Amber Waves

contents

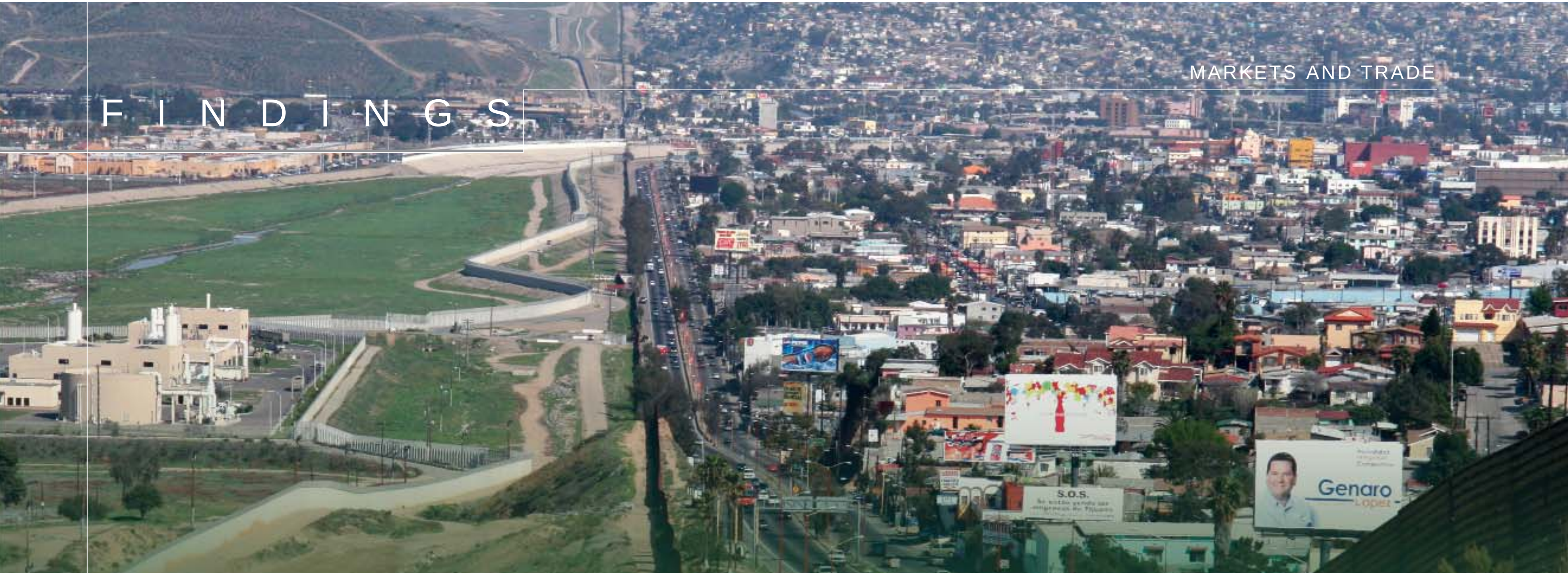
MARCH 2009 ● VOLUME 7 ● ISSUE 1

Economic Research Service/USDA

FEATURES

FINDINGS

STATISTICS



What's Next for NAFTA?

Department of Defense

Removal of the last transitional trade restrictions established by the North American Free Trade Agreement (NAFTA) presents a new challenge to the agreement's signatories—Canada, Mexico, and the United States. Because the architects of NAFTA deliberately avoided creating strong supranational institutions that could have deepened the economic relationship fostered by the agreement, the member countries will have to exercise their national autonomy, either individually or in concert, in order to take additional actions that advance regional economic integration. Actions that would build upon NAFTA are sometimes referred to as "NAFTA Plus."

One possible approach to NAFTA Plus, analyzed by ERS and Canadian researchers, is for the member countries to move in the direction of a customs union, a free-trade area with a common set of external tariffs. A customs union would eliminate the possibility that differences in external tariffs would distort decisionmaking by the private sector. However, reaching consensus on these tariffs may be difficult. Each member country has preferential trade agreements other than NAFTA, and there are some substantial differences in the most-favored-nation (MFN) tariffs applied by individual NAFTA countries. In conformance with the World Trade Organization, a country must apply its MFN tariffs to all trading partners that have MFN status with that country. Important exceptions to this rule include preferential trade agreements and special access for developing countries.

Common external tariffs would enable the NAFTA countries to eliminate the agreement's rules of origin. In a preferential trade agreement, rules of origin determine whether a product originated from the area covered by the agreement and thus qualifies for its preferential tariff, which in NAFTA's case is usually duty-free status. NAFTA's rules of origin are not a major impediment to regional agricultural trade since most of the goods traded are produced using inputs originating from the NAFTA countries. Nevertheless, compliance with these rules imposes an administrative cost on firms participating in NAFTA trade. Those firms must complete NAFTA Certificates of Origin and ensure that they seek preferential tariff treatment only for qualified products.

Some differences in the most favored nation tariffs of the NAFTA countries are quite large

Product	Canada	United States	Mexico
		Percent	
Chickens, uncut (fresh or chilled)	238.0*	3.5	234.0
Butter	298.5*	35.3*	20.0
Cheddar cheese	245.5*	24.0*	125.0
Durum wheat	0.4**	1.3	67.0
Barley	0.4**	0.4	115.0
Potatoes	1.0	1.8	245.0
Raspberries	Free	Less than 0.05	20.0
Raw sugar (cane or beet, solid form, not containing added flavoring or coloring)	9.3	91.5*	73.5
Strawberry jam	12.5	2.2	51.0
Peanuts (shelled)	Free	131.8*	Free

* = Over-quota tariff ** = In-quota tariff. Some tariffs were converted to ad valorem equivalents using unit import values and other trade data, as compiled by Global Trade Information Services, Inc.
Source: USDA, Economic Research Service, using 2008 data from Canada Border Services Agency, Mexico Secretariat of Economy, and U.S. International Trade Commission.

Since 2003, the NAFTA Working Group on Rules of Origin has crafted multiple incremental changes to the agreement's rules of origin that have been implemented by the NAFTA governments. A handful of these changes directly apply to agriculture. For instance, one provision allows the regional content of certain cranberry juice mixtures to be determined on the basis of transaction value or net cost, rather than volume. Whether these steps eventually lead to a North American customs union remains to be seen, however, since they do not involve the establishment of common external tariffs. W

Steven Zahniser, zahniser@ers.usda.gov
Karl Meilke, University of Guelph
James Rude, University of Alberta

This finding is drawn from . . .

"Is NAFTA Plus an Option in the North American Agrifood Sector?" by Karl D. Meilke, James Rude, and Steven Zahniser, in *The World Economy* 31(7):925-46, July 2008.

Colombia Becoming a New Ethanol Player

The U.S. and Brazil are the Western Hemisphere's leading ethanol producers. During the past few years, however, Colombia has emerged as the second largest ethanol producer in Latin America. Colombia's energy self-sufficient production process uses byproducts from ethanol processing such as bagasse, the product remaining after crushing and extracting the juice from the cane, and vinasse, the product generated after the distillation of fermented molasses.

Colombia began producing sugarcane-based ethanol in October 2005 and produced an average of 277,380 gallons per day in 2007, or less than 1.5 percent of Brazil's current daily production. Colombia's cane is grown in the Cauca Valley, located in the country's central southwest. The Cauca Valley has about 988,000 acres of crop area, of which 518,000 are sugar plantations, including 101,000 acres for ethanol production.

Colombian ethanol plants, like most in Brazil, use bagasse as a power source. With this feedstock, the ethanol plants not only generate all of the energy they need for producing ethanol, but also are able to sell surplus energy to the national electric grid. An equivalent of 1 percent of Colombia's annual electricity consumption, or 90 megawatts (MW), is produced from bagasse, of which 15 MW are sold to the national electricity network. The industry's potential, however, is 230 MW, or about 2.5 percent of Colombia's electricity consumption.

In addition, due to the vinasse treatment, the process used by Colombia's ethanol producers appears to benefit the environment. This process uses a technology imported from India and enables ethanol producers to comply with the environmental regulations set by Colombia's government. Vinasse can pose water or soil pollution hazards if not properly disposed of or further processed. The production process used in Colombia generates low volumes of vinasse rich in phosphorous, magnesium, and potassium, which can be further processed into fertilizer.

About 70 percent of all gasoline sold in Colombia is mixed with 10-percent ethanol, and cane-based ethanol production is expanding. Colombia has the potential to expand sugarcane production to approximately 3 million acres. By 2010, if all existing projects evolve as planned, Colombia will produce about 1 million gallons per day, up 218 percent from 2007. If the U.S. Congress approves the proposed U.S.-Colombia Trade Promotion Agreement, Colombia could permanently ship its ethanol surplus to the United States duty free and not be subject to any quota. Because the cane for future production will come from new crops and unused land, Colombia's agricultural exports and food security should not be affected by expanding ethanol output.

Encouraged by domestic success, Colombians are beginning to invest in ethanol production in Peru and Brazil. The Colombian government, private sector, and multilateral organizations, such as the Inter-American Development Bank, are developing Colombia's potential in order to expand the country's role in the Western Hemisphere biofuels industry. AW

José Toasa, jtoasa@ers.usda.gov

This finding is drawn from . . .

Colombia: A New Ethanol Producer on the Rise? by José Toasa, WRS-0901, USDA, Economic Research Service, January 2009, available at: www.ers.usda.gov/publications/wrs0901/

José Toasa, USDA/ERS

Consumers Willing To Pay a Premium for Organic Produce

Consumers are buying organic food despite its generally higher price tag. Retail sales of organic food increased from $3.6 billion in 1997 to $18.9 billion in 2007, accounting for over 3 percent of total U.S. food sales. According to the *Nutrition Business Journal*, organic food sales could reach an estimated $24 billion in 2010. Among the organic food categories, fruit and vegetable sales were the largest ($6.9 billion), almost 37 percent of organic sales in 2007.

ERS researchers estimated price premiums for 10 popular fresh organic fruit and vegetables. These price premiums reflect consumers' willingness to pay for attributes and additional production costs associated with organic foods, such as organic certification and the lack of pesticides during production.

Organic price premiums vary among fresh produce

	Price premium (%)	Organic share of sales (%)
Potatoes	62.2	0.8
Grapes	35.1	1.2
Strawberries	40.3	1.6
Onions	23.0	1.7
Peppers	36.7	1.8
Bananas	27.5	2.3
Oranges	22.0	2.3
Tomatoes	16.6	3.2
Apples	31.8	3.3
Carrots	17.2	11.1

Note: Organic produce are identified by the presence of the USDA organic seal or organic-claim codes created by Nielsen.

Source: Calculated by USDA, Economic Research Service using Nielsen Homescan Consumer Panel data, 2006.

Traditionally, organic premiums have been calculated using surveys that ask consumers how much more they would pay for organic foods over conventional foods. The ERS study, however, used actual consumer purchase data to estimate a pricing model that accounts for various product attributes, market factors, and consumer sociodemographics. Data were obtained from Nielsen, a market research firm that recruits a panel of households to record their food purchases from grocery stores and other retail outlets.

The research found that organic fresh fruit commanded a significant price premium, varying from 13 cents per pound for bananas in 2006 to 88 cents per pound for strawberries. The per pound premium for fresh vegetables ranged from 19 cents for onions and carrots to 54 cents for peppers. Organic price premiums converged in the range of 13-36 cents per pound for 7 of the 10 fresh produce items considered in the study. For fruit, the estimated organic premiums varied from 22

Shutterstock

percent for oranges to 40 percent for strawberries. For vegetables, organic premiums varied from about 17 percent for tomatoes and carrots to 62 percent for potatoes.

Premiums reflect both consumer demand and available organic supply. Increased demand or tight supplies drive up price premiums, which, in turn, can translate into lower sales relative to the nonorganic commodity, and this is true for some of the produce items examined. For example, potatoes commanded the highest organic price premiums and also accounted for a low share of total fresh potato sales (less than 1 percent). Similarly, carrots had one of the lowest organic premiums and a high organic share of the carrot market (11 percent). For other fruit and vegetables, such as onions and apples, this relationship is not as strong, inferring that many factors affect the magnitude of organic price premiums and market share. W

Travis A. Smith, tsmith@ers.usda.gov

Biing-Hwan Lin, blin@ers.usda.gov

This finding is drawn from . . .

"Organic Premiums of U.S. Fresh Produce," by Biing-Hwan Lin, Travis A. Smith, and Chung L. Huang, in *Renewable Agriculture and Food Systems*, 23(3): 208-216, 2008.

Higher Food Prices Can Take a Bite Out of SNAP Benefits

Rising prices can erode the purchasing power of benefits provided through government assistance programs. To help protect program participants from the effects of higher prices, many government benefits, including those from the Supplemental Nutrition Assistance Program (SNAP, formerly the Food Stamp Program), are adjusted annually for inflation. In periods of steeply rising food prices, however, the timing of annual adjustments may result in periods of the year when SNAP benefits are inadequate for purchasing the nutritious diet designed by USDA as the basis for benefits.

SNAP is designed to provide low-income families with increased purchasing power to obtain foods that make up a low-cost, nutritionally adequate diet. The maximum monthly SNAP benefit amounts are based on the cost of the Thrifty Food Plan—a market basket of foods which, if prepared at home, would provide a complete, nutritious diet at minimal cost. Households with no or minimal incomes receive the maximum benefit amount. Benefits are less for higher income eligible households, and these households are expected to spend some of their own money on food.

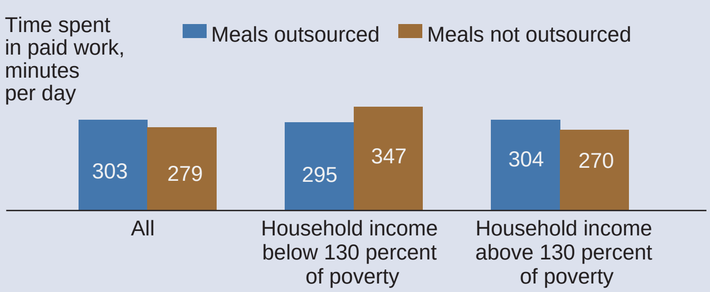
Working Parents Outsource Children's Meals

Ken Hammond, USDA

Virtually all households take the dollar cost of food into account when making food choices. But for some households, the time involved in planning, shopping for, and preparing a meal is also an important consideration. Findings from the Eating & Health Module of the American Time Use Survey (ATUS) indicate that many working parents free up time by "outsourcing" their children's meals—that is, they purchase prepared meals for their children at school or day care.

In 2007, principal meal preparers in households with individuals younger than age 19 were asked whether any of the children or youths ate a breakfast and/or lunch prepared at a school, a paid day care or Head Start center, or a summer day program in the week before the survey interview day. Having their children eat meals prepared at school or day care can save households time otherwise spent preparing and packing meals at home. Time savings may be valuable to households with principal meal preparers employed in paid work, especially the more hours they work. ATUS data indicate that employed meal preparers who took advantage of prepared meals at school or day care spent more time in paid work (303 minutes per day, or 5 hours) than those who did not (279 minutes, or 4.6 hours).

For most households with children and an employed principal meal preparer, more time at work corresponds with greater outsourcing of children's meals



Notes: Data include civilian population age 19 or over. 130 percent of poverty is the gross income limit to qualify for free school meals.
Source: Calculated by USDA, Economic Research Service using data from Bureau of Labor Statistics' 2007 ATUS and ERS 2007 Eating & Health Module.

This result held across most income levels, except for households at the lowest income level. Among households with incomes qualifying them for free meals, employed people who prepared meals and who did not obtain meals for their children from school or day care worked longer hours (347 minutes, or 5.8 hours) than those whose did obtain meals (295 minutes, or 4.9 hours). The reverse was true for higher income groups.

Why are low-income families who work more hours less likely to obtain school or day care meals for their children? One possibility is that the low-income households in the survey were more likely to have children ages 5 and younger. Preschoolers are the least likely to eat outsourced meals because participation in day care centers that provide meals is not as universal as school attendance. W

Joanne F. Guthrie, jguthrie@ers.usda.gov
Ket McClelland, ksdolan@ers.usda.gov

This finding is drawn from . . .

ERS Eating & Health Module of the American Time Use Survey (ATUS), available at: www.ers.usda.gov/data/atus/

SNAP benefits are adjusted annually in October (the beginning of the fiscal year), based on the 12-month food price change measured in June. SNAP benefits lag food price changes. If food prices increase, program participants may experience a shortfall in benefits even at the start of the new fiscal year: the benefit adjustment that takes effect on October 1 does not account for nearly 4 months of price changes (mid-June to the end of September). And, since the adjustment is made only once a year, nearly 16 months of food cost changes occur before the next benefit adjustment.

Prices for the Thrifty Food Plan basket rose 9.3 percent between October 2007 and September 2008. ERS researchers estimate that the shortfall in the caseload-weighted maximum benefit for the program grew from $7 per household in October 2006 to $19 in September 2007. And the shortfall grew from almost $8 in October 2007 to $38 by September 2008. In an average month, SNAP households faced shortfalls of $12 in FY 2007 and $22 in FY 2008, representing losses in food purchasing power of 4 percent and 7 percent, respectively, of the maximum household benefit.

Alternative adjustment methods can reduce the shortfall but will raise program costs. ERS estimates that adjusting benefits semiannually would have reduced the loss in food purchasing power for the maximum benefit by 20 percent in 2007 and 26 percent in 2008. Implementation of this alternative would have increased benefits by $330 million in 2007 and $789 million in 2008. W

Kenneth Hanson, khanson@ers.usda.gov
Margaret Andrews, mandrews@ers.usda.gov

This finding is drawn from. . .

Rising Food Prices Take a Bite Out of Food Stamp Benefits, by Kenneth Hanson and Margaret Andrews, EIB-41, USDA, Economic Research Service, December 2008, available at: www.ers.usda.gov/publications/eib41/

Shutterstock

F I N D I N G S

Agriculture and Water Quality Trading

Exploring the Possibilities

Sarah Minor, USDA/NRCS

Water quality trading is a market-based approach intended to reduce pollution at a lower cost than through traditional regulatory action. The Environmental Protection Agency and USDA are actively promoting water quality trading programs in watersheds impaired by pollutants, such as nutrients, produced by both regulated and unregulated sources, such as agriculture. Polluted runoff from agricultural fields is not regulated under the Clean Water Act, and greater use of trading might increase the number of farms willing and able to change their farming practices to reduce nutrient runoff.

Under a trading system, a regulated source of water pollution (such as a factory, wastewater treatment facility, or power plant) can pay an unregulated source, such as a farm operator, to reduce pollution rather than reducing its own discharges. These transactions usually involve the regulated firm purchasing pollution credits (or offsets) from an unregulated firm. Firms choose to participate when it is financially advantageous to do so (see "Creating Markets for Environmental Stewardship: Potential Benefits and Problems," *Amber Waves,* September 2008).

To succeed, a trading program must be located in a watershed where Federal regulations have placed caps on the amount of pollution from nutrients that can be legally discharged. In order for farmers to benefit by participating in a market, there also must be sufficient demand for agricultural offsets from regulated sources, as well as an adequate supply of low-cost agricultural offsets from farmers.

States have reported nitrogen-impaired waters in 710 watersheds that potentially could support the formation of a water quality trading market. In 68 percent of these watersheds, agriculture is estimated to be responsible for over 90 percent of the nitrogen loadings. As a result, the demand for nitrogen offsets by nonfarm regulated sources would likely be small. While a market might develop, only a small percentage of agriculture's nitrogen runoff would be eliminated through practices funded by water quality trading.

The demand for and supply of nitrogen offsets is more balanced in the 142 watersheds where agriculture's nitrogen contributions ranged from an estimated 50 to 90 percent. If a successful market develops within these watersheds, enough financial resources could flow to farmers to significantly reduce nitrogen runoff from agriculture. A water quality trading market is likely to attract farmers who can reduce nitrogen runoff relatively easily and inexpensively. Farmers who already practice good nutrient management, however, might not be able to reduce runoff further without substantially increasing costs.

ERS researchers found that, in these balanced watersheds, no more than 22 percent of cropland was under a nutrient management plan developed with assistance from USDA, and most had less than 5 percent. In most of these watersheds, therefore, agriculture is likely to be a relatively cheap source of nitrogen offsets.

