# *Spring . . .*

# *A Season of Uncertainty*

Spring is a time of transition—-leaves bud, the grass hints at green, and farmers are preparing for spring planting of crops that grow over the summer (such as corn, soybeans, and rice). It is also a time of uncertainty, as farmers and others try to get a sense of how the new season will unfold. Key data presented in USDA's annual *Prospective Plantings* report (released March 31) and other publications are helpful assessment tools. Still, questions remain. What will farmers plant, and how will markets respond?

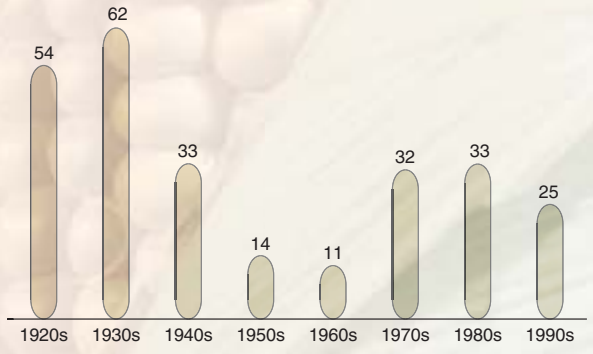
At first glance, uncertainty this year appears particularly keen. Fluctuating energy prices in late winter and early spring have implications for farm production costs, including diesel fuel, irrigation pumping, and fertilizer. Prolonged dryness in the western U.S. and parts of the Great Plains complicates planting in those regions. Heightened competition from foreign countries in several markets—Brazil for soybeans, Russia and Ukraine for wheat, and China for several commodities—raises questions of how the global marketplace will shape up in 2003.

While weather and international factors are obvious sources of uncertainty, government policies affecting agriculture—including trade, commodity, and environmental policies—can be sources of uncertainty, too. Indeed, a USDA survey in the late 1990s indicated that policy and regulatory changes were perceived by farmers to rank highest among the risks they faced.

But are times more uncertain now than in the past? Uncertainty in agricultural markets can be measured in many different ways, but variability in commodity prices is one "bottom-line" way to assess the situation. Using prices for corn, a major crop planted in the spring, the answer appears to be "no." Variability in corn prices was quite high during the 1920s and 1930s, largely due to the collapse in grain prices in the post-World War I period and low yields in several years. Variability was low during the 1950s and 1960s, a period characterized by high government support, fairly stable yields, and consistent demand. From 1990 to the present, corn price variability appears to be near its long-term average.

**Corn Price Variability, by Decade**

Percent variation from the mean price




Over time, of course, the prices an individual producer receives may be more or less variable than those at the aggregate level. Whatever comes, spring is a time for renewal…and, for farmers…a time to gather information and analyze it to best position themselves to weather the ups and downs of the market.

Joy Harwood

**Joy Harwood,** Deputy Director for Market Analysis & Outlook
Market and Trade Economics Division, Economic Research Service

# FEATURES


## DYNAMICS OF AGRICULTURAL COMPETITIVENESS: Policy Lessons From Abroad

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## METHYL BROMIDE PHASEOUT PROCEEDS: Users Request Exemptions

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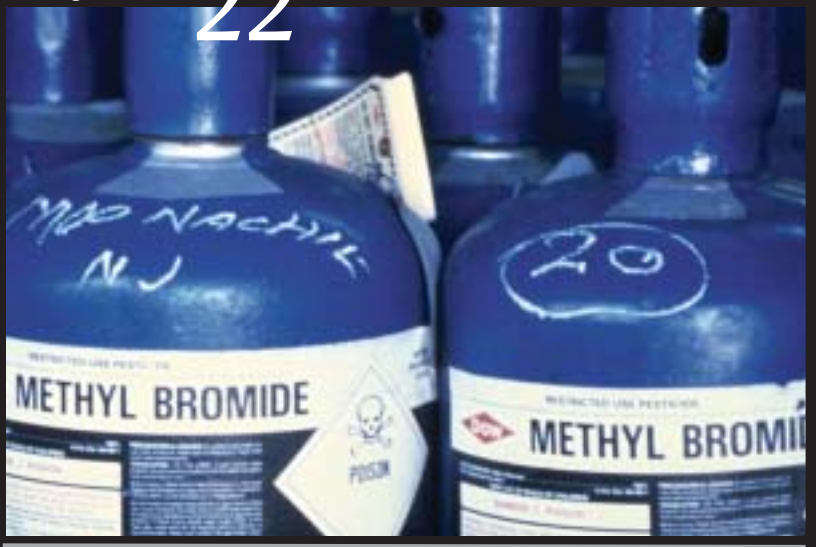


The worldwide phaseout of methyl bromide could mitigate some of the harmful effects of ozone depletion, but because the fumigant is so important to agricultural production, the phaseout could also have some negative effects for producers and consumers.


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What If: Cash Instead of Food Stamps?
*www.ers.usda.gov/AmberWaves/Feb03/Findings/cashnotfoodstamps.htm*

Market Dynamics Keep Food Prices Steady
*www.ers.usda.gov/AmberWaves/Feb03/Findings/marketdynamics.htm*

Photo by Frederick W. Crook

As water for agriculture becomes more scarce, changes in the pattern of crops are more likely than a reduction in cultivated acreage.







# Will Water Scarcity Limit China's Agricultural Potential?

Water shortages in important grain-producing regions of China may seriously compromise China's agricultural production potential. Rapidly increasing industrial and domestic water consumption and expanding irrigation have drawn down groundwater tables and disrupted surface-water deliveries. The problem is most severe in north-central China, where most of China's wheat and cotton is produced and irrigation is essential to maintaining high yields. The situation may worsen unless effective water conservation policies can be put into place rapidly.

China is responding to these concerns on several levels. At the national level, the Ministry of Water Resources began promoting water conservation through various measures in the late 1990s, such as strengthening the authority of National River Basin Commissions to enforce water withdrawal limits and promoting irrigation management reforms. Provincial and other local officials are mediating conflicts between users to improve overall water management. In villages, local water managers and farmers are adopting water management reforms and water-saving techniques, such as forming water user associations and alternating wet-dry irrigation for rice. In addition, reforms in the pricing and fee collection system may provide farmers with better incentives to conserve water. Pricing water deliveries to farms based on volume could improve efficiency, but would be costly to monitor since China has over 200 million farm households, each tending several tiny plots of land.

As water for agriculture becomes more scarce, changes in the pattern of crops are more likely than a reduction in cultivated acreage. Wheat is most likely to suffer declines, since wheat is irrigated in much of north China and brings low returns to water. Production of a variety of crops—corn, cotton, and high-value fruits and vegetables—may increase as farmers switch from irrigated wheat. High-value fruits and vegetables are often more water intensive, but are also more suited to water-saving irrigation technologies, such as drip irrigation and greenhouse production.

The success of current efforts to encourage water conservation in China will depend on a variety of factors. Policy reforms will depend critically on the enforcement of withdrawal limits both from surface-water systems and from ground water. Also important is the extent to which policies and local management practices motivate water users and water managers to conserve water resources.

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**This finding is drawn from…**

*China's Agricultural Water Policy Reforms: Increasing Investment, Resolving Conflicts and Revising Incentives*, by Bryan Lohmar, Jinxia Wang, Scott Rozelle, Jikun Huang, and David Dawe, AIB-782, USDA/ERS, March 2003, available at: www.ers.usda.gov/publications/AIB782/

In water-stressed Hebei province, a farmer irrigates his winter wheat field with ground water via flexible plastic tubes.

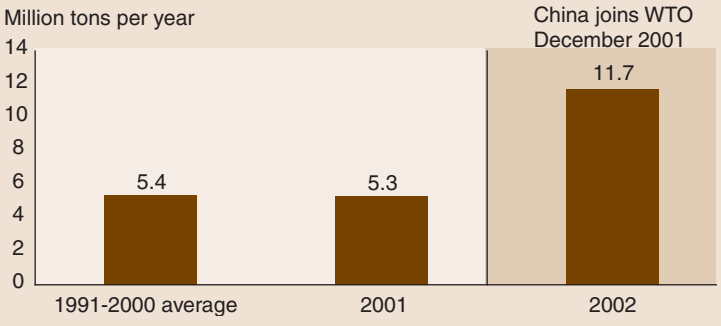
Photo by Frederick W. Crook

FINDINGS

# China Slow in Meeting WTO Commitments

The impact of China's accession to the World Trade Organization (WTO) fell short of expectations in 2002. Its agricultural imports failed to increase despite tariff cuts, elimination of export subsidies, a reduced role of government-sponsored trading companies, and greater transparency in trade-related regulations. Its exports of many agricultural commodities increased, also contrary to expectations.

**China's corn exports accelerated in first year as WTO member**




The corn market is the most prominent example of unrealized WTO effects. After joining the WTO, China's elimination of export subsidies for corn was expected to reduce its corn exports—among the world's largest in recent years. Instead, China's corn exports continued at near-record levels in 2002 (11.7 million tons) as China promoted exports to draw down large stockpiles of grain accumulated during the 1990s. Though China ended export subsidies for corn as part of its WTO commitments, those subsidies were reportedly replaced by internal transportation subsidies and tax rebates, and its exports in 2002 were still priced well below domestic prices.

China's corn imports were negligible in 2002, despite China's agreement to allow corn imports at a low 1-percent tariff. Potential importers (mostly Chinese feed mills) had to apply for permission to import, and there were several months of delays in processing applications. Most applicants were given permission to import only a small quantity of corn that would not fill a cargo ship. Imports were assessed a 13-percent value-added tax in addition to the 1-percent tariff, raising the cost of imports above the cost of Chinese corn.

China's trade performance in 2002 was not due entirely to its policy measures. Tight world supplies helped China's corn exports. Rising world market prices due to drought in North America reduced the need for subsidies, making Chinese exports more competitive and imports more costly for Chinese buyers. China's corn exports are likely to drop if world prices decline.

China's WTO accession negotiations were unusually lengthy and complex, as negotiators sought to close potential loopholes. Nevertheless, China's policymakers are still finding ways to align agricultural trade with domestic policy objectives. China's agricultural sector has become more market oriented and transparent in recent years, but tight government control over foreign trade still makes it difficult to predict global market impacts. In the long run, WTO accession will likely provide the competitive pressures needed to integrate China's agricultural sector with world markets, but it may be slow in coming.

