The Economic Impact of Ethanol Plants in South Dakota

December 27, 2005
Final Report

By Randall M. Stuefen of
Stuefen Research, LLC

www.stuefenresearch.com
randall@stuefenresearch.com
Phone 605-624-9754
Cell 605-677-8384

813 Valley View Drive
Vermillion, South Dakota 57069

Introduction

The ethanol industry impacts South Dakota's economy in the short term while a plant is being constructed and in the long term through the operation of the plant. The economic impact from the operation of the state's ethanol plants is addressed in this study.

Ethanol production is manufacturing but it qualifies as a value added agricultural industry. It transforms corn into ethanol, distillers' grain and carbon dioxide enhancing the value of the original commodity. The agricultural community benefits through ownership in the industry as investors and increased revenues from corn by narrowing the basis between the Chicago futures price and the local price for the commodity.

The South Dakota ethanol industry is relatively young. The state's first production facility was located in the community of Scotland, South Dakota. It was the state's only plant for five years until an Aberdeen plant began production in 1993 which was followed six years after that by a plant in Huron. The industry after more than a decade consisted of three plants with a production capacity of approximately 35 million gallons per year. Following the decade of modest growth, the industry began a dramatic expansion in 2001 with a 48 million gallon plant constructed in Wentworth. In 2002, the last plant with production capacity smaller than 40 million gallons per year was put into production in Rosholt.[1] New plant sizes now range from 40 to more than 100 million gallons.

National Distribution of Ethanol Production Facilities
(In January 2005)

---

[1] Tri-State Ethanol of Rosholt is now North Country Ethanol of Rosholt. Tri-State Ethanol experienced an accident in December of 2002 that ended operations and with bankruptcy following in May of 2003. North Country Ethanol began production at the plant again in 2005 with an increase in production capacity planned. The economic impact estimates in this analysis will not include the Rosholt plant because of no production in 2004.

South Dakota's production capacity increased from 35 million gallons in 2000 to 420 million gallons in 2004 which is an increase of nearly thirteen (375/35=12.8) times the production capacity in 2000.[2] The increase is dramatic with the state producing over ten percent of all ethanol nationwide in 2004. Nationally, the industry produced a record 3.41 billion gallons in 2004 which the Renewable Fuels Association cites as more than double the production of 2000.[3]

Ethanol Production Facilities in South Dakota (2004)[4]

The economic impact analysis is for calendar year 2004. There were ten plants producing ethanol in South Dakota in 2004 with an estimated capacity of 420 million gallons. Precise plant capacity measures are difficult to pinpoint. The industry has demonstrated continued improvements in the science and processing methods resulting in more ethanol being produced by the plants than was initially anticipated and that evolution continues. The 420 million gallon capacity of 2004 is estimated to have increased to approximately 450 million gallons in 2005 in the ten plants with advancements in technology and practices. New plant capacity is planned or is in the process of being built. A new 60 million gallon a year plant is currently under construction in the community of Loomis near Mitchell and 129 acres has been purchased near Redfield as a site for a 50 million gallon plant. The earthwork for the plant began in November of 2005.

South Dakota Ethanol Production Facilities[5]
(In 2004)[6]

	City	County	Approx Size	Operational
Sioux River Ethanol	Hudson	Lincoln	48	2004
VeraSun Energy	Aurora	Brookings	102	2003
James Valley Ethanol	Groton	Brown	48	2003
Great Plains Ethanol	Chancellor	Turner	48	2003
Glacial Lakes Energy	Watertown	Codington	48	2002
Northern Light Ethanol	Big Stone City	Grant	47	2002
Dakota Ethanol	Wentworth	Lake	49	2001
Heartland Grain Fuel	Huron	Beadle	13	1999
Heartland Grain Fuel	Aberdeen	Brown	9	1993
Broin Enterprises	Scotland	Bon Homme	8	1988
Capacity in Millions of Gallons			**420**	

[2] The 375 million gallon measure does not include Tri-State Ethanol now known as North Country Ethanol plant. The plant located in Rosholt was did not distill product in 2004.
[3] Homegrown for the Homeland, Ethanol Industry Outlook 2005, Renewable Fuels Association
[4] Ibid
[5] Ibid
[6] Sioux River Ethanol did not produce for the full year in 2004. Operations began near the end of the first quarter.

Basic Ethanol Business Structure

The fundamental business structure for a dry mill ethanol production facility is reflected in the graphic below. An ethanol plant receives its revenue flows from the sale of ethanol and the co-products distiller's grain and carbon dioxide. The distiller's grains can be sold as Wet Distiller's Grains (WDG) or as Dry Distiller's Grains (DDG). Carbon Dioxide can be compressed or liquefied and sold in their respective markets or released if no local market exists.

The "Out-Flows" identified in the graphic below exemplify the expenses per bushel of corn associated with the production of ethanol and its co-products. One can see that the largest cost of production in the graphic is corn followed by the investment in plant and equipment. The expense for natural gas compared to the cost of corn has changed since this graphic was developed. The price of corn has fallen dramatically while the cost for natural gas has risen substantially.

As noted, the actual cost for the factors of production and the other side of the ledger, the value of the ethanol plants products, will vary with market conditions. The graphic is for illustrative purposes only. Market conditions are fluid and the risks associated with all assumptions in a model are constantly changing.

## An Example of In-Flows and Out-Flows in the Production of Ethanol[7]

---
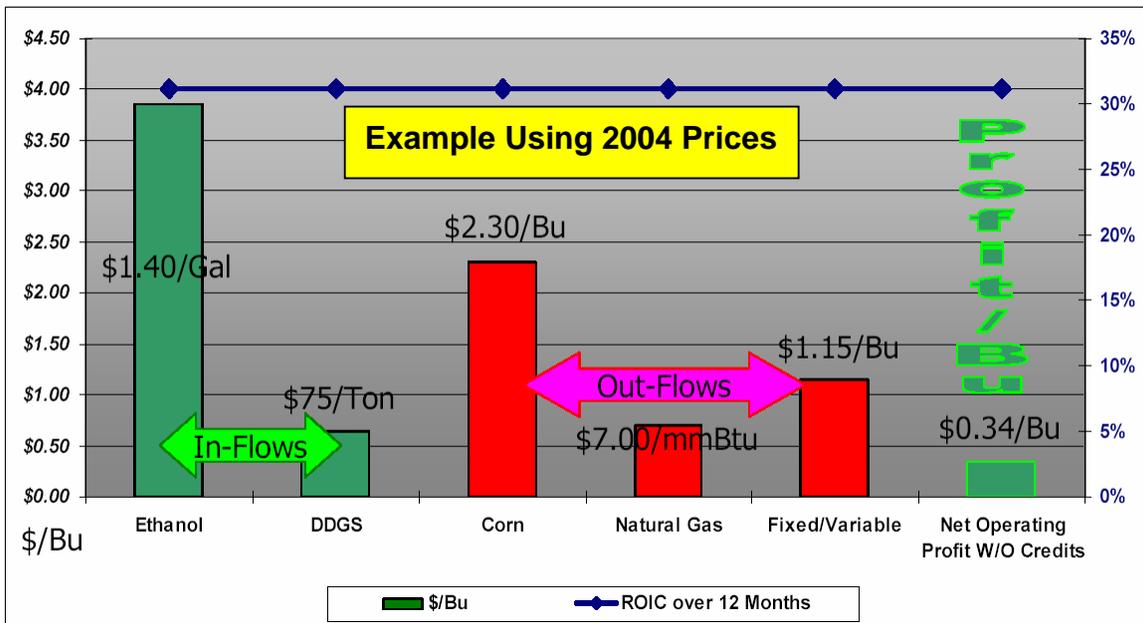
[7] Presentation "Commodity Marketing's Approach to Ethanol Risk Management", Mr. Craig Ludtke, Commodity Marketing Co., Albert Lea, Minnesota, Presentation in Omaha, 2005

Ethanol Production Impact on Corn Prices

South Dakota has the distinction of being the most geographically remote corn market in the United States. It costs more to transport corn from South Dakota to the nation's major markets than from anywhere else in the country. This distinction is reflected in the historical price of the commodity relative to prices received by growers in other states.

