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# **Biodiesel Industry Status**

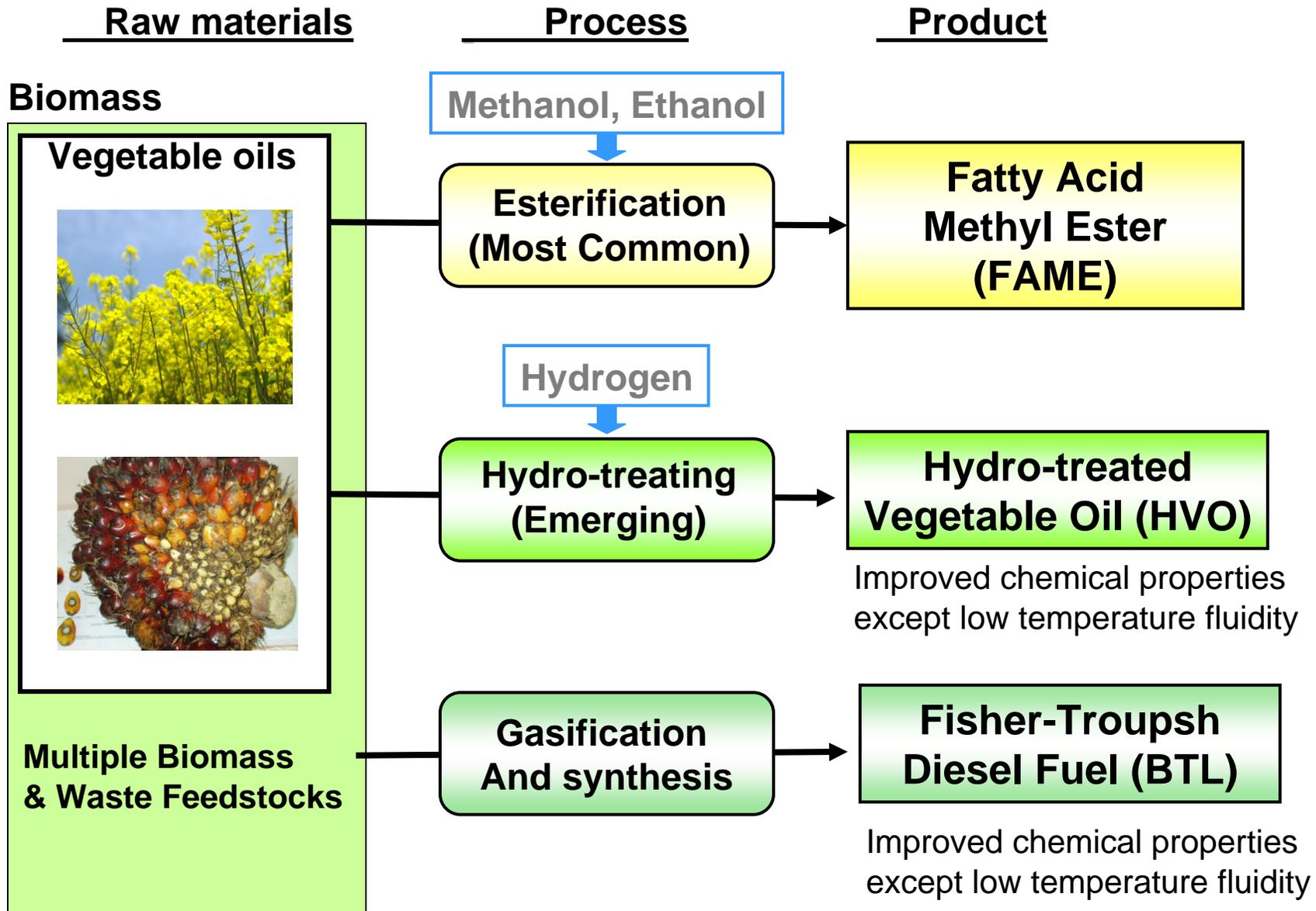
## **Renewable Fuels Commission**

**May 12, 2008**

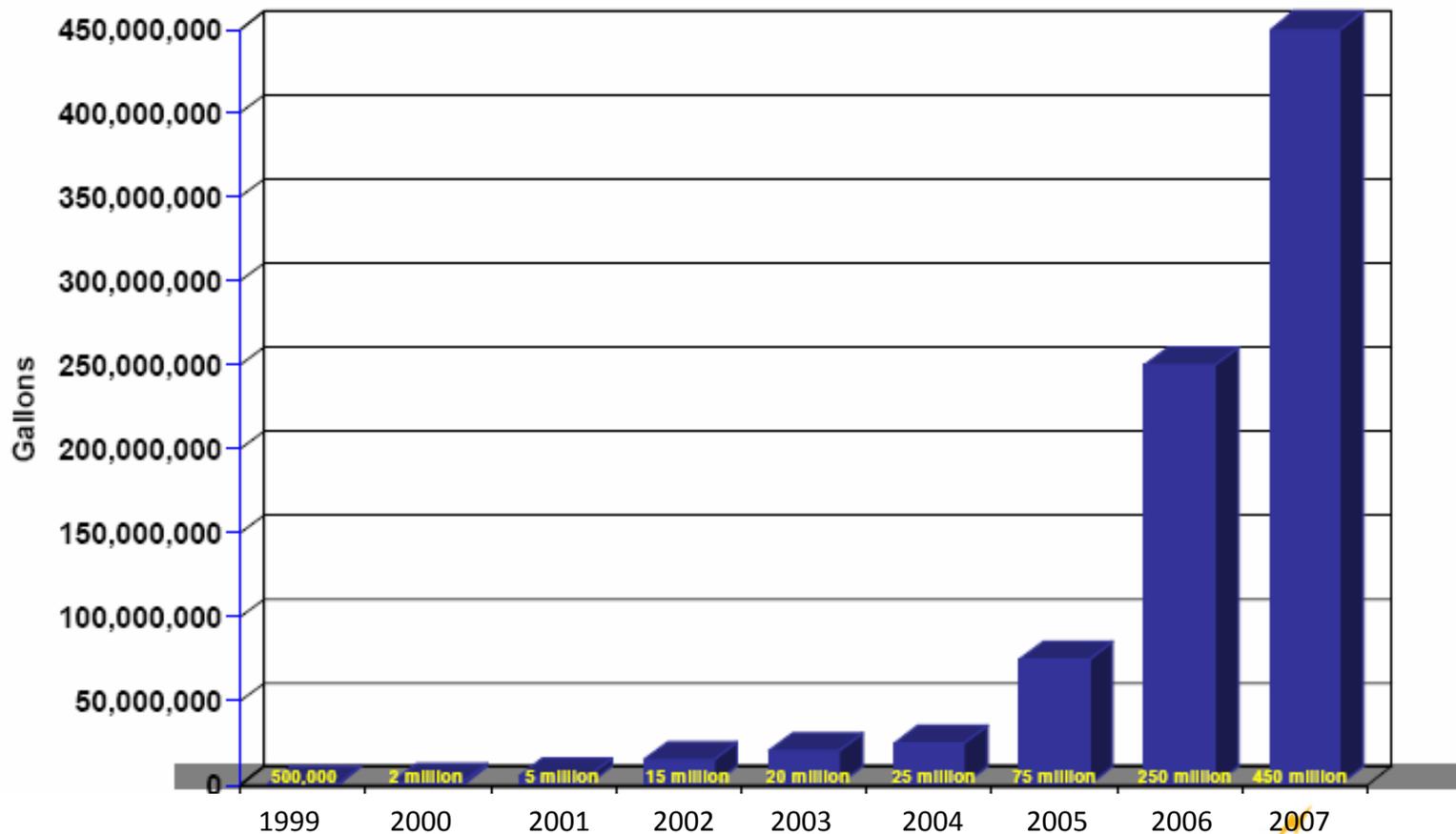
**Jim Croce  
President and CEO  
NextEnergy**



