



## A Statement from the Editors

Welcome to our fourth issue of *Choices*. Please keep in mind the following:

- *Choices* is a good communication vehicle, reaching a large number of readers. Importantly for academics, all articles appearing in *Choices* are peer reviewed. During the period January 1, 2005 to March 31, 2005, our *Choices* website has had 256,732 total hits, representing the total number of requests made to our server. There were 116,033 hits during the 4<sup>th</sup> Quarter of 2004. Consequently, awareness of *Choices* seems to be on the rise. Most of these hits came from the United States, but many also are from countries worldwide.
- We need outreach partners. Please help us reach more people with mailing lists who can join in our outreach partner campaign. See our plea and forms to nominate or agree to be a partner at <http://www.choicesmagazine.org/outreach.htm>. In this regard, we are pleased to welcome several new outreach partners, including CattleNetwork.com, which will consider redistributing our web page and email announcements to their 15,000 subscribers. Outreach partners are important, not only in helping us increase readership, but also in helping us maintain relevance.
- We are trying to get issues out on time. After this issue, we will strive to publish at the end of each quarter of the year. Please note that our thematic coverage in this issue centers on economic incentives, public policies, and private strategies to control foodborne pathogens, as well as on forces shaping trade—specifically, the WTO, trade agreements, and market integration. Future themes will focus on supply chains, nonmarket valuation, biofuels, GMOs, checkoff programs, the Farm Bill, and tilling Latin American soils.
- Please send us content. We would like to see the profession begin to participate in developing thematic and grab bag submissions. For submission requirements, please refer to <http://www.choicesmagazine.org/submissions.htm>. We also would like any contributions centered on the Washington Scene—that is, hot issues involving public policy.

### Contents of Vol. 20, No. 2:

Washington Scene ..... 93

#### **Theme: Economic Incentives, Public Policies, and Private Strategies to Control Foodborne Pathogens**

Economic Incentives, Public Policies, and Private Strategies to Control Foodborne Pathogens ..... 95

The Case in Support of Restaurant Hygiene Grade Cards .. 97

The Response to BSE in the United States. .... 103

Opportunities for the Coregulation of Food Safety: Insights from the United Kingdom. .... 109

Economics of Private Strategies to Control Foodborne Pathogens ..... 117

Supply Chain Contracts and Food Safety. .... 123

#### **Theme: 2005 Forces Shaping Trade: The WTO, Trade Agreements, and Market Integration**

Forces Shaping Trade: The WTO, Trade Agreements, and Market Integration ..... 129

The WTO Agricultural Negotiations: Progress and Prospects ..... 131

Regional Trade Agreements and Implications for US Agriculture: The Case of CAFTA-DR ..... 137

The WTO Cotton Case and US Domestic Policy ..... 143

Food Chain Disruptions and Trade: The Importance of North American Market Integration ..... 149

#### **Grab Bag**

Farmers and Social Security Reform ..... 157

The Business of an Agricultural "Way of Life" ..... 161

Beef Packers' Captive Supplies: An Upward Trend? A Pricing Edge? ..... 167

Coming Attractions ..... 173





## Washington Scene

Coordinated by Joe L. Outlaw, Co-editor, *Choices*

Early summer in Washington, DC is normally one of the busiest times of the year, as Congress tries to move legislation along before their summer break. This year is no exception. There are a number of important issues working their way through Congress that could affect the US agricultural sector.

Both the House and Senate have passed agricultural appropriations bills. As usual, there are notable differences that will have to be addressed in conference committee. One of these differences is the House provision that would delay mandatory country-of-origin labeling (COOL) for a year. The Senate bill does not have similar language. There is also a significant difference in a \$300 million item for food aid involving USAID.

Congress is again trying to pass an energy bill. Recall that energy bill legislation was one of the initial requests President Bush made to Congress after he was elected. Each of the past few years, Congress failed to pass an energy bill for various reasons. Two of the most controversial bills were related to drilling in the Arctic National Wildlife Refuge (ANWR) and liability protection for US oil interests from litigation over groundwater contamination from the oxygenate MTBE; these remain issues. The size of the renewable fuels standard is also an issue. Currently, the renewable fuels standard requires refiners to use a minimum of two billion gallons of renewable fuels. The Senate bill raises the standard to eight billion gallons by 2012, and the House version increases the standard to five billion gallons. The House of Representatives passed its version of the energy bill in April and is waiting to conference with the Senate.

Attempts to reopen Japan's borders to US beef were making slow progress, but the recent discovery of a second BSE-positive animal will likely halt progress for some time.

### Agriculture Secretary Mike Johanns Announces 2007 Farm Bill Forums

Beginning with the first Farm Bill Forum in Nashville, TN held July 7, 2005, Johanns and other senior USDA officials will participate in Farm Bill Forums to be held across the country in 2005. Dates, locations, and times of the forums will be available on the USDA website at <http://www.usda.gov/farmbill>. The public will be invited to attend the forums and to provide oral comments. As the current farm bill covers a diverse array of program areas, six topics have been identified to provide a framework for the forums. The primary topics addressed at the forums will reflect various concerns affecting rural America, such as commodity, conservation, and rural economic development issues. In addition, some forums will be dedicated to other important programs authorized by the farm bill, such as food assistance, research, and education programs.

Two important agricultural trade issues are currently being debated in Washington. First is the proposed vote to pass (or reject) the US–Central American–Dominican Republic Free Trade Agreement (CAFTA–DR) in Congress. Second is the June 9, 2005, decision by a NAFTA panel to remand the US International Trade Commission's October 2003 determination to impose 14.15% antidumping and countervailing duties on certain US imports of Canadian hard red spring (HRS) wheat.

### CAFTA-DR

The Senate Finance and House Ways and Means Committees approved draft implementing legislation for the CAFTA-DR FTA on June 14 and June 15, 2005, respectively, in informal nonbinding markup sessions. The Senate Finance Committee voted the CAFTA-DR out of committee with one amendment—a proposal to extend Trade Adjustment Assistance to service-sector workers whose jobs would be affected by the agreement. In the House, an amendment was passed that requires the administration to report on labor capacity building and di-

rects the president to report, after one year, the effect of the agreement on the services industry. The committees' approval of the draft legislation opens the way for the president to submit the FTA for final congressional approval. Once submitted, lawmakers will have 90 legislative days to either pass or defeat the agreement on an up-or-down vote procedure. Although it covers all industrial and agricultural products, CAFTA-DR supporters contend that the agreement will enhance US exports of manufactures and agricultural commodities, such as grains, cotton, soybeans, and poultry (Tanner, 2005). The agreement's opponents fear erosion of the US manufacturing base in textiles (Graham, 2005); sugar producers are concerned about the impact of increased in-quota access for CAFTA-DR sugar under the TRQ. The US International Trade Commission (USITC) prepared a report (*US–Central America–Dominican Republic Free Trade Agreement: Potential Economy-wide and Selected Sectoral Effects*), as required by US trade law, for consideration of the impacts of the agreement.

### NAFTA Panel Remand on Wheat

There are currently 14.15% US antidumping and countervailing duties imposed on certain US imports of Canadian hard red spring wheat. On October 3, 2003, the USITC determined that such imports were injuring US farmers; on November 24, 2003, the Canadian Wheat Board filed a request for a NAFTA panel review of the USITC's determination of injury of such hard red spring wheat imports; and on June 9, the NAFTA panel remanded the USITC injury determination (Elliot, 2005). The panel granted the US government 90 days until September 6, 2005, to justify its injury decision and requested that the government answer nine questions and come up with a new determination.

### For More Information

Elliot, I. (2005). U.S. ordered to review injury in wheat case. *Feedstuffs*, 77(25). Available on the World Wide Web: <http://www.feedstuffs.com>.

Futures and Commodity Market News. (2005). *CWB calls NAFTA wheat decision a "decisive victory."* Available on the World Wide Web: <http://news.trading->

[charts.com/futures/0/5/67214750.html](http://charts.com/futures/0/5/67214750.html).

Graham, Senator Lindsay. (2005).

Letter to Governor John Engler, President, National Association of Manufacturers. *World Trade Online*.

North Dakota Wheat Commission. (2005). *Canada's wheat subsidies to receive another look*. Bismarck, ND: NDWC. Available on the World Wide Web: [http://www.ndwheat.com/in/news/news\\_detail.asp?ID=288](http://www.ndwheat.com/in/news/news_detail.asp?ID=288).

Tanner, Congressman John. (2005). CAFTA vital for national security, Tennessee farmers. *World Trade Online*.

United States House Committee on Ways and Means. (2005, June 15). *Committee approves draft DR-CAFTA legislation* (press release). Washington, DC: US House of Representatives. Available on the World Wide Web: <http://waysandmeans.house.gov/News.asp?Form-Mode=release&ID=316>.

*Thanks to Cathy L. Jabara and Ronald A. Babula, US International Trade Commission, Tamara Wag-ester, C-Fare, and Annette Clauson, USDA ERS, for their contributions to this piece.*



# Economic Incentives, Public Policies, and Private Strategies to Control Foodborne Pathogens

By Tanya Roberts

New scientific and management knowledge in both public and private sectors is improving economic incentives for food safety. New threats, such as bovine spongiform encephalopathy (BSE, popularly known as “mad cow disease”) are altering global markets. Market incentives for food safety are relatively weak, however, because food safety is a credence good. Even after food has been consumed, the lag between consumption and illness hinders identification of the contaminated food. Food safety information is improving because of new testing and surveillance methods as well as new public and private control initiatives. Better supply chain control systems are being invented and used from farm to fork. Recent food safety innovations have been spurred by stringent standards demanded by large buyers—domestic and overseas—and by regulatory agencies.

The public and private sectors are in a food safety dance. Hazard Analysis and Critical Control Point (HACCP) systems started as a private-public partnership to develop safer food for US astronauts. Some firms were early adopters of HACCP to prevent pathogens from entering, surviving, and growing in their production processes. Starting in the mid-1990s, the Food and Drug Administration and the United States Department of Agriculture Food Safety and Inspection Service required HACCP for seafood, meat and poultry, juice, and shell eggs. Regulatory HACCP system requirements differ, and each plant has to develop and monitor its own HACCP system for the foods it produces. HACCP systems are evolving as regulators, scientists, corporate managers, and economists apply new scientific information, innovative equipment, and new pathogen tests and management strategies. Some companies are using continuous food safety innovation as a competitive strategy.

## Articles in this Theme:

<b>Economic Incentives, Public Policies, and Private Strategies to Control Foodborne Pathogens.....</b>	<b>95</b>
<b>The Case in Support of Restaurant Hygiene Grade Cards ..</b>	<b>97</b>
<b>The Response to BSE in the United States.....</b>	<b>103</b>
<b>Opportunities for the Coregulation of Food Safety: Insights from the United Kingdom .....</b>	<b>109</b>
<b>Economics of Private Strategies to Control Foodborne Pathogens .....</b>	<b>117</b>
<b>Supply Chain Contracts and Food Safety.....</b>	<b>123</b>

In this issue of *Choices*, we explore the complex world of global food safety and the evolving economic incentives. The economics of food safety is a relatively new area of research. New models and improved understanding of the public policy/private strategy interface are bridging scientific disciplines and bringing new understanding to food safety issues. Not only are global markets at stake, but foodborne pathogens cause acute illness in 76 million US consumers, 5,000 deaths, and an unknown number of chronic complications annually.

Throughout the United States, consumers rely on local health authorities to regulate and inspect restaurants in an attempt to assure that high-quality hygiene standards are maintained. How effective are the regulations and inspections by public health authorities at assuring good-quality restaurant hygiene? Jin and Leslie study restaurant hygiene and the role played by health inspections. In January 1998, Los Angeles implemented a critical change in their regulations leading to a dramatic improvement in restaurant hygiene—restaurants are required to prominently display in their window a letter-grade card (A, B, or C)

corresponding to the result of their most recent hygiene inspection. They analyze a variety of different data to assess the effects of these grade cards on restaurant hygiene, restaurant revenue, restaurant prices and output, behavior of inspectors, and, most importantly, the occurrence of food-related illnesses.

Prior to the December 2003 discovery of a cow with BSE in Washington State, the United States implemented measures to prevent the disease from entering the country and to prevent its spread if it were found. Following that discovery, additional measures were introduced both to safeguard public health and reassure domestic and foreign consumers about the safety of US beef. Fox et al. review the various measures that have been taken and additional measures that have been proposed

and discuss the efficiency of the US response to the disease.

Fearne and Garcia Martinez note that growing concern about food safety is pressuring government agencies to be more prescriptive and proactive in their regulation of the food industry. Given the scarcity of public sector resources and the scale of the task at hand, however, there is growing interest in the notion of coregulation, with public and private sectors working hand in hand to deliver safer food at lower (regulatory) cost. This paper explores the opportunities for and some of the barriers to coregulation of food safety from a UK perspective.

To maintain a reputation or to meet contractual or regulatory requirements, firms choose different target levels of pathogen control for various meat and poultry products.

Roberts finds that private strategies to control pathogens are diverse and that supply chain control is crucial. Public information and regulations strengthen private incentives for pathogen control. Starbird uses a principal agent model to examine the design of supply chain contracts and improve the safety of purchased inputs. The opportunity to use supply chain contracts to improve food safety exists even when food safety is difficult to measure.

*Tanya Roberts is a senior economist with the Diet, Safety, and Health Economics Branch of the Economic Research Service, United States Department of Agriculture, Washington, DC. The views expressed in this article are not necessarily those of the USDA.*



# The Case in Support of Restaurant Hygiene Grade Cards

By Ginger Zhe Jin and Phillip Leslie

Throughout the United States, consumers rely on local health authorities to regulate and inspect restaurants in an attempt to assure that high-quality hygiene standards are maintained. Few people would argue that this is unimportant. If hygiene were left unregulated and unmonitored, it is likely that restaurant workers would shirk in their efforts to maintain good hygiene, and customers would generally have little idea that their meals may have been prepared without meeting appropriate health standards. Of course, not all restaurants would be irresponsible in this way, but it only takes one shirking restaurant to give rise to a public health emergency.

How effective are the regulations and inspections by public health authorities at assuring good-quality restaurant hygiene? We have studied restaurant hygiene and the role played by health inspections in Los Angeles County over a three-year period (1996–1998). Our research indicates that restaurant hygiene regulations and inspections are a fairly imperfect device for assuring good-quality hygiene. However, in January 1998 the Department of Health Services (DHS) in Los Angeles implemented a critical change in their regulations that led to a dramatic improvement in restaurant hygiene—restaurants were henceforth required to display prominently in their window a letter-grade card (A, B, or C) corresponding to the result of their most recent DHS hygiene inspection. We analyzed a variety of different data to assess the effects of these grade cards on restaurant hygiene, restaurant revenue, restaurant prices and output, behavior of DHS inspectors, and, most importantly, the occurrence of food-related illnesses. We also explored the differential effects of the grade cards on different types of restaurants.

## Weak Incentives for Good Hygiene in the Absence of Grade Cards

Before the grade cards were introduced in Los Angeles, DHS inspectors would randomly inspect restaurants about twice a year. During these inspections, the inspector would explain to the restaurant staff where violations occurred, tell them to fix these problems, and offer general advice on how to maintain good hygiene. Restaurants were given a score out of 100, with prespecified points being deducted for each violation. For example, a food temperature violation results in a five-point deduction, and evidence of cockroaches results in a three-point deduction. However, there are no fines for these violations, and a restaurant is only closed in severe cases such as an infestation, or if a restaurant received two consecutive scores below 60. Even then, it would be closed only for the time it took to fix the problems. Hence, a restaurant could consistently have many violations and incur little penalty. Furthermore, the assigned hygiene scores were not made available to the public.

It would be wrong to argue that restaurants had zero incentives to maintain good hygiene in the absence of grade cards. On the regulatory side, inspectors provide education about safe food-handling practices and require at least one certified food handler be present in each restaurant. This probably causes some hygiene improvements. On the consumer side, consumers are not completely ignorant about restaurants' hygiene qualities. Consumers may observe some aspects of restaurant hygiene (such as bathroom cleanliness). Consumers may also learn from experience and form beliefs over time about the hygiene at certain restaurants. These consumer beliefs may provide incentives for restaurants to form and maintain reputations for providing good hygiene.

In search of evidence of reputational incentives for restaurant hygiene, we measured a restaurant's hygiene condi-

tion by the average hygiene scores across all the inspections that restaurant received before graded cards. We found that chain-affiliated restaurants develop reputations for good hygiene quality, which provides an incentive to maintain good hygiene, leading to better hygiene than non-chain restaurants on average (Jin & Leslie, 2005). We also showed that franchised chain restaurants tend to have lower hygiene quality than company-owned chain restaurants, indicating that franchised units tend to free-ride on the chain reputation to some extent.

There is also variation across neighborhoods in the degree of repeat customers at restaurants, which affects the ability of restaurants to form reputations. For example, in locations with many tourists (who are not repeat customers), restaurants may be less able to develop reputations for good hygiene; hence, these restaurants tend to have worse hygiene. Our analysis showed that regional variation in the degree of repeat business has a significant effect on restaurant hygiene quality.

We concluded that hygiene regulations and inspections (without posted grade cards), as well as free-market reputation mechanisms, provide some degree of incentives for restaurants to maintain good-quality hygiene. However, these incentives are likely weak, as many aspects of restaurant hygiene are unobservable to consumers, and inspectors cannot punish a restaurant for violations if the restaurant's hygiene score is above 60. This may be why only 25% of restaurants in Los Angeles had the equivalent of A-grade hygiene before the grade cards were introduced in 1998.

## **Grade Cards Lead to a Reduction in Food-Related Illnesses**

By posting grade cards in restaurant windows in 1998 in Los Angeles, the DHS increased the provision of information to consumers about restaurant hygiene quality. From a public health point of view, the key question is whether the increased information generates any improvement in health outcomes. An ideal answer to this question requires data on the number of people who get sick from eating at restaurants. But, obviously, most people get sick and spend an unpleasant day at home without this being recorded by any kind of authority. Even when there is a visit to a doctor, it is not recorded in a central database of such incidents.

However, in California we have access to data on people who are admitted to hospitals. This data comes from the California Office of Statewide Health and Planning Development. Using this data, we observed the number of people admitted to hospitals with specific diagnoses each month in each three-digit zip code for the period January 1993 to 2000. We determined which diagnoses were almost certainly due to unsafe food by following the criteria of a prior study (Mead et al., 1999) and independently with the help of medical specialists.

We used the data for all periods before and after the grade cards were introduced. We compared the number of food-related hospitalizations in the zip codes in Los Angeles to (a) the number of hospitalizations for non-food-related digestive disorders in zip codes in Los Angeles and (b) the number of hospitalizations for food-related illnesses in zip codes in the rest of California. Our approach was to estimate a regression model in

which the dependent variable was the log of the number of people admitted to hospital with a particular kind of diagnosis in a particular month and zip code. The independent variables were binary indicators for each zip code and illness-type combination, binary indicators for year and month, and a binary variable equal to one for zip codes in Los Angeles after the introduction of grade cards.

Estimating this regression model, we found that the introduction of grade cards in January 1998 in Los Angeles corresponded to a 20% decrease in the number of people admitted to hospitals with food-related illnesses. The estimate is significantly different from zero with 99% confidence. This was a discrete change exactly at the time of the grade cards, leading us to suspect strongly that this reduction in food-borne illnesses was because of the grade cards.

Remember, this finding was based on data for hospitalizations. These were very sick people that needed to spend at least one night in hospital. It is unclear whether grade cards affected less severe cases of food-related illness. It is conceivable this broader effect may be either larger or smaller than 20%. We do not know the answer to this.

There are two ways the grade cards may lead to improved health outcomes. First, the grade cards may cause restaurants to make actual hygiene improvements. Second, they enable consumers to substitute demand away from poor-hygiene restaurants in favor of good-hygiene restaurants. Under the second mechanism, even if restaurants make no actual improvements, we could still find a decrease in the incidence of food-related illnesses. We refer to this as a *sorting effect*, because consumers sort themselves across restau-

rants with different hygiene grades. From the point of view public health, it does not matter if only the sorting effect applies. However, it would be interesting to know whether the grade cards cause restaurants to make actual improvements, which also contribute to the apparent improvement in health outcomes.

We developed a model of consumer sorting, which we estimated using the combined revenue and inspection grades data. Specifically, we obtained permission from the California State Board of Equalization to access confidential sales-tax data for all restaurants in Los Angeles county in 1996, 1997, and 1998. This data allowed us to infer each restaurants' quarterly revenues during this period. We matched this data to the DHS hygiene inspection scores of each restaurant over the same period of time.

In order to disentangle consumer sorting effects from actual hygiene improvements by restaurants, we separated restaurants into three groups—A, B, and C or below—according to their hygiene scores before grade cards. Suppose each group represents a specific risk of food-borne illnesses, and restaurant revenue is a good proxy for consumer flows to these restaurants. If posted grade cards generated no actual improvement in restaurant hygiene, but motivated consumers to sort into better restaurants, the improvement in foodborne hospitalization should follow a specific pattern, given restaurant revenues and the risk of food-borne illnesses in each type of restaurant. If the actual health improvement exceeds the predicted sorting effects, it is likely due to actual hygiene improvement by restaurants. Using econometric techniques, we showed that both effects do in fact contribute to the decrease

in food-related-illness hospitalizations. Full details are available in Jin and Leslie (2003).

### **Grade Cards Magnify Economic Incentives for Good-Quality Hygiene**

The above analysis suggests that restaurant owners have made efforts to improve hygiene after the introduction of grade cards. We argue that this is because grade cards magnify economic incentives for good-quality hygiene.

The 1996–1998 revenue data allowed us to analyze whether consumers are responsive to the grade cards. We found that before the grade cards, changes in restaurants' hygiene quality (as measured by the DHS inspection scores) had no impact on restaurant revenue. This is consistent with consumers having limited ability to assess restaurant hygiene. After the grade cards were implemented, if a restaurant received an A grade, their revenue increased by 5.7% relative to their revenue when there were no grade cards. For restaurants that received a B grade, revenue increased by 0.7%. For a C grade, revenue decreased by 1%.

The analysis of the revenue data verifies that after grade cards, consumers become sensitive to restaurant hygiene when choosing which restaurants to patronize. Critics of the grade cards argue that consumers may be misled—the fact that a restaurant obtained an A during an inspection does not ensure the restaurant has A-grade hygiene at other times. This is true. However, before the grade-card system was implemented in Los Angeles, the average difference in DHS inspection scores between two randomly chosen restaurants was 13.5. Meanwhile, the average difference in scores between

two randomly chosen inspections at a single randomly chosen restaurant was only 8.8. The point is that there tends to be much greater variation in hygiene across different restaurants than there is at any individual restaurant over time. Hence, although grade cards don't assure consumers that the restaurant has the posted grade at other times, they provide valuable information about which restaurants are more likely to have better hygiene. Grade cards are an informative, although imperfect, signal.

The revenue analysis also suggests that restaurants may actually benefit from the grade cards. The impact on revenue varies according to the grade and is positive for A and B-grade restaurants. Revenue is not the same thing as profit, and we have no information on the cost for restaurants to obtain an A or B. As noted above, about 25% of restaurants already had the equivalent of A-grade hygiene, so for these restaurants there was only upside to the grade cards. Some restaurants will incur significant costs to improve hygiene to become an A or B, and in these cases it is conceivable the grade cards have reduced their profits. However, these are the worst hygiene offenders, so policymakers may be unsympathetic with these restaurants.

The grade cards stimulate demand for good-hygiene restaurants, raising the possibility that restaurants may also increase prices, which would be bad for consumers. Revenue equals price times quantity, and so the fact that revenue has increased at good restaurants implies we can only rule out the possibility that both price and quantity have fallen. It could be that price has increased and quantity has fallen, with a net positive impact on revenue.

We are unaware of restaurant-level data on prices. To shed light on the possible impact of the grade cards on prices, we examined price indices constructed by the Bureau of Labor Statistics. Specifically, we looked at the monthly price index for “food away from home” in the combined region of Los Angeles, Riverside, and Orange counties (LRO). This is the least aggregated price index available that includes Los Angeles restaurant prices. Note that Los Angeles has more than twice the combined population of Riverside and Orange counties. We compared this index with the same product category in regions other than LRO<sup>1</sup> and with other consumer price indices<sup>2</sup> within LRO. The data cover the time period January 1991 to February 2001.

In separate regressions we examine the dependent variables: (a) prices over time for food away from home in various regions and (b) prices over time for various goods categories within LRO. Explanatory variables were a grade-card dummy (1 for food away from home in LRO in all months after January 1998) and binary indicators for year, month, region, and goods category. The level of the price index for food away from home in LRO in December 1997 is 171.1. In the cross-region regression, the coefficient on grade cards was estimated to be -2.14, suggesting a 1.25% price drop in LRO after 1998 as compared to non-LRO regions. In

the cross-categories regression, the coefficient on grade cards was estimated to be -5.78, suggesting a 3.38% drop in the price of food away from home as compared to other industries within LRO. In both cases, the estimates are statistically different from zero with 99% confidence.

Because revenue is equal to price times quantity, an overall increase in restaurant revenue and a decrease in the price index suggests that output may have increased after grade cards. This conjecture is confirmed when we compare the total number of people employed in the food industry in and out of Los Angeles county, as well as before and after graded cards within Los Angeles county. (More details are available at Jin and Leslie, 2003). Decreased price and increased output may be explained by the grade cards lowering search costs for consumers, leading to more intense competition among restaurants. In other words, the grade cards make consumers more confident about trying restaurants they have not experienced before and make them less captive to the restaurants they have had good experiences at.

### **Grade Cards Make Inspectors Slightly More Lenient**

The revenue analysis verified that the restaurant hygiene grade cards create an economic incentive for restaurants to obtain an A grade. However, these incentives may also affect the behavior of inspectors, probably because the grade cards cause restaurant managers to pressure inspectors during an inspection. In our conversations with DHS inspectors, it was clear that inspectors feel much more pressure from restaurants than they did before the grade cards. For example, an unhappy restaurant manager may complain of discrimination by the

inspector. This is of course not surprising—restaurants will do what they can to obtain an A; this includes improving hygiene as well as pressuring inspectors.

Some evidence is highly suggestive that the grade cards cause inspectors to become more lenient in their inspections. Before the grade cards, the distribution of inspection scores was a smooth bell-shaped distribution. After the introduction of grade cards, there is a dramatic upward spike in the distribution at the score of 90, which is the cut-off score for obtaining an A grade. There is also a downward spike at 89. A similar pattern occurs around the cut-off for a B grade.

One interpretation of this pattern, which is also consistent with the anecdotal evidence from inspectors, is that inspectors choose to “bump up” a score of 89 to 90 so that the restaurant is not punished because of one point. As long as inspectors do not bump up restaurants which deserve even lower scores, this is a mild form of grade inflation. However, monitoring from the DHS is needed to ensure that the grade inflation does not become worse over time.

A final point of interest: Before the grade cards, the average DHS inspection score for restaurants in locations where residents have income below the Los Angeles median was 74.5. For restaurants in locations with income above the median, the average score was 78.8. In the first year after the grade cards, the averages increased to 89.8 and 89.5, respectively. Hence, grade cards appear to be particularly effective at improving restaurant hygiene in low-income areas.

1. *Comparison regions include San Francisco-Oakland-San Jose counties, Chicago-Gary-Kenosha counties, and New York-Northern New Jersey-Long Island counties.*
2. *Comparison industries include food at home, alcoholic beverages, and all items.*

## Conclusion and Further Thoughts

In conclusion, the use of restaurant hygiene grade cards in Los Angeles has been a great success. By increasing the provision of information to consumers, powerful economic incentives are created for restaurants to improve hygiene, leading to a significant improvement in public health outcomes. Moreover, because the DHS already perform inspections, the grade cards create negligible additional cost for the government.

Three factors seem to have contributed to the successful implementation of the grade cards in Los Angeles County. First, the grade-card policy was adopted in response to a three-part report aired on CBS 2 News on the Los Angeles-based Channel 2000 on November 16–18, 1997. The report, “Behind the Kitchen Door,” used hidden cameras to show viewers unsanitary restaurant kitchens. The TV exposé had an immediate influence—it raised consumer awareness about restaurant hygiene, highlighted the weakness of the existing system, and added political pressure for regulatory change.

A second key factor is the format of the grade cards. There are many ways to disseminate hygiene inspection results. Rather than issue a grade card to be displayed in the front window of a restaurant, Los Angeles County government could publicize the inspection reports online (which has been adopted recently in New York City) or require every restaurant owner to provide the most recent hygiene report if a consumer asks for it (which is the state law of California). The policy of “available upon request” was apparently insufficient for maintaining good restaurant hygiene. This was confirmed by Tribbey (2005), who reported a very

low degree of compliance with the state law in Napa, CA. As for internet posting, we are not aware of any study examining the impact of publicizing inspection reports in an online database. Arguably, grade cards reach more consumers and are more readily available to consumers than an internet database. According to what we have seen in Los Angeles County, wide access to the inspection results plays a critical role in enhancing consumer awareness of restaurant hygiene, thus reinforcing the economic incentives for restaurants to improve hygiene quality.

Within the format of grade cards, the DHS could print the numerical inspection score instead of a simple letter grade on the card. In fact, some counties in North Carolina have adopted a “Know the Score” program, which indicates that grade cards must show the letter grade and numeric score in the same size type, side by side (Pytko, 2005). Posting the numerical score may give more information to consumers and alleviate inspector bias around the cutoff of the letter grades. However, it may also entail more education efforts to ensure that consumers understand the details behind the numerical scores. We are not aware of any study evaluating the “Know the Score” program, but the experience in Los Angeles County suggests that letter grades have a clear interpretation to consumers, which is essential for consumers to pay attention to grade cards. Nevertheless, it would be useful future research to examine the issue of what is the ideal form of information to provide consumers.

A third factor contributing to the success of grade cards is the assessment criteria. In Los Angeles, inspectors follow rigid codes that relate specific violations to carefully defined numerical point deductions. By min-

imizing the subjective component in hygiene inspections, the criteria help standardize evaluations across restaurants and inspectors, helping to encourage consumer confidence in the grade cards. Of course, this does not mean the Los Angeles assessment criteria are perfect. There have been concerns that the current criteria in Los Angeles may not reflect the true hygiene conditions and may not give appropriate weights to certain aspects of restaurant hygiene. Although we are unaware of any specific evidence indicating the inspection criteria in Los Angeles may be imperfect, this is surely a topic for ongoing evaluation by public health specialists in Los Angeles as well as the rest of the United States.

Finally, restaurant hygiene regulations fall within the jurisdiction of local governments (to the best of our knowledge). In the case of Los Angeles, the inspections are carried out by county health inspectors, but at least some of the regulations are at the discretion of each city government. For example, the policy of mandatory posting of grade cards that we have studied was a decision made separately by each city government in Los Angeles County. At the other end of the spectrum, the federal government provides guidelines for retail food handling, which are voluntary for local governments to adopt (Food and Drug Administration, 2001). Our research suggests that standardized assessment criterion and mandatory posting of grade cards for every city in the United States would provide significant public health benefits. We cannot help but wonder if the federal government could play a more active role in this respect.

## For More Information

- Jin, G., & Leslie, P. (2003). The effect of information on product quality: Evidence from restaurant hygiene grade cards. *Quarterly Journal of Economics*, 118(2), 409-51.
- Jin, G., & Leslie, P. (2005). *Reputational incentives for restaurant hygiene* (working paper). College Park, MD: University of Maryland. Available on the World Wide Web: <http://www.glue.umd.edu/~ginger/research/reputation-feb05.pdf>.
- Mead, P.S., Slutsker, L., Dietz, V., McCaig, L.F., Bresee, J.S., Shapiro, C., et al. (1999). Food-related illness and death in the United States. *Emerging Infectious Diseases*, 5(5), 607-25.
- Pytko, E. (2005). *Publicly posted health inspection grade cards* (Research Report 2005-R-0403). Hartford, CT: Connecticut General Assembly Office of Legislative Research. Available on the World Wide Web: <http://cga.ct.gov/2005/rpt/2005-R-0403.htm>.
- Tribbey, C. (2005, February 13). Local restaurants skirt the law when it comes to telling diners about cleanliness and health. *Napa News*.
- United States Food and Drug Administration. (2001). *U.S. Department of Health and Human Services Public Health Service Food and Drug Administration 2001 food code*. Available on the World Wide Web: <http://www.cfsan.fda.gov/~dms/fc01-pre.html>.

*Ginger Zhe Jin is an assistant professor of Economics at the University of Maryland, and Phillip Leslie is an assistant professor of Strategic Management at Stanford University. Both authors are affiliated with the National Bureau of Economic Research.*



# The Response to BSE in the United States

By John Fox, Brian Coffey, James Mintert, Ted Schroeder, and Luc Valentin

Since the emergence of bovine spongiform encephalopathy (BSE) in the United Kingdom in the late 1980s, the United States has implemented various measures to prevent the disease from entering the country, to prevent its spread if discovered here, and to safeguard human health. Regulatory actions included import restrictions, a ban on certain ruminant tissues in ruminant feed, and a surveillance program. Additional measures, aimed at reassuring domestic and foreign consumers about the safety of US beef, were implemented following the December 23, 2003 announcement that a dairy cow in Washington State had tested positive for BSE. In the sections that follow, we discuss the US response to BSE under three broad categories—trade policy, food and feed restrictions, and surveillance. Our analysis focuses on the costs associated with various regulatory actions and less so on potential benefits that are more difficult to quantify.

