Amber Waves

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FINDINGS

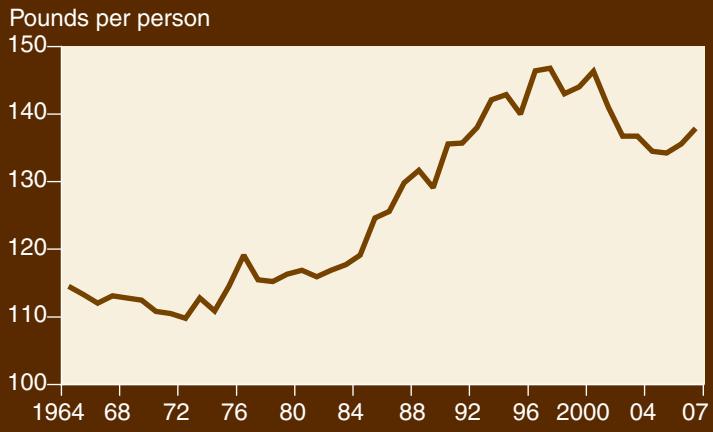
Consumer Preferences Change Wheat Flour Use

After 5 years of declining flour use in the U.S., ERS estimates an increase in per capita wheat flour use to 137.9 pounds in 2007, up 2.3 pounds from a year earlier. The 2007 total is still down 8.9 pounds from its high in 1997. ERS calculates per capita use by dividing the total annual availability by the U.S. population in the same year. These per capita availability estimates provide an indication of trends in Americans' consumption of various foods over time.

Between 1972 and 1997, U.S. wheat producers and millers could count on rising per capita food use of wheat flour to expand their domestic market. Contributing to this growth was the boom in away-from-home eating, the desire of consumers for greater variety and more convenient food products, promotion of wheat flour and pasta products by industry organizations, and wider recognition of health benefits stemming from eating high-fiber, grain-based foods.

The decades-long growth ended in 1997, as changing consumer preferences, led by the increased adoption of low-carbohydrate diets after 2000, reduced per capita wheat consumption. Per capita flour use dropped rapidly at first and then fell more slowly until reaching a low of 134.2 pounds in 2005. In response, the flour milling industry began to downsize, leading to the closure of some smaller, older, and less efficient mills. From 2000 to early 2006, 12 percent of the 223 mills listed in the industry publication *Grain and Milling Annual* closed, and milling capacity fell by 7 percent.

U.S. per capita wheat flour use



Source: USDA, Economic Research Service.

The baking industry responded by developing products to satisfy these new dietary preferences, particularly the increased demand for higher fiber and protein. According to Datamonitor, 558 wheat-flour products were introduced in 2007—more than a fourfold increase from the 97 new wheat-flour products that hit the shelves in 1997. Eighty-six whole-wheat flour products were introduced in 2007, up from 16 in 1997. These new product introductions appear to be succeeding because per capita use bottomed out and then rose sharply in 2007.

Despite the recent increase in per capita consumption and new recommendation in the 2005 *Dietary Guidelines for Americans* that whole grains should account for half of all grains consumed, Americans still favor refined-wheat flour products over whole-wheat flour products. According to *Milling & Baking News*, whole-wheat flour grew from 2.1 percent of total flour production in 2002-03 to 4.1 percent in 2006-07.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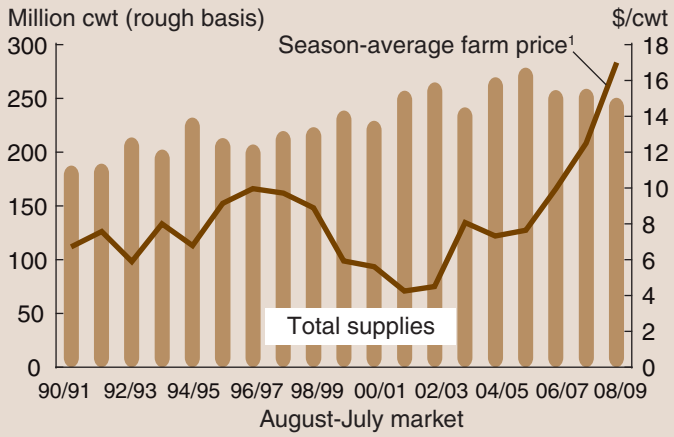
ERS Food Availability (Per Capita) Data System, available at: www.ers.usda.gov/data/foodconsumption

What's Behind the Surge in Global Rice Prices?

U.S. and global rice prices surged to record highs this spring. Thailand's high-quality long-grain rice—a benchmark for global trading prices—exceeded $1,000 per ton in late April 2008, double its price in early February and triple prices of a year earlier. U.S. prices soared as well, with long-grain milled rice quoted at $950 per ton, up $410 from early February and more than double the price of a year earlier. The global market has a big impact on U.S. prices, as the U.S. exports about half its crop each year. Global prices have declined about 25 percent since late April; U.S. prices have dropped about 13 percent.

The 2008/09 U.S. season-average farm price is the highest on record



[1]2008/09 mid-point of range.

Sources: USDA, Economic Research Service, 1990/91-2005/06, 2007 *Rice Yearbook*; 2006/07-2008/09, World Agricultural Supply and Demand Estimates, www.usda.gov/oce/commodity/wasde/index.htm

The rapid price increases were not due to poor harvests, a surge in demand, or a tight global supply situation. Global rice production in 2007-08 was the largest on record, and the 2008-09 crop is forecast to be even larger. Global ending stocks actually increased in 2007-08, and are projected to rise this year, as well. Instead, factors not directly related to rice market fundamentals accounted for the surge in prices.

Export bans, restrictions, and taxes implemented by several major suppliers were the most important factors behind the price surge. In fall 2007, Vietnam and India, the second- and third-largest global exporters of rice, placed partial bans or restrictions on new sales. Then, in December 2007, China announced an export tax. The bans, restrictions, and taxes were imposed to ensure affordable domestic prices for rice, a key food staple in Asia, in an environment where rising fuel and commodity prices are eroding the purchasing power of low-income Vietnamese, Indian, and Chinese consumers. However, by insulating and stabilizing rice prices in domestic markets, these actions reduced the availability of rice on global markets, and world rice prices began to rise.

The price increases accelerated in March 2008 when India and Vietnam reimposed their bans, and two smaller exporters, Egypt and Cambodia, announced temporary bans as well. Prices were further boosted when the Philippines—the world's largest rice importer—attempted to purchase large amounts of rice to ensure adequate supplies and limit food price increases. Finally, in late April 2008, Pakistan announced minimum export prices for various grades of rice. By early May, among top global exporters, only Thailand and the U.S. were not restricting sales.

Three other factors also contributed to the surge in global rice prices. First, prices for fuel and fertilizer—major farm inputs—reached record levels. Second, prices for most other agricultural commodities, such as wheat, corn, and soybeans, were at or near-record highs. And finally, the weak U.S. dollar boosted global prices since most rice is traded in dollars.

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This finding is drawn from . . .

Rice Outlook, by Nathan Childs, RCS-08g, USDA, Economic Research Service, July 2008, available at: http://usda.mannlib.cornell.edu/usda/ers/rcs//2000s/2008/rcs-07-14-2008.pdf

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

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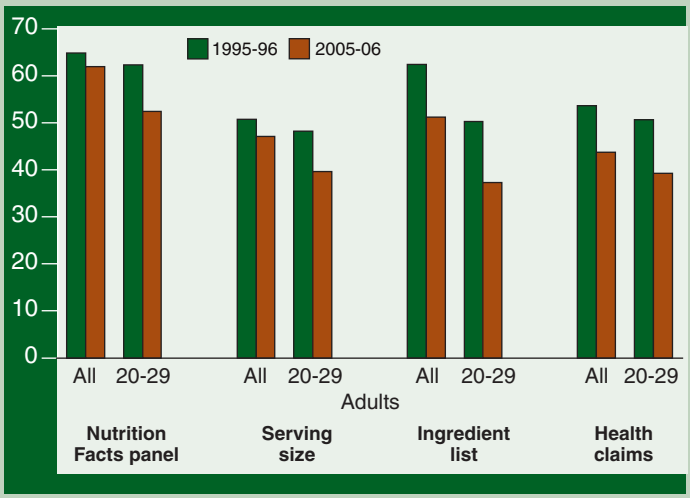
Young adults increasingly less likely to check nutrition information when food shopping

Percent reporting regular use of nutrition labels



Source: Calculated by USDA, Economic Research Service using data from the 1995-96 Continuing Survey of Food Intakes by Individuals and the 2005-06 Flexible Consumer Behavior Module in the National Health and Nutrition Examination Survey.

Use of Nutrition Labels Declining, Especially Among Young Adults

For more than 10 years, Americans have had access to standardized nutrition information on almost all packaged foods. The current format of the Nutrition Facts panel was introduced in 1994, following the Nutrition Labeling and Education Act (NLEA) of 1990. In addition, Federal regulators placed strict requirements on the content and wording of health claims made on food packages.

In creating standards for the presentation and content of nutritional information, NLEA made it easier for consumers to make more healthful food choices. Prior to NLEA, approximately 70 percent of adults reported using nutrition labels when making food purchases. A 1995-96 survey found no increase in label use, but consumers did report that the new labels made it easier to make more healthful food choices.

According to recent ERS analyses, label use is lower today than in 1995. After controlling for changes in population demographics, label use when food shopping dropped from 65 percent in 1995 to 62 percent in 2005. The decline in use of health claims was larger: 44 percent in 2005 versus 54 percent in 1995. For those who reported using labels, the proportion that referenced information about calories declined from 76 percent in 1995 to 68.5 percent in 2005, while use of fiber information increased slightly.

The decline in label use was greater among adults 20 to 29 years old than among other groups of U.S. consumers. Use of the Nutrition Facts panel by this group fell from 62 percent in 1995 to 52 percent in 2005, three times the decline observed among all adults. The decrease in use of information on calories, fat, cholesterol, and sodium was also greater among young adults than among all adults.

Today's young adults may use nutrition labels less than their predecessors because they were not exposed to the informational campaigns that introduced the new labels. Alternatively, since young adults eat out more often than others, their benefits of label use may be lower since restaurants are not required to provide nutrition information. Moreover, nutritional information is currently available from other sources, such as the Internet, which young adults may be more likely to access than older consumers. More generally, other information on food labels, such as country of origin, production methods, and trade practices, may compete with nutrition information for consumers' attention during their limited shopping time.

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This finding is drawn from . . .

The Decline in Consumer Use of Food Nutrition Labels, 1995-2006, by Jessica E. Todd and Jayachandran N. Variyam, ERR-63, USDA, Economic Research Service, August 2008, available at: www.ers.usda.gov/publications/err63

Despite Higher Food Prices, Percent of U.S. Income Spent on Food Remains Constant

Over the past 2 years, U.S. food prices have risen faster than at any time since 1990. Prices for all food purchased in the U.S. increased 4.0 percent in 2007, up from the 2.4-percent gain in 2006.

The U.S. Department of Labor's Bureau of Labor Statistics collects price data for food purchased in grocery stores and other retailers (food at home) and food purchased at restaurants and other eating places (food away from home). Together these two categories are combined to determine the Consumer Price Index (CPI) for all food. Prices for food-at-home rose 4.2 percent in 2007, while food-away-from-home prices increased 3.6 percent. In 2008, food-at-home prices are projected to be up 5 to 6 percent, while prices for food away from home are expected to rise 3.5 to 4.5 percent.

The jump in prices for food at home reflects relatively large increases for staples such as milk, eggs, vegetable oil, and bread. In 2007, retail milk prices rose 11.6 percent, and egg prices were up 29.2 percent, while vegetable oil and bread prices are expected to increase 9 percent or more in 2008. Higher fuel costs for transporting foods to grocery stores and restaurants also contributed to rising food prices.

The average U.S. consumer spent 9.8 percent of disposable personal income (income available after taxes) on all food in 2007—5.7 percent on food at home and 4.1 percent on food away from home. The percentage of disposable income spent on all food, food at home, and food away from home remained constant from 2005 to 2007.

Although food prices rose at an accelerated rate in 2007, Americans overall still spent less than 10 percent of their disposable income on food. Between 1970 and 2005, the percentage of disposable income spent on all food fell from 13.9 to 9.8 percent on average. This drop occurred because prices of other consumer goods outpaced the price of food, and incomes rose at a faster rate than food prices. Disposable personal income increased 5.7 percent in 2007, after increasing 5.9 percent in 2006.

Government surveys indicate that lower income consumers spend a larger share of their available income on food than middle- or higher income consumers. Data from the 2005 Consumer Expenditure Survey indicate that households earning $10,000 to $14,999 a year, before taxes, spent an average of 25 percent of their income on food. Households earning $15,000 to $19,999 a year, before taxes, spent 19 percent of their income on food in 2005. The recent accelerated increase in food prices is likely to result in lower income households spending an even greater share of their available money on food in 2008.

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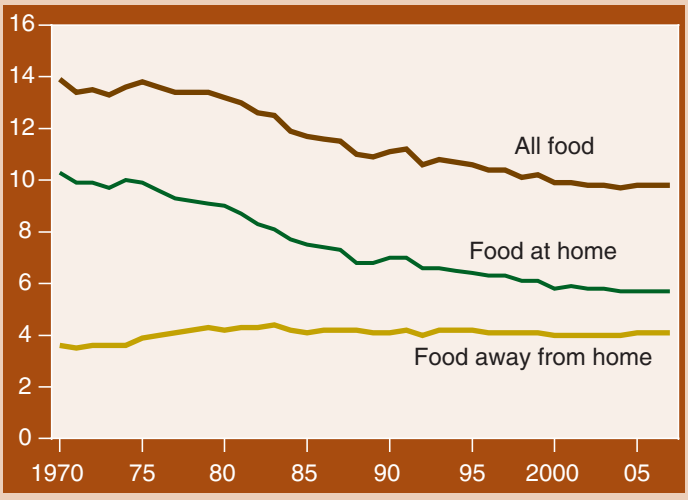
This finding is drawn from . . .

ERS Briefing Room on Food CPI, Prices, and Expenditures, available at: www.ers.usda.gov/briefing/cpifoodandexpenditures

R.M. Morrison, USDA/ERS

Percent of income spent on food has been constant in recent years

Percent of disposable personal income



Source: USDA, Economic Research Service analysis of U.S. Department of Commerce, Bureau of Economic Analysis data.

Rapid Growth in Adoption of Genetically Engineered Crops Continues in U.S.

Scott Bauer, USDA/ARS

U.S. farmers have rapidly adopted genetically engineered (GE) soybeans, cotton, and corn with herbicide tolerance and/or insect resistance traits over the 13 years since their commercial introduction. According to ERS research, U.S. farmers are realizing economic benefits from GE crops, including higher yields, lower pesticide costs, and savings in management time. The impacts of GE crops vary with the crop, technology, pest infestation levels, and other factors.

Herbicide-tolerant (HT) crops are treated with certain effective herbicides, allowing adopters of these varieties to control pervasive weeds more effectively. In the U.S., HT soybean adoption has expanded more rapidly and widely than other GE crops, reaching 92 percent of planted soybean acreage in 2008. The second most adopted variety, HT cotton, was planted on 68 percent of cotton acreage. The level of HT corn adoption, which had been modest in earlier years, has recently accelerated, reaching 63 percent of U.S. corn acreage.

Insect-resistant (Bt) crops contain a gene from the soil bacterium *Bacillus thuringiensis* that produces a protein toxic to specific insects. Bt cotton, which controls tobacco budworm, bollworm, and pink bollworm, was planted on 63 percent of U.S. cotton acreage in 2008. Adoption of Bt corn plateaued in the U.S. during 1998-2002 because farmers who needed to protect their crops against the European corn borer had already adopted it. However, adoption of Bt corn is increasing again since a Bt variety to control corn rootworm was introduced in 2003. Bt corn was planted on 57 percent of U.S. corn acreage in 2008.

The rapid increase in the adoption of crop varieties with more than one GE trait (stacked traits) continues. Corn varieties with both Bt and HT traits grew from 1 percent of corn-planted acres in 2000 to 40 percent in 2008, while cotton varieties with stacked traits increased from 20 to 45 percent of cotton-planted acres in the same period.

In addition to corn, soybeans, and cotton, U.S. farmers have adopted HT canola and virus-resistant papaya and squash. Moreover, other GE crops are in various stages of development. As of May 2008, USDA's Animal and Plant Health Inspection Service had approved 1,311 field-testing applications for crops with resistance to virus, 842 for resistance to fungi, 2,200 for improved agronomic properties (such as resistance to cold, drought, and salinity), and 3,362 for higher product quality (including crops with increased protein and/or oil content, and crops with added vitamins and iron).

Worldwide, more than 280 million acres of GE crops with HT and/or Bt traits were planted in 23 countries in 2007, with the U.S. accounting for about 50 percent. Argentina, Brazil, Canada, India, China, Paraguay, and South Africa accounted for about 49 percent.

