Issue Brief: Economic Impacts of Ethanol Production

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The replacement of imported oil with domestically produced ethanol is an appealing prospect for a host of reasons. Perhaps the most significant of these reasons is the economic impact associated with the domestic production and use of renewable ethanol.

The impact of ethanol production and use goes far beyond Rural America. Virtually every sector of the U.S. economy benefits from the rapidly expanding ethanol industry. From the technology sector which provides software for sophisticated plant operations, to the manufacturing sector, which provides plant components, ethanol production stimulates economic activity. Economists continue to measure the impact of ethanol production at the local and national level. A variety of econometric models are used to calculate this rapidly expanding business activity. This publication examines a variety of ways in which the ethanol industry affects the U.S. economy and local communities. As this largely Midwestern industry expands across the continent, these economic impacts are projected to have an ever expanding effect from coast to coast.

Evolution of the Ethanol Industry

While the production and use of ethanol spans more than a century, the current industrial expansion began in 1978 with one plant producing fuel grade ethanol for a handful of gas stations in the Midwest. With the oil embargoes of the 1970s and the petroleum price spikes of the 1980s, interest in ethanol production increased rapidly. Initial attempts at commercial fuel ethanol production in the mid to late 1980s were handicapped by technology and market barriers. The first commercial plants evolved from small-scale stills and, with annual operating capacities of five to ten million gallons per year, are considered small by current standards.

Most plants constructed in the mid to late 1980s remain in operation today. Virtually all have expanded, thereby increasing the economic contribution to state and local economies. As the next generation of ethanol plants evolved in the early and mid-1990s, the size of plants continued to grow. Plants capable of producing 25 million gallons of ethanol annually became standard. As economies of scale became clear, the economic impact of the plants increased along with capital commitments, employment, grain utilization and tax revenues.

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Dear Friends:

On behalf of my fellow board members of the Ethanol Across America education campaign, I am pleased to bring to your attention the latest in our series of Issue Briefs. Understanding the positive impacts of building an ethanol plant goes to the heart of what ethanol development is all about. As the case studies we have prepared in this Brief illustrate, there are significant economic benefits at the local, state and federal level. Ethanol plant development is truly a lifeline to rural America, providing us with a homegrown answer to spiraling oil imports, and returning literally billions of dollars back into our communities.

In this Brief you will see firsthand how these facilities create jobs, raise farm income, and generate important tax revenue. And these benefits are not limited to the cornfield states—ethanol projects are being developed from California to New York, and we are on the verge of technological breakthroughs that truly can reduce our dependence on oil. As a member of the Senate Energy Committee, I am acutely aware of the perils of this dependence and it is critical that we stem the flow of hard-earned American dollars being used to buy foreign energy.

On behalf of all of us involved in this project, I hope you find this information helpful and that we foster a better understanding of the positive impacts of U.S. ethanol plants.

Sincerely,

Tim Johnson U.S. Senate

By the year 2000 it became clear that plants of 40 million gallons per year were the new standard and in most cases these plants were pre-engineered for future expansion to twice the initial capacity.

By 2005 a new model for plant size was established. The first 50 and 100 million gallon per year plants were in operation. These facilities demonstrated improved economies of scale and lower per-gallon capital costs. Even these facilities were designed for future expansion as demand for ethanol increases nationally. These larger plants are constantly incorporating new technical capabilities and demonstrating economic profitability that is superior to earlier plants. The economic impact of these plants literally transforms local economies by creating demand for local goods and services, stimulating additional local investment, generating tax revenues at the local and state level, invigorating local grain markets and offering salaries that are typically higher than county averages in the area. By mid-2006, nearly 100 ethanol facilities in the United States were producing more than four billion gallons of ethanol annually. The following sections will examine the impact of these plants individually and collectively.

"Unquestionably, the most important value-added product to the Nebraska economy is, and will continue to be, ethanol production."

