



The Cellulosic Revolution: A Sustainable Market Policy for Canada

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June 9, 2008



driven by nature

Context

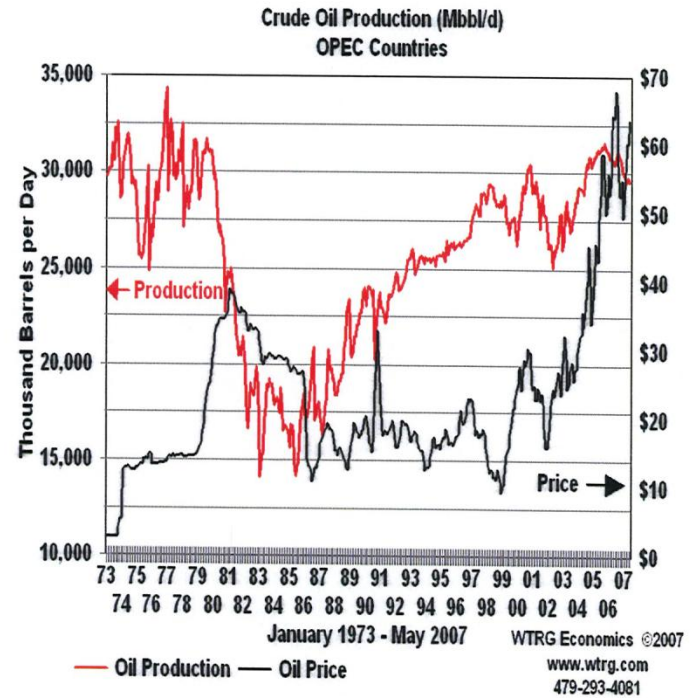
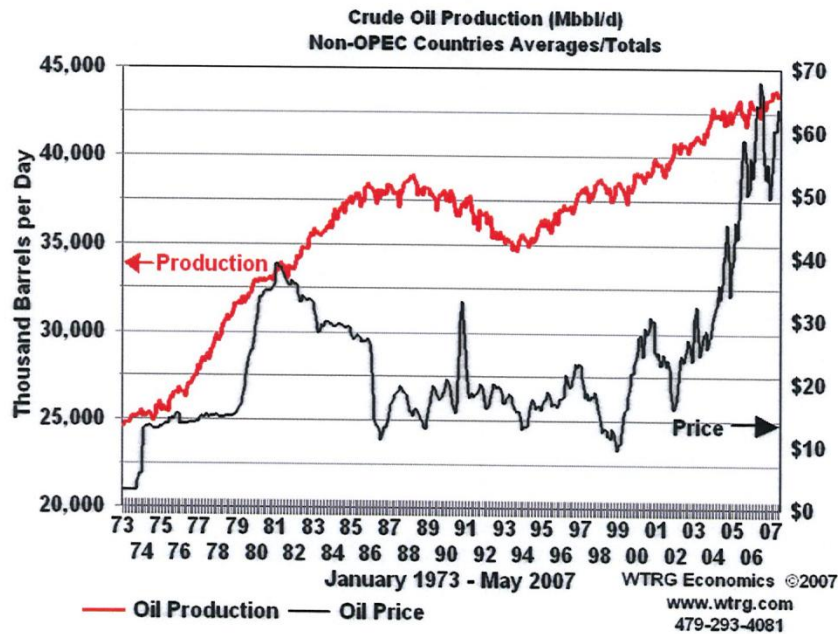
- Tremendous interest in biofuels
- Positive
- Negative
- Facts / science – who cares ?

Oil Prices

- Oil at \$15 – 1985 to 2001
- Oil at \$50 – impossible in 2006
- Oil at \$100 – impossible in 2007
- Oil at \$150 – impossible in 2008
- Oil at \$200 – impossible ?
- Oil at \$75 – possibly in 2009?

■ WHO KNOWS?

Oil Price and Supply



Source: "Energy Victory," Dr. Robert Zubrin

Bubbles

- 1830's – Rail ways
- 1920's – Manufacturing and pulp & paper
- 1990's – Dot com
- 2000 – Bio energy (?)

