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***CARD Briefing Paper 96-BP 10***

**Pork Production in Iowa:  
An Industry at a Crossroads**

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This is tenth in a series of *CARD Briefing papers* that analyzes a variety of issues of interest to agriculture.

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# PORK PRODUCTION IN IOWA: AN INDUSTRY AT A CROSSROADS

## Executive Summary

- Iowa has a century-long propensity for building nationally ranked livestock feeding industries and then allowing these industries to move to other states and countries. Prior to 1990, Iowa had lost its national ranking in all but one industry C pork production C and was beginning to lose this industry as well.
- The keys to understanding movements in livestock feeding industries are (a) the relative costs of moving grain vs. moving the final livestock product and (b) the impact of government policies.
- In general, economic conditions have favored Iowa as a premier livestock-producing state. This favorable economic climate has been particularly strengthened by technological advances in meat processing and transportation and production facility design.
- In general, government policies have worked against Iowa's livestock-feeding industries. For example, the U.S. government legislated unfavorable policies regarding trucking industry regulation and national loan rates (which removed natural patterns in grain price differentials). In addition, foreign governments created policies that ensured that the United States exported grain to the detriment of its feeding industries. These policies included asymmetric import barriers in food-importing countries and export subsidies in the European Union (which were higher for finished product than for grain).
- The national and international policies that worked against Iowa's livestock-feeding industries began to be eliminated with the 1990 Farm Bill, reform of the European Union's Common Agricultural Policy (CAP), the recent General Agreement on Tariffs and Trade (GATT), and the North American Free Trade Agreement (NAFTA). As a result, U.S. livestock product exports are surging, and there is renewed interest in constructing new livestock-feeding facilities in Iowa.
- Although the emergence of new livestock-feeding operations has so far not fully offset the ongoing exit of small-scale producers in Iowa, the presence of many new facilities has created great interest on the part of local media and in political discussions. So far, most of this discussion has focused on perceived negative environmental, economic, and social aspects of these new firms. In this report, we attempt to show some of the economic benefits these firms bring, both locally and statewide. We do this to show the importance to Iowa of solving the environmental and social concerns associated with these facilities.
- Conditions on international meat markets strongly favor U.S. livestock producers. An increase in U.S. exports potentially could halt the boom-and-bust cycle that has characterized U.S. livestock industries in the past because when U.S. livestock prices fall, export demand will increase. The availability of new international meat markets also means that U.S. livestock feeding will continue to grow C often at the expense of U.S. grain exports.
- The enormous worldwide demand for livestock products plus continued moderate

growth in the U.S. domestic market means that, under certain circumstances, large parts of the state of Iowa's grain and livestock production may come into balance in the next ten years. Some of the benefits associated with these trends include a fivefold increase in value added when processed livestock products are exported in lieu of grain. In certain agriculturally dependent counties in Iowa, this could mean as much as a 50 percent increase in total economic activity. These agriculturally dependent counties have been among the hardest hit from previous statewide losses in animal feeding, and their existing economic and social infrastructures could quite easily absorb much of this new activity.

- A reduction in statewide grain exports caused by increased livestock production would also reduce the state's need to import fertilizer. Balancing grain and livestock production would create a more sustainable agriculture by recycling fertilizer nutrients in the form of animal manure.
- If economic forces eventually create areas of the state that are either self-sufficient or grain-importing, local crop producers will benefit. Because these benefits have not yet occurred, support of large-scale livestock feeders by grain producers, which might have been expected, has been slow to develop.
- The grain price impact is best explained in a simplified example. Currently, the bulk of grain produced in Wright County is fed to livestock. Because some grain is exported, however, all the grain sold in the county is sold at the export price. Assume that it costs \$0.30 per bushel to transport corn from Wright County to southeastern Iowa and that the grain passes through Mahaska County (about the halfway point). Then, corn prices in southeastern Iowa will be \$0.15 per bushel higher than prices in Mahaska County, and corn prices in

Mahaska County will be \$0.15 per bushel higher than prices in Wright County. If current trends continue and Wright County becomes self-sufficient in corn, the transportation discount will be removed and corn prices in Wright County will be free to rise to equal prices in Mahaska County. If Wright County imports corn to meet its feed needs, then prices in Wright County could potentially be greater than prices in Mahaska County.

- This county-by-county comparison could be extended to states or even nations. In general, grain producers in regions farthest from export ports will receive the lowest grain prices. Iowa corn producers currently receive some of the lowest grain prices in the world. Iowa has the most to gain from balancing livestock feeding to grain production.
- Pork production in Iowa is at a crossroads. The state currently feeds only about 57 to 71 percent of the grain that it grows. Iowa may choose to become self-sufficient in feed, or be one of the last states to serve as an export source. Economic forces will encourage new investments in livestock facilities. If the state chooses to solve livestock-feeding issues by legislating increasingly restrictive penalties on new feeding operations, there is a danger that the new investment will move to other states. If Iowa's leaders can solve these differences without creating the impression that the state is anti-livestock, the investment can occur here.

## Introduction

Passengers who traveled by air from Minneapolis to Des Moines five years ago and made the return trip in 1995 could be excused for thinking they were on the wrong plane. From the air, (and from ground level), the number of buildings in north central Iowa appears to have doubled or tripled over the past five years. These buildings are visual evidence of an ongoing evolution in Iowa's agriculture. They hold large numbers of sows, feeder pigs, and laying hens, and represent a fundamental restructuring in the economic forces that drive the state's agriculture.

Much has been written about one particular attribute of these facilities: C problems with waste disposal C and most of what has been written has been negative. This initial negative press is not all that unusual. Typically, those who oppose new industries are initially more vocal than those who stand to gain. This situation occurs because those who are going to work in or sell to the new industry will not benefit until the industry has developed.

The purpose of this report is to project the likely economic benefits these new hog and egg facilities will bring to Iowa. This report does not discuss the social and environmental concerns that have caused some individuals to oppose these new facilities. The absence of such a discussion does not mean we view these concerns as unimportant. Rather, we hope that by presenting the likely benefits new pork production brings to the state, we can show the importance of addressing and solving the social and environmental concerns that potentially could halt industry growth.

All the benefits we measure occur when new animal-feeding facilities are operated within the state. These benefits are similar, regardless of whether the facility is corporate owned or family owned, the operation is large or small, or the livestock in question are dairy cows, laying hens, or hogs. Because of these similarities, this report does not contribute to

the debate about which type of livestock farm is most suitable for Iowa. However, because much of the recent controversy surrounds large-scale hog facilities and because most of the recent growth in animal feeding in the state originated in this type of facility, we use these facilities in most of our examples.

The first section of this report discusses the pork-producing companies and explains their sudden emergence in north central Iowa. The second section discusses likely future growth in the industry and discusses who will benefit and by how much. This section also examines the possible displacement of existing pork producers by large-scale pork production and the conditions under which Iowa corn and soybean farmers would benefit from the presence of these facilities.

## Why Here and Why Now?

At various points in its history, Iowa has been a leading producer of dairy products, broilers, eggs, beef, and pork. By 1990, however, Iowa had lost its dominance in all these industries except pork. At the same time, rapid growth in large-scale pork production was occurring in states such as North Carolina, where feed grains were much more expensive than in Iowa.

