

**An Analysis of the Economic Impacts of the Iowa
Bioprocessing Center in Eddyville, Iowa**

**Dave Swenson
Department of Economics
Iowa State University
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Introduction

The Iowa Bioprocessing Center (hereafter, the Center) in Eddyville Iowa is an industrial complex comprised of Cargill, Inc., Ajinomoto Heartland, LLC, and Wacker Chemical Corporation. Combined, the companies transform 85 million bushels of corn into starch, sweetener, alcohol, corn oil, gluten meal, lysine, food and feed supplements, and other additives and cyclodextrins that are useful to the pharmaceutical industry. The Center exerts a strong regional influence in Southeast Iowa, but most especially on Mahaska, Monroe, and Wapello County where it derives most of its workforce and directly influences the value of area agricultural production.

This report documents the regional economic impact of the Center. The report has been commissioned by the Indian Hills Regional Economic Development Group. All of the research and model development for this project occurred at Iowa State University. The economic impacts of the Center were compiled using an input-output model of the primary economic region of scrutiny with an eye towards identifying especially the job and income impacts that are attributable to industrial operations in the region and the linkages that the firms at the Center have with the regional economy.

The analysis isolates three dimensions of impact: (1) the overall regional economic impact of the Center, (2) the fraction of economic activity in the region attributable to the Center and its linkages with the region, and (3) potential gains to corn producer considering its strong demand for corn.

Understanding the Language of Economic Impact Assessment

All businesses have relationships with other businesses and with a regional labor supply; at a fundamental level all businesses appear to have an economic “impact.” In this research, however, we are isolating economic activity that is seen to cause or stimulate even more economic activity in the region because of sales to non-residents. These sales are called exports, and they create a flow of money into the region. To maintain that flow of money into the region, a company of course must hire workers and purchase production inputs to keep selling its export commodity. Hence, the firm has an economic impact in that it is producing in excess of local demand for the commodity and it is able to sell its surplus. If the plant closed, then all labor and supply relations would be lost and the regional economy would shrink; if a plant opens or expands production, then all labor and supply relationships would expand accordingly and the regional economy would expand as well. Economic impacts work in both directions.

When we conduct economic impact assessments, we concentrate on industries that are producing for export sales. Exporting industries can be traditional manufacturers, value added agricultural processors, or regional service, trade, or transportation systems. So long as the firm is producing in excess of local demand and able to sell its surplus, it is an exporting industry. A regional health care center can be an exporting industry for a community, for example, as can a regional retail center. The firm or firms do not need to be commodity producers or processors.

The degree to which an industry produces for exports or in excess of local demand is estimated by comparing local levels of production with national averages. If a firm is producing at the national average as a percentage of the workforce or some other pertinent industrial measure, then it is not exporting. If it is producing in excess of the national average, we assume the excess is exported. These comparisons are commonly estimated using a simple statistic called a location quotient.¹

¹ A location quotient is merely the percentage of employment in an industry locally divided by the percentage of employment in that industry nationally. A value of 1.0 means that you are only satisfying local demand for a commodity or service. A value greater than 1.0 means that you are exporting surplus production.

The next step in analyzing a firm and its economic impacts is to isolate the kind of supply relationships that exist for that firm in the region of scrutiny. Those assessments can be made in a rudimentary way by looking at published industrial characteristics of similar firms and inferring to the firm or firms in question. A more sophisticated estimation is made using an input-output model of the regional economy that contains information on the types of firms that you are ²measuring. An input-output model is a comprehensive estimate of the amount of industrial activity that takes place in a region with a very high level of industrial detail. The advantage of such models is that they contain information on the kinds of industrial inputs that all industries in the region must purchase along with an estimate of the probability that those inputs were purchased from regional suppliers. As a consequence, the economic value of all linkages firms have with one-another can be compiled and transformed into figures that describe their nature, magnitude, and extent. This accounting process is at the core of economic impact assessment for a region. Once the value of all linkages to a firm or a set of firms has been compiled, then we can produce sets of multipliers that help us to understand the overall statistical magnitude of the relationship firms have with one-another.