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**This finding is drawn from…**

*China's Corn Exports: Business as Usual, Despite WTO Accession,* by Fred Gale, FDS1202-01, USDA/ERS, December 2002, available at: www.ers.usda.gov/publications/fds/dec02/fds1202-01/

Photo by Fred Gale, USDA/ERS

**After joining the WTO, China's elimination of export subsidies for corn was expected to reduce its corn exports.**


Photo by Fred Gale, USDA/ERS

# Calculating the Cost of Foodborne Illness–A New Tool To Value Food Safety Risks

Seventy-six million Americans fall ill each year from eating foods contaminated with bacteria, viruses, and parasites. If you have ever been one of them, you are acquainted with some of the costs these diseases inflict. Discomfort, pain, time lost from normal activities, forgone earnings, spending on medications, long-term medical treatment, and even death are all among the possible consequences of foodborne illness. Possible financial costs can run to millions of dollars.

ERS researchers have estimated the costs of illness and premature death for a number of foodborne illnesses. For example, ERS estimates the annual U.S. economic costs due to foodborne *Salmonella* infections at $2.4 billion. Policymakers use such estimates to help them rank risks, focus policy, and prioritize spending. The ERS estimates, like all cost-of-illness estimates, include assumptions about disease incidence, the severity of the illness, and the costs incurred for medical care, lost productivity, and so on. Changes to any of these assumptions change the cost estimates and, as a result, could change risk rankings, spending priorities, and food safety policies.

To provide policymakers and others with information on the assumptions behind foodborne illness cost estimates—and to give them a chance to make their own assumptions and calculate their own cost estimates—economists at ERS have developed a web-based "Foodborne Illness Cost Calculator" (available at www.ers.usda.gov/data/foodborneillness). The Calculator currently describes the assumptions and calculations behind the ERS cost estimates for one foodborne pathogen, *Salmonella*. (Four more pathogens—*E. coli* O157, *E. coli* non-O157 STEC, *Listeria*, and *Campylobacter*—will be added later.) The Calculator also describes alternative epidemiological and cost assumptions, including those used by the Environmental Protection Agency and the Food and Drug Administration when they calculate illness costs for policy analyses.


The Calculator allows users to create their own cost estimates by changing the ERS assumptions and to examine the impact that different assumptions have on cost estimates and risk rankings. Calculator users can change assumptions to reflect any specific information they may have about disease incidence, medical costs, productivity losses, or other costs. By changing the assumption about the number of cases, users can calculate the costs of foodborne illness for a particular State or region, or for a particular foodborne illness outbreak. A user could even calculate his or her own potential costs from a bout of foodborne illness.

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**For more information** on ERS research on foodborne illnesses, visit: www.ers.usda.gov/Emphases/SafeFood

# Emergency Food Providers Supplement Federal Aid

During times of need, many households turn to local, nongovernment emergency food providers. Yet only limited information about these organizations has been available to policymakers. A recent ERS-funded study of emergency food providers estimates that almost 33,000 food pantries and over 5,000 emergency kitchens operate in the United States, and they provided an estimated 2.4 billion meals in 2000. The study is the first to provide a broad, national overview of these private, nonprofit organizations and their relationship to Federal food assistance programs.


USDA photo

Food pantries and emergency kitchens (often called soup kitchens) provide food directly to needy households. Food pantries distribute bags of food to be prepared and eaten at home. Emergency kitchens provide prepared meals that are eaten onsite. Food pantries and emergency kitchens are typically locally based and rely heavily on volunteers. Almost two-thirds are affiliated with a religious organization.

About 30 percent of food pantries and 40 percent of emergency kitchens in the 2000 survey had been in operation for more than 10 years. But, almost one in five emergency kitchens and one in three food pantries had been operating for 3 years or less.

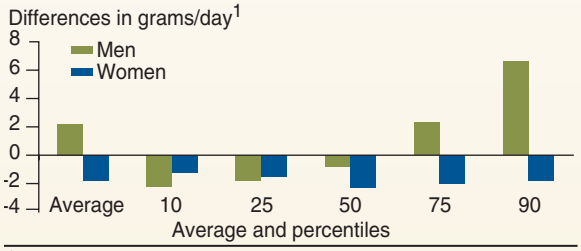



# Dietary Differences Masked by Averages

As the rates of obesity and related health problems, such as type 2 diabetes, continue to rise, the quality of our diets is being increasingly scrutinized by health professionals in both the public and private sectors. The diets of different sociodemographic groups are of particular interest to public health officials because of the disparities among these groups in terms of incidence of diet-related deficiencies and diseases. With better knowledge of the dietary differences associated with gender, education, income, race, and ethnicity, public health officials can identify groups that are particularly vulnerable to poor health.

Looking at average intakes of dietary components such as fats, cholesterol, and calories across sociodemographic groups shows that the richer, more educated segments of society have better diets, on average, than the poorer and less educated groups. Similarly, the quality of diets tends to increase with age. But assessing dietary differences by comparing average intakes can be misleading. In fact, for many nutrients and other dietary components, most groups meet the intake levels recommended by health authorities. Comparing dietary differences between groups at different intake levels—that is, between the light, moderate, and heavy eaters in these groups—provides a clearer perspective on disparities in diet quality.

**Differences in saturated fat intakes by education**




[1]Difference equals intakes of those with less than 12 years of education minus intakes of those with more than 12 years of education.

High intakes of saturated fats tend to raise blood cholesterol, a risk factor for heart disease. On average, men with less than a high school education consume 2 grams more of saturated fat per day than men with at least some college education. Because 2 grams of saturated fat is about 6 percent of a 21-50 year old male's recommended daily limit of 32 grams, this difference is not so alarming. What tips the balance is the difference in saturated fat intakes between the heavy eaters in the two education groups. Among the heavy eaters—those in the top 10 percent of intake levels (90th percentile or higher)—men with less than a high school education consume 7 grams or more additional saturated fat per day than do men with some college education. For women, the average difference does give a good indication of the difference in saturated fat intake by education level across the range of intakes. After adjusting for other socioeconomic characteristics, Black men and women consume more cholesterol per day on average than White men and women. The picture is more alarming at higher intake levels where the gap widens for both men and women.

This is a sobering message for nutritionists, dietitians, and other public health professionals. Judging disparities in diet quality based on average intakes alone may be misleading. Many of the disparities in the intakes of energy, fats, and cholesterol are more extreme at the higher, unhealthful levels. Closing these gaps in dietary quality may pose a greater challenge than we realize.

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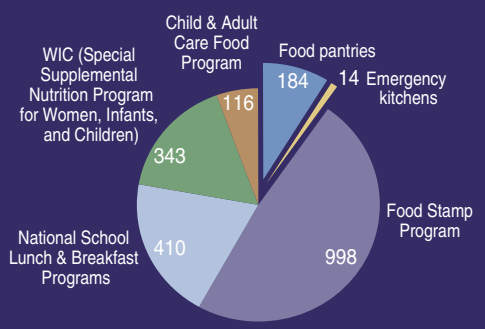
**This finding is drawn from…**

*Factors Affecting the Macronutrient Intake of U.S. Adults: Looking Beyond the Conditional Mean*, by Jayachandran N. Variyam, TB-1901, USDA/ERS, March 2003, available at: www.ers.usda.gov/publications/tb1901/

Most food pantries and emergency kitchens receive at least some of their food from food banks, which collect mostly nonperishable food in bulk from private and government sources. Food pantries and emergency kitchens may also receive food from food rescue organizations, which recover perishable food from foodservice operations, food retailers and wholesalers, and farmers.

**Public programs and private organizations provide food assistance to low-income Americans**




Millions of meals or meal equivalents provided to needy Americans per month in 2000

Emergency food providers offer a valuable service in many communities, but the amount of food they distribute is small relative to Federal food programs. Food pantries and emergency kitchens provided an estimated 198 million meals per month in 2000. In contrast, the five largest Federal food assistance programs provided the equivalent of 1.9 billion meals per month in 2000.

Many emergency food providers receive and distribute USDA commodities to households, mainly through The Emergency Food Assistance Program (TEFAP). Roughly 85 percent of food banks receive USDA commodities, such as fruit, vegetables, meats, and rice, and about half of food pantries and emergency kitchens report using USDA commodities. Emergency food providers distributed about 422 million pounds of USDA commodities in 2000, which accounted for nearly 14 percent of all food distributed by them.

***Laura Tiehen**, ltiehen@ers.usda.gov*

**This finding is drawn from...**

*The Emergency Food Assistance System—Findings from the Provider Survey, Volume I: Executive Summary*, by James C. Ohls and Fazana Saleem-Ismail, FANRR-16-1, USDA/ERS, October 2002, available at: www.ers.usda.gov/publications//fanrr16-1/

# Trends in Extension Resources

Communities, businesses, and individuals alike benefit from the programs, services, and projects provided by the Cooperative Extension Service. Its four programs—agriculture and natural resources, 4-H and youth development, home economics and human nutrition, and community resource development—disseminate various types of information and tools that the general public can apply in daily life. The agriculture and natural resources program, for example, advises farmers on agricultural production techniques, contracting, and a host of other topics through classes, web sites, or one-on-one consultation.

With a third of the U.S. population employed in farming at the inception of the Service in 1914, its largest program—in terms of funding and staffing resources—was agriculture and natural resources. Even now, agriculture and natural resources remains the Service's largest program area, though farming currently accounts for only 1 percent of U.S. employment.

A cooperative effort of Federal, State, and local governments, the Extension Service receives funds from all three sources. Over time, the proportion of funding from each source has shifted to rely more on State and local funding. States accounted for about half of total funding in 2000. The Federal share declined from 42 percent in 1972 to 24 percent in 2000.

Changes in staffing resources have been more subtle than changes in funding sources. ERS researchers recently examined administrative records on full-time equivalent (FTE) staff at the State level to gain a more precise understanding of these changes over the past quarter-century. Extension personnel declined by 2,100 positions, about 12 percent, overall between 1977 and 1997, with the greatest changes occurring between 1982 and 1987. In 1992, the most recent year for which program area data are available, nearly half of the Extension staff were allocated to the agriculture and natural resources program. From 1977 to 1992, as total staff declined, the staff dedicated to agriculture and natural resources increased slightly—less than 1 percent (30 FTEs)—while the staff dedicated to home economics and nutrition increased by 7 percent (253 FTEs).

