



CONTRIBUTION OF THE BIOFUELS INDUSTRY TO THE ECONOMY OF IOWA

Prepared for the Iowa Renewable Fuels Association

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2007 was a year of remarkable challenges and opportunities for the biofuels industry. Producers were faced with significant increases in grain and oilseed prices that seriously eroded profitability. However, the year was capped by President Bush signing an energy bill that requires the use of 36 billion gallons of renewable fuels by 2022. Despite the challenge to profitability the ethanol industry continues to expand. Nationally, total ethanol capacity expanded 37 percent to 7.5 billion gallons. Iowa leads the Nation in biofuels output accounting for 31 percent of U.S. ethanol and 20 percent of biodiesel production capacity. At the end of 2007 Iowa's 28 operating ethanol plants had operating capacity of more than 2 billion gallons and its 14 biodiesel plants had 318 million gallons of capacity. In addition, three ethanol plants are expanding production and 14 new ethanol plants and two new biodiesel plants are under construction. When completed, these new plants will increase Iowa's biofuel production capacity by nearly 70 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 2007, ethanol and biodiesel:¹

- Add \$12.7 billion, or about 10 percent, to Iowa GDP
- Generate \$2.9 billion of household income for Iowa households
- Support the creation of more than 96,000 jobs through the entire Iowa economy, and
- Generate nearly \$790 million in state tax revenue.

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

¹ This study estimates the annualized impact of producing 2.03 billion gallons of ethanol and 318 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.

Table 1
Total Economic Impact of the Biofuels Industry for Iowa: 2007

	Annual Spending (Mil \$)	Iowa Iowa GDP (Mil \$)	Household Earnings (Mil \$)	Employment (Jobs)	State Tax Revenue (Mil \$)
Annual Operations					
Ethanol	\$4,353.7	\$7,391.9	\$1,659.1	48,123	\$362.1
Biodiesel	\$1,080.6	\$2,311.0	\$79.8	14,650	\$255.6
Subtotal	\$5,434.3	\$9,702.9	\$1,738.9	62,773	\$617.8
Construction					
Ethanol	\$1,695.8	\$2,945.7	\$1,122.2	32,796	\$165.8
Biodiesel	\$35.0	\$43.3	\$16.7	489	\$4.8
Subtotal	\$1,730.8	\$2,989.0	\$1,138.9	33,285	\$170.6
Total	\$7,165.1	\$12,691.9	\$2,877.8	96,058	\$788.4

These impacts result from the combination of ongoing operations as well as construction of new biofuels 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 \$4.1 billion on raw materials, other inputs, goods and services to produce nearly 2.1 billion gallons of ethanol. An additional \$260 million is spent to transport ethanol from the plant to the terminal where it is blended with gasoline. 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 about 760 million bushels of corn. At current prices this amounts to nearly \$3.2 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.² The nearly 1.6 billion gallons of new construction and expansion under way at year's end 2007 represents the expenditure of an additional \$1.7 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.³ 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-products. About 70 percent of Iowa ethanol is produced in dry mill plants that also produce distillers dried grains as a co-product.⁴ The remaining ethanol is made in large wet mill plants that produce corn gluten feed, corn gluten meal, corn oil, and CO₂ as co-products. Ethanol and co-product output was valued at current (year-end) prices. The final demand multipliers for output, earnings, and

² To account for this we assume that only 10 percent of machinery and equipment spending is directed to Iowa producers.

³ 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 2005 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 includes both ethanol and biodiesel.

⁴ The dry mill process also produces CO₂ as a co-product. Based on local market conditions not all plants capture CO₂ for sale.



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 \$10.3 billion to Iowa GDP.⁵ This is made up by the impact of spending to produce and transport 2.04 billion gallons of ethanol which contributes \$4.3 billion to State GDP. The construction of new ethanol facilities contributes \$2.9 billion and the value of the ethanol industry output (ethanol and co-products DDGS, corn gluten feed, corn gluten meal, corn oil and CO₂) accounts for \$3 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 more than 48,100 permanent jobs in all sectors of the Iowa economy. The economic activity generated by construction supports an additional 32,800 jobs statewide; however these jobs are not permanent.
- Increased economic activity and new jobs result in higher levels of income for Iowa households. The ethanol industry puts \$2.8 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.