## Trade Policy

Following the announcement of the first US case, 53 countries, including major markets such as Japan, Mexico, South Korea, and Canada, banned imports of US cattle and beef products. This came as no surprise—automatic border closure following such announcements had become standard procedure. The United States itself blocked imports of Canadian beef and cattle following the announcement of the first Canadian case in May 2003.

Border closure in response to a very low BSE incidence in an exporting country is not endorsed by the World Organization for Animal Health (OIE), particularly when control measures are in place. Moreover, although the United States itself had not adhered to OIE guidance on trade, the United States Department of Agriculture (USDA) did initiate regulations to allow imports from countries, specifically Canada, that presented a “minimal risk” of introducing BSE. This minimal risk region (MRR) rule that would reopen the border to imports of Canadian cattle less than 30 months old was to become effective

March 7, 2005. However, in response to a motion filed by the Ranchers-Cattlemen Action Legal Fund (R-CALF), a federal court in Montana granted a preliminary injunction blocking the measure. A hearing to determine whether a permanent injunction should be granted is scheduled for July 27, 2005.

The controversy surrounding the reopening of the Canadian border illustrates the potential gains and losses from any change in trade policy. Although R-CALF may indeed be concerned about the human health risk from Canadian cattle (though some might doubt it), it is clear that US cattle producers, particularly those in the northwestern US, would lose from import competition in the short run. Marsh, Brester, and Smith (2005) estimate that Canadian imports would reduce US feeder cattle prices by \$4.57/cwt. However, in the long run, if adequate cattle supplies are not available locally to keep US packing plants in the region open, producers in the Northwest will lose local cattle markets. Similarly, US producers are losing from the current restrictions on US exports. In 2003, beef exports were valued at \$3.95 billion and accounted for 9.6% of US commercial production. Although some important markets, including Mexico and Canada, did partially reopen during 2004, exports for the year were 82% below 2003. Coffey, Mintert, Fox, Schroeder, and Valentin (2005), in an analysis performed for the Kansas Department of Agriculture, suggest that US beef industry losses from export restrictions during 2004 ranged from \$3.2 billion to \$4.7 billion.

The question we might ask here is whether these trade disruptions and associated welfare losses could have been avoided. Caswell and Sparling (in press) emphasize the importance of an internationally coordinated response to managing risks from diseases such as BSE, and Caswell (in press) argues that the potential trade impacts of BSE discovery were not sufficiently weighted in the BSE risk management process. Thus, if MRR legislation had been enacted prior to the recent discoveries of BSE outside of

Europe, we may never have banned imports of Japanese beef when they discovered their first case in September 2001, nor vice versa. Of course, with the benefit of hindsight, it is easy to point out what might have been. Nevertheless, both Canada and the United States had been warned by the European Union in July 2000 that they were at risk for discovering the disease (Scientific Steering Committee, 2000).

## Surveillance

In 2003, the USDA tested approximately 20,000 cattle for BSE. Countries in which the disease is established have more intensive surveillance—for example, the EU has tested around 8 million head per year since 2001 (Fox & Peterson, 2004). Following the Washington State case, the USDA announced a one-year enhanced surveillance program. The objective was to test as many cattle as possible from high-risk categories—those exhibiting signs of central nervous system disorders, nonambulatory cattle, and those that die on farms—in addition to a random sample of healthy older animals. In various news releases, the USDA stated that a sample size of 268,000 animals would allow for the detection of BSE at a rate of one positive in 10 million adult cattle with a 99% confidence level. That claim, however, is based on the assumption that all cases occur in the targeted high-risk group and that the incidence in nontargeted categories is zero. As of April 2005, 314,000 cattle had been tested under the new protocol with no positive cases identified. Table 1 provides an excerpt from the test results.

The surveillance program has been a source of controversy in areas related to testing protocol, announcement of inconclusive results,

and an incident in Texas in May 2004 in which an animal exhibiting central nervous system symptoms was not tested for the disease. Inconclusive (or false positive) test results are expected with the Bio-Rad rapid screening test used by USDA. The false positive rate is variously estimated at between one in 50,000 to as little as one in 300,000 tests. Thus far, the USDA has announced three inconclusive results—two in June 2004 and one in November 2004—all of which, upon confirmatory testing using immunohistochemistry (IHC), were found to be negative. The initial announcements of inconclusive cases were controversial and led the Animal and Plant Health Inspection Service (APHIS) to revise their announcement procedure—delaying announcement until a sample produced two inconclusive results with the rapid test. Concern about potential market disruption due to false positives is one reason cited by opponents of wider scale or voluntary testing. For example, following the announcement of the third inconclusive test result on the morning of November 18, 2004, most live cattle futures contracts opened around \$2/cwt lower than the previous day's close, and many moved limit down that day. Very light sales in the cash market in the following days were likely the short-run cash market reaction to the news.

At the same time, there has been speculation that the USDA deliberately chose a test with a relatively high rate of inconclusive results as a means of desensitizing markets to the possible discovery of true positive cases (Mitchell, 2004). Also controversial is the USDA's choice of IHC as their "gold standard" test. In February 2005, Consumers Union called on the USDA to retest inconclusive samples using the Western Blot test,

which, they argued, was more sensitive and more objective. According to the Consumers Union, the Western Blot test is used as the confirmatory test in Japan and Europe and had been used previously by the USDA to confirm the December 2003 Washington State case. (See Pruisner, 2004, for more information on BSE testing.)

The future of the surveillance program has not yet been decided. Industry officials have called for it to be scaled back. Not surprisingly, some consumer advocacy groups favor wider scale testing. For example, a March 16, 2005 editorial in *The New York Times* proposed that "the only responsible way to resume international trade in beef is to ensure the health of the cattle. And the only way to do that is to test the cattle—all of them, if need be."

In what turned out to be a particularly thorny issue for the USDA, in July 2004 the agency denied an application by a small Kansas beef processor, Creekstone Farms, for permission to voluntarily test slaughter cattle in an attempt to regain access to the Japanese export market. The beef industry is sharply divided on the issue of voluntary testing. Proponents tend to view it in terms of a marketing decision with expected benefits outweighing costs, at least in the short run. Indeed, our analysis for the Kansas Department of Agriculture (Coffey et al., 2005) suggests a potential net benefit ranging from \$27.50 to \$48.50 per head (before fixed costs) if voluntary testing restored full access to the Japanese and South Korean markets. Opponents argue that BSE testing is unnecessary and costly, that it sets a dangerous precedent in terms of acquiescing to an unreasonable customer demand, and that it is not scientifically valid and provides no risk-

reduction benefit to consumers. Large US meat processor stances regarding BSE testing suggest that the investments and logistics of large-scale testing, in addition to the potential impact on demand of a positive case, are such that it is a losing proposition for bigger firms—perhaps in particular for those diversified either internationally or across meat products. For a single small firm, on the other hand—especially one more heavily reliant on export sales to high-quality foreign markets than the major packers—the situation is different. If voluntary testing provided export market access, it could produce substantial monopoly-type benefits in the short run. Creekstone officials have stated that their increased revenue from regaining access to the Japanese market would far exceed the testing cost of \$20 or less per head. Thus, for Creekstone, the private incentive to pursue testing was fairly clear. It is worth noting however, that this scenario would produce no benefit for producers, because increased demand from a single small firm would have a negligible impact on cattle prices. However, if testing did provide market access, more firms would be attracted to testing, and domestic cattle prices would increase.

Finally, regarding the current surveillance effort, it is not yet clear how successful the USDA has been in its efforts to sample the targeted high-risk groups. The APHIS website provides no breakdown of samples by animal categories (Table 1), in contrast to the UK, where detailed breakdowns for various risk categories in the active surveillance programs are provided (Table 2). Clearly, no one associated with the US beef industry wants to find this disease. However, the perception that officials may have latitude in terms of sample

**Table 1.** Excerpts from the USDA's BSE test results report.

Date	Negative	Inconclusive	Inconclusive result	Positive	Total
<b>Week 45</b> <b>(4/4/05–4/10/05)</b>	9,138	0	—	0	9,138
<b>Week 44</b> <b>(3/28/05–4/3/05)</b>	10,663	0	—	0	10,663
<b>Week 25</b> <b>(11/15/04–11/21/04)</b>	7,900	1	Negative	0	7,901

Note. Data from USDA Animal and Plant Health Inspection Service (2005).

**Table 2.** Excerpts from the UK BSE test results report—2005.

Ongoing surveys (cattle)	Tested	Results pending	BSE not confirmed	BSE confirmed
<b>Fallen stock</b>	18,574	3	18,558	13
<b>Casualties on farm</b>	30,825	11	30,788	26
<b>Casualties at OTMS abattoirs</b>	3,165	0	3,164	1
<b>24–30 month casualty cattle at fresh meat abattoirs</b>	211	0	211	0
<b>Over thirty months (OTM) scheme—random animals (born before August 1996) (before feed ban)</b>	2420	0	2417	3
<b>OTM scheme—animals born after July 1997</b>	28,613	0	28,613	0
<b>Animals sampled as 96/97 cohort (excluding fallen stock, casualties, etc.)</b>	26,726	0	26,726	0
<b>Birth cohorts of BSE cases</b>	380	0	380	0
<b>BSE offspring</b>	43	0	43	0
<b>Animals slaughtered for human consumption: OTM (beef assurance scheme)</b>	22	0	22	0

Note. Data from Defra UK (2005).

selection, rumors about animals not sampled, and allegations by at least one former USDA employee about the mishandling of potentially positive test samples, does not help engender confidence among foreign buyers or policy decision makers. Critics have commented that Germany did not begin to find BSE until it allowed private testing. If the disease is truly not present in the US herd, then the industry has little to fear from allowing expanded private testing. However, what are the odds that the surveillance program in place during 2003 managed to detect the

only BSE-infected cow in a herd of 100 million?

## Food and Feed Restrictions

In January 2004, the Food Safety Inspection Service (FSIS) banned nonambulatory animals and certain tissues designated as specified risk material (SRM) from the human food supply. The new regulations require firms to age animals using postmortem dentition, to deal with nonambulatory animals, and to segregate SRM material. Using data from a survey of meat processors, Coffey et al. (2005) estimated the

additional labor costs of these tasks at approximately \$0.45 per head of plant capacity.

As currently defined, SRM includes the brain, skull, eyes, trigeminal ganglia, dorsal root ganglia, spinal cord, and vertebral column from cattle 30 months of age and older, and the tonsils and the distal ileum of all cattle. In order to ensure complete removal of the distal ileum, the rules required that the entire small intestine be disposed of as inedible. The small intestine rule has been the most controversial aspect of the SRM regulation because for some firms it was a valuable by-product, particularly in some export markets. Coffey et al. (2005) estimated that on average, firms that previously sold small intestines were losing from \$3.23 to \$4.13 per head because of the rule. Other products condemned as a result of BSE regulations include bone-in cuts from over-thirty-month (OTM) animals that contain vertebral column (i.e., T-bone steaks) and product obtained from advanced meat recovery (AMR) using OTM vertebral columns. Coffey et al. (2005) estimated that restrictions on bone-in cuts and AMR reduce per-head revenues by approximately \$8.50 and \$9.36, respectively, on affected OTM animals, while the ban on nonambulatory (downer) cattle resulted in an aggregate loss of approximately \$63 million.

On February 2, 2004, a panel of experts (the International Review Team or IRT) commissioned by the USDA provided recommendations for future actions for managing BSE risk. With regard to feed regulations, the IRT recommended that (a) unless aggressive surveillance showed BSE risk to be minimal, SRM should include the brains and spinal cords of all animals over 12 months and the

entire intestine of all animals; (b) SRM should be excluded from all animal feed including pet food; and (c) all meat and bone meal (MBM), including avian, be excluded from ruminant feed. Earlier, on January 26, the Food and Drug Administration (FDA) announced plans to strengthen the ruminant feed ban that had been in place since 1997. In particular, the FDA said it would eliminate exemptions for bovine blood and plate waste and ban the feeding of poultry litter. In July 2004, the FDA published an Advance Notice of Proposed Rule-making (ANPR) with an invitation to comment on several aspects of the ruminant feed ban, including the recommendations of the IRT. The comment period for this notice ended on September 13, 2004, but as of April 2005, the FDA had not implemented any of its proposed actions, and the exemptions for plate waste and bovine blood products in the 1997 feed ban remained in place.

Additional restrictions on SRM or ruminant feed would hurt the cattle sector by eliminating markets for certain products or increasing feed costs. Ruminant blood meal, for example, is widely used in cattle feed, particularly for dairy cows and in milk replacement rations for calves. When FDA announced plans to eliminate the blood exemption, the values of ruminant and porcine blood meal, which had been similar, diverged. During 2004, ruminant blood meal traded at an average discount of \$250 per ton compared to the porcine product. Coffey et al. (2005) estimated that if the blood exemption were eliminated, the value of ruminant blood meal would fall by an additional \$225 per ton, resulting in a combined loss of approximately \$1.43 for an average steer. Similarly, the cost of banning currently defined

SRM from all animal feed was estimated at \$2.16 per head, and if the SRM definition were extended (as recommended by the IRT), the cost would be \$6.77 per head.

If additional cases of BSE are found in the United States, it seems likely that some of the changes proposed by the FDA will become law. The benefits of implementing those measures are more difficult to quantify than their costs. The Harvard/Tuskegee risk analysis (Cohen et al., 2001) estimated that a ban on SRM in both human and animal feed would reduce the predicted number of BSE cases (in the event it is present) by 80% and the potential human exposure by 95%. However, the baseline level of exposure is so low that further reductions appear to have minimal value. As testing technologies develop and testing costs fall, it may be more efficient to test animals for the disease instead of condemning their products. Testing, even at current prices, appears preferable to a total ban on feeding any ruminant derived proteins to animals—a measure currently in place in the EU and Japan. Coffey et al. (2005) estimated the cost of such a ban at \$14.00 per head in lost revenue plus \$4.50 per head in additional feed costs. However, for reasons that are not clear to us, the testing option is not currently applied to nonambulatory animals—even in cases in which an animal sustains an injury in transport.

## Conclusions

Although the US response to BSE can be critiqued in some areas, the overall response appears to be far more efficient than, for example, that of Japan, which removed all cattle over 30 months from the food chain, instituted universal BSE testing, and banned meat and bone meal for all

uses. US policy makers appear to have considered the costs and benefits of various approaches and recognized that the risk to human health is extremely low.

How low is the risk? In the United Kingdom, the human version of BSE has claimed around 150 victims. However, they have had more than 180,000 BSE infected cows, most of which were found before the connection to human disease was recognized. Estimates of the total number of animals infected in the United Kingdom run to as high as two million. Had Canadian and US authorities taken no precautions to eliminate SRM tissues from food, four Canadian BSE cases might have led to 0.004 human cases in the next 10–15 years. The human health risk from BSE is probably far lower than the risk of choking on a toothbrush. Thus, to suggest, as did Judge Richard Cebull in granting the injunction blocking imports of Canadian cattle, that BSE poses a “genuine risk of death for US customers” is a complete distortion of the concept of what is really risky.

Beef, like any other food, is not and never can be 100% risk free. However, today's salient risk is not mad cow disease. Instead, it is the more familiar bacterial pathogens like *Salmonella* and *E. coli*, the incidences of which have dropped significantly in recent years. By refusing to implement drastic measures in response to a virtually nonexistent threat, policy makers may foster a more rational perception of the risk associated with the disease. Not permitting voluntary testing of young animals, because it provides no useful information for consumers, could well be viewed as part of that strategy. The wider impact of such a measured response may be one of enhancing the overall stability of food demand and making

it less responsive to food scares that occur from time to time.

### For More Information

- Caswell, J. (in press). A food scare a day: Why aren't we better at managing dietary risk? *Human and Ecological Risk Assessment*.
- Caswell, J., & Sparling, D. (in press). Risk management in the integrated NAFTA market: Lessons from the case of BSE. In Karen Huff (Ed.), *Proceedings of the First Annual North American Agrifood Market Integration Workshop*. Guelph, Ontario: University of Guelph.
- Coffey, B., Mintert, J., Fox, J., Schroeder, T., & Valentin, L. (2005). *The economic impact of BSE on the US beef industry: Product value losses, regulatory costs, and consumer reactions*. (Extension Bulletin MF-2678). Manhattan, KS: Kansas State University Agricultural Experiment Station and Cooperative Extension Service.
- Cohen, J., Duggar, K., Gray, G., Kreindel, S., Abdelrahman, H., Habtemariam, T., et al. (2001). *Evaluation of the potential for bovine spongiform encephalopathy in the United States*. Boston, MA: Harvard Center for Risk Analysis. Available on the World Wide Web: <http://www.hcra.harvard.edu/pdf/madcow.pdf>.
- Defra UK. (2005). *BSE: Statistics - BSE - GB weekly cumulative statistics*. London: Defra. Available on the World Wide Web: <http://www.defra.gov.uk/animalh/bse/statistics/weeklystats.html#act>.
- Fox, J., & Peterson, H. (2004). Risks and implications of bovine spongiform encephalopathy for the United States: Insights from other countries. *Food Policy*, 29(1), 45-60.

- Marsh, J., Brester, G., & Smith, V. (2005). *The impacts on US cattle prices of re-establishing beef trade relations* (Briefing No. 74). Bozeman, MT: Montana State University Agricultural Marketing Policy Center.
- Mitchell, S. (2004). *USDA advised against mad cow test in 2002*. United Press International. Available on the World Wide Web: <http://www.organicconsumers.org/madcow/test71304.cfm>.
- Pruisner, S. (2004, July). Detecting mad cow disease. *Scientific American*, 291(1), 86-93.
- Scientific Steering Committee of the European Union. (2000). *Report on the assessment of the geographical BSE-risk (GBR) of the United States of America*. Brussels: European Commission. Available on the World Wide Web: [http://europa.eu.int/comm/food/fs/sc/ssc/outcome\\_en.html](http://europa.eu.int/comm/food/fs/sc/ssc/outcome_en.html).
- United States Department of Agriculture Animal and Plant Health Inspection Service. (2005). *USDA's BSE testing: Protecting America's herd*. Washington, DC: United States Department of Agriculture. Available on the World Wide Web: [http://www.aphis.usda.gov/lpa/issues/bse\\_testing/test\\_results.html](http://www.aphis.usda.gov/lpa/issues/bse_testing/test_results.html).
- Vina, S. (2004). *The private testing of mad cow disease: Legal issues* (report RL32414). Washington, DC: Congressional Research Service. Available on the World Wide Web: <http://www.ncseonline.org/NLE/CRSreports/04Jun/RL32414.pdf>.

*John Fox, James Mintert, and Ted Schroeder are professors and Brian Coffey and Luc Valentin are research assistants in the Department of Agricultural Economics at Kansas State University, Manhattan, Kansas.*





# Opportunities for the Coregulation of Food Safety: Insights from the United Kingdom

By Andrew Fearne and Marian Garcia Martinez

## Introduction

The increase in the recorded incidence of foodborne illness and the recent history of high-profile outbreaks of illness that have been linked to food have created both political and economic demands for more effective controls. Consequently, government regulation of food safety has increased substantially in the last decade, including the introduction of ex ante direct regulations as well as ex post indirect controls. Alongside public intervention, private mechanisms of food safety control have also developed substantially and now play an important role in the supply of higher quality, safer food.

In reality, the distinction between public and private regulations and standards is less discrete than often assumed; in practice, there is a continuum between the two (Gunningham, Grabosky, & Sinclair, 1998). In most markets public and private safety regulations coexist, and there can be considerable interrelationships and dependencies between them. On the one hand, private regulations and standards can evolve as a mechanism to facilitate compliance with regulatory requirements. On the other, regulations can reference private standards as part of their requirements. Moreover, the interaction between self-regulation and public regulation could provide a superior outcome, as industry and firms are often more knowledgeable regarding product quality, and public regulation can generate reputation-based incentives to monitor quality, in the form of public exposure (Nuñez, 2001).

This paper explores opportunities for coregulation of food safety as an alternative to traditional direct government intervention. It aims to contribute to the current debate on the role that government and industry should play in providing for an optimal food safety system while ensuring that all actors in the chain, from producers to consumers, benefit from the efficiency gains that are possible when the responsibility for protecting consumers from

foodborne illnesses is shared between the public and private sectors.

The potential benefits of coregulation of food safety are self-evident—coercion breeds minimal compliance, resulting in suboptimal improvements to public health, and often comes with a significant bill for enforcement and monitoring—but coregulation remains a relatively a new concept in most parts of the world. The lack of trust among actors in the food chain and the perceived risk associated with allowing market forces to play a role in the regulatory process are, in our opinion, key limiting factors for closer coordination of private and public resources in the regulation of food safety. However, the view of food safety responsibilities (and liabilities) from farm to table brings about a new paradigm in stakeholder relationships characterized by complex interaction between public and private modes of regulation (Fearne et al., 2004a). This shift of responsibilities towards the private sector has created a more complex and demanding “policy space” involving public and private sector incentives and controls (Garcia Martinez & Poole, 2004), hence the need to explore the opportunities for greater public-private coordination in the effective and efficient regulation of food safety.

In the United Kingdom, food safety regulation and standards are articulated through a central coordination standard-setting system headed by the Food Standards Agency (FSA) with implementation and enforcement delivered by its own agents (the Meat Hygiene Service) or others (Environmental Health Practitioners [EHPs] employed by the local authorities). Although the majority of food law is derived from the European Union (EU), there remains scope for the FSA to propose new direct regulations or alternative approaches aimed at improving public health and protecting consumers in policy areas not regulated by EU law. Moreover, current EU regulatory

developments towards more flexible risk-based approaches to food safety, with greater responsibility lying more explicitly with the private sector, are opening new opportunities for government and industry to work together to deliver a socially optimum level of food safety.

### **Coordinated Approach to Food Safety**

For any given policy issue, the options for public intervention range from doing nothing to direct prescriptive regulation (Better Regulation Task Force, 2003). In between, there is a wide range of options available, ranging from information and education campaigns where people change their behavior of their own accord, to incentive-based structures, private regulation, and coregulation.

Though probably unpopular among consumer lobby groups, there may be circumstances where it could be better for the government not to intervene. A careful analysis of the benefits and costs of alternative regulatory options could advise policy makers that no intervention is the best course of action, in particular when the costs of preventing a highly improvable food safety failure outweigh the estimated benefits. Moreover, there could be issues of equality on the incidence of costs and/or benefits placed upon, or derived by, a particular section of society as a direct result of public intervention, which could advise governments not to exercise their powers. In addition, the difficulty or impossibility of enforcing new legislation could also prevent governments from intervening.

At the other extreme, command-and-control intervention would be required when the market fails to deliver the level of safety necessary to

meet public health requirements. Within this hierarchy of public intervention, there are a number of possibilities to coordinate public and private resources in the regulation of food safety. The question is what form should this coregulation take, and under what circumstances might private regulations and standards be the most efficient and effective mechanisms to manage food safety, either in combination with or as an alternative to public intervention?

*Coregulation* is an approach in which a mixture of instruments is brought to bear on a specific problem, typically involving both primary legislation and self-regulation or at least some form of direct participation of bodies representing stakeholders in the regulatory process (Eijlander, 2005). Coregulation aims to combine the advantages of the predictability and binding nature of legislation on the one hand and the more flexible self-regulatory approach on the other. Coregulation thus involves self-regulation and regulation working together, mutually reinforcing each other.

Hence, an essential aspect of a cooperative approach to governance is the cooperation between the public and private sectors in the process of creating new rules. This cooperation in the field of regulation may, however, result in various forms, such as agreements, conventions, and even regular legislation (Eijlander, 2005). In the last case, this government regulation is the result of a process of negotiating between the public and the private parties involved. However, the key to the coregulation debate is the distinction between private and public motives for the use of coregulation and the possible relationship between private and social benefits and costs emerging under a coregulatory framework. In the field

of food safety economics, the public-interest and private-interest approaches in the regulation theory are well documented (Fearne et al., 2004a). The public food safety policies focus on the regulation of markets to increase social welfare (improvements in public health), whereas the private-interest approach is concerned with the study of the position of interest groups in the process of regulation. An element in the latter approach is the concern that the relationships between the regulators and the regulated may become too close and thus lead to capture, that is, the pursuit of the regulated businesses' interests rather than those of the public at large.

Within this context, the analysis of coregulation of food safety presented in this paper will focus on four stages in the regulatory process where greater coordination of public and private efforts may be justified: (a) setting the standards; (b) process implementation; (c) enforcement; and (d) monitoring.

### **Setting Standards**

#### ***Early-Stage Coordination: Impact on the Quality of Regulation***

In recent years, governments have turned to the use of risk assessment methodologies to provide fairly standardized evaluations of specific risks. On the risk management side, careful analysis of the benefits and costs of alternative regulatory interventions can play a similar role in disciplining decision making and providing solid support for the regulatory options chosen (Caswell, 1998, 2004). Precise forecasts of economic benefits and costs can rarely be made, but systematic analysis can differentiate between policy options that are promising and those that are not.

Regulatory impact assessment (RIA) for all new legislation is a common feature in developed countries, including the United Kingdom, where existing legislation is also subject to periodic assessment every three years (post-implementation reviews). RIAs have the potential benefit of allowing for comparative analysis of different policy options, which may inform the policy decision-making process. However, the widespread perception within the UK food industry is that RIAs are generally undertaken too late in the decision-making process to have any significant influence on the legislation, and there is inadequate consultation with industry over the scale and incidence of likely compliance costs (Fearne et al., 2004b). This is of particular concern, as previous research has revealed little evidence to enable conclusions to be drawn about the effectiveness of RIAs to produce better food safety legislation (Fearne et al., 2004a).

Greater and earlier engagement of stakeholders would lead to better regulation by taking account of industry/sector-specific requirements and characteristics while facilitating implementation and enforcement. The possibility of using the industry as a sounding board is particularly important in the process of evaluating compliance costs and potential impacts on the competitiveness of UK food businesses of emerging legislation at an early stage in the regulatory decision-making process. Closer cooperation is particularly relevant when legislation is developed at EU levels in order to ensure that emerging regulations can be properly and simply implemented and enforced. However, early work on RIAs before the relevant legislation is fixed brings its own problems. If the legislation has not been decided, or

the guidelines to regulators written, then how can the interpretation of those guidelines be understood in terms of its effect on businesses? If the legislation and its interpretation cannot be described, how can stakeholders estimate the cost implications?

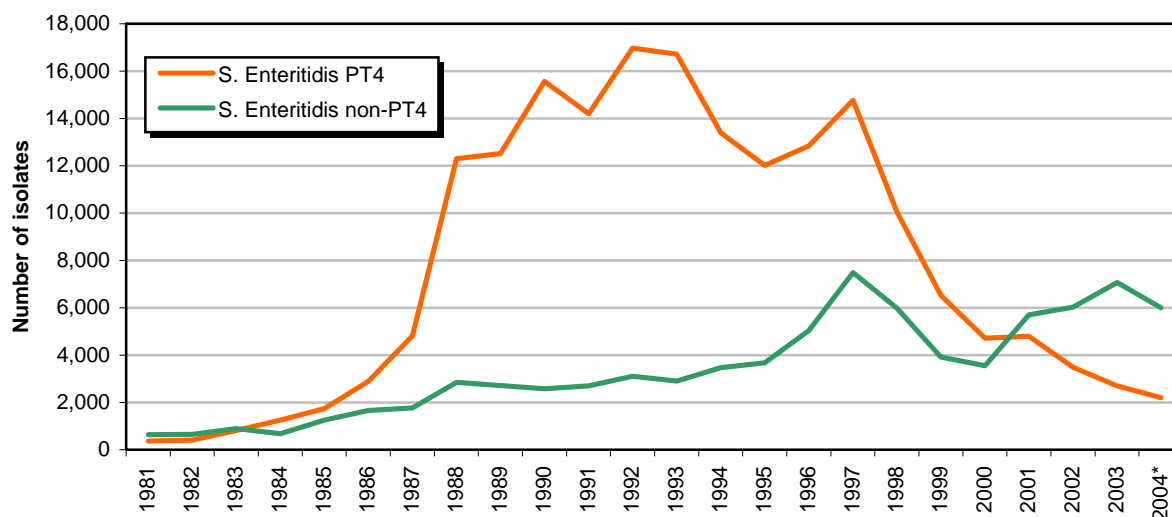
### **Development of Baseline Standards**

Governments can produce and/or stimulate the generation of codes of practice (COPs), which industry can comply with voluntarily. These codes are a form of information and set standards of good practice. For example, in the UK, a plethora of private farm assurance schemes (primarily driven by UK supermarkets seeking to comply with the due diligence requirements of the 1990 Food Safety Act and subsequent public and private demands for traceability back to the farm) that incorporate official COPs have evolved over the past decade. All schemes require their members to be aware of and to implement COPs. Some scheme assessors have specific questions aimed at checking that members understand and are applying them (Food Standards Agency, 2002).

However, should the industry move beyond the legal and official guidance by setting stringent standards? This debate is at the heart of the development of farm assurance schemes in the UK. Baseline schemes have an implicit inclusive approach by aiming at majority participation and an increase in standards across all producers while avoiding “gold plating”—increasing standards (and thus compliance costs) without justification from a public health perspective. In the UK, baseline schemes cover over 85% of production in the milk, eggs, chicken, pork, and combinable crop sector and over 65% for beef and lamb and horticultural produce

(Food Standards Agency, 2002). However, the value of schemes that do little more than repeating the basic legal position by focusing primarily on greater uptake is questionable. Yet, if by doing so, the scheme raises standards across the whole sector, consumers and the society in general would benefit. This argument touches on the issue of the development (or lack thereof) of food safety baseline standards among UK farm assurance schemes aimed at improving public health compared to the “success” of proprietary quality-assurance schemes developed by UK food retailers.

Two examples in the UK—the Lion quality scheme and the ZAP Salmonella Monitoring Programme—illustrate how the progressive development of assurance schemes towards stringent standards are seen as beneficial in providing socially optimum levels of food safety. Between 1981 and 1991, the number of cases of salmonellosis in humans in the UK rose by approximately 170% and remained high throughout most of the 1990s. In March 1991, the Advisory Committee on the Microbiological Safety of Food (ACMSF) agreed to set up a working group to consider the extent to which eggs were responsible for this problem. Their report, published in 1993, concluded that much of the rise in human salmonellosis was due to *Salmonella enteritidis*, mostly phage type 4 (PT4), which can invade the reproductive tract of chickens (ACMSF, 1993). In an attempt to restore consumer confidence, the British Egg Industry Council (BEIC) developed in 1993 the Lion Code of Practice to reduce *Salmonella* in eggs throughout the food chain. It was substantially amended in 1998 to provide for a major *Salmonella* vaccination pro-



**Figure 1.** Salmonella Enteritidis infections, England and Wales, 1981–2004.

\*Provisional data.

Note. Data from UK Health Protection Agency, 2005 ([http://www.hpa.org.uk/infections/topics\\_az/salmonella/data\\_human\\_se.htm](http://www.hpa.org.uk/infections/topics_az/salmonella/data_human_se.htm)).

gram. Because of the life cycle of a laying hen, this means that since the end of 1999, the Lion scheme considers it has effectively eliminated *Salmonella* from Lion eggs. The scheme sets standards for the production of eggs to significantly higher levels than required by UK and EU law in areas including food safety, product quality, labelling, and animal welfare. All major retailers specify Lion eggs and display the Lion logo. It is UK-wide in coverage. It calculates that it covers over 85% of UK egg production (i.e., 95% of free range, organic, and barn egg production and 75% of cage egg production). Vaccination is reinforced by extensive cleaning and monitoring. Hatcheries, pullet rearing, and laying hen flocks are regularly tested. Feed is UFAS assured. Strict on-farm rodent and biosecurity controls are enforced; other controls ensure that the “best before” date on the egg and pack does not exceed 21 days from the date of packing and that the egg is kept at a temperature below 20°C. The scheme has a detailed passport system for birds, eggs, and feed. It

requires on-shell date marking to prevent eggs removed from packs from losing their age mark.

The results of the scheme are encouraging. Official data shows there has been a substantial decrease in human illness caused by *Salmonella enteritidis* since 1997 (Figure 1). A study carried out by the FSA in 2003 (Food Standards Agency, 2004c) shows that only one in every 290 boxes of six eggs on retail sale in 2003 had any *Salmonella* contamination, compared with one in 100 boxes in a survey carried out in 1995/96. This equates to an almost three-fold reduction in the level of *Salmonella* contamination since 1995/96. The FSA recognises that this is likely to reflect the measures introduced by the UK egg industry to control *Salmonella*.

