CONTRIBUTION OF THE BIOFUELS INDUSTRY TO THE ECONOMY OF IOWA

Prepared for the Iowa Renewable Fuels Association

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2008 was a year of unprecedented challenges for the biofuels industry. Producers were faced with a commodity boom that resulted in record grain, oilseed, and oil prices by mid-year followed by a collapse in oil and ethanol prices that erased profitability by year's end. The industry also had to contend with a collapse of the financial markets that made access to operating credit virtually unobtainable. The economic challenges resulted in the bankruptcy of a major producer that closed 12 plants representing nearly 1.2 billion gallons of capacity. Nationwide, 23 ethanol plants accounting for 1.7 billion gallons of capacity were idled during the year. In Iowa, four ethanol plants with 305 million gallons of capacity and five biodiesel plants accounting for nearly 107 million gallons were idled during 2008.

Despite the challenge to profitability the biofuels industry continued to grow and met the Renewable Fuel Standard target of nine billion gallons for 2008. Nationally, total ethanol capacity expanded 31 percent to 10.6 billion gallons. Iowa leads the Nation in biofuels output accounting for 26 percent of U.S. ethanol and 12 percent of biodiesel production capacity. At the end of 2008 Iowa's 34 operating ethanol plants had capacity of more than 2.7 billion gallons and its 9 operating biodiesel plants had 211 million gallons of capacity. In addition, five ethanol and two biodiesel plants are under construction or expansion. When completed, these new plants will increase Iowa's biofuel production capacity by nearly 25 percent.

Ethanol and biodiesel producers are part of a manufacturing sector that adds substantial value to agricultural commodities produced in Iowa and makes a significant contribution to the Iowa economy. Based on the size of the biofuels industry at year-end 2008, ethanol and biodiesel:[1]

[1] This study estimates the annualized impact of producing 2.8 billion gallons of ethanol and 211 million gallons of biodiesel on Iowa's economy. These figures reflect the capacity of ethanol and biodiesel plants operating at year's end and not the actual production during the year.

- Adds nearly $12.0 billion, or about 9 percent, to Iowa GDP
- Generates $2.8 billion of household income for Iowa households
- Supports nearly 83,000 jobs through the entire Iowa economy (or 5.4% of private, non-farm employment), and
- Generates $576 million in state tax revenue.

The annualized contribution of the ethanol and biodiesel industries is summarized in Table 1.

Table 1
Total Economic Impact of the Biofuels Industry for Iowa: 2008

	Purchases (Mil 2008$)	**GDP (Mil 2008$)**	**Household Earnings (Mil 2008$)**	**Employment (Jobs)**	**State Tax Revenue (Mil 2008$)**
Operations					
Ethanol	$4,899.1	$9,699.7	$1,934.3	58,281	$449.6
Biodiesel	$441.4	$1,009.5	$196.8	5,435	$46.6
Subtotal Operations	$5,340.5	$10,709.2	$2,131.1	63,716	$496.2
New Construction					
Ethanol	$1,196.0	$1,249.5	$666.1	18,521	$77.5
Biodiesel	$35.0	$39.3	$23.9	715	$2.6
Subtotal Operations	$1,231.0	$1,288.8	$690.0	19,236	$80.1
Total	**$6,571.5**	**$11,998.0**	**$2,821.1**	**82,951**	**$576.3**

These impacts result from the combination of ongoing operations as well as construction of new biofuel plants. The impact of ongoing operations is permanent and increases as the industry grows. While the impacts from construction are temporary and end when construction is complete, Iowa is expected to benefit from continued expansion of the biofuels industry over the next decade.

Contribution of the Ethanol Industry

The ethanol industry provides a significant contribution to the Iowa economy, spending $4.9 billion on raw materials, other inputs, goods and services to produce nearly 2.9 billion gallons of ethanol. The largest share of this spending is for corn and other grains used as the raw material to make ethanol. The Iowa ethanol industry currently uses nearly one billion bushels of corn. At current prices this amounts to nearly $3.5 billion of revenue to Iowa corn farmers. In addition to providing a growing and reliable domestic market for Iowa farmers, the ethanol industry also provides the opportunity for farmers to enjoy some of the value added to their commodity by further processing. Farmer-owned ethanol plants account for nearly half of Iowa fuel ethanol plants and a full third of production capacity.