Decision Analyst, Inc. Report to the Nebraska Department of Agriculture

Local Benefits of Ethanol Production

Most ethanol plants today are located in the Grain Belt states of the Midwest. However, ethanol production offers significant economic opportunities for virtually all states due to the diversity of feedstocks from which ethanol can be derived. Corn is the primary feedstock for most ethanol produced in the United States today. But new technologies can convert a variety of other renewable materials ranging from residual food and dairy processing streams to cellulose materials into ethanol. This diversity of potential feedstock materials creates an opportunity for many communities across the country to attract ethanol production facilities. In locations where feedstock materials and other plant development criteria can be met economically, communities are actively evaluating opportunities for ethanol development.

Record high fuel prices and public policy initiatives continue to stimulate interest in renewable fuels including ethanol. Communities seeking economic development opportunities, job creation, tax base diversification and new capital investment are quick to recognize the economic benefits of a local ethanol processing plant. These benefits are obvious from the point of initial construction and continue to expand throughout the operating life of the plant. Several economic analyses have examined these impacts and quantified the benefits. Each ethanol plant generates similar but different benefits depending on local and state tax rates, employment requirements and a host of other factors. However, econometric models used to calculate economic impact provide a high degree of uniformity in the results. Following are examples of specific projects for which impact studies have been conducted.

"I don't know of a single industry that has had a more positive impact on rural economies than ethanol."

Donis Petersan, Chief Economist Nebraska Public Power District

And There's More...

Jeff Kapell, Associate Principal at SJH & Company and John M. Urbanchuk, Director of LECG, LLC, combined their skills in consulting to produce the June 2002 report entitled, "Ethanol and the Local Community." Kapell and Urbanchuk were intrigued by the flurry of ethanol plant development across

Community Case Studies

Husker Ag, LLC

As many rural communities struggle to sustain economic



vitality they look for businesses most likely to bring quality jobs to the area. Most of these communities have very few resources to entice a company to invest in the area. One thing these communities have to offer is corn and lots of it. Take the small town of Plainview, Nebraska located in Pierce County in the northeast part of the state. This farming town of 1353 people was looking for a way to boost its local economy. The answer they found was ethanol. Area residents invested millions of dollars to build a twenty-five million gallon facility. Thirty-three direct jobs came with the plant as well as 73 additional indirect and induced jobs that the area badly needed. The average salary paid to employees of the plant significantly exceeds the county average salary. Not only did the area gain from the increased number of jobs but from the grain purchases as well. By turning corn into ethanol, \$3.10 is added to each of the 9.6 million bushels of corn that make their way through the plant each year. That equates to almost \$30 million dollars being added to the income of local farmers each year. Annually, \$128,772 in property taxes is paid to Pierce County by the ethanol facility, thereby boosting revenue for essential services in this rural county.

Groton, South Dakota

Many rural communities across the Great Plains have mounted a grassroots effort to attract



quality jobs and value-added industries. Residents of rural communities fully understand that the ethanol industry is ideally suited to

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Ethanol's Impact on Local Economies

The extensive list of quantifiable economic benefits is one reason many states and communities have identified ethanol plants as a primary economic development target. Nearly 100 communities across America host ethanol plants. While corn is the predominant feedstock, a variety of materials including wood wastes, food processing waste, dairy products, grain and sugar sources are converted to ethanol. The local economic impact of the plants varies but many plants consistently demonstrate the significant economic benefits illustrated in a report by the Nebraska Public Power District (NPPD). During the past decade NPPD has made a concerted effort to assist communities and companies in their efforts to develop ethanol plants in Nebraska. This spirit of cooperation and hard work is motivated by a clear understanding of the economic benefits generated by ethanol plants.

NPPD reports that a typical 40 million gallon ethanol plant will generate the following economic activity:

- The plant will provide a one-time boost of \$71 million to the local economy during construction.
- The plant will expand the local economic base of the community by \$70.2 million each year through the direct spending of \$58 million.
- The plant will create at least 33 full-time jobs at the plant and a total of at least 120 jobs throughout the local economy.
- The plant will increase household income for the community by \$6.7 million annually.

