The Great Food and Fuel Debate

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Food and Fuel Right Now

- The short-run is a mess!
  - Barrel of oil: $150-$30
  - Corn: $7-$3
  - Ethanol: HOT-NOT
  - Global economy: HOT-NOT
  - Perfect storm up, then perfect storm down
  - Once again: point of maximum uncertainty!
- The long-run?

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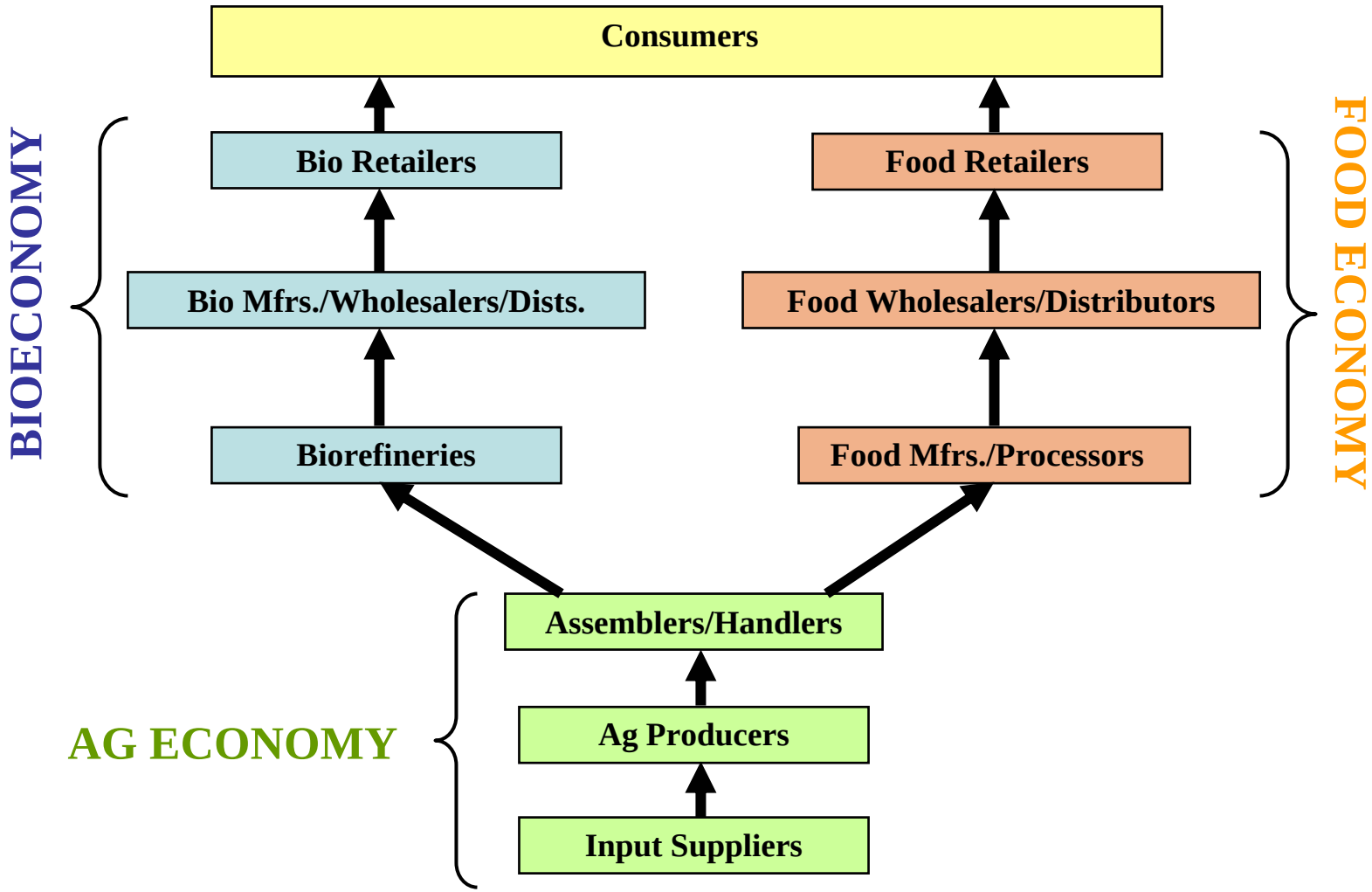
“The Debate”