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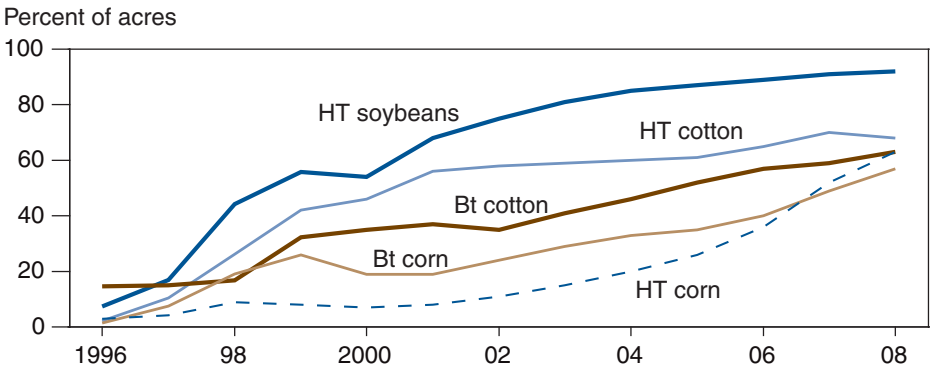
Use of genetically engineered crops continues to grow in the U.S.



HT= herbicide tolerant. Bt = Insect resistant. Data for each crop category include varieties with both HT and Bt (stacked) traits.

Source: USDA, Economic Research Service.

This finding is drawn from . . .

ERS Data on Adoption of Genetically Engineered Crops in the U.S., available at: www.ers.usda.gov/data/ biotechcrops/

The First Decade of Genetically Engineered Crops in the United States, by Jorge Fernandez-Cornejo and Margriet Caswell, EIB-11, USDA, Economic Research Service, April 2007, available at: www.ers.usda.gov/publications/eib11/

Fee Hunting May Boost Farm Income, Wildlife Habitat

Mark Vandever, USGS

Hunting is a recreation activity that mostly occurs on private land, where the right to hunt is controlled by landowners. In most cases, such use of private land is arranged through personal contacts. However, some U.S. landowners market hunting opportunities by managing wildlife on their property and charging hunters a fee to access their land. In their attempts to provide hunting experiences worth paying for, these landowners may also provide a public service for those who value wildlife for reasons other than hunting.

Access to private land for hunting is becoming more limited, helping to explain recent declines in hunting participation rates, as measured by the U.S. Department of the Interior's Fish and Wildlife Service. Encouraging more landowners to offer fee hunting can offset this trend, providing enhanced opportunities to hunters while augmenting landowners' income. But could fee hunting also benefit game and nongame species by encouraging landowners to make improvements in wildlife habitat?

To explore this issue, ERS recently examined the implications of expanded fee hunting on land enrolled in the Conservation Reserve Program (CRP). The CRP retires environmentally sensitive cropland from production and pays the owners to plant conservation cover. The ERS study considers a nationwide program similar to existing State programs (such as those in Kansas and South Dakota) that encourage landowners to grant hunters access to their land.

The impacts of such a program were simulated using the CRP "Likely To Bid" Model, which ERS developed jointly with USDA's Farm Service Agency. When combined with an estimate of the demand for wildlife-based recreation within each county, the model predicts changes in the type and geographic distribution of land enrolled in the CRP as landowners take fee hunting opportunities into account.

The ERS study found that hunting fees increase landowners' willingness to participate in the CRP by supplementing CRP rental payments. An estimated 3 million acres, or 8 percent of all CRP land, would shift into counties where hunting demand is greatest. CRP payments in these counties increase by about 10 percent, reflecting both greater enrollment and higher rental rates due to an approximately 25-percent increase in the wildlife attributes of land enrolled.

In essence, where feasible, hunting fees motivate landowners to install wildlife-friendly land-use practices. On land that is eligible for the CRP, improving wildlife habitat increases the likelihood of being accepted into the program, allowing landowners to receive CRP and hunting fee income. Elsewhere, landowners may find that by improving wildlife habitat, they can provide higher quality hunting experiences—thereby generating higher hunting fee income.

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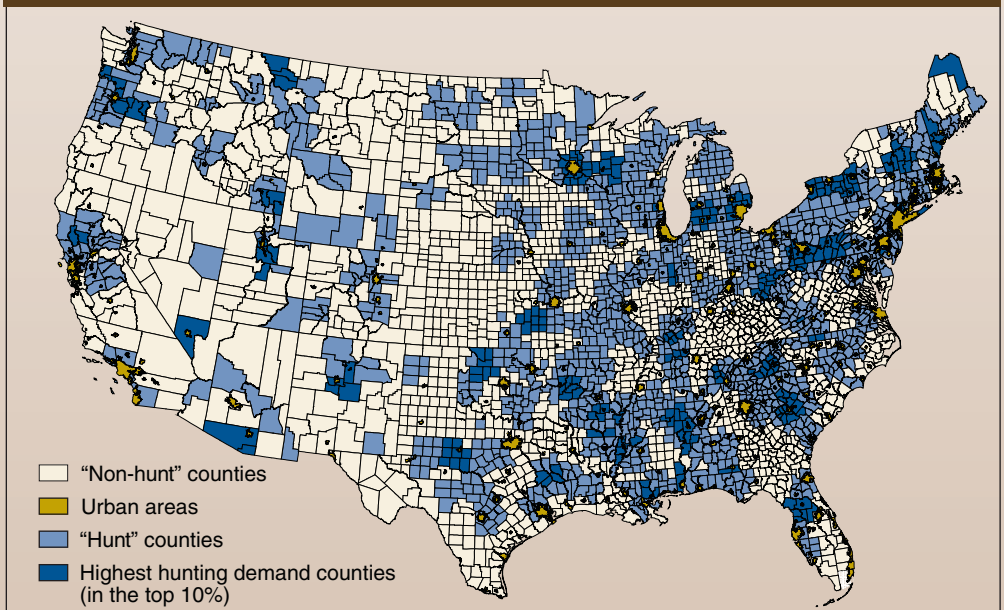
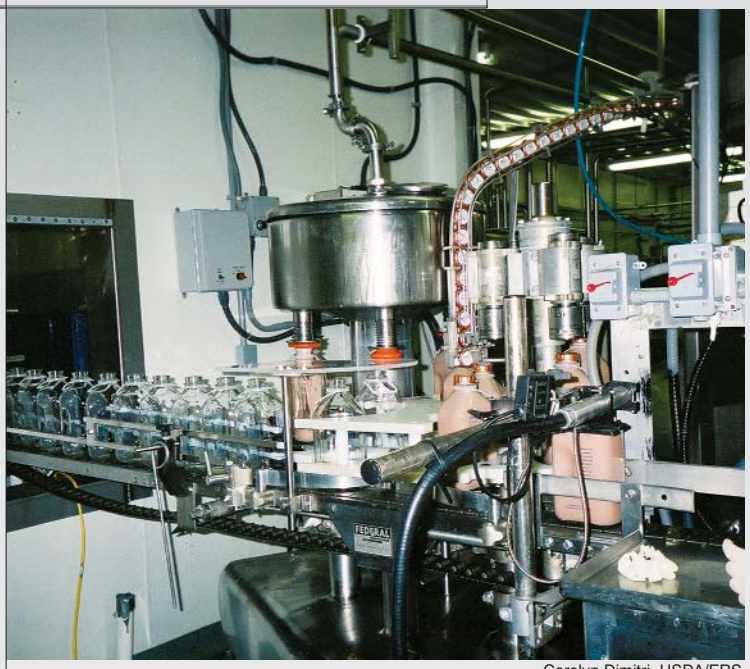
This finding is drawn from . . .

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

Demand for access to private lands for hunting is highest in the East



Source: USDA, Economic Research Service, using the 2001 Fishing, Hunting, and Wildlife Associated Recreation Survey and the 2000 National Survey of Recreation and the Environment. Counties with higher than average demand for hunting are classified as "hunt counties" and are assumed to be most able to support fee hunting.



Carolyn Dimitri, USDA/ERS

U.S. Organic Handlers Mostly Small, Focus on Fruit and Vegetables

Retail sales of organic food increased an average of 17 percent annually between 1995 and 2006. This growth was accompanied by significant changes in organic food marketing. Organic versions of conventional brands (such as Organic Rice Krispies) and private label organic products are now commonly sold alongside longtime organic brands (such as the Safeway "O" line of organic products).

These trends have increased the quantity of organic foods grown, processed, and distributed in the U.S. and placed new pressures on manufacturers and distributors of organic products. Supply chains that once served distinct market channels now provide organic food to both the natural product and conventional channels. Handlers, the firms that manufacture, process, and distribute organic foods, are central to the evolving supply chains. A new ERS study provides baseline information about handlers of organic products in 2004.

Organic handlers are typically small firms, with 48 percent reporting sales below $1 million annually, and 22 percent between $1 and $5 million per year. Most organic handlers are mixed operations, handling both conventional and organic products. Nearly two-thirds of these firms began their businesses by producing and selling conventional products, later adding organic foods. Organic products accounted for 34 percent of handler sales in 2004. Handlers report they expect the share of organic sales to increase to an average of 42 percent by 2009.

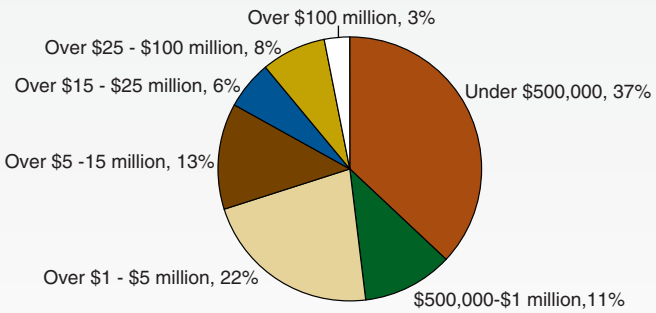
Fruit and vegetables were the top organic product category sold by handlers in 2004, followed by dairy products and breads, grains, or seeds. The main marketing outlets for handlers are wholesalers, brokers, distributors and repackers, followed by retail outlets. Organic handlers' sales to retail natural-product stores were nearly double their sales to supermarkets and club stores. Small handlers were more likely to market their products to natural-product stores than to conventional supermarkets, while large handlers were more likely to sell to natural-product chains and conventional supermarkets.

Although national organic standards were developed in part to facilitate international trade, exports accounted for only 7 percent of organic product sales in 2004. Of U.S. sales, 39 percent were national and 30 percent were regional. Local (within an hour's drive of the handlers' facilities) sales amounted to 24 percent of handler sales to U.S. outlets.

The organic sector is poised to continue growing into the next decade, further increasing the flow of organic products distributed and processed by handlers. The data from the ERS study will enable researchers to examine the factors influencing handlers' marketing decisions, such as the choice of outlets or the geographical range of sales (local, regional, national, and international).

Most organic handlers are small firms

Handler gross sales in 2004



Source: USDA, Economic Research Service.

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This finding is drawn from . . .

The U.S. Organic Handling Sector in 2004: Baseline Findings of the Nationwide Survey of Organic Manufacturers, Processors, and Distributors, by Carolyn Dimitri and Lydia Oberholtzer, EIB-36, USDA, Economic Research Service, May 2008, available at: www.ers.usda.gov/publications/eib36/

Small Farms Still Important in Broiler Production

Agricultural production is shifting to large farms: in 2006, farms with at least $500,000 in sales accounted for over 60 percent of U.S. agricultural commodity sales. But broiler production—raising young chickens for meat—remains an exception. While U.S. broiler operations are getting larger, small farms still dominate production.

Unlike other commodities, the important role played by small broiler operations suggests that no significant and systematic cost advantages accrue to farm size. Moreover, smaller operations limit the potential spread of poultry diseases as well as the concentration of poultry manure.

Commercial growers almost always produce broilers under a production contract with an integrator. Most integrators are corporations that own processing plants, feed mills, and hatchery farms. An integrator provides the grower with chicks, feed, and veterinary services and transports the birds to processing plants. The grower invests in broiler houses (a significant capital investment), provides labor and purchases utilities, and feeds the chicks until they reach market weight (5-9 weeks).

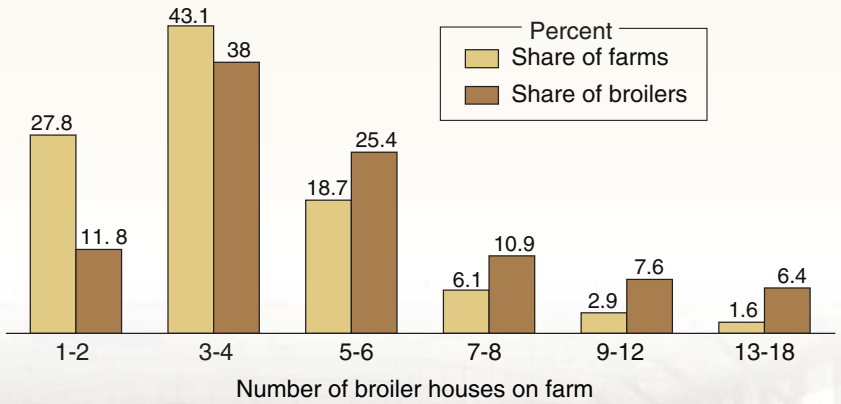
Seventy percent of all contract growers own four or fewer broiler houses, and those operations collectively accounted for half of the 8.9 billion broilers produced in the U.S. in 2006. Each house produces between 110,000 and 120,000 broilers annually, and, on average, growers are paid 26-27 cents per bird. As a result, the smallest operations—those with a single house—realize about $32,000 in annual contract fees for broiler production, while operations with four houses realize about $126,000.

Broilers provide one source of income to households that run small grow-out farms. Most operations produce other farm commodities (primarily cattle and field crops), although broiler fees account for nearly 90 percent of total commodity revenue. Grower households also receive income from farm-related activities, including rentals of farmland and custom work for other farms, such as harvesting or planting services. In addition, grower households receive income from off-farm work and from other sources.

Income diversification is important for growers: most face a choice of only one or two integrators close enough for contracting. The availability of other earning options for growers, whether from other farming activities or off-farm employment, tends to limit integrators' market power.

On average, operators of small broiler grow-out operations received a household income of $63,700 in 2006, of which about 30 percent represented net income received from their farming business. This is slightly below the average for all U.S households ($66,570) but compares quite favorably to mean household incomes in rural areas in the South ($44,804), where broiler production is concentrated.

Small farms still dominate broiler production



Source: 2006 Agricultural Resource Management Survey.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This finding is drawn from . . .

The Economic Organization of U.S. Broiler Production, by James M. MacDonald, EIB-38, USDA, Economic Research Service, June 2008, available at: www.ers.usda.gov/publications/eib38

Obesity in the Midst of Unyielding Food Insecurity in Developing Countries

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- Income disparity within and among developing countries explains how there can be obesity in the midst of undernutrition.
- Rising incomes, urbanization, global integration, and more supermarkets have contributed to increased consumption of convenient, high-calorie foods among the higher income population.
- Obesity-related diseases have become more widespread in developing countries.

The continued escalation of food prices has again focused attention on global food insecurity and its root cause, poverty. Despite international commitments to improve food security in low-income countries, progress has been limited. For the 70 countries covered in ERS's Food Security Assessment, nearly 1 billion people were estimated to be undernourished (food insecure) in 2007. The persistence of food insecurity is troublesome because it comes at a time when food consumption in many developing countries has been improving. In fact, the rising rate of overweight and obesity in many developing countries is a growing concern. While the economic and health consequences of malnutrition and hunger have been studied extensively, less attention has been given to the economic implications of rising obesity rates in developing countries.

How can obesity exist in the midst of persistent food insecurity and hunger? (see box, "Defining Obesity"). The answer lies mainly in differences in income levels among and within countries. The range of per capita incomes among developing

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countries is extremely broad: from $124 per year in Ethiopia to $24,000 in Singapore in 2005. Within countries, too, income levels vary greatly. For example, in Guatemala, the poorest 20 percent of the population holds less than 3 percent of the country's total income. The wealthiest 20 percent of the population accounts for 64 percent of the country's total income. This case is not an anomaly. On average, in 11 of the lower income Latin American and Caribbean countries included in ERS's Food Security Assessment, the lowest income quintile holds a little over 3 percent of total income, whereas the highest quintile has just under 60 percent. This disparity in income shares translates into vast differences in income levels and, hence, purchasing power, within a country. In Guatemala, for example, the lowest income quintile consumed an estimated 75 percent of the daily nutritional requirement in 2007, while the highest income quintile exceeded the nutritional requirement by nearly 30 percent.

A number of forces have contributed to rising rates of obesity among the upper income quintiles. Average per capita food consumption in developing countries increased 28 percent between 1970 and 2005, three times the rate in developed countries.

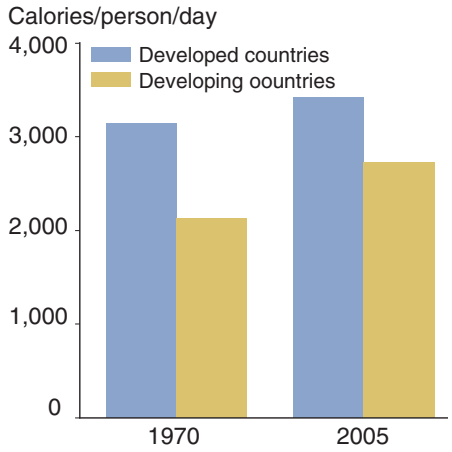
The diets of people in the upper income quintiles have changed as they moved away from some traditional foods, such as root crops and vegetables, to higher calorie foods. In addition to income growth and declining food prices, urbanization is a key factor behind the dietary changes. An urban lifestyle means less

Defining Obesity

For adults, overweight and obesity ranges are determined by using weight and height to calculate the "body mass index" (BMI). BMI is used because, for most people, it correlates with their amount of body fat. An adult who has a BMI between 25 and 29.9 is considered overweight, and an adult who has a BMI of 30 or higher is considered obese.