Source: Nebraska Public Power District, Employment and Other Economic Impacts Associated with the Construction of an Ethanol Production Facility (January 2005), and Estimated Economic Effects for the Prospective Ethanol Production Facility in Boone County, Nebraska (June 2004).

the country and especially the trend of rapid plant capacity expansion soon after the start of initial operations at a new facility.

Since the publication was released, ethanol plant capacities continue to increase, both in initial size and subsequent expanded capacity. As noted in a July 2005 news release from Platte Valley Fuel Ethanol in Central City, Nebraska, the economic success of a new plant in this community of 3,000 residents prompted local owners to re-invest in the facility that began operation in April 2004. The initial plant, designed to produce 40 million gallons of ethanol annually, will be expanded to produce nearly 100 million gallons. Plant owners will invest more than \$35 million to expand the plant, thereby creating a demand for dozens of jobs during construction, 6 to 10 new permanent jobs, and a market for an additional 15 million bushels of locally produced corn.

Kapell explains that while the size of the plants has changed, the impacts multiply significantly. "All of those costs and impacts simply multiply," Kapell said. "With larger plants, the economic impact of construction and operations will be significantly larger."

Local Impacts: Dividends...

Local investment participation in ethanol plants can also yield dividends beyond the economic benefits reported in this publication. A recent newspaper story explored the impact of dividends paid to owners of a locally owned ethanol plant near Minden, Nebraska. As noted in the article, "When the first \$9 million in dividends from the year-old KAAPA Ethanol plant were distributed to investors, they lifted the entire community." "We've added lots of jobs to the area and any time you have that kind of money going out, it helps," says Lamoine Smith, a farmer who invested in the plant. "My guess is that most of that money was spent locally." The dividend distribution came to around \$18,000 each to the roughly 500 investors. Adds Ron Horst, a local banker, "Some are using the money to retire debts, and it's money that will help the overall profitability of a producer's operation. But the main thing I see here from the ethanol plant is that it creates a market for local corn, as well as creating jobs all around."

"Policy decisions at the federal level along with increased demand for ethanol could dramatically increase U.S. net farm income and create many jobs over the next few years."

Report by Decision Analysts, Inc. to the Nebraska Department of Agriculture

...And Jobs

The construction and operation of ethanol plants is widely recognized as a catalyst for additional job creation beyond the plant site. An Associated Press story from Wisconsin provides several examples of indirect jobs generated by the national expansion of ethanol production. many of our nation's prime agricultural areas. Gerald Rix, mayor of Groton for 15 years, attributes the recent population growth in the area to several factors, perhaps most importantly to the start of ethanol production at the James Valley Ethanol plant in the spring of 2003. The new ethanol plant today produces nearly 50 million gallons per year of ethanol from locally produced corn. Groton now boasts a population of more than 1,300 residents which includes families of employees attracted to quality jobs at the new plant. "I think that we are going to grow some more and James Valley is, too. We are tickled to death that they came here. To me, there is only one direction that we can go, and that is ahead," said Mayor Rix.

"Ethanol production is at an all-time peak," said Mike Peterson, sales manager for Apache Stainless Equipment Corp where production of ethanol equipment makes up 25 percent of the work. A&B Process Systems is doubling the size of a production plant and hiring about 60 more people to handle the increased business, said president Glenn Linzmeier. Ethanol equipment makes up about 30 percent of the company's sales. "And our sales in the ethanol industry should double next year," said Linzmeier.

Paget Equipment Company has months worth of ethanol equipment orders on its books. To keep up with demand, the company has hired more workers. As a result of orders from ethanol plant builders, "We have a workload that takes us out to next summer, and that's just with ethanol," said project engineer Brian Johnson. The metal fabrication sector is just one of many allied industries that benefits from ethanol plant development across the nation.

Economic Benefits of Ethanol Production and Use at the State Level

"Energy Security", a previous publication in this series from the "Ethanol Across America" campaign, explores in detail the economic benefits of displacing petroleum with ethanol. The publication notes: "While the oil displacement benefit of biofuels is obvious at the state level, a wide range of other economic benefits are also attributable to the production and use of ethanol. As noted earlier, these benefits are not exclusive to Midwestern grain producing states."

