

The background features a vibrant, abstract pattern of colors including reds, oranges, yellows, and greens, resembling a textured surface or a close-up of natural materials. This pattern is partially obscured by a dark grey, semi-transparent overlay that covers most of the slide.

Energy and Agriculture

Gary Blumenthal
World Perspectives, Inc.




Opening Thoughts

1. Energy is not funny.
2. Defies common assumptions.
3. *It is manageable:*
“Agriculture and Rural Communities are Resilient to High Energy Costs” Amber Waves, April 2006, USDA/ERS



Energy and the Agriculture Sector

Overview

- Agriculture and **energy use**:
 - the largest user of energy – solar energy. 
 - Changes by geography (pests, irrigation, etc.)
- **Conservation**: efforts underway since the first oil crisis of the early 1970's.
- **Impact**: Food quality and quantity are correlated to energy availability.

Labor Trumps Energy

- Australia sends shrimp to China for processing and shipment back to Australia
- U.S. Congress moves to block chicken sent to China for processing and re-importation (AI)



Farm-Level Impacts

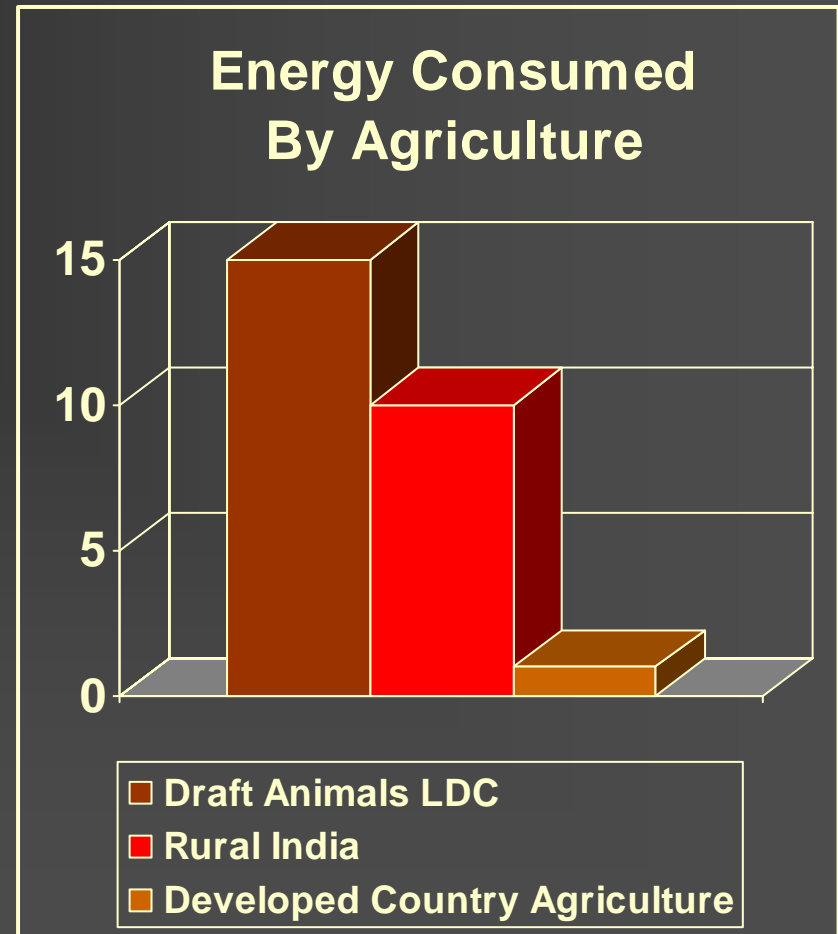
And Adjustments



Agriculture as a User of Energy

More Fossil Fuel, Less Relative Impact

- Fertilizer (natural gas) is more than double the cost per acre as tractor fuel.
- Green revolution agriculture is more “hydrocarbon” intensive, but scale yields savings.
- Savings in energy expenditures by rich countries in the agrifood sector has little impact in the larger economy.



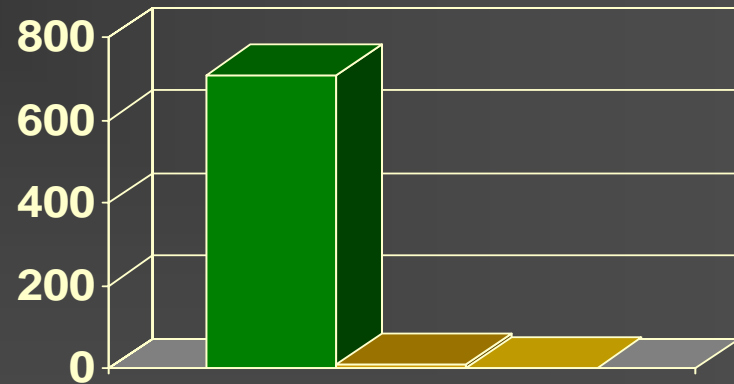
Farmers Feel Higher Energy Prices



- Farm fuel costs +113% versus four years ago.
- Greenhouse production is particularly impacted.
- Congress has \$1.5 billion relief to farmers but rejected \$100 per taxpayer.



Need for Emergency Farm Energy Assistance Package

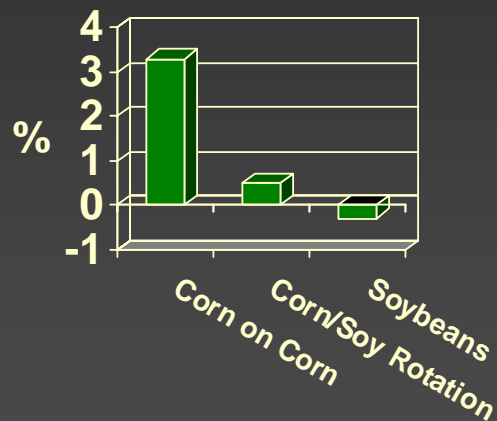


Source: Washington Wheat Growers

■ Very Important ■ Somewhat Important
■ Not Important

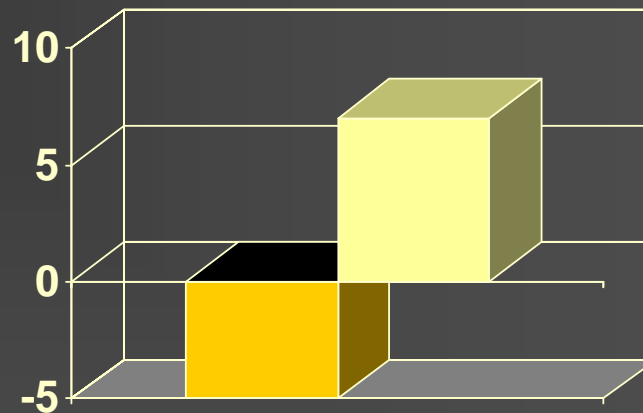
Energy's Importance

High Yield Production With High Energy Costs



Source: Duffy & Hanna, ISU

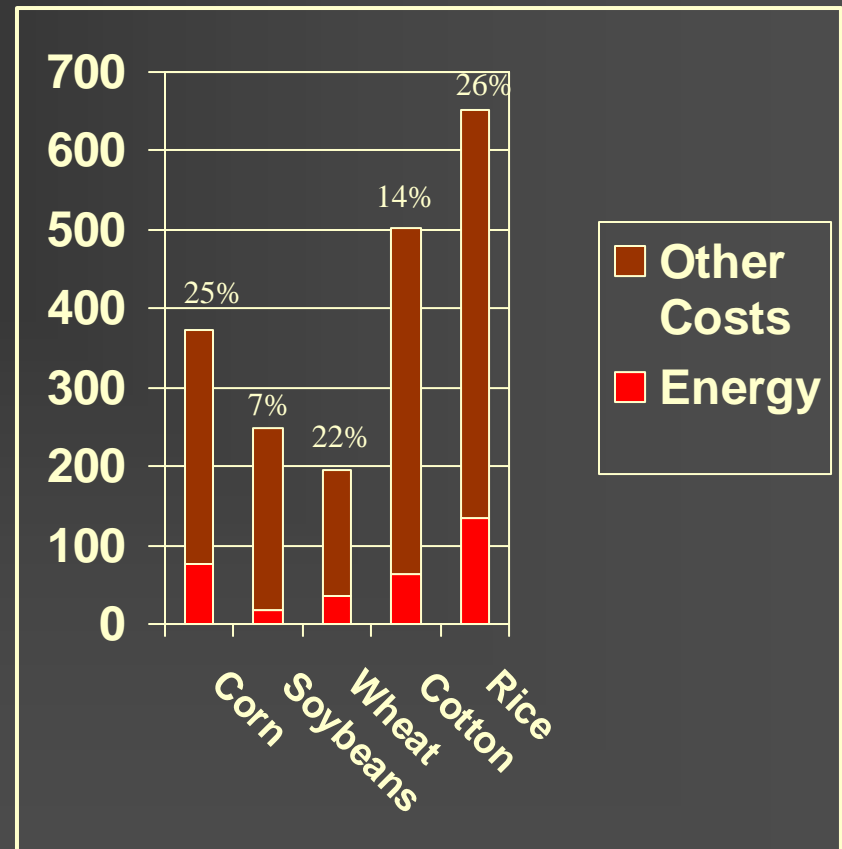
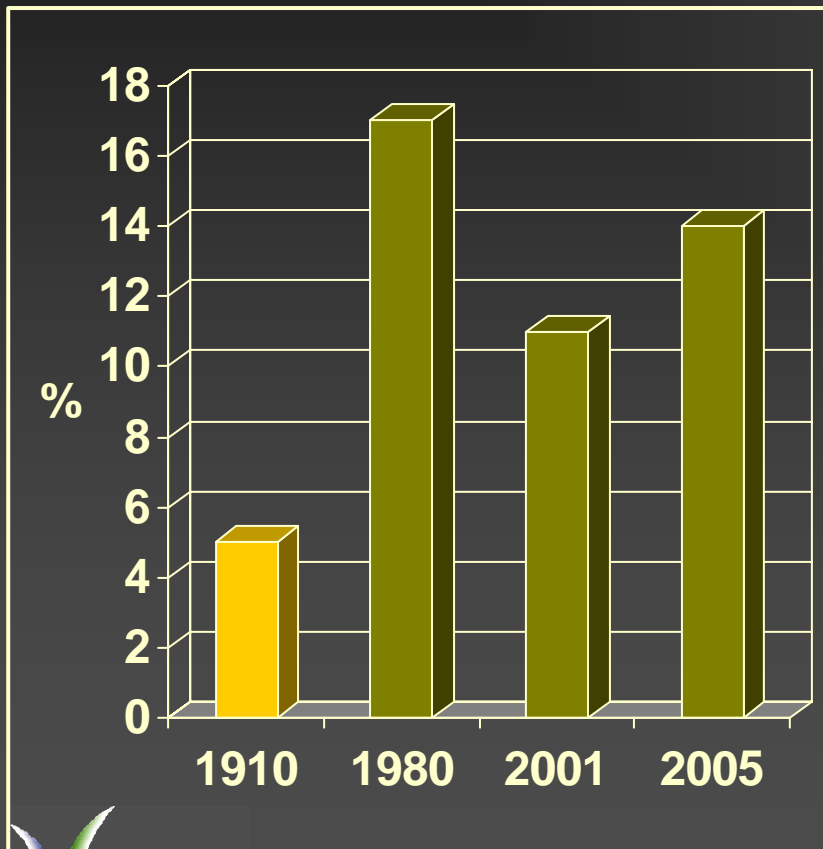
Energy Driven Percent Change in USA 2006 Plantings