The remainder of the spending by the ethanol industry is for a wide range of inputs such as industrial chemicals; electricity, natural gas, and water; labor; transportation and services such as maintenance, insurance, and general overhead. Spending for these goods and services represents the purchase of output of other industries, mostly in Iowa.

In addition, the construction of new ethanol plants results in spending for a wide range of goods and services. The capital expenditure for new plants and equipment includes specialized machinery and equipment such as pumps, tanks, pipes, etc. and engineering services that are likely supplied by out-of-state manufacturers and suppliers. Consequently only part of the spending for construction directly benefits Iowa businesses. The 690 million gallons of new construction and expansion under way at year's end 2008 represents the expenditure of an additional $1.4 billion in Iowa by the ethanol industry.

The spending associated with current ethanol production and construction of ethanol facilities circulates throughout the entire Iowa economy several fold. Consequently this spending stimulates aggregate demand, supports the creation of new jobs, generates additional household income, and provides tax revenue for State and local governments. The impact of the ethanol industry on the Iowa economy was estimated by applying the appropriate final demand multipliers for output, earnings, and employment for the relevant supplying industry calculated by the U.S. Bureau of Economic Analysis (BEA) to the estimates of spending described above.[2] The full impact of the industry is arrived at by adding the value of industry output to the results of the multiplier analysis. In the case of ethanol this includes the value of ethanol production as well as the value of co-

[2] The multipliers used in this analysis are the detailed industry RIMS II multipliers for Iowa estimated by the Regional Economic Analysis Division, Bureau of Economic Analysis. These multipliers are based on the 1997 Benchmark Input-Output Table for the Nation and 2006 regional data for Iowa. The distribution tables used to allocate output at producer prices among the components of manufacturing, transportation, and wholesale margins were for NAICS industry 325190: Other basic organic chemicals which include both ethanol and biodiesel.

products. About 70 percent of Iowa ethanol is produced in dry mill plants that also produce distillers dried grains as a co-product.[3] The remaining ethanol is made in large wet mill plants that produce corn gluten feed, corn gluten meal, corn oil, and CO_2 as co-products. Ethanol and co-product output was valued at current (year-end) prices. The final demand multipliers for output, earnings, and employment for the selected industries are shown in Appendix Table 1. The price assumptions used in estimating the value of expenditures are shown in Appendix Table 2.

The following summarizes the economic contribution of the Iowa ethanol industry. These impacts are detailed by industry segment in Table 3.

- The ethanol industry adds $10.9 billion to Iowa GDP.[4] This is made up by the impact of spending to produce and transport 2.87 billion gallons of ethanol which contributes $4.5 billion to State GDP. The construction of new ethanol facilities contributes $1.3 billion and the value of the ethanol industry output (ethanol and co-products DDGS, corn gluten feed, corn gluten meal, corn oil and CO_2) accounts for $5.1 billion.

- New jobs are created as a consequence of increased economic activity caused by ethanol production. The increase in aggregate economic activity generated by ongoing production by the ethanol industry supports the creation of nearly 58,300 permanent jobs in all sectors of the Iowa economy. The economic activity generated by construction supports an additional 18,500 jobs statewide; however these jobs are not permanent. Put into context, the annual operations of the ethanol industry supports 3.8 percent of the more than 1.5 million private non-farm jobs in Iowa.

- Increased economic activity and new jobs result in higher levels of income for Iowa households. The ethanol industry puts $2.6 billion into the pockets of Iowa consumers on an annual basis.

- The ethanol industry generates $528 million of additional corporate and personal income and sales tax revenue for Iowa.

[3] The dry mill process also produces CO_2 as a co-product. Based on local market conditions not all plants capture CO_2 for sale.
[4] The BEA multipliers produce a calculation of value added which is a measure of GDP.

