
Employment and Economic Benefits of Ethanol Production in Missouri

Missouri Corn Growers Association

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Acknowledgment

“Employment and Economic Benefits of Ethanol Production in Missouri”, which was completed by Donald L. Van Dyne at the University of Missouri, discussed the impacts that the ethanol industry had in 2002 on the state of Missouri and estimations about future scenarios that may occur within the state. Some of Van Dyne’s original assumptions are incorporated into this updated paper. We appreciate his foundational work on the subject.

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1. Executive Summary

Rapid growth in the U.S. ethanol industry is being fueled by investors seeking profitable returns from allocating capital to the biofuel industry. Ethanol industry profitability is driven by the price of oil, the price of corn feedstocks, and existing federal and state energy policies. Nationally, investment in ethanol will continue to grow and the industry will continue to build new plants under current energy policies until a new equilibrium point is reached where the market price of oil and the market price of corn or another feedstock limits the expected future ethanol profitability to the extent that new capital stops flowing into the U.S. ethanol industry.

Volumes of research have been and are being published detailing the implications of every aspect of this U.S. biofuels revolution. The scope of this study is much more limited. This study assumes that the national ethanol industry will continue to grow somewhere in the U.S. until a new market equilibrium point of oil prices and corn prices curtails new investment in ethanol production. Given that assumption, this study seeks to answer the question, “What are the economic impacts of growing an ethanol industry in Missouri?”

Missouri’s ethanol processing facilities have quickly become major contributors to the state’s economy. As of January 2007, the four existing plants at Macon, Malta Bend, Craig and Laddonia bring Missouri’s ethanol production capacity to 160 million gallons per year (MGY). Additional plants and further increases in production capacity are in the construction and planning stages.

Multipliers are used in this study to estimate the ripple effects throughout the economy of the impact of existing plants, their potential expansion, and construction of additional ethanol plants. Direct effects are changes in the economy that come immediately from money spent for constructing and running the ethanol plants. Indirect effects are changes that occur to industries that supply the ethanol plants or otherwise benefit from the initial added economic activity. Induced effects reflect changes in household spending from the additional income received in a specified region resulting from changes in the production capacity and business activities.

Terminology used in this report to categorize impacts include total output, value-added, labor income and employment. Total output refers to the value of an industry’s total production. Value-added refers to payments made by an industry to workers, interest, profits and indirect business taxes. Labor income refers to all forms of employment income, a component of the value-added category. Employment refers to the single number of jobs for each industry.

Construction Impacts of the Four Existing Ethanol Plants

The construction of facilities of this size involves purchasing inputs and materials and drawing expertise in construction and manufacturing which reach far beyond the borders of the city in which it is located, indeed beyond the borders of even the state of Missouri; and as a result, provides fuel for the engines of the economy nationwide. The construction of these four facilities had a one-time impact on the U.S. economy; directly

creating 2,098 U.S. jobs, increasing U.S. labor income by \$96 million, increasing value added to the U.S. economy by \$114 million and directly adding \$207 million to total U.S. output.

When the direct construction expenditures are transmitted through the economy to include the multiplier effect of indirect and induced impacts, the total impact of construction to existing plants is estimated to create 5,245 U.S. jobs, a \$229 million increase in U.S. labor income, a \$332 million increase in value-added to the U.S. economy and a \$625 million increase in total output across the entire U.S. economy.

Operational Impacts of the Four Existing Ethanol Plants

In estimating the recurring annual economic impacts from operations of these plants, we are able to more narrowly model the expected economic benefits to just the state of Missouri. The benefit to Missouri of operating these four ethanol plants includes:

- Maintaining 161 full time equivalent jobs, increasing labor income by \$20 million, increasing the value added to the economy by \$36 million and creating a net increase in total output to Missouri's economy by \$285 million.
- When the direct operational expenditures are coupled with the multiplier effect to create indirect and induced economic impacts, the total annual impact to Missouri of these four facilities is estimated to create 3,022 jobs statewide resulting in an \$121 million annual increase in labor income, create \$215 million increase in value-added income to the economy and create a net increase in total output to Missouri's economy of \$522 million.
- In addition to the value added by processing the corn, purchasing 56 million bushels of corn for production, the four ethanol plants raise the value of Missouri's corn crop by \$45 million at the farm level.
- Tax revenues are increased at the federal, state, and local level by \$43 million each year.

Construction Impact When Missouri's Production Capacity Reaches 500 MGY

The construction of additional ethanol plants and expansion of existing plants is under consideration. Completing this construction would raise Missouri's ethanol capacity to 500 MGY in the year 2008. Continuing the analysis discussed above, adding the existing construction and the new construction necessary to reach a capacity of 500 million gallons per year in Missouri would directly create 6,772 U.S. jobs, increase U.S. labor income by \$311 million, increase value added to the U.S. economy by \$367 million and increase total U.S. economic output by \$668 million.

Direct expenditures of construction including the multiplier effect creates the following indirect and induced economic impacts: the total impact of construction is estimated to create 16,930 U.S. jobs, a \$740 million increase in U.S. labor income, a \$1.073 billion increase in value-added to the U.S. economy and a \$2.018 billion increase in total output across the entire U.S. economy.

