

ILLINOIS RURAL POLICY DIGEST



Illinois Agricultural Policy Center
 Department of Agricultural and Consumer Economics
 University of Illinois at Urbana-Champaign



Fall 2002, Vol. 1, No. 2

The Emperor Has No Clothes; I'm a Lousy Golfer; and Brazil Has Soybeans

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I used to golf. A typical day on the links would result in a score well above par, usually somewhere between 100 and 110 (if I kept score). Yet, in my mind, that above-par average did not represent "my game." Instead, my true game was represented by those rare shots that led to pars or birdies on a couple of holes. The fact that I did not shoot that way consistently simply meant that I was not playing enough and if I had enough time to play more, my scores would drop considerably. While this type of denial in golf is of no consequence, I sometimes wonder if we are applying a similar logic when thinking about the future direction of the U.S. crop sector and attendant policy implications.

Has the game changed?

Anyone who even remotely follows the commodity markets realizes that South America has changed the supply fundamentals in a dramatic way over the past ten years. So pointing out that South America is now an important producer of soybeans represents nothing more than a profound grasp of the obvious. The focus here, however, is on some of the economic and policy implications of this increase in long-run production capacity.

To help provide perspective, production and yield estimates for wheat, corn, and soybeans are provided in Table 1. Three year averages for the U.S., South America, and the world are given for 1970-1972 and 1999-2001.

Most of the story can be found in the world rates of change in yield and production over the past 30 years (bolded numbers, Table 1). During this period, the average world yield increased 70% for wheat and 74% for corn. Land use for wheat stayed virtually constant and thus the total increase in production matches the increase in yield. Worldwide corn production increased by about 100%, reflecting a 70% increase in yield as well as an increase in acres planted. The noteworthy change, however, is in soybeans. While the average world soybean yield rose by only 50%, production more than tripled, increasing by 260%! Moreover, this 260% increase may well understate the growth rate given that most 2003 production projections for South America are now around 80 million metric tons, compared to the 65 mmt three-year average used in Table 1.

Table 1. Production and yields for the U.S., South America, and world.

	1970-1972		1999-2001		Relative change over 30 years	
	Prod. (mmt)	Yield (bu/ac)	Prod. (mmt)	Yield (bu/ac)	Prod. c/a	Yield d/b
	a	b	c	d		
Wheat						
U.S.	41.00	32.60	58.90	41.60	1.44	1.28
S. America	9.60	18.00	21.30	35.30	2.22	1.96
World	333.80	23.30	585.40	40.60	1.75	1.74
Corn						
U.S.	130.20	85.60	244.30	136.30	1.88	1.59
S. America	28.70	24.70	62.70	52.30	2.20	2.12
World	296.30	40.70	602.80	69.30	2.03	1.70
Soybeans						
U.S.	32.40	27.30	75.30	37.60	2.32	1.38
S. America	2.50	19.60	60.50	36.30	24.20	1.85
World	45.60	22.00	165.10	33.00	3.62	1.50

Source: Food and Agricultural Organization of the U.S. (*apps.fao.org*).

Why?

There are several drivers behind this dramatic increase in soybean production in South America, particularly in Brazil. Soybean varieties have been developed that do well in its sub-tropical and tropical climates and soils. Soil fertility has been increased successfully. No-till technology allows maintenance of this fertility in areas where it is quickly lost when the soil is turned over and exposed to sunlight. The opportunity cost of land in much of South America, and particularly in many cerrado areas, is very low. And finally, economic conditions and inflation have stabilized over the past eight years.

This combination of economic, institutional, and technical change has made soybean production possible in a big way, and there are strong signs that the expansion is far from over. Brazil's west-central area has millions of cerrado savanna acres which can yet be converted from scrubland into land used for crop and pasture rotation.

Who has the comparative advantage?

A frequently asked question is, "are we competitive with Brazil?" Often, the underlying motivating question is, "who will grow the soybeans?" The response, unfortunately, usually places too much emphasis on absolute advantage (whether it's called that or not) and on inappropriate cost calculations.

In a free market economy, the most important factor determining production and trade flows is comparative advantage. Yet, "comparative advantage" is one of the most misused terms involving economics. The comparative advantage principle is often illustrated in introductory economics by the case where the business executive is a faster (more productive) typist than the secretary, but because of what the executive must give up in order to do the typing (that is, the opportunity cost of typing) the slower typist types, while the executive does other things. Similarly, when thinking about soybean production, absolute and comparative advantages can be illustrated by the following questions:

- **Absolute:** What is the monetary cost of growing and transporting soybeans from the U.S. (versus Brazil) to Rotterdam?

