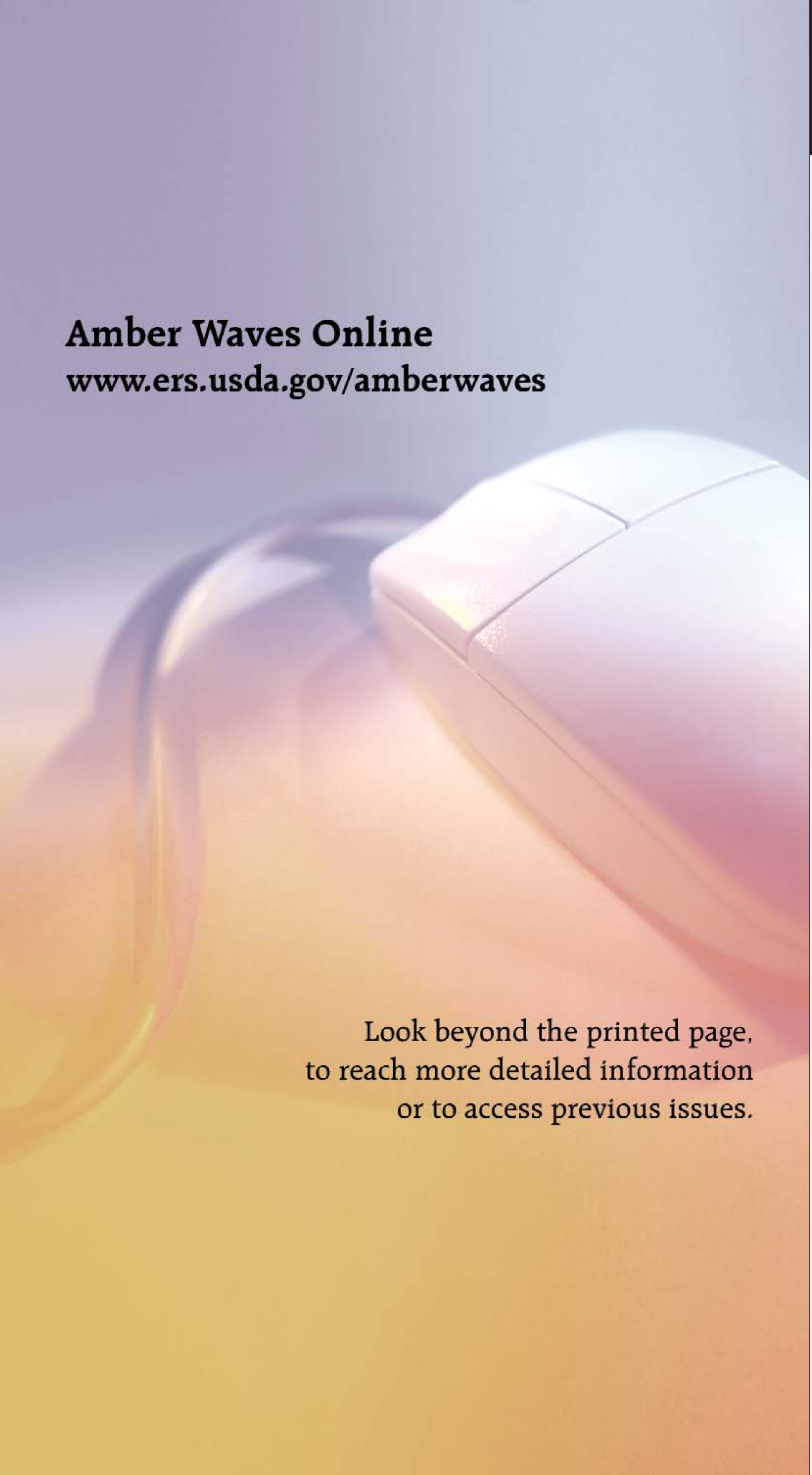
April 2006

United States Department of Agriculture • Economic Research Service • Volume 4, Issue 2

Amber Waves

The Economics of Food, Farming, Natural Resources, and Rural America

Public Information Helps Farmers Make Better Decisions



Amber Waves is published five times per year (February, April, June, September, and November) by the U.S. Department of Agriculture, Economic Research Service.

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Amber Waves

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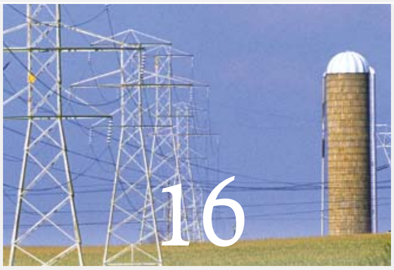


Brazil Emerges as Major Force in Global Meat Markets

Frank Lukasseck, Corbis

Since 2004, Brazil has been the world's largest beef and poultry exporter and fourth-largest pork exporter, with total meat sales generating over US$8 billion in 2005. Exports have been driven by the combination of rising incomes in many parts of the world and Brazil's ready availability of land and feed resources to support meat production.

Brazil achieved this position over the past decade as Brazilian agriculture benefited from macroeconomic stability, high international commodity prices, currency devaluations, technological advancements, expansion in arable land, and large capital inflows from domestic and direct foreign investment. Domestic policies (credit and tax-exemption programs) also spurred production and processors' incentives.

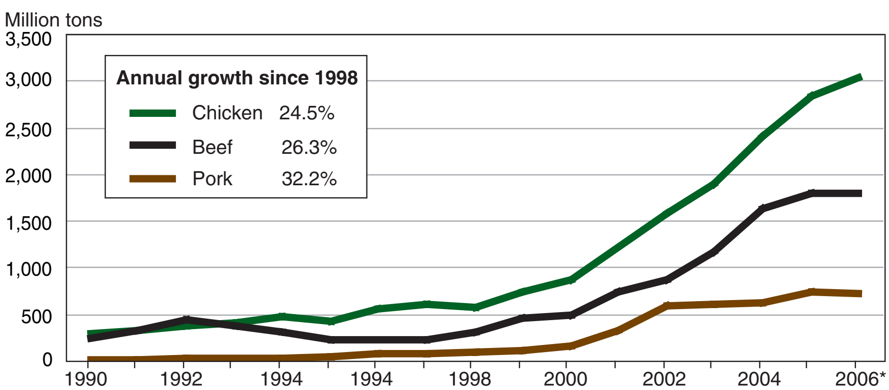
Brazil's poultry meat exports account for 41 percent of global trade. More than two-thirds of exports are frozen chicken parts, 29 percent are whole frozen chickens, and 3 percent are prepared or preserved. Export destinations include the EU-25, Middle Eastern countries, Japan, Russia, and Hong Kong.

Brazil is now the world's largest beef-exporting country by volume (second largest by value, behind Australia). The presence of foot-and-mouth disease (FMD) in the country, sanitary problems associated with cattle slaughter, and sales of lower value cuts account for Brazil's lagging in export value (per ton) relative to exporters from North America and Oceania. FMD also prevents Brazilian exports of fresh, chilled, and frozen beef to important North American markets—the U.S., Canada, and Mexico—as well as Japan, South Korea, and Taiwan. Chilled, fresh, and frozen exports account for just over 80 percent of Brazil's beef trade and prepared/preserved beef accounts for nearly 20 percent. Major markets for Brazil's beef exports include the EU-25, Russia, and Chile, while the EU and the U.S. accept processed beef.

Brazil is the world's third largest pork exporter, accounting for 15 percent of global pork trade. Pork exports are largely frozen cuts, and Russia is the primary market (65 percent in 2005). Other export destinations are Hong Kong, Ukraine, and Argentina.

Despite a new outbreak of FMD in 2005 that led several countries to ban meat imports from regions affected by the disease, Brazil will remain a significant player in world meat markets. Future increases in meat exports and greater access to the global market will depend on the success of current efforts to improve its disease status and Brazil's ability to implement and maintain sanitary controls.

Brazil's meat exports are growing rapidly



* Forecast

Source: USDA's Foreign Agricultural Service, Production, Supply, and Distribution database.

Constanza Valdes,
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This finding is drawn from . . .

Livestock, Dairy, and Poultry Outlook, Mildred Haley, coordinator, LDP-M-137–LDP-M-139, USDA, Economic Research Service, January 2006, available at: www.ers. usda.gov/publications/ldp/

Chinese Banks Carry Out Rural Policy

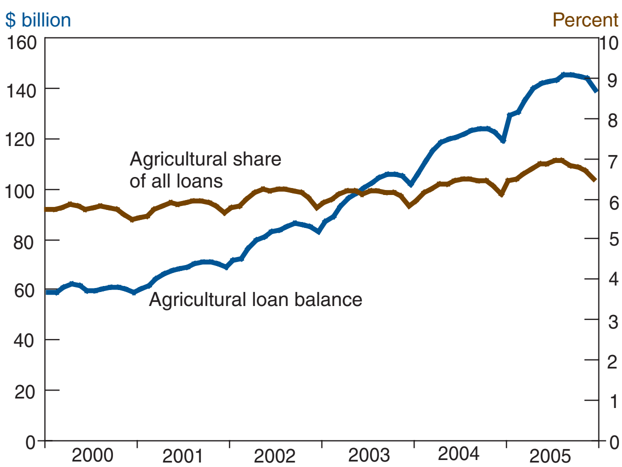
Fred Gale, USDA/ERS

Since 2001, China has been pushing vast amounts of cash into its countryside through rural financial institutions. The value of outstanding agricultural loans more than doubled in 4 years, from $60 billion in 2001 to $145 billion in late 2005. Surprisingly, agriculture's share of loans rose as well, even with lending to industrial and real estate sectors growing at a rate of 20-30 percent per year.

The boost in agricultural lending is part of a policy campaign to bolster the rural economy, where growth is lagging far behind that of China's booming cities. The agricultural loan campaign reflects the strong policy role of financial institutions, one of the last segments of China's economy to be reformed. Banks and rural credit cooperatives increasingly resemble commercial banks, but they must still set aside loans to support government initiatives. But for all the rhetoric, the surge in agricultural lending has had little impact on China's agricultural sector.

Some of the loans finance agribusiness firms, rural roads, water projects, and other infrastructure. Most of the loans, however, are small short-term loans of less than $1,000 made to agricultural households by rural credit cooperatives, the primary financial institutions serving rural communities. While the loans are labeled "agricultural," their value far exceeds the combined value of agricultural fixed asset investments and farm input expenses, so it is not clear how the borrowers are spending the money.

China's agricultural loan balance rises rapidly



Source: Calculations by USDA, Economic Research Service based on data from Peoples Bank of China.

Such a large boost in agricultural lending should improve the competitiveness of China's agricultural sector. However, statistics show little discernible increase in agricultural investment or input expenditures coinciding with the increase in agricultural lending. Farms remain small—on average, less than 2 acres—and labor-intensive, with minimal capital investment.

China's financial institutions, flush with cash from China's high saving rate, foreign investment, and government injections of cash to clean up nonperforming loans, continue to lend at a furious pace. China's financial liquidity has allowed its financial system to simultaneously boost lending to rural areas and other lagging regions, recapitalize its shaky banks, and fund one of the largest infrastructure construction efforts in history. China's ability to continue its financial juggling act depends on continued growth in domestic savings and inflows of foreign capital. AW

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This finding is drawn from . . .

New Directions in China's Agricultural Lending, by Fred Gale and Robert Collender, WRS-06-01, USDA, Economic Research Service, January 2006, available at: www.ers.usda.gov/publications/wrs0601/

How Low-Income Households Economize on Groceries

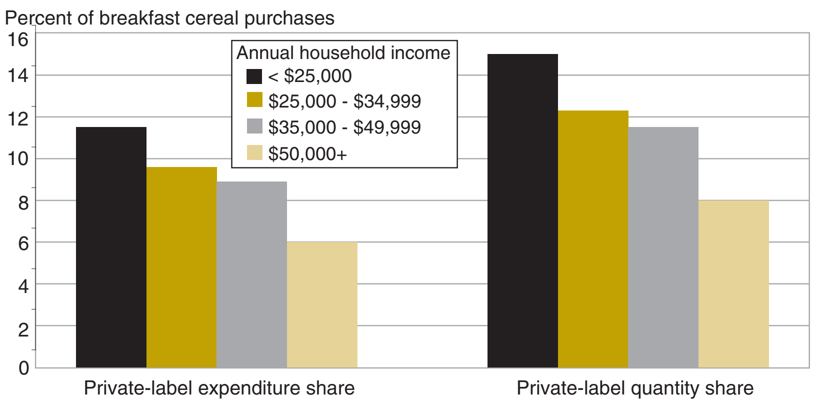
Food purchase decisions entail tradeoffs among taste, preference, and quality factors—real or perceived—to meet spending constraints. This is especially true for the poor. Low-income shoppers can stretch their food dollars in a number of ways: shopping in discount foodstores, buying and eating less food than higher income shoppers, or buying low-priced (and possibly lower quality) food products. Nutrition educators and those who manage food assistance programs would benefit from knowing just how this economizing behavior occurs, and at what cost to low-income consumers.

ERS researchers investigated the food purchases of low-income households in four product categories: breakfast cereals, cheese, meat/poultry, and fruits/vegetables. They analyzed average annual quantities and expenditures using product descriptions, brand names, and package sizes; they also took into account whether items were on sale or purchased with a coupon. Such detailed data allowed ERS to calculate the average unit cost (per ounce or per pound) for food items bought by shoppers of different income levels.

Comparisons across income groups show that the poor economized on food by buying more non-UPC coded random-weight foods (such as block cheese or loose apples) on sale, a greater proportion of private-label (store-brand) products, and less expensive varieties of meats, fruits, and vegetables. For example, low-income households bought just 3.3 percent fewer pounds of fruits and vegetables per person than high-income households, but spent 13 percent less for those products over the course of the year.

These economizing practices allowed the poor to spend 4.8 percent less for food products from the four categories. However, the economizing practices of low-income food shoppers may be hampered by the types of stores they patronize. For example, private-label products and volume-discounted packages are less available in small grocery stores, which are sometimes the only foodstores easily accessible to the poor. In addition, food assistance programs, such as food stamps and WIC, enhance low-income households' food purchasing power. Were it not for these factors, differences in purchase patterns between low- and higher income shoppers would likely have been even larger. W

One way that low-income households economize is by purchasing more private-label breakfast cereal than wealthier households



Source: Calculated by USDA, Economic Research Service using ACNeilsen Homescan data.

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Phil R. Kaufman, pkaufman@ers.usda.gov

This article is drawn from . . .

Exploring Food Purchase Behavior of Low-Income Households: How Do They Economize? by Ephraim S. Leibtag and Phil R. Kaufman, AIB-747-07, USDA, Economic Research Service, June 2003, available at: www.ers.usda.gov/publications/aib747/aib74707.pdf

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Chicken Consumption Continues Longrun Rise

Is chicken on your menu today? Perhaps in an enchilada or a stir fry made at home, or chicken tenders at a restaurant tonight? If so, you will have plenty of company. Chicken consumption more than doubled between 1970 and 2004, from 27.4 pounds per person to 59.2 pounds (boneless, edible weight). Chicken is gaining ground on beef, the current leading meat.

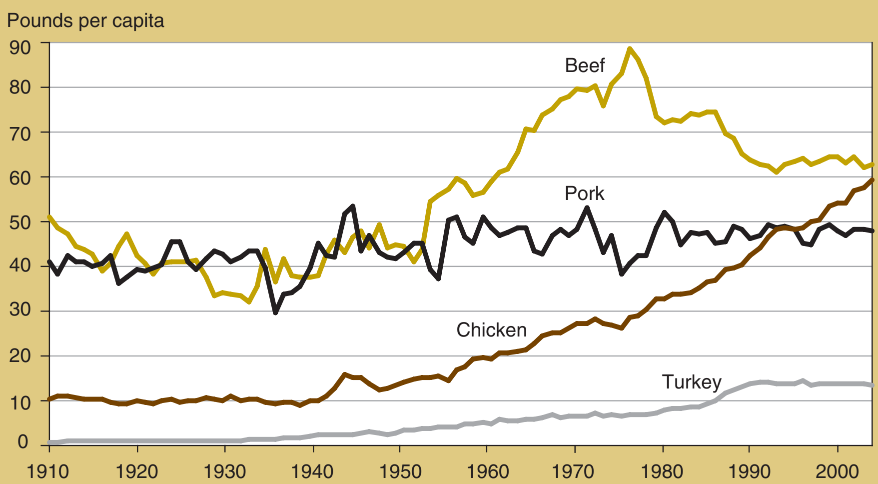
Chicken consumption has climbed since the 1940s, according to ERS's per capita food availability data, a widely used proxy for actual food intake. Food availability data go back to 1909 for many commodities and include all food—from grocery stores, restaurants, school cafeterias, and other eating places.

Part of the rise in chicken consumption results from the chicken industry's response to demands by consumers and foodservice operators for value-added, brand-name, and convenience products. McDonald's Chicken McNuggets revolutionized chicken as both a convenience and a frozen food in the early 1980s. According to the National Chicken Council, 42 percent of chicken is now sold through foodservice outlets. Of this amount, 60 percent is sold through fast-food chains, which have introduced new lines of chicken sandwiches, salads, wraps, and tenders to meet the rising demand for chicken.

Grocery stores typically stock boneless, skinless breasts; rotisserie-cooked whole chickens; and seasoned chicken parts—all value-added products for convenience-minded shoppers. Chicken consumption has also benefited from health-related concerns about beef. Ounce for ounce, chicken has less total fat, saturated fat, and cholesterol than beef, according to USDA's 2005 nutrient database.