Source: USDA

■ Corn ■ Soybeans

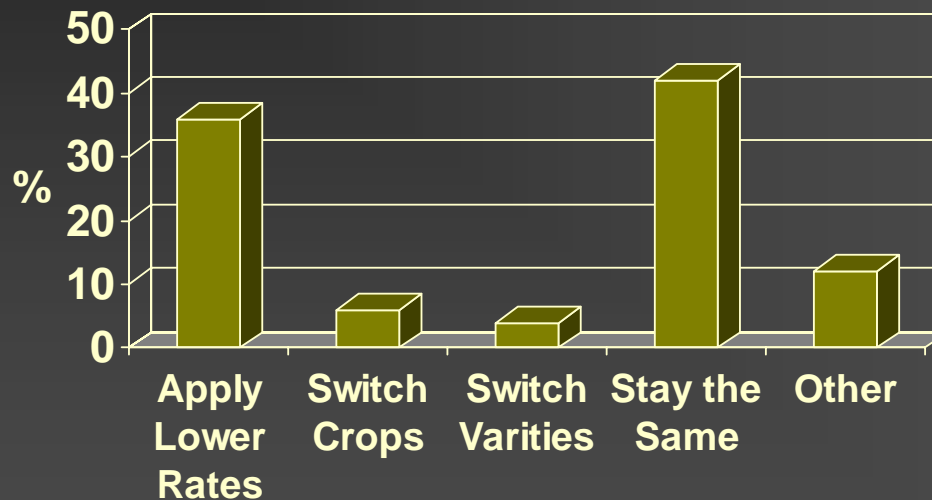
Energy as Share of Cost of Production (USA)



Some Elasticity in Gas/Fertilizer Use – but in the U.S.



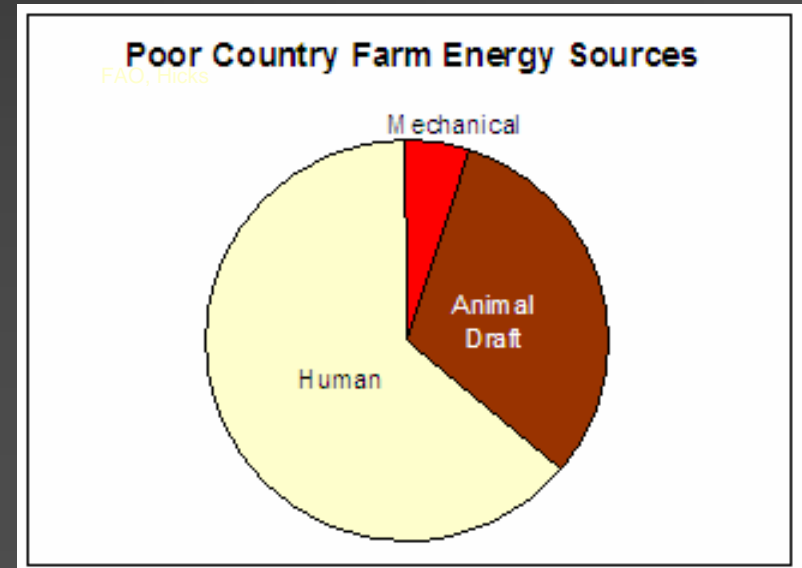
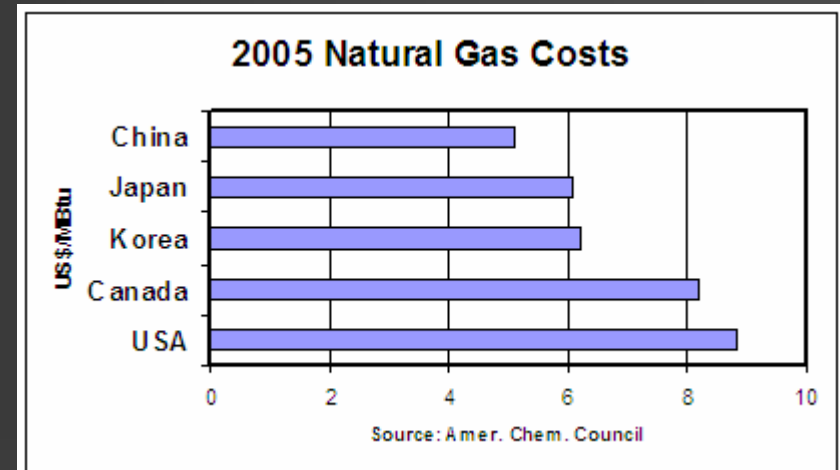
Farmer Intentions Due to Higher Fertilizer Costs



Sources: Cotton Farming, WPI

Varied Energy Factors

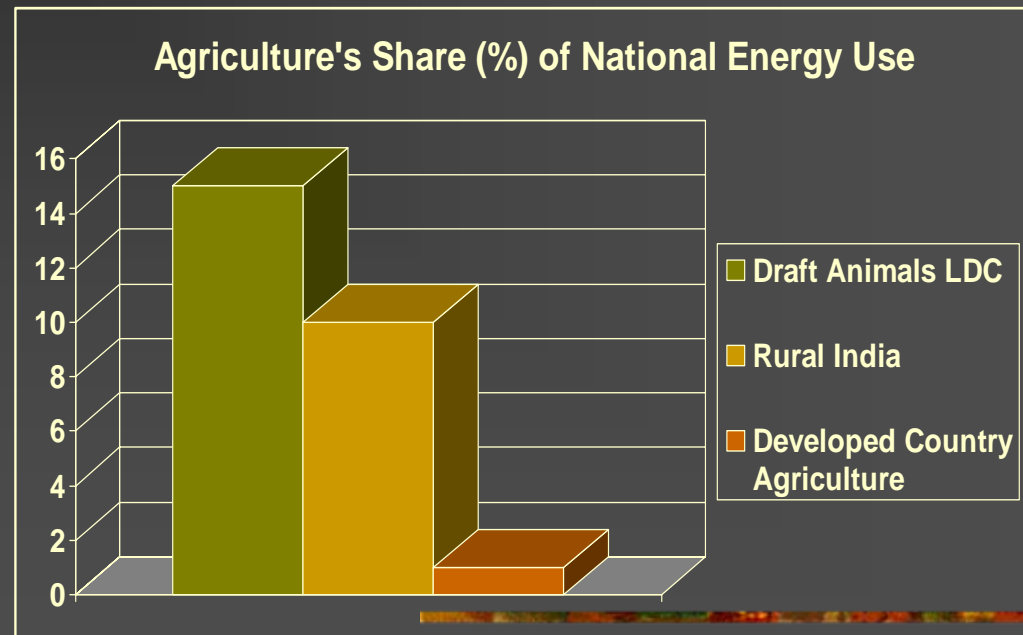
- Natural gas pricing varies by country.
- Commercial energy consumption in agriculture varies greatly (relatively high in China, Malaysia, Thailand and Indonesia - Ramani, et al).



Agriculture's Energy Share: Developed vs. Developing

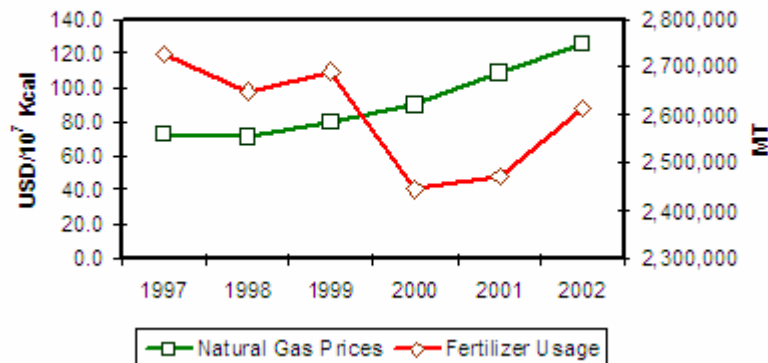
- When hydrocarbons are cheap, farmers may over-apply fertilizer, when they are expensive – they cut back.
- Developing countries apply fertilizer sub-optimally due to cost.