The Direct Values

According to information supplied by the three firms under scrutiny, there are 702 jobs at the Center with a combined payroll of \$41.86 million – an average earnings level per job of \$59,635 across the three firms (earnings include all wages and salaries plus the annual value of employee benefits). In addition, the Center requires 85 million bushels of corn annually, more than 2.5 times as much corn as is produced in the three counties comprising the study region.

At the outset it is important to note that the Center processes existing Iowa agricultural commodities into value added products. In and of itself, then, the company exists because there is an adequate supply of its primary input: corn. Hence, the company does not cause corn regional agricultural production, it merely utilizes existing supply as an industrial input. Subsequent analyses will control for the implied economic

² Input-output models are relatively sophisticated accountings of regional economies. Most analysts purchase input-output software and data from a firm called IMPLAN. Those data were utilized for this analysis, but were modified to reflect the modern production characteristics of the firms that were measured.

value of that corn production, but it will not include that value in the total estimates. As the corn was already in the regional economy, this analysis focuses primarily on the net increment to regional productivity that occurred when that commodity had value added to it by the firms at the Center. We do, however, look at the price premium that area farmers might expect considering the strength of regional demand and the resulting transportation savings on prices received.

Economic Impacts: Describing the Indicators

There are several types of information that economic impact assessments can produce. The first value is called *industrial output*. Industrial output is the value of the commodity that is produced during the measurement period. It is analogous, primarily, to gross sales. Next is *labor income*. Labor income consists of the wages and salaries paid to workers and to sole proprietors, plus the value of all benefits. *Value added*, another common statistics, is comprised of the aforementioned labor income, plus payments to investors and indirect tax payments that are part of the production process. Value added is the best measure of industrial activity because it consists of the same information that measures gross domestic (or regional) product, the standard U.S. measure of economic activity in an area.³ Last, the models produce *job* estimates. Jobs are not to be confused with employed persons: people can have more than one job, and there are more jobs than employed persons.⁴

The modeling produces this information at three levels. First it identifies the *direct value*, the information that is only pertinent to the firm or firms that we are studying. Next the model produces the *indirect values*, which are the value of all regionally supplied inputs. Last, the model produces estimates of the *induced activity* that can be expected in the regional economy. When workers take their labor incomes and convert them into household spending, they induce another round of regional spending, which further stimulates the economy. The induced round can also be called

³ Gross domestic product (GDP) is a measure of gross industrial sales minus all inputs. The remaining values amount to the sum of all payments to factors: labor, land rent, capital, and indirect payments to governments.

⁴ Jobs are counted where they occur. This is not to be confused with the number of persons in a county that are employed. Jobs are counted on a place of work basis, while standard employment and unemployment statistics are compiled on a place of residence basis.

the household round. When we combine the direct, indirect, and induced activity we get an estimate of total economic impact for each of the economic categories that we are measuring.

Economic Impacts: The Center

The input-output model for the three-county region was adjusted to contain, for the industries assessed, their actual job and labor income values. Nearly all other inter-industrial relationships were left as is.⁵ The mathematics in input-output systems assumes that all production for final demand (in this case, export sales) requires concomitant increases in all “up-stream” commodity inputs. As regional primary agricultural production is not enhanced by value added processing, that assumption is invalid in this case and an adjustment is necessary. Consequently, the expected increases in corn production have to be reduced to zero so as to not double-count economic activity that was already in the economy irrespective of the plant. Once that adjustment was made, estimates of the overall economic impact of the Center were compiled.⁶

Table 1 displays the results of the analysis. In producing an estimated \$718 million in industrial output among the three firms measured, 702 job holders received \$41.9 million in labor income. In producing those inputs, the Center required \$153.85 million in non-corn inputs from regional suppliers, which in turn stimulated 1,107 more jobs receiving \$54.2 million in labor incomes. Here is an instance, which is common among value added agricultural product processing in Iowa, where the indirect values on jobs and labor income exceed the direct values. Next, the direct and indirect workers convert their labor incomes into household spending. That spurs \$43.9 million in induced output in the region, which required 551 more jobs making \$13.3 million in labor income. In all, the Center links to \$915.7 million in total industrial output, \$190.2

⁵ The model was adjusted to assume that the vast preponderance of the flow of corn into the facility required rail and not truck transport owing to the relationship between area corn supply and the overall demand for corn at the Center.

