

Food, Fuel and Spice: Wild World of Ag Trends!



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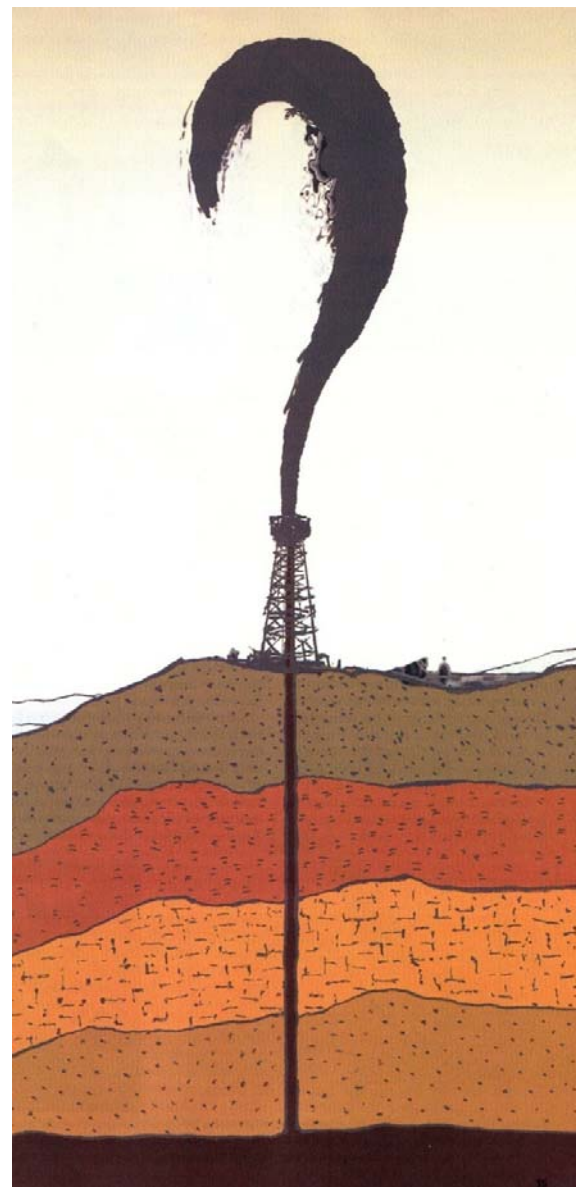
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The Great Food and Fuel Debate