# Bio-Diesel Production Processes



# Estimated US Biodiesel Production by Fiscal Year



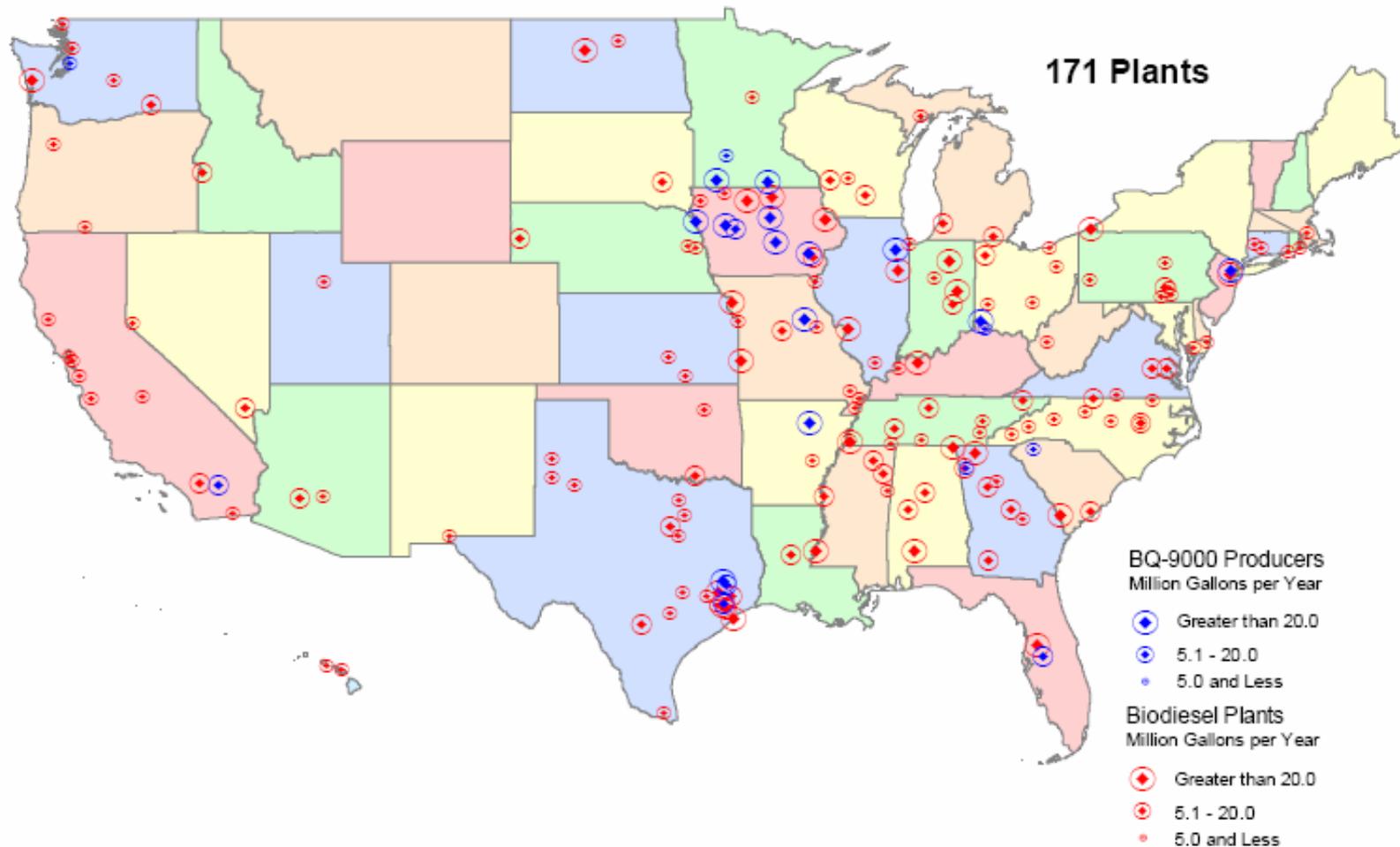
# Biodiesel Production Drivers

- Renewable Fuels Standard
  - 2007: 500 Million gallons; increasing to 1-1.5 Billion gallons by 2012
- Federal Tax (Blenders) Credit (\$0.50-\$1.00/gallon)
- Premium Wholesale Price to Petroleum Diesel