## Average Corn Price Per Bushel
1992 to 2001[8]
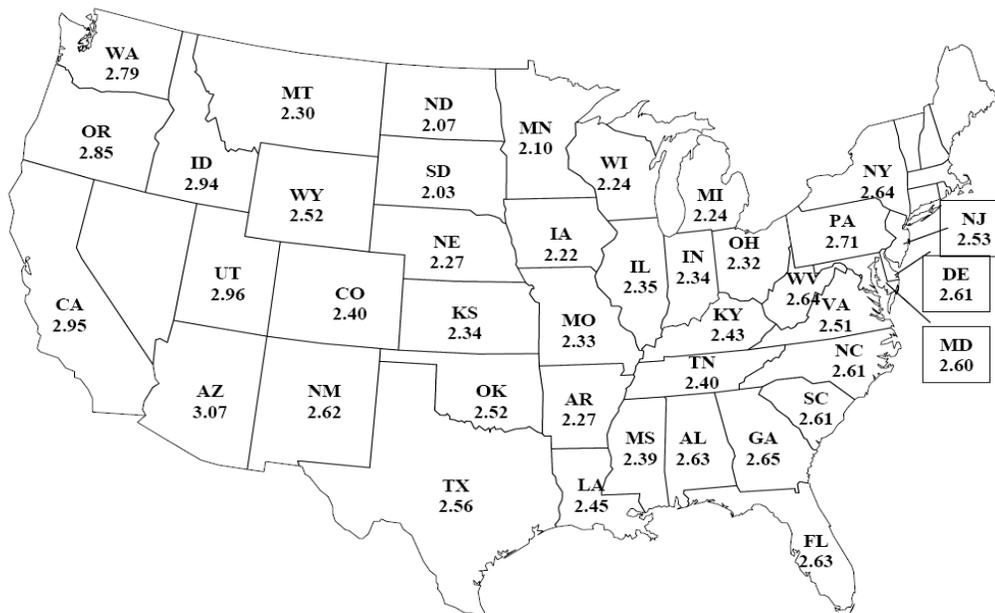
Dr. Kevin McNew[9] and Professor Duane Griffith with the Agricultural Economics and Economics Department at Montana State University have researched corn prices in the United States. Their work compares the price of corn throughout the nation relative to the price at the Chicago Board of Trade (CBOT). The professors observe that corn prices are like a river flow. As you move upstream to the Dakotas from the main river, the decreasing local prices for corn reflect the gradually increasing cost of transportation as you move further away from the large river ports.

---

[8] An Economic Examination of Potential Ethanol Production in Texas, J.L. Law, D.P. Anderson, S.L. Klose, J.W. Richardson, B.K. Herbst, M.L Waller, J.M. Raulston, S.L. Sneary and R.C. Gill, Department of Agricultural Economics, Texas A&M University, College Station Texas, February 2003, p5.
[9] Dr. Kevin McNew is in addition to his academic appointment the President and Founder of Cash Grain Bids, Inc of Bozeman, Montana which is a source of cash grain market intelligence.

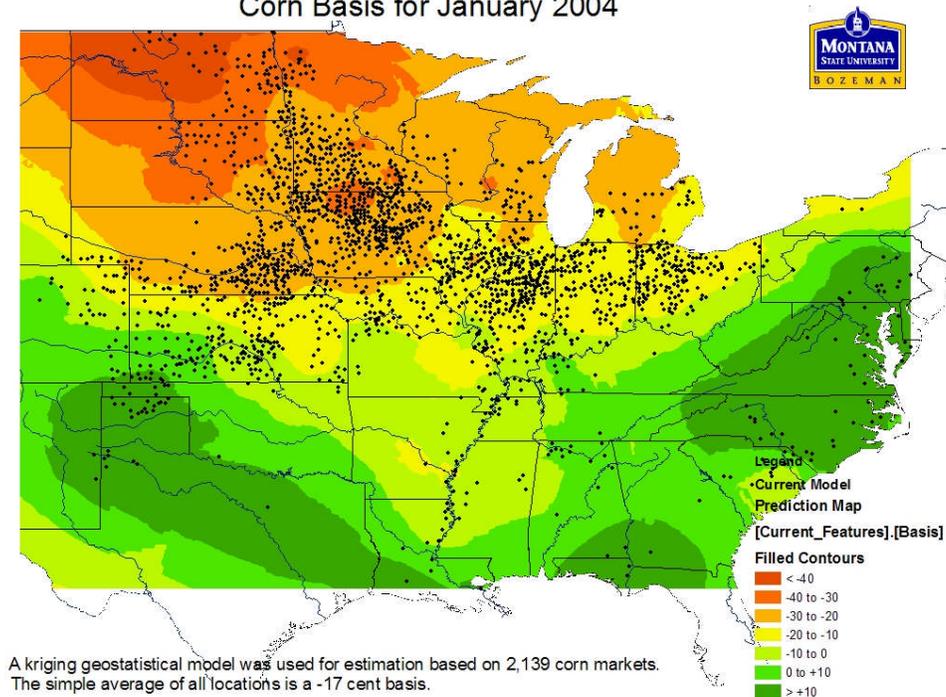# Corn Basis Flow in 2000 Prior to Ethanol Plant Expansion

Darker is Higher Basis and Lighter toward Mississippi River represents Lower Basis
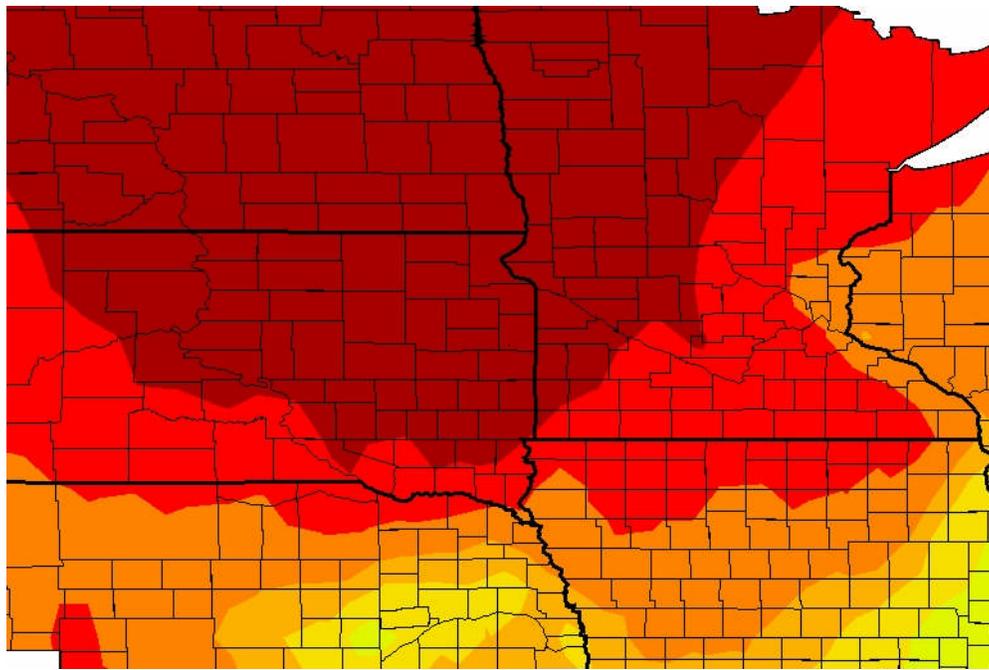
Changes in the marketplace brought by the ethanol industry are evident in the changed transportation patterns in Iowa. Visible in the graphic above, Iowa corn was historically shipped to the river ports where it was transported to the gulf by barge. The lighter colors in the graphic represent a smaller basis adjustment as transportation becomes less costly.

The general pattern of larger corn basis adjustments as markets move away from the Mississippi and Missouri Rivers remains evident in the 2004 graphic on the following page, but price basis patterns have changed in eastern South Dakota and northwestern Iowa. Much of the South Dakota basis is now similar to that throughout Iowa, unlike the situation in the graphic above. In fact there is an island in north central Iowa where the basis adjustment for corn is now deeper meaning transportation is more costly than in South Dakota. Dr. McNew describes this change as a "basis inversion". He writes that this means the region of Northwest Iowa and Southeast South Dakota generally has a lower basis adjustment than does a portion of central Iowa. Corn in central Iowa is now more likely to move north and northwest toward the growing ethanol industries in northwest Iowa and southeast South Dakota than to the historical river port markets.

Corn Basis for January 2004

A kriging geostatistical model was used for estimation based on 2,139 corn markets. The simple average of all locations is a -17 cent basis.

Legend
Current Model Prediction Map
[Current_Features].[Basis]
Filled Contours
- < -40
- -40 to -30
- -30 to -20
- -20 to -10
- -10 to 0
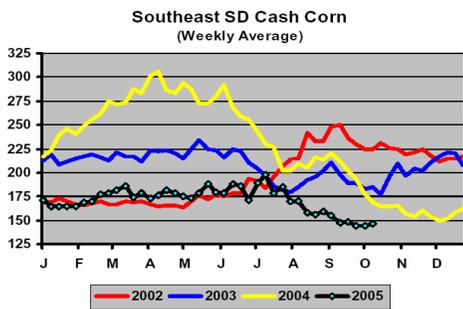- 0 to +10
- > +10

Purpose of Reporting "Basis"

Reporting the "basis" for corn provides information about local supply and demand conditions. Basis is comparative data that assists farm operators and commodity marketers in choosing between the local markets for the best place to sell their corn. Basis is calculated by subtracting the local cash or market price for the commodity from the futures price at the Chicago Board of Trade (CBOT).

