The Economic Impact of Canadian Biodiesel Production on Farmers in Western Canada

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AIC *Making Choices*

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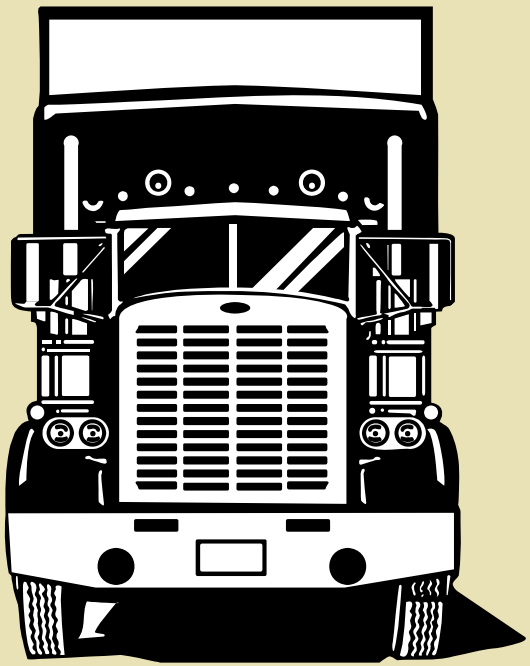
Questions for Western Canadian Farmers

- How much canola will the biodiesel industry need?
- How much will the price of canola need to change to induce farmers to produce enough?

What is biodiesel?

- Diesel fuel made from organic oils
  - Canola oil**
  - Soy oil
  - Cottonseed oil
  - Yellow grease
  - Animal fats
  - Palm oil



How is biodiesel made?

Combine vegetable oil with alcohol (methanol)

Wait....

....

... Output is methyl ester (biodiesel fuel) and glycerine

Benefits of Biodiesel

- Fewer impurities than conventional diesel fuel
- Renewable inputs
- Biodegradable
- Burning pure biodiesel produces
  - 50 percent **less** CO and particulate matter
  - 70 percent **less** hydrocarbons
  - 10 percent **more** nitrous oxides
  - Fewer sulphur compounds

(Source: U.S. Department of Energy, 2006)

Policies to Support Biofuels

- Federal
  - By 2012 all diesel fuel must have 2 % biodiesel (B2)
  - $1.4 billion incentives to support biofuels products
- Alberta
  - $239 million to support biofuels production
    - Bio-Energy Producer Credit Program
    - Bio-Refining Commercialization and Market Development Program
    - Bio-Energy Infrastructure Development Program
    - 3 plants will be online with capacity to produce 799 million L by 2009

Question 1

How much canola does it take to feed the biodiesel industry?

Estimated Demands

- It is estimated we need **800 million L** of biodiesel / year
- The Canola Council estimates this requires 1 million tonnes of canola / year
- Canola Council reports that 2006 carry over stocks were 1.5 million tonnes

Conclusion: NO PROBLEM

?

