



# Food and Fuel Debate



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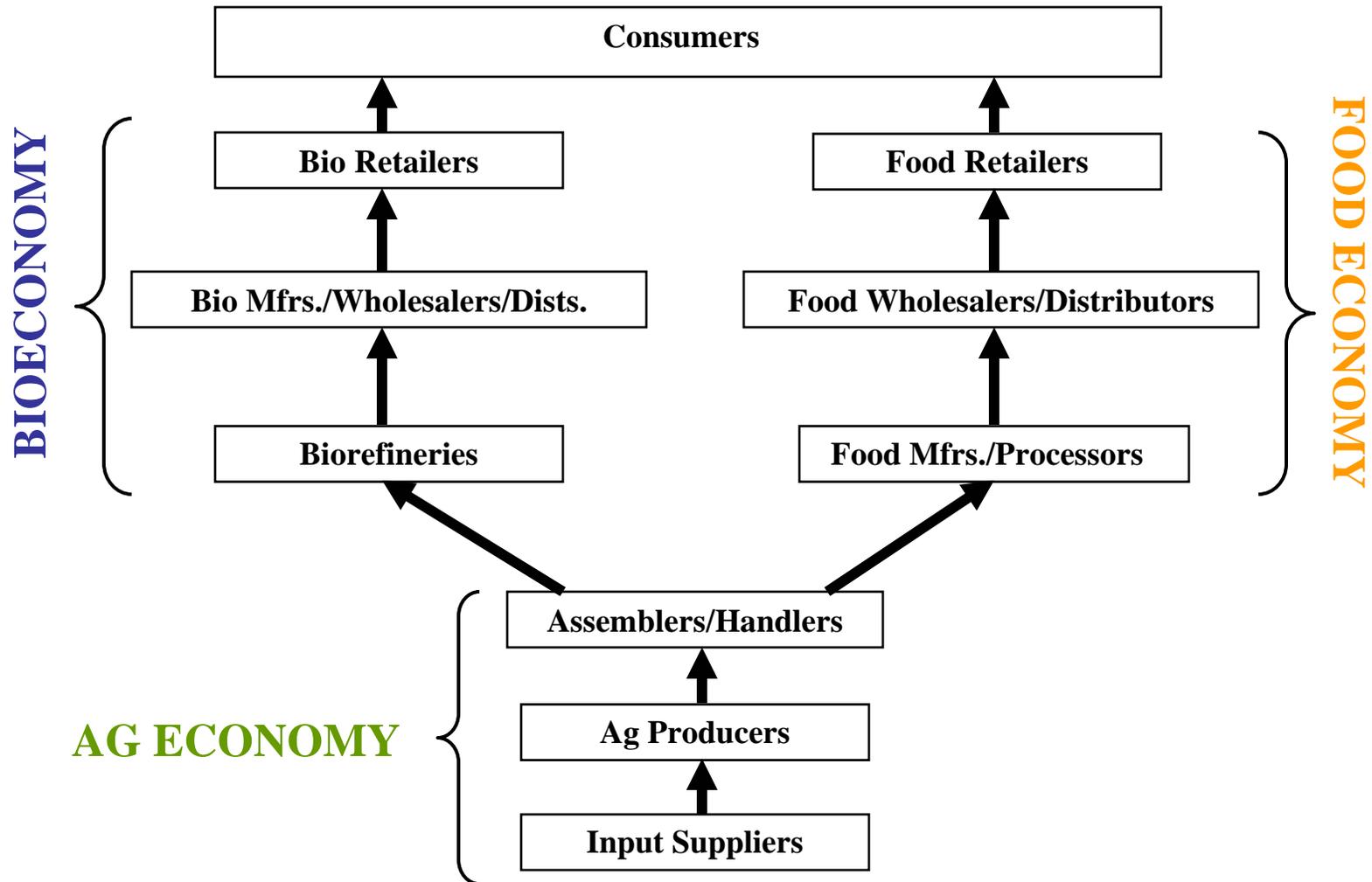
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# The Issues

- A recent substantial increase in food prices!
- What role do biofuels play in this increase?
  - They have played a role
  - No definitive answer as to exact role
    - It all depends on assumptions!
  - Short-run effects
  - Long-run effects

# Agri-Food-FFMCP Supply Chain



# Food Inflation in Perspective

- Food inflation has gone from just under 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.
- For the poor, here and around the world, this increase is substantial.
  - 50% or more of disposable income is food.