Reality

- Winners and Losers
- Creativity survives
- New quantum leap in technology

Energy Demand

- Will continue to grow
- Estimated 3 to 5% per year
- Double by 2025
- Improved standards of living = more energy (India, China, Russia, South America)

Reality

- Fossil fuels cannot supply demand
- GHG from fossil fuels at 125MT / day
- Climate Change
- No choice but to react

REALITY

- Creativity and Technology
- Solutions Exist
- Solutions Can be developed

But we need:

- Knowledge
- Understanding
- Focus
- Leadership

How do we address the issue?

- Public education
- Public pressure / action
- Government Policy
- Creativity

Public education

What is ethanol?

- A renewable transportation fuel, traditionally made by fermenting corn, wheat, or sugar cane
- Typically blended with gasoline at 10 per cent and can be used in gasoline engines without any modification
- Cellulosic ethanol comes from agricultural residues and biomass such as wheat straw, corn stover, wood waste and even municipal waste



- Public education :
 - Cellulosic Ethanol – NEXT Generation
- Biochemical:
 - Use of Lignocellulosic Materials such as Biomass, Stover etc...
 - Three Step process:
 - Pretreatment, Enzymatic Hydrolysis and Fermentation
 - Very expensive today and not viable; needs technological breakthrough.

■ Public education :

- Cellulosic Ethanol – NEXT Generation

■ Thermo Chemical

- Use of Lignocellulosic Materials such as Biomass, Stover and municipal waste.
 - Complicated but proven process:
 - Pretreatment, Vaporization, Gasification / Pyrolysis and reforming of Syngas
 - Expensive and Government Policies are critical.

Public education

Food vs Fuel Myth (U.S.)

Year	Corn Production (Bushel per Acre)	% Ethanol	Net For Other Use
1980	90	10%	9,500
2000	130	17%	10,400
2010F	150	20%	11,400
2015F	170	25%	12,500

