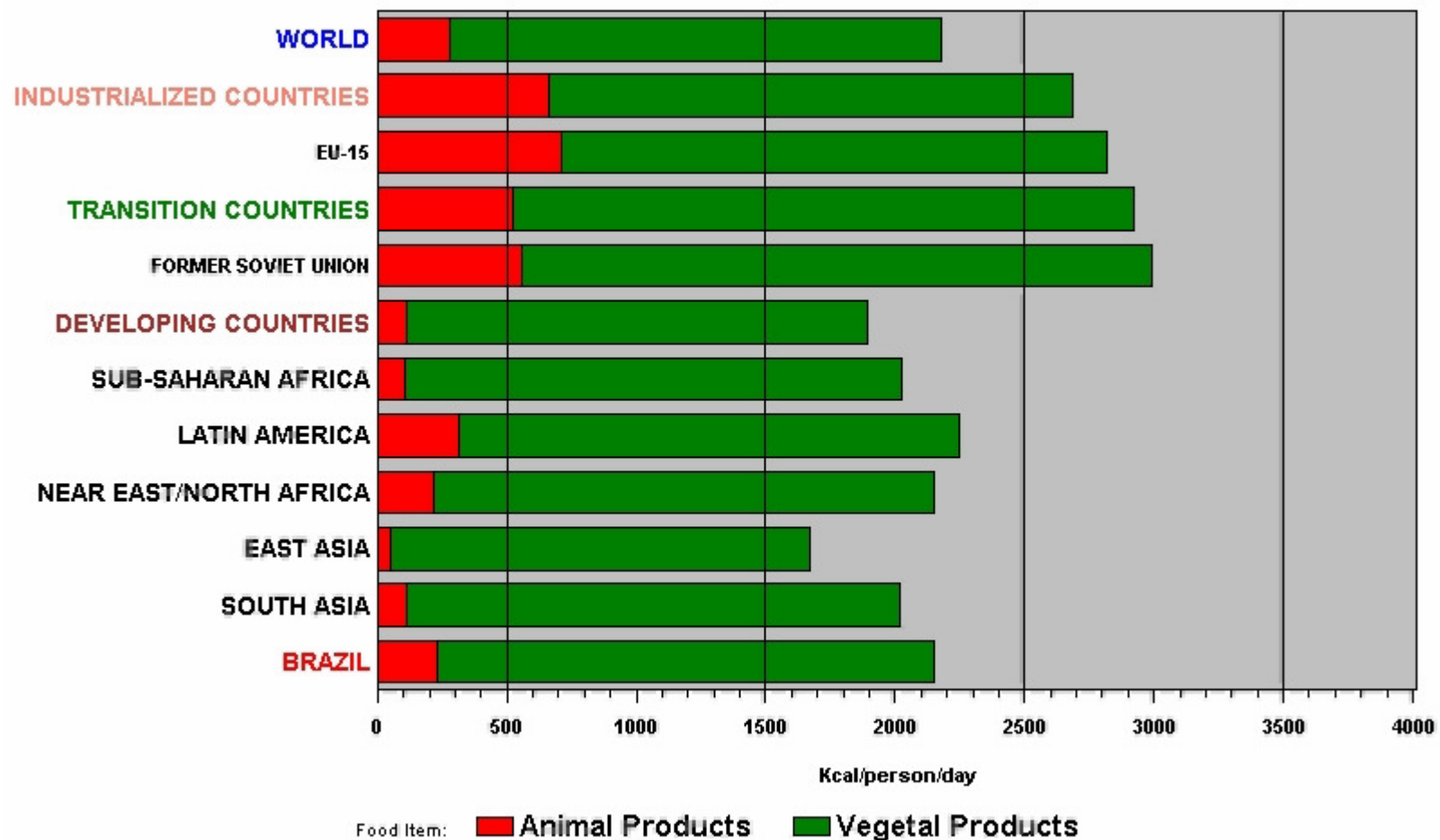


Source: FAO



Food markets: Shift towards more meat in developing countries, saturation in developed countries

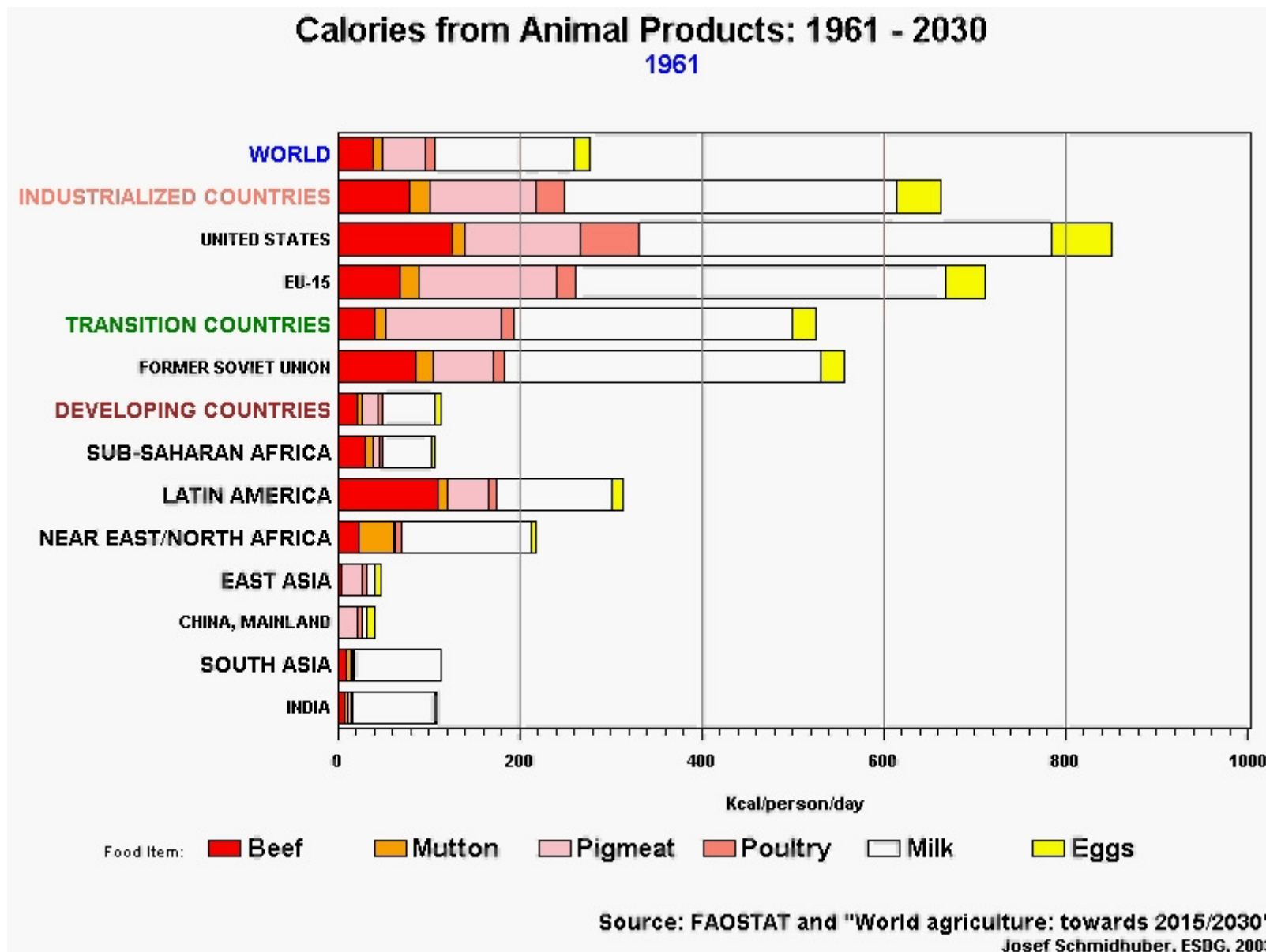
Calories from Vegetal and Animal Origin: 1961 - 2030
1961