- A substantial increase in food prices!
  - $150 barrel for oil; $7 bushel for corn
- What role did biofuels play in this increase?
  - They 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



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Food Inflation in Perspective

- Food inflation went 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.
  - But came at the same time gas was $4.00+
- For the poor, here and around the world, this increase was substantial.
  - 50% or more of disposable income is food.

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What role did biofuels play?

- Several credible sources would put the ***maximum*** impact of biofuels at 1/3 of the food inflation.
- Effect may have been much less
  - One study estimates that corn price is 41¢ a bushel higher that 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 went from ***$70 to $140+*** in a 24 months.
  - Now around $40!
- Clear interaction with biofuel production

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Budget Savings Resulting From Ethanol By Region

(Household of Four)

Region	*Ethanol Savings (dollars)*	*Higher Food Costs (Dollars)*	*Net Savings (Dollars)*
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 is either Chinese or Indian
  - Last 20 years, per capita caloric consumption
    - China up 26.2%
    - India up 17.3%
- 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 makes 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 as 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

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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.

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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

- Remember 1.1% population growth
- Can agricultural productivity continue to rise fast enough?
  - Productivity gains > population growth
  - For example, corn may attain 2.3% yield growth if projected seed modifications succeed.
  - Ag productivity growth may have fallen to 1% overall
  - Past: Long-run ***declines*** in commodity prices
  - Future: ***Potential*** to have both food and fuel

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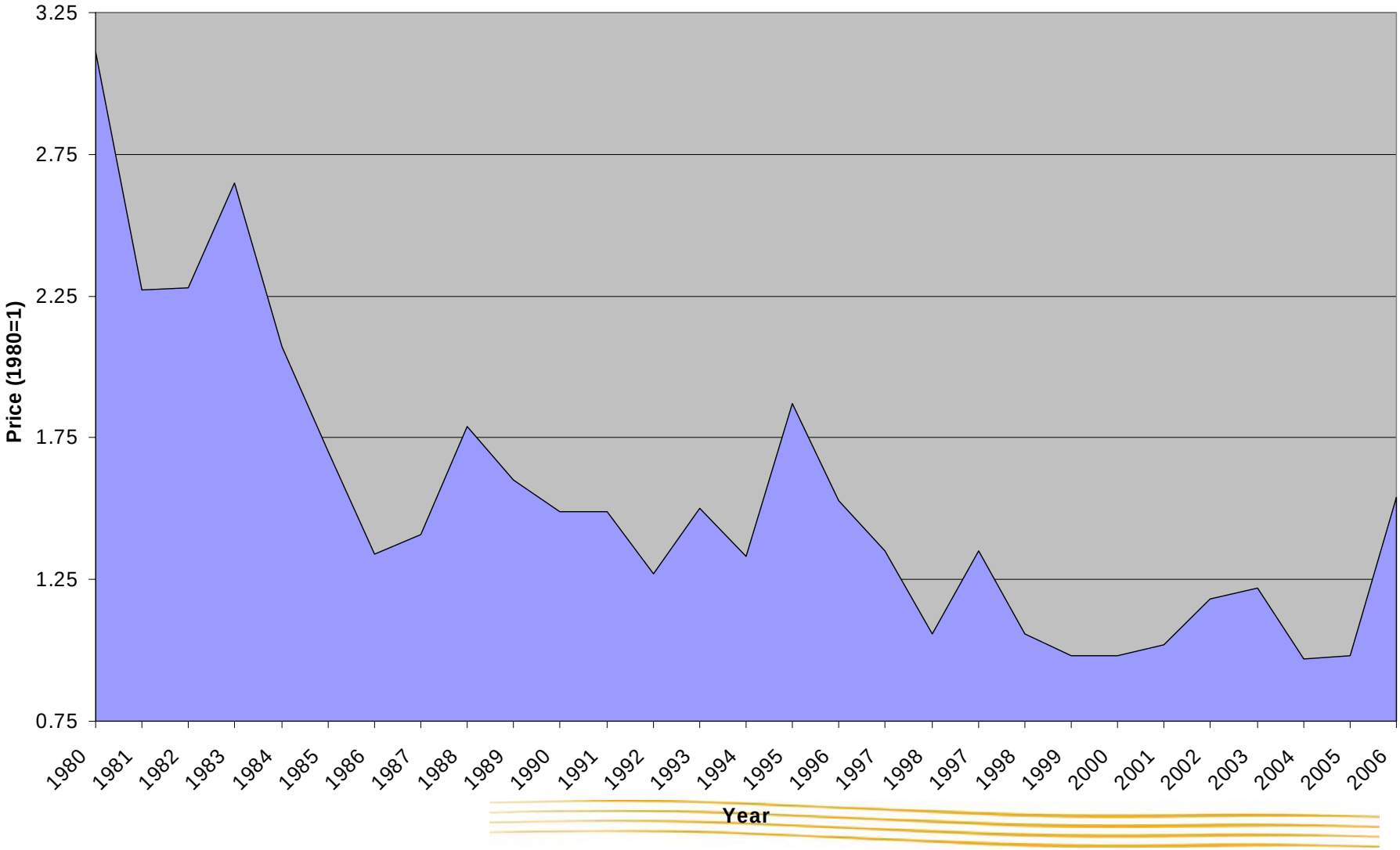
Real Corn Price 1980-2006