Innovations in breeding, mass production, contract farming, vertical integration, and marketing have made chicken more plentiful and affordable. The average live weight per broiler nearly doubled to 5.35 pounds from 1934 to 2004, and it reaches that weight in less time. These supply-side changes and the expansion of the broiler industry have lowered per unit production costs. As a result, the "composite" price (whole bird, breast, and leg prices, weighted by estimated quantities purchased) in 2004 dollars for a pound of chicken was $1.74 in 2004, versus $2.22 in 1980. W

Versatile, affordable chicken has grown in popularity



Source: USDA, Economic Research Service, 2005.

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For more information . . .

Visit the ERS Food Consumption (Per Capita) Data System, available at: www.ers.usda.gov/data/foodconsumption/

U.S. Organic Farm Sector Continues To Expand

Picturequest

Most segments of the U.S. organic farm sector have expanded since USDA set uniform organic standards in 2000. About 50 organic certification programs—State and private—are currently accredited by USDA to certify U.S. farmers, ranchers, and processors, about the same as before USDA made certification mandatory. USDA's organic rules also streamlined organic import procedures, and over 40 foreign programs are now accredited to U.S. standards.

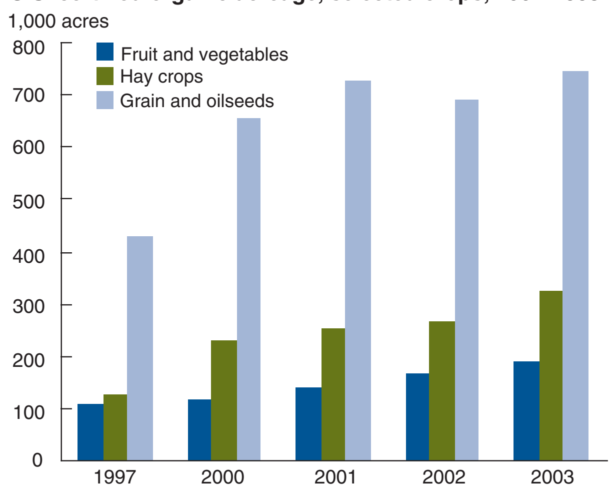
Certified organic crop acreage increased 11 percent between 2001 and 2003, with large increases for fruits and vegetables and for hay crops used in dairy. Overall, certified organic acreage declined slightly in 2002 from the previous year, as USDA implemented national organic rules, but rebounded in 2003. Farmers in 49 States dedicated 2.2 million acres of cropland and pasture to organic production systems in 2003. Nearly 1.5 million acres were used for growing crops. California, North Dakota, Minnesota, Montana, Wisconsin, Colorado, and Iowa had the most organic cropland, and Texas, Alaska, and California had the largest amount of organic pasture and rangeland. Certified organic cropland accounted for 0.1 percent of U.S. pasture and 0.4 percent of U.S. cropland, although the share is much higher in some crops, such as vegetables at nearly 4 percent and fruit at about 2 percent.

The number of certified organic livestock animals—beef cows, milk cows, hogs, pigs, sheep, and lambs—increased more than fivefold from 1997 to 2003, and rose 15 percent between 2002 and 2003 alone. Dairy has been one of the fastest growing segments of the organic foods industry. Milk cows accounted for over half of the certified livestock animals during 1997-2003, and organic milk cows accounted for 1 and 2 percent of the total in California and Wisconsin, the two top dairy States for both organic and conventional production in 2003.

Organic cotton and soybeans acreage declined after 2001, despite growth in retail sales of organic cotton and soy-based products. Import competition likely played a role in this. USDA's Foreign Agricultural Service estimates that the value of U.S. organic imports was $1.0- $1.5 billion in 2002, while the value of U.S. organic exports was $125- $250 million. Although consumer spending on organic foods is still small—approximately 2 percent of at-home food sales in 2003—rapid growth is expected to continue in the U.S. and other major markets, while the competition for these markets is likely to increase considerably.

Organic pasture and rangeland also declined (6 percent) between 2001 and 2003, mostly for rangeland in the West. As USDA implemented uniform organic standards—including stringent standards for livestock—some organic ranchers switched to the natural meat market exclusively. Although natural meat products may be produced under private standards that go beyond USDA's guidelines, natural meat producers are not prohibited from using antibiotics in production and are not required to use certified organic feed grains or pasture or provide cows with access to pasture. W

U.S. certified organic acreage, selected crops, 1997-2003



Source: USDA, Economic Research Service.

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For more information . . .

See ERS Data on U.S. Organic Agriculture, 1992-2003, www.ers.usda.gov/data/organic/

Economic Research Helps Manage Invasive Species


David Cappaert, www.forestryimages.org

Trade is essential to U.S. agriculture. U.S. exports account for as much as 30 percent of total farm receipts. Increased movement of people and products across international borders heightens the risk of introducing invasive species—such as the longhorn beetle or the imported fire ant—that can reduce crop and livestock production or harm natural resources and amenities.

In response, ERS initiated the Program of Research on the Economics of Invasive Species Management (PREISM) in 2003, whereby ERS funds several extramural research projects each year and conducts inhouse research (see "Public Information Creates Value," on page 10). PREISM research focuses on three general themes: international dimensions of invasive species prevention and management; development and application of methods to analyze important invasive species issues, policies, and programs; and analysis of economic, institutional, and behavioral factors affecting decisions to prevent or manage invasive species.

As global trade in agricultural products continues to grow, so too does the need to develop policy tools to address the potential spread of invasive species. Do international market failures propagate invasive species? Is public enforcement of trade-related regulations effective? How are firms reacting to trade-related regulation? PREISM research projects are examining such issues, as well as how to regulate invasive species introduced through maritime trade and the effects of invasive species on international trade in forest products.

Decisionmakers need practical tools and analysis to evaluate alternative strategies for managing invasive species. The application of economic and data management tools and techniques can inform USDA decisions and actions related to invasive species prioritization, detection, monitoring, management, and regulation. One PREISM study focuses on three important diseases: foot-and-mouth disease, classical swine fever, and highly pathogenic avian influenza. A resultant model will rapidly estimate the market impacts of disease-related animal cull, export market disruption, or adverse consumer reaction following an outbreak. Such cost-benefit analysis can be used by USDA in rulemaking and evaluation of alternative control and surveillance procedures.

Public and private sector institutions are motivated by different incentives and thus are likely to take different actions to prevent and manage invasive species. Understanding the interactions between public and private sector institutions will also inform policy design. Another PREISM-funded study evaluates how agronomic, ecological, and economic factors influence State-level noxious weed lists and how different lists affect interstate seed and commodity trade. W

Craig Osteen, costeen@ers.usda.gov

This finding is drawn from . . .

The ERS Briefing Room on Invasive Species Management: www.ers.usda.gov/briefing/invasivespecies/

For information about the fiscal year 2006 program, see: www.ers.usda.gov/briefing/invasivespecies/preism.htm


Alice Welch, USDA

Peanut Sector Resilient Despite Policy Challenges

The end of the decades-old marketing quota system in 2002 required U.S. peanut growers to adapt to a more market-oriented policy structure similar to other major field crops. This development prompted substantial changes in the peanut sector, including lower prices for many peanut producers and major geographical shifts in production. While the sector appears to have adapted quickly to the new policy environment, it faces new uncertainties as Federal budget pressures and the implications of existing and potential new trade agreements loom ahead.

Lower prices have fueled exceptionally strong growth in demand since 2002, and yield gains over the same period suggest increases in efficiency. Data from the 2004 USDA Agricultural Resource Management Survey suggest U.S. peanut farmers are relatively strong financially. Peanut farmers have an average household income about 80 percent greater than the average for all U.S. households, and they have higher levels of wealth than other farm and nonfarm households.

At the same time, the peanut sector has much at stake as policymakers begin to discuss potential changes to commodity programs. Government outlays constitute a comparatively large share of peanut sector revenues on both a per base acre and a value-of-production basis. Government payments to the peanut sector under the three main commodity programs (marketing loans, direct payments, and countercyclical payments), for example, are projected to average $226 million annually during the 2002 Farm Act (2002-07). During 2003-05, these payments represented only about 2 percent of total payments made to all eligible crops under these programs, but equalled 29 percent of cash receipts from peanut production. Continued strong production growth in 2005 has led to lower peanut prices, which could push government outlays for income support even higher, at least in the short run. In the longer run, international trade agreements, which are gradually opening the U.S. market to increased peanut imports, could put additional pressure on prices, but expanding market access abroad could provide new export opportunities. W

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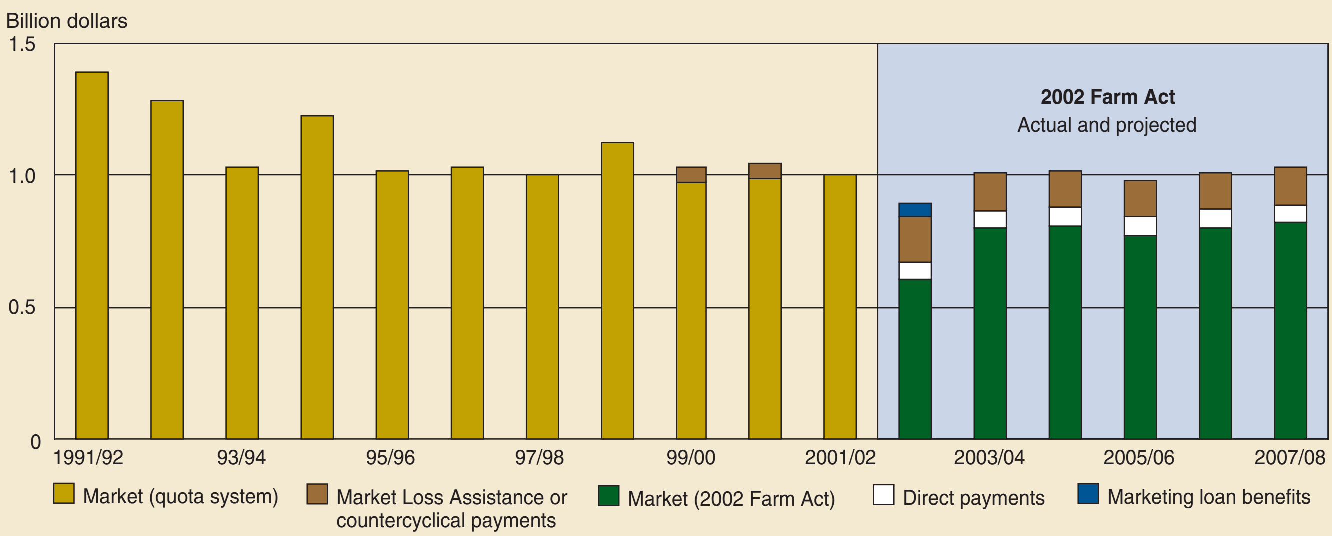
This finding is drawn from . . .

Peanut Backgrounder, by Erik Dohlman and Janet Livezey, USDA, Economic Research Service, OCD-05i-01, October 2005, available at: www.ers.usda.gov/publications/ocs/oct05/ocs05i01/

Government payments now constitute nearly 30 percent of peanut sector revenues



Notes: Years refer to peanut marketing years (August-July).
Sources: 1991/92-2003/04: USDA's Economic Research Service (http://www.ers.usda.gov/Briefing/FarmPolicy/1996emerge.htm#1, and National Agricultural Statistics Service (Agricultural Statistics Database); 2004/05-2007/08: Office of Management and Budget, President's FY 2006 Budget (February 2005).

Specialized Wheat Farms Earn Less Than Other Farms

Corbis

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Mir Ali, mirali@ers.usda.gov

This finding is drawn from . . .

Wheat Backgrounder, by Gary Vocke, Edward W. Allen, and Mir Ali, WHS-05k-01, USDA, Economic Research Service, December 2005, available at: www.ers.usda.gov/publications/whs/dec05/whs05k01/

The U.S. wheat sector is facing decreased demand and increased competition. Domestic food-use demand has fallen over the past decade as consumer preferences have changed, and the sector faces strong competition in export markets. Subsequent low returns relative to other crops have led to the substitution of competing crops for wheat in many areas, particularly in the Plains States. U.S. wheat planted area in recent years is about 30 percent less than in the early 1980s. In the future, downward pressures on wheat plantings can be expected to continue, as total returns (sales plus government payments) favor other crops, and export and domestic demand for wheat remains modest. However, low stocks and wheat prices above $3 per bushel will prevent a dramatic decline in acreage.

These challenges are particularly severe for farms that depend upon wheat for over half of their receipts. These specialized wheat farms are concentrated in the Great Plains and the Pacific Northwest and account for over 40 percent of total wheat production.

According to USDA's Agricultural Resource Management Survey, specialized wheat farms typically have significantly lower gross and net farm incomes and fewer financial assets than other farms producing wheat. In addition, specialized wheat farms are more dependent on government payments and off-farm earnings.

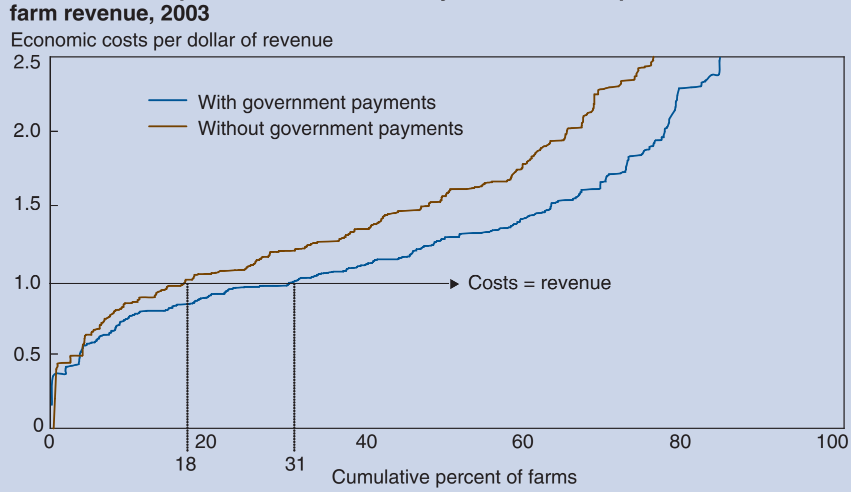
In 2003, government payments to the specialized wheat farms averaged nearly $17,000, about 60 percent of their total net farm earnings ($28,000).

Total household income for the specialized wheat farms averaged about $55,000 in 2003, with 75 percent of that ($42,000) coming from off-farm sources; in contrast, total household income for other wheat farms averaged about $78,000, with off-farm income contributing less than half of that ($37,000).

Though total acreage on specialized wheat farms and other wheat farms is similar, sales per farm tend to be smaller among specialized wheat farms. Less than 10 percent of these specialized wheat farms had sales over $250,000, compared with nearly one-third of the other wheat farms.

A farm is financially viable if its revenue fully covers economic costs (cash costs plus an allowance for depreciation plus imputed returns to management, land, and unpaid labor of the operator and family). The long-term viability of specialized wheat farms depends heavily on government payments. Without government payments, fewer than 20 percent of the specialized wheat farms would have had farm revenue greater than economic costs. With government payments, nearly a third of the farms were financially viable. W

Distribution of specialized wheat farms by economic cost per dollar of farm revenue, 2003



Source: USDA, Economic Research Service, 2003 Agricultural Resource Management Survey (ARMS).