Source: FAO, Global Perspectives Studies Group
Josef Schmidhuber, 2004



Food markets: Review and outlook to 2030



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 - The relative size of food and fuel markets
 - Possible price impacts and quantity shifts



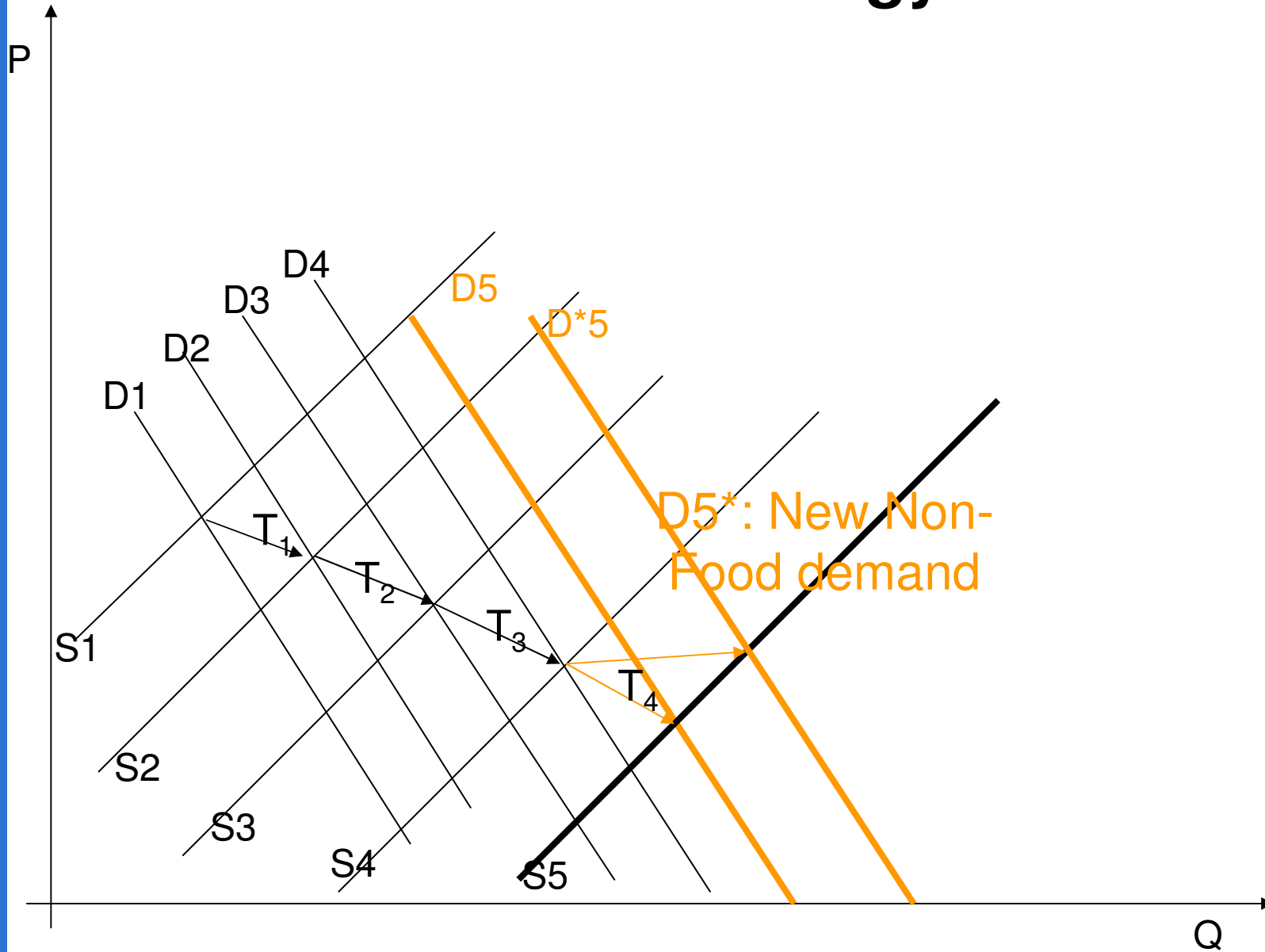
How big is the market for biofuels?

		⁹ Exajoule/a [10^{18} Joule]/a				million ha
Energy source:	Potential and actual use	Year	World	OECD	non-OECD	World
All sources (TPES)		1973 ²	253	157(62.3%)	95(37.7%)	
		2004 ²	463	231(49.8%)	232(50.2%)	
		2030 ²	691	285(41.2%)	406(58.8%)	
		2050 ²	>850			
Biomass	Actual use	2004 ²	49 ¹¹	8	41	
	Theoretical potential		>>2000	Global photosynthesis: > 3000 EJ		
	Technical potential	1990 ¹	225	48 ¹²	177 ¹²	
		2050 ¹	400	80 ¹²	320 ¹²	
Biofuels	Ethanol⁷ (actual)	2006 ³	1.06	0.48	0.58	16.5 ⁴
	Biodiesel⁷ (actual)	2007 ³	0.45	0.27	0.18	4.5 ⁴
	Potential¹	2050 ¹	53 ¹⁰			
	Use	2030	4.8(8.4) ¹³	2.3(4.0) ¹³	2.5(4.4) ¹³	
Resources:			million ha			
Agricultural land⁸	Used for agriculture	1997-99	1506	658	848	850 ^{4/5}
	Total suitable		4188	1406 ⁶	2782 ⁶	(4730)
	Used for biofuels	2006	23			=1.5% of land
		2030	32.5 (57)	EIA estimate for 2030		=2% of land



Stuck in the technology treadmill?

