Iowa Ag Review

Fall 2005, Vol. 11 No. 4

Center for Agricultural and Rural Development

Are More Livestock in Iowa's Future?

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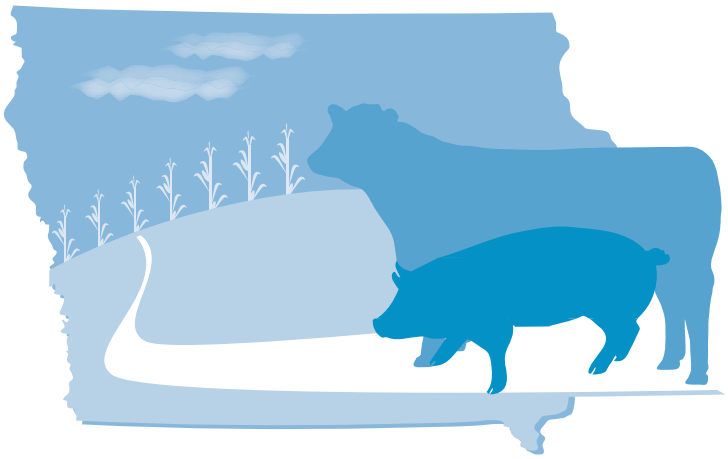

Soaring energy prices, continued strong hog and cattle prices, and consecutive bumper crops have created a unique economic climate for Iowa agriculture. Margins for livestock producers are at record high levels thanks to cheap feed and strong product demand. And despite less-than-optimal growing conditions, Iowa's corn crop will be the second largest ever and soybean yields look to rebound for a second straight year, reversing a series of disappointing yield years. On the downside, high energy prices translate into higher crop production costs because of higher fertilizer, chemical, diesel, and propane prices. And bumper crops mean lower corn and soybean prices.

There is a chance that the current combination of factors will be with us for a while. Continued world economic growth will likely sustain high energy prices. There seems to be growing evidence that trend yields for corn and soybeans will continue to increase at a robust rate. And if a meaningful Doha Round agreement in the World Trade Organization can be achieved, we should expect increased demand for U.S. beef, pork, and poultry exports.

Such an agreement will only take place if the United States and Europe agree to reduce price support payments and export subsidies. In the United States, such payments overwhelming flow to crop producers, who will consequently bear the brunt of any cuts. Depending on the level of cuts, the future under a new agreement may look much brighter for U.S. livestock producers than for most crop producers.

Expansion of activities that add value to corn and soybeans is a popular prescription for enhancing crop prices and rural economies. The current favorite value-adding activity is to convert corn into ethanol and soybean oil into biodiesel. And there is growing interest in the conversion of corn into polylactic acid (PLA), a biodegradable synthetic polymer that can be used to make containers, biomedical supplies, synthetic fiber and many other items.

One potential drawback of building a large demand base on new uses of corn is that technology breakthroughs or policy shifts can quickly drop demand to zero. For example, either a drop in ethanol subsides or a drop in the ethanol import tariff would greatly decrease ethanol demand. A breakthrough in cellulose-to-ethanol technologies would have the same net effect on corn markets.

The original value-adding activity that has not been targeted for expansion in Iowa or other Corn Belt states is livestock production. The reluctance to embrace this proven value-adding activity stems from how the introduction of new technologies favored larger-scale operations. However current economic conditions are increasing the relative profitability of moving more livestock production into Corn Belt states. Might these market incentives to bring more livestock into Iowa override other concerns, thereby expanding local demand for Iowa's corn and soybeans?

Separation of Crops and Livestock Production

Not long ago, the fortunes of farmers were tied more to the price of livestock than to the price of corn and soybeans because nearly every farm marketed a significant portion of its crops in the form of livestock. And producers had protection against high fertilizer prices because of the availability of on-farm manure nutrients. But now most crop farmers don't own livestock and most livestock producers don't grow crops.

This change is the result of many factors. The size of minimum-cost livestock production operations has increased tremendously. Relatively small cattle feeding operations that characterized Corn Belt

ISSN 1080-2193
http://www.card.iastate.edu

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Iowa Ag Review is a quarterly newsletter published by the Center for Agricultural and Rural Development (**CARD**). This publication presents summarized results that emphasize the implications of ongoing agricultural policy analysis, analysis of the near-term agricultural situation, and discussion of agricultural policies currently under consideration.

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agriculture were largely replaced by huge operations in the High Plains of Kansas, Oklahoma, and Texas. Separation of sows from finishing hogs in the late 1980s meant better disease control, which reduced the risk for large-scale feeding and feeder-pig operations. Lower per-unit costs of larger, specialized units led to consolidation.

Many crop farmers were happy to let the livestock go. New equipment and crop production methods have increased the per-bushel cost advantage of larger operations. And larger operations are easier to manage without the worry of livestock. Expanded crop insurance options and generous commodity programs greatly reduced the risk to farmers who moved to crop specialization. These financial tools removed most of the advantage that diversified farmers enjoyed in the past.