Public Information Creates Value

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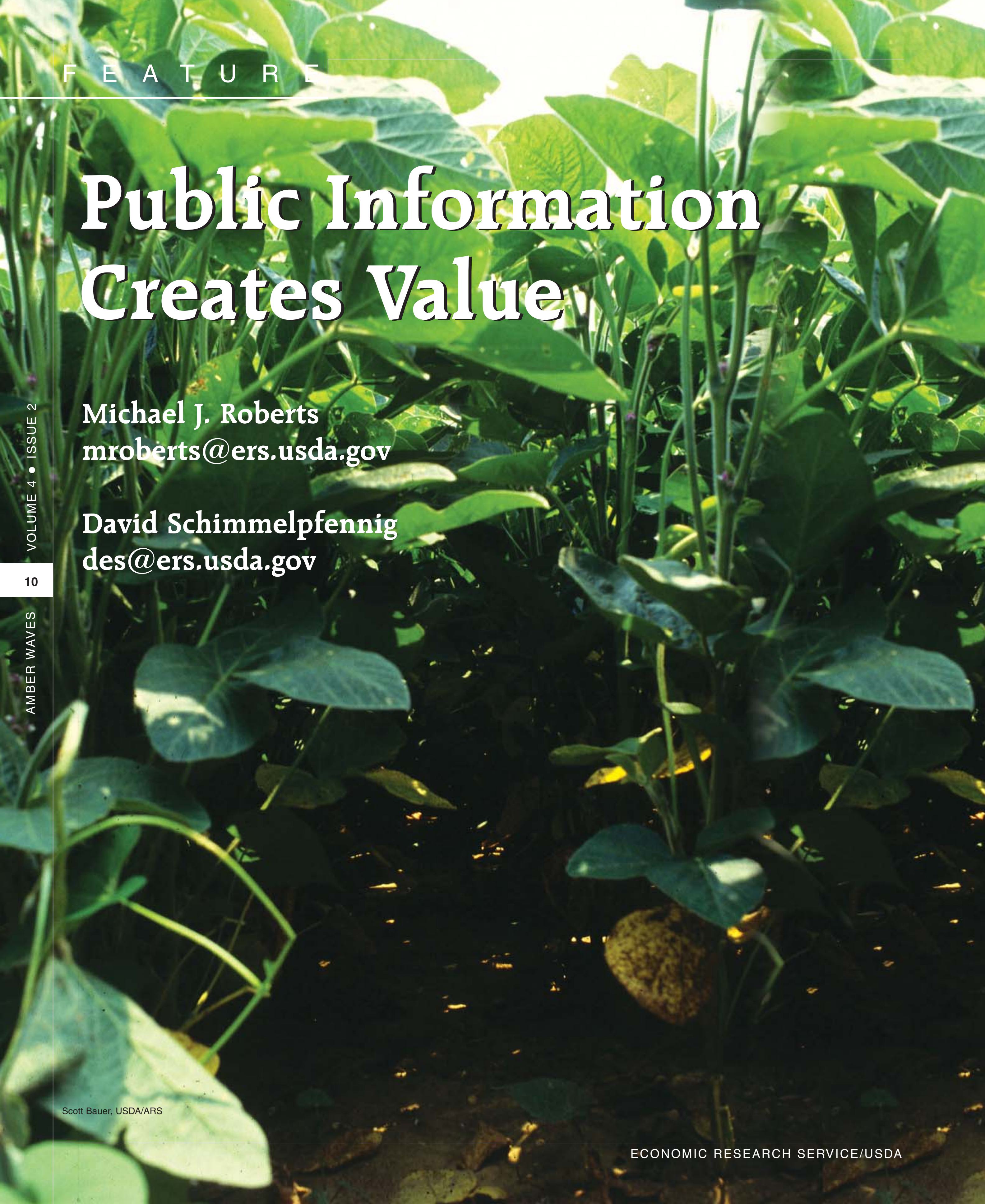


Scott Bauer, USDA/ARS

- With accurate information, individuals can make sound decisions that allow them to adjust their actions to the situation at hand. Information comes from many sources, but the value of publicly provided information is often underestimated.

- For farmers who are trying to react to a potential pest infection, such as soybean rust, information about the likelihood of infection can help them to make better decisions about the amount and timing of fungicide applications, which will ultimately increase their profits.

Soybean rust (SBR), which is believed to have been transmitted to the United States on the winds of hurricanes during the summer of 2004, is a new pest threatening the U.S. soybean crop. In response to this threat, USDA leads an initiative to monitor outbreaks of SBR and provide real-time forecasts of its spread to help farmers efficiently apply preventative and curative fungicides. In 2005, SBR turned out to be less damaging than expected, which led some to question whether or not development of the initiative was worthwhile. But ERS research finds that the public information about SBR was still quite valuable because it helped farmers make better decisions in managing their operations. In general, the more information influences decisions, the greater its value. Although the precise value of the SBR information is unclear, with estimates ranging broadly from $11 million to $299 million in 2005, even the lowest estimated value is several times the costs of providing the information to farmers.

Information is an unusual kind of economic good. It is not bought and sold in stores like apples, cars, or DVD players, mainly because people can easily share or replicate information. As a result, markets do not always create and disseminate information as efficiently as other kinds of goods and services because it is hard for businesses to control access and charge all users. Sometimes the government can step in and provide information, like hurricane or crop forecasts, that private markets do not provide.

USDA and other agencies also implement regulations that create incentives for individuals and businesses to provide information they otherwise may not. For example, the Food and Drug Administration (FDA) requires "Nutrition Facts" labels on food products, which helps consumers make better dietary choices. These examples are a few of the many ways government influences the creation and dispersal of information.

Information is not normally traded in competitive markets like apples. Thus, quantifying its value is difficult because it involves determining the decisions farmers would have made without the information and what the consequences of those decisions would have been. ERS estimated the value of public information from USDA's SBR initiative by comparing farmers' expected profits, as viewed from the beginning of the season, with and without the information. The value reflects the degree to which information allows farmers to adjust their decisions to suit the particular situation at hand.

Reid Frederick, USDA/ARS

Estimating the value involves quantifying how large a threat farmers would have perceived SBR to have been without the real-time forecasts. It also involves evaluating what farmers' decisions and profit outcomes would have been without the framework.

The Soybean Rust Coordinated Framework

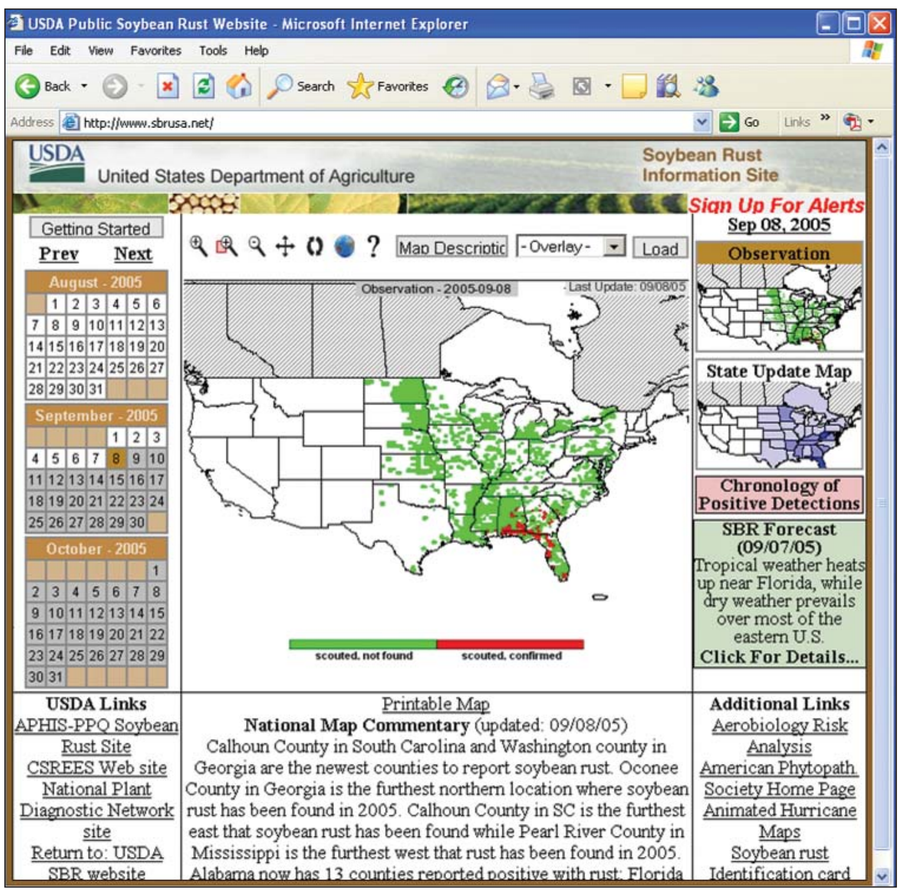
In 2005, USDA initiated the Soybean Rust Coordinated Framework to track and forecast the incidence and spread of a new pest threatening the U.S. soybean crop: *Phakopsora pachyrhizi*, a fungus with the common name soybean rust. SBR has been a recurrent problem for soybean producers in much of the southern hemisphere. In recent years, SBR has reduced yields and raised production costs for soybeans in every major production region of the world except the United States. Although SBR has the potential to cause significant yield losses, these can be almost entirely mitigated with application of fungicides. The fungicides, however, are expensive, so application reduces farmers' profits if SBR does not occur.

Almost 60 percent of the U.S. soybean crop is produced in areas where climatic conditions are expected to support establishment of SBR in at least 5 of 10 years. SBR was first detected in the Southern U.S. in fall 2004, late enough in the season that it posed no threat to that year's soybean crop. After overwintering in the South, SBR posed a new, uncertain, and potentially large threat at the beginning of the 2005 U.S. soybean season. Fields infected with SBR were anticipated to see markedly reduced soybean yields if not treated with fungicides.

With sufficient notice of an SBR threat, farmers could treat their fields in advance with preventative fungicides. Another approach to the threat was to carefully monitor fields and immediately treat with curative fungicides once the disease was detected. Because curative fungicides must be applied immediately after first infection, this approach also benefits from timely information on the spread of SBR by allowing farmers to limit scouting to times when infection risks are highest. Fungicides are costly, and the efficacy of both preventative and curative fungicides is sensitive to the timing of application, which means that better information about the likelihood of infection helps farmers improve management decisions and increase profits.

Information collected and analyzed by the framework is communicated to the public via the website, www.sbrusa.net. The public website includes a regularly updated map showing where field and test-plot monitoring has found and not found evidence of SBR; national and local commentary discussing the incidence and likely spread of SBR; and management strategies, often delineated by county. The framework also uses a web-based system to facilitate communication between the many experts, comprised from government and nongovernment agencies and universities, who monitor for SBR in soybean fields and sentinel plots strategically located throughout the country. USDA built and tested the new information infrastructure before SBR had caused any significant U.S. crop losses.

The website, which was updated almost daily during the growing season, was viewed about 4.9 million times in 2005. Approximately 4,500 users of USDA's SBR Internet website signed up to be alerted via email when new information, such as new incidence of SBR in the U.S., was posted. This was the broadest USDA delivery over the Internet of an information system to provide pest forecasts to farmers and other stakeholders.



Estimating the Value of Soybean Rust Forecasts

How valuable is information provided by the framework? This question has become particularly salient in light of the modest outbreak of SBR during the 2005 season. Given the expense of developing the website and its underlying infrastructure, some have questioned whether the infrastructure was a worthwhile endeavor. After all, if some farmers had simply managed their crops as if there were no SBR threat, it is possible that they would have fared as well as or better than they actually did in 2005.

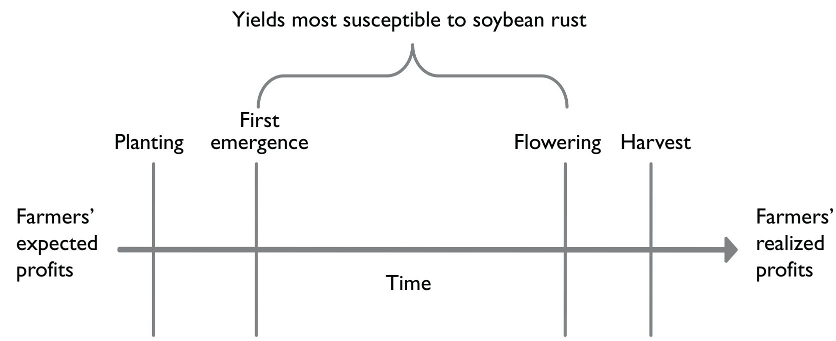
This view overlooks the widespread perception that SBR posed a threat (of unknown magnitude) at the beginning of the season, and it is not clear how farmers might have prepared for that threat in the absence of the framework, which provided real-time information about local, more imminent threats. It could not have been known in advance that optimal conditions for infection ultimately would not arise in most areas. Indeed, without the framework, individual farmers in some areas may have incurred even greater expenses in monitoring their own fields and perhaps spraying fungicides for a threat that did not exist. Without the framework, some farmers may have forgone planting soybeans entirely and planted a less profitable alternative crop.

ERS assessed the framework's value by estimating farmers' expected profits, as viewed from the beginning of the growing season, with and without the information from the framework. Making this calculation involved quantifying farmers' expectations about the likelihood of SBR at the beginning of the season—that is, how likely they perceived the SBR threat to be. It also involved evaluating what farmers' decisions and profit outcomes would have been without the framework.

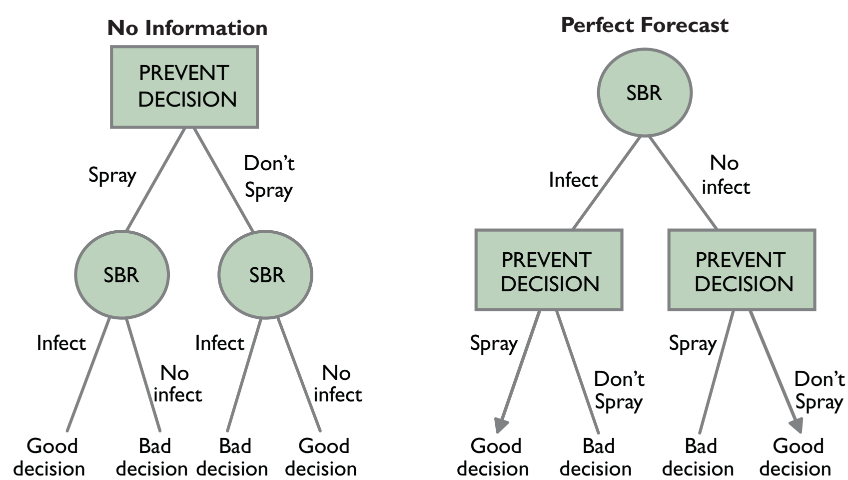
Farmers' decisions are fundamentally different with and without information about the SBR threat. With no information (the left decision tree), farmers have to decide whether to spray or not without knowing if their fields will become infected with SBR. In this instance, farmers will sometimes spray when not needed and sometimes not spray when needed. Information about natural events will seldom be perfect, but for illustrative purposes a decision tree is shown that displays the outcome with a perfect forecast. With perfect information, farmers can always make the correct decision and have higher profits.

The ERS analysis of the value of SBR information addressed several intermediate scenarios and used decision trees that allowed for less than perfect information and a wait-and-see (monitor-and-cure) treatment option. This richer analysis

Farmers can use information to adjust practices during the growing season...



...and can make better decisions with better forecasts



Without information, farmers will sometimes spray when not needed or not spray when needed

With perfect information, farmers will always make the correct decisions allowed for sensitivity tests of the results to changes in assumptions about risk aversion, heterogeneous beliefs of farmers, and market price feedbacks from soybean yield changes (see box, "Different Scenarios Affect Estimated Information Values, But Not by Much").

We examined how values might have varied over different soybean-producing regions and what the information values would have been if farmers had different expectations about the likelihood of SBR at the beginning of the season. Although pinning down a precise value is impossible, the analysis provides some perspective on the likely benefits from the publicly provided information.

Across all scenarios and forecast accuracies considered, we found the value of information from the framework to range between $11 million and $299 million in 2005, or about $0.16 to $4.12 per acre. This value is made up of a combination of reduced expected costs and higher expected yields, as viewed from the beginning of the season. The range of possible information values is small relative to total U.S. soybean sales (about $16.1 billion, or $214 per acre), but quite large relative to the cost of establishing the framework. Although we did not conduct a comprehensive cost analysis, including amortization of any fixed one-time costs, the framework's total development cost in 2005 was $2.6 million, which suggests that the benefits of the framework exceeded its costs.

Note that forecast quality pertains to forecast accuracy, not the incidence of SBR. A poor (imprecise) forecast is one that resolves 20 percent of farmers' uncertainty about whether or not they will be infected; medium and good (accurate) forecasts resolve 50 and 80 percent of their uncertainty.

As one would expect, accurate forecasts have much higher value than do imprecise forecasts. More surprising,


Reid Frederick, USDA/ARS

Different Scenarios Affect Estimated Information Values, But Not by Much

The Base Case: The value of information is determined by estimating the increase in expected profit per acre of soybeans planted and assuming soybean prices were fixed at May 2, 2005, futures prices.

Risk Aversion: Like the base case, except farmers are assumed to be strongly risk averse, meaning they strongly prefer a steady flow of profits over one that is variable, holding expected profits the same. Risk-averse farmers are more prone to apply preventative fungicides in the absence of information. They may also derive less value from a lot of information because, somewhat counter-intuitively, fine-tuning their decisions in response to information may cause their profits to be more variable, even though profits are higher on average. For example, without an accurate forecast a farmer may always apply the preventative fungicide, resulting in a steady but low level of profits. With an accurate forecast, farmers apply fungicides only when needed, leading to higher average profits but somewhat more variability. Because risk-averse farmers dislike profit variability, the information is therefore less valuable than it is to a farmer who cares only about average profits. The difference, however, is small.

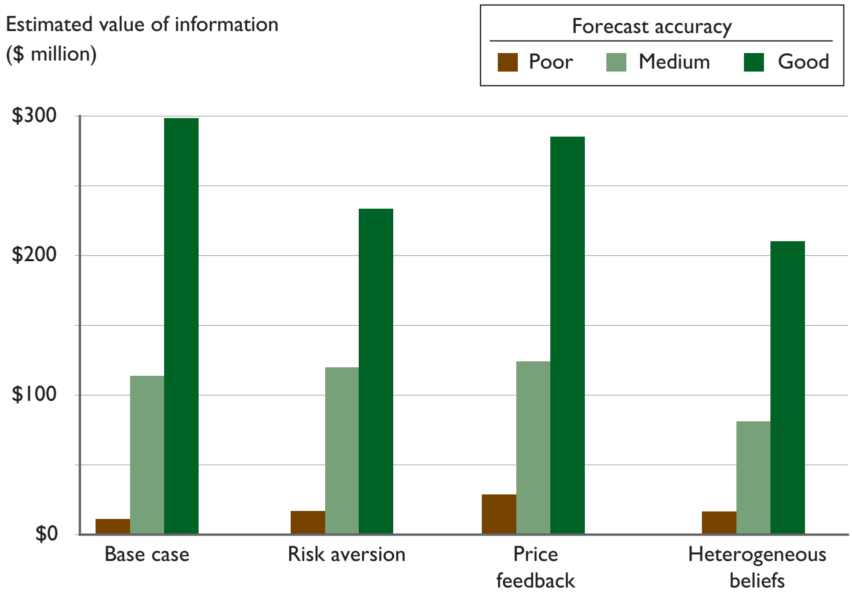
Price Feedback: Like the base case, except in the event of an SBR outbreak, soybean prices adjust to the reduced supply. The price response is estimated using historical price response to local yield shocks. Because price increases offset farmers' profit losses but hurt those who purchase soybeans, the analysis considers the total effect of information on both soybean farmers and soybean purchasers. Because prices tend to move in the opposite direction as yield shocks, these effects tend to offset each other, and thus have little overall effect on the value of information.