The traditional paradigm



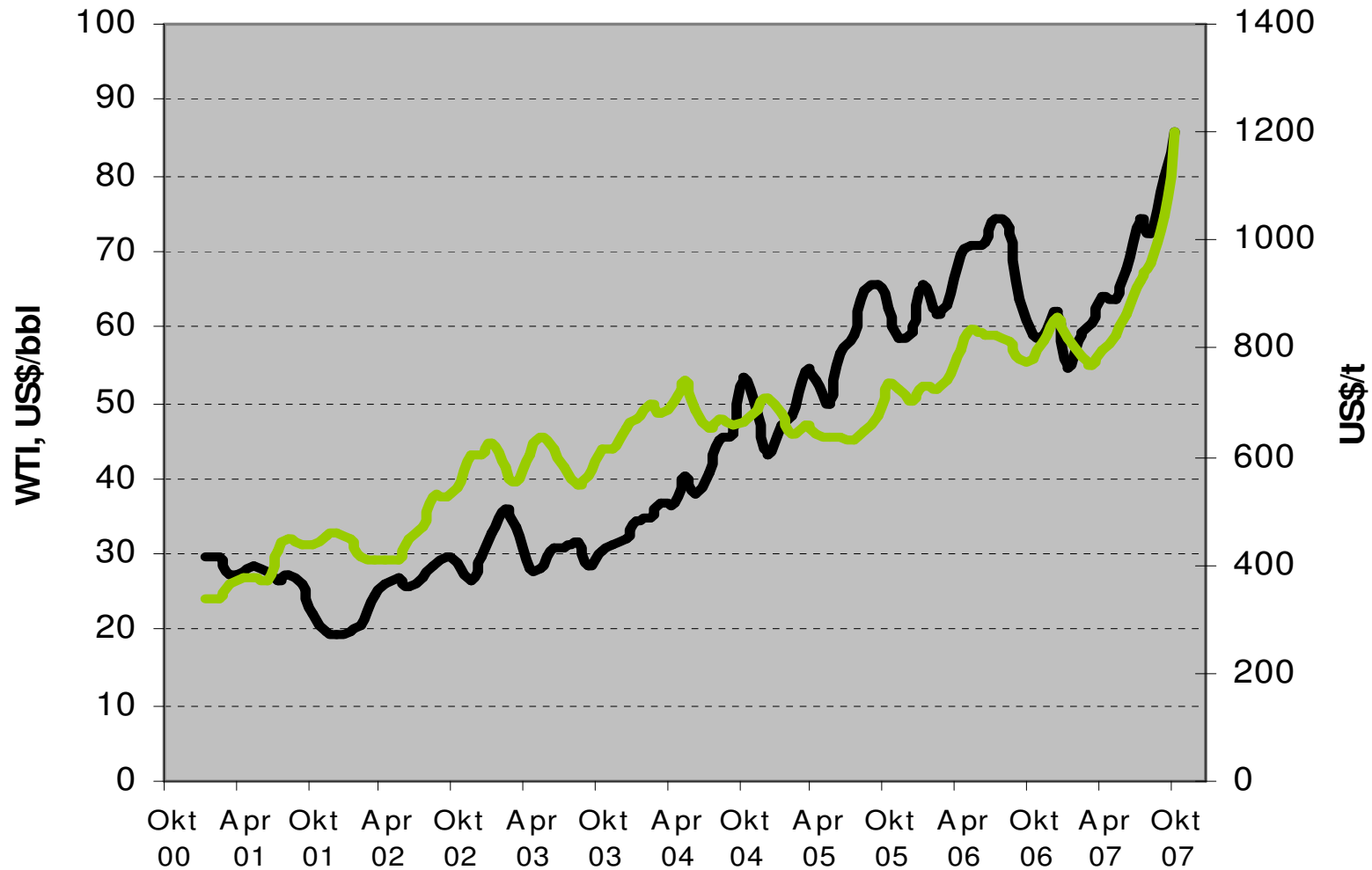
Overview

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2. The food outlook
3. How does bioenergy use *currently* affect international agricultural markets and prices?
 1. Floor price effects.
 2. Tighter links, multi-market effects
 3. Ceiling price effects.
 4. Differential, non-uniform price changes across agricultural commodity markets.
 5. Shrinking quality premia!?
 6. Subsidies and lack of market integration