A New Competitive Environment for Corn Belt Agriculture?

Of course, nobody can reliably predict the future. But if certain trends continue, competitive forces will emerge that could transform Corn Belt agriculture. High diesel prices create an advantage for those producers who can more easily adopt conservation tillage and who can market their crops locally. High natural gas prices create an advantage for those producers who can use manure instead of commercial fertilizer.

At current prices, per-acre commercial fertilizer costs in Iowa range from a low of around $40 for a corn-soybean rotation to a high of $72 for a farmer who plants continuous corn. Though a farmer who uses manure has a large cost advantage over a farmer who does not, it is doubtful that large numbers of crop farmers will start producing livestock. But what if crop farmers allow livestock producers to site production facilities on their land? This gives the crop farmer inexpensive access to manure and it gives the livestock producer a place to raise livestock.

Table 1 shows the number of animal spaces it takes to generate enough manure nutrients to meet crop requirements per section of land under alternative rotations. Each space is assumed to be filled 2.45 times for finishing hogs and 2 times for fed cattle. As shown, two to three standard-size hog finishing houses are adequate to supply the manure requirements in each situation except under a nitrogen standard with continuous corn, which would require perhaps five. For cattle feeding operations, between 400 and 700 spaces are adequate except for continuous corn under a nitrogen standard.

Unless the rotation is corn-soybeans, fertilizing to a nitrogen standard results in over-application of phosphorus. Given the likelihood of relatively stronger demand growth for corn than soybeans, it seems reasonable to expect many farmers to move to a corn-corn-soybean rotation. With this rotation and following a phosphorus standard, how realistic is it to fertilizer an entire county's crops from manure?

Consider Sioux County, which has approximately 660 sections of corn and soybeans planted in a corn-corn-soybean rotation. Under a phosphorus standard, if 430 sections were fertilized by hogs and 230 sections were fertilized by cattle, then 2.5 million hogs and 264,000 fed cattle could fertilize all of Sioux County's corn and soybean acres. In 2003, Sioux County marketed 2.5 million hogs and 228,000 fed cattle, so even Sioux County must import some fertilizer. If full credit were given to these nutrients, then at today's prices, the manure would generate approximately $17 million of cost savings to Sioux County crop farmers.

Now consider the feasibility of fertilizing all Iowa corn and soybeans with manure. Iowa has about 36,000 sections of corn and soybeans. If they were all planted in a corn-corn-soybean rotation under a phosphorus

Table 1. Number of animal spaces needed to generate adequate manure to fertilize 640 acres

Crop Rotation	Finishing Hogs	Fed Cattle
Continuous Corn		
N-standard	5,734	1,213
P-standard	2,731	651
Corn-Corn-Beans		
N-standard	3,186	674
P-standard	2,412	575
Corn-Beans		
N-standard	1,911	404
P-standard	2,275	542

standard, then it would take 104 million fed hogs and 21.1 million fed cattle to generate adequate nutrients. Total U.S. marketings in 2004 were 103.4 million hogs and 26 million beef cattle. If Iowa crop farmers used almost all the phosphorus generated by all the fed hogs and fed cattle in the United States, they would still have to import nitrogen fertilizer. Also, it is interesting to note that in a corn-corn-soybean rotation, Iowa would produce almost enough corn and soybeans to finish all U.S. hogs and beef cattle.

Such a large-scale movement of livestock is not likely to occur, if for no other reason than that many rural Iowans express opposition to large-scale livestock production in the state. But the current situation in Sioux County suggests that if enough of a county's residents have a financial stake in livestock production, then the tolerance of the residents for livestock is dramatically increased. Might it be that livestock odors are less objectionable if local crop farmers can save $50 an acre in production costs?

What About Ethanol?

Of course, if Iowa were to attract more livestock, that would mean less corn left over to fuel Iowa's growing ethanol industry. Feeding enough hogs and beef cattle to generate adequate manure for Iowa corn and soybeans under a phosphorus standard leaves about 10 bushels per acre of corn for each acre in rotation. Thus, 23 million acres of manure-fertilized corn and soybean land would leave only 230 million bushels for all other uses. If in the future we can consistently generate three gallons of ethanol for each bushel of corn, then the 230 million bushels would generate 690 million gallons of ethanol. But Iowa already has the capacity to produce about 955 million gallons and will have 1.62 billion gallons of capacity soon, which would require 540 million bushels of corn. Where would Iowa get the 310 million bushels of corn?

Each bushel of corn fed through an ethanol plant generates about 17 pounds of DDGs (dried distillers grains and solubles). If DDGs displace energy from corn on a pound-for-pound basis, then Iowa would only need to import about 150 million bushels of corn to feed the 1.62 million gallons of ethanol capacity.