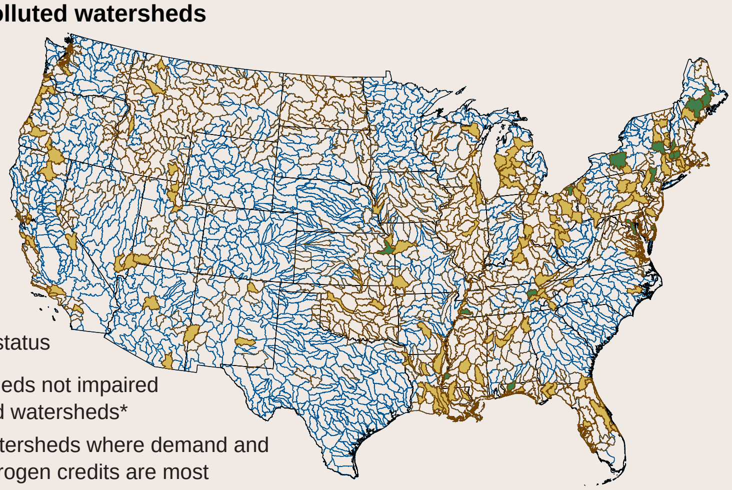
While not a panacea, water quality trading can effectively involve agriculture in efforts to abate nutrient pollution in a number of areas. Where such trading programs are successful, USDA's conservation programs—which also provide incentives to farmers to reduce nutrient runoff—would be able to address other environmental issues.

Marc Ribaudo, mribaudo@ers.usda.gov

This finding is drawn from . . .

The Use of Markets To Increase Private Investment in Environmental Stewardship, by Marc Ribaudo, LeRoy Hansen, Daniel Hellerstein, and Catherine Greene, ERR-64, USDA, Economic Research Service, September 2008, available at: www.ers.usda.gov/publications/err64/

Nitrogen credit trading opportunities are most likely in 142 of 710 nutrient-polluted watersheds



Watershed status

- Watersheds not impaired
- Impaired watersheds*

Impaired watersheds where demand and supply of nitrogen credits are most likely to be in balance (142 watersheds):

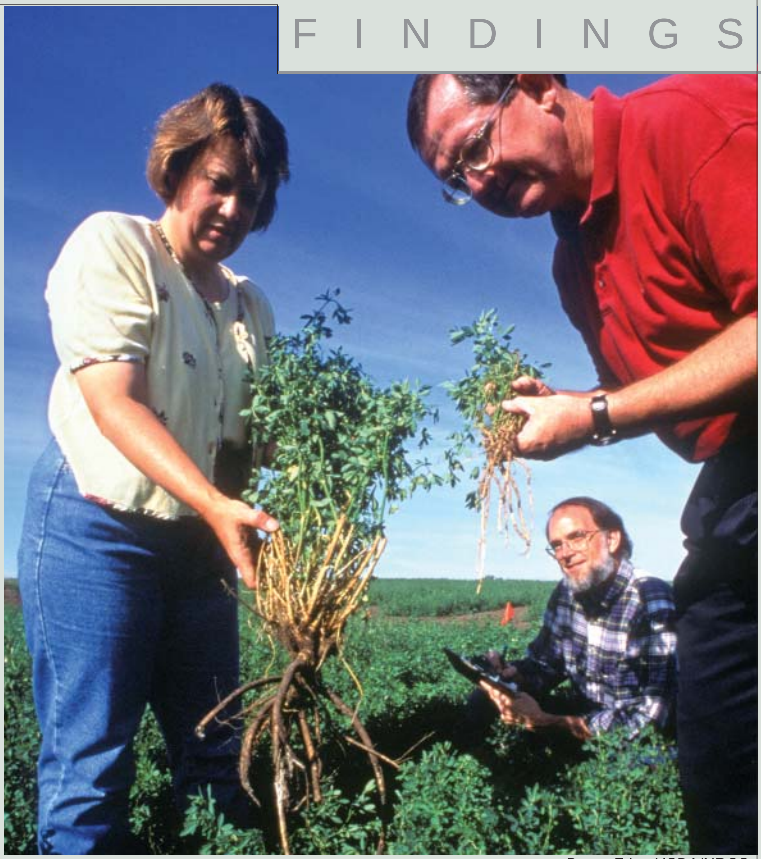
- Greatest availability of low-cost credits (<5% of cropland acres under a Nutrient Management Plan (NMP)).
- Somewhat lower availability of low-cost credits (5-25% of cropland acres under a NMP).

Note: None of these 142 watersheds have >25% of cropland acres under a NMP.
*Impaired watersheds cannot support designated uses because of pollutants, such as nutrients, produced by both agriculture and regulated sources.
Source: USDA, Economic Research Service analysis of Environmental Protection Agency, U.S. Geological Survey, and USDA, Natural Resources Conservation Service data.

The Evolving Public Agricultural Research Portfolio

The Federal-State partnership that constitutes public research and development (R&D) contributes to agricultural productivity through the introduction of new technologies that improve efficiency or enhance the quality of products. Over the past few decades, advances in the biological sciences, as well as legislation that strengthened intellectual property protection, have provided new tools for agricultural research and enhanced private incentives for technology development. The growth in private R&D spending (which surpassed public spending in the early 1980s) has freed publicly funded agricultural research to focus on basic research and topics with broad public benefits—topics not pursued by private companies focused on developing commercial products.

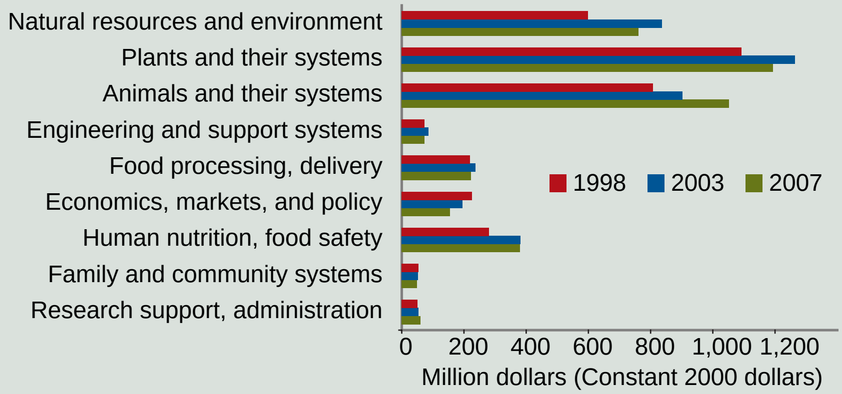
At the same time, the sources of funding for public agricultural research have been changing (see "Sources of Public Agricultural R&D Changing," *Amber Waves,* June 2007), as have the programs that channel funds to the agricultural research community. One result of all these developments has been a gradual shift in the emphasis of public agricultural research over the years.



Bruce Fritz, USDA/NRCS

Within the last decade, funding for public agricultural research, conducted by scientists at USDA's Agricultural Research Service, State Agricultural Experiment Stations, and related research institutions, has increased in real (inflation-adjusted) terms by slightly over 10 percent. Research spending on both plants and animals—which together accounted for 57 percent of total public research spending in 2007—increased faster than average. Animal research jumped 30 percent between 1998 and 2007, reflecting increased research on animal diseases, animal physiological processes, and animal genomes. The largest dollar increase in animal-related research was for animal diseases, partially in response to threats such as bovine spongiform encephalopathy (BSE), foot-and-mouth disease, and avian influenza. The largest percentage amount was for animal genomics, an area in which the public sector has played a prominent leadership role.

Research spending on animals and the environment increased the most from 1998 to 2007



Source: USDA, Economic Research Service research deflator; USDA, Cooperative State Research, Education, and Extension Service, Current Research Information System.

Funding also increased substantially for natural resources and the environment, which accounts for roughly 20 percent of the public agricultural research pie. This broad research area includes soil and water conservation and management, forest and range management, pollution, weather, and impacts of production on biological diversity. Research on these issues often has particularly strong public benefits that accrue over the long term. As a result, private firms have little incentive to pursue these topics.

The other agricultural research areas receive far less support. Only research programs on human nutrition and food safety showed pronounced growth, with spending (in constant dollars) growing 35 percent between 1998 and 2007. Like environmental research, research on human nutrition and food safety has substantial public benefits. Funding for the other smaller research areas has remained relatively stable over the past 10 years. W

David Schimmelpfennig, des@ers.usda.gov

Paul Heisey, pheisey@ers.usda.gov

This finding is drawn from . . .

ERS Briefing Room on Agricultural Research and Productivity, available at: www.ers.usda.gov/briefing/agresearch/

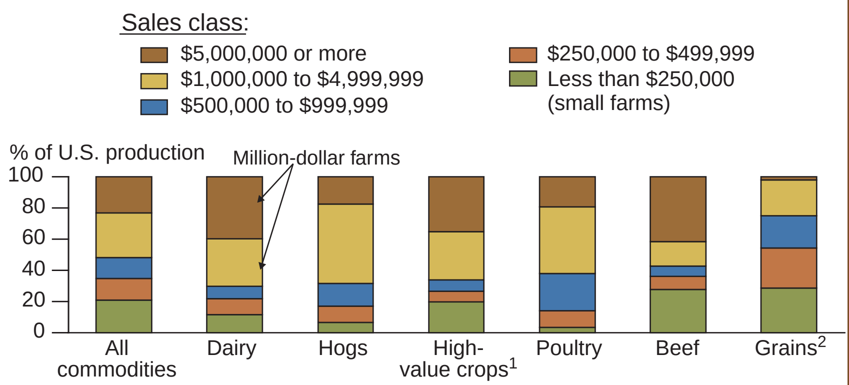
Million-Dollar Farms Dominate Production of Some Commodities

In 2007, 37,300 farms—2 percent of U.S. farming operations—accounted for half of U.S. agricultural production, according to the Agricultural Resource Management Survey. These farms were million dollar farms—that is, they had sales of $1 million or more. Operating profit margins are high for million-dollar farms, giving them a competitive advantage (see chart, "Operating profit margins for farms increase with sales," on page 43).

Jeff Vanuga, USDA/NRCS

Million-dollar farms accounted for roughly 60 to 70 percent of the production of five major commodities: dairy products, hogs, high-value crops, poultry, and beef. The largest million-dollar farms, those with sales of at least $5 million, accounted for 42 percent of beef cattle production, 40 percent of milk production, and 35 percent of high-value crop production.

Million-dollar farms accounted for large shares of dairy, hogs, high-value crops, poultry, and beef in 2007



Note: Sales are calculated as the farm's crop and livestock sales plus the shares of production received by any share landlords and production contractors. They are measured before taxes and production expenses and do not equal net income. The measure also includes any government payments received by the farm and its landlords.

[1]Vegetables, fruit and tree nuts, and nursery and greenhouse products.

[2]Barley, corn, rice, grain sorghum, soybeans, wheat, and oats.

Source: USDA, Economic Research Service, 2007 Agricultural Resource Management Survey.

Certain characteristics of high-value crops make their production more routine, or standardized, which encourages large-scale farming. High-value crops are often irrigated, which reduces the variability in production conditions. They are more labor intensive than other crops, but the labor is applied in a relatively small area—compared with large farms specializing in grains, for example—making it easier to supervise and manage. In areas like California, several plantings and harvests of vegetables may occur in a year, which means labor is used more continuously.

Beef cattle production has three basic phases, with million-dollar cattle farms specializing in the last phase. In the first phase, cow-calf operations produce and sell calves. In the second phase, stocker operations buy the calves and pasture them to gain weight. Finally, fed-cattle operations take yearlings from stocker operations, place them in feedlots until they reach slaughter weight, and ship them to packers. Cow-calf enterprises are typically found on small farms. Million-dollar beef farms—especially those with sales of at least $5 million—are much more likely to be fed-cattle operations.

Several technological advances helped make livestock production (dairy, hogs, poultry, and fed cattle) more routine, making it easier for farms to operate on a large scale. Milk and livestock production moved from an open environment to climate-controlled buildings, making production less dependent on the weather. Other technologies—disease control, transportation, and nutrition—have increased the number of production cycles per year.

Million-dollar farms accounted for 25 percent of U.S. grain production in 2007—a relatively small amount compared with million-dollar farms' share of U.S. high-value crop and livestock production. Grain growers have only one production cycle per year and highly seasonal labor requirements, which hinder large-scale production. Million-dollar grain farms made up 2 percent of all U.S. grain farms in 2007, compared with 9 percent of dairy farms and 17 percent of poultry farms.

Robert A. Hoppe, rhoppe@ers.usda.gov

This finding is drawn from . . .

Million-Dollar Farms in the New Century, by Robert A. Hoppe, Penni Korb, and David E. Banker, EIB-42, USDA, Economic Research Service, December 2008, available at: www.ers.usda.gov/publications/eib42/

Federal Funding in Rural America Goes Far Beyond Agriculture

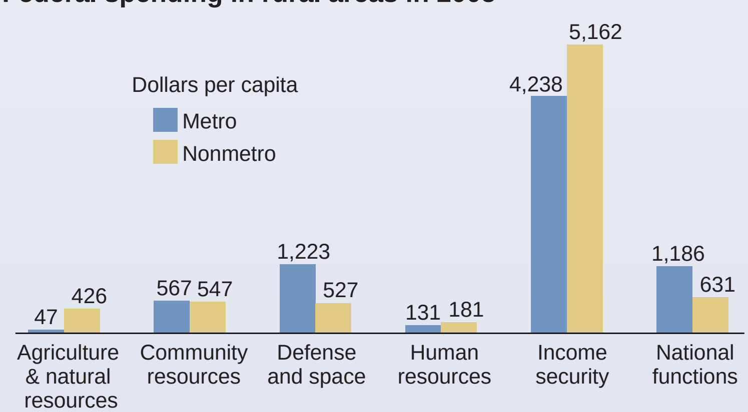
Wayne Eastep, Photographer's Choice

For the first time in the nearly 40 years that ERS has been analyzing the geographic distribution of Federal spending, rural areas received more in total per capita Federal funding ($7,473) in fiscal year (FY) 2005 than urban areas ($7,391). This reversal is likely due to changes in the housing market, as many home buyers—particularly in urban areas—opted to use more flexible and risky private-sector mortgages instead of federally insured mortgages in 2005. Between 2004 and 2005, community resource programs, including housing, infrastructure, and business assistance, declined 34 percent in urban areas but only 3 percent in rural areas. Recently, many urban home buyers began using federally backed mortgages again, suggesting that the rural funding advantage may be short lived.

Federal spending in rural communities can have a significant impact on rural economies. However, the amount of spending may be less important as an indicator of its effect than its intended use. For example, while important to the recipients, spending on social services may have less impact on rural economies than an equal amount of spending on basic infrastructure because people are mobile while infrastructure is geographically fixed.

Rural areas received more per capita for human resources, including education, nutrition, training, and social and health services, than urban areas did. These patterns reflect greater percentage shares of elderly, poor, and less educated populations in rural areas.

Income security comprised nearly 70 percent of Federal spending in rural areas in 2005



Source: USDA, Economic Research Service, based on data from the Bureau of the Census, fiscal year 2005.

Rural areas also received more per capita in Federal agricultural and natural resource funds than urban areas did in FY 2005 (the most recent year for which accurate county-level data are available). Activities covered by this funding (agricultural payments, agricultural research and services, forest and land management, and water and recreational resources) tend to be land intensive, and rural communities encompass about 75 percent of the Nation's land area. But funds from agricultural and natural resource programs were dwarfed by those from income security programs in FY 2005. Income security, including Social Security, Medicare, and other Federal income support, comprised nearly 70 percent of Federal spending in rural areas, far surpassing its 57-percent share in urban areas. W

Rick Reeder, rreeder@ers.usda.gov

Faqir Bagi, fsbagi@ers.usda.gov

This finding is drawn from . . .

Rural America At A Glance, 2008 Edition, by Lorin Kusmin (ed.), EIB-40, USDA, Economic Research Service, October 2008, available at: www.ers.usda.gov/publications/eib40/

Federal Funds and Development Policy chapter of the ERS Briefing Room on Rural Development Strategies, tables 1-3, available at: www.ers.usda.gov/briefing/ruraldevelopment/federalfunds.htm

Growing Crops for Biofuels Has Spillover Effects

Scott Malcolm
smalcolm@ers.usda.gov

Marcel Aillery
maillery@ers.usda.gov

- Federal mandates for biofuel production promote expanded crop acreage and shifts in cropping patterns and livestock production due to higher prices for corn and other grain crops.
- An increase in the extent of agricultural land in production and intensity of input use increases the potential for environmental degradation.
- Research that improves crop productivity and conversion efficiency, as well as conservation practices like no-till and buffer strips, could lessen the environmental impacts of biofuels.

An interview with the authors is featured online at: www.ers.usda.gov/amberwaves/

Volatile petroleum prices, along with Federal policies aimed at reducing U.S. dependency on oil imports and mitigating climate change, have sparked rapid growth in biofuel demand. In response, production of agricultural commodities that serve as feedstock for biofuels has increased. Federal policy initiatives and private-sector investment point to continued growth in biofuel production and, consequently, increased demand for agricultural products.

The Energy Independence and Security Act (EISA) of 2007 includes provisions for a Renewable Fuel Standard (RFS) to increase the supply of alternative fuel sources by requiring fuel producers to use at least 36 billion gallons of biofuel by 2022. The RFS provision establishes a level of 15 billion gallons of conventional ethanol by 2015 and at least 21 billion gallons of cellulosic (noncornstarch) ethanol and advanced biofuels (including ethanol from sugarcane and biodiesel) by 2022.

The share of total domestic corn production supplying the ethanol market grew from 7.5 percent in 2001 to 22.6 percent in


Corbis

2007. The 2007 USDA Agricultural Baseline, which was produced before EISA became law (see box, "2007 USDA Baseline Provides Projections Through 2016"), assumed that production of corn-based ethanol will reach 12 billion gallons by 2016, or 3 billion gallons below the federally mandated target for that year. By 2016, ethanol production is expected to consume over 35 percent of U.S. corn production. To meet the EISA mandates, ethanol production from cellulosic feedstocks would have to grow from current pilot project levels to roughly 4.25 billion gallons in 2016 and 21 billion gallons in 2022.

ERS used a national agricultural sector model to estimate expected market and environmental outcomes of expanded feedstock production. The model compares the implications of producing 12 billion gallons of corn-based ethanol in 2016 (the 2007 USDA baseline estimate) with production of 15 billion gallons (as reflected in the RFS).

Growing demand for corn and other biomass feedstocks will transform the agricultural landscape as regional cropping patterns

2007 USDA Baseline Provides Projections Through 2016

The 2007 USDA baseline provides long-term projections for the agricultural sector through 2016. Projections cover agricultural commodities, agricultural trade, and aggregate indicators of the sector, such as farm income and food prices. The projections are based on specific assumptions regarding macroeconomic conditions, policy, weather, international developments, and yields. The projections assume that there are no shocks due to abnormal weather, outbreaks of plant or animal diseases, or other factors affecting global supply and demand. Government programs that influence agriculture are assumed to remain in effect through the projection period.

adjust and production practices adapt. While biofuels have been viewed as an environmentally preferred alternative to fossil-based fuels, there is growing concern about the potential effects of feedstock development on resource use and environmental quality. By increasing demand for agricultural feedstocks, the new RFS will encourage increased production of crops that may lead to conversion of land for use in crop production, and more intensive use of fertilizers and other inputs, increasing the potential for environmental degradation.

Changes Expected to the Agricultural Landscape

Higher demand for corn, for biofuel as well as for animal feed and human food, has increased corn production in traditional corn-growing regions and elsewhere. As farmers responded to higher corn prices, prices and production levels for other crops adjusted as well. Crop producers have generally benefited from higher returns to corn and other grain crops. Some livestock and poultry producers, however, are worse off. More corn going to biofuels, together with reduced production of soybeans, sorghum, and other feed crops, has contributed to a net increase in grain feed costs for livestock producers. The availability of distillers' grains, a byproduct of corn-based ethanol production that can be used as a feed supplement for some livestock, may lessen the impact on feed costs (see "Grain Prices Impact Entire Livestock Production Cycle," on page 24). These changing feed markets, according to ERS analysis, will prompt a slight decline in animal production.

Given the spillover effects of expanded corn acreage on agricultural markets and the environment, technologies are being developed to produce cellulosic ethanol from a wide range of feedstocks, including crop residues and new crops dedicated to energy production, such as switchgrass. Other potential feedstocks which would not compete for existing cropland—forestry byproducts, municipal solid waste, and even algae—are under development. Since these technologies are not yet commercially operational, corn is likely to remain the major feedstock through the next decade.

Cultivated cropland is expected to expand in all U.S. regions but one, as producers respond to higher crop prices. ERS research suggests that the largest increases in cultivated cropland will likely occur in the traditional corn-producing regions of the Corn Belt (1.6 million more acres in 2016), Northern Plains (1.5 million acres), Delta (540,000 acres), and Lake States (510,000 acres). These estimated changes are conditional on model assumptions regarding corn yield growth, energy costs, ethanol conversion rates, and other factors affecting ethanol productivity and returns.