  - Over \$1/gallon (only \$0.15 premium during 2005-07)
- Environmental/Health Benefits
  - Reduction in CO<sub>2</sub>, PM, CO, and SO<sub>2</sub>
- Energy Independence
  - Produced from domestic feed stocks (vegetable oils, animal fats)

# Existing US Biodiesel Plants

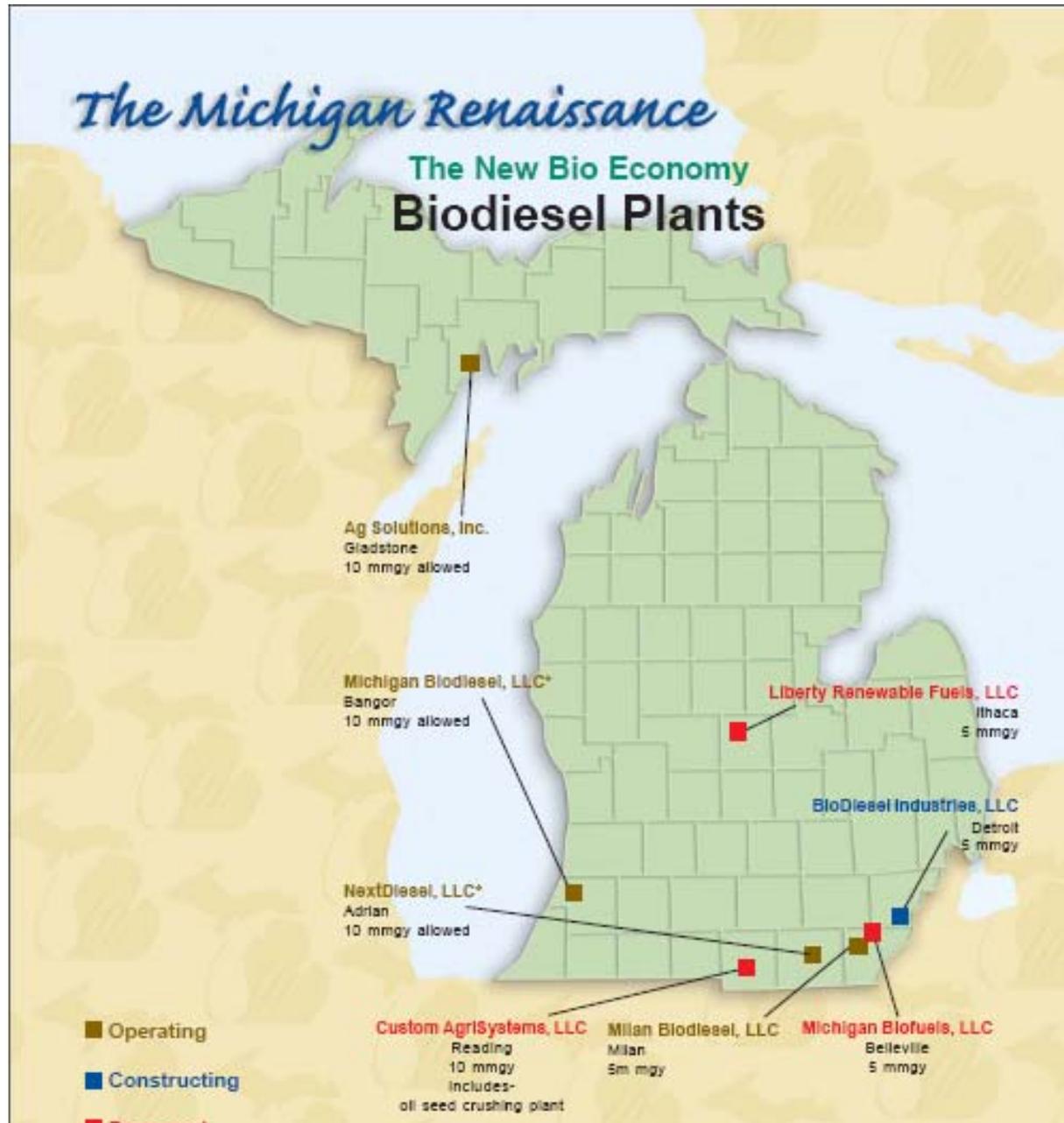


Commercial Biodiesel Production Plants (Jan. 25, 2008)