- **Comparative:** What is the opportunity cost of growing and transporting soybeans from the U.S. (versus Brazil) to Rotterdam? Or, what is the highest return to land if not used for soybean production?

While the U.S. might have an absolute advantage (lower production and transportation costs) in growing soybeans, its opportunity cost (say, growing 140 bushel corn) is usually much higher than in Brazil where average yields for non-soybean crops are lower.

In addition to not asking the right questions about comparative advantage, monetary costs for calculating absolute advantage can be misleading, especially as they relate to land. It is important to keep in mind that land rents and prices can be as much of an effect of "competitiveness" as a cause because they are a function of expected returns (whether from the market or the government) from using the land.

To illustrate, Table 2 presents 1998 costs estimated by the USDA for the U.S., Argentina, and the Brazilian state of Matto Grosso, where soybean production is increasing rapidly. The total cost of producing a bushel of soybeans and then transporting it to Rotterdam is \$5.92 for the U.S., \$5.80 for Matto Grosso, and \$5.23 for Argentina. Does this mean that the U.S. is "less competitive" than either Argentina or Brazil? Not necessarily. Included in these per-bushel cost estimates is land rent, reflecting both market returns and government support payments. If, for example, U.S. support programs did not exist, rents (and land prices) would fall to the point where a normal or reasonable profit is available, and the U.S. would "appear" to be more competitive under this lower cost structure. In Matto Grosso, the non-land cost and the transportation cost in particular are so high that there is little remaining profit that can be capitalized into land value.

Table 2. USDA 1998 bean costs per bushel.

	U.S.	M. Grosso	Arg.
Non-land Prod.	\$3.20	\$3.75	\$2.69
Transportation	<u>\$0.81</u>	<u>\$1.91</u>	<u>\$1.30</u>
	\$4.01	\$5.66	\$3.99
Land	<u>\$1.91</u>	<u>\$0.14</u>	<u>\$1.24</u>
Total	\$5.92	\$5.80	\$5.23

Source: Schnepf, Dohman, Bolling. "Agriculture in Brazil and Argentina: Developments and Prospects for Major Field Crops." USDA, November 2001.

Given that land rents/prices are determined “residually,” a more appropriate way to determine absolute advantage is by using non-land costs. When viewed this way, the non-land cost estimates in Table 2 suggest that Argentina and the U.S. are about equally “competitive,” at \$4.00 per bushel, far below the Matto Grosso cost of \$5.66.

As noted earlier, however, absolute advantage does not tell the whole story about who will grow what. The average corn yield during 1998-2001 in the U.S. was 136 bushels per acre, compared to 52 bushels in South America. In general, if the return to corn production represents the opportunity cost of growing soybeans, then even though the U.S. may have an absolute advantage over Matto Grosso in soybean production, the comparative advantage may go to Matto Grosso. Like the typist who does the typing for the faster-typing executive, soybeans are grown in South America.

Production, Market, and Policy Ramifications

The idea that parts of South America have a comparative advantage in growing soybeans over the U.S. is not well received by many groups in the U.S. But instead of denying this possibility, let’s consider some of the ramifications.

Production. Specialization is a result of comparative advantage. For example, over the past 70 years, Kansas has “specialized” in wheat, while Illinois has evolved toward a corn/soybean specialization. Free trade encourages countries to also evolve toward their comparative advantage, which in this case may mean a shift away from soybeans and toward corn in the U.S. Current market prices are already signaling for such a change. And without the loan rate program, this signal would be much stronger.

This does not mean that we will quit growing soybeans in the U.S. Domestic needs as well as a significant share of the export market will continue to be served by the U.S. But producers will increasingly consider two- or three-year continuous corn rotations that will shift aggregate U.S. supply away from soybeans.

Another possible ramification—that would take several years to unfold—is the ability of land re-

sources to move in to as well as out of crop production in general and soybeans in particular. While we are accustomed to seeing this in the livestock industry, where breeding stock and capacity respond to profit, it is less notable and less controllable in crop production. Instead of large resource shifts in crop production, the response to changes in profit is reflected in land rents and prices. Only small changes occur in the number of acres used for agriculture. Yet, in parts of Brazil, land rents and prices are close to zero, leaving little room for rents to adjust downward. Under these conditions, if land comes into production because \$6.00 beans offer a normal profit, then it may be rational to take it completely out of production at \$4.00.