Iowa's Future Competitive Advantages

There are clear economic advantages to raising livestock and locating biofuels plants near crops. Efficiencies are gained from reduced transportation costs because it is less expensive to transport meat and fuel than feed. Also, manure nutrients can be a valuable fertilizer substitute rather than a waste by-product if livestock are raised in nutrient-importing regions. And ideally, by-products from biofuels production can be integrated directly into feed rations of nearby livestock rather than having to go through costly drying procedures in preparation for shipment to distant livestock.

The magnitude of these efficiency gains depends on transportation and energy costs. The current high transportation costs are creating an incentive for livestock and biofuels production to move closer to where feed grains and oilseeds are grown. High fertilizer prices are creating an incentive for crop producers to welcome livestock producers onto their land. Thus, high energy prices underscore the strength of Iowa and other Corn Belt states as the location where livestock and biofuels production should take place.

Whether we see a resurgence of interest in Iowa as a livestock-friendly place is more a political than an economic question. The economic incentives exist and are growing. But there are also regulatory hurdles, government indifference, and outright public opposition to expanded livestock and milk production. Iowa is not increasing its cattle population, its hog numbers are only slowly increasing, and there is no sign that milk production is reversing its long, slow decline. Only the egg-laying industry has moved rapidly in recent years to exploit the economic advantages of locating in Iowa.

States and regions that look to the future and adopt policies and programs that emphasize their competitive advantages will tend to prosper. Iowans need to assess the range of possibilities that agriculture offers in terms of jobs, income growth, and population. Should policies be adopted that emphasize corn and soybean exports to other states and countries, continued reliance on government crop and biofuels subsidies, and continued indifference to livestock production? Or should Iowa proactively adopt a livestock-friendly research and regulatory environment that determines how best to maximize the value of manure while minimizing the risks of water contamination from runoff and spills and controlling damage from odors? ◆

Agricultural Situation Spotlight

Corn Prices, Basis, and Transportation

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Corn prices in Iowa are being beaten down by consecutive years of exceptional production, high fuel prices, and the effects of hurricanes Katrina and Rita. Last year's record national and Iowa corn production has been followed by the second-highest corn production for both the nation and the state. In 2004, the United States produced 11.8 billion bushels of corn, with Iowa producing 2.24 billion. In 2005, the United States is projected to produce 10.9 billion bushels of corn, with Iowa producing 2.15 billion. This increased production has translated into larger corn stocks. In September 2004, national corn stocks stood at 960 million bushels, with Iowa holding roughly 25 percent of the total. By September 2005, corn in storage nationwide had jumped to 2.11 billion bushels and corn stored in Iowa had risen to nearly 500 million bushels.

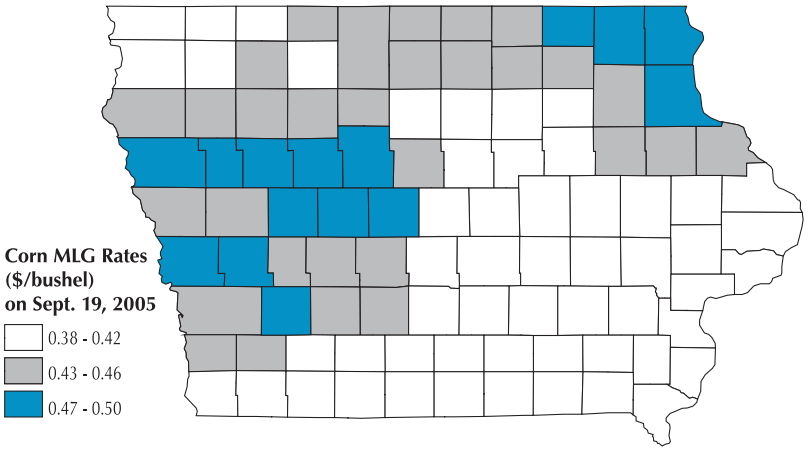

Figure 1. Iowa rates for corn marketing loan gains and loan deficiency payments on September 19, 2005

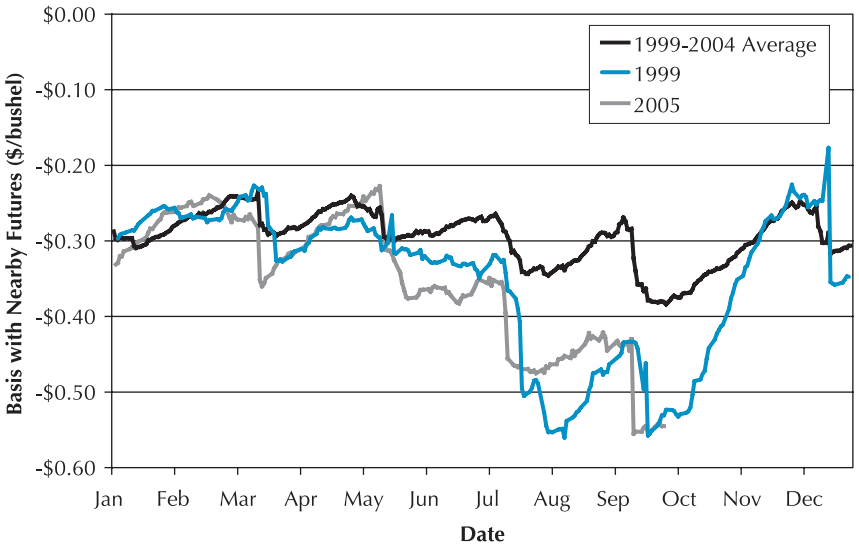

Figure 2. Basis between Iowa state-average cash corn price and nearby corn futures price