***Last
year
this was
hot!!!***

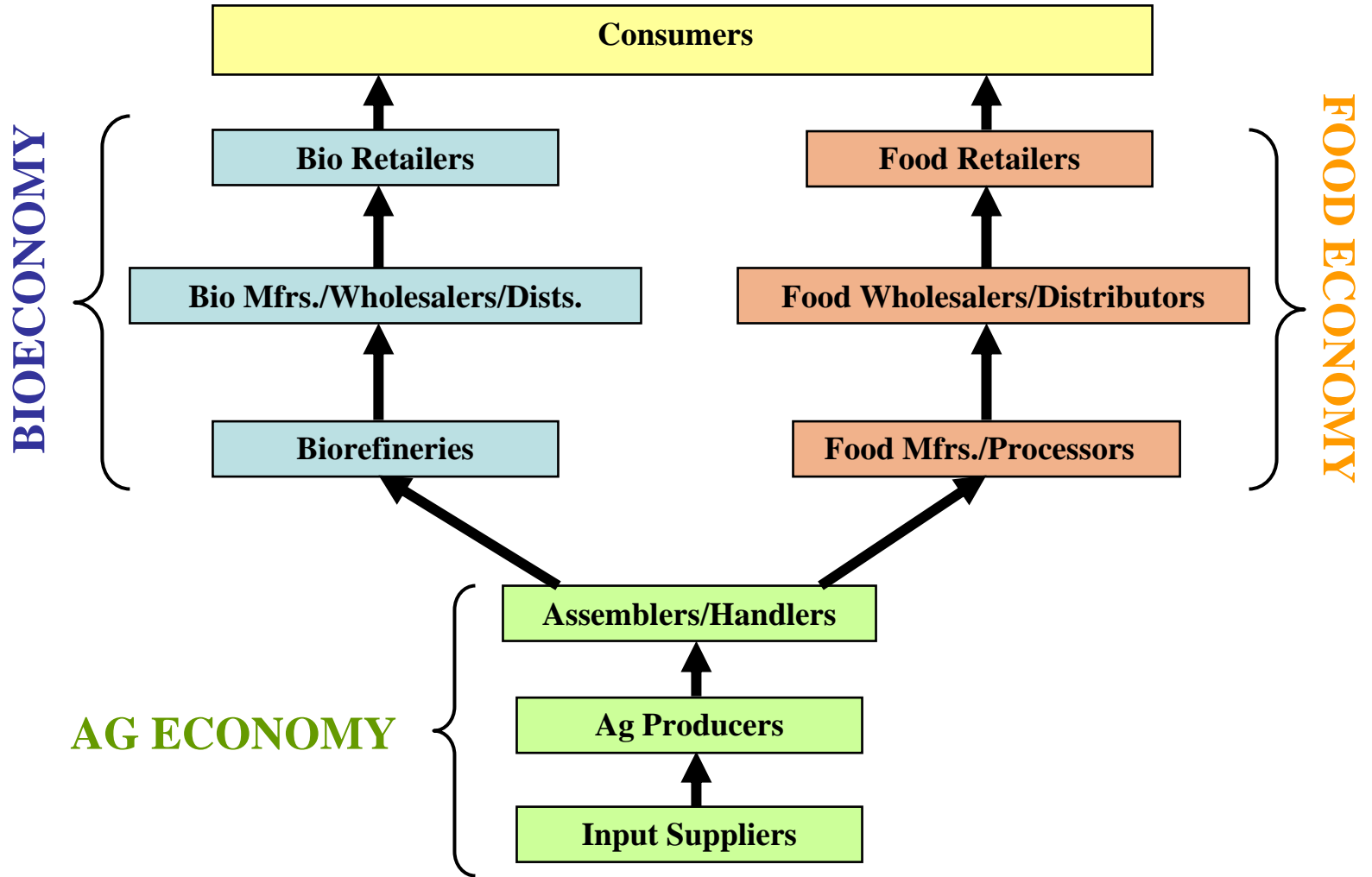
***What
about
now?***



Food and Fuel Right Now

- The short-run is a mess!
 - Barrel of oil: \$150-\$30
 - Corn: \$7-\$3
 - Ethanol: HOT-NOT
 - 20% of US capacity idle!
 - Global economy: HOT-NOT
 - Perfect storm up, then perfect storm down
 - Once again: point of maximum uncertainty!
- The long-run?
- What's fundamentally different?

Agri-Food-FFMCP Supply Chain

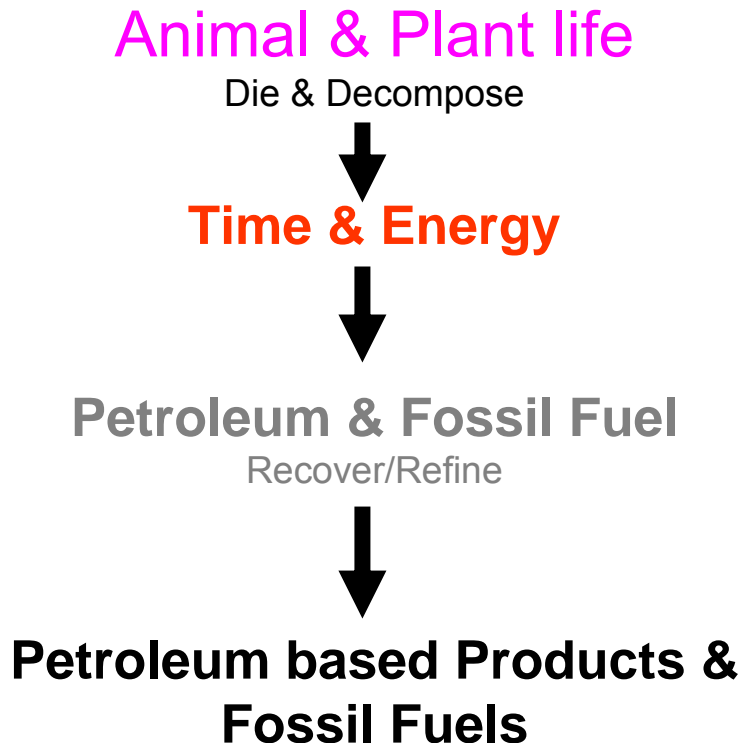


“Bioeconomy”?

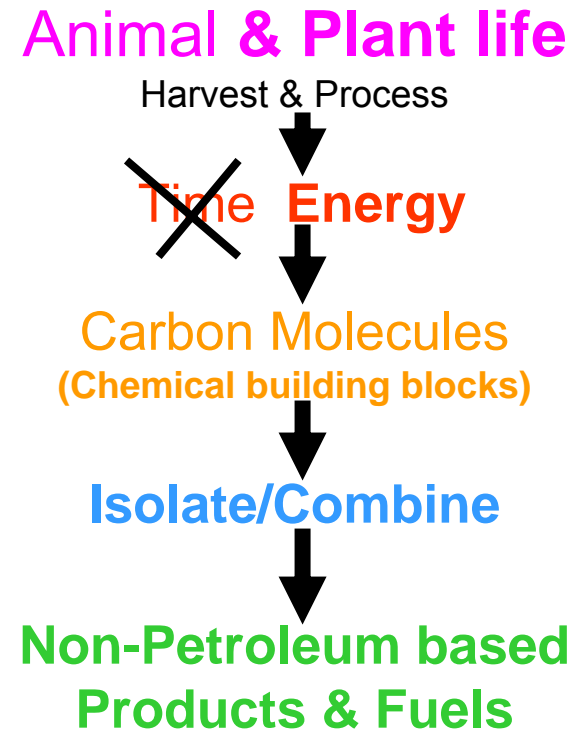
- Bioeconomy represents an emerging alternative to the petroleum economy.
 - Based on replacing petrochemical or fossil inputs with biobased or biomass inputs in a broad array of commercial & industrial products
- Bioeconomy products include:
 - Biofuels (ethanol, biodiesel)
 - Biomass (plant materials and animal waste)
 - Biomaterials (e.g., degradable plastics from corn starch)
 - Fine chemicals extracted from plant materials
 - Biobased pharmaceuticals.