The Assured British Pig (ABP) scheme has moved in similar direction with the introduction in June 2002 of the Zoonoses Action Plan (ZAP) Salmonella Monitoring Programme. ZAP was introduced following a report published in 2000, which indicated that a proportion of

pigs arriving at abattoirs carried *Salmonella* and presented a significant risk of meat contamination. The ZAP program is voluntary but operates in all British assured abattoirs collecting samples from all assured pigs, which represent 90% of British pig meat production. Meat samples are collected from slaughter pigs by abattoir staff and despatched to the laboratory once weekly at the abattoirs' expense. Three samples are collected from each batch of farm assured pigs that arrive at the abattoir. Farms with excessive levels of positive results will usually have their assured status suspended, and meat from their pigs would no longer be eligible for the Quality Standard or Special Selected Scotch Marks. Pigs from these holdings could still be slaughtered as nonassured pigs in abattoirs that process these animals, but the number and market share of these is in sharp decline. The results to date are impressive (Table 1); the target is to reduce the level of positive results by 25% by the end of 2005.

The above examples illustrate how the progressive development of

**Table 1.** Positive results from ZAP salmonella program, July 2003 through June 2004 (%).

	Jul–Sep 2003	Oct–Dec 2003	Jan–Mar 2004	Apr–Jun 2004
<b>Total</b>	25.0	24.8	24.0	20.7
<b>England</b>	28.2	28.1	27.8	24.5
<b>Scotland</b>	14.0	14.3	11.7	10.1
<b>N. Ireland assured</b>	14.1	13.7	11.3	10.2
<b>Total samples reported</b>	31,851	33,095	36,542	34,212

Note. Data from Zoonoses Action Plan Salmonella Programme Annual Report, 2004 (<http://www.bpex.org/technical/zap/zapannualreport04.pdf>). Milton Keynes, UK: British Pig Executive.

assurance schemes towards stringent standards are seen as beneficial in providing socially optimum levels of food safety. However, this development seems to be uneven across UK farm assurance schemes (Food Standards Agency, 2002). It has been easier for schemes to raise standards more rapidly where industries are more integrated or where a smaller number of suppliers or processors account for a large percentage of the market, as in the case of eggs, poultry, and pigs. In the beef and lamb sector, conversely, progress has been hampered due to the complexity and length of the red meat chain. There is a tension between the scheme owners' desire to keep the majority of producers loyal to the scheme and their recognition that consumers expect standards to improve throughout the chain.

## Process Implementation

Following the application of new EU Food Hygiene Regulations beginning January 1, 2006, the responsibility for the production of safe food will lie more explicitly with the food business operator, a requirement that is contained in current legislation and is underpinned in General Food Law. All food business operators will be required to put in place appropriate controls that demonstrate they are managing food safety within their business. This legislative framework

represents a move from a prescriptive *command-and-control* approach towards an *enforced self-regulatory* approach (Braithwaite, 1982) with the regulator imposing a requirement on businesses to determine and implement their own internal rules and procedures in order to fulfill the regulator's policy objectives. The more risk-based and flexible procedures are better matched to the needs of individual businesses and to enforcement. They will provide better opportunities for businesses to demonstrate that they have effective risk management systems, and therefore their products present lower risk to consumers.

The three main EU regulations that make up the package will be directly applicable and therefore constitute the law in each member state of the EU. This means that national legislation is not required (or indeed allowed) to give effect to the EU regulations, beyond providing for their enforcement in the UK. However, there are a number of areas in the EU regulations that either require or allow member states to adopt certain provisions as appropriate in their national law, and these regulations address these aspects too.

The FSA has produced draft guidance on the requirements of the food hygiene legislation applying in the UK. The aim is to help food businesses to understand what provisions apply to them and to guide

them through the legislation. Where necessary, the guidance points food businesses to other guidance and sources of advice that will help them to understand how to comply with the relevant legal requirements.

However, the move from a prescriptive approach towards an enforced self-regulatory approach raises a number of concerns regarding the delivery of a socially optimum level of food safety. Though by law, individual food sectors can develop and implement their own guidance, is this level of self-regulation acceptable by all stakeholders, particularly consumers and other watchdog groups? To what extent can individual food sectors involved in developing this guidance ensure compliance by their members? Some form of inspection system will still be necessary.

## Enforcement

Effective regulation depends on effective and consistent enforcement to ensure compliance. Therefore, it is important to determine the type of inspection policies most appropriate for motivating food businesses to achieve target levels. Different inspection regimes influence behavior in different ways. If the aim is to win the hearts and minds of food business operators and their employees to encourage well-embedded and lasting changes to practices, enforcement officers may concentrate on promoting good practice through advice and education rather than enforcement action. Conversely, the speed of action needed may drive the decision regarding the best approach in some cases. For example, where food products on sale are known to pose an acute and serious health risk, enforcement officers discovering them may seek to have the foods vol-

untarily surrendered by the food business operators or seize them with a view to their subsequent destruction (Food Standards Agency, 2004b).

Good advice is important, particularly in the case of small and medium enterprises (SMEs) to help them to comply with existing and emerging legislation. A recent study by Yapp and Fairman (2004) on enforcement approaches for food safety in SMEs shows that local authority education activity has significant effects upon inspection ratings scores and compliance levels of SMEs. The survey results show that 62% of proprietors in food SMEs demonstrated a lack of knowledge throughout the compliance decision process and that interventions that increase specific food safety knowledge within businesses were the most effective at improving conditions. Generic written information was frequently misinterpreted and misunderstood, thus limiting its effectiveness in improving food safety compliance within SMEs. Formal enforcement was a vital component of the compliance process. It acted as a last-resort action for the enforcer and maintained the general fear of enforcement presence in SMEs.

As well as good advice and support, and an effective inspection regime, the right incentives need to be in place to encourage compliance (Hampton, 2004). Regulatory incentives may be positive, resulting in the voluntary adoption of appropriate food safety controls, or negative, either purposive (in the form of policy-mediated sanctions for noncompliance, such as fines) or consequential (in the form of declining market share and exclusion from the market). In general, incentives to enhance food safety have been largely negative, often focused on warnings

backed up by the threat of financial penalties in the magistrates' courts, whereas a more positive approach, aimed at helping farms and businesses comply with food safety legislation, has been largely overlooked.

Regulators can use incentives to encourage compliance. Good performance can be rewarded, most obviously through lighter inspections when risk profiling has taken place (see below). The role of reputational mechanisms as drivers for investments in food safety, whereby consumers "discipline" firms by switching to rival firms when quality is below certain tolerance levels, has been found as having a positive effect for instance on hygiene levels in restaurants (Jin & Leslie, 2003).

Finally, effective penalties are an essential last resort in the regulatory system. They deter businesses from breaching regulations and provide assurance to law-abiding businesses that those who do try to gain competitive advantage by breaking the law are properly punished (Hampton, 2004). Moreover, an effective penalty regime could help to build consumer confidence in food and food regulation (Cragg Ross Dawson, 2005).

### Monitoring

Compliance with food safety regulations and standards requires ongoing monitoring and evaluation of business performance to ensure continued conformity. There is increasing recognition that inspections could be inefficient (in terms of use of limited resources), particularly in the case of low-risk or high-performing businesses, and that many objectives of inspection can be achieved through means other than inspection, particularly through giving advice (Hampton, 2004). Hence, many regulators

are starting to use risk profiling to try to concentrate limited resources where they are of most use. However, visiting high risk businesses more frequently must not be at the expense of the quality and consistency of inspection (Griffith, 2005).

In the United Kingdom, the FSA determines how regulation should be enforced through a statutory code of practice that directs and advises local authority EHPs. Until very recently, the food safety code of practice required all businesses to be inspected at least every five years. The new code of practice for local authorities, issued by the FSA in October 2004, allows alternative (non-inspection-based) enforcement strategies to be used with the lowest-risk premises (Food Standards Agency, 2004a). Moreover, following the application of the new EU Food Hygiene Regulations beginning January 2006, food business operators would be required to implement procedures based on Hazard Analysis and Critical Control Point (HACCP) principles. The universal adoption of HACCP will move the focus of food safety inspections from prescriptive rules to an auditing of HACCP procedures.

There are opportunities for government agencies to rely more on private mechanism of food safety control (i.e., ISO 9000, HACCP) to assist their enforcement and monitoring process in terms of inspection frequency ratings. The implementation of the new EU Food Hygiene Regulations in January 2006 will offer an opportunity for the FSA to move away from physical inspections of food businesses that have good systems and a demonstrably good record through formal recognition of the level of consumer protection that is delivered through independently audited industry standards and assur-

ance schemes. This level of cooperation between the public and private sectors would allow local authorities to concentrate limited resources on food enforcement in businesses with high and poorly controlled risk.

However, the opportunity to use private industry schemes to assist the enforcement process could, in turn, bring equity problems that need to be considered. For instance, farm assurance schemes are voluntary, and thereby nonmembership should not be considered by the FSA as a failure by businesses to comply with legislation (the scope and level of private and public standards could differ significantly). There is a danger that the issue of “voluntariness,” which is at the heart of private standards, could be undermined by government interference.

Moreover, the role of the enforcer would change as inspections of good performers could eventually become a “checking a box” exercise. However, this would mean little if the quality and time for inspections are inadequate and if the process is target-driven rather than outcome-driven (Griffith, 2005). Achieving consistency and ensuring minimum standards of food safety, at a time when inspections move towards a more audit-based approach with possibly less-trained EHPs, may become more difficult. This would eventually raise concerns as to the ability of the system to be a strong deterrent for free riders and the kind of private standards the FSA should recognize.

## Conclusions

The potential benefits of coregulation of food safety are self-evident—coercion breeds minimal compliance, resulting in suboptimal improvements to public health, and invariably comes with a significant heavy

monitoring cost. Coordination of activities, public and private, at different stages in the regulatory process (from standard setting to enforcement and monitoring) *should* result in safer food at lower (regulatory) cost as a result of a more effective allocation of scarce resources. The fact that we see relatively little coregulation in practice is, we believe, a reflection of the lack of trust in the food chain and the perceived risk associated with allowing market forces to play a role in the regulatory process.

However, change is afoot in the UK and throughout the EU, where the principles of coregulation are being embraced as a mechanism for moving faster, with greater effect, and/or at lower cost in certain circumstances, where risk assessment and industry structure provide the right prognosis.

It is perhaps a little early to claim there are lessons to be learned for the United States from these recent developments in the UK, but the implications of a more widespread adoption of coregulatory principles and practices for countries outside of the EU are significant, not least from the perspective of international trade. Food safety is widely regarded as a regulatory burden that inhibits the ability of commercial stakeholders (particularly the smaller ones) to compete, yet the clamor for more regulation increases with every new food scare. Coregulation provides a mechanism for moving quicker, in a more targeted (risk-based) way, at lower cost to both the taxpayer and private enterprise. Yet the tension between public and private incentives, the lack of trust, and the challenge of imperfect information represent significant hurdles to be overcome. Thus, any insights that trigger discussion of how this

approach might develop in other countries and how these tensions might be reduced should be encouraged, however different the institutional and political approach to regulation might be.

The work in which we are currently engaged aims to identify which combination of public and private regulation is appropriate for different regulatory objectives at different stages in the regulatory process. The challenge now is to find case studies of best practice, which we will be doing in conjunction with our research partners in the United States, Canada, and Australia. The hope is that these case studies will give pointers to the incentive structures and regulatory contexts in which coregulation is most likely to succeed. It will then rest with the government agencies and industry organizations to decide what, if anything, needs to be changed to the regulatory processes and incentive structures to facilitate the more widespread consideration of coregulation as a more efficient and effective way of improving the safety of our food supplies.

## For More Information

Advisory Committee on the Microbiological Safety of Food. (1993).

*Report on Salmonella in eggs*. London: ACMSE.

Better Regulation Task Force.

(2003). *Imaginative thinking for better regulation*. London: BTRF. Available on the World Wide Web: <http://www.brtf.gov.uk/docs/pdf/imaginativeregulation.pdf>.

Braithwaite, J. (1982). Enforced self-regulation: a new strategy for corporate crime control. *Michigan Law Review*, 80(1), 1466-1507.

- Caswell, J.A. (1998). Valuing the benefits and costs of improved food safety and nutrition. *The Australian Journal of Agricultural and Resource Economics*, 42(4), 409-424.
- Caswell, J.A. (2004). Setting food safety priorities: Towards a risk analysis based system. In S.A. Hoffman and M.R. Taylor (Eds.), *Setting Food Safety Priorities: Towards a Risk-Based System*. Washington, DC: Resources for the Future.
- Cragg Ross Dawson (2005). *Food scares and food safety regulation: Qualitative research on current public perceptions* (report prepared for COI and Food Standards Agency). London: Cragg Ross Dawson Qualitative Research. Available on the World Wide Web: <http://www.food.gov.uk/multimedia/pdfs/foodscaresearch.pdf>.
- Eijlander, P. (2005). Possibilities and constraints in the use of self-regulation and co-regulation in legislative policy: Experience in the Netherlands - Lessons to be learned for the EU? *Electronic Journal of Comparative Law*, 9(1).
- Fearne, A., Garcia Martinez, M., Bourlakis, N., Brennan, M., Caswell, J., Hooker, N., & Henson, S. (2004a). *Review of the economics of food safety and food standards* (document prepared for the Food Standards Agency). London: Imperial College London.
- Fearne, A., Garcia Martinez, M., Bourlakis, N., Brennan, M., Temple, M., & de Motte, L. (2004b). *Mapping of potential research areas for economic research* (document prepared for the Food Standards Agency). London: Imperial College London.
- Food Standards Agency. (2002). *Review of food assurance schemes, food standards agency*. London: FSA. Available on the World Wide Web: [http://www.food.gov.uk/multimedia/pdfs/FAS\\_Report.PDF](http://www.food.gov.uk/multimedia/pdfs/FAS_Report.PDF).
- Food Standards Agency. (2004a). *Food safety act 1990: Code of practice*. London: FSA. Available on the World Wide Web: <http://www.food.gov.uk/multimedia/pdfs/codeofpractice.pdf>.
- Food Standards Agency. (2004b). *Protecting consumers: The food standards agency and regulation* (discussion paper for the stakeholder meeting on 16 June 2004). London: FSA. Available on the World Wide Web: <http://www.food.gov.uk/multimedia/pdfs/protectingconsumers.pdf>.
- Food Standards Agency. (2004c). Report of the survey of salmonella contamination of UK produced shell eggs on retail sale, London: FSA. Available on the World Wide Web: <http://www.food.gov.uk/multimedia/pdfs/fsis5004report.pdf>.
- Garcia Martinez, M., & Poole, N. (2004). The development of private fresh produce safety standards: Implications for developing Mediterranean exporting countries. *Food Policy*, 29(3), 229-255.
- Griffith, C.J. (2005). Are we making the most of food safety inspections? *British Food Journal*, 107(3), 132-139.
- Gunningham, N., Grabosky, P., & Sinclair, D. (1998). *Smart regulation*. Oxford: Oxford University Press.
- Hampton, P. (2004). *Reducing administrative burdens: Effective inspection and enforcement*. London: HM Treasury. Available on the World Wide Web: [http://www.hm-treasury.gov.uk/media/935/64/Hampton\\_Interim\\_Report\\_709.pdf](http://www.hm-treasury.gov.uk/media/935/64/Hampton_Interim_Report_709.pdf).
- Jin, G.Z., & Leslie, P. (2003). The effect of information on product quality: evidence from restaurant hygiene grade cards. *The Quarterly Journal of Economics*, 118(2), 409-451.
- Núñez, J. (2001). A model of self-regulation. *Economics Letters*, 74(1), 91-97.
- Yapp, C., & Fairman, R. (2004). *The evaluation of effective enforcement approaches for food safety in SMEs* (Project Code E03003). London: FSA.

*Dr. Andrew Fearne is principal research fellow and director of the Centre for Supply Chain Research, Kent Business School, University of Kent. Dr. Marian Garcia Martinez is a research associate at Imperial College London. Andrew and Marian have worked together on several projects sponsored by the UK Food Standards Agency, with particular emphasis on the economics of food safety and the interaction between statutory and voluntary regulation and the roles of public and private institutions in the governance thereof. The authors wish to acknowledge the funding from the Food Standards Agency (FSA) for the research upon which this paper is based. The views expressed in the paper are entirely those of the authors and do not necessarily represent the views of the FSA.*



# Economics of Private Strategies to Control Foodborne Pathogens

By Tanya Roberts

**F**oodborne pathogens are naturally occurring contaminants that public policies and private strategies target for control. In the 1990s, both the Food and Drug Administration (FDA; US Department of Health and Human Services) and the Food Safety and Inspection Service (FSIS; Department of Agriculture) required a new system for many regulated food plants. Hazard Analysis and Critical Control Points (HACCP) is based on preventing pathogens from entering the food supply chain and controlling this contamination after it occurs. The new federal HACCP regulations have not automatically solved the pathogen-contamination problem, and foodborne illness outbreaks and product recalls continue.

This paper examines the role of public and private economic incentives in the market for food safety, how pathogen information influences this market, the variety of strategies firms use to control foodborne pathogens, and the firm's package of choices: Are inputs sold for a cooked or raw product? What are the safety requirements of buyers? What is the risk a firm is willing to bear of a foodborne disease outbreak or product recall? In evaluating economic incentives for pathogen control, the food safety externalities caused by joint production of quality attributes are often overlooked but may alter the willingness of a firm to adopt food safety controls. This paper focuses on the supply chain for meat and poultry products, estimated to cause more than 40% of human illnesses associated with common pathogens. Case studies are examined for economic incentives for achieving pathogen control.

## Role of Information in Economic Models

Although neoclassical economics assumed zero information and transaction costs, Akerlof's seminal article on the used car market (1970) created awareness of how missing information about quality alters the marketplace. In

today's knowledge economy, the role of information has become even more central (Metcalf, 1995). Firms do not have equal access to information; this asymmetry is a driving force in the economic selection process, in how different technologies change over time, and in core policy-making behavior within a firm that can hinder or enhance the creative process. Competition is a process of change in an inefficient world. On the empirical front, Metcalf reports that firms in the United Kingdom's manufacturing industries have "substantial unit cost deviations from best practice" (p. 472), even in very competitive environments. As evolutionary economists predicted, the range of firm efficiencies was most diverse in rapidly growing industries. New shocks, such as changes in demand and development of new technologies, add to the inefficiency of old behaviors in the framework of evolutionary economics and give firms new opportunities for creating profit.

## HACCP Regulations and New Tests Shock Food Safety Markets

Firms used to talk of testing for pathogens as looking for a needle in a haystack—lingo that is no longer heard. Improved tests and pathogen surveillance systems have undergone a sea change in the past decade (Unnevehr, Roberts, & Custer, 2004). The problem of false positives caused by DNA from killed pathogens has been solved. Tests are faster, cheaper, and much more highly automated with standardized results. Most significantly, new information revealed by better pathogen tests allows firms to develop new control strategies, because the tests are reliable enough to document the impact of alternative control strategies on pathogens. Both the public and private sectors are reacting around the globe, tightening pathogen control with new regulations or contract provisions.

To comply with the FSIS HACCP regulations, meat and poultry plants have to follow standard sanitation oper-

ating procedures, test for generic *E. coli*, and develop a seven-point HACCP plan to monitor and control production operations: (a) identify food safety hazards; (b) identify critical control points (CCP); (c) set critical limits for each CCP; (d) develop CCP monitoring procedures; (e) perform corrective actions; (f) establish recordkeeping systems; and (g) verify the system is working as planned. Under the HACCP regulations, FSIS tests for *Salmonella* on raw meat and poultry products. If the plant fails *Salmonella* tests, their HACCP plan is subject to an in-depth review by FSIS.

### Joint Production Functions Reduce Costs

One factor complicating economic analysis is the joint production function between pathogen control and other economic benefits. McDonald's clamshell cookers were put into use in 1984 to meet three objectives: to cook patties faster, to reduce labor costs, and to enhance food safety. More uniform cooking was achieved by simultaneously heating the patty from both sides in the clamshell cooker. Cost savings and pathogen control were complementary objectives for McDonald's. The American Meat Institute reports that companies find shelf-life extension to be a benefit from pathogen control in combination with new packaging systems. Economic analyses of the marginal costs of pathogen control, then, are more complete if they include estimates of the savings derived from these joint-production-function benefits.

Mazzocco (1996) reports that the business management literature on quality control and innovation reveals that "the cost of poor quality exceeds the cost of developing pro-

cesses which produce high-quality products" (p. 770). The characteristics of internally driven quality management systems include heavy reliance on employee involvement, development of new measurement methods (e.g., new pathogen tests), and continual change in processes. The private application of process control complements FDA and FSIS HACCP regulations to control pathogens in the food supply chain.

### Firm Strategies for Pathogen Control

Traditional methods of pathogen control in foods include drying, curing, salting, sugaring, heating, and cooling. A "kill step," such as pasteurizing food in cans or cooking meat well-done just before serving, can effectively control pathogens. A kill step, however, can create quality tradeoffs, such as changes in flavor and texture (Ralston, Brent, Starke, Riggins, & Lin, 2002). The food industry typically designs new food products with multiple hurdles that either kill pathogens or minimize pathogen growth. Some meat and poultry producers now use multiple hurdles to control pathogens in their production processes for raw products. Other firms, however, may choose to ignore pathogen contamination of the foods they produce. These firms are then faced with an increased risk of legal liability when consumers become ill, when the CDC reports an outbreak associated with their product, or when the FSIS requests a recall of product that has failed a pathogen test. Ollinger and Ballenger (2003) report that badly managed meat and poultry plants tend to go out of business.

A firm's choice of a pathogen control strategy is influenced by how strictly it chooses to control patho-

gens in specific raw meat products. Within a meat company, the target level for pathogen control can vary by plant and/or product. For example, plants slaughtering bulls and cows used in breeding and milk production sell in three markets with differing levels of pathogen risk in their final marketplace products: high-risk raw ground beef market (grinding mixes pathogens throughout), medium-risk roast market (pathogens remain on the exterior and are killed by conventional cooking), and low-risk processed products, such as soup that is cooked thoroughly. Different requirements for pathogen control exist in each of these three markets. Different requirements also exist in the international marketplace. A firm must analyze its competitive advantage: Is it competing today on low price, high safety, or high quality (tenderness or a product sold in the organic market)? What is the firm competing on tomorrow in this dynamic environment of improving food safety knowledge?

Based on implementation of HACCP, industry literature, and risk assessment models, meat and poultry firms use seven generic strategies to control pathogens in their products. Combinations of the strategies are often used. The strategies are arranged from least complex to most complex. In general, the level of pathogen control increases from Strategy 1 to Strategy 7.

**Strategy 1: sanitation control.** Cross-contamination of meat and poultry is minimized by regular sanitation of the conveyor belts and other equipment in the plant. Systematic cleaning of the plant's walls, drains, and air ventilation at regular intervals further reduces risk. Although HACCP requires certain sanitation practices,

firms may choose to comply minimally (or do nothing) until receiving notice of a regulatory violation.

**Strategy 2: kill step for pathogens.** A firm decontaminates food at the end of the production line, for example pasteurizing milk, canning fruits, or irradiating hamburger patties in case-ready packages for sale in supermarkets.

**Strategy 3: pathogen prevention.** A firm prevents pathogens from entering the plant at one or more locations, keeps pathogens from growing on food through control over temperature and shelf-life, and minimizes cross-contamination between food products and between the plant environment and food products.

**Strategy 4: multiple-hurdle approach.** A firm improves control over all operations in the plant, or at least at several prevention and decontamination steps. This is similar to the standard practice in food companies for designing new foods with several barriers or hurdles to keep pathogens from surviving or growing in foods.

**Strategy 5: key risk locations.** A firm uses microbial testing at various locations in the plant to determine where the highest probability of pathogen contamination occurs. Pathogen data are used to identify key risk locations, where managers improve pathogen control using new processes and employee training. Or, the data can be put into a risk model and various control scenarios evaluated to determine key risk locations and effective control strategies.

**Strategy 6: compare risk/cost tradeoffs.** A firm adds explicit consideration of the costs of alternative control options to Strategy 5 and evaluates

the risk/cost tradeoffs of different control options.

**Strategy 7: invest in R&D.** A firm adopts a long-run strategy to invest in research and development and invent new control options, either by adapting management systems or processes used in a related industry or by inventing a new management system or process (complete with new equipment) to control pathogens.

What empirical evidence exists about the pathogen-control strategies used by firms? Case studies reveal what strategies are used and present evidence of the high information costs of pathogen control, joint production functions, and incentives for innovation.

#### ***New Testing and Management System***

The Bacterial Pathogen Sampling and Testing Program (BPSTP) was invented by the Texas American Foodservice Corporation (Golan et al., 2004). Developed in collaboration with four other partners, the BPSTP demonstrates the evolving market incentives for pathogen control. In the early 1990s, Texas American tightened its quality-control procedures in response to increased product returns and customer complaints about hamburgers contaminated with fragments of plastic or metal.

In 1993, Jack in the Box was hit with a major outbreak associated with *E. coli* O157:H7 in its hamburger patties. For Texas American, Jack in the Box's offer of a negotiated contract for successful pathogen control in hamburger patties offered the opportunity to intensify the company's new commitment to safety and quality assurance. With the contract, Texas American was able to reduce its sales in the spot market. The contract permitted more effi-

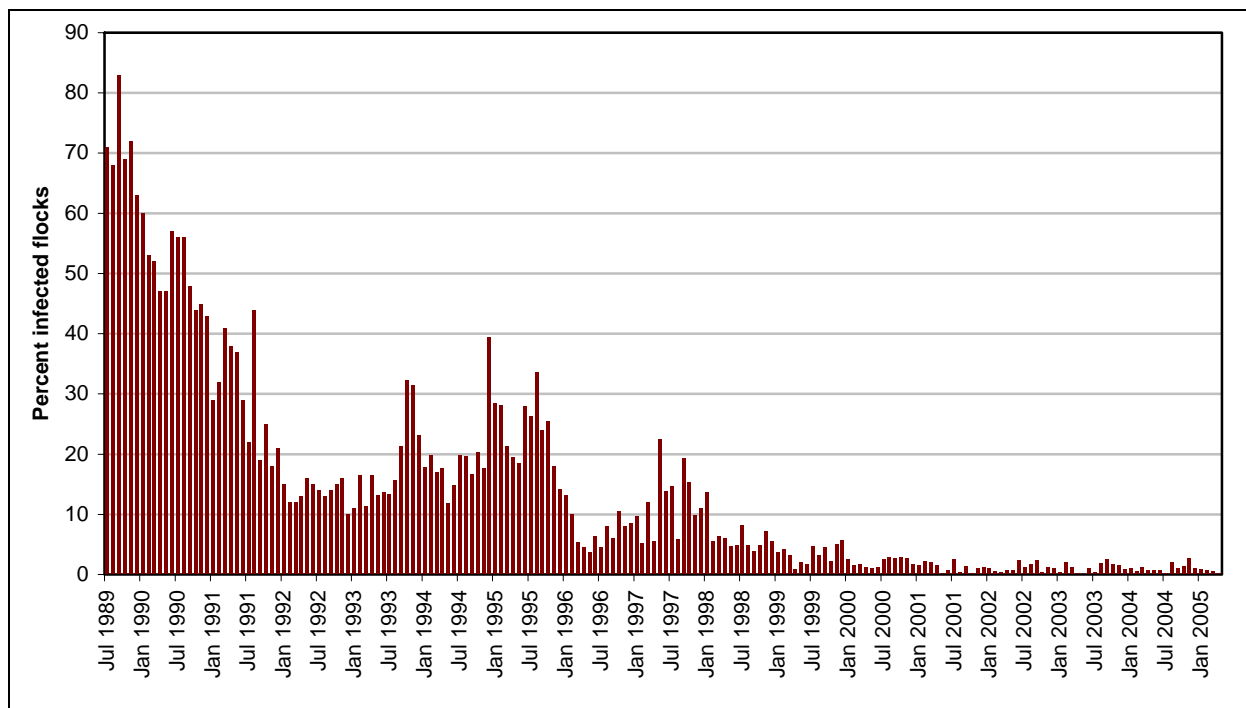
cient use of equipment and more efficient scheduling of the workforce as well as reduced product spoilage and product returns due to spot market sales. These production cost savings were transferred into development of the BPSTP pathogen control program.

The BPSTP is a process innovation combining a new sampling protocol/management system for *E. coli* O157:H7, *Listeria monocytogenes*, and *Salmonella* and a new application of a patented testing technology to hamburger patty processing lines. The process innovation has resulted in a product innovation: hamburger patties with consistently low levels of pathogen contamination. Both companies were first motivated by the need for risk management to limit or eliminate the damage in reputation, sales, and liability stemming from inadequate quality control. Both companies have found that leadership in pathogen control has been a foundation for growth.

The food-safety strategy used in this example was Strategy 5 (control at key risk locations) in combination with Strategy 7 (invest in R&D to develop a new management system). The joint production function for economic efficiency and pathogen control were also exhibited. The inaccuracy of pathogen information drove Texas American to collaborate with Qualicon, a company developing a superior test (BAX) for detecting *E. coli* O157:H7 in beef.

#### ***Innovative Equipment***

Frigoscandia Equipment invented the Beef Steam Pasteurization System (BSPS) to sterilize the exterior of beef carcasses in collaboration with beef industry and academic partners (Golan et al., 2004). The BSPS technology uses steam to kill pathogens on beef carcasses. The BSPS unit is in



**Figure 1.** *Salmonella* in Danish broiler flocks as determined by bacteriologic testing of every flock 2–3 weeks before slaughter ( $N > 4,000$  flocks/year).

Note. Data from Wegner et al. (2003).

a stainless steel cabinet at the end of the slaughter line before the sides of beef (hanging from an overhead rail) enter the chiller. The BSPS can be purchased with automatic record-keeping capabilities for carcass identification, steam temperature, steam exposure time, and deviations. For companies selling equipment to meat processors, a central information question is validating the ability of the equipment to kill pathogens. Efficacy, however, is linked to other downstream actions; for example, a poorly run chilling procedure can negate the benefits of the BSPS, as cross-contamination and pathogen recovery and growth can occur. Other issues in equipment sales are the uncertainty about the level of safety required by the marketplace or government regulations.

In inventing the BSPS, Frigoscandia Equipment was using Strategy 6—invest in R&D for sales to other companies. The BSPS illustrates

Strategy 2—the kill step for pathogens (if the steam temperature is high enough and the steam time is 20–30 seconds). The joint production function problem occurs in two ways: (a) if the steam is applied for too short a time, perhaps to save money, efficacy in killing pathogens can be compromised, or (b) if the steam is applied long enough to kill virtually all pathogens, the tradeoff is some cooking on the carcass exterior. Information uncertainty is a large issue, especially because downstream controls must be rigorous to maintain the high level of pathogen control.

#### ***Employee-Run Electronic Continuous Monitoring***

By turning over monitoring of the the production line to employees, Hatfield Quality Meats in Pennsylvania reduced the defect levels on pork carcasses from 8% to 1% over four years (Bolton, Oser, Cocoma, Palumbo, & Miller, 1999). The pro-

gram first enforced job pride—a strong factor in the success of the system. The on-line monitoring was able to identify when intensive training was needed to improve evisceration practices, when engineering problems called for redesign of operating practices, and when feed-withdrawal practices for hogs needed modification. Implementation resulted in less trimming and less product waste and required fewer employees. The plant may have saved money, even though there were training and equipment costs. Food safety increased dramatically: Microbial contamination levels decreased 99.8% to less than half the US national average level for pork.

This case study illustrates the benefit of improved information in food safety. Joint production function issues were exhibited. Hatfield Quality Meats used Strategy 5—monitoring and identification of key risk locations on the slaughter line.

### **Hog Total Confinement Production System**

Using data from the National Animal Health Monitoring System survey, Wang et al. (2002) compared traditional US hog production systems (barns, sheds, and access to the outdoors) to total confinement systems. They found traditional production had slightly higher long-run production costs: \$0.31/cwt for hogs. Although the confinement buildings were more expensive, costs were more than offset by greater feed and bedding costs in nonconfinement production. Analysis of blood samples found that total confinement market hogs had a statistically significant lower level of contamination with the parasite *Toxoplasma gondii*, a human pathogen.

This case study illustrates three points: (a) the joint production function of economic efficiency and parasite control in a total confinement production; (b) the information problem in linking the human illness (toxoplasmosis) to pork consumption that causes weak economic incentives to switch to confinement systems for pathogen control; and (c) use of Strategy 4 (the multiple-hurdle approach) to use a combination of methods to limit cat and rodent access to hogs and reduce contamination of hogs with *Toxoplasma gondii*.

### **Salmonella Control in Danish Broilers**

Wegener et al. (2004) found that government-mandated *Salmonella* control programs of broiler chickens were successful five years after implementation (Figure 1). The control strategy used extensive pathogen testing of feed supplies and of birds in quarantine, in the hatchery, on the farm, and in the slaughterhouse. The pathogen test data were used to identify *Salmonella*-control problems and

execute changes in the production chain, such as destruction of all *Salmonella*-contaminated birds and feed.