While the CBOT price for corn reflects the general supply and demand pressures in the national marketplace, the local market price reflects transportation, storage and local supply and demand pressures. The improved basis throughout eastern South Dakota as shown in the graphic illustrates that factors affecting local prices have changed. A proportion of that change is attributed to the use of corn in the production of ethanol, distiller's grains and carbon dioxide. Other significant structural changes that could have affected the market are economies of scale from the use of unit trains and the increased size of modern elevators and storage facilities.
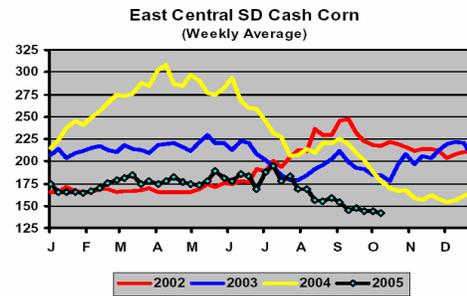
Modern markets go beyond state and national borders and so do influences of supply in the international markets. In March of 2004, Argentina's record crop started reaching the international market impacting the price and volume of US exports. China announced increased exports at about that same time. Following the entry of more corn from other countries in the marketplace, the US harvested a bumper crop. The impact of the increased supply of corn can be seen in the 2004 cash price in the graphic below. The price fell dramatically in the spring and throughout the summer based on international

news and continued the decline in price as confidence increased that the 2004 crop was going to be a record harvest.
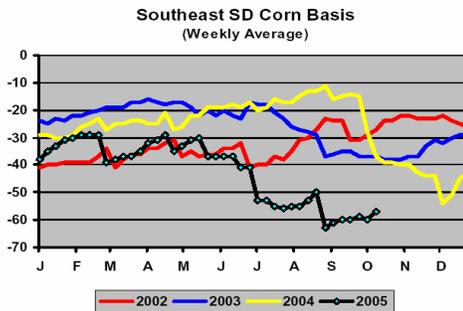
Market complexity is apparent. The use of corn for ethanol production has placed upward pressure on the commodity's local price. The increased efficiencies from using unit trains and larger scale storage facilities have done the same. Yet, the abundance of corn brought to the marketplace domestically and internationally was so pronounced beginning in 2004 and into 2005 that the price of corn in South Dakota is lower in 2005 than the 1992 to 2001 average. The impact of ethanol production can be lost in this time of abundance but the price basis records show price impacts and changes in the flow of corn to markets.
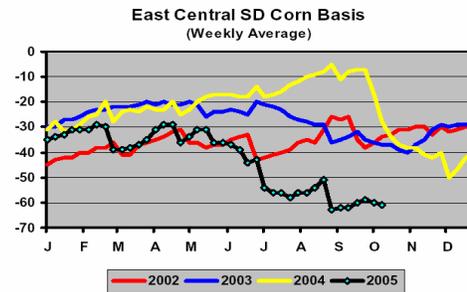

Southeast SD Cash Corn
(Weekly Average)

Data compiled by SDSU Extension Economics - http://econ.sdstate.edu

East Central SD Cash Corn
(Weekly Average)

Data Compiled by SDSU Extension Economics - http://econ.sdstate.edu

Southeast SD Corn Basis
(Weekly Average)

Data compiled by SDSU Extension Economics - http://econ.sdstate.edu

East Central SD Corn Basis
(Weekly Average)

Data Compiled by SDSU Extension Economics - http://econ.sdstate.edu

Corn Prices and Ethanol Production

Dr. McNew estimates that the change in price basis for corn between June 1999 and 2004 was between 20 and 30 cents per bushel in the southeast part of South Dakota with an impact of more than 30 cents in the northeastern part of the state. The increased demand for corn to support ethanol production contributed to those changes. More conservative estimates from other sources attribute from 10 to 12 cents a bushel narrowing of the basis to ethanol production on average.

The average improvement of 10 to 12 cents per bushel is assumed to be the impact on local corn price at the ethanol plants. The cost of transporting the corn from farm and field to the plants is an offset to this increase in value. The benefit to the corn producer diminishes as distance from the plant and the cost of transportation increases. The price advantage of shipping and selling corn to an ethanol plant is thought to exhaust at a distance of 35 to 50 miles.
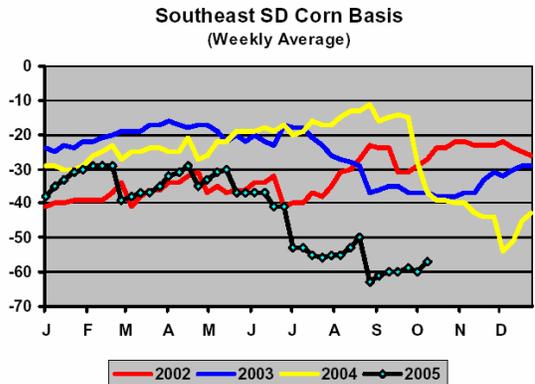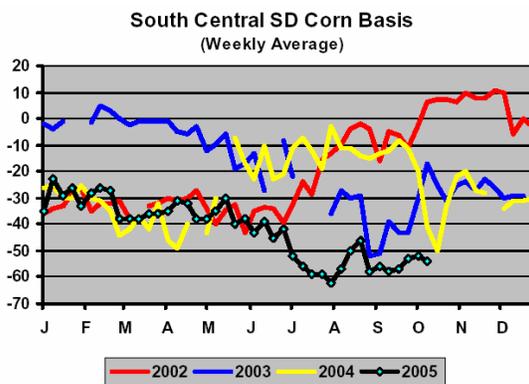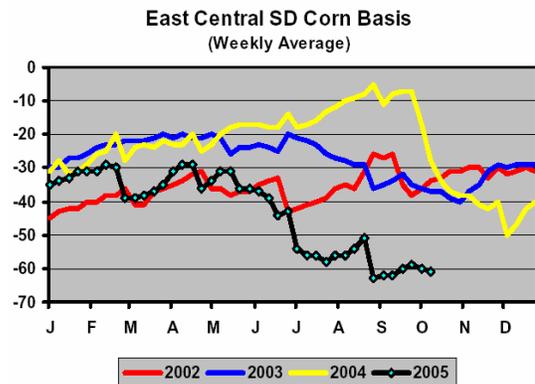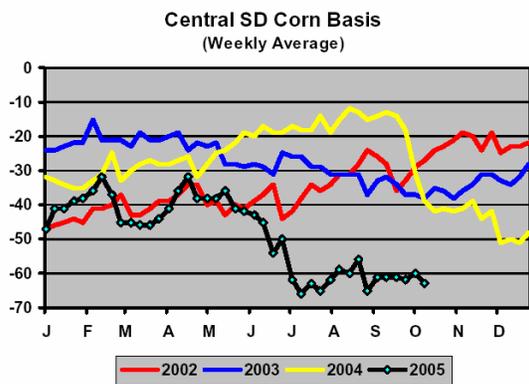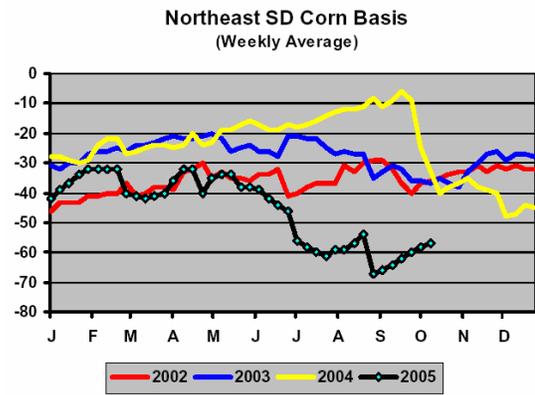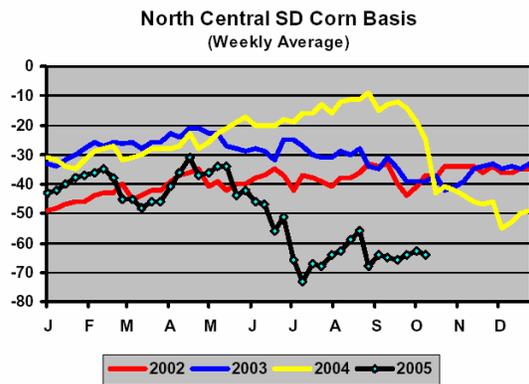
Perspective can be lost in a time of abundance. The tremendous growth in the state's ethanol industry has come at a time of record and near record corn crops. There has been ample supply of corn "available for export" in the local market. Corn crops have exceeded the local need by large margins but that may not always be the case. The current surplus may not always be there and the industry has cautioned that use of more than fifty percent of the corn available for export for ethanol production could dramatically increase the local price of corn, increasing costs and the profitability of ethanol production.