More detailed information is available at:
http://www.cdc.gov/NCCdphp/dnpa/obesity/defining.htm and
http://www.who.int/mediacentre/factsheets/fs311/en/

Calorie availability is increasing in developing countries



Source: Food and Agriculture Organization of the United Nations.

physical activity and higher demand for convenience foods. At the same time, expansion and improvement of the global transportation systems have facilitated trade in perishable foods and opened markets. Many exporters were able to capitalize on these changes by supplying a wider variety of products in growing and evolving markets.

Rising Incomes, Declining Food Prices Boosted Calorie Intake

Rising calorie intake per capita and the shift toward higher calorie and more processed foods have been observed in both developing countries and the least developed countries. In both cases, much of this diet transition can be attributed to high per capita income growth, particularly in large countries, such as China, Brazil, and India. Developing countries' per capita income almost tripled between 1970 and 2005. Conversely, per capita income in the least developed countries increased only 20 percent during the 35-year period.

The recent, well-publicized runup in food prices was preceded by several decades of declining real food prices (adjusted for inflation). In 2000, real world prices for rice, sugar, and soybean oil were less than 40 percent of 1970 levels. Real beef prices in 2000 were about half of 1970 levels, while wheat prices were 60 percent. Although food prices have increased since 2004, they remain below 1970 levels, in real terms.

Per capita consumption in developing countries exceeded 2,722 calories per day in 2005, up from 2,134 calories in 1970. The Food and Agriculture Organization (FAO) of the United Nations recommends a minimum daily per capita intake of roughly 2,100 calories. Grains account for more than half of the diet in developing countries, but the 8-percent increase in grain consumption between 1970 and 2005 was much lower than the overall increase in calorie consumption. Per capita consumption of some higher valued food items soared; meat, eggs, and vegetable oils increased roughly threefold, while sugar increased 66 percent. Meat, however, still accounted for only about 7 percent of the diet in developing countries in 2005, compared with 12 percent in developed countries.

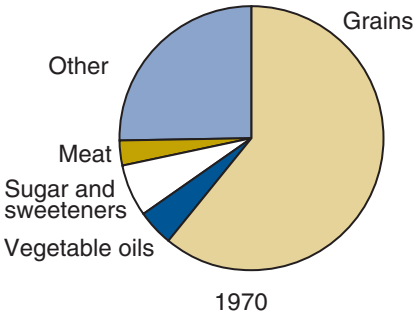
During the same period, calorie consumption per capita also rose in the least developed countries (those with per capita incomes below $500 per year). The gain from 2,000 calories in 1970 to 2,200 in 2000, however, was much smaller than in developing countries, and least developed countries remain far behind the rest of the world in overall nutrition. The calorie contribution of vegetable oils grew the most (28 percent), followed by sugar and eggs (15 percent) and meat and milk (7 percent). In absolute terms, however, consumption of these foods remains well below the level in other countries. Moreover, consumption of nutritionally beneficial foods, such as pulses, vegetables, and fruits, has declined in least developed countries. The decline was sharpest for vegetables (32 percent), followed by fruit (9 percent) and pulses (5 percent). Even with the modest increase in overall calorie consumption in these countries, the shift in diet toward fats and sugar and away from their traditional diet of vegetables and pulses seems to be clear.

Urbanization and Globalization Also Influence Diet Change

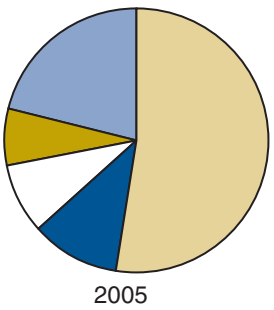
Increasing urbanization has been gaining attention for its contribution to shifts in diets. Unlike rural agricultural households, urban residents do not rely solely on home-grown or locally grown foods and therefore have access to a wider selection of foods. In developing countries, the rate of urbanization was two to three times higher than the population growth rate during the last three decades.

Although detailed data for each country are not available, examining diet composition across countries shows that, in countries with the same income level, those with a higher share of urban population tended to have diets with more fat,

Grain share of developing country diet shrinks...



...as meat and vegetable oil share rises



Source: Food and Agriculture Organization of the United Nations.

both vegetable and animal. For example, the urbanization rate is 67 percent in Mexico versus 92 percent in Uruguay, and daily per capita consumption of fat in Mexico was half that of Uruguay, despite similar per capita income levels ($6,172, and $6,248 in 2005). Similarly, fat consumption in Jordan was more than four times that of Namibia. Although their per capita income was almost the same ($2,086 in Jordan and $2,083 in Namibia in 2005), the 82-percent urbanization rate in Jordan was much higher than that of Namibia's 35 percent. Other factors, such as cultural and dietary habits, might also contribute to differences.

All urban environments are not the same; the openness of an economy, access to mass media, particularly television, and marketing systems can also significantly influence consumers' choices. Regardless of consumer food choices, however, an urban lifestyle usually means a decline in physical activity and higher participation of women in the workforce. The latter often translates into less time for preparing food, which often leads to increased consumption of processed foods.

ERS statistical analysis confirms this relationship. Analysts used cross-country data for 136 countries to estimate the impact of such factors as per capita income, urbanization rate, share of households with TVs, and a country's development level on daily consumption of calories and fat. The results showed positive and statistically significant relationships between each of three variables (per capita income, urbanization rate, and share of households with TVs) and calorie and fat consumption.

Global Integration and More Trade Increase Availability of Processed Foods

In addition to income growth and urbanization, the expansion of international trade through world economic integration has influenced global diets. Trade agreements of the last three decades, in addition to expanding global trade, have been a catalyst for increased investment in transportation and communication systems. The average ocean freight and port charges for U.S. import and export cargo decreased 60 percent between 1970 and 1990. Technologies, such as refrigeration, allowed trade in perishable products, including cut flowers and live shellfish. The decline in global trade barriers was followed by liberalization in global financing, which altered the food systems of most countries by expanding the role of supermarkets in food marketing.

© Redlink Production/Corbis

Food imports have become an important component of food supplies in both developed and developing countries because national food self-sufficiency has declined in many countries during the last few decades. Trade in grains, vegetable oils, and meat increased three to five times during the past three decades. Developing countries also became more dependent on imports of staple commodities, such as grains, and vegetable oils. Rising consumption of wheat, in the processed form of bread and pasta, has replaced traditional grains such as millet and sorghum, as well as root crops.

Import growth was not limited to staple foods; imports of a variety of commodities, including semi-processed and processed foods, have also grown. Between 1970 and 2005, global trade volume of highly processed foods (the FAO definition includes food items such as canned meat, breakfast cereals, pastries, and wine) increased more than four times. Import growth for this category of food was highest in developing countries—growing more than fivefold between 1970 and 2005.

Growth of Supermarkets Increases Food Variety

The evolution of the global food system and the increase in the number of supermarkets have promoted convenience shopping and wider food varieties in developing countries. With their large scale of operations, supermarkets are often able to offer lower prices than traditional retail stores. Lower prices have boosted the market shares and profits of supermarkets, which have fueled their expansion. The high growth in market share of supermarkets in Latin America highlights the extent

of the change: from a 10- to 20-percent market share in the 1980s to 50-60 percent in the 1990s, and now rapidly approaching the U.S. share of about 70-80 percent. The experience of East and South Asia also shows a similar pattern. In Sub-Saharan Africa, with the exception of South Africa, the supermarket share in the retail food market is much smaller, but expansion is underway due to growing investment by South African companies.

The growing role of supermarkets has both positive and negative implications for consumers. On the positive side, supermarkets are introducing better quality, greater variety, higher standards, and lower prices to the food systems of developing countries. On the negative side, increased access to low-cost, high-calorie, convenience foods for urban consumers with limited physical activity fuels obesity problems.

Both Obesity and Undernutrition Are Problems in Developing Countries

The global increase in calorie consumption has included excess food consumption by some segments of the population in many countries. In developing countries, consumption of high-calorie foods, such as fats and sugar, has risen, and the income elasticity (percentage change in consumption for each 1-percent change in income) for these products remains positive. Because incomes are projected to rise for almost all developing countries, the role and contribution of these commodities in the diets of these countries is expected to increase. At the same time, the problems of undernutrition and food insecurity still exist. An estimated 800 million to 1 billion people are food insecure, and, according to FAO and ERS researchers, the number of food insecure people has remained relatively steady during the last decade. The International Food Policy Research Institute estimated that there are about 1 billion overweight and obese people worldwide. Although this problem is more prevalent in Western countries, it is increasing rapidly in developing countries, as well.

In many developing countries, the growing trend of overweight populations is most prevalent among the higher income groups. In contrast, in higher income countries, this problem is more prevalent among lower income groups. ERS estimates that in 2007, consumption by those in the upper 20 percent income group in low-income Asian, Latin American and the Caribbean, and North African countries equaled roughly 2,800 calories per person per day. This level is in the upper range of the requirement for a moderately active adult. In fact, consumption for the highest income quintile in North Africa was estimated at nearly 3,300 calories per day. Among individual countries, food consumption in the highest income quintile was 2,800 calories or higher in 23 of the 70 study countries. Therefore, although an estimated 982 million people in these 70 countries were food insecure, an estimated 370 million, or 12 percent of the population, consumed at least 2,800 calories per day in 2007.

The situation with overweight populations in developing countries could worsen because of the increasing number of overweight children. For example, according to a study by the World Health Organization (WHO), 8-9 percent of children under age 5 in Egypt and Algeria were overweight, which is close to the 10 percent estimated for the United States. According to FAO, in six case study countries (China, Egypt, India, Mexico, the Philippines, and South Africa), the increase in food consumption over the past 20 years led to a reduction in the number of underweight children and adults. In China, Egypt, Mexico, and the Philippines, there were more overweight adults than underweight adults in 1999.

Maurice R. Landes, USDA/ERS

Rising Rates of Obesity-Related Diseases Bring New Challenges to Developing Economies

The main concern of the developing countries continues to be how to curb food insecurity, hunger, and associated diseases. More recently, however, obesity-related diseases such as diabetes and hypertension have become more widespread. For example, the WHO reports that, in China, hypertension increased 12 percent (or the equivalent of 160 million people) between 1991 and 2002. Similarly, an estimated 25-50 percent of the population in countries like Mexico, Thailand, and Tunisia suffer from diabetes. The WHO assessment indicates that overweight and obesity represent a rapidly growing threat to health in an increasing number of developed and developing countries. It also indicates that, in some countries, overweight and obesity are now replacing the more traditional public health concerns of undernutrition and infectious diseases.

The direct cost of obesity is the increased risk of chronic diseases such as diabetes, cardiovascular disease, gallbladder disease, and cancer. If current trends continue, health costs for the developing economies could be substantial. In most developing countries, people are a major resource, and public health is a key to economic progress. Research in developed countries shows that obesity reduces productivity. Moreover, health costs associated with the growing rate of obesity and its related diseases could overwhelm the

health care systems of developing countries already overburdened with the costs of combating communicable diseases and the effects of malnutrition among lower income populations. According to the latest World Bank data, average health expenditures per capita in developing countries are less than 10 percent of expenditures in developed countries and less than 1 percent in the least developed countries.

Policy Options

In contrast to undernutrition and hunger, issues and problems related to overweight and obesity are a fairly new phenomenon for developing countries. As a result, data in this area are limited, but health statistics indicate a growing trend in diet-related diseases. For example, WHO estimates that the top 10 countries in the number of cases of diabetes are India, China, the United States, Indonesia, Japan, Pakistan, Russia, Brazil, Italy, and Bangladesh. The health and economic costs associated with these diseases are well known. The new challenge for developing countries is to identify effective policies that could prevent repeating the obesity experience of Western countries.

Nutritional education is probably the key in terms of reaching out to consumers. Because dietary habits are formed at a young age, nutritional education of children can play a vital role in influencing dietary habits. Advertising, particularly on television, directed to children profoundly affects their perceptions. A survey of six Asian countries—India, Indonesia, Malaysia, Pakistan, the Philippines, and South Korea—showed that most children in these countries watch television 2-4 hours per day on weekdays, and more on weekends and during school vacations. Each hour typically contains 20 minutes of advertising. The survey also revealed that, with the exception of parents in South Korea, more than 50 percent of parents in the study countries said that their children influenced family food purchases. U.S. research shows a significant correlation between television viewing and obesity among children. For this reason, countries like Sweden, Australia, Canada, and the United Kingdom have taken steps to curb the impact of advertising on children.

Other policy interventions can promote healthy eating. The Scandinavian countries reduced coronary heart disease between 1976 and the 1980s by providing subsidies for the purchase of healthy food items, such as fish. During the 1990s, Singapore reduced child obesity through a combination of changes in school diets and increased fitness and physical activity programming. Its Trim and Fit program, started in 1992 and managed by the Ministries of Health and Education, is credited as one of the most successful programs in the world in terms of sustained obesity management (see box, "Singapore's Efforts To Control Obesity"). The program includes teacher and student education, changes in school lunches, assessment of students, and increased physical activities during school time.

Singapore's Efforts To Combat Obesity

Recognizing a rise in obesity rates as well as Type 2 diabetes among children, the Singapore Government introduced the Trim and Fit (TAF) program in 1992. The program was targeted toward schoolchildren from primary school to pre-university levels. The program's goal was for the students to achieve a healthier lifestyle through improved nutrition and regular exercise.

Through this program, all students participated in fun runs and aerobic workouts. Overweight students engaged in 1½ hours of physical activity per week, in addition to their regularly scheduled physical education classes, until they lost a required amount of weight. This activity could be in the form of playing games or a particular sport. The schools provided parents with information on the program as well as ideas for activities and improved nutrition at home. The Government also provided guidelines to the schools as to the types of food and drinks they should sell. Additionally, water coolers were installed in all schools to encourage students to drink more water.

Since TAF was implemented in 1992, the share of students who passed the Government's national physical fitness test jumped from less than 60 percent in 1992 to more than 80 percent in 2002. The share of overweight students fell from 14 percent in 1992 to 9.5 percent in 2005.

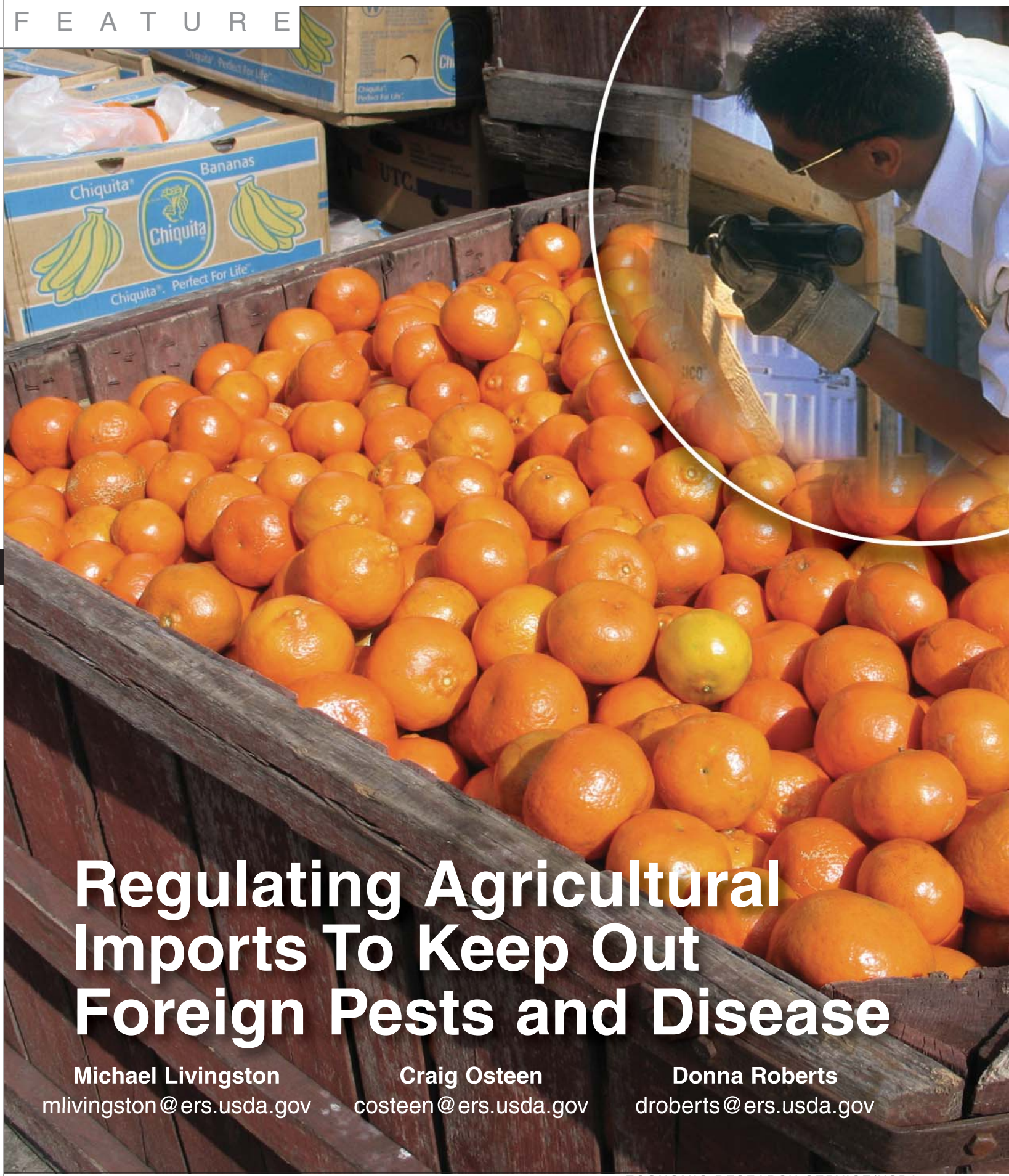
After receiving criticism for targeting overweight children and thereby stigmatizing them, the Singapore Government ended the TAF program in 2007. It was replaced by the Holistic Health Framework (HHF), which targets all schoolchildren and has a broader focus than TAF. In addition to improving physical fitness, it aims to improve mental and social health through a general healthy lifestyle.