Petroleum & Fossil Fuel (Coal) vs. Renewables

Natural processes



Renewable Alternatives



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Oil Today, Renewables Tomorrow



Food Inflation in Perspective

- In 2008, around 30% of US corn became ethanol!
- Simultaneously food inflation went from 3% per year to 4.5-6% per year.
- Average American consumer spends less than 10% of disposable income on food
 - Added inflation → an extra \$100-120 per year.
 - But came at the same time gas was \$4.00+
- For the poor, here and around the world, this increase is substantial.
 - 50% or more of disposable income is food.

What role did biofuels play?

- Several credible sources would put the ***maximum*** impact of biofuels at 1/3 of the food inflation.
- Effect may be much less
 - One study estimates that corn price is 41¢ a bushel higher than if ethanol production had not doubled in 06/07.
 - Corn price from 9/06 to 3/08 up \$2.94/bu.

Other Causes: Price of Oil

- Oil is important to the entire agri-food chain
 - Fertilizers, chemicals, other inputs
 - Gasoline and diesel fuel costs affect the agri-food transportation bill
- Per barrel cost had gone from **\$70 to \$140+** from '06-'08.
 - Now in the \$40!
- Clear interaction with biofuel production

Budget Savings Resulting From Ethanol By Region (Household of Four)

<i>Region</i>	<i>Ethanol Savings (dollars)</i>	<i>Higher Food Costs (Dollars)</i>	<i>Net Savings (Dollars)</i>
East Coast	\$349.50	\$188.00	\$161.50
Midwest	592.50	188.00	404.50
Gulf Coast	369.00	188.00	181.00
Rocky Mountain	256.50	188.00	68.50
West Coast	349.50	188.00	161.50

Other Causes:

Increased Global Food Demand

- Higher incomes in developing countries, especially China and India, have increased demand and helped support high prices
 - About 1/3 of world's population Chinese or Indian
 - Last 20 years, per capita caloric consumption dramatically increased
- Growth factors
 - Population growth
 - Income growth
 - Transformation of diet as income grows
 - Preferences increasingly like our own
 - ***Protein shortages***

Other Causes

- Declining U.S. dollar made our exports less expensive, but “their” exports to us (e.g. oil) more expensive.
 - \$1.75 billion per day to import oil @ \$142/bl
 - \$0.5 billion @ \$40
- Supply Shortfalls
 - Australia has suffered two wheat failures in a row
 - Canada has also had bad years
- Government Policies in Other Countries
 - Argentina, export quotas
 - Thailand, Egypt, Ukraine & other exporters placed export controls to keep domestic prices low but increased global prices, especially rice.
- Irrational Speculation

Short-run Summary

- “Perfect Storm” of causes put food prices up.
 - Biofuels (but less than 1/3 of total effect)
 - Higher oil prices
 - Higher global food demand
 - Some weather related supply constrictions
 - Declining dollar
 - Speculation
- “Perfect Storm” of economic decline took the pressure off.

The Long-run?

- Food and energy demand will continue to grow as world population grows.
 - 1.1% annual growth in world population
 - Understates food demand effects given shift in diets as incomes rise
 - Potential for conservative makes energy less clear
- Global economy will take off again!
- Food and fuel will return as an issue.

Long-run Key #1

Can agricultural productivity continue to rise fast enough?

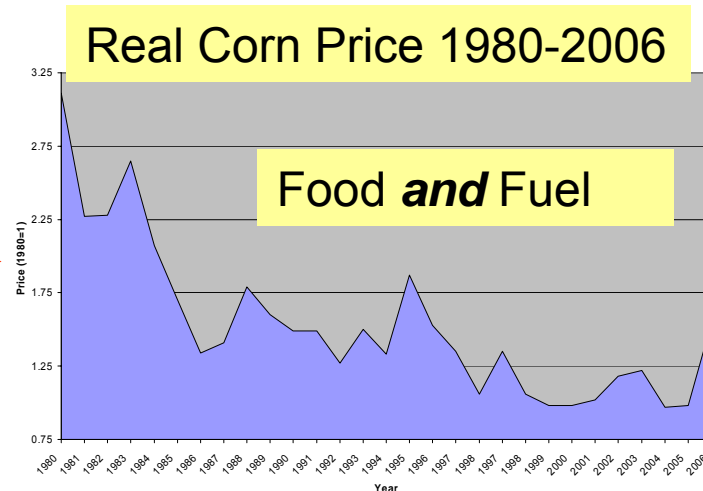
Productivity gains > population growth

Case 1 2.3% > 1.1% 

- corn yield growth if projected seed modifications succeed.