Price. The general picture of supply is provided in Table 1, and growth in demand over several years is driven primarily by population and income. Over the 30-year period represented in Table 1, world population grew about 60% and real GDP (income) increased at an average annual rate of 3.6% (IMF). Under these types of general supply and demand conditions long run price forecasts are provided by groups such as the Food and Agricultural Policy Research Institute (FAPRI) and the Congressional Budget Office (CBO). Under what might be considered fairly conservative soybean growth rates in South America, FAPRI’s forecasts (made in early 2002) for Decatur soybean prices start at around \$4.40, increasing to the \$5.00 level by 2007/08. CBO’s March 2002 baseline projections are similar, but reach \$5.00 by the 2005/06. The important point here is not whether the forecasts are accurate, (the 2002 growing season exemplifies the challenge in forecasting out one year, let alone five), but rather, the point is that under reasonable expectations about supply and demand, we are in an era where it is likely that the long-term equilibrium price is less than \$5.00 per bushel.

Market prices during recent months have reinforced this idea that we are in a new era. In August, low yield expectations caused the most bullish U.S. production and carry-out conditions since the mid 1990s, yet the price of soybeans stayed below \$6. Not long ago, it was reasonable for producers to expect at least \$6 soybeans during “normal” years. This is now not normal. But this fact is neither good nor bad, unless we treat it like the (fairly tale) community of

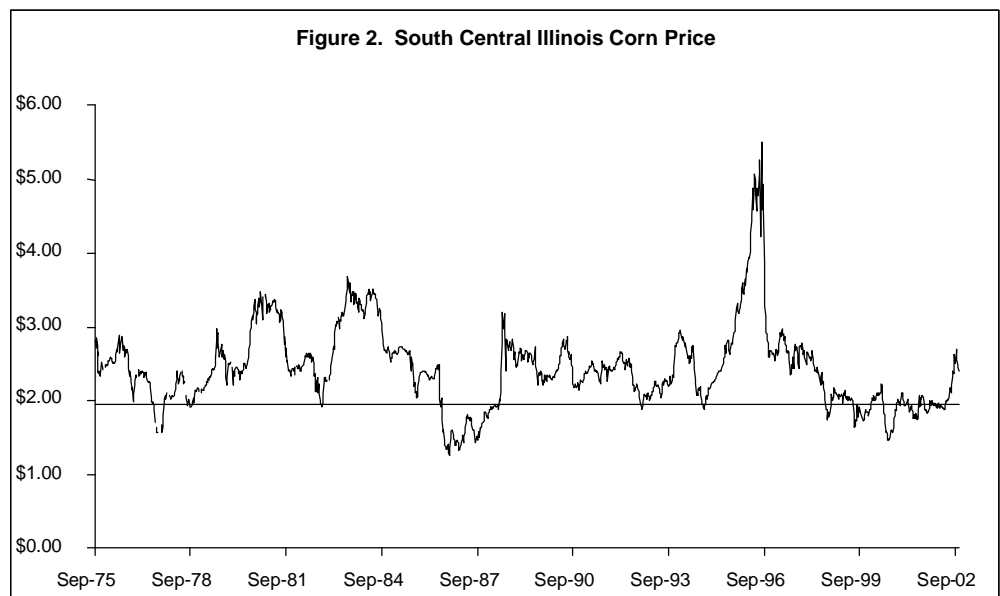
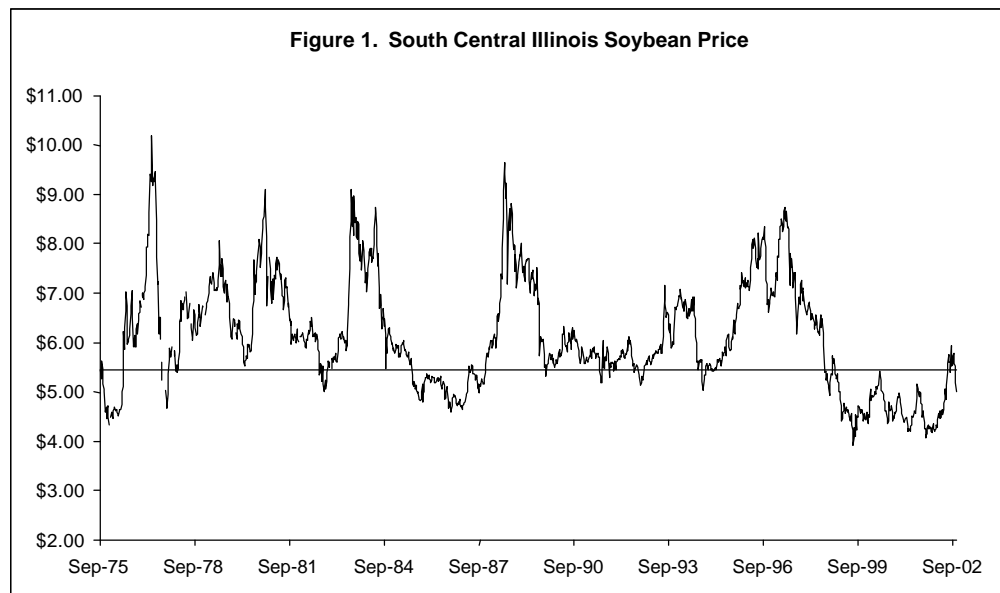
adults who would not recognize the obvious nakedness of their king, or like I treat my golf scores.