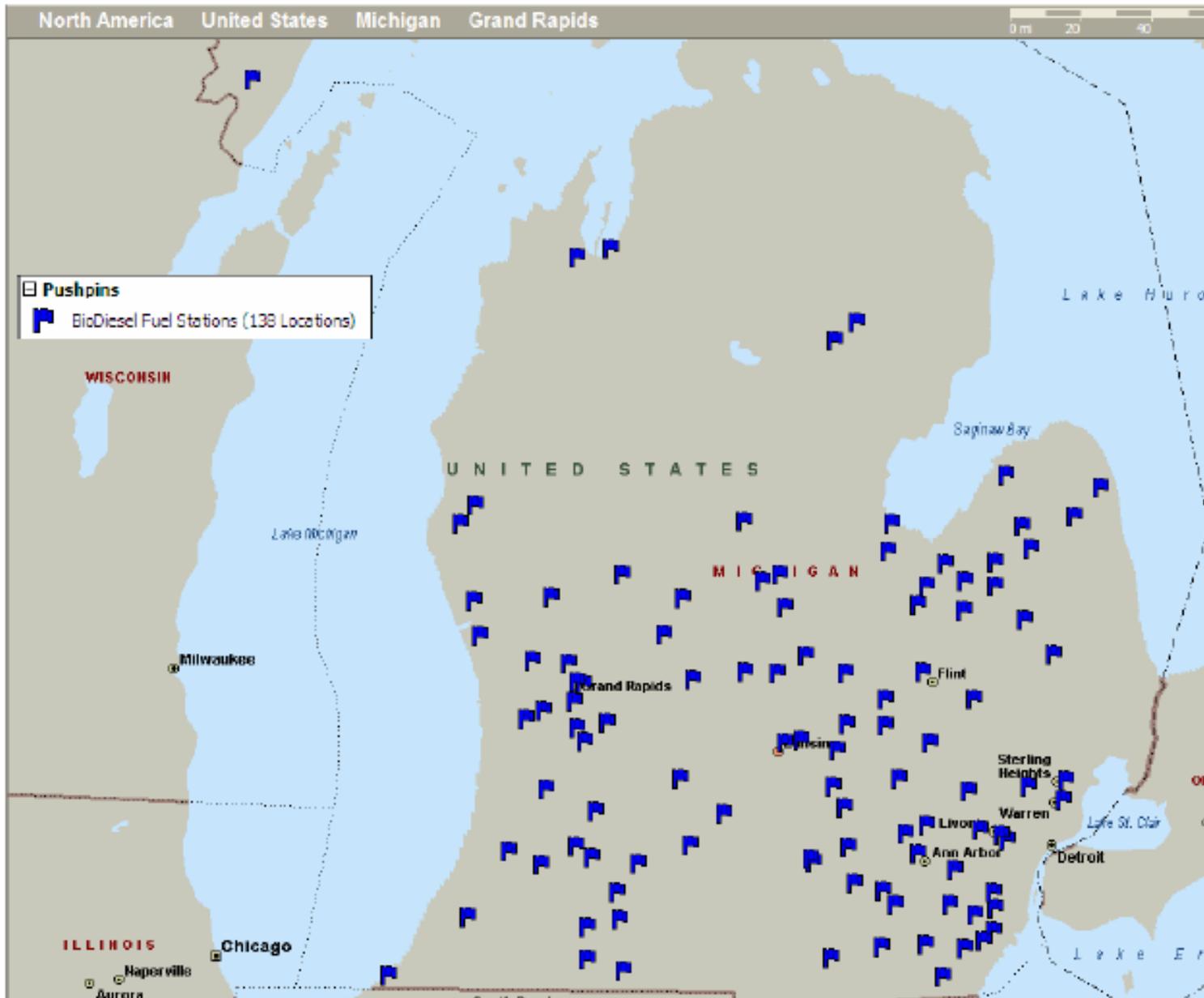
'BQ' Denotes BQ-9000 Accredited Producers

# Michigan Biodiesel Production



# Michigan Biodiesel Fueling Stations (233 Pumps)

Biodiesel Fuel Stations (138)



# Economics of Biodiesel Production

- Feedstock Cost (80-92%)
    - Varies by feedstock type (e.g. soybean oil, yellow grease, animal fats)
  - Methanol Cost (4-7%)
    - Cost has decreased by \$0.70/gallon since January
  - Processing Cost (4-13%)
    - Capital recovery, personnel, natural gas, maintenance
- 
- Byproduct (Glycerine) Sales (3-5% credit)
    - Price has tripled in last 12 months

# Current Biodiesel Production Profitability (from Soybean Oil)

## B100 GROSS PROCESSING MARGIN

(Jacobsen Upper Midwest Values – May 07th, 2008)

Components	Pricing Date: 05-07-08
RBD Soy Oil Price (\$/lb)	\$0.6316
RBD Cost @ 7.5 lb/gal	\$4.7370
Methanol Price (\$/gal)	\$1.80
Methanol Cost @ 0.112 utilization	\$0.2016
Processing Costs (\$/gal)	\$0.2114
Byproduct Credit (\$/gal) [Glycerin @\$0.18/lb X 0.8530 #/gal]	\$0.1535
Total Transesterification Costs (\$/gal)	\$4.9965
B100 Market Price (\$/gal)	\$4.95
Gross Processing Margin (\$/gal)	\$-0.0465