Energy Ratio of Marketed Product Value	
Mechanized Pennsylvania Dairy Farm	Amish Farm
0.69	0.14-0.29
Source: Marty Bender, The Land Institute	

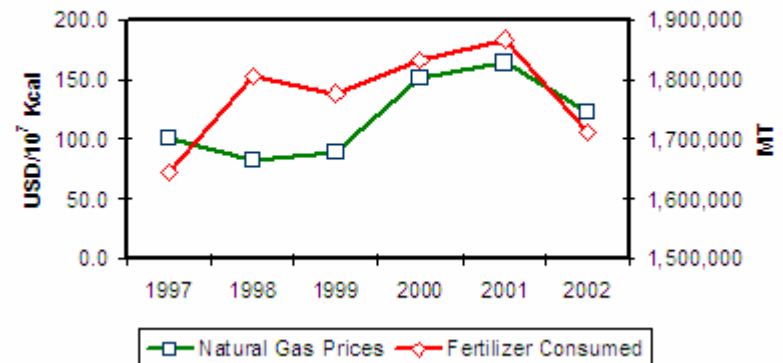


Similarities in N. America

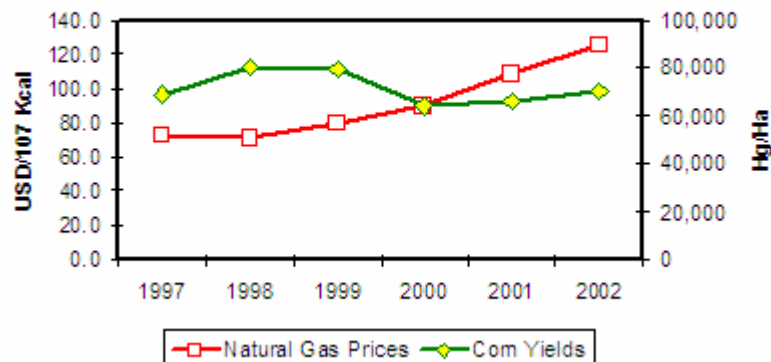
Canada Natural Gas Prices and Fertilizer Usage



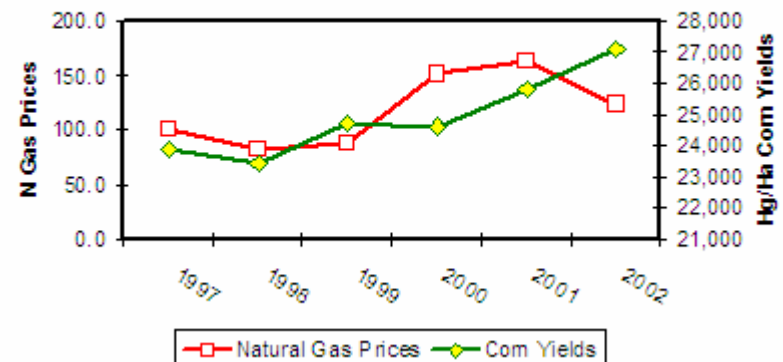
Mexico Natural Gas Price and Fertilizer Usage



Canada Input Costs and Corn Yields

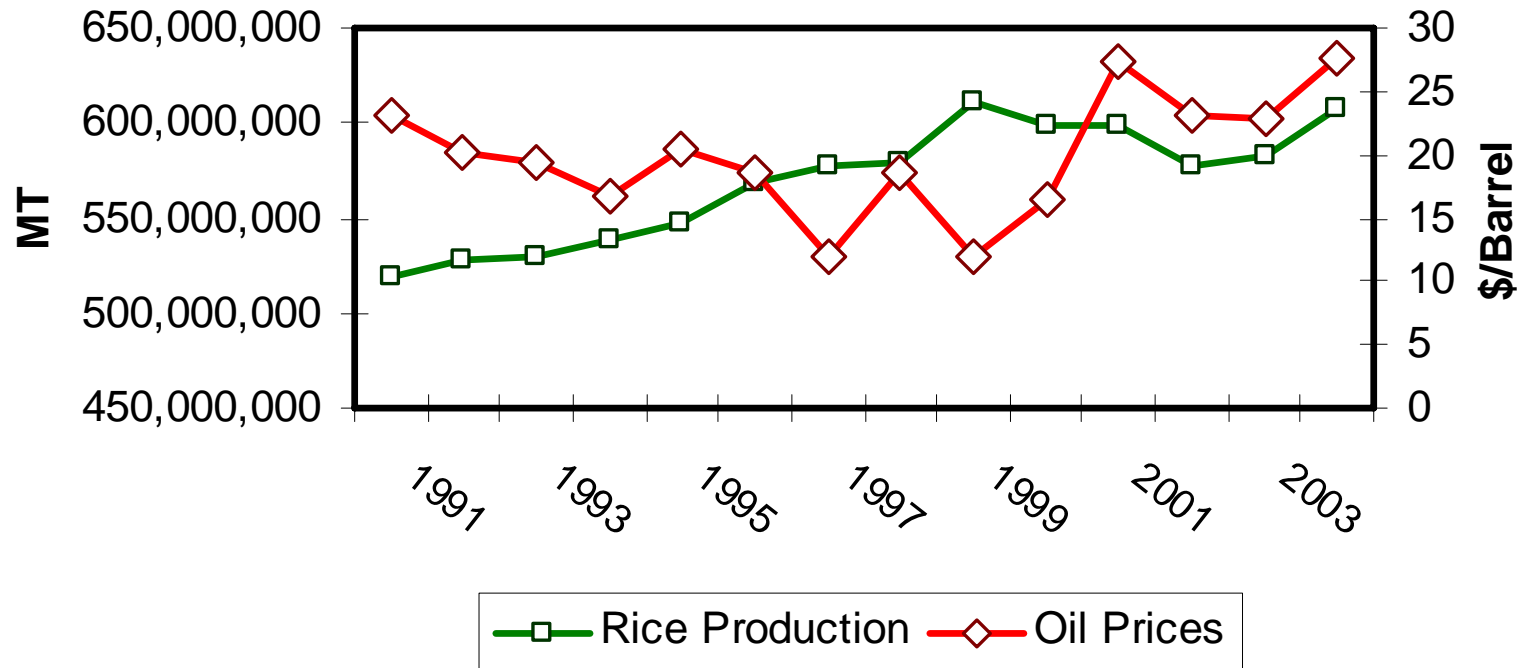


Mexico Input Costs and Yields



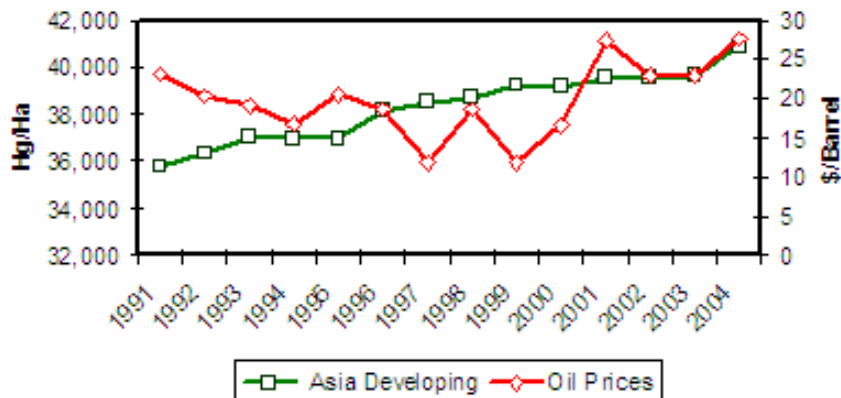
Staple Crop Exemption?