Heterogeneous Beliefs: Like the base case, except farmers within each region are assumed to have held widely varying expectations about the likelihood of an SBR outbreak. In this scenario, some farmers value information far more than others do, but on average, the value is close to the base case.

perhaps, is that risk aversion (how much soybean farmers prefer steady profits over variable profits), anticipated price shocks (i.e., price feedback) from large rust outbreaks, and widely varying farmer expectations (i.e., heterogeneous beliefs) about the risk of infestation have relatively little influence on the value of information, when keeping the accuracy of the forecast fixed.

Public information has been particularly valuable for SBR management, mainly because the forecasts aided farmers in their decisions about whether or not to apply fungicides. Because of the high cost of monitoring and applying fungicides, farmers would have wanted to apply these management strategies only if an SBR threat were likely. Without a forecast, they would have been more likely to spray when it was unnecessary and not spray when it was necessary. If preventative measures had not been available and the only management options were to lose crops to infection, if infection were certain to occur, the forecasts would have had little or no value. Thus, in evaluating the cost effectiveness of developing public monitoring and forecasting services for pests other than SBR, a key feature to consider is whether or not preventative management strategies might take advantage of any information provided. The lesson learned is that the more information influences decisions, the greater its value. This is true regardless of whether information takes the form of hurricane forecasts, food nutrition labels, crop production forecasts, Internet searches, or SBR forecasts. W

Value of soybean rust forecasts with different accuracies and scenarios



Source: USDA, Economic Research Service.

This article is drawn from . . .

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Agriculture and Rural Communities Are Resilient to High Energy Costs

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Fred Habegger, Grant Heilman Photography

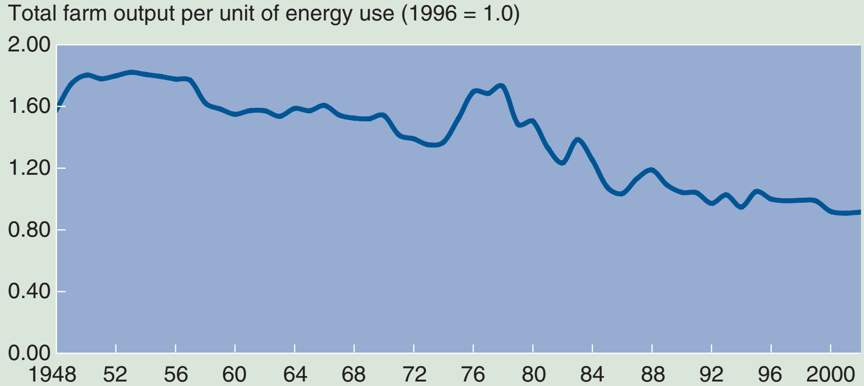
- Farm energy expenditures continue to rise, but at a slower rate. Fuel expenditures are estimated to increase 12 percent between 2005 and 2006, compared with 36 percent in 2004-05.
- Farmers may be induced to adopt farming practices that use less energy. And when farming is only one source of household income, additional household members may seek off-farm employment.
- Rising energy costs affect rural household transportation and heating costs. Transportation costs are higher for rural residents; urban and rural residents face roughly the same heating costs.

Higher energy costs in the 1970s prompted all sectors of the U.S. economy to increase energy efficiency. Agricultural producers responded by making tradeoffs—replacing more expensive fuels with less expensive fuels, shifting to less energy-intensive crops, and employing energy-conserving production practices where possible. Energy intensity—defined as energy consumed per unit of total output—has steadily declined over time due to gains in energy efficiency in the agricultural sector, and this trend is likely to continue.

Nominal energy prices have been steadily increasing, although inflation-adjusted energy prices have remained largely unchanged until recently. In the agricultural sector, energy expenditures for gas, diesel, electricity, and other inputs have increased over time and vary by major commodity produced. However, the U.S. Department of Energy expects the prices of crude oil and gas to decrease in 2006-07 by roughly 5 and 3 percent, respectively, but expects the price of natural gas to rise by over 6 percent.

Rural communities face somewhat different issues associated with increases in petroleum and natural gas costs. As energy prices rise, so do household costs for transportation and home heating. Rising fuel costs also could discourage people from vacationing in or moving to rural areas, particularly remote areas far from major services and employment centers. Because rural households tend to have higher travel expenses—simply because they travel longer distances—they are more likely to be affected by increases in gas prices than urban households.

Energy intensity in U.S. agriculture has declined over time due to energy efficiency gains and changes in commodities produced, 1948-2002



Source: USDA, Economic Research Service.

Farm Energy Costs Vary by Commodity and Region

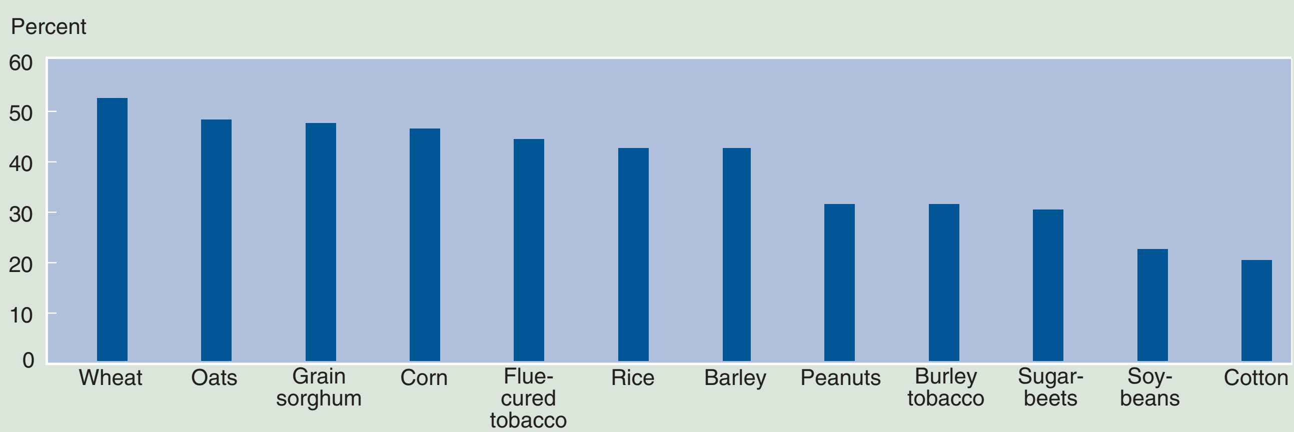
Direct energy consumption in the agricultural sector includes use of gas, diesel, liquid petroleum (LP), natural gas, and electricity. Indirect energy use involves agricultural inputs, such as nitrogen fertilizer, which have a significant energy component associated with their production. Since 1992, direct fuel and electricity expenses for U.S. farms have averaged around 7 percent of total operating costs. Diesel fuel and gasoline are widely used for tillage, planting, transportation, and harvesting. Electricity, LP, gas, and natural gas are primarily used in drying; irrigation; operation of livestock, poultry, and dairy facilities; and onfarm processing and storage of perishable commodities. Expenses from indirect energy use increase total energy expenditures to 15 percent of operating costs. Fertilizers embody the most energy among production inputs because natural gas is the primary input (70-90 percent of the cost of producing nitrogen fertilizer).

The impact of energy cost changes on producers depends on both overall energy expenditures and, more importantly, energy's share of production costs. Even if farms spend a lot on energy, the impact of cost changes on farm profits depends on the extent to which energy is a significant share of total costs.

The potential impacts on farm profits from changes in energy prices are greatest for feed grain and wheat producers. Beef cattle operations consume large amounts of fuel nationally but have small energy expenses per farm. Crops with the highest energy input costs per acre generally do not have the highest share of operating costs from energy inputs. For example, the high energy costs for rice producers accounted for 42 percent of total operating costs. In contrast, energy input costs for wheat production accounted for 52 percent of total operating costs in 2004. Other commodities with a high share (44 percent or more) of operating costs from energy inputs are wheat, corn, grain sorghum, and oats.

Rising energy prices make cotton and soybeans more attractive alternatives to other crops for which energy represents a higher share of total operating costs. Per-acre energy input costs are lowest for soybean production ($18), which comprised 22 percent of total operating costs in 2004. Energy input costs for cotton, at $64 per acre, were among the highest of major field crops but made up just one-fifth of the total operating costs of cotton production. In areas where feed grain and wheat

Energy costs as a share of total operating costs, 2004



Source: USDA, Economic Research Service.

Costs of energy inputs used on field crops, by region, 2004

Energy inputs	Heartland	Northern Crescent	Northern Great Plains	Prairie Gateway	Eastern Uplands	Southern Seaboard	Fruitful Rim	Basin and Range	Mississippi Portal
Soybeans									
Per-acre costs (dollars):									
Fertilizer	8.20	14.28	7.96	5.12	15.54	14.06	na	na	8.26
Fuel, lubrication, and electricity	7.72	10.73	8.47	23.03	7.66	6.26	na	na	12.26
Total energy input costs	15.92	25.01	16.43	28.15	23.20	20.32	na	na	20.52
Operating costs (percent):									
Fertilizer	11	15	11	6	19	16	na	na	9
Fuel, lubrication, and electricity	10	12	11	25	9	7	na	na	13
Total energy input costs	20	27	22	30	28	23	na	na	21
Wheat									
Per-acre costs (dollars):									
Fertilizer	45.47	42.03	20.28	19.29	na	55.57	37.01	35.40	32.66
Fuel, lubrication, and electricity	11.53	21.49	7.32	14.23	na	9.36	22.06	12.21	9.77
Total energy input costs	57.00	63.52	27.60	33.52	na	64.93	59.07	47.61	42.43
Operating costs (percent):									
Fertilizer	50	41	34	32	na	48	3	37	35
Fuel, lubrication, and electricity	13	21	12	24	na	8	17	13	10
Total energy input costs	62	62	46	55	na	56	47	49	45

na = Not available.
Note: Fertilizer and fuel, lubrication, and electricity are the primary energy-related inputs. Fertilizer includes commercial fertilizers, soil conditioners, and manure. Costs of other inputs, such as chemicals, custom operations, and purchased water, would, to a lesser extent, also be affected by changes in energy prices.

Source: 2004 Agricultural Resource Management Survey, USDA.

compete for acreage with soybeans, higher energy prices may induce a switch to soybean production.

Variation in the regional distribution of energy input costs suggests that changes in energy prices would most affect producers in regions where irrigation is indispensable for crop production. Corn, soybean, wheat, cotton, grain sorghum, and peanut producers in the Prairie Gateway have a higher share of total operating costs from direct energy costs than do producers in other regions, partly due to irrigation expenses. The higher energy input costs in this region are mainly due to additional fuel costs associated with irrigation. High energy prices could reduce production of these crops in the Prairie Gateway if less acreage is planted or if reduced irrigation lowers yields.

Changes in energy prices may have a greater effect on producers of major field crops in the Southeast—the Southern Seaboard and Eastern Uplands. Fertilizer costs as a share of total operating costs were highest for corn and cotton producers in these regions. Higher energy prices could result in a reduction of these crops in the Southeast if fewer acres are planted or if reduced fertilizer use cuts yields.

Direct energy costs make up a small share of total operating costs on livestock operations, comprising 3-7 percent of the operating costs for hogs, dairy, and cow-calf operations in 2004. However, these operations can experience higher energy costs indirectly through higher feed production costs. Feed costs make up roughly 60 percent of total livestock production costs, so livestock producers could expect to see cost increases through either purchased feed or feed produced onfarm.

Some Agricultural Production Practices Save More Energy

Certain production practices provide important means of energy conservation. For example, conservation tillage provides key opportunities for both direct and indirect energy conservation. Reduced tillage involves less fuel consumption when a tractor runs over the field fewer times and saves indirectly by reducing fertilizer requirements. Drip irrigation methods involve lower water-pumping costs and can also use nutrients more effectively. But, additional gains in agricultural energy efficiency could still be captured, especially in the areas of tillage, pest, nutrient, machine, irrigation, and drying management for crops. ERS researchers used the most recent (2001) production practice survey for corn (one of the most widely planted and input-intensive crops) to examine the extent of adoption and use of selected energy-reducing practices:

- *Conservation tillage:* Acres devoted to conservation tillage could increase. In 2001, 70 percent of corn acres used some form of conservation tillage, while 26 percent still tilled conventionally, and 4 percent were moldboard plowed.
- *Low-water-use irrigation:* More irrigated acres could use energy-reducing low-pressure systems. Only about one-third of irrigated corn acres use a low-pressure system. Of the 14 percent of the acreage irrigated, over two-thirds used a high-pressure system.
- *Nitrogen management:* Commercial nitrogen use could be reduced through soil testing and more efficient application methods. While commercial nitrogen fertilizer was applied to nearly all corn acreage, less than 30 percent reported using a nitrogen soil test. Over 20 percent of the acreage received a fall nitrogen application; less than 10 percent received a nitrogen inhibitor; and less than 30 percent received a split nitrogen application. Manure was applied to less than 15 percent of the acreage.

The above examples indicate areas where energy use can be reduced. However, at the time this information was gathered, the higher energy-using practices may have been economically efficient. The current increases in energy prices may result in changes to such practices.

In Rural Economies, Rising Energy Costs Have Direct Effects . . .

Increases in petroleum and natural gas costs directly affect rural communities and their residents through higher transportation and home heating costs. A secondary effect of rising fuel costs is to discourage people from vacationing in or moving to rural areas, particularly remote areas far from major services and employment centers, thereby reducing revenues to businesses that provide services to these people.

Rural Households. Because of higher personal transportation expenditures, rural households are more likely than urban households to feel the pinch of increased gas prices. Rural residents depend more on cars and trucks than on public transit, driving 17 percent more miles each year per household than urban residents do. Less than 1 percent of nonmetropolitan (nonmetro) residents use public transportation, compared with 6 percent of metro residents, according to the Census Bureau. In addition, rural drivers are more likely to use SUVs or trucks as personal transportation than are metro residents, another factor raising rural fuel costs.

Estimates based on recent surveys of vehicle use and projected fuel prices suggest that the average rural household with at least one driver will spend about 30 percent more on fuel in 2006 than in 2004, unless driving patterns change. Because urban households drive less and are less likely to drive small trucks, their fuel costs will increase less—$680 compared with $850 for nonmetro drivers.

Rural communities with persistent poverty may be hit hardest by energy cost increases. The poverty threshold for a family of four in 2004 was $19,157. Assuming that their driving level is the rural average, their projected increase in household fuel costs would represent over 4 percent of income. While poor families may not drive as much as other families, workers in persistent-poverty counties tend to travel longer (25 minutes) to their jobs than do workers in other rural counties (21 minutes). Commuting time increased 24 percent between 1990 and 2000, a period of declining poverty in these counties. Adjustments to rising fuel costs in poverty counties are likely to be difficult because residents are already more likely to carpool (17 percent) than are workers in other nonmetro counties (13 percent), and public transport, as in other nonmetro counties, is virtually nonexistent.

Heating costs will also be affected, with variations by region, but rural and urban residents will be affected about the same. Rural residents use more LP than urban residents because of limited access to natural gas. LP prices follow heating oil prices and are expected to fall between 2006 and 2007. Both rural and urban residents rely on electricity, which hasn't seen the price increases petroleum-based products have. And, urban residents use 25 percent more natural gas than rural residents, and the price of natural gas is expected to increase. So on net, urban

Comstock and Eyewire

Potential rises in the cost of driving for urban and rural areas

Item	Metro	Nonmetro
Vehicle miles per year:[1]	*Number*	
Per household	24,674	28,397
Total gallons per household	1,180	1,437
Costs per year:[2]	*Dollars*	
2006	2,867	3,492
Increase, 2004-06	684	833

[1]Based on National Household Transportation Survey, 2001.
[2]Prices from U.S. Department of Energy, Energy Information Administration, "Short Term Energy Forecast," November 2005.

Sources: U.S. Department of Transportation and U.S. Department of Energy.

residents may face somewhat higher heating costs than rural residents.

. . . and Indirect Effects

Rural communities increasingly depend on tourism, second-home ownership, retiree inmigration, and the ability of people to commute long distances to work from rural places with desirable attributes. Substantial rises in transportation costs are likely to reduce these activities, particularly in rural areas that are relatively remote from major urban centers, and to slow rural growth, possibly leading to job and population losses. Earnings from recreation industries have grown considerably faster than overall earnings in rural areas. Also, recreation counties have generally gained population at a much faster rate than have other types of rural counties. The advantage is especially striking in counties not adjacent to metro areas. In 2000-04, recreation counties were the only type of county to gain population in nonadjacent counties. With high rates of growth, construction jobs are plentiful in these counties. Moreover, these counties attract entrepreneurs and retirees, whose incomes are generated by other types of businesses or investments, as well as tourism. While it is difficult to determine the impact rising energy costs may have on these trends, significantly increasing transportation costs may slow some of these growth patterns.