**Extension staff by program area, 1977-92**

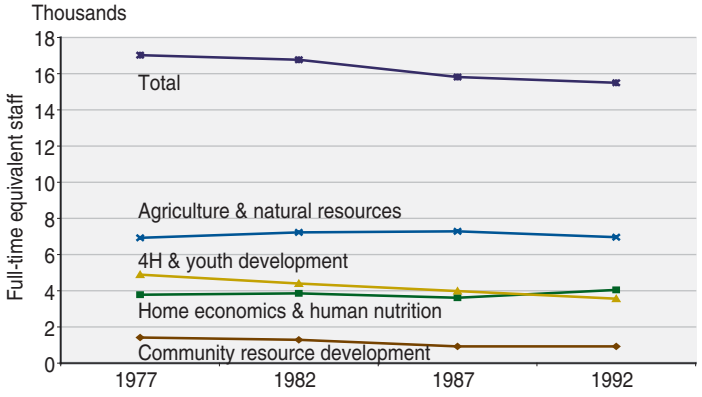
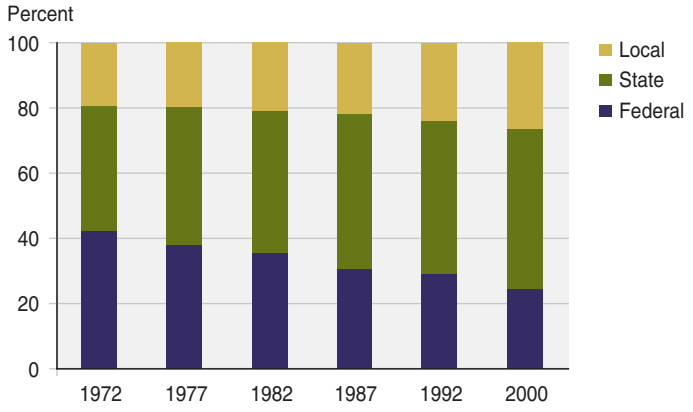



Photo by Bob Nichols, USDA/ARS

**Sources of Extension funding**




Much of the information disseminated through the agriculture and natural resources program benefits farmers individually and is available in alternative forms in the private marketplace. Proponents of the Extension Service argue, however, that public investment in private, individual decisions benefits society as a whole because the resulting decisions translate into a more efficient agricultural system with lower food costs and more benign environmental impacts.

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**This finding is drawn from…**

*Regional Trends in Extension System Resources*, by Mary Ahearn, Jet Yee, and John Bottum, AIB-781, USDA/ERS, April 2003, available at: www.ers.usda.gov/publications/aib781/

USDA/ARS photo

Photo by Peggy Greb, USDA/ARS

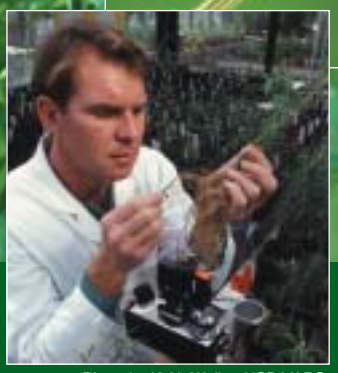

Photo by Keith Weller, USDA/ARS


Photo by Scott Bauer, USDA/ARS

# ERS Launches Invasive Species Initiative

An "invasive species" is one that is alien to the ecosystem and causes harm to the economy, the environment, or human health. Unintentionally transported from one country to another, invasive species can be particularly damaging to agriculture, as recent instances of karnal bunt in wheat and Exotic Newcastle Disease in poultry have demonstrated. The rising potential for invasive pest incidents, brought about by increased global commerce, prompted ERS to launch a research program on the economics of invasive species policies and programs that affect food, agriculture, or natural resources, and are managed by USDA. The research program, which will be supported by extramural research agreements with universities and other external cooperators, covers three critical topic areas.

***The Economics of Trade and Invasive Species:*** Global agricultural trade and travel can generate economic benefits but can also increase the risks of introducing invasive species to nonnative ecosystems. Since invasive species can be introduced through imported products, policies to mitigate these risks may be needed. These policies may in turn affect commodity prices and U.S. trade. Public policy should be designed to mitigate the economic risks to U.S. agriculture from the introduction of invasive species, while preserving the economic gains from trade and travel.

***Bioeconomic Risk Assessments of Alternative Pests and Diseases:*** Risk assessments help public agencies allocate resources among programs that exclude, monitor, and control invasive species introductions. Uncertainties about the establishment and spread of invasives, and the damage they cause to crops and livestock, abound. Information from biological, epidemiological, and other sciences must be integrated to develop credible and concrete bioeconomic risk assessments.

***Policies To Manage Damage Caused by Invasive Species:*** A range of policies can be designed to exclude, monitor, and control invasive pests. Imports from specific countries can be banned or restricted; pests can be treated during production, or in shipments after production; voluntary or mandatory area-wide spraying campaigns can be mounted; and private pest control actions can be encouraged. International agreements can foster global cooperation on controls, information exchange, research, or foreign aid to source countries. Grades, standards, labels, and certification can promote trade by ensuring that phytosanitary requirements have been met. The need to assess the economic efficiency of different prevention and control strategies for invasive species management is real and complex.

To kick off the research program, ERS will host a 2-day workshop on the economics of invasive plant pests and animal diseases on May 12-13, 2003. The workshop will engage those who would perform, and those who have a stake in the results of, the economic research, to review and discuss research priorities for the extramural competitive grants program. USDA agencies, including the Animal and Plant Health Inspection Service, are collaborators on the workshop agenda. Representatives from higher education institutions, USDA, other Federal and State agencies, industry, and nongovernmental organizations will provide perspectives on bioeconomic risk assessment, links between trade expansion and invasive introductions, and the economics of policies to exclude, monitor, and control plant pests and animal diseases.

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FINDINGS


# Nonmetro Black Migration Reverses Trends of Earlier Decades

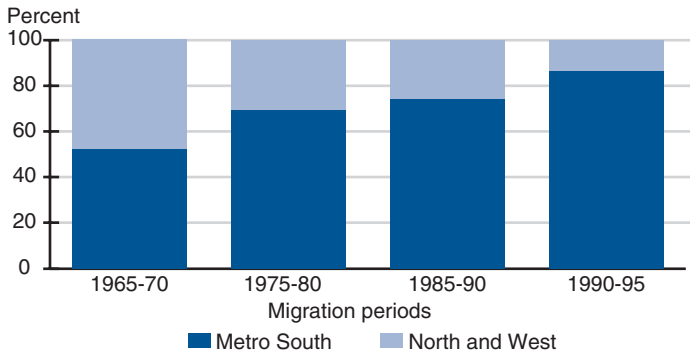
The migration of Blacks out of the rural South was one of the most dramatic population trends of the 20th century. Between 1940 and 1970, about 4 million Blacks (out of an average annual base of less than 11 million) left the South altogether, while large numbers also moved from the countryside into southern cities. With farming no longer the major employment of Blacks who have remained in the rural South, what are the more recent patterns since the end of the large midcentury migration?

From 1965 to 1995, the most significant change in Black migration from southern nonmetropolitan (nonmetro) counties was a major drop in the number and proportion that moved to the North or West. From 1965 to 1970, near the end of the period of peak outmigration, 46 percent of Blacks leaving the nonmetro South went to the North or West. But by 1985-90, there was a small net flow of Blacks back to the nonmetro South from the North and West, and by 1990-95, only 13 percent of Blacks leaving the nonmetro South elected to go to other regions, as most settled in southern metropolitan (metro) areas instead.

Although people moving in opposite directions may offset each other in numbers, they are not necessarily alike in characteristics. From 1985 to 1995, Black migration led to a net loss of college-educated Blacks from the nonmetro South, as only half as many college graduates came in as moved out. At the same time, 11 percent more Blacks who had not finished high school moved into the nonmetro South than moved away. Thus, the loss of college graduates and the arrival of more people with limited education slowed the educational advance of the nonmetro Black population.

Given the educational makeup of migrants, it is not surprising that the 1990 poverty rate of Blacks who had moved into the nonmetro South from 1985 to 1990 nearly equaled that of nonmetro residents who had stayed put during that time. For both newly arrived and longstanding nonmetro Blacks, two-fifths lived in households with poverty-level incomes, three times the rate of the Nation as a whole (13 percent). Blacks who moved away from the nonmetro South between 1985 and 1990 had slightly lower poverty levels than those who did not move, reflecting both the outmigrants' higher schooling and the steadier, better paid jobs in their metro destinations.

**Destinations of outmigrants from nonmetro South, 1965-95**




Although migration data are not yet available from the 2000 Census, we know that in the 1990s the southern nonmetro Black population rose by 11 percent, versus just 1.4 percent in the 1980s. This trend suggests that many more Blacks are judging the nonmetro South favorably as a place to live than have done so in the past.

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**This finding is drawn from…**

*The Shifting Patterns of Black Migration From and Into the Nonmetropolitan South, 1965-95,* by Glenn V. Fuguitt, John A. Fulton, and Calvin L. Beale, RDRR-93, USDA/ERS, December 2001, available at: www.ers.usda.gov/publications/rdrr93/

# "Digital Divide" Not To Blame for Rural Earnings Shortfall

Workers who use computers on the job generally receive higher wages, suggesting that some workers without computer skills or access to computer technology may be disadvantaged. On-the-job computer use is less common in nonmetropolitan (nonmetro) areas than in metro areas, and wages for nonmetro, or rural, workers are generally lower. But does lower computer use explain the metro-nonmetro wage gap?

In 1997, on-the-job computer users earned 43 percent more than other workers in the U.S. However, this wage gap reflects not only computer use but also differences in worker education and skill level, occupation and type of industry, and other worker and job characteristics. After accounting for these differences, a wage premium of about 11 percent remains associated with on-the-job use of computers.

On-the-job computer use was significantly more common in metro areas (52 percent) than in nonmetro areas (40 percent) in 1997. Still, greater computer use in metro areas combined with higher wages for computer users accounts for only a small portion of the overall metro-nonmetro wage gap.

ERS research shows that the wage premium associated with computer use in nonmetro areas is about 6 percent, less than half the 13-percent premium in metro areas. Moreover, other measured job or worker characteristics do little to explain this difference in wage premiums. Rurality itself appears to dampen returns to worker skills, suggesting lower employer demand for skills in nonmetro areas. Because of the lower level of return to computer skills in rural areas, nonmetro workers who use computers on the job (two-fifths of all nonmetro workers) appear to lose out on an additional wage premium that they would receive if employed in metro areas.