Corn accounts for roughly three-fourths of the estimated increase in national acreage cultivated under the 2016 baseline case. Corn acres are expected to expand in all regions, with the Corn Belt and Northern Plains showing the largest gains due to comparative advantage in corn production. More farmers are expected to plant corn on a continuous basis, rather than rotating corn with soybeans or other crops. Some of the additional acreage planted to corn and other crops will likely come from land enrolled in USDA's Conservation Reserve Program (CRP).

Land Use and Management Changes Affect Environmental Quality

As more of the Nation's land is cultivated and as farmers adjust cropping patterns and production practices, the farm sector's impact on soil and water likely will change. The shift to corn, for example, has largely displaced soybeans and small-grain crops that are generally less input intensive. Higher commodity prices also may intensify use of both irrigation and chemical inputs that enhance crop yield. Much of the new acreage under cultivation may occur on marginal lands that are more highly erodible.

ERS model results indicate that meeting biofuel targets will raise total nitrogen fertilizer use by an estimated 2.0 percent over previous expectations for 2016.

Corn Belt and Northern Plains could show the largest increase in corn acreage

Region	2016 USDA baseline			2016 Federal mandate		
	Total cropland	Corn acres	Continuous corn acres[1]	Total cropland	Corn acres	Continuous corn acres[1]
	Million acres					
Appalachian	18.3	4.8	1.2	18.6	5.0	1.3
Corn Belt	101.0	44.6	8.8	102.6	45.9	9.4
Delta	15.9	0.7	0.3	16.4	0.8	0.3
Lake States	40.0	14.5	4.3	40.5	15.1	4.8
Mountain	20.8	1.2	1.2	20.3	1.3	1.3
Northern Plains	63.1	16.5	8.2	64.7	17.6	8.6
Northeast	15.1	3.9	2.0	15.2	4.1	2.0
Pacific	7.7	0.3	0	7.7	0.4	0
Southeast	7.5	2.3	1.1	7.6	2.4	1.1
Southern Plains	27.6	1.1	0.5	27.7	1.2	0.5
U.S.	317.0	90.0	27.6	321.4	93.7	29.3

[1]Acres of cropland planted to corn on a continuous basis, rather than rotating between corn and the planting of other crops, such as soybeans.
Source: USDA, Economic Research Service.

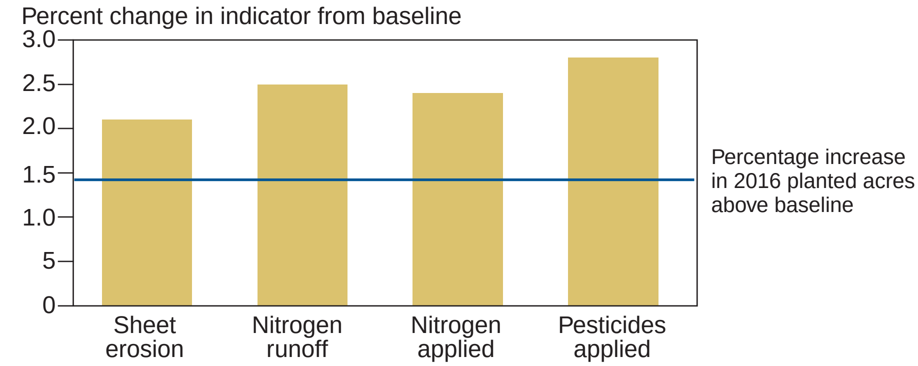
Eywire

Higher fertilizer use reflects increases in both cropland cultivated and intensity of applied fertilizer in corn production (see "Recent Volatility in U.S. Fertilizer Prices: Causes and Consequences," on page 28). Nitrogen use rises in all regions except the Delta, where additional soybean acres supplant more fertilizer-intensive crops. The Northern Plains show the largest increase in nitrogen use, reflecting expanded production of corn.

Increases in applied fertilizer may lead to water quality impairment due to nutrient leaching and runoff. Nitrogen and phosphorus runoff from farm fields is a significant source of water pollution throughout the United States. Applied nitrogen on corn fields in the Mississippi River Basin is a primary cause of the oxygen-depleted hypoxic zone in the Gulf of Mexico. The nature and extent of environmental damage from increased fertilizer use will vary depending on farm management practices, soil characteristics, topography, and proximity to water bodies.

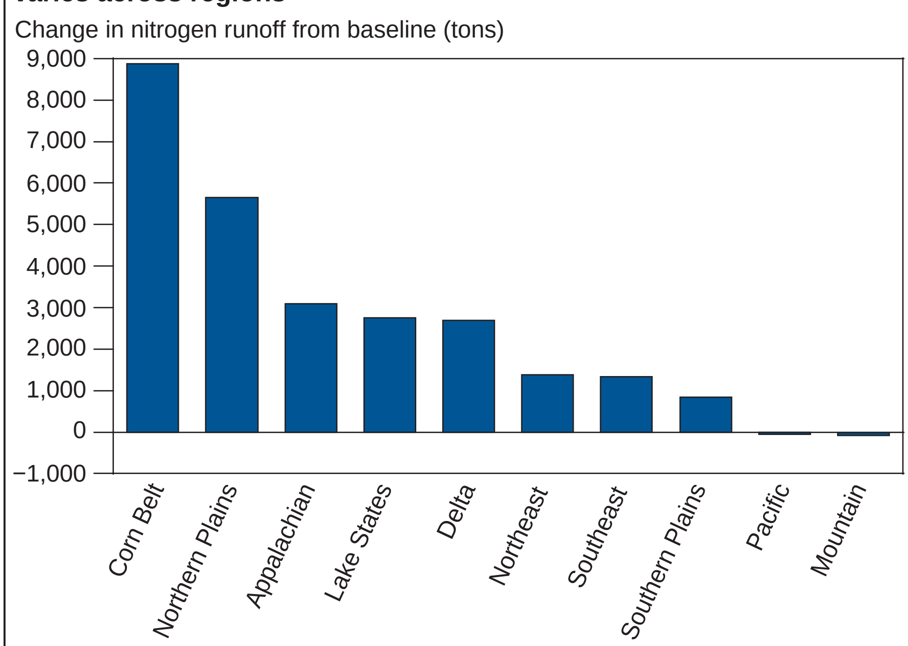
While the ERS model cannot predict changes in water quality due to expanded production of corn-based ethanol, results indicate an increase in the amount of nitrogen reaching water bodies under the higher biofuel target. Nitrogen runoff to surface-water bodies in the U.S. is estimated to increase roughly 26,500 tons by 2016, or 2.5 percent above estimated baseline levels. The projected increase in nitrogen runoff is more than proportional to the 1.5-percent increase in U.S. planted acreage, reflecting

Environmental indicators expected to increase beyond change in planted acreage

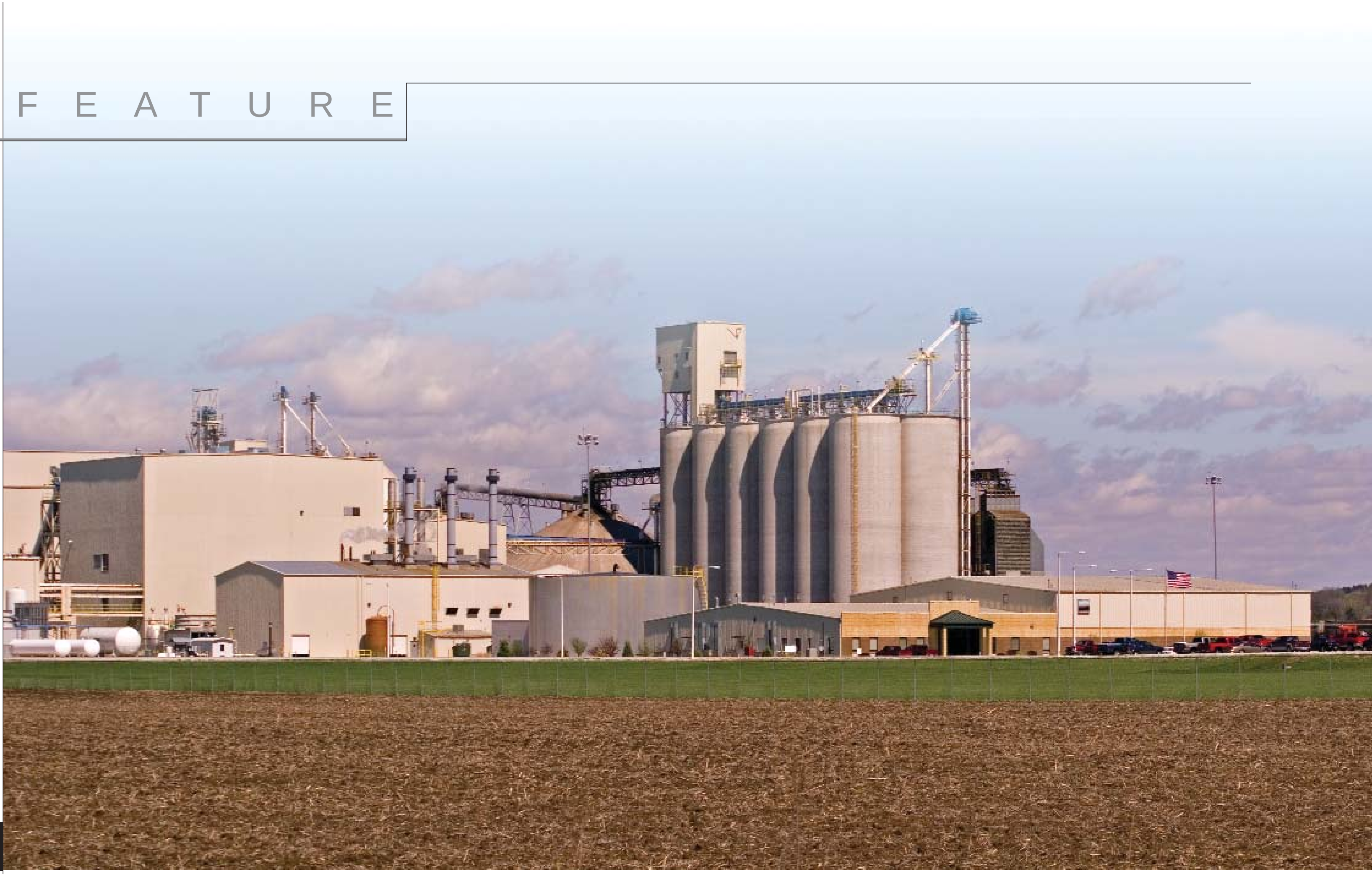


Source: USDA, Economic Research Service.

Nitrogen runoff response to higher biofuel target varies across regions



Source: USDA, Economic Research Service.



Shutterstock

the shift to corn acreage and additional cropland expansion on marginal land. The change in nitrogen loadings over current levels will likely vary considerably by region, following the pattern of expanded nitrogen use. The Corn Belt, which accounted for 44 percent of nitrogen deposited to surface water from field crop production in 2006, shows an increase in nitrogen runoff of less than 2 percent (8,500 tons) by 2016. In percentage terms, larger increases in nitrogen runoff occur in the Northern Plains, Delta, and Appalachian regions, reflecting expansion in acreage under cultivation.

Water quality is also affected by soil erosion on cultivated cropland. Nationwide, sheet (rainfall) erosion to surface water is expected to rise 2.1 percent by 2016 under the higher biofuel target, with higher increases likely in the Northern Plains, Lake States, and Delta. Wind erosion in the U.S. is primarily concentrated in the Northern Plains, with lesser amounts in the Corn Belt and Southern Plains. Increased erosion reflects increases in cultivated acreage, with potential expansion on marginal croplands. Model results suggest that broader use of soil-conserving tillage systems that minimize soil disturbance at planting time—particularly no-till and reduced-till systems in the Northern Plains and Northeast, and reduced-till in the Corn Belt—may help moderate the net increase in sheet and wind erosion from expanded corn acreage and continuous corn rotations.

Feedstock production for biofuels may involve additional environmental concerns. Greenhouse gas emissions from the U.S. crop sector could increase. Changes in tillage practices and conversion of land to crop production may reduce stored soil carbon. Increased use of nitrogen fertilizers can also increase nitrous oxide emissions (another greenhouse gas). The net effect of biofuels on greenhouse gas emissions is unclear: total emissions could be higher or lower than those associated with carbon-based fuels. A lifecycle analysis, accounting for direct and indirect links along the biofuel production chain, would be needed to fully assess the net effects of biofuels on greenhouse gas emissions.

Feedstock production may also increase demands on limited groundwater and surface-water resources. The net effect on agricultural water withdrawals is uncertain, however, and is likely to vary regionally and over time depending on the location of feedstock sources and local production conditions. The demand for corn ethanol would increase water use where corn feedstock production displaces crops that require less water, such as soybeans. Biofuel production could also increase water use due to expansion of irrigated cropland, both through reduced fallow acreage and conversion of nonirrigated crop and pastureland. However, significant expansion in groundwater and surface-water withdrawals may be limited by physical supply availability, legal constraints, and economic considerations.

Land conversion for crop production may also strain local wildlife resources. Converting lands from less intensive uses—including native grasslands, forestland, and cropland set aside for environmental purposes, as through USDA's CRP—could reduce wildlife habitat and degrade habitat for fish and other aquatic species through increased delivery of sediment, nutrients, and pesticides to water bodies.

Research and Policy Initiatives Can Help Mitigate Environmental Impacts

The demand for corn as a biofuel feedstock has put increasing pressure on land resources and the environment. Research underway to increase ethanol output per acre of corn could help reduce pressure on cropland to meet Federal biofuel mandates. Average U.S. corn yield per harvested acre, based on a projection of historic trends, increases by 1.8 bushels per year under the USDA baseline (170 bushels per acre by 2016). Growth in average yield depends on many factors, including availability of higher yielding varieties, the use of irrigation, and potential expansion in less productive areas. Higher corn yields, as well as new corn cultivars with higher starch content and improved crop-ethanol conversion efficiencies, could reduce the amount of land needed for corn feedstock production. These research-driven gains in productivity also suggest potential improvements in environmental indicators, through both reduced feedstock acreages to meet biofuel mandates and indirect commodity price effects that reduce competition for land.

Cellulosic feedstocks—such as switchgrass, Miscanthus, and poplar—that may be grown commercially on land not currently used for crop production could further relieve pressures on land for food and feed production. Cellulosic feedstocks provide potentially more ethanol per acre of feedstock. Moreover, reduced tillage and input requirements for perennial energy crops may lessen the potential environmental impact of meeting biofuel mandates, with regional effects depending on the allocation of emerging feedstocks. However, significant challenges involving feedstock production practices, transport infrastructure, ethanol conversion technologies, and market formation must be addressed before cellulosic feedstocks become commercially viable.

Crop residues, such as corn stover and wheat straw, may serve as an important source of cellulosic feedstock in meeting mandated targets for biofuel production. Crop residues are already widely available as biomass alternatives to corn feedstock, although significant markets and processing capacity do not currently exist. Moreover, crop residues could provide an additional revenue source for grain producers. Crop residues, however, play an important role in managing soil erosion, nutrient loss, soil carbon, and soil moisture. Thus, residues are not "free"—there is a cost to residue harvesting, and soil productivity and environmental quality may suffer. The amount of residue that can be harvested while maintaining productivity—based in part on the erodibility of the soil and tillage regime used—is an important policy concern and a focus of ongoing research. Research is also needed to determine the environmental effects of large-scale cultivation of dedicated energy crops.

Conservation programs can help mitigate environmental impacts from biofuel feedstock production. USDA's Environmental Quality Incentives Program provides cost sharing and technical assistance for adoption of conserving practices that improve environmental stewardship. Nutrient and soil management measures could offset potential increases in runoff and leaching under input-intensive corn production. The use of conservation tillage systems, such as no-till, may counteract potential increases in soil erosion. Use of corn stover as a biofuel feedstock would likely promote conservation tillage systems, although guidelines would be needed to ensure sustainable harvest of crop residues. The CRP, which removes environmentally sensitive cropland from production under long-term rental agreements, could also be part of a broader agricultural biofuel strategy. Riparian buffers installed under the CRP Continuous Signup Program may help reduce soil and nutrient runoff from cropland used in feedstock production. USDA conservation compliance provisions, which withhold Federal farm payments to producers converting highly erodible soils or wetlands, may limit corn feedstock production on environmentally sensitive lands. Grazing and haying on CRP land, under an approved conservation plan, can help livestock producers facing high feed costs due in part to biofuel demand. CRP lands could also potentially be used for perennial trees and grasses harvested as biofuel feedstock, if environmental benefits are preserved. Additional research would be needed to assess the potential environmental effects of dedicated energy crops on CRP lands. AW

This article is drawn from . . .

Increasing Feedstock Production for Biofuels: Economic Drivers, Environmental Implications and the Role of Research, by Biomass Research and Development Board, available at: www.brdisolutions.com/Site%20Docs/Increasing%20Feedstock_revised.pdf

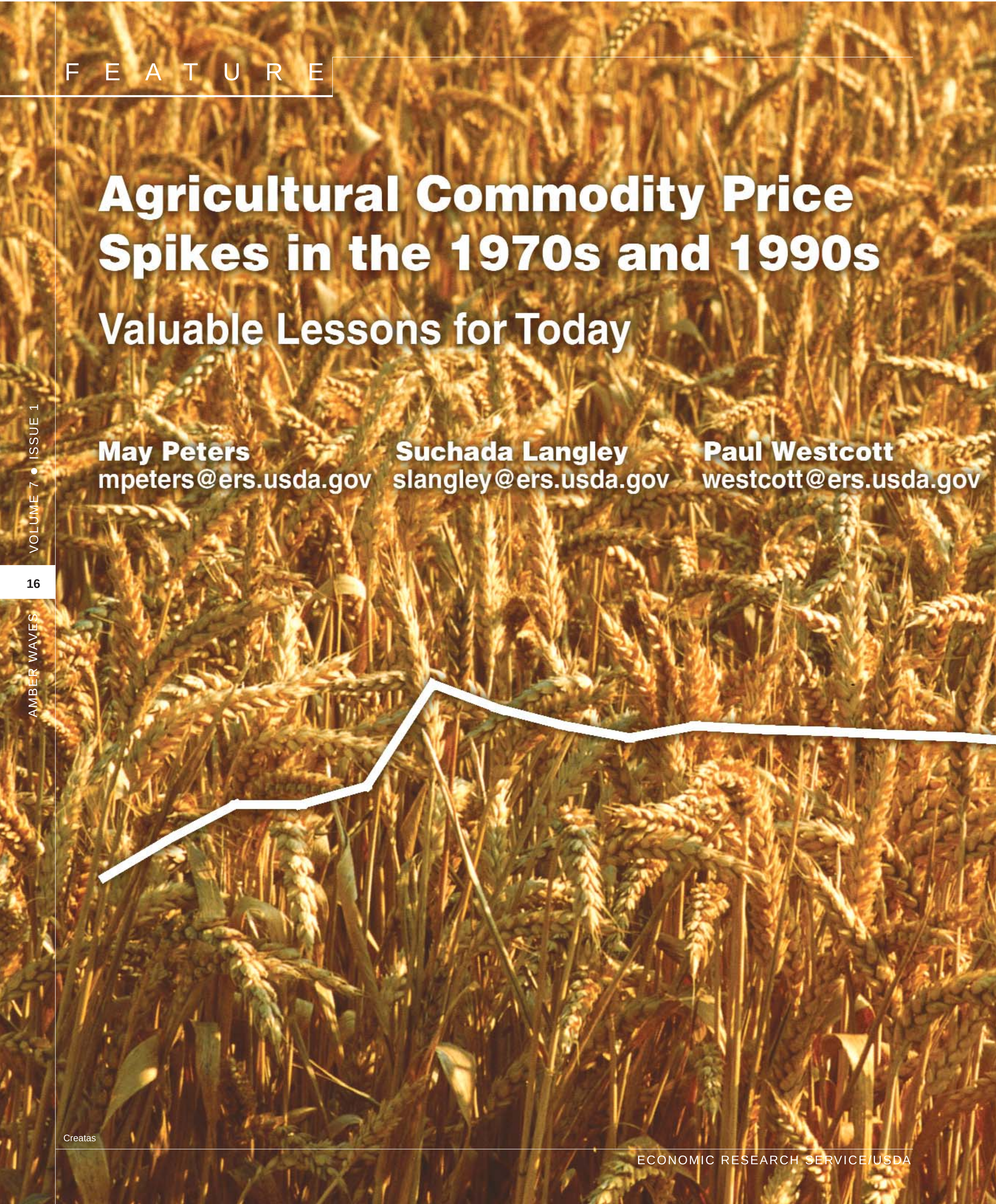
Agricultural Commodity Price Spikes in the 1970s and 1990s