Tradeoffs May Lie Ahead

Farm and rural households may need to make certain tradeoffs to adjust to higher energy prices. Farmers may need to grow commodities that use less energy. High fuel costs may also induce more farmers to adopt farming practices that use less energy. And because farming is only one source of household income, additional members of the farm household may seek off-farm employment.

Because of higher transportation expenses, rural communities may see changes in settlement patterns, especially in more remote rural areas. Commuting patterns may also change in terms of type of vehicle used and distance people drive to work (some could move closer to their employment, usually near urban centers). With greater use of computers and the Internet in rural areas, more rural workers may seek jobs where they could work from home at least part of the week.

In addition, rising energy prices will likely increase the demand for bioenergy, from which agriculture may benefit and play a key role. However, data are not currently available to support a comprehensive economic analysis of these effects. Some insights are contained in the *USDA Agricultural Baseline Projections to 2015*, which assumes an increase in corn demand for bioenergy and incorporates energy price forecasts from the Energy Information Administration in production costs for all countries. The USDA baseline embeds an assumption about future corn use for ethanol: "Corn used to produce ethanol in the United States more than doubles the 2004/05 level by 2015/16. This increase reflects the Renewable Fuel Program of the Energy Policy Act of 2005, large ongoing ethanol plant construction, and economic incentives provided by continued high oil prices." W

This article is drawn from . . .

The ERS Briefing Room on Farm Income, www.ers.usda.gov/briefing/farmincome/

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To help farmers begin to think about how reduced tillage can save energy, USDA has developed an online Energy Estimator for Tillage, available at: http://ecat.sc.egov.usda.gov

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FEATURE

Economic Effects of Animal Diseases Linked to Trade Dependency

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David Harvey, djharvey@ers.usda.gov

- Global levels of meat trade have not declined despite the last decade's high-profile bans on meat trade flows.
- The economic effects of disease-related trade bans on an individual country depend on the size of its livestock trade relative to domestic consumption. The most severe impacts have been felt in a few export-dependent markets and in those import-dependent markets where substitutes for banned trade were not found.
- The economic significance of animal disease outbreaks is also influenced by consumer response: Fears that the disease can spread to humans can lead to sharp drops in consumption.

The importance of livestock and poultry trade to producers and consumers around the world increased in the last part of the 20th century. Producers in major exporting countries grew to rely on trade as a significant outlet for their products, and consumers in the importing countries relied increasingly on trade for a significant contribution to their diets.

In the last decade, however, a spate of animal disease outbreaks has repeatedly disrupted livestock and poultry meat trade and created uncertainty about future trade disruptions. Two diseases, avian influenza (AI) and bovine spongiform encephalopathy (BSE), are at the forefront of today's trade disruptions, but a third disease, foot-and-mouth disease (FMD), has caused havoc in livestock markets for the past decade and emerged again very recently in Brazil. Some of the trade disruptions have resulted in losses for livestock industries, such as the pork exporters of Taiwan, whose exports were nearly eliminated from early 1997 to the present because of FMD. Disease-related interruptions of trade flows have also affected the food industry and consumers in the importing countries, when the meat affected by the ban could not be replaced by either domestic producers or other exporting countries or when consumers reduced purchases because of fears for their health.

The economic costs of these disruptions vary, and three criteria help explain the extent of damage done by a disease outbreak. First is the relative importance of meat exports to producers in the affected country. Loss of export markets is much more serious if 40 percent of the country's output is exported than if 5 percent is exported. For example, disease outbreaks among the pork industries in Denmark and Taiwan and the poultry industry in Thailand, all heavily dependent on exports, have inflicted great damage on producers in those countries. A sudden end to trade leaves an increased supply of meat that must be sold domestically, reducing prices. In contrast, a large country like China has suffered less disruption from AI because it was less dependent on poultry exports.

Second is the relative importance of imports from an affected country to consumers in an importing country. If a country affected by disease supplies 20 percent of an importing country's meat, a sudden end to the imports can lead to a fall in consumption unless domestic production or imports from another country can make up the deficit. For example, after the AI outbreaks in China and Southeast Asia, Japan was able to partially replace poultry imports from Asia with imports from Brazil. In contrast, Japan's beef imports from the U.S. were not so easily replaced.

The final factor is whether the animal disease poses a threat to humans, because consumers' fears can reduce consumption. FMD and highly pathogenic AI are both contagious viral infections in animals and birds that cannot be contained easily. BSE is a different kind of disease—it is not contagious and does not spread rapidly. FMD does not typically affect humans, but the highly pathogenic H5N1 strain of AI appears to have been transmitted to humans through very close contact with infected birds. Cooking kills the viral agents of FMD and AI in meat but not the BSE agents. BSE is thought to cause a fatal brain disease in humans who eat high-risk tissue from infected animals.

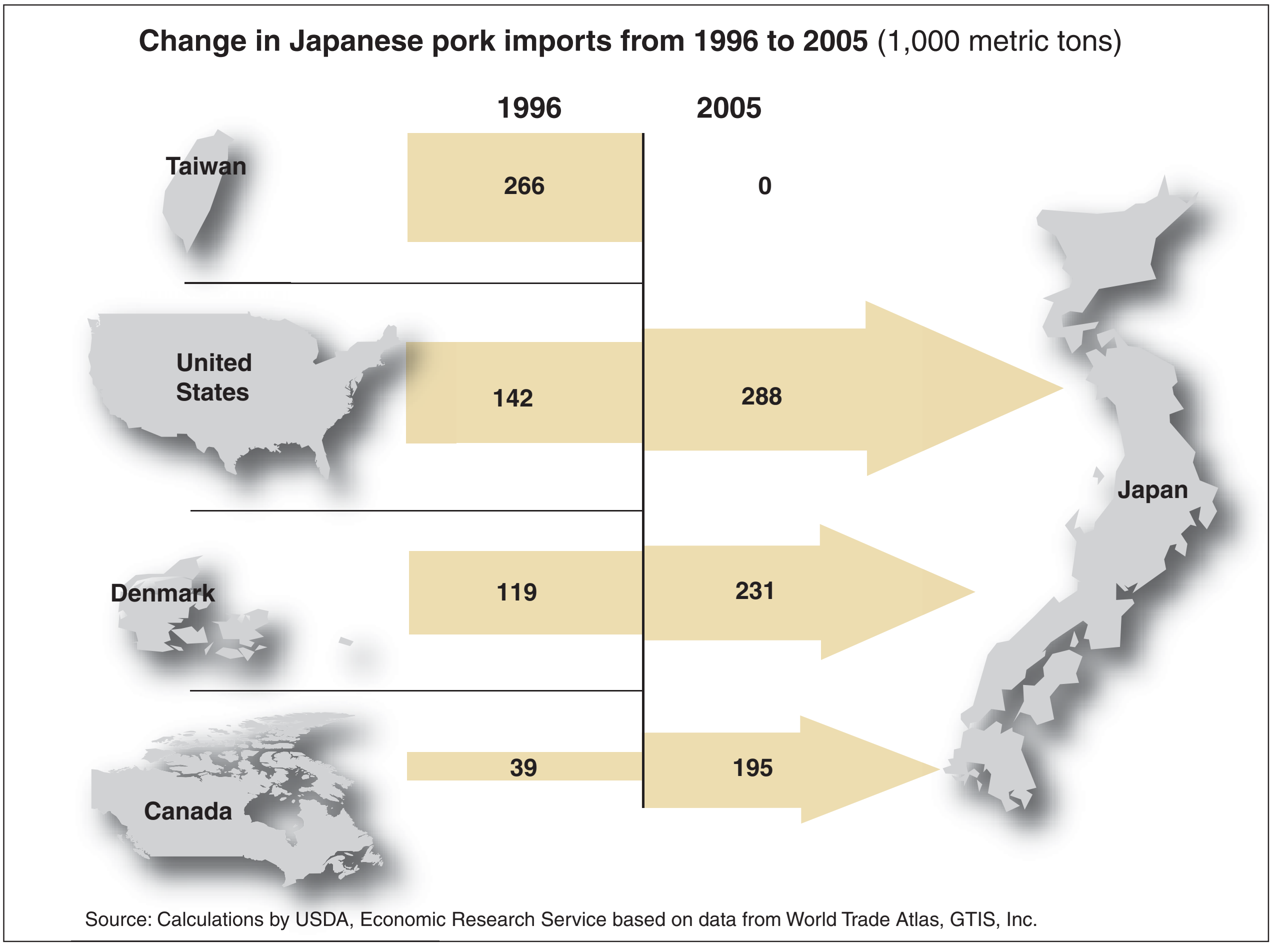
A Decade of FMD Shocks Brings an End to Taiwanese Pork Exports

FMD is a very contagious viral infection that can cause death or permanent disability for cattle and swine and can spread very rapidly in a number of different ways. Beef and pork trade flows have long been defined by the identification of "FMD-free" and "FMD" zones. For much of the 20th century, the FMD-free zone was a stable group of countries or territories including the U.S., Canada, Australia, New Zealand, Japan, South Korea, Taiwan, and, sometimes, Denmark. Because these countries recognized each other as free of FMD, sanitary barriers did not ordinarily inhibit trade among them or affect their exports to countries that were not FMD-free. Countries not recognized as FMD-free can export only cooked meats, such as corned beef or canned hams (cooking kills the virus), to the FMD-free zone, not chilled or frozen meat. The strict enforcement of FMD trade restrictions reflects the efforts that went into eradicating the disease in places where it was done successfully. Japan's eradication in 1907, and the eradications in Taiwan and the U.S. in the 1920s, required massive campaigns. Reportedly, all hogs on the island of Taiwan were destroyed, an action that made the island FMD-free for the next 50 years. The stability of the FMD-free zone ended in the latter half of the 1990s.

Trade in beef and pork (and live cattle and swine), both within the disease-free zones and among countries that had not yet achieved FMD-free status, was shaken by events beginning in 1997. FMD began to spread widely around the world, and Taiwan experienced an outbreak in that year so severe that more than a third of the island's hogs (4 million of the 11 million on the island) died or were slaughtered and the carcasses destroyed, not eaten. Dependence on exports was high, with 40 percent of output going to Japan. A decade later, despite efforts to recover FMD-free status and regain its once-large export presence, Taiwan has a much smaller hog population and lower exports. Exports from Taiwan made up 40 percent of Japan's pork imports, but that loss was offset by rising imports from Canada, Denmark, and the U.S., as well as greater-than-expected production within Japan itself. Pork from Taiwan had distinct appeal in Japan's market, but was not so [

The Council of Agriculture, Executive Yuan, Taiwan, ROC

On March 20, 1997, Taiwan announced an export ban on its pork because of an outbreak of FMD on its hog farms.



Over the next 5 years, smaller outbreaks occurred in Japan and South Korea (both FMD-free for many decades) and a large outbreak swept parts of Western Europe, which had long struggled to become FMD-free. In South America, Argentina and Brazil had been working hard to achieve FMD-free status, but experienced outbreaks after 2000. The stability of the FMD-free zone from about 1930 to 1997 has given way to volatility caused by the outbreaks of the last decade, and renewed fear among producers in all the exporting countries.

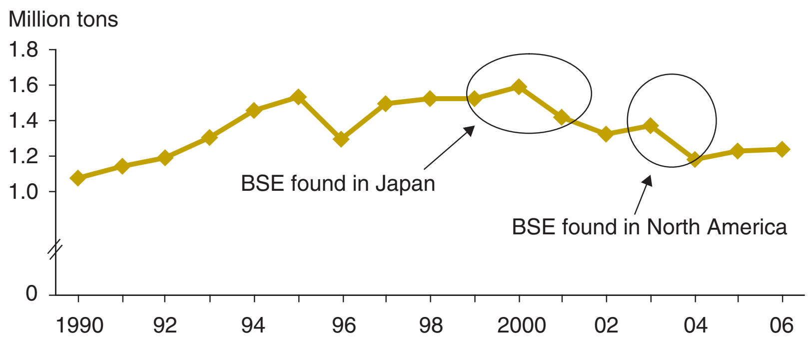
In the past, FMD outbreaks typically resulted in bans on imports from anywhere in affected countries. However, over the last two decades, in order to help mitigate the drastic consequences of whole-country bans, importing countries have sometimes agreed to restrict their trade bans to those regions within the country where the outbreak occurred, allowing imports from other regions that are disease free, a practice known as *regionalization.*

BSE Perceptions Affect Consumers in Japan and Korea More Than U.S. Producers

Unlike FMD, the discoveries of BSE in cattle have caused widespread concern about the safety of beef consumption in some markets. BSE, also called mad cow disease, is a neurological disease in cattle that was first discovered in Britain in 1986. It was thought to affect only cattle until 1996, when the British Government announced a possible link to a new human variant of Creutzfeldt-Jacob Disease, and BSE was elevated from an animal health concern to a human health concern. Unlike viral diseases, such as AI and FMD, scientific research indicates that cooking does not kill the causal agent of BSE. But, with measures in place to remove the significant risk materials from the food system, human health risks from BSE are minimized.

The Canadian Government announced the discovery of the first case of BSE in a North American-born animal, a beef

BSE discoveries have led to drop in Japanese beef consumption



Source: Production Supply, and Distribution Database, 2/17/2006, USDA's Foreign Agricultural Service.

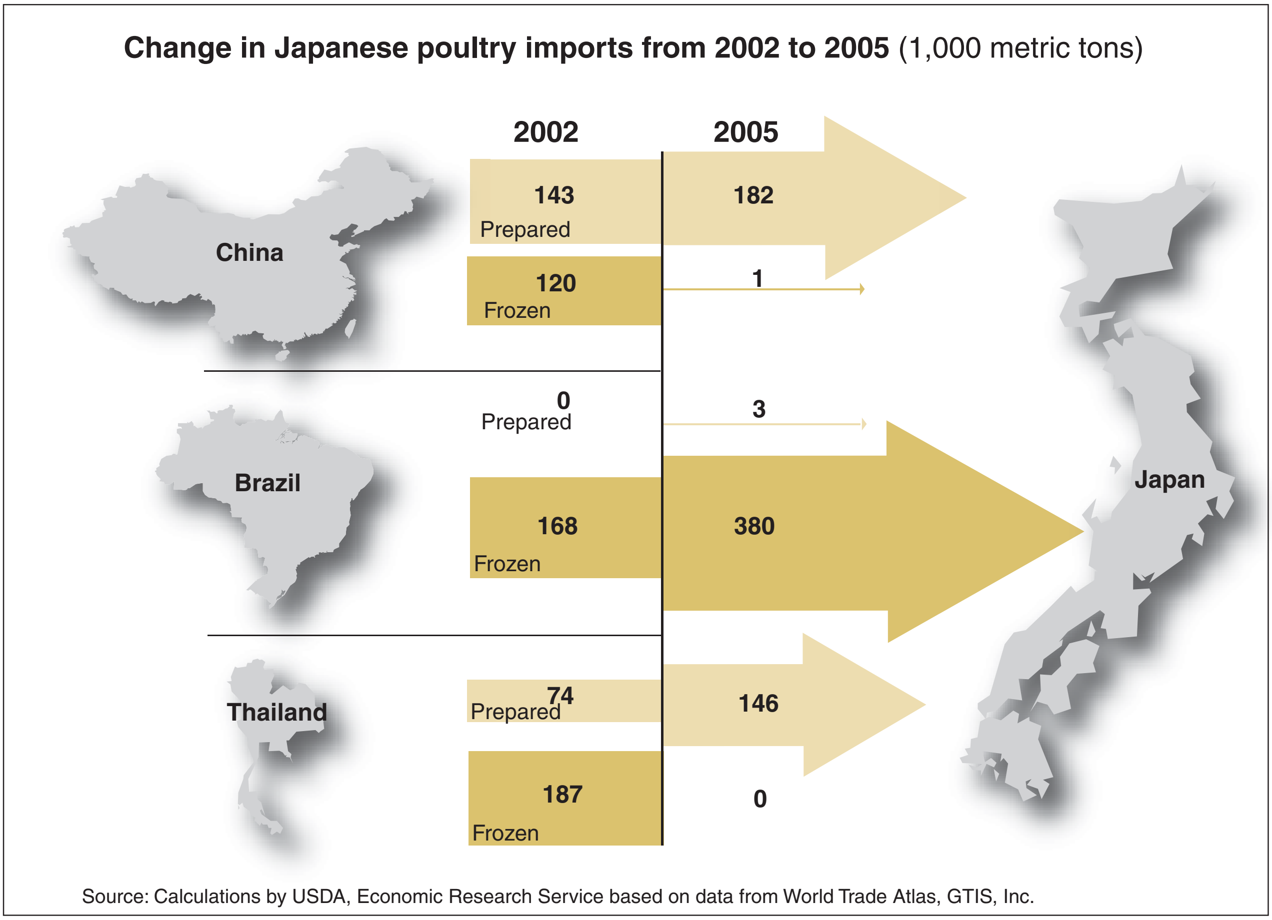
cow in Alberta, in May 2003. All of the country's major trading partners, including the U.S., banned imports of Canadian beef and live cattle immediately. In August, the U.S. allowed boneless beef from cattle under 30 months of age, but not live cattle, to be imported from Canada. Then, in December 2003, discovery of a BSE-infected cow in Washington State led some 70 countries, including Canada and Mexico, to impose import bans of varying degrees on U.S. beef and cattle. U.S. beef exports dropped from a record 2.5 billion pounds in 2003 to 461 million pounds in 2004, a fall of over 80 percent. The bans on U.S. beef exports clearly were significant to U.S. exporters and to the consumers of U.S. high-quality, grain-fed beef in countries such as Japan, Korea, and Hong Kong, whose markets were closed to the U.S. and where beef prices rose. While the U.S. beef industry depended on exports to take 9-10 percent of output, the domestic market was strong and absorbed the increase in supply.