Policy. When discussing the appeal of support programs, the term “safety net” is often used, creating the image where producers are protected from an unusual or abnormal decline in economic conditions, like the net that protects the tight-rope walker from disaster. The commodity loan program is intended, for example, to provide a safety net by guaranteeing producers a national average price of \$1.98 for corn and \$5.00 for soybeans. Likewise, counter-cyclical and subsidized insurance programs provide safety-net payments that are triggered when prices, yield and/or income fall below specific levels.

Parameters of the safety net are clearly defined. The location of the tight rope being walked, however, is not. If the loan rate for corn is about \$2.00 per bushel, then one might deduce that the “normal situation” is when corn price is higher than \$2.00. Or, given that the soybean national loan rate is \$5.00, then it is reasonable to assume that policy makers believe (explicitly or implicitly) that the long-run equilibrium price for soybeans is above \$5.00. While that belief is certainly not a necessary condition for creating such a policy, I’ve never heard it argued that the intent of farm programs is to provide a support price that is rarely less than the market price over a long period of time. Nonetheless, there are strong indications that this is indeed the current situation due to some fundamental and obvious changes

that have taken place in production outside the U.S.

A long run view is provided by Figure 1, showing the south-central Illinois soybean price from September 1975 through September 2002. The horizontal line is the 1996-2001 loan rate level for this area of the state (about \$5.45), and looks like a “safety net” price for most this 27-year period, meaning that the market price was generally above the loan rate. A similar generalization can be made for corn (Figure 2). During the past four years, however, corn price has hovered around the \$2.00 loan rate while soybean price has stayed consistently well below the “safety net” level until the summer of 2002. The weather



Source: www.farmdoc.uiuc.edu

market of 2002, however, does not change the fundamental supply and demand situation pointing to continued low soybean prices due to increased South American production, and the need for comparative advantage adjustments.

The 2002 Farm Bill made adjustments to the relative loan rates in recognition that the soybean rate was too high relative to corn and wheat, given production costs and yields. The new national-average loan rates of \$5.00 for soybeans and \$2.00 for corn better reflect relative U.S. production costs, but from an economic efficiency standpoint, the absolute levels remain in question.

The last general policy ramification (discussed here) involves transportation infrastructure. In the debate on whether to upgrade locks and dams on Mississippi River system, it is often argued that to stay competitive with South America, we must improve and maintain our ability to transport commodities by barge. The general idea here is that we now hold an “advantage” over many parts of South America because of our inland waterway system, but that we may lose some of this advantage if we do not modernize (increase) select locks.

The comparative advantage discussion so far suggests that there will be economic incentives for the U.S. to specialize toward corn and away from soybeans. Lower transportation rates could very well encourage this specialization even more, given the need to transport 140 bushels from an acre of corn versus 40 bushels from an acre of soybeans. So when projecting benefits and costs of upgrades to the inland waterway system, it may be useful to consider different scenarios about crop production. As shifts away from soybeans toward corn increase, the benefits of a better transportation infrastructure also increase. The paradox here is that while the argu-

ments for improvements are often based on the need to “compete” with South America, the resulting lower barge rates may well encourage less production of the crop that is causing the competitive scare.

The Sky is Not Falling

Thirty three years ago, Professor Thomas A. Hieronymus wrote an article entitled *Soybeans: End of an Era?* (*Illinois Agricultural Economics*, Vol. 9, No. 2, July 1969). Like all of Tom’s writings, it was a cogent piece based firmly on empirical evidence and sound logic. But, as it turns out, he was simply wrong in predicting the end of a soybean era where “the urgent need for protein made it possible to use resources for the production of soybean oil even though oil lacked comparative advantage.” In sum, Tom was arguing that the growth in demand for protein would be slower than what it turned out to be, and that soybean (protein) substitutes would be more important than what they turned out to be. Instead, increased demand for soybean protein caused price relationships that encouraged continued growth in soybean acres at the expense of acres in oats, barley and hay.