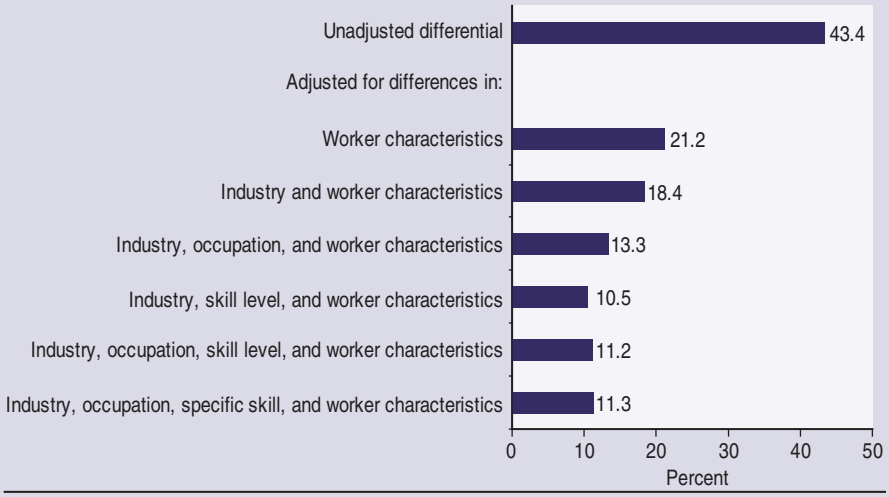
As returns to computer use on the job are smaller for rural workers, improving the computer literacy of rural workers may contribute only slightly to reducing urban-rural wage inequality. While computer training may benefit workers in nonmetro areas, those workers may need to relocate to gain the most employment benefits. Computer literacy programs may also improve the earnings of some racial and ethnic minorities, who experience a much larger computer use wage premium.

With the explosive growth in the economic significance of the Internet in the late 1990s as well as current efforts to expand broadband services to rural areas, the potential is great for increases in the returns to computer skills in rural areas. Clearly, we will need to revisit the "digital divide."

PhotoDisc®

**Wage premium for computer use, 1997**

*The wage premium persists when other job and worker differences are considered*




***Lorin Kusmin*** *lkusmin@ers.usda.gov*

**This finding is drawn from…**

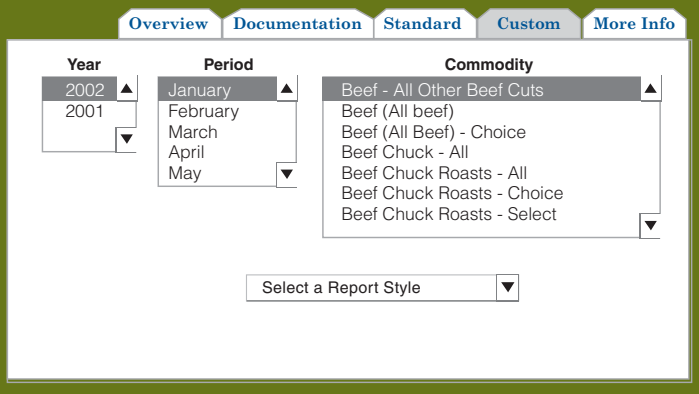
*Wage Premiums for On-the-Job Computer Use: A Metro and Nonmetro Analysis*, by Lorin Kusmin, RDRR-95, USDA/ERS, December 2002, available at: www.ers.usda.gov/publications/rdrr95/

# Retail Scanner Data for Meat

ERS has compiled supermarket scanner data of meat prices into a unique searchable database that contains monthly average retail price data for selected cuts of beef, pork, chicken, turkey, lamb, and veal (www.ers.usda.gov/data/meatscanner/). In addition to prices of various cuts of meat, the database includes information on the volume sold and the volume of "featured" products sold under retailers' weekly advertised specials and frequent shopper discounts. These data are collected at the point of sale by supermarkets using electronic scanners in checkout lines. The data set reflects information from stores representing 20 percent of supermarket sales in the United States.

The database allows users to create custom tables in three different formats based on selected time periods (beginning in January 2001) and specific types and cuts of meat. The resulting tables report the average price of cuts of meat sold during the month, the volume of sales (indexed for 2001=100), and the percentage of volume sold under featuring (discounting).

Other items on the web page include documentation of methodology, frequently asked questions, and descriptions of planned research.

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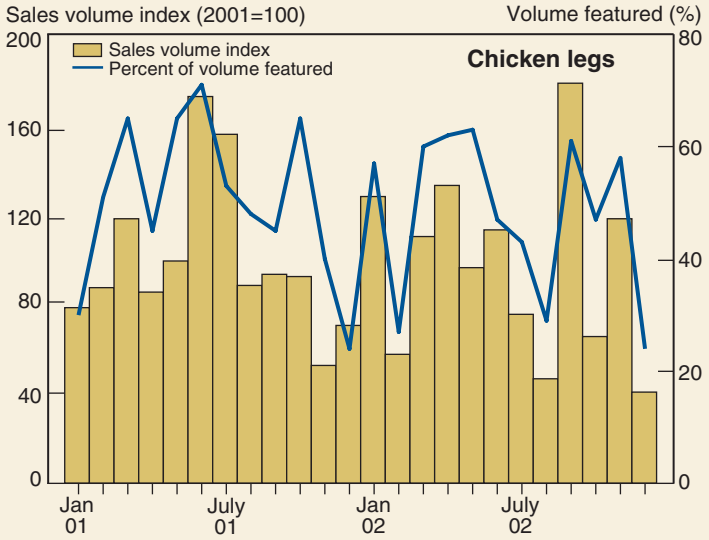
## Sales respond to discounting and seasonality

When stores feature, or discount, a particular meat product, its volume of sales rises. The sales volume for chicken leg quarters, for example, appears to be quite responsive to featuring.



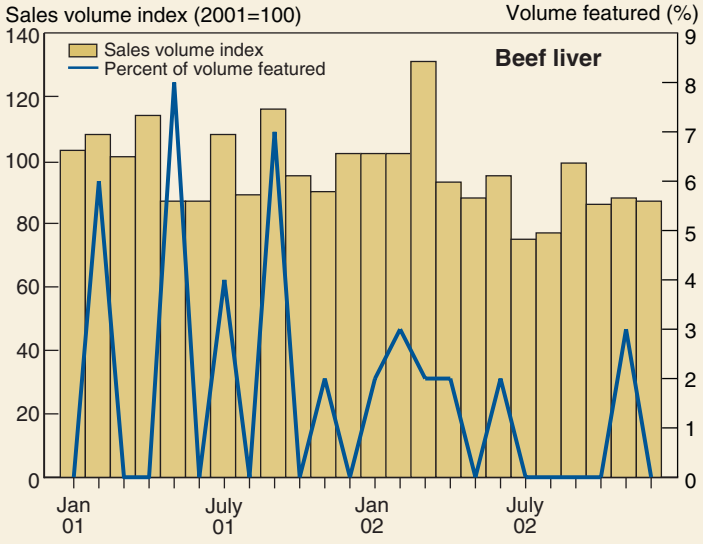

### How Are the Data Compiled?

Only supermarkets with annual sales of $2 million or more and that voluntarily provide their information are included in the study. These data do not include sales from fast food shops or restaurants, butcher shops, warehouse clubs, convenience stores, institutions, mail order firms, or food distributors that choose not to provide their data for commercial use. Commercial sources combine the data from retailers to protect confidentiality. Scanner data are grouped according to standardized categories. Then, after adjusting for feature discounts, prices are weighted according to volume to calculate the average price for a category (for example, round roast, USDA Choice boneless) for that month.

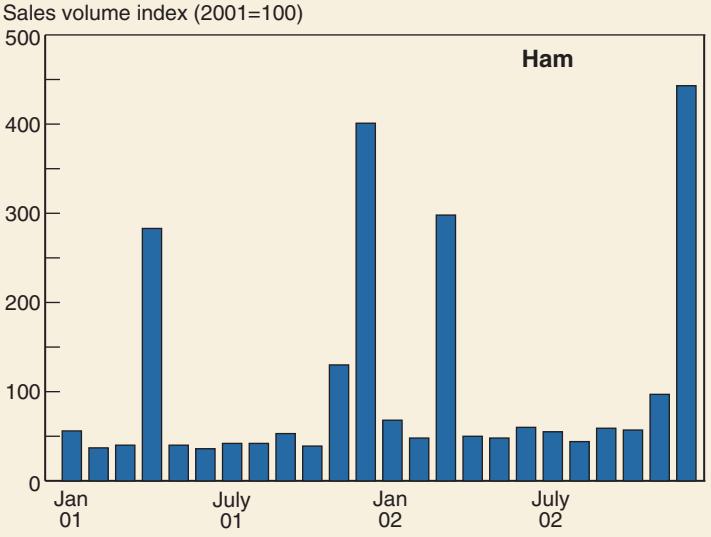
Scanner data for meat are particularly difficult to compile. Aggregation is complex because meat is sold in randomly sized packages and, unlike most other packaged foods, does not have uniform product codes (UPC) for each cut. In addition, stores can provide a name and code for a meat cut that is unique to that store, that geographic area, or that franchise. Because of the difficulties in assigning an average price to a given standardized cut, no one has used scanner data before for analysis of meat prices.

**Meat prices vary according to type of cut, season, and relative price of competing meats. Examining the impact of discounting and seasonality on the volumes sold of different cuts will help us understand the demand for meat and thus the forces shaping the livestock market.**

Conversely, if featuring activity is low, as it is for beef liver, the volume changes very little.




Seasons and holidays affect meat purchases even when prices are not discounted. For example, ground beef and steaks are popular during the summertime, but ham is heavily purchased around Easter, Thanksgiving, and Christmas.