Case 2 1.0% < 1.1%

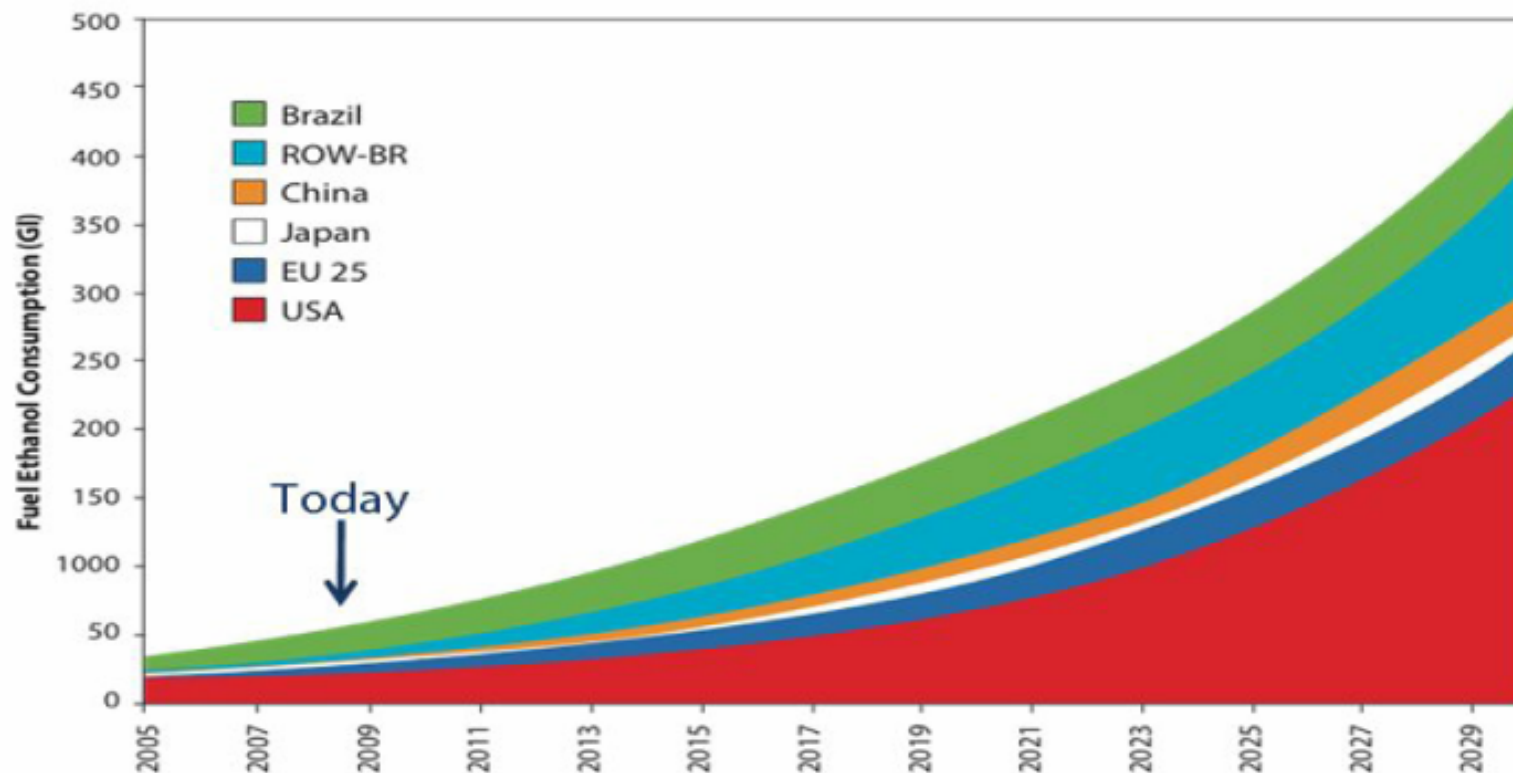
- Recent ag productivity growth worldwide may be this low!