Farmers were initially indemnified for contaminated broilers, but private insurance is required now, and high-risk farmers pay increased premiums—a strong incentive for *Salmonella* control. An economic incentive available to retailers is a “*Salmonella*-free” label for broilers sold in Denmark. This study illustrates how a combination of government regulations and private requirements for pathogen-insurance coverage can overcome the information problem related to pathogen control.

The primary strategies used were a combination of Strategies 3, 4, and 5. Pathogens are prevented when *Salmonella* tests are required throughout the supply chain. When contamination is detected, immediate actions are taken, such as destruction of *Salmonella*-contaminated birds and feed and effective cleaning of all contaminated facilities documented by environmental testing. This case study also reveals the importance of strong regulatory controls that are enforced.

### **Choices About Achieving Greater Pathogen Control**

Food safety is an example where weak market incentives are changing with new information about pathogen risks and controls. In the last decade, foodborne disease outbreaks and surveillance, new pathogen tests, and new regulations have strengthened private incentives for pathogen control. Supply chain managers face a steep learning curve to control bacteria that can multiply in the food chain. Public policy makers have been challenged by how to get the economic incentives right. Innovation has occurred in both public and

private management strategies, resulting in positive change in both sectors. HACCP and its enforcement procedures are a step toward new pathogen control policies. The focus of this paper, however, is the strategies used by private companies to control foodborne pathogens.

The five case studies displayed an array of innovative management systems (e.g., the hamburger patty plant), superb supply chain control that extended back to the grandparents of broilers, and employee empowerment to control pathogens (e.g., the pork plant). Although weaker incentives to control pathogens were exhibited in hog confinement production and the beef carcass steam pasteurization equipment case studies, significant pathogen control was nonetheless within economic reach of private firms.

The strong role that public policies play in providing incentives to firms is illustrated by the Danish requirements for *Salmonella* control in broilers. Especially noteworthy is the system of initially compensating farmers for contaminated broilers, then phasing this system out and replacing it with private insurance. In the last decade, there has been continuous improvement by both public regulators and private companies in pathogen control. Some private companies are taking the concept one step further to create continuous innovation in pathogen control and using this as a marketing strategy.

### **For More Information**

Akerlof, G. (1970). The market for “lemons”: Quality uncertainty and the market mechanism.

*Quarterly Journal of Economics*, 84(3), 488-500.

Bolton, D., Oser, A., Cocoma, G., Palumbo, S., & Miller, A. (1999).

- Integrating HACCP & TQM reduces pork carcass contamination. *Food Technology*, 53(4), 40-43.
- Golan, E., Roberts, T., Salay, E., Caswell, J., Ollinger, M., & Moore, D. (2004). *Food safety innovation in the United States: Economic theory and empirical evidence from the meat industry* (Agricultural Economic Report No. AER831). Washington, DC: United States Department of Agriculture Economic Research Service. Available on the World Wide Web: <http://www.ers.usda.gov/publications/AER831/>.
- Malcolm, S., Narrod, C., Roberts, T., & Ollinger, M. (2004). Evaluating the economic effectiveness of pathogen reduction technology in beef slaughter plants. *Agribusiness: An International Journal*, 20(1), 109-123.
- Mazzocco, M. (1996). HACCP as a business management tool. *American Journal of Agricultural Economics*, 78(3), 770-774.
- Metcalf, S. (1995). The economic foundations of technology policy: Equilibrium and evolutionary perspectives. In Paul Stoneman (Ed.), *Handbook of the Economics of Innovation and Technological Change* (pp. 410-512). Oxford, UK: Blackwell Publishers Ltd.
- Ollinger, M., & Ballenger, N. (2003, April). Weighing incentives for food safety in meat and poultry. *AmberWaves*, 1(2), 34-41. Available on the World Wide Web: <http://www.ers.usda.gov/Amberwaves/April03/Features/WeighingIncentives.htm>.
- Ralston, K., Brent, C., Starke, Y., Riggins, T., & Lin, C.T. (2002). *Consumer food safety behavior: A case study in hamburger cooking and ordering* (Agricultural Economic Report No. AER804). Washington, DC: United States Department of Agriculture Economic Research Service. Available on the World Wide Web: <http://www.ers.usda.gov/Publications/aer804/>.
- Roberts, T., Ahl, A., & McDowell, R. (1995). Risk assessment for foodborne microbial hazards. In *Tracking Pathogens from Farm to Table: Data Needs to Evaluate Control Options*. (MP 1532; pp. 95-115). Washington, DC: United States Department of Agriculture Economics Research Service. Available on the World Wide Web: <http://www.ers.usda.gov/publications/MP1532/mp1532.pdf>.
- Unnevehr, L. (2003). Food safety: Setting and enforcing standards. *Choices*, 18(1). Available on the World Wide Web: <http://www.choicesmagazine.org/2003-1/2003-1-03.htm>.
- Unnevehr, L. (2004). Mad cows and Bt potatoes: Global public goods in the food system. *American Journal of Agricultural Economics*, 86(5), 1159-1166.
- Unnevehr, L., Roberts, T., & Custer, C. (2004). New pathogen testing technologies and the market for food safety information. *AgBioForum*, 7(4), 212-218.
- Wang, C.-H., Diderrich, V., Kliebenstein, J., Patton, S., Zimmerman, J., Hallam, A., et al. (2002). *Toxoplasma gondii* levels in swine operations: Differences due to technology choice and impact on costs of production. *Food Control*, 13(2), 103-106. Available on the World Wide Web: <http://www.sciencedirect.com/science/journal/09567135>.
- Wegener H.C., Hald T., Wong D.L.F., Madsen M., Korsgaard H., Bager F., et al. (2003). *Salmonella* control programs in Denmark. *Emerging Infectious Diseases*, 9(7), 774-780. Available on the World Wide Web: <http://www.cdc.gov/ncidod/EID/vol9no7/03-0024.htm>.

*Without implicating them for the paper's shortcomings, the author appreciates insightful comments from Mike Doyle, Andrew Starbird, and two anonymous reviewers. Tanya Roberts is with the Diet, Safety and Health Economics Branch in the Economic Research Service, United States Department of Agriculture. The views expressed in this article are not necessarily those of the USDA.*



# Supply Chain Contracts and Food Safety

By S. Andrew Starbird

As this issue of *Choices* attests, food safety has become one of the most important issues facing the food industry. Unnevehr (2003) gives four reasons why food safety is more important than ever to consumers: Improved diagnostic techniques make it easier to trace illnesses to food-borne pathogens; increasing consumer affluence has led to increased demand for safer, higher quality foods; new sources of food and new production practices have introduced new risks into the food supply chain; and consumers are purchasing more prepared food and food away from home than ever before. The food industry is well aware of the market's demand for food safety, and it continues to develop methods and adapt operations to meet this demand (Golan et al., 2004).

In this issue of *Choices*, Roberts defines seven generic strategies employed by food companies to reduce the contamination that leads to food safety failures. Her second strategy, pathogen prevention, includes efforts to keep pathogens out of a processing facility, destroying pathogens or limiting their growth if they are already in a facility, and minimizing cross-contamination. The best way for a consumer or processor to prevent food safety failures is to make sure that inputs, ingredients, and raw materials are safe when they are purchased.

In this article, I examine how supply chain contracts can be designed to improve the safety of purchased inputs. Contracts are frequently used to govern the exchange of goods, services, information, and money between supply chain participants. Even when sellers have more information about the product safety than buyers do, contracts can be used to enhance food safety.

## Safe or Unsafe?

Two critical problems associated with ensuring food safety is defining *safe* and figuring out how to measure it. Although advances in public health have made it possible to link illness to specific pathogens, the definition of a safe level of pathogen contamination remains imprecise. The

involvement of the government in establishing food safety standards has not resolved the issue. The lack of resolution is due in part to the incompatible interests of producers, processors, and consumers, and in part to the shortage of scientific evidence relating contamination rates to illness.

When the definition of safety is imprecise, firms participating in the supply chain face uncertainty with respect to the economic consequences of their actions. A firm may be able to calculate the cost of a lot failing a safety inspection or the cost of a lot being recalled because it is unsafe; however, without a precise definition of safety, the firm cannot compute the probability of these events. Without knowing the probability of these events, managers cannot measure the return on investments that improve safety, the value of food safety insurance (if it is available), or the value of testing the safety of raw materials and ingredients.

Even if the definition of safe is unambiguous, measuring safety is subject to significant error. Two sources of measurement error are *diagnostic error* and *sampling error*. Diagnostic error is the error associated with false positive and false negative test results. A *false positive* is a test that indicates that a pathogen is present when it is not; a *false negative* is a test that indicates that a pathogen is not present when it is. Recent developments in diagnostic technology have reduced the false positive and false negative rates to less than 1% (Qualicon, 2005). In economic jargon, the rate of false positives is the producer's (or in our case supplier's) risk—the risk that an uncontaminated lot will be classified as contaminated. The rate of false negatives is the consumer's (or in our case buyer's) risk—the risk that a contaminated lot will be classified as uncontaminated.

Some food safety inspection procedures include a sequence of tests in order to reduce the rate of false positives. A positive first test is called a *presumptive positive* until it is confirmed with a second test. This practice is common in drug screening of employees and athletes. In the case of drug screening, the double sampling procedure

is designed to protect the person being tested from false accusations of drug use. In food safety, the double sampling procedure is designed to protect companies from false accusations of contaminated food. Unfortunately, double sampling does not reduce the buyer's risk associated with contaminated food passing inspection (false negatives). The rate of false negatives is influenced by the accuracy of the test for pathogens, the frequency of sampling, and by sampling at multiple places in the production process.

The other source of error in food safety testing is sampling error. The enormous volumes of food that move through the supply chain on a daily basis make it impossible to test every gram, square centimeter, or milliliter of food for the presence of pathogens. Buyers are forced to take samples in order to test the safety of purchased lots. Sampling error occurs when the characteristics of the sample are different from the characteristics of the lot from which the sample is drawn. Random sampling is a means of controlling this error, but establishing random sampling techniques and making sure they are followed everywhere in the supply chain is a daunting task.

The existence of diagnostic and sampling error means that buyers know less than suppliers about the safety of the product they are buying. It also means that unsafe product will sometimes pass inspection and that safe product will sometimes fail inspection. The risk associated with these events influences the behavior of both suppliers and buyers, because it influences supplier and buyer profitability.

## Measurement Error and Imperfect Information About Safety

Measurement error leads to what economists call *imperfect* or *asymmetric* information about food safety. One of the assumptions behind neo-classical economic analysis is that market participants have perfect information about quality and price. Safety is an attribute of food that is not immediately observable, also called a *credence attribute*, so information about safety is imperfectly distributed among supply chain participants.

When suppliers have better information about quality than buyers do, the market is subject to two rather unpleasant economic phenomena: *moral hazard* and *adverse selection*. Moral hazard occurs when a supplier promises to exert effort to enhance safety but does not do so. Because safety measurement is subject to significant diagnostic and sampling error, a buyer cannot be sure that a supplier has fulfilled its promise to deliver safe food ingredients. Adverse selection occurs when suppliers can be divided into different categories or types based on the safety of their product. The supplier's type is imperfectly observable when safety is imperfectly observable. If the supplier's type is unobservable, buyers offer a price that reflects the "average" quality or safety they get from suppliers. The average price is too low for the highest quality suppliers to make money, so they leave the market. Of course, this outcome is undesirable from the point of view of policy makers and consumers.

Under certain conditions, however, we can use the uncertainty associated with food safety to motivate suppliers to deliver safer food. We are assuming, of course, that the buyer

wants safer inputs because the profitability of safer food is higher. This assumption implies that the buyer faces high safety failure costs or high inspection failure costs that can be partially allocated to the supplier responsible for the unsafe food. The objectionable effects of an imperfect allocation of information can be partially corrected by an equitable allocation of cost.

## Correcting Problems Associated with Imperfect Information

Several strategies exist for correcting the problems associated with imperfect safety information. The most obvious strategy is to get more information about the supplier and the quality of the supplier's product. This strategy will correct some of the asymmetry in the distribution of information, but acquiring accurate information is expensive and may be infeasible. Another strategy is vertical integration. If the buyer cannot segregate safe and unsafe suppliers, the buyer can acquire or merge with a supplier and make it safe. A third strategy is to make revealing information valuable, thereby encouraging the supplier to "signal" its safety level in some fashion. Safety and quality signals include the adoption of process standards (ISO 9000 or HACCP compliance, for example), guarantees, warranties, and third-party certifications. A fourth strategy is to design contracts that appeal to safe suppliers but not to unsafe suppliers. A contract, consisting of a bid price, specifications, and inspection protocols, may exist that segregates safe and unsafe suppliers.

## A Safe Contract

A safe contract is a contract that will be accepted by safe suppliers and rejected by unsafe suppliers. To

**Table 1.** The influence of contamination rate on the supplier's return per lot and buyer's cost per lot.

Contamination rate	Probability that a lot passes inspection	Probability that a contaminated lot passes inspection	Production cost per lot (\$)	Supplier's return per lot (\$) <sup>a</sup>	Buyer's cost per lot (\$) <sup>b</sup>
0.00	0.99	0.000000	1.000	0.0046	1.0300
0.02	0.97	0.000206	0.942	0.0043	1.0403
0.04	0.95	0.000421	0.887	0.0020	1.0510
0.06	0.93	0.000644	0.835	-0.0024	1.0622
0.08	0.91	0.000878	0.787	-0.0090	1.0739
0.10	0.89	0.001121	0.741	-0.0177	1.0861

<sup>a</sup> Supplier's return per lot is net of inspection failure costs and the allocated portion of safety failure costs.  
<sup>b</sup> Buyer's cost per lot includes the portion of safety failure costs that could not be allocated to the supplier.

design a safe contract, the buyer selects contract parameters that persuade the safe supplier to participate in the transaction, but deter the unsafe supplier. Contract parameters related to safety include the bid price, the safety standard (definition), premiums or discounts associated with deviation from the standard, the sampling plan, the diagnostic test used to measure safety, and provisions for sharing the cost of food safety failures. Of course, supply chain contracts include many other provisions in addition to those that influence safety.

These contract provisions influence safety because they influence the cost of delivering contaminated food. The supplier of contaminated food faces two kinds of costs. First, if a contaminated lot is delivered and fails inspection, the supplier faces an *inspection failure cost*. Inspection failure cost includes the cost of disposing of the contaminated food, penalties and fines that might be levied against the supplier, and the cost of the additional production that will be needed to replace the rejected lots. Second, if a contaminated lot is delivered and passes inspection, the supplier faces a *safety failure cost*. Safety failure cost is the cost associated with contaminated food entering the buyer's production system and, perhaps, causing an illness when

it reaches the consumer. Estimates of the safety failure cost are difficult to come by (see Buzby, Frenzen, & Rasco, 2001) and are different for private firms that seek to maximize profit and public agencies that seek to maximize consumer welfare and public health. Safety failure costs affect suppliers only if the supplier responsible for the failure can be identified and made to pay a portion of the cost associated with the safety failure.

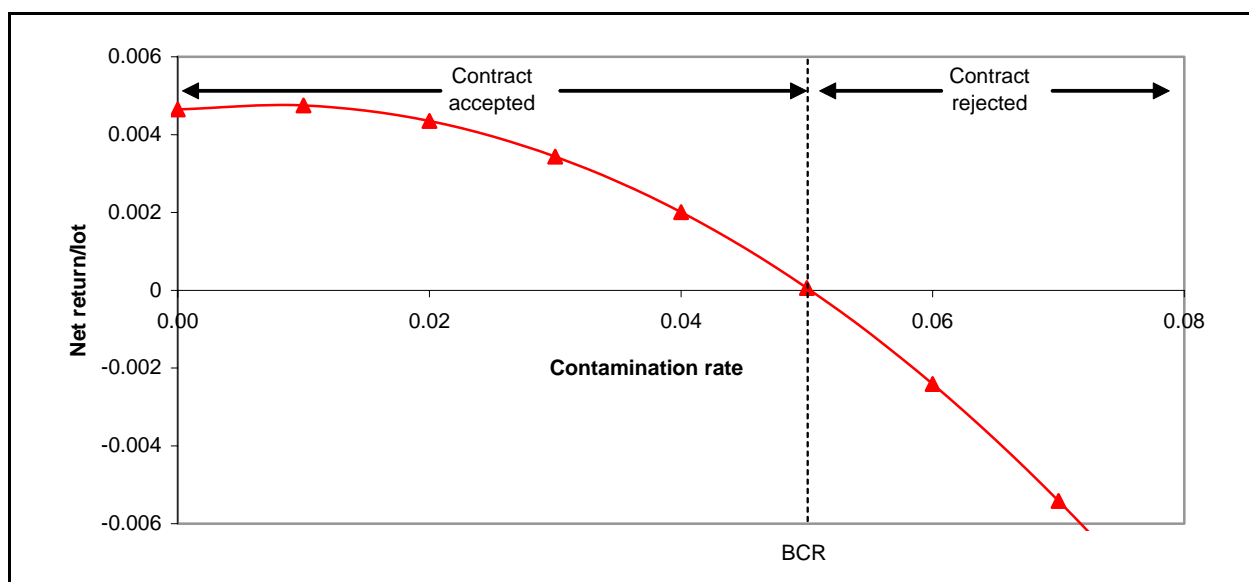
The probability that a supplier will have to pay an inspection failure cost or a safety failure cost depends on the accuracy of the inspection procedure. The probability of a false positive test result contributes to the probability that a supplier has to pay the inspection failure cost. The probability of a false negative test result influences the probability that a contaminated lot passes inspection. If a lot that passes inspection is contaminated, then the supplier may have to pay a portion of the safety failure costs.

### Segregating Safe and Unsafe Suppliers

A safe contract appeals to safe suppliers and does not appeal to unsafe suppliers. The appeal of a contract depends on the supplier's production cost, the probability of inspection failure, the probability of a safety fail-

ure, and the costs of inspection and safety failures. To illustrate this relationship, we examine the hypothetical case of a buyer offering to buy a product for \$1.03 per lot. (This price can be scaled up and down without changing the results.) The contract requires inspection with a pathogen test that exhibits 99% sensitivity and 99% specificity, and the buyer only pays for lots that pass inspection. The production cost is \$1.00 per lot for suppliers with no contamination. Suppliers with higher contamination rates have lower production costs. If the product fails inspection, the supplier pays \$0.50 per lot to dispose of the contaminated product, and if a contaminated lot passes inspection, the buyer must pay \$100 in safety failure costs. The buyer can allocate half of this cost to the supplier responsible for the failure.

Table 1 shows how contamination rate influences supplier return per lot in this hypothetical case. Suppliers break even at a contamination rate between 4% and 6%. This threshold is called the *breakeven contamination rate* (BCR) in Figure 1. Suppliers with a contamination rate below the BCR will accept the contract because their return is positive, and suppliers with a contamination rate above this threshold will not because their return is negative. The



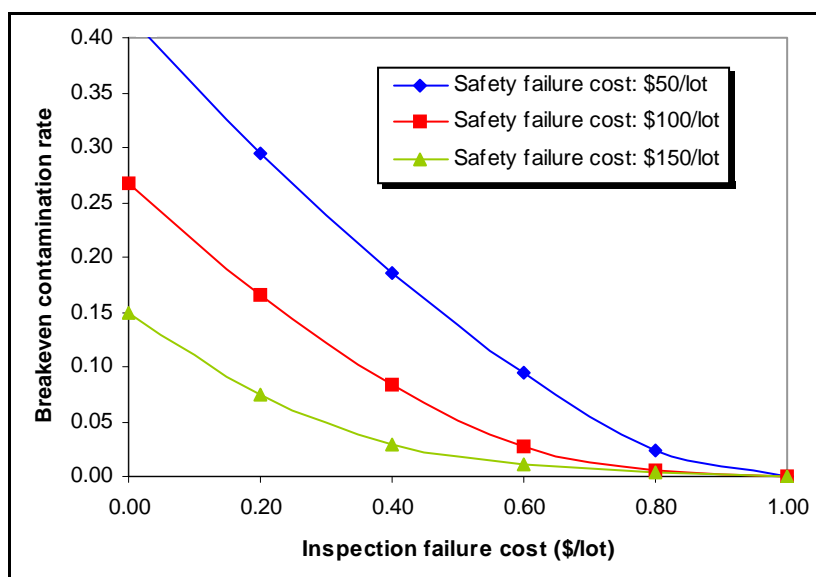
**Figure 1.** The breakeven contamination rate (BCR).

lower the BCR, the safer the ingredients entering the food supply chain.

Buyers and policy makers can influence the BCR by changing the parameters of the contract: the inspection and safety failure costs, the type and accuracy of the inspection procedure, or the bid price. Figure 2 shows the influence of inspection and safety failure costs on the BCR in our hypothetical case. As the inspection failure cost increases, the threshold declines. The threshold also declines when the safety failure cost increases. Suppliers who have a contamination rate above the threshold are dissuaded from participating unless, of course, they make the investment or exert the effort required to reduce their contamination rate.

### An Opportunity for Buyers and Policy Makers

Private firms and public agencies often use contracts to regulate transactions with suppliers. Prudent contract design can segregate safe and unsafe suppliers and lead to an improvement in the safety of food



**Figure 2.** The effect of inspection and safety failure costs on the BCR.

purchased for school lunch programs, the military, food service, and other distribution channels. This opportunity exists even if suppliers know more about product safety than buyers do. Imperfect information about safety exposes both suppliers and buyers to significant financial risks. In a carefully designed contract, these financial risks can be used to deter unsafe suppliers from delivering harmful product.

However, poor contract design can lead to problems. First, if the safety failure and inspection failure costs are too high, the market will fail because no suppliers will participate. Second, if the safety failure and inspection failure costs are too low, then segregation is infeasible because all suppliers will accept the contract. Third, even if a contract effectively segregates suppliers, adverse selection can exist for the set of suppliers below the threshold. When the buyer

cannot tell the difference between suppliers with nearly zero contamination and suppliers with contamination near the BCR, the buyer will offer a price that the safest suppliers find unsatisfactory. If this happens, the safest suppliers are likely to relax their efforts directed toward food safety. Finally, if suppliers have the option of avoiding inspection (because of a third-party certification of safety, for instance), perverse incentives that lead to cheating and less safe food can enter the supply chain (see van Ravenswaay & Bylenga, 1991, for an example).

Buyers have several strategies available for ensuring that suppliers deliver safe food ingredients. These strategies include reducing measurement error through improved diagnosis, vertical integration, and motivating suppliers to provide safety signals. These strategies are not possible in all supply chains, and even when they are possible, they can be expensive. Careful contract design is a relative inexpensive alternative that has promising potential for improving food safety.

## For More Information

- Buzby, J.C., Frenzen, P.D., & Rasco, B. (2001). *Product liability and microbial foodborne illness* (agricultural economic report no. 799). Washington, DC: United States Department of Agriculture Economic Research Service. Available on the World Wide Web: <http://www.ers.usda.gov/publications/aer799/aer799.pdf>.
- Qualicon, Inc. (2005). *BAX system reagent kits*. Wilmington, DE: E.I. du Pont de Nemours and Company. Available on the World Wide Web: [http://www.qualicon.com/bax\\_targets.html](http://www.qualicon.com/bax_targets.html).
- Golan, E., Roberts, T., Salay, E., Caswell, J., Ollinger, M., & Moore, D. (2004). *Food safety innovation in the United States: Evidence from the meat industry* (agricultural economic report no. 831). Washington, DC: United States Department of Agriculture Economic Research Service. Available on the World Wide

- Web: <http://www.ers.usda.gov/publications/aer831/aer831.pdf>.
- Starbird, S.A. (2005). Moral hazard, inspection, and food safety. *American Journal of Agricultural Economics*, 87(1), 15-27.
- Unnevehr, L. (2003). Food safety: Setting and enforcing standards. *Choices*, 18(1), 9-14.
- van Ravenswaay, E.O., & Bylenga, S.A. (1991). Enforcing food safety standards: A case study of antibiotic and sulfa drug residues in veal. *Journal of Agribusiness*, 9(1), 39-53.
- Wu, S. (2003). Regulating agricultural contracts: What are the tradeoffs? *Choices*, 18(1), 19-22.

*S. Andrew Starbird is an associate professor in the department of operations & MIS at Santa Clara University. The author wishes to thank Dr. Tanya Roberts and two anonymous reviewers for their thoughtful and constructive comments on an earlier draft of this paper. The author, however, retains responsibility for all flaws, blunders, and muddled prose.*





# Forces Shaping Trade: The WTO, Trade Agreements, and Market Integration

By C. Parr Rosson III

International trade is of major importance to US agriculture, with exports accounting for 25% of all harvested acres and nearly one third of farm cash receipts in most years. Since March 2000, the members of the World Trade Organization (WTO) have been engaged in negotiations to reform agricultural and trade policies among all 148 members. Furthermore, the WTO Dispute Settlement Body issued findings against the US cotton program and export credit guarantees in March 2005. Additionally, the United States has implemented eight trade agreements and is now negotiating eight others. The Central American Free Trade Agreement–Dominican Republic (CAFTA-DR) is presently being considered by the US Congress and will likely be voted upon this summer. In addition, the North American Free Trade Agreement (NAFTA), implemented in 1994, has spurred market integration among businesses and communities in Canada, Mexico, and the United States.

This issue of *Choices* provides an overview of these major forces, emphasizing the present status of each, prospects for the outcomes and likely implications for the future of US farm and trade policies. Progress and prospects for a successful Doha Round of multilateral trade negotiations are examined. Although WTO negotiations have been tenuous at times, some progress has been made. The Doha Work Program, agreed to in July 2004, provides that export subsidies must be eliminated and that total allowable trade-distorting domestic support must be reduced 20% in the first year of implementation. The elimination of export subsidies alone would be significant, absent other reforms.

The WTO cotton case against the United States, DS-267, is discussed, along with an overview of the findings and implications for US farm programs and trade policy. The Step 2 component of the program was ruled to be in violation of WTO rules along with export credit guarantee

## Articles in this Theme:

<b>Forces Shaping Trade: The WTO, Trade Agreements, and Market Integration .....</b>	<b>129</b>
<b>The WTO Agricultural Negotiations: Progress and Prospects. ....</b>	<b>131</b>
<b>Regional Trade Agreements and Implications for US Agriculture: The Case of CAFTA-DR .....</b>	<b>137</b>
<b>The WTO Cotton Case and US Domestic Policy .....</b>	<b>143</b>
<b>Food Chain Disruptions and Trade: The Importance of North American Market Integration .....</b>	<b>149</b>

programs. It is likely that the process to bring both of these programs into compliance must begin by July 1, 2005. Restrictions on planting fruits and vegetables on program acres were ruled to render direct payments to US producers out of compliance with WTO Green Box criteria. Marketing loan payments and other major program payments were also ruled to depress prices and cause damage to cotton farmers in Brazil. These and other elements of the case are examined and discussed.

With a congressional vote on CAFTA-DR likely this summer, the trade agreement article examines the major provisions of the agreement, the likely impacts on US agriculture, and prospects for the future. Costa Rica, El Salvador, Dominican Republic, Guatemala, Honduras, and Nicaragua are members of this regional trade agreement. Although CAFTA-DR has modest near-term potential, its long-term prospects depend on income growth, development of infrastructure, and economic growth in the region.

Despite the discovery of bovine spongiform encephalopathy (BSE), outbreaks of avian flu, numerous anti-dumping petitions, and other disruptions to trade, North American agricultural markets are more closely integrated

than in the past. Although many attribute this to NAFTA, evidence indicates that the trend toward developing a single agricultural market began in the mid-1980s, as US companies invested in feedlots and packing facilities in Canada. Greater market integration, however, has exacerbated the negative impacts of

recent animal disease outbreaks and called into question the extent to which deep integration will continue in North America.

Contributors to these articles were Timothy Josling, Darren Hudson, Jaime Malaga, John Robinson, Mickey Paggi, Lynn Kennedy,

Fumiko Yamazaki, and Flynn Adcock.

*C. Parr Rosson III is a professor, extension economist, and director of the Center for North American Studies, Department of Agricultural Economics, Texas A&M University, College Station, Texas.*



# The WTO Agricultural Negotiations: Progress and Prospects

By Tim Josling

In the wee hours of August 1, 2004, the assembled trade negotiators in Geneva agreed to a framework for the continuation of the Doha Round of trade negotiations, the first under the auspices of the World Trade Organization (WTO).<sup>1</sup> Although it is somewhat behind the schedule envisaged when the talks were launched in November 2001, the agreement has at least kept the Doha Round alive and at best renewed hopes of a successful outcome.

A key part of the Framework Agreement was an accord on the way forward for the agricultural talks.<sup>2</sup> The agricultural component of the Doha Round has been a long time in the making. Talks started five years ago, in March 2000, as mandated by the Uruguay Round Agreement on Agriculture. Completing the negotiations has proved difficult. The world of agricultural trade negotiations is significantly more complex now than in the late 1980s, when the Uruguay Round was at a similar stage. Many more countries are taking an active part in the talks, both adding to the constraints and contributing new demands. Moreover, the impact of the stronger legal provisions of the WTO, relative to its predecessor the General Agreement on Tariffs and Trade (GATT), adds additional burdens on those negotiating new rules and reduction schedules for agricultural trade. This article discusses the main issues that are under negotiation in the agricultural talks and the prospects for success.

Although the framework, discussed below, was a necessary step in the agricultural talks, it did not signal the start of the final phase of the negotiations. The next step is to

move to an agreement on how, by how much, and when cuts in tariffs and subsidies should be made (known as the *modalities*).<sup>3</sup> The essential disagreements among countries still remain, but they have been channeled into decisions on specific parameters, such as the depth of tariff cuts and reductions in domestic support. Importantly, this has ruled out discussion of many issues that were not included in the framework.

The main question now before the negotiators is how to move from the Framework Agreement to a modalities document in time for ministers to give their approval to it at the next ministerial meeting in Hong Kong in December 2005. Should that (optimistic but still possible) timetable hold, the year 2006 would be taken up by countries translating the agreed modalities into draft schedules of tariff cuts and subsidy reductions. A final end to the Doha Round could come in early 2007, making the process just a few months shorter than the previous round.

Several aspects of this round make it rather different from the Uruguay Round that ended a decade ago. First, the agricultural and food sector has “gone global” in the past decade. This has been fuelled by the explosive growth in supermarkets in developing countries and by the steady lengthening of supply chains in developed countries as retailers compete on price, quality, and choice. Second, input industries have continued to consolidate and cross borders, as have processing and transportation sectors.

1. See WTO, *Doha Work Programme: Decision Adopted by the General Council on 1 August 2004*, WT/L/579. This document is sometimes called the *July Framework*, as it was largely negotiated in that month.

2. This agricultural framework is Annex A of the Framework Agreement.

3. The first attempt at a Modalities Draft was made by the then chairman of the Agricultural Committee Stuart Harbinson in February 2003. The document was ahead of its time, as countries were not ready to commit to the level of detail that it contained. Instead, the decision was taken to start with the framework to be agreed by the Cancun Ministerial. The July Framework essentially completes the work of the Cancun Ministerial.

This has given rise to concerns about competition and the role of farmers in contract-driven agriculture. Third, much more agricultural trade is now in high-value-added goods, with the market for undifferentiated commodities relatively static (though still important). Profit margins in value-added products have continued to lure producers and processors. As a result of these trends, the aspects of the agricultural trade system that have dominated the debate for several decades—protective tariffs on temperate-zone foodstuffs and generous subsidies to producers where market prices were deemed inadequate—must now share attention with overly restrictive health and safety regulations and obtrusive intellectual property protection.

The country dynamics in the agricultural trade talks have changed along with the issues. The GATT was essentially dominated by developed countries: Many developing countries belonged to the GATT, but numerous opt-out provisions meant that their impact on the negotiating decisions was minimal. In the Uruguay Round, the negotiations could in effect only be concluded when the EU and the United States reached agreement among themselves (as they did at Blair House in November 1992). A similar attempt to develop a joint position in August 2003, just before the Cancun Ministerial, met a very different fate, as Brazil, India, China, and seventeen other countries objected strongly to the US-EU proposal and tabled their own plan for curbing subsidies and cutting tariffs. The G-20, as the group is known, has essentially taken the lead in the agricultural talks (particularly on subsidies) since that time, and the Framework Agreement gives them the possibility (if they can maintain their cohesion and credibility as a

negotiating force) of achieving much of what they have sought.

So what is on the table in Geneva? The main features of the Framework Agreement for agriculture are given in Table 1. Negotiations have focused on the three pillars of the Uruguay Round Agreement on Agriculture, market access (tariffs and tariff quotas, along with safeguards), export competition (export subsidies and similar measures), and domestic support (farm subsidies paid or prices supported inside the border).

Improving market access is politically essential for an agreement, as is appropriate for trade talks aimed at opening up markets in developed and developing countries. Eliminating export subsidies is a cherished aim of several exporters and has been endorsed by all countries including those that would have to make significant adjustments.<sup>4</sup> Curbing domestic support is somewhat less essential in improving trade opportunities but has taken on a symbolic significance beyond its commercial impact. Competing exporters consider that US farm programs enable farmers to sell below production costs; developing country governments claim that such subsidies deny their farmers of a

chance to make a living. Policies in the developed countries are in any case moving in the direction of being less trade-distorting, as a by-product of improving the targeting of farm payments at home, but they will be anxious to gain some concessions from developing countries at the bargaining table for such changes.