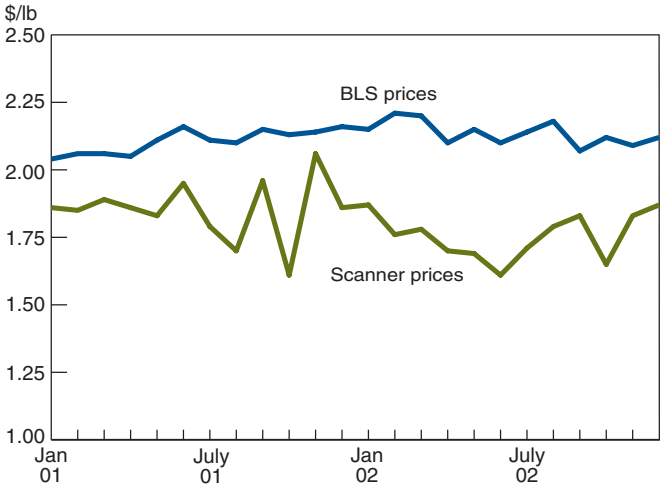



## How Do Scanner Data Differ From BLS Price Data?

The Bureau of Labor Statistics (BLS) estimates the Consumer Price Index using retail food price data gathered by data collectors who visit a wide variety of stores. The new scanner data supplement BLS data by including more cuts of meat (for example, veal and lamb), data on volume of meat sold, and the effects of featuring (discounting).

The datasets differ in many other ways, as well. BLS data are based on a large sample and include stores that may not discount meat prices. BLS measures prices as snapshots in time every month. Scanner data, on the other hand, continuously capture purchase prices throughout the month. In addition, the BLS data may not capture the extent of supermarket featuring, which is assumed to be widespread. ERS data for many meat cuts show lower prices than BLS data by better capturing volume-weighted featuring and price variability.

**Scanner prices tend to be lower and more variable than BLS prices for hamburger made from chuck**



# Dynamics of Agricultural Competitiveness: Policy Lessons From Abroad

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Whether from the perspective of an individual enterprise or a broader economic sector, such as agriculture, maintaining "competitiveness" is an unceasing concern. To assess competitiveness, observers often refer to changes in market share, exports, and profitability—but ultimately, the competitiveness of a nation's product is rooted not in any single outward measure, but in the quantity and quality of the country's productive resources. These are the factors that determine the relative efficiency of making different goods and, consequently, a country's "comparative advantage" in international trade (see box, p.16).

To many, the idea that comparative advantage depends on relative resource endowments conveys the sense that nations have little control over their economic destinies, at least in international trade.

This is not entirely true. As ERS research on agriculture in South America, the former Soviet Union, and China reveals, government policies, national institutions, and even cultural values can profoundly affect the overall productivity of a country's existing resources, and have

Soybean field in Brazil's frontier state of Mato Grasso. Photo by Rao Achutuni, USDA/FAS

important implications for international agricultural markets. When significant policy changes are made, the result can be rapid changes in the competitiveness of a nation's agricultural products.

The spectacular growth of agricultural sectors in Brazil and Argentina in the past decade, for instance, can be largely attributed to important macroeconomic reforms implemented by the two countries in the early and mid-1990s. In contrast, agricultural production in Russia and Ukraine slumped following the dissolution of the Soviet Union in 1992, largely due to the loss of heavy subsidies and because the poor institutional environment discouraged investment. In China, a slower pace of reform and longstanding self-sufficiency policies have delayed the country's transition from land-intensive grains production to labor-intensive goods, such as vegetables, where it has a comparative advantage. Developments in these three regions highlight the way policies interact with existing resource endowments to reinforce, or undermine, underlying economic strengths.

## A Country Can't Be Competitive in Everything

During the 1980s, "competitiveness" became a national buzzword, with economists, business people, and politicians alike asking, "Can America compete?" However, as some observers eventually pointed out, discussions about national competitiveness are somewhat misguided. A trade deficit, for example, does not necessarily mean living standards are declining, and uncompetitive nations, unlike corporations, do not go out of business. It also makes little economic sense to promote exports that can be sold only at a loss. A more appropriate discussion of competitiveness would center on specific industry groups within a nation and the factors that drive their success.

At the same time, it is important that a country make the best overall use of its resources. To fully exploit its "comparative advantage," a country should produce and export goods that reflect the relative abundance, and quality, of its land, labor, and capital resources. A densely populated country, for example, would tend to produce and export goods requiring labor-intensive production practices (such as vegetables or textiles), while a country with a large land base would tend to produce land-intensive goods (such as grains).

Government policies affect competitiveness insofar as they can change the overall productivity of existing resources, and allow resources to flow into the production of goods that reflect the nation's comparative advantage. For example, policymakers can act to improve the quality of the labor force (through education), to create a macroeconomic environment favorable to investments in infrastructure and equipment, and to establish legal institutions, such as well-defined property rights, that encourage entrepreneurship and optimal resource allocation.

**Countries at a glance (2000)**

| Item | Unit | Argentina | Brazil | China | Russia | Ukraine | United States |
|---|---|---|---|---|---|---|---|
| Population | Million | 37 | 170 | 1,282 | 145 | 50 | 283 |
| Agricultural workers[1] | Million | 1.5 | 13.2 | 510.8 | 8.2 | 3.6 | 3.0 |
| Total area | Million acres | 687 | 2,111 | 2,370 | 4,218 | 149 | 2,378 |
| Cropland[2] | Million acres | 62 | 130 | 306 | 309 | 80 | 437 |
| Cropland per agricultural worker | Acres | 41.3 | 9.8 | 0.6 | 37.7 | 22.2 | 145.7 |
| Harvesters-threshers and tractors in use | 1,000 | 330 | 860 | 1,041 | 985 | 384 | 5,462 |
| Value of agricultural production[3] | $ Billion | 13 | 64 | 173 | 26 | 5 | 194 |
| Agricultural exports[4] | $ Billion | 10.8 | 12.8 | 13.1 | 1.1 | 1.7 | 56.5 |
| Agricultural imports[4] | $ Billion | 1.3 | 4.3 | 15.4 | 7.2 | 1.0 | 44.9 |

[1]Total economically active population in agriculture (Food and Agriculture Organization of the United Nations).
[2]Cropland including nonpermanent pasture and fallow. Does not indicate amount of land potentially cultivable (Food and Agriculture Organization of the United Nations).
[3]For countries other than the U.S., agricultural value-added, 1999 (World Development Indicators; calculated by ERS).
[4]Crops and livestock, primary and processed, calendar year (Food and Agriculture Organization of the United Nations).

### Brazil and Argentina Show the Way

With a combined total land area greater than that of the United States, fertile soils, and a favorable climate, Brazil and Argentina have long had an inherent advantage in producing land-intensive grains and pasture-fed livestock. During much of the last half century, though, agricultural productivity and area growth were impeded by periodic bouts of hyperinflation, import-substitution policies, export taxes, and other policies that created uncertainty, blunted investment and production incentives, and kept transportation and marketing costs high.

The two countries' agricultural sectors clearly benefited from policy reforms, initiated first by Argentina in the early 1990s and then by Brazil in the middle part of the decade. Until recent setbacks, these reforms created economic stability, reduced trade restrictions, stimulated investment in the sector, and more fully revealed their comparative advantage in crop production.

The results were spectacular and, to their competitors, alarming. Already significant producers and exporters of soybeans and soybean byproducts, Brazil and

Argentina nearly tripled their combined soybean production from under 30 million tons during 1989-91 to an estimated 86 million tons in 2002—and now account for more than half of global exports. This growth was accompanied by healthy production gains for many other crops and livestock products as well. Argentine wheat and corn production grew by 50 and 85 percent, respectively, between 1989-91 and 2001, and Brazilian corn production expanded by 40 percent. Poultry production in each country more than doubled, as did Brazilian pork production.

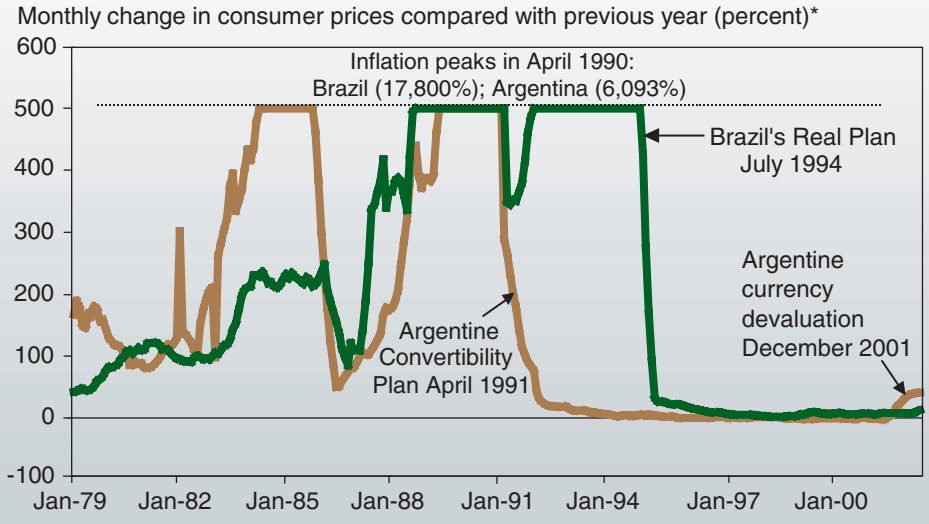
Reforms in the two countries shared many common elements, including currency reform designed to restrain inflation, deregulation, and the curtailment of export taxes and import tariffs. During the 1980s, annual inflation in Argentina and Brazil consistently exceeded 100 percent and surpassed 1,000 percent on several occasions, but inflation was quickly dampened after Argentina (in 1991) and Brazil (in 1994) linked their currencies to the U.S. dollar. With reduced inflation, lenders faced less risk, borrowing costs fell, and longer term investments became more attractive.

Along with improved credit, reduced import barriers spurred greater use of agricultural inputs, such as fertilizers and machinery. Argentina dropped tariffs on agricultural inputs to 15 percent in 1991, one-quarter the rate prevailing during the 1970s, and Brazil cut average import tariffs in half between 1989 and 1991, to 20 percent. As a result, the countries' combined imports of agricultural machinery grew from less than $40 million annually in the early 1990s to a peak of nearly $530 million in 1998. The greater availability of advanced technologies and imported inputs aided productivity growth in both countries.

Photo by Rao Achutuni, USDA/FAS

**Expensive trucking operations are still a common way of transporting agricultural products in Brazil and Argentina.**

**Currency reforms in the 1990s helped Argentina and Brazil stem inflation and stabilize their economies**




* Scale capped at 500 percent to facilitate presentation.
Source: International Monetary Fund (through December 2002).