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## What role have biofuels played?

- Several credible sources would put the *maximum* impact of biofuels at 1/3 of the food inflation.
- Effect may be much less
  - University of Wisconsin estimates that corn price is 41 cents 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 marketing chain
  - Fertilizers, chemicals other inputs
  - Gasoline and diesel fuel costs affect the agri-food transportation bill
- Per barrel cost has gone from \$70 to \$120 in the last 24 months.
- Clear interaction with biofuel production

<b>Table 1: Estimated Break Even Ethanol Prices for a New Plant</b>					
<b>Corn Price</b>	<b>0% Return on Equity</b>		<b>12% Return on Equity</b>		
	<b>60 Million</b>	<b>120 Million</b>	<b>60 Million</b>	<b>120 Million</b>	
	<b>Gallon Plant</b>	<b>Gallon Plant</b>	<b>Gallon Plant</b>	<b>Gallon Plant</b>	
\$2.00/bu.	\$1.19/gal	\$1.14/gal	\$1.32/gal	\$1.24/gal	
\$3.00	\$1.44	\$1.40	\$1.57	\$1.49	
\$4.00	\$1.70	\$1.66	\$1.83	\$1.75	
\$5.00	\$1.96	\$1.91	\$2.09	\$2.00	
\$6.00	\$2.21	\$2.16	\$2.34	\$2.25	
Source: Eidman B					

**Assumes:** \$90/bl oil, \$2.74/gal wholesale gasoline price, DDGS p ↑ = 90% corn p ↑, Inv = \$112.5 m @ 60 m gal or \$180 m @ 120 m gal

**May 8, 2008:** Oil \$120, Corn \$6.21, Ethanol \$2.56

# Biodiesel Breakeven

- Eidman
  - \$90/bl oil → \$2.94/gal wholesale petro diesel
  - Assume 30 mgpy plant capacity
  - Feedstock costs = 85% of production cost
  - @ \$0.30/lb feedstock → \$2.72/gal biodiesel
  - @ \$0.35/lb feedstock → \$3.09/gal biodiesel
- May 8, 2008: **\$0.60/lb soy oil**
  - Implies wholesale diesel would have to exceed \$5.00/gal to achieve breakeven

## 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 is either Chinese or Indian
- Growth factors
  - Population growth
  - Income growth
  - Transformation of diet as income grows
  - Preferences increasingly like our own
  - ***Protein shortages***