The Framework Agreement specifies that conditions of market access be improved by means of significant tariff cuts, using a tiered formula that imposes higher percentage cuts on items with higher levels of current tariffs. This attempt at harmonization, if applied consistently and with substantial cuts, would also create new trade opportunities. It could also significantly reduce the tariff “overhang” (between applied and bound tariffs) and the “water” in the tariff (the extent to which a tariff can be reduced before imports are competitive). However, the Framework Agreement would allow all countries to shelter some farm commodities (designated as *sensitive products*) from sharp cuts in tariffs, with the option of increasing tariff-rate quotas (TRQs) in these products to have an equivalent effect on improving market access.<sup>5</sup> If the TRQs are not expanded enough, much of the benefit of the tariff cuts could be lost. The agreement does, however, allow for a tariff cap to be imposed; this could apply some constraints to the continued protection of sensitive products.<sup>6</sup>

For many countries, opening up markets brings concerns about import surges and other disruptions of the domestic market. The Uruguay Round Agreement included a *special agricultural safeguard* (SSG), a mechanism that allowed for temporary tariff increases in response to price drops or import surges for some products, mainly in developed countries.<sup>7</sup> The fate of the SSG is still

---

4. *The EU is by far the greatest user of direct export subsidies, whereas the United States has programs in export credit and food aid that contain potential subsidy elements; Canada sells wheat abroad through a state trading agency that also is deemed to distort competition. Elimination of the subsidy element of these programs would have a relatively small impact on trade but remove a glaring exception to WTO rules and a continued irritant to trade relations.*

**Table 1.** Summary of the main agricultural provisions of the WTO Framework Agreement.

<b>Market access</b>	
<b>Tariff cuts</b>	<ul style="list-style-type: none"> <li>•Substantial improvement in market access through tariff reductions from bound rates.</li> <li>•Single approach for all countries: tiered formula to ensure progressivity. Types of reduction commitments within bands and number of bands to be negotiated.</li> <li>•Role of a tariff cap to be evaluated.</li> <li>•Designation of an “appropriate number” of sensitive products, which would be subject to a mix of tariff cuts and TRQ expansion.</li> </ul>
<b>Tariff rate quotas</b>	<ul style="list-style-type: none"> <li>•Reduce in-quota tariffs and improve administration (as part of balance of concessions).</li> <li>•Some TRQ expansion for all sensitive products.</li> </ul>
<b>Safeguards</b>	<ul style="list-style-type: none"> <li>•Future of special agricultural safeguard (SSG) under negotiation.</li> <li>•Establish new special safeguard mechanism (SSM) for developing countries.</li> </ul>
<b>Special and differential treatment for developing countries</b>	<ul style="list-style-type: none"> <li>•Proportionately less tariff reductions for developing countries, with longer implementation period.</li> <li>•Developing countries may designate special products on criteria of “food and livelihood security,” which would be subject to more flexible treatment.</li> <li>•Fullest possible liberalization of trade in tropical products and alternatives to illicit narcotic crops by developed countries.</li> </ul>
<b>Other</b>	<ul style="list-style-type: none"> <li>•Tariff escalation reduced by formula to be agreed upon.</li> <li>•Erosion of preferences to be addressed using Harbinson Para 16 as reference.</li> </ul>
<b>Export competition</b>	
<b>Export subsidies</b>	<ul style="list-style-type: none"> <li>•Eliminate export subsidies by a credible end date.</li> <li>•Schedule and modalities of reductions to be agreed.</li> </ul>
<b>Export credits</b>	<ul style="list-style-type: none"> <li>•Eliminate export credits, guarantees, and insurance programs with repayment period of more than 180 days.</li> </ul>
<b>Food aid</b>	<ul style="list-style-type: none"> <li>•Eliminate food aid that is not in conformity with disciplines to be agreed. Disciplines will be aimed at preventing commercial displacement.</li> <li>•Other food aid issues (role of international organizations, humanitarian and development issues, and provision of aid in grant form) will be discussed in negotiations.</li> </ul>
<b>State trading enterprises</b>	<ul style="list-style-type: none"> <li>•Eliminate trade-distorting practices of state trading enterprises.</li> <li>•Further negotiation on issue of use of monopoly powers.</li> </ul>
<b>Special and differential treatment for developing countries</b>	<ul style="list-style-type: none"> <li>•Longer implementation periods for reductions and elimination.</li> <li>•Developing countries to continue to benefit from Article 9.4 exceptions.</li> <li>•Appropriate provisions for export credits in line with Decision on Least Developed and Net Food-Importing Countries.</li> <li>•Developing countries to receive special consideration in negotiation of disciplines on STEs.</li> <li>•Ad hoc temporary financing arrangements relating to exports to developing countries may be agreed in exceptional circumstances.</li> </ul>
<b>Export restrictions</b>	<ul style="list-style-type: none"> <li>•Strengthen disciplines on export prohibitions and restrictions.</li> </ul>
<b>Domestic support</b>	
<b>Overall trade-distorting support</b>	<ul style="list-style-type: none"> <li>•Move to harmonize trade-distorting support (TDS) in developed countries (total AMS plus <i>de minimis</i> plus Blue Box levels) by use of tiered formula: greater efforts to reduce support by countries with higher TDS payments.</li> <li>•Reduce overall trade-distorting support substantially: downpayment (20%) in first year.</li> </ul>
<b>Amber Box</b>	<ul style="list-style-type: none"> <li>•Reduce total aggregate measures of support (AMS) substantially by use of tiered formula: greater efforts to reduce support by countries with higher Amber Box payments.</li> <li>•Cap product-specific AMS levels at historical averages.</li> <li>•Reductions in total AMS should lead to product-specific reductions.</li> </ul>
<b>Blue Box</b>	<ul style="list-style-type: none"> <li>•Redefine to include payments with production limiting requirement and those with no production required: include payments based on fixed areas and yields and headage as well as payments based on less than 85% of base production.</li> <li>•Cap payments to 5% of agricultural production from start of implementation period.</li> </ul>
<b>Green Box</b>	<ul style="list-style-type: none"> <li>•Review Green Box criteria and improve surveillance and monitoring.</li> </ul>
<b><i>De minimis</i> level</b>	<ul style="list-style-type: none"> <li>•Negotiate the reduction of the level of <i>de minimis</i> support.</li> </ul>
<b>Special and differential treatment for developing countries</b>	<ul style="list-style-type: none"> <li>•Developing countries have longer implementation periods.</li> <li>•Developing countries have lower reduction coefficients and higher <i>de minimis</i> levels.</li> <li>•Developing countries retain the use of Article 6.2, allowing extra scope for domestic program.</li> </ul>
Note. Data from author's compilation based on WTO, Doha Work Programme: Decision Adopted by the General Council on 1 August 2004, WT/L/579 (2004).	

under negotiation. The Framework Agreement does, however, call for the introduction of a *special safeguard mechanism* (SSM) for developing countries, with the aim of giving these countries some contingent protection and encourage them to lower tariffs.

On export subsidies, the Framework Agreement is more clearly defined. The Framework Agreement calls for the negotiation of a credible date for eliminating export subsidies and similar export aids, though that date may be several years away. A key provision is that there is parallel treatment for the export subsidy component of export credits (long time periods and below-market interest rates) and of state trading exporters (low-interest loans and government underwriting of losses). Food aid is to be disciplined to avoid disruption of commercial trade flows. Export taxes and restrictions are also to be subject to tighter rules. If an ambitious but feasible date can be set for the removal of export subsidies, the trade

system for agricultural products will at last come into line with that for manufactured goods, where export aids have been banned for 40 years.

Negotiations on domestic support touch closest to home, as they circumscribe the ability of domestic legislatures to use particular farm policy instruments. Domestic support (i.e., that not given at the border, through tariffs or export assistance) is classified under the WTO Agreement on Agriculture as falling into three “boxes.” *Amber Box* policies are those deemed to be the most trade-distorting and include deficiency payments and other producer subsidies. *Blue Box* policies are also potentially trade-distorting, but as they include supply restrictions, they are considered less likely to harm other countries. *Green Box* payments are those subsidies that are not related to current price or output and are therefore considered minimally trade-distorting.<sup>8</sup> In addition to the boxes, subsidies up to a fixed proportion of the value of production (5%) can be given in product-specific support, and another similar proportion can be given in non-product-specific support (de minimis payments).

The Framework Agreement calls for a harmonization of levels of trade-distorting domestic support (TDS) and substantial cuts in the individual components of this TDS—the total

aggregate measure of support (AMS) or Amber Box payments, the Blue Box, and the *de minimis* levels. The TDS would be reduced progressively, with higher levels coming down by a greater percentage. A downpayment of a 20% cut in the first year would be followed by annual cuts. The Blue Box criteria would be modified to include payments on fixed acres and yields but not linked to production cuts, and the total Blue Box would be limited to 5% of the value of production. Green Box definitions would not change, and there would be no restrictions on this (minimally trade-distorting) support. However, tighter scrutiny (along with the implementation of the outcome of the cotton panel) could yet cause some adjustments in Green Box policies.

Impacts on individual developed countries would vary, with significant policy changes needed in the operation of both US and EU farm programs and some modification to Japanese programs.<sup>9</sup> The change in the Blue Box definition would accommodate countercyclical payments under current US programs, and the downpayment would be feasible without too immediate reductions. Significant AMS cuts would limit payments under some other programs, as the United States is approaching its current AMS ceiling (\$19.1 billion). The EU has recently moved many of its payments into line with Green Box criteria, and so would be able to live with steep cuts

- 
5. *Tariff-rate quotas (reduced tariffs for specified quantities of imports) were introduced in the Uruguay Round as a way of ensuring some degree of market access for products formerly subject to nontariff import barriers (quotas and licenses, as well as minimum import prices). Many of these products will also be on the lists of sensitive products in the current round. The Framework Agreement mentions the reduction of in-quota tariffs as part of the achievement of a balanced result, but it confines the expansion of TRQs to the sensitive products.*
  6. *Developing countries successfully pushed for the creation of a category of “special products” that would be subject to lower levels of tariff cuts.*

- 
7. *The SSG has been available only for products where protection was converted from nontariff to tariff barriers in the Uruguay Round; this took place predominantly in developed countries.*
  8. *Green Box payments include direct payments based on historical yields and acreage, or animal numbers, as well as the provision of public goods such as research and extension.*

- 
9. *The United States, Japan, and the EU account for most of the domestic support notified to the WTO. However, other developed countries, such as Norway and Switzerland, have an active interest in the extent of further constraints on domestic support.*

in TDS and AMS. Japan has also shown flexibility in modifying the details of its domestic programs, though with little impact so far on its overall level of protection.

The players in the WTO game include the EU and the United States, of course, although the traditional conflict in agricultural matters between the transatlantic partners is muted. The Cairns Group of fourteen small and medium-sized farm exporters, led by Australia, which was active in the Uruguay Round, has played a minor role in the Doha talks since the Cancún Ministerial. Even the "Quad" (the United States, the EU, Japan, and Canada), who for years acted as an informal executive for the GATT and WTO negotiations, has lost some of its significance. Of increased stature in the talks is the G-20 (mentioned above), who agree on the importance of eliminating export subsidies and curbing developed country subsidies but have somewhat divergent internal views on opening up developing-country markets.

Several other groups have emerged. The G-90—countries with special access into the EU market as well as many of the LDCs—was formed at about the time of the Cancún Ministerial. This group of countries is concerned that they will be asked to watch their preferences being eroded in the European market but would be unlikely to reap comparable benefits in other areas. The G-10—developed country importers with high levels of protection—was formed to counter what they saw as an alliance of exporters (including the EU) pushing for greater market access and lower domestic support than their own political system could accept. Finally, the July package was brokered by a "nongroup" comprising the United States, the EU, Brazil,

India, and Australia, known as the Five Interested Parties (FIPS), who agreed on the need to keep the talks going even if they disagreed on the details.

So, if these groups stay together, the dynamic of the talks will reflect the tensions within and between these groups. The G-20 is pressuring the EU and United States to make significant cuts in domestic support but will have to concede significant tariff cuts if a balanced outcome is to be reached. The ability of countries such as Brazil to persuade India to go along with deep tariff cuts will be crucial both for the deal with the United States and the EU but also to expand south-south trade—an objective of the Latin American negotiators. The G-90 will be keen to limit the cuts in tariffs in the EU and the United States for products such as sugar and bananas where their preferences are particularly significant, although compensation schemes could blunt some of this opposition. Overuse of the special products option by developing countries, particularly those with relatively competitive agricultural sectors, would weaken their bargaining power in other areas of the talks. The G-10, of reluctant but not poor importers, will be under extreme pressure from domestic constituencies to resist the sharp cuts in tariffs implied by the tiered formula. However, the potential use of the sensitive product category could help them to accept inevitability and open up their markets to competition.<sup>10</sup> The G-10 will also be keen to keep flexibility in domestic support, as many of them regard national farm programs as part of the social and economic fabric of rural life. The issue of whether the sensitive products option is a minor refinement to allow a balanced agreement or a deal-breaking loophole

that undermines the impact of tariff cuts in major commodities and markets will be only be resolved by hard bargaining on the details.

Is there the political will for a deal? To have any realistic chance of agreeing on a modalities document at Hong Kong, negotiators will have to have a fairly complete draft of a Modalities Agreement by late summer. Although this timetable may seem somewhat optimistic for a round that has yet to pick up any political momentum, there are reasons to think that many countries may wish to settle soon rather than delay further. The expiry of the US 2002 Farm Bill gives the best chance for other countries to steer the course of US policy back to the path set in 1996, when payments were essentially decoupled from production and current prices, and the government relaxed its attempts to control supply and handle surpluses. A farm bill negotiated in the context of a stalled round would not be so restrained. The need for renewal of Trade Promotion Authority will also add urgency to the discussions.<sup>11</sup> Across the Atlantic, the necessity for further

- 
10. *For these countries, the main reason to reach an agreement is the benefits that they can get from the nonagricultural aspects of the negotiations. The depth of cuts in farm tariffs are therefore linked with the agreement to cut tariffs in other sectors in the nonagricultural market access (NAMA) negotiations and that in services. Keeping this balance is a challenge for negotiators in the run-up to the Hong Kong Ministerial.*
11. *Extension of TPA is needed in June 2005, although this is considered more likely to be approved than the reauthorization needed after the expiry of TPA in 2007.*

reforms in the EU's Common Agricultural Policy will increase, as the budgetary pressures from enlargement will intensify as Bulgaria, Romania, and Croatia join around 2007 and as talks continue with Turkey. In addition, increased pressure for policy modifications from WTO dispute settlement decisions—particularly those related to cotton and sugar—could be enough to energize the trade talks in the next two years. If changes are to be made to bring a program into compliance with WTO rules, why not get some credit for those changes at the bargaining table?

Countries do have an alternative option to agreeing to a deal on agriculture in the WTO. There has been an increased tendency for countries to negotiate regional trade agreements, with most WTO members now belonging to a regional group. But such talks are not ideal venues for removing trade impediments in agriculture, and there is a tendency to

omit sensitive farm products in order to reach an agreement. Domestic policy curbs are not easily included in such talks, as that would give an advantage to other competitors, and export subsidies from third countries could still disrupt markets even if such subsidies are banned within the free trade zone. Therefore, the option for exporting developing countries, in particular, looks less attractive. Even importing developing countries may find that pressures to open up markets are no less relentless in regional agreements: They will have to reduce their trade barriers to partner countries that will often include competitive supplies of the good in question. So, although the regional talks may receive a boost from a stalled Doha Round, the outcome may be less comprehensive and just as difficult to achieve.

The Doha Round agricultural talks are important in the long-run development of agricultural trade.

The opportunity to build upon the Uruguay Round rules for agriculture and reduce tariffs sharply is not to be passed up lightly. Unless the modalities become watered down with large loopholes for sensitive and special products, the reductions in tariffs should translate into real market access opportunities. Significant cuts in trade-distorting subsidies are in the cards and will put relatively tight constraints on farm policies. In addition, to have finally eliminated export subsidies would of itself be a welcome and long-overdue step in improving the functioning of the agricultural trade system.

*Tim Josling is Senior Fellow at the Stanford Institute for International Studies and visiting professor at the Imperial College at Wye. The author would like to thank two anonymous referees for helpful comments.*



# Regional Trade Agreements and Implications for US Agriculture: The Case of CAFTA-DR

By Mechel S. Paggi, P. Lynn Kennedy, Fumiko Yamazaki, and Tim Josling

**A**t present the United States is actively engaged in twelve bilateral and five regional trade agreements or initiatives (Table 1). These agreements are designed to provide the United States with additional access to foreign markets and help foster positive relationships with trading partners. Among these is the Dominican Republic–Central American Free Trade Agreement (CAFTA-DR). Given the current debate on CAFTA-DR in the US legislature and the likelihood that the United States will negotiate future similar trade agreements, this paper is intended to provide an overview of CAFTA-DR and discuss its potential implications for US agriculture and agribusiness. The paper will also discuss implications for US imports by focusing on the case of the US sugar industry.

## Overview of the Agreement

The United States and five Central American countries—Costa Rica, El Salvador, Guatemala, Honduras, and Nicaragua—began negotiations for a Central American Free Trade Agreement (CAFTA) on January 27, 2003. President Bush notified the US Congress of his intent to enter into the CAFTA on February 13, 2004. If approved by Congress, CAFTA would most likely take effect in late 2005. Negotiations were concluded on March 15, 2004 that would fully integrate the Dominican Republic into the CAFTA, creating a Dominican Republic–Central American Free Trade Agreement (CAFTA-DR). In addition, negotiations are underway with Panama (Hornbeck, 2005).

The CAFTA-DR is intended to help enhance economic growth and improved living standards in the Central American region by reducing and eliminating barriers to trade and investment. CAFTA-DR converts the nonreciprocal and discretionary benefits that these countries get

from the Generalized System of Preferences (GSP) and the Caribbean Basin Initiative (CBI) into permanent and reciprocal access to the US market. Though covering all trade, the agricultural component is one of the most important aspects of the agreement. The key to the agricultural agreement is market access, with relatively few provisions in the areas of export subsidies and sanitary and phytosanitary regulations. Domestic subsidies are not covered by the agreement.

The CAFTA-DR will create improved market opportunities for US agricultural products and related goods and services. Agricultural trade barriers in the Central American countries are higher than those for manufactured goods. The average bound tariff rates on US agricultural products entering CAFTA-DR vary by country from 35% in Honduras to 60% in Nicaragua. Although the applied rates are lower, in the range of 11–13%, they are not permanent and can be increased to the bound level without consultation with trading partners.

The role of CAFTA-DR is to reduce these high tariff rates to levels that will allow a freer flow of goods and services with the United States. CAFTA-DR locks in the lower applied rates for many products and ensures permanent US access to the market. However, the short-term impact on US exports of the CAFTA-DR may be modest, as the terms of the agreement are phased in over time, and for some commodities the commitments are backloaded. This means that the negotiated adjustments are postponed until some future date.<sup>1</sup>

Increased market access for Central American goods to the United States will also be a consequence of CAFTA-DR. However, the impact is likely to be limited, as most CAFTA-DR countries have had permanent duty-free access to the US market since the late 1960s under the

GSP and, since the 1980s, under provisions of the Caribbean Basin Initiative (CBI) and the Caribbean Basin Economic Recovery Act (CBERA) that implements the CBI. Approximately 99% of CAFTA-DR exports already enter the US market duty free. Duties are paid only on over-quota imports as part of the US tariff-rate quota regimes for sugar, dairy, cotton, meats, and peanuts.

The essence of a free trade agreement is to open up markets to greater access from partner countries. Given that most CAFTA-DR products already enter the United States duty free, the majority of US producers will not be harmed by increased imports. On the other hand, the opening up of new markets in the Central American region promises much in the way of benefits to US agriculture. However, these expectations must be tempered by the realities of the current level of economic development of the countries in the region. Of the CAFTA-DR partner countries, only Costa Rica and the Dominican Republic have incomes over \$5,000 per person. Although US producers will benefit in the short term, additional future benefits will accrue as these economies expand.

## Strong Trade History

United States trade with CAFTA-DR countries has exhibited strong growth over the last decade. Total US merchandise exports to CAFTA-DR increased 74% from 1995 to 2004,

1. *A more detailed overview of the agricultural provisions of the agreement can be found at the website: [http://www.ustr.gov/assets/Document\\_Library/Fact\\_Sheets/2004/asset\\_upload\\_file793\\_5328.pdf](http://www.ustr.gov/assets/Document_Library/Fact_Sheets/2004/asset_upload_file793_5328.pdf).*

**Table 1.** Current regional and bilateral free trade agreements involving the United States.

Country/agreement	Date/status
Israel	1985 (agricultural agreement 1996–2001)
Canada	1986 (grandfathered into NAFTA)
NAFTA (Mexico & Canada)	1994
Jordan	2001
Singapore	2004
Chile	2004
Australia	2005
CAFTA (Costa Rica, Honduras, Nicaragua, El Salvador, Guatemala)	Negotiations concluded January 2004; awaiting submission of implementing legislation to US Congress
Dominican Republic (added to CAFTA)	Negotiations concluded March 2004; awaiting submission of implementing legislation to US Congress
Panama (to be added to CAFTA)	Negotiations began April 2004
Morocco	Negotiations concluded in March 2004; implementation legislation passed US Congress; awaiting ratification by Moroccan Parliament
Bahrain	Negotiations concluded in May 2004; awaiting submission of implementing legislation to US Congress
SACU (South African Customs Union: Botswana, Namibia, Lesotho, Swaziland, South Africa)	Negotiations began in June 2003
Thailand	Negotiations began in June 2004
Colombia, Ecuador and Peru	Negotiations began in May 2004
Bolivia	Expected to join Colombia, Ecuador, and Peru talks later
Oman	Notification to Congress of intent to negotiate, November 2004
United Arab Emirates	Notification to Congress of intent to negotiate, November 2004
Note. Data from Office of the United States Trade Representative (2005) and public statements.	

reaching \$15.7 billion in the latter year (including the Dominican Republic). US merchandise imports increased by 91% during the same period to \$17.7 billion (United States International Trade Commission [USITC], 2005). US agricultural exports to CAFTA-DR countries increased 56%, from \$1.09 billion to \$1.71 billion over the same period, while US agricultural imports from the region have grown by 23%, from \$2.01 billion to \$2.47 billion (United States Department of Agriculture Foreign Agricultural Service [FAS], 2005). The trade deficit reflects the production of tropical products in Central America for the

US market that exceeds their current purchases of temperate and Mediterranean goods from the United States.

Coarse grains, wheat, rice, soybean meal, tobacco, and other intermediate goods are major US exports to the CAFTA-DR countries. In 2004, these products accounted for 59% of US agricultural exports to the region. Wheat, soybeans, and rice are the major grain exports. Animal fats, poultry meat, and dairy products are the major animal and animal products exports. The major consumer-ready exports to CAFTA-DR are prepared fruits and vegetables, poultry meat, dairy products, snack foods, red meats, and fresh fruit. Although

bulk commodities account for the largest share of US exports, intermediate and consumer-ready products are becoming more prominent in CAFTA-DR countries (FAS, 2005).

Bananas and other fresh fruit, coffee, sugar, processed vegetables and fruit, and seafood are the major US imports from CAFTA-DR, accounting for 85% of US agricultural imports from the region in 2004. Bananas and plantains, avocados, pineapples, melons, fresh citrus, berries, okra, squash, tomatoes, fresh or frozen carrots, and various types of peas are among the most important fruit and vegetable imports from the Central American region (USDA/FAS). Given the trading history of the Dominican Republic and Central America with the United States, solidifying and increasing market access through CAFTA-DR will serve to strengthen trade relations and improve the economic welfare of each signator.

### **The Impacts of CAFTA-DR**

The key provisions in CAFTA-DR, as with most other trade agreements, are those that increase market access. US producers will be better able to sell into markets that reduce tariff barriers and others will have greater access to the US market. Along with tariff cuts come other aspects of market access: relaxation or reassignment of tariff-rate quotas (or their introduction when negotiated as a part of the agreement); trade remedies such as safeguards that limit market access in times of import surges; and other conditions that affect the cost of selling into a foreign market or that influence the costs of others selling into the US market.

CAFTA-DR countries already have preferred access for a wide range of goods under the CBI and also

under the GSP. The impact of CAFTA-DR on these countries will be to grant them wider access, at least for sensitive products that have been excluded from the other market access schemes. They will, in effect, catch up with Mexico in term of access into the US market, except in one or two sectors such as sugar.

With respect to market access in the CAFTA-DR countries, US goods gain preference relative to those countries that do not have a free trade arrangement with CAFTA-DR members. This means that competitiveness is affected by the current trade agreements that these countries have with other countries. US suppliers would move (over a transition period) from supplying at most-favored-nation tariffs to having duty-free access. The advantage of this depends on which other suppliers already enjoy such privileges.

Consider the case of fresh grapes. Costa Rica imported approximately \$3.9 million of fresh grapes in 2001. Over 70% of Costa Rica's fresh grape imports were supplied by the United States, followed by Chile with 27%. On October 18, 1999, Central America and Chile signed a free trade agreement. Thus, Chile enjoys duty free status for its fresh grape exports to Costa Rica. In this example, CAFTA-DR enhances US competitiveness relative to exporters such as Chile who previously enjoyed duty-free access. For trade in fruits, vegetables, and nuts, the USITC estimates that US imports will decline by 1.84% and US exports will increase by 14.23% after full implementation of CAFTA-DR.

### **The Implications of CAFTA-DR for the US Sugar Industry**

Implementation of the CAFTA-DR would allow an immediate expansion

of the sugar and sugar-containing product imports into the United States from CAFTA-DR partners. This increase is in addition to their current access to the US sugar market. The duty-free tariff rate quota would initially increase by 109 thousand metric tons (tmt), increasing to 153.14 tmt over a 15-year phase-in with an increase of 2,000 metric tons each year thereafter. The additional market access is limited to either the specified amount or the net trade surplus for each country, whichever is smaller (USITC, 2004).

In addition to this agreement on market access for sugar, several related provisions were included in the agreement. The United States may provide compensation to its CAFTA-DR partners in place of the additional duty-free tariff-rate quota (TRQ) access. At the same time, although the United States is able to use certain price-based safeguard measures against sugar and sugar-containing product imports from other suppliers, the CAFTA-DR agreement does not allow the United States to use these measures against its CAFTA-DR partner countries (USITC, 2004).

The impact of additional US sugar imports on domestic raw sugar prices was estimated by Kennedy and Roule (2004) as a decrease from a base price of 20.66 cents per pound. As expected, the expansion of the US TRQ import levels resulted in a modest rise in world sugar prices. As shown in Table 2, the estimated impact of an additional 100 tmt alone—approximately the amount of additional imports allowed in the first year of the proposed CAFTA-DR agreement—would result in a reduction in US raw sugar prices of 0.63 cents per pound. In this scenario, domestic consumption, referred to in its raw sugar equivalent,

**Table 2.** Changes in prices and quantities resulting from alternative US market access scenarios.

Additional imports from 2003/04 base (tmt)	Domestic price (¢/lb)	World price (¢/lb)	Beet production (tmt)	Cane production (tmt)	US consumption (tmt)
Base	20.66	7.43	4,416	3,716	8,946
100	20.03	7.44	4,370	3,700	8,984
150	19.73	7.44	4,347	3,693	9,003
500	17.71	7.46	4,190	3,637	9,141
1,000	15.13	7.49	3,972	3,558	9,344
2,000	10.96	7.56	3,560	3,401	9,775
3,089	7.63	7.63	3,148	3,233	10,284

would increase by approximately 38 tmt, while beet and cane production would decrease by approximately 62 tmt.

In addition to the welfare impacts associated with changes in production and consumption, there will also be both job creation and reduction. The US sweetener industry has stated that it would stand to lose jobs as a result of increased imports. At the same time, sweetener-using industries have stated that they would likely increase their employment (USITC, 2004).

The combined impact of additional free trade agreements, such as the North American Free Trade Agreement, allowing for further increases in sugar importation into the United States, was estimated to be much greater. With a 500 tmt increase in US sugar imports, estimated world raw sugar prices increase slightly to 7.46 cents per pound, a less than 1% change from the base price. With a 3,000 tmt increase in US sugar imports, estimated world raw sugar prices increase to 7.62 cents per pound, an approximate 2.59% increase from the base price. However, these additional sugar imports resulted in a substantial decline in the US raw sugar price. A 500 tmt increase in US sugar imports was estimated to cause

the US raw sugar price to drop below the loan rate to 17.71 cents per pound. A 3,000 tmt increase in sugar imports was estimated to cause the US raw sugar price to drop to world price levels of 7.86 cents per pound.

The tendency is that increased sugar imports will cause downward pressure on domestic prices in the absence of government intervention. When the government does intervene, as it currently does through the use of a nonrecourse loan, increased imports will increase the cost of maintaining the sugar program. As the US sugar industry faces increased pressure from the world market, the government faces the dilemma of how it can continue to support the sugar industry in light of the increased expense.

### Additional Implications

CAFTA-DR is a reflection of current trade policy of the United States, emphasizing the negotiation of bilateral trade agreements leading to freer trade with regional partners as well as keeping up the traditional support for further liberalization of the multilateral trade regime. The goal of the bilateral agreements with countries in the hemisphere is an eventual Free Trade Area of the Americas (FTAA).

The predominant feature of the CAFTA-DR itself is that most of the adjustment will fall on the Central American countries and the Dominican Republic; the United States has granted liberal access for exports from these countries for many years, whereas the United States has not had free access onto their markets. Tariffs on agricultural goods into these markets are still high, even though generally well below the rates bound in the WTO. The United States has insisted that reductions towards free access start from these applied rather than the higher bound rates. However, this does not mean that US exporters of farm products will be immediate gainers from the CAFTA-DR. The Central American markets are too small to be a lucrative prize for US business and agriculture. Moreover, access will only come over time. For some sensitive commodities, including agricultural goods, long transition periods of up to twenty years have been negotiated.

Adjustment costs in the United States are likely to be minimal. As a result, trade remedies are less central to the FTAA from the viewpoint of the United States. Surges of imports from the Central American region are unlikely, and any market growth will be a result of the increasing sophistication of exporting firms in the region rather than the changes in trade barriers. Accordingly, trade remedy arrangements are unlikely to be used, in contrast to the situation with Mexico a decade ago, when imports under NAFTA of some products increased rapidly. However, import surges are of concern to the countries of Central America and the Dominican Republic. The trade remedies specified in the CAFTA-DR complement the long transition period and the gradual expansion of tariff-rate quotas.

## For More Information

Hornbeck, J.F. (2005). *The Dominican Republic-Central America-United States free trade agreement (CAFTA-DR)* (CRS Report for Congress, Order Code RL 31870). Washington, DC: Library of Congress Congressional Research Service.

Kennedy, P.L., & Roule, E.D. (2004). *International trade agreements: Implications for U.S. sugar* (CNAS Issue Brief IB 2004-01). College Station, TX: Texas A&M University Center for North American Studies.

Office of the United States Trade Representative. (2005). *Trade agreements*. Washington, DC: USTR. Available on the World Wide Web: <http://www.ustr.gov/>

Trade\_Agreements/  
Section\_Index.html.

Paggi, M.S., Yamazaki, F., & Josling, T. (2005). *The Central American free trade agreement: What's at Stake for California agriculture?* (CATI Publication #030605). Fresno, CA: California State University Center for Agricultural Business.

United States International Trade Commission. (2004). *U.S.-Central America-Dominican Republic free trade agreement: Potential economywide and selected sectoral effects* (Investigation No. TA-2104-13, Publication 3717). Washington, DC: USITC.

United States International Trade Commission. (2005). *U.S. international trade commission trade database*. Washington, DC:

Author. Available on the World Wide Web: <http://dataweb.usitc.gov>.

United States Department of Agriculture Foreign Agricultural Service. (2005). *U.S. trade internet system*. Washington, DC: Author Available on the World Wide Web: <http://www.fas.usda.gov/ustrade>.

*Mechel S. Paggi is director of the Center for Agricultural Business at California State University, Fresno. P. Lynn Kennedy is a professor of Agricultural Economics & Agribusiness at Louisiana State University. Fumiko Yamazaki is a senior research economist at the Center for Agricultural Business, California State University, Fresno. Tim Josling is a professor emeritus at Stanford University.*





# The WTO Cotton Case and US Domestic Policy

By Darren Hudson, C. Parr Rosson III, John Robinson, and Jaime Malaga

Once in a while, an event comes along that portends to reshape agricultural policy. Brazil's complaint in the World Trade Organization (WTO) against the United States on domestic support for cotton, export credit guarantees, and export subsidies could be one such event. (For background on the WTO, the dispute resolution process, and the specifics of the cotton case, see the Economic Research Service, <http://www.ers.usda.gov/briefing/wto/>, and Mercier, 2004). The initial ruling, however, was a mixed bag. The WTO dispute resolution panel did rule in favor of Brazil on most key points, and the appellate body report, released March 3, 2005, mostly confirmed the initial panel's rulings. The result of both could have serious implications for US farm policy.