Managing Overflowing Corn Stocks

This storage left a tremendous amount of corn supply hanging over the corn market, which held down corn prices. The impact of this supply has been felt in several ways. First, a sizable portion of the corn in storage was held under the marketing loan program. At the end of August and beginning of September, many producers in Iowa and across the nation were at or nearing the end of their nine-month loan period, at which time the producer must decide whether to repay the loan or forfeit the crop to the government. In what looks like an attempt to reduce the probability that producers would find crop forfeiture the better choice, USDA began to manipulate the repayment rates (known as posted county prices) on marketing loans in September 2005. When the posted county price is below the crop loan rate, producers who have a marketing loan can capture a marketing loan gain. (This is the difference between the loan rate and the posted county price, which is the same calculation that creates the loan deficiency payment for producers who do not choose to take a marketing loan.)

In Iowa, the usual pattern is that all counties have the same marketing loan gain or loan defi-

ciency payment rate on a given day. Throughout September 2005, the usual pattern did not hold. Posted county prices were set to avoid crop forfeitures and this created county differences in marketing loan gains (MLGs). Figure 1 shows the per-bushel MLGs for corn in Iowa on September 19, 2005. Instead of a uniform rate across Iowa, there were differences of up to 12¢ a bushel across the counties. However, as the harvest season has progressed, the normal MLG pattern has returned.

Large Supply Affects Basis

The corn in storage has also affected the relationships between Iowa cash corn prices and other corn markets. Figure 2 shows the difference between Iowa state-average cash corn prices and the nearby futures contract price (price differences like this are referred to as basis). The black line shows the 1999-2004 average basis levels during the year. Typically, Iowa corn priced on the cash market runs 30¢ per bushel below the Chicago Board of Trade nearby corn futures price. So far, the pricing pattern for 2005 is following the pricing relationship we saw in 1999. Then, the basis widened to nearly 60¢ per bushel around harvest time before recovering at the end of November. But given the potential size of the Iowa corn crop this year and the amount of last year's crop still in storage, the ability for the basis to strengthen this year is limited.

Figure 3 displays the basis between Iowa cash corn prices and corn export bids out of New Orleans. The black line again shows the 1999-2004 average basis, which ranges from 45¢ per bushel in late April to 60¢ per bushel from harvest time to the end of the year. The thick gray line marks the lowest basis levels over the five-year period. As the graph shows, this basis widened to its largest margin at the end of 2004 and has continued to be extremely weak throughout 2005. Every basis observation for 2005 has been below the lowest basis level for the same date in the 1999-2004 period. The gap in the basis data for 2005 around the end of August is due to Hurricane Katrina and the closing of the export facilities in New Orleans. Following the resumption of activity at the port of New Orleans, this basis widened to over a dollar per bushel, a record gap between Iowa cash corn prices and corn export bids.

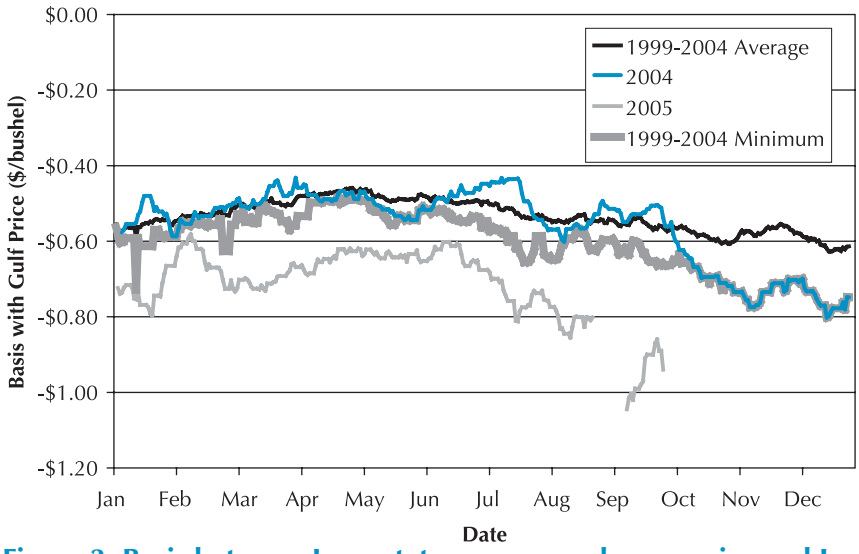

Figure 3. Basis between Iowa state-average cash corn price and Louisiana Gulf corn export price