Operational Impact When Missouri's Production Capacity Reaches 500 MGY

The estimated recurring annual economic impact to Missouri of operating this ethanol capacity would include:

- Maintaining 358 full time equivalent jobs, increasing labor income by \$41 million, increasing the value added in the economy by \$70 million and creating a net increase in total output to Missouri's economy by \$628 million.
- When the direct expenditures include the multiplier effect capturing the indirect and induced economic impacts, the total annual impact to Missouri is estimated to create 7,724 jobs statewide, create a \$290 million annual increase in labor income, create \$515 million increase in value-added to the economy and create a net increase in total output to Missouri's economy of \$1.168 billion.
- In addition to the value added by processing the corn, purchasing 177 million bushels of corn to feed the ethanol production is estimated to raise the value of Missouri's corn crop by \$76 million at the farm level.
- Tax revenues collected at the federal, state, and local level with this level of production will be \$110 million each year.

Construction Impact When Missouri's Production Capacity Reaches 800 MGY

Continuing the analysis discussed before, when Missouri production capacity reaches 800 MGY in 2009, existing and new construction is estimated to directly create 11,217 U.S. jobs, increase U.S. labor income by \$515 million, increase value added to the U.S. economy by \$607 million and increase total U.S. economic output by \$1.106 billion.

Direct expenditures of construction including the multiplier effect creates the following indirect and induced economic impacts: the total impact of construction is estimated to create 28,045 U.S. jobs, a \$1.225 billion increase in U.S. labor income, a \$1.777 billion increase in value-added to the U.S. economy and a \$3.342 billion increase in total output across the entire U.S. economy.

Operational Impact When Missouri's Production Capacity Reaches 800 MGY

The estimated recurring annual economic impact to Missouri of operating this ethanol capacity would include:

- Maintaining 520 full time equivalent jobs, increasing labor income by \$52 million, increasing the value added in the economy by \$86 million and creating a net increase in total output to Missouri's economy by \$839 million.
- When the direct expenditures include the multiplier effect capturing the indirect and induced economic impacts, the total annual impact to Missouri is estimated to create 11,220 jobs statewide, create a \$408 million annual increase in labor income, create \$723 million increase in value-added to the economy and create a net increase in total output to Missouri's economy of \$1.577 billion.
- In addition to the value added by processing the corn, purchasing 282 million bushels of corn to feed the ethanol production is estimated to raise the value of Missouri's corn crop by \$83 million at the farm level.
- Tax revenues collected at the federal, state, and local level with this level of production will be \$160 million each year.

2. Introduction

Missouri’s ethanol industry has provided a new value-added processing opportunity for corn producers in the state. The evolution of this transition begs the question, while considering further expansion in the state, as to what impact this industry has economically on Missouri’s corn producers and the communities in which they operate. While many of the benefits are received by the commodity producers, many other employment and economic benefits are conveyed to communities and businesses throughout the state.

Prior to the ethanol plants, marketing Missouri-produced corn consisted of livestock feeding, exporting the corn for processing, or moving Missouri corn into the international export market. Throughout this study, the economic impact of the pre-existing commodity corn industry marketed through those existing channels was subtracted from the economic impacts of the new ethanol industry that displaced those bushels flowing into traditional marketing channels. This allows a more accurate evaluation of the net benefits of the ethanol industry to Missouri’s economy.

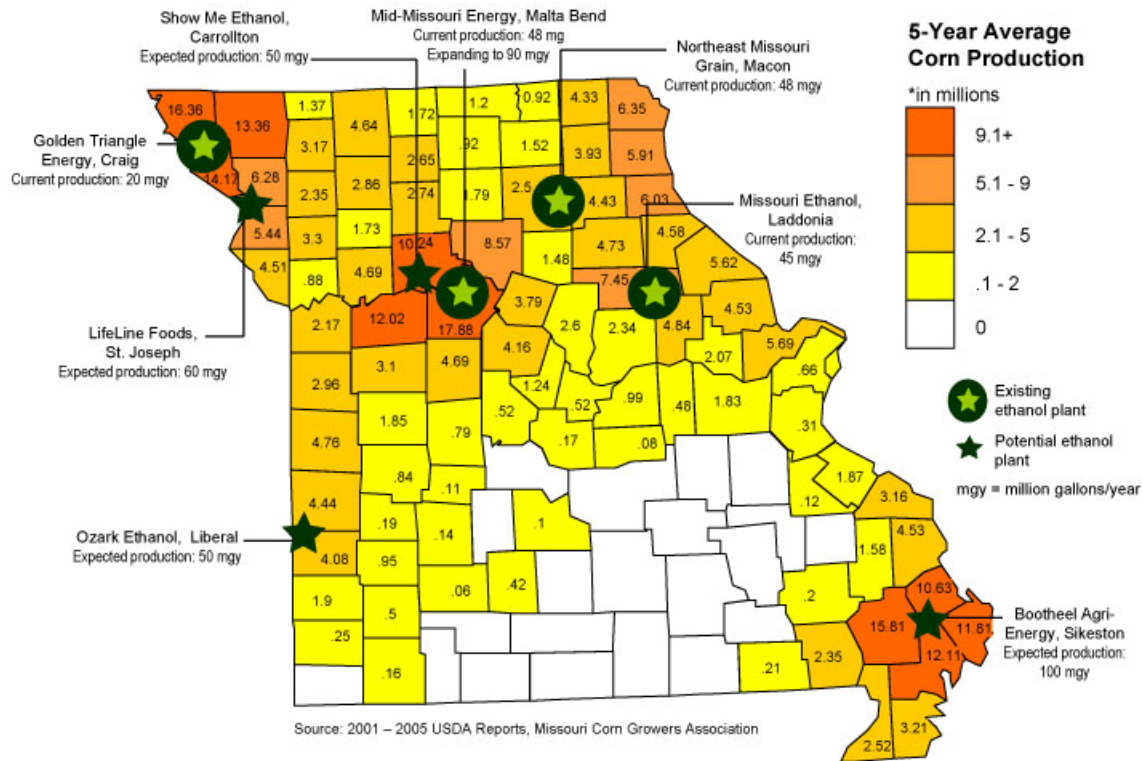
Prior to construction and operation of the ethanol plants in Missouri, industrial value-added opportunities for Missouri corn producers were limited. After years of planning and support by local farmers, ethanol plants began being built and have become successful business operations. In addition to ethanol, the ethanol plants also produce livestock feeds: distillers dried grains and solubles (DDGS) and/or wet distillers grain. Both co-products are an excellent high protein feed for livestock and poultry. Another co-product that is created by ethanol plants is carbon dioxide. Northeast Missouri Grain, LLC. in Macon is currently marketing carbon dioxide in addition to ethanol and DDGS.