In about 1990, the factors that had caused Iowa to lose its animal-feeding industries began to reverse and Iowa entered its current phase of livestock production. This current phase is characterized by rapid expansion of pork production from large-scale hog operations coupled with a continued reduction in output from small-scale producers.<sup>1</sup>

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<sup>1</sup>The reasons for the continued decline in small-scale pork production in Iowa are detailed in a recent publication from Iowa State University titled *The Iowa Pork Industry in Transition: Local Decisions in a Global Marketplace* (Lawrence et al., 1995). The report shows a gradual decline in Iowa hog farms with fewer than 500 head in inventory (p. 5). This decline has been relatively smooth and has continued through the profitable periods in the mid-1980s and early 1990s. The report shows that pork producers were relatively well capitalized and that most producers who requested loans

Economic forces are such that the growth originating from the new units could lead to a large increase in Iowa's share of U.S. pork, and already has done so in egg production. Because these facilities are not linked to ownership of farmland, however, this type of production is also quite mobile and sensitive to industry perceptions about future economic and regulatory conditions. To understand what will happen in Iowa in the future, it is important to understand what has driven these industries to move in the past.

Iowa's early dominance in animal feeding occurred because it was more profitable for Iowa's farmers to feed their grain to livestock than to transport the grain to livestock feeders in grain-deficit regions. In other words, it was cheaper to transport the livestock product than to transport its grain equivalent. These relative transportation costs created wide differences in grain costs across states, and livestock production was most profitable in states where grain prices were lowest.

From the early part of this century until 1990, advances in rail transportation reduced the grain price differential, and consumers became more interested in fresh livestock products, which are best transported via trucks. Also, the U.S. government began using the loan rate as a tool to support farm prices. Because this loan rate was the same in all regions, it effectively removed the grain price differential that had given Iowa's livestock feeders their initial advantage.

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*to finance expansions were successful (p. 60). The report also shows that the producer's age was negatively associated with the size of the hog operation.*

*It is difficult to summarize all the thousands of individual reasons that small-scale producers exit hog production, but it does seem likely that many realized that small-scale production was simply not worth the time and effort involved and that many chose to concentrate on grain production or on off-farm jobs. To the extent that this is true, Iowa's prosperity in both the farm and nonfarm sectors may have given small-scale producers the freedom to choose not to raise hogs and in a sense contributed to the decline of an industry upon which some of that prosperity is based.*

Governments abroad also worked to encourage U.S. grain exports at the expense of U.S. livestock exports. The European Community placed subsidies on value-added exports such as dairy products, poultry meat, pork, and beef. At the same time, in an attempt to capture value-added livestock industries, food-importing countries placed import restrictions on livestock products. The result of these international policies was that the United States exported more feed grains than would otherwise have been the case. And with U.S. domestic prices working to the detriment of Iowa's livestock producers, more of this exported grain came from the Upper Midwest than would otherwise have been the case. Other factors specifically worked to the detriment of Iowa's livestock industry, such as the state's corporate farming law and the climate.

With the exception of the state's corporate farming law, nearly all the features that earlier worked against Iowa's livestock industry have now been removed.<sup>2</sup> The GATT and NAFTA agreements have opened world meat markets, and because it is now more efficient to export meat than to export feed grains, U.S. meat exports have surged. For example, in the spring of 1995, it cost \$67 per hundredweight to produce hogs in Taiwan. At that time, it was possible to produce hogs in the United States and transport the boneless boxed meat to Taiwan for the live weight equivalent of \$54 per hundredweight. Taiwanese production costs

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<sup>2</sup>*Iowa's corporate farming law does slow the inflow of capital into the state as well as slowing the rate of growth of finishing facilities. However, it is not clear that removing this restriction would increase the rate at which value is added by the industry. This is true because home-grown, Iowa-based operations are more likely to incorporate farrowing facilities than are companies located outside the state. A report by Hayes and Otto (1996) shows that 54 percent of the total value-added in hog production is created prior to finishing. An example of a home-grown, large-scale operation is Iowa Select Farms. Because this company maintains its headquarters and farrowing facilities in Iowa, it creates about one-quarter of a billion dollars of wealth within the state.*

are high because the industry depends on imported grain and because it is expensive to transport bulk grain from the Upper Midwest to hog farms in Taiwan. U.S. pork can be delivered to Taiwan at a price that is lower than Taiwan's pork production costs because meat transportation costs have fallen in recent years as meat transportation technology has improved. In the past, whenever new pork export markets would open, the European Union would quickly capture the market using export subsidies. With recent GATT-induced policy changes, however, the European Union has begun to severely restrict the use of export subsidies. With production costs of \$63 per hundredweight in the Netherlands and \$65 per hundredweight in Denmark, European pork cannot compete with U.S. pork without subsidies. Because the European Union and Taiwan have been major competitors against the United States in Asian markets, the outlook for continued U.S. pork export growth to countries such as Japan, South Korea, Singapore, Hong Kong, and even China is now very positive. This export-oriented growth will offset much of the price drops that reversed expansion in the past as the U.S. pork industry to expands.

Figures 1, 2, and 3 show U.S. meat exports over the past 30 years. The increase in exports since 1985 is evident in all three figures. The export data for 1995 in these figures are USDA projections, made in the spring of 1995. Actual 1995 exports show approximate increases of 70 percent for pork, 17 percent for beef, and 30 percent for broilers for the year.

U.S. domestic agricultural policy has also changed. With the 1990 farm bill, the target price became the principal support mechanism. Because deficiency payments were paid only on a proportion of output, market prices began to accurately reflect true conditions. (This trend is expected to be continued in the 1995 Farm Bill.)

In addition, advances in production technology, deregulation of the trucking industry, investment in processing facilities, and shelf-life extension

technologies for meat and eggs all improved Iowa's competitive position.

The overhang of earlier developments left Iowa (and southern Minnesota) with very low relative feed costs and a pork-packing industry with excess capacity. For example, Iowa's corn prices are about \$0.40 to \$0.60 per bushel lower than corn prices in the pork-intensive counties of North Carolina. Twenty-five percent overcapacity in Iowa's pork-packing industry, coupled with a low depreciation charge on older facilities, allows Iowa packers to offer prices that are \$2.00 to \$4.00 per hundredweight higher than prices paid to producers in other states.

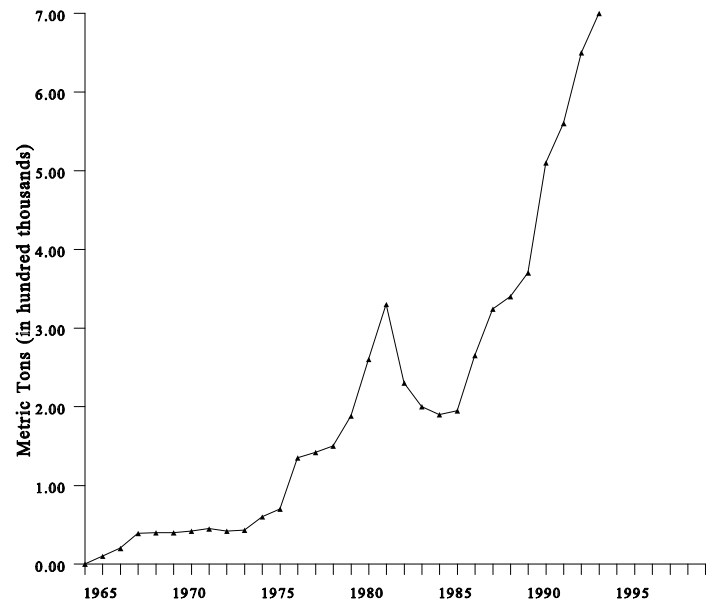
A similar opportunity has developed for egg producers. With production costs of less than \$0.60 per dozen and trucking costs to California of about \$0.10 per dozen, Iowa's egg industry can put eggs into California markets at \$0.30 per dozen under market prices.

