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Effect of Mandated Biodiesel Blend on Canadian Canola

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Overview

- Commissioned by CCGA to determine the likely impact of biodiesel blend requirements on the demand for canola oil and canola
- Study had three components:
  - Review of previous economic studies on biodiesel
  - Overview/market analysis for major biodiesel feedstocks
  - Analysis of least-cost competition among candidate biodiesel feedstocks
- Last component provides insight on nature of demand complex for fats/oils post-biodiesel blend requirement

Analytical Approach

- Construct a model of Canadian fat-oil market without biodiesel blend, solve for a least-cost solution
  - Sources: canola oil, soybean oil, tallow, yellow grease, palm oil
  - Uses: foods/food manufacturing, feed, soap/industrial chemicals
  - Levels of sources and uses defined by historical data
- Introduce demand from biodiesel manufacturing, observe realignment given constraint of historic source availability
- Counterfactual analysis
- But indicative of the ordering of feedstocks in biodiesel demand and of anticipated adjustments in fat/oil markets

Empirical Model

- Least-cost linear programming model
- Minimize total cost of satisfying Canadian demand for fat/oils in food, feed, soap/chemical manufacturing and biodiesel production,
- Constraints:
  - Historic product supply and demand levels
  - Restrict tallow and yellow grease from food use
- Allow historic exports to be “pulled back” into domestic market to satisfy demands from biodiesel
- Allow expansion in vegetable oil supplies to meet 5% blend
- Two scenarios- one with inelastic prices based on history, one with elastic prices

Data/Assumptions

- Yield:
  - 1000 kg of feedstock+100 kg of methanol and a catalyst→1010 kg of biodiesel and 90 kg of glycerine
- Food demand (Statistics Canada Food Statistics)
  - Exclusive of butterfat:
  - 29.75 kg/capita, or 960,048 tonnes
- Feed use:
  - Assume 10% of soybean oil supply, 50% of tallow supply and 75% of yellow grease supply
- Soap/industrial use:
  - Assume 40% of soybean oil supply, 40% of tallow supply, about 25% of yellow grease supply, and 80% of imported palm oil
- Domestic production based on 2000-05 average
- Imports 2003-2005 average
- Prices 2003-2005 average

Data/Assumptions

- Allow supply flexibility of 50% in vegetable oils to meet the 5% blend requirement
- Elasticities
  - Canola Oil -.35 (FAPRI)
  - Soybean Oil -.17 (FAPRI)
  - Palm Oil -.38 (FAPRI)
  - Tallow -1*
  - Yellow Grease -1*
    - *Assumed Values

Results- Base Run

	Biodiesel (tonnes)	Food (tonnes)	Feed (tonnes)	Soap and Chemical (tonnes)	Export (tonnes)	Price ($/tonne)
Canola Oil	-	561,715	-	164,451	471,834	705
Soybean Oil	-	384,333	-	-	-	670
Tallow	-	-	361,258	27,892	-	394
Yellow Grease	-	-	-	171,000	-	328
Palm Oil	-	14,000	-	-	-	452
Total	-	960,048	361,258	363,343	471,834	

Scenario 1

- Test impact of biodiesel blend requirement at 2% and 5%
- For 5% blend, allow increase in domestic availability of 50% over base for vegetable oils
- Assume that prices are completely inelastic

Results- Scenario 1 2% Blend

	Biodiesel (tonnes)	Food (tonnes)	Feed (tonnes)	Soap and Chemical (tonnes)	Export (tonnes)	Price ($/tonne)
Canola Oil	-	575,715	229,105	363,343	29,837	705
Soybean Oil	-	384,333	-	-	-	670
Tallow	256,997	-	132,153	-	-	394
Yellow Grease	171,000	-	-	-	-	328
Palm Oil	14,000	-	-	-	-	452

Results- Scenario 1 5% Blend

	Biodiesel (tonnes)	**Food (tonnes)**	**Feed (tonnes)**	**Soap and Chemical (tonnes)**	**Export (tonnes)**	Price ($/tonne)
Canola Oil	-	907,484	361,258	363,343	164,915	705
Soybean Oil	523,936	52,564	-	-	-	670
Tallow	389,150	-	-	-	-	394
Yellow Grease	171,000	-	-	-	-	328
Palm Oil	21,000	-	-	-	-	452