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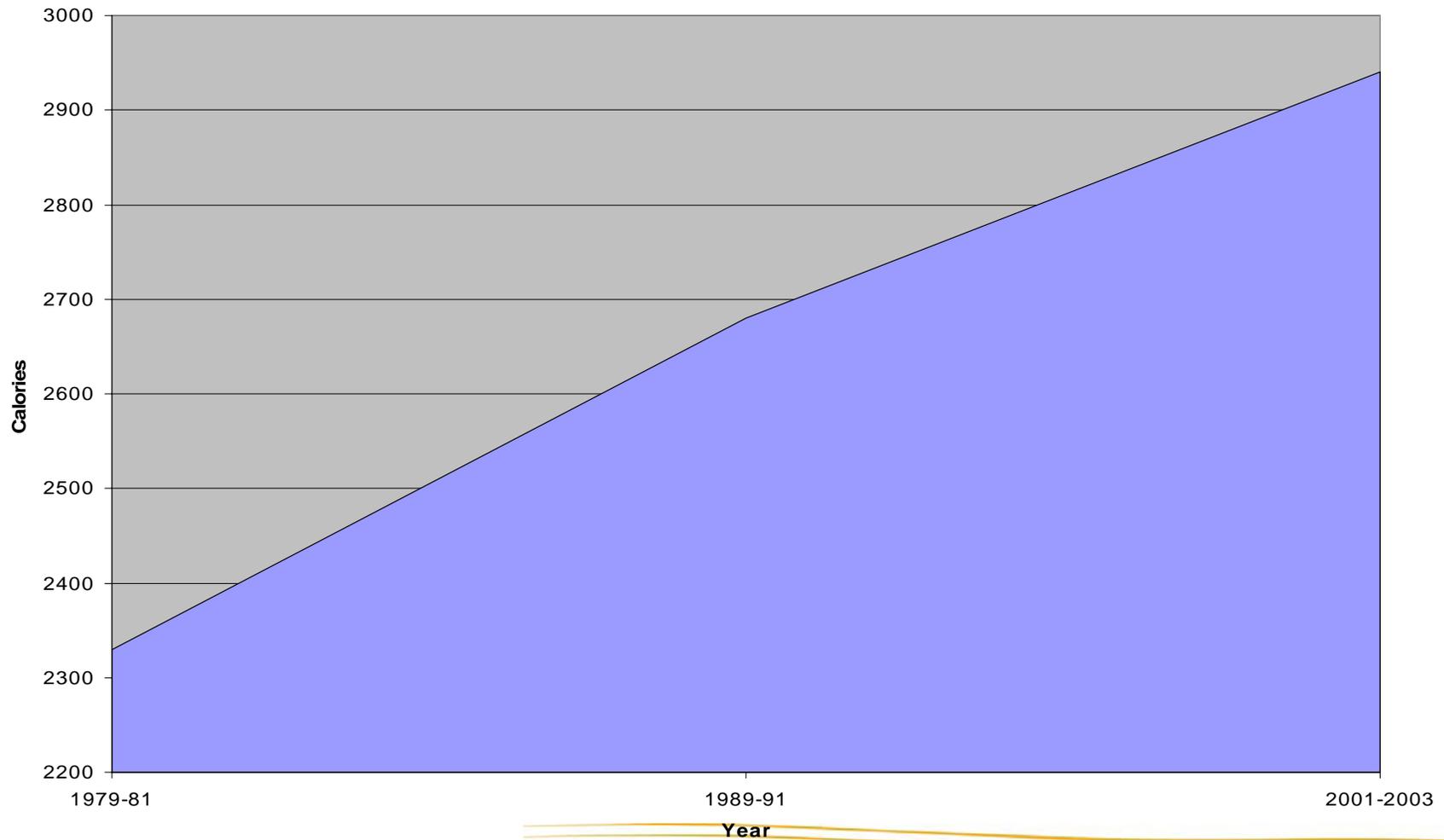
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# China

Per Capita Consumption in China 1979-2003



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# China and India

- Last 20 years
  - Per capita caloric consumption
    - China up 26.2%
    - India up 17.3%
  - Total daily calories
    - China up 1.55 trillion calories
    - India up 1.20 trillion calories
- Demand for meat and dairy products is also increasing in these countries further putting upward pressure on feed grain prices.

# Other Causes: Exchange Rates

- Declining U.S. dollar makes our exports less expensive in others, but their exports to us (e.g. oil and food) more expensive.
- Last 3 yrs., U.S. dollar declined by:
  - 36.4% to Brazilian Real
  - 18.0% to Canadian Dollar
  - 14.6% to Chinese Yuan
  - 14.5% to the Euro

# Other Causes

- Supply Shortfalls
  - Australia has suffered two wheat failures in a row putting upward pressure on prices
  - Canada as also had bad years
- Government Policies in Other Countries
  - Argentina, export quotas
  - Thailand, Egypt, Ukraine & other exporters placed export controls to keep their domestic prices low which has increased global prices, especially rice.
- Irrational Speculation

# Short-run Summary

- A “Perfect Storm” of causes have 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
  - Dwindling carryover stocks of ag commodities

## What about the long-run?

- Food 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
- Can agricultural productivity continue to rise?
  - Productivity gains > population growth
  - For example, corn may attain 2.3% yield growth if projected seed modifications succeed.
  - Past: Long-run **declines** in commodity prices
  - Future: **Potential** to have both food and fuel