Soon after 1990, the nation's pork and egg industries quickly realized the opportunities that existed for animal feeding in Iowa. A surge in investment began in parts of the state where soybean meal and grain prices were lowest. Counties in north central Iowa that were farthest from navigable rivers and closest to soybean-crushing facilities saw a surge in feed demand.

An extreme example is Wright County, which, over a four-year period, went from exporting 23 million bushels of corn and feeding 1 million bushels to feeding 23 million bushels of corn locally.

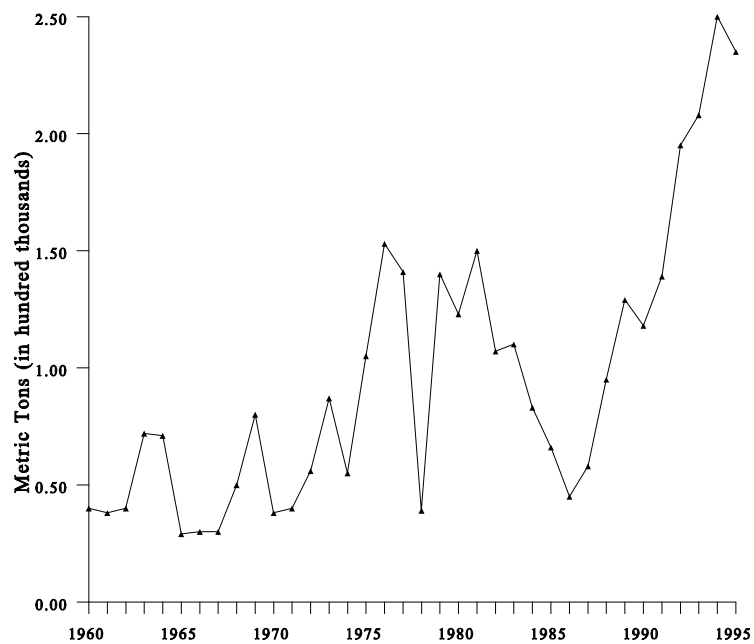
In other parts of the state, however, the continued decline in small-scale hog production offset the growth in large-scale units. As a result of these two offsetting trends, Iowa has maintained its share of U.S. pork finishing but reduced its share of the U.S. breeding herd. This reduction in Iowa's sow herd occurred because many of the new entrants into the state





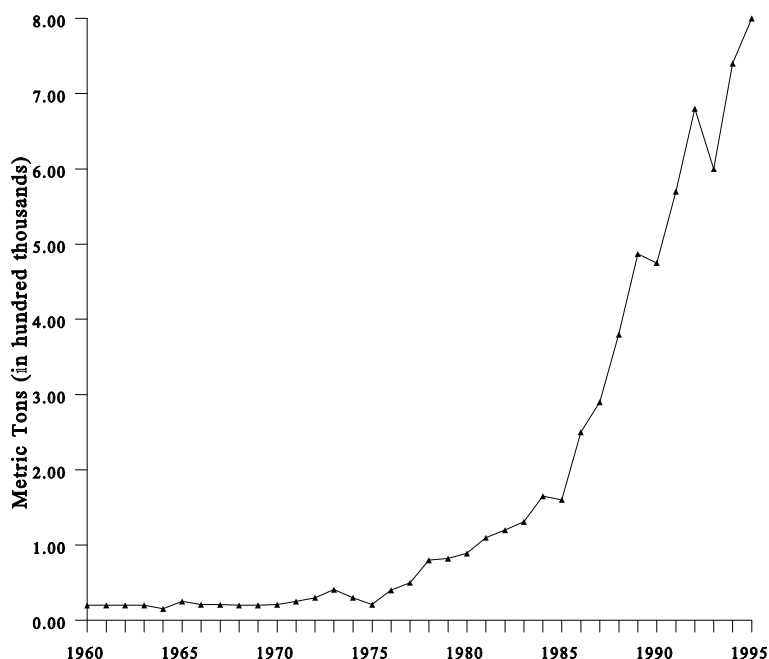
**Figure 1. U.S. pork exports, 1960-95**

*Source: USDA*



**Figure 2. U.S. broiler exports, 1964-94.**

*Source: USDA*



**Figure 3. U.S. beef exports, 1960-95**

*Source: USDA*

maintain their sow herds outside Iowa.

According to the most recent USDA Hogs and Pigs Report (issued December 28, 1995), Iowa had 21 percent of the U.S. swine breeding herd (1.5 million head) and 24 percent of the total swine inventory.

Some of Iowa's large pork companies have evolved from locally owned hog operations. Many of these operations have sows in Iowa, including Iowa Select Farms, Swine Graphics Enterprises, TIP Farms, Pork Tech, Farmland Industries, Land O'Lakes, and Continental Grain Company. Other companies finish hogs in Iowa but keep their sows outside the state, including Heartland Pork Enterprises and Murphy Family Farms. Some major egg companies that have located in Iowa include Sparbo, Embly, DeCoster, Boomsma, Rose Acre Farms, Farm Egg, and Sunbest Foods.

### **Future Development in Iowa's Egg and Pork Industries**

As U.S. and world agricultural policies continue their recent evolution toward free trade, meat and eggs will be produced where it

makes most sense. The United States likely will capture any new world pork markets that emerge, and Iowa is an ideal location for pork-producing facilities. Iowa is also in a strong position to increase its share of the U.S. egg and poultry markets. If the state can find a way of satisfying social and environmental concerns without placing stringent conditions on industry growth, market forces will cause the recent growth surge to continue.

The up-side growth potential for Iowa's pork industry is therefore enormous and, in theory, Iowa could become the primary source of U.S. pork exported to Mexico and Asia. However, history has shown that livestock enterprises "move" in response to relatively

minor differences in prices and regulations, and so it is also possible that export-oriented livestock facilities will locate in other parts of the United States.

Iowa has a profit advantage over all U.S. regions except southern Minnesota. However, in light of the enormous investment required

and the inability to move these units once they are constructed, new facilities will not be built in states perceived as unfriendly to livestock feeding. This is true because the companies involved are concerned about potential future changes in state regulations.

In summary, world economic trends indicate that the United States is now the low-cost producer of pork, and U.S. trends suggest that Iowa is the best place to produce pork and eggs. Thus, these industries will grow until they meet some restriction. Under current economic and regulatory conditions, this restriction will not be met until parts of the state no longer have any surplus corn or soybeans.<sup>3</sup> In light of the importance of state regulations to Iowa's egg and pork industries, it is worth looking at the benefits that will accrue if the current expansion is allowed to continue to its natural conclusion.