This article is drawn from . . .

"Global Diet Composition: Factors Behind the Changes and Implications of the New Trends," by Shahla Shapouri and Stacey Rosen, in *Food Security Assessment, 2007*, GFA-19, USDA, Economic Research Service, July 2008, available at: www.ers.usda.gov/publications/gfa19/

You may also be interested in . . .

"Converging Patterns in Global Food Consumption and Food Delivery Systems," by Elizabeth Frazão, Birgit Meade, and Anita Regmi, in *Amber Waves*, Vol. 6, No. 1, USDA, Economic Research Service, February 2008, available at: www.ers.usda.gov/amberwaves/february08/features/covergingpatterns.htm



Regulating Agricultural Imports To Keep Out Foreign Pests and Disease

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ShutterStock; Inset: PPQ Archive, USDA/APHIS

- Increasing agricultural imports benefits U.S. consumers, but shipments can transport harmful foreign pests and diseases.
- The United States and other nations use a number of approaches to reduce risks to agriculture and the environment from pests and diseases entering through trade.
- Economic analysis can help identify measures that mitigate risks of economic or environmental damage with minimal impact on trade benefits.

Increased trade helps meet U.S. consumers' growing demand for a variety of fresh and processed foods. Imports rose from 4.7 percent of the total value of U.S. food and beverage consumption in 1995 to 6.8 percent in 2005. The import share of certain categories of foods has grown much faster. For example, ERS calculates that the import share of the value of domestic consumption of fruit increased from 23.3 percent in 1995 to 32.5 percent in 2005; the share for vegetables rose from 13.9 to 24.9 percent. Growth in imports of fresh produce and other imported foods can lower costs, increase variety, and extend seasonal availability, contributing to a healthier diet for U.S. consumers.

Increased agricultural imports, however, can raise the risk of inadvertently introducing foreign pests and diseases, and the resulting damage to domestic crops, livestock, and the environment can reduce or offset some of the benefits of trade. Trade is not the only vector for pests and diseases—natural factors, such as wind currents, can spread insects, fungal spores, pathogens, and weed seeds. Asian soybean rust, for example, may have entered the United States in conjunction with two hurricanes. Passenger baggage, migration of wild animals, and smuggling are also pathways for foreign pests and diseases. In 2002, an outbreak of exotic Newcastle disease in backyard poultry flocks in California may have been introduced through infected game birds smuggled from Mexico.

Nonetheless, it is widely recognized that trade, along with the packing materials and means of conveyance that make trade possible, can introduce foreign pests and diseases that can potentially jeopardize domestic plant and animal health. For example, the emerald ash borer and Asian long-horned beetle, which are damaging trees in the Northeast and Great Lakes States, are thought to have first entered the United States on wooden pallets in the 1990s. More recently, *Ralstonia solanacearum*, a bacterial pathogen that damages potatoes, eggplant, tomatoes, and other horticultural products was detected on greenhouse geraniums imported from Kenya and Guatemala but has been contained thus far.

Although not every introduction of a pest or disease results in its establishment, some grow and spread, leading to losses in present or future production or resource values and/or increased production costs. The cost of foreign pests and diseases can also include the temporary loss of export markets, such as when Japan, Korea, and other countries suspended imports of U.S. beef when bovine spongiform encephalopathy (BSE) was detected in an imported cow in December 2003. Comprehensive damages are difficult to ascertain, but studies by the National Plant Board, the Government Accountability Office, the Office of Technology Assessment, and others report that foreign pests and diseases cause billions of dollars of economic losses to U.S. agriculture each year, while also adversely affecting ecosystem values and services.

These cost estimates include sizable public expenditures, including emergency funding to address new pest or disease threats and outbreaks. Today, 21 Federal agencies are responsible for some aspect of managing foreign pests and diseases in the United States. USDA's Animal and

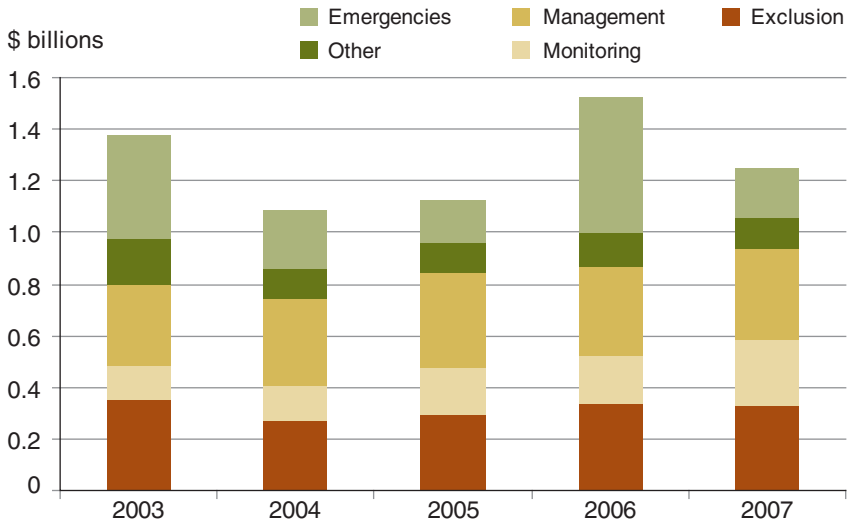
Plant Health Inspection Service (APHIS) has, by far, the leading role, accounting for about $9 out of every $10 that the Federal Government spends annually on prevention and control of foreign pests and diseases. Annual expenditures for APHIS programs ranged from $1.1 to $1.5 billion between 2003 and 2007, including emergency expenditures for programs such as increased BSE surveillance in 2004-06.

Public Sector Has a Role in Reducing Risks From Foreign Pests

In some instances, farmers and ranchers can adopt available technologies or management practices to safeguard their crops or livestock and will do so if it improves their bottom line. Although the use of pest and disease controls will generally increase operating costs, they will also raise expected profits if yield or herd losses are sufficiently reduced. However, pest management decisions made by producers exporting to the United States may be made without accounting for the costs associated with unintentionally introducing foreign pests and diseases into this country. Economists describe these kinds of situations, in which the action of one economic agent affects the well-being or production possibilities of another, as *externalities*. For example, a farmer may apply a fungicide to reduce orchard yield losses to negligible levels, but if fruit harboring any fungal spores were exported to a country that grows more susceptible fruit cultivars, the fungus could cause widespread damages. When private production decisions result in negative externalities or spillovers, economic theory indicates that public intervention can increase societal well-being.

Furthermore, low prevalence of a pest or disease can be considered a *public good* if the pest is highly mobile, the disease is contagious, or either is initially widespread. Economists define a public good, such as regional control of a pest or disease, as a good or service that is *nonexcludable* (no one can be effectively excluded from using it) and nonrival (use by one individual does not reduce the amount available to another). Economic theory holds that markets will fail to provide incentives for individuals to provide these goods in the amounts that society considers optimal. In these instances, cooperative effort is needed to create the public good of improved production capacity, requiring public intervention in the form of monitoring, regulation, and/or control to reduce hazards to animal and plant health.

APHIS outlays for pests and diseases exceeded $1 billion per year from 2003 to 2007



Source: USDA Annual Budget summaries.

Tim McCabe, USDA/NRCS

Economic Impacts Vary by Type of Intervention

Governments use a range of interventions to combat the entry of foreign pests. Best known, perhaps, are quarantine measures such as import bans. But other, more targeted, tools are also available. The level and distribution of benefits and costs along the international supply chain depend partly on the type of public intervention used. But even for a single type of measure, economic impacts vary widely depending on the specifics of an individual case.

A well-known example of quarantine measures is the U.S. ban on beef imports from countries where foot-and-mouth disease is endemic in cattle. The rules of the World Trade Organization allow the use of import bans and other sanitary and phytosanitary (SPS) measures to reduce the risk of international transmission of pests and diseases if such measures are based on scientific risk assessment, and their use is common. For example, countries accounting for 84 percent of global apple production are not currently eligible to export to the United States.

In evaluating such bans, economists try to measure the benefits of imports against the management, production, market, and/or resource costs that might be associated with an outbreak of a disease or pest. Studies show that this varies on a case-by-case basis. Import bans have reduced total welfare in some cases, because the cost of disease establishment was outweighed by the consumer benefits from imports. For example, APHIS estimated that the annual net benefits of replacing a longstanding ban on imports of Mexican avocados with more targeted phytosanitary measures totaled about $70 million, providing analytic support for USDA's decision to grant Mexico full access to the U.S. market in 2007. On the other hand, there can be cases where an import ban is less costly than the economic consequences of disease establishment, especially in those instances when the country might lose potential export markets.

Jean L. Williams-Woodward, University of Georgia

Even in instances where the benefits of an import ban outweigh the costs to domestic consumers, there still may be more efficient ways to mitigate foreign pest and disease risks if the costs of hazards and hazard reduction and the benefits of improvement are shared across borders. Economists have identified three potential approaches for the provision of global public goods when problems and solutions transcend national borders.

The *best shot approach* pushes or pulls private innovation by using public funds. An example of this approach is the decades of research and evaluation on the efficacy and safety of irradiation on fruits and vegetables by the World Health Organization, the United Nations Food and Agriculture Organization, the U.S. Food and Drug Administration, and other public institutions. This research laid the groundwork for commercial use of irradiation as a phytosanitary treatment to sterilize quarantine pests. This technology enabled USDA to lift bans on exports of mangos and other tropical fruits from Thailand, the Philippines, and India that have been irradiated to reduce the risk to negligible levels of infestation by 11 quarantine pests.

The *summation approach* is the creation of global mechanisms to enforce individual behavior along the supply chain and/or among countries so that the sum of individual actions produces the desired outcome. The international standard promulgated by the International Plant Protection Convention (IPPC) for wooden packaging material provides an example of this type of global public good. The standard sets out the terms for IPPC certification of heat treatment or methyl bromide treatment of wooden pallets, crates, and boxes to reduce the risk of transmission of timber pests such as the Asian long-horned beetle. Widespread acceptance of IPPC-certified packing materials provides a viable alternative to the required use of more expensive packaging materials in the international supply chain that would make trade more costly, and, in some cases, prohibitively expensive.

The *weakest link approach* uses foreign aid to overcome the constraint imposed by those with the fewest

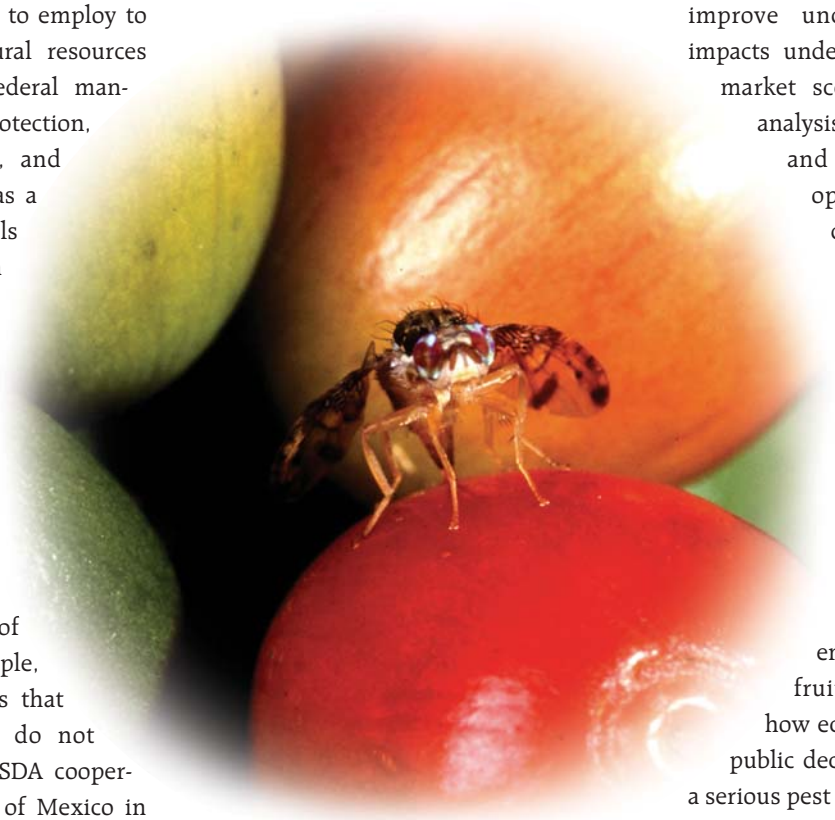
resources to combat a common problem. U.S. technical assistance for a capacity-building project that entailed training in pest risk assessment in West Africa provides an example of this approach. This project supported scientific assessments that facilitated USDA's approval of exports of eggplant, okra, and peppers from Ghana into the United States in 2007.

USDA determines which approach, or combination of approaches, to employ to protect domestic and natural resources under the authority of Federal mandates, including the Plant Protection, Animal Health Protection, and Federal Seed Acts. USDA has a wide range of regulatory tools at its disposal under each approach, including import protocols requiring agricultural producers and exporters abroad to adhere to specific pest and quality control guidelines and commodity inspection and quarantine programs at U.S. ports.

Usually a combination of measures is used. For example, to ensure that screwworms that afflict ruminant livestock do not enter the United States, USDA cooperates with the Government of Mexico in administering a fly sterilization and release program (weakest link approach). In addition, import protocols require the application of screwworm disinfection and monitoring protocols in Mexico (with additional safeguards required for the State of Chiapas) and at the U.S. port of first entry for imported live animals originating in Mexican States in which screwworm outbreaks have occurred (summation approach).

Economic Analysis Can Inform the Choice and Design of Intervention Measures

Agricultural products are imported into the United States only after successfully completing USDA's approval process. After a country petitions USDA to allow importation of a specific commodity, APHIS conducts a risk assessment to identify the economic and environmental damage that pests associated with the commodity might cause if they were to enter the United States. No import is risk free, but APHIS may recommend that the commodity be allowed to enter if certain steps are followed to reduce pest and disease risk to levels acceptable to U.S. authorities.



Scott Bauer, USDA/ARS

Economic analysis of different options available to public authorities can improve the economic basis of pest and disease management decisions in three important ways. First, the most important determinants of the benefits and costs associated with different policies can be examined, highlighting the essential informational needs of public decisionmakers seeking to implement economically efficient measures. Second, the impacts of different policies on the pest management behavior of foreign and domestic agricultural producers can be analyzed to improve understanding of economic impacts under different infestation and market scenarios. Finally, economic analysis can quantify the benefits and costs of different policy options and determine the degree to which the costs of different options are borne by domestic and foreign firms and consumers.

ERS Researchers Investigate Medfly Measures

A recent study by an ERS economist, which examined options for policies to reduce the risk of entry of the Mediterranean fruit fly (medfly), illustrates how economic analysis can inform public decisionmaking. The medfly is a serious pest for many fruit and vegetable crops and is known to exist in 65 foreign countries (hereafter referred to as quarantine countries). APHIS allows imports of fresh produce from these countries only if they have been treated to eliminate medfly larvae.

Currently, eight treatments are approved for the medfly. One of the most widely used is cold treatment, under which produce imported for fresh consumption must be refrigerated according to specific schedules (temperature-duration combinations) before allowed entry into U.S. markets.

Ken Hammond, USDA

Interceptions of live medfly larvae in separate shipments of clementines from Spain during November and December of 2001 prompted USDA to ban this fruit temporarily and re-examine its cold treatment protocols. After imports were suspended, APHIS launched an investigation to identify the causes of the infestations to determine if there were feasible phytosanitary measures that could be adopted to permit trade to resume. Investigators determined that the infestations were due to a number of factors, including unseasonably warm weather conditions and above-average medfly populations during the 2001-02 growing season, susceptibility of early-season clementine varieties, and problems with the application of cold treatment.

To mitigate these newly identified risks, APHIS proposed revised import regulations for Spanish clementines, including mandatory medfly population monitoring and threshold-based insecticide applications (see box, "SPS Measures for Spanish Clementines"). APHIS also proposed lengthening the mandatory cold treatment periods of all medfly host commodities, including clementines, imported from all quarantine countries. Economic and risk analyses concluded that allowing clementine imports from Spain under the new measures would increase expected net benefits relative to the ban that was put in place during the investigation. Following adoption of these measures in October 2002, USDA allowed clementine imports from Spain to resume.

Recently, ERS research extended this analysis to determine which cold treatment schedules would maximize net U.S. benefits from trade in 15 fruit and vegetables with all 65 quarantine countries. This analysis concluded that treatment periods with the largest net benefits closely correspond to the currently mandated treatment periods.