In addition to the significant value of substituting petroleum products used in a state with ethanol produced in that state, this publication expands the economic focus to the quantitative economic impacts associated with the production of ethanol.

According to recent reports nearly eight of every ten gallons of gasoline sold in Iowa contain ethanol.

The Iowa Report Card: 2005 and Beyond

As one of the nation's top corn producing states, lowa has focused on strategies for creating corn demand while adding value to the commodity through processing opportunities. Ethanol production has unquestionably proven to be one of the fastest growing industrial sectors in the state. In an effort to quantify the value of this rapidly expanding industry, lowa State University researchers evaluated key factors associated with the construction and operation of ethanol plants. A January 2005 study conducted by ISU economists Paul Gallagher and Dan Otto concluded that Iowa's developing ethanol industry benefits the state's economy on many levels. Iowa's 14 existing ethanol plants and nine plants under development will contribute a total of \$3.9 billion to the state's economy once all plants are in production, according to the 2005 study. The Iowa industry as a whole will contribute \$16 million annually in state tax revenues and create a total of 5,187 direct and indirect jobs within Iowa's economy, according to the recent study by Iowa State University economists.

A July 2005 report by the U.S. Department of Commerce ranked the Iowa economy as one of the fastest growing in the nation. A key factor benefiting Iowa and the economies of Iocal communities is the fact that almost all of the ethanol industry's corn and labor, plus 44% of other inputs, are purchased within the state. Clearly, the ethanol industry is well suited to Iowa and many other agricultural states. And the economic impacts in Iowa ripple throughout the state's economy:

- \$910 million in corn purchases are made annually and this impact is projected to increase each year.
- More than \$82.4 million is expended on wages each year.
- The ethanol industry purchases more than \$161.6 million in ingredients for plant operations annually.
- More than \$203.7 million in energy is purchased each year with much of the energy provided by Iowa-based companies.
- About \$2.40 is added to the value of each bushel of corn processed at the plants.

Mike Jerke, of the Iowa Renewable Fuels Association, understands the impact of this economic activity in Iowa. He states, "When ethanol production delivers so many benefits, we think every Iowan has good reason to support ethanol use. 'Buying Iowa' is a lot better for our economy than importing foreign oil."

A Word on Econometric Models

Studies cited throughout this publication were conducted by distinguished economists from across the country. However, economic models vary in many ways and often fail to capture the full impact of an industry. The models used in some of the reports are no exception. For example, much of the Nebraska data includes economic benefits at the community level but impacts on other sectors are not fully measured.

As a major cattle feeding state, researchers from the University of Nebraska attempted to quantify the impact of feeding the high protein distillers feed from ethanol production. Distillers feed is used in a variety of animal and pet food rations. However, the trend of feeding distillers feeds in wet form is a fairly new innovation and one that was not clearly understood until recently.

First in 1999 and again in 2005, researchers at the University of Nebraska reported that the trend of feeding wet distillers feed from Nebraska ethanol plants to cattle in the state generated a significant economic impact. By mid-2005, this impact was estimated to be more than \$55 million annually. Of this amount, 85% of the value accrued to cattle feeders in the form of reduced cost of gain and

State Case Studies

In the Land of 10,000 Lakes Minnesota's diverse crop and livestock production is well suited to ethanol production. Proud of its reputation as a "clean air state", Minnesota



has taken great strides to use cleaner burning fuels including ethanol and biodiesel. Minnesota law presently requires that virtually all gasoline sold in the state contain 10% ethanol. In 2005 Governor Tim Pawlenty proposed a requirement for the state to displace 20% of gasoline use with ethanol by 2010. This proactive move to replace petroleum with renewable fuels in the state generates a host of positive environmental and economic benefits. According to the Minnesota Department of Agriculture the 14 ethanol plants operating in the state generate:

- \$1.36 billion in total economic impacts.
- More than 5,300 jobs.
- A local market for more than 1/6th of the corn produced in Minnesota.

And Nebraska, too.