The cotton case, or Dispute Settlement (DS) 267, has received considerable national and international attention. Whereas most agricultural issues (with the exception of bovine spongiform encephalopathy [BSE]) are, at best, relegated to the business section of the newspaper, the cotton case has been front-page news. Many popular press publications, including *The New York Times* and *The Wall Street Journal*, have made the case that the US government has exploited subsistence farmers around the world by lavishing subsidies on US cotton farmers. US cotton interests and some farm organizations have countered that as the 2002 farm bill was being developed, assurances were given to US policy makers that the farm bill provisions were compliant with WTO rules. In the world of international trade policy, however, nothing is assured. Many provisions within agreements are subject to interpretation. Here, we attempt to draw out the key complaints, findings, and economic arguments underlying the case and explore some implications for future directions in US farm policy.

## The Key Complaints

To be successful, Brazil first had to establish that US subsidies exceeded agreed-upon limitations set in 1992. Brazil successfully argued that US production flexibility contract payments (PFCPs) and direct payments (DPs) were not eligible to be classified in the non-trade-distorting Green Box category due to planting restrictions on fruits and vegetables. The 1996 and 2002 Farm Bills restrict planting of fruits and vegetables on base acres,<sup>1</sup> which, the Brazilians argued, effectively ties direct payments to current production. The WTO panel ruled in favor of Brazil on this point, meaning that PFCPs and DPs were counted as Amber Box for this case. This finding, along with several others, meant that the United States had exceeded agreed-upon 1992 subsidy limits and was not entitled to Peace Clause protection, thus opening the door for Brazil to argue the remainder of its complaints. However, more importantly, this seemingly innocuous technical point may have more major long-run implications for US policy, which we discuss later in this article.

Brazil challenged four primary components of US agricultural policy. First, US domestic support for cotton causes "serious prejudice"<sup>2</sup> to Brazilian producers by depressing or suppressing the world price of cotton and results in a larger US share of the world cotton market. Second, US export credit guarantees are an export subsidy. Third, the Step 2 payments are both an export subsidy and an import substitution policy.<sup>3</sup> Finally, tax credits/deferrals given for cotton to US exporters amount to an export sub-

1. *Specifically, planting fruits and vegetables on base acres affects payments.*
2. *Serious prejudice occurs when a subsidy (a) displaces or impedes exports or imports, (b) results in significant price undercutting, suppression, or lost sales, or (c) results in an increase in the subsidizing country's market share.*

sidy. The United States attempted to limit the scope of the complaint to cotton, but Brazil successfully argued to include all other commodities in the argument related to export credit programs as well.

Ultimately, many of Brazil's claims hinged on the assertion that US cotton policies bestow excessive subsidies and depress world prices. This claim is important from a public relations perspective, because it is consistent with claims made by international watchdog groups (such as Oxfam and others) that US farm policy depresses world prices and has had significant adverse consequences for subsistence farmers in developing and less developed countries, where approximately 75% of the world's cotton is grown.<sup>4</sup> The United States provided some evidence that cotton prices actually increased by nearly 100% from 2001 to 2003, which hardly makes for good evidence of price depression. Further, a study by Texas Tech University in January 2004, using a world textile/cotton model, concluded that the elimina-

tion of all cotton subsidies by the United States will cause a short-term international cotton price increase of only 2.14% and that the price effects of such policy will quickly dissipate as other countries increase their production (Pan, Mohanty, Ethridge, & Fadiga, 2005).

### Key Findings

Given the Peace Clause determination mentioned above, the WTO panel ruled on each claim in Brazil's case.<sup>5</sup> First, the panel found that export credit guarantees were export subsidies. For unscheduled commodities such as cotton and soybeans, these export subsidies are prohibited and must be removed. For scheduled commodities such as rice, the panel found that export credit guarantees were subsidies; inclusion of these in subsidy calculations meant that the United States had exceeded subsidy limits in several of the years in question. Despite this finding, however, the panel found that guarantees for both scheduled and unscheduled commodities did not constitute circumvention of US WTO reduction commitments. Additionally, the panel found that Brazil had failed to establish that tax credits to exporters were export subsidies.

Most importantly, the WTO panel found that key elements of the 1996 and 2002 farm programs, such as the marketing loan, countercyclical payments, market loss assistance,

and Step 2, caused significant price suppression and serious prejudice to Brazil over the 1999–2002 period. However, the panel failed to find compelling evidence that US support programs would cause serious prejudice over the 2003–2007 period. Conversely, the panel found that other support programs, such as production flexibility contract payments, direct payments, and crop insurance, did not cause serious prejudice to Brazil. Interestingly, the panel did not rule on the issue of market share, because it could not agree on a sufficient definition of market share.

Step 2 payments to domestic users of cotton were ruled to be subsidies that favor the use of US cotton over imported goods. Step 2 payments to exporters are subsidies contingent upon export performance and are therefore inconsistent with WTO rules. The Step 2 provisions must be modified or eliminated by July 1, 2005 for the United States to comply with obligations in the WTO. The Step 2 program has long been a popular tool in the US cotton program. However, from the WTO ruling one can clearly see that the Step 2 program has been successfully targeted by Brazil and must be significantly changed to remain in compliance.

In sum, the WTO panel found sufficient evidence to call for an immediate end to export credit guarantees (in their present form) and the Step 2 payments. The panel further found that these subsidies, or the effects of these subsidies, caused serious prejudice to Brazil and must be eliminated. Interestingly, however, the panel did not provide an indication of the *degree* of serious prejudice (i.e., the magnitude of the economic damage). Thus, the original ruling suggests that there are many issues related to US domestic agricultural

- 
3. *The Step 2 payment is part of a three-step competitiveness program for US cotton. Because US cotton is often higher priced than world market prices, the Step 2 program paid the difference between world prices and US prices to both exporters and domestic users (we are, of course, simplifying the mechanics). The contention is that this program allowed exporters to sell cotton at prices consistent with world market prices and allowed domestic users to purchase US cotton at world market prices.*
  4. *This amount is the percentage of world production outside of the United States, Australia, and the European Union.*

- 
5. *The panel ruled on all major points except for the issue of increased market share. The lack of a ruling on increased market share is immaterial because it was ultimately not necessary for Brazil's case. There were numerous rulings and findings in the case, but we focus on the key elements here for clarity.*

policy that are to be considered in the future if the United States wishes to remain in compliance with WTO rules.

Both the United States and Brazil appealed different parts of the decision, but the appellate findings, released on March 3, 2005, upheld most of the relevant points in the initial panel's findings. Although some provisions of US farm policy will need to be changed in order to comply with the rulings, the implications for other program components are less clear—the panel provided no real guidance as to *what* must be changed or *how* it must be changed to be in compliance.

### Policy Options and Consequences

There are a number of options available to the United States as a result of this decision. First, the United States can bring farm policy into full compliance with the rulings of the WTO. This approach requires some modification of the export credit guarantee and Step 2 programs by July 1, 2005, with other programs to be addressed in the near future. If Brazil is satisfied with the July 1 outcome, the process will end. However, if Brazil believes the United States has not complied with the ruling, Brazil can request the formation of a compliance panel, which will reexamine the steps taken by the United States. Thus, whatever is done by the United States must be accepted by Brazil and is subject to WTO review.

Second, the United States can partially comply by modifying some policies and compensating Brazil for maintaining other selected policies. The United States could comply with part of the ruling—Step 2 and export credit guarantee modifications, for example—but arbitrate with Brazil over compensation for marketing

loan payments and countercyclical payments. This option would no doubt cause some countries to be less than satisfied, might undermine the effectiveness of the WTO, and could delay or derail progress in the Doha round of WTO negotiations currently underway. Brazil could impose tariffs, not necessarily on cotton or agricultural products, in amounts consistent with damages caused by the US policies.<sup>6</sup> Brazil is not obligated to place tariffs and must gain approval from the WTO for products and tariff rates. Although the WTO encourages that like products be dutied, this suggestion is not a requirement—possibly opening the door to industrial goods.

Finally, the United States could opt not to comply at all with the decision, in which case Brazil will be allowed to retaliate by imposing punitive tariffs on Brazilian imports of US products. Although this approach would reduce some US exports, imposing punitive tariffs would also raise the cost of imports to Brazilian consumers. More important, however, this option would almost certainly undermine the effectiveness of the WTO, reduce the ability of the United States to lead trade liberalization efforts, and stall or completely negate progress in Doha. If the United States took the position of complete noncompliance,

---

6. Given the WTO panel's reluctance to provide an estimate of the economic damages in its initial ruling, these would have to be determined before tariffs could be placed. This begs the question of just how large the damages actually are. If one takes the Pan et al. (2005) study at face value, it would appear that the economic damages are relatively small (around 3%).

Brazil would be more likely to seek compensation, because Brazil would view the US position as inflexible (not to mention illegal according to WTO rules).

### Is Compliance the Likely Outcome?

There are at least three reasons for the United States to comply with the WTO rulings. First, as stated above, compliance sends a clear signal that the United States still intends to lead the trade liberalization agenda, thus providing substantial support to the Doha Development Agenda in the WTO negotiations. In fact, cursory observation of past WTO cases involving the United States suggests that the United States tends to comply with WTO rulings. Second, with respect to the Peace Clause determination, the United States is vulnerable to further litigation in cotton now that it has been established that subsidy reduction commitments were exceeded.<sup>7</sup> Although compliance will not completely insulate US farm programs from further litigation, compliance may make arguments of serious prejudice violations less valid

---

7. It should be noted that because the Peace Clause expired in 2003, all countries can now move straight to arguments about serious prejudice in other commodities without establishing Peace Clause violations first. The critical element here is that because the WTO panel deemed many US programs as trade distorting, they may have set a precedent that encourages other countries to seek remedy in the WTO. That process is very expensive, however, which may limit the number of suits brought against the United States.

and nearly moot in multilateral negotiations.

Perhaps a more compelling reason is the potential for retaliatory tariffs. Figure 1 shows that cotton is the largest US agricultural export to Brazil. Of course, Brazil may choose to place tariffs on US cotton if compliance is not offered. However, as Figure 2 shows, agriculture is only a small portion of overall exports to Brazil, and Brazil is not obliged to place tariffs on cotton. In computers, for example, even a small tariff on this high-volume, low-margin industry could significantly damage US sales.

Brazil likely does not want to increase consumer prices by placing tariffs on key consumer goods. Moreover, political pressure from potentially affected industries in the United States will likely mount as well. Thus, US compliance seems the most likely course of action.

## Conclusions

The WTO case has focused attention and debate on the future direction of US farm policy. Although budgetary pressures have been mounting, Congress has so far not taken action to reduce the overall level of support to US agriculture, but farm program payments are seen as vulnerable nonetheless (Conley, 2005). At the same time, some farm groups (such as the National Corn Growers Association) have signaled a desire to move from supporting farm incomes to providing incentives for value-added product production (Tolman, 2005). The budgetary path in the short run is uncertain, but the WTO decision has provided ammunition for proponents of farm subsidy reductions and has provided longer-term political cover for politicians

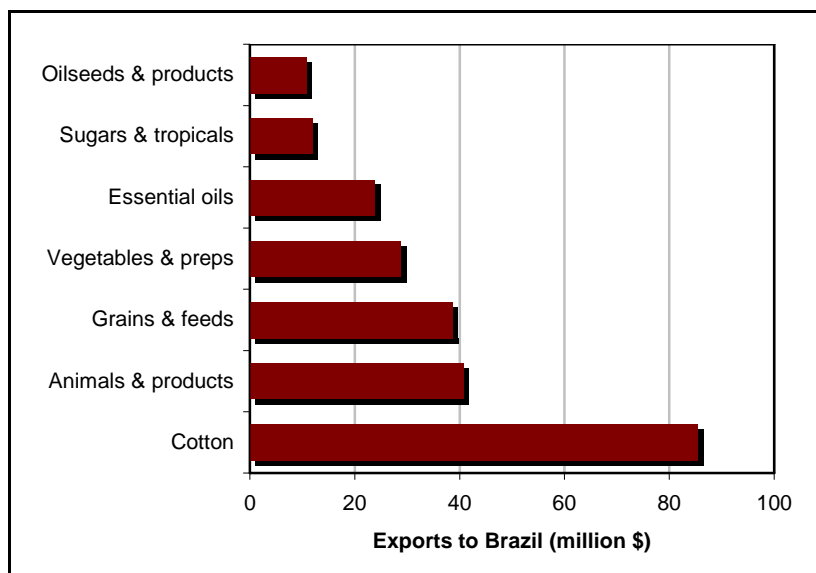


Figure 1. US agricultural exports to Brazil, 2004.

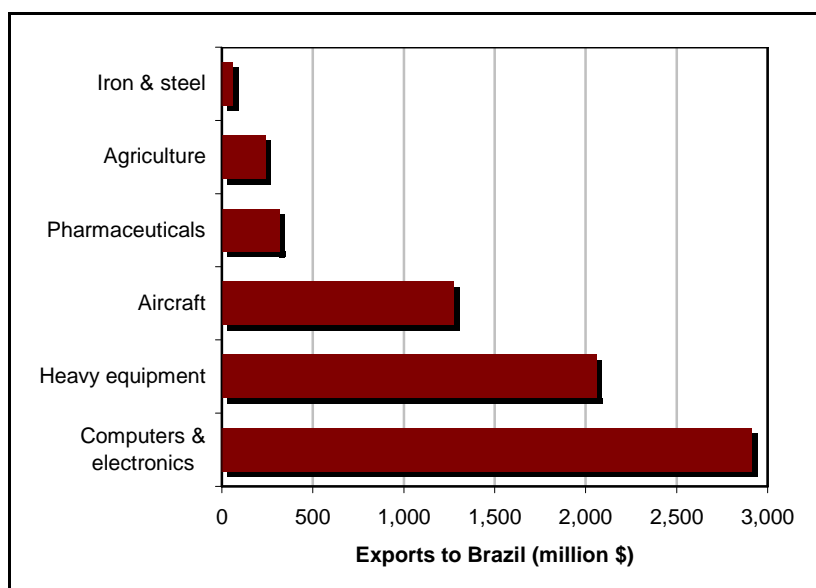


Figure 2. US product exports to Brazil, 2004.

who would like to reduce farm support for budgetary or other reasons.

The WTO decision will not likely lead to a reduction in the overall level of farm program payments by itself, but may lead to a diversion out of traditional commodity payments into programs that can be deemed non-trade-distorting. If the United States is successful in arguing for a continuation of the Blue Box program in the Doha Development

Agenda of trade negotiations and can move programs such as the PFCs and countercyclical payments into that category, it will solve the short-term problem of Amber Box subsidy limit violations. However, any negotiated reductions in the aggregate measure of support (AMS) in the Doha Round will necessarily lead to overall reductions in total support. Any AMS reduction does not derive directly from the cotton case, but the

findings of the cotton case certainly draw direct attention to the level of domestic support in the United States.

One clear signal sent by the results of DS 267 is that safety-net programs employing countercyclical components are under close scrutiny and likely to be unacceptable in the future. If this is the case, the countercyclical programs could be challenged by other countries and for other crops, even if these programs are modified and survive. This finding also raises the question of whether countercyclical payments will be allowed in the new Blue Box being negotiated in the Doha Development Agenda noted above.

The WTO looms large in the next fall bill debate. Although some farm groups are attempting to downplay the potential impact of the WTO cotton ruling on the future of farm policy, one must question how Congress will be able to ignore compliance issues and the costs of non-compliance as a new farm policy is formulated. Clearly, export subsidies will have to be eliminated, and export programs of any kind will be closely scrutinized to ensure compliance. More important is the fate of farm program payments. The US Trade Representative has clearly linked reductions in domestic support to market access to developing country markets in the Doha negotiations. Given that the United States is currently at or near agreed-upon subsidy limits in the current WTO, any additional reductions in the AMS negotiated through the Doha

Round will necessitate overall reductions in farm program payments. Thus, discussion of which "box" payments go into may become only an interesting sideline discussion, with the more relevant issue being the total payments received by farmers.

US farm policy is formed in a dynamic setting. Agriculture is becoming an ever-shrinking share of the US federal budget; demographic trends make the population further removed from the farm and rural life. As international problems and goals consume more time and money, agriculture will increasingly become the residual claimant for federal resources. Agriculture may increasingly become the carrot for the United States to use in trade negotiations, because agriculture is a larger relative share of the economy of developing and less developed countries.

Although US agricultural tariffs are already among the world's lowest, its trade-distorting domestic farm support ranks near the top, along with the European Union and Japan. The farm programs of all three countries may be targets of challenge in the future. A successful conclusion to the Doha Round would likely mitigate this outcome, whereas failure in Doha will almost certainly ensure a future fraught with litigation.

### For More Information

Conley, C. (2005, June). *Legislative views on the future of agricultural policy*. Panel discussion at the World Trade Organization

Impacts on U.S. Farm Policy Conference, New Orleans, LA.  
 Mercier, S. (2004). The WTO and U.S. agricultural policy: Intersections and consequences. *Choices*, 19(4), 31-36.  
 Pan, S., Mohanty, S. Ethridge, D. & Fadiga, M. (2005). *The impacts of U.S. cotton programs on the world market: An analysis of Brazilian WTO petition* (working paper). Lubbock, TX: Texas Tech University Department of Agricultural and Applied Economics. Available on the World Wide Web: <http://www.ceri.ttu.edu/policy/publications/publications/brazil%20final%20paper.pdf>.  
 Tolman, R. (2005, June). *Position of the National Corn Growers Association*. Paper presented at the World Trade Organization Impacts on U.S. Farm Policy Conference, New Orleans, LA.

*Darren Hudson is an associate professor at Mississippi State University. C. Parr Rosson III is a professor, extension economist, and director of the Center for North American Studies, Department of Agricultural Economics, Texas A&M University. John Robinson is an associate professor at Texas A&M University. Jaime Malaga is an assistant professor at Texas Tech University. The authors would like to express their thanks to Joe Glauber and Carol Goodloe for their assistance with the intricacies of the case. Of course, all remaining errors belong to the authors. The policy world is fluid; this paper was prepared based on facts available at writing.*





# Food Chain Disruptions and Trade: The Importance of North American Market Integration

By C. Parr Rosson III and Flynn J. Adcock

## Background

Since the mid-1980s, the pace of North American food market integration has rapidly accelerated. This was due in part to Mexico entering the General Agreement on Tariffs and Trade (GATT) in 1986, followed by the Canada-US Trade Agreement (CUSTA) in 1989 and the North American Free Trade Agreement (NAFTA) in 1994. The North American food distribution system has become characterized by a well-integrated, efficient, and low-cost supply chain designed to deliver food and agricultural products safely and just in time across the continent. Spurred by CUSTA and NAFTA, agricultural trade and investment in North America have surpassed many expectations. The future of this system in its present form, however, has been challenged by the threat of agroterrorism and recent animal disease outbreaks.

The September 11, 2001, terrorist attacks on the United States resulted in closed borders and uncertainty about the prospects for resuming trade and raised serious doubt about how the United States might respond to another attack or similar event. In the aftermath of the attacks, questions were raised about the vulnerability of the US food supply to intentional contamination and the safety of the US animal and plant populations.

Since then, the United States has implemented legislation to consolidate government agencies to increase security and efficiency. The 2002 Bioterrorism Act was designed to give the Food and Drug Administration more time and information to evaluate the likely risk posed by firms shipping foods to the US market. Despite these changes, the vulnerability of the US food chain, and indeed the integrity of the entire North American food distribution system, remains a concern.

Nearly 90% of US citizens live in food-secure households (United States Department of Agriculture Economic Research Service, 2005). Events that limit the physical availability of food or increase its cost to consumers could disrupt the food chain and reduce the overall level of US food security. There is general consensus that a potential threat to US food security is the intentional contamination of the food supply to cause illness, death, or economic loss. Other factors that could cause disruption to the North American food chain include regulatory changes, such as mandatory country-of-origin labeling (MCOOL), and the use of available trade remedy laws, such as the filing of antidumping and countervailing duty petitions.

This paper reviews developments in North American food market integration and their importance to the US food system. Using the cases of beef cattle, beef, hogs, and pork as examples, implications for trade, foreign direct investment, and food security are examined. How consumers, policy makers, and regulatory authorities respond to these and subsequent events will shape the future and degree of market integration in North America and ultimately US food security.

## US-NAFTA Agricultural Trade

The growth in US agricultural trade with NAFTA partners, although well documented, is worthy of mention. US agricultural exports to Mexico have nearly doubled to \$8.5 billion since NAFTA was implemented in 1994, while exports to Canada have increased more than fourfold, reaching \$10 billion in 2004. Since 1980, agricultural exports to NAFTA partners have expanded 250%. US agricultural imports have also grown, with imports from Mexico more than doubling to \$7.3 billion and imports from Canada expanding almost fourfold to \$11.5

billion. Agricultural imports from NAFTA trading partners have increased nearly 800% since 1980. In 2004, the United States had an agricultural trade surplus of \$1.2 billion with Mexico and a trade deficit of \$1.5 billion with Canada.

Also noteworthy is the relative importance of both countries as markets and suppliers. US agricultural exports to NAFTA have increased from about 12.5% of the total in 1989 to 29.7% of total in 2004. The share of US agricultural imports from NAFTA has grown from 23.7% to 34.6% during the same period. As a practical matter, NAFTA now accounts for about one third of US agricultural exports and imports, as opposed to 16% in 1989 and 11% in 1980. The rapid and significant growth in agricultural trade is one of the major contributing factors to the higher degree of market integration within North America.

NAFTA represents a diverse market for commodities as well as high-value products. Nearly two thirds of all US agricultural exports to Mexico are either consumer-ready products or intermediate goods that require some processing before use. Major consumer goods include boxed beef, broilers, pork, and other processed foods. Intermediate goods include powdered milk and vegetable oils. The rest are bulk commodities such as corn, rice, grain sorghum, soybeans, and cotton. When considering US agricultural products to Canada, nearly three fourths are consumer-oriented products and almost 20% are intermediate.

US agricultural imports from Canada and Mexico are composed of 80% consumer-oriented products. Vegetables, fruits, beef, pork, snack foods, and beverages account for the majority of this trade. Seventeen percent of US agricultural imports from

NAFTA are intermediate products, with a third to a half of these being live cattle and hogs. Less than 10% are bulk commodities.

### **Implications of Food Chain Disruptions for Market Integration**

The prospects of bioterrorism, coupled with a rash of animal disease outbreaks and continued concerns about the safety of imported foods, have led many to question whether the North American food chain may have reached the highwater mark of market integration. The following indicates that this may not be the case.

#### ***North American Cattle and Beef***

Cattle and beef have become one of the most highly traded and deeply integrated sectors in the North American market. About 99% of all cattle imported by the United States come from Canada and Mexico, and 98% of all US cattle exports go to those same countries (Figure 1). An average of 821,000 Mexican cattle has come to US pastures and feedlots each year since 1970. Almost all Mexican cattle entering the US market are of stocker/feeder weight. Canada normally ships more than one million head of fed cattle for slaughter to the United States annually. In addition, more than \$2.2 billion in beef and beef products are traded among NAFTA partners annually, representing one third of all North American beef trade. The discovery of bovine spongiform encephalopathy (BSE) in Canada and the United States, however, drastically altered some of these relationships.

When BSE was discovered in Canada in May 2003, the international market for Canadian beef and beef cattle closed. The United States,

which imported nearly 1.7 million head of Canadian fed steers in 2002 and a half million prior to the discovery in 2003, could no longer rely on those cattle to process. The US market for live Canadian cattle, which was scheduled to reopen March 7, 2005, remains closed due to an injunction filed to stop the implementation of this regulation. Canadian beef, banned by the United States for three months in 2003, is now imported in boneless form and from cattle less than 30 months of age. While awaiting the reopening of the US market for live cattle to reopen, investment in the Canadian beef packing industry has increased, and slaughter capacity is increasing.

Japan, South Korea, Mexico, and Canada accounted for 90% of US beef exports before BSE, and exports represented 9.6% of US beef production. The impact of BSE in the United States, caused in part by the immediate closure of all foreign markets to US beef, was a 20% drop in live cattle prices over a four-day period coupled with a 17% decline in feeder cattle prices. Prices rebounded, however, and set a record high during the summer of 2004. Rapid price recovery was attributed to several factors, including quick action by the USDA to reassure consumers that the US meat supply was safe; low beef supplies because the US was at a low point in the cattle cycle; prohibitions on importing Canadian cattle; and an upswing in domestic consumer demand for meat, driven in part by changes in diet.

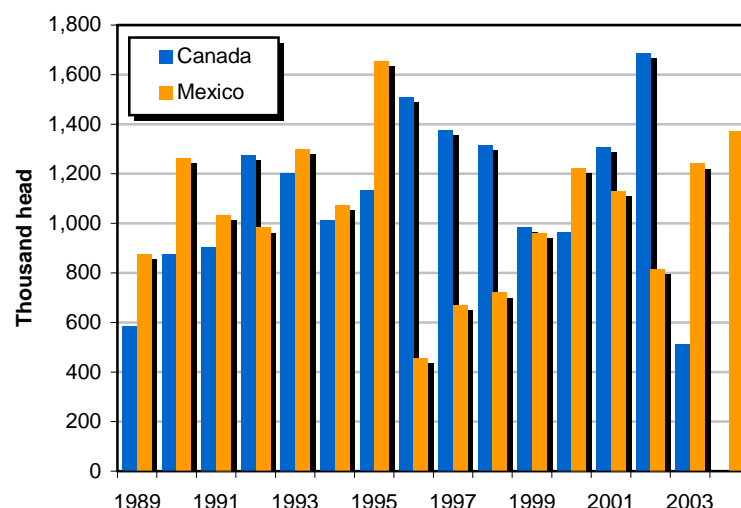
Canada and Mexico have reopened their borders to US boneless beef from cattle less than 30 months of age, which currently account for 84% of US beef exports. Although US beef exports have resumed, they are at only 17% of pre-BSE levels and will not recover

until Japan and South Korea again allow US beef (Figure 2).

Foreign direct investment (FDI) in North America contributed to increased market integration as well. US FDI in Canadian agriculture expanded from \$1.7 billion in 1985, reaching \$5.8 billion in 1999. Since then, however, it has fallen to \$4.5 billion in 2001. For Mexico the trend was much the same, with US FDI reaching \$4.7 billion in 1998, dropping the next year, and recovering to \$4.5 billion in 2001.

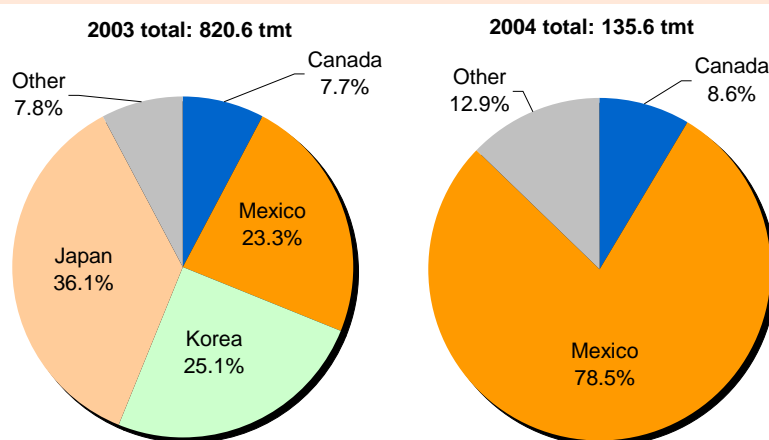
Within Canada, much of the growth in FDI has been in additional feeding and beef packing capacity as firms have focused on exporting beef instead of cattle in the post-BSE business environment. With 80% of the cattle feeding and packing industry located in the provinces of Alberta and Saskatchewan, those regions are of key importance in assessing the direction of the Canadian cattle industry. The number of cattle on feed (Alberta/Saskatchewan) was 974,403 in April 2005. This is 23% more than one year ago and only 20,000 head below pre-BSE levels. At the same time, the cattle herd was reported to be 15.1 million head, higher than at any time since at least 1960. Cattle marketed reached 203.3 thousand head for the same period—28% above 2004 and the highest since 2000.

Another potential disruption to the North American beef market is the MCOOL provision in the 2002 US Farm Bill. This provision required muscle cuts of beef and pork, fruits, vegetables, peanuts, and seafood products sold in US grocery stores to be labeled as to country of origin beginning October 1, 2004. Implementation for all but seafood was delayed until 2006. There are two issues associated with this regulation. The first issue was the belief



**Figure 1.** US cattle imports, 1989–2004.

Note. Data from USDA ERS (2005).



**Figure 2.** US beef exports, 2003 and 2004.

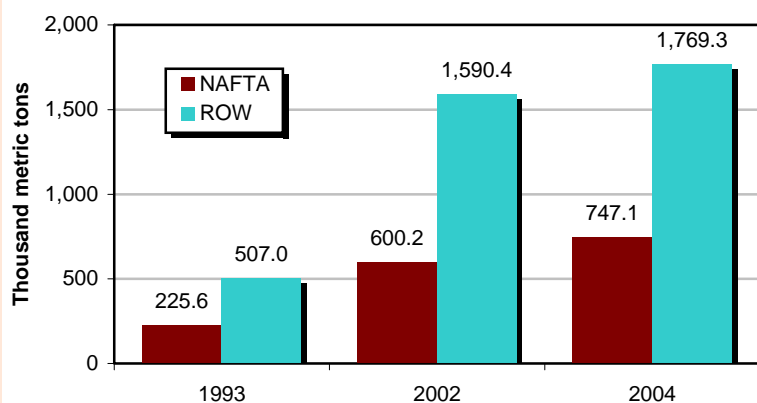
Note. Data from USDA FAS (2005c).

that US consumer preference for US beef would decrease US consumption or price of beef from Canadian and Mexican cattle. Second, the need to put all countries on the label might cause processors to decrease their use of foreign cattle so that only US would be used, thereby negating the need for multiple sources on the label. The MCOOL provision, however, has only been enforced for seafood products as a result of funding being withheld by the US Congress for enforcement for other products. There is also proposed legislation to

make MCOOL voluntary instead of mandatory.

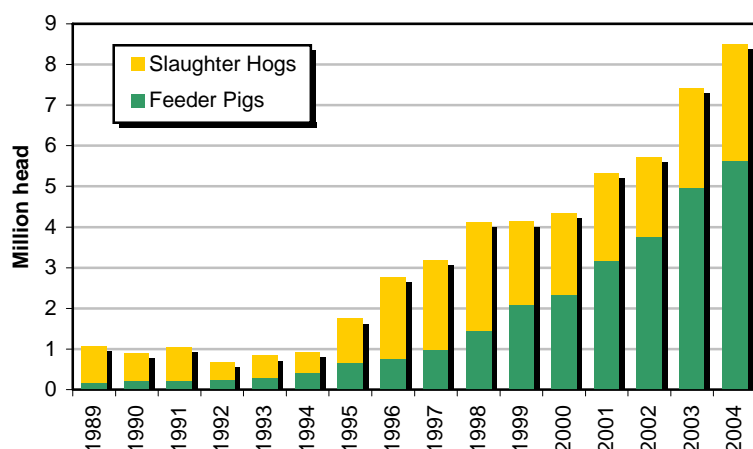
### **North American Hogs and Pork**

During 2004, NAFTA countries traded 2.5 million metric tons (mmt) of pork, 30% of which occurred within NAFTA (Figure 3). This represents approximately the same percentage of intra-NAFTA pork trade as in 1993, although the magnitude of the trade increased by 243%, reaching 733 thousand metric tons (tmt) in 2004. Although this does not signify an increase in intra-NAFTA trade, it does show that as



**Figure 3.** Intra-NAFTA and ROW pork trade.

Note. Data from USDA FAS (2005b) and CanFax (n.d.).



**Figure 4.** US swine imports from Canada, 1989–2004.

Note. Data from USDA ERS (2005).