⁵ The BEA multipliers produce a calculation of gross output or final demand. Gross output represents the market value of an industry's production that differs from the more commonly referenced GDP. Gross Output is larger than GDP since it includes the value of intermediate goods and services, which are "netted out" of GDP. On average GDP is 54 percent of Gross Output.

**Table 3
Contribution of the Ethanol Industry to Iowa: 2007**

Industry	Iowa Expenditures (Mil 2007\$)	Impact		
		IA GDP (Mil 2007\$)	Earnings (Mil 2007\$)	Employment (Jobs)
Construction	\$1,544.6	\$1,859.5	\$1,053.7	30,839
Machinery and equipment	\$151.2	\$163.7	\$68.4	1,956
Plus initial changes		\$922.5		
Total		\$2,945.7	\$1,122.2	32,796
Annual Operations				
Feed Grains (Corn)	\$2,297.1	\$2,383.4	\$706.1	25,205
Electricity	\$77.5	\$65.0	\$25.5	532
Natural gas	\$507.4	\$412.2	\$128.5	2,634
Water and wastewater	\$17.7	\$17.5	\$8.2	219
Wholesale Trade	\$580.1	\$576.6	\$312.1	8,094
Maintenance	\$53.0	\$51.7	\$35.1	1,053
Office admin services	\$91.7	\$92.6	\$62.9	1,719
Rail Transportation	\$346.1	\$327.5	\$143.1	3,171
Water Transportation	\$18.8	\$18.6	\$6.5	170
Truck Transportation	\$312.5	\$346.8	\$161.0	4,674
Earnings paid to households	\$51.8	\$36.4	\$18.4	652
Subtotal	\$4,353.7	\$4,328.3	\$1,607.3	48,123
Plus initial changes:				
Value of ethanol		\$2,437.4	\$51.8	
Value of co-products				
DDG		\$412.3		
CO2		\$1.9		
Corn gluten feed		\$59.3		
Corn gluten meal		\$58.5		
Corn Oil		\$94.3		
Total Annual Operations		\$7,391.9	\$1,659.1	48,123
Grand Total		\$10,337.6	\$2,781.3	80,919

Contribution of the Biodiesel Industry

The Iowa biodiesel industry is not as mature or developed as the ethanol industry. Nonetheless, the biodiesel industry also makes a substantial contribution to the Iowa economy. We have estimated the annualized economic impact of Iowa's biodiesel industry based on capacity in place as of December 31, 2007.



The biodiesel industry spends \$1 billion on raw materials, other inputs, goods and services to produce an estimated 317.5 million gallons of biodiesel. An additional \$146 million is spent to transport biodiesel from the plant to the terminal where it is blended with diesel fuel, bringing total industry spending to \$1.15 billion. 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 1.7 billion pounds of soybean oil valued at \$781 million and 707 million pounds of other fats and oils valued at \$166 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 2007 an estimated 35 million gallons of new biodiesel capacity was under construction. The spending for construction activities and machinery and equipment in Iowa is expected to amount to about \$25 million.

The spending associated with current biodiesel production capacity 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 \$2.4 billion to Iowa GDP. This is made up by the impact of spending to produce and transport 318 million gallons of biodiesel which adds more than \$1.6 billion to Iowa GDP. The construction of new biodiesel facilities contributes \$43 million and the value of the biodiesel and glycerin, the co-product of biodiesel production, accounts for \$670 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 14,654 permanent jobs in all sectors of the Iowa economy. Construction activities support an additional 489 jobs.