# Production Economics (Assumptions)

## *Methodology:*

### *Feedstock*

*SBO G/D: 7.5 lbs/gal (prices updated monthly)*

*YG and SPF: 7.75 lbs/gal (prices updated monthly)*

### *Pre-Treatment (YG and SPF only)*

*Methanol: 0.1078 lbs/gal (prices updated monthly)*

*Other: \$0.1161/gal*

### *Transesterification*

*Methanol: 0.7422 lbs/gal (prices updated monthly)*

*Other: \$0.2114/gal*

### *Capital*

*Depreciation: \$0.1130/gal (\$11.3 million plant with 10 million gallon capacity over 10 years\*)*

*Interest: \$0.0435/gal (55% borrowed at 7%)*

*\*5 Years: \$0.2260/gal and 3 Years: \$0.3767/gal*

### *Current By-Product Revenue*

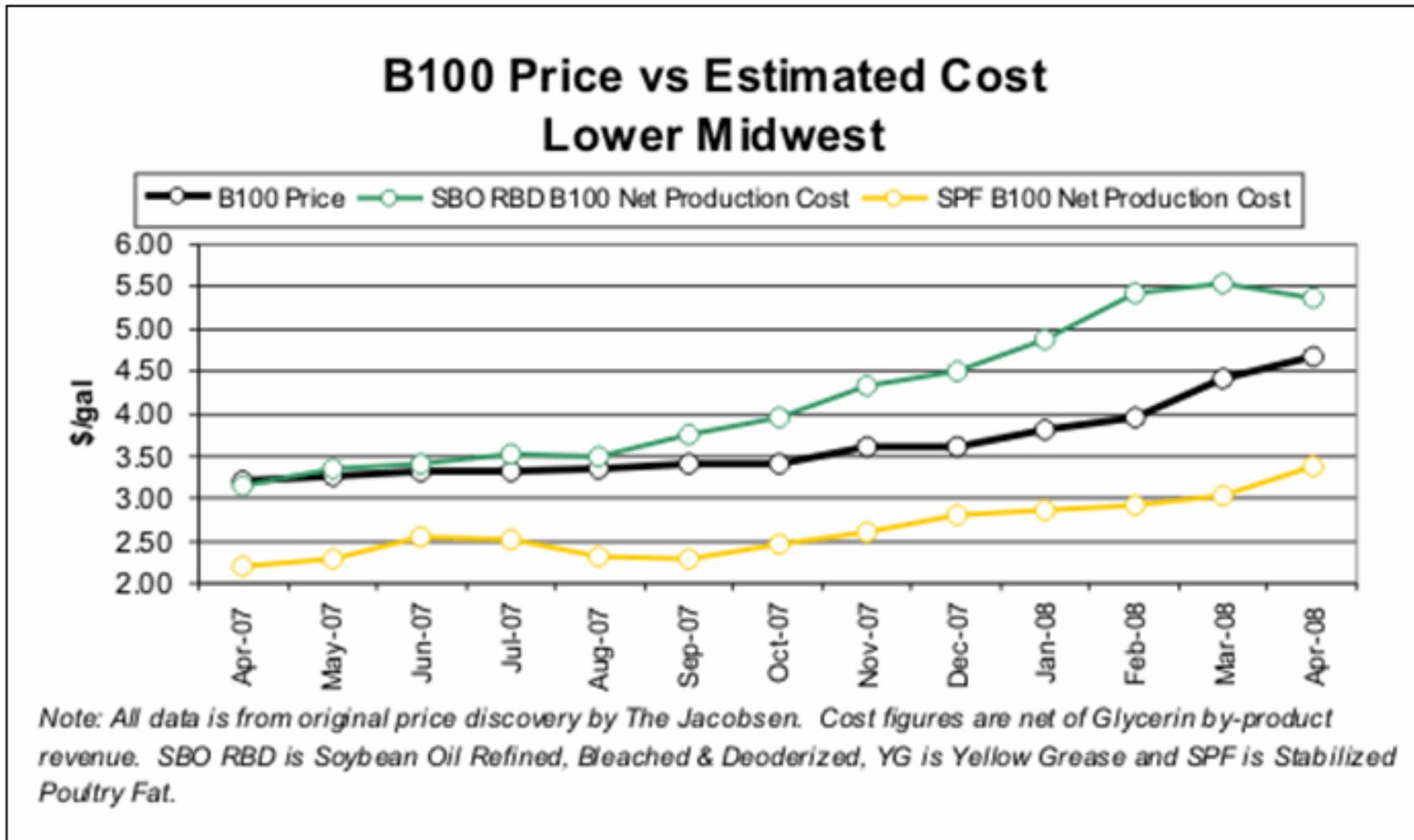
*Glycerin: 0.8530 lbs/gal @ \$0.025/lb = \$0.0213/gal*

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## *Sources:*

1. Feedstock, Glycerin and B100 prices: The Jacobsen Publishing Company
2. Methanol prices: Methanex.com
3. Pre-Treatment: "A Pilot Plant to Produce Biodiesel from High Free Fatty Acid Feedstocks", Canakci & Van Gerpen, Iowa State University, 2001
4. Transesterification: "A Process Model to Estimate Biodiesel Production Costs", Haas, McAloon, Yee & Foglia, 2005
5. Inflation Adjustment: John Ferris, Michigan State University using a database from his forecasting model AGMOD