Valuable Lessons for Today

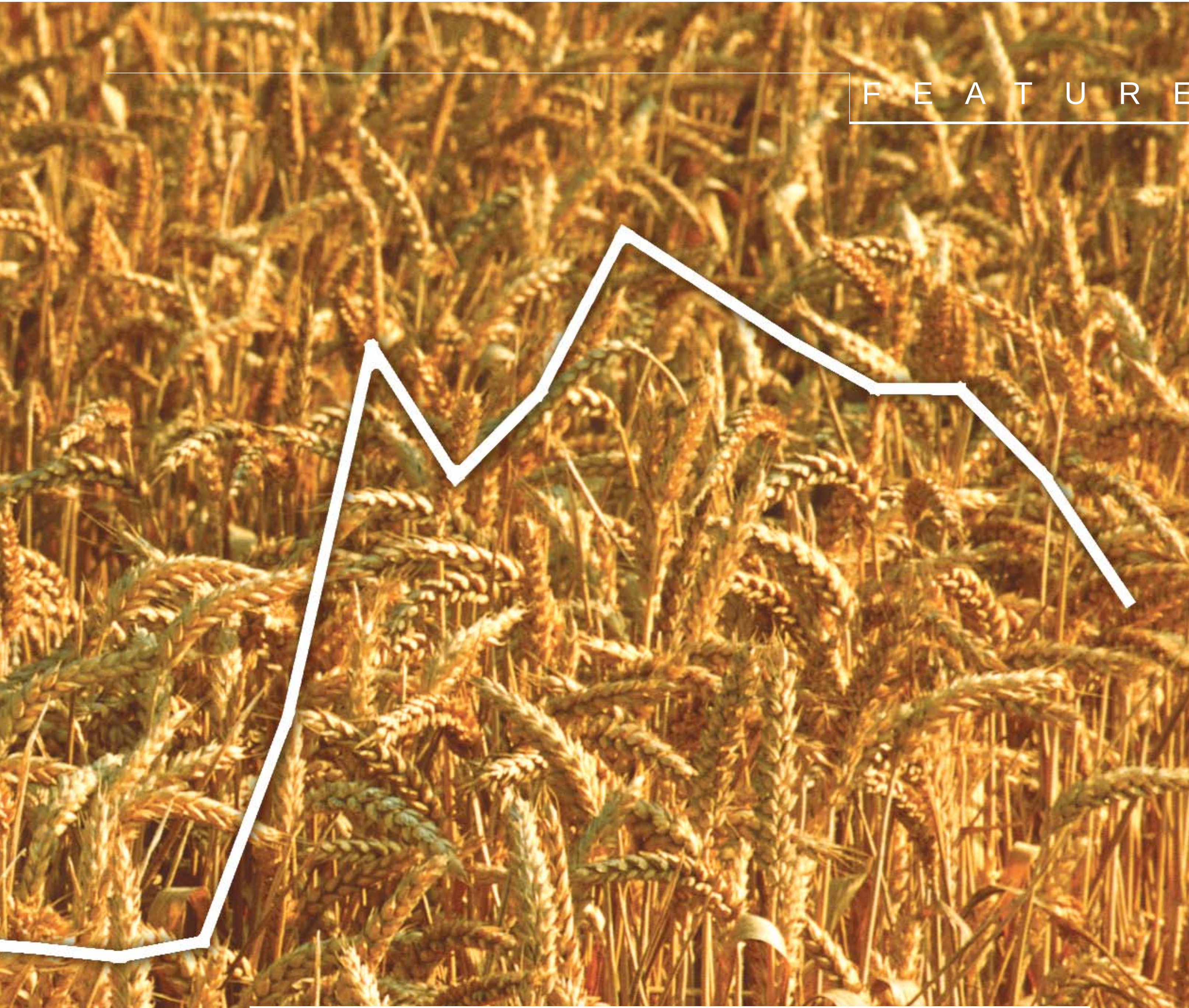
May Peters
mpeters@ers.usda.gov

Suchada Langley
slangley@ers.usda.gov

Paul Westcott
westcott@ers.usda.gov



Creatas



- The rapid increase in crop prices between 2006 and mid-2008, while unprecedented in magnitude, was not unique. Two other periods of major rapid runups in prices occurred in 1971-74 and 1994-96.
- Each price surge resulted from a combination of factors, including depreciation of the U.S. dollar, strong worldwide demand for agricultural products, supply shocks, and policy responses by major trading countries.
- In the past, market adjustments eventually brought prices back down. Similarly, the high prices seen in 2008 have dropped; however, these adjustments are occurring in a more volatile environment.

The rapid increase in crop prices from 2006 through the first half of 2008 caught the world's attention and raised concerns that permanent changes in the agricultural market environment were occurring. However, this recent dramatic rise in prices also has many features reminiscent of the past.

A number of factors combined to cause the 2006-08 runup in prices (see "Fluctuating Food Commodity Prices—A Complex Issue With No Easy Answers," *Amber Waves*, November 2008). These factors included burgeoning food demand in developing and transition economies, sharply higher energy prices that boosted production costs of agricultural products, increased demand for corn and oilseeds for bioenergy, the depreciating U.S. dollar, production shortfalls due to weather, and policy responses of both importing and exporting countries. Many of these same factors were observed in two past periods of rapid price increases, making it worthwhile to review those incidents and the lessons learned regarding the response of the agricultural sector and the role of market forces in bringing prices back down.

It remains uncertain how market participants will finally adjust this time around. Crop prices have already fallen from their 2008 peak. The ongoing global economic crisis that started in 2008 will likely soften domestic and global agricultural demand, but continued mandatory biofuels blending will likely keep prices from falling to levels as low as those of the late 1990s and early 2000s.

Looking Back at Historical Prices

Since the beginning of the 20th century, there have been several periods of dramatic crop price increases in the United States, including those experienced during the two World Wars. Two periods of rising agricultural prices are of particular interest, the early 1970s and the mid-1990s. Both periods saw record-breaking prices of at least two of three principal field crops—wheat, corn, and soybeans—and the price increases were sustained for two or more consecutive years. Each period was followed by declines in prices as the conditions that prompted the rapid increase in prices were reversed.

Wheat, corn, and soybean prices began rising rapidly in 1971. Prices peaked and reached record highs in 1974 and then declined, settling at a higher level than during the 1960s.

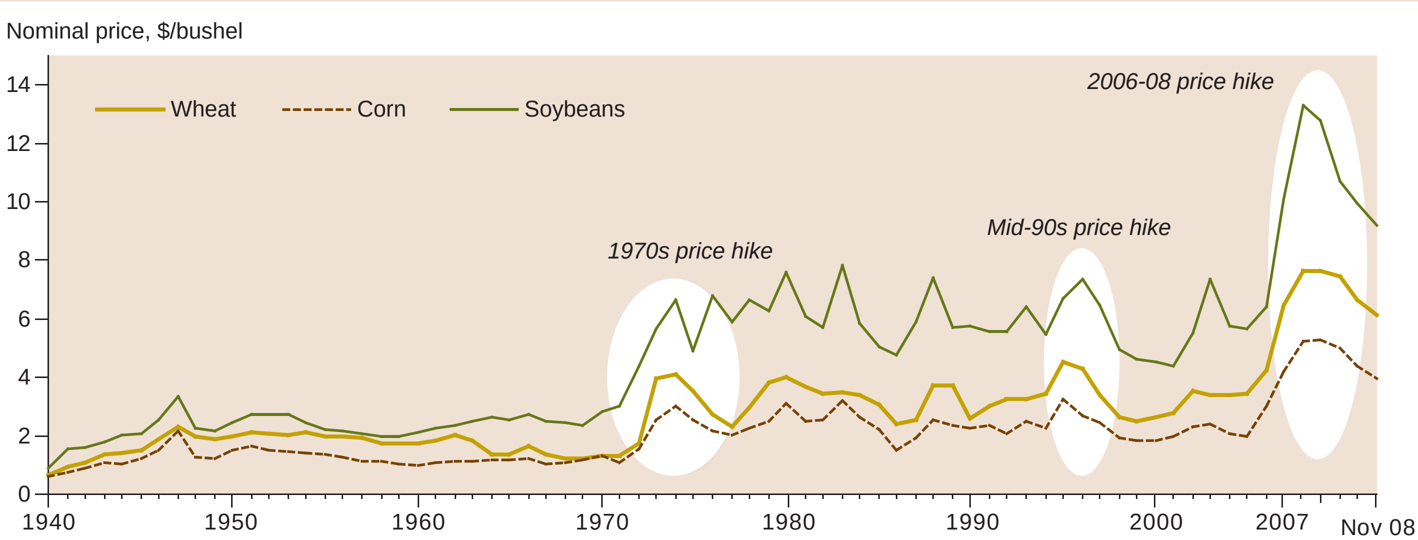
Prices for most crops again started to climb slowly in 1990 and escalated rapidly beginning in 1994, peaking in 1995 (corn and wheat) and 1996 (soybeans) before declining sharply. While the increases in this period were not as dramatic as those in the 1970s, corn and wheat prices reached record levels.

Rapid Increase in Demand for Grains, Oilseeds Boosts 1970s Crop Prices

A rapid increase in global demand for grains and oilseeds triggered the 1971-74 runup in prices. A series of events, including the Soviet Union's unexpected purchase of a large amount of grain in the global markets in the early 1970s, stimulated world demand. Many other centrally planned countries also decided to increase grain imports, causing world agricultural trade to rise dramatically. World exports of wheat increased nearly 29 percent between 1971 and 1972.

The entry of the Soviet Union and other centrally planned economies into global markets represented a significant change in grain and oilseed trade and

As in 2006-08, rapid increases in commodity prices occurred in 1971-74 and 1994-96



Sources: USDA, National Agricultural Statistics Service and World Agricultural Supply and Demand Estimates, 2008.

Changes in supply and demand conditions put pressure on agricultural crop prices

Contributing factor	1970s	1990s	2006-08
Long run			
Demand			
Export demand growth	X	X	X
Due to food demand growth		X	X
Due to population growth			X
New use/innovation: biofuels			X
Supply			
Slow production growth	X	X	X
Declining R&D investment		X	X
Land retirement	X	X	
Short run			
Demand			
Government food policies	X	X	X
Supply			
Government food policies	X	X	X
Weather-induced crop losses/failure	X	X	X
Macroeconomic			
Economic growth		X	X
Depreciation of U.S. dollar	X	X	X
Rising oil prices	X		X
Accumulation of petrodollars/foreign reserves	X		X
Futures market/speculation	X		X
Inflation	X		
Financial crisis		X	X

Source: USDA, Economic Research Service.

started a period of strong growth in agricultural commodity trade that lasted throughout the 1970s. The abundance of petroleum-related revenues (petrodollars) and foreign exchange reserves generated by major oil-exporting countries also facilitated global trade growth. During the 1970s, the value of global agricultural commodity imports grew 4.8 percent a year, while the value of U.S. agricultural exports grew at an annual rate of 11.7 percent.

The 1971-74 price surge also coincided with a major depreciation of the U.S. dollar. In 1971, the United States, lacking sufficient gold reserves to defend the dollar's fixed exchange rate, removed the dollar from the gold standard and began its transition to a floating exchange rate, finally realized in March 1973. This shift resulted in a persistent depreciation of the U.S. dollar against other major currencies, and, by the end of the decade, the dollar's value had fallen by nearly 30 percent. The declining value of the dollar made U.S. products more competitive in overseas markets, so exports and prices rose.

Production shortfalls due to adverse weather conditions compounded the situation. In 1972, world grain production declined due to poor yields in the United States, Australia, Canada, and the Soviet Union. The Soviet Union turned to the global market to meet grain needs. Adverse weather conditions in major grain-producing countries persisted for several years. Production of grains and oilseeds continued to fall, even as plantings in the United States and other major grain-producing countries expanded. The failure of the Peruvian anchovy catch in 1972 led to a significant decline in the availability of high-protein feedstocks and increased demand for soybean meal. As a result, soybean prices soared in 1973 and 1974.

The effect of these production shortfalls was compounded by the decisions of the United States and other major exporting countries in the late 1960s to reduce stocks and idle cropland to cut government costs and support prices. By 1973/74, wheat ending stocks in Australia had fallen 93 percent from 1970/71, Canada's stocks had dropped 64 percent, and U.S. wheat stocks had declined 59 percent.

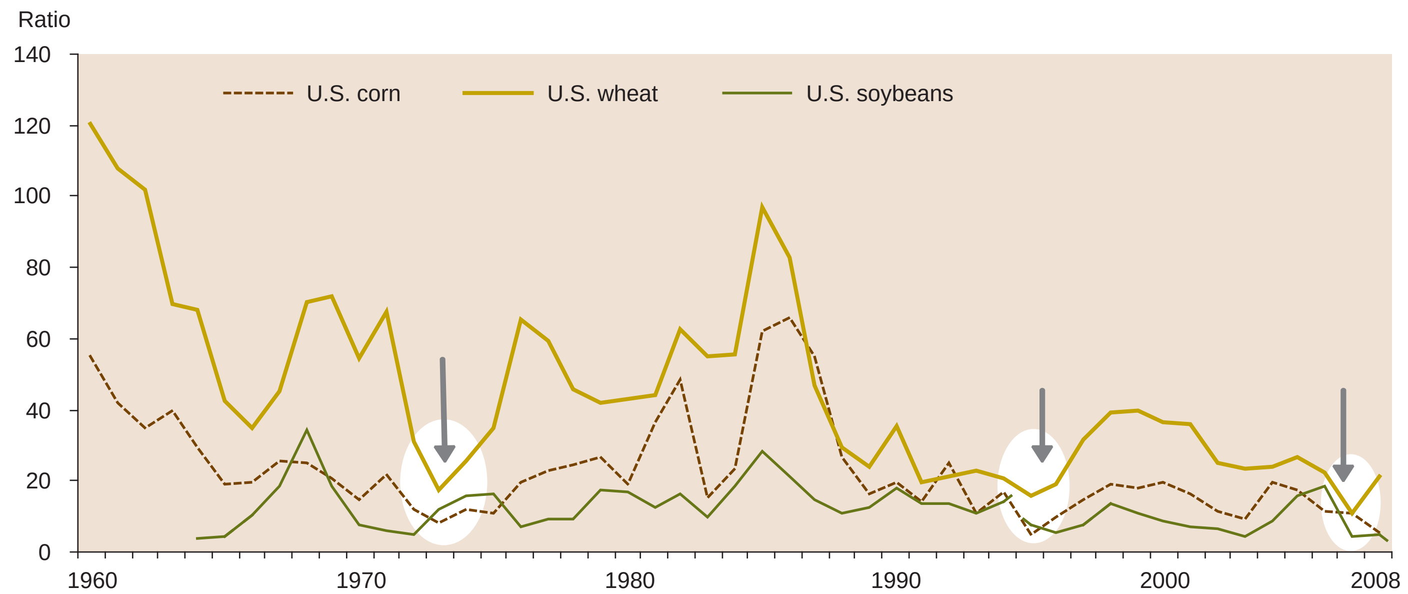
During the 1970s, many countries adopted policies, such as export taxes, restrictions, and bans, to insulate their domestic markets from global grain and oilseed price increases. Importers also reduced tariffs, rebuilt stocks, and subsidized consumer prices. The availability of foreign exchange reserves resulting from the depreciation of the dollar and abundance of petrodollars in major oil-exporting countries facilitated these import and export policies. Overall, these policy actions further contributed to the tight global market conditions.

High Crop Prices in the 1990s—Similar Causes but Shorter Duration

Strong demand and increasing trade, driven primarily by robust economic growth in newly industrialized Asian countries, were also behind the agricultural commodity price spike of 1994-96.

Soybean producers increased production in the 1970s to meet rising global demand.

Low U.S. stocks-to-use ratios for corn, wheat, and soybeans contributed to rising prices



Source: USDA, Economic Research Service using data from USDA, National Agricultural Statistics Service, and Production, Supply and Distribution Database, 2008.

But trade gains ended when the 1997-99 financial crisis and resulting decline in economic growth in Asia caused global demand to fall.

Like the events of the early 1970s, the 1994-96 price hikes coincided with the depreciation of the U.S. dollar against currencies of major U.S. trading partners, though, like the surge in global demand, this lasted for only a few years. Also in 1994-96, global production of grains fell for 3 consecutive years due to below-normal harvests in the major grain-exporting countries.

As in the 1970s, the impact of declining production on prices in the 1990s was compounded by the decisions of some countries, including the United States, to reduce carryover stocks and idle cropland to support prices. With lower stocks, global markets were more sensitive to production shortfalls and grain prices soared.

In contrast to the 1970s, however, country policy responses to the 1990s price spikes were muted, largely because the price increases lasted only 2 years. Moreover, inflation was relatively low, so the overall impact on consumer budgets was not severe. In addition, foreign reserves of many Asian markets were low in the mid-1990s, preventing many major importing countries from increasing imports above usual needs and limiting their ability to implement policies to protect consumers from higher prices. Increased trade liberalization also helped make agricultural commodity markets more flexible and responsive to changes in global supply and demand conditions.

Looking at the Most Recent Price Surge From a Historical Perspective

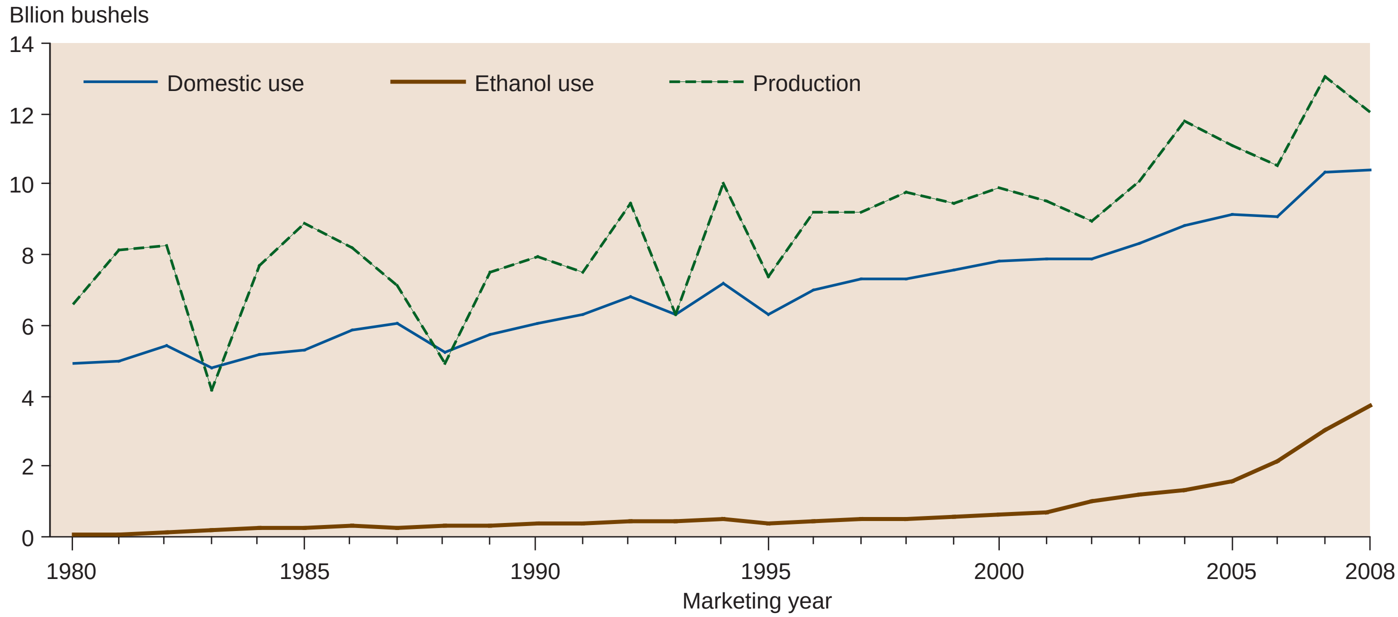
As in the 1970s and the 1990s, one of the key factors contributing to higher crop prices in 2006-08 was the rapid increase in foreign demand for U.S. agricultural products since 2000. The value of global agricultural trade increased over 50 percent between 2000 and 2006, spurred primarily by rising incomes in developing countries. These nations accounted for 63 percent of the total value of U.S. agricultural exports in 2007.

Demand for agricultural food commodities in large developing countries, such as China, Brazil, Mexico, India, and countries of Southeast Asia and Central America, has grown rapidly as consumers have diversified their diets to include more vegetable oils, meat, and dairy products. As a result, demand for grains and oilseeds for livestock feed by developing countries has risen disproportionately more than overall demand for food.