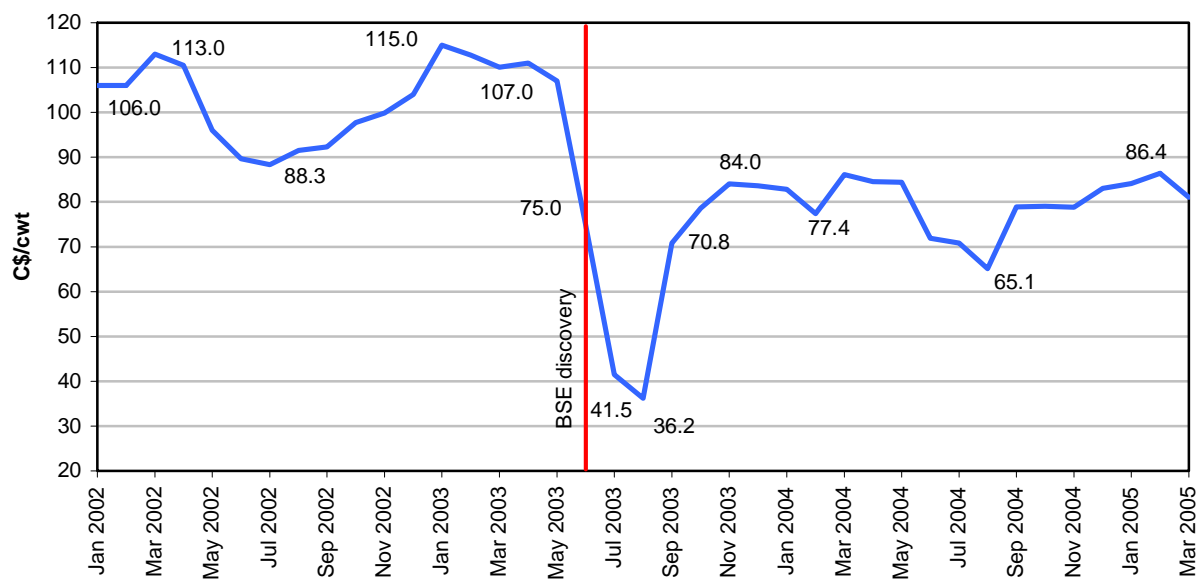
the overall volume of NAFTA pork trade increased, the intra-NAFTA relationship has remained strong. Accounting for much of the increase in total pork trade among NAFTA countries are US imports from Canada, up 118% from 1993 to 2004, and US exports to Mexico and Canada, up 598% and 680%, respectively, over the same period.

When examining the live hog trade, one major change is the increase in US imports. Since the implementation of CUSTA, Canadian exports of live hogs to the United States have grown from 1.1 million head in 1989 to 8.5 million head in 2004, accounting for all but a few hundred head of US hog

imports (Figure 4). Most of this increase has occurred since 1995, when exports were 1.7 million head. Since that time, Canadian exports of fed hogs to the United States has grown 485%, from 1.1 million head to 2.9 million head. Even more dramatic growth has occurred in US imports of feeder pigs from Canada, from 700,000 head in 1995 to 5.6 million head in 2004. The main reason for the large increase in US feeder pig imports is limited hog finishing capacity in Canada when compared to advances in farrowing capacity and efficiency, partially due to strict environmental regulations in Canada.

Since 1994, US hog exports to Mexico have been as erratic as they were prior to NAFTA (albeit at a higher level), particularly since 1998, when exports reached a seven-year high of 207,900 head. Most US hog exports to Mexico have been for slaughter, averaging 86% of the total since the implementation of NAFTA. In 1992, 1997, and 2002, slightly more than one half of US hog exports to Mexico were for breeding. US hog exports to Mexico during 2004 were 138,775 head and accounted for 80% of US exports. Other US hog exports, particularly those to China, Hong Kong, Japan, and Korea, are mainly breeding stock.

The potential for food chain disruption has taken a different form in North American hog and pork trade. The large increase in US hog imports from Canada prompted many in the US pork industry to suspect that Canada was shipping hogs to the United States at a price that was less than fair value (LTFV). In March 2004, the National Pork Producers Council filed a case with the US International Trade Commission (ITC) and the US Department of Commerce (DOC) alleging injury to the US pork industry from these imports. This was the second case filed by the US industry since 1998. Although the DOC agreed that these hogs were entering the United States at LTFV, the ITC concluded that this did not cause “material injury” to the US industry and that the establishment of the US industry had not been “materially retarded.” Had there been a finding of material injury or retardation to the industry, an anti-dumping compensatory tariff would likely been imposed on the importation of Canadian hogs, potentially causing disruption in the US pork market.



**Figure 5.** Alberta, Canada direct sale steer prices, midmonth midpoint, January 2002 to March 2005.

Note. Data from Alberta Agriculture, Food and Rural Development (2005).

Just a year before the US case against Canada, the Mexican pork industry initiated an antidumping case against the imports of pork from the United States. This followed an antidumping case filed by the Mexican industry in 1999 against US slaughter hogs. The hog case resulted in a compensatory duty of \$0.351/kg imposed on Mexican imports of US hogs effective October 2000 through May 2003. The pork case, however, ended in May 2004 with no compensatory duties being levied. However, an investigation of imports of US pork hams was initiated immediately following the broader pork case. The final determination on this case has not yet been announced.

What these hog and pork cases indicate is that when combined with animal health, food safety, and other regulatory issues such as MCOOL, there are many potential disruptions to the North American meat food chain. Furthermore, only a few examples have been highlighted here. In pork and hogs, there is also concern about MCOOL, and there are

animal health issues. By the same token, there have been antidumping and countervailing duty cases filed in the North American beef cattle industry, by the United States against Canada and Mexico, and by Mexico against the United States. Thus far, however, only the case of North American BSE has caused major disruptions.

### **The Case of BSE in North America: A Closer Look at Trade Issues and Implications**

The short-run industry response to BSE was to concentrate trade and resources within the North American food chain. Although Canadian steer prices initially fell 65% after the Canadian BSE case in May 2003, they have since recovered most of their value, reaching the high \$80s (Canadian) in February 2005 before dropping to the low \$80s in March (Alberta Agriculture, Food and Rural Development, 2005; Figure 5). Prices also appear to be exhibiting more normal seasonal patterns as well.

Price recovery stems from two major market factors. First, consumers did not panic when BSE was found and continued to purchase beef. Second, as soon as the US market was reopened to Canadian beef, meat packers specialized in the export of boneless beef from cattle less than 30 months of age in order to comply with US regulations, thereby increasing the demand for cattle. The value of mature Canadian cows fell by 75% and is still struggling to recover.

US beef exports fell from 820 tmt in 2003 to a mere 136 tmt in 2004. Export prospects for 2005 are not much better, as companies wait for Japan to reopen its market to US beef. Cattle prices did decline in late 2003 and early 2004 but soon recovered their value.

Although beef imports were lower in 2003 due to less Canadian product, overall US imports of beef rose in 2004, with Uruguay setting a record for shipments to the United States with 99,000 tons. Larger supplies of beef also arrived from Australia and New Zealand. The majority

of this beef was classified as frozen, boneless trimmings and about 90% lean. It was used to blend with US beef in order to obtain an 80% lean product used for ground meat in grocery and fast food businesses. US imports of Mexican cattle also rose in 2004, reaching 1.37 million head. Imports of Canadian cattle remain banned as of this writing.

It is less clear what may happen over the long run, and much depends on when (or whether) the US market for Canadian cattle reopens and US beef sales to Japan and South Korea resume. What is clear, however, is that Canadian feedlot placements have increased and packing capacity is increasing. Should this trend continue, US imports of Canadian beef will increase, and Canada will be well positioned to respond to market opportunities as more markets for beef reopen. It also appears that Canadian hog exports are set to continue, unless US antidumping or countervailing action slows them. More hogs will likely mean less Canadian pork, a trend that appears to have started in 2003.

In the United States, the cattle herd appears set to rebuild. As this occurs, less imports of beef from Uruguay are likely, especially since it appears higher valued than imported beef from Canada, Australia, or New Zealand. Australia and New Zealand have also responded to market opportunities in Japan in the absence of US beef. About 60% of Australian beef exports went to Japan in 2004, accounting for 47% of Japan's beef imports. Australian feedlots were expected to reach 77% of capacity in late 2004, with a growing share of the beef destined for Japan over the next two years (USDA, 2005a).

US exports of pork and poultry likely will outpace beef during 2005, especially if Japan and South Korea

do not open by summer. The US beef industry is set to respond, however, and will attempt to regain lost market share in both countries. Reliance on a larger number of export markets may emerge as a viable long run strategy as exports resume. Spreading market risk across more countries appears to be one way to somewhat mitigate the negative impacts of disease outbreaks and unforeseen events and is likely a sound marketing strategy for the long term.

Mexico appears to be in a cattle herd rebuilding phase. Capital availability and high interest rates may retard achievement of expected gains in herd replacement, especially for smaller ranchers. As long as US cattle prices remain strong, Mexico will respond with increased exports of feeder calves, likely exceeding one million head for the third consecutive year in 2005. It is also likely that some Mexican businesses will consider expanding feedlots and packing plants to avoid animal disease outbreak issues.

## Summary and Conclusions

The degree of dependence on trade is an obvious and important variable in determining just how much of an impact an animal disease outbreak or other food chain event will have on trade. Maintaining consumer confidence in science and the integrity of the North American food chain is absolutely critical. It also remains to be seen whether the high degree of integration in the beef cattle industry, specifically among the United States and Canada, will return if the US border is reopened to Canadian cattle. US reliance on Mexico for an ever-growing number of feeder cattle seems to be well established. The question is whether Mexico can sus-

tain these exports over an extended period of time and still rebuild the cattle herd. The discovery of BSE in Mexico would not only be devastating for Mexican cattle producers, but also for Southwestern feedlots, packing plants, and ranchers.

Now that there is increased integration in North American agriculture, adverse events have the potential to create larger disruptions than in the past. BSE is a case in point. Whether North America will return to the previous path of integration in the beef industry, or whether this integration takes a new path as the Canadian beef processing industry grows and focuses on exporting beef, is a crucial issue. As the duration of a disruption grows, the opportunity to return to the pre-BSE levels of trade seems to be slipping away. Protectionist sentiment, coupled with rent seeking, appears to have garnered the attention of policy makers and could derail continued market integration well into the future.

## For More Information

- Alberta Agriculture, Food and Rural Development. (2005). *Weekly Livestock Market Review*. Various Issues, January 2004 – March 2005. Available on the World Wide Web: <http://www1.agric.gov.ab.ca>.
- CanFax. (n.d.). *Cattle on feed report*. Various monthly issues. Available on the World Wide Web: <http://www.canfax.ca>.
- Lloyd, T., McCorriston, S., Morgan, C.W., & Rayner, A.J. (2001, August). *The impact of food scares on beef and inter-related meat markets*. Paper presented at the annual meeting of the American Agricultural Economics Association, Chicago, IL.

United States Department of Agriculture Economic Research Service. (2005). *Food security briefing room*. Washington, DC: USDA. Available on the World Wide Web: <http://www.ers.usda.gov/Briefing/FoodSecurity/>.

United States Department of Agriculture Foreign Agricultural Service. (2005a). *Australia livestock and products semi annual 2005* (GAIN report AS5003). Washington, DC: USDA. Available on the World Wide Web: <http://www.fas.usda.gov/gainfiles/200502/146118708.pdf>.

United States Department of Agriculture Foreign Agricultural Service. (2005b). *Mexico livestock*

*and products semi annual 2005* (GAIN report MX5011). Washington, DC: USDA. Available on the World Wide Web: <http://www.fas.usda.gov/gainfiles/200501/146118622.pdf>.

United States Department of Agriculture Foreign Agricultural Service. (2005c). *U.S. internet trade system*. Washington, DC: USDA. Available on the World Wide Web: <http://www.fas.usda.gov/ustrade>.

United States Department of State. (2002). Food security and safety. *Economic Perspectives: An Electronic Journal of the U.S. Department of State*, 7(2). Available on the World Wide Web: [\[usinfo.state.gov/journals/ites/0502/ijee/ijee0502.htm\]\(http://usinfo.state.gov/journals/ites/0502/ijee/ijee0502.htm\).](http://</a></p></div><div data-bbox=)

United States International Trade Commission. (2005). *Live swine from Canada* (investigation no. 731-TA-1076 [final]; publication 3766). Washington, DC: USITC. Available on the World Wide Web: <http://www.usitc.gov>.

*C. Parr Rosson III is a professor, extension economist, and director of the Center for North American Studies, Department of Agricultural Economics, Texas A&M University, College Station, Texas. Flynn J. Adcock is international program coordinator and assistant director of the Center for North American Studies, Texas A&M University.*





## Farmers and Social Security Reform

By James L. Novak, Paul Gentle, Patricia Duffy, and Alison Keefe

For several years, reports from the Trustees of the Social Security system have warned us that at the current rate of benefits and given the current age structure of our population, the Social Security system will go broke sometime between 2038 and 2042. To address Social Security Trustees' concerns, President Bush, in his postelection speech, reported that one of the legacies of his administration would be to reform the Social Security system. Farm operators tend to be older, on average, than people in other populations, meaning that changes in Social Security would more likely be of near-term concern to them. Although there is still considerable debate on whether reform is necessary or desirable, this article reports on what a changed Social Security system might look like, and how changes in the system might affect farmers' need for additional savings.

### Social Security Today

Trustees of the Social Security system are appointed to oversee the four separate funds that make up the current Social Security Trust Fund Account. These funds are *Social Security* (Old Age and Survivors Insurance, OASI), *Disability Insurance* (DI), *Medicare's Hospital Insurance* (HI), and *Supplementary Medical Insurance* (SMI). OASI is what most people consider when they talk about Social Security retirement income.

Social Security is a pay-as-you-go system (sometimes called "pay-go"). It was designed so that current workers pay for the benefits of current retirees out of taxes. Payroll and self-employment taxes, premiums, and other income are deposited to trust fund accounts. Retirement and disability benefits and administrative costs are paid from the OASI and DI funds. Trust funds not used in the current year are invested in government bonds. When the bonds reach maturity or are needed, they are cashed to pay benefits. According to the Social Security Administration, the nominal interest rate earned on OASI and DI funds in 2004 was 4.3% (OASDI Trustees, 2005).

### Proposals for Reform

Many proposals for fixing the Social Security system have been drafted over the past years. These can be summarized as follows:

- keep the current system (OASDI) intact and maintain or raise existing benefits;
- keep the current system intact but reduce benefits;
- change to a regulated two-tiered retirement system, which includes reducing current OASI benefits and making up the difference with a Personal Savings Account (PSA);
- develop a regulated PSA system, eliminate SS benefits entirely, and provide a PSA invested in securities but regulated by the government; or
- eliminate the Social Security system and allow the private sector to handle retirement.

In 2001, the final report of the President's Commission to Strengthen Social Security (2001) listed three voluntary proposals for reforming the Social Security system. The President's recent proposal for reform comes largely from this Commission's study. The idea behind all three proposals is that Social Security benefits would be lowered but made up for ("offset") using a worker's own *Personal Savings Account* (PSA). PSA funds are to be invested and are to earn an interest rate guaranteed to exceed inflation. A retirement annuity would be paid from these funds based on the individual's life expectancy and contributions to his or her own PSA. Benefits from individual savings are projected by the 2001 Commission to be higher or to at least equal to those received under the current Social Security system.

Under the Commission's first proposal, a *Two Percent Personal Account* would result in expected benefits that would exceed (by approximately 12%) those received under the current (2001) Social Security system. This proposal establishes a PSA with voluntary contributions of 2% of taxable wages. Invested funds would be com-

pounded at a guaranteed rate of 3.5% above inflation.

The Commission's second proposal is called the *Voluntary Progressive Personal Account*. This proposal establishes voluntary personal accounts without raising taxes or requiring worker contributions above what is currently required. Features of this program include:

- voluntary contributions of 4% of "redirected payroll taxes" from the OASI trust fund to a PSA, with PSA contribution limits of \$1,000 annually;
- contributions are to compound earnings at an interest rate of 2% above inflation;
- the \$1,000 contribution limit would be adjusted upward for annual inflation; and
- OASI benefits would be indexed to price inflation rather than national wage growth.

Social Security benefits payments will be offset by payments from the workers' individual personal accounts. According to the Presidential Commission, total benefits are expected to at least equal the OASI benefits received (as measured by 2001 income). Under this plan, additional Social Security benefits would be paid to low-pay, high-risk workers. The minimum Social Security benefit payable to 30-year minimum wage earners would be at a rate of 120% of the poverty level.

The third proposal deals with *Voluntary Add-On Accounts with Matches from Payroll Taxes*. This proposal "carves out" a part of the payroll tax and invests that amount in PSAs. This proposal is designed to preserve Social Security benefits (as calculated in 2001) by allowing workers to contribute voluntarily an additional 1% of wages to a PSA. Features of this proposal are:

- The 1% would be matched by 2.5% of a worker's payroll taxes up to a maximum of \$1,000 annually;
- contributions would be compounded at 2.5% above inflation, with the maximum contribution indexed by inflation; and
- refundable tax credits would be given for the add-on contribution.

Under this plan, scheduled Social Security benefits would be offset by payments from workers' personal accounts. Minimum benefit of 100% of poverty level would be guaranteed for 30-year workers and 111% of the poverty level would be guaranteed for 40-year workers. Any benefits received from the Social Security system would be modified by adjusting the growth rate for future changes in life expectancy, decreasing early retirement benefits, increasing benefits for delayed retirement, and reducing the benefits for those with higher incomes.

### So What's the Downside?

If all of this sounds good, what's the downside? Concern has been expressed about the cost of implementing the personal savings account system. The cost of funding and regulating such a system, independent of the contributions required by the workers, has been estimated by at least one source to be an additional \$25–50 per person per year, on top of what the current system costs, which is about \$16 per person per year (Hill, 2000). A Congressional Budget Office report (Walliser & Becker, 1999) estimates PSA administrative costs (based on Chilean and Argentinean PSA experience) at about \$50 per contributing worker per year—similar to the cost experi-

enced by US employer-sponsored pension plans.

Legislated minimum guarantees may be of particular value in the case of limited-resource farmers or for farmers with financial difficulties. A potential PSA fund accumulation problem for farmers in particular is that they may have years of minimum or no contributions because of farm operating losses. Farm profits contribute to the size of fund an individual can accumulate. The longer contributions are in a fund, the more time they can compound and potentially accumulate into a larger nest egg on which to draw during the retirement years.

Issues such as the definition of emergencies (natural disasters, health emergencies, etc.), which would allow for early withdrawal, would need to be worked out. Other questions include: If participants outlive their PSAs, should the system continue paying benefits? If individuals mismanage their portfolios, what should be done?

### Investment Policy

An excellent article on the marginal effects of four proposals for restoring long-run actuarial solvency to the Social System looked at "including the establishment of private accounts, providing for Trust Fund investment in private securities, using General Fund revenues, and changing the benefit structure of Social Security" (Lyon & Stell, 2000, p. 473). Their finding is that a one-step process of contributing 2% of payroll taxes to a PSA (at the historic 3% rate of return earned on long-term bonds) would not fix the system. Additional measures, such as a transfer of funds from the General Fund or earning higher rates of return (6%), are required to balance the sys-

tem. Restoring solvency to the system as it currently exists requires such measures as including newly hired state and local workers in the system, raising the Normal Retirement Age, and increasing the contributions and benefits base to 90% of covered wages.

With regard to private investments, a portfolio of 40% bonds and 60% stocks has been suggested for Personal Savings Accounts (Liu, Rettenmaier, & Wang, 2001; Lyon & Stell, 2000). At least one opponent to stock market investment, John Mueller, expressed concern over its volatility (Mueller, 1997). Liu et al. (2001) point out that the higher interest rate earned in the market is largely a risk premium. The relative riskiness of alternative investments would certainly need careful weighing in any move to a PSA-type system.

### Farmer Savings Needed to Replace Social Security?

Table 1 shows the accumulated savings needed to provide \$775, \$979, and \$1,327 monthly annuities to replace average age 62, 65, and 70 Social Security benefits, respectively, for an individual born in 1936 and who earned the national average wage for the past 35 years. Although it is unlikely that there is a farmer who earned exactly the national average wage rate for the past 35 years, these numbers are provided to show the approximate retirement fund necessary to replace Social Security on average. For example, on average, a \$152,000 nest egg would be required (at a 2.5% real rate of return on investment) to replace a \$775 Social Security monthly annuity with a PSA annuity.

Seventy to eighty percent of pre-retirement earnings has been estimated to provide a retiree with his or

**Table 1.** Savings required to provide a monthly annuity equal to average earned social security benefits (\$).

Retirement age	Monthly annuity (\$)	Investment portfolio rate of return				
		2.5%	3.5%	4.5%	5.5%	6%
<b>62 (early retirement)</b>	775	152,000	138,166	126,197	115,678	110,893
<b>65 (normal retirement)</b>	979	170,500	156,725	144,753	134,052	129,128
<b>70 (delayed retirement)</b>	1,327	176,583	166,125	156,510	147,661	143,502

Note. Assumes a person will live to age 83.

her pre-retirement standard of living. Shipman states that to achieve a 70% income replacement at retirement, "one's portfolio would have to earn an annual real rate of return of 5.7%" (p. 1). Table 1 shows that a 6% return on investments would require retirement funds of \$110,893 to pay \$775 per month, \$129,128 to pay \$979 per month, and \$143,502 to pay \$1,327 per month. Additional family savings would be required to replace Social Security annuities for both a husband and wife. At Normal Retirement Age, spousal annuities are currently 50% of the primary earner's annuity. Family earnings are subject to maximum limits. Higher earnings on investment would reduce the size of the fund required for retirement.

### Care Needed In Redesigning the System

There is significant discussion about the cost of implementing a dual retirement system and whether any cost savings would result from such changes. Farmers who participate in the Social Security system would be subject to the same impact as the general population of self-employed if the benefits formula were changed. In 1998, 150,000 limited-resource farmers had household incomes of \$9,924 and current assets of \$6,790. This group of farmers is relatively poor (19.1% of national average income) and would expect a significant impact from Social Security

changes. However, farmer retirees are not generally totally dependent on Social Security. According to a USDA Economic Research Service study of retired farmers, farm rental, value of farm products consumed, and CRP are listed as sources of retirement income (Hoppe, 1996). Total household income was listed as 88% of the national average income (Hoppe et al., 2001). Two problems identified by ERS with farm assets as a source of retirement funding is the relatively fixity of real estate assets and that partnership arrangements may complicate conversion of wealth to a liquid form (Hoppe et al., 2001).

Alternatives to reforming the Social System include raising payroll taxes, cutting benefits, and eliminating tax cuts. Although reform is mostly targeted to younger wage earners, changes to the tax system will affect nonretired as well as retired farmers.

According to the Trustees and others, if the system is to be "fixed," an early fix is preferred. According to the 2003 Trustees report, "To the extent that changes are delayed or phased in gradually, greater adjustments in scheduled benefits and revenues would be required" (Social Security and Medicare Boards of Trustees, 2003, p. 1).

Clearly, changes to the system should be designed with care and with adequate safeguards for farm as well as nonfarm participants. Potential savings problems of farmers and

other self-employed individuals, like accounting for low or negative income years, health problems, and accidents, should be factored into the reform equation. Anything less would result in more insecurity than the current debate provides over the future of Social Security.

## For More Information

- Hill, C. (2000). *Why privatizing social security would hurt women* (publication #D437RB). Washington, DC: Institute for Women's Policy Research. Available on the World Wide Web: <http://www.iwpr.org/pdf/CATORIB.PDF>.
- Hoppe, R.A., Johnson, J., Perry, J.E., Korb, P., Sommer, J.E., Ryan, J.T., et al. (2001). *Structural and financial characteristics of U.S. farms: 2001 family farm reports* (Ag Information Bulletin 768). Washington, DC: United States Department of Agriculture Economic Research Service. Available on the World Wide Web: <http://www.ers.usda.gov/publications/aib768/>.
- Hoppe, R. (1996). *Change in farm survey allows first in-depth look at farming retirees* (AER 730). Washington, DC: United States Department of Agriculture Economic Research Service.
- Liu, L., Rettenmaier, A.J., & Wang, Z. (2001). *Social security and*

- market risk* (policy report no. 244). Washington, DC: National Center for Policy Analysis.
- Lyon, A.B., & Stell, J.L. (2000). Analysis of current social security reform proposals. *National Tax Journal*, 53(3), 473-514.
- Mueller, J. (1997). *Three new papers on "privatizing" social security, one conclusion: bad idea*. The National Press Club, October 14, 1997. New York: Global Action on Aging. Available on the World Wide Web: <http://www.globalaging.org/pension/us/socialsec/mueller.htm>.
- OASDI Trustees. (2005). *2005 OASDI trustees report: Assumptions and methods underlying actuarial estimates: Economic assumptions and methods*. Washington DC: United States Social Security Administration. Available on the World Wide Web: <http://www.ssa.gov/OACT/TR/TR05/tr05.pdf>.
- President's Commission to Strengthen Social Security. (2001). *Strengthening social security and creating personal wealth for all Americans*. Washington, DC: Author. Available on the World Wide Web: [http://www.csss.gov/reports/Final\\_report.pdf](http://www.csss.gov/reports/Final_report.pdf).
- Shipman, W.G. (2001). *Is the stock market too risky for retirement?* (brief analysis 382). Dallas:

- National Center for Policy Analysis. Available on the World Wide Web: <http://www.ncpa.org/pub/ba/ba382/ba382.pdf>.
- Social Security and Medicare Boards of Trustees. (2003). *Status of the social security and medicare programs. A summary of the 2003 annual reports*. Washington, DC: United States Social Security Administration. Available on the World Wide Web: <http://www.ssa.gov/history/pdf/tr03summary.pdf>.
- Walliser, J., & Becker, S.M. (1999). *Social security privatization: Experiences abroad*. Washington, DC: Congressional Budget Office. Available on the World Wide Web: <http://www.cbo.gov/ftpdocs/10xx/doc1065/ssa-broad.pdf>.

*James Novak is an extension economist and professor in the Department of Agricultural Economics and Rural Sociology at Auburn University. Paul Gentle is a visiting assistant professor at the School of Economics of Renmin University, China. Patricia A. Duffy is with the Department of Agricultural Economics and Rural Sociology at Auburn University. Allison Keefe is an assistant professor of economics in the Department of Leadership and Professional Development at Kennesaw State University.*



## The Business of an Agricultural “Way of Life”

By Steven C. Blank

In an earlier *Choices* article, Blank (2002) argued that a majority of America's farms and ranches are “hobby farms” that represent a lifestyle choice more than a commercial business. In answering the question “Is agriculture a ‘way of life’ or a business?”, Blank concluded that:

Agriculture is both a way of life and a business. It is a way of life to, possibly, all participants, but it is a business to only some. Large-scale “commercial farms” clearly act like businesses. Many of those farm operators may also view their business as a desirable way of life. On the other hand, “rural residence farms” are hobbies that operators must subsidize with earnings from off-farm sources. (p. 29)

This article takes the analysis a step further by posing a second explanation for why farmers are willing to subsidize their family farm. It abandons the naive view, often expressed by farm advocates, that rural residents are only in it for the lifestyle. That gross underestimate of farm owner-operators' business savvy is replaced with a modern view of the big picture.

### The Never-Ending Debates

In agricultural policy debates, farm advocates have often used the “way of life” argument to support their claim that production agriculture in general and family farms in particular need to be protected in various ways—such as subsidization through direct and indirect government payments. However, many things in agriculture are not what they seem. The net farm income totals reported by the United States Department of Agriculture (USDA) overstate the profitability of agricultural production while they understate the profitability of being a farm owner-operator. The overstatement comes in the form of direct government transfers to agriculture that in some recent

years have been nearly half the total net farm income reported by the USDA (2005). The understatement comes from the income data's focus on only farm/ranch production related activities, ignoring other sources of income. Of these two misrepresentations of American agriculture's big picture, the understatement is far more important. It leads to the perception that an agricultural way of life is one of poverty for most farmers, thus providing a justification for government support.

However, if things down on the farm are so bad, why do farmers stay in agriculture, and why has the number of farms with annual sales of less than \$10,000 increased since 1992, while total farm numbers continue to decline? As Blank noted, the reverse migration from cities to small farms observed over the past decade suggests that more Americans want to pursue a rural lifestyle (Deller, Tsai, Marcouiller, & English, 2001). But is that all there is to it?

The debate over why farmers stay dates back many decades and is typified by Brewster's (1961) hypothesis that farmers willingly accept lower returns than other investors because of the lifestyle benefits derived from farming. This view often leads to a mistaken interpretation of the fact that most farmers are part-timers. The misinterpretation usually made is that farmers seek off-farm income simply to enable them to pursue their lifestyle choice. However, a second possible explanation for why farmers stay is implied by the results of Blank, Erickson, Moss, and Nehring (2004), who found that farmers' wealth comes from capital gains, not production income. This leads to the proposition that many owner-operators may be real estate investors using off-farm income to help them stay on the farm until they choose to capture their capital gains. This implies that farmers, like all investors, have a desire to build wealth, which is consistent with the view that owner-operators see agriculture as a business.

**Table 1.** Average rates of return by region, 1960–2002.

	ROA from current income	ROA from capital gains	Total ROA	SD of total ROA	Total ROE	SD of total ROE
Northeast	-0.03	2.56	2.54	3.65	2.24	4.38
Lake States	1.82	2.13	3.95	6.22	3.53	8.15
Corn Belt	3.13	1.06	4.18	7.83	3.86	9.57
Northern Plains	3.97	0.83	4.80	6.57	4.57	8.37
Appalachia	2.58	1.45	4.04	4.59	3.86	5.52
Southeast	5.50	1.92	7.42	4.48	7.90	5.50
Delta	4.62	-0.02	4.60	6.58	4.34	8.42
Southern Plains	1.87	0.71	2.58	4.92	2.27	5.88
Mountain	2.67	1.24	3.90	5.51	3.78	6.88
Pacific	5.41	0.97	6.39	4.95	6.84	6.57
AK & HI	2.93	1.92	4.85	5.26	4.92	5.80
US total	3.04	1.26	4.30	5.26	4.12	6.60

Note. ROA—return on assets; ROE—return on equity; SD—standard deviation of the time series.

## Wealth is the Key

A business has the objective of increasing the wealth of owners. For most small and mid-sized farms, owners' wealth is reduced by the production losses they incur most years, on average; thus, they are often labeled as "hobby farms" (Mishra, El-Osta, Morehart, Johnson, & Hopkins, 2002). However, if you understand the full definition of wealth, you know that production income is only one source.

Three types of income (or economic gains) contribute to wealth: profits from farm output, off-farm income, and capital gains on assets. Total wealth ( $W$ ) is usually expressed as equity at time  $t$ . Changes in wealth during a time period ending at  $t$  ( $\Delta W_t$ ) equal farm income ( $FInc$ ) plus off-farm income ( $OFInc$ ) plus capital gains ( $\Delta K$ ) minus consumption ( $C$ ), or  $\Delta W_t = FInc_t + OFInc_t + \Delta K_t - C_t$ .

Capital gains are simply the change in value of a farmer's capital from one period to the next:  $K_t - K_{t-1}$ . Capital gains are only realized if the asset is sold. However, lenders will usually loan a farmer up to some

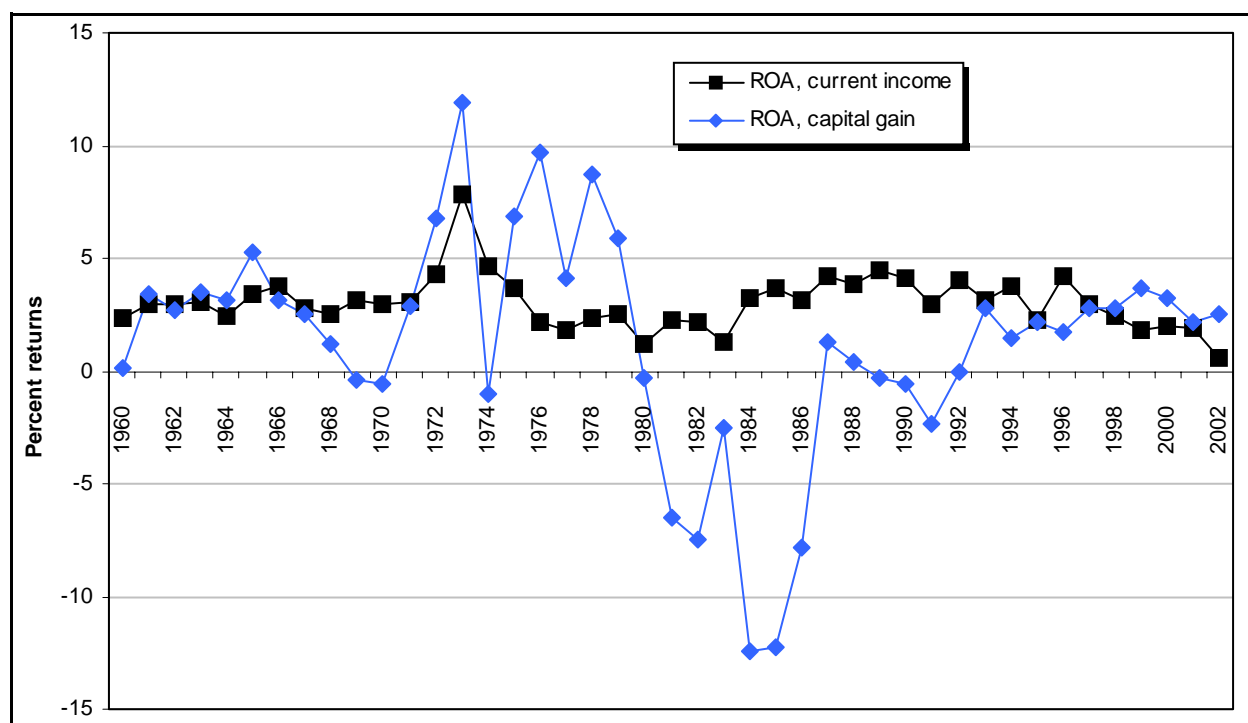
specific portion of the market value of assets, referred to as the *loan-to-value* ratio. Thus, some portion of unrealized capital gains can be immediately converted into cash and used to acquire other assets. In this regard, capital gains—even unrealized gains—immediately improve a farmer's ability to borrow, and thus they aid in financing a larger operation, which presumably will increase the growth in wealth.