Food **vs** Fuel

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Biofuels Growth Potential

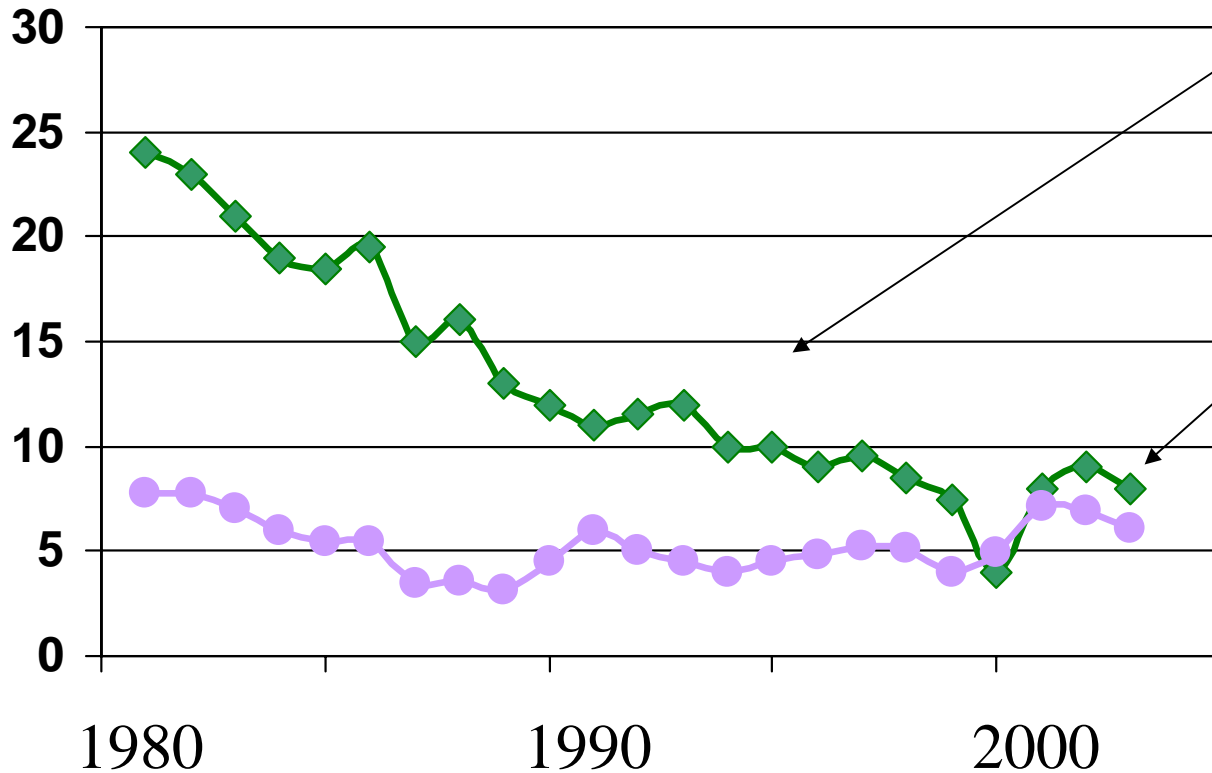


Long-run Key #2

How efficient can we be in producing bio energy?
US corn is not the only option in the world.

Brazil's Success Story: The Importance of Sticking to It!

Energy Cost (\$ per gJ)