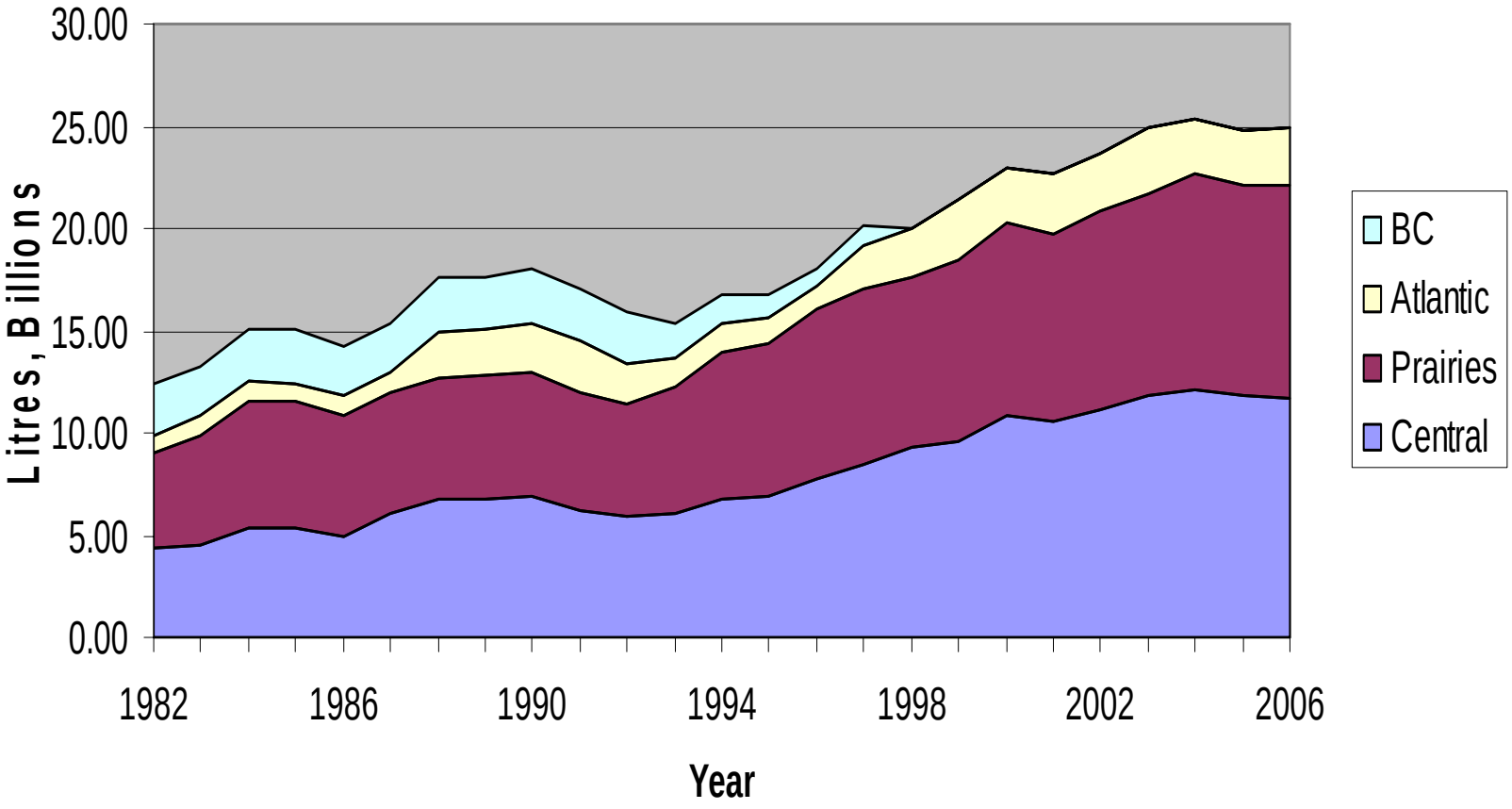
Conversion Facts

- Specific gravity of diesel fuel = 0.88 kg / L
- Canola is approximately 40 % oil