Rice as a World Staple Crop

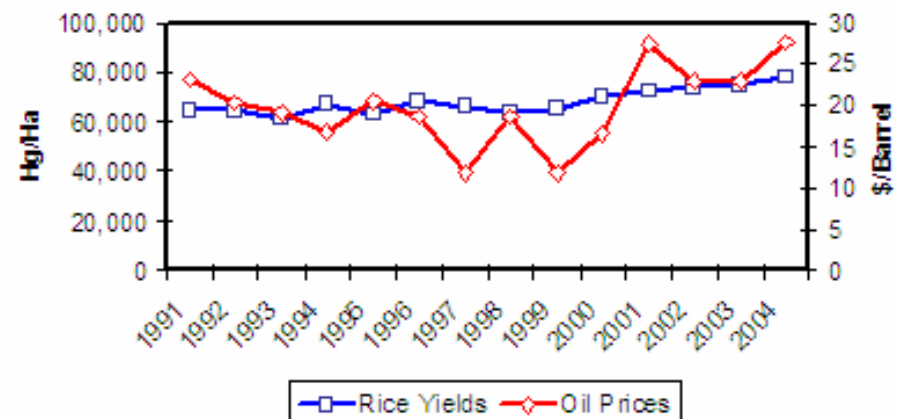



Rice Yields Do Not Change with Oil Price

Oil and Rice in Developing Asia



Oil and Rice in U SA





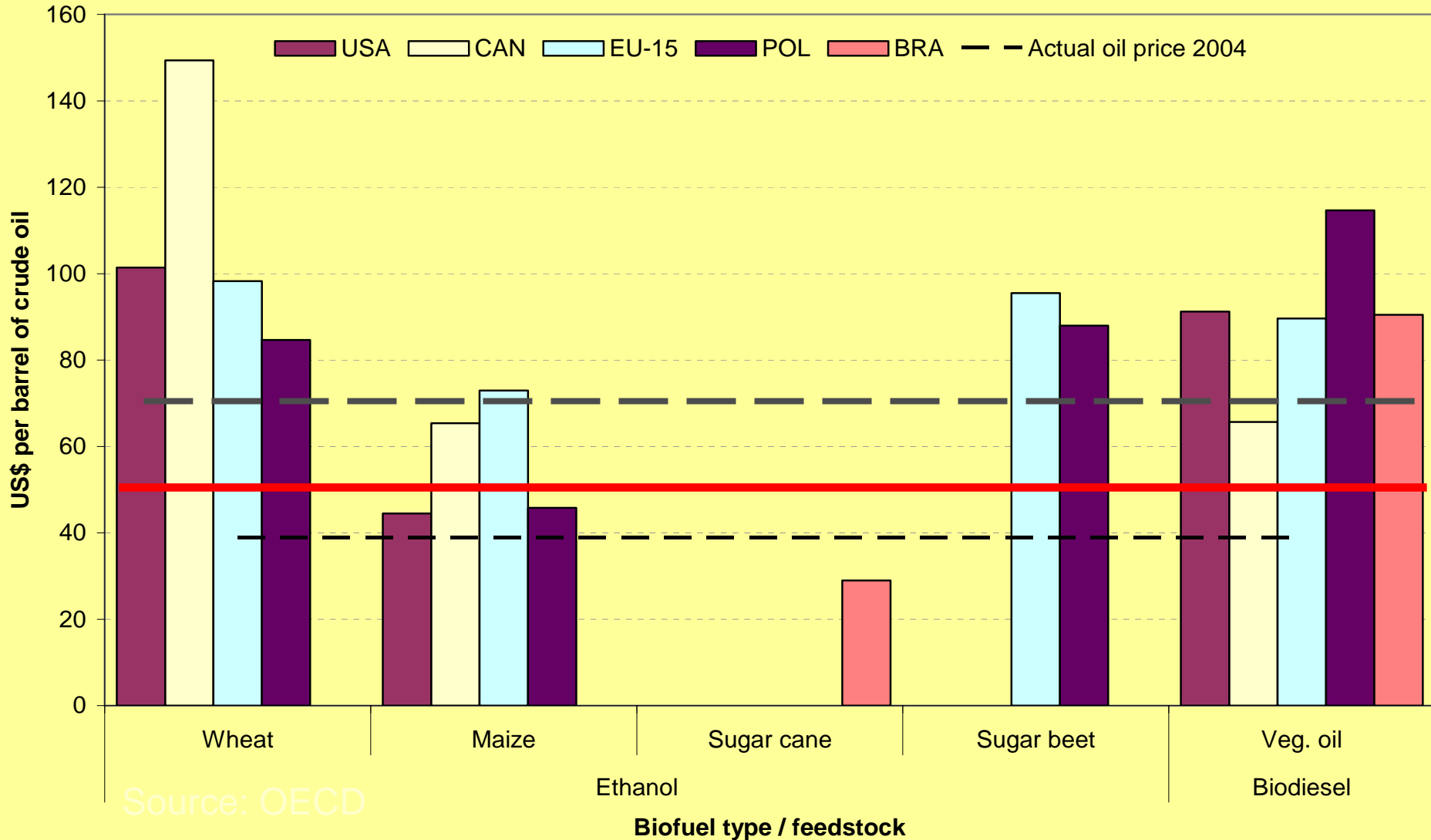
Agriculture as a Producer of Energy



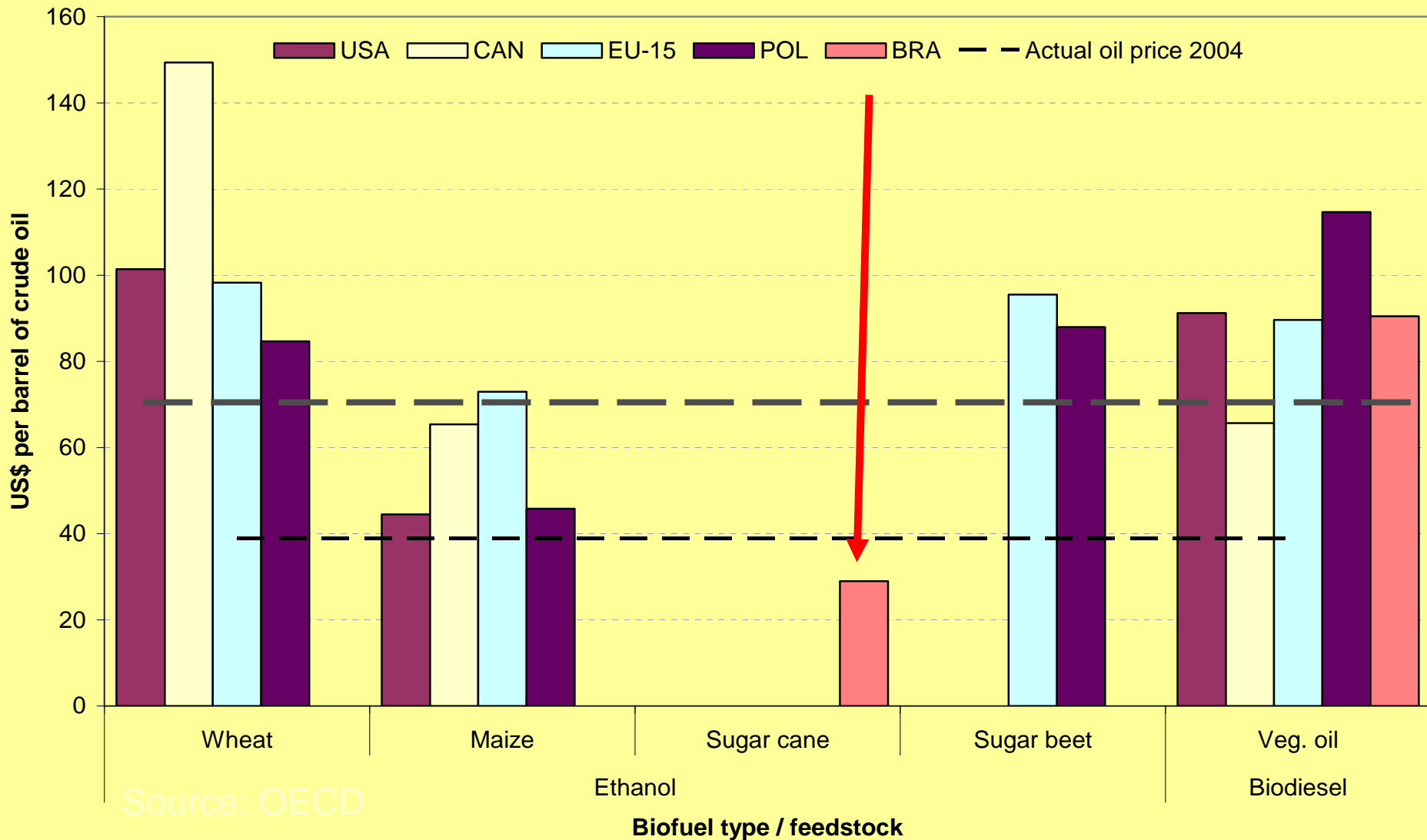
Production Costs of Biofuels

Biofuel production costs		Ethanol from				Biodiesel from Veg. oil	
		Wheat	Maize	S/cane	S/beet		
US\$ / l of fuel	USA	0.545	0.289				0.549
	CAN	0.563	0.335				0.455
	EU-15	0.573	0.448		0.560		0.607
	POL	0.530	0.337		0.546		0.725
	BRA			0.219			0.568
Petrol-based fuel prices		Gasoline (IFP) ¹⁾			Diesel (IFP) ¹⁾		
		W/ tax	W/o tax	RSC	W/ tax	W/o tax	RSC
US\$ / l of fuel	USA	0.540	0.384	0.311	0.570	0.373	0.301
	CAN	0.680	0.401	0.311	0.680	0.391	0.301
	EU-15	1.316	0.406	0.311	1.286	0.396	0.301
	POL	1.200	0.392	0.311	1.090	0.382	0.301
	BRA	0.840	0.394	0.311	0.490	0.384	0.301