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Long-run Key #2

- Food and fuel are also possible if in 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

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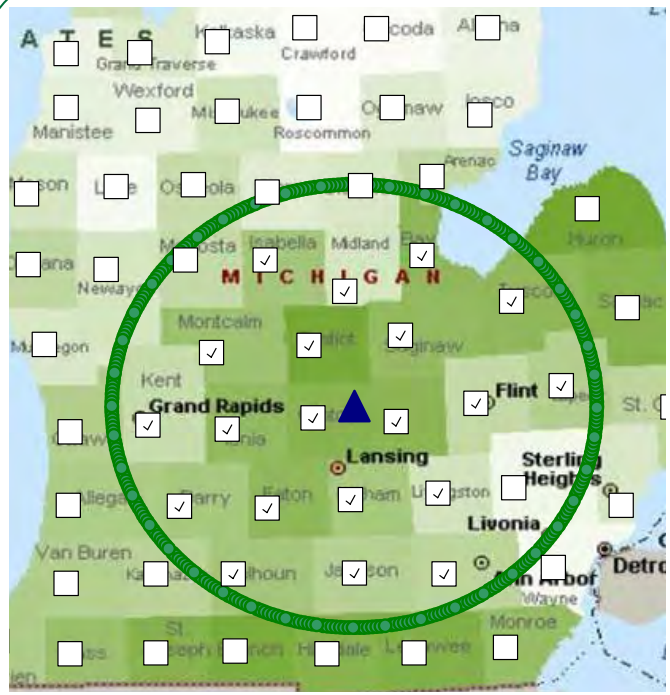
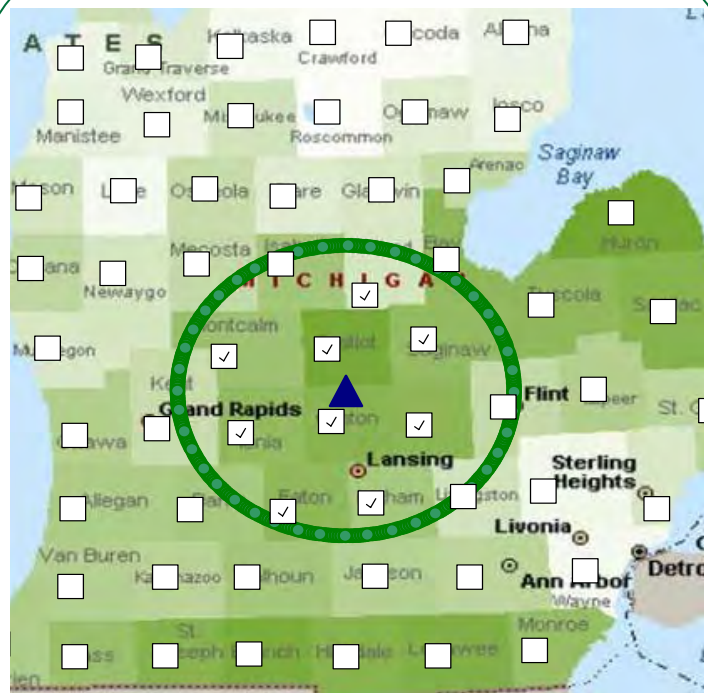
What about corn stover?