# 12 Month Production Economics (Soy Oil and Animal Fat)



# Biodiesel Profitability from Soy Oil

Matrix of Profits from Biodiesel Production Related to Wholesale Prices of B100 and the Price of Soybean Oil (RBD)<sup>1</sup>

Price of B100 \$/Gal.	Price of Soybean Oil (Cents/Pound)							
	52	54	56	58	60	62	64	66
4.20	-15	-30	-45	-60	-75	-90	-105	-120
4.40	5	-10	-25	-40	-55	-70	-85	-100
4.60	25	10	-5	-20	-35	-50	-65	-80
4.80	45	30	15	0	-15	-30	-45	-60
5.00	65	50	35	20	5	-10	-25	-40
5.20	85	70	55	40	25	10	-5	-20
5.40	105	90	75	60	45	30	15	0
5.60	125	110	95	80	65	50	35	20

<sup>1</sup> Assumes a conversion of 7.5 pounds of soybean oil per gallon of B100. Total economic costs are estimated at a net of 45.3 cents per gallon including an offset of 21.3 cents per gallon for returns from glycerine. These costs include depreciation and a nominal return on investment. The data are based on prices and interest rates typical for the spring of 2008 as applied to a new 10 million gallon plant.

# Biodiesel Profitability from Yellow Grease

Matrix of Profits from Biodiesel Production Related to Wholesale Prices of B100 and the Price of Yellow Grease<sup>1</sup>

Price of B100 \$/Gal.	Price of Yellow Grease (Cents/Pound)							
	24	26	28	30	32	34	36	38
4.20	115	100	84	69	53	38	22	7
4.40	135	120	104	89	73	58	42	27
4.60	155	139	124	109	93	77	62	46
4.80	175	159	144	128	113	97	82	66
5.00	195	180	164	149	133	118	102	87
5.20	215	199	184	169	153	137	122	107
5.40	235	220	204	189	173	158	142	127
5.60	255	240	224	209	193	178	162	147

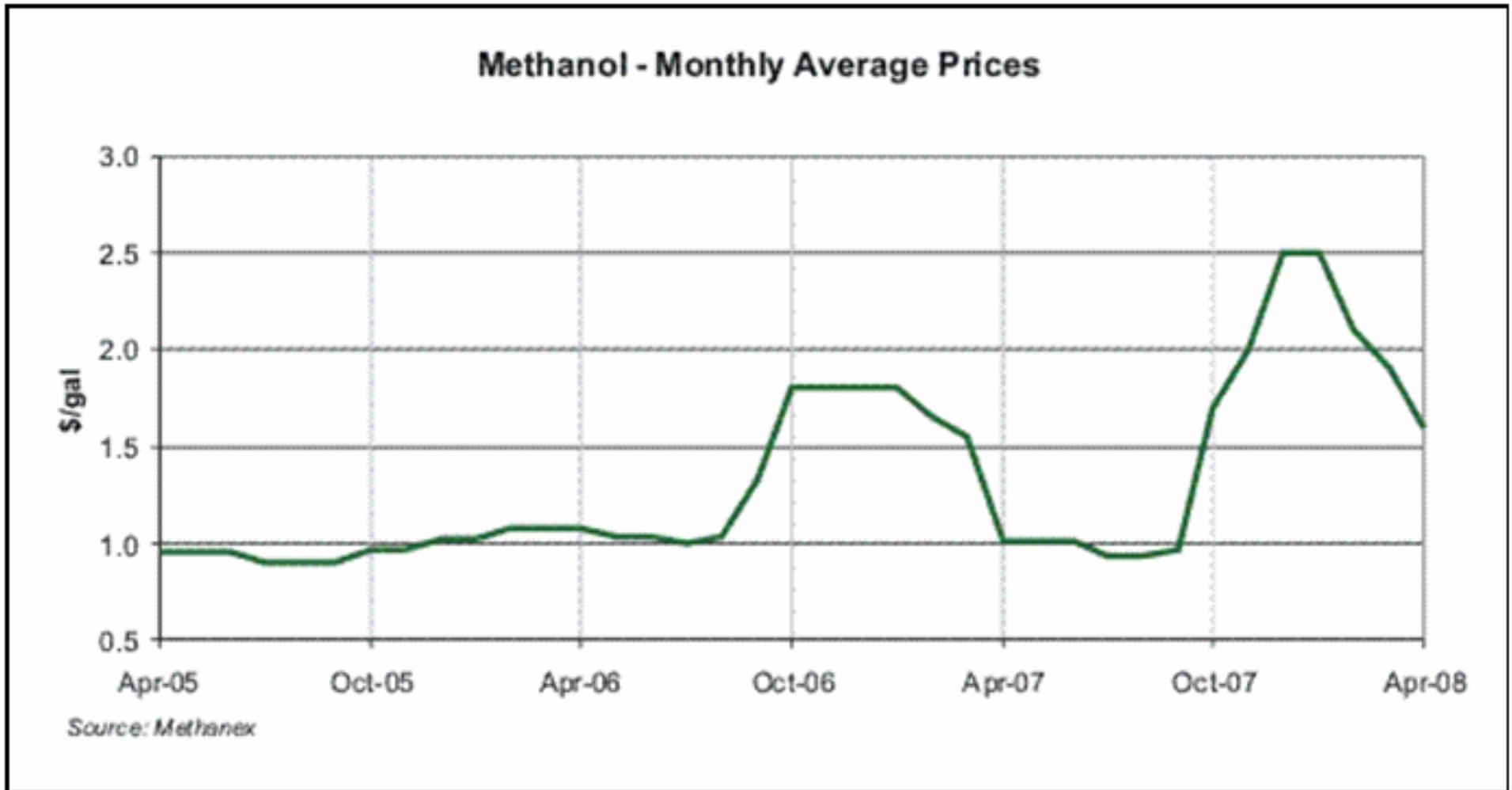
<sup>1</sup> The price received for B100 is 50 cents per gallon less than indicated in this table because yellow grease is eligible for the 50 cent blenders' tax credit rather than \$1.00 for virgin feedstock. Assumed is a conversion rate of 7.75 pounds of yellow grease per gallon of B100. Total economics costs are estimated at a net of 70.0 cents per gallon including and offset of 12.8 cents per gallon for returns from glycerine. See footnote to Table 1.