A recent study by the Nebraska Ethanol Board provided an in-depth



look into the benefits of ethanol production. In November of 2005 eleven ethanol facilities were operating in the state of Nebraska. The eleven plants have the capability to produce 534 million gallons of ethanol annually using over 205 million bushels of corn. More than \$712 million of capital investment has gone into these facilities.

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15% of the value went to ethanol producers in the form of lower energy costs associated with avoided drying costs. While the economic impacts cited in this publication are impressive, they may not fully capture the value of ethanol plants across the economic spectrum of every state.

Beyond Corn Country

Ethanol production is helping to fuel the economy in Nebraska, Iowa, Minnesota and many of the Midwestern states. But the Midwest is not the only region of the country that can benefit from ethanol.

A study conducted by the Northeast Regional Biomass Program in 2000 found that ethanol production can greatly affect the Northeast Region as well. The study looked into the building of ethanol plants in Maine, New Hampshire, New York, New Jersey and Pennsylvania. While these are not major grain producing states, they do have an alternative to corn when it comes to ethanol production: wood.

The study focused on the building of a 50 million gallon-per-year wood-to-ethanol plant. Authors of the report found that production of an ethanol facility would generate between \$170 million to over \$200 million in income and create from 4,000 to 6,000 jobs depending on the state. How about long-term impacts of the facility? The study found that a 50 million gallon-per-year wood-to-ethanol plant would generate from \$41 to \$48 million per year in income, 540 to 830 permanent jobs, and \$1 to \$3 million in state taxes depending on the state and other factors chiefly concerning the purchase of wood feedstocks. "According to our analysis, an RFS of 8 billion gallons could have a positive effect on the farm economy. While impacts vary by commodity, net farm income would increase. The construction boom in ethanol plants experienced over the last 5 years would continue generating rural jobs. The nation's reliance on crude oil and gasoline imports would decline slightly and its fuel sources would become more diversified. The ethanol production boost provided by the RFS would attract more financial capital into ethanol production that would improve the production and delivery infrastructure and in all likelihood continue the advances in production efficiencies that are reducing ethanol's cost of production."

Keith Collins, Chief Economist, U.S. Department of Agriculture; Testimony before U.S. Senate Committee on Agriculture, July 2005

And, if you want to think big, build a 100 million gallon facility. The study found that wood-based ethanol plants of that size are estimated to generate from \$65 to \$95 million in income, 950 to 1,650 permanent jobs and \$2 to \$6 million in state taxes annually. With supportive public policy there is no reason why more states can't experience many of the same economic benefits from ethanol production as Midwestern states.

The Renewable Fuels Standard: More Ethanol, More Benefits

Passage in 2005 of landmark legislation requiring a renewable fuel content will have a profound impact on the future of ethanol plant development. On August 5, 2005, President Bush signed into law legislation that will require a modest percentage of the American motor fuel pool to be derived from renewable fuels—and it is likely ethanol will play the key role in meeting that requirement.

The economic impacts documented in this Issue Brief are linear: the more ethanol plants we build, the greater the returns. The RFS is the new catalyst for a new era of plant development resulting in significant investment with corresponding positive impacts throughout many sectors. The U.S. Department of Agriculture has conducted assessments of the impact of this new program. Even without increases above current production levels, according to USDA, 1.5 billion bushels of corn will be used for ethanol production in 2006, which is 14 percent of projected U.S. corn production. USDA has assessed the effects on the farm economy of a RFS. To do so they used their Food and Agriculture Policy Simulator (FAPSIM) econometric model of crop and livestock markets. Looking at an 8 billion gallon per year level of ethanol production (slightly higher than the final version of the legislation), the USDA came to several important conclusions as they looked at the direct and indirect effects on farm economy.

The new ethanol requirements would result in an average annual increase in corn demand of 685 million bushels during the 2006 to 2013 period. This increase results in a corn price increase of Nebraska's ethanol facilities have a net-value of production (ethanol and feed co-products) of over one *billion dollars annually!*.