⁶ This is a common and very serious mistake in economic impact assessments of agriculture commodity production and processing in Iowa leading to inflated estimates of the job creation potential of certain industries.

million in value added of which \$109.35 million is labor income to the area’s 2,360 benefitted workers.

Table 1. The Iowa Bioprocessing Center Economic Impacts (Excluding Regional Corn Purchases)

	Direct	Indirect	Induced	Total	Total Multiplier
Output	717,923,368	153,847,485	43,923,885	915,694,738	1.28
Value Added	87,201,376	76,949,672	26,025,499	190,176,547	2.18
Labor Income	41,863,450	54,186,956	13,296,029	109,346,435	2.61
Jobs	702	1,107	551	2,360	3.36

The table also lists multipliers. The output multiplier means that for every \$1 of output at the Center, \$.28 in additional (on corn) industrial output is stimulated in the rest of the economy. The value added multiplier of 2.18 means that for every estimated \$1 of value added produced by the Center, \$1.18 in value added is stimulated in the remainder of the economy. The labor income multiplier of 2.61 means that for every \$1 in labor income at the complex, \$1.61 in labor income is sustained in the rest of the economy. Last, the Center has a very high jobs multiplier of 3.36. That means that for every job at the facility, 2.36 jobs are otherwise sustained in the supplying industries and the industries that provide goods and services to households. Multipliers can help us to understand the potential for region-wide growth were the Center to expand employment, but more importantly the multipliers help us to understand the strength of relationships the regional economy has with the Center.

Economic Impacts: The Center as a Fraction of the Regional Economy

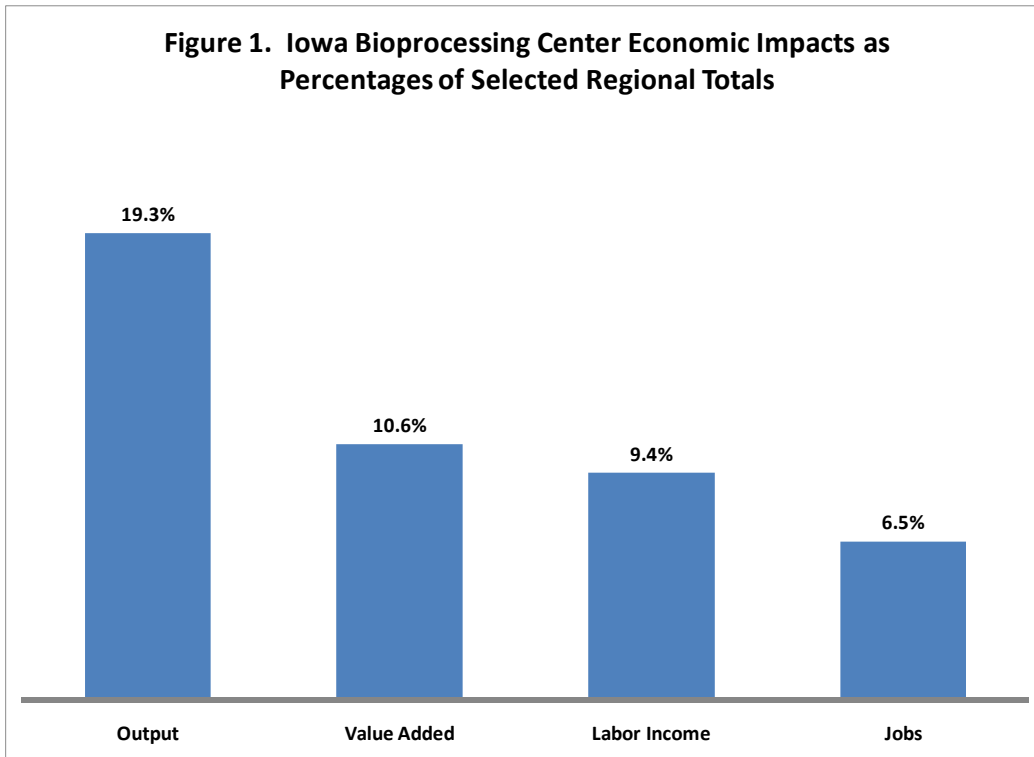
The total values in Table 1 represent the amount of regional economic activity that links to the sale of the commodities produced at the Center. For perspective, we can estimate how much of the regional economy (excluding the existing corn production) is directly or indirectly dependent on the Center. Table 2 describes the entire three-county economic region. For the period assessed in this project the area had \$4.75 billion in industrial output, \$1.8 billion in value added, and 36,103 jobs