Another important finding was that the cold treatment period that maximizes profit received by a foreign producer varies with medfly population levels abroad. The results have important implications for policy design. When medfly populations are at or below normal levels, the results suggest that the economic incentives of fruit and vegetable producers in quarantine countries are consistent with U.S. cold treatment policy, because

SPS Measures for Spanish Clementines

A complete description of the regulations (Title 7, Sec. 319.56-2jj) can be found at www.gpoacess.gov/CFR/retrieve.html. Briefly, Spanish clementine producers who export to the United States must register with the government of Spain and agree to adhere to the following management and inspection program:

Pheromone-baited medfly traps must be placed in orchards 6 weeks prior to harvest, and baited pesticide sprays using malathion, spinosad, or other approved pesticide must be applied according to a population threshold rule.

To improve compliance, registered growers are required to file detailed records of their medfly population data and pesticide sprays with the government of Spain and allow APHIS inspectors access to their groves and records.

Boxes of clementines must be clearly labeled to identify the orchard in which they were grown.

Before loading onto sea vessels for export to the United States, 200 clementines must be randomly selected from each individual shipment (not to exceed 200,000 boxes) by an APHIS inspector. If a single live medfly (egg, larvae, pupae) is found, the entire shipment is rejected, and if there is a second occurrence for the same orchard, shipments are suspended for the remainder of the season from that orchard.

Shipments that pass inspection must then undergo cold treatment prior to offloading in the United States.

APHIS inspectors examine the cold treatment data and inspect the fruit; if the cold treatment has not been successfully completed or if a single live medfly is found, the shipment is held until an investigation is completed and appropriate remedial actions implemented.

profits received by fruit and vegetable producers in quarantine countries are maximized at the treatment periods that maximize net U.S. benefits associated with trade in these commodities. However, when medfly populations abroad are above normal levels, the incentives of producers in quarantine countries could lead to cold treatment of produce imported into the United States at durations below what the U.S. has determined to be the optimal cold treatment period. This is because profits abroad are maximized at a lower treatment period. These results suggests that it is important to closely monitor fulfillment of cold treatment requirements and justify USDA's current practice of doing so, even though it increases private compliance costs and public enforcement expenditures. Containers accepted at U.S. ports are required to have temperature- and treatment-period duration gauges, which are examined at the port of first entry.

Economists and Biologists Work Together To Inform Public Policy and Investment

Biology and economics play key roles in the arrival of foreign pests and diseases and in the processes by which they become established. Economic activities related to international trade, commodity and livestock production, and domestic commerce are pathways by which foreign pests and diseases penetrate the U.S. border and disperse to new areas. At the same time, to become established in new areas, pests require suitable habitats, compatible climatic conditions, and minimal populations of potential predators. To inform decisions about policy responses to today's challenges of managing foreign pests and diseases, research must address the joint impacts of economic and biological factors on the benefits and potential costs of agricultural trade. Such research is also critical to decisions about public and private roles for meeting new challenges that might arise from changing trade flows, cropping patterns, or pest populations. Finally, continuing research can help policymakers capitalize on new scientific discoveries and technological innovations in order to increase welfare-enhancing trade.

Peggy Greb, USDA/ARS

Hot water immersion is one type of quarantine treatment that can be used to reduce the risk of entry of pests and diseases on imported fruit.

This article is drawn from . . .

"Phytosanitary Regulations Shape Fruit and Vegetable Trade Patterns," by Megan Romberg and Donna Roberts, in *Amber Waves*, Vol. 6, Issue 2, April 2008, USDA, Economic Research Service, available at: www.ers.usda.gov/amberwaves/april08/datafeature

"Pest Problems Abroad May Affect Compliance With U.S. Safeguards," by Michael Livingston, in *Amber Waves*, Vol. 6, Issue 3, June 2008, USDA, Economic Research Service, available at www.ers.usda.gov/amberwaves/june08/findings/pestproblems.htm

"The Mediterranean Fruit Fly and the United States: Is the Probit 9 Level of Quarantine Security Efficient?" by M.J. Livingston, in the *Canadian Journal of Agricultural Economics* 55(2007a):517-528, available at: www.blackwellsynergy.com/doi/abs/ 10.1111/j.1744-7976.2007.00106.x)

You also may be interested in . . .

"What Share of U.S. Consumed Food Is Imported?" by Andy Jerardo, in *Amber Waves*, Vol. 6, Issue 1, February, 2008, USDA, Economic Research Service, available at: www.ers.usda.gov/amberwaves/february08/datafeature

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

Creating Markets for Environmental Stewardship

Potential Benefits and Problems

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- Farmers and other landowners typically under-provide environmental services such as clean air and water, carbon sequestration, and improved wildlife habitat.
- Markets for environmental services could increase farmer investments in environmental stewardship, thereby expanding the supply of environmental services.
- Impediments to the formation of fully functioning markets for agricultural environmental services may be difficult or costly to overcome.

What does a farm produce? Food and fiber is the obvious answer, but most farms have only a portion of their land in crop production. Farms also contain significant amounts of pasture, forest, ponds, meadows, grasslands, and wetlands. In 2002, farms accounted for 41 percent of all U.S. land, including 395 million acres of pasture and range, 76 million acres of forest and woodland, and 16 million acres of wetlands. This natural capital can provide a host of environmental services, including cleaner air and water, flood control, improved wildlife habitat, and carbon sequestration.

When farmers decide how to use their land, they generally consider only uses that produce goods and services that can be sold. Products expected to generate the greatest net returns are the ones generally selected for production. As a result, when farmers make their production choices, market commodities win out. Since environmental services generally do not have markets, they have little or no value when the farmer makes land-use or production decisions. As a result, environmental services are under-provided by farmers. This is one reason why billions of dollars are spent each year by government and nongovernment organizations to pay farmers to maintain natural areas and improve the environmental performance of their farms.

Lynn Betts, USDA/NRCS

If environmental services could be sold like other commodities, at prices that reflected their true value to society, farmers would likely invest more to maintain wildlife habitat, woodlots, and wetlands. And, those who benefit the most from environmental services would pay for them. This could mean a reduced need for taxpayer-funded investments in environmental services, increased private investments that are more responsive to changing economic and environmental conditions, and, perhaps, less costly service provision. The question remains: If these services are valued by society, why are there no markets for environmental services?

Environmental Services Defy Ownership

The biggest reason that markets for environmental services do not develop naturally is that the services themselves have characteristics that defy ownership. With private goods, such as traditional agricultural commodities, a farmer transfers ownership only when a buyer pays the desired price. Environmental services do not have this characteristic. Once they are produced, people can "consume" them without paying a price. Improved water quality, for example, benefits everyone downstream, whether or not they pay for it. Most consumers are unwilling to pay for a good that they can obtain for free, so markets cannot develop. Without a market, there are no price signals encouraging farmers to produce environmental services as part of the farms' output.

Can anything be done other than relying on government programs to provide publicly funded investments in environmental stewardship? While government programs provide incentives to farmers to provide environmental stewardship, they lack many of the desirable characteristics of fully functioning markets. Markets allocate resources efficiently (at least in theory), those who benefit pay, and markets are flexible in the face of changing conditions. Farmers could also benefit from the additional stream of income earned from their land.

Experiences With Creating Markets for Environmental Services

Creating markets for environmental services is not an entirely novel idea. Several markets (water quality trading, carbon trading, and wetland mitigation) have been created to reduce compliance costs associated with environmental regulations. Two other markets (eco-labeling and fee hunting) have developed on their own. Experiences with these markets highlight their promise and pitfalls.

One important characteristic of most markets for environmental services is that government or some other authority plays a central role in setting them up—they do

Without a market, there are no price signals encouraging farmers to produce environmental services as part of the farms' output.

Roger Hill, USDA/NRCS

not spontaneously develop from the interaction of buyers and sellers, as most markets do. The reason, as noted, is that environmental services, to varying degrees, defy ownership—they are public goods. One way to get around this is to create a good related to the environmental service that has private-good characteristics, as has been done for markets in water quality trading, carbon trading, and wetland mitigation. These markets would not exist without government programs that require regulated business firms (such as industrial plants and land developers) to meet strict environmental standards. In essence, legally binding caps on emissions (water and carbon) or mandatory replacement of lost habitat (wetland mitigation) create the demand needed to support a market for environmental services.

In the case of water quality, the U.S. Environmental Protection Agency (EPA) has established caps on total pollutant discharges from regulated firms in some watersheds, and issued discharge allowances to each firm specifying how much pollution the firm can legally discharge. A firm can discharge more pollution than its original allocation by purchasing allowances from other firms that have cut their own pollution discharges below EPA allowances or from unregulated sources of pollution, such as agriculture. This transaction is known as a trade. Discharge allowances, therefore, have characteristics of a private good. So-called cap and trade programs create a tradable good related to an environmental service, and use program rules to create demand. Farmers are likely to be able to provide discharge reductions at a lower unit cost than industry can, and to profit from the exchange (see box, "Trading Can Reduce the Cost of Lowering Emissions").

In markets for greenhouse gases, carbon credits are exchanged. Members of the Chicago Climate Exchange that voluntarily commit to reducing their carbon

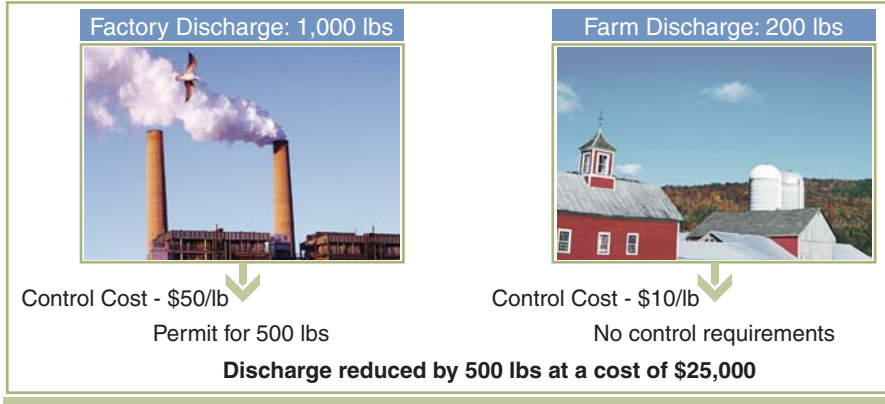
Trading Can Reduce the Cost of Lowering Emissions

Without trading, the regulated firm reduces discharges by 500 pounds at a cost of $25,000 (500 lbs at $50 per pound), and the farm does nothing.

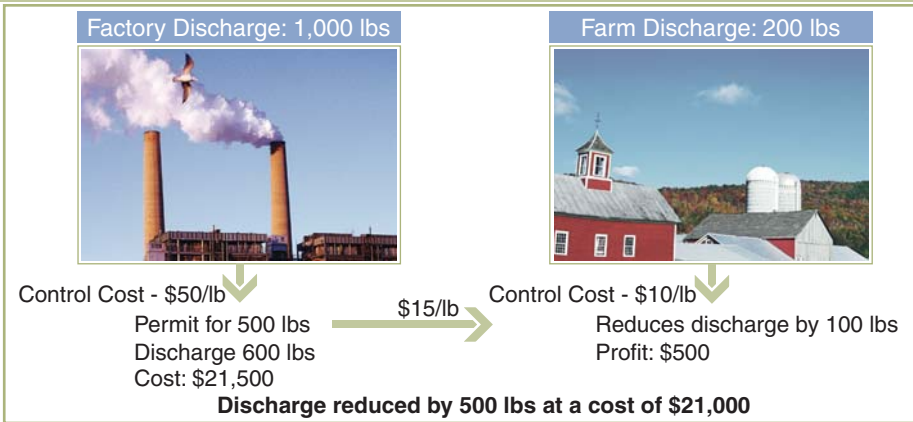
With trading, the firm reduces discharges by 400 pounds at a cost of $20,000 (400 lbs at $50 per pound). The farm is willing to reduce discharges for a price of $15 per pound. The firm purchases 100 pounds of reduction from the farm at a cost of $1,500 (100 pounds at $15 per pound). The firm's costs have been reduced to $21,500 (a savings of $3,500). The farm reduces discharges by 100 pounds at an actual cost of $1,000 (100 pounds at $10 per pound). The farmer receives a payment of $1,500 from the firm, so actually realizes a profit of $500 for trading with the firm.

The total cost of reducing pollution (not considering profit to the farmer) has been reduced from $25,000 to $21,000.

Example: Firm discharge limit, no trading



Example: Firm discharge limit, with trading



emissions by 17 percent can purchase carbon credits in an offset market. For wetlands, it is mitigation credits. No-net-loss requirements for new housing and commercial development require that lost wetland services be replaced, creating demand for mitigation credits, which are produced by creating new wetlands. In all of these cases, the managing or regulatory entity defines the tradable good and enforces the transactions.

Eco-labeling uses a different approach. Rather than creating a new good, labeling establishes a link between an existing private good (for example, a food product) and an environmental service (wildlife viewing, for example). Eco-labels allow consumers to purchase products, possibly for a higher price, that are produced in an environmentally friendly manner. Dolphin-friendly tuna and organic labeling are examples. The organic label can be used only by farms that agree to follow a specific set of environmentally friendly management practices.

Fee hunting is another example of linking an environmental service with a private good. Wildlife is a public good. However, access to private land to hunt is a private good. Landowners can sell access to their land for hunting. The fee provides an incentive for the farmer to maintain wildlife habitat on the farm (see "Fee Hunting May Boost Farm Income, Wildlife Habitat," on page 7).

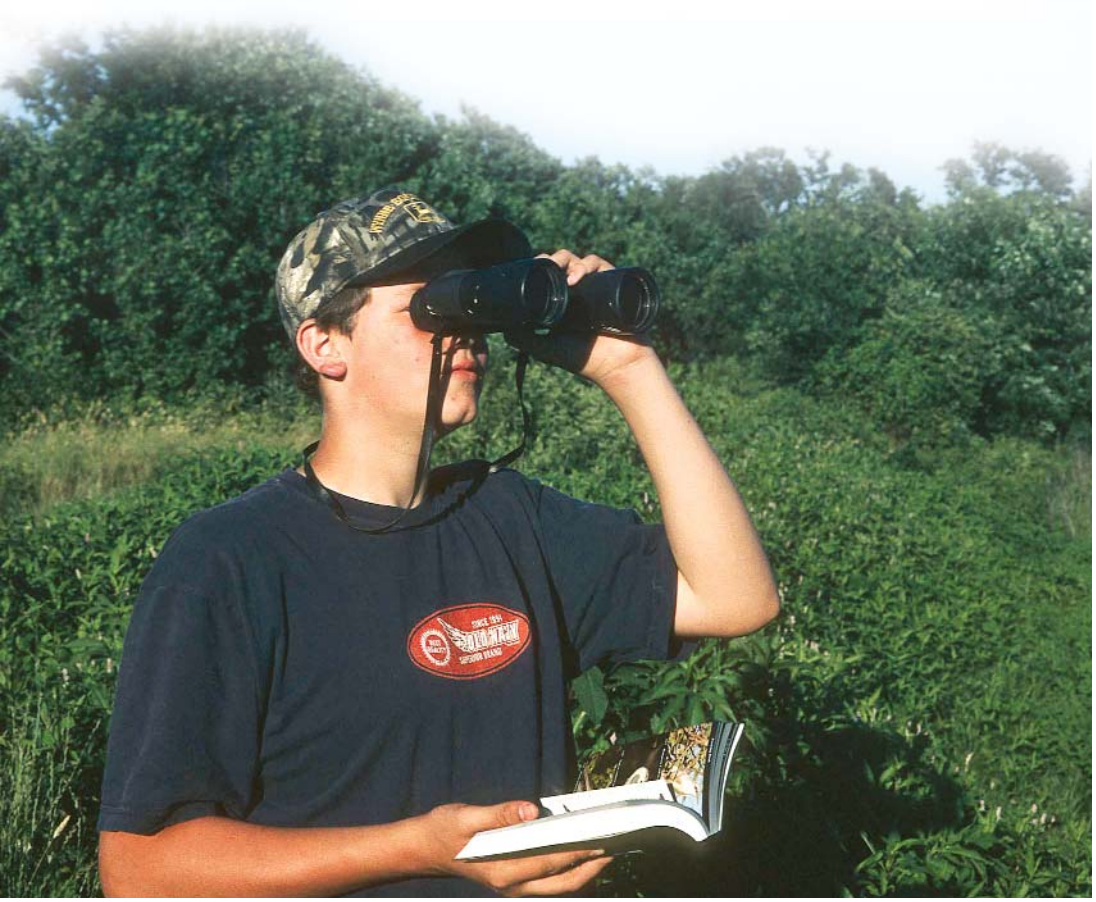
Markets Depend on More Than Just the Existence of a Good

Simply creating demand for an environmental service does not guarantee that a market for services from agricultural sources will actually develop and thrive. For example, trades have occurred in only 4 of the 22 water quality trading programs that include agriculture as a source of credits. Only a small percentage of farmers run fee hunting operations, despite a high demand for access to private land for hunting. Farmers appear to be able to restore wetlands at a lower cost than many other landowners, yet only a handful of the more than 600 current wetland mitigation banks are operated by farmers.