Price effect 1: floor price

Crude oil prices above US\$ 60/bbl drive prices for rapeseed oil

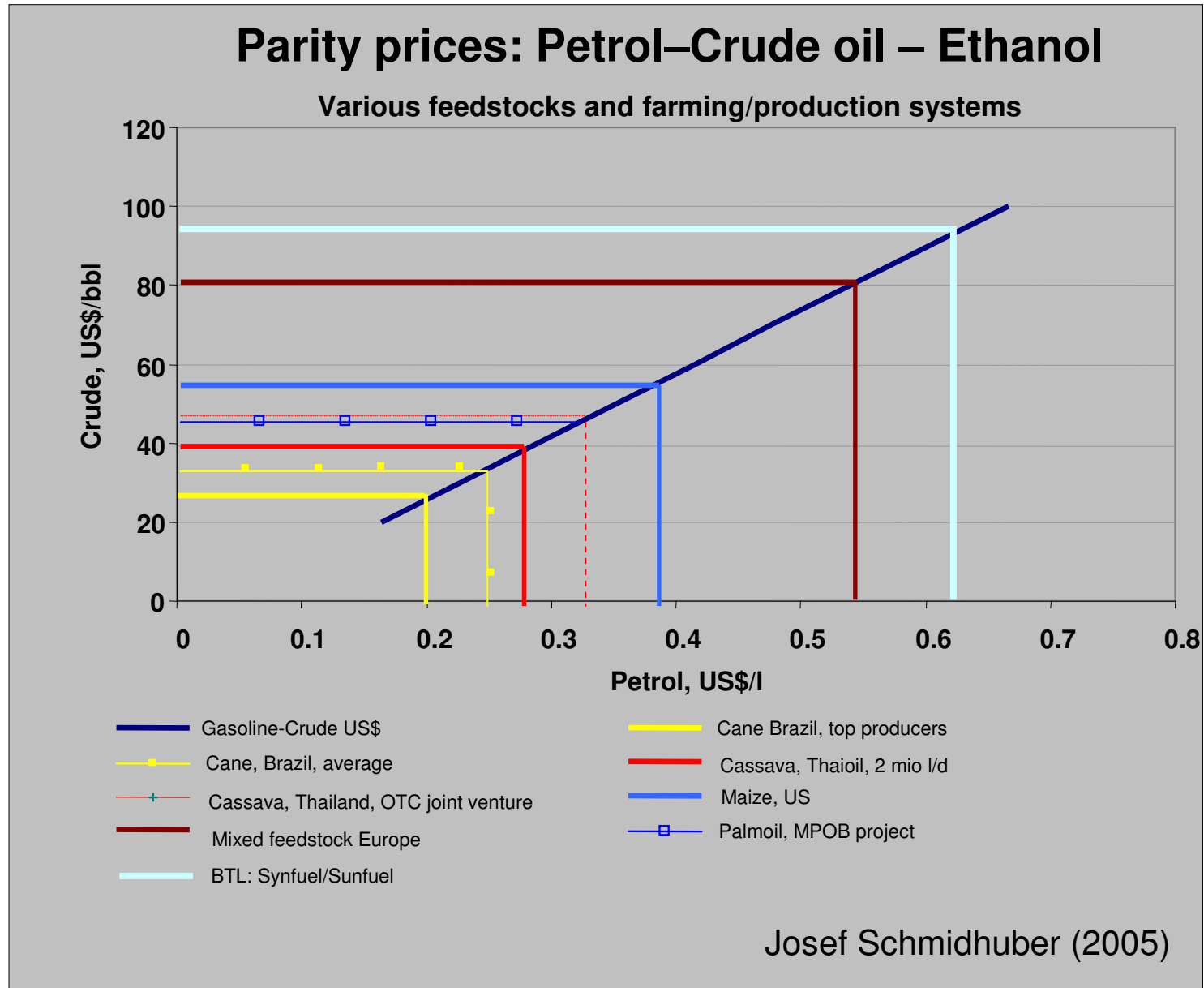


— Crude (WTI) — Rape seed oil

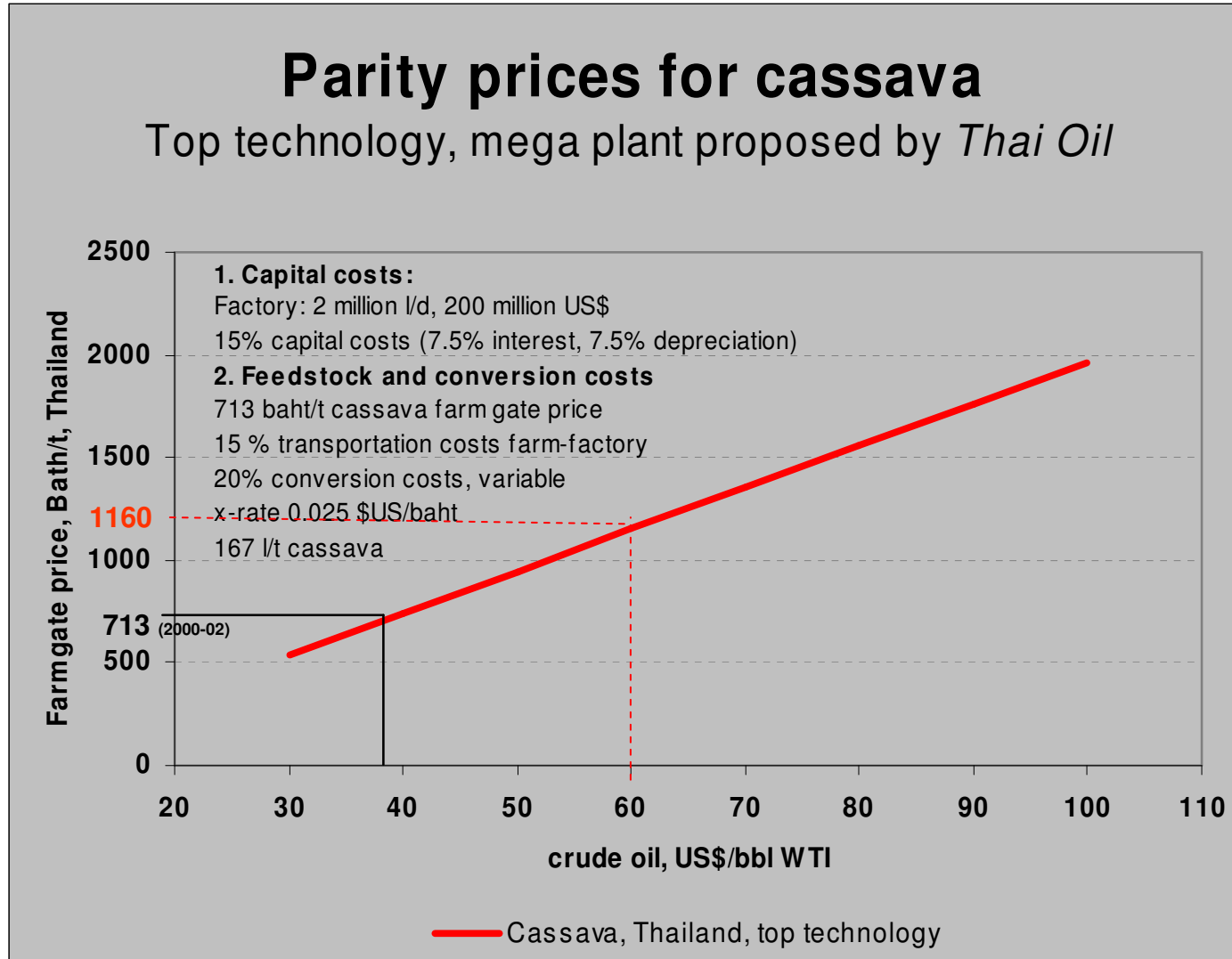


Price effect 2: Price link tightens with rising energy prices

The competitiveness



Price effect 3: Ceiling price effect



Source: own calculations based on EIA, IEA, FAO data. J. Schmidhuber (2005)



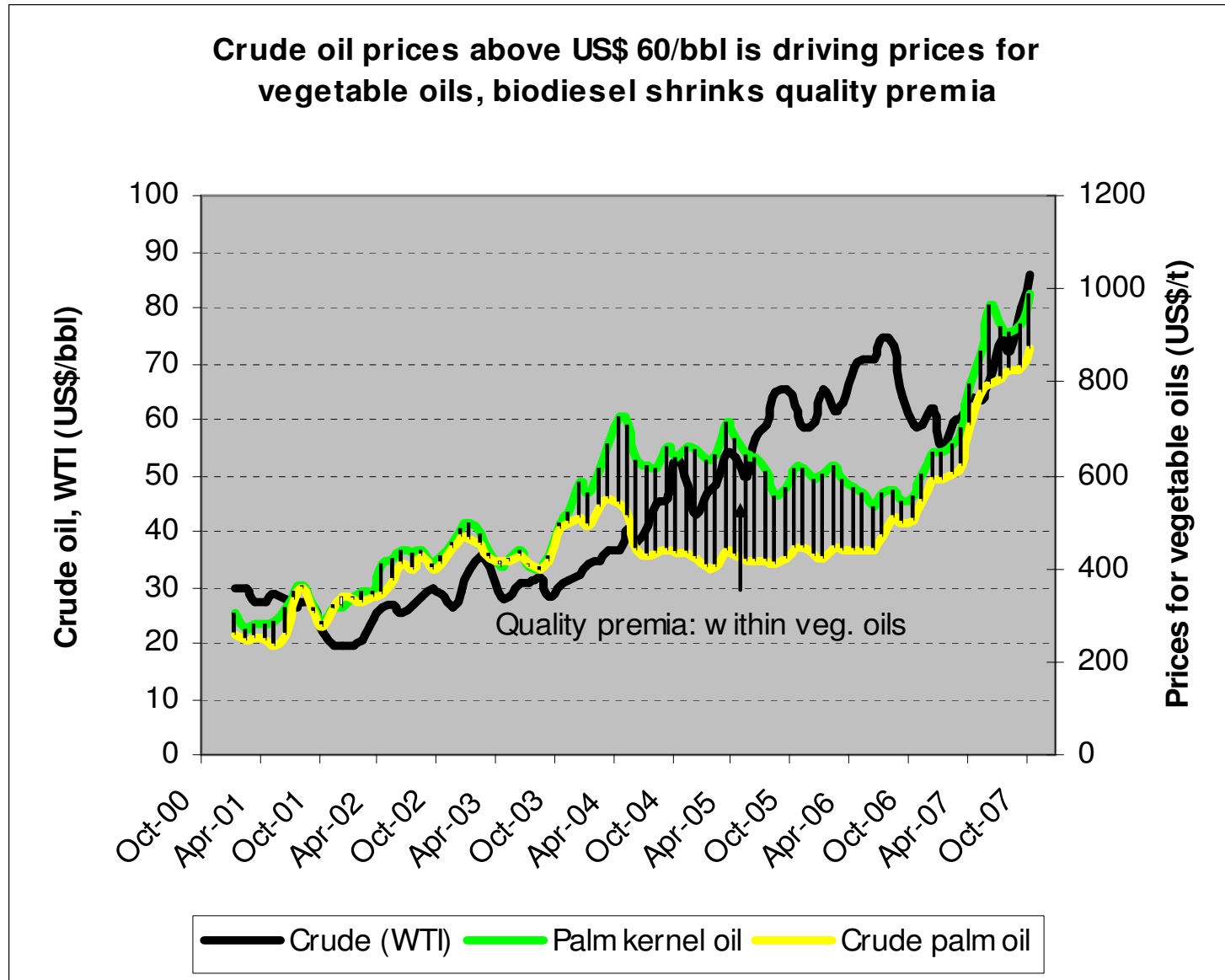
Price effect 4: Energy/protein differentiation

	An additional 10 million tonnes of ...				
	Sugar	Maize	Sugar and Maize	Soybeans and Maize	Sugar, Maize and Soybeans
Corresponding energy [biofuels]	0.195 EJ	0.087 EJ	0.282 EJ	0.167 EJ	0.349 EJ
Commodity	... used for biofuels would change international prices (percent) in the long-run by :				
Sugar	+9.8	+1.1	+11.3	+2.3	+13.8
Maize	+0.4	+2.8	+3.4	+4.0	+4.2
Vegetable oils	+0.3	+0.2	+0.2	+7.6	+7.8
Protein	+0.4	-1.2	-1.2	-8.1	-7.6
Wheat	+0.4	+0.6	+0.9	+1.8	+2.0
Rice	+0.5	+1.0	+1.2	+1.1	+1.4
Beef	+0.0	+0.2	+0.2	+0.4	+0.4
Poultry	+0.0	-0.4	-0.4	-2.1	-2.0