Once again, the depreciation of the U.S. dollar, worldwide production shortfalls in 2006-07, and low stocks pushed commodity prices up. Global aggregate stocks-to-use ratios for grains and oilseeds declined to less than 15 percent, the lowest level since 1970. Policy responses, such as export controls, reduction of import barriers, and consumer subsidies on the part of both importers and exporters, exacerbated these developments.

A new factor contributing to agricultural markets is the emergence of biofuels

U.S. corn: Growth in ethanol use began accelerating in 2000



Source: USDA, Economic Research Service, Feed Grains Database, available at: www.ers.usda.gov/data/feedgrains/

as a major source of demand for grains and oilseeds (see "Growing Crops for Biofuels Has Spillover Effects," on page 10). Although ethanol production represented less than 7 percent of U.S. gasoline use in 2008, ethanol production accounted for 23 percent of total 2007-08 corn use. Neither the 1970s nor the mid-1990s were characterized by a comparable change in the makeup of global demand. Similarly, expanded biodiesel demand in the European Union has pressured global prices for vegetable oils.

Markets Adjust and Prices Retreat

The period of high prices during the 1970s ended as growth in world consumption slowed because of declining global economic expansion and oil prices, which reduced the availability of petrodollars. Restrictive monetary policies designed to curb inflation in some key countries (including the United States and the United Kingdom) and the debt crisis in many developing countries contributed to slowing economic growth. Thus, continued growth in global export demand proved unsustainable.

At the same time, global production, stimulated by productivity increases and government policies, grew faster than consumption. U.S. farmers responded to high prices by bringing cropland idled under acreage set-aside programs into production. Harvested areas of wheat, corn, and soybeans expanded over 20 percent from 1974 to 1980. Multinational firms responded to high grain and oilseed prices by making large investments in the development of agricultural infrastructure and port facilities in South American countries. This made it possible for farmers in Brazil and Argentina to compete and become major suppliers in the global grain and oilseed markets. The gains in production coupled with the slowdown in consumption caused global stocks of grains and oilseeds to grow to record levels. As a result, wheat and corn prices declined.

Unlike events in the 1970s, a shock external to the agricultural sector—namely, the Asian financial crisis of 1997-99—quickly ended the 1994-96 crop price surge. With the crisis, economic growth, and hence, agricultural consumption and trade, plummeted in the Asian countries. A reduction in food demand in high-income countries and an appreciating U.S. dollar also dampened agricultural trade. At the same time, the 1996 Farm Act ended the crop acreage reduction program, increasing land available for planting and boosting production.

Will We See Similar Market Adjustments This Time?

During previous periods of price increases, markets adjusted and prices declined. Similarly, in the current situation, many market adjustments are already occurring. The U.S. dollar has started to strengthen against other major currencies. High prices for many crops encouraged increased plantings in 2008. Some land enrolled in the Federal Conservation Reserve Program has become available for production as contracts expire. These and other ongoing adjustments have placed downward pressure on prices.

Creatas

Further, the current global economic crisis, a shock external to the agricultural sector, is a major contributing factor in reversing the 2006-08 price surge. In this way, the situation is similar to that in the mid-1990s, when a decline in crop prices was precipitated by the Asian financial crisis. This time, however, the crisis originated in more developed countries, such as the United States and Europe. The length and severity of the current global economic slowdown will help determine how fast, how far, and how long prices retreat. As agricultural markets adjust in this weakened economic environment, price behavior may continue to be volatile.

While history provides some insights into current and future economic phenomena, the past does not necessarily predict the future nor does it fully explain events occurring in the markets today. The current financial and economic structure in the agricultural sector is different than in the past and policy options and actions have changed as well. Nonetheless, future global income growth and policy developments will have a substantial impact on demand for agricultural commodities. Although movements in the value of the dollar will influence demand for U.S. agricultural exports, it is expected that food demand growth will resume and stimulate gains in global agricultural trade as the world economy recovers.

In particular, food demand in developing economies will likely accelerate since incomes in these countries are far from levels where food demand becomes saturated. Additionally, developing countries, which accounted for over 80 percent of global population in 2007, will continue to experience large population gains along with increased urbanization and expansion of the middle class. And populations in developing countries tend to be younger than those in developed countries, further supporting the potential for increased food demand and sustained growth in export demand.

Additional demand strength can be expected if U.S. and international policies continue to favor development of biofuels. These factors combined are likely to keep crop prices from falling as low as their pre-spike levels. AW

For more information . . .

Global Agricultural Supply and Demand: Factors Contributing to the Recent Increase in Food Commodity Prices, by Ronald Trostle, WRS-0801, USDA, Economic Research Service, July 2008, available at: www.ers.usda.gov/publications/wrs0801/

"Fluctuating Food Commodity Prices—A Complex Issue With No Easy Answers," by Ronald Trostle, in *Amber Waves*, Vol. 6, No. 5, USDA, Economic Research Service, November 2008, available at: www.ers.usda.gov/amberwaves/november08/features/foodprices.htm

You may also be interested in . . .

USDA Agricultural Projections to 2018, (ERS contact: Paul Westcott), OCE-2009-1, USDA, Office of the Chief Economist, World Agricultural Outlook Board, February 2009, available at: www.ers.usda.gov/publications/oce091/

Grain Prices Impact Entire Livestock Production Cycle

Richard Stillman
stillman@ers.usda.gov

Mildred Haley
mhaley@ers.usda.gov

Ken Mathews
kmathews@ers.usda.gov

- Between 2006 and 2008, feed costs nearly doubled and are expected to result in lower meat and dairy production in 2009.
- Feed prices have declined since mid-2008 and are expected to be lower in 2009, but the biological timeline of livestock production means meat producers are limited in what they can do in the short run to change production.
- Changes in U.S. livestock-industry structure and the use of alternative feeds, such as byproducts from ethanol production, will help reduce the impact of higher input costs on livestock producers.

BrandXPictures

Manufacturers make decisions on the amount and timing of production based on input costs and the expected product price. Manufacturers may react to a significant increase in the price of a variable input, such as energy, by reducing production. As energy prices decline, manufacturers may respond in the short run by boosting output.

Biology, however, prevents livestock producers from instantly responding to price changes. The timeline for meat production—from farm to retail—ranges from 2 months for poultry meat to 2 years for beef. From the time a female is bred, it takes about 9 to 10 months to expand milk production, 30 months to produce a steak, 10 months for a pork roast, and 10 weeks for a chicken breast from when incentives to do so appear.

Livestock production's varying timeframes make it difficult to change the direction of output quickly. Producers make decisions to expand or contract production before feed and product prices are known. Biological lags mean that animal products consumed today are based on production decisions made up to 2 years ago.

Record-high grain, oilseed, and energy prices between 2006 and 2008 increased the costs of producing and marketing meat and dairy products. Expecting feed and energy costs to remain high, livestock producers began to cut back on animal and dairy production. But just as producers were making their livestock-production decisions for 2009, feed prices began to decline. The dollar strengthened, which lowered exports, and worldwide economic growth began to slow.

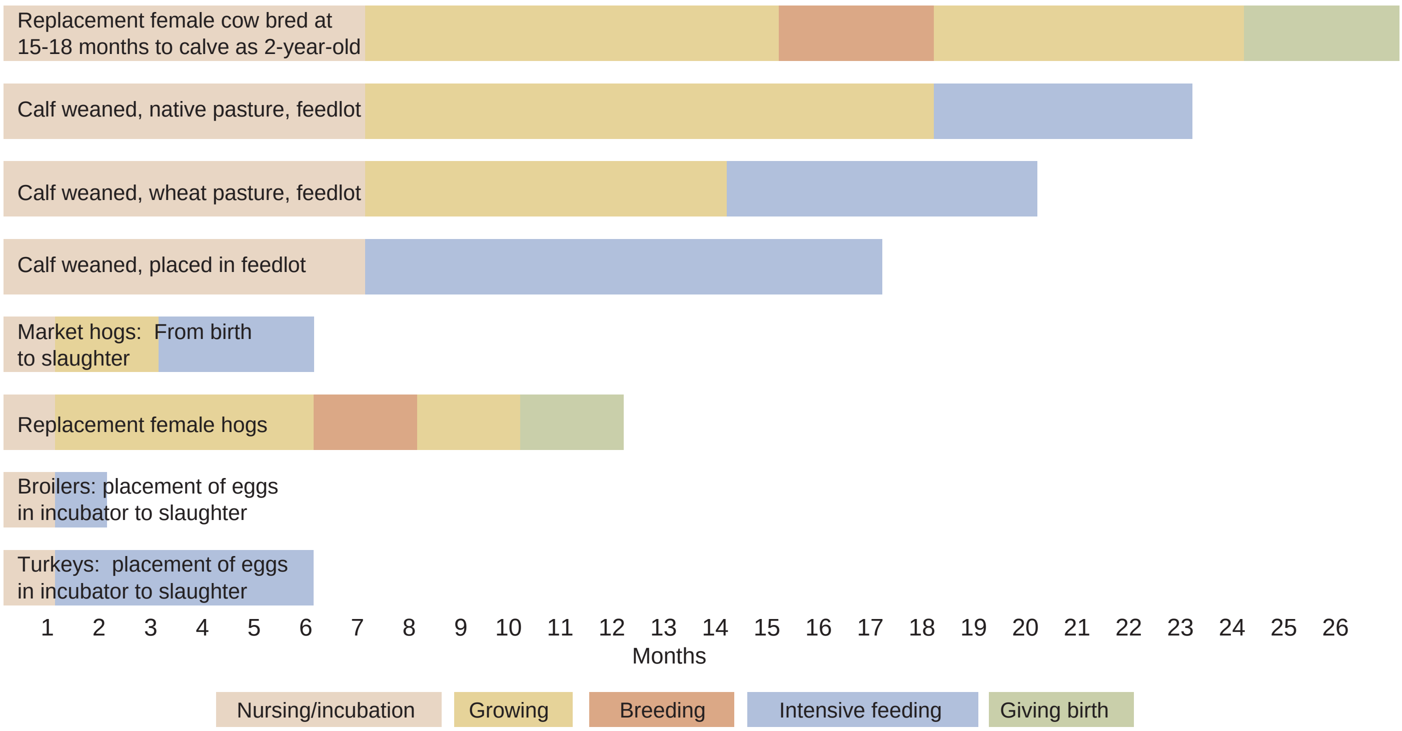
As a result of decisions made before the end of 2008, livestock production will likely grow more slowly in 2009 and could begin to decline. Because of this, consumers can expect to pay higher prices for meat and dairy products through 2009, even as the costs of feeding and raising livestock decline.

Higher Feed, Energy Prices Shape Production Decisions

Prices paid for feed doubled from 2006 to 2008, mainly due to higher corn and soymeal prices. Corn accounts for 91 percent of feed grains used for feed, and soymeal is the principal oilseed crop product used as feed. By mid-2008, corn prices were about 140 percent above those of a year earlier. Similarly, soymeal prices reached a record $367 per ton in 2008.

Increased energy prices also affected the livestock sector in a number of ways, raising the costs of slaughtering, processing, and retailing. Beyond the slaughter plant, meat and dairy products require what is known as a "cold chain" of energy-intensive refrigeration. Margins, the difference between live animal prices and retail meat prices, are a reflection of the cost of processing the

Timeline for livestock production varies from 2 months to 2 years



meat. To cover higher energy costs, margins must also rise.

Feed and energy costs are large components of livestock production expenses. The length of time necessary to produce meat animals governed the short-term reaction of the livestock industry to these higher input costs. Initially, livestock producers continued to feed the animals in the production queue, while eliminating their least productive animals and cutting back in less profitable areas of their operations.

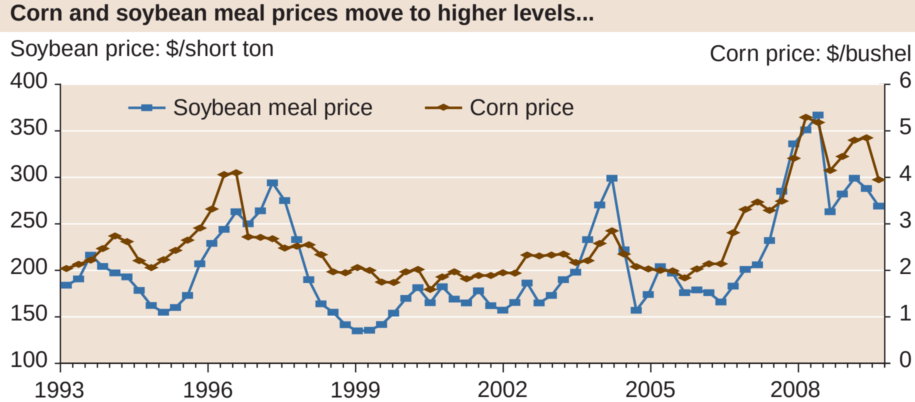
Two Cattle Industries Affected Differently by Higher Costs

Two separate industries comprise U.S. beef production. The cow-calf industry, which produces calves that go into feedlots, is pasture based and is less directly affected on the cost side by rising grain prices. Higher grain prices do affect cow-calf producers indirectly, however, through lower prices offered for their output—feeder cattle, which are placed in a feedlot to be fattened prior to slaughter.

The demand for feeder cattle is a "derived demand"—demand for a good or service that is an input into the production of another good or service. The demand for the input is derived from the demand for the final output. As feed prices increase or finished-cattle prices decline, cattle feeders will pay less for the feeder cattle purchased from cow-calf producers. The differences between feeder- and finished-cattle prices began to increase in the second quarter of 2004, an indication of higher demand for feeder-cattle. The difference narrowed substantially in the fourth quarter of 2006, with the sharp runup in corn prices, and remained much lower than from the third quarter of 2004 to the same period in 2006. The change in 2006 indicated demand for feeder cattle had declined.

The cattle-feeding industry is more directly affected by feed costs than are cow-calf operations. When feed costs are high, cattle feeders can adjust by buying heavier feeder cattle that had remained on pastures, eating forage, for a longer period of time. When feed costs are lower, cattle producers may put feeder animals in the feedlot at a lower weight in order to gain more weight from grain-based feed rations. Feeder animals typically enter the feedlot weighing 650 to 800 pounds and are slaughtered at 1,250 to 1,350 pounds. During their time in a feedlot, cattle consume about 3,000-3,200 pounds of corn. If feed costs rise, cattle feeders can wait until their animals are 100 to 300 pounds heavier (from the typical 650 to 800 pounds) before placing them in feedlots. This practice reduces the amount of grain needed to "finish" the cattle. But there are limits to this practice because it can lower the quality grade (e.g., USDA Choice) of the beef animal.

Corn and soybean meal prices move to higher levels...



Source: USDA, Economic Research Service.

Some Producers Have More Feed Options Than Others

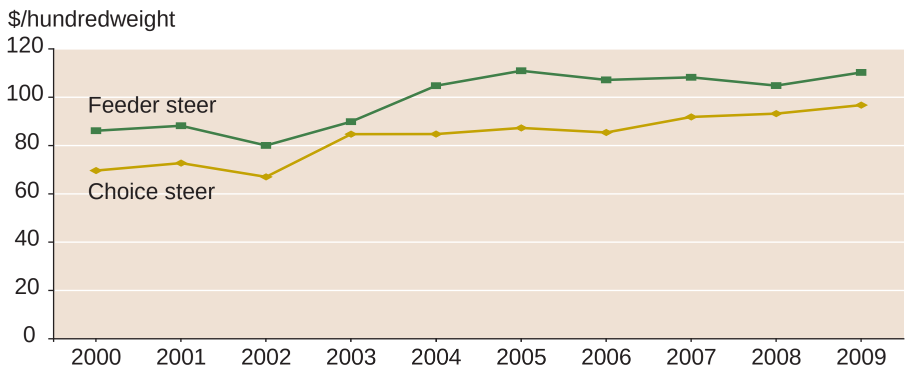
Livestock producers can adjust feed costs by altering the types and amounts of feed in rations and by changing feeding practices. The resulting "least-cost" ration varies the amount of specific feeds, depending on costs. Typical feed rations are made up of energy (carbohydrates and fat) and protein. If feed costs increase, cattle can eat grass for growth and milk production. Cattle and dairy producers can reduce the amount of feed grains and protein meals fed to cattle by giving them more forage.

Livestock producers can also use alternative feeds, like distillers' dry grains (DDGs), one of several byproducts of grain-based ethanol and sweetener production that can be fed to livestock. With expanded ethanol production, DDGs are likely to become a more important component of feed, particularly for cattle, and will offset some of the demand for traditional feeds like corn.

Cattle feeders can use DDGs for up to about 60 percent of their feed rations, mixing DDGs with straw or corn stubble. Cattle feeders also can use byproducts coming directly from ethanol production plants in a wet form, avoiding the high cost of drying DDGs. One problem with wet grain byproducts is that the high moisture content makes the cost of shipping them more than about 100 miles prohibitive. Even so, DDGs and the wet byproducts will become a more important component of feed and will offset some of the demand for traditional feeds. Recently, there has been an increase in cattle fed in areas in the Midwest near ethanol plants.

The story is different, however, for hog and poultry producers. They have fewer alternative feed sources because hogs and poultry are monogastric (stomachs with only one compartment). These animals also need a balanced diet of energy and protein, but cannot easily digest

...reflected in narrowing gap between feeder and finished steer prices



Source: USDA, Economic Research Service.

cellulose from ethanol byproducts or forages. Pork and poultry producers cannot use pasture grazing to reduce feed costs. The feeds used for pigs and chickens/turkeys are energy (feed grains like corn) and protein meals (soybean meal). The pork and poultry industry can use ethanol byproducts for energy if the cost is low enough, but this practice can affect the rate of weight gain and the meat quality at high rates of inclusion in the diet. DDGs can be used as feed for pork and poultry production, but there are limits to the amounts that may be fed to preserve meat quality, and the DDGs are best utilized in a dry form, which raises costs.

Dairy producers have some of the advantages of feed alternatives that beef-cattle producers have, along with some of the disadvantages pork and poultry producers share. Dairy producers can reduce costs by replacing some feed grains with forage. However, there is a tradeoff—as dairy producers increase forage use, average milk yields will decline. Dairy producers can also use DDGs, though they cannot rely on the substitution as much as producers of beef cattle.

Changing Industry Structure Will Alter Supply Response

The pork and poultry industries have one significant advantage in feed costs over cattle and dairy producers. Vertical integration and contracting may limit the contraction in the pork and poultry industries in response to higher feed costs because the whole marketing chain from farm to retail is viewed as a single profit center, which can better absorb price shocks in one part of the vertical supply chain.

The structure of U.S. animal production, particularly pork and poultry, has changed dramatically in the past 25 to 50 years. The industry has shifted from a large number of small, independent, diversified producers to fewer but larger, more specialized, and more capital-intensive supply-chain-coordinated operations. This structural change in animal production will likely affect the sector's response to sustained high feed costs.

Under the structure in place prior to the 1980s, contraction of output—and thus higher product prices—came about almost entirely through the exit of higher cost producers. Under the new larger structure, industry-wide negative returns will be reversed less often by producer exits than through sales of production facilities to new owners at reduced prices. The new owners, having purchased assets at cents-on-the-dollar, will operate the facilities at lower break-even prices because they have lower capital costs to cover. Consequently, output adjustments will be smaller than in the past. The new operators are also likely to be more efficient and so will be better able to survive a period of high feed costs. However, new entrants will be discouraged until product prices rise sufficiently to allow all allocated costs to be covered.

There is considerable quantitative evidence to suggest that animal-product output does not have to fall significantly to bring about an increase in output price. Demand for meats is inelastic, meaning that for any given change in the supply of meats, the price will change at a greater rate than the corresponding quantity change. For example, if the supply of beef decreases by 1 percent, the price of beef will increase by 1.5 percent. So, a relatively small decline in supplies of beef, pork, or poultry could raise prices sufficiently to cover higher feed costs. Alternatively, prices could rise even with stable supplies if demand continues to steadily increase.

In 2009, meat production is expected to decline because producers have already made decisions based on their 2007-08 expectations of higher grain and energy prices. Per capita meat supplies are likely to fall, and consumers can expect to pay more for meats and dairy in 2009. The magnitude of the production decline is unknown, as some livestock producers can adjust more quickly than others to changing costs.

An even larger unknown is the length and depth of the economic downturn that began in late 2008 and its potential effect on demand for meats. What is certain is that due to biologically determined timelines in livestock production, fluctuating grain and oilseed costs and variable meat prices make it more difficult for producers to gauge which way the market price will be heading when their product is ready to be sold. W

This article is drawn from . . .