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.

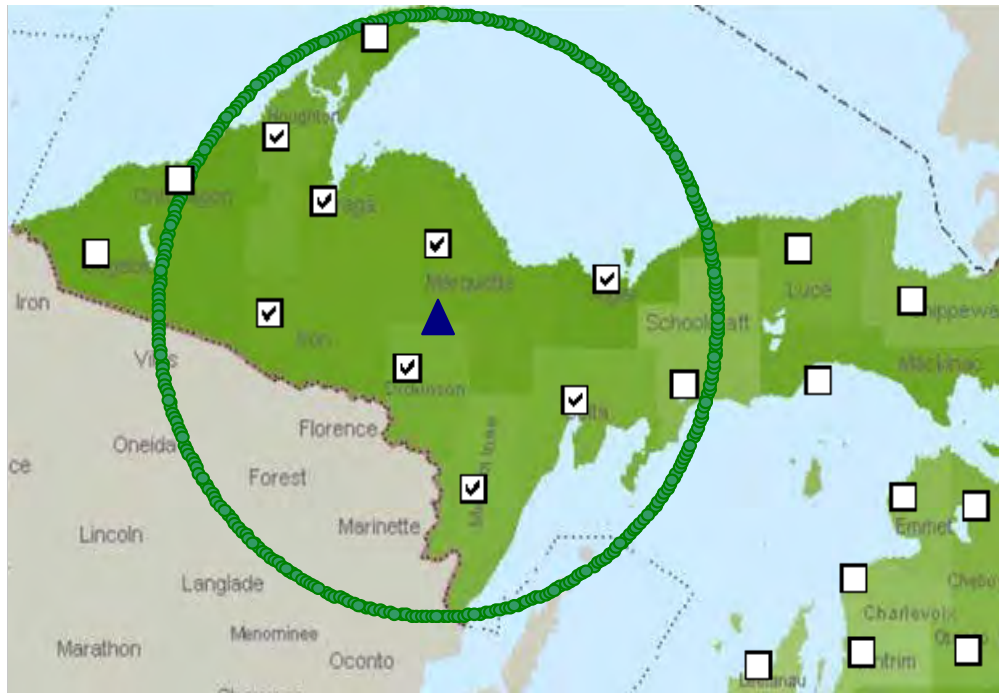

Figure . Catchment Area for Hypothetical Forest Products Biorefinery

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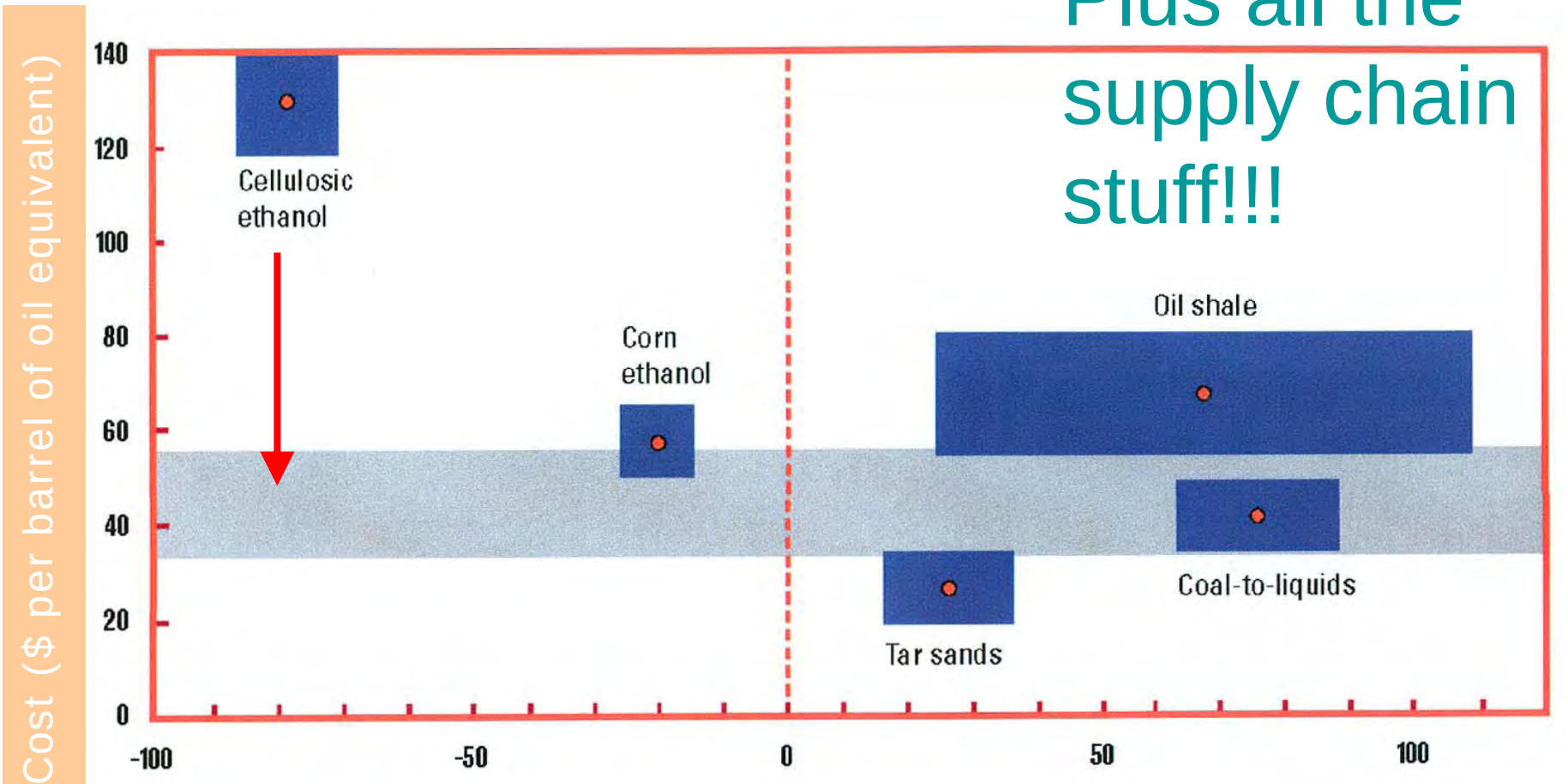
The Challenge of Cellulosic Ethanol Economics

Plus all the supply chain stuff!!!



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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!

Agri-Food-FFMCP UNCERTAINTIES

- Who will hold power and how?
- 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 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.
- 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.

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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?
  - Sustainability?
  - Enough profits for all and for how long?