As it turns out, a number of impediments affect agricultural producers' ability to participate in markets for environmental services. One of the most important is uncertainty over the environmental impact of changes in farming practices. In emissions trading and offset markets, uncertainty about the quantity of credits supplied by agricultural producers reduces demand. Purchasers may be unwilling to enter into a contract with a farmer who

Only a small percentage of farmers run fee hunting operations, despite a high demand for access to private land for hunting.

Gary Kramer, USDA/NRCS



Robert G. Price, USDA/NRCS

USDA is supporting the development of tools and methods for quantifying how farming practices affect environmental services.

cannot guarantee delivery of the agreed-upon quantity of pollution abatement, wetlands services, or other environmental service. This unwillingness is especially true if the good is being used to meet a regulatory requirement. Uncertainty can be addressed by regulators' requiring "factors of safety" and other coefficients (referred to as a "trading ratio") to compensate for that uncertainty. However, trading ratios increase the number of credits the buyer must purchase to replace one unit of pollution abatement, thereby increasing costs and reducing demand for credits produced on farms.

Uncertainty about label claims can be a major problem with eco-labels. Consumers have no way of knowing if the agricultural goods they purchase are from producers that actually deliver the environmental services claimed on the label. Eco-labels can only deliver environmental services if consumers believe the label claims are accurate, and producers live up to their claims.

Uncertainty also affects the potential supply of environmental services. A farmer who is uncertain about the economic benefits of investing in environmental stewardship because the quantity of the resulting environmental services is uncertain is far less likely to make the investment. Some markets prevent uncertain services from being sold. The Chicago Climate Exchange does not certify credits from soil types for which scientific evidence is lacking on the soil's ability to sequester carbon.

Transaction costs can also undermine the development of markets for environmental services. Environmental services from agriculture are produced across a diverse landscape, and unlike food and fiber, they cannot be packaged and shipped to a central market. Just locating trading partners can be costly for individual market participants, particularly if a buyer needs to find and negotiate contracts with multiple farmers in order to accumulate enough credits to meet permit requirements. In addition, providing environmental services is likely to be secondary to a farmer's primary activity of producing agricultural commodities. It may be too costly for farmers to learn about potential demand for an environmental service, meet participation requirements, develop a business plan, keep the necessary records, and integrate the new business into the traditional farming operation.

Fee hunting faces a unique problem—peer pressure. Fee hunting is looked upon unfavorably in many States with a tradition of open access to the land for hunting. Farmers looking to profit from what traditionally had been a simple handshake agreement may be regarded unfavorably by their peers. This may be a reason that fee hunting is not widespread in many parts of the country, even though demand for access is high.

What Can Be Done To Assist Market Development?

If markets are to become important tools for generating resources for conservation on farms, Government or other

organizations may have to help emerging markets overcome uncertainty and transaction costs. One feature of markets is that once they become established, entities will emerge that provide cost-reducing services that benefit the market. For example, private integrators are seeking out greenhouse gas reduction projects, assembling credits, and selling them on the Chicago Climate Exchange.

Government can play a major role in reducing uncertainty by providing research on the level of environmental services from different conservation practices. USDA is supporting the development of tools and methods for quantifying how farming practices affect environmental services. For example, USDA and EPA are developing an online Nitrogen Trading Tool to help farmers determine how many potential nitrogen credits they can generate on their farms for sale in a water quality trading program. Other USDA research programs include Greenhouse Gas Reduction through Agricultural Carbon Enhancement Network (GRACENet) and the Conservation Effects Assessment Project (CEAP).

Government can reduce uncertainty by setting standards for environmental services. USDA is playing an important role in establishing standards for organic agriculture that provide assurance to consumers that the claims on the label are believable. Standards also protect producers from dilution of price premiums due to false claims by those not meeting the organic standards. USDA also supports "market-based stewardship" by cooperating with other Federal agencies and groups to develop accounting practices and procedures for quantifying environmental goods and services in other types of markets (see box, "USDA Activities That Support Environmental Service Markets").

Information from Government and other groups can reduce the costs of market participation. For example, many State

USDA Activities That Support Environmental Service Markets

In 2006, USDA released a departmental regulation defining its policy on markets for environmental services. This policy stated that USDA would:

Cooperate with other Federal, State, and local governments to establish a role for agriculture in environmental markets;

Find ways to make USDA policies and programs support producers wanting to participate in such markets;

Conduct research and develop tools for quantifying environmental impacts of farming practices.

The Food, Conservation and Energy Act of 2008 requires the Secretary of Agriculture to establish technical guidelines for measuring ecosystem services from conservation and other land management activities, with priority given to participation in carbon markets. Guidelines are also to be established for a registry to record and maintain information on measured environmental service benefits, and a process for verifying that a farmer has implemented the conservation or land management activities reported in the registry.

Lynn Betts, USDA/NRCS

cooperative extension offices provide information to producers interested in offering fee hunting, with checklists to help identify business goals, the type of lease to offer (such as daily, long-term lease, or lease to a hunt club), other services to offer (such as bed and breakfast, guides, or game cleaning), how to advertise, and how to manage risk.

One way that markets have addressed the issue of bringing all potential parties together is through the establishment of clearinghouses that collect information from buyers and sellers and provide it at little or no cost to potential market participants. Clearinghouses are used in some water quality trading programs. Third-party brokers and aggregators also bring buyers and sellers together by purchasing credits from producers and selling them to buyers. Both government and private sector entities are playing the aggregator role in water quality, carbon, and wetland mitigation markets. Aggregators also reduce uncertainty by verifying the level of services sold.

Government can help farmers who must meet minimum practice standards before being eligible to participate in offset markets by targeting them for assistance from conservation programs. Government can also encourage fee hunting by offering liability coverage to landowners allowing hunters on their land.

Where farmers can participate in more than one market, stacking credits provides an additional incentive to adopt practices that provide multiple benefits. For example, a producer can install a vegetative buffer at the end of a field to capture the nutrient and sediment runoff. Within this buffer, carbon is also sequestered and wildlife habitat is created. Each of these benefits has value and can be traded if markets exist.

But There Are Limits to Markets

While markets have many desirable properties, they are limited in what they can accomplish, even with government assistance. Public good characteristics that defy ownership discourage markets for environmental services from developing—and prevent the full value of environmental services from being reflected in prices. Even though some consumers may be willing to pay a higher price to support an eco-label, for example, many others who benefit from the resulting environmental services avoid paying for them by purchasing unlabeled goods at lower prices. The prices of credits in water, carbon, and wetland markets also may not reflect their full social value, only their value to the regulated community.

Some markets may eventually become widespread. A national cap-and-trade program, such as that proposed by Congress, could establish a national market for carbon credits and create sufficient demand to entice many farmers to enter. Others, such as water quality trading or wetland mitigation, may be limited to a few specific geographic areas. For example, of more than 700 watersheds impaired by nutrients, less than a third have characteristics that are required to support active markets for discharge credits from farms. The bottom line is that markets for environmental services are not likely to supplant the need for traditional conservation programs, which will continue to play a major role in providing environmental services. But where they can become economically viable, they can provide an important vehicle for encouraging investment in environmental stewardship.

This article 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

You also may be interested in . . .

Environmental Credit Trading: Can Farming Benefit? by Marc Ribaudo, Robert Johansson, and Carol Jones, in *Amber Waves*, Vol. 4, Special Issue, USDA, Economic Research Service, July 2006, available at www.ers.usda.gov/AmberWaves/July06SpecialIssue/Features/Trading.htm

Balancing Nutrition, Participation, and Cost in the National School Lunch Program

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- Schools face the dual constraints of meeting nutrition requirements and covering costs.
- The free-meal subsidy covers most of the per meal cost, but the price paid by most paying students covers only half of the per meal cost.
- School foodservice managers say that to appeal to students and raise revenues, they need to offer less nutritious a la carte foods and vending snacks.

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The National School Lunch Program (NSLP) provides federally subsidized meals to more than 30 million children each school day. Recently, reported high rates of obesity and overweight among children have focused attention on the nutritional quality of school lunches. But this attention has raised another fundamental question: Can schools meet the program's nutrition goals while covering costs, especially in times of rising food prices?

School districts are responsible for providing school meals. They receive a per meal subsidy and free agricultural commodities from USDA to help operate school lunch programs. Schools also get revenues from NSLP meal sales to students who are not eligible for free meals. The costs of running the program can exceed these two revenue sources, and schools often turn to other funding or food sales to make up the difference. For many schools, calls to raise nutrition standards could mean higher costs. Some schools say that to satisfy students and keep up revenues, they may need to offer foods of lower nutritional quality.

While nationally representative data are not available, several case studies have found that schools can keep their budgets in the black while still serving nutritious lunches. Some have succeeded by reducing costs, and others have raised revenues through increased student participation. And schools have found creative ways to make healthy food appealing to students. Federal nutrition guidelines, meal reimbursement, and commodity donations can help schools meet their objectives, although variation in food prices and nutrition goals present added challenges.

Ken Hammond, USDA

USDA Provides Per Meal Subsidies and Commodities

USDA support is intended to cover much of the cost of providing NSLP lunches, and most of it is in the form of cash reimbursement for meals served. In 2007-08, USDA reimbursed schools $2.47 for each free lunch served, $2.07 for each reduced-price lunch, and $0.23 for each paid lunch (see box, "The National School Lunch Program Feeds More Children in a Day Than McDonald's"). Basic Federal reimbursement rates are the same for all school districts across the country except in Hawaii and Alaska, which have higher rates to compensate for higher food prices in those States. Rates are also 2 cents more in districts where at least 60 percent of school meals are served free or at a reduced price. Reimbursement rates are adjusted by the Consumer Price Index for Food Away from Home for Urban Consumers once a year for inflation.

USDA also donates commodities to States to use in school lunches. In FY 2007, the commodities given to schools were worth 17 cents per meal for a total of $1.04 billion. Donation amounts vary per year, depending on availability and prices. States select from a wide variety of foods (including fruit and vegetables), based on what school food authorities need for their planned menus. The 2002 farm bill directed that USDA spend $200 million of entitlement funds for fruit and vegetables from 2002 through 2007, and the 2008 farm bill increased that amount to $406 million by 2012. In addition to the basic "entitlement" commodities, "bonus" commodities are sometimes available through USDA's price support and surplus removal programs.

The Fresh Fruit and Vegetable Snack Program is another program designed to increase fruit and vegetable availability to schools. Federal dollars are used directly by schools to purchase fresh fruit and vegetables for snacks. The 2008 farm bill called for a gradual expansion of this program to all States by 2012 and a total expenditure of $1 billion.

Schools Face Nutrition and Cost Constraints

School food authorities (SFAs) face the dual constraints of meeting Federal nutrition requirements and covering operating costs. In many cases, SFAs must meet State and local nutrition requirements that are more stringent than Federal standards.

Federal law requires that NSLP lunches provide one-third of the Recommended Dietary Allowances for protein, vitamin A, vitamin C, iron, calcium, and calories. Schools can use a food-based meal pattern, in which certain types of foods must be served, or use a nutrient-based meal pattern that requires an entree and side dish that meet the nutrient regulations. Schools must offer a variety of milk with every meal, and this can be some combination of whole, 2-percent, 1-percent, skim, or flavored milk. Since 1996, Federal standards require that no more than 30 percent of meal calories can come from total fat and 10 percent from saturated fat when averaged over the school week.

States and local school districts, however, have been instituting their own stricter standards for years. In 2004, Congress called on SFAs to develop a "Local Wellness Policy," which would set goals for nutrition standards and physical activity. An estimated 33 States have instituted additional standards for school foods. Some States call for the complete

The National School Lunch Program Feeds More Children in a Day Than McDonald's

The NSLP operated in over 101,000 public and nonprofit private schools in 2007.

Schools participating in the NSLP served over 5 billion lunches to more than 30 million children in 2007.

Of the 30 million students served in 2007, 15 million students qualified for free lunches, 3 million students paid a reduced price, and 12 million students paid full price. Children from families with incomes below 130 percent of the poverty level are eligible for free meals. Those with incomes between 130 and 185 percent of the poverty level are eligible for reduced-priced meals.

Federal Government contributions to the NSLP were $8.7 billion in 2007, with $7.7 billion in cash payments and $1.04 billion in commodity donations.

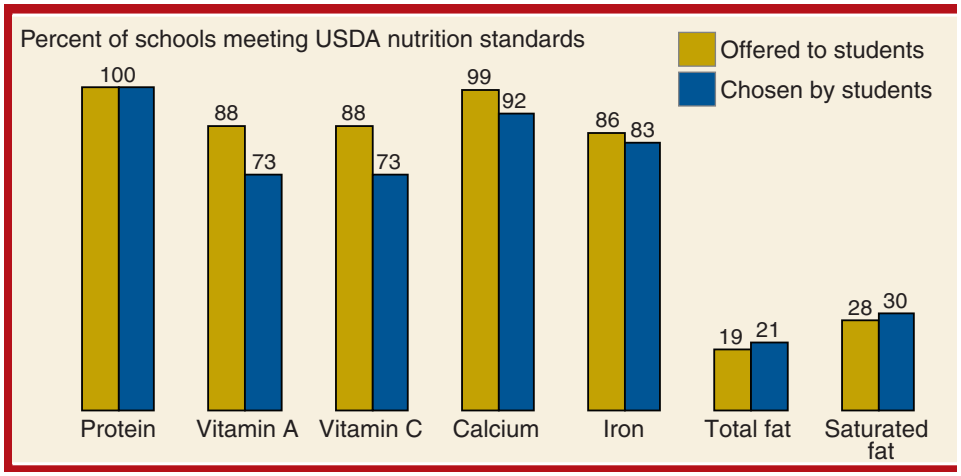
removal of non-NSLP foods from cafeterias or campuses, while others restrict the times when non-NSLP foods are available.

Cost pressures present a challenge to improving the school food environment. The costs of producing school meals are rising, driven partly by higher health care costs for employees and recently by increasing food costs. Although Federal reimbursement rates are adjusted for inflation, some observers question whether the rates accurately track cost increases.

Report Card: Do NSLP Lunches Make the Grade?

Studies show that students who get the NSLP meal have higher intakes of key nutrients (such as vitamins A, C, B_6, folate, thiamin, iron, and phosphorus) than children who bring their lunches from home or buy a la carte items. Studies found that NSLP participants consume more milk and vegetables and fewer sweets, sweetened beverages, and snack foods than nonparticipants do at lunch, and the same trend holds for milk, vegetables, and candy over a 24-hour period.

Most schools meet USDA nutrition standards for NSLP lunches except for total fat and saturated fat



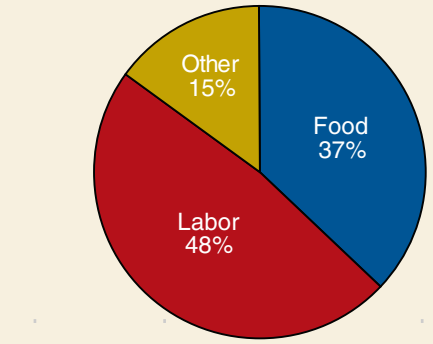
Source: USDA, Food and Nutrition Service. *School Nutrition Dietary Assessment-III, Menu Survey*, Nutrition Assistance Program Report Series, November 2007.

In one study, NSLP participants were found to consume more calcium, fiber, fruits, and 100-percent juices, both at lunch and over 24 hours. The difference in intake between participants and nonparticipants was largest for calcium and was probably due to higher milk consumption for participants—about half a serving on average. The fact that differences were maintained over 24 hours indicates improvement in the overall daily diet, as opposed to improvement only at the lunch meal and counteracted at other meals.

Studies of nutrient intake also show similar calorie intake for participants and nonparticipants but higher fat and sodium intake for participants. Whether the higher fat intake extends to weight gain is not clear: One study shows no effect of school meal participation on children's obesity, and another study shows that NSLP participants have a 2-percentage-point higher probability of obesity.

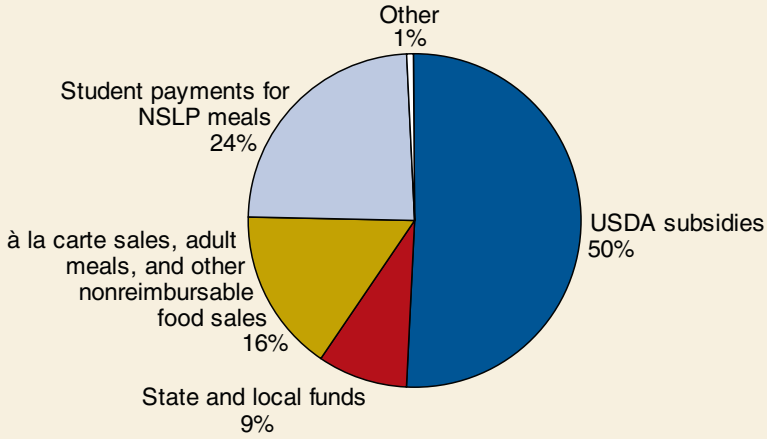
Despite Federal regulations, many NSLP lunches do not actually meet fat and nutrient requirements. The most recently available data, the 2005 School Nutrition Dietary Assessment (SNDA), showed improvement in saturated fat content from the 1998-99 SNDA, but it found that only one in four elementary schools served lunches that met the standard for fat and one in three met the standard for saturated fat. For high schools, the numbers were even lower: 1 in 10 for fat and 1 in 5 for saturated fat.

Labor accounts for almost half of full costs for school meals . . .



Other costs include supplies, contract services, depreciation, indirect charges by the school district and others.