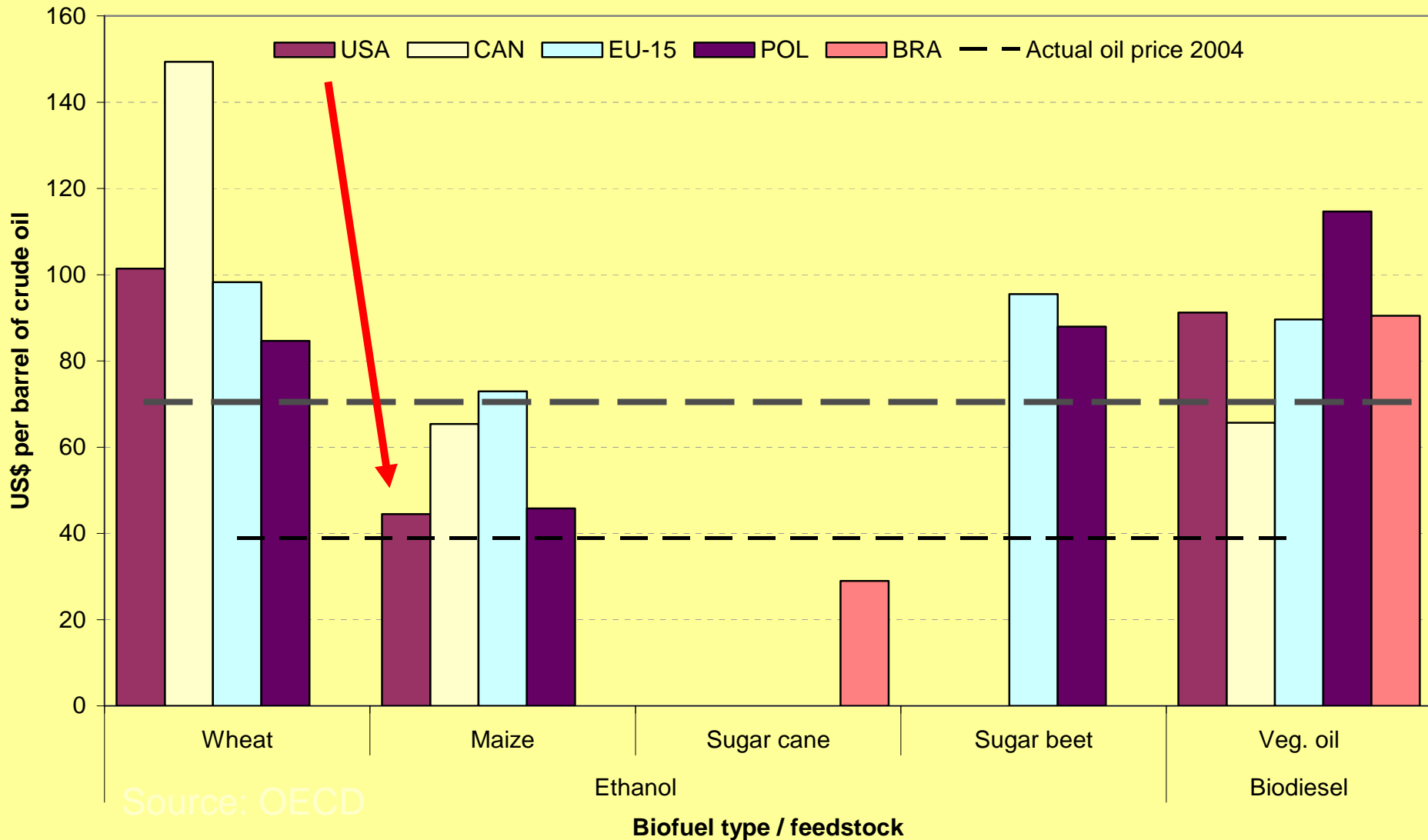
Oil Price Thresholds



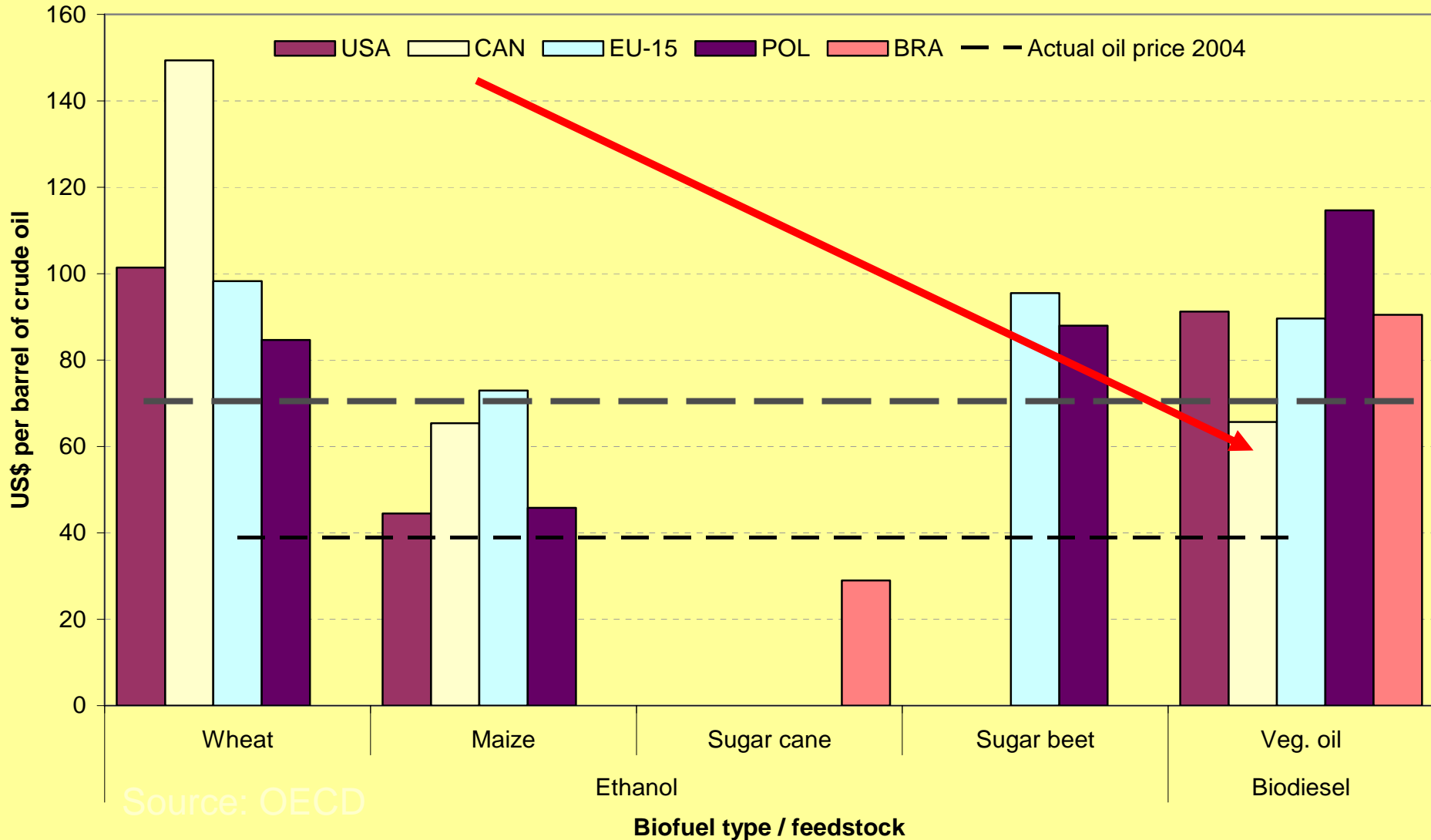
Brazilian Sugar Ethanol



USA Corn Based Ethanol



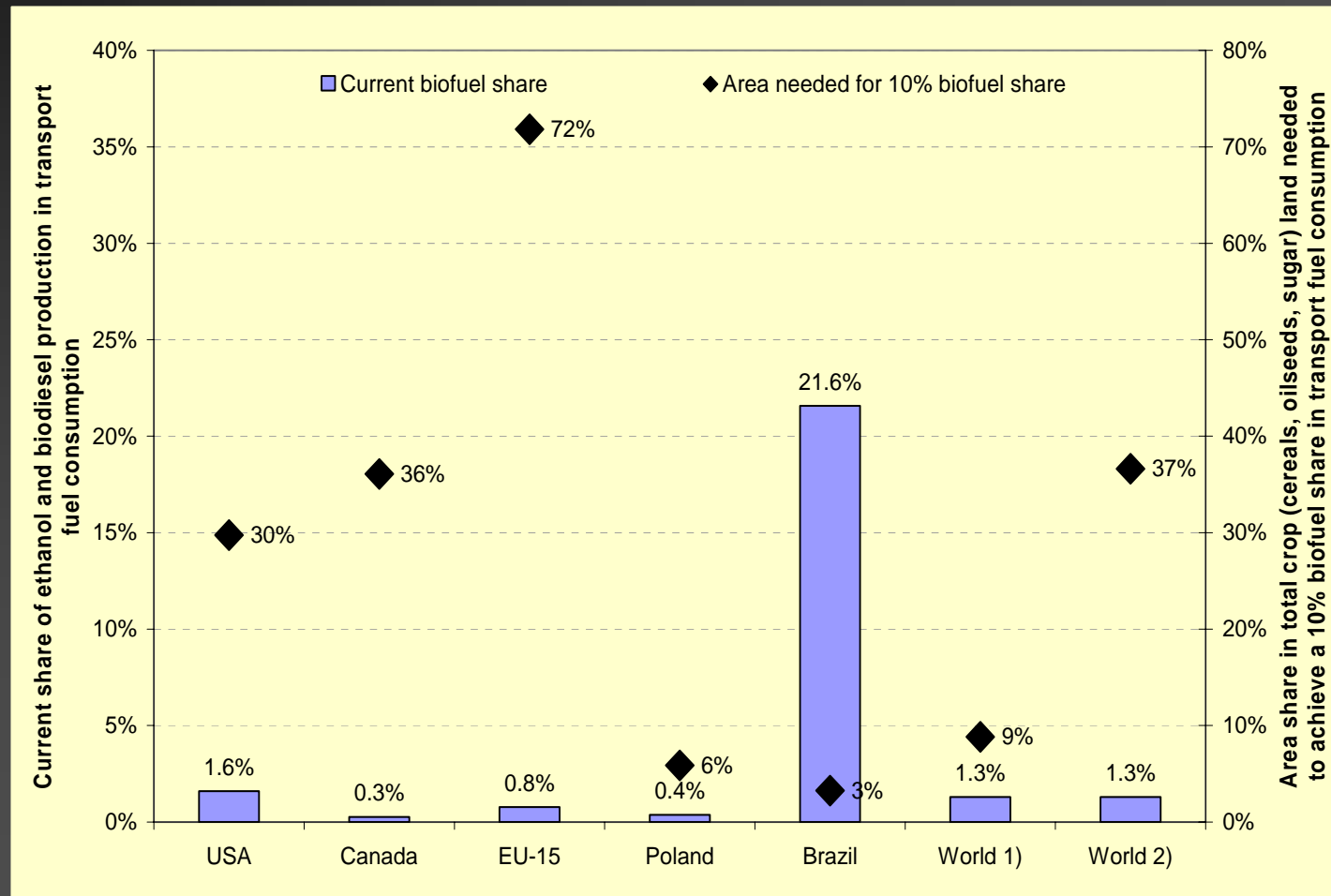
Canadian Canola Biodiesel



Limited Ability for Agriculture to Fuel the World



- Brazil = 22% of fuel on 3% of area, but low per capita fuel use.
- US and Canada would use 1/3 of land area for a 10% renewable mandate.
- EU would use 2/3 of ag area to meet 10% goal.