# Biodiesel Feedstocks – 12 Month History

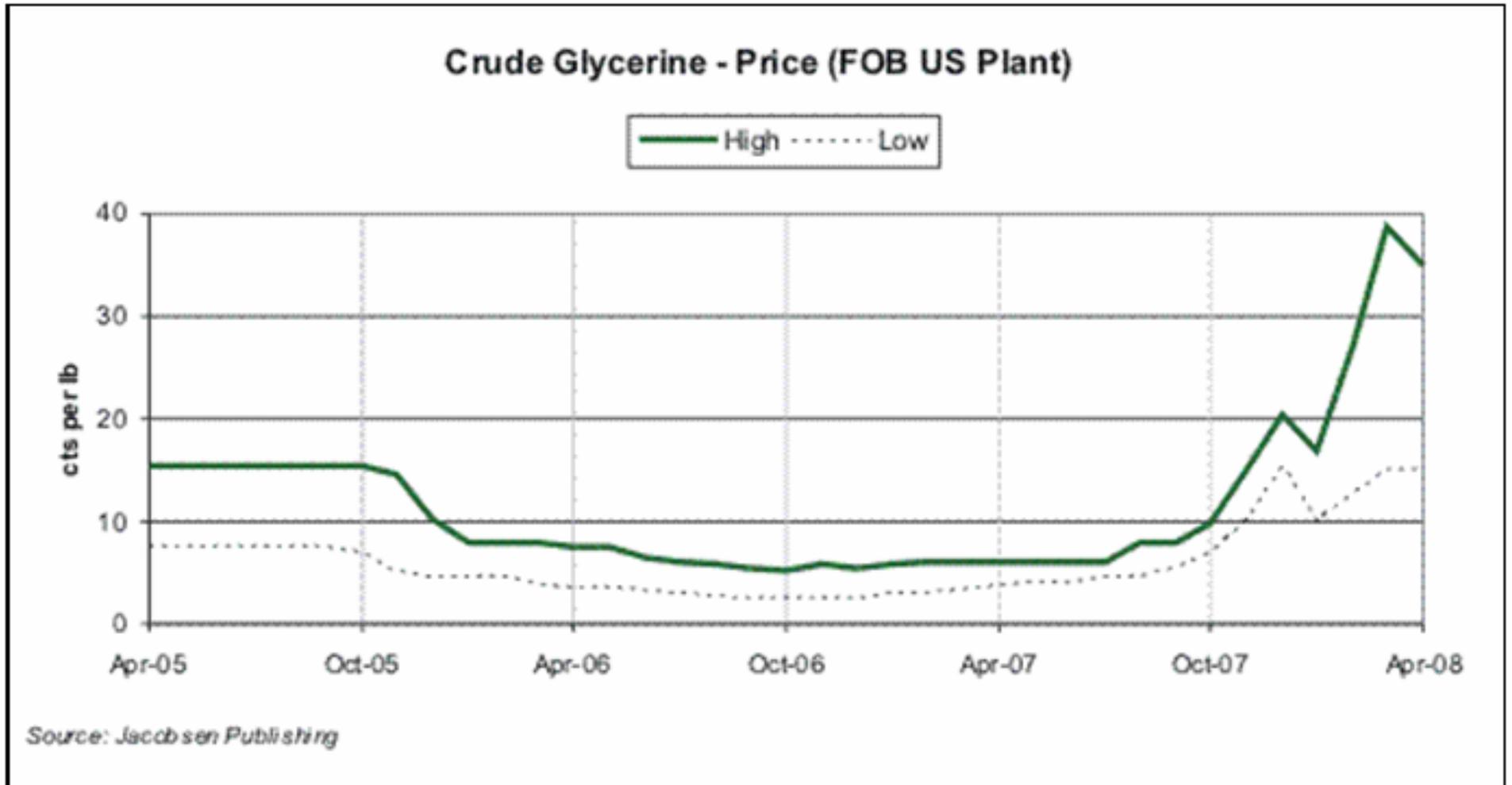
		Today (5/9/08)	Change	Week Ago (4/30/08)	4 Weeks Ago (4/9/08)	52 Weeks Ago (5/9/07)
<b>Soybean Oil (crude/de-gummed)</b>						
<a href="#">chart</a>	Central Illinois	57.6600	1.4900	56.1700	55.5700	31.8100
<a href="#">chart</a>	US Gulf	61.4100	0.4900	60.9200	61.0700	32.1600
<a href="#">chart</a>	East Coast	62.1600	1.4900	60.6700	60.5700	33.8100
<a href="#">chart</a>	West Coast	62.1600	1.4900	60.6700	60.5700	33.8100
<b>Soybean Oil (RBD)</b>						
<a href="#">chart</a>	Central Illinois	63.1600	1.9900	61.1700	60.5700	35.8100
<a href="#">chart</a>	US Gulf	64.6600	1.4900	63.1700	62.5700	37.3100
<a href="#">chart</a>	East Coast	66.1600	1.9900	64.1700	63.5700	37.8100
<a href="#">chart</a>	West Coast	66.6600	1.9900	64.6700	64.0700	37.8100
<b>Cottonseed Oil (PBSY)</b>						
<a href="#">chart</a>	Midsouth	79.0000	-1.0000	80.0000	77.0000	36.0000
<a href="#">chart</a>	US Gulf	82.0000	-1.0000	83.0000	80.0000	37.7500
<b>Palm Oil (RBD)</b>						
<a href="#">chart</a>	US Gulf	62.1600	-	62.1600	60.3400	36.7500
<a href="#">chart</a>	West Coast	64.5000	0.5000	64.0000	63.0000	37.5000
<b>Canola Oil (RBD)</b>						
<a href="#">chart</a>	Central Illinois	71.6400	-0.0300	71.6700	72.0700	41.8100
<a href="#">chart</a>	West Coast	74.1400	0.9700	73.1700	74.0700	42.5600
<b>Yellow Grease</b>						
<a href="#">chart</a>	Illinois	32.0000 - 32.2500	0.1250	32.0000	32.0000	20.8750
<a href="#">chart</a>	Missouri River	32.0000	-	32.0000	32.0000	20.8750
<a href="#">chart</a>	US Gulf	37.5000 - 38.0000	-0.2500	38.0000	35.5000	21.5000
<a href="#">chart</a>	New York	36.0000 - 37.0000	-	36.5000	30.0000	19.0000
<a href="#">chart</a>	San Joaquin Valley (Divd)	32.2500	0.1250	32.1250	31.0000	19.0000
<a href="#">chart</a>	Los Angeles	31.0000 - 32.0000	-	31.5000	29.0000	18.0000
<a href="#">chart</a>	San Francisco	30.0000 - 31.2500	-	30.6250	29.0000	18.0000
<a href="#">chart</a>	Pacific Northwest	30.0000 - 32.0000	-	31.0000	29.0000	18.0000
<a href="#">chart</a>	Carolinas (Divd)	36.5000 - 38.5000	0.5000	37.0000	36.0000	20.7500