Like many other lower and middle-income countries, Brazil and Argentina also had a legacy of export taxes that placed a drag on agricultural production and exports. At one point in the early 1990s, Argentina taxed soybean exports at over 40 percent. These taxes, combined with regulated marketing systems and inefficient port operations, added an average of $70 per ton to the cost of exporting

soybeans during the 1980s—more than one-quarter the export price. Following privatization and reduced export taxes in the early 1990s, these costs fell to just over $10 per ton.

One of the greatest challenges facing the two countries is to improve their marketing and transportation infrastructures. In the past decade, private and public investments have improved rail and highway systems and opened up new production areas in Argentina's northeast and Brazil's Center-West region, where the availability of nearly 150 million acres of potential cropland provides ample expansion opportunity. Despite improvements, though, transportation costs from main production regions in Brazil and Argentina to ports remain two to three times higher than in the United States.

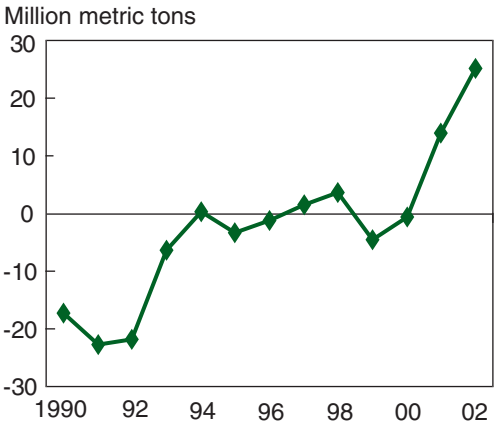
Unfortunately for Brazil and Argentina, the relative macroeconomic stability they enjoyed may have been transitory, and their recent economic woes (most notably Argentina's default on public debt) threaten to undermine progress. Reflecting this instability, the Brazilian currency (real) has dropped by more than 60 percent against the dollar since January 1999. The Argentine peso fell from parity with the dollar in December 2001 to 3.3 pesos per dollar in January 2003. On the surface, the currency devaluations will make their export-oriented agriculture sectors more competitive. However, it should be recalled that their agricultural sectors thrived during the 1990s despite generally overvalued currencies. In Argentina in particular, it is more likely that growth in agriculture will suffer from tighter credit conditions, higher input prices, and the re-imposition of export taxes on agricultural goods.

## Russia and Ukraine: Two Steps Back and One Step Forward?

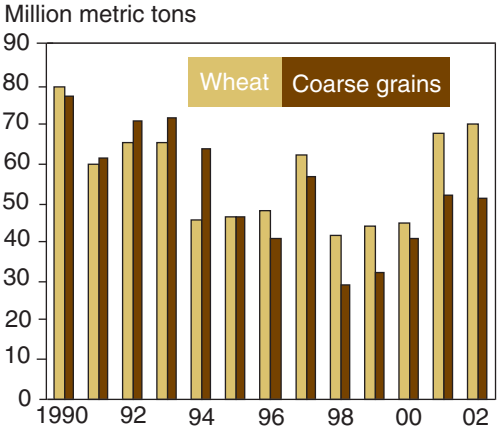
Like Brazil and Argentina, Russia and Ukraine are endowed with vast stretches of fertile land, particularly in the Black Soil regions bordering the Black Sea, giving them a seemingly strong comparative advantage in grain production. However, in contrast to Brazil and Argentina, agricultural production in Russia and Ukraine declined drastically in the 1990s following the dissolution of the Soviet Union. Grain (wheat and coarse grains) production dropped 46 percent between 1988-90 and 1998-2000, and the livestock sector suffered even greater declines. Much of the decline can be tied to the initial elimination of direct and indirect subsidies to the agricultural sector. The main ongoing problem, however, has been the failure to fully implement institutional reforms, such as bankruptcy laws for agricultural enterprises and land codes establishing well-defined property rights. Without effective reforms in these areas, investment incentives in the agricultural sector are limited and potential productivity growth is constrained.

Before the collapse of the Soviet Union in 1992, agricultural production in the USSR was hugely inefficient and relied on heavy subsidies—estimated at 11 percent of GDP—to maintain production. These subsidies were suddenly removed and, as expected, agricultural production initially fell. Many analysts projected that production would recover as market-oriented farmers became more efficient. In fact, total factor productivity of agriculture in Russia and Ukraine actually fell between 1993 and 1998, and production continued

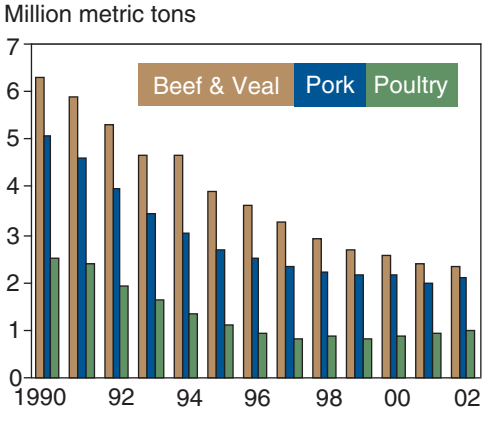
**Soaring net grain exports by Russia and Ukraine...**




**... reflect rebounding grain production...**




**... and continued decline of meat production**




Source: Production, Supply, and Distribution database (March 2003), Foreign Agricultural Service, USDA.

to fall throughout the 1990s. Despite the decline, Russia and Ukraine shifted from being major importers of about 22 million tons of grain in 1992 to net exporters of about 2 million tons in 1998, reflecting the large drop in livestock numbers and consequent loss of domestic demand for feed grains.

Recent good harvests and growing net grain exports—estimated at an unprecedented 25.1 million tons for the 2002/03 marketing year—have caught the attention of international markets and suggest to some observers that agricultural productivity may finally be responding to market reforms. Improved production and increased exports, however, are more likely the result of good weather over the past 2 years, rather than increased efficiency or new investment. To bring about a true improvement in agricultural productivity, Russia and Ukraine will have to replace wornout machinery and implement appropriate production practices.

Unfortunately, a number of entrenched institutional problems make investment in the two countries' agricultural sectors problematic. For example, in 1998, more than 80 percent of the large corporate farms in Russia were not profitable, but very few agricultural enterprises went bankrupt, thus tying up resources in inefficient farms. In addition, a prohibition on using land for collateral limited the liquidity of the agricultural sector, and the existing system of commercial law still does not protect investors from appropriation by government officials or organized crime. Profitable investments are particularly vulnerable to overly aggressive tax collectors, and unclear rules allow officials too much individual discretion in deciding whether an investor is complying with tax laws.

Recent legislation has addressed some of these institutional problems. The tax code passed by Russia in 2001 has clarified tax laws, and recent court system reforms should help improve property rights. Most interestingly, Russia passed a land code in 2002 that now allows agricultural land to be used as collateral. Ukraine also passed a land code allowing land to be used as collateral and bought and sold beginning in 2005. The land codes, however, will not significantly affect investment if other institutional reforms fail to create a functioning credit market or allow agricultural enterprises to go bankrupt.

The next few years will reveal whether recent legislation has indeed created a favorable environment for investment in agriculture in Russia and Ukraine. ERS research shows that, if the new laws are successful, the 25.1 million tons of net exports expected from Russia and Ukraine in 2002 could become more common. In

**Producers in Russia and Ukraine are phasing out aging Soviet-era technology, such as this combine, in favor of smaller scale equipment.**

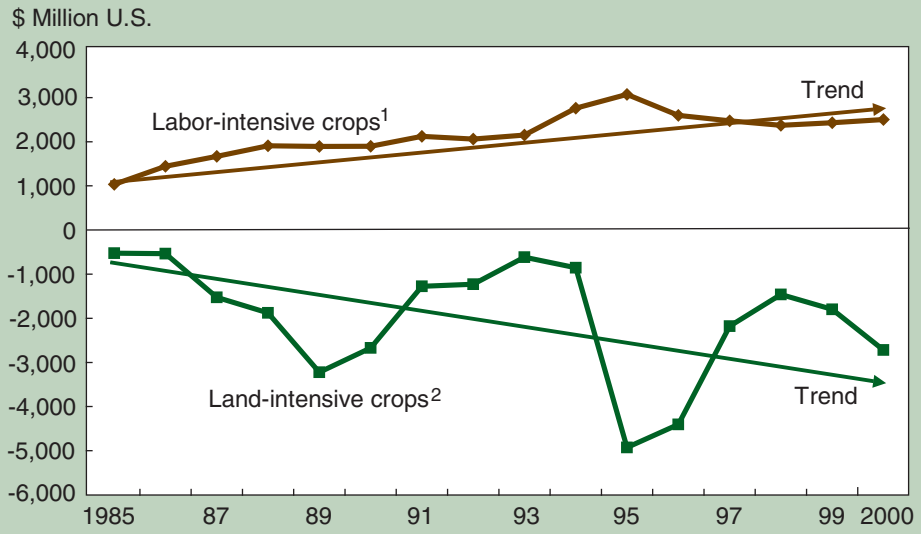
Photo by Mark Lindeman, USDA/FAS

that case, the competitiveness of their agricultural products will have been enhanced by resolving institutional problems.

## China Slowly Changes Direction

As one of the world's leading agricultural economies, China is destined to remain both a market and a competitor for U.S. agricultural exports. China has roughly 40 percent of the world's farmers and only 9 percent of the world's agricultural land. Consequently, its comparative advantage clearly lies in labor-intensive products, such as fruits and vegetables, a fact that tantalizes potential exporters of land-intensive crops to China. In particular, land-intensive grain production is not well suited to China's limited arable land base, and this is especially true of irrigated wheat production in north China, where water supplies are diminishing. In contrast, China's labor-intensive vegetable, fruit, and livestock industries are cost-competitive not only in the domestic market but also overseas. China is already a net exporter of these goods and a net importer of land-intensive crops. But, for a number of reasons—often based on long-held cultural values—China has been reluctant to move away from the production of land-intensive grains and more fully exploit its comparative advantage in other agricultural products (see, in this issue, "Will Water Scarcity Limit China's Agricultural Potential?" and "China Slow in Meeting WTO Commitments").

**Net exports of labor- and land-intensive crops increasingly reflect China's comparative advantage**




1Fruits and vegetables. 2Cereals and oilseeds.
Source: Food and Agriculture Organization, United Nations (January 2003).