Livestock, Dairy, and Poultry Outlook newsletters, available at www.ers.usda.gov/publications/ldp/

Recent Volatility in U.S. Fertilizer Prices

Causes and Consequences

Wen-yuan Huang
whuang@ers.usda.gov

William McBride
wmcbride@ers.usda.gov

Utpal Vasavada
vasavada@ers.usda.gov

VOLUME 7 • ISSUE 1

AMBER WAVES

- Strong domestic and global demand, coupled with tight supplies and low inventories, contributed to record fertilizer prices in early 2008.
- Softening global fertilizer demand, disruptions in U.S. farmer application of fertilizers, an increase in fertilizer imports, and tighter credit for purchasing inputs contributed to the decline in fertilizer prices in late 2008.
- Fertilizer price volatility affects the profitability of corn and small grains, where fertilizer accounts for a relatively large share of production costs, compared with that for soybeans and cotton.

During 2007 and 2008, farmers saw a rapid runup in fertilizer prices to record highs, followed by lower prices in late 2008. The significant ups and downs of the market in 2008 can serve as a textbook example of supply-and-demand analysis in price determination.

Though U.S. nominal prices of nitrogen, phosphate, and potash fertilizers, among others, began trending upward as early as 2002, they increased sharply and reached historic highs in mid-2008. During the 12 months ending in April 2008, nitrogen prices increased 32 percent, phosphate prices 93 percent, and potash prices 100 percent. This price surge in 2008 was due to strong domestic and global demand for fertilizers, low fertilizer inventories, and the inability of the U.S. fertilizer industry to adjust production levels (see charts on page 43).

But by late 2008, monthly average prices had fallen. Global fertilizer demand softened in response to the record-high fertilizer prices and declining crop prices. Some U.S. farmers postponed fertilizer application, tighter credit availability slowed fertilizer purchases, and fertilizer supplies from overseas increased, all contributing to the price decline.

Global Demand for Agricultural Products Pushed Fertilizer Prices Higher

Since 2000, rising populations (roughly 75 million additional people worldwide per year) and strong global growth in average incomes, particularly in developing countries, have increased food and feed demand. Consumers in developing countries not only increased consumption of staple foods but also diversified diets to include more meats, dairy products, and vegetable oils. This, in turn, amplified rising demand for the feed grains and oilseeds used to produce these foods.

Between January 2007 and mid-2008, corn prices increased 100 percent, wheat prices rose 83 percent, and soybean prices were up 112 percent. At the same time, growth in worldwide biofuel

Lynn Betts, USDA/NRCS

production diversified the use options of grains, sugarcane, soybeans, and rapeseed and contributed to higher prices for biofuel feedstocks, particularly corn.

High agricultural commodity prices encouraged producers to expand total crop acres, adjust the mix of crops planted, and increase fertilizer use to boost yields, all of which led to increased global fertilizer demand.

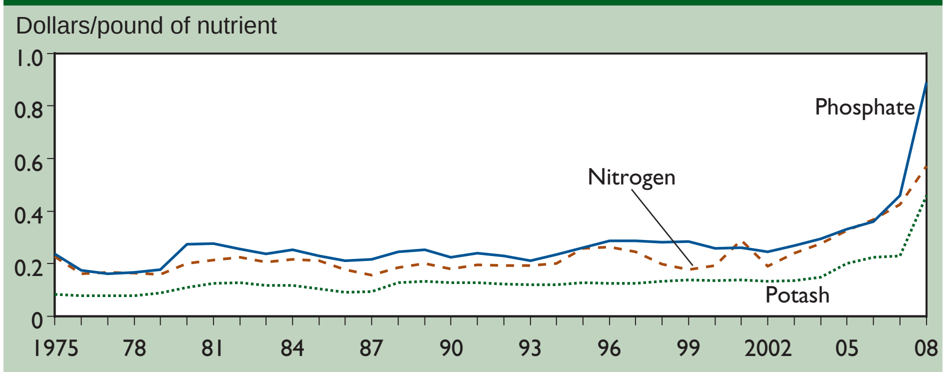
The fertilizer price surge in 2008 was partially triggered by low fertilizer inventories at the beginning of the year, resulting from an additional 15 million corn acres planted and over 3 million more wheat acres planted in 2007. As fertilizer demand increased in 2007, U.S. nitrogen inventory fell 15 percent to 0.88 million tons by the end of 2007. U.S. phosphate inventories dipped 27 percent to 0.59 million tons in late 2007. Potash inventories in North America (including Canada) dropped by 1 million tons (49 percent) to 0.9 million tons at the end of 2007. Domestic and foreign fertilizer producers were not able to quickly adjust production as inventories dwindled.

Fertilizer Prices Fueled by Costs of Raw Inputs, Energy, and Transport

The influence of raw input material prices also contributed to the surge in fertilizer prices. Prices of phosphate rock, sulfur, and ammonia—raw input materials used to produce diammonium phosphate and other fertilizers—increased from January 2007 to early 2008. Moroccan phosphate rock contract prices tripled, international contract prices of sulfur increased more than 170 percent, and Tampa prices of ammonia doubled.

Rising energy prices also increased the cost of producing and delivering fertilizers. Prices of natural gas, which is used to produce ammonia, the main input in all nitrogen fertilizers, rose more than 550 percent over the past 10 years. Between June 2007 and June 2008, natural gas prices increased more than 65 percent. As a result, the cost to produce nitrogen fertilizer increased.

Prices of fertilizer nutrients increased sharply to historical highs in 2008



Price is the average for April of each year. Nitrogen prices are average prices of nitrogen nutrient in anhydrous ammonia, nitrogen solution, and urea. Phosphate prices are the P_2O_5 prices of superphosphate. Potash prices are the K_2O prices of muriate of potash.
Source: USDA, Economic Research Service.

Rapidly rising fuel costs also translated into higher transportation costs. In 2007, 58 million tons of fertilizers were shipped to U.S. agricultural producers by ocean freight, railroads, trucks, barges, and pipelines. Transportation is a significant component of total fertilizer costs, accounting for about 22 percent of the cost of ammonia shipped from Trinidad and Tobago to the U.S. Gulf Coast, and more than 50 percent of the cost of ammonia shipped from Russia to the U.S. Gulf Coast. In addition, the cost of transporting fertilizers from the U.S. Gulf Coast to farmers throughout the Midwest rose dramatically. Specifically, over the 3 years ending in January 2008, U.S. rail rates to transport ammonia increased 63 percent, and an additional 44-percent fuel surcharge was added to U.S. rail transport costs in July 2008 because of high fuel prices.

Global Trade and Financial Events Also Affected Fertilizer Prices

In 2007, imports accounted for 49 percent of the nitrogen fertilizer supply in the U.S. and 85 percent of the U.S. potash supply. The value of the U.S. dollar relative to the currencies of major nations supplying fertilizer to U.S. farmers, except Mexico and Trinidad and Tobago, has declined since 2003. For example, relative to the Brazilian real, the U.S. dollar dropped 48 percent from January 2003 to January 2007. As a consequence, fertilizer imports became more expensive, and U.S. exports of phosphate products became more attractive to foreign buyers.

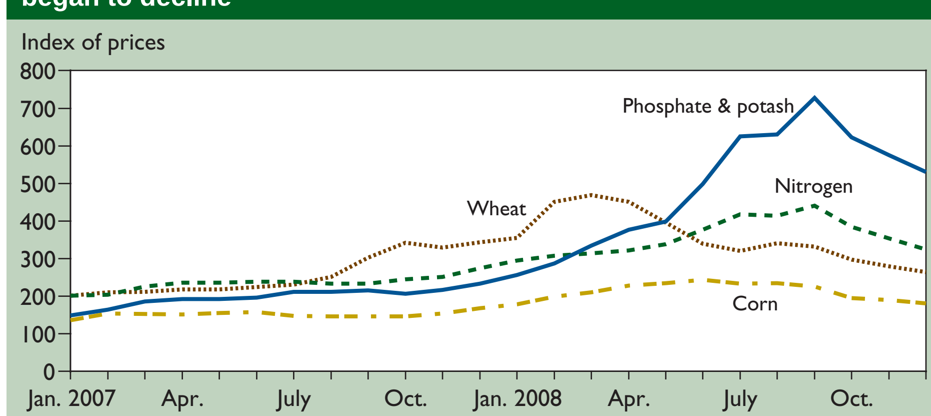
Facing short supplies, China increased its export taxes on fertilizers from 35 percent in 2007 to 135 percent in 2008 to ensure that domestic production remained in the country. China is the world's largest exporter of urea—a major source of nitrogen fertilizer—and the second largest exporter of phosphate. China provided roughly 17 percent of the urea and 18 percent of the phosphate traded globally in 2007. The announcement of higher export taxes tightened the global supply of phosphate and urea, contributing to upward pressure on prices in 2008.

Fertilizer Prices Have Softened Recently, But the Future Is Uncertain

Fertilizer prices continued increasing in early 2008 and were 26 percent higher in August than in April. But prices began to decline in October, particularly for nitrogen fertilizer. The decline in monthly average prices might be attributed to several factors: (1) softening global fertilizer demand in reaction to the fertilizer price surge and declining crop prices; (2) a shortened window for U.S. application of fertilizer in fall 2008, caused by wet weather that delayed spring plantings and fall crop harvests; (3) an increase in fertilizer supplies from overseas (from July to October); (4) tighter credit availability, making debt-financed fertilizer purchases more difficult; and (5) congested distribution supply chains due to farmers postponing purchases.

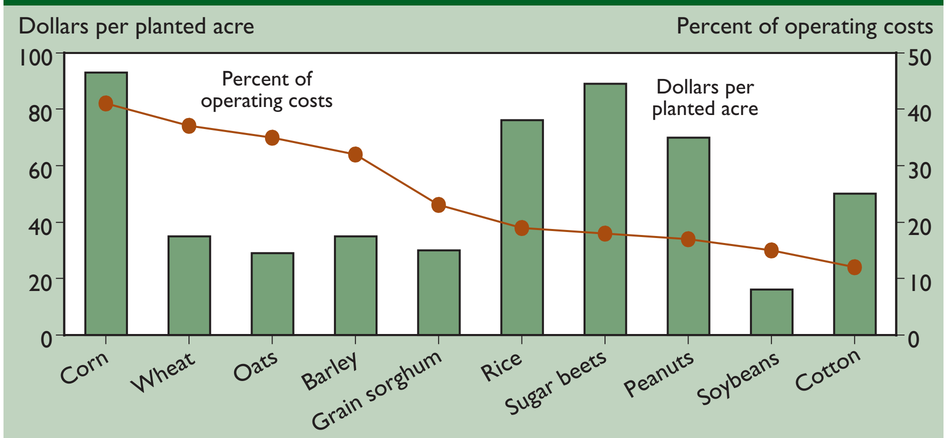
Price volatility in the U.S. differs among fertilizer nutrients because of fundamental differences in nutrient markets. Nitrogen markets are more volatile than phosphate and potash markets. Volatility in the price of natural gas—a basic input in the manufacture of nitrogen—contributes to swings in nitrogen prices. Price swings are less likely

Mid-2008 fertilizer prices continued high, even as crop prices began to decline



Source: USDA, Economic Research Service using data from USDA, National Agricultural Statistics Service.

Corn had highest fertilizer costs per acre and as a share of total operating costs in 2007



Source: USDA, Economic Research Service.

for phosphate and potash, whose underlying input markets are more stable.

The recent decline in fertilizer prices, however, may not be sustainable. While a deepening global economic slowdown would put downward pressure on fertilizer prices, fertilizer markets could also be affected by unforeseen weather events or by changes in global fertilizer trade. It is possible that the prices of U.S. fertilizers could again move higher during spring 2009.

Many of the causes of the recent spike in fertilizer prices could still put upward pressure on fertilizer prices in early to mid-2009. Meanwhile, commodity prices for corn, wheat, and soybeans, for example, while lower than their peaks in 2008, remain high relative to historic averages (see "Fluctuating Food Commodity Prices—A Complex Issue With No Easy Answers," *Amber Waves*, November 2008). Thus, while planted acreage in 2009 may fall from that in 2008, overall plantings are likely to remain high. In addition, low fertilizer prices (as of January 2009), particularly for nitrogen, may favor corn planting in spring 2009, continuing to hold up fertilizer demand.

Fertilizer Price Volatility Impacts Relative Crop Profitability

Crops requiring heavy application of fertilizers are not necessarily those for which fertilizer makes up the greatest share of total costs. Fertilizer use is relatively high for sugar beet, rice, and peanut producers, for example, but fertilizer expenses amount to less than 20 percent of their operating costs.

Among major U.S. field crops, corn uses the most fertilizer, has the highest fertilizer costs per acre ($93 at average 2007 prices), and has the highest fertilizer costs as a share of operating costs for planting, growing, and harvesting (41 percent). But producers of wheat, oats, and barley are also sensitive to fertilizer price swings, despite having relatively low fertilizer costs per acre (less than $40), because fertilizer costs account for more than 30 percent of their operating costs.

Rising fertilizer prices make crops such as soybeans attractive alternatives to crops for which fertilizer costs are higher. Soybeans compete for acreage with corn and other feed grains and wheat in the Corn Belt and Plains States. Higher fertilizer prices may encourage the cultivation of more soybeans and result in less acreage planted to corn, wheat, and other feed grains in these areas. In the South, cotton has been losing acreage to corn in recent years due to high corn prices. Corn production in the South requires more fertilizer than in other areas to compensate for lower quality soils. Higher fertilizer prices may entice farmers in the South to plant more soybeans or to switch back to more traditional southern crops, such as cotton, rice, and peanuts, for which fertilizer costs per acre are lower.

High Commodity Prices May Not Compensate for High Fertilizer Prices

While higher farm commodity prices in 2008 offset much of the negative effect of higher fertilizer prices on farm incomes, fertilizer prices in the U.S. do not necessarily move in tandem with food and feed grain prices. Fertilizer prices approaching those experienced in late 2007, caused mainly by global demand and tight supply factors, might be sustainable even if U.S. and world commodity prices continue to soften.

With lower crop prices, high fertilizer prices would place downward pressure on farmers' net returns. Farms with higher than average fertilizer costs, a greater need to use fertilizers on the crops they grow, and/or a limited ability to either move away from fertilizer-intensive crops or substitute other inputs will be especially vulnerable if fertilizer prices increase once again. W

This article is drawn from . . .

Factors Contributing to the Recent Increase in U.S. Fertilizer Prices, 2002-08, by Wen-yuan Huang, AR-33, USDA, Economic Research Service, February 2009, available at: www.ers.usda.gov/publications/ar33/

You may also be interested in . . .

Impacts of Rising Natural Gas Prices on U.S. Ammonia Supply, by Wen-yuan Huang, WRS-0702, USDA, Economic Research Service, August 2007, available at: www.ers.usda.gov/publications/wrs0702/

ERS Data on Commodity Costs and Returns, available at: www.ers.usda.gov/data/costsandreturns/

ERS Data on U.S. Fertilizer Imports/Exports, available at: www.ers.usda.gov/data/fertilizertrade/

ERS Data on U.S. Fertilizer Use and Price, available at: www.ers.usda.gov/data/fertilizeruse/

When *Nudging* in the Lunch Line Might Be a Good Thing

Lisa Mancino
lmancino@ers.usda.gov

Joanne Guthrie
jguthrie@ers.usda.gov

- With millions of children served each schoolday, USDA-sponsored school meals provide an important opportunity to improve diet and health.
- Schools can exert considerable control over the food choices they offer and the manner in which they are presented—the "choice architecture" in behavioral economic terms.
- Behavioral economic theory suggests several possibilities to structure school cafeteria environments in a noncoercive manner to encourage healthy choices.

Yellow Dog Productions

Ever planned to have fruit at lunch, but in the cafeteria line, selected a brownie instead? That spur-of-the-moment decision is proof that consumer behaviors predicted by traditional, neoclassical economic models do not always occur. Experimental psychology and behavioral economic studies show that simple rules of thumb and certain cues, like presentation and visual appeal, can influence on-the-spot decisionmaking. For example, a diner going through the cafeteria line is more likely to choose the "default" side of fries with a hamburger, rather than another (and perhaps healthier) option. Though more expedient than calculating the expected payoff from each and every decision, these cues and rules of thumb can lead to systematic reasoning errors when people make food choices.

When distracted or under stress, people also are more likely to make poorer food choices. Certain decisionmaking environments, such as social situations, can also increase the likelihood of choosing options or engaging in behaviors, like overeating or overspending, that are not in sync with future goals, such as losing weight or saving money.

Behavioral economists Richard Thaler and Cass Sunstein argue that understanding how presenting choices may influence decisions—termed "choice architecture"—can reveal potential options to increase the link between intentions and behaviors. Choice architecture relies heavily on subtle cues, or "nudges," to encourage people to follow through on their intentions.

Findings from behavioral economic research are typically applied to adult decisionmaking. But children most likely have limits on their patience, foresight, and analytic skills, too, so choice architecture may also help them. In particular, applying choice-architecture research findings to school foodservice could help encourage more healthy behavior in children and teens. School cafeteria managers may be able to control many of the elements shown to influence food choice, such as how foods are presented. Identifying how these elements could be used to cue healthier choices may help improve students' diets without sacrificing freedom of choice.

Displaying healthy items more prominently can boost their selection.

JupiterImages

School Cafeterias, a Promising Venue for Choice Architecture

Thirty million children and adolescents eat a USDA-sponsored school lunch and almost 10 million eat a USDA-sponsored breakfast every schoolday, making school meals a particularly important opportunity to improve the diets and health of U.S. schoolchildren. With rising rates of child obesity, child health advocates are eager to see America's schools make more use of this opportunity.

USDA's Food and Nutrition Service, which regulates the school meal programs, has urged school foodservices to make meals healthier by offering more whole grains, fruit, and vegetables; encouraging consumption of low-fat milk; and reducing the amounts of sodium, saturated fat, and transfat in meals. Since passage of the Child Nutrition Reauthorization Act of 2004, schools that participate in USDA school meal programs have been required to develop wellness policies covering foods available in school, nutrition education, and physical activity.

Despite pressure to improve meals, most schools continue to sell less nutritious foods and beverages in addition to USDA meals. The School Nutrition Dietary Assessment Study-III (SNDA-III) collected nationally representative data on school food offerings and student dietary intakes in spring 2005. Results showed that, in addition to providing USDA meals, most middle and high schools sold low-nutrient, high-calorie foods and beverages either through vending machines or as à la carte cafeteria items. Some school administrators justify the presence of these "competitive foods" on the grounds that they meet student preferences, offer choice, and help to balance tight foodservice budgets in a period of escalating food costs.

Many child-health advocates want to ban less nutritious competitive foods, citing that children may lack the maturity to consider the long-term consequences of their choices when faced with the immediate appeal of sugary or high-fat foods. However, some schools and parents oppose such bans, either for school budgetary reasons or because they believe students are entitled to have food choices and, in the larger world, will eventually have to learn to make such choices on their own. In particular, choice may be more important to older students, and data show that the variety of competitive foods available expands in secondary schools. For example, snack chips are available à la carte in more than half of secondary schools but in only a quarter of elementary schools. This wider range of choices is associated with declining diet quality. Only about a quarter of high school students eat fruit with their lunch, compared with one-half of elementary school students.

With skillful application of choice architecture, however, students' freedom of choice can be preserved while they are steered toward selections more in their long-term interest. Since the arrangement of the school food environment may influence students' choices, it is important to consider the consequences, unintended or not, of design and layout. Given that school cafeteria managers have considerable influence over the types of foods and the manner in which they are presented, this strategy may be a highly effective way to improve students' food choices.

How Might School Cafeterias Currently Influence Choice?

Thaler and Sunstein point out that nearly ubiquitous subtle decision cues can intentionally or unintentionally influence consumer choices. For example, marketing research finds that items displayed more prominently, at eye level, or first in line tend to be chosen more often than other items. This tendency suggests that a carefully planned arrangement of food in cafeterias could influence students' choices, and ultimately, their diet quality.

Other behavioral studies have found that specific situations and behavioral cues may further bias behavior toward short-term goals. Simply seeing a brownie or other high-calorie food, for example, can lead to unplanned consumption. Certain situational factors, such as feeling hungry, stressed, or distracted also are associated with more impulsive behavior. It is possible that noise levels, crowding, and long cafeteria lines may work against rational decisionmaking about food choices.

Analysis of the SNDA-III data shows that 40 percent of school principals and over 50 percent of students regard cafeteria noise as a problem. Nearly 48 percent of students also said that lack of seating was an issue, and more than 80 percent cited long lunch lines. On average, students spent close to 5 minutes of the 30-minute lunch period waiting in line. Positive decision cues, such as smartly packaged healthy "grab and go" options, may help time-pressed, hungry, and distracted students make better food choices.