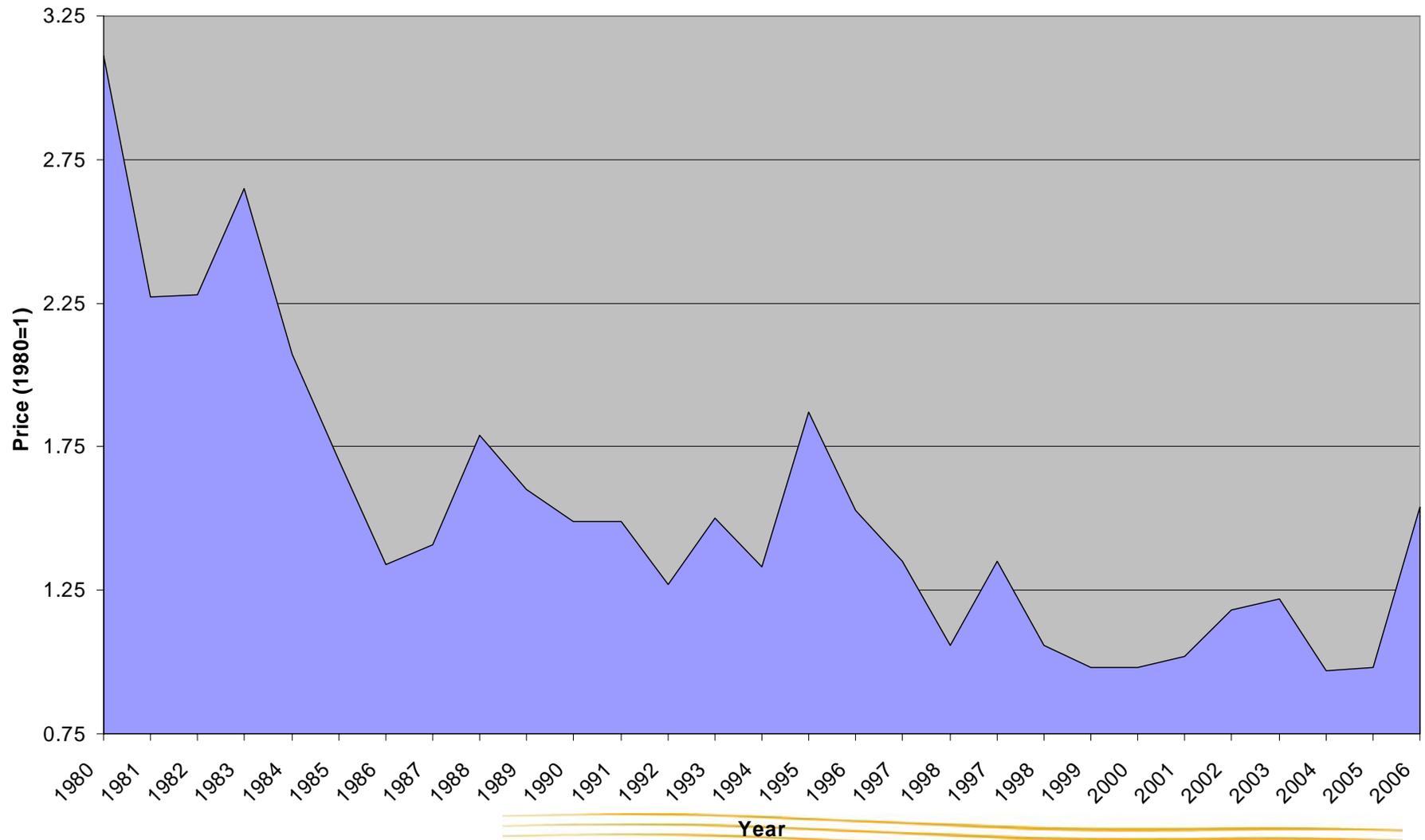
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## Real Corn Price 1980-2006



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# Ethanol Impacts: Improved Yield

# of MI Plants	5	10	10	10
Yield Improvements	Current	1 yr trend	10 yr trend	10 yr new
Harv. Corn Acres (m)	2.2	2.2	2.2	2.2
Yield (bu/a)	135	138	155	170
Corn Prod (m bu)	301	304	341	374
Ethanol Use (m bu)	104	227	227	227
Feed/Other Use (m bu)	73	73	73	73
Surplus (Deficit) (m bu)	124	4	41	74