The caution should be of particular interest to South Dakota ethanol producers. South Dakota uses a higher percentage of its annual corn production to produce ethanol than any other state. Rough estimates are that one in three or one in four rows of the state's annual corn crop are currently being used to produce ethanol and those are gross measures.[10] If corn used for other purposes is subtracted from the total, the proportion of the crop available for export and used for ethanol production is greater than twenty-five to thirty-three percent. South Dakota is positioned to test the hypothesis that the local price of corn changes dramatically if pressure beyond a point is applied on the local supply of corn that is available for export.

Poor corn years have happened and the 1993 and 1995 corn crops can add perspective. In 1993, South Dakota's farmers had a crop that averaged 63 bushels to the acre. The average crop was 79 bushels to the acre in 1995. If one assumes that the number of acres planted to corn is 4 million acres as it was in 2005, years like those would yield 47 and 59 percent of the bumper 2004 crop, or 59 and 74 percent of the 2003 crop. If there comes a time when stores of corn are short and crops like 1993 and 1995 happen again, the hypothesis will be tested.

Dr. McNew's work indicates a narrowing of the basis in eastern South Dakota by 10 to 30 cents a bushel with improvement exceeding 30 cents in northern parts of the state from historical local prices. A portion of that improvement will be used to estimate the impact of the ethanol industry. Other experts estimate the basis narrowing attributable to the ethanol industry out of that larger amount at 10 to 12 cents per bushel and it is this more conservative measure that will be used in the analysis. This analysis does not specifically address price impact differences between plants that require the delivery of corn as a condition of investment and those that strictly buy in the open market.

---

[10] The 2004 estimate of corn used for ethanol production in 2004 is 145.0 million bushels of corn. The amount harvested in 2004 was 539.5 million bushels or about one in four rows. The amount harvested in 2003 was 427.4 million bushels. The 2004 use would be about one in three rows of 2003 production.

North Central SD Corn Basis
(Weekly Average)

Northeast SD Corn Basis
(Weekly Average)

Central SD Corn Basis
(Weekly Average)

East Central SD Corn Basis
(Weekly Average)

South Central SD Corn Basis
(Weekly Average)

Southeast SD Corn Basis
(Weekly Average)

Data collected and compiled at South Dakota State University, Cooperative Extension Service, Economics Department. Alan May, Extension Grain Marketing Specialist.
For questions or to request data set, call 605-688-4862 or email may.alan@ces.sdstate.edu
http://econ.sdstate.edu - SDSU Economics Department

COOPERATIVE
EXTENSION
SERVICE
SDSU

10

Estimating Economic Multipliers and Impacts

The multiplier estimation product used in the analysis is IMPLAN (IMpact Analysis for PLANning). IMPLAN was developed at the University of Minnesota over a period of years in conjunction with the U.S. Forest Service's Land Management Planning Unit in Fort Collins. Governmental agencies and leading universities across the nation use this product for estimating economic impacts.

IMPLAN is an input-output (I-O) estimation model. The versatility of this model enables specific analysis for each area of interest, including county, multi-county regions, a state or a group of states. Naturally, some estimation error will remain. The I-O technique describes an enterprise based on average ingredient and performance measures and therefore best predicts the impact of an average enterprise. While the I-O modeling technique has been designed and refined to minimize error, estimation error does occur because of our inability to distinguish the specific enterprise from the average.

Three multiplier effects are presented: the *output*, *value-added*, and *employment* effects. Each of these in turn reflects three components: the *direct* effect, the *indirect* effect, and the *induced* effect. The output multiplier is the change in the economy required to deliver an additional dollar of construction services to demand. The initial response in final demand is the direct effect, always with a multiplier of one. The construction contractors will in turn buy goods and services from other industries to produce the dollar's worth of construction, and these industries buy inputs themselves, creating a whole series of additional purchases that are captured by the indirect effect component. Finally, there will be additional purchases motivated by the income generated for households in these transactions; these are called induced effects. All three effects combine to create the output multiplier.

The output multiplier measures the economic activity that will occur as a result of the initial stimulus. It will rise as more inputs are purchased and more income is spent in the region in question. If most inputs are purchased and most income is spent outside the region, the output multiplier will be relatively small. Small counties, for example, will have smaller output multipliers than counties with large wholesale and retail operations, and county multipliers will be smaller than the state multipliers.

The output multiplier is appropriate for sizing up the total economic activity that will occur in an area as a result of a project. The value-added effect is a better measure of the income created for people and the government by the project. Payments for raw materials continue through the system, but payments for labor, or proprietors' income, or distributed corporate profits represent added wealth for people, and thus value-added. Payments for input materials are referred to as "leakages" from the stream of payments. Eventually a dollar spent on the final product ends up split among many income recipients, some of whom live outside the region under consideration. As a result, the value-added multiplier effect is expected to be below one. Like the output multiplier, the value-added effect will typically be larger for the state than for individual counties.

Value-added is decomposed into the same three parts as the output multiplier: direct effects, indirect effects, and induced effects. The direct component will be income generated over and above the cost of resources in the immediate enterprise. The indirect multiplier effect similarly measures net income created in the upstream industries that supply inputs for the final good. The induced component reflects the on-going effect of the income created directly and indirectly: income that is spent on goods and services creates demand for additional goods and services, thus creating a repeating cycle of expenditures. The sum of the three parts creates the value-added multiplier effect.

Finally, the analysis in this report provides an employment multiplier, showing the estimated number of jobs created by one million dollars of output. Again, the multiplier is comprised of three parts. The direct component shows the number of jobs created by the immediate enterprise, ethanol plant construction. The indirect again refers to jobs created in supporting industries, and the induced component reflects jobs created by additional demand throughout the area's economy.

The economic impacts resulting from the production of ethanol and the economic impacts resulting from increased local price as a result of narrowing of the basis will be estimated separately. The economic multipliers for ethanol plant operations are presented first followed by a discussion of the multipliers for corn revenues resulting from the basis improved local price of corn. The corn multipliers are that which would be applied to a windfall. The production activities associated with growing the corn are not considered. Only the costs associated with the delivery of the corn to the ethanol plants are considered and this activity has an impact separate from the increase in income.

Multiplier Estimates for the Ethanol Industry[11]

Table 1 shows the direct economic impact on the South Dakota economy of delivering one dollar of ethanol and its co-products to final demand. For every dollar of ethanol delivered to final demand in South Dakota, nine and one-half cents (0.0953) of new income will be created. That income will be realized by investors or owners, management and the labor force at the plant. A delivery of one million dollars of ethanol to final demand is estimated to directly result in 0.7 full and part time jobs and the creation of 95,300 dollars of new income. The difference between the initial delivery of 1 million dollars of ethanol to final demand and the 95,300 dollar increase (1,000,000 x .0953) in income is that money spent on non-labor costs.

The indirect output includes those goods and services purchased from other businesses in the state to produce one million dollars of ethanol. It is estimated that for every one million dollars of ethanol produced, 446,100 dollars of goods and services will be purchased from other businesses in the state and those expenditures will result in an

---

[11] The operations impact described in this section of the report does not include the impact of ethanol production on the price of corn. All agricultural crop inputs were excluded from the IMPLAN estimate in this section. Impacts from increased corn prices will be addressed in a following section.

additional 214,600 dollars of income for these businesses and their employees. The purchases from these businesses will result in 2.6 people being employed full or part time in the state.

Induced output is the spending of households in the economy by people employed directly in the operation of the plant and the businesses benefited indirectly by purchases related to the operation of the ethanol plant. People taking their paychecks from work directly and indirectly related to the operation of an ethanol plant, result in 113,500 dollars of spending for each million dollars worth of production. The state's income is increased by 67,500 dollars and an additional 1.1 full and part time jobs will be created.

Table 1
Multipliers Used to Estimate the Economic Impact of Ethanol Plant
Operations on the South Dakota Economy

	Total Output[12]	Value Added	Employment[13]
Direct	1.0000	0.0953	0.7
Indirect	0.4461	0.2146	2.6
Induced	0.1135	0.0675	1.1
Total	*1.5596*	*0.3774*	*4.4*

Source: IMPLAN regional input-output economic impact estimator, 2002 data.

The multiplier in Table 1 states that for every dollars worth of ethanol and its co-products delivered to final demand, the estimated total impact of that dollar in the state's economy is one dollar and fifty-six cents ($1.56). That measure includes the economic activity resulting directly from construction, transactions with local businesses selling goods and services supporting construction activities and the spending by the households of people employed at the construction site and by the supporting businesses.