### **Benefits to Iowa of Allowing New Egg and Pork Producers to Locate in the State**

New livestock and poultry facilities create several benefits when they locate in Iowa. They create employment during construction and operation, and these workers in turn create service sector positions. Also, these facilities reduce the need to import some fertilizers and create additional supplies of livestock for the state's packing industry. Finally, corn and soybean farmers located near new feed demand will, under certain conditions, receive higher prices than would otherwise be the case.

These benefits are best separated into two categories. The first relates to the price impact patterns that are measurable only when several companies are considered. The second includes the economic activity created by single facilities—the employment, fertilizer, and packing industry benefits already mentioned.

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<sup>3</sup> *The acreage restriction in current Iowa law will slow the growth of the industry but will not halt the general trend toward self-sufficiency.*

### **Benefits Arising from Additional Economic Activity Created by New Livestock Facilities**

Two approaches are generally accepted for measuring the economic activity generated by new industry. The more general method—the value-added approach—simply subtracts the value of products that would otherwise have been exported (feed) from the value of the finished products (eggs and pork). This measure captures the thousands of transactions created by businesses without the need for transaction-specific data.

With the value-added approach, capital investments and construction costs are valued in terms of their annual contribution to output and not in terms of the original purchase cost. Service sector activity can be calculated by multiplying the value added in direct activity by an industry-specific multiplier. State tax revenues can be calculated by multiplying the total value added by 0.07—the proportion of total economic activity captured by the state of Iowa. Similarly, property tax revenues are calculated by multiplying this value-added figure by 0.01. The value-added measure is useful because the sum of all value added within the state must equal that state's gross domestic product (GDP).

The second approach—the input-output method—examines a company's expenditure and employment records on a location-by-location basis. This latter measure is very labor-intensive, but it has the advantage of providing accurate employment data and showing benefits in the counties where they occur. The following example uses the value-added approach for the livestock sector in general and both the input-output and value-added methods for data from Iowa Select Farms.

### **Value Added by New Livestock Facilities**

Here, we consider the impact of new livestock facilities on local economies. First, we examine the increase in economic activity when corn and soybeans that would otherwise have been exported are instead fed to hogs. We perform these calculations for a two-acre plot

that represents the corn-soybean rotation typically used in much of Iowa.

A second issue that we address in this section is the economic impact of new livestock facilities on nearby farmers. This discussion includes the conditions under which nearby corn and soybean prices will be affected and the effects of new production on local livestock prices.

### **A Comparison of Value Added from Hog and Crop Production**

Depending on the year, Iowa exports between 50 percent and 75 percent of its corn and soybean production. The arguments outlined earlier in this report suggest that it is within the state's ability to create sufficient domestic demand to eliminate grain exports from large areas of the state in years when yields are average. The purpose of this section is to compare, per acre of cropland, the value added when the crop is exported with the value added when the crop is fed to a local hog industry.

Hog production allows fertilizer nutrients to be recycled, whereas fertilizer must be imported when grain is exported. Therefore, the results presented here subtract the value of fertilizer that must be imported from outside the region from the value of crop and livestock production. This need for imported fertilizer is obviously smaller when hogs are fed; therefore, this assumption will tend to increase the relative value added under the hog production option.

### **Economic Activity Generated by One Acre of Corn and One Acre of Soybeans**

Consider a two-acre plot of land with one acre devoted to corn and the second devoted to soybeans. Assume that the acre of corn yields 135 bushels per acre and the acre of soybeans yields 45 bushels. Using Iowa State University Extension budgets for corn following soybeans

and soybeans following corn, we can separate out costs as fertilizer and non-fertilizer (see Table 1). Subtracting the value of land and fertilizer from total revenues means that the total value added to the land (net of fertilizer costs) is  $\$641.25 - \$210.00 - \$60.19 = \$371.06$ . This result implies that this two-acre parcel created about \$371.06 worth of economic activity. Some of this value represents contributions from the herbicide, insurance, banking, seed, and machinery sectors, and the rest represents returns to the producer.

### **Economic Activity Generated by Feeding Corn and Soybeans to Hogs**

Now consider the economic impact of feeding corn and soybeans to hogs. Using the ISU Livestock Enterprise Summary, each bushel of corn produces about 19 pounds of live hog. A 135-bushel crop would be sufficient to produce 10.25 market-ready hogs. The ration for these hogs also requires 1,500 pounds of soybean meal. The acre of soybeans produces 2,115 pounds of soybean meal, leaving 615 pounds of meal and 540 pounds of soyoil that must be sold.

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The 10.25 hogs will each produce 300 gallons of manure per year with a fertilizer content per thousand gallons of 36 pounds of nitrogen, 25 pounds of phosphorous, and 19 pounds of potassium. Table 2 compares the

**Table 1. Costs for a two-acre corn-soybean rotation, 1995**

Input	Cost
Fertilizer Costs	
Nitrogen (117 lb)	23.40
Phosphate (87 lb.)	22.62
Potash (109 lb.)	14.17
Total fertilizer costs	\$60.19
Nonfertilizer Costs	
Pre-harvest machinery	47.98
Seed	36.68
Lime	12.00
Herbicide	25.85
Insurance	9.40
Miscellaneous	14.00
Interest	12.48
Harvest	75.92
Labor	39.00
Land	210.00
Total return on 135 bushels @ \$2.75/bushel and 45 bushels @ \$6.00/bushel	\$641.25

**Table 2. Nutrients needed for two-acre plot (pounds)**

	Available in Manure	Needed for 1 Acre of Corn and 1 Acre of Soybeans
Nitrogen	111	117
Phosphate	77	87
Potassium	58	109

nutrients needed for the two-acre plot with those that would become available via manure if the grain is fed to hogs. The data show that about 10 pounds of phosphate and 51 pounds of potassium would need to be added, for a total cost of \$9.23. This cost must be subtracted from the hog value-added number presented in Table 3. Note that hog feeding is close to being a sustainable use of the land (particularly for nitrogen), requiring only \$9.23 worth of outside fertilizer per year for a two-acre rotation.

Comparing the value added from hog production (\$1,687.84) with the value added when crops are exported (\$371.06) shows that direct economic activity per acre increases by a factor of 4.54. To obtain the total effect of this direct economic activity, one must multiply these values by an appropriate multiplier to get the total effect on statewide economic activity. It is standard practice to assume that for each \$100 generated in Iowa's pork industry, an additional \$150 is generated in the state's service sectors. Including these values would

**Table 3. Value added in hog production**

10.25 hogs @ 250 lb. @\$0.45/lb	\$1,153.12
615 lb. soybean meal @\$0.09/lb	55.35
540 lb. soyoil @ \$0.25/lb	135.00
Processing of hogs @	
40% of live value	<u>563.60</u>
	\$1,907.07
Less land value	210.00
Less fertilizer	<u>9.23</u>
Total value added	\$1,687.84

inflate both the income generated from crop production and from livestock feeding, but would not change the relative values.

For counties that traditionally export more than half their corn and soybeans and that depend heavily on agriculture, a shift to self-sufficiency in grains would result in an increase of almost 70 percent in total economic activity. To see why this is true, consider a county where half the output is exported and half is fed. Using the numbers generated above, the average value added per acre currently is \$514.73. If all the corn crop were fed, however, the average value added per acre would increase to \$843, a 64 percent increase. For a county with an economic base that depends heavily on agriculture, a 64 percent increase in direct agricultural value added would cause a similar increase in total economic activity. This increase would also be seen in employment, tax returns, and school enrollments.