There are at least two lessons here. The first one is readily accepted by most folks—that is, economists are often wrong in their predictions. There are not many agricultural economists who can match Tom Hieronymus’s track record, so if I’m wrong here about the end of the current U.S. soybean era, then I’m in good company. But if I’m right, the second lesson is that the sky is not falling and shifts in crop patterns and production are common, stimulated by economic signals from both the cost and demand side. Producers should take advantage of these signals to increase profit; legislators should pay attention to them to improve policies. ❖

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Food Safety: Setting and Enforcing Standards

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In December 2001, the U.S. Court of Appeals for the Fifth Circuit upheld a district-court decision in Texas blocking the U.S. Department of Agriculture from closing a beef processing plant that had failed a series of tests for control of salmonella. This court ruling is the latest development in the evolution of food-safety policy for meats and poultry. Over the last decade, the federal government has adopted new approaches and set new kinds of standards for food safety in meat. But these actions have been controversial with both industry and consumers. How the disputes over setting and enforcing food-safety standards are resolved will have important consequences for the food industry, the prices of food products, and public health.

The Federal Role in Food Safety

Because of the quality of U.S. food production and the governmental standards that are in place, most food safety hazards today are fairly modest in scope and severity. Nevertheless, food safety is now receiving considerable attention from the public for several reasons. Science can trace many food-borne illnesses to specific pathogens found in food. As consumers live longer and become more affluent, they demand higher levels of quality and safety. Changes in production practices and new sources of food, such as imports, introduce new risks into the food system. And more foods are purchased away from home or in prepared form, giving consumers less control.

More fundamentally, there is a clear economic rationale for governmental involvement in food safety. Consumers often cannot detect food hazards at the time of purchase, and thus cannot always make their demand for safer food known through purchase decisions. Even the producers may be unable to identify these hazards, or therefore, to guarantee any particular level of safety. Accordingly, unregulated economic markets will fail to provide a satisfactory

level of safety from the consumer's standpoint.

Public policies have addressed this market failure by setting standards and creating a process for testing designed to ensure acceptable safety. There are 12 different government agencies with authority over different aspects of food safety in the U.S., with most food safety oversight activities carried out by the Food and Drug Administration (FDA) and the U.S. Department of Agriculture (USDA). The USDA has primary responsibility for food safety in meat and poultry; the FDA has primary responsibility for all other foods. In addition to the federal agencies involved in food safety, the state and local governments also play a role. The state governments have oversight for meat and poultry plants that do not ship their product across state lines. Both state and local governments are responsible for the food retail sector, including grocery stores and restaurants.

There have been changes in the way that public agencies approach food hazards. The National Academy of Sciences has advocated a risk assessment approach to the design of food safety regulation. This means looking at how hazards enter food during production, and where it is easiest to control them. The approach also requires that the benefit of a regulation should exceed its cost. The risk assessment framework should help to identify whether and how regulation can provide the greatest benefits (higher safety) for the lowest costs. The USDA and the FDA have used this approach in design of their most recent regulations.

A related trend in food safety regulation is the mandated use of the Hazard Analysis Critical Control Point (HACCP) systems of safety management. HACCP requires that processors identify critical control points and develop procedures for monitoring controls and addressing any failures in control. In 1996, the USDA mandated the use of HACCP in meat and poultry plants, in order to reduce microbial pathogens in meat and poultry. The FDA mandated HACCP for seafood plants in 1995 and for fruit juice in 2001. The mandated use of HACCP reflects a growing recognition that it is important to prevent and control hazards before they reach the consumer. This approach to food safety regulation has also been adopted in Australia, Canada, and the European Union.

Microbial Pathogens in Meat and Poultry

Since the turn of the century, the USDA has examined each meat carcass at slaughter (poultry was added to federal inspection in 1957). If the animal is free of disease, then the meat is considered suitable for human consumption. In addition to carcass-by-carcass inspection, the USDA also monitors the operation of equipment, plant sanitation procedures, use of ingredients, and labeling of products. While this system removed diseased animals from the food supply and ensured sanitation procedures, it was not designed to address microbial pathogens. Pathogens such as E.coli O157:H7 and salmonella can live in the gastrointestinal tract of animals without harming them, and may enter meat during slaughter and processing.

To address these hazards, the USDA proposed a Pathogen Reduction Regulation, which was finalized in 1996. It called for several changes in how meat is inspected for food safety. First, all plants are required to develop HACCP plans to monitor and control hazards during production. Under these plans, plants identify critical control points where hazards can enter, establish control procedures, and set critical limits for monitoring to ensure that procedures are followed. A simple example is ensuring that refrigerated product is kept chilled at a certain temperature. HACCP includes steps for record-keeping and verification of control procedures, including some tests for the presence of microbial pathogens to ensure that controls are meeting the target level of safety.