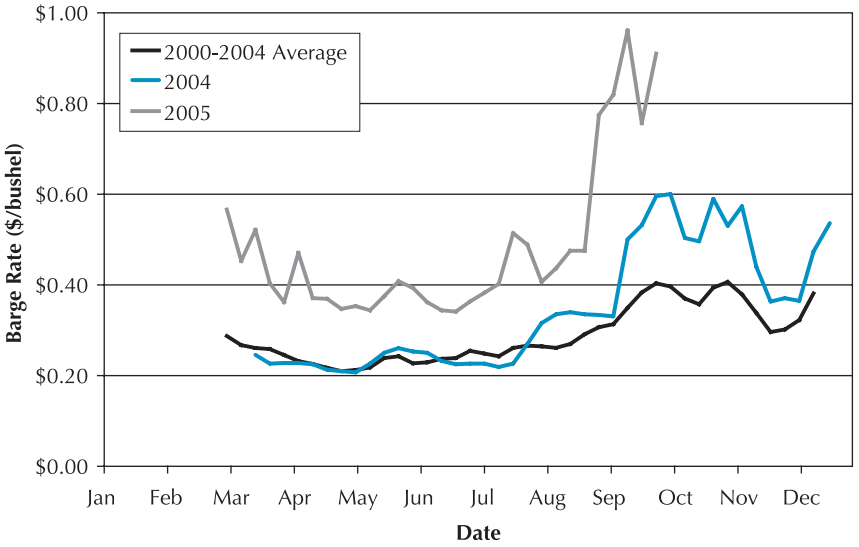

Figure 4. Per-bushel barge rates from eastern Iowa to New Orleans

Shipping Costs Swell with Supply and Fuel Costs

Much of the weakness in the basis between Iowa cash corn and corn export prices can be linked to the rise in the cost of shipping corn from Iowa to the export markets. Figure 4 shows per-bushel barge rates to move corn from eastern Iowa to New Orleans. The grain barge rates are generally higher during harvest season. Barge rates

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Are We Underestimating Corn Production Potential?

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As Figure 1 shows, the 2004 and 2005 corn crops in Iowa are the two highest yielding corn crops the state has ever seen. But producers had questions about both crops going into harvest. Precipitation was below average over both growing seasons and the 2004 and 2005 summers were at the extremes for temperature. In fact, since 1993, Iowa corn yields have not fallen below 120 bushels per acre. For the last eight years (counting 2005), state-average corn yields have exceeded 140 bushels per acre. While Iowa has not experienced a statewide drought or weather disaster over this period, the weather conditions have not been what is typically considered ideal for crop production.