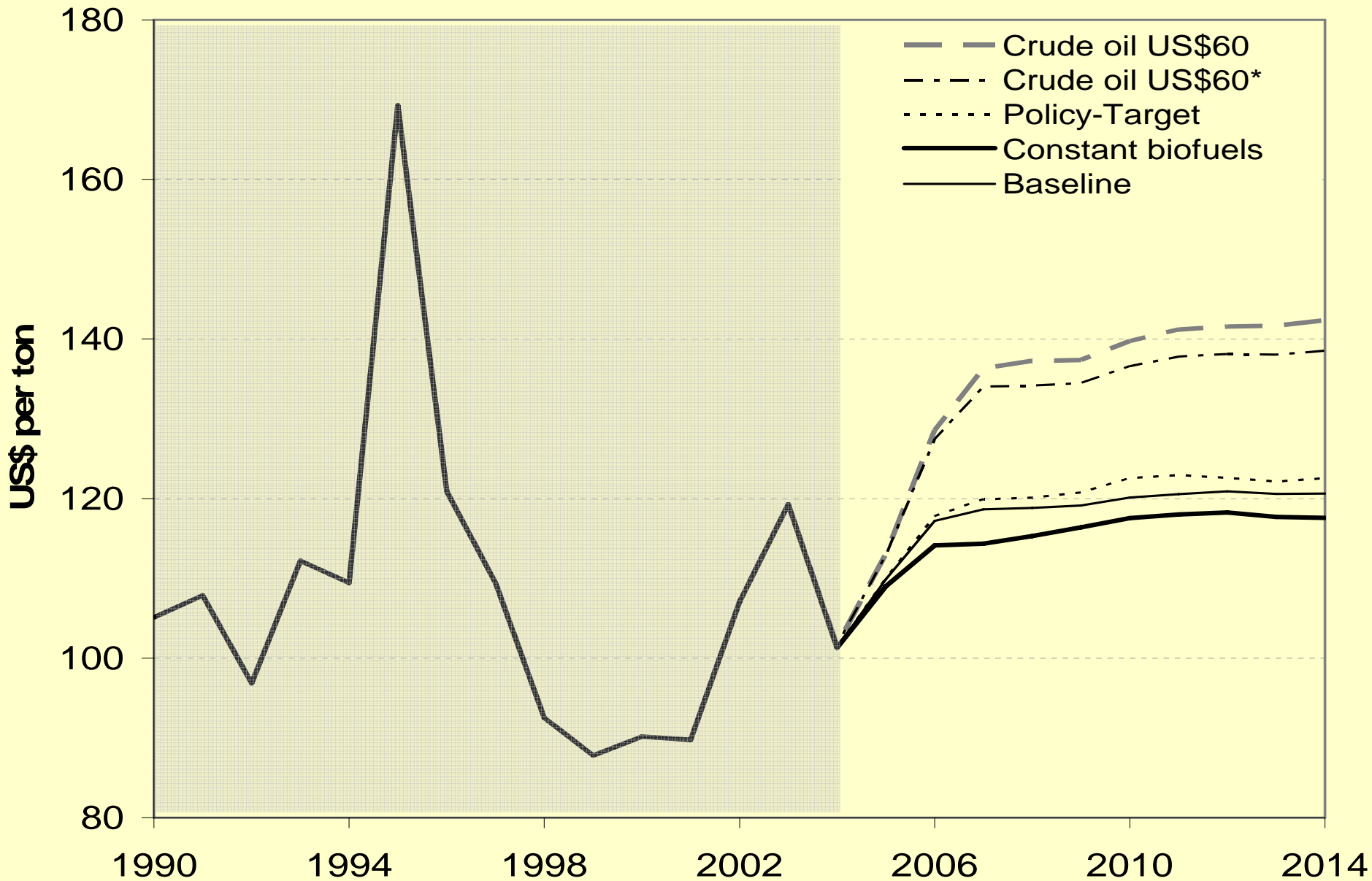


National Policy Support for Biofuels

- **Australia:** Goal is 1% renewable by 2010; maximum blend is 10%. Subsidies and grants to plant construction. Tax breaks switched to subsidies with excise tax phase-in in out years.
- **Canada:** Goal of 34% E10 by 2035 and 500 million liters of biodiesel consumed. Construction loans and excise tax exemptions are granted.
- **China:** E10 mandates in some areas and subsidies provided to four plants thus far.
- **Japan:** E3 permitted and goal of 500 million liters by 2010.
- **Thailand:** Tax breaks and other incentives to use cassava, sugar and rice in reaching 10% ethanol goal.
- **USA:** Goal of 7.5 billion gallons renewable by 2012 will be reached by 2007 and a much higher level will get enacted. “12 bil. gals by 2012 has no impact on food”