Later in this report, we attempt to provide these impacts as measured for a single company. For current purposes, however, an effective way to consider the total impact of many similar companies is to compare economic activity in Denmark with activity in the wheat-intensive areas of Kansas. These regions represent extremes because Denmark traditionally exports its agricultural surplus as

pork, whereas western Kansas exports a raw commodityCwheat.

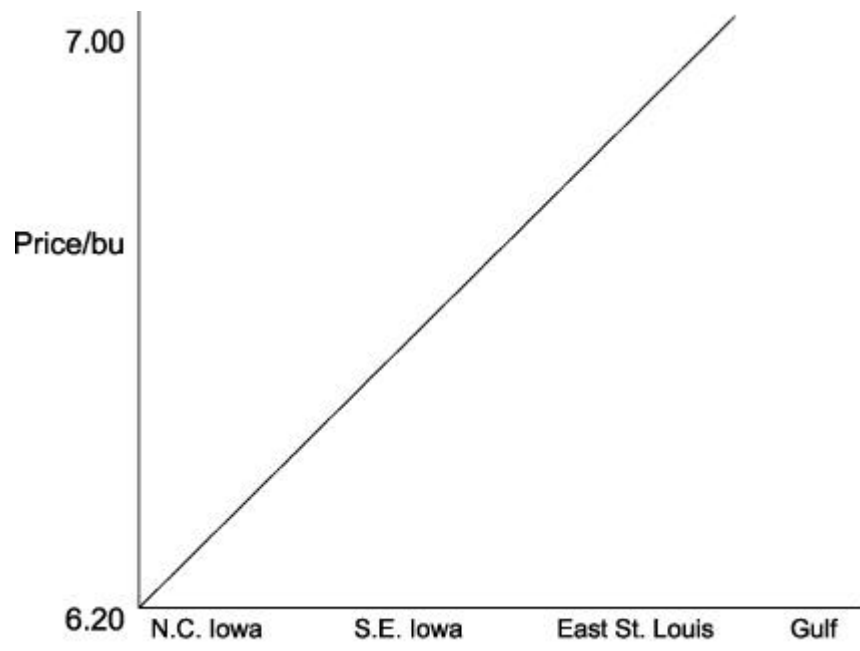
A key difference between the two regions is that Denmark has many vibrant rural communities that retain young people by offering them local jobs. In the wheat-producing regions of Kansas, the number of viable small communities is much lower than in Denmark. Iowa represents a half-way point between these two extremes in that Iowa has numerous small towns but some of these towns have suffered as Iowa has lost its dominance in livestock feeding.

### **The Impact of New Livestock-Feeding Facilities on Existing Local Producers**

New feeding facilities can have three possible effects on existing local producers. The new feeding operations might alter (1) corn and soybean prices, (2) pork prices, and (3) the capacity of nearby slaughter facilities. Each of these possible effects is discussed in turn.

#### ***1. Impact of new livestock facilities on local grain prices.***

Figure 4 shows a schematic representation of U.S. soybean price patterns. The same type of pattern holds true for corn prices. Grain prices near export ports are typically very high, and prices fall off as one approaches north central and northwestern Iowa.



**Figure 4. Schematic map of U.s. price pattern for soybeans**

So long as market prices are driven by export demand, local grain prices will not reflect new demand, even if only 10 percent is exported. This situation occurs because, at the margin, the export market always sets the price, and if prices rise above the export price, no exports will occur. This is true because local elevators pay all producers the same price for grain, regardless of whether that grain is fed locally or exported. Elevators in grain-surplus regions will therefore offer a single price to all farmers that allows the elevators to profitably sell on export markets. This price will essentially equal the Gulf price less the cost of transporting grain to the Gulf. Note that in the case of Wright County, which now feeds most of its grain, the export market will continue to drive prices much as it did when Wright County exported most of its grain so long as some grain is exported. Also note that the export price will be received by all producers, therefore, it is as if

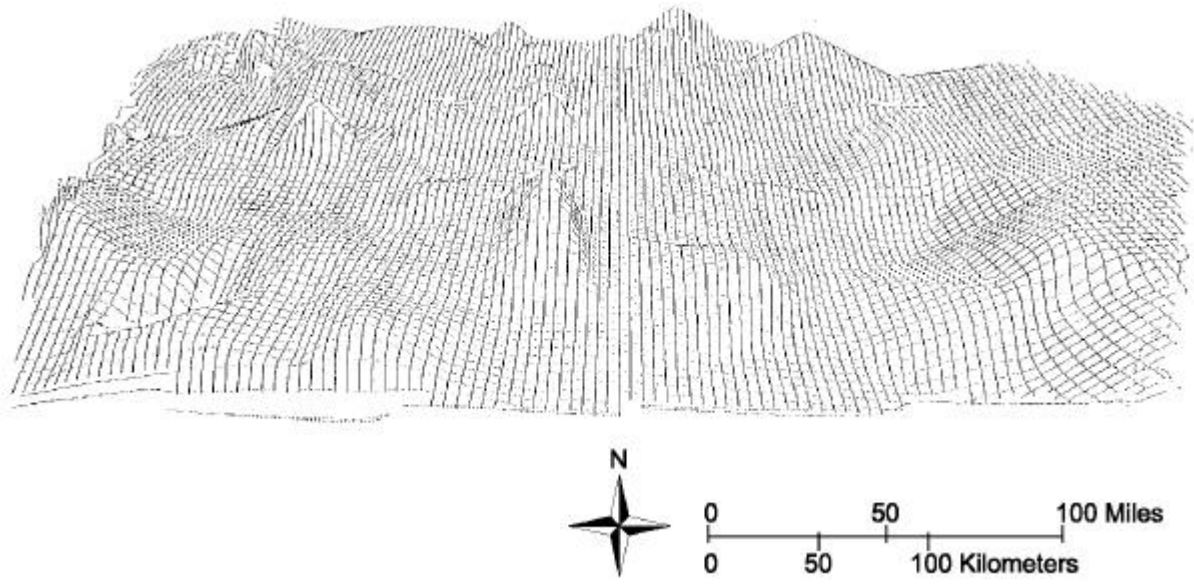
Wright County corn producers are paying the transportation costs on all their production.