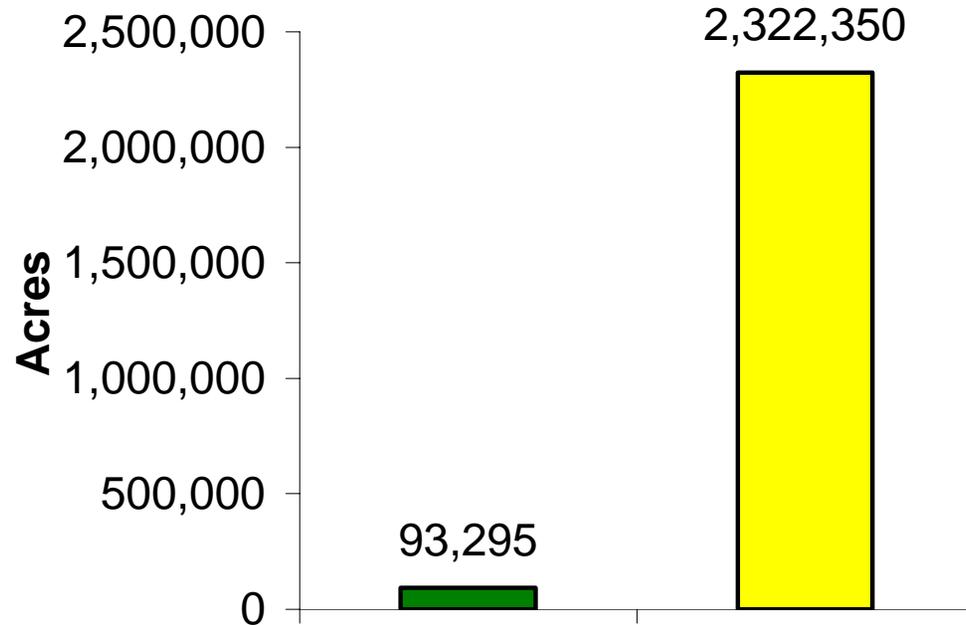
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# Cellulosic Ethanol

- Longer-run we're looking at ***non-food*** feedstocks providing biofuels.
- Cellulosic ethanol
  - Energy crops, e.g. switchgrass
    - May compete for food crop land
  - Agricultural residue, e.g. corn stover
  - Wood and wood byproducts