Conversions

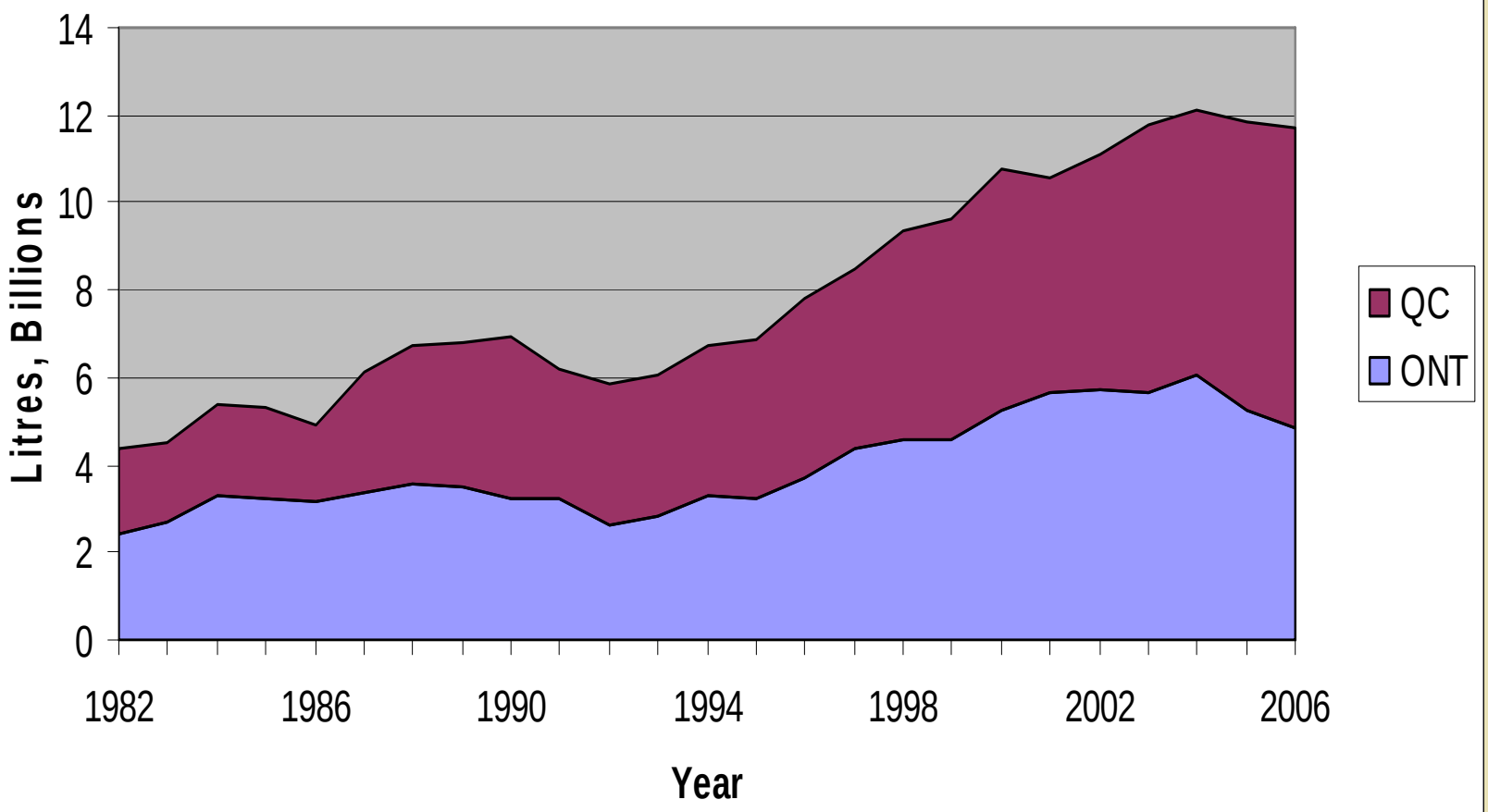
- LOW
  - 1 tonne of canola produces 421.13 L of fuel
  - 1000 L of diesel requires 2.4 tonnes of canola
- HIGH
  - 1 tonne of canola produces 460 L of fuel
  - 1000 L of diesel requires 2.1 tonnes of canola
- **Our decision**:
  - 1 tonne of canola produces 450 L fuel
  - 1000 L of diesel requires 2.222 tonnes of canola