Table 1. Plant characteristics and performance of the four existing ethanol plants

Characteristics	Northeast Missouri Grain, LLC.	Golden Triangle Energy, LLC.	Mid-Missouri Energy, Inc.	Missouri Ethanol, LLC.
Location	Macon	Craig	Malta Bend	Ladonia
Ethanol produced (gallons)	45,000,000	19,500,000	50,000,000	45,000,000
Began construction	Spring 1999	February 2000	October 2003	Fall 2005
Began operation	May 2000	February 2001	February 2005	Winter 2006
Number of employees	43 FTE and 3 Part-time	34 FTE	38 FTE	42 FTE and 5 Part-time

Missouri’s ethanol processing facilities are located in various locations throughout the state. By combining the current and proposed farmer-owned ethanol plants onto a map with Missouri’s 5-year average of corn production (figure 1), one may note that the ethanol plants are located in regions of the state with close proximity to an available corn supply. While this map shows the status of farmer-owned ethanol plants in Missouri, there are several non-farmer, investor-owned plants proposed to be built at various locations throughout Missouri.

Figure 1. Current and proposed farmer-owned ethanol plants in Missouri



The economic analysis that was conducted in this Missouri ethanol industry report utilized the IMPLAN® input-output model. IMPLAN® is an economic impact modeling system that was developed by the University of Minnesota and includes comprehensive and detailed data coverage of the entire U.S. economic infrastructure by county. The ability to incorporate user-supplied data is included at each stage of the analysis. Using specific data provides a high degree of flexibility both in terms of geographic coverage and analytical formulation. IMPLAN® includes data sets of some 528 economic sectors and structural analysis based upon actual local economic activity in the study area. The complete data set includes millions of data points.

The multipliers used in the model estimate the effects of changes on economic activity by these three components:

- **Direct effects** are changes in the industry to which a final demand change was made.
- **Indirect effects** are changes that occur in industries in backward linked industries that respond to new demands from the directly affected industries.
- **Induced effects** reflect changes in household spending from the additional income received due to the changes in production.

Terminology used in this report to categorize impacts include total output, value-added, labor income and employment. Total output refers to the value of an industry's total production. Value-added refers to payments made by industry to workers, interest, profits and indirect business taxes. Labor income refers to all forms of employment income. Employment refers to the single number of jobs for each industry.

3. Economic Impact of Ethanol Plants in Production

This section discusses the various economic impacts of the four existing plants. The four plants include the following:

- N.E. Missouri Grain, LLC.- Macon
- Golden Triangle Energy, LLC. – Craig
- Mid-Missouri Energy, Inc. – Malta Bend
- Missouri Ethanol, LLC. - Laddonia

3.1 Total Economic Impacts from Constructing the Four Ethanol Plants (160 Million Gallons per Year)

Table 2 presents the total economic impact of constructing the four ethanol plants (Macon, Malta Bend, Craig, and Laddonia). Total employment of 5,245 in the U.S. is created by the construction effort. This employment total consists of 2,098 direct jobs created in construction, 1,084 indirect jobs created by the impact of purchases necessary for construction and 2,063 jobs created by income created from the direct and indirect purchases and then spent into the national economy. A similar explanation underlies the labor income, value added, and total output categories presented in table 2.

Table 2. Estimated impacts for the construction of the four ethanol plants

Category	Direct	Indirect	Induced	Total
Employment (jobs)	2,098	1,084	2,063	5,245
Labor income (dollars)	\$96,306,880	\$52,486,466	\$80,314,324	\$229,107,670
Value added (dollars)	\$113,581,272	\$77,698,018	\$141,069,825	\$332,349,115
Total output (dollars)	\$206,795,504	\$158,302,456	\$259,945,778	\$625,043,741

3.2 Total Economic Impacts from Operation of the Four Ethanol Plants (160 Million Gallons per Year)

Table 3 presents the total annual recurring economic impacts by operating the four ethanol plants (Macon, Malta Bend, Craig, and Laddonia) at their 2006 level of production of 160 MGY. Total employment of 3,022 full time workers is created in Missouri. This employment total consists of 161 direct jobs created in the plants, 2,146 indirect jobs created by purchases necessary to operate the plants and 715 jobs created by income created from the direct and indirect purchases and then spent in the Missouri economy. Approximately 50% of the indirect jobs created can be attributed to jobs on the farms that supply these ethanol plants. A similar explanation as employment underlies the labor income and value added categories presented in table 3.