So, how are agricultural producers doing in generating income to build wealth? The 2002 Census of Agriculture (USDA, 2004) reports that 53.3% of all farms generated a net *loss* for the year, although the average household earnings from farming activities for that year were \$3,473 (USDA, 2005). Clearly, this amount is not sufficient to support a family—it does not exceed household consumption cost. Thus, relying on this source of income only would result in annual reductions in household wealth.

So, why continue to farm? Although income from farming activities is low, on average, if it is still positive, it helps operators cover

(at least part of) their ownership costs. As an investment, farming has generated a positive return for American farmers. The first column of Table 1 shows the average return on assets (ROA) received by producers in the different regions of the country, plus the average for the United States, over the 1960–2002 period. It shows that over the long run, American agriculture has generated a 3.04% average return on assets used in production activities. That provides some incentive to continue investing in the business.

What about capital gains? Farmland has historically represented about 75% of assets held by farm households (USDA, 2000). Therefore, the ROA from capital gains reported in the second column of Table 1 are primarily from farm real estate. Agricultural land prices are the result of assessments of a parcel's value by both agricultural and nonagricultural markets (Drozdz & Johnson, 2004; Plantinga, Lubowski, & Stavins, 2002), and many of those factors are out of the control of the farm owner. Therefore, farmland values vary much more than do the val-



**Figure 1.** US agriculture's returns on assets, 1960–2002.

ues of other agricultural assets, but they have generated an average return on those assets of 1.26% annually for owners over the 1960–2002 period. The volatility of the two sources of returns is apparent in Figure 1. What is also apparent is that returns from capital gains have been higher than returns from current production income for most of the past decade. What is not apparent is the relative scale of the contributions to owner wealth that are made by capital gains.

As it turns out, capital gains have increased owner-operators' wealth more than have farming profits, on average, in many years. For example, in 2002 the Census of Agriculture found that the estimated market value of farm real estate was \$1.145 trillion dollars. Assuming that the long-run national average rate of return from capital gains of 1.26% (shown in Table 1) was earned on the real estate gives a conservative estimate of \$14.4 billion for capital gains in agriculture for 2002. That total

equals \$6,777 in capital gains earned for the year by each of the 2,128,739 farms reported in the Census. The actual capital gain rate reported for 2002 was 3.18% (USDA, 2005), which gives an estimate for average capital gains of \$17,078 per farm—nearly five times as much as the average amount of farm income per household. Therefore, capital gains are relatively much more important in building farm owner-operator wealth, even though they look relatively minor when reported as in Table 1. In addition, the distribution of capital gains is likely to be weighted more heavily toward small lifestyle farms (that are more often closer to cities) than to large commercial farms (that are usually farther from urban areas). In other words, it is expected that small farms are earning above-average rates of capital gain, thus improving owner-operator wealth faster for lifestyle farms because of the “urban influence” on

land values in their location (USDA, 2000).

Finally, it should be clear that farm income must be augmented by off-farm income to cover the cost of living for most farm households. Even if capital gains could all be realized each year, combining the long-run annual average of \$6,777 in capital gains with the low average earnings from farm activities (\$3,473 in 2002) gives an average farm household income of only \$10,250 per year—far below the poverty line for a family of four. Therefore, off-farm income is a necessity for most farmers. Is this an indicator of poverty?

Apparently not. Farmers are doing better than the rest of us, on average. The average off-farm earnings of farm households in 2002 was \$62,285, with lifestyle farms averaging much more than that and large farms averaging much less (USDA, 2005). Combining this figure with the \$3,473 average earnings from farming activities gives a total income

of \$65,757, which was 13.7% higher than the US average household income of \$57,852 for that year. This means that farm households may be building wealth faster than other Americans, on average.

So, who wants to argue that the agricultural “way of life” needs government subsidies?

## A Growing Investment

Agriculture is a way of life to rural residents, but it is a business to all its investors, including absentee owners. Large-scale farms clearly act like profit-maximizing businesses. On the other hand, most smaller farms are lifestyles that provide owners with deductions to write off against their taxable earnings from off-farm sources while gaining wealth in the form of capital gains. In other words, all farmers are pursuing both lifestyle and business goals. This can be more easily understood if we describe farm and ranch owner-operators as investors and wealth builders like all businesses.

A business that builds wealth primarily from capital gains is an investment firm. In many cases, a farm is a passive investment that does not interfere with the owner's ability to work off-farm. The Census shows that 54.8% of all farmers reported working off-farm at some time during 2002, with the share being higher for small farms and lower for large farms, as expected. Even more telling is that 39.1% of farmers reported working off-farm 200 days or more during the year. That is virtually full-time employment! No wonder farmers earned more money per household off-farm during 2002 than the average American household earned in total. This indicates that farm owners are a talented group and are valued by the labor market, on aver-

age, more highly than average Americans are. Therefore, the business savvy of farmers should no longer be underestimated.

Many farmers are smart investors who have taken “moving to the suburbs” one step further and have found wealth. The direction of causality in the migration from cities to small farms is unclear. Do rising rural real estate values cause the migration, or does migration raise farm real estate values? Or are both explanations working in a circular fashion?

Clearly, the answers vary across the country. For example, the regional results in Table 1 show that farms in the Northeast and Lake States derive a majority of their long-run returns from capital gains, which have outperformed returns from agricultural production as an investment. The reverse has been true in the Delta region. Thus, the relative portions of “farms” in a region that might be called “investment firms” will differ across locations.

## What is a “Farm”?

The discussion to this point has raised questions about whether all operations currently defined as “farms” by the American government truly deserve that label and the government support that comes with it. This article offers the proposition that many owner-operators may be real estate investors using off-farm income to help them stay on the farm until they choose to capture their capital gains. If this description fits an operation, it can be argued that the household is more accurately portrayed as an investment firm, even if they are enjoying an agricultural way of life. For these firms, the business motivating their rural way of life has little to do with real agriculture.

“Real” farms and ranches make a real effort to support their household on earnings from agricultural activities. This means making household labor allocations with the primary objective of producing agricultural output, rather than viewing agriculture as the residual market for excess labor in the household. When more household labor is allocated off the farm than is allocated to agricultural activities, the operation is primarily a real estate investment firm, not a farm.

However, care must be taken when trying to distinguish between real farms and investment firms. Sometimes farmers act very much like investors in their business decisions, but they have very different motives. For example, it has often been observed that farmers reinvest most farm income into their operations. This raises the question: Do farmers reinvest out of economic necessity, or are they making investments in expanding their farms to increase their long-run wealth derived from increased capital gains? It might appear that any investment made with capital gains in mind indicates that the person is not a real farmer. However, farm real estate investments play a very important role in the life of real farmers: providing current farmers with a retirement “nest egg.” With no other source of income, most real farmers need to capture their farmland capital gains to be able to retire from the business that has been their life. Ultimately, differences in the nature of investments made in a farm will indicate whether the household is operating like a real farm or an investment firm. A farmer makes investments that raise the value of the operation as a “working farm.” An investment firm makes investments that raise the real estate value of the operation.

Some investments can raise both values.

## Policy Implications

Policies aimed at protecting an agricultural “way of life” are outdated and badly in need of replacement by programs that are based on an understanding of the true business objectives of those living in rural America. The country needs a modern definition of what constitutes a “farm” and an agricultural policy with differential treatment of farms across scale ranges with regard to policy benefits. Also, care must be taken in land-use policies so as not to hurt those people who have served the country as agricultural producers.

At present, at least 53% of farms lose money each year, on average, and focus much of their attention and household labor off-farm. This raises the question of whether those operations should be considered “farms” and receive agricultural policy benefits. It does not make good business sense for the country to have taxpayers subsidize these real estate investors. Yet current subsidies include income tax breaks and direct government payments to farm owners totaling billions of dollars each year. The fact that a lot of money goes to large farms and/or absentee owners adds fuel to the argument that much of agricultural policy is no longer accomplishing its original goals of providing an economic “safety net” for those people producing our country’s food supply.

Land-use policy now holds the future of American agriculture. The lifestyle-driven reverse migration from cities to rural areas has several economic impacts on American agriculture. It creates demand for agricultural parcels that can be developed; thus, it increases the price of farm-

land in at least two ways (Drozd & Johnson, 2004). First, farmland with potential for development serves two markets (rural and urban) and is valued at its “highest and best use,” which is the urban value. Second, each time land leaves agriculture there is a new delineation of the urban fringe, thus causing an outward ripple in land prices reflecting the new pattern of development potential. This can raise the value of current farmers’ retirement “nest egg” but can also make it more difficult for new farmers to enter the profession. On the other hand, if land-use policy tries to keep land in agriculture through zoning (for example), it can hurt real farmers. Without the freedom to capture the development value of their farmland, many farmers will lose most of their expected retirement funds.

Thus, policy-makers need to understand the composition of real farmers’ wealth and the effects of any proposed legislation before undertaking a much-needed overhaul of agricultural programs. The country would be better served by investments in “real” farms, rather than in “lifestyle” operations housing real estate investment firms in rural locations.

## For More Information

Blank, S.C. (2002). Is agriculture a “way of life” or a business?

*Choices*, 17(3), 26-30.

Blank, S., Erickson, K., Moss, C., & Nehring, R. (2004). Agricultural profits and farm household wealth. *American Journal of Agricultural Economics*, 86(5), 1299-1307.

Brewster, J. (1961). Society values and goals in respect to agriculture. In *Goals and Values in Agricultural Policy* (pp. 114-37).

Ames, IA: Iowa State University Press.

Deller, S., Tsai, T., Marcouiller, D., & English, D. (2001). The role of amenities and quality of life in rural economic growth. *American Journal of Agricultural Economics*, 83(2), 352-365.

Drozd, D., & Johnson, B. (2004). Dynamics of a rural land market experiencing farmland conversion to acreages: The case of Saunders County, Nebraska. *Land Economics*, 80(2), 294-311.

Mishra, A., El-Osta, H., Morehart, M., Johnson, J., & Hopkins, J. (2002). *Income, wealth, and the economic well-being of farm households* (Agricultural Economic Report No. 812), Washington, DC: United States Department of Agriculture Economic Research Service.

Plantinga, A., Lubowski, R., & Stavins, R. (2002). *The effects of potential land development on agricultural land prices* (FEEM Working Paper No. 41.2002; KSG Working Paper No. RWP02-012). Available on the World Wide Web: <http://ssrn.com/abstract=305498>.

United States Department of Agriculture. (2000). Accumulated farm real estate value will help farmers and their lenders through period of declining cash receipts. In *Agricultural Income and Finance: Situation and Outlook Report* (AIS-74; pp. 30-33). Washington, DC: Economic Research Service. Available on the World Wide Web: <http://usda.mannlib.cornell.edu/reports/erssor/economics/ais-bb/2000/ais74.pdf>.

United States Department of Agriculture. (2004). *2002 census of agriculture, volume 1* (Geographic Area Series Part 51, AC-02-A-

51). Washington, DC: National Agricultural Statistical Service. Available on the World Wide Web: <http://www.nass.usda.gov/census/>.

United States Department of Agriculture. (2005). *Farm income and*

*costs: Farm sector income*. Washington, DC: Economic Research Service. Available on the World Wide Web: <http://www.ers.usda.gov/Briefing/FarmIncome/nationalestimates.htm>.

*Steven C. Blank is an extension economist in the Agricultural and Resource Economics Department of the University of California, Davis and a member of the Giannini Research Foundation.*



# Beef Packers' Captive Supplies: An Upward Trend? A Pricing Edge?

By Clement E. Ward

Captive supplies in fed cattle procurement have been a major concern and divisive issue in the beef industry for nearly two decades. The issue has sparked lawsuits, protracted debates among cattlemen, and research by agricultural economists.

Issues related to captive supplies contributed to producer support for the Livestock Mandatory Reporting Act, which required packers to report considerable detail regarding their livestock purchases to the United States Department of Agriculture (USDA) Agricultural Marketing Service (AMS). Alleged "sweetheart deals" offered to selected large feedlots by large packers were thought to unfairly harm smaller cattle feeders. Limited data and information on how packers procured fed cattle were believed to hinder cattle feeders in price discovery. As a result, there was a push to move from voluntary to mandatory price reporting.

Implementation of the Livestock Mandatory Reporting Act began in April 2001. One immediate effect of the act was to create new data series on prices and quantities of fed cattle procurement, some of which pertain to captive supplies. New data in the first three years since mandatory price reporting (MPR) began provide insightful information regarding packer procurement (and cattle feeder marketing) methods.

## Captive Supplies Before Mandatory Price Reporting

*Captive supplies* are slaughter livestock that are committed to a specific buyer (meatpacker) two weeks or more in advance of slaughter. The three most common captive supply methods are marketing/purchasing agreements, forward contracts, and packer feeding. A common element of these procurement methods is that packers have a portion of their slaughter needs purchased two weeks to several months prior to the livestock being slaughtered. A key issue is whether captive supplies can be used as leverage by

packers to pay lower prices for fed cattle purchased in the cash market.

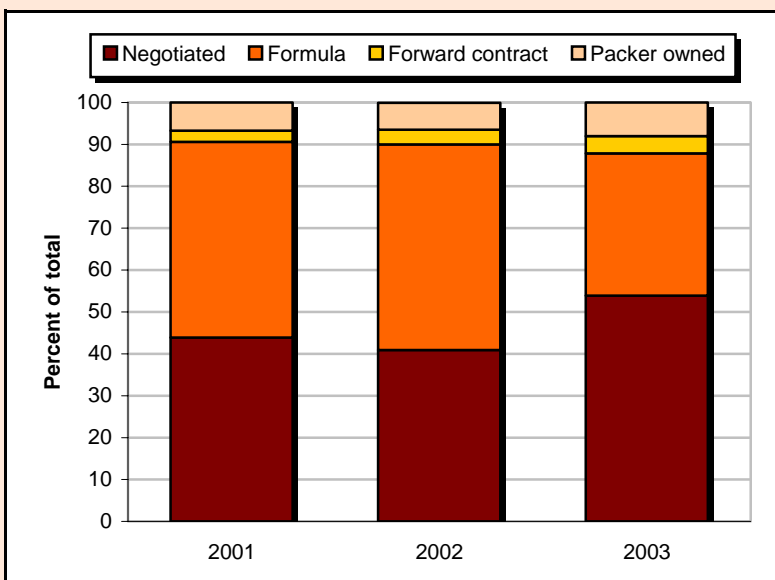
Official data on captive supplies are from the USDA Grain Inspection, Packers and Stockyards Administration (GIPSA, 2002, 2004). GIPSA began requiring packers in 1988 to report monthly procurement of fed cattle by captive supply methods. In 1994, AMS began reporting data on non-cash-market shipments of fed cattle. This series, called *additional movement*, became a proxy for some people regarding the extent of captive supplies. However, although it included shipments of cattle that constituted captive supplies, it also included shipments of cattle priced by methods not defined as captive supplies.

## Captive Supplies After Mandatory Price Reporting<sup>1</sup>

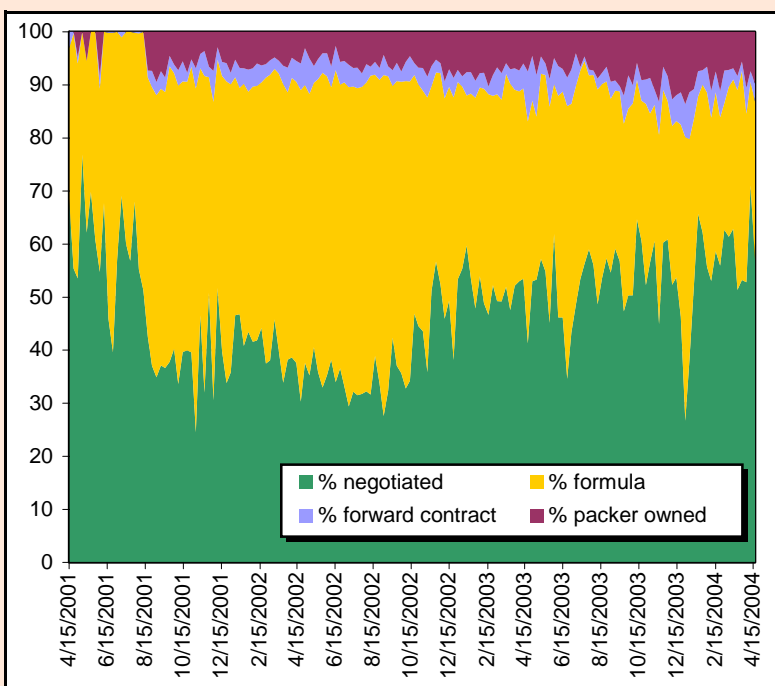
### Annual Averages

Negotiated pricing on average over the three-year period accounted for 46.1% of fed cattle marketing (Figure 1). In 2003, negotiated pricing represented the majority of fed cattle procurement (53.9% of the total). Formula pricing averaged 43.3% of fed cattle procurement for the three-year period and was the most used procurement method in 2001 and 2002. However, it declined sharply to 34.0% in 2003. According to cattle feeders who responded to a 2002 survey in Iowa, Nebraska, Kansas, and Texas, most formula price arrangements are tied to the cash market—either a quoted market price or a plant average price (Schroeder, Ward, Lawrence, & Feuz, 2002).

1. In this article, year 2001 refers to April 2001 to March 2002, 2002 refers to April 2002 to March 2003, and 2003 refers to April 2003 to March 2004. Data for this article were compiled by the Livestock Marketing Information Center from AMS reports. See more detail in Ward (2004a, 2004b).



**Figure 1.** Average annual percentage of fed cattle purchases by procurement method since mandatory price reporting, April 2001 to April 2004.



**Figure 2.** Average annual percentage of fed cattle purchases by procurement method since mandatory price reporting, April 2001 to April 2004.

Forward contracting, which consists mostly of basis contracts between packers and cattle feeders, represented a small percentage of fed cattle procurement each year. Forward contracts averaged 3.5% of packers' procurement for the three

years. Packer ownership of livestock, one of the most discussed components of captive supplies and a frequent target for legislative reform, accounted for 7.1% of total fed cattle procurement on average for the three years.

## Weekly Dynamics

Figure 2 shows the weekly percentage of negotiated, formula-priced, forward-contracted, and packer-owned trades for the first three years since MPR began. For any given week, the percentage of negotiated pricing was as low as 24.5% and as high as 76.9%. Generally, negotiated pricing can be interpreted as cash market pricing. Formula pricing also varied widely from week to week, ranging from 22.1% to 64.8%.

For the other two procurement methods, there was considerable week-to-week variation, but the variation was of a much smaller magnitude. The range for forward contracts was 0.2–9.4%, and the range for packer-owned cattle was 2.6–13.6% of total fed cattle procurement. Week-to-week variation in negotiated trades and formula-priced trades is extensive, both on a percentage basis and in absolute volume traded. At times over the three years, formula pricing exceeded negotiated trades, and at times, the reverse occurred. The exact reason for the variation or apparent tradeoff between these two pricing methods is not clear.

Forward contracting was the least used pricing alternative over the three years. Basis contracts are dependent on the expected cash minus futures market basis, supply-demand market conditions, and the willingness of both sides to contract and take an appropriate position in the futures market. Prior to MPR, there were no weekly data on the extent of packer ownership of fed cattle, only the annually reported figures released later by GIPSA. The extent of packer feeding was reasonably stable over the three years, ranging in most weeks between 5% and 10% of total procurement but exceeding 10% on occasion in 2003.

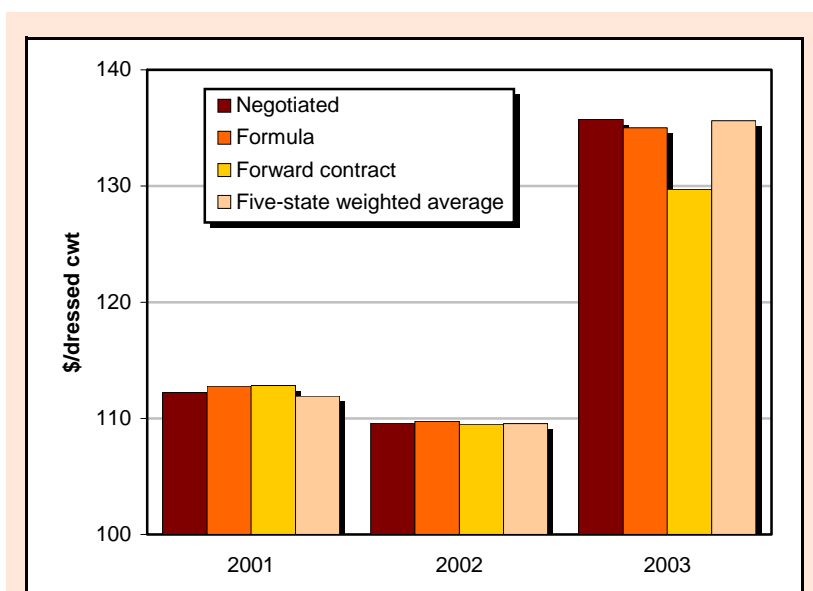
### Estimating Captive Supplies

MPR has generated additional information on packer procurement, but it is difficult to compare AMS data with GIPSA data. What is the true extent of captive supplies? Some might argue that captive supplies constitute the sum of formula pricing, forward contracting, and packer-owned procurement by packers. For two of the three categories (forward contracting and packer ownership), this argument is seemingly clear, though there could be exceptions. For formula pricing, the argument is much less clear. Many formula-priced trades are associated with supply contracts or marketing agreements. Many of those agreements allow feeders to determine the delivery date for fed cattle one to three weeks prior to harvest, either alone or in conjunction with the participating packer.

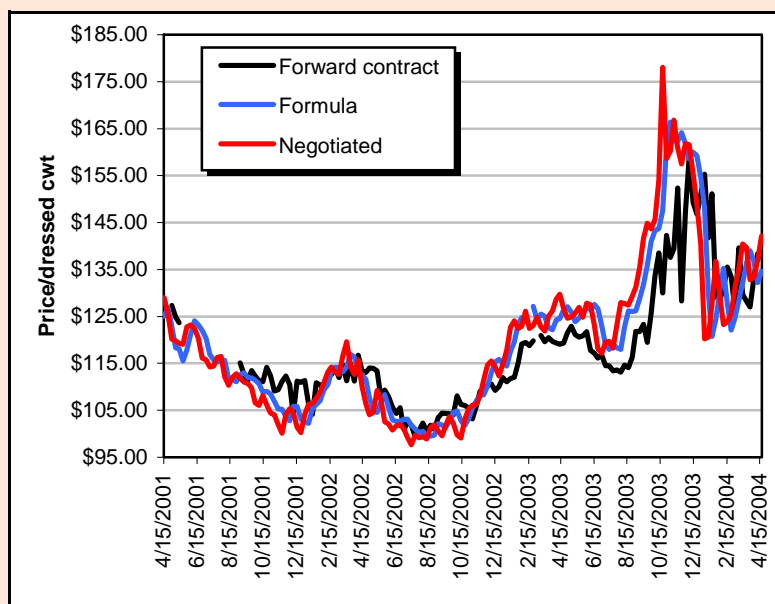
For purposes here, I assume that three types of procurement methods (formula-priced transactions, forward contracts, and packer ownership of fed cattle) comprise captive supplies. This set of procurement methods effectively establishes a near-maximum extent of captive supplies from the weekly MPR data. Combining data reported earlier, captive supplies accounted for 56.1% of fed cattle procurement in 2001, 59.0% in 2002, and 46.1% in 2003. Although the level of captive supplies no doubt concerns some, there is no apparent upward trend in the percentage based on the first three years of MPR data.

### Pricing Method Data from Mandatory Price Reports

Additional information is available since mandatory price reporting began for negotiated pricing, formula pricing, and forward contract pricing



**Figure 3.** Average annual price of fed cattle purchases by procurement method since mandatory price reporting, April 2001 to April 2004.



**Figure 4.** Weekly negotiated, formula, and forward contract dressed steer prices since mandatory price reporting, April 2001 to April 2004.

of fed cattle. Price data are not reported for packer-owned cattle, because those cattle are transferred internally from one business area of the company (cattle feeding) to another (slaughter-fabrication).

### Summary of Prices

Price comparisons are on a dressed weight basis, and the five-state

weighted average price includes prices for all grades of fed cattle purchased from several major cattle-feeding states (Texas-Oklahoma, Kansas, Nebraska, Colorado, and Iowa-So. Minnesota). It could be argued that the five-state weighted average price is the most comprehensive and representative of market conditions in the cash market. Here,

the five-state weighted average steer price is used as the base or standard for comparing prices reported by procurement methods.

Negotiated prices for the three years together averaged \$0.14/cwt above the five-state weighted average price (Figure 3). On an annual basis, negotiated prices averaged as little as \$0.04/cwt higher than the five-state average in 2002 to as much as \$0.29/cwt in 2001. Formula prices averaged higher than other pricing methods or the five-state average in some years and lower in others. For the three-year average, formula prices were \$1.43/cwt higher than the average for forward contracts and \$0.07/cwt higher than average negotiated prices.

Forward contract prices varied the most relative to other pricing methods. They were \$0.06–0.91/cwt higher than comparison prices in 2001. However, in 2003, forward contract prices were \$6.02/cwt below negotiated prices and \$5.31/cwt below formula prices. This large price difference is likely related to the nature of pricing basis contracts.

One of the major concerns with some producers is whether there are special “sweetheart deals” between packers and feedlots. Given the annual average prices reported here, although sweetheart deals may exist, there is no significant advantage on average with formula prices relative to other procurement methods or the more broadly reported five-state weighted average price.

### ***Comparison of Negotiated, Formula, and Forward Contract Prices***

Comparing each of the price series for pricing methods to the broader weighted average price is important to identify similarities and differences. In a comparison of weekly weighted average dressed steer prices

versus negotiated prices for the three years since MPR began (not shown here; see Ward, 2004a), there appears to be no distinguishable difference between prices.

One of the major concerns for many supporters of MPR was the presumed favorable relationship of formula prices relative to negotiated prices. Figure 4 compares weekly negotiated prices, formula prices, and forward contract prices for the first three years of MPR. Because the weighted average dressed steer price was indistinguishable from negotiated prices, we compare formula prices and forward contract prices graphically with reported negotiated prices. Between formula prices and negotiated prices, there is a noticeable difference in many weeks. Do those who formula price receive preferential prices? The answer appears to be yes—sometimes—and no—sometimes.

Recall that the price difference on average between negotiated and formula prices was just a few cents per hundredweight and favored formula prices two of the three years. A partial explanation may be gleaned from Figure 4. Negotiated prices tend to be lower than formula prices on a declining market. Conversely, formula prices tend to trail negotiated prices on a rising market. Many base prices in grids are formula prices tied to last week's cash market—either a reported cash market price quote or the average cost of fed cattle at the packer's plant where the cattle will be harvested. Therefore, a closer relationship is expected between this week's formula prices and last week's negotiated prices, compared with this week's negotiated prices and this week's formula prices.

A comparison of forward contract prices with negotiated prices shows that forward contract prices

deviate sharply from negotiated prices in some weeks. With basis contracts, packers bid a futures market basis in the month fed cattle are expected to be harvested, and cattle feeders can pick the fed cattle price anytime before delivery of the cattle. Thus, cattle feeders determine when the futures market contract price has peaked for the expiration month just after the cattle will be harvested. As a result, this week's reported forward contract prices may or may not be closely aligned with this week's negotiated prices.

Summary observations can be made regarding the above comparisons. First, prices for the three procurement methods track each other relatively closely in general. Each is generally representative of broad market conditions but not of what might be affecting prices within and between weeks. However, less reliance should be placed on forward contract prices as an indicator of current market conditions compared with either negotiated or formula prices.

Second, no single pricing method has been consistently higher or lower than any other. This seems especially important, given the concerns regarding captive supply prices versus cash market prices. Neither of the two pricing methods typically associated with captive supplies is consistently above cash market prices. However, there appears to be differences associated with rising or declining prices that could be important in choosing one marketing method over another.

### **Final Assessment**

Is there more information available on the volume of captive supplies since mandatory price reporting? Yes. The extent of captive supplies can be

tracked now with weekly data. Although the data do not present an exact picture of captive supplies, most would likely conclude the new information is insightful and an improvement.

Moreover, more price information by procurement method is available since mandatory price reporting was established. This availability enables tracking prices by procurement method and making comparisons that were not previously possible.

One final comment is appropriate. It bears repeating that the data on captive supplies using the AMS mandatory price reports does not match exactly the definition GIPSA has used for captive supplies. Thus, although there is both more timely and more information on captive supplies from mandatory price reports, caution must be exercised in using the AMS data to estimate the exact extent of captive supplies.

### For More Information

Schroeder, T.C., Ward, C.E.,  
Lawrence, J., & Feuz, D.M.

(2002). *Fed cattle marketing trends and concerns: Cattle feeder survey results* (MF-2561). Manhattan, KS: Kansas State University Agricultural Experiment Station and Cooperative Extension Service. Available on the World Wide Web: [http://www.agmanager.info/livestock/marketing/bulletins\\_2/marketing/default.asp#Fed%20Cattle%20Pricing](http://www.agmanager.info/livestock/marketing/bulletins_2/marketing/default.asp#Fed%20Cattle%20Pricing).

United States Department of Agriculture Grain Inspection, Packers and Stockyards Administration. (2002). *Captive supply of cattle and GIPSA's reporting of captive supply*. Washington, DC: United States Department of Agriculture. Available on the World Wide Web: <http://www.usda.gov/gipsa/pubs/pubs.htm>.

United States Department of Agriculture Grain Inspection, Packers and Stockyards Administration. (2004). *Packers and stockyards statistical report: 2002 reporting year* (SR-04-1).

Washington, DC: United States Department of Agriculture. Available on the World Wide Web: <http://www.usda.gov/gipsa/pubs/psp-stat-reports.htm>.

Ward, C.E. (2004a). *Captive supply price relationships and impacts* (Fact Sheet F-598). Stillwater, OK: Oklahoma Cooperative Extension. Available on the World Wide Web: <http://pods.dasnr.okstate.edu/docushare/dsweb/Get/Document-1732/F-598web.pdf>.

Ward, C.E. (2004b). *Captive supply trends since mandatory price reporting* (Fact Sheet F-597). Stillwater, OK: Oklahoma Cooperative Extension. Available on the World Wide Web: <http://pods.dasnr.okstate.edu/docushare/dsweb/Get/Document-1734/F-597web.pdf>.

*Clement E. Ward is a professor and extension economist at Oklahoma State University.*





# Coming Attractions

## *Consumers and Markets*

### **Supply Chains in the Agricultural Sector**

Mike Boehlje, Guest Editor

The agricultural production, processing, and distribution industries are increasingly being characterized by more tightly aligned supply or value chains rather than more traditional coordination or governance structures of open access market systems. Benefits are generated through better flow scheduling and resource utilization, increased ability to manage and control quality throughout the chain, reduction of risk associated with food safety and contamination, and increased ability to respond quickly to changes in consumer demand for food attributes. This theme will explore the various business and policy implications of the development of value/supply chains in the agricultural sector.

## *Consumers and Markets*

### **Valuing the Quality of the Environment and Human Health: Nonmarket Valuation for Informing Public Policy Debates**

John Loomis, Guest Editor

The quality of the air we breathe, the water we drink, and the environment around us affects our mental and physical well-being in many direct and indirect ways. However, the cleanliness of natural environments and their effects on human health are not directly priced in markets. An accurate economic analysis obviously requires all the benefits and costs of an action to be included. Economists have developed ways to estimate the monetary values that people place on cleaner water, safer food, better health, and

publicly provided outdoor recreation activities. Incorporating such values into policy analysis can provide balance and reveal the way the environment and environmentally related actions contribute to economic well-being. The collection of papers in the forthcoming issue will provide a nontechnical introduction to the economic principles and methods that underlie commonly used nonmarket valuation techniques along with examples of usage of the results.

## *Resources and the Environment*

### **Developing New Energy Sources from Agriculture**

Jim Duffield, Guest Editor

As recently as the early 1900s, energy sources around the world were mostly agriculturally derived, and industrial products were primarily made from plant matter. Early motor fuels also came from agriculture—Henry Ford used ethanol in his original engine, and Rudolf Diesel's engine could run on peanut oil. By 1920, petroleum emerged as the dominant energy source for transportation fuels and industrial products. For more than 80 years, the United States and other industrialized countries have relied on petroleum as an economical and dependable source of energy. However, this reliance on petroleum is becoming a major issue as our domestic oil supplies shrink and our dependence on oil imports grows. The papers in this theme will look at agriculture's current role as an energy producer and explore opportunities for agriculture as our nation struggles to secure its energy future.

We are working on future theme coverage on supply chains, nonmarket valuation, biofuels, GMOs, checkoff programs, the Farm Bill, and tilling Latin American soils.