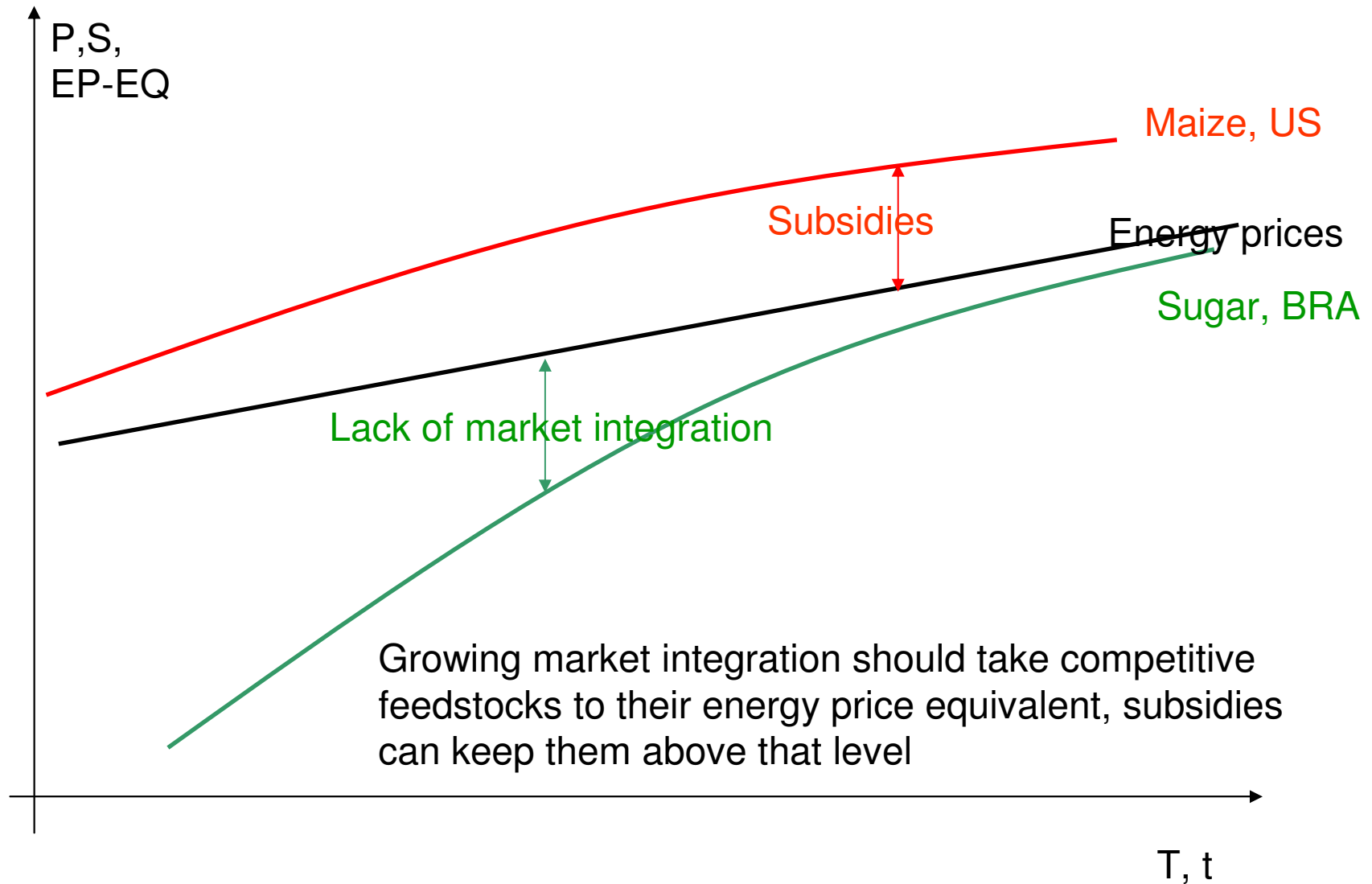
Source: @2030 simulation results (2005)