One reason is that many Chinese farmers still operate at the subsistence level, with roughly 70 percent of total grain production consumed by the household that produces it. Since staple grains are a major portion of household consumption, it is natural that subsistence farmers continue to produce these grains. In addition to subsistence production patterns, many policies bias agriculture in China toward food self-sufficiency. For centuries, China's leaders have sought to maintain large grain stocks to guard against famines, which have led to peasant rebellions. China has also historically considered foreign trade unnecessary, so it has a natural inclination to produce its own grain. Current policy seeks to maintain at least 95 percent grain self-sufficiency, a goal it has more than achieved in the last few years.

To support its self-sufficiency goals, China has maintained tight control over agricultural trade, and until very recently, state-owned trading enterprises held absolute monopolies on the trade of many agricultural commodities, including staple grains. Under this system, China issued licenses authorizing fixed levels of imports and exports of agricultural commodities based on annual production and consumption projections. The political

**Farmers in China are slowly shifting from production of subsistence grains to high-value fruits and vegetables for domestic and overseas markets.**

Photo by Ron Marlow, USDA/NRCS

**Unlike in Russia, farmers in China use labor-intensive techniques and farming is not heavily mechanized.**

Photo by Fred Gale, USDA/ERS

process that set these quotas sometimes prevented importers and exporters from responding to market incentives when world and domestic prices differed.

A variety of local-level policies, such as land tenure and "grain quota" delivery policies, affect the production decisions of farmers as well, albeit in more subtle ways than the state trading monopolies. Farmland in China is usually controlled by the village government, and local officials allocate farmland to village households, often on a per capita basis. In exchange, households are obligated to deliver a fixed amount of grain to the state grain bureaus, generally below the market price. Since local leaders are evaluated by their success at increasing grain production, farmers generally had to produce grain on the land allocated to them rather than produce higher valued crops (vegetables, for example).

The policies that have promoted grain cultivation are being reformed to allow market forces to guide production and trade decisions. For example, with China's accession to the World Trade Organization in 2001, monopolized imports have been replaced with a system of tariff-rate quotas that explicitly undermine the control of state-trading enterprises. China is also reforming its land tenure system and granting farmers longer lease rights, written contracts, and greater rights to transfer land between households—providing farmers with greater flexibility to choose crops and more incentive to invest in the land. Many provinces are no longer enforcing grain quota deliveries, and private traders are handling a larger portion of internal grain trade. These policy reforms, along with market infrastructure investments, are expected to facilitate a shift in China's agricultural production away from grains and toward production of more labor-intensive products.

## Comparative Advantage, Competitiveness, and Policy Are Intertwined

The competitiveness of a nation's product in international markets is clearly related to the relative quantity (and quality) of resources available to that country. At the same time, production and trade flows are also sensitive to policies, institutions, and even cultural values. According to ERS research:

- Brazil and Argentina were better able to respond to international market signals and quickly expand exports of grain and livestock products once macroeconomic conditions stabilized.
- Russia's and Ukraine's failure to establish institutions—such as property rights laws and tax codes—hampered the transition from a heavily subsidized to a market-oriented agricultural system.
- China still adheres to policies that maintain production of grains that could be imported in exchange for crops in which it has a comparative advantage, such as fruits and vegetables.

These three examples demonstrate that policymakers are responsible for ensuring that the conditions and institutions that allow markets to function smoothly are in place. Only then will markets draw a nation's resources to the production of goods that reflect its underlying comparative advantage.

## This article is drawn from . . .

Gale, Fred (ed.). *China's Food and Agriculture: Issues for the 21st Century,* AIB-775, USDA/ERS, April 2002, available at: www.ers.usda.gov/publications/aib775/

Osborne, Stefan, and Michael Trueblood. *Agricultural Productivity and Efficiency in Russia and Ukraine: Building on a Decade of Reform,* AER-813, USDA/ERS, July 2002, available at: www.ers.usda.gov/publications/aer813/

Schnepf, Randall, Erik Dohlman, and Christine Bolling. *Agriculture in Brazil and Argentina: Developments and Prospects for Major Field Crops,* WRS-01-3, USDA/ERS, November 2001, available at: www.ers.usda.gov/publications/wrs013/


RESTRICTED USE PESTICIDE
METHYL BROMIDE
POISON
RESTRICTED USE PESTICIDE
DOW
METHYL BR
DANGER
POISON

USDA photo

# Methyl Bromide Phaseout Proceeds: Users Request Exemptions

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Methyl bromide, a widely used fumigant in agriculture, is one of a number of chemicals—including refrigerants such as freon—being phased out of use worldwide under the Montreal Protocol signed by the U.S. and 182 other countries. The Protocol is an international treaty aimed at reducing or eliminating use of chemicals that contribute to the depletion of the atmosphere's ozone layer, which protects the Earth from ultraviolet radiation (UV). Higher levels of UV can increase the incidence of skin cancer and cataracts, suppress the immune system, and damage crops. The phaseout of methyl bromide could mitigate some of these harmful effects, but because methyl bromide is so important to agricultural production, the phaseout could also have some negative effects for producers and consumers.

Methyl bromide is a principal product used to fumigate soil before planting many fruit and vegetable crops, for post-harvest storage and facility fumigation, and for government-required quarantine treatments. The product controls many soil insects, diseases, nematodes, and weeds, as well as insects and other organisms present in stored or shipped commodities and storage, shipping, and processing facilities. For many uses, no single alternative to methyl bromide is available that is as effective and economical. Analyses by ERS and cooperators indicate that the phaseout could cause short-term losses until more cost-effective alternatives are developed and made available. Initially U.S. producers could experience lower yields, higher costs, or lost market share to imports, while U.S. consumers could face higher prices and reduced supply, depending on the commodity.

Under the Protocol, the U.S. and other developed countries will be prohibited from producing or importing methyl bromide for domestic use after 2004, except for quarantine and preshipment uses and for temporary "Critical Use Exemptions" granted for approved uses (see box, "The Methyl Bromide Phaseout"). The international phaseout is already reducing the supply of methyl bromide. Supplies for the U.S. and other developed countries were first reduced in 1999 by 25 percent from a 1991 baseline. The reduction reached 50 percent in 2001 and is scheduled to reach 70 percent in 2003. Developing countries are on a slower timetable, with complete phaseout scheduled for 2015.

## The Methyl Bromide Phaseout

**Phaseout Schedule.** Under the Montreal Protocol, developed countries are scheduled to reduce methyl bromide consumption (production + imports - exports) from a 1991 baseline by:

- 25 percent in 1999,
- 50 percent in 2001,
- 70 percent in 2003, and
- 100 percent in 2005.

Developing countries that have signed the Protocol are scheduled to freeze consumption in 2002 at the 1995-98 average level and reduce consumption from that baseline by 20 percent in 2005 and 100 percent in 2015.

**Quarantine and Preshipment Exemption.** Quarantine and preshipment applications of methyl bromide are exempt from the phaseout. Quarantine applications are performed or authorized by a national plant, animal, environmental, or health authority to prevent the introduction, spread, or establishment of quarantine pests.

Under the current U.S. Environmental Protection Agency rule, quarantine treatments include those for:

- U.S. imports when methyl bromide is on an official list of treatments for quarantine pests or required for emergency quarantine application.
- U.S. exports when needed to meet the quarantine requirements of an importing country, including quarantine pest-free requirements that do not specify control measures.
- Phytosanitary requirements of Federal, State, or local authorities that specifically address the control of quarantine pests.
- Production of propagative materials to meet official requirements of destinations where the materials are to be transported, such as preplant soil fumigation of nursery stock for replanting to meet official pest-free standards for underground portions of the material.

Preshipment treatments are performed 21 or fewer days before export to another country to meet official requirements, including nonquarantine standards such as food sanitation, of the importing country or existing U.S. export requirements. However, preventive treatments of stored commodities or facilities not related to quarantine or preshipment requirements are not exempt.

**Critical Use Exemptions.** Critical uses can be exempted on a yearly basis in developed countries after 2004 by the determination that a technically and economically feasible alternative with acceptable health and environmental effects is not available and that a significant market disruption would occur without methyl bromide. The country must take technically and economically feasible steps to minimize methyl bromide use and emissions and conduct research to develop and deploy alternatives.

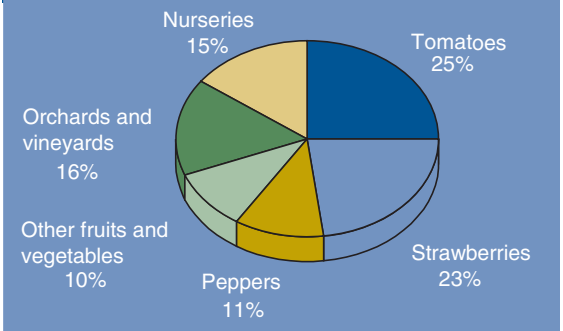
**Emergency Use.** After the phaseout, a country can use up to 20 metric tons per year for emergency use and apply for approval after the event.

## Methyl Bromide's Use in the U.S.

The U.S. Environmental Protection Agency (USEPA), the agency responsible for implementing the Protocol in the U.S., estimates that U.S. use of methyl bromide for soil fumigation in 1997, before the mandated reductions began, was 38 million pounds of active ingredient (a.i.). About 70 percent of this quantity was applied to land used to raise small fruits, melons, and vegetables, mostly fresh-market tomatoes, strawberries, and peppers. Methyl bromide was also widely used before planting or replanting orchards and vineyards, accounting for about 16 percent of use, while ornamentals and agricultural nurseries accounted for another 15 percent. Agricultural nurseries use methyl bromide to ensure vigorous transplants of strawberries, perennials, and other crops, and to meet the pest-free requirements of such States as California for transporting transplants. California and Florida together accounted for about 75 percent of total preplant use.

By killing insects and other organisms, methyl bromide protects the quality of stored commodities and perishable goods and helps meet sanitary standards of the Food and Drug Administration (FDA) and of importing countries. Large quantities of dried plums, raisins, figs, dates, almonds, and walnuts produced in California are routinely treated before and during storage and before packing or shipping. Walnuts are treated prior to export for European holiday markets to meet import standards. Other products treated include grains, grain products, dried fish and meats, dry beans, tobacco, and timber and wood products. Methyl bromide is also used to control pests and meet FDA sanitary standards in mills, processing plants, warehouses, ships, railcars, and other transport vehicles.

**Soil fumigation before planting tomatoes and strawberries accounted for nearly half of U.S. preplant use of methyl bromide, 1997**




Preplant use was 38 million pounds of active ingredient.
Based on USEPA data at
www.epa.gov/ozone/mbr/background

Agricultural exports and imports are often fumigated with methyl bromide to control pests.