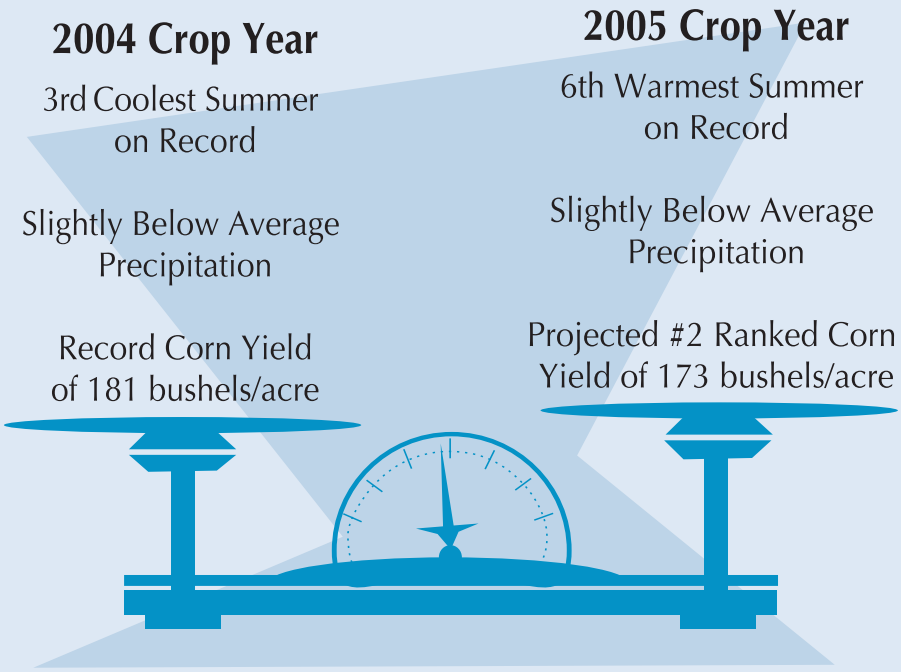

Figure 1. Temperature extremes and corn yields

Figure 2 shows Iowa corn yields per planted acre over the 1980 to 2005 crop years. The graph highlights the significant yield declines in the drought years of 1983 and 1988 and during the 1993 floods, but it also shows the amazing yield run since 1993, topped by last year's record. Using this period to estimate a linear yield trend for Iowa corn (the black line), we see trend yields growing by 2.38 bushels per planted acre per year. But this estimate of trend includes the three disaster years and assumes that yield growth has been constant over the entire period. To create a better trend yield estimate, we remove the three disaster years from the yield trend estimation and allow the trend yield growth rate to vary over different periods within the 1980-2005 timeframe. For each year between 1982 and 2001 (which we call the break-point year), we estimate a trend yield equation that has a different trend yield growth rate for the period 1980 to break-point year than for the period break-point year to 2005. The trend estimate is also required to give the same trend estimate for the break-point year under both trend lines (that is, the trend yield estimate for the break-point year is the same under the 1980 to break-point year trend and the break-point year to 2005 trend). From the various estimates using the Iowa corn yield data, we see a break point in 1994. The "adjusted trend" (the gray line) in Figure 2 shows the new trend estimate with the 1994 break point. Trend yield growth was 1.11 bushels per planted acre from 1980 to 1994 but jumped to 3.43 bushels per planted acre from 1994 to 2005. This trend shows that corn production potential in Iowa may have been underestimated over the last few years.

Under the linear trend, the trend yield for 2006 is 159.9 bushels per planted acre. This would grow to 181.3 bushels