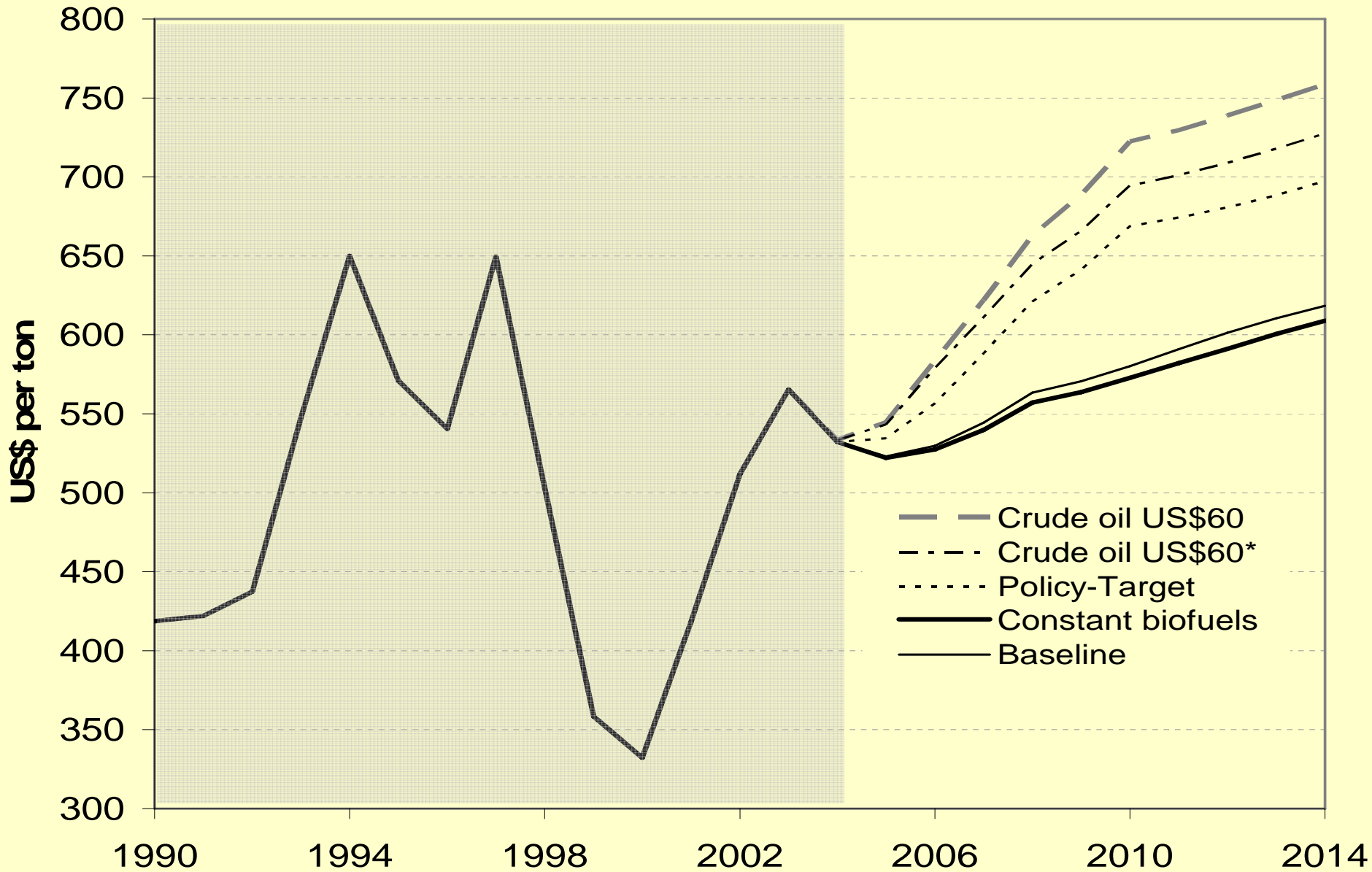
OECD

Maize



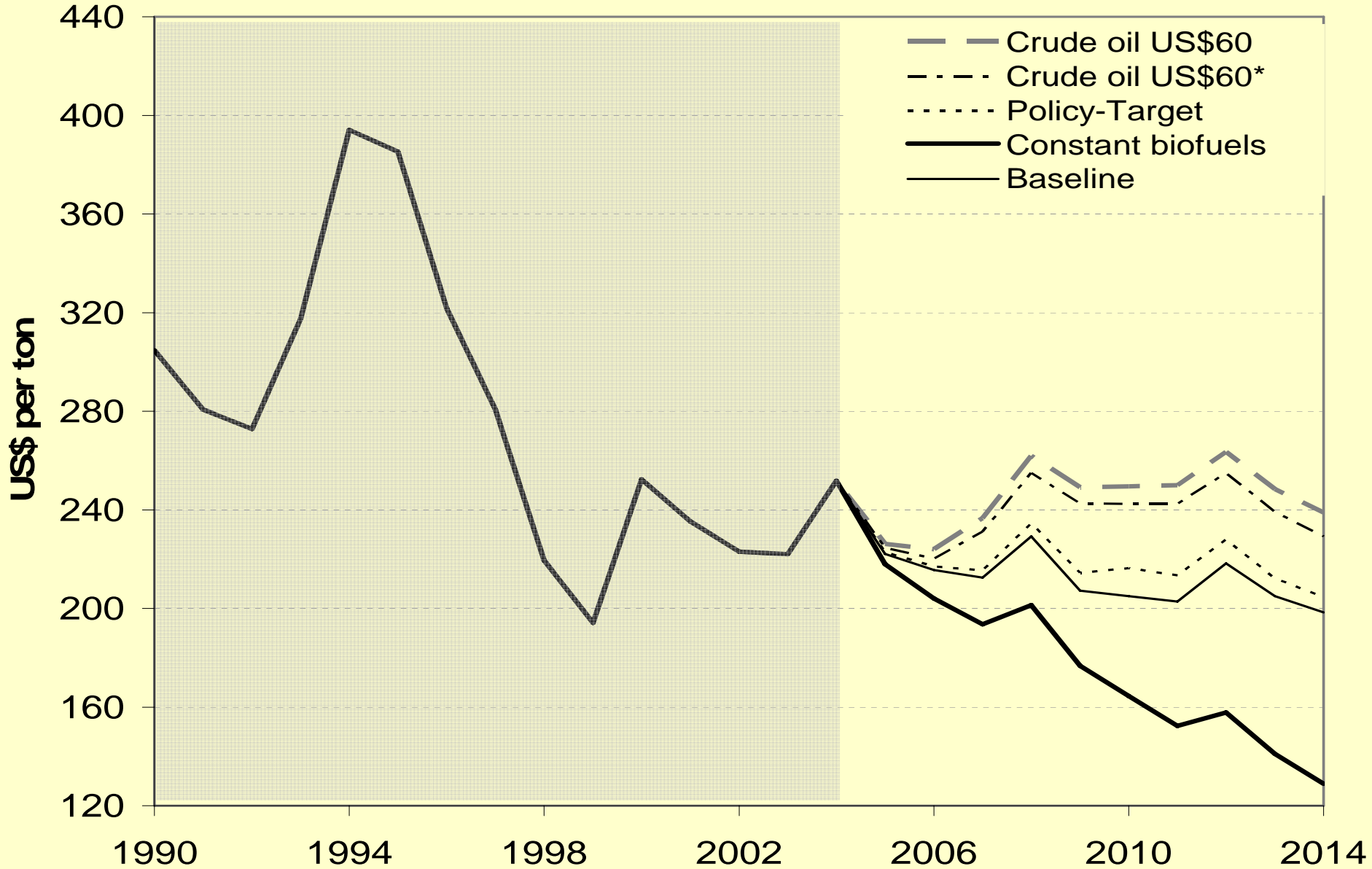
OECD

Vegetable oil



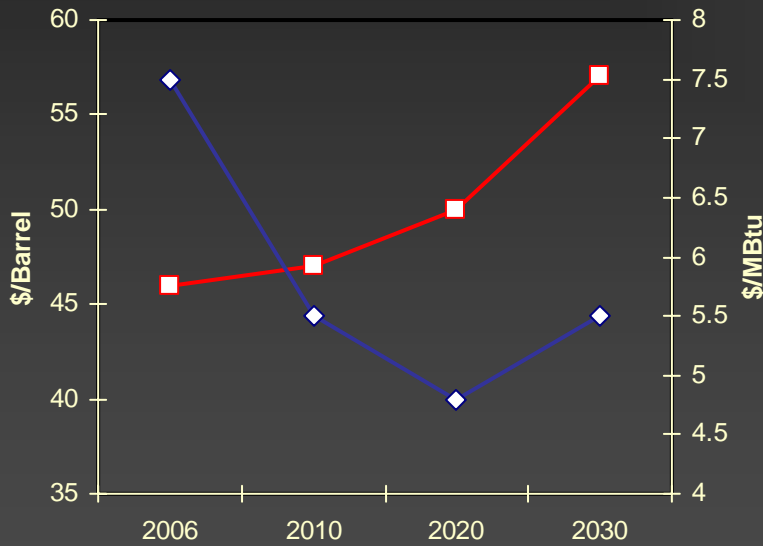
OECD

White sugar



Energy Outlook

Price Forecasts

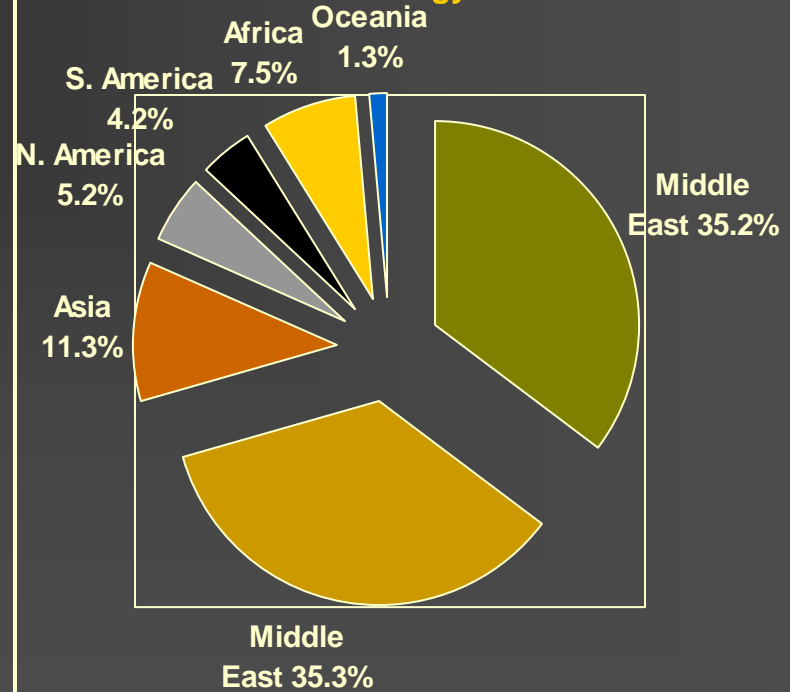


Sources: Oil - EIA, Gas - Energy and Environment Analysis, Inc.

Oil Gas

Proven Gas Reserves

World Energy Council





Adjustments

- **No-Tillage** (saves 3.5 gallons fuel/acre)

Note: Agricultural residue competes as a household cooking fuel in poor countries.

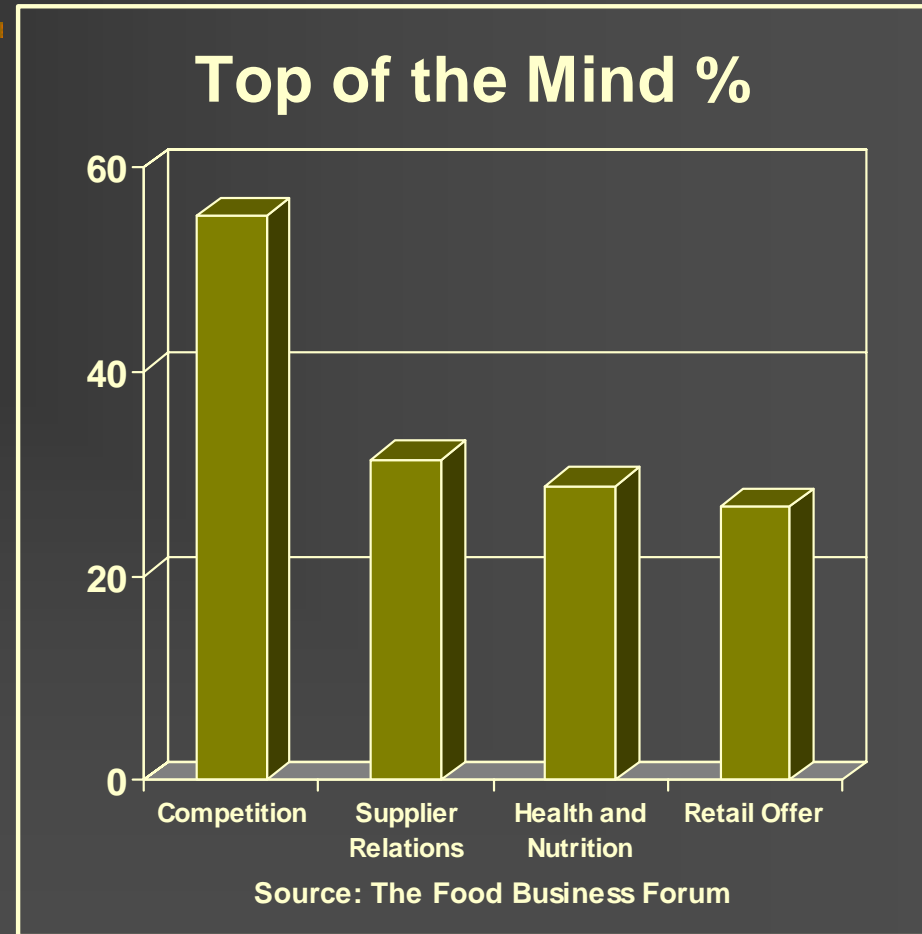
- **Low pressure irrigation** (saves \$9-41/acre over medium-high pressure systems)
- **Precision agriculture** saves \$13 per acre.
- **Biomass** gasifiers and digesters
- **Symbiotic** use of Livestock and Crops
- **Switch** to lower energy crops



Impacts Further Along the Supply Chain

Food Processors and Retailers

- CIES: 299 executives in 42 countries.
- Health and nutrition moved up from 5th to 3rd place in 2006.
- **Competition #1**: energy cost compounds price pressure. Difficulty passing it along and so innovation and differentiation is the goal; consolidation is a result.





Investor Perspectives

- 28 executives briefed Consumer Analyst Group of NY (CAGNY) in February.
- Energy cost was mentioned but not in the summarized remarks of major companies like Tysons, Kraft, Pepsico, Sara Lee, Campbell's, Cadbury Schweppes.



USA Food Processing Sector

Meeting Agendas as Proxies

- **Grocery Manufacturer's Association (CEO's):**
celebrity speakers
- **Food Products Association (technical):** AI, BioSecurity, Labeling
- **Food Marketing Institute (grocery stores):**
 - 2003 Publication
 - Energy Conference in September
 - Initiated Energy Star  program with USG





EU Food Processing Sector

- CIIA Conference Programme:
 - Food and Health
 - Food Safety
 - Obesity: Diet, Physical Activity
- CIIA Position on Biofuels:
 - Food companies need energy
 - Agriculture going to energy competes with food

Energy not amongst the eight stated priorities of the six-month Austrian presidency.





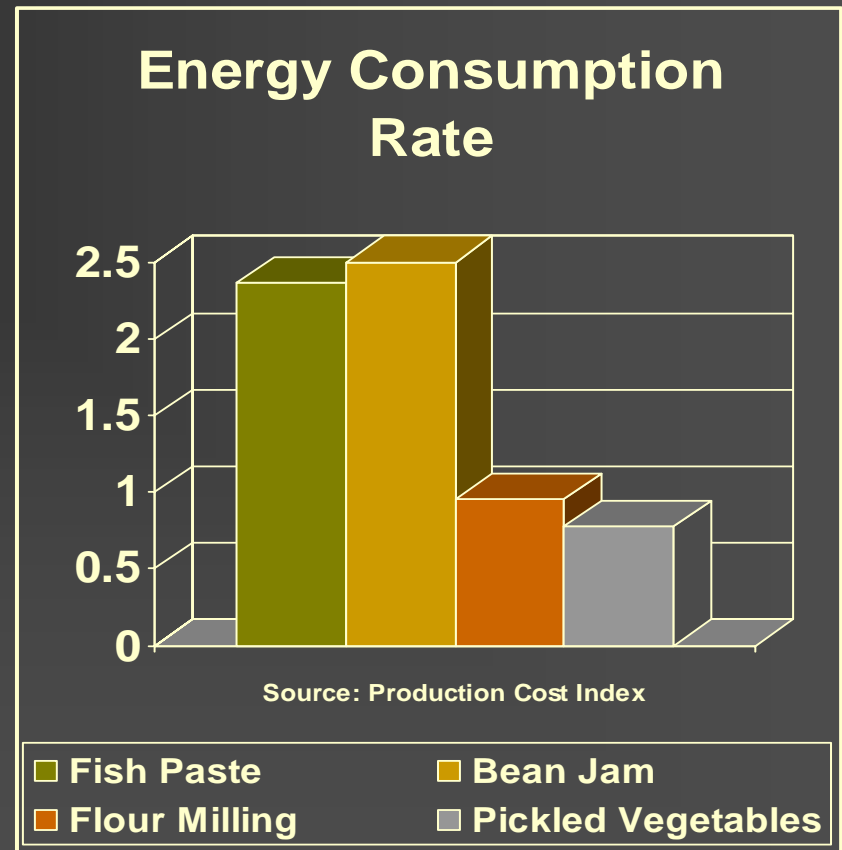
Food Processing Overview

- Since 5,000 BC, energy used to enhance quality and health (preservation) of food.
- Today, 40% of the value added is through energy intensive processes (thermal/preservation).
- Food processing is dwarfed as energy consumer by other industries (refining, chemicals, paper, steel, etc.).
- Transportation: Some rationalization, but travels farther.
- Food service consolidates energy use (deep freezer).
- IT: better S&D data = energy savings.
- Thermal (energy) processing reduces use of additives, and waste – fresh foods incur 5x more loss.

Sector Use of Energy: Two Views



- Japan's food processing sector consumes 10% of all manufacturing energy on a shipping volume basis;
- But just 2% in terms of gross manufacturing energy.