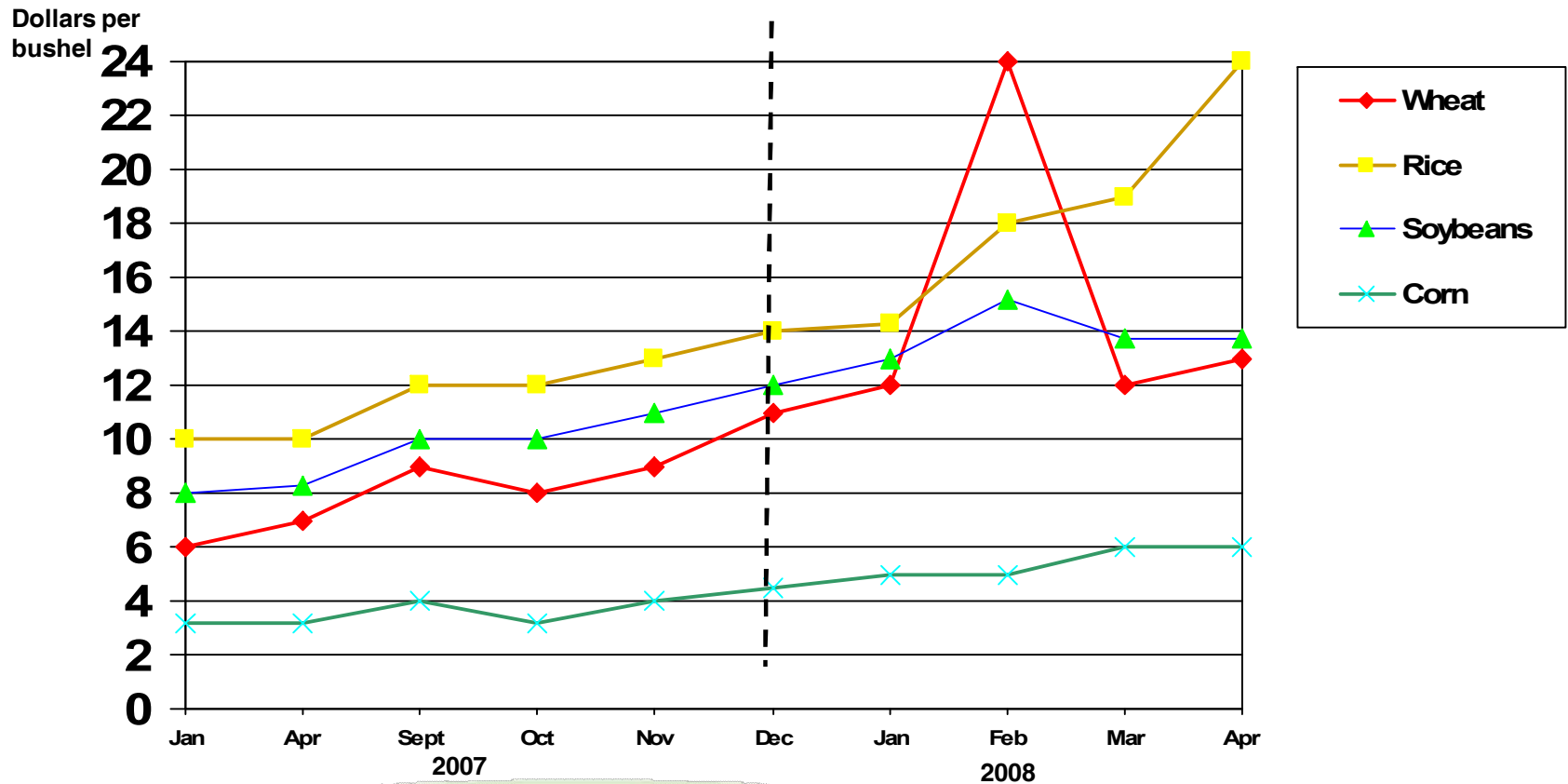
Public education

Food vs Fuel Myth (Quebec)

- 3.5 M Tonnes / Yr produced
 - 3.0 M Tonnes / Yr feed
 - 0.5 M Tonnes / Yr ethanol
- Only 10 - 15% used for ethanol
 - THIS IS NOT A FOOD CORN !

Public education

Food vs Fuel -- Food Volatility



Public education

- Fossil fuels vs Green fuels

- Carbon cycle – sustainable
 - Trees, plants, biomass

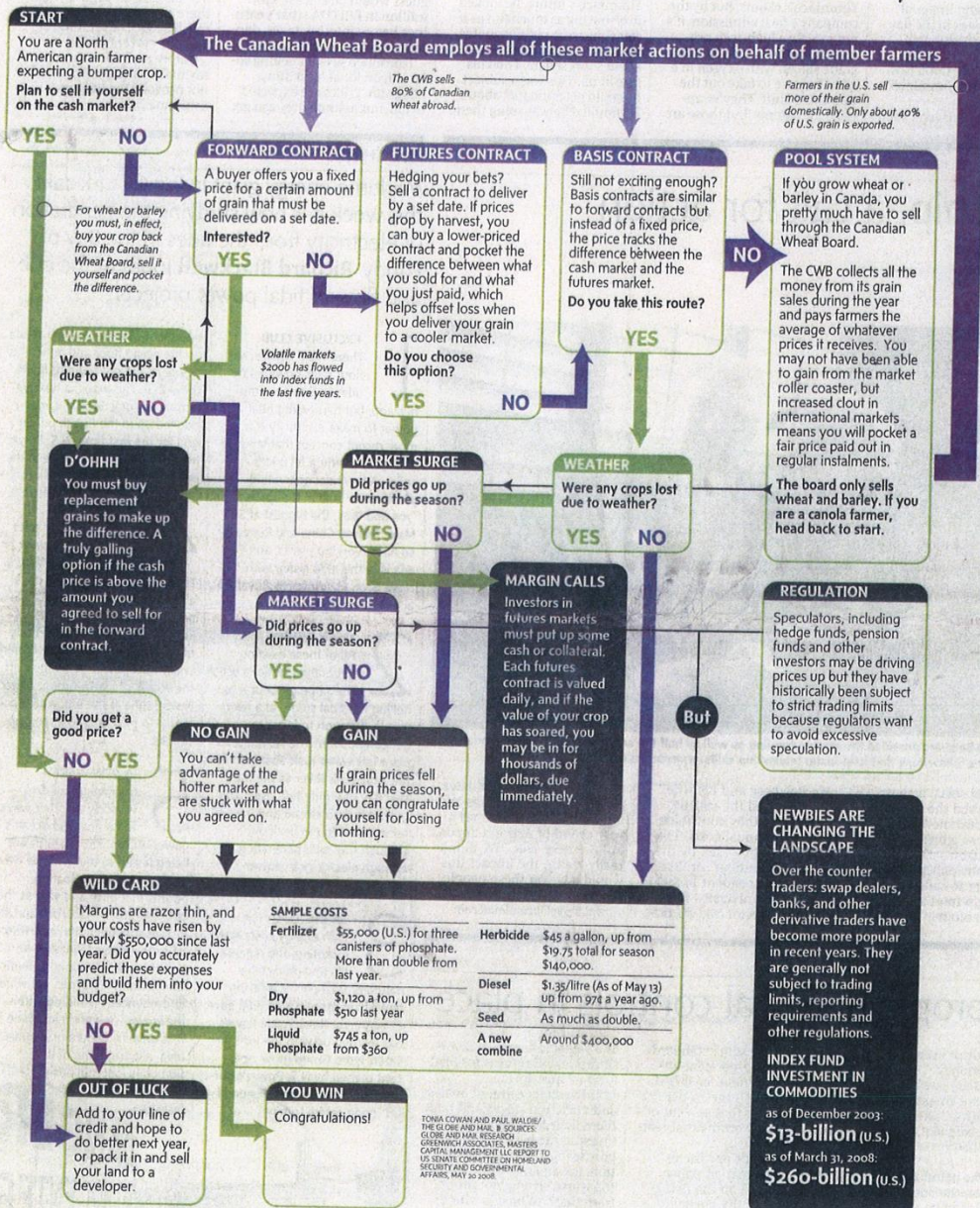
- Fossil fuels – out of sink and into atmosphere
 - GHG
 - Climate change