Breakdown of Diesel Production by Region

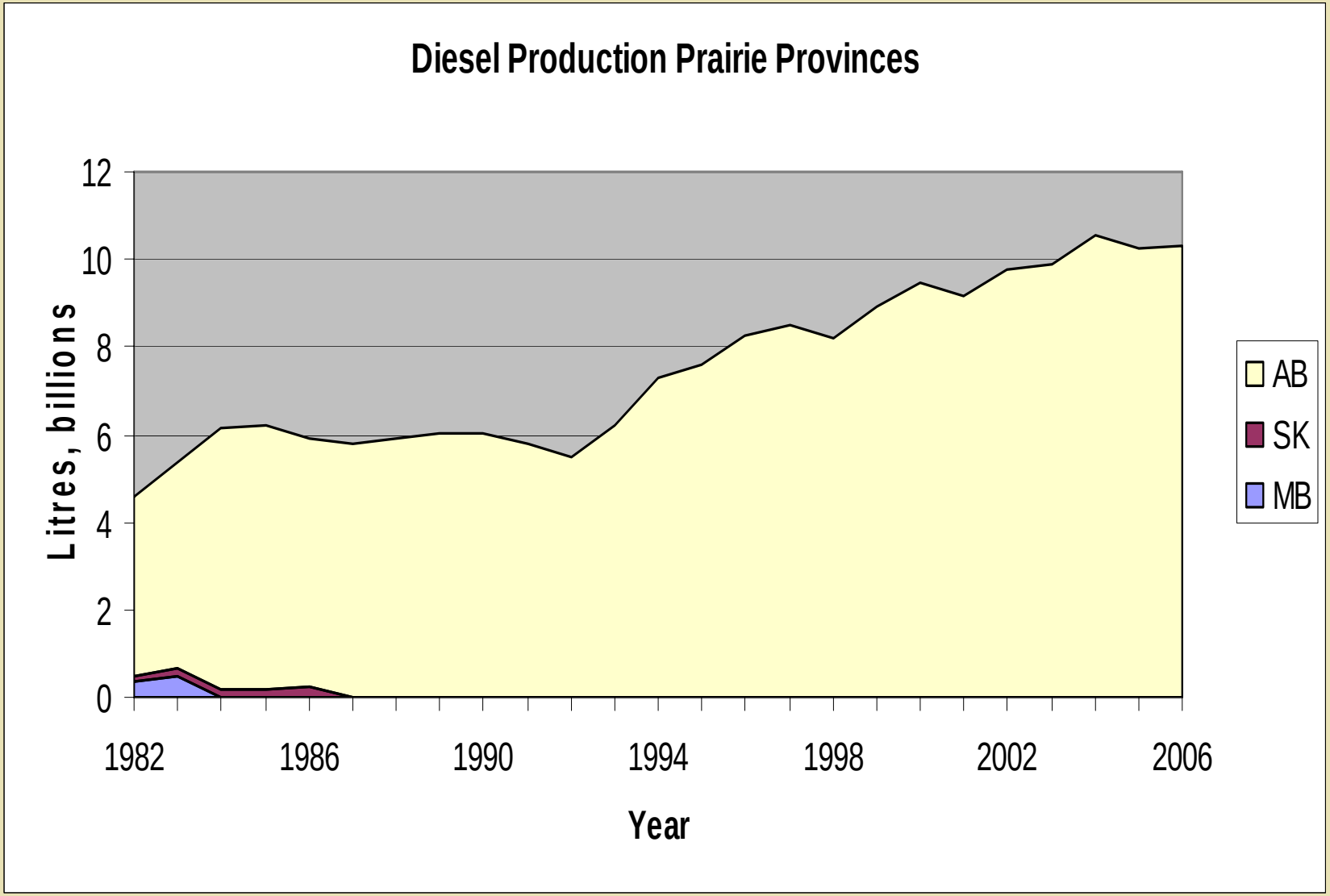


Source: Statistics Canada/CanSim II

Central Canada Diesel Production