Thanks to ethanol production nearly 3000 jobs have been added in the state. At least 865 of those jobs are directly at the ethanol facilities themselves. The annual average payroll at the eleven facilities is well over \$36 million and that amount increases each year. Purchases by Nebraska ethanol facilities equate to nearly \$483 million per year. Utility purchases by these facilities are more than \$92 million dollars each year. Since Nebraska is a public power state, these purchases keep electricity costs low for all residential and industrial consumers in the state.

Where the state as a whole is most affected is the area of tax dollars. State income tax receipts increased by \$19 million each year and the existing plants pay \$3.4 million in local property taxes as well. More than \$2.5 million in payroll taxes are paid annually. This tax impact increases each year as the plants invest additional capital in expanded capacity.

8 percent during the early years of the program, rising to 12 percent, or 30 cents per bushel by 2013. Importantly, this increase in corn prices has a nearly negligible impact on retail food prices. The USDA model analysis projects no effect on the Consumer Price Index (CPI) for food until 2009 and even then it is *one-tenth of one percent rising to three-tenths of one percent by the conclusion of the program!* One of the key areas for measuring the impact on the farm economy is to examine farm cash receipts and net farm income. The RFS is estimated to result in a \$1.4 billion or a 2.3 percent net farm income increase over the period of 2006-2013. And, the slightly higher corn prices in the first several years of the program would reduce government payments by nearly \$1 billion over those years. Depending on actual market conditions that might keep prices from rebounding, there could also be savings in subsequent years.

The RFS program would also increase the value of U.S. grain and feed exports by \$300 million. Further modeling employment generated by the increase in ethanol production would result in a net increase of approximately 10,000 jobs in ethanol production, feed grain production, service, and manufacturing sectors.



Ethanol Demand from Renewable Fuels Standard

To Learn More About the Economic Benefits of Ethanol Production and Use...

See "Ethanol Today" (Ace Magazine), June 2005,

"Ethanol Production's Impact on the Local Community": www.ethanol.org

Clean Fuels Development Coalition: www.cleanfuelsdc.org

Ethanol Across America: www.ethanolacrossamerica.net

Ethanol's Impact on the Nation's Economy

While the USDA analysis tends to focus on the impact of ethanol production on the rural economy, other studies have assessed the impact of the industry on a national basis. Economist John M. Urbanchuk has conducted several comprehensive assessments of the impacts of various levels of ethanol production. In a January 2005 report released by the Renewable Fuels Association, he details the following findings based on 2004 production of just under 4 billion gallons per year:

- The ethanol industry spent more than \$5.1 billion on raw materials, other inputs, goods and services to produce an estimated 3.41 billion gallons of ethanol in 2004.
- The ethanol industry represents an excellent domestic market for grain. This is important to the U.S. balance of trade at a time of declining export markets for grain. The ethanol industry used more than 1.25 billion bushels of corn in 2004, valued at nearly \$3.1 billion.
- In addition to creating a valuable and reliable local market for their products, the ethanol industry
 represents an important economic strategy for farmers. Farmer-owned ethanol plants account
 for half of the U.S. fuel ethanol plants. Profits generating by adding value to corn via ethanol
 processing represent an important profit opportunity in many communities.
- The combination of spending for annual operations and capital spending for new plants under construction added \$25.1 billion to gross output in 2004.
- The ethanol industry added \$14 billion to the nation's Gross Domestic Product in 2004.
- The increase in gross output resulting from ongoing ethanol production and construction of new capacity supports the creation of 147,206 jobs in all sectors of the economy. This figure includes more than 13,000 jobs in America's manufacturing sector.
- Increased economic activity and new jobs created by the ethanol industry will put an additional \$4.4 billion into the pockets of American consumers this year.
- The full impact of annual ethanol plant operations and spending for new construction of plants will add more than \$1.3 billion of tax revenue for the Federal government and \$1.2 billion for state and local governments.

Clearly, increased ethanol use as called for in the RFS has substantial economic benefits affecting a range of economic and energy security interests.

Nebraska Ethanol Board: **www.ne-ethanol.org** Nebraska Public Power District: **www.nppd.com** Renewable Fuels Association: **www.ethanolrfa.com** South Dakota Corn Council: **www.sdcorn.org**



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