Price effect 5: declining quality premia

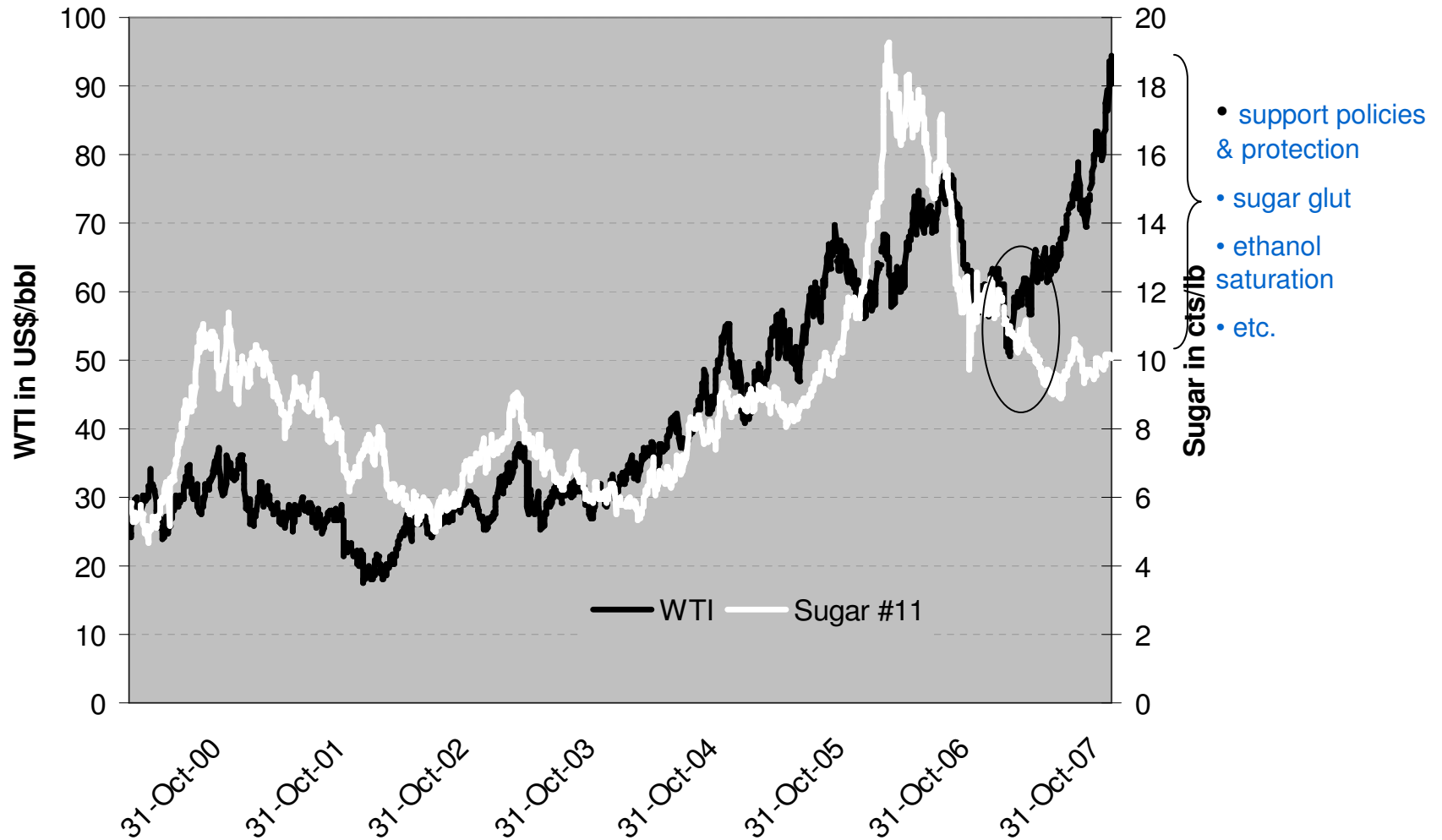


Price effect No.6: Distortions through subsidies and protection



Policy distortions can affect floor price effect significantly

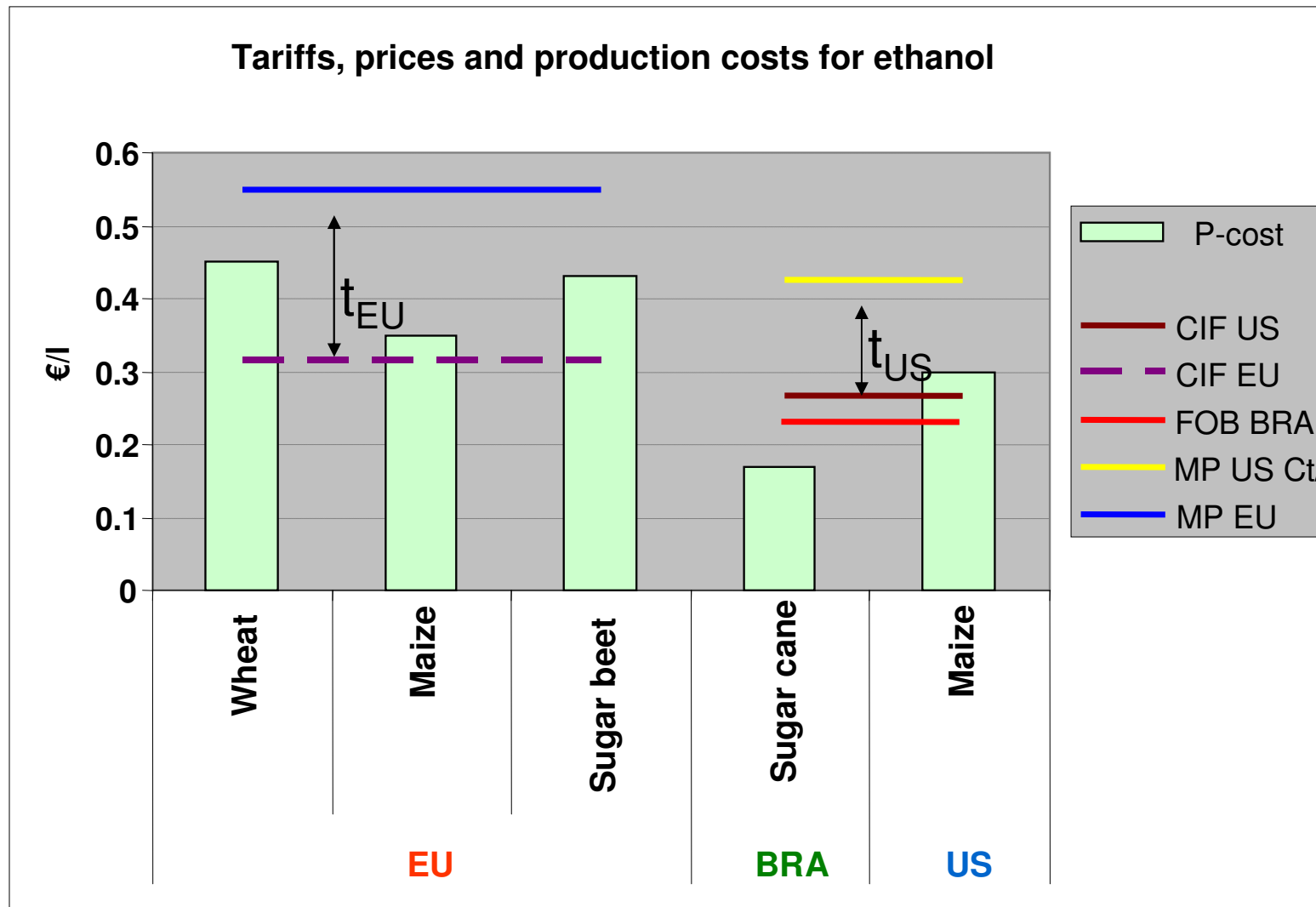
Oil and sugar - have they lost the track for good?



Data: Nybot and EIA, J. Schmidhuber (2007)



How strong is the impact of policy distortions?



Impacts of EU and US ethanol policy reforms (tariff & subsidy cuts) on international prices for:

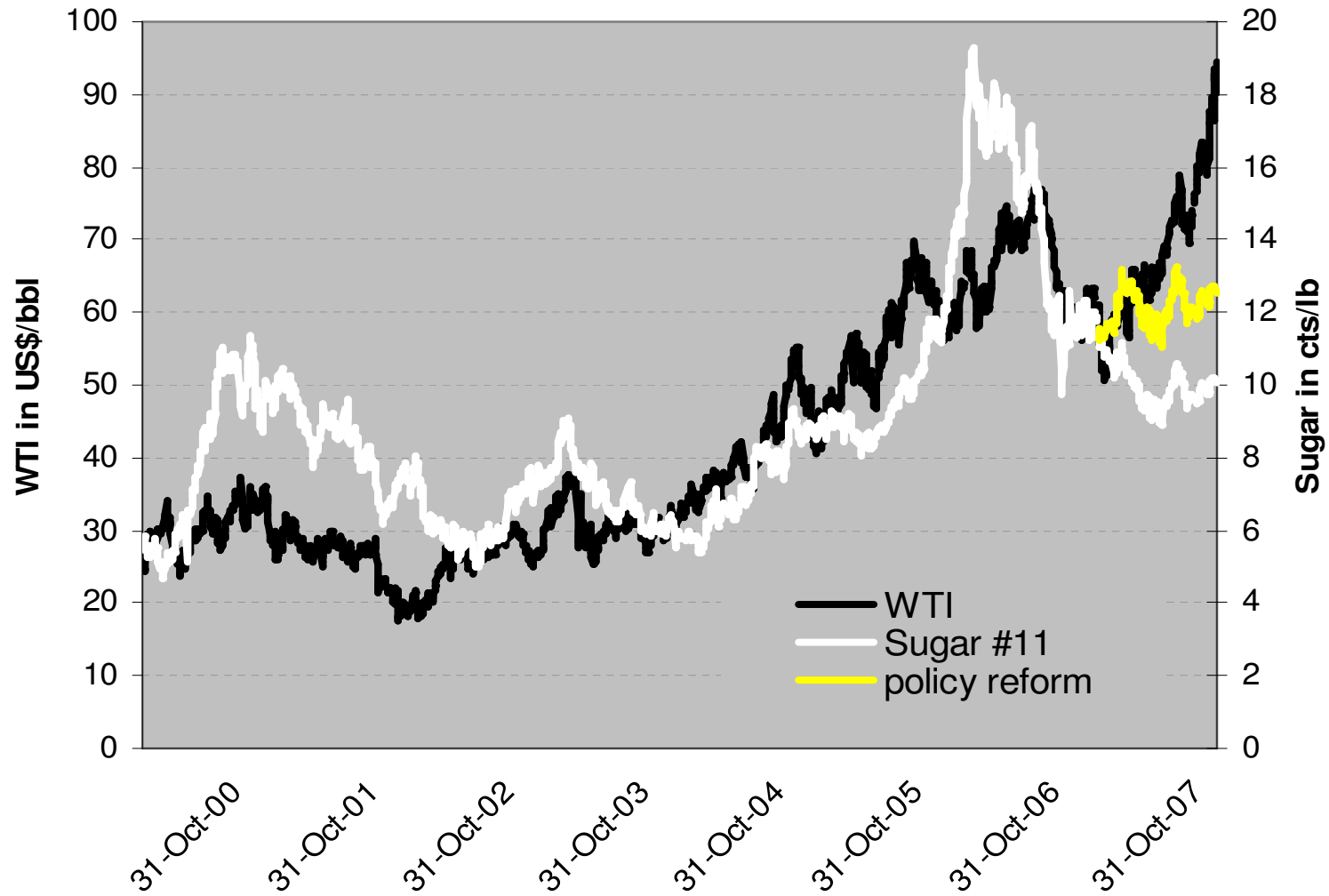
Reforms in:		Wheat	Maize	other CG	Sugar	Veg. oils	Protein
		% change vis-à-vis 2007 baseline					
EU	ST	-8.1	-0.9	-4.7	5.1	-1.2	2.3
	LT	-3.7	-0.5	-2.3	2.9	-0.9	1.3
USA	ST	-11.2	-15.9	-6.3	18.8	-2.3	9.6
	LT	-5.9	-9.1	-3.9	6.3	-1.4	5.1
both	ST	-19.3	-18.5	-12.3	24.9	-3.7	12.3
	LT	-9.6	-11.2	-7.3	9.4	-2.5	6.8