# Total Acres and Output Yields

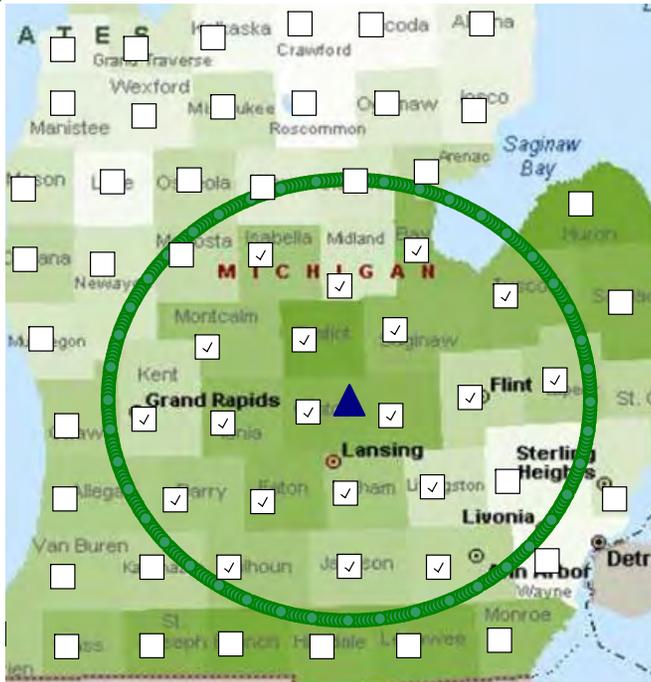


**Assume 50% of acres**  
gives us 46,648 acres  
at 6 tons/acre  
yields 280K tons

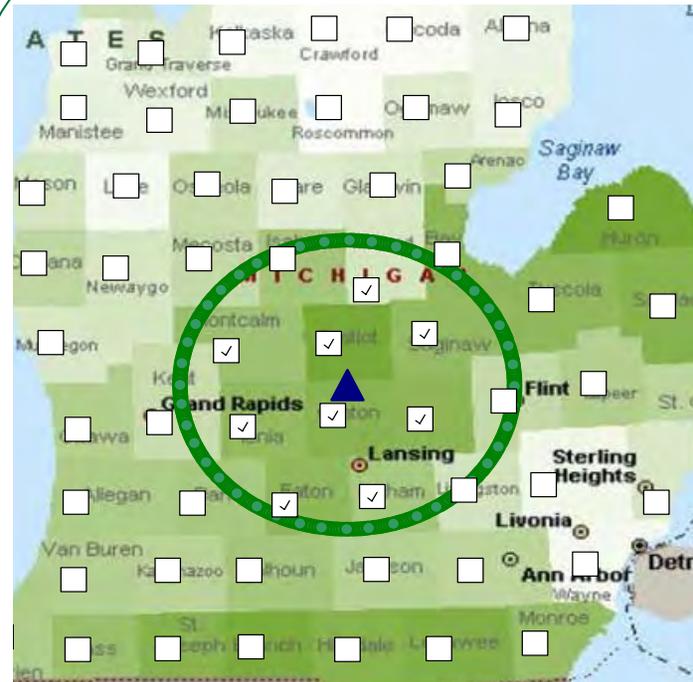
**Assume 5% of acres**  
gives us 116,118 acres  
at 7 tons/acre  
yields 813K tons

At 90 gallons/ton  
yields 98 million gallons ethanol

# What about corn stover?



**50% Collection rate**  
**19 counties/69 mile radius**



**100% collection rate**  
**9 counties/45 mile radius**

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# Wood Products Biorefinery

- 100 MMgpy
- 8 county area
- 75% pulpwood
- Harvest: 11 mo./yr.
- Storage & transportation looks similar to current logging and pulping.
- Existing infrastructure converted & enhanced.