Figure 5 presents a three-dimensional representation of actual corn prices in Iowa on

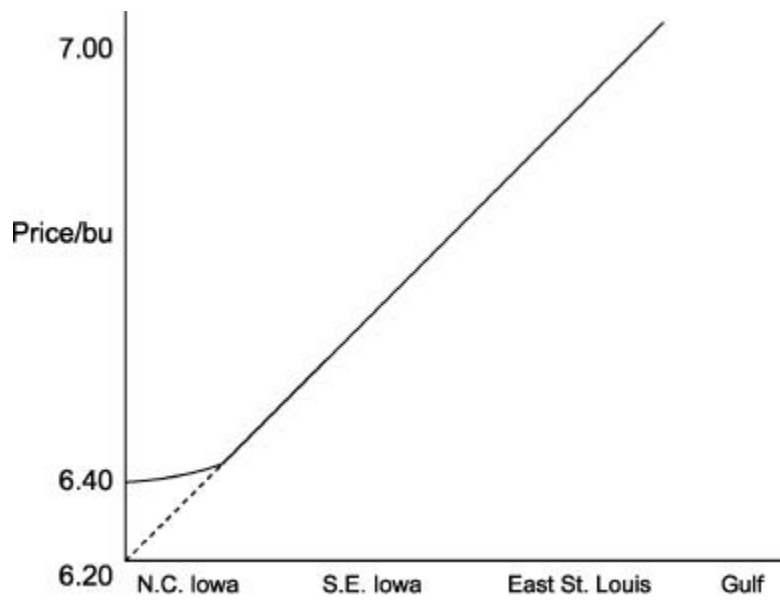
November 1, 1995. The vertical height represents the local price of the corn. This Apicture@ is taken from the south (i.e., over Missouri at a 35-degree angle). Figure 5 shows a valley in north central Iowa, with steep price increases as one moves east.

Now consider what would happen if one county became self-sufficient in grain. The grain price would rise to reflect local conditions, but only as high as the grain price in the nearest exporting county. For example, if grain in Wright County was \$0.30 per bushel less than the Chicago price and grain in Mahaska County was \$0.15 per bushel less than the Chicago price, self-sufficiency would cause the basis in Wright County to fall to as low as \$0.15 per bushel. Prices probably would not rise any higher in Wright County because integrated operations would locate elsewhere.

This point is made in Figure 6, which shows schematically what would happen if parts of the state become self-sufficient, and by Figure 7, which shows actual soybean prices on August 1, 1995. The data for soybeans (Figure 7) are unlike the data for corn (Figure 5) in that

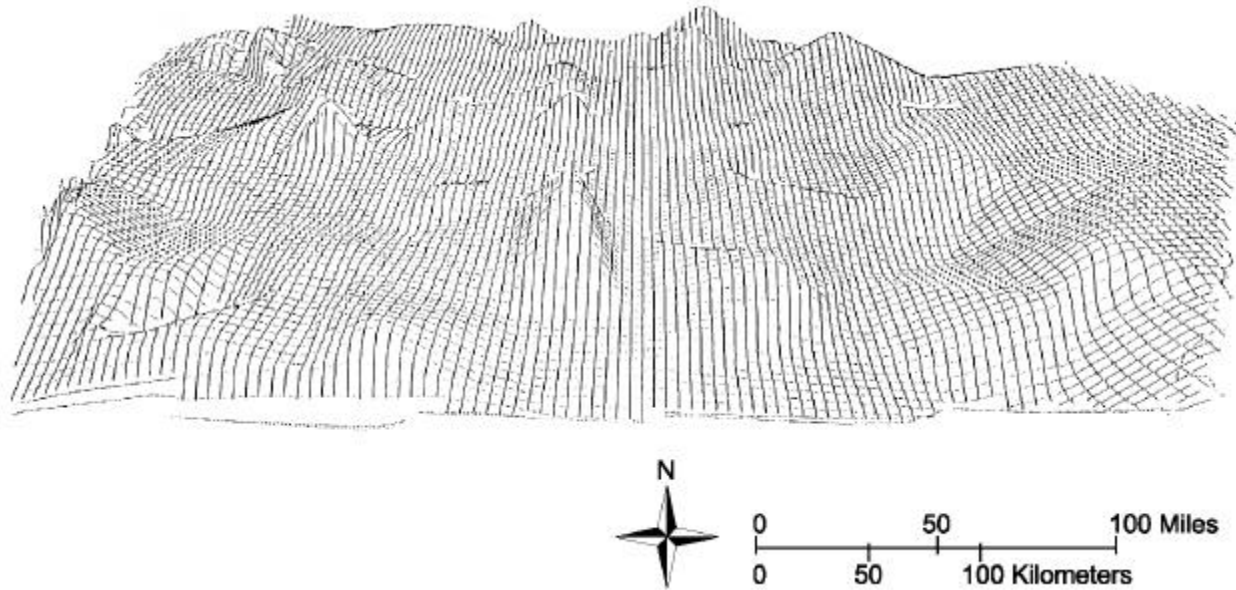


**Figure 5. Three-dimensional representation of actual corn prices for November 1, 1995**  
 Source: Graph created by Atilla Konkoly, Department of Economics, Iowa State University



**Figure 6. Price trends if parts of Iowa become self-sufficient in soybeans**





**Figure 7. Three-dimensional representation of actual soybean prices for August 1, 1995**

*Source:* Graph created by Attila Konkoly, Department of Economics, Iowa State University

soybean-crushing facilities effectively create deficit areas around them. Prices near facilities are higher because local soybean farmers have a local source of demand.

The foregoing information and figures allow us to describe the impact of new feeding operations on local feed prices. This impact is best subdivided into three phases.

*Phase 1: Local (county) supply exceeds local demand.*

Export prices drive market prices, and the livestock-feeding facilities have no impact on local grain prices.<sup>4</sup>

*Phase 2: County demand equals county supply.*

When this balance occurs, grain prices in the county rise to equal those in the nearest exporting county.

*Phase 3: County demand exceeds county supply.*

The county becomes an importing, or grain-deficit, region and grain prices rise to reflect the cost of transporting grain from outside the region. (This situation has occurred in parts of North Carolina and the Netherlands.)

Suppose, for example, that 1995 corn prices in Wright County were \$2.60 per bushel and prices in Mahaska County were \$2.75 per bushel. The \$0.15 price difference occurs because Mahaska County is closer to the Gulf. This is a Phase 1 price pattern. Now suppose that livestock production in Wright County increased so that grain was imported from as far away as Mahaska County. Then, instead of taking a \$0.15 per bushel discount compared to prices received by Mahaska County producers, Wright County producers would see a \$0.15 premium - \$2.80 per bushel in Mahaska County would translate into a corn price of \$2.95 per bushel in Wright County,

<sup>4</sup> This statement presupposes that the transportation sector is working normally. In the harvest of 1995, rail transportation was not readily available in North Central Iowa, and some of the 1995 harvest was stored outside while awaiting transportation to export ports. In this specific circumstance, the existence of a local demand was beneficial because grain fed to local livestock did not have to enter the system. Had this grain not been fed locally, it would have added to the transportation bottlenecks and increased the amount of grain stored outside. These extra costs have been approximately \$0.10 to \$0.25 per bushel.

representing a \$0.15 price increase for Wright County producers.<sup>5</sup>

This logic also extends to differences between states and between countries. Figure 8 shows historical information on U.S. corn production and utilization. As shown, U.S. corn consumption has increased at a faster rate than has U.S. corn production as animals are fed for export markets. A simple projection shows that, under current trends, the United States could become self-sufficient in corn in about 15 years. If these trends continue, entire states will become self-sufficient long before the nation does. If Iowa allows its livestock and poultry sector to expand, it may be one of the first states to become self-sufficient in corn this would benefit Iowa's grain farmers. Iowa may become one of the last states to serve as an export source to the world.