The final category, net total output, describes the net change in total output in the Missouri economy derived from operating these four ethanol plants at the 2006 production level of 160 MGY. This net effect reflects the gross impact of the ethanol plants minus the prior value to the economy of the same amount of corn moving through the traditional commodity corn market paths that existed before the ethanol plants were established. The net effect also adds into the economy the impact of the rising corn prices due to operation of the ethanol plants. Thus, net total output reflects the change to the Missouri economy of the establishment of the ethanol plants.

Table 3. Estimated impacts for operating the four existing ethanol plants

Category	Direct	Indirect	Induced	Total
Employment (jobs)	161	2,146	715	3,022
Labor income (dollars)	\$20,315,195	\$72,857,249	\$27,467,139	\$120,639,582
Value added (dollars)	\$35,625,347	\$129,594,347	\$49,957,172	\$215,176,866
Net total output (dollars)	\$285,047,713	\$191,913,283	\$44,567,218	\$521,528,207

Table 4. Total yearly operating expenses for the four existing ethanol plants

Category	Aggregated Expenses
Corn	\$126 million
Natural gas	\$40 million
Electricity	\$5 million
Enzymes and chemicals	\$15 million
Repairs and maintenance	\$6 million
Labor	\$8 million
Water	\$2 million
Depreciation	\$14 million
Other	\$24 million
Total operating expenses	\$241 million

3.3 Farm Level Impacts Concerning Local Corn Prices and Livestock Feed

In addition to the value added by processing the corn, the ethanol plants raise the value of Missouri's entire corn crop at the farm level by purchasing millions of bushels of corn for local use, increasing aggregate demand. Direct and indirect price effects are generated within a region's corn market when an ethanol plant is constructed and begins drawing the available supply.

Direct impact refers to the premium that the ethanol plant pays for corn that it purchases. This premium is paid due to convenience yield. Convenience yield is the willingness of firms to hold stocks of commodities, when storage is not profitable, to enable the business to continue to operate (Parcell).

Indirect impact refers to a corn price increase generated for all corn sold in the region, due to the increased demand for corn from the ethanol plant.

Numerous academic studies (see Parcell) have indicated that at least a \$0.10 per bushel strengthening of local corn price observed across the entire regional corn market in locations where these facilities were located. The regional market is defined by that area nearby the ethanol plant, where the ethanol plant purchases approximately 25% of the available corn. A survey of existing ethanol plant operators in Missouri was used to establish the information provided in Table 5.

Growth of ethanol demand for corn is changing the cash prices paid for corn across the Corn Belt. Estimates to quantify the impacts of multiple ethanol plants are ongoing (Food and Agricultural Policy Research Institute). Producers and local markets in Missouri have often reported a stronger increase in cash corn basis since the opening of their local ethanol plant. For each \$0.01 per bushel rise in the regional market corn basis, the total state's corn crop value rises by more than \$2 million.

Table 5. Summary of direct and indirect impacts on value of corn crop

Ethanol Plant	Membership Incentives (membership and transportation premiums)	Total Direct (based on bushels purchased by the ethanol plant)	Total Indirect (based on bushels of corn in the regional market)	Total Impact
N.E. Missouri Grain, LLC.*	\$660,000	\$15,500,000		\$16,160,000
Golden Triangle Energy, LLC.	\$322,000	\$680,000	\$2,720,000	\$3,722,000
Mid-Missouri Energy, Inc.	\$545,579	\$4,590,000	\$6,800,000	\$11,935,579
Missouri Ethanol, LLC.*	\$441,000	\$12,400,000		\$12,841,000
TOTALS				\$44,658,579

* Direct and indirect impacts were combined in these scenarios due to the proximity of these two plants causing overlapping relevant market areas.

Growth of Missouri’s ethanol industry creates opportunities to use the co-products of ethanol plants to enhance the profitability of other industries. Distillers grains are increasing in supply, lowering their cost to livestock feeders, particularly those livestock operations close enough to purchase the distillers grains in the cheaper wet form. Table 6 lists the feeding capacity in either all dairy cows or all background/finishing animals of the four ethanol plants. Currently most of the distillers grains are sold out of state, but the opportunity exists to build additional livestock production around these plants.

Table 6. Livestock feed from the four existing ethanol plants

Distiller grains produced by the ethanol plants (dry matter basis)	461,560 tons
Dairy herd feeding capacity	252,910 head
Background/finishing beef cattle feeding capacity	337,213 head

4. Economic Impact of Ethanol Plants with a Future State Level Production of 500 Million Gallons per Year

This section assumes a future state level ethanol production of 500 MGY will be attained in 2008 by existing and new ethanol facilities.

4.1 Total Economic Impacts from Construction of 500 Million Gallons per Year State Level Production

Table 7 presents the total economic impact of a 2008 level of production of 500 MGY. Total employment of 16,930 in the U.S. is created by the construction effort, both from all existing plants and new construction to attain the 500 MGY state production level. This employment consists of 6,772 direct jobs created in construction, 3,500 indirect jobs created by purchases necessary for construction and 6,659 jobs created by income created from the direct and indirect purchases and then spent into the national economy. A similar explanation underlies the labor income, value added and total output categories presented in Table 7.