Source: @2030 simulation results (JS/11/2007)





Oil and sugar - the impact of policy EU and US reforms



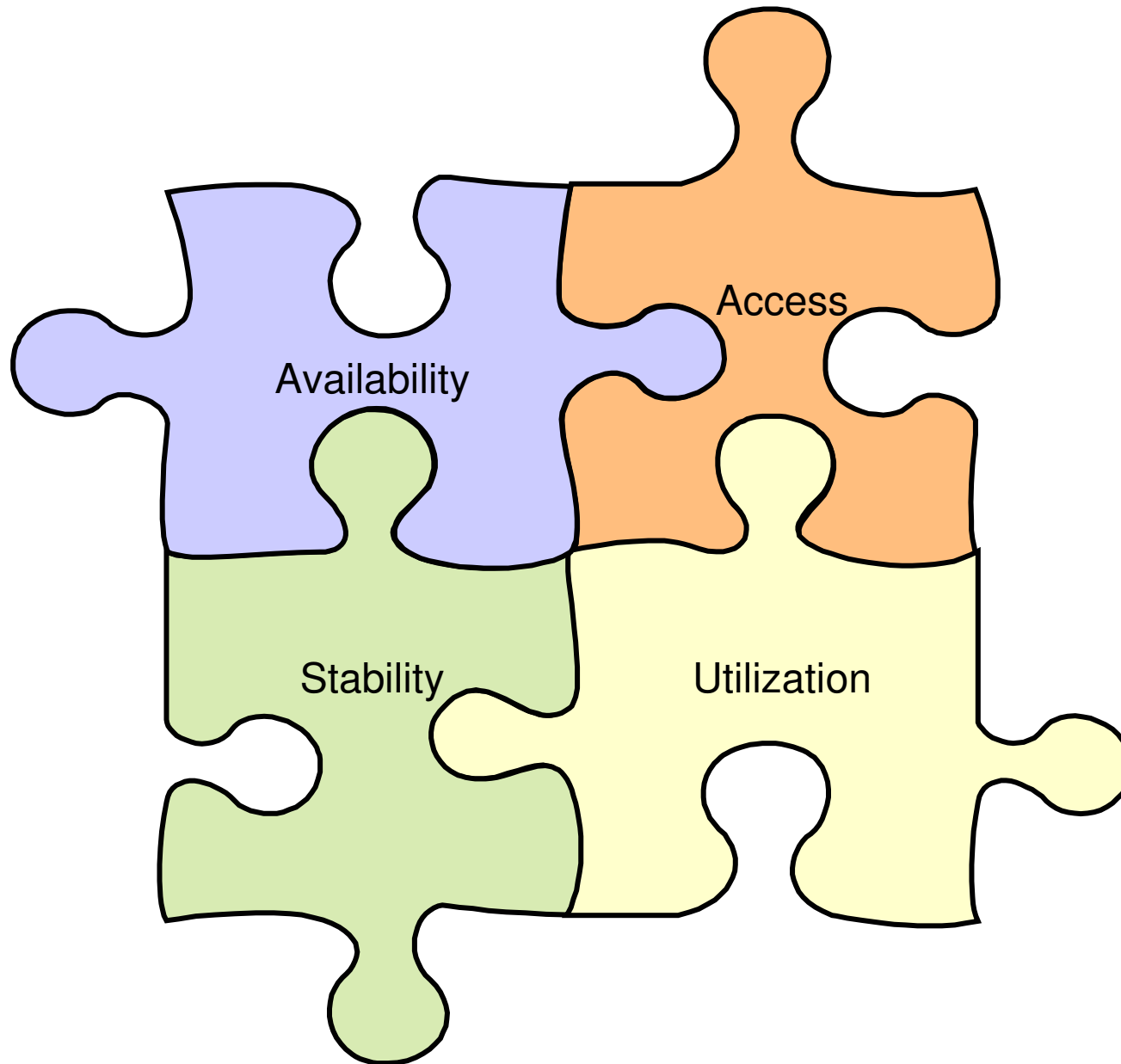
Data: Nybot and EIA, J. Schmidhuber (2007)

Overview

1. The driving forces and the outlook for agricultural markets
2. The food outlook
3. How does bioenergy use affect international agricultural markets and prices?
 1. A new paradigm for global agriculture?
 2. Floor price effects.
 3. Tighter links, multi-market effects
 4. Ceiling price effects.
 5. Differential, non-uniform price changes across agricultural commodity markets.
 6. Shrinking quality premia?!
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Bioenergy can affect all four dimensions of food security