For every million dollars of ethanol and its co-products delivered to final demand, the wealth in the state is estimated to increase by three hundred and seventy-seven thousand dollars ($374,400) and create four and four-tenths (4.4) full and part time jobs in the state.

---

[12] Output and value added in millions of dollars. 1.0000 represents one million dollars.
[13] Estimated number of jobs resulting from one million dollars of ethanol plant operations activity.

Multiplier for Increased Revenue from Corn

Increased revenue to corn producers is an additional impact of ethanol production. The complexities in markets and the international, national and regional influences have been discussed. When assessing the impact, the location of ethanol plants relative to the state's borders is one more consideration. Some of the impact will accrue to out-of-state corn producers. Literature suggests that corn is transported distances of thirty-five to fifty miles to take advantage of a plant's reduction in basis. Most South Dakota plants are nearer the state border than fifty miles. The plant located in Hudson is very nearly on the Iowa border.

Be mindful that the increase in revenues to the corn producers is not the result of significantly increasing the general price for the commodity. Ethanol demand for corn affects the basis of the corn delivered to the plant and only that corn sold to ethanol producers has a decreased basis adjustment attributable to ethanol production. The benefit to corn producers is the increase in revenue from selling their corn to ethanol producers less any increase in transportation costs.

Two additional economic impacts result from the sale of corn to ethanol plants. There is the increase in revenue to the corn producer net transportation costs and there are the transportation costs. There will be economic activity associated with the windfall of revenue and the money spent on transportation will impact the economy.

The windfall of revenues to the corn producers from ethanol production is money that is available to be spent which is disposable income. It is the new revenue less additional transportation costs and taxes. Expenditures of disposable income are made by households and are modeled as induced spending. Each additional million dollars of disposable income will create a total of one million three hundred and twenty-nine thousand dollars of economic activity as the initial sum moves through the economy. One million dollars of new disposable wealth will create five hundred and sixty-seven thousand dollars of additional income in the state and create 11.4 full and part time jobs.

Table 2
Multipliers Used to Estimate the Economic Impact of Increased
Corn Revenues on the South Dakota Economy

	Total Output[14]	Value Added	Employment[15]
Total	*1.3292*	*0.5676*	*11.4*

Source: IMPLAN regional input-output economic impact estimator, 2002 data.

---

[14] Output and value added in millions of dollars. 1.0000 represents one million dollars.

[15] Estimated number of jobs resulting from one million dollars of increased corn revenues.

The benefit from the reduction in basis that is not new wealth to the corn producer is that proportion of the increased revenues that is spent on the transportation from farm or field to the ethanol plant. There is economic activity associated with the task of trucking the corn and that economic activity and its multipliers are described in Table 3.

The table shows the direct economic impact on the South Dakota economy of delivering one dollar of truck transportation to final demand. For every dollar of truck transportation delivered to final demand in South Dakota, forty-two cents (0.4223) of new income will be created. That income will be realized by owners, management and the labor force involved in truck transportation. If one million dollars of service is considered, its delivery is estimated to directly result in 9.6 full and part time jobs and the creation of 422,300 dollars of new income.

It is estimated that for every one million dollars of trucking services, 438,300 dollars of goods and services will be purchased from other businesses in the state and those expenditures will result in an additional 232,300 dollars of income for these businesses and their employees. The purchases from these businesses will result in 4.4 people being employed full or part time in the state.

Spending by households in the economy by truck owners, people employed directly by truck owners and the businesses benefited indirectly by purchases related to the transportation of the corn is estimated to result in 332,800 dollars of spending for each million dollars worth of trucking services provided. The state's income is increased by 197,900 dollars and an additional 4.1 full and part time jobs will be created.

Table 3
Multipliers Used to Estimate the Economic Impact on the South Dakota
Economy from Trucking Corn to Ethanol Plants

	Total Output[16]	Value Added	Employment[17]
Direct	1.0000	0.4223	9.6
Indirect	0.4383	0.2323	4.4
Induced	0.3328	0.1979	4.1
Total	*1.7712*	*0.8525*	*18.1*

Source: IMPLAN regional input-output economic impact estimator, 2002 data.

---

[16] Output and value added in millions of dollars. 1.0000 represents one million dollars.
[17] Estimated number of jobs resulting from one million dollars of truck transportation.

Ethanol Industry Economic Impact

The economic impact estimate is for ethanol production in South Dakota in 2004. The state's production facilities were predominantly sized between forty and fifty million gallon production capacities in that year but there were exceptions. Plants built prior to 2000 had capacities of eight to fifteen million gallons and one of the more recently built plants has a one hundred million gallon capacity. The size of plants is important as it relates to economies and diseconomies of scale. Larger plants use labor more efficiently and will have an impact on the economy different from that of smaller plants with fewer employees. Another factor of production and an area with potential for diseconomies of scale is the cost of corn. Too large a plant relative to corn availability in an area may relative to smaller plants disproportionately narrow the basis. With these exceptions, the industry is fairly uniformly sized in South Dakota in the forty to fifty million capacity range. The exceptions are assumed in total to be offsetting with regard to economies of scale. IMPLAN model fit as measured by employment supports this assumption.

Three multipliers effects are presented: the output, value-added and employment effects. The output multiplier is the change in the economy required to deliver a dollar of additional 100% ethanol product to final demand. The initial response to the one-dollar change in final demand is the *direct effect*. This is the activity at the plant. The *indirect effects* are the inter-industry changes as businesses respond to the delivery of one additional dollar of 100% ethanol product. The *induced effect* reflects changes in spending from all households as income increases due to the changes in production.[18]

It is estimated that the South Dakota ethanol industry delivered 675.5 million dollars worth of 100% ethanol to market in 2004. Of that amount, approximately 301.8 million dollars was spent by the plants purchasing goods and services from other businesses in the state. And, the households of the workers at the plant and the businesses throughout the state were able to spend 77.2 million dollars as a result of the business activity generated by the production of the plants.

The income or new wealth in the state resulting from the ethanol industry's economic activity was 255.2 million dollars spread among the investor owners at the plant and supporting businesses and their employees.

It is appropriate to address the state's ethanol production payment program. This subsidy represents purchasing power that was secured from South Dakota households to show support for the ethanol industry. South Dakota paid producers 4.0 million in fiscal year 2003 and 5.5 million in fiscal year 2004. These periods bookend calendar year 2004 because the state's fiscal years start in July. Calendar year 2004 is estimated by averaging the two amounts at 4.75 million dollars. With the offset of 4.75 million dollars, households are estimated to be approximately 250.5 million dollars wealthier as a result of the state's ethanol plant operations and production.

---

[18] IMPLAN user's guide, p.102

Table 4
Estimated Economic Impact of Ethanol Production on
South Dakota Economy in 2004

	Total Output	Value Added	Employment
Direct	675,500,000	64,375,000	472.9
Indirect	301,839,000	144,827,000	1,756.3
Induced	77,230,000	46,002,000	743.1
Total	*1,055,398,000*	[19]*255,204,000*	*2,972.2*
Total less 4.75 million*		*250,454,000*	

Source: IMPLAN regional input-output economic impact estimator, 2002 data.
* Total less estimated 4.75 million dollars is a deduction of the state's ethanol production subsidy in 2004

Transportation Assumptions

The local price of corn is increased by the narrowing of the basis but the proportion of that benefit retained by the corn producer is determined by increased transportation costs. The expenditure of new wealth has an impact as does the transportation industry. Money spent on trucking corn has an economic impact. Without knowledge of actual trucking costs, assumptions need to be made.

The Baseline Scenario assumes that corn brought to a plant has a uniform distribution to a distance of 35 to 50 miles. This would be like a water level in a circular pan with the plant located in the middle. This is unrealistic but it provides a bound on transportation.

The Mainline Scenario assumes that a larger proportion of the corn used at the plant comes from fields and farms closest to the plant. This distribution would look more like a uniformly shaped hill with the plant at the top. The selection of a 70 percent to the corn grower and 30 percent toward the cost of transportation is arbitrary. However, comparison of the 70/30 split to the 50/50 split shows the consequences of being wrong in terms of overall economic impact are not that great.

---

[19] This estimate is an amount before the offset of the state's production subsidy is taken away. The new wealth in the state less the 2004 subsidy is estimated at 250.5 million dollars.

Baseline Scenario: Economic Impact from Increased Price of Corn (50% to Corn Producer / 50% to Transportation)

It is assumed that ethanol production narrowed the basis on corn by ten to twelve cents a bushel at the plant door. Further, it is recognized that the basis improvement resulting from ethanol production is eroded from the perspective of the corn grower by the distance the commodity is transported. The cost of transportation diminishes the improvement in basis until the revenue improvement is exhausted which is thought to be between thirty-five and fifty miles.