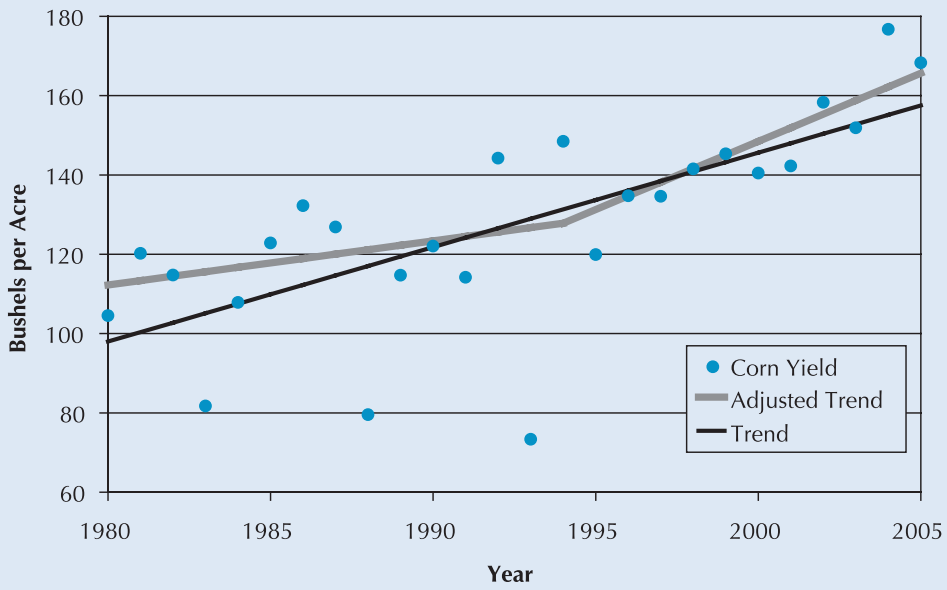

Figure 2. Corn yields per planted acres and trend estimates, 1980-2005

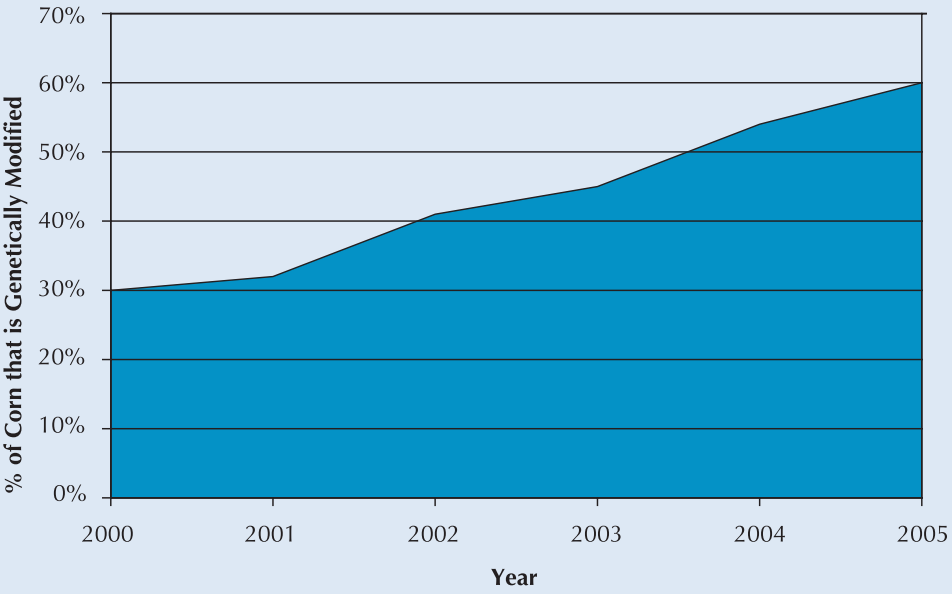

Figure 3. The percentage of Iowa corn that is genetically modified

per planted acre in 2015. Under the break-point trend, the trend yield for 2006 is 169.1 bushels per planted acre, 9.2 bushels per acre higher. The 2015 trend yield is 200.0 bushels per planted acre, roughly 10 percent higher. The 1994 break point in corn yield trend seems to be related to technological improvements in corn production. Seed companies have significantly invested in creating higher-yielding corn varieties over the past 25 years. The introduction of these new varieties and of genetically modified corn in 1996 represented a major technological change in corn production, and this change may be the main driver of the sizable trend yield growth rate we see since 1994. Figure 3 shows the adoption of genetically modified corn in Iowa. In 2000, 30 percent of all Iowa corn was genetically modified. By 2005, that percentage had doubled. The continuing growth in the adoption of genetically modified corn and the accompanying growth in trend corn yields point to a future of increasing supplies of Iowa corn to fuel the budding ethanol industry in Iowa, to feed Iowa livestock, and to export to other markets. ◆

Beef Packing Concentration: Limiting Branded Product Opportunities?

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Programs to differentiate beef products based on geographic indications (GIs) include Nebraska Corn-Fed Beef, South Dakota Certified Beef, and Iowa-80 Beef. An unexpected difficulty in developing these types of brands will be a lack of federally inspected small- to medium-size packing facilities best suited for processing segregated cattle and beef products. South Dakota has eight small or very small federally inspected meat packing facilities. South Dakota Certified Beef is using a number of small packers. Currently four are licensed for the program and others have applied. Iowa has one major beef kill plant in Denison, but no processing is done on site. Nebraska-based brands have a major advantage in that the state has several large and small plants—some of which have experience in dealing with relatively small batches of different sizes. In developing Iowa-80 beef, we have found it difficult to develop a brand that can certify beef that comes from cattle born, fed, killed, and processed in Iowa so that it can be exported to other states and overseas. The lack of ideally sized facilities is a direct result of the increased concentration in the beef industry.

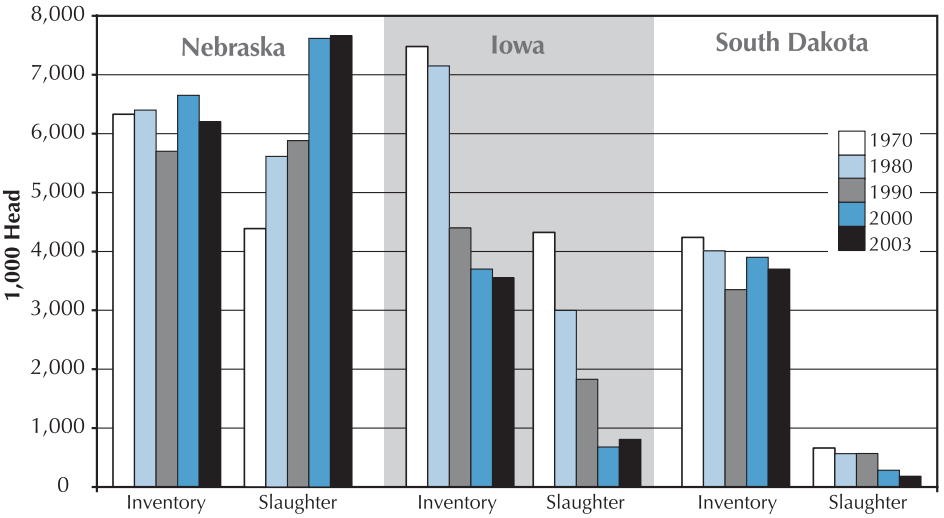
Packer History

Concentration in the U.S. packing industry has deep historical roots. In the early 1900s, a group of companies called the "Big Five" dominated the meat packing industry. Holding an estimated 50 to 75 percent of the market, these companies operated large, multispecies slaughter facilities near terminal markets. In 1920, following an investigation by the Federal Trade Commission, the Big Five packing companies agreed, among other things, to divest themselves of certain assets such as public stockyards and to cease retail sales. Over the following 40 years, single-species slaughter plants gradually were located in livestock production areas and the proportion of cattle slaughter by the four largest packing firms fell to about 30 percent by 1956.