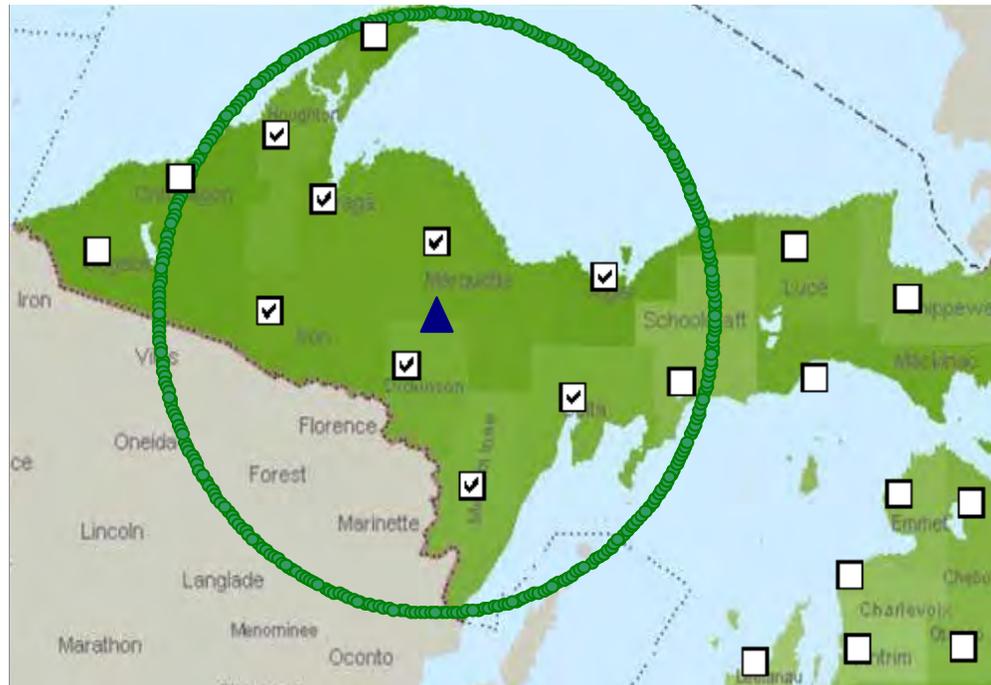
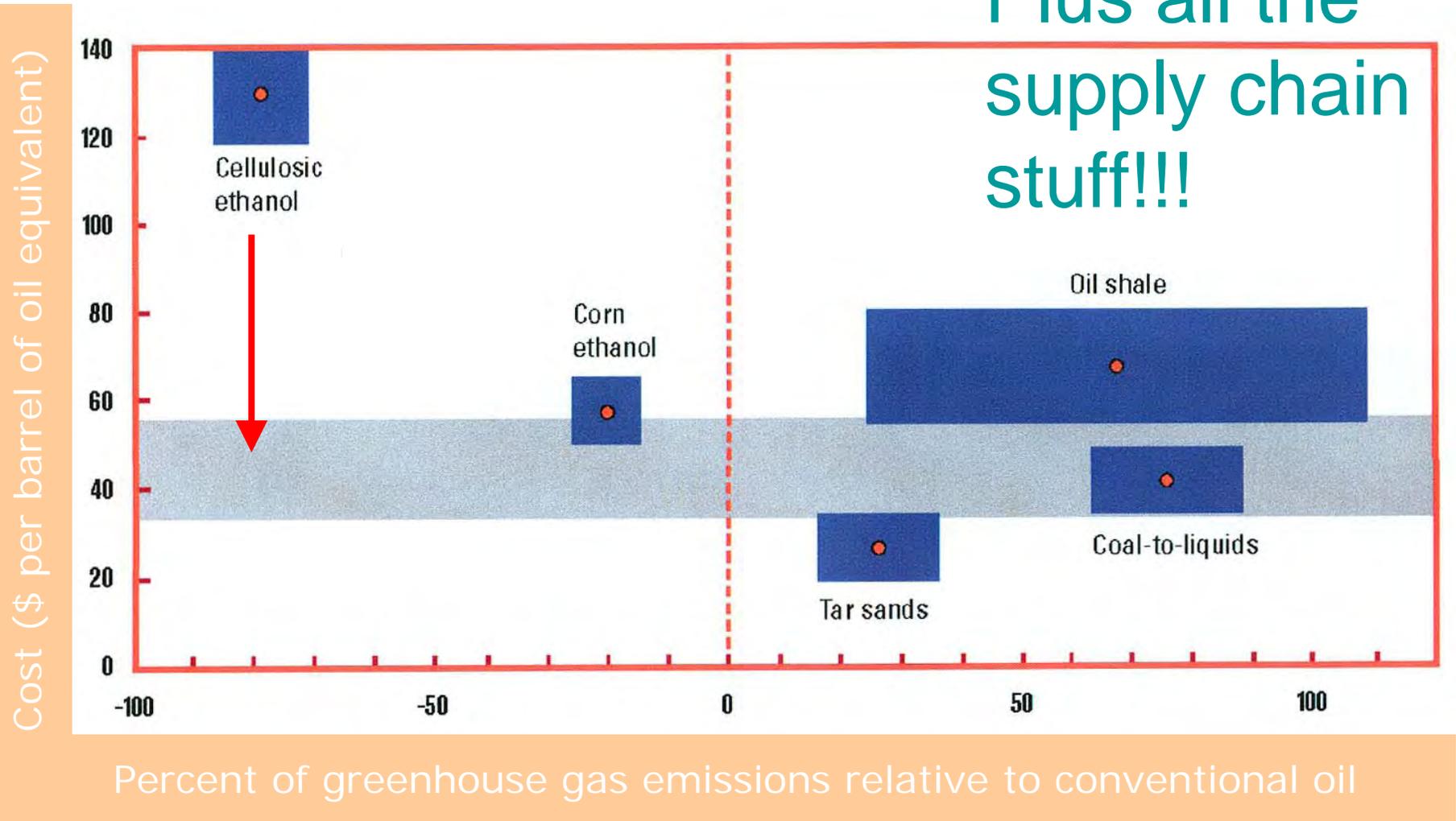


Figure . Catchment Area for Hypothetical Forest Products Biorefinery

# The Challenge of Cellulosic Ethanol Economics

Plus all the supply chain stuff!!!



# Long-run Summary

- Food *and* fuel are possible but hinge on several critical issues:
  - Population growth and diet transformation?
  - Productivity growth in agriculture?
  - 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!

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