# Historical Methanol Costs

(Approx. 4% of Total Cost of Production)



# Historical Glycerine Price



# B100 - 12 Month Historical Price

		Today 5/7/2008	Change	Week Ago 4/30/2008	4 Weeks Ago 4/9/2008	52 Weeks Ago 5/9/2007
<b>Biodiesel (B100)(Cents/Gal)</b>						
<a href="#">chart</a>	Northeast	450.0000 - 500.0000	-10.0000	485.0000	470.0000	332.5000
<a href="#">chart</a>	Lower Midwest	435.0000 - 495.0000	-5.0000	470.0000	465.0000	327.5000
<a href="#">chart</a>	Southeast	440.0000 - 500.0000	-	470.0000	440.0000	317.5000
<a href="#">chart</a>	South Central	445.0000 - 505.0000	-5.0000	480.0000	465.0000	307.5000
<a href="#">chart</a>	Upper Midwest	470.0000 - 520.0000	-10.0000	505.0000	500.0000	320.0000
<a href="#">chart</a>	Rocky Mountain	540.0000 - 580.0000	-	560.0000	565.0000	315.0000
<a href="#">chart</a>	West Coast	490.0000 - 540.0000	10.0000	505.0000	490.0000	325.0000



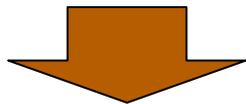
# Future of Biodiesel

- Uncertain Premium to Petroleum Diesel (as RFS is exceeded)
  - May exceed RFS target in 2008
- Uncertain Methanol and Natural Gas cost curves
- Uncertain fate of federal tax (blenders) credit
  - \$0.50-\$1.00 per gallon due to expire at end of 2008
- Continued price pressure on food grade feed stocks
  - Soy-based production likely to remain unprofitable

# Food-derived Biodiesel Production Issues (e.g. Soybean, Canola)

Source: Toyota

To increase biomass production:



Increase cultivation area

Compete with foods

Deforestation

Increase yields

Increase Fertilizer usage

Groundwater pollution

Genetic modification

Unknown ecosystem impacts

Solution → Diversify to non-food grade feed stocks (with higher oil content)

# Future of Biodiesel – Suggested RFC Priorities

- Encourage feedstock innovations (esp. non-food)
  - Algae (2,500-5,000 gal/acre vs. 48 gal/acre for soybean oil)
  - Jatropha (202 gal/acre; establish linkages to Southwest US, Mexico)
  - Yellow grease and animal fats
  - Corn oil (18 gal/acre; extract from DDGs)
  - Other?
- Encourage biodiesel processing innovations
  - Multi-feedstock
  - FAME efficiency improvements
  - Hydro-treated Vegetable Oil
- Target synthetic diesel production processes (coal, waste)
- Reinstate/expand state tax credit on fuel sales



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