The baseline assumption is that corn attracted to a plant has a uniform distribution to a distance between 35 and 50 miles. Making that assumption, on average the basis advantage is split between enhancing the value of the corn and the cost of transporting the grain from field or farm to the plant. That assumption yields a realized revenue improvement from corn delivered to the ethanol plant of five to six cents per bushel with an identical amount paid for transportation.

It is estimated that the state produced 400 million gallons of ethanol in 2004 and that it took approximately 145 million bushels of corn to make that number of gallons. That is a yield of 2.76 gallons of ethanol per bushel of corn. If the basis was improved by ten cents a bushel at the door of the plant, the split of revenues between the corn producers and transportation costs, 7.25 million dollars would be paid to each. At twelve cents per bushel, there would be 17.4 million dollars to divide (17.4/2 = 8.7 million).

The impact of this windfall is estimated from new money spent by households after taxes and contribution for social security. The average disposable income in South Dakota in 2004 less contributions by employees and the self employed for social security is 80.1%. After that leakage, the 7.25 million dollars is reduced to 5.8 million dollars at ten cents per bushel and 7.0 million at twelve cents but one last assumption needs to be made for this to be a South Dakota economic impact estimate. Not all corn used in the production of ethanol in South Dakota plants originates from the state. The following economic impact is overstated by the proportion of income and transportation expense that is attributable to imported corn. Without supporting data or evidence, it is assumed that 25% of the income flows to out of state corn producers and that 30% of the transportation costs and impact are treated as leakages. This division between income and transportation decreases the 5.8 and 7.0 million dollar disposable income less social security contributions to 4.4 and 5.2 million dollars.

Table 5
Estimated Economic Impact of Increased Corn Revenues
Scenario One 50/50 Split to Corn and Transportation
In-State Income 75%, Out-of State Leakage 25%

Disposable Income	Total Output[20]	Value Added	Employment[21]
4.4 Million	*5,789,000*	*2,472,000*	*49.7*
5.2 Million	*6,947,000*	*2,967,000*	*59.6*

Source: IMPLAN regional input-output economic impact estimator, 2002 data.

Table 6 and 7 present economic impact estimates for transporting the corn from field or farm to the ethanol plants in South Dakota. The first table shows the impact assuming that the basis for corn was narrowed by 10 cents a bushel and Table 7 is the estimate using the assumption of 12 cents per bushel. Both assume that 30% of the transportation costs and any associated impact take place in states neighboring South Dakota.

The transportation share of the basis improvement impact is not reduced initially by federal taxes and social security like the income measure in Table 5. Taxation and social security are leakages that affect the economic activity created by the trucking industry but that leakage does not occur until a service has been rendered and income has been earned. Not reducing the windfall to the corn producers would suggest the income is tax free earnings.

The economic activity in the trucking industry created as a result of ethanol production is estimated to be between 9.6 and 11.6 million dollars under the assumptions in Scenario 1. The amount of new wealth in the form of income created in the state from that activity is estimated to be between 4.6 and 5.6 million dollars. The total number of full and part time jobs created using the models is estimated to be between 98.4 and 118.1.

---

[20] Output and value added in millions of dollars. 1.0000 represents one million dollars.

[21] Estimated number of jobs resulting from 6.1 and 7.3 million dollars of new income from corn revenues.

Table 6
Estimated Economic Impact of Transporting Corn
70% of 7.25 Million Dollars at Ten Cents/Bushel
30% Out-of State Leakage

	Total Output	Value Added	Employment
Direct	5,438,000	2,296,000	52.2
Indirect	2,383,000	1,263,000	23.9
Induced	1,810,000	1,076,000	22.3
Total	*9,630,000*	*4,635,000*	*98.4*

Source: IMPLAN regional input-output economic impact estimator, 2002 data.

Table 7
Estimated Economic Impact of Transporting Corn
70% of 8.7 Million Dollars at Twelve Cents/Bushel
30% Out-of State Leakage

	Total Output	Value Added	Employment
Direct	6,525,000	2,756,000	62.6
Indirect	2,860,000	1,516,000	28.7
Induced	2,172,000	1,292,000	26.8
Total	*11,556,000*	*5,563,000*	*118.1*

Source: IMPLAN regional input-output economic impact estimator, 2002 data.

Mainline Scenario: Economic Impact from Increased Price of Corn (70% to Corn Producer / 30% to Transportation)

The Mainline Scenario assumes that more corn comes from producers located nearer the plant than from those nearing the point where financial gain is exhausted at a distance of 35 to 50 miles. The assumptions other than the 70/30 division of revenues for the two

scenarios are the same. The two estimates reflect an income enhancing narrowing of the basis by 10 and 12 cents a bushel. The induced impact of the windfall income to the corn producer is estimated using disposable income adjusting for taxes and social security contributions. Without supporting data or evidence, it is assumed that 25% of the income flows to out of state corn producers and that 30% of the transportation costs are paid to truckers out of state.

The revenue from corn is again assumed to increase 10 and 12 cents per bushel attributed to the narrowing of the basis. This is consistent with Baseline Scenario. The split of the revenues is changed from 50/50 to 70/30 favoring corn producers over the transportation industry. Changing the distribution assumption increases income measures after adjustments from 4.4 and 5.2 million dollars for the 10 cent and 12 cent per bushel assumptions to 6.1 and 7.3 million dollars. The new wealth after the 6.1 million dollars of corn producer income makes its way through the economy is estimated to total 9.6 million dollars at ten cents a bushel and the total impact at twelve cents a bushel is estimated to be 11.5 million dollars.

Table 8
Estimated Economic Impact of Increased Corn Revenues
Scenario One 70/30 Split to Corn and Transportation

Disposable Income	Total Output[22]	Value Added	Employment[23]
6.1 Million	*8,105,000*	*3,461,000*	*69.5*
7.3 Million	*9,726,000*	*4,153,000*	*83.4*

Source: IMPLAN regional input-output economic impact estimator, 2002 data.

The income measures to the corn producers were increased by changing their share to 70 percent. It follows that 30 percent is paid to the transportation industry. After reducing transportation's share of 4.4 million dollars by 30 percent for neighboring state-provided trucking, the amount assumed spent is 3.0 million dollars at 10 cents per bushel and 3.7 million dollars at 12 cents per bushel of basis improvement.

The range of economic activity in the sector resulting from the operation of ethanol production facilities under this scenario is estimated to be between 5.4 and 6.5 million dollars. The amount of new wealth or value added by the transportation sector is estimated to be between 2.6 and 3.1 million dollars. Full and part time jobs created are estimated to be between 55.1 and 66.2.

---

[22] Output and value added in millions of dollars. 1.0000 represents one million dollars.
[23] Estimated number of jobs resulting from 6.1 and 7.3 million dollars of new income from corn revenues.

The total impact of new wealth to the corn producer (6.1 million), the impact (3.5 million), and the transportation impact (2.6 million) total 12.2 million dollars assuming a ten cent narrowing of basis. With a twelve cent narrowing increases the impact estimate to total 14.6 million dollars.

Table 9
Estimated Economic Impact of Transporting Corn
70% of 4.4 Million Dollars

	Total Output	Value Added	Employment
Direct	3,045,000	1,286,000	29.2
Indirect	1,335,000	707,000	13.4
Induced	1,013,000	603,000	12.5
Total	*5,393,000*	*2,596,000*	*55.1*

Source: IMPLAN regional input-output economic impact estimator, 2002 data.

Table 10
Estimated Economic Impact of Transporting Corn
70% of 5.2 Million Dollars

	Total Output	Value Added	Employment
Direct	3,654,000	1,543,000	35.1
Indirect	1,602,000	849,000	16.1
Induced	1,216,000	723,000	15.0
Total	*6,472,000*	*3,115,000*	*66.2*

Source: IMPLAN regional input-output economic impact estimator, 2002 data.

Summary of Local Corn Price Economic Impact Assumptions

Estimating the economic impact resulting from the improvement in corn prices is complicated by data availability but estimates that provide perspective are possible. The estimates presented are conservative from the perspective that ten to twelve cents per bushel improvements are used and not the higher basis impact evidenced in the Montana State University research. South Dakota uses more of its corn and consequently a greater proportion of its corn is available for export in the production of ethanol than any other state. The industry assumption and some early research suggest the impact on basis adjusted local price for corn is greater when a larger percentage of corn available for export is used by the industry.