Table 7. Estimated impacts for the construction of the all existing ethanol facilities and expansion of Missouri’s ethanol production capacity to 500 MGY

Category	Direct	Indirect	Induced	Total
Employment (jobs)	6,772	3,500	6,659	16,930
Labor income (dollars)	\$310,874,592	\$169,424,141	\$259,251,319	\$739,550,052
Value added (dollars)	\$366,635,616	\$250,805,991	\$455,367,564	\$1,072,809,173
Total output (dollars)	\$667,527,296	\$510,993,782	\$839,094,222	\$2,017,615,301

4.2 Total Economic Impacts from Operation of 500 Million Gallons per Year State Level Production

Table 8 shows the total annual recurring economic impact by operating the ethanol plants at a 2008 level of production of 500 MGY. Total employment of 7,724 full time workers is created in Missouri. This employment total consists of 358 direct jobs created in the plants, 5,538 indirect jobs created by purchases necessary to operate the plants and 1,828 jobs created by income created from the direct and indirect purchases and then spent in the Missouri economy. A similar explanation underlies the labor income and value added categories presented also in Table 8.

The final category, net total output, describes the net change in total output in the Missouri economy that is derived from operating these ethanol plants at the 2008 production level of 500 MGY. This net effect reflects the gross impact of the ethanol plants minus the prior value to the economy of the same amount of corn moving through the traditional commodity corn market paths that existed before the ethanol plants were established. The net effect also adds into the economy the impact of the rising corn prices due to the ethanol plants. Thus, net total output reflects the change to the Missouri economy of the establishment of the ethanol plants.

Table 8. Estimated impacts for operating all existing ethanol facilities and expansion of Missouri’s ethanol production capacity to 500 MGY

Category	Direct	Indirect	Induced	Total
Employment (jobs)	358	5,538	1,828	7,724
Labor income (dollars)	\$40,917,086	\$182,958,782	\$65,831,869	\$289,707,737
Value added (dollars)	\$69,579,522	\$325,600,010	\$119,734,741	\$514,914,274
Total output (dollars)	\$628,238,245	\$462,096,130	\$78,156,250	\$1,168,490,610

Table 9. Estimated yearly operating expenses for the ethanol plants (500 MGY)

Category	Aggregated Expenses
Corn	\$592 million
Natural gas	\$132 million
Electricity	\$17 million
Enzymes and chemicals	\$50 million
Repairs and maintenance	\$19 million
Labor	\$28 million
Water	\$6 million
Depreciation	\$43 million
Other	\$75 million
Total operating expenses	\$961 million

4.3 Farm Level Impacts Concerning Local Corn Prices and Livestock Feed

The direct and indirect impacts were combined to compute an overall economic impact of the corn price improvement on all bushels of corn sold in the surrounding area when Missouri ethanol production reaches 500 MGY.

Following the same methodology for farm level impacts as before, the estimated benefits for membership and transportation premiums to these ethanol plants will add \$6,571,661 in value to the corn crop in the state of Missouri. Other estimated impacts to the value of corn crop include raising the corn basis in the regions surrounding the ethanol plants. This basis impact alone equates to a \$69,802,800 improvement in the value of Missouri's corn crop. The combination of these two farm level impacts improve the value of Missouri's corn crop by \$76,374,461

Growth of Missouri's ethanol industry creates opportunities to use the co-products of ethanol plants to enhance the profitability of other industries. Distillers grains are increasing in supply, lowering their cost to livestock feeders, particularly those livestock operations close enough to purchase the distillers grains in the cheaper wet form. Table 10 lists the feeding capacity for either all dairy cows or all background/finishing animals of the 500 million gallon per year production level. Currently most of the distillers grains are sold out of state, but the opportunity exists to build additional livestock production around these plants.

Table 10. Livestock feed from the ethanol plants (500 MGY)

Distiller grains produced by the ethanol plants (dry matter basis)	1,420,401 tons
Dairy herd feeding capacity	778,302 head
Background/finishing beef cattle feeding capacity	1,037,736 head

5. Economic Impact of Ethanol Plants with a Future State Level Production of 800 Million Gallons per Year

This section assumes a future state level ethanol production of 800 MGY will be attained by existing and new ethanol facilities.

5.1 Total Economic Impacts from Construction of 800 Million Gallons per Year State Level Production

Table 11 presents the total economic impact of an estimated 2009 level of production of 800 MGY. Total employment of 28,045 in the U.S. is created by the construction effort, which includes all preexisting construction and all new construction needed to attain the 800 MGY state production level. This employment consists of 11,217 direct jobs created in construction, 5,797 indirect jobs created by purchases necessary for construction and 11,030 jobs created by income created from the direct and indirect purchases and then spent into the national economy. A similar explanation underlies the labor income, value added and total output categories presented in Table 11.