- Increased economic activity and new jobs result in higher levels of income for Iowa households. The biodiesel industry puts \$97 million into the pockets of Iowa consumers on an annual basis.
- The biodiesel industry generates \$260 million of additional corporate and personal income and sales tax revenue for Iowa.

**Table 4
Contribution of the Biodiesel Industry to Iowa: 2007**

Industry	Annual Expenditures (Mil 2007\$)	Impact		
		GDP (Mil 2007\$)	Earnings (Mil 2007\$)	Employment (Jobs)
Construction	\$23.8	\$28.7	\$16.3	476
Machinery and equipment	\$1.0	\$1.1	\$0.5	13
Plus initial changes		\$13.5		
Total		\$43.3	\$16.7	489
Annual Operations				
Soybean Processing	\$705.1	\$1,108.17	\$1.3	8,876
Fats and oils refining and blending	\$146.1	\$209.95	\$1.1	1,765
Electricity	\$1.6	\$1.36	\$0.5	11
Natural gas	\$16.1	\$13.05	\$0.4	83
Water and wastewater	\$1.6	\$1.63	\$0.8	20
Wholesale Trade	\$113.9	\$113.19	\$61.3	1,589
Maintenance	\$7.9	\$7.75	\$1.2	158
Office administration	\$4.1	\$4.17	\$1.3	77
Rail Transportation	\$38.9	\$36.80	\$0.7	356
Truck Transportation	\$106.9	\$118.67	\$1.1	1,600
Earnings paid to households	\$9.4	\$6.61	\$0.5	118
Subtotal	\$1,151.7	\$1,621.3	\$70.7	14,654
Plus value of industry output				
Biodiesel		\$686.56	\$9.4	
Glycerin		\$3.32		
Total Annual Operations		\$2,311.2	\$80.1	14,654
Grand Total		\$2,354.5	\$96.8	15,143

**Appendix Table 1
BEA RIMS II Final Demand Multipliers, Iowa⁶**

NAICS	Industry	Output	Earnings	Employment (Jobs)
230000	Construction	2.2130	0.6822	21.1241
332996	Machinery and equipment	1.9902	0.4527	13.6907
1111B0	Feed Grains (Corn)	1.9073	0.3074	11.6086
311222	Soybean Processing	2.8892	0.4452	13.3187
311225	Fats and oils refining and blending	2.6419	0.4052	12.7854
2211A0	Power generation and supply	1.5415	0.3288	7.2630
221200	Natural gas distribution	1.4931	0.2532	5.4920
221300	Water, sewage	1.8188	0.4630	13.0847
420000	Wholesale Trade	1.8270	0.5380	14.7603
561200	Facilities support services	1.7937	0.6620	21.0374
561100	Office administrative services	1.8572	0.6862	19.8446
482000	Rail Transportation	1.7393	0.4134	9.6948
483000	Water Transportation	1.8197	0.3466	9.5836
484000	Truck Transportation	2.0398	0.5150	15.8242
	Earnings paid to households	1.2927	0.3552	13.3072

Source: Regional Input-Output Modeling System (RIMS II)

Regional Economic Analysis Division, BEA.

Multipliers based on 1997 Benchmark I-O Table; 2005 Iowa data.

⁶ The multipliers represent the effect on output, income and employment of every \$1 million of expenditures.