. . . and USDA subsidies account for half of revenues



Source: USDA, Food and Nutrition Service. *School Lunch and Breakfast Cost Study-II.* Nutrition Assistance Program Report Series, April 2008.

The Free-Meal Subsidy Covers Most, but Not All, Costs

In 2005-06, USDA's Food and Nutrition Service (FNS) sponsored a national study—the School Lunch and Breakfast Cost Study II—to evaluate the adequacy of reimbursements. The study measured cost in two ways: the *reported cost* and the *full cost* of producing a reimbursable or nonreimbursable meal.

Reported costs are those incurred by SFAs in providing meals; these costs are charged to their foodservice accounts. Full costs are the reported costs plus unreported costs that the school districts, not the SFAs, incur on behalf of the program. Unreported costs can include meal-time supervisory labor, administrative labor, such as that needed for payroll and accounting, as well as indirect costs, such as those associated with equipment and utility costs that are not charged to the SFA. In school year 2005-06, full costs were composed of food (37 percent), labor (about 48 percent), and other costs (about 15 percent), which included supplies, contract services, and indirect costs.

The FNS cost study found that in school year 2005-06, the average reported cost for producing a reimbursable lunch was $2.36 across SFAs. Summing the cash reimbursement for free lunches from that year ($2.32 and $2.34 for qualifying low income districts) and the entitlement commodity rate for that year ($0.175), the midpoint reimbursement rate was $2.51, which was higher than the average reported cost. Most schools had costs below the reimbursement rate: 78 percent of schools had reported per lunch costs that were below the USDA free-lunch subsidy rate.

On the other hand, in school year 2005-06, the average full cost for producing a reimbursable lunch was $2.91 across SFAs, which is 40 cents higher than the midpoint free subsidy of $2.51. Only 32 percent of schools had full lunch costs that were below the USDA free-lunch subsidy. The finding that full costs are generally not covered by the free-meal rate points to the larger problem of hidden or, perhaps, unanticipated costs that can affect the long-term financial health of the program.

Schools with a larger share of students receiving free or reduced-price meals were likely to cover both types of costs. In schools where more than 60 percent of lunches served were free or reduced-price, revenues averaged 125 percent of reported costs and 107 percent of full costs. By contrast, in schools with less than 60 percent of free and reduced-price lunches served, revenues averaged 111 percent of reported costs and 88 percent of full costs. The greater amount of Federal subsidies received for those meals makes an important difference to schools in covering their costs.

Schools Turn to Competitive Foods for Revenues

Revenues for school meal programs come from various sources: USDA subsidies, student payments for NSLP meals, sales of other foods, and State and local funds. According to the FNS cost study, 45 percent of revenues for the average SFA came from per meal reimbursements in 2005-06; 5 percent from commodity donations; 24 percent from student payments for NSLP meals; 16 percent from other

food sales; and 10 percent from local and State government funds and other cash revenues. The sales of other foods have become a flash point for SFAs: The foods are less nutritious in general and yet their sales are considered necessary by many SFAs for financial survival.

These other foods, known as "competitive" or "nonreimbursable" foods, can include a wide variety of foods available at or near schools, including a la carte items sold in the cafeteria and snacks sold in vending machines. Vending machines were in 98 percent of senior high schools, 97 percent of middle/junior high schools, and 27 percent of elementary schools in 2004-05. A la carte items were available for sale in 75 percent of elementary schools and over 90 percent of middle and high schools.

Competitive foods are generally lower in key nutrients and higher in fat than the NSLP reimbursable meal. USDA requires only that "foods of minimal nutritional value" not be sold in foodservice areas during mealtimes. However, this requirement covers a limited number of foods, a small area of the school, and a short part of the day. The availability of competitive foods in a school has been found to reduce participation in NSLP, decrease nutrient intake from lunches, and increase the amount of food left uneaten and thrown away by students. The availability of unhealthy foods also sends a mixed message to students about the importance of nutrition.

Surprisingly, FNS's cost study finds that the revenues from nonreimbursable food sales do not cover their costs on average. Revenues from nonreimbursable foods covered less of their costs (both full and reported costs) than was the case for NSLP lunches. Revenues from NSLP lunches covered 93 percent of their full costs, compared with 61 percent for nonreimbursable meals. For reported costs, revenue from NSLP lunches covered 115 percent of costs versus 71 percent for nonreimbursable meals. Perhaps nonreimbursable sales serve other purposes for schools—such as attracting more students to the cafeteria. Or the costs incurred in selling nonreimbursable foods may be difficult to accurately separate from costs for reimbursable foods. The study assigns labor costs proportionately to the costs of nonreimbursable and reimbursable foods, and this may explain why the costs for nonreimbursable foods seem higher than expected.

Kathryn L. Lipton, USDA/ERS

Building a Healthy School Lunch Program

The available evidence, while limited, suggests that nutrition and financial health do not have to conflict. A study of SFAs in Minnesota found that meal costs were not higher for cafeterias that met regulations for nutritional quality than for those that did not. Some, but not all, SFAs in a pilot study in California were able to improve nutritional quality while continuing to break even.

According to the case studies, schools have found ways to lower costs and increase revenues. Some SFAs have switched to part-time labor with lower health care benefits, some buy more food in bulk, and some use more ready-to-eat foods. In some cases, SFAs have outsourced meal provision to private foodservice management companies. Schools have joined purchasing cooperatives to reduce food costs, and a small but increasing number of schools are purchasing directly from local farmers. As of May 2008, 1,929 school districts have an operational "farm-to-school" program,

New Ideas From School Kitchens

Schools have successfully implemented a wide range of changes in their lunch rooms, from dramatic changes to small tweaks. Many have substantially modified their lunch programs by remodeling their kitchens and serving areas and, in some cases, by hiring new foodservice directors. Kitchen renovations can provide needed space for fresh food preparation, storage, and new serving areas, such as salad bars, which are typically popular with students. The Berkeley Unified School District in Berkeley, CA, as part of a public/private partnership called the School Lunch Initiative, has upgraded school kitchens to better handle fresh food and reheat meals made from scratch in a central kitchen. They now have a salad bar in each school; they serve fresh fruits and vegetables daily, and they give priority to locally produced, organic food.

New management can also make a difference. In 2003, Hopkins School District in Minneapolis, MN, hired a new foodservice director with professional foodservice management experience. The initial changes made by the new director were small: Healthy foods were made available as an option and the soda vending machine contract was canceled. After the community approved a bond initiative, more major changes were made: Meals were prepared completely onsite and fresh, low-fat, and whole-grain foods became the only options. Food costs rose, and they charged more for the meal to paying students, but the director was able to keep labor and other non-food costs down to where they had been before the change. Also, students were not allowed to go off campus to buy other food.

Smaller innovations at other schools have included bringing students into the food selection process through tastings and demonstration events. Schools have used marketing-style promotions, games, and parties to highlight different new foods. Wolftrap Elementary in Vienna, VA, sponsors monthly "tasting parties," where students are asked to rate different versions of a healthy entree or snack. Student participation provides the unique perspective that an adult may completely miss, such as whether the food is too messy to eat or whether it can get caught in one's braces. And schools get student buy-in as they move to more nutritious meal options.

Other successful strategies have included changes to the cafeteria environment—longer lunch periods, shorter lunch lines, and pleasant seating areas. Studies have found that, when students have more time to eat and especially when lunch follows recess, they are more likely to eat all of their lunch and thus more likely to eat a balanced meal. Also, when the cafeteria is designed to reduce time in lunch lines, students spend more time eating. Schools have also found that students eat well when there are nice seating areas that are conducive to socializing.

For more information, see . . .

Making It Happen! School Nutrition Success Stories, FNS-374, USDA, Food and Nutrition Service, U.S. Health and Human Services, Centers for Disease Control and Prevention, and U.S. Department of Education, January 2005, available at: www.fns.usda.gov/TN/Resources/makingithappen.html

according to the National Farm to School network.

Schools have also found creative ways to increase revenues through higher student participation. Most of these strategies have revolved around food preparation changes, lunch scheduling changes, and nutrition education. Smaller efforts have brought students into the process of tasting, selecting, and learning about nutrition through games and parties. Some schools have completely revamped their lunch programs, while others have implemented more gradual changes (see box, "New Ideas From School Kitchens").

Studies have identified several supporting factors as necessary complements to lunch program changes. First, eliminating or greatly reducing competitive foods has been essential. Students eat more healthful foods and purchase more NSLP meals when their options are reduced. Second, school lunch programs can benefit from buy-in from all stakeholders: superintendents, principals, school foodservice personnel, parents, and students. Efforts to improve nutritional quality have

proven successful when everyone is onboard, and particularly when leadership is energetic.

The economics of providing school meals needs to be further investigated, especially in light of recent food and fuel price increases. The 2005-06 FNS cost study is the only study that provides national estimates of the revenues and costs of school lunch operations, and it provides important insights. Contrary to conventional wisdom, the findings suggest that competitive foods are not especially profitable for school food services. Instead, the study suggests that financial solvency is likely to be gained via the most profitable component, the NSLP meals themselves. In FY 2008, 62 percent of public and private school students received or purchased an NSLP meal on an average day, so there is room to expand participation. Serving additional meals raises revenues while spreading the cost of the cafeteria and other fixed costs over more meals.

Another way to increase revenues is for schools to raise the prices charged to students for full and reduced-price NSLP lunches and other foods. According to the SNDA study, in 2004-05, most SFAs charged $1.50 for a full-price NSLP meal and $0.40 for a reduced-price meal. The full price charged to students was significantly lower than the average full cost to produce that meal of $2.91. The gap between prices for paid lunches and full costs helps explain why SFAs with lower rates of free and reduced-price meal participation are vulnerable to deficits.

SFAs historically have been reluctant to raise prices because their main goal as nonprofits is to serve affordable meals. In practical terms, SFAs face the need to balance the increased revenues from a price increase against potential losses from the reduction in meals purchased as a result of the higher price. Little is known of the tradeoffs between higher prices and demand for lunches for most schools.

When schools have needed the significant capital investment to completely overhaul their lunch programs, they have largely turned to their communities for funding. This may be an area where the Federal Government could assist further, as it has in the past when funds were needed to equip school cafeterias.

A clear way to increase revenues relative to costs is to get more students to join the lunch line. Following the lead of successful schools, an important change is to offer freshly made, healthful meals that students help to choose and that they have time to enjoy. Whether this is accomplished by completely revamping the program, by making it more efficient, or by raising prices charged to paying students, schools have shown that providing quality, nutritional meals can be done, and it can lead to higher participation rather than lower.

Ken Hammond, USDA

This article is drawn from . . .

The National School Lunch Program: Background, Issues, and Trends, by Katherine Ralston, Constance Newman, Annette Clauson, Joanne Guthrie, and Jean Buzby, ERR-61, USDA, Economic Research Service, July 2008, available at: www.ers.usda.gov/publications/err61

School Lunch and Breakfast Cost Study – II, Nutrition Assistance Program Report Series, USDA, Food and Nutrition Service, April 2008, available at: www.fns.usda.gov/oane/MENU/Published/CNP/FILES/MealCostStudy.pdf

You may also be interested in . . .

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/

Productivity Growth Drives Expanded Agricultural Production

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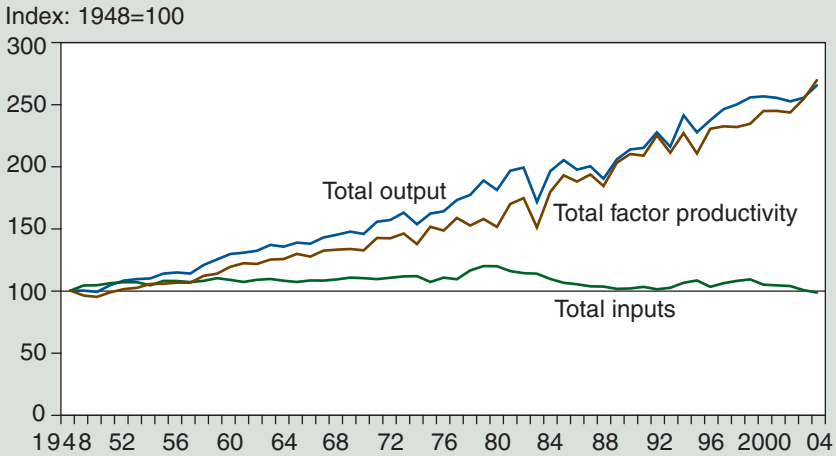
U.S. agriculture relies almost entirely on productivity growth, primarily from innovation and changes in technology, to raise output. Total production nearly tripled between 1948 and 2004, while land in agriculture fell by one-quarter and labor declined by three-quarters. Because of high productivity growth, agricultural commodity prices rose at less than half the rate of economy-wide prices over those 56 years.

What Is Productivity?

Simple measures of productivity growth, such as increases in output per acre (yields) or output per worker (labor productivity) have been used for many years. These are called single-factor measures because they relate changes in output to changes in a single input, such as land or labor. Single factor measures, while useful, take no account of the usage of other inputs. Land yields could be raised, for example, by adding more capital or chemicals. But that would not provide true productivity improvements if the value of the added inputs exceeded that of the land that they replaced.

ERS's productivity indexes allow researchers to identify the separate roles of changes in input use and productivity-improving developments in technology in driving growth in U.S. agricultural output. Increased total factor productivity (TFP) is the difference between the growth in agricultural output and growth in inputs. ERS publishes TFP measures for the U.S. farm sector for 1948 to 2004 and for individual States from 1960 to 2004.

Changes in U.S. agricultural output, inputs, and total factor productivity[1] since 1948



[1]Total factor productivity measures total output per total inputs, or the overall efficiency of agricultural production.

ERS Estimates Show Less Land, Labor, but Greater Productivity

The TFP indexes reveal the dramatic contraction of labor in the farm sector. Agricultural land, a component of capital, also fell steadily, except for a brief cessation in the

Sources of growth in the U.S. farm sector (average annual growth rates in percent)

	1948-2004	1948-53	1953-57	1957-60	1960-66	1966-69	1969-73	1973-79	1979-89	1989-99	1999-2004
Labor	-0.56	-0.86	-1.14	-0.89	-0.86	-0.65	-0.42	-0.22	-0.35	-0.24	-0.78
Capital (inc. land)	-0.08	0.61	0.01	-0.06	0.06	0.14	-0.12	0.39	-0.67	-0.28	-0.11
Materials	0.61	1.56	1.16	1.45	0.74	1.23	0.76	1.01	-0.66	1.24	-1.15
Total factor productivity	1.77	0.45	1.00	3.80	1.11	1.56	2.24	1.28	2.53	1.44	2.79
Total output growth	1.74	1.76	1.03	4.31	1.04	2.28	2.46	2.46	0.86	2.17	0.75

The sub-periods are measured from cyclical peak to peak.
Source: USDA, Economic Research Service.

1970s, and by 2004 amounted to less than three-quarters of its 1948 value. In contrast, the sector's use of equipment and of material inputs—energy, fertilizers, pesticides, and purchased services—increased considerably until the early 1980s. After that, materials inputs fluctuated but showed no strong growth, and equipment inputs declined.

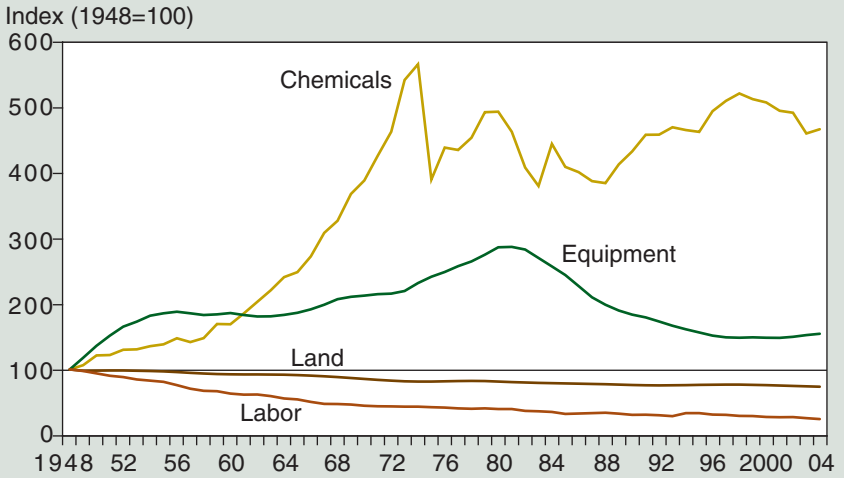
Between 1948 and 1979, the sector substituted expanded usage of equipment and agricultural chemicals for declining land and labor inputs. As a result, materials accounted for a significant share of agricultural output growth, even though growth in total factor productivity was also important. However, output continued to grow after 1979, while capital inputs declined and material inputs (including chemicals) grew very little, compared with levels in 1979. Consequently, growth in TFP accounted for all of the post-1979 expansion of output.

There can be little doubt that productivity growth has been the engine of economic growth in post World War II agriculture. TFP growth sparked most of the gains in production between 1948 and 1979, with added capital and materials accounting for the remainder. After 1979, when inputs in total declined, TFP drove all of the substantial increase in aggregate agricultural production.