Table 11. Estimated impacts for the construction of the all existing ethanol facilities and expansion of Missouri's ethanol production capacity to 800 MGY

Category	Direct	Indirect	Induced	Total
Employment (jobs)	11,217	5,797	11,030	28,045
Labor income (dollars)	\$514,957,824	\$280,647,844	\$429,444,852	\$1,225,050,522
Value added (dollars)	\$607,324,928	\$415,455,318	\$754,307,658	\$1,777,087,903
Total output (dollars)	\$1,105,746,176	\$846,451,421	\$1,389,943,536	\$3,342,141,137

5.2 Total Economic Impacts from Operation of 800 Million Gallons per Year State Level Production

Table 12 shows the total annual recurring economic impact by operating the ethanol plants at a 2009 level of production of 800 MGY. Total employment of 11,220 full time workers is created in Missouri. This employment total consists of 520 direct jobs created in the plants, 8,045 indirect jobs created by purchases necessary to operate the plants and 2,656 jobs created by income created from the direct and indirect purchases and then spent in the Missouri economy. A similar explanation underlies the labor income and value added categories presented also in Table 12.

The final category, net total output, describes the net change in total output in the Missouri economy that is derived from operating these ethanol plants at the 2009 production level of 800 MGY. This net effect reflects the gross impact of the ethanol plants minus the prior value to the economy of the same amount of corn moving through the traditional commodity corn market paths that existed before the ethanol plants were established. The net effect also adds into the economy the impact of the rising corn prices due to the ethanol plants. Thus, net total output reflects the change to the Missouri economy of the establishment of the ethanol plants.

Table 12. Estimated impacts for operating all existing ethanol facilities and expansion of Missouri's ethanol production capacity to 800 MGY

Category	Direct	Indirect	Induced	Total
Employment (jobs)	520	8,045	2,656	11,220
Labor income (dollars)	\$51,663,664	\$263,499,460	\$92,550,165	\$407,713,288
Value added (dollars)	\$85,903,936	\$469,050,576	\$168,329,779	\$723,284,286
Total output (dollars)	\$839,439,839	\$650,580,196	\$87,433,368	\$1,577,453,393

Table 13. Estimated yearly operating expenses for the ethanol plants (800 MGY)

Category	Aggregated Expenses
Corn	\$942 million
Natural gas	\$212 million
Electricity	\$27 million
Enzymes and chemicals	\$82 million
Repairs and maintenance	\$31 million
Labor	\$45 million
Water	\$10 million
Depreciation	\$70 million
Other	\$120 million
Total operating expenses	\$1.5 billion

5.3 Farm Level Impacts Concerning Local Corn Prices and Livestock Feed

The direct and indirect impacts were combined to compute an overall economic impact of the corn price improvement on all bushels of corn sold in the surrounding area when Missouri ethanol production reaches 800 MGY.

Following the same methodology for farm level impacts as before, the estimated benefits for membership and transportation premiums to these ethanol plants will add \$13,483,678 in value to the corn crop in the state of Missouri. Other estimated impacts to the value of corn crop include raising the corn basis in the regions surrounding the ethanol plants. This basis impact alone equates to a \$69,802,800 improvement in the value of Missouri's corn crop. The combination of these two farm level impacts improve the value of Missouri's corn crop by \$83,286,478

Growth of Missouri's ethanol industry creates opportunities to use the co-products of ethanol plants to enhance the profitability of other industries. Distillers grains are increasing in supply, lowering their cost to livestock feeders, particularly those livestock operations close enough to purchase the distillers grains in the cheaper wet form. Table 16 lists the feeding capacity for either all dairy cows or all background/finishing animals of the 800 million gallon per year production level. Currently most of the distillers grains are sold out of state, but the opportunity exists to build additional livestock production around these plants.

Table 14. Livestock feed from the ethanol plants (800 MGY)

Distiller grains produced by the ethanol plants (dry matter basis)	2,374,807 tons
Dairy herd feeding capacity	1,301,264 head
Background/finishing beef cattle feeding capacity	1,735,019 head

6. Tax Revenues Resulting from Operating Ethanol Plants in Missouri

While employment and economic activities resulting from ethanol production in Missouri have been shown to be very positive, tax revenue implications from the value-added processing are also very important. Tax revenues described in this section include those from federal and state programs. Tax revenues are based on estimated employment and earnings developed in the previous sections, plus other relevant data and information.

Table 15. Annual tax impacts for the four existing ethanol plants (160 MGY)

Level	Category	Employee Compensation	Proprietary Income	Household Expenditures	Enterprises (Corporations)	Indirect Business Taxes	Total
Enterprises (Corporations)	Transfers	-163,354					-163,354
Federal Govt. NonDefense	Corporate Profits Tax				4,129,529		4,129,529
	Indirect Bus. Tax: Custom Duty					553,144	553,144
	Indirect Bus. Tax: Excise Taxes					1,695,041	1,695,041
	Indirect Bus. Tax: Fed NonTaxes					591,128	591,128
	Personal Tax: Estate and Gift Tax						0
	Personal Tax: Income Tax			6,311,894			6,311,894
	Personal Tax: NonTaxes (Fines-Fees)						0
	Social Ins. Tax – Employee Contribution	4,011,211	1,175,115				5,186,326
Social Ins. Tax – Employer Contribution	4,165,612					4,165,612	
	Total	8,176,823	1,175,115	6,311,894	4,129,529	2,839,313	22,632,674
State/Local Govt. NonEducation	Corporate Profits Tax				278,904		278,904
	Dividends				1,579,224		1,579,224
	Indirect Bus Tax: Motor Vehicle License					137,159	137,159
	Indirect Bus Tax: Other Taxes					927,338	927,338
	Indirect Bus Tax: Property Tax					5,776,801	5,776,801
	Indirect Bus Tax: S/L NonTaxes					572,093	572,093
	Indirect Bus Tax: Sales Tax					8,706,956	8,706,956
	Indirect Bus Tax: Severance Tax					76	76
	Personal Tax: Estate and Gift Tax						0
	Personal Tax: Income Tax			2,192,879			2,192,879
	Personal Tax: Motor Vehicle License			98,298			98,298
	Personal Tax: NonTaxes (Fines-Fees)			89,881			89,881
	Personal Tax: Other Tax (Fish/Hunt)			52,007			52,007
	Personal Tax: Property Taxes			40,778			40,778
Social Ins Tax- Employee Contribution	65,245					65,245	
Social Ins Tax- Employer Contribution	216,705					216,705	
	Total	281,950	0	2,473,843	1,858,128	16,120,423	20,734,343
	TOTAL	8,295,419	1,175,115	8,785,737	5,987,657	18,959,736	\$43,203,664