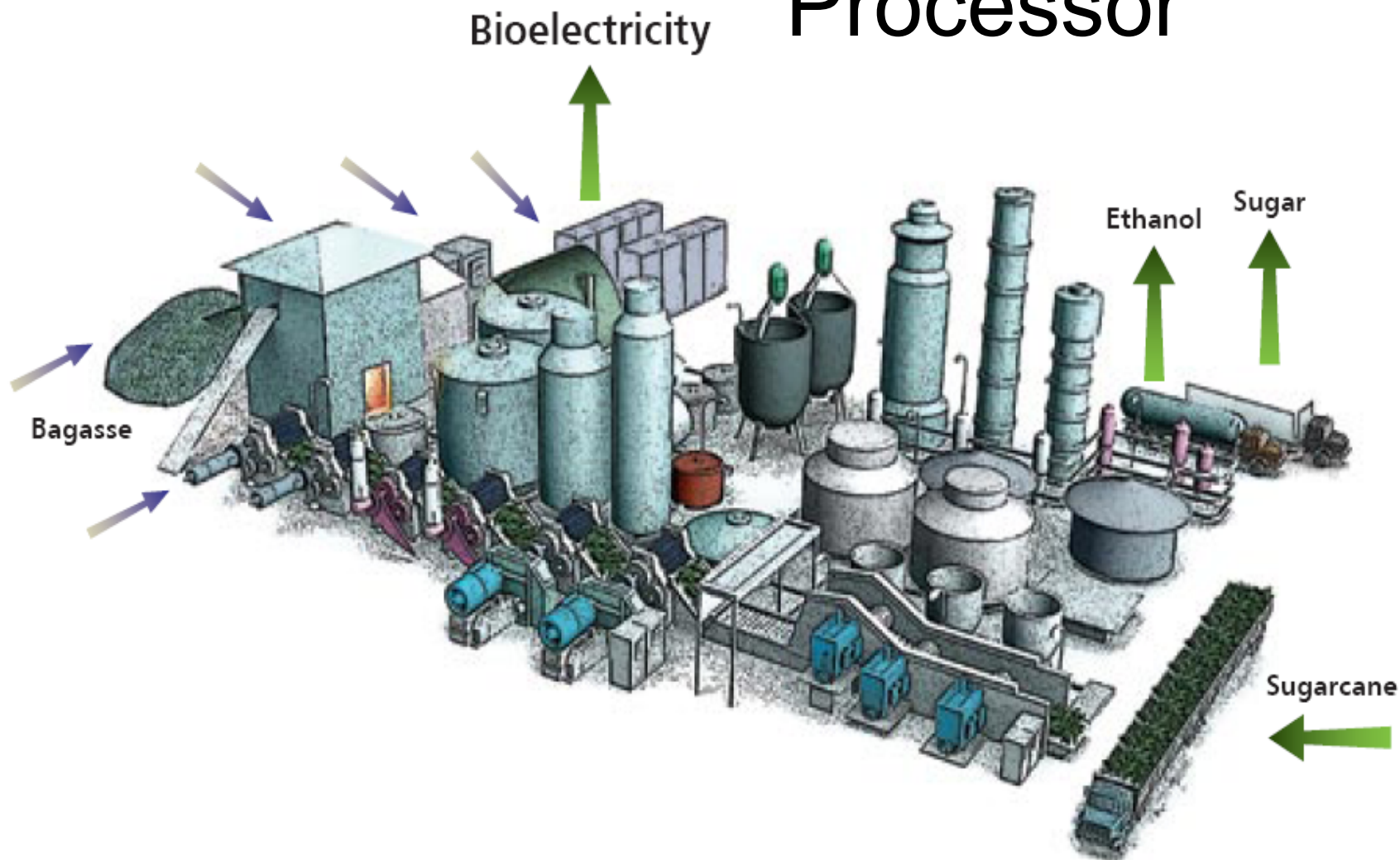
Brazilian
ethanol

Gasoline in
Rotterdam



-- Goldemberg, 2003

Brazilian Cane Processor



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Machine Harvesting of Cane



Machine harvesting of sugar cane

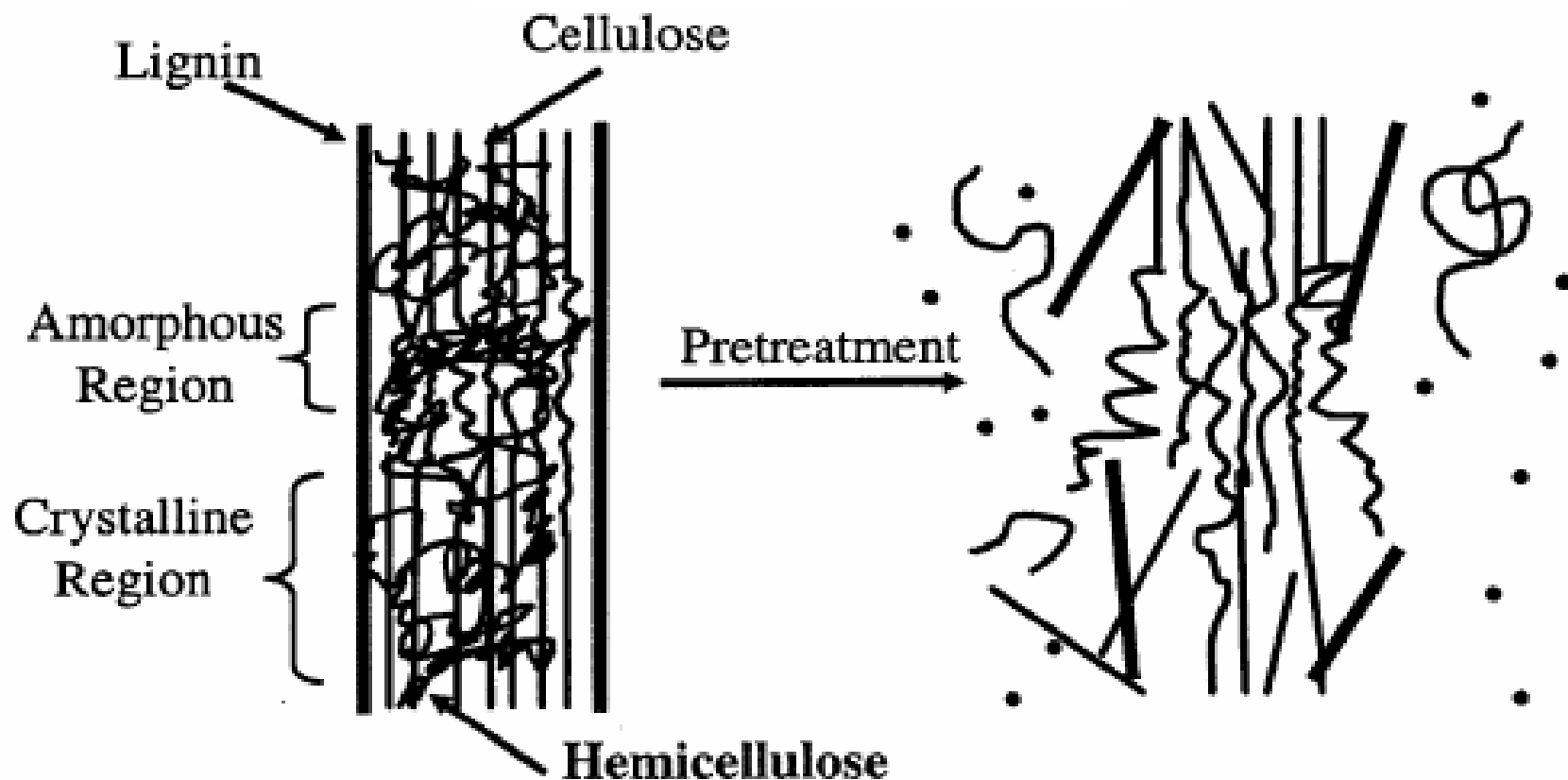
Long-run Key #3

- Food and fuel are also possible if in the longer-run we use ***non-food*** feedstocks for biofuels.
- Cellulosic ethanol
 - Energy crops, e.g. switchgrass
 - May compete for food crop land
 - Agricultural residue, e.g. corn stover
 - Wood and wood byproducts

Cellulose: What is it?