Assumptions used in the economic impact estimates include the following:

- Estimated corn use in production of ethanol in 2004 is 145 million bushels
- Ten and twelve cents per bushel of corn is the assumed narrowing of the basis
- More revenue from narrowing increases the feasible distance to transport corn
- Revenue increases to the corn producers above increases in transportation cost are a bonus or a windfall in income
- Disposable income determines the economic impact of the windfall
- Some corn is imported from neighboring states (25%) and the cost of transporting the corn is on average assumed to be higher and a larger proportion (30%).
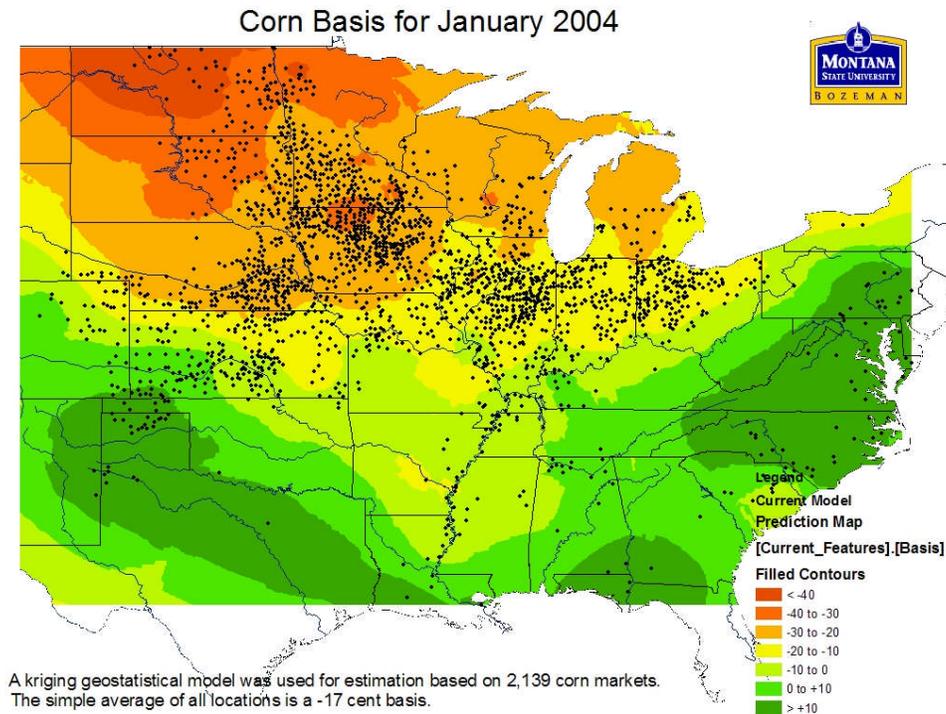
The out of state corn grower participation percentage is recognition of neighboring state's participation in the South Dakota industry. Actual participation rates and transportation adjustments would require additional research.

Ethanol Industry's Impact on Corn Price beyond the Plant

The economic impact estimate discussed to this point is an estimate of impacts at the ethanol plants and upon the price of corn relative to the general market. Existing opinion suggests corn is shipped distances as far as 35 to 50 miles to take advantage of improved prices. The 10 to 12 cents per bushel assumption relates to transportation of the commodity. It is assumed that 10 to 12 cents per bushel was the appropriate incentive necessary to induce growers to truck corn past local grain elevators or other community buyers.

That impact addresses only the corn delivered to ethanol plants and limits the economic impact to the incremental or differential cost that the ethanol plants must pay to attract sufficient amounts of corn to maintain full production. The graphic presented earlier and reproduced below shows corn basis as reported by grain elevators. The basis improvement applies to all corn sold in the local market and not just the corn sold and delivered to ethanol plants. Basis and changes in basis for corn is measured at the local

grain elevators. The basis adjusted price paid by grain elevators is the local price paid in competition with ethanol plants and other corn buyers.

Corn Basis for January 2004

A kriging geostatistical model was used for estimation based on 2,139 corn markets. The simple average of all locations is a -17 cent basis.

Legend
Current Model
Prediction Map
[Current_Features].[Basis]
Filled Contours
< -40
-40 to -30
-30 to -20
-20 to -10
-10 to 0
0 to +10
> +10

Dr. McNew estimates that local basis for corn has been narrowed from 10 to 30 cents per bushel while other industry experts have estimated the average basis improvement in South Dakota is just over 20 cents on average. Ethanol is an important factor in the local market price for corn but experts do attribute some of the improvement in basis to other market forces. To make it even more difficult to put in perspective, the greater the percentage of corn available for export used in the production of ethanol, the greater influence on local price these market forces become. The end result is that there is no indisputable measure of the ethanol industry's influence in the state's local basis price of corn.

Because 2004 was not a typical corn production year, calculating impacts on that record crop wouldn't be very meaningful. An average measure is a better perspective when setting longer term expectations given this circumstance. Average corn production in South Dakota between 1995 and 2004 was 375,355,000 bushels per year. The value of narrowing the basis 10, 15 and 20 cents is 37.5, 56.3 and 75.1 million dollars using that average production measure. Further study is required to determine the appropriate basis amount to attribute to ethanol production and additional analysis is required to determine what portion of any basis improvement contributes to the cost of producing corn and that which is additional profit.

The multipliers previously used for a windfall in income or bonus are applied here to add perspective to the range of estimates. The multipliers used are those from Table 2. The 37.5, 56.3 and 75.1 million dollars amounts adjusted for income tax and social security yield disposable income estimates of 30.1, 45.1 and 60.1 million dollars. That money spent in the economy will generate between 30.1 and 60.1 million dollars of economic activity. The additional disposable income along with the income created while the money makes its way through the economy is expected to generate between 51.4 and 102.7 million dollars with full and part time jobs of 428 to 856 supported. Regardless of the price improvement level that proves appropriate, the impacts are in addition to the incremental or differential impacts shown in Table 8 of the mainline scenario.

Table 11
Economic Impact of General Corn Price Basis Improvement
Ten Year Statewide Average Production of Corn

New Income (10, 15, 20 Cents)	Less Tax and SS (80.1%)	Total Output *1.3292*	Value Added *0.5676*	Employment *11.4*
37,535,500	30,065,936	49,892,187	21,305,150	427.9
56,303,250	45,098,903	74,838,280	31,957,725	641.9
75,071,000	60,131,871	99,784,373	42,610,300	855.8

There are still other impacts to consider not addressed here. These are offsetting impacts that result from higher local prices of corn. For example, the cost of cattle and hog feeding increases with the cost of this factor of production. Decreases in livestock production resulting from increased ethanol production should be accounted for to fully understand the industry's impact. That analysis and the analysis of other changes in rural South Dakota resulting from production and use choices are beyond of the scope of this study.

Taxes

Every enterprise carries with it the issue of taxation. In South Dakota, taxation of businesses with a few exceptions primarily falls into the categories of sales and property taxes. The state does not have a general corporate income tax. The sales taxes paid by the ethanol industry on operations and the property taxes paid on capital improvements are discussed below.

Industry Sales Taxes Paid

The ethanol industry pays substantial sums in sales taxes to the state of South Dakota. Electricity and gas are substantial inputs in ethanol production. It is estimated that plants

paid more than three million dollars in sales tax on energy expenses in 2004. Other purchases are also sales taxable and the total amount of sales tax paid to the state is conservatively estimated to have been between 3 and 4 million dollars in that year.

Property Taxes Paid

Property tax levies are applied to all ethanol plants. Taxes received by a county will be the amount received on that property prior to plant construction or greater. No property tax revenues collected prior to the ethanol plants location is lost in any case. The tax on land continues as it was with payments going to support local government.

There are provisions in South Dakota property tax law designed to encourage economic development of which the industry is taking advantage. Property can be taxed in one of three ways. Capital improvements can be taxed as any other property, a discretionary formula can be applied or a tax incremental finance (TIF) can be allowed.

The state's discretionary formula allows the value of the capital improvement for tax purposes to be reduced for a period of up to five years. The phase-in of value is as the local jurisdiction determines appropriate. Typically, levies start at 20 percent of the capital improvement value and increase 20 percent a year to 100 percent in year five. Nothing would stop local officials from approving a start at 0 percent in the first year on the capital improvements and phasing in the levy to 100 percent in year six. Any other preferential scheme over the five years is allowable as well.

The TIF is an economic development tool similar to a loan program. Money required to make the plant operational in excess of that raised from investors is obtained by issuing a bond. The property tax revenues from the capital improvement, the plant, are used to retire the bond. Contribution of tax revenues for the support of local government on the capital improvement is forgone by the taxing entities to encourage the economic development. The bond repayment periods are variable typically ranging between ten and twenty years. One plant has a provision that is TIF like in repayment, the term is for twenty-five years but the funds used were economic development funds and not bonds. At the end of the repayment period, the plants will pay property taxes like other commercial property.

The outcome for local government support is very different between the use of the discretionary formula and a TIF. The discretionary formula diminishes the plant's contribution to local government from its capital improvements for a five year period. The TIF will delay contributions to local government on its capital improvements for a considerably longer time. Early retirements of the bonds result in the property tax support of local government coming earlier.

The table shows older plants being taxed under a discretionary formula. Discretionary formula provisions are allowed on plant improvements and reinvestments. Older plants receiving preferential tax treatment are paying the full levy on the older capital improvements and are receiving relief on new investments.