Table 3
Contribution of the Ethanol Industry to Iowa: 2008

Industry	Purchases (Mil 2008$)	Impact GDP (Mil 2008$)	Impact Earnings (Mil 2008$)	Impact Employment (Jobs)
Construction	**$1,196.0**	**$1,249.5**	**$666.1**	**18,521**
Annual Operations				
Feed Grains (Corn)	$2,448.7	$2,175.4	$748.6	30,804
Other basic organic chemicals	$129.4	$89.9	$43.2	1,011
Natural gas	$484.1	$306.8	$132.3	2,690
Electric, water, sewer	$146.1	$140.6	$50.5	1,060
Facilities support services	$71.8	$90.9	$47.7	1,407
Wholesale Trade	$666.9	$753.0	$359.9	9,239
Office administrative services	$165.7	$206.5	$114.1	3,015
Earnings to households	$90.7	$69.0	$32.4	1,145
Transportation	$695.7	$697.7	$315.0	7,910
Subtotal	**$4,899.1**	**$4,529.7**	**$1,843.6**	**58,281**
Plus value of output:				
Ethanol		$4,222.5	$90.7	
Co-products		$947.5		
Total Annual Operations	**4,899**	**$9,699.7**	**$1,934.3**	**58,281**
Grand Total		**$10,949.2**	**$2,600.3**	**76,802**

Contribution of the Biodiesel Industry

The Iowa biodiesel industry is not as mature or developed as the ethanol industry. Nonetheless, the biodiesel industry also contributes to the Iowa economy. According to the National Biodiesel Board, total biodiesel production is only about a third of reported industry capacity. In the absence of actual statewide biodiesel production figures, we have estimated the economic impact of Iowa biodiesel operating capacity as of December 31, 2008.

The biodiesel industry spends $441 million on raw materials, other inputs, goods and services to produce an estimated 211 million gallons of biodiesel. The largest share of this spending is for fats and oils (soybean oil and other fats and oils) used as the raw material to make biodiesel. The Iowa biodiesel industry currently uses about 783 million pounds of soybean oil valued at $227 million and

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an equivalent quantity of other fats and oils valued at $123 million in the production of biodiesel. Virtually all of the raw material for biodiesel production in Iowa is procured locally. The remainder of the spending by the biodiesel industry is for a wide range of inputs such as industrial chemicals; electricity, natural gas, and water; labor; and services such as maintenance, insurance, and general overhead. As with ethanol, spending for these goods and services represents the purchase of output of other industries. At the end of 2008 an estimated 35 million gallons of new biodiesel capacity was under construction.

The spending associated with current biodiesel also circulates throughout the entire Iowa economy stimulating aggregate demand, supporting the creation of new jobs, generating additional household income, and creating new tax revenue. The following summarizes the economic contribution of the Iowa biodiesel industry at the end of 2007. These impacts are detailed in Table 4.

- The biodiesel industry adds nearly $1.1 billion to Iowa GDP. This is made up by the impact of spending to produce and transport 211 million gallons of biodiesel which adds more than $400 million to Iowa GDP. The construction of new biodiesel facilities contributes $39 million and the value of the biodiesel and glycerin accounts for $613 million.

- New jobs are created as a consequence of increased economic activity caused by biodiesel production. The increase in economic activity generated by biodiesel production supports the creation of more than 5,400 permanent jobs in all sectors of the Iowa economy. Construction activities support an additional 715 jobs.

- Increased economic activity and new jobs result in higher levels of income for Iowa households. The biodiesel industry puts $220 million into the pockets of Iowa consumers on an annual basis.

- The biodiesel industry generates $80 million of additional corporate and personal income and sales tax revenue for Iowa.

Table 4
Contribution of the Biodiesel Industry to Iowa: 2008

Industry	Spending (Mil 2008 $)	Impact GDP (Mil 2008 $)	Impact Earnings (Mil 2008 $)	Impact Employment (Jobs)
Feedstocks (soybean oil and other fats)	$310.3	$280.7	$132.0	4,033
Industrial chemicals	$53.1	$36.9	$17.7	415
Electric, natural gas, water	$13.5	$9.9	$4.2	90
Maintenance and repair	$3.2	$4.0	$2.1	62
Wholesale Trade	$40.3	$45.4	$21.7	558
Office administrative services	$2.7	$3.4	$1.9	50
Earnings paid to households	$9.6	$7.3	$3.4	121
Transportation	$8.8	$9.0	$4.1	107
Subtotal	$441.4	$396.7	$187.2	5,435
Plus Value of biodiesel output				
Biodiesel		$599.9	$9.6	
Co-products (glycerin)		$13.0		
New Construction	$35.0	$39.3	$23.9	715
Total Impact		**$1,048.8**	**$220.7**	**6,150**

Losses due to plant closures

As indicated earlier four Iowa ethanol plants with 305 million gallons of capacity and five biodiesel plants accounting for nearly 107 million gallons were idled during 2008 due to adverse economic conditions. The loss of output from operations of these plants represents forgone economic activity for Iowa. Continued closure of these facilities reduces Iowa GDP $1.6 billion, costs Iowa households $308 million in earnings, and represents the loss of 9,100 jobs throughout the State economy. Finally, the reduced economic activity caused by the shutdown of these facilities reduces tax revenue by nearly $73 million.