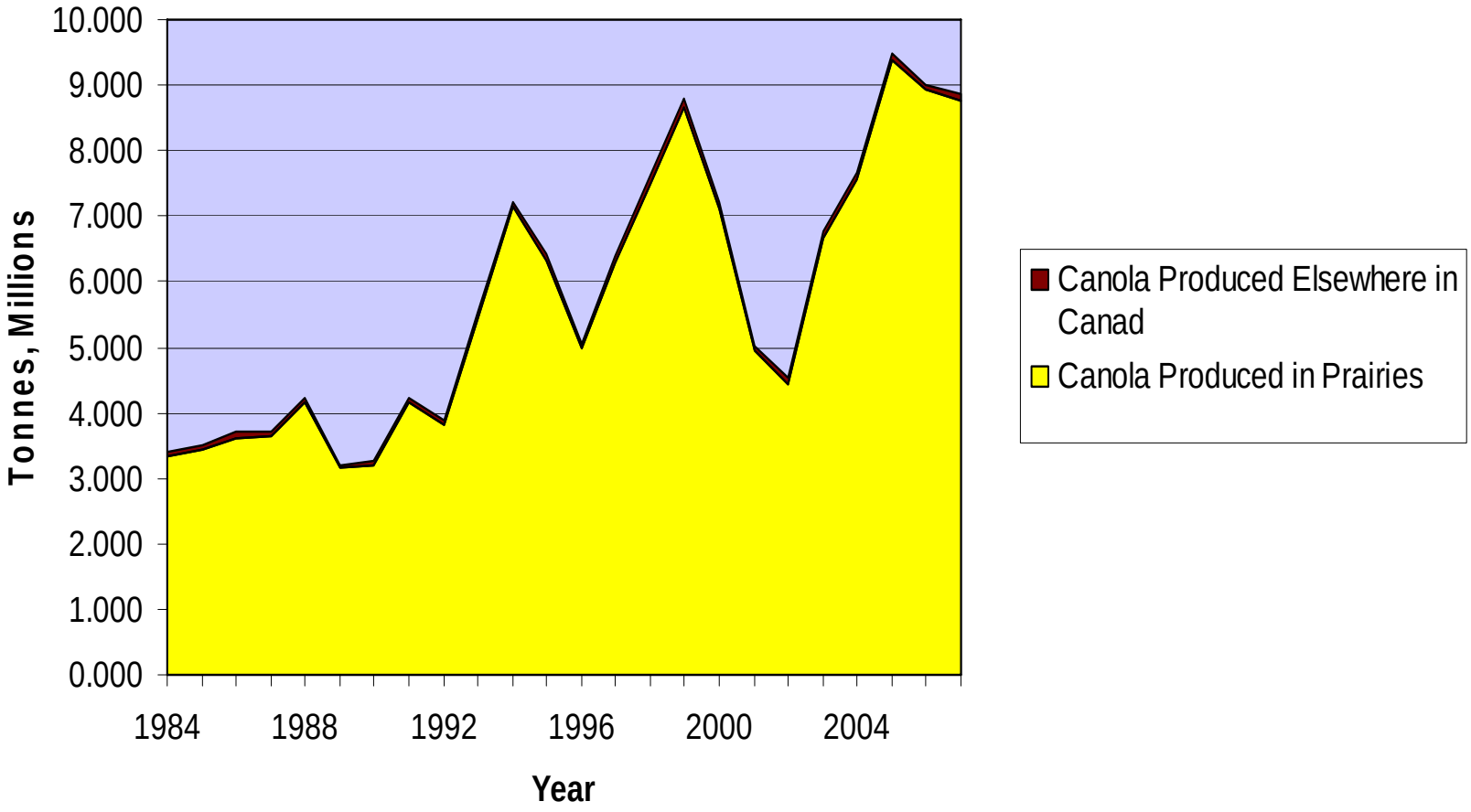


Source: Statistics Canada/CanSim II



Source: Statistics Canada/CanSim II

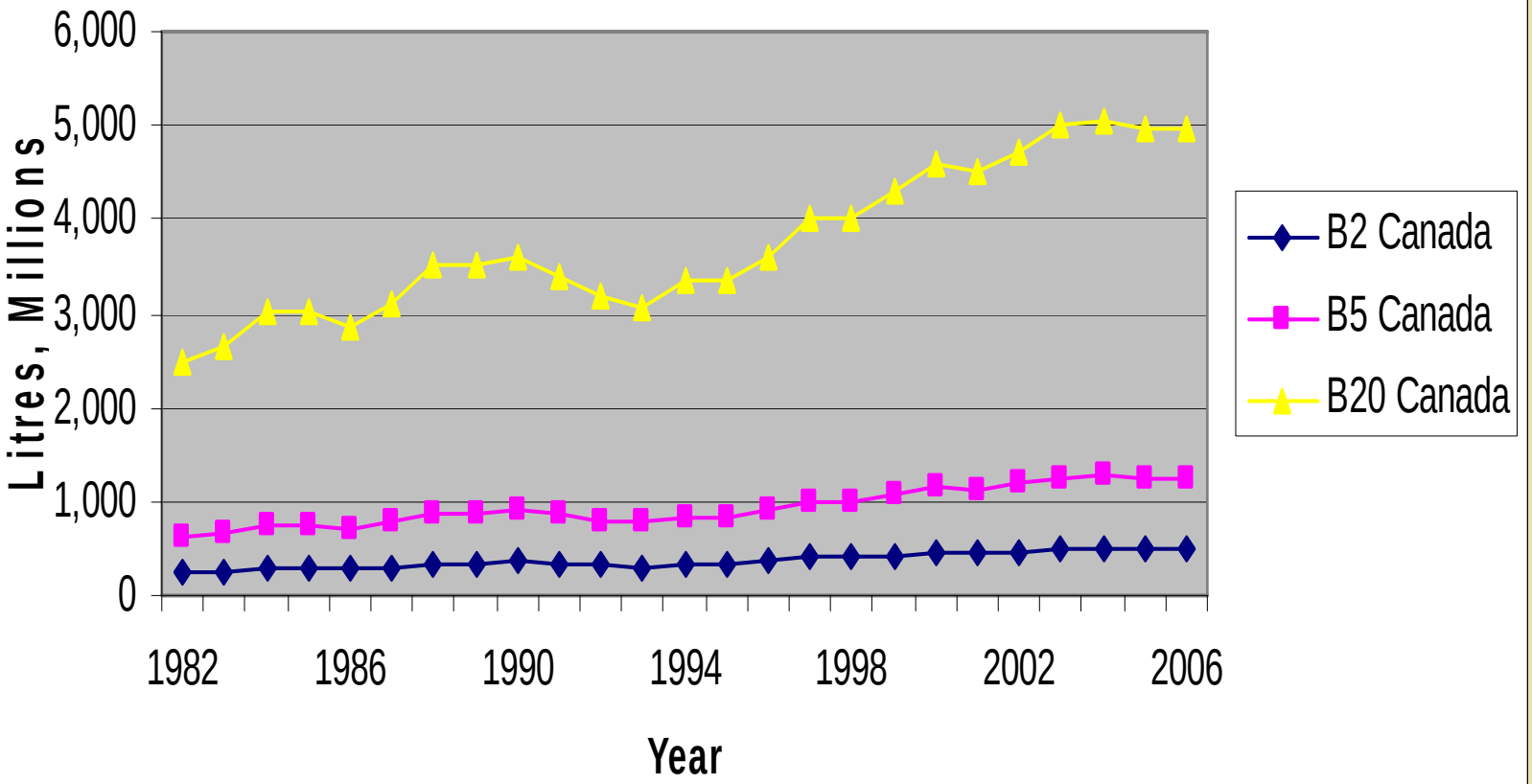
Overview of Canola Production in Canada



Conclusion: Canadian biodiesel from canola will primarily be produced in the Prairie region.