Table 12
Ethanol Plant Property Tax Status in 2004

		Support of Local Government	Discretionary Formula	Payment to TIF	TIF	Estimated Full Value
Sioux River Ethanol*	2004	$ 1,738		$ 53,631	x	2023
VeraSun Energy	2004	16,702		281,503	x	2020
James Valley Ethanol	2003	32,415	x	-	-	-
Great Plains Ethanol	2003	1,848		96,828	On Structure	2019
Glacial Lakes Energy	2002	1,773	x	70,097	Repay Fund	2027
Northern Lights Ethanol	2002	466		188,174	x	2022
Dakota Ethanol	2001	976		143,169	x	2018
Heartland Grain Fuel	1999	94,662		-	-	-
Heartland Grain Fuel	1993	39,213	x	-	-	-
Broin Enterprises**	1988	25,827	x	-	-	-
Totals		**$ 215,618**		**$ 833,402**		

*Distribution of funds between support of local government and TIF estimated using proportions of property values.

** A new addition to the existing plant is under a discretionary formula.

Conclusions

Large scale ethanol production is a relatively new form of manufacturing and value added agriculture in South Dakota. Prominence of the industry is new to South Dakota with substantial growth in this decade following modest beginnings in the 1990s. While it is an industry that becomes more mature each year, the technology and production processes are continuing to improve, increasing efficiency and the potential of the production facilities.

The economic impact of ethanol production and the impacts associated with narrowing corn's price basis are addressed separately in this study. The benefits from the ethanol industries' operations and the increase in revenue to corn producers are very different. Ethanol producers will have an economic impact in the state as the result of employing people, buying factors of production and delivering additional product to final demand. The economic impact to the corn producer occurs if the basis is narrowed on their existing product. The increase in income to corn producers is a windfall added to the receipts for existing production.

In 2004, the ethanol industry was a substantial part of the South Dakota economy. It is estimated that 675.5 million dollars of product which includes ethanol, distillers' grain and carbon dioxide was sold by South Dakota ethanol producers. That is the value of the product at the door of the ethanol plants. The shipment of the ethanol product, the distillers' grains and the carbon dioxide from the plants to their customers is not considered in this estimate.

The total economic activity created by the production of ethanol in South Dakota at the plants' doors is over one billion dollars (1.055 billion). That impact does not include the improvement in the basis narrowed local price for the corn used in the production of the ethanol which is estimated separately.

Approximately one hundred forty-five million bushels of corn was used for ethanol production in 2004. A ten and twelve cent a bushel narrowing of basis yields a direct gross revenue improvement of 14.5 and 17.4 million dollars. These revenues were distributed between the corn producers and transportation costs for moving the grain from farm or field to the plant. Using the assumptions of the mainline scenario, it is estimated that the additional economic activity was between twelve and fifteen million dollars. (12.2 and 14.6 million or 0.0122 and 0.0146 billion)

The increase in economic activity throughout the state's economy as a result of producing ethanol without considering general price improvements due to basis narrowing in 2004 including the increase in corn revenues is estimated to have been between 1.067[24] and 1.070[25] billion dollars, measured at the door of the ethanol plants. If the increase in income to corn growers due to general improvement in basis is considered using a ten

---

[24] 1.0551 + 0.0122 = 1.0673 or 1.067
[25] 1.0551 + 0.0146 = 1.0697 or 1.070

year average crop yield, the economic activity range increases to 1.099 and 1.131 million dollars. Note that impacts beyond the door of the plant are not included in these estimates. Transportation of ethanol and distillers' grains away from the plant and use of the co-products in the state are not included.

New income or new wealth throughout the economy as a result of ethanol plant operations is estimated at more than a quarter billion dollars at 255.2 million dollars. Of that total, 64.3 million dollars is paid to the investors in the plant and the workers at the plant. It is estimated that the ten plants included in the study employed 472.9 people on a full or part-time basis in 2004.

The economic activity created by ethanol production in other businesses in the state and the activity of the employees at the plant and these businesses result in nearly three thousand (2,972.2) people having full or part time employment throughout the state's economy.

Corn basis improvement and resulting economic activity are considered separately. The income or new wealth directly attributed to the increased value of corn relative to the general market is estimated to be between 12.2 and 14.6 million dollars and the increased number of full and part time jobs is estimated to be between 124.6 and 149.6.

Assuming a ten year average production of 375.4 million bushels and calculating 10, 15 and 20 cent local price improvements, value added or new wealth with multiplier applied are calculated to fall between 51.4 and 102.7 million dollars. The lower figure assumes half the 20 cent improved basis (10 cents) is attributable to the ethanol industry impacting the local price for corn and the latter is calculated using the full 20 cent per bushel improvement. The number of full and part time jobs created or supported by the economic activity is estimated to be between 427.9 and 855.8.

The ethanol industry is estimated to have paid between three and four million dollars in sales tax in 2004. That amount is paid on the purchases of energy and other factors of production that support operations but the sales tax contribution resulting from ethanol production does not end at the plant. The businesses supporting the plant had costs and paid additional tax. And, there are the household purchases made in the South Dakota economy as a result of a quarter billion dollars of new income or wealth being created in the state. Offsetting these contributions, the producer subsidy paid to ethanol plants in calendar year 2004 is estimated to have been 4.75 million dollars.

Property tax on the land where ethanol plants are located did not change. The land is taxed now as it was. Older ethanol plants that have exhausted economic development incentives now pay property taxes like any similar commercial property. Recent capital improvements which include new plants and new additions to older plants are typically taxed in one of two ways. There is a discretionary formula that reduces a plants tax liability or the property is in a tax incremental finance (TIF) district.

The discretionary formula applied to plants typically provides that 20 percent of full tax liability will be paid the first year and the contribution is increased by 20 percent each year thereafter until full payment is made in the fifth year. The schedule of payments is set by the local authorities. The only restriction is the five year time limit.

TIF's are created at the option of the local governing boards. The definition of a tax incremental financing district is in the name. It is the issuing of a bond or bonds to finance a project with the proceeds from what would have been the "tax levy" applied to the bond's repayment. This method results in no direct contribution for the support of local government above that on the land for ten to twenty-five years.

But it doesn't end there. The creation of jobs in the communities that these plants are located in or the surrounding communities have the benefit of their employees living in homes paying property taxes. The businesses that support the plants operations indirectly have employees that pay property taxes. The same can be said for the retail industry that feels the support of expenditures from both groups of employees.

New technology brings new efficiencies and South Dakota's energy industry continues to become more competitive with alternatives. A failed plant was put back on line in 2005. New plants were announced and construction commenced in the communities of Loomis and Redfield. The Loomis plant will have a 60 million gallon capacity and the Redfield plant will have the more traditional 50 million gallon plant. Changes in technology, efficiencies and knowledge of this new market have brought the industry a long way from its 8 million gallon plant beginnings.

Estimated Economic Impact of Ethanol Industry Operations on the South Dakota Economy in 2004

Production Estimates and Assumptions

Record Corn Crop in 2004: 539.5 million bushels

Corn Used in Ethanol Production in 2004: 145.0 million bushels

Ethanol Plant Production of Ethanol in 2004: 400 million gallons

Estimated Ethanol per Bushel of Corn: 2.76 gallons

Ten Year Average Corn Crop: 375.4 million bushels

Economic Activity

Marketing of Ethanol, Distiller's Grain & CO_2: 675.5 million dollars

Economic Activity Attributed to Operations of Ethanol Production: 1.055 billion dollars

Direct Attributed to Narrowed Basis in Local Corn Price: 13.5 to 16.2 million dollars

General Attributed to Improved Statewide Basis: 30.1 to 60.1 million dollars

Total Economic Impact Estimate: 1.099 to 1.131 billion dollars

New Wealth

New Wealth or Income Created: 255.2 million or over a quarter of a billion dollars

New Wealth Created by Local Corn Price Improvement: 9.6 to 11.5 million dollars

New Wealth from General Improvement in Price Basis: 51.4 to 102.7 million dollars

Total New Wealth Created in State: 316.2 to 369.4 million dollars

Employment

Estimate of Employment at Ten Plants in Analysis: 472.9 full and part time jobs (F&PT)

Estimated Employment in State's Economy because of Operations: 2,972.2 (F&PT)

Estimate of Employment from Local Corn Price Improvement: 124.6 to 149.6 (F&PT)

Estimated Employment from General Price Basis Improvement: 427.9 to 855.8 (F&PT)

Total Employment Impact from Operation of Ethanol Plants: 3,524.7 to 3,977.6 (F&PT)

Sales Tax

Ethanol Industry Sales Tax Payments on Operations: 3 to 4 million dollars in 2004

Estimated State Producer's Payment in CY2004: 4.75 million dollars