Scenario 1 Summary

- As the demand from biodiesel increases:
  - Palm oil moves out of food and into biodiesel
  - Tallow moves out of feed and into biodiesel
  - Yellow grease moves out of soap/chemical and into biodiesel
  - Soy oil moves into biodiesel
  - Canola oil concentrates in food; fills in demands vacated by other oils and fats
- Rendered product cannot fill entire demand
- Greatest cost reduction benefit comes from additional yellow grease, followed by tallow and palm oil
- Sensitivity analysis at 2% blend showed canola oil price had to decrease below soy oil before general nature of solution changed
  - soy oil was exported, and canola oil captured more of food market

Scenario 2

- Similar to Scenario 1, but assume feedstock prices shift according to changes in demand

Results- Scenario 2 2% Blend

	Biodiesel (tonnes)	**Food (tonnes)**	**Feed (tonnes)**	**Soap and Chemical (tonnes)**	**Export (tonnes)**	Price ($/tonne)
Canola Oil	29,985	415,797	-	337,615	414,603	724
Soybean Oil	32,249	544,251	-	-		727
Tallow	102,238	-	361,258	25,728		495
Yellow Grease	256,500	-	-	-		492
Palm Oil	21,000	-	-	-		538
Total	441,972	960,048	361,258	363,343	414,603	

Results- Scenario 2 5% Blend

	Biodiesel (tonnes)	**Food (tonnes)**	**Feed (tonnes)**	**Soap and Chemical (tonnes)**	**Export (tonnes)**	Price ($/tonne)
Canola Oil	262,510	686,101	44,138	359,245	-	918
Soybean Oil	262,509	269,852	44,138	-		727
Tallow	323,613	-	256,014	4,098		591
Yellow Grease	239,532	-	16,968	-		492
Palm Oil	16,906	4,094	-	-		538
Total	1,105,070	960,048	361,258	363,343	-	

Scenario 2 Summary

- As the demand from biodiesel increases, results are directionally similar to Scenario 1
- Canola oil is used in biodiesel at more significant level at 5% blend
- Greatest cost reduction benefit comes from additional palm oil, due to its price elasticity
- Price increase in canola oil:
  - $19/tonne at 2% blend
  - > $200/tonne at 5% blend

Observations

- Canola oil is not the first choice on the basis of cost to make biodiesel
- Only at extreme points does it come into material use as a biodiesel feedstock
- Primary effect is to tighten supplies of competing fats and oils in other uses to the point that canola oil can penetrate these markets

Observations

- Results assume *instantaneous* adjustment
  - 5% blend results probably exaggerate adjustment
  - 2% blend scenarios better reflect adjustment over time to the 5% blend
- Results with a price response at 2% blend suggest $19/tonne price effect on canola oil, or approximately $5/tonne canola

Caveats

- Results are based on least-cost given product yields; do not consider cold weather gel properties of product
  - Summer vs. winter biodiesel (?)
- Elasticities are based on small changes in demand
- Information on fat/oil use across product demands is poor

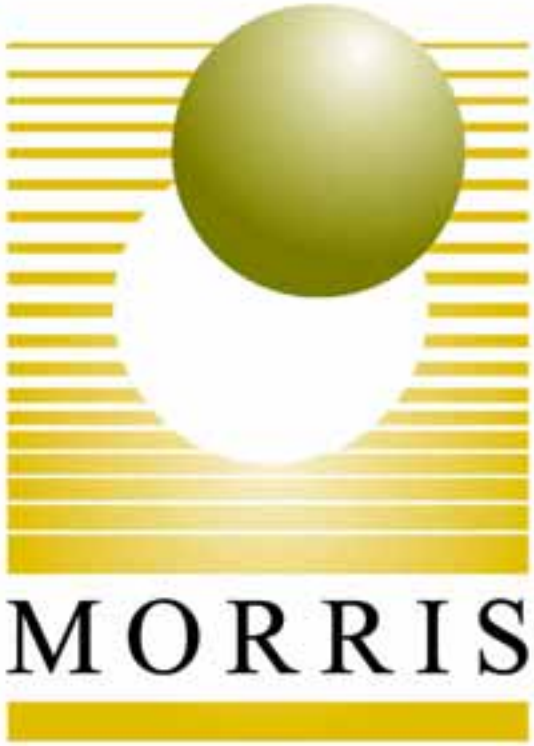
Conclusions

- Canola oil is not likely to be a leading feedstock for biodiesel on the basis of cost
  - Consistent with previous economic studies
  - Market analysis suggests rendered product to remain low cost
- Main implication for canola is in supplying feedstock in uses displaced by biodiesel
- Impact on canola & canola oil prices is probably marginal
- Prospects probably improved for canola if it finds use in making a winter biodiesel product
- Expectations need to be realistic

Study Available Online

Canadian Canola Growers' Association

www.ccga.ca



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