## ***2. Impact of new hog operations on wholesale pork prices.***

The extra pork being produced by new entrants feeding livestock in Iowa, or elsewhere in the United States, presumably will have some impact on national prices, and these lower national prices may make it more difficult for existing Iowa producers to stay in business. The extent to which national prices respond to Iowa production depends in large part on the sensitivity of demand to prices - the own-price elasticity of demand. This sensitivity in turn depends on the potential size of the export market. Recent studies at Iowa State University and Purdue University have shown that the United States currently has a \$15 to \$20 per hundredweight production cost advantage over Denmark and Taiwan. As a consequence, U.S. pork exports have surged (see Figure 1).

Studies by the authors and by the Food and Agricultural Policy Research Institute (FAPRI) have shown that this cost advantage, coupled with GATT commitments, will cause U.S. pork exports to increase by about 150,000 metric tons

per year, or by almost 2 percent of national production. Coupled with U.S. population and income increases, this increase in exports means that U.S. pork production can grow at 2 percent to 3 percent per year without any significant reduction in prices. This situation essentially is what has occurred in 1995.

In other words, U.S. pork prices will potentially remain at or above production costs for average producers as exports continue to increase. The market can handle the output of the new facilities because an equivalent amount will be exported. In economic terms, this means that at live hog prices between \$40 and \$45 per hundredweight, the export elasticity of demand is extremely large.

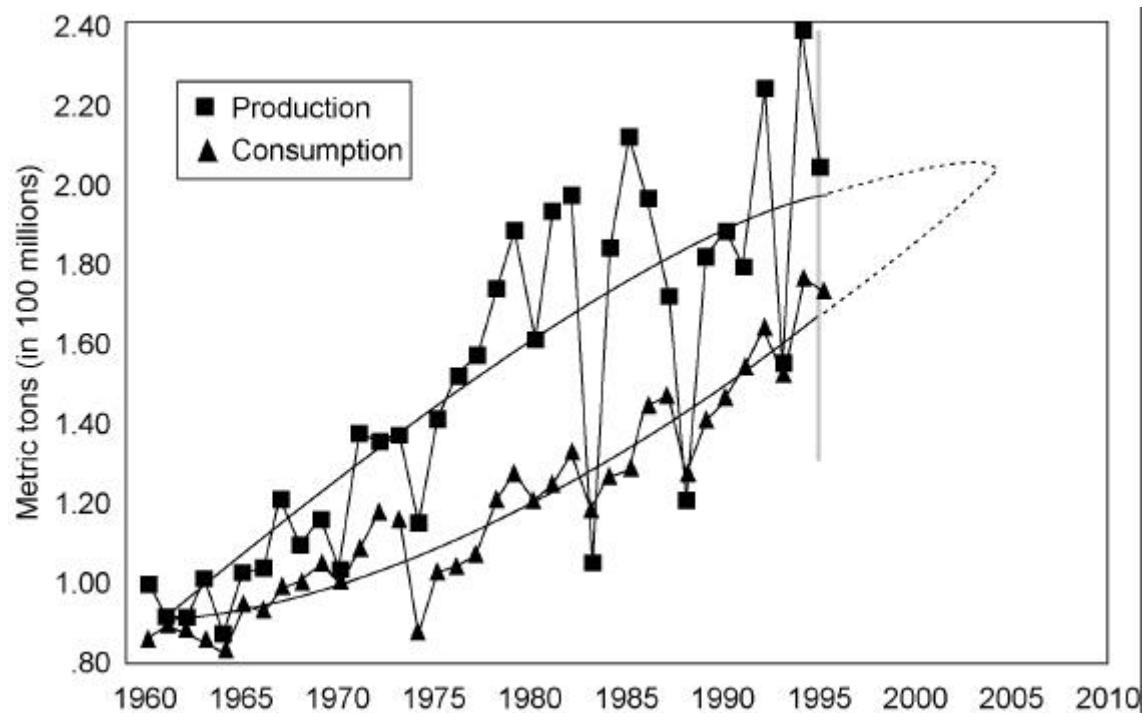
## ***3. Impact of new production on prices paid by packers.***

In the fall of 1994, U.S. pork slaughter capacity was reached for the first time in recent history and hog prices fell below \$30 per hundredweight. On the face of things, this price decline would seem to show a direct link between new pork facilities and the prices received by existing pork producers. However, at no point during this period did Iowa's pork production equal the capacity of its slaughter plants. Throughout the fall of 1994, hogs were imported into the state from as far away as Indiana to fill the state's slaughter capacity.<sup>6</sup>

When a state imports 20 percent to 25 percent of its slaughter hogs to fill its capacity, that state's prices must be higher than prices in surrounding states. Again, this price differential reflects transportation costs. Therefore, it is in the interests of all Iowa hog producers that hog slaughter plants in the state remain open. One Iowa packer closed in 1995. Without new production originating from new larger units, it is likely that the Iowa packing industry would have contracted further. Similarly, if the pork production industry in Iowa fails to grow as fast as production in other areas, we can expect the packing industry to follow new pork production out of Iowa. Therefore, it is very

<sup>5</sup>This same logic holds for all agricultural commodities. Iowa is at Phase 3 for pork processing, which attracts slaughter-ready hogs from surrounding states.

<sup>6</sup>In the fall of 1995, IBP opened a new plant in Indiana and began processing some of the hogs originally destined for Iowa.



**Figure 8. U.S. corn production and utilization, 1960-95**

Source: USDA

difficult to show that these new producers caused Iowa market hog prices to be lower than they otherwise would be. In fact, it is likely that these facilities caused local prices to be higher than would otherwise have been the case by allowing packers to run plants more efficiently on local supply.

It has been argued that because packers will pay slightly more for large lots of hogs than for small lots, large-scale producers have a competitive advantage. However, these price differences often reflect lower procurement costs and the convenience to the packer of having large numbers of consistent animals, and the price differences that do exist provide an incentive for small-scale producers to improve genetic quality and to combine loads in a shared marketing arrangement. There is no evidence to suggest that the existence of these premiums causes prices received by small-scale producers to be lower than would otherwise have been the

case. In fact, in light of the capacity arguments just mentioned, these prices may be higher so long as Iowa can maintain its packing industry.

### Summary and Conclusions

Iowa has a century-long propensity for building nationally ranked livestock feeding industries and then allowing these industries to move to other states and countries. Prior to 1990, Iowa had lost its national ranking in all but one industry - pork production - and was beginning to lose this industry as well. The keys to understanding movements in livestock feeding industries are (a) the relative costs of moving grain vs. moving the final livestock product and (b) the impact of government policies.

In general, economic conditions have always favored Iowa as a premier livestock-producing state. This favorable economic climate has been particularly strengthened by technological advances in meat processing and

transportation and production facility design. Government policies, however, generally have worked against Iowa's animal-feeding industries. For example, the U.S. government legislated unfavorable policies regarding trucking, industry regulation, and national grain loan rates (which removed natural patterns in grain price differentials). In addition, governments abroad created policies that ensured that the United States exported grain to the detriment of its feeding industries. These policies included asymmetric import barriers in food-importing countries and export subsidies in the European Union (which were higher for finished product than for grain).

The national and international policies that worked against Iowa's livestock-feeding industries began to be eliminated with the 1990 Farm Bill, reform of the European Union's Common Agricultural Policy, and the recent GATT and NAFTA agreements. As a result, U.S. livestock product exports are surging, and there is renewed interest in constructing new livestock-feeding facilities in Iowa.