Table 16. Annual tax impacts for operating all existing ethanol facilities and expansion of Missouri’s ethanol production capacity to 500 MGY

Level	Category	Employee Compensation	Proprietary Income	Household Expenditures	Enterprises (Corporations)	Indirect Business Taxes	Total
Enterprises (Corporations)	Transfers	-417,465					-417,465
Federal Govt. NonDefense	Corporate Profits Tax				10,553,385		10,553,385
	Indirect Bus. Tax: Custom Duty					1,413,609	1,413,609
	Indirect Bus. Tax: Excise Taxes					4,331,831	4,331,831
	Indirect Bus. Tax: Fed NonTaxes					1,510,681	1,510,681
	Personal Tax: Estate and Gift Tax						0
	Personal Tax: Income Tax			16,130,616			16,130,616
	Personal Tax: NonTaxes (Fines-Fees)						0
	Social Ins. Tax – Employee Contribution	10,251,013	3,003,112				13,254,125
Social Ins. Tax – Employer Contribution	10,645,597					10,645,597	
	Total	20,896,610	3,003,112	16,130,616	10,553,385	7,256,121	57,839,844
State/Local Govt. NonEducation	Corporate Profits Tax				712,764		712,764
	Dividends				4,035,849		4,035,849
	Indirect Bus Tax: Motor Vehicle License					350,521	350,521
	Indirect Bus Tax: Other Taxes					2,369,896	2,369,896
	Indirect Bus Tax: Property Tax					14,763,138	14,763,138
	Indirect Bus Tax: S/L NonTaxes					1,462,035	1,462,035
	Indirect Bus Tax: Sales Tax					22,251,414	22,251,414
	Indirect Bus Tax: Severance Tax					194	194
	Personal Tax: Estate and Gift Tax						0
	Personal Tax: Income Tax			5,604,100			5,604,100
	Personal Tax: Motor Vehicle License			251,208			251,208
	Personal Tax: NonTaxes (Fines-Fees)			229,699			229,699
	Personal Tax: Other Tax (Fish/Hunt)			132,909			132,909
	Personal Tax: Property Taxes			104,213			104,213
	Social Ins Tax- Employee Contribution	166,739					166,739
Social Ins Tax- Employer Contribution	553,810					553,810	
	Total	720,549	0	6,322,129	4,748,613	41,197,197	52,988,488
	TOTAL	21,199,694	3,003,112	22,452,745	15,301,998	48,453,318	\$110,410,867

Table 17. Annual tax impacts for operating all existing ethanol facilities and expansion of Missouri’s ethanol production capacity to 800 MGY

Level	Category	Employee Compensation	Proprietary Income	Household Expenditures	Enterprises (Corporations)	Indirect Business Taxes	Total
Enterprises (Corporations)	Transfers	-606,456					-606,456
Federal Govt. NonDefense	Corporate Profits Tax				15,331,017		15,331,017
	Indirect Bus. Tax: Custom Duty					2,053,565	2,053,565
	Indirect Bus. Tax: Excise Taxes					6,292,899	6,292,899
	Indirect Bus. Tax: Fed NonTaxes					2,194,582	2,194,582
	Personal Tax: Estate and Gift Tax						0
	Personal Tax: Income Tax			23,433,122			23,433,122
	Personal Tax: NonTaxes (Fines-Fees)						0
	Social Ins. Tax – Employee Contribution	14,891,758	4,362,654				19,254,411
Social Ins. Tax – Employer Contribution	15,464,975					15,464,975	
Total	30,356,733	4,362,654	23,433,122	15,331,017	10,541,046	84,024,572	
State/Local Govt. NonEducation	Corporate Profits Tax				1,035,440		1,035,440
	Dividends				5,862,922		5,862,922
	Indirect Bus Tax: Motor Vehicle License					509,206	509,206
	Indirect Bus Tax: Other Taxes					3,442,773	3,442,773
	Indirect Bus Tax: Property Tax					21,446,571	21,446,571
	Indirect Bus Tax: S/L NonTaxes					2,123,914	2,123,914
	Indirect Bus Tax: Sales Tax					32,324,871	32,324,871
	Indirect Bus Tax: Severance Tax					282	282
	Personal Tax: Estate and Gift Tax						0
	Personal Tax: Income Tax			8,141,137			8,141,137
	Personal Tax: Motor Vehicle License			364,933			364,933
	Personal Tax: NonTaxes (Fines-Fees)			333,686			333,686
	Personal Tax: Other Tax (Fish/Hunt)			193,078			193,078
	Personal Tax: Property Taxes			151,391			151,391
Social Ins Tax- Employee Contribution	242,223					242,223	
Social Ins Tax- Employer Contribution	804,526					804,526	
Total	1,046,749	0	9,184,225	6,898,362	59,847,618	76,976,954	
TOTAL	30,797,026	4,362,654	32,617,347	22,229,379	70,388,664	\$160,395,070	