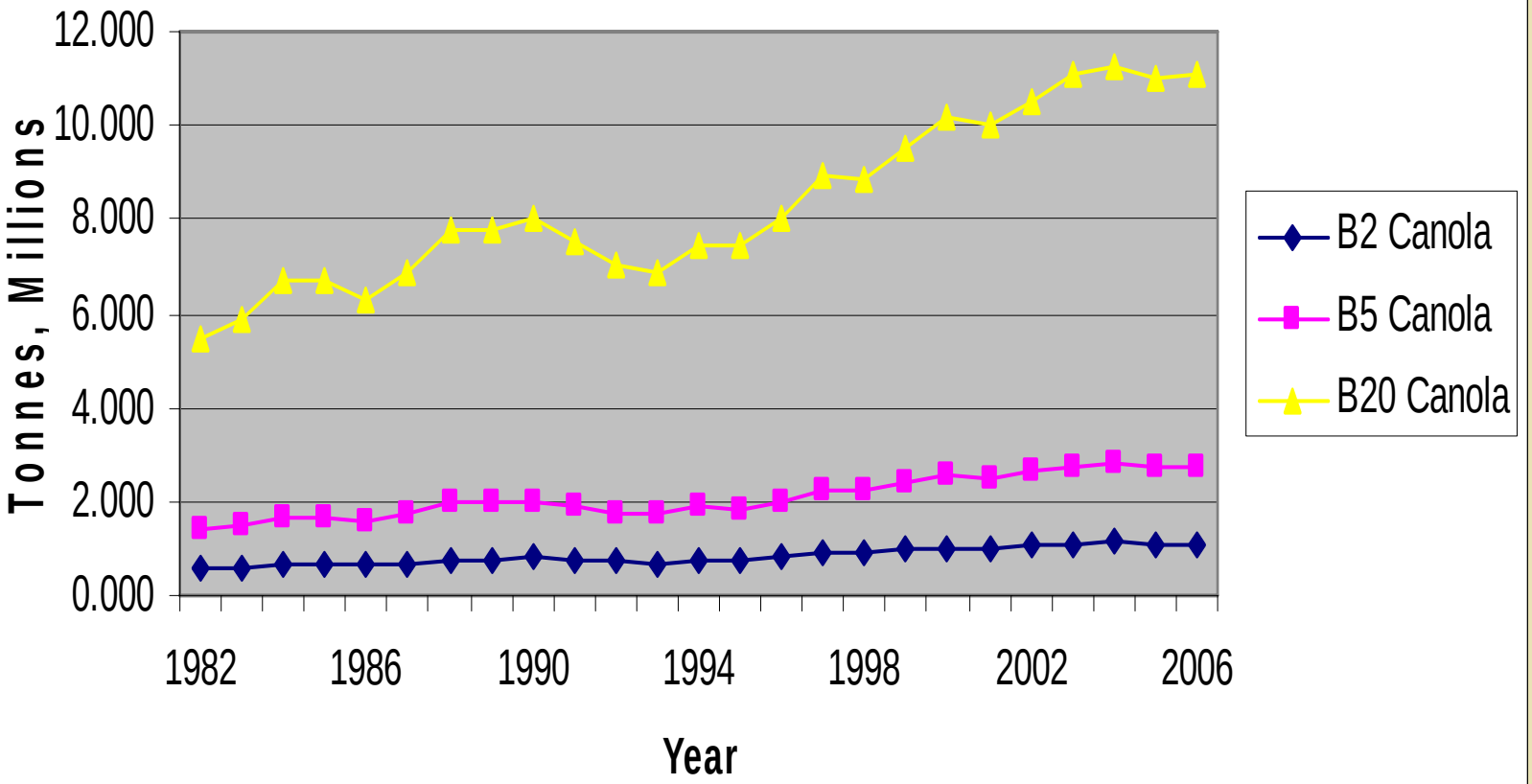
Source: Statistics Canada/CanSim II

Biodiesel Demand in Canada



Source: Statistics Canada/CanSim II

Demand for Canola for Biodiesel Production



Source: Statistics Canada/CanSim II

What type of Canola?

- Grades 1 and 2 and 3 and sample
- Canola is aggressively marketed as a healthful oil for the food market
- So why put it in our cars???