Energy Impacts on Food

- **Kraft:** +\$800 million this year = -11% annual earnings.
- **Danone:** -0.75% operating income FH.
- **S&P:** Most companies offset by cutting other costs.
- **Malacca Poultry Processor:** No reaction.

Most Energy Intensive

Energy Use by Food Processing Subsector

Subsector	Share of Sector's Energy Inputs	Subsector's Revenues (\$ mil)	Subsector's Energy Costs (\$ mil)	Energy as share of Revenues
<i>Wet Corn Milling</i>	15%	7,860	Fuel: 469 Electricity: 265	9%
<i>Beet Sugar</i>	7%	2,256	Fuel: 94 Electricity: 22	5%
<i>Soybean Oil Mills</i>	5%	12,783	Fuel: 192 Electricity: 97	2.2%
<i>Malt Beverages</i>	5%	17,601	Fuel: 113 Electricity: 123	1.3%
<i>Meat Packing</i>	5%	56,481	Fuel: 158 Electricity: 216	0.06%
<i>Canned Fruit and Vegetables</i>	5%	18,961	Fuel: 190 Electricity: 143	1.7%
<i>Frozen Fruits and Vegetables</i>	4%	9,035	Fuel: 129 Electricity: 146	1.4%
<i>Bread, Cake and Related</i>	3%	26,617	Fuel: 179 Electricity: 222	1.5%

UNIDO Energy Conservation in Food Processing Industry



- 42 Page; supported by GoJ
- Survey of energy use: Baseline and efficiency measures



EU Food, Drink and Milk Industries

January 2006

- 650 page inventory including energy use and saving strategies.

- Process heating = 29% of energy use
- Process cooling = 16% of energy use

- Major Users of Energy:

- Extruders
- Centrifugation



Energy Use by Sausages		
	Salami	Other Sausages
<i>Electricity</i>		1300
<i>Heat</i>	1240	450
Total Energy	Unknown	1750

Energy Use by Frozen Vegetables	
Product	kWh _e /t
<i>Spinach</i>	0
<i>Cauliflowers</i>	1
<i>Peas</i>	4
<i>Sprouts</i>	4
<i>Beans</i>	5
<i>Carrots</i>	8

Regional Energy Initiative

UNIDO vs. EU: Japan's beer making requires slightly less energy (12 kWh/hl) than does Europe's.

<i>Measured Brewery Use of Energy</i>	
	kWh/hl
<i>Brewhouse</i>	13.89-22.22
<i>Bottling</i>	10.56-16.11
<i>Kegging</i>	
<i>Process Water</i>	
<i>Service Water</i>	
<i>Miscellaneous</i>	26.39
<i>Total</i>	24.44-64.72
Source: EU	



Energy Saving Strategies

Government

- Set standards, taxes, subsidies, audits, counseling
- Subsector Competition Approach (poultry)
- Regional Industry Focus Approach (wine)

Industry

- Energy Savings Technologies:
 - Waste Utilization (i.e. heat recovery; cooking oil)
 - Cold processes and electron beam
 - Atmospheric packaging
 - Operation rate/speed of lines
 - Replace recirculating chillers with cooling towers
 - Multiple effect evaporators
 - Thermal vapor recompression

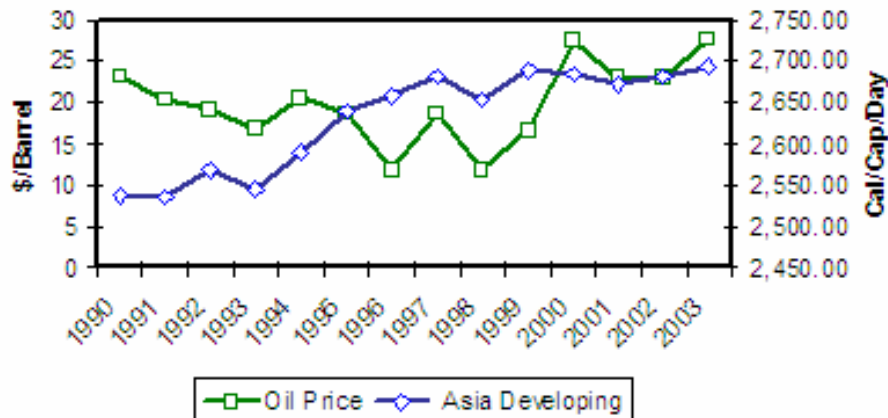




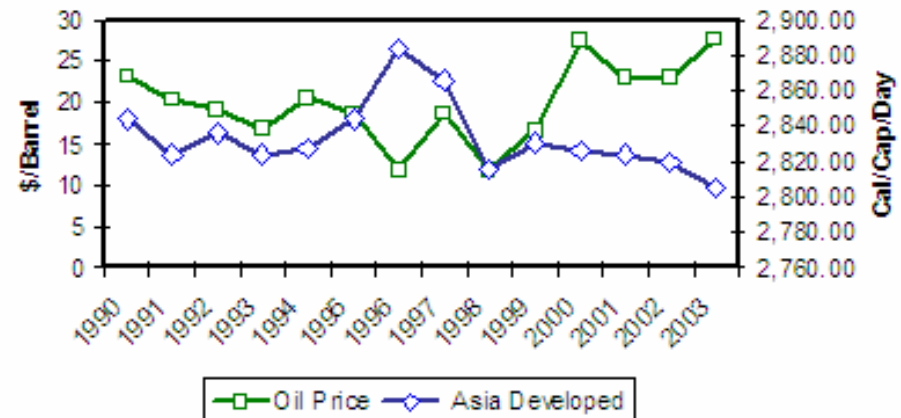
Impacts on Food Consumption

Oil Impact on Caloric Intake

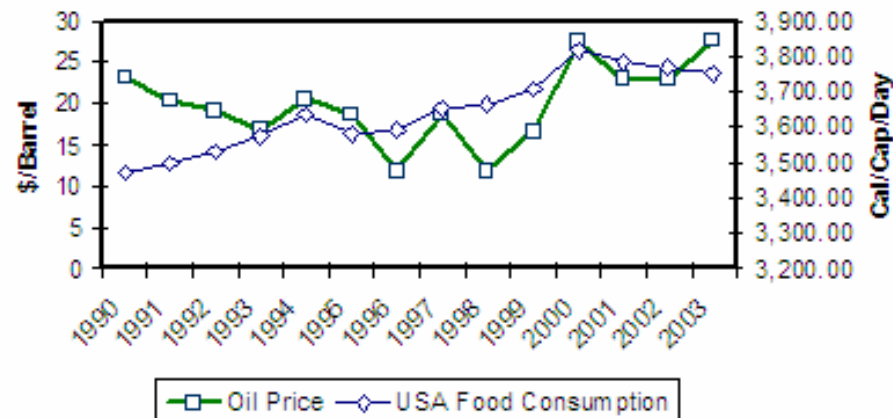
Oil Price and Developing Asia Food Consumption



Oil Price and Developed Asia Food Consumption



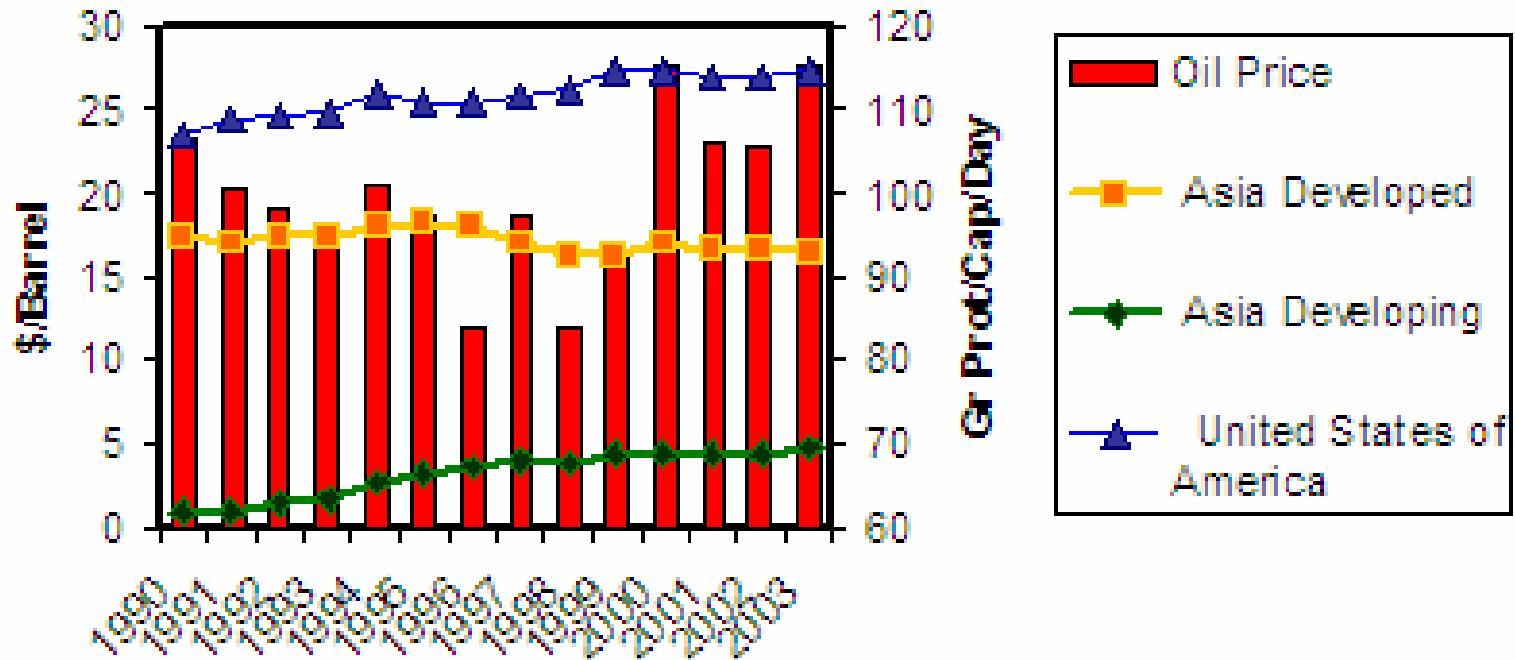
Oil Price and American Food Consumption



Oil, Income and Protein Consumption



Oil Price and Protein Consumption





Conclusions

- Energy costs have some limited impacts on agriculture.
- The sector adapts to those cost structures.
- Biofuels are a tricky component in the sector's future.



Thank you!