The U.S. ban on Canadian beef imports in May 2003 came at a time when U.S. beef supplies were already tight, and the ban led to even tighter supplies. By October 2003, the supply situation had generated record-high U.S. cattle and beef prices. Domestic beef production was declining because producers had been reducing inventories since 1996, while the demand for high-quality, grain-fed beef remained high. With the domestic market fetching high prices, the beef industry was better able to absorb losses in export revenue. In addition, U.S. meat consumers did not abandon eating beef after the BSE discoveries as consumers in Europe and Japan had done, at least for limited periods. Japan's annual consumption of beef dropped by about 15 percent in 2001, when BSE was discovered in Japan.

Japanese and Korean consumption of beef fell even more when U.S. beef was cut off. The two Asian markets depended heavily on North American, especially U.S., beef. North American beef constituted one-fourth of total Japanese consumption in 2002. Furthermore, beef trade was concentrated on a few cuts of beef, particularly short plate and short ribs. Japanese and Korean restaurants had developed a strong demand for dishes made with these cuts. No other BSE-free beef supply in the world was big enough to replace the U.S.

South Korea was the third-largest buyer of U.S. beef before banning imports in December 2003 following the first case of BSE.

Kim Kyung-Hoon, Corbis



supply of these cuts. Japanese and Korean consumers also liked the taste of grain-fed beef from North America. Beef from Australia and New Zealand has traditionally been grass fed, and attempts to feed grain to the degree that it is fed in North America have not been viable on a large scale. Most North American beef has not been replaced in the two Asian markets. Japan's beef consumption in 2004 was 25 percent below 2000 levels because of the combined effect of drops in demand and reduced supply.

Asian Poultry Markets Disrupted by Avian Influenza

Well-publicized outbreaks of the highly pathogenic H5N1 strain of AI began in Asia in 1998. The strain was first identified in Hong Kong, where it killed several people. In response, the entire poultry population in Hong Kong—millions of birds—was slaughtered to eradicate the disease. However, in 2001, H5N1 reappeared in China, and in 2003 and 2004, it affected several poultry populations in Southeast Asia. In 2005, it spread across Asia and reached Europe; cases were reported in Europe and Africa in early 2006. Highly pathogenic strains of AI are very dangerous to birds, spreading quickly and often killing the birds. The H5N1 strain has also spread from birds to people when people have been in close contact with diseased birds.

Like FMD, AI viruses in meat are killed by cooking. Unlike FMD, however, H5N1 can infect and kill humans from bird-to-human contact. Medical experts worry about a possible human pandemic if the H5N1 variant mutates in ways that make transmission of the virus directly between people easier. This worry has led to extra efforts to eradicate AI, such as killing or banning all live chickens and other birds in major Asian cities—examples include Hong Kong and cities in Vietnam—and to campaigns to vaccinate entire populations of various species of birds against H5N1 AI.

Trade disruptions from H5N1 AI affected two of the world's major exporters of chicken meat, Thailand and China. Thailand's broiler industry depends heavily on exports and was hard-

Asian Markets Restructured by AI

In the 1990s, the principal driver of Asia's poultry meat trade was Japanese demand for imports supplied by China and Thailand. Because fresh poultry meat does not keep as long as beef and pork, the trade focused mainly on frozen cuts, primarily from broilers. The Japanese place a higher value on chicken legs than on white meat, a factor exploited by the Asian exporters that supplied such products as de-boned legs. These de-boned products competed successfully against the bone-in legs long supplied by the U.S. Thailand also successfully developed a large export market to the European Union.

In addition to supplying frozen products, Thailand and China also supplied Japan with further processed broiler meat, often seasoned, cooked, cut, packaged, and ready for restaurants or consumers to use, once reheated. Shipments of further processed products had a considerably higher value than did frozen cuts, reflecting the greater convenience they offered to customers and the higher costs of inputs needed to manufacture them. By 2000, Japan was importing over 150,000 tons of prepared and preserved broiler meat, valued at over $500 million. China, because of the relatively short sea passage between its Shandong Province and Japan, was also able to ship chilled broiler meat to Japan that could compete with the fresh and chilled Japanese meat in supermarkets.

The discovery of the high-pathogenic H5N1 strain of AI in Hong Kong in 1998 brought new uncertainty to Asia's poultry meat trade. China's chilled and frozen exports to Japan were halted for 3 months (July-September) in 2001 after an H5N1 outbreak in China. Late in 2003 and early in 2004, H5N1 AI appeared in all of Japan's large Asian suppliers, and their exports of chilled and frozen broiler meat ceased. South Korea, an emerging importer, also banned chilled and frozen poultry product imports from all major Asian suppliers.

A direct result of the outbreak was a large increase in Japanese imports from Brazil. Brazil had not experienced any AI outbreaks and, except for the U.S. bone-in legs, faced almost no competition for the frozen cut markets in Japan and smaller Asian importing countries. Brazil's exports of frozen broiler meat to Japan shot up from 109,000 tons in 2000 to 403,000 tons in 2005.

In another shift, Chinese and Thai poultry-exporting firms refocused on increasing production of prepared and preserved broiler cuts. The heat treatment for such further processed cuts kills the AI virus if it is present. The share of further processed cuts in Thai poultry exports rose from 28 percent in 2000 to 88 percent in 2004 and to 98 percent in 2005. The share of China's exports of further processed cuts of poultry went from 20 percent in 2000 to 58 percent in 2005 (China still ships chilled/frozen poultry meat to its Hong Kong Special Autonomous Region). Poultry meat exports from major Asian suppliers to Japan and South Korea are now almost 100 percent prepared and preserved meat. In contrast, Brazil ships almost entirely frozen, unprocessed chicken meat to Asia.

The AI outbreaks have helped depress Asia's poultry meat trade since 2000. However, trade is recovering—Japan's import volume in 2005 exceeded 2000 levels, and the unit value of its imports is higher, reflecting the value added from processing in China and Thailand. The AI outbreaks in Asia thus accelerated a transition to production and export of higher valued products that was already underway in several countries.

OFAC Photo Library

hit by the bans. China's exports are a small share of its chicken meat output, and the impact of bans on its exports was less significant nationally, although severe for producers focused primarily on the Japanese market.

Consumer concerns about the safety of poultry in certain markets—e.g., Japan, China, Vietnam, and Thailand—led to sudden drops in consumption, although cooked chicken meat and egg products are safe to eat. But even though Japan is dependent on imports for a large share of consumption, the AI outbreaks in China and Thailand have not negatively affected supplies in Japan. Brazil has greatly expanded its exports to Japan, and China and Thailand have transformed their exports into heat-treated products that to some extent replace earlier frozen exports (see box, "Asian Markets Restructured by AI").

Animal Diseases Are a Continuing Threat

Meat sectors in a number of countries have suffered serious damage from disease outbreaks. On a global scale, however, trade disruption by and consumer reaction to fears of infectious animal diseases are not readily apparent (see box, "Effects of AI on U.S. Poultry Industry So Far Are Minimal"). Global production, consumption, and trade of pork and broiler meat have continued to grow through the animal disease episodes of the last decade, and global beef production and consumption have stayed relatively constant since 1990. In most cases, disease-related import bans have been mitigated by increasing supplies from domestic or alternative foreign sources of meat. Similarly, global feed use of corn has continued to rise, despite drops in annual corn use as high as 25 percent in certain countries (Thailand from 2001 to 2003, Taiwan from 1996 to 1998).

Meat trade increasingly requires that a supply chain for meat can be identified that both the importing and exporting countries agree poses low risk of disease transmission. Elements of this risk-based decisionmaking have been adopted by the World Organization for Animal Health for BSE and AI and in recent agreements among countries affected by BSE (e.g., Japan, Canada, and the U.S.). It may lead to a reduction in the extent and duration of trade bans. Technological advances in identifying disease strains and in tracing the origin of meats and the increasing use of risk analysis offer hope that outbreaks may be avoided or contained more quickly. Animal diseases, however, remain volatile threats to global trade in meats. W

Effects of AI on U.S. Poultry Industry So Far Are Minimal

So far, the U.S. has been spared from major disruptions of its poultry trade. AI outbreaks in the U.S. have been mostly of the less dangerous low-pathogenic varieties. U.S. poultry producers and processors enjoy a healthy domestic market situation partly supported by slowly growing retail prices relative to other meat prices and steady per capita consumption. (See "Chicken Consumption Continues Longrun Rise," page 5.) Most of the bans on U.S. poultry product exports due to AI or other poultry diseases have been regionalized quickly. For example, in 2002, U.S. trading partners banned poultry product imports from selected States including, at various times, Maine, North Carolina, Pennsylvania, Texas, Virginia, and West Virginia, after outbreaks of the low-pathogenic AI. If such regionalization does not affect areas that are primary sources of poultry product exports, national exports may not be seriously affected. Of the five largest broiler-producing States—Georgia, Arkansas, Alabama, Mississippi, and North Carolina—only North Carolina has been included in trade bans. However, the U.S. is also the second largest exporter of poultry products in the world. That position in international markets makes AI-related trade issues a key concern for the U.S. poultry industry.

This article is drawn from . . .

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F E A T U R E

Ethanol Reshapes the Corn Market

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- Work is underway to add over 2 billion gallons to the annual capacity of the U.S. ethanol sector.
- To meet the sector's growing demand for corn, some U.S. corn is likely to be diverted from exports.
- In the future, corn may cease to be the main feedstock for U.S. ethanol production if cellulosic biomass is successfully developed as an alternative.

Grant Heilman, Grant Heilman Photography

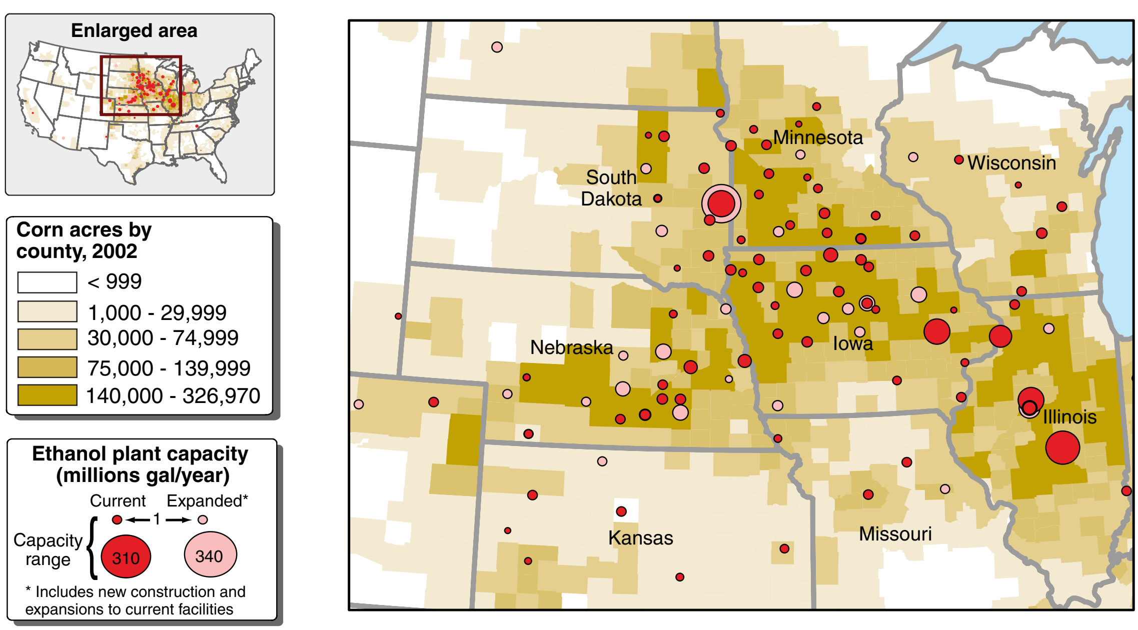
The year 2005 was marked by a flurry of construction activity in the Nation's ethanol industry, as ground was broken on dozens of new plants throughout the U.S. Corn Belt and plans were drawn for even more facilities. As of February 2006, the annual capacity of the U.S. ethanol sector stood at 4.4 billion gallons, and plants under construction or expansion are likely to add another 2.1 billion gallons to this number (map). If this trend and the existing and anticipated policy incentives in support of ethanol continue, U.S. ethanol production could reach 7 billion gallons in 2010, 3.3 billion more than the amount produced in 2005.

The tremendous expansion of the ethanol sector raises a key question: Where will ethanol producers get the corn needed to increase their output? With a corn-to-ethanol conversion rate of 2.7 gallons per bushel (a rate that many state-of-the-art facilities are already surpassing), the U.S. ethanol sector will need 2.6 billion bushels per year by 2010—1.2 billion bushels more than it consumed in 2005. That's a lot of corn, and how the market adapts to this increased demand is likely to be one of the major developments of the early 21st century in U.S. agriculture. The most recent USDA Baseline Projections suggest that much of the additional corn needed for ethanol production will be diverted from exports. However, if the United States successfully develops cellulosic biomass (wood fibers and crop residue) as an economical alternative feedstock for ethanol production, corn would become one of many crops and plant-based materials used to produce ethanol (see box, "That 70s Energy Scene").

Where Will the Corn Come From?

Large corn stocks will enable U.S. ethanol production to increase initially without requiring much additional adjustment in the corn market. The U.S. ended the 2004/05 marketing year (MY—September 2004-August 2005) with stocks of 2.1 billion bushels—enough to produce 5.7 billion gallons of ethanol. As long as corn is the primary feedstock for ethanol in the U.S., however, sustained increases

The U.S. ethanol sector is adding over 2 billion gallons to its capacity



Sources: 2002 Census of Agriculture; Renewable Fuels Association and other industry sources.

That 70s Energy Scene

The factors behind ethanol's resurgence are eerily reminiscent of the 1970s and early 1980s, when interest in ethanol rebounded after a long period of dormancy. First, the price of crude oil has risen to its highest real level in over 20 years, averaging more than $50 per barrel in 2005. Long-term projections from the U.S. Department of Energy's Energy Information Administration (EIA) suggest that the price of imported low-sulfur light crude oil will exceed $46 per barrel (in 2004 prices) throughout the period 2006-30 and will approach $57 per barrel toward the end of this period. It is important to remember, however, that as the price of oil dropped during the first half of the 1980s, so, too, did ethanol's profitability.

Second, many refineries are replacing methyl tertiary butyl ether (MTBE) with ethanol as an ingredient in gasoline. Oxygenates such as MTBE and ethanol help gasoline to burn more thoroughly, thereby reducing tailpipe emissions, and were mandated in several areas to meet clean air requirements. But many State governments have recently banned or restricted the use of MTBE after the chemical was detected in ground and surface water at numerous sites across the country. In the 1970s and 1980s, a similar phaseout ended the use of lead as a gasoline additive in the United States. Both ethanol and lead raise the octane level of gasoline, so the lead phaseout also fostered greater use of ethanol.

Third, the Energy Policy Act of 2005 specifies a new Renewable Fuel Standard (RFS) that will ensure that gasoline marketed in the United States contains a specific minimum amount of renewable fuel. Between 2006 and 2012, the RFS is slated to rise from 4.0 to 7.5 billion gallons per year. Assessments of the existing and likely future capacity of the U.S. ethanol industry indicate that the RFS will easily be achieved. The RFS joins a long list of incentives that the State and Federal governments have directed toward ethanol since the 1970s. One of the most important of these incentives is the Federal tax credit, initiated in 1978, to refiners and marketers of gasoline containing ehtanol. The credit, which may be applied either to the Federal sales tax on the fuel or to the corporate income tax of the refiner or marketer, currently equals 51 cents per gallon of ethanol used.

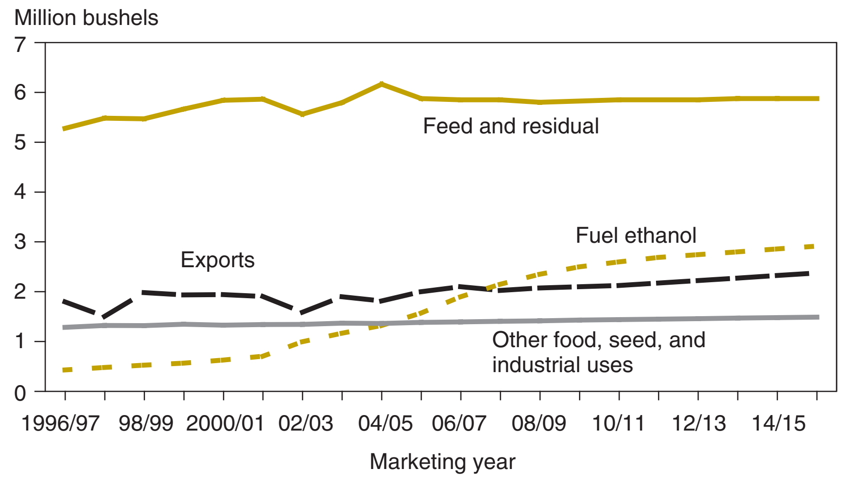
in ethanol production will eventually require adjustments in the corn market.