The second major new requirement under the rule is for microbial tests. USDA and the plants share this responsibility under the regulation. USDA tests for salmonella on raw meat and poultry; the plants are required to test for e.coli on carcasses. Salmonella was chosen because it is one of the most common food-borne illnesses, accounting for 1.3 million cases and 550 deaths per year, according to the Centers for Disease Control. Under the regulation, plants showing higher than industry-average levels were expected to reduce the incidence of these bacteria over time.

The third requirement is that plants develop written sanitation procedures to show how they will meet daily sanitation requirements. These require-

ments also apply to meat plants that are state inspected. In Illinois, there are 279 meat plants and 506 meat brokers inspected by the Illinois Department of Agriculture.

Under the Pathogen Reduction/HACCP regulations, USDA can initiate a withholding, suspension, or withdrawal action based on any of the following: failure to collect and analyze samples for the presence of e.coli and record results, failure to develop or implement Sanitation Standard Operating Procedures, failure to develop or implement a required HACCP plan, or failure to meet applicable salmonella performance standard requirements. It is this last requirement that was the subject of the court case.

In 1999, the Supreme Beef Processors of Dallas, Texas filed suit against the USDA to prevent a shut-down of their plants due to the results of salmonella tests. The standards permitted no more than 7.5 percent of a plant's ground beef to contain salmonella; more than 90 percent of federally inspected plants met that standard. Other plants that failed the tests undertook corrective actions, and were allowed to remain open. The USDA moved to withdraw inspectors after the Supreme Beef plant failed salmonella tests three times over eight months. Removal of inspectors would have shut down the plant, but a court injunction prevented this action and was later upheld by the ruling. Supreme Beef argued that the government has no authority to regulate salmonella, "because salmonella is not an adulterant and because salmonella is destroyed during normal cooking, the presence of salmonella is not a public safety issue."

The first ruling in Texas was appealed and upheld in December 2001. This ruling found that the USDA did not have statutory authority to suspend inspection in the plant because salmonella test results do not necessarily evaluate the sanitation conditions of the plant. The salmonella found at Supreme Beef, which grinds beef for hamburger, comes in on raw materials purchased from beef slaughter plants. This ruling applies only to Supreme Beef, which has since gone out of business, but sets a precedent for salmonella tests at other meat and poultry plants.

According to the USDA, however, the salmonella performance standard continues to be a part of its Pathogen Reduction/HACCP inspection system. Salmonella testing will be used in conjunction with

other information to verify that Pathogen Reduction /HACCP systems and sanitation systems are under control. Plants that fail two salmonella sample sets will be subject to an in-depth review of the plant's food safety systems. If deficiencies are identified in these systems, USDA may initiate enforcement action. Thus, salmonella test results must be used in conjunction with other information to shut down a plant, and can no longer be the sole basis for that decision. The use of microbial pathogen testing to set performance standards in meat and poultry is currently under study by the National Academy of Sciences and the National Advisory Committee on Microbiological Criteria for Foods.

Economic and Policy Issues

There are several issues in how food safety is regulated that are not fully resolved, as the recent court decision demonstrates. These issues include USDA's legal authority under current meat inspection laws as well as the scientific validity of sampling and testing procedures. Setting aside these legal and scientific issues for the moment, does it make sense from an economic perspective to set a microbial pathogen standard for meat and poultry plants? The economic issues surrounding responsibility, balancing costs and benefits, and efficiency are explored below.

Who is responsible for food safety, the food producer or the consumer? Microbial pathogens are naturally occurring; many can enter food at several points from farm to table. Once in food, they can multiply or cross-contaminate other foods. The current USDA position is that food safety responsibility is shared by all of those involved in food production and consumption. Yet even acceptance of shared responsibility does not preclude controversy over who will bear specific risks or the costs of risk avoidance.

Historically, responsibility for reducing such pathogens rested mainly with the final food preparer. The appeals court decision noted that "American housewives and cooks normally are not ignorant or stupid and their methods of preparing and cooking food do not ordinarily result in salmonellosis." But food preparation methods have changed with the advent of more fresh foods and use of new technologies such as microwave ovens, and food preparation

has increasingly moved outside the home. This includes not only restaurant meals, but also more meals consumed in institutions such as day care centers or nursing homes, as well as more meals purchased prepared in stores. These changes either reduce the amount of direct consumer control over food preparation or change the traditional ways of ensuring food safety. Clearly, consumer protection in this changing food system means shifting more responsibility to the food industry for food safety. The question is how and to what extent to regulate different parts of the food chain.