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Appendix Table 1
BEA RIMS II Final Demand Multipliers, Iowa[5]

NAICS	Industry	Value Added	Earnings	Employment (Jobs)
230000	**Construction**	1.1221	0.6829	21.3966
	Annual Operations			
1111B0	Feed Grains (Corn)	0.8884	0.3057	13.1838
325190	Other basic organic chemicals	0.6950	0.3604	8.1419
311222	Soybean processing	0.9874	0.4445	14.0879
311225	Fats and oils refining and blending	0.8220	0.4067	13.1554
2211A0	Power generation and supply	0.9456	0.3326	7.0995
221200	Natural gas distribution	0.6337	0.2733	5.8240
221300	Water, sewage	1.1176	0.4656	12.3302
561200	Facilities support services	1.2653	0.6636	20.5388
420000	Wholesale Trade	1.1291	0.5397	14.5182
541200	Office administrative services	1.2458	0.6883	19.0660
H00000	Households	0.7603	0.3567	13.2268
482000	Rail Transportation	0.9742	0.4138	9.5318
483000	Water Transportation	0.7090	0.3444	8.7607
484000	Truck Transportation	1.0655	0.5156	15.4826

Source: Regional Input-Output Modeling System (RIMS II)
Regional Economic Analysis Division, BEA.
Multipliers based on 1997 Benchmark I-O Table; 2006 regional data.

[5] The multipliers represent the effect on output, income and employment of every $1 million of expenditures.

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Appendix Table 2
2008 Price Assumptions

	Corn Price Farm IA ($/bu)	Corn Price No 2. Yel Central Ill ($/bu)	Distillers Grains 10% Iowa ($/ton)	Distillers Grains 65% Iowa ($/ton)	Ethanol FOB Plant Iowa ($./gal)
Jan	$4.53	$4.55	173.13	44.56	$2.19
Feb	$4.95	$4.90	162.70	48.95	$2.15
Mar	$5.18	$5.16	161.88	50.25	$2.29
Apr	$5.66	$5.59	170.50	52.63	$2.48
May	$5.60	$5.58	174.75	55.75	$2.48
Jun	$6.48	$6.56	182.17	58.25	$2.54
Jul	$5.92	$5.97	184.30	67.25	$2.54
Aug	$5.17	$5.04	150.63	58.88	$2.17
Sep	$5.04	$4.99	138.75	49.25	$2.14
Oct	$3.98	$3.69	130.00	44.75	$1.74
Nov	$3.50	$3.42	119.00	37.00	$1.61
Dec	$3.46	$3.34	132.61	43.22	$1.47
YTD Ave	$4.96	$4.90	$156.70	$50.89	$2.15

	Crude Soy Oil Iowa (cents/lb	Crude Corn Oil Midwest (cents/lb	Choice W. Grease Central US (cents/lb	Yel Grease Midwest (cents/lb	B100 FOB Plant Iowa ($/gal)
Jan	48.79	62.25	26.56	24.31	4.28
Feb	56.18	75.10	31.35	27.28	4.68
Mar	56.88	83.50	38.44	34.00	5.17
Apr	55.70	87.10	33.60	32.15	5.00
May	58.34	86.75	40.69	32.53	5.26
Jun	61.78	82.83	45.04	34.92	5.52
Jul	60.38	76.30	48.68	38.99	5.41
Aug	51.11	58.88	42.53	33.63	4.80
Sep	45.27	49.00	36.99	35.00	4.43
Oct	35.57	35.50	20.38	18.50	3.67
Nov	31.12	31.00	12.69	12.91	3.19
Dec	29.52	26.50	13.13	12.21	2.88
Ave	49.22	62.89	32.50	28.03	$4.52

Sources: USDA/AMS Weekly Ethanol Summary
Weekly Ag Energy Roundup