Although the emergence of these new operations has so far only offset an ongoing tendency for small-scale producers in Iowa to quit production, the presence of these new facilities has created great interest on the part of local media and in political discussions. So far, most of this discussion has focused on perceived negative environmental, economic, and social aspects of these new firms. In this report, we have attempted to show some of the economic benefits these firms generate, both locally and statewide. We do this to show the importance to Iowa of solving the environmental and social concerns associated with these facilities.

We have argued that conditions on international meat markets strongly favor U.S. livestock producers. An increase in U.S. exports potentially could halt the boom-and-bust cycle that has characterized U.S. livestock industries in the past because when U.S. livestock prices fall, export demand will

increase. The availability of new international livestock markets also means that U.S. livestock feeding will continue to grow - often at the expense of U.S. grain exports. If Iowa solves current tensions surrounding large-scale feeding facilities, much of these new exports will originate here.

The enormous worldwide demand for livestock products plus continued moderate growth in the U.S. domestic market means that, under certain circumstances, large parts of the state of Iowa will become self-sufficient in grain in the next ten years. Some of the benefits associated with these trends include a fivefold increase in value added when processed livestock products are exported in lieu of grain. In certain agriculturally dependent counties in Iowa, this could mean as much as a 50 percent increase in total economic activity. These agriculturally dependent counties have been among the hardest hit from previous statewide losses in animal feeding, and their existing economic and social infrastructures could quite easily absorb much of this new activity. A reduction in statewide grain exports would also reduce the state's need to import fertilizer and would create a more sustainable agriculture that recycles fertilizer nutrients in the form of animal manure.

If these economic forces eventually do create areas of the state that are either self-sufficient or grain-importing, local crop producers will benefit. The possible grain price increase has not yet occurred, and its absence has removed some of the support that grain producers might have been expected to provide to large-scale feeding facilities.

The grain price impact is best explained in a simplified example. Currently, the bulk of grain produced in Wright County is fed to livestock. However, because some grain is exported, all the grain sold in the county is sold at the export price. Assume that it costs \$0.30 per bushel to transport corn from Wright County to southeastern Iowa and that the grain passes through Mahaska County, which is about the halfway point. Then, corn prices in

southeastern Iowa will be \$0.15 per bushel higher than prices in Mahaska County, and corn prices in Mahaska County will be \$0.15 per bushel higher than prices in Wright County. If current trends continue and Wright County becomes self-sufficient in corn, the transportation discount will be removed and corn prices in Wright County will be free to rise to levels seen in Mahaska County. If growth in Wright County continues so that Wright County imports corn from Mahaska County, then Wright County prices will be \$0.15 per bushel greater than prices in Mahaska County, representing a total corn price impact of \$0.30 per bushel in Wright County.

This county-by-county comparison could be extended to states or even nations. In general, grain producers in regions farthest

from export ports will receive the lowest grain prices and will have the most to gain from becoming self-sufficient in grain. These same regions will have the most to offer new livestock feeders. Iowa represents an extreme in both regards, and Iowa corn producers currently receive some of the lowest grain prices in the world.

Iowa is at a crossroads. If the state chooses to solve its livestock-feeding issues by legislating increasingly restrictive penalties on new feeding operations, there is a danger that the state will be viewed as unfriendly to livestock feeding and that new investment will move to other states. If Iowa's leaders can solve these differences without creating the impression that the state is more anti-livestock than surrounding states, economic forces will create enormous new investments within Iowa.

## References

- Baumel, C. Phillip, Shawn R. Ferriss, and Craig O'Riley. 1989. AThe Iowa Grain Flow Survey: A Comparison of Iowa Corn and Soybean Movements in 1977 and 1985.@ Pm-1370. Iowa State University Extension, Ames.
- Brenneman, Greg. 1994. AYou Can Afford to Haul Manure!@ Leopold Letter 4(Winter):2, 12.
- Chase, Craig, Michael Duffy, and William Lotz. 1991. AEconomic Impact of Varying Swine Manure Application Rates on Continuous Corn.@ *Journal of Soil and Water Conservation* 6(November-December):460-64.
- DiPietre, Dennis, and Carl Watson. 1994. AThe Economic Effect of Premium Standard Farms on Missouri.@ CA 144. University Extension, University of Missouri.
- Duffy, Michael. 1992. AThe Role of Animal Production in Sustainability.@ Leopold Letter 4(Winter):1, 9-11.
- Duffy, Michael, and Alan Vontalge. 1995. AEstimated Costs of Crop Production in Iowa.@ FM-1712. Iowa State University Extension, Ames.
- Edwards, William, and Alan Vontalge. 1995. A1995 Iowa Farm Custom Rate Survey.@ FM-1698. Iowa State University Extension, Ames.
- Freese, Betsy. 1995. APork Powerhouses 1995.@ *Successful Farming*.
- Hayes, Dermot J., Daniel M. Otto, and John D. Lawrence. 1995. AThe Importance of Iowa Select Farms to the State of Iowa.@ Ames, Iowa.
- Iowa Select Farms. 1995. Telephone communications, faxes, and letters to authors at Iowa State University, Ames, Iowa.
- AKoepckey v. National Farms, Inc.@ 510 N.W.2d 41 (Neb. 1994). North Western Reporter (2d Series):41-52.
- Lasley, Paul. 1995. AIowa Farm and Rural Life Poll: 1995 Summary Report.@ Pm-1628. Iowa State University Extension, Ames.
- Lawrence, John D. 1995. AHog Profits Projected Through Most of 1996.@ Iowa Farm Outlook. Econ. Info. 1679. (October 2):1-2.
- \_\_\_\_\_. Nd. APricing and Valuing SEW Pigs.@ Iowa State University, Department of Economics.

- Lawrence, John D., Daniel M. Otto, James Kliebenstein, Neil E. Harl, and Robert W. Jolly. 1995. *The Iowa Pork Industry in Transition: Local Decisions in a Global Marketplace*. PM-1642. Ames: Iowa State University Extension.
- Lawrence, John D., Alan Vontalge, and Jason Kies. 1994. *ALivestock Enterprise Budgets for Iowa 1995*.@ FM-1815. Iowa State University Extension, Ames.
- Lorimor, Jeff, Ruihong Zhang, Stewart W. Melvin, and Randy Killorn. Nd. *ALand Application for Effective Manure Nutrient Management*.@ Pm-1599. Iowa State University Extension.
- Otto, Dan. 1995. *ACharacteristics and Economic Impacts of 3,800-Sow Facility in North Central Iowa*.@ Iowa State University, Department of Economics.
- Otto, Dan, and John Lawrence. Nd. *AEconomic Importance of Iowa's Pork Industry*.@ Iowa State University Extension, Ames.
- Owings, William J. 1994. *Egg Production in Iowa: Today Tomorrow*. PS-250. Ames: Iowa State University Extension.
- APioneer R&D Summary: Economic and Fiscal Impacts.A 1995. IE/FIMS. Iowa State University Extension, Ames.
- Sands, James K., and Howard R. Holden. 1995. *1995 Iowa Agricultural Statistics*. Washington, DC: U.S. Department of Agriculture.
- U.S. Department of Agriculture. 1995. *1994 National Carlot Meat Trade Review*. Des Moines: Livestock and Seed Division, Livestock and Grain Market News.