One approach is to examine the entire food chain to identify where it is most cost-effective to intervene. However, this approach is not easy for federal agencies, since they have responsibility for only certain portions of the food chain or types of food. As the food retail sector is not federally regulated, actions at the federal level have focused on meat and poultry plants. Requiring these plants to meet a standard for minimizing microbial pathogens reduces the amount of such pathogens entering the food system at the retail level, and thus reduces the probability of later contamination and food borne illness. Animal slaughter and processing have been shown to be critical control points for reducing pathogens throughout the food chain, and thus enforcing standards for these plants should be part of an effective control strategy. Enforcing standards at this point does not preclude mishandling or cross-contamination at the retail or consumer level. By making such standards more difficult to set and enforce at the processing level, the court decision forces consumers and regulators to focus on other ways of preventing food borne illness.

How should costs and benefits be balanced in setting food safety standards? Benefits from reducing food borne illness are potentially very large. The range of estimated annual benefits from reducing food borne illness due to improved meat and poultry food safety may be as high as \$172 billion or as low as \$2 billion over the next 20 years. This wide range reflects varying estimates of the extent of food borne illness and different methods for valuing life and health. On the cost side, there is uncertainty about what kind of new investments plants must undertake to reduce pathogen levels over time. The USDA estimates the

costs of the Pathogen Reduction Regulation at \$1.1 to 1.3 billion over the next 20 years. Recent research has shown that specific costs at some plants may be 30 to 100 times higher than USDA estimates, although still only 1 to 2% higher than current total processing costs. Furthermore, the costs of improving food safety have been shown to increase sharply with efforts to achieve very low levels of hazard. Thus, the level of the standard will determine the increases in processing costs.

The salmonella standard of no more than 7.5% of samples was based on average industry levels in tests conducted by USDA before the regulation took effect. The USDA's nationwide test results show that most plants are below this average; there are a few plants with much higher levels of salmonella. Use of this outcome standard is intended to force plants producing food with higher risks to consumers to change their practices to produce a measurable improvement in food safety. These plants with higher levels might have low costs to achieve initial reductions in pathogens or they may face unique situations that create much higher than average costs for reducing pathogens. Whether improvements in these plants will result in widespread reductions in food borne illness is also unknown. Thus, the economic impact of this kind of standard is still unknown, and needs to be considered in setting any new standard.

What kind of standard will be most efficient in achieving improved food safety? Standards can be specified either by requiring a certain product outcome, such detection of salmonella in no more than 7.5 percent of samples, or by requiring that certain processes be used in production, such as specific sanitation procedures. Economists argue that product outcome standards lead to lower costs over time, because firms can choose how to meet such standards

and find ways to reduce costs. Process standards force firms to use the same procedures, which may or may not make sense when there are changes in technologies or knowledge about hazards. An outcome standard provides accountability to the public and transparency to industry that ensures regulation is enforced in the same way for all plants. In practice, it is difficult and expensive to test food products, so food safety standards are often a mix of product outcome and process standards.

The Pathogen Reduction Regulation combines both kinds of standards. It requires certain processes (e.g. a HACCP plan with monitoring and record-keeping) but also requires outcome measures such as e.coli and salmonella tests. The court ruling reduces the importance of the salmonella tests as an outcome standard, although both e.coli and salmonella tests will continue to provide information to USDA about how well HACCP is working to reduce pathogens. It would enhance the long run efficiency of the Pathogen Reduction Regulation if scientists can agree on appropriate performance standards for microbial pathogens in meat. This would encourage firms to find ways to reduce the incidence of these pathogens in the food supply.

Analysis of these issues regarding responsibility for risks and costs, balancing costs and benefits, and achieving public health with least cost all point to the desirability of setting clear standards for microbial pathogens. Both consumers and ultimately industry would be better served by standards that are well understood. This may require changes in the meat and poultry inspection laws, as well as further research to determine the best sampling and testing methods.

This article was first published in Policy Forum by the Institute of Government and Public Affairs at the University of Illinois. ❖

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Health Care and the Local Economic Vitality of a Rural Illinois County

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While many people think of rural economic development efforts in terms of the attraction of major employers, such as a new manufacturing facility, the health care sector can make a significant contribution to the economy of a rural county. The Illinois Rural Health Workshop, a joint program of the University of Illinois Extension and the Illinois Area Health Education Consortium, works with rural Illinois counties to help local leaders understand the economic contribution of health care in their community, as well as to develop strategies to strengthen locally provided health care in rural Illinois. A recent study that I conducted with David Hancock details the economic contribution of the health care sector in DeWitt County, Illinois and addresses many issues faced by rural Illinois counties in the areas of rural health care and economic development.