Verbal prompts can also cue food choices and eating behaviors. Anyone who has ever unexpectedly agreed to choose fries with an entrée, supersize a meal, or order a decadent dessert may have realized the power that suggestion can have on choices. But these prompts can also encourage one to make healthier choices. Yale University researcher Marlene Schwartz found that 70 percent of students in a 2007 study ate a serving of fruit at a meal when school cafeteria workers asked if they would like fruit or fruit juice. Only 40 percent of students ate a serving of fruit when not prompted.

Ken Hammond, USDA

Seventy-six percent of public schools use a prepayment system for purchasing school meals and a la carte items.

What individuals choose has also been shown to vary with when they make their choices—and when they get their rewards. One of the most widely documented anomalies in behavioral studies is that individuals are more likely to make future sacrifices than immediate ones. People are less willing to limit salt, calories, and fat for better future health if they are considering these sacrifices on the spot rather than for a future meal or snack.

Precommitting to a choice can also help people act on their intentions. Behavioral studies show individuals who made food choices before being confronted with distractions, visceral influences, or the promise of immediate gratification were less likely to exhibit present-biased preferences and more likely to follow through on their dietary objectives. Allowing students (or for younger children, their parents) to select healthy meal options ahead of time also may help reduce purchases of less nutritious foods in the cafeteria.

Choices have even been shown to vary with payment methods, with those paying cash making more deliberative choices than those paying with credit. Prepayment options such as student debit cards or personal identification numbers

In the Cornell University experiment, healthy menu items were marked with a green dot.

(PIN) numbers linked to prepaid meal accounts are an increasingly popular way of handling school meal payments. Parents can prepay for meals in a private, designated school lunch account, with students receiving meal cards that are used to debit the account when they go through the cafeteria line. Students receiving free and reduced-price meals also are provided debit meal cards to minimize any appearance of differences in payment between them and students paying full price. Analysis of SNDA-III data indicates meal prepayment systems are used in 76 percent of public schools.

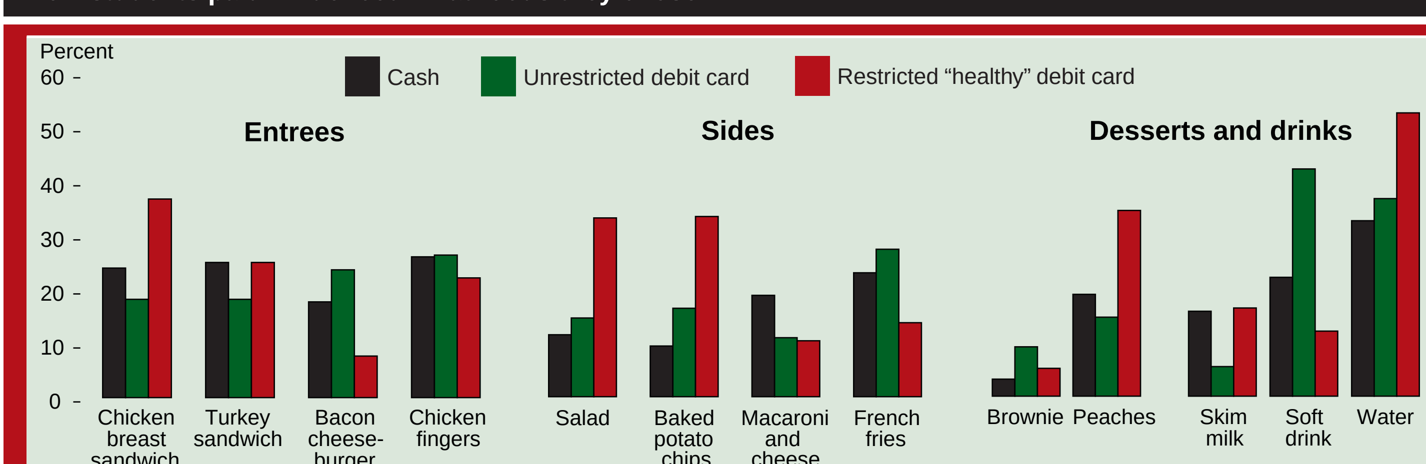
While cash not spent on school meals can be used for other items, prepaid account "dollars" are restricted to school lunch items (at least until the end of the school year when excess money is returned). Because the use of prepaid dollars is limited by both time and choice, behavioral economists hypothesize that these dollars constrain choice and are therefore less valuable to students than cash. Thus, the cue to eat more in the cafeteria may be stronger for students receiving $20 in a prepaid account rather than the same amount in cash. But allowing individuals to only prepay for nutritious foods could serve as a commitment device that would help nudge students to make healthier choices.

Testing the Power of Nudges: Lessons From a Small Study of College Students

Research conducted at Cornell University helps shed light on some possible effects of adjusting the choice architecture within cafeterias. The first experiment found that payment options do indeed significantly affect food choices. Using approximately 200 college students from Cornell University, researchers randomly assigned participants to one of three payment options: unrestricted prepaid cards that could be used for any menu item, restricted cards that could only be used for more healthful items, and cash.

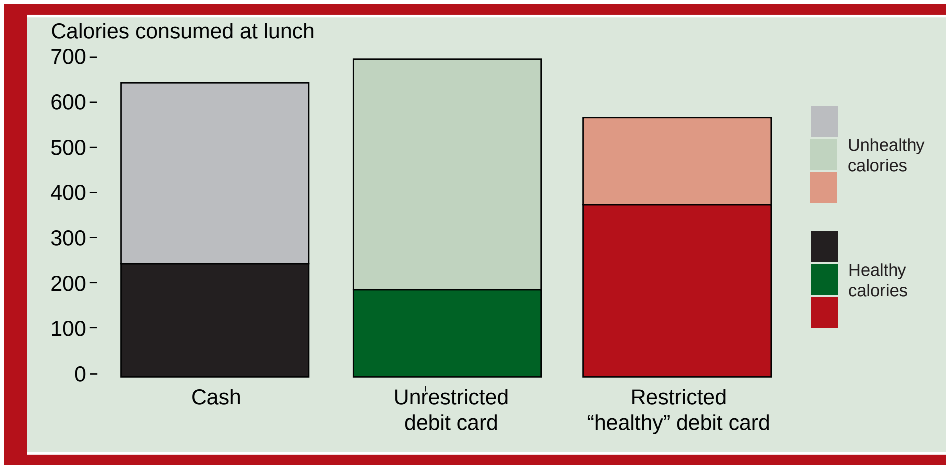
Participants received a total of $20 either all in cash or $10 in cash and a $10 restricted or unrestricted prepayment

How students paid influenced what foods they chose



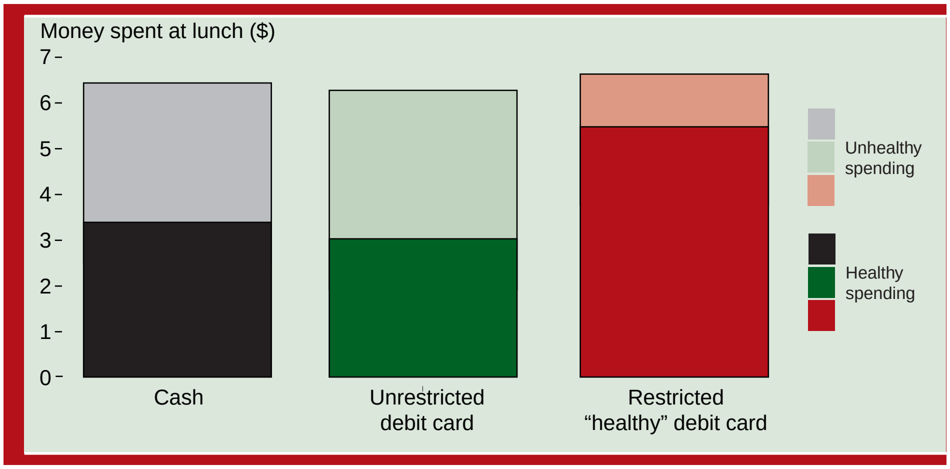
Source: USDA, Economic Research Service.

Restricted card users ate fewer total calories, and more calories from healthy foods



Source: USDA, Economic Research Service.

Restricted card users spent more on healthy foods



Source: USDA, Economic Research Service.

card. Cash was provided to prepaid card recipients so that they were not completely restricted in their lunch purchases. For example, a participant with a restricted "healthy" card could have spent the $10 in cash to purchase any combination of entrée, side dish, dessert, and drink. Participants were told that all cash not spent or money left on their card would be returned to them.

Green stickers designated restricted cards. The same stickers were used to identify the healthy food choices on the menu and in front of the items offered in the cafeteria line. Participants were informed that the debit card could only be used for these items, and that they could use cash for other menu items.

The researchers found the frequency with which certain foods were ordered differed significantly by payment type. Students using the unrestricted debit card were about 25 percent more likely to purchase a brownie, 27 percent more likely to buy soda, and 7 percent less likely to buy skim milk than those using cash. Individuals using the unrestricted card were more likely to buy less healthful (though similarly priced) side items and desserts than those using cash. These participants also tended to substitute soft drinks for skim milk. Purchases by students using the restricted debit card were markedly different than those by students using either the cash or the unrestricted cards. In nearly every case, students were more likely to order healthy items when purchase options were restricted.

The form of payment also led to significant differences in diet quality. Those using the unrestricted debit card ate significantly more calories than either the cash or restricted groups, with restricted-debit card users consuming the fewest calories. The calories derived from healthful foods varied as well. Those using the unrestricted card consumed the most calories at lunch but had the fewest calories from nutritious foods. By comparison, students using the restricted debit card consumed the fewest total calories but the most calories from nutritious foods. Compared with the students who used the unrestricted card, those using the restricted debit card also ate significantly less added sugar, total fat, saturated fat, and caffeine.

The researchers also found that total spending varied by payment method. Surprisingly, individuals using cash spent more on average than those with an unrestricted prepaid card. Students using the restricted card spent the least on less nutritious items, while those using the unrestricted card spent the most on these foods.

To test the potential efficacy of pre-ordering, these same researchers asked participants in a pre-selected group to make their food choice off a menu board and fill out an order card prior to entering the cafeteria. A researcher accompanied the participant to the food line and gave the order card to the food preparation staff. Another group of participants made up the control group, whose members


Cornell University

Pre-ordering of food selections by Cornell students did not always result in healthier choices.

filled out the same card in line while viewing all the menu options and handed their order directly to the foodservice staff.

The results showed that the effect of ordering in line while viewing the food was varied and may have had more to do with the visual appeal of the food than its health content. While the control group members were more likely to choose brownies than the pre-selection group members were, control group members also were more likely to choose a salad and turkey sandwiches. They were less likely to choose french fries, chicken sandwiches, and caffeinated beverages.

Can Nudging Promote Health While Preserving Choice?

The research presented here indicates that knowledge of how to successfully apply behavioral economic theory to school cafeteria settings is still in its "kindergarten stage." Results from the Cornell experiment were mixed. While allowing prepayment only for healthier foods seems a promising approach, it is not known how well it will work with school-age children in a real-world cafeteria environment. Preordering, at least as carried out in the Cornell experiment, did not reliably encourage healthier choices. It may be that other preordering approaches could be more effective—or preordering may simply not work as behavioral economic theory predicts.

Clearly, more piloting in real-world cafeteria situations with school-age children is needed before behavioral economics can graduate to being a source of recommended practices. However, these strategies offer a new set of potential options for improving choices within school cafeterias. W

This article is drawn from . . .

Behavioral Economic Concepts To Encourage Healthy Eating in School Cafeterias: Experiments and Lessons From College Students, by David R. Just, Brian Wansink, Lisa Mancino, and Joanne Guthrie, ERR-68, USDA, Economic Research Service, December 2008, available at: www.ers.usda.gov/publications/err68/

Is Dietary Knowledge Enough? Hunger, Stress, and Other Roadblocks to Healthy Eating, by Lisa Mancino and Jean Kinsey, ERR-62, USDA, Economic Research Service, August 2008, available at: www.ers.usda.gov/publications/err62/

Could Behavioral Economics Help Improve Diet Quality for Nutrition Assistance Program Participants? by David R. Just, Lisa Mancino, and Brian Wansink, ERR-43, USDA, Economic Research Service, June 2007, available at: www.ers.usda.gov/publications/err43/

You may also be interested in . . .

Nudge: Improving Decisions About Health, Wealth, and Happiness, by Richard H. Thaler and Cass R. Sunstein, Yale University Press, 2008.

"Balancing Nutrition, Participation, and Cost in the National School Lunch Program," by Constance Newman, Katherine Ralston, and Annette Clauson, in *Amber Waves*, Vol. 6, No. 4, USDA, Economic Research Service, September 2008, available at: www.ers.usda.gov/amberwaves/september08/features/balancingnslp.htm

Got Data?

Multiple Data Sources Track U.S. Food Consumption

Rosanna Mentzer Morrison, rosanna@ers.usda.gov

Travis A. Smith, tsmith@ers.usda.gov

Biing-Hwan Lin, blin@ers.usda.gov

Health professionals, farmers, food companies, and policymakers want to know what Americans are eating, both the type of foods and how much. But charting the eating habits of 300 million people is not easy. Researchers rely on a number of surveys and data sources, each with strengths and weaknesses. Some data sources depend on production or sales statistics, and others rely on consumers to report what they eat. Some surveys report food bought at grocery stores and other retailers (food at home), while others capture purchases in fast food places, restaurants, and other eating places (food away from home).

ERS food availability data measure the flow of raw and semi-processed food commodities through the U.S. marketing system. Going back to 1909 for most commodities, the food availability data are useful for understanding national trends in food consumption and for calculating the approximate nutrient content of the food supply. Adjusting U.S. production for exports and imports, seed and feed use, beginning and ending inventories, and industrial uses yields the amount of a commodity available for domestic consumption. To get closer to actual consumption amounts, ERS produces a second data series that adjusts the availability data to account for spoilage, plate waste, and losses from nonedible parts (see table on page 41).

Surveys are another way to measure consumption or intake. Food intake surveys, such as the National Eating Trends Survey, rely on consumers keeping food diaries or, in the case of the National Health and Nutrition Examination Survey (NHANES), being asked to recall what they and their families ate during the previous 24 hours. Reporting bias is a potential shortcoming of diaries and recalls; for example, consumers may over-report their intakes of nutritious foods or under-report less healthy foods. NHANES also collects information through a physical exam on respondents' height, weight, blood pressure, cholesterol levels, and other health markers, making the data useful for examining the relationship between food consumption, diet, and health conditions of the U.S. population.

Using consumer purchase surveys, such as Nielsen's Homescan Consumer Panel, or grocery store sales data from such surveys as InfoScan and Scantrack Services, researchers can analyze what consumers purchased, but not necessarily what they ate, particularly if spoilage or waste is high. Homescan is unique in that it contains both quantity and expenditure data; however, it does not include information on food eaten in restaurants or institutions, such as hospitals and schools. Surveys like NHANES and Homescan, which collect demographic information about survey participants, can be used to determine consumption patterns for specific demographic groups. Researchers choose the data set that is best suited for the focus of their study.

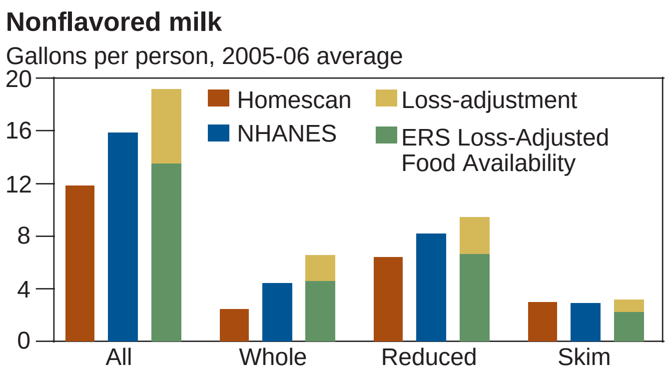
To discover how closely the different consumption estimates derived from these data sources track each other, ERS researchers compared in the following charts, three foods and three data sources: ERS Loss-Adjusted Food Availability, NHANES consumer recall, and Nielsen Homescan Consumer Panel data.

For more information, see:

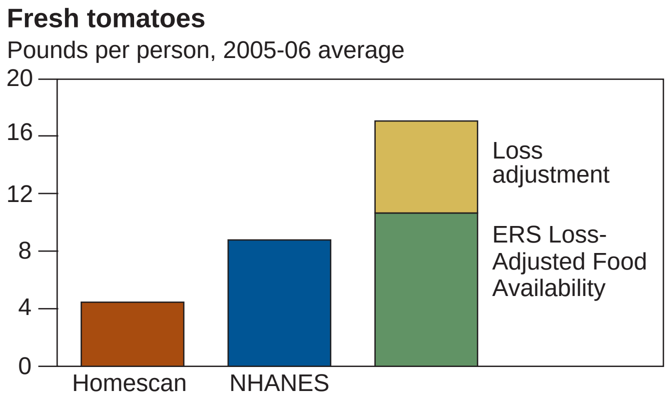
ERS Food Availability (Per Capita) Data System, available at: www.ers.usda.gov/data/foodconsumption/

ERS Briefing Room on Food Assistance and Nutrition Programs: Recommended Data, available at: www.ers.usda.gov/briefing/foodnutritionassistance/data/

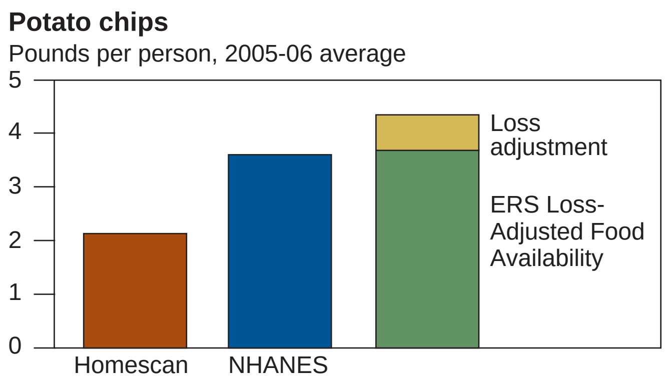
STATISTICS



- ERS data indicate that the average American drank 13.5 gallons of milk per year in 2005-06, compared with 15.9 gallons for people recalling their milk consumption for the NHANES interviewer. This difference could arise from NHANES respondents inflating their consumption of reduced-fat milk, or from over-estimation of loss in the ERS data.
- It is not surprising that the Homescan measure is lower (11.8 gallons per person) because it does not capture milk provided by schools or consumed in restaurants.



- ERS data report the highest total for fresh tomato consumption at 10.6 pounds per person, compared with 8.8 pounds in the NHANES data. When tomatoes are used as an ingredient in a food, such as stew or salad, NHANES respondents will report eating the stew or the salad, not fresh tomatoes, thus under-estimating fresh tomato intake. Also, ERS may be under-estimating loss for fresh tomatoes.
- The lower 4.5 pounds per capita from the Homescan data point out the importance of fresh tomatoes—salads, salsas, and sandwich toppings—in the foodservice sector. According to NHANES, 36 percent of fresh tomatoes are eaten away from home. Even after accounting for the away-from-home market, the Homescan consumption amount is lower than expected when compared with the ERS data.



- Intake of potato chips from NHANES (3.61 pounds per person) is quite similar to the ERS measure (3.68 pounds). The small difference between intake and adjusted availability likely reflects improvements in NHANES survey techniques for helping respondents recall their intake of foods known to be under-reported.
- Homescan data show at-home purchases of potato chips at 2.14 pounds per person, a relatively low number that does not include chips eaten at restaurants or institutions.

Source for all charts: Calculated by USDA, Economic Research Service using ERS Food Availability Data, USDA/HHS National Health and Nutrition Examination Survey (NHANES) data, and Nielsen Homescan Consumer Panel data.