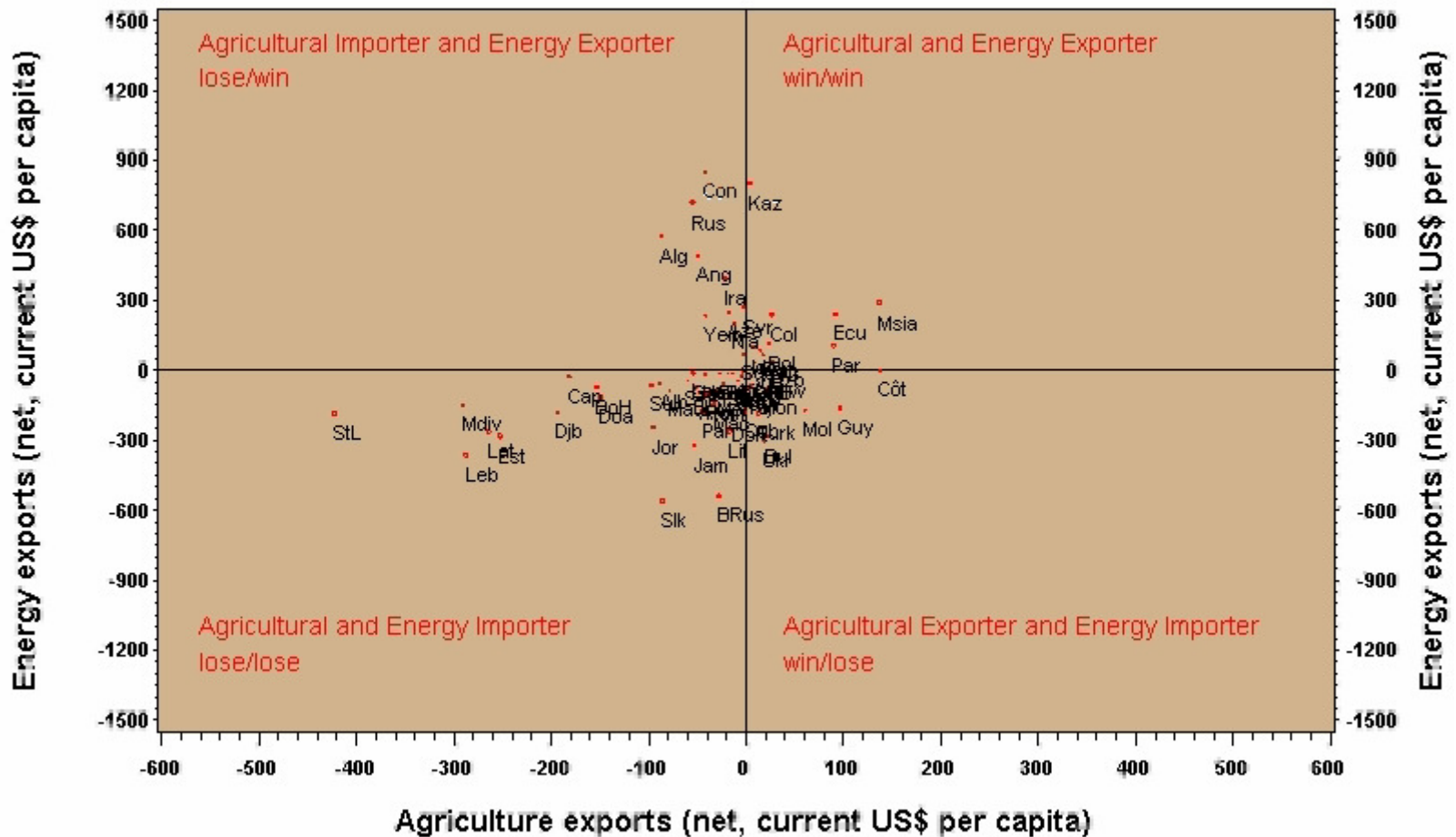


International food security: Boom or bust for trade balances through an increased link between energy and food prices

Poor countries: Winners and losers from the energy transition

Only countries with less than US\$5000 GDP (in constant 95 US\$)

The assumed energy price is: **US\$30/bbl**



Data: FAO, OECD-IEA and US-EIA
Josef Schmidhuber, ESDG



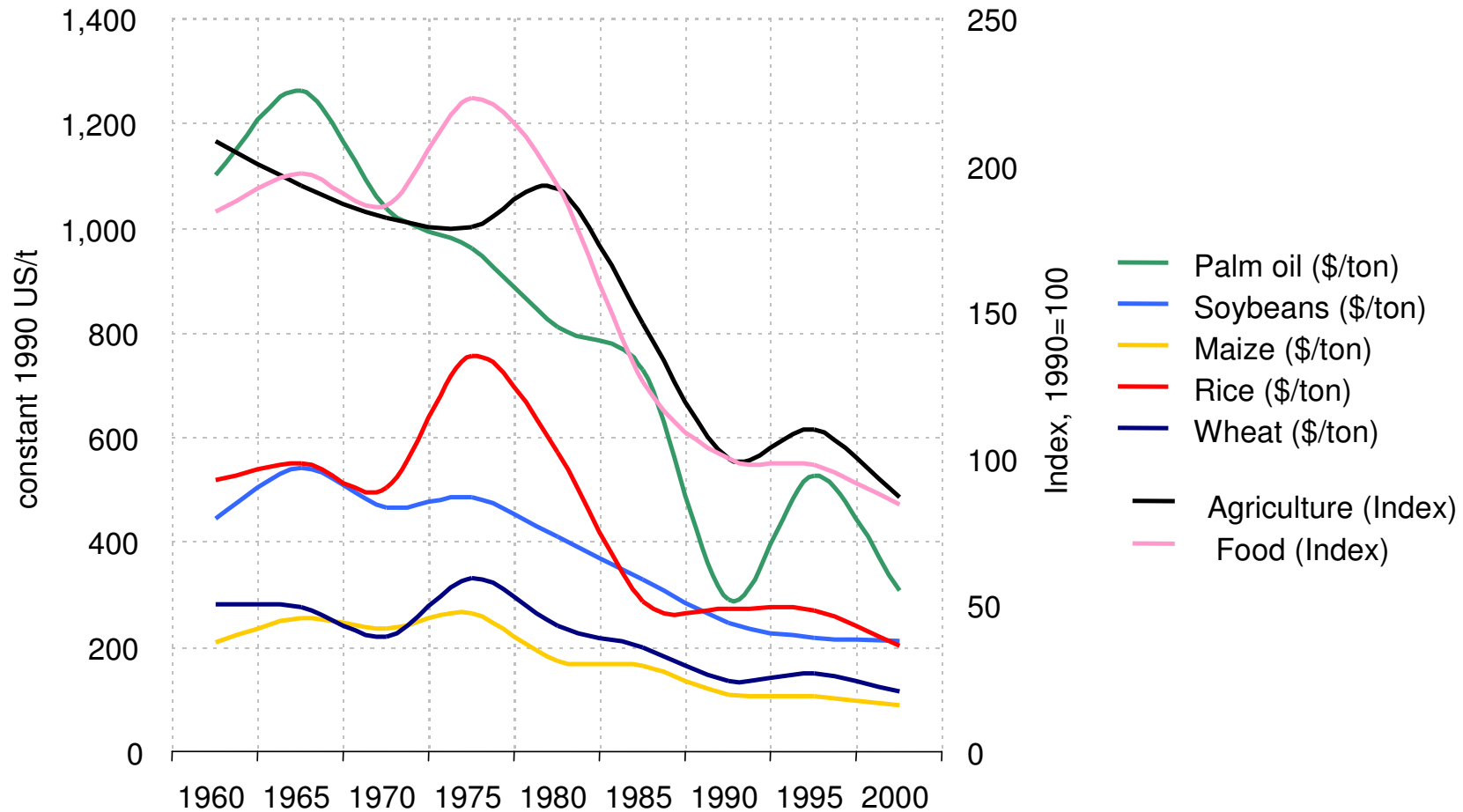
Summary, Conclusions, Outlook

1. Potential: differentiate between theoretical, technical and economic potential
 - Energy markets are “large” compared with agricultural markets; create (perfectly) elastic demand for competitive agricultural produce.
 - Energy markets *drive* agricultural markets but not vice versa.
 - In the long-run, bioenergy can become a noticeable contributor to transportation fuel supplies
 2. Price and market effects
 - Distinguish short-run from long-run!
 - *Floor price* effect
 - Price *links tighten* with rising energy prices
 - *Ceiling price* effect
 - Lower *quality price* premia, at least short-term
 - Policy distortions can disrupt “energy pricing”
 - Paradigm shift possible with an end to falling real prices, but neo-Malthusian scenarios are unwarranted.
 3. Impacts on food security
 - Food security: Winners and losers depending on the trade balance and net effects on energy and food prices:
 - Food availability likely to decline, access to food to improve? rural-urban shift in food security
- Bioenergy is good news for agriculture (but not necessarily for anything else)



The traditional market paradigm

A drastic decline in real prices for food and agriculture



Source: World Bank, "Pink Sheets"