Public education

- Speculators
 - See Globe & Mail (following slide)
- Oil price
- Commodity price
- Food price issues

The Byzantine world of food pricing

How big money is wreaking havoc



Globe and Mail
May 31st 2008

Public education

- Lots of misinformation
- Rice:
 - Not used for ethanol (sake!)
 - Japan – record inventories
 - Artificial pricing
- Wheat:
 - 2% for ethanol
- Subsidies & Government policies are a problem.
 - DOHA round

Public pressure / action

■ Personal action

- Reduce energy consumption by 30%
 - E.g.: teleconferencing instead of jets, waste reduction, fuel efficient cars,

■ Public pressure

- Pressure governments to develop policies to address climate change, GHG

Government policy

■ Government regulations

- E.g.: Carbon tax on users

■ Create Carbon Technology Fund

- E.g.: Finance new, economically-driven technologies
 - 50% interest free money for 10 years 50% private investment

- Technology exists today to address many of the issues
 - E.g.: 40% of energy and GHG produced by fossil fuels can be replaced by nuclear energy
 - E.g.: 30% of North American and European energy can be reduced via consumer education, awareness and cultural change

- Cellulosic biofuels – uniquely positioned for growth
- GreenField is at the forefront of R&D in the area of cellulose ethanol production
 - Unique approach – not theoretical. Everything measured against “Can we make money? Can we be self-sustaining in the long-term?”
 - Use our own experienced process engineers and scientists to come to a practical solution

- Cellulosic biofuels – uniquely positioned for growth

- Researching two parallel paths
 - Bio Chemical (enzymatic hydrolysis and fermentation) from feedstocks including corn cobs and other selected forms of biomass
 - Thermo Chemical (Gasification) through a joint venture with Enerkem using sorted and clean municipal waste including construction wood waste
 - Two proposed locations

Uniquely Positioned for Growth – Cellulosic Biofuels

GreenField's Cellulosic Division is advancing its effort on two parallel paths and is working with several key partners

Bio Chemical

- GreenField has established its Centre for Excellence and R&D in Chatham, Ontario
- Initial focus is on pre-treatment process for biomass to reduce enzyme requirements
- Concurrently, establishing partners in enzyme R&D to explore ways to reduce the cost to commercially viable levels
- Holistic view of reducing overall costs to economically produce cellulosic ethanol

Thermo Chemical

- Joint venture with Enerkem to produce biomass to methanol and ethanol using gasification technology
- Two facilities in development in Canada – announcements coming within weeks



The Outlook

- Cellulose ethanol is not here yet
- Major break-throughs required
 - Pre-treatment
 - Enzyme cost and efficiency

If Canada wants to be a player in sustainable energy, we need:

- 1) A sustainable energy policy
- 2) A greenhouse reduction policy to address climate change
- 3) Policy to encourage and support creativity based on sound economics
- 4) And a climate that lets consumer and markets pick the winners

Conclusion

Wind power, Solar, Fossil Fuels are all receive government support : why not ethanol?

A free and transparent market where the consumer decides always provides the best result.

Ethanol is not the cause of the food crisis.

GreenField will be a player and accept the challenge.