making \$1.17 billion in labor incomes for an average of \$32,338 per worker. Workers at the Center average \$59,634 in earnings, 84.4 percent more per worker than the regional norm.

The total economic impacts of the Center relative to the regional economy are displayed in Figure 1. While the Center accounts for a very large fraction of regional output on an impact basis, it is more appropriate to look at value added to gauge size. Value added is 10.6 percent, labor income is 9.4 percent, and jobs are 6.5 percent of the regional total. The labor income and value added fractions are much higher than the jobs percentages owing to the superior levels of compensation in both the Center and in the industries that supply inputs to the facility.

**Table 2. Total Economic Values
for the Region**

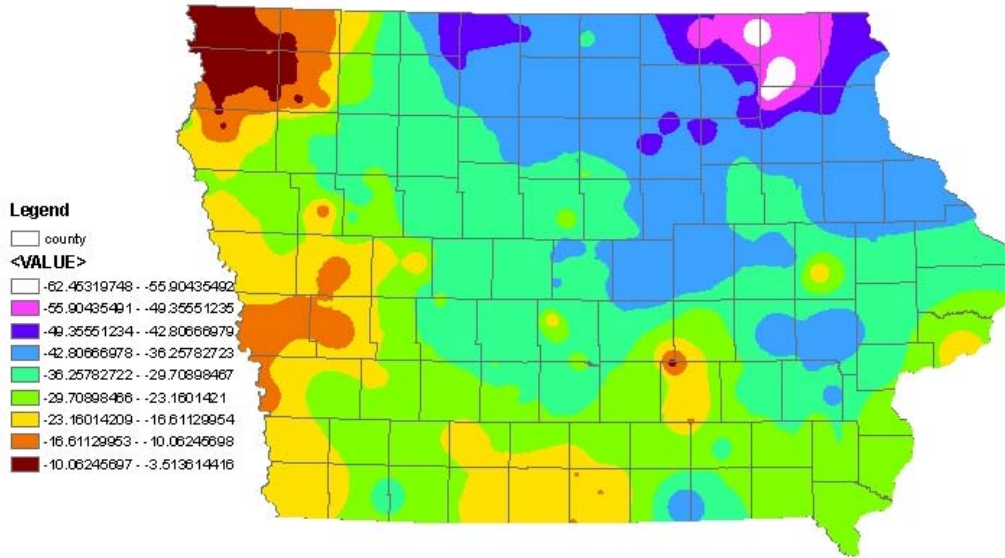
Output	4,746,411,000
Value	
Added	1,800,006,000
Labor	
Income	1,167,510,000
Jobs	36,103



Economic Impacts: Potential Returns to Area Corn Producers

While Iowa is a very efficient producer of corn, shipping that corn to final users who are mostly at a great distance comes at a cost. Over the years producers have learned that it is better for their bottom lines to have a strong local versus external demand for their commodity. With a strong local demand, the cost penalties of shipping are minimized as the agricultural commodity is converted into a higher valued product and with a minimum of intermediate handling. Figure 2 demonstrates the extreme variability of corn prices across the state of Iowa at mid-year, as an example. This map gauges the penalty or the “basis” per bushel that farmers pay based on Chicago Board of Trade bid prices for corn to be delivered in September. Brown, orange, and yellow areas had comparatively lower penalties. Pink, purple, and blue areas had more severe penalties. It is evident from this map that overall price penalties are much lower in the three county region of scrutiny than in much of central Iowa. As a consequence, we can simulate the overall benefits to corn producers from receiving a better price, all other things considered, for their corn.