One possibility is that ethanol producers will secure the additional corn they need by competing with other buyers in the marketplace and bidding up the price of corn. According to the USDA Agricultural Baseline Projections (released in February 2006), the share of ethanol in total corn use will rise from 12 percent in 2004/05 to 23 percent in 2014/15. A comparison of the 2006 Baseline with the 2005 Baseline suggests that much of the increased use by ethanol producers will be diverted from potential exports; the 2006 Baseline projects higher use for ethanol and lower exports than the 2005 Baseline.

If demand for ethanol reduces the availability of U.S. corn for export, one might ask how this will alter the geographical composition of U.S. exports. The 2006 Baseline suggests that among the major foreign buyers of U.S. corn, Japan and Taiwan are likely to be the least responsive to a rise in corn prices, while Canada, Egypt, and the Central American and Caribbean region are likely to be the most responsive. Japan and Taiwan both have relatively high per capita incomes and limited corn production. In contrast, Canada, another high-income country, has substantial levels of corn production and could respond to higher prices with increased output of corn, wheat, and other feed grains. Per capita income in Egypt, Central America, and the Caribbean is relatively low, and higher prices may drive these countries to cut back in corn use, increase domestic corn production, or seek out substitutes. Egypt already produces a sizable amount of corn.

Slower growth of U.S. corn exports would create new opportunities for corn producers in other parts of the world, including Argentina, Brazil, and China. Another country to watch is Mexico, where irrigated lands have accounted for about half of the increase in domestic corn production since the late 1980s. Much of this

USDA's Baseline Projections suggest that corn use by ethanol producers will grow much faster than corn use by other industries



Note: Feed and residual corn use is calculated by subtracting the other three categories plus ending stocks from total supply. Thus, the term “residual” refers to a statistical residual.
Source: *USDA Agricultural Baseline Projections to 2015.*

Denny Eilers, Grant Heilman Photography

increase has taken place in the State of Sinaloa, where farmers are applying advanced agricultural techniques to obtain yields comparable to those in the United States. Sinaloa, however, is relatively distant from corn-deficit areas in Mexico, and many of these producers have counted on marketing subsidies to offset some of the transportation costs. Increased demand for corn by U.S. ethanol producers might push prices high enough that these transportation costs are more easily surmounted.

Farmers May Increase Corn Supply

The growing corn demand of ethanol producers could also be satisfied through higher corn output. Rising productivity is likely to assure some increase in U.S. corn production in the years to come, even if the amount of farmland devoted to corn remains constant. Over the past decade (1996-2005), U.S. corn yields averaged 138 bushels per acre, compared with 115 bushels during the previous decade. The United States also could increase corn production by devoting more land to the commodity. Such an effort would probably draw upon lands less suited to corn production. Much of these lands would probably be diverted from soybean production.

Growing corn more intensively is yet another approach. For instance, some producers who currently pursue a corn-soybean rotation (planting corn one year and soybeans the next) might shift to a corn-corn-soybean rotation (planting corn 2 years in a row and then planting soybeans in the third). Continuous production of corn (planting corn every year on the same plot of land) is another possibility. Interestingly, one of the key factors boosting ethanol demand—high oil prices—also makes intensive corn production less attractive because more fertilizer would be needed.

One way to get more ethanol feedstock out of existing levels of corn production is to use the stalk, leaves, and cobs left over after harvest—materials that are formally known as stover. An acre of corn will yield roughly 5,500 dry pounds of stover, enough to produce about 180 gallons of ethanol. In the United States, corn stover is typically left in the field following harvest to minimize erosion and to contribute organic matter to the soil, so removing some of the stover at harvest might adversely affect the long-term viability of the soil.

Market Adjustments Extend to Ethanol Co-Products and Beyond

As ethanol production increases, the supply of ethanol co-products will also increase. Both the dry-milling and wet-milling methods of producing ethanol generate a variety of economically valuable co-products, the most prominent of which is perhaps distiller's dried grains with solubles (DDGS), which can be used as a feed ingredient for livestock. Each 56-pound bushel of corn used in dry mill ethanol production generates about 17.4 pounds of DDGS. In the United States, cattle (both dairy and beef) have so far been the primary users of DDGS as livestock feed, but larger quantities of DDGS are making their way into the feed rations of hogs and poultry. Use of distiller's grains in animal production lowers the use of corn and protein supplements (see box, "Emergence of DDGS Market Creates New Needs for Data").

The marketing of ethanol co-products is just one way in which ethanol producers are making their operations more profitable. Another way is to save energy by locating ethanol plants in close proximity to dairy or livestock production. Specifically, a dairy or livestock producer is able to lower the transport costs associated with feed acquisition by establishing a nearby facility to manufacture ethanol and distiller's grains. The latter may be quickly transported to feed nearby livestock without needing to be dried, and the manure generated by the livestock can

Emergence of DDGS Market Creates New Needs for Data

The growing supply of DDGS has spurred demand for detailed market information about this commodity, comparable to what exists for other feedstuffs. USDA's Agricultural Marketing Service (AMS) already collects and disseminates some information about this fledgling market. The *Corn Belt Feedstuffs* weekly out of St. Josephs, Missouri, provides DDGS price information for a number of regional markets. USDA and the Wisconsin Department of Agriculture provide a weekly report containing different DDGS price quotes for Wisconsin and Eastern Minnesota based on different moisture levels of the product. And in February, AMS unveiled a new Illinois report for the eastern Corn Belt that includes data about the DDGS market.

be used to produce heat or electricity for the ethanol plant, but this entails a sizable capital cost.

Closer integration of ethanol production with other agri-industrial activities is likely to displace some traditional marketing and distribution channels for corn. Indeed, the services of some grain elevators may no longer be needed in some areas if local corn supplies are used in their entirety for ethanol production. The transportation sector may be the site of several noteworthy adjustments, as the profitability of the expanded ethanol sector will depend on economical methods of handling the growing supply of ethanol and its co-products, as well as the feedstock necessary to produce them. Some large-scale ethanol plants may find it cost effective to receive corn deliveries by rail on specially constructed trunk lines, while others may rely on truck, barge, or existing rail lines, depending on the location of the facility. The transportation of ethanol requires special attention. Ethanol is usually not moved across large distances by pipeline because the product has the ability to absorb the water and impurities commonly found in pipelines. Instead, the product is customarily shipped in tanks by train, truck, or barge, and then mixed directly with gasoline in the tanker trucks that deliver fuel to gas stations.

New Feedstocks Are the Wild Card

The search for ethanol feedstocks will not stop at the edge of the corn field. While corn is currently the primary feedstock for U.S. ethanol production, many other agricultural commodities and plant-generated materials can be used to produce the fuel. For example, ethanol derived from sugar cane satisfies roughly half of Brazil's annual demand for motor vehicle fuel, and sorghum is the feedstock for about 3 percent of U.S. ethanol production.

The U.S. and many other countries are very interested in cellulosic biomass as a potential feedstock for ethanol. Cellulosic biomass refers to a wide variety of plentiful materials obtained from plants—including certain forest-related resources (mill residues, precommercial thinnings, slash, and brush), many types of solid wood waste materials, and certain agricultural wastes (including corn stover)—as well as plants that are specifically grown as fuel for generating electricity. A report prepared for the U.S. Department of Energy and USDA in 2005 suggests that, by the middle of the 21st century, the United States should be able to produce 1.3 billion dry tons of biomass feedstock per year—enough to displace at least 30 percent of its current petroleum consumption.

Harnessing cellulosic biomass to produce ethanol will require the development of economically viable technologies that can break the cellulose into the sugars that are distilled to produce ethanol. No one knows for sure how long it will take to develop these technologies, although the more optimistic predictions are in the neighborhood of 5-10 years. To expedite the achievement of this goal, the Energy Policy Act of 2005 directs incentives specifically toward the use of cellulosic biomass as a feedstock for renewable fuel. For the purpose of meeting the Renewable Fuel Standard, 1 gallon of cellulosic biomass ethanol is treated as 2.5 gallons of renewable fuel through the end of 2012. The Act also provides for research, development, and demonstration projects concerning cellulosic biomass, and it mandates that at least 250 million gallons of renewable fuel be produced per year using cellulosic biomass, beginning in 2013. Until cellulosic biomass is successfully commercialized, however, corn will almost certainly remain the primary feedstock for U.S. ethanol production. W

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China's Rising Profile in the Global Market for Fruits and Vegetables

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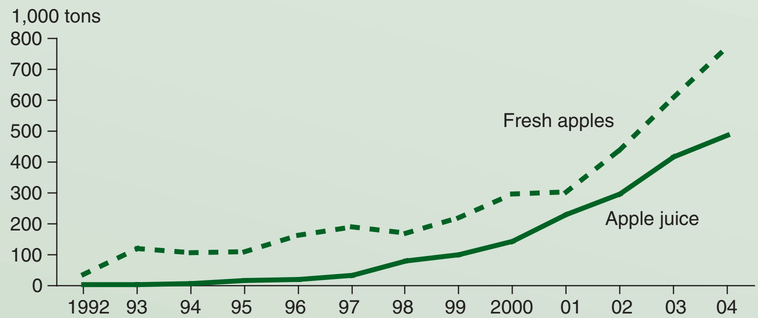
China's emergence as a fruit and vegetable exporter presents a new source of competition for U.S. producers. China's fruit and vegetable exports have increased most rapidly in three categories: apples, apple juice, and fresh vegetables. Since 2003, China's apple exports have surpassed those of the United States and have made inroads into major U.S. export markets in Asia. China is now the world's leading exporter of apple juice, and U.S. apple juice producers face both import competition and loss of export markets. China's exports of processed fruits and vegetables do not yet pose a serious challenge to the United States, because the two countries do not export the same types of products. However, China's rising exports of fresh vegetables have begun to compete with U.S. exports to Asian markets, and in some cases U.S. market shares have slipped.

However, such rapid export growth on the part of China may not be a long-term phenomenon. Growing domestic demand for fruits and vegetables is likely to reduce the supply available for export. As Chinese household incomes rise, fruit and vegetable consumption will rise, as will the variety demanded. Several important U.S. horticultural products are already popular among high-income Chinese households. Moreover, as the growth in the Chinese economy deepens, income gains will be spread more widely over the Chinese population. In the coming years more households will likely emulate the consumption patterns of the top-earning households, and Chinese consumption of fruits and vegetables could rise sharply.

Chinese apples and apple juice erode U.S. market share

China, the world's largest apple producer, has boosted its exports of apples and apple juice. In 1992, apple juice exports were negligible, and apple exports were less than 50,000 tons. Exports of both products began growing rapidly during the late 1990s. By 2004, fresh apple exports reached more than 750,000 tons and apple juice exports reached nearly 500,000 tons. China is now the world's leading exporter of apple juice and, in 2004, had a 56-percent share of the U.S. import market.

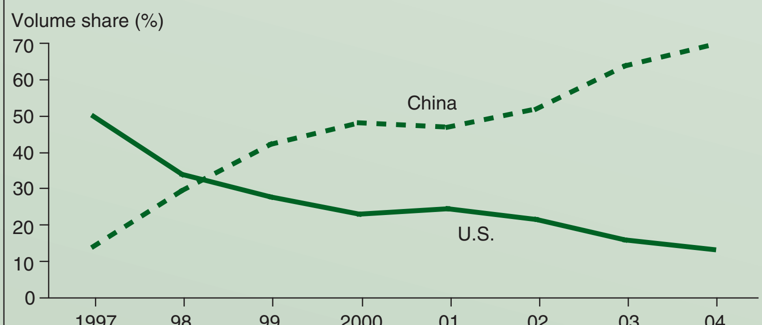
China increased its exports of fresh apples and apple juice



Source: USDA, Economic Research Service calculations based on data from USDA, Foreign Agricultural Service, Global Agricultural Trade System.

While Chinese fresh apples are not allowed into the United States because of phytosanitary issues, China's apple exports are eroding U.S. market share in Southeast Asian markets, which purchase nearly 60 percent of China's apple exports. In 1999, China surpassed the United States as the leading supplier of apples to Southeast Asia, and its share in volume grew to nearly 70 percent in 2004. The U.S. share of the Southeast Asian apple market fell from 50 percent in 1997 to 13 percent in 2004.

China surpassed the U.S. in Southeast Asian import market for apples*

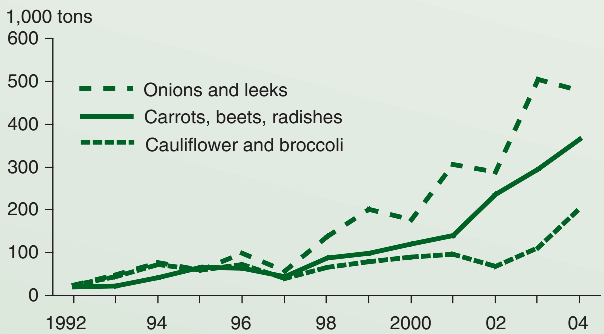


*Southeast Asia includes Indonesia, Malaysia, the Philippines, Singapore, and Thailand.
Source: USDA, Economic Research Service calculations based on data from USDA, Foreign Agricultural Service, Global Agricultural Trade System.

And China's fresh vegetable exports take over Asian markets

China's fresh vegetable exports include a wide variety of products grown in coastal regions, often under contract for Japanese or other Asian companies. Many vegetable products exported by China are different from those exported by the United States. But as China's fresh vegetable exports have diversified, they present more competition to U.S. exporters. Exports of onions, carrots, cauliflower, and broccoli grew from just a few thousand tons in 1992 to a combined total of over 1 million tons in 2004, making China the largest supplier in some Asian markets. Other prominent vegetable exports include garlic and mushrooms.

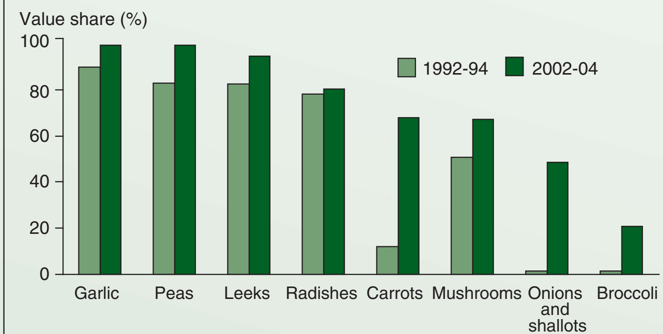
Chinese exports of selected fresh and chilled vegetables



Source: USDA, Economic Research Service calculations based on data from USDA, Foreign Agricultural Service, Global Agricultural Trade System.

China's vegetable exports compete with U.S. products primarily in Japan and, to a much lesser degree, South Korea. China surpassed the United States as the leading fresh vegetable exporter to Japan in 1996. It is the dominant supplier to Japan of imported garlic, peas, leeks, radishes, and mushrooms. China's share of Japan's imports of carrots, onions, and broccoli also grew rapidly over the past decade, and these are displacing U.S. products.

China's growing market share in Japan's top imported fresh vegetables



This chart includes 8 of the 10 top fresh vegetables imported by Japan during 2002-04. The other 2 in which China's shares were negligible were asparagus and peppers. These 8 vegetables accounted for 60 percent of Japan's global import value for fresh vegetables in that period.

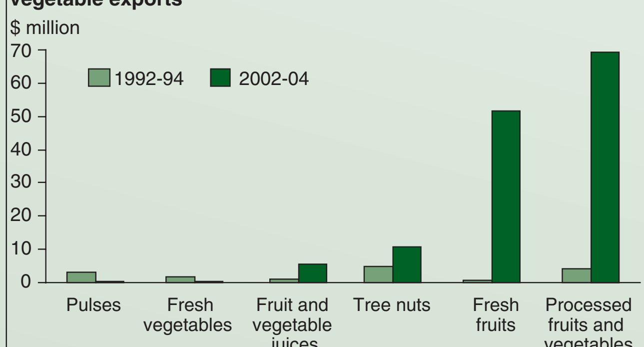
Source: USDA, Economic Research Service calculations based on data from USDA, Foreign Agricultural Service, Global Agricultural Trade System.

China emerges as a market for U.S. exports of fruits and vegetables

Driven by demand from the growing population of upper income consumers in urban centers, China expanded its global import value of fruits and vegetables (including fresh fruit, fresh vegetables, processed fruits and vegetables, fruit and vegetable juices, pulses, and tree nuts) more than ninefold since the early 1990s to reach $910.2 million in 2002-04. China's imports of U.S. fruits and vegetables increased almost without interruption from $15.7 million in 1992-94 to $137.7 million in 2002-04, despite existing trade barriers. While China's fruit and vegetable imports still remain small, China now ranks among the top 15 largest importers of U.S. fruits and vegetables.

Among all categories of these imports, fresh fruits and processed fruits and vegetables grew the fastest—to the benefit of U.S. exporters. The U.S. share of China's fresh fruit import market grew from less than 4 percent to nearly 15 percent, in part because of China's growing upper income class and relaxation of trade barriers. Grapes, oranges, and apples accounted for the bulk of shipments. China's imports of U.S. processed fruits and vegetables also increased substantially, reflecting rapid Westernization in the Chinese diet. Processed potatoes (mainly french fries) and sweet corn accounted for 83 percent of China's imports of U.S. processed fruits and vegetables in 2002-04.

China becomes an important market for U.S. fruit and vegetable exports



Source: USDA, Economic Research Service calculations based on data from USDA, Foreign Agricultural Service, Global Agricultural Trade System.

This article is drawn from . . .