7. Summary

Missouri's ethanol processing facilities have quickly become a major contributor to the state's economy. As of January 2007, the four existing plants at Macon, Malta Bend, and Craig, bring Missouri's ethanol production capacity to 160 million gallons per year (MGY). Additional plants and further increases in production capacity are in the construction and planning stages.

Construction Impacts of the Four Existing Ethanol Plants

The construction of these four facilities has one-time impact on the U.S. economy; directly creating 2,098 U.S. jobs, increasing U.S. labor income by \$96 million, increasing value added to the U.S. economy by \$114 million and directly adding \$207 million to total U.S. output. The total impact of construction we estimate created 5,245 U.S. jobs, a \$229 million increase in U.S. labor income, a \$332 million increase in value-added to the U.S. economy and a \$625 million increase in total output across the entire U.S. economy.

Operational Impacts of the Four Existing Ethanol Plants

The benefit to Missouri of operating these four ethanol plants includes:

- Maintaining 161 full time equivalent jobs, increasing labor income by \$20 million, increasing the value added to the economy by \$36 million and creating a net increase in total output to Missouri's economy by \$285 million.
- When the direct operational expenditures are coupled with the multiplier effect to create indirect and induced economic impacts, the total annual impact to Missouri of these four facilities is estimated to create 3,022 jobs statewide resulting in an \$121 million annual increase in labor income, create \$215 million increase in value-added income to the economy and creating a net increase in total output to Missouri's economy of \$522 million.
- In addition to the value added by processing the corn, purchasing 56 million bushels of corn for production, the four ethanol plants raise the value of Missouri's corn crop by \$45 million at the farm level.
- Tax revenues are increased at the federal, state, and local level by \$43 million each year.

Construction Impact when Missouri's Production Capacity Reaches 500 MGY

Continuing the analysis discussed above, existing and new construction to reach 500 MGY is estimated to directly create 6,772 U.S. jobs, increase U.S. labor income by \$311 million, increase value added to the U.S. economy by \$367 million and increase total U.S. economic output by \$668 million.

Direct expenditures of construction including the multiplier effect creates the following indirect and induced economic impacts: the total impact of construction is estimated to create 16,930 U.S. jobs, a \$740 million increase in U.S. labor income, a \$1.073 billion increase in value-added to the U.S. economy and a \$2.018 billion increase in total output across the entire U.S. economy.

Operational Impact when Missouri's Production Capacity Reaches 500 MGY

The estimated recurring annual economic impact to Missouri of operating this ethanol capacity would include:

- Maintaining 358 full time equivalent jobs, increasing labor income by \$41 million, increasing the value added in the economy by \$70 million and creating a net increase in total output to Missouri's economy by \$628 million.
- When the direct expenditures include the multiplier effect capturing the indirect and induced economic impacts, the total annual impact to Missouri is estimated to create 7,724 jobs statewide, create a \$290 million annual increase in labor income, create a \$515 million increase in value-added to the economy and a net increase in total output to Missouri's economy of \$1.168 billion.
- In addition to the value added by processing the corn, purchasing 177 million bushels of corn to feed the ethanol production is estimated to raise the value of Missouri's corn crop by \$76 million at the farm level.
- Tax revenues collected at the federal, state, and local level with this level of production will be \$110 million each year.

Construction Impact when Missouri's Production Capacity Reaches 800 MGY

Continuing the analysis discussed above, existing and new construction to reach 800 MGY is estimated to directly create 11,217 U.S. jobs, increase U.S. labor income by \$515 million, increase value added to the U.S. economy by \$607 million and increase total U.S. economic output by \$1.106 billion.

Direct expenditures of construction including the multiplier effect creates the following indirect and induced economic impacts: the total impact of construction is estimated to create 28,045 U.S. jobs, a \$1.225 billion increase in U.S. labor income, a \$1.777 billion increase in value-added to the U.S. economy and a \$3.342 billion increase in total output across the entire U.S. economy.

Operational Impact when Missouri's Production Capacity Reaches 800 MGY

The estimated recurring annual economic impact to Missouri of operating this ethanol capacity would include:

- Maintaining 520 full time equivalent jobs, increasing labor income by \$52 million, increasing the value added in the economy by \$86 million and creating a net increase in total output to Missouri's economy by \$839 million.
- When the direct expenditures include the multiplier effect capturing the indirect and induced economic impacts, the total annual impact to Missouri is estimated to create 11,220 jobs statewide, create a \$408 million annual increase in labor income, create a \$723 million increase in value-added to the economy and a net increase in total output to Missouri's economy of \$1.577 billion.
- In addition to the value added by processing the corn, purchasing 282 million bushels of corn to feed the ethanol production is estimated to raise the value of Missouri's corn crop by \$83 million at the farm level.
- Tax revenues collected at the federal, state, and local level with this level of production will be \$160 million each year.

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