Figure 2: July 25, 2007 Corn Price Basis Map



This next assessment uses a two-part sensitivity analysis to estimate the potential gains to area farmers from having a strong local demand and reduced transport penalties. The first is an assumption that the price advantage ranges from a nickel to a dime a bushel. The next ranges the amount of locally-purchased corn (corn originating in the three-county study region) from a minimum of one-third to a maximum of two-thirds of area supply. According to 2006 agricultural statistics, there were 32.237 million bushels of corn produced in the region. The Center uses 85 million bushels of corn annually, so it must have extensive procurement capacity beyond the primary study region.

Using the 1/3 to 2/3 allocation and the 5 to 10 cents premium assumptions, the better returns to farmers in the region could range in value from \$532,000 to a high of \$2.13 million, as indicated in Table 3.

Table 3. Potential Price Premium to Regional Farmers

Bushels of Regional Corn Supply Purchased	5 Cents Per Bushel Premium	10 Cents Per Bushel Premium
10.64 Million	\$ 532,000	\$ 1,064,000
15.97 Million	\$ 798,080	\$ 1,596,160
21.28 Million	\$ 1,064,000	\$ 2,128,000

These values were then entered into the input-output model as increases in earnings to sole proprietors (area farmers). The values were treated as higher returns to operations without concomitant increases in land rents or any other inputs. In so doing, and were the returns within the ranges displayed in Table 3, the following regional economic impacts would be feasible:

Table 4. Producer Premium Economic Impact Ranges

Bushels of Regional Corn Supply Purchased	5 Cents Per Bushel Premium		10 Cents Per Bushel Premium	
	Labor Income	Jobs	Labor Income	Jobs
10.64 Million	90,265	3.7	180,530	7.4
15.97 Million	135,411	5.6	270,822	11.1
21.28 Million	180,530	7.4	361,060	14.8

With regional farmers increasing spending as proprietors, the region could see an additional \$90,265 in labor incomes accruing to 3.7 jobs to a high of \$361,060 in labor income accruing to 14.8 jobs. This analysis assumes that all proprietors convert their incomes into spending in the region in exactly the same proportions as they had historically and as estimated in the original modeling system. If, because prices have been boosted because of the plant complex and land rents increase as a result, then it could also be feasible to shift a portion of the gains to land owners. Doing so would lower the economic impact results due to absentee ownership of some agricultural land.

In any case, as we know neither the amount of corn purchased from within the region or the ultimate premium enjoyed by area producers, these estimates should be used for discussion purposes primarily.

Conclusions

By all measures, the Iowa Bioprocessing Center is an extremely important component of the regional economy. Directly or indirectly it links to \$190.2 million in regional value added (another word for economic product), \$109.35 million in payments to workers and to sole proprietors in the region, and it supports 2,306 jobs. As a fraction of all enterprises in the three-county region, it accounts for 9.4 percent of labor income and 6.5 percent of jobs.

The Center is important for other reasons, as well. One of the important concepts in modern economic development planning is the identification and nurturing of beneficial industrial clusters. Industrial clusters exist when similar firms co-locate near each other to take advantage superior supply-processing relationships, as well as regional or external scale economies. Scale economies accumulate when transportation, labor, and other specialized inputs into production are of a scale and scope to handle industrial needs and to adapt to changing conditions, if necessary. By all measures, the Iowa Bioprocessing Center is an industrial cluster with the capacity, as biotechnology improves, to expand in operational scope and size.

Indeed, Midwest Chlor-Alkali, LLC, announced plans to co-locate at the Center to provide critical inputs to the Cargill facility at Eddyville and other facilities. This is an example of beneficial synergies in economic development where important suppliers over time align spatially with their most important customers. In addition, advanced feed technology is also researched at the Center. There is a Cargill and Renessen joint venture that is developing better uses for byproducts that may have profound applications across the state of Iowa and the Midwest by expanding the suitability of byproducts for uses by more livestock.