China's Rising Fruit and Vegetable Exports Challenge U.S. Industries, by Sophia Huang and Fred Gale, FTS-320-01, USDA, Economic Research Service, February 2006, available at: www.ers.usda.gov/publications/fts/feb06/fts32001/

Global Trade Patterns in Fruits and Vegetables, edited by Sophia Wu Haung, WRS-04-06, USDA, Economic Research Service, June 2004, available at: www.ers.usda.gov/publications/wrs0406/

STATISTICS

Data may have been updated since publication. For the most current information, see www.ers.usda.gov/publications/agoutlook/aotables/.

Farm, Rural, and Natural Resource Indicators

	2000	2001	2002	2003	2004	2005	Annual percent change 2002-03	2003-04	2004-05
Cash receipts ($ billion)	192.1	200.1	195.0	216.6	241.2	239.0 f	11.1	11.4	-0.9
Crops	92.5	93.3	101.0	111.0	117.8	114.1 f	9.9	6.1	-3.1
Livestock	99.6	106.7	94.0	105.6	123.5	124.9 f	12.3	17.0	1.1
Direct government payments ($ billion)	22.9	20.7	11.2	17.2	13.3	23.0 f	53.6	-22.7	72.9
Gross cash income ($ billion)	228.7	235.6	221.0	249.5	271.7	279.5 f	12.9	8.9	2.9
Net cash income ($ billion)	56.7	60.1	49.5	71.6	85.5	82.8 f	44.6	19.4	-3.2
Net value added ($ billion)	91.9	95.0	78.6	101.2	125.9	119.3 f	28.8	24.4	-5.2
Farm equity ($ billion)	1,025.6	1,070.2	1,110.7	1,180.8	1,293.9	1,376.9 f	6.3	9.6	6.4
Farm debt-asset ratio	14.8	14.8	14.8	14.4	13.8	13.4 f	-2.7	-4.2	-2.9
Farm household income ($/farm household)	61,947	64,117	65,761	68,597	81,480 p	83,461 f	4.3	18.8	2.4
Farm household income relative to average U.S. household income (%)	108.6	110.2	113.7	116.1	134.6 p	na	2.1	15.9	na
Nonmetro-metro difference in poverty rate (% points)	2.6	3.1	2.6	2.1	na	na	-19.2	na	na
Cropland harvested (million acres)	314	311	307	315	312	312 p	2.6	-1.0	0.0
USDA conservation program expenditures ($ bil.)[1]	3.3	3.7	4.2	4.3	5.1	na	2.4	18.6	na

Food and Fiber Sector Indicators

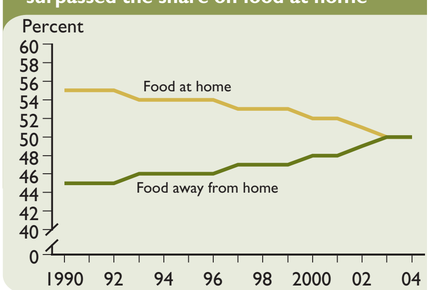
	2000	2001	2002	2003	2004	2005	2002-03	2003-04	2004-05
U.S. gross domestic product ($ billion)[2]	9,817	10,128	10,470	10,971	11,734	na	4.8	7.0	na
Food and fiber share (%)	5.8	5.8	5.7	5.8	6.0	na	2.2	3.3	na
Farm sector share (%)	0.7	0.7	0.7	0.8	1.0	na	14.3	19.2	na
Total agricultural imports ($ billion)[1]	38.9	39.0	41.0	45.7	52.7	57.7	11.5	15.3	9.5
Total agricultural exports ($ billion)[1]	50.7	52.7	53.3	56.2	62.4	62.4	5.4	11.0	0.0
Export share of the volume of U.S. agricultural production (%)	17.6	17.6	16.7	17.9	16.3	na	7.2	-8.9	na
CPI for food (1982-84=100)	167.9	173.1	176.2	180.0	186.2	190.7	2.2	3.4	2.4
Share of U.S. disposable income spent on food (%)	9.8	9.8	9.5	9.4	9.5	na	-1.1	1.1	na
Share of total food expenditures for at-home consumption (%)	51.7	51.7	50.8	50.3	49.7	na	-1.0	-1.2	na
Farm-to-retail price spread (1982-84=100)	210.3	215.4	221.2	225.6	232.9	na	2.0	3.2	na
Total USDA food and nutrition assistance spending ($ billion)[1]	32.6	34.2	38.0	41.8	46.2	50.9	10.0	10.5	10.2

f = Forecast. p = Preliminary. na = Not available.

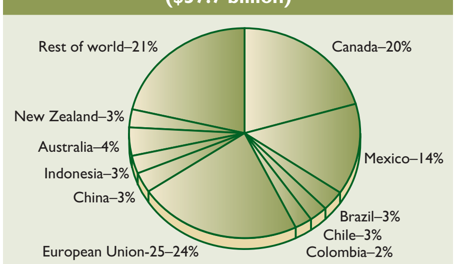
[1] Based on October-September fiscal years ending with year indicated.

[2] GDP data released July 29, 2005, and agricultural output data released December 15, 2005, by U.S. Department of Commerce, Bureau of Economic Analysis.

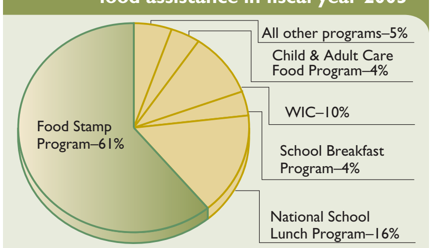
In 2004, the share of U.S. food expenditures on food away from home surpassed the share on food at home



Top 10 sources of U.S. agricultural imports, fiscal year 2005 ($57.7 billion)



Food stamps accounted for 61 percent of total USDA expenditures for domestic food assistance in fiscal year 2005

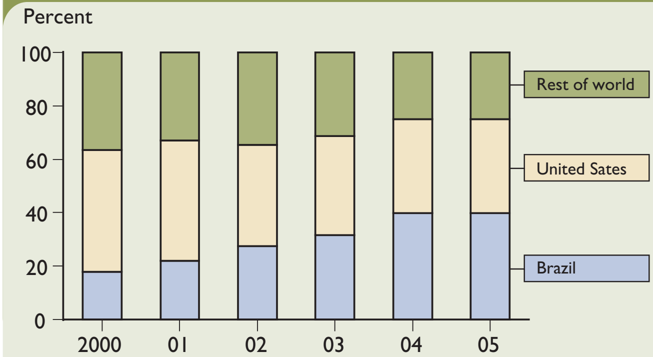


Note: Expenditures for domestic food assistance totaled $50.9 billion in fiscal 2005.

For more information, see www.ers.usda.gov/amberwaves/

Markets and Trade

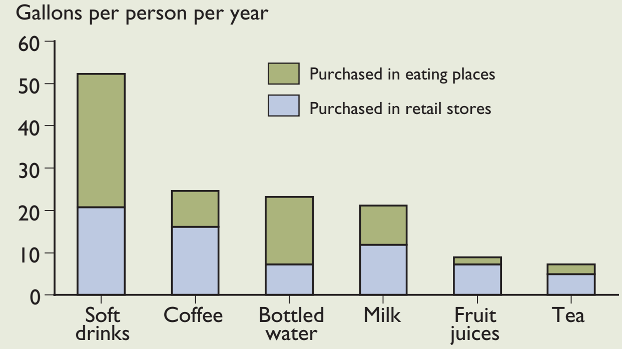
Brazil's share of world broiler exports rises dramatically



Source: USDA, *Agricultural Baseline Projections to 2015*, www.ers.usda.gov/publications/oce061/.

Diet and Health

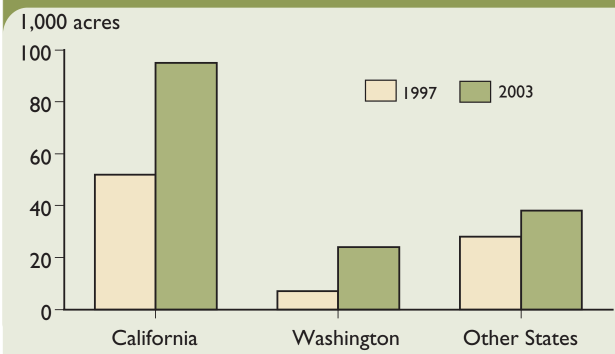
In 2004, more soft drinks and bottled water were purchased in eating places than in retail stores



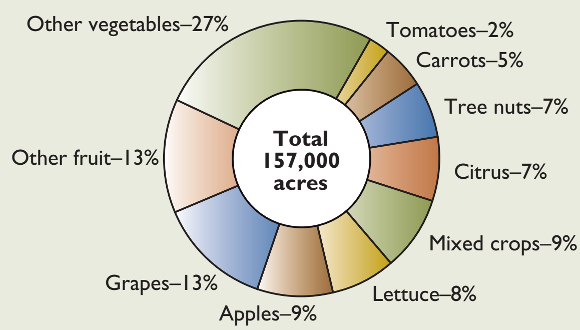
Source: Calculated by USDA, Economic Research Service using ACNielsen Homescan data and ERS data.

Farms, Firms, and Households

California and Washington are top States in certified organic fruits and vegetables



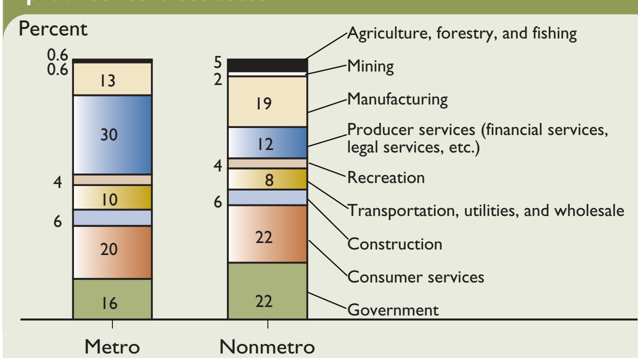
U.S. certified organic fruit and vegetable acreage, 2003



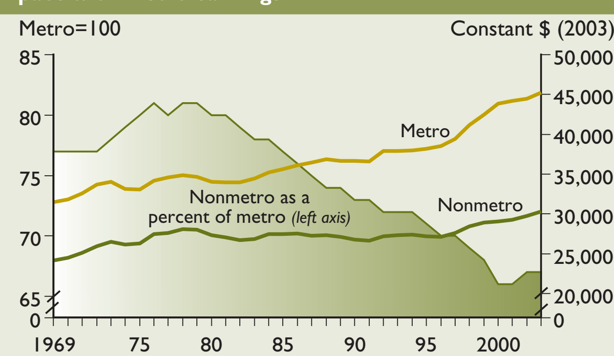
Source: USDA, Economic Research Service calculations based on information from USDA-accredited organic certification agencies.

Rural America

Nometro areas have a low share in the rapidly growing producer services sector



Nometro earnings per job have risen, but not in pace with metro earnings



Source: USDA, Economic Research Service, based on Regional Economic Information System data from the U.S. Department of Commerce, Bureau of Economic Analysis.

On The Map

Most farms with highly erodible cropland receive Federal farm program payments

Conservation compliance effectiveness depends on where the money goes

USDA's Conservation Compliance Program was designed to ensure that Federal farm programs did not encourage crop production on highly erodible land (HEL) in the absence of measures to protect against soil erosion. Under this program, farmers who grow crops on HEL must apply an approved soil conservation system or risk losing eligibility for Federal income support, conservation, and other payments.

The effectiveness of conservation compliance in enhancing soil conservation depends, in part, on the extent to which farms that crop HEL also receive Federal farm program payments. Overall, 86 percent of all cropland and about 83 percent of highly erodible cropland is located on farms that receive farm program payments.

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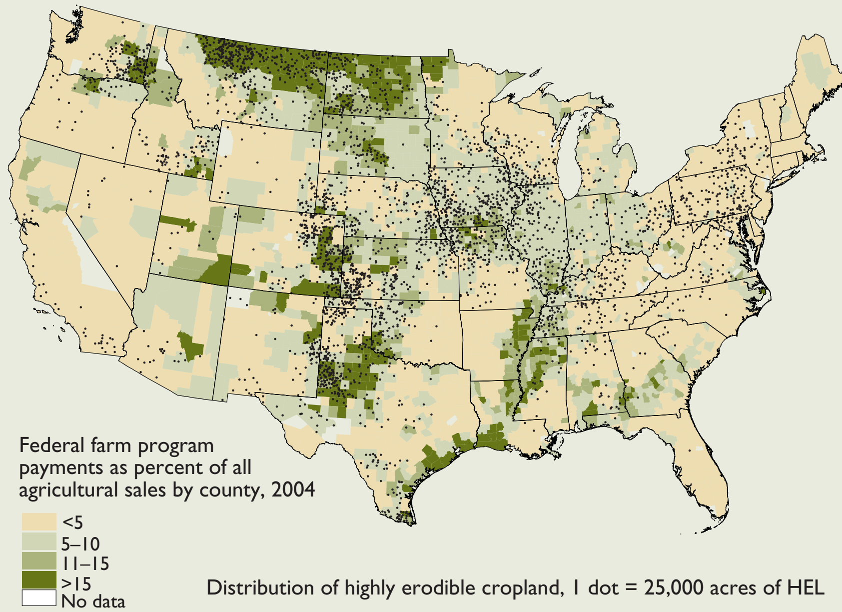

Source: USDA, Economic Research Service using data from USDA, Natural Resources Conservation Service's National Resources Inventory, the Commodity Credit Corporation, and the Census of Agriculture.

In the Long Run

USDA expenditures on major agricultural conservation programs, 1935-2005

USDA conservation spending on working agricultural lands bucks long-term trend

For over 70 years, USDA has provided financial assistance to help farmers implement conservation practices on working agricultural lands or on lands temporarily retired from production. Farmers have also received technical assistance for the purpose of helping to ensure that conservation plans are effectively designed and implemented.

As measured in constant (2002) dollars, Federal conservation assistance has fluctuated widely over the period. Peaks have typically been associated with large-scale land retirement in the Agricultural Conservation (1936-1943), Soil Bank (1956-1972), and Conservation Reserve (1986-present) Programs. Beginning in 2002, however, the major increase in conservation assistance was directed to programs that help farmers defray conservation costs on working agricultural lands.

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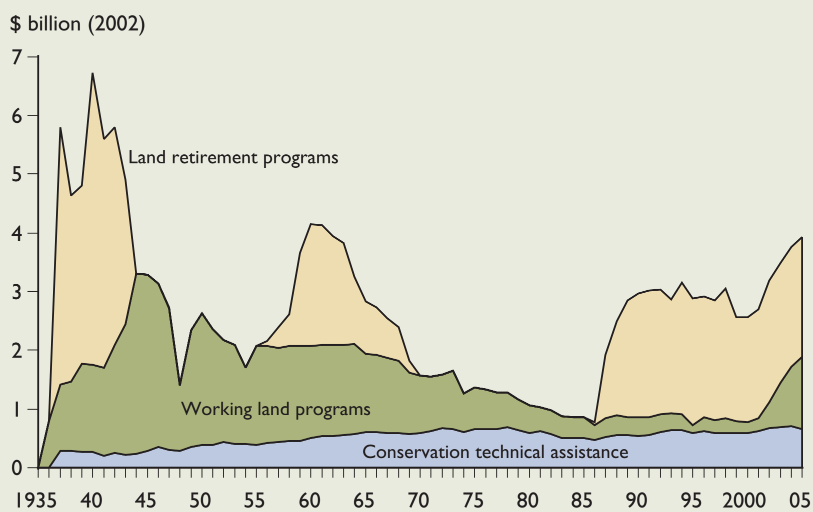
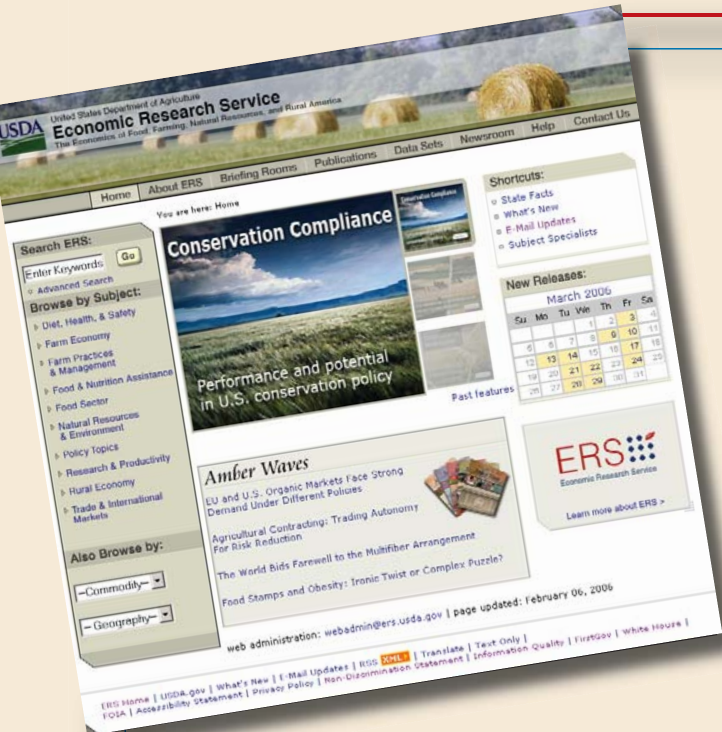


Source: Prepared by USDA, Economic Research Service using data from USDA's Office of Budget and Program Analysis and other sources of historical data.



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