The transition from carcasses to boxed beef took place in the 1960s, and high slaughter levels kept plenty of independents in business until the late 1970s, when slaughter numbers dropped. Since then, the pendulum has swung back toward consolidation, with a few companies operating very large plants. In 1996, 28.6 million steers and heifers were slaughtered, with 22 plants slaughtering 79 percent of this total. By 2003, the top four companies accounted for about 80 percent of steer and heifer slaughter.

Currently the beef packing industry fits the Federal Trade Commission's definition of a highly concentrated industry (see the four-firm concentration ratios in the table below). Research on the effects of this concentration has focused on whether packers have used market power to lower the prices they pay for slaughter-ready cattle or whether packers have used captive supplies to manipulate market prices. Little attention has been paid to the effect

Cattle inventories and slaughter for Nebraska, Iowa, and South Dakota, 1970-2003



Note: Slaughter data include both federally inspected and non-federally inspected commercial slaughter.

Percentage of total commercial slaughter by four largest firms

	1980	1985	1990	1995	2000	2001	2002	2003
Four-firm concentration	35.7	50.2	71.6	80.8	81.4	80.4	79.2	80.3

Source: Grain Inspection, Packers, and Stockyards Administration, 2004.

of this concentration on producer groups or small companies that need to segregate cattle in a fully traceable system.

A Hurdle for Niche Products

There are two difficulties raised by a lack of competition between packers for developers of niche beef products. The first is that the economic fortunes of today's packers are driven by maximizing throughput. That is, because of large fixed costs, money is made by moving large numbers of animals through packinghouses quickly and efficiently. Stopping or slowing a production line to process a batch of animals separately simply runs counter to how modern packers operate.

A second potential problem can occur after an agreement is reached with a packer for special treatment of a batch of animals. A traceable and auditable system requires close coordination between all participants in a value chain. Any break or disruption in the chain implies that no product can be sold under that system. This dependence creates the possibility that one participant can "hold up" the value chain by demanding more favorable terms. Of course, the credibility of any such attempt depends on the ease with which a participant can be replaced. If there is only one packer in a state and the niche product requires that livestock be slaughtered in the state, then over time one would expect that most of the value in a value-chain will be captured by the packer.

Iowa's unique problem of having only a single major beef facility did not result solely from increased packer consolidation. Perhaps the biggest driver of this change was the movement of cattle away from the Corn Belt. Historically, the majority of cattle were fed in the Corn Belt. As shown in the accompanying figure, Iowa once accounted for a relatively large proportion of cattle production. But the feedlot industry gradually migrated to the Southern Plains, leaving less than 5 percent of U.S. cattle-feeding capacity in the hands of smaller-scale farmers. Texas, Kansas, Nebraska, and Colorado now account for 65 percent of U.S. feeder cattle supply and more than two-thirds of U.S. cattle slaughter.

Nobody expects increased development of small-scale slaughter and processing capacity to meet the demands of niche beef markets and small-scale producers. In fact, the economic realities of livestock processing favor continuing consolidation in the number of packers and plants. A key strategic hurdle for niche players in the beef business is the development of business relationships with multiple packers and plant managers to avoid the possibility of a holdup in the chain. In addition, care must be taken in defining the standards for GI certification. In the case of Iowa-80 Beef, for example, requirements may reflect that the animal must be born and fed in Iowa but that it can be slaughtered in Nebraska. ◆

Corn Prices, Basis, and Transportation
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are not reported from late December to the first of March due to ice buildup on the Upper Mississippi River. Barge rates shot up in mid-September 2004 and have been consistently above average since then. The pressures of large corn and soybean crops—combined with barge traffic near or at capacity on the Upper Mississippi River, increased competition on covered barges from imported non-grain commodities (such as steel), lower water levels due to drought, and higher fuel prices—drove barge rates up. These pressures have continued through 2005 and have been intensified by the potential size of the 2005 crops and the double-barreled impacts of Hurricanes Katrina and Rita, limiting barge movement and fuel supplies.

As of early October, only 15 percent of the capacity in the Port of New Orleans is up and running. Barges cannot unload grain shipments because of damaged freight terminals, which has delayed the movement of barges back up the river and consequently limited barge supplies for farmers in the Midwest. In simple economic terms, given the limited supply of barge space and the increased demand for that space from strong crop production, barge rates (the price for barge space) had to increase. Fuel cost increases in the barge industry are passed on to the farmer in the competition to obtain barge space. The effects of the hurricanes just exacerbate the problem. Barge rates are not the only transportation costs that have skyrocketed. Agricultural commodities shipped by truck and/or rail face many of the same issues: limited transportation supplies and higher fuel costs.

Low Prices, Higher Support

All of these factors point to a continuation of low crop prices in Iowa and the nation over the near term. USDA is currently projecting a season-average farm price of $1.90 per bushel for the 2005 corn crop. This would be 16¢ per bushel below the 2004 crop year price and 52¢ below the 2003 crop year price. Price support government programs, such as the marketing loan and countercyclical payment program, will likely provide a significant amount of support to the farm sector in the coming year. ◆

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