Research objectives drive the data source used (selected surveys and data series)

	Database/ Source	Description	Time period	Sample	Major uses and content	Major weaknesses
Supply	**Food Availability Data** *ERS, USDA*	Annual estimates of commodities available for U.S. consumption based on production adjusted for inventory changes, exports, imports, and nonfood uses.	Annual data; 2-year lag between collection and release.	Estimates not based on sampling.	Analyze trends and shifts in food supply. Calculate nutrient content of food supply. Series dates back to 1909.	National averages only. Overstates actual consumption.
	Loss-Adjusted Food Availability Data *ERS, USDA*	Adjustment factors for spoilage and other losses applied to availability data to approximate actual consumption.	Annual data; 2-year lag between collection and release.	Estimates not based on sampling.	Compare consumption estimates to *Dietary Guidelines* and MyPyramid. Series dates back to 1970.	National averages only. Requires assumptions on food loss, waste, and spoilage.
Consumer-reported intake	**NHANES** *USDA/DHHS*	Food intake by individuals based on 24-hour recall for 2 days; includes personal, economic, health status, and demographics of sampled person only; includes where food was purchased and eaten.	Annual data; 2-year lag between collection and release.	Nationally representative sample of 5,000 individuals.	Compare intake with *Dietary Guidelines*. Analyze effects of individual characteristics on food consumption. Link food intake with health outcomes.	Food intake recall method undercounts calories; no food prices.
	National Eating Trends *NPD Group*	Food intake by individuals based on a 2-week diary includes personal, economic, health information, and demographics of each household member; includes where food was purchased and eaten.	Quarterly data; 3-month lag between collection and release.	Nationally representative sample of 2,000 households and 5,000 individuals.	Compare intake with *Dietary Guidelines*. Analyze effects of household and individual characteristics on food consumption. Link food intake with health conditions, exercise, and attitudes.	Self-reported diary reduces reliability. Based on frequency of consumption; amount consumed derived from NHANES average serving size.
Consumer purchases	**Consumer Report on Eating Share Trends** *NPD Group*	Individual food purchases at commercial and noncommercial foodservice establishments; includes check for the visit and identifies establishment.	Monthly data; 1-month lag between collection and release. Noncommercial data released semi-annually with 6-week lag.	Nationally representative sample of 640,000 individuals.	Analyses of household food-away-from-home purchases. Menu information allows evaluation of nutrient content as well as price and quantity studies.	Self-reported diary reduces reliability. Does not include food prepared at home.
	Consumer Expenditure Survey *Bureau of Labor Statistics, U.S. Dept. of Labor*	Household spending on at-home and away-from-home food; limited breakdown of spending for food away from home.	Annual data; 1-year lag between collection and release.	Nationally representative survey of 7,500 households.	Analyses of yearly consumer food spending.	Self-reported diary reduces reliability. No information on quantities or prices.
	Homescan Consumer Panel *Nielsen*	Household panel members scan food purchases from all retail stores (food at home); includes prices, quantities, promotion information, and demographics.	Daily and weekly data; 6-week lag between collection and release.	Nationally representative panel of 125,000 households.	Analyses of household purchases, including prices and quantities. Includes random-weight products. Captures sales from all retail stores.	Not as accurate as point-of-sale data for estimating national sales. Does not include food away from home.
Store sales	**InfoScan** *Information Resources Inc.*	Point-of-sale data for food stores, drug stores, dollar stores, and mass merchandisers.	Weekly data; 11-day lag between collection and release.	Nationally representative sample of 34,000 retail outlets.	Analyses of sales, prices, and quantities for stores.	Does not include non-UPC coded products or sales from Wal-Mart or Costco.
	Scantrack Services *Nielsen*	Point-of-sale data for food stores, food/drug combinations, drug stores, and mass merchandisers.	Weekly data; 2-week lag between collection and release.	Nationally representative sample of 4,100 stores.	Analyses of sales, prices, and quantities for stores.	Does not include non-UPC coded products or sales from Wal-Mart.

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

	2004	2005	2006	2007	2008	Annual percent change 2004-05	2005-06	2006-07	2007-08
Cash receipts ($ bil.)	237.2	240.9	240.8	284.8 p	323.4 f	1.6	0.0	18.3	13.6
Crops	113.6	116.0	122.6	147.0	179.9 f	2.1	5.7	19.9	22.4
Livestock	123.6	124.9	118.2	137.9	143.5 f	1.1	-5.4	16.7	4.1
Direct government payments ($ bil.)	13.0	24.4	15.8	11.9	12.5 f	87.7	-35.2	-24.7	5.0
Gross cash income ($ bil.)	267.3	281.5	274.1	313.4	353.5 f	5.3	-2.6	14.3	12.8
Net cash income ($ bil.)	82.3	86.6	68.0	87.4	90.7 f	5.2	-21.5	28.5	3.8
Net value added ($ bil.)	127.6	123.6	103.1	135.2	134.9 f	-3.1	-16.6	28.5	1.8
Farm equity ($ bil.)	1,434.6	1,642.2	1,851.0	1,998.4	2,134.5 f	14.5	12.7	8.0	6.8
Farm debt-asset ratio	11.3	10.5	9.6	9.6	9.2 f	-7.1	-8.6	0.0	-4.2
Farm household income ($/farm household)	80,843	81,086	81,251	86,223	87,138 f	0.3	0.2	6.1	1.1
Farm household income relative to average U.S. household income (%)	133.7	128.0	122.1	127.5	na	na	na	na	na
Nonmetro-metro difference in poverty rate (% points)[1]	na	2.3	3.4	5.5	na	na	na	na	na
Cropland harvested (million acres)	312	314	304 p	na	na	0.6	-3.2	na	na
USDA conservation program expenditures ($ bil.)[1,2]	4.1	4.3	4.3	4.4 p	5.0 f	4.9	0.0	2.3	13.6

Food and Fiber Sector Indicators

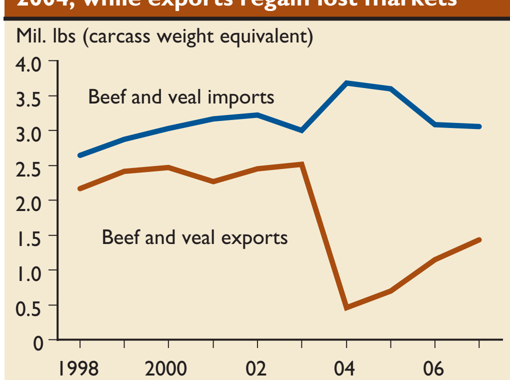
	2004	2005	2006	2007	2008	2004-05	2005-06	2006-07	2007-08
U.S. gross domestic product ($ bil.)	11,686	12,434	13,195	13,844	na	6.4	6.1	4.9	na
Share of agriculture & related industries in GDP (%)[1]	4.8	4.5	4.3	na	na	-6.3	-4.4	na	na
Share of agriculture in GDP (%)[1]	1.0	0.8	0.7	na	na	-16.3	-12.5	na	na
Total agricultural imports ($ bil.)[2]	52.7	57.7	64.0	70.1	79.3	9.5	10.9	9.5	13.1
Total agricultural exports ($ bil.)[2]	62.4	62.5	68.6	82.2	115.5	0.2	9.8	19.8	40.5
Export share of the volume of U.S. agricultural production (%)[1]	22.8	21.5	23.0	23.8 p	na	-5.7	7.0	3.5	na
CPI for food (1982-84=100)	186.2	190.7	195.3	202.9	214.1	2.4	2.4	3.9	5.5
Share of U.S. disposable income spent on food (%)	9.7	9.8	9.8	9.8	na	1.0	0.0	0.0	na
Share of total food expenditures for at-home consumption (%)	51.4	51.4	51.1	51.2	na	0.0	-0.6	0.2	na
Farm-to-retail price spread (1982-84=100)	232.1	239.2	246.2	248.3	na	3.1	2.9	0.9	na
Total USDA food and nutrition assistance spending ($ bil.)[2]	46.2	50.9	53.1	54.3	na	10.2	4.3	2.3	na

f = Forecast. p = Preliminary. na = Not available. All dollar amounts are in current dollars.

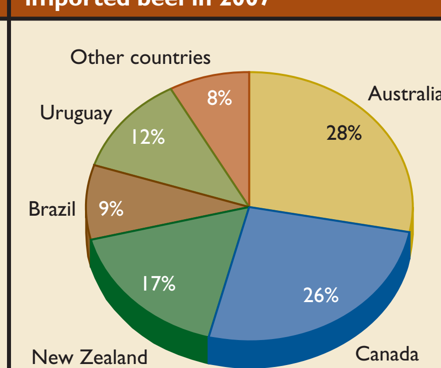
[1] The methodology for computing these measures has changed. These statistics are not comparable to previously published statistics. Sources and computation methodology are available at: www.ers.usda.gov/amberwaves/indicatorsnotes.htm

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

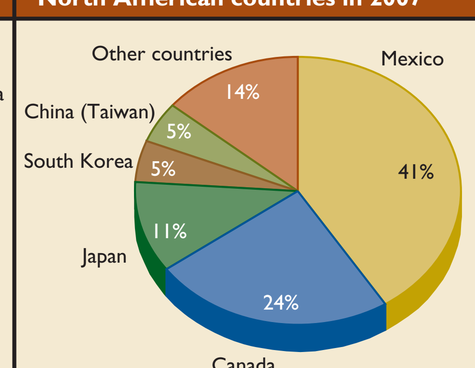
U.S. imports of beef and veal declining since 2004, while exports regain lost markets



Australia was the largest source of imported beef in 2007



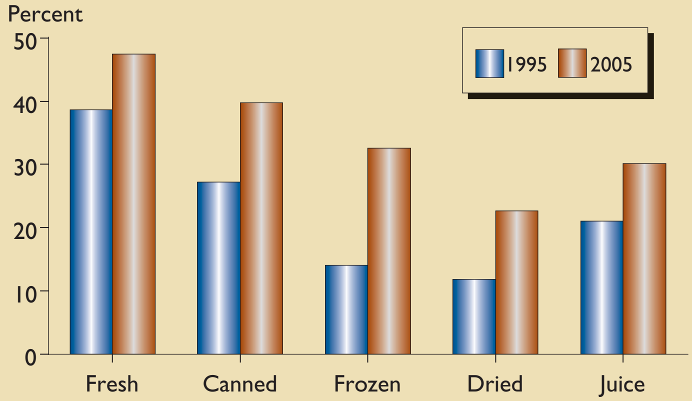
Most U.S. beef exports went to North American countries in 2007



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

Markets and Trade

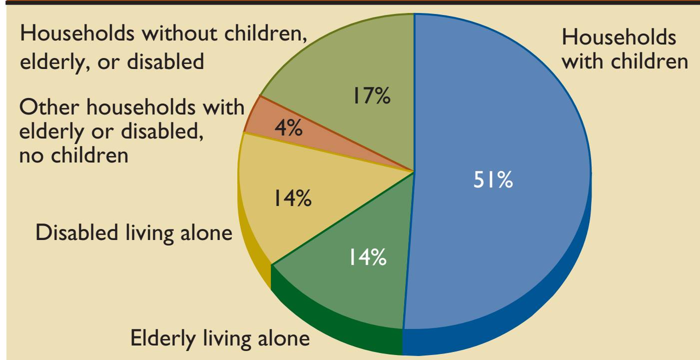
U.S. fruit imports gaining in share of domestic consumption



Source: USDA, Economic Research Service.

Diet and Health

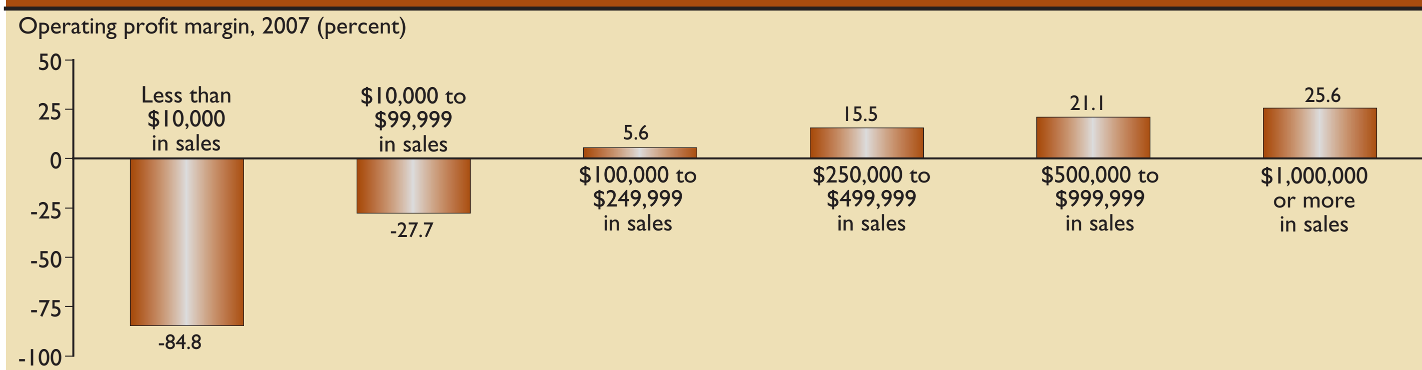
Over 83 percent of the 11.6 million U.S. households receiving SNAP benefits in FY 2007 had at least one child, elderly person, or disabled person



Source: Prepared by USDA, Economic Research Service using data from USDA's Food and Nutrition Service.

Farms, Firms, and Households

Operating profit margins for farms increase with sales

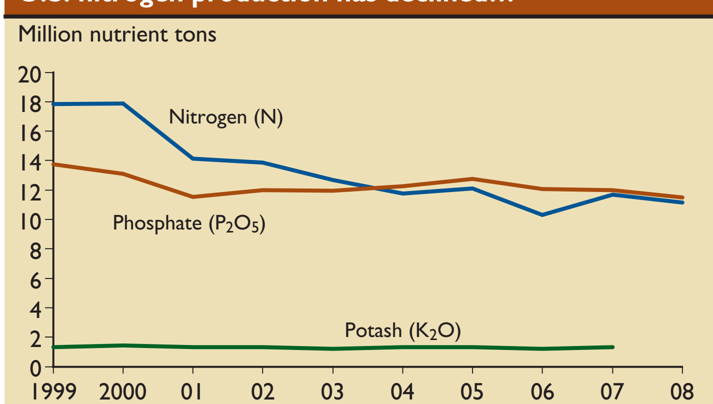


Note: Operating profit margins indicate the percentage of revenue retained as profit and are more fully defined in *Structure and Finances of U.S. Farms: Family Farm Report, 2007 Edition*, www.ers.usda.gov/publications/eib24/.

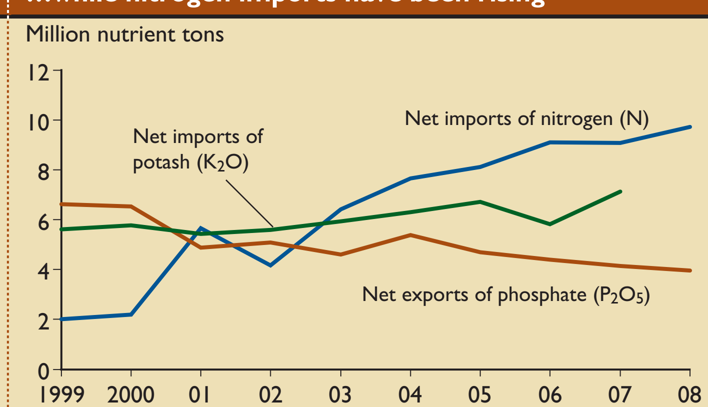
Source: USDA, Economic Research Service, 2007 Agricultural Resource Management Survey, Phase III.

Resources and Environment

U.S. nitrogen production has declined…



…while nitrogen imports have been rising



Note: Nitrogen and phosphate data are in fertilizer years (July to June), while potash data are in calendar years.

Source: USDA, Economic Research Service, using nitrogen and phosphate data from U.S. Department of Commerce and potash data from U.S. Geological Survey.

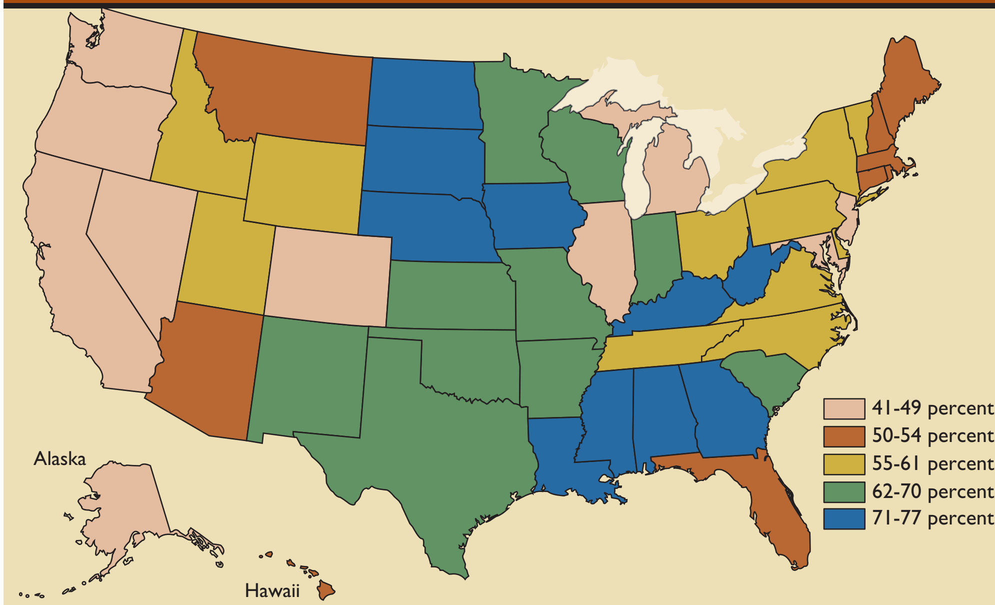
On the Map

National School Lunch Program Feeds 30 Million Children

In the 2006-07 school year, over 30 million school children, 57 percent of the U.S. population age 5-17, participated in USDA's National School Lunch Program. Iowa, Kentucky, Nebraska, North Dakota, and South Dakota had the highest participation rates—above 75 percent. Income-eligible students can receive lunches for free or at a reduced price. Nationally, 54 percent of students participating in the program received a free or reduced-price lunch in 2006-07. Colorado, Maryland, and New Jersey had some of the lowest overall participation rates and were among the 21 States where less than half of the participants received free and reduced-priced lunches.

Melissa Musiker,
mmusiker@ers.usda.gov

Percent of children age 5-17 participating in the National School Lunch Program, fiscal year 2007



Source: Prepared by USDA, Economic Research Service using data from USDA's Food and Nutrition Service, U.S. Census Bureau, and the Food Research and Action Coalition.

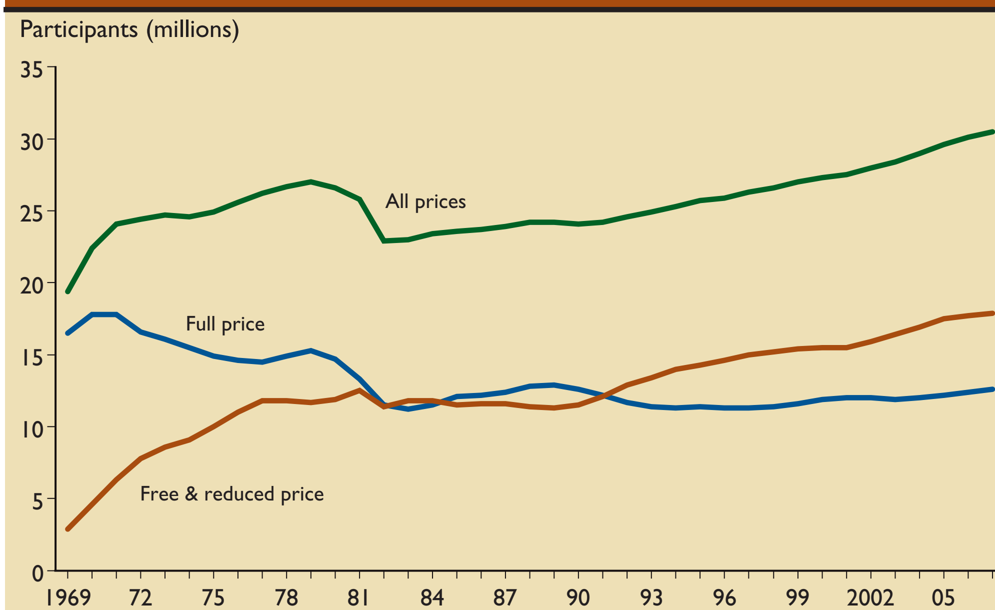
In the Long Run

National School Lunch Program Participation Up 57 Percent Since 1969

Since 1969, the sixfold increase in the number of students receiving free and reduced-price lunches has been the driving force behind the growth in USDA's National School Lunch Program. In the 1970s, laws relaxed eligibility criteria and prohibited overt identification of children receiving free and reduced-price meals, and the number of free and reduced-price participants grew by 154 percent. The Omnibus Budget Reconciliation Acts of 1980 and 1981 temporarily halted this upward trend by establishing stricter income guidelines and requiring income verification. Since 1990, the number of children receiving free and reduced-price lunches has grown from 11.5 to 17.9 million.

Melissa Musiker,
mmusiker@ers.usda.gov

National School Lunch Program participation by price paid for meals



Source: Prepared by USDA, Economic Research Service using data from USDA's Food and Nutrition Service.