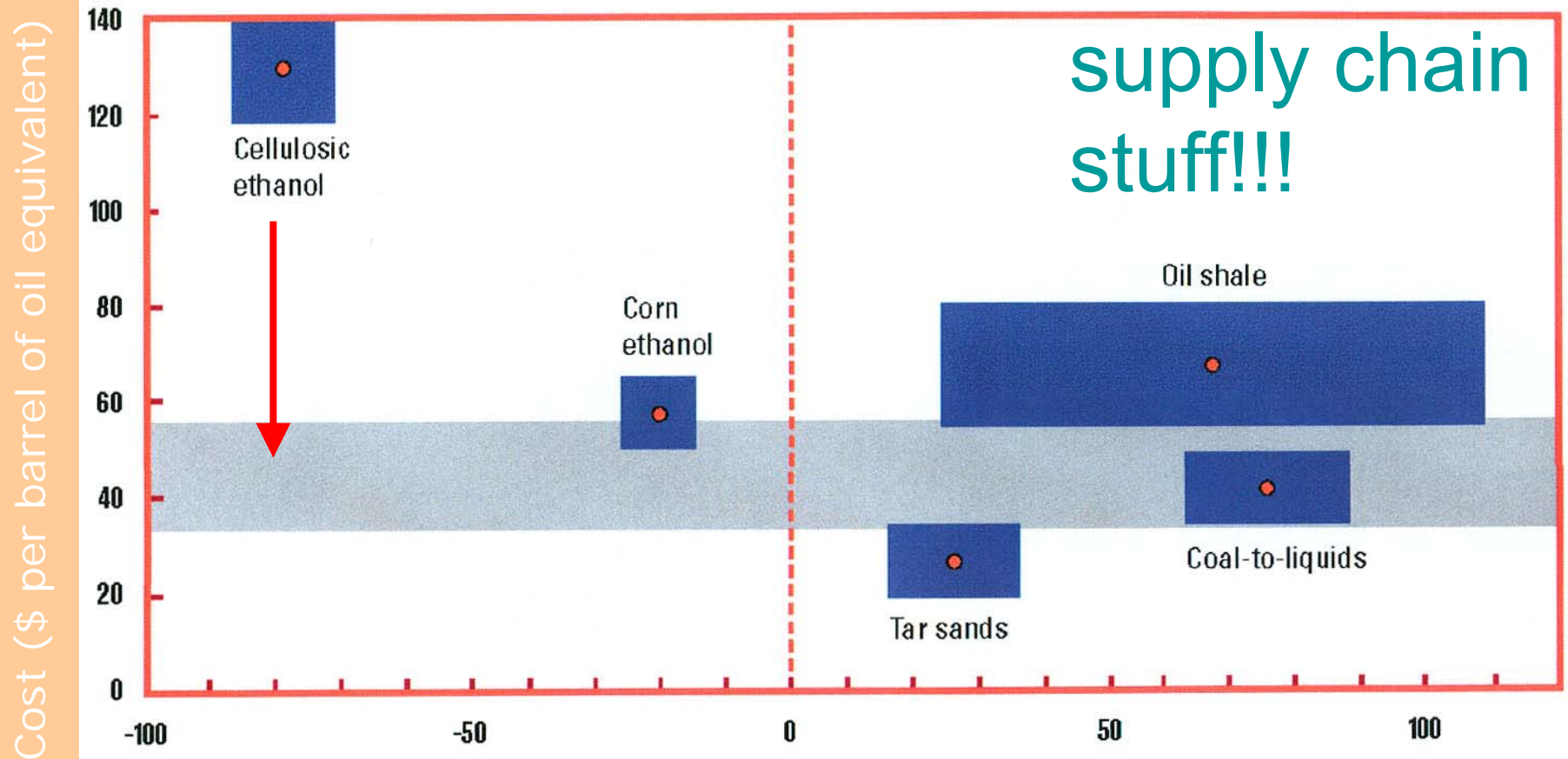
Pretreatment of LCB



Goals of pretreatment on lignocellulosic biomass (adapted from Hsu, et. al, 1980)

The Challenge of Cellulosic Ethanol Economics

Plus all the
supply chain
stuff!!!