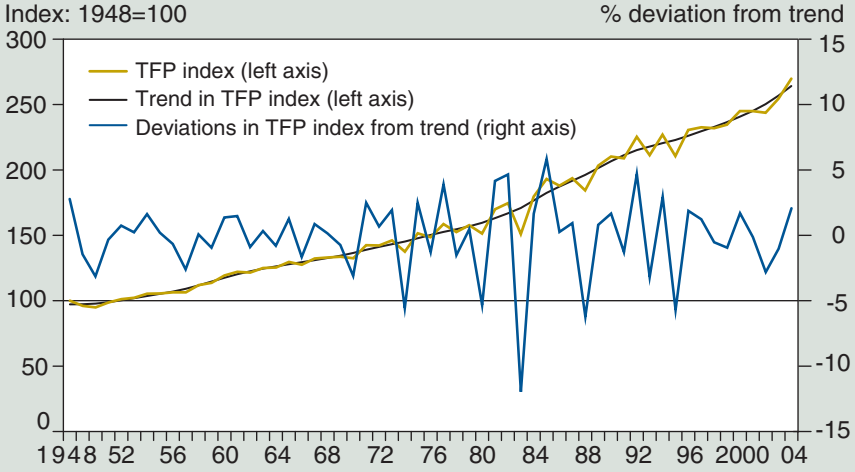
While the trend rate of TFP growth is large, the measures also show sharp year-to-year deviations from that trend, and TFP can even decline in some years as a result of weather and economic events. Measured TFP growth fell in 1974 and 1978 when energy prices spiked, and sharp downturns occurred during drought years in 1983, 1988, and 1995. Poor weather hindered production and left TFP flat between 2000 and 2002. But the return of favorable weather in 2003 and 2004 led to sharp increases in output and productivity, with TFP growing by 4.4 percent in 2003 and 6.0 percent in 2004.

Longrun TFP growth is driven by the development and diffusion of innovations in plant and animal breeding, capital and materials, production practices, and agricultural organization. Economic researchers have found a strong link between investments in research and innovation and agricultural productivity growth.

Trends in use of selected agricultural inputs, 1948-2004



Annual fluctuations in agricultural total factor productivity



This data feature is drawn from . . .

ERS Data on Agricultural Productivity in the United States, available at: www.ers.usda.gov/data/agproductivity/

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.)	237.3	240.7	239.3	285.4 p	313.2 f	1.4	-0.6	19.3	9.7
Crops	113.7	115.9	120.0	143.9 p	174.6 f	1.9	3.5	19.9	21.3
Livestock	123.6	124.9	119.3	141.4 p	138.7 f	1.1	-4.5	18.5	-1.9
Direct government payments ($ bil.)	13.0	24.4	15.8	12.0 p	13.4 f	87.7	-35.2	-24.1	11.7
Gross cash income ($ bil.)	267.4	281.3	272.5	316.2 p	346.0 f	5.2	-3.1	16.0	9.4
Net cash income ($ bil.)	82.2	85.8	67.9	87.6 p	96.6 f	4.4	-20.9	29.0	10.3
Net value added ($ bil.)	127.8	121.4	104.4	137.6 p	144.1 f	-5.0	-14.0	31.8	4.7
Farm equity ($ bil.)	1,401.9	1,576.1	1,771.8	2,002.7 p	2,286.2 f	12.4	12.4	13.0	14.2
Farm debt-asset ratio	11.5	10.9	10.5	9.9 p	9.1 f	-5.2	-3.7	-5.7	-8.1
Farm household income ($/farm household)	81,596	81,599	77,654	84,159 p	89,434 f	0.0	-4.8	8.4	6.3
Farm household income relative to average U.S. household income (%)	134.8	128.8	116.7	na	na	-4.5	-9.4	na	na
Nonmetro-metro difference in poverty rate (% points)[1]	na	2.3	3.4	na	na	na	na	na	na
Cropland harvested (million acres)	312	314	304 p	na	na	0.6	-3.2	na	na
USDA conservation program expenditures ($ bil.)[2]	5.1	na	na	na	na	na	na	na	na

Food and Fiber Sector Indicators

U.S. gross domestic product ($ bil.)	11,713	12,456	13,247	na	na	6.3	6.4	na	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	70.0	76.5	9.5	10.9	9.4	9.3
Total agricultural exports ($ bil.)[2]	62.4	62.5	68.7	81.9	101.0	0.2	9.9	19.2	23.3
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	213.3 f	2.4	2.4	3.9	5.1
Share of U.S. disposable income spent on food (%)	9.7	9.8	9.9	na	na	1.0	1.0	na	na
Share of total food expenditures for at-home consumption (%)	51.5	51.4	51.1	na	na	-0.2	-0.6	na	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

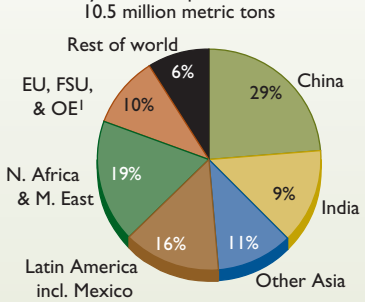
f = Forecast. p = Preliminary. na = Not available. All dollar amounts are in current dollars.

[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.

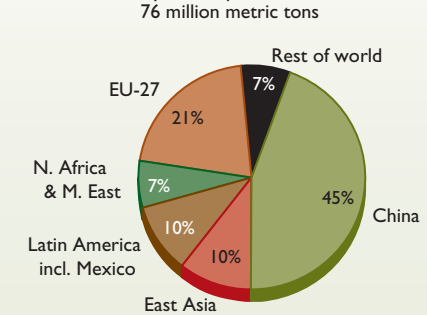
China's and India's strong economic growth...

...translates into large imports of soybean oil



[1] EU-27, former Soviet Union, and other Europe.

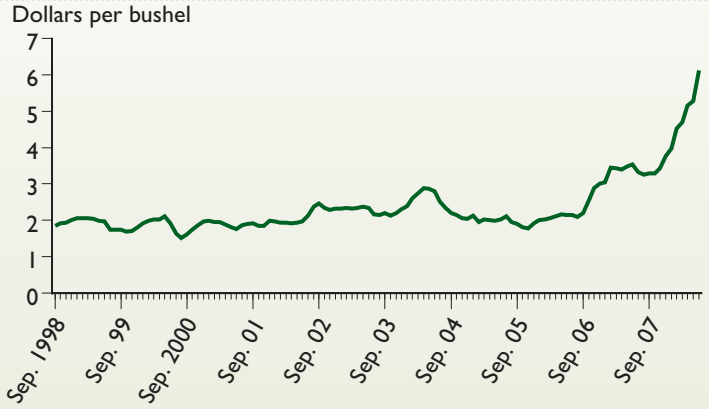
China also a major importer of soybeans



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

Markets and Trade

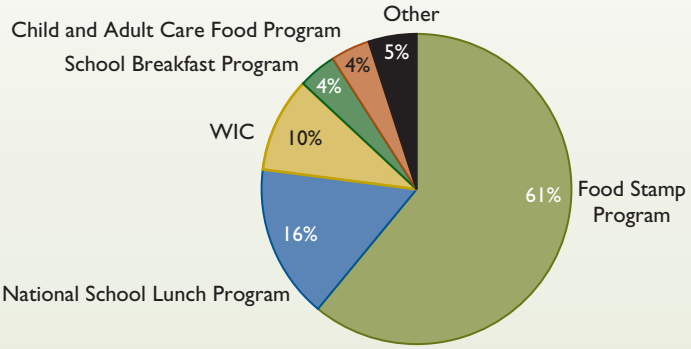
Average farm price for corn has risen sharply in 2008



Source: USDA, Economic Research Service, Feed Grains Database.

Diet and Health

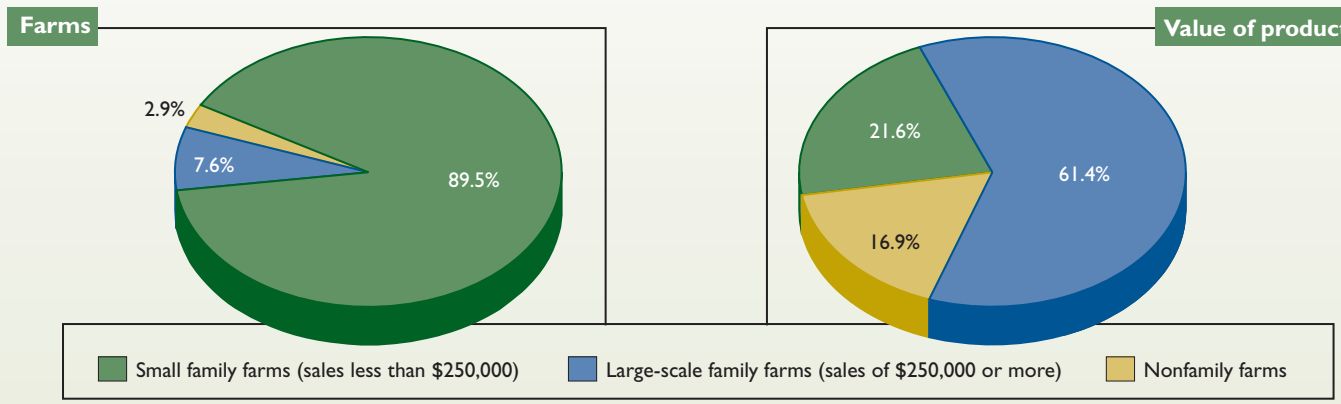
The National School Lunch Program accounted for 16 percent of the $54.5 billion USDA spent for food and nutrition assistance in fiscal 2007



Source: Compiled by USDA, Economic Research Service using data from USDA, Food and Nutrition Service.

Farms, Firms, and Households

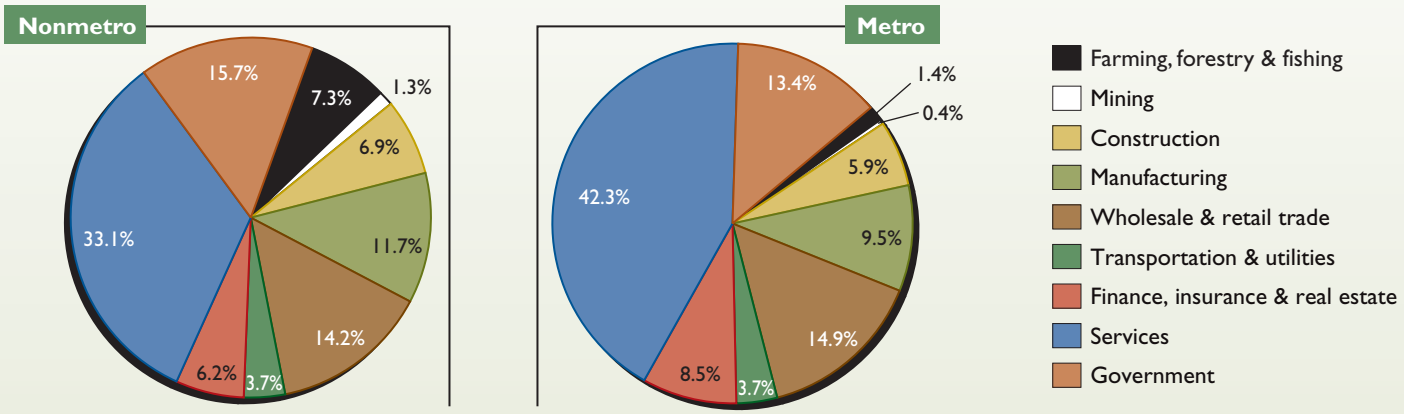
Only about 8 percent of farms—large-scale family farms—accounted for 61 percent of sales in 2006



Source: USDA, Economic Research Service, 2006 Agricultural Resource Management Survey.

Rural America

Service industry jobs account for the largest share of employment in both nonmetro and metro areas, 2006



Source: Calculated by USDA, Economic Research Service using data from the Bureau of Economic Analysis.

On the Map

Agricultural Productivity Grew in Every State

ERS provides estimates of annual growth in agricultural productivity for each of the 48 contiguous States. ERS calculates productivity as the difference between growth in agricultural output and growth in inputs used. Eastern Corn Belt States show the effects of continuing productivity gains in growing feed grains, while innovations in raising hogs and poultry drove high productivity growth in several Southern States. Northwestern States' relatively high productivity growth reflects shifts to high-value specialty crops and dairy production. Several New England States illustrate a striking development: output and inputs declined, but productivity increased, as higher value commodities and relatively productive land and labor remained in agriculture.

Eldon Ball,
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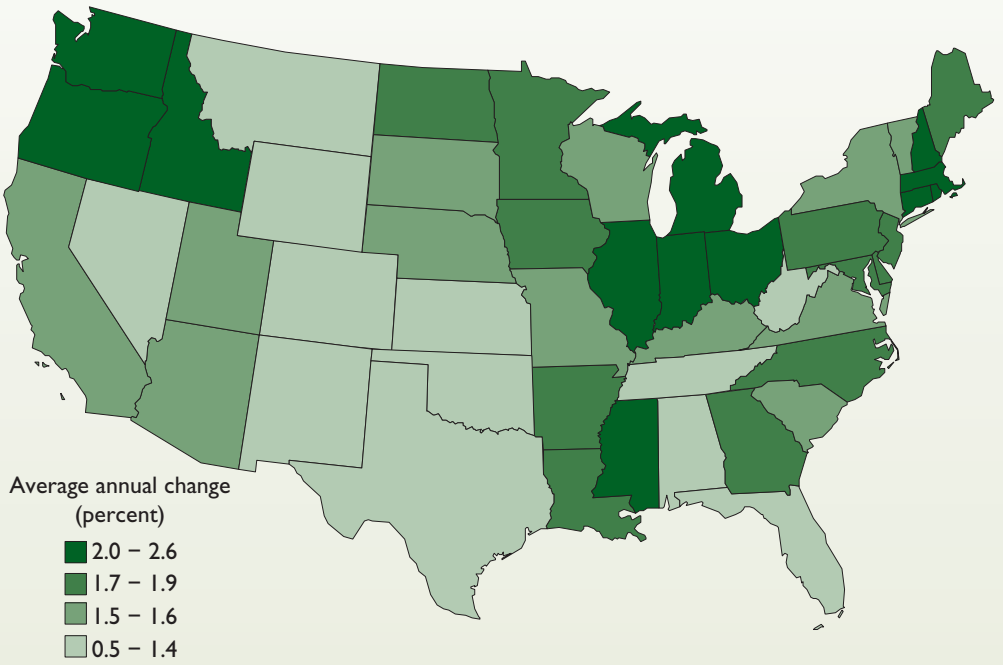
Average annual change in agricultural productivity by State, 1960-2004



Average annual growth for the U.S. was 1.85 percent in 1960-2004.
Source: USDA, Economic Research Service, data product, Agricultural Productivity in the United States.

In the Long Run

Growth in Agricultural Productivity Limits Price Increases

Prices across the U.S. economy rose an average of 3.4 percent per year between 1948 and 2007. Prices for agricultural inputs such as seeds, fertilizers, agricultural chemicals, equipment, and labor rose 3.6 percent annually over the same period. In contrast, prices of agricultural outputs such as crops and livestock rose 1.7 percent per year. The gap between agricultural input and output prices reflects productivity growth. Between 1948 and 2007, the agricultural output generated from a bundle of inputs increased significantly, largely offsetting input price increases. Faced with growing worldwide demand for agricultural products, the benefits of continued high productivity growth include the capability to expand output while reducing commodity price escalation and volatility.

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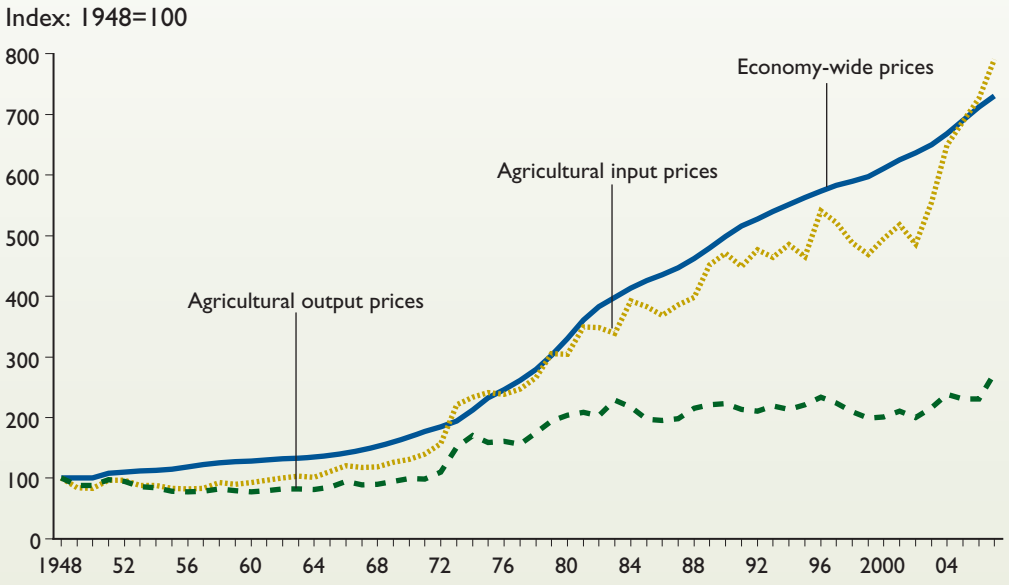
Trends in prices for agricultural inputs and outputs



Source: USDA, National Agricultural Statistics Service for agricultural price indexes; *Economic Report of the President* for economy-wide price index (GDP implicit price deflator).