**Appendix Table 2
2007 Price Assumptions**

	Corn Price Farm U.S. (\$/bu)	Corn Price Farm IA (\$/bu)	Corn Price No 2. Yel Central Ill (\$/bu)	DDG 27% Pro Lawrenceburg Indiana (\$/ton)	Corn Gluten Feed 21% Pro Ill Points (\$/ton)	Corn Gluten Meal 60% Pro. Ill Points (\$/ton)
Jan	\$3.05	\$3.03	\$3.66	\$118.00	\$92.00	\$333.00
Feb	\$3.44	\$3.47	\$3.90	\$129.00	\$85.38	\$346.88
Mar	\$3.43	\$3.34	\$3.76	\$130.88	\$84.94	\$361.50
Apr	\$3.39	\$3.40	\$3.36	\$131.00	\$72.82	\$363.33
May	\$3.49	\$3.52	\$3.52	\$105.00	\$59.50	\$344.00
Jun	\$3.51	\$3.38	\$3.68	\$105.00	\$62.25	\$352.75
Jul	\$3.32	\$3.29	\$3.03	\$105.00	\$66.40	\$398.50
Aug	\$3.17	\$3.26	\$3.08	\$105.00	\$75.00	\$404.38
Sep	\$3.29	\$3.23	\$3.15	\$105.00	\$85.50	\$414.38
Oct	\$3.29	\$3.25	\$3.28	\$115.00	\$105.00	\$472.50
Nov	\$3.43	\$3.43	\$3.66	\$115.00	\$129.38	\$495.63
Dec	\$3.88	\$3.90	\$4.02			
YTD Ave	\$3.39	\$3.38	\$3.51	\$114.90	\$83.47	\$389.71

	Soybean Price Farm U.S. (\$/bu)	Soybean Price Farm IA (\$/bu)	Soybean Meal 48-50% Pro Central Ill (\$/ton)	Soybean Oil Price Crude Decatur (cents/lb)	Corn Oil Price Crude Chicago (cents/lb)
Jan	\$6.38	\$6.22	\$190.56	28.00	28.05
Feb	\$6.87	\$6.81	\$208.81	28.94	28.66
Mar	\$6.95	\$6.89	\$205.26	29.74	29.08
Apr	\$6.88	\$6.85	\$189.37	31.06	29.93
May	\$7.13	\$7.11	\$198.66	32.90	31.56
Jun	\$7.51	\$7.54	\$229.70	34.01	34.71
Jul	\$7.56	\$7.48	\$222.05	35.74	37.25
Aug	\$7.72	\$7.66	\$217.63	34.87	39.61
Sep	\$8.18	\$8.23	\$254.41	36.89	43.58
Oct	\$8.58	\$8.37	\$260.55	38.10	52.50
Nov	\$9.41	\$9.86	\$280.76	42.68	56.32
Dec	\$10.40	\$10.50	314.78	45.16	59.47
YTD Ave	\$7.80	\$7.79	\$231.05	34.84	39.23

Sources:

Corn and soybean farm prices: USDA/NASS Agricultural Prices. December prices are preliminary

Corn byproduct market prices: USDA/ERS Feed Outlook.

Soybean and corn oil prices: USDA/ERS Oil Crops Outlook.



**Appendix Table 2 Continued
2007 Price Assumptions**

	Natural Gas Price Industrial IA (\$/mcf)	Electricity Price Industrial IA (cts/kwh)	Ethanol Spot Market Chicago (Cents/gal)	Conventional Regular Gasoline Gulf Pts (Cents/gal)	Crude Oil WTI (\$/bbl)	No 2 Diesel Low Sulfur Spot FOB Gulf (Cents/gal)
Jan	\$8.60	4.45	207.1	141.0	54.19	161.11
Feb	\$9.10	4.61	211.0	161.2	59.28	175.42
Mar	\$8.99	4.42	233.2	185.0	60.44	191.14
Apr	\$8.31	4.53	221.4	216.2	63.98	203.45
May	\$7.75	4.53	223.9	230.5	63.53	200.52
Jun	\$8.32	5.10	208.9	215.5	67.49	208.49
Jul	\$8.34	5.44	201.5	220.1	72.86	212.38
Aug	\$7.63	5.44	181.9	196.6	72.36	206.87
Sep	\$7.25	5.06	159.2	211.1	79.91	224.82
Oct	\$7.25		164.8	212.1	85.82	234.45
Nov			190.8	235.6	94.78	264.81
Dec			217.0	226.7	91.69	256.31
YTD Avg	\$8.15	4.84	201.74	204.30	72.19	211.65

Sources:

Gasoline, diesel, crude oil, natural gas and electricity prices: EIA

Ethanol spot prices: OPIS