The objective of our DeWitt County study was to assess the economic impact of the health care sector on the local economy. Specifically, we sought to answer the following questions:

- What is the economic contribution of locally provided health care in DeWitt County in terms of employment, incomes, and retail sales?
- What is the structure of locally provided health care in DeWitt County? What services are

provided? Who are the providers?

- How does the health care sector fit in with local community and economic development efforts?

To answer these questions in the DeWitt County study, we gathered data on the county from available health and economic development databases, interviewed local leaders from government, economic development, and health care, and constructed an input/output model of the local economy.

From the background data we learned that DeWitt County, with a population of 16,798 in 2000, has experienced slower population growth (1.7%) over the previous decade than the Illinois average (8.6%). In addition, compared to the Illinois average (12.1%), a greater proportion of DeWitt County residents are age 65 years and older (15.9%). With regards to employment, DeWitt County experienced a 7.8% decline in nonfarm employment over the period 1990-1999, whereas Illinois saw 15% growth in non-farm employment over the same period. The demographic and employment situation in DeWitt County relates directly to the demand for and availability of local tax funds for the support of locally provided health care services.

Our study found that health care contributes significantly to DeWitt County's employment and income. In 1999, the health care system generated 611 jobs directly from employment in hospitals, doctors' offices, nursing homes, and other health care services. However, when we measure the secondary impact of economic activity in the DeWitt County health care system through the effects of supplier firms and health care employee spending, we estimate the total employment effect of health care to be 748 jobs (Table 1). Table 1 reports our estimated employ-

Table 1. DeWitt County health care system employment multipliers (IMPLAN 1999).

Sector Name	Employment	Type SAM Multiplier	Total Employment
Pharmacies	35	1.09	38
Doctors and Dentists	93	1.36	126
Nursing and Protective Care	220	1.14	250
Hospitals	179	1.28	229
Other Medical and Health Services	84	1.25	105
TOTAL	611		748

ment multipliers (the amount of employment in other sectors of the economy attributable to activity in the health care sector on a per position basis) at the sub-sector level. When we examined the impact on incomes in DeWitt County, we found that health care directly contributes \$12.98 million to DeWitt County incomes. However, secondary effects from the health care sector generate an additional \$3.13 million in income, leading to a total contribution of the sector of \$16.11 million (Table 2).

The local leaders from the business, government, and health care sectors we interviewed raised a number of points about the relationship between locally provided health care and economic development in DeWitt County. Local leaders realize that a quality local health care system is an important contributor to the quality of life of county residents and an important factor in the location decisions of businesses seeking to locate in DeWitt County. One issue identified in the interviews with leaders was the difficulty of getting local residents who work outside of the county and receive health insurance from their employers to have the ability to see DeWitt providers. Another issue identified from the interviews was the mixed perceptions of local health care by some residents. While nearly all residents with exposure to the hospital had a favorable impression of the services delivered, some residents were unaware of services available locally. In addition, some members of the local health care sector were not aware of what services were available locally. Another issue identified from our interviews with local leaders was the lack of awareness of how local health care can con-

tribute to the local economy and contribute to future economic development efforts. Some health care and economic development leaders saw local health care and economic development as isolated fields without fruitful potential for interaction. However, our experience around Illinois, as well as community development research, emphasizes the potential for economic gains if health care and local economic development can partner together on issues of shared interest, such as workforce development programs, tapping into economic development financing for expansion of local health care services, and advocacy on health care issues that affect the business climate.

To sum up, we found that DeWitt County possesses a strong local health care system. In addition to its ability to meet the health care needs of local residents, this system acts as a major cog in the local economy. However, several issues, such as community perceptions of the local health care system, the role of health care in development efforts, a lack of awareness of locally available services, and insurance problems appear to exist, which hinder the health care system from maximizing its potential contributions to the health of residents and to the health of the local economy. Addressing these issues will further increase the contribution of the local health care sector to the DeWitt County economy and the quality of life of its residents.

To learn more about the Illinois Rural Health Workshop or obtain a copy of the DeWitt County study (or another report we have completed), please visit the website at www.ace.uiuc.edu/ruralhealth. ❖

Table 2. DeWitt County health care system income multipliers (IMPLAN 1999).

Sector Name	Income	Type SAM	
		Multiplier	Total Income
Pharmacies	\$513,000	1.20	\$615,254
Doctors and Dentists	\$2,435,000	1.29	\$3,133,804
Nursing and Protective Care	\$3,141,000	1.21	\$3,794,765
Hospitals	\$5,143,000	1.24	\$6,370,464
Other Medical and Health Services	\$1,752,000	1.26	\$2,200,333
TOTAL	\$12,984,000		\$16,114,620

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