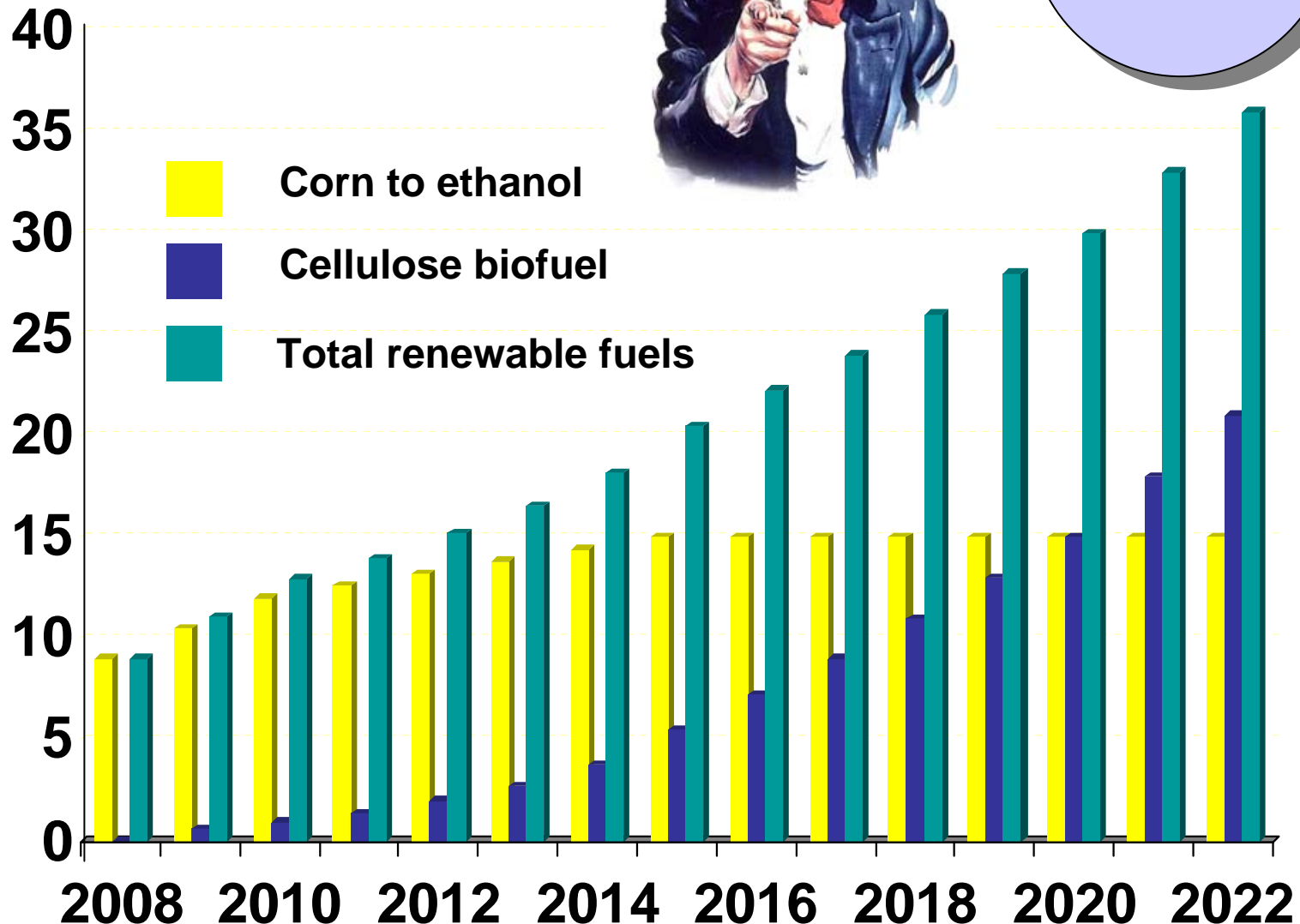
Percent of greenhouse gas emissions relative to conventional oil

Renewable Fuels Standard



Turn
cellulose
into
ethanol

Billion gallons



Long-run Keys

- Food ***and*** fuel are possible but hinge on several critical issues:
 - Population growth and diet transformation?
 - Productivity growth in agriculture?
 - Efficiency in bioenergy production?
 - Cellulosic ethanol using non-food feedstocks?
 - How sustainable will the bioeconomy be?
 - Water use, carbon impacts, logistics, land use
 - We have a choice to design the future!

Impacts on Spices?

- Specific impacts: Limited
- General impacts: Perhaps more threatening
 - Competition for land
 - Direct competition for best land will be returns driven
 - So-called use of “marginal” land for biofuel feedstocks
 - Cassava, sweet potato, sweet sorghum, palm, jatropa
 - Competition for water
 - Linkage of agricultural prices to energy prices
 - Volatility issues
 - Higher commodity prices in the long-run

Agri-Food-FFMCP UNCERTAINTIES

- Food safety/security assurance?
- Do consumers want low budget impact or diversity of attributes from food?
- World effective demand and openness?
- Relative demand arising from bio uses **vs.** relative supply of ag commodities **vs.** governmental incentives **vs.** sustainability of the whole system?
- Is food vs. fuel a short-term adjustment or long-term nightmare?
- Emergence and adoption of technology?

Agri-Food-FFMCP Scenarios

Scenario 1: Sustainable Nirvana

Technology, openness,
and effective land use
lead to a world
sustainably fed and
fueled.

Scenario 3: Dynamic Dual

A dual system of large-scale &
small-scale supply chains
innovatively & dynamically resolve
bottlenecks & sustainability issues
as consumers are well served
in the long-run while
facing short-term
disruptions.

Scenario 2: Clashing Worlds

Food and fuel compete for
basic inputs while
consumers pick & choose in
a world of uneven growth &
openness while torn
between high food and high
energy prices.



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Final Thoughts . . .

- Opportunities abound (long-turn)!
 - Commodity agriculture
 - Niche/value-added agriculture
 - Bioeconomy agriculture
- Risks are clear!
 - Surviving the short run?
 - Bidding for acres, water, inputs?
 - Sustainability?
 - Enough profits for all and for how long?