Excluding Grade 1 Canola

- Average total production over 10 years is 7.3 million tonnes
- 10 year average of Grade 1 is 75%
- Grades 2, 3 and sample canola = 1.825 million tonnes (0.25 * 7.3)
- 1.8 tonnes of canola could produce 810 million L of biodiesel.

Source: http://www.grainscanada.gc.ca/quality/Canola/2006/canola06hshighlights-eng.htm#production

Recent Trends

- 2007:
  - 9 million tonnes canola
  - 88 percent grade 1
  - 1.08 million tonnes lower grade seed
  - 486 million L using grades 2, 3 and sample only

INSUFFICIENT SUPPLY

Using “Excess;” All classes

	Units: millions of tonnes			Units: L, Millions		
Year	Production	Exports	Carry Over	Convert Carry Over	Convert Exports	Convert Both
1997	5.062	2.519	0.563	253.35	1,134	1,387
1998	6.393	2.964	0.363	163.35	1,334	1,497
1999	7.643	3.9	0.633	284.85	1,755	2,040
2000	8.798	3.885	2.157	970.65	1,748	2,719
2001	7.205	4.859	1.088	489.60	2,187	2,676
2002	5.017	2.524	1.2	540.00	1,136	1,676
2003	4.521	2.394	0.894	402.30	1,077	1,480
2004	6.771	3.754	0.609	274.05	1,689	1,963
2005	7.674	3.412	1.587	714.15	1,535	2,250
2006	9.483	5.409	2.007	903.15	2,434	3,337
2007	9.00	5.435	1.82	819.00	2,446	3,265

Source: http://www.agr.gc.ca/mad-dam/index_e.php?s1=pubs&s2=go-co&page=go-co-hist

Where does this leave us?

- If the Canola Council is correct and the estimated demand for biofuels is in fact 800 million L
  - We need 1.8 million tonnes of canola to meet that need.
  - This cannot be supplied from carry over stocks alone

CONCLUSION:

Farmers will need to increase production of canola OR reduce exports by approximately 2 million tonnes / year

Question 2

How much do prices need to increase for farmers to produce enough canola?

Model

- Individual linear OLS regressions for
  - Saskatchewan
  - Manitoba
  - Alberta
- Dependent variable: area seeded for canola (ha)
- Double log format
- 30 years of data

Regression Results

Variable	**Manitoba**	**Saskatchewan**	**Alberta**
Lncan *t-1*	0.591 *	0.565 *	0.439 *
Lncanpr *t-1*	0.950 *	1.368 *	0.965 *
Lnryepr t-1	*0.348*	*-0.165*	*-0.-516*
Lnwhpr *t-1*	-0.918 **	-0.920 *	-0.785 *
Lnbarlpr *t-1*	*-0.346*	-0.559 *	-0.426 **
Lnoatspr *t-1*	*-0.00093*	0.352 ***	*0.165*
Lnflaxpr t-1	*-0.347*	*-0.029*	*0.0519*
Constant	6.731 *	4.886 *	7.504 *

*** significant at 10 %
** significant at 5 %
* significant at 1 %

Application of Results

- From 1998 to 2007 hectares planted to canola were
  - 20 % Manitoba, 48 % Saskatchewan and 32 % Alberta.
  - Price Changes required:

	B2	B5	B20
MB	91.42	137.13	502.80
SK	75.73	113.59	416.51
AB	86.56	129.85	476.11

Conclusions

- Alberta will be able to supply biodiesel for a B2 program
- A B2 program alone requires price increases of 23 to 27 % *holding other prices constant*
- Is fuel the best use for canola oil?
- Program/Government support stability?

Areas for Future Research

- Interactions of markets for fuel and food
- Infrastructure and transportation
- Risk management (boom/bust cycles)
- Full environmental accounting of net benefits of biodiesel
- Alternative feedstock sources (palm oil?)

Thank you!

Questions?