USDA photo

The U.S. and many other governments require the use of methyl bromide to prevent the spread of specific regulated pests and for emergency quarantine treatments. These uses are exempt from the phaseout. USEPA estimated about 600,000 pounds of methyl bromide were used in the U.S. for quarantine treatments in 1997. Fresh fruit—including grapes, peaches, nectarines, and kiwifruit—imported from Chile during the winter accounted for a major portion of U.S. food imports receiving methyl bromide quarantine treatments. U.S. exports of sweet cherries, peaches, nectarines, plums, prunes, apricots, dates, dried prunes, walnuts, oak logs, cotton, rice, and tobacco have been treated to meet requirements of importing countries. Methyl bromide is also used for domestic quarantine treatments of such goods as Florida and Texas citrus and southeastern blueberries before shipment to Western States.

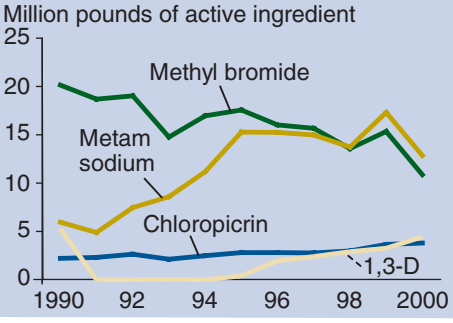
## Phaseout Has Reduced Use and Increased Price

Methyl bromide use in the U.S. has declined since the phaseout began. Data collected by California's EPA show lower total methyl bromide use from 1990 to 2000, while USDA data for Florida show reductions for three major crops (peppers, strawberries, and tomatoes) from 1992 to 2000. Available data show a decline since 1999, when the required 25-percent reduction went into effect, but there are no data showing use since 2001, when the reduction reached 50 percent. Florida growers reduced application rates and tomato and pepper acreage, contributing to the decline in use, while the share of crop acreage treated with methyl bromide remained high. Methyl bromide use for California and Florida strawberries was relatively stable between 1992 and 2000, despite increasing crop acreage. The share of strawberry acreage treated with methyl bromide declined in California, while application rates declined in Florida, especially since 1996.

The price of methyl bromide increased as the phaseout reduced supply. The U.S. average price rose from $2.50 per pound of active ingredients in 1999, when the first reduction began, to $4.50 in 2001—a more rapid increase than in previous years. Users receiving the greatest benefits from methyl bromide are willing to pay more to obtain the fumigant and have driven up the price. The rising price reduces users' net revenues and lowers the material's cost effectiveness. This should encourage some growers to try available alternatives (see box, "Alternatives to Methyl Bromide").

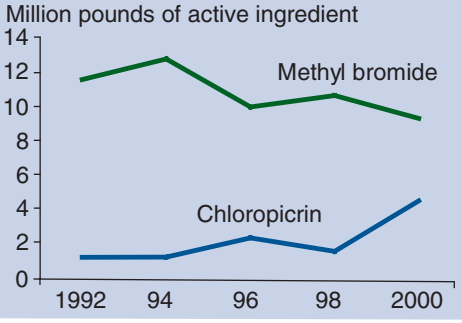
The use of alternative fumigants has also increased. Data collected by California's EPA show a general increase in the use of metam sodium, chloropicrin, and 1,3-D between 1990 and 2000, with chloropicrin and 1,3-D use increasing between 1998 and 2000. USDA data for Florida show a general increase in chloropicrin use for peppers, strawberries, and tomatoes throughout the 1990s, but espe-

**Methyl bromide use down and other fumigant use up in California...**



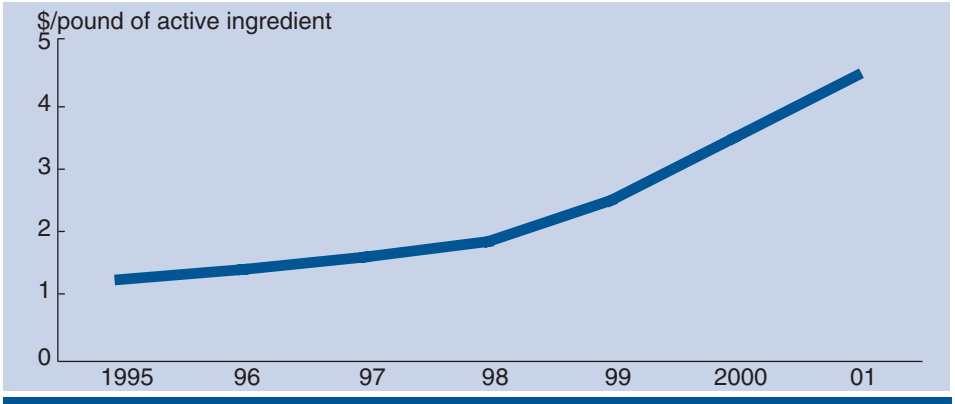

Based on California EPA data at
www.epa.gov/ozone/mbr/background

**...and in Florida**




Use on peppers, strawberries, and tomatoes.
Based on NASS, USDA data

**Average methyl bromide price has jumped since the product's phaseout began in 1999**




Based on USEPA data at www.epa.gov/ozone/mbr/background

cially since 1996. Reformulating products to reduce the application rate of methyl bromide and increase that of chloropicrin, often applied simultaneously with methyl bromide, has contributed to these trends.

## Higher Costs, Lower Returns Could Result

U.S. tomato, pepper, eggplant, and strawberry production could decline for several years as effective alternatives are developed, especially in States dependent on methyl bromide. A cooperative ERS/University of Florida study, assuming a complete ban on production uses of methyl bromide for annual fruit and vegetable crops, estimated that Florida and California initially would each lose about $200 million annually in gross shipping point revenues, which represented about 20-30 percent of estimated revenues from treated commodities in each State.

With reduced U.S. production and higher retail prices, U.S. imports of Mexican-produced tomatoes, peppers, eggplants, and strawberries could increase. The phaseout would have little immediate effect on Mexican costs and yields because Mexico, as a developing country under the Montreal Protocol, is subject to a freeze on methyl bromide use at 1995-98 levels and a longer phaseout that lasts until 2015. Use in Mexico is much less than in the U.S., averaging 4.2 million pounds of active ingredient from 1995-98, less than 10 percent of U.S. use as estimated by USEPA.

The National Center for Food and Agricultural Policy (NCFAP), in cooperation with ERS, estimated initial annual losses of $480 million from using available alternatives in place of methyl bromide for preplant fumigation of specialty crops: $235 million for annuals (strawberries, tomatoes, and other vegetables), $143 million for perennial crops, and $102 million for ornamentals and nurseries (excluding forest nurseries). These losses represented 12 percent of revenues for annual crops (10 percent for strawberries, 15 percent for tomatoes), 3 percent for perennial crops, and 15 percent for ornamental and nursery crops. The NCFAP study also estimated that post-harvest treatment costs for dates, figs, prunes, raisins, and walnuts would rise by $2 million if phosphine were used instead of methyl bromide. There would be additional costs for retrofitting storage facilities, increasing storage, or changing processes to accommodate longer treatment times and revenue losses from missed market opportunities.

Several factors will influence the actual impact of the phaseout. The NCFAP and University of Florida estimates of economic effects assume that methyl bromide

Agricultural engineers discuss methyl bromide alternatives.

Photo by Peggy Greb, USDA/ARS

Photo by Brian Prechtel, USDA/ARS

This healthy looking strawberry plant was grown in soil treated with methyl bromide alternatives. The other is from untreated and unfumigated soil and is infested with Verticillium wilt.

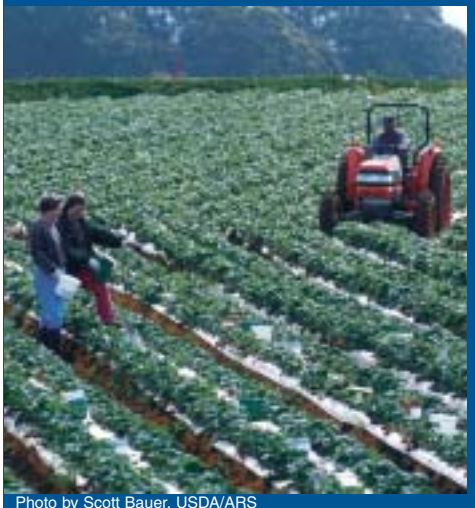


Photo by Scott Bauer, USDA/ARS

Growers in California set aside portions of their farms for collaborative studies on methyl bromide alternatives for strawberries.

## Alternatives to Methyl Bromide

**For preplant control of the same spectrum of pests**, some potential alternatives to methyl bromide are chloropicrin or Telone (trade name) products containing 1,3-D and chloropicrin, in combination with an herbicide such as napropamide (trade name Devrinol) or metam sodium (trade names Busan, Metam, Sectagon, Vapam). While there has been much research on using 1,3-D/chloropicrin in combination with pebulate (trade name Tillam) in Florida and Southeastern tomato production, this alternative might not be feasible because the pebulate registration under the Federal Insecticide, Fungicide, and Rodenticide Act (FIFRA) lapsed in December 2002. Metam sodium or other materials might be used where 1,3-D use is restricted to protect air quality or ground water. In addition, researchers are examining the potential use of such herbicides as halosulfuron-methyl (trade names Permit, Sempra) and trifloxysulfuron-sodium (trade name Brawn) in combination with fumigants. Researchers in California are studying the application of Telone, chloropicrin, or metam sodium products through drip irrigation systems to improve efficacy.

To control pests before planting some perennial crops, a year of fallow may be needed in addition to application of chemical alternatives. Dazomet (trade name Basamid) might be used for some nonfood crops, such as forest seedling nurseries. Methyl iodide (or iodomethane) is a potentially effective pesticide alternative, but its use is prohibited until it is registered under the FIFRA.

**For some postharvest uses**, phosphine (trade names Phostoxin, Magtoxin) and a phosphine/carbon dioxide combination (trade name $ECO_2FUME$) are potential alternatives. Research continues on other postharvest treatments, such as controlled atmospheres, pressurized carbon dioxide, heat, and cold. Phosphine fumigation and some other potential alternatives require a longer treatment time than methyl bromide fumigation to be effective. As a result, processors might miss higher market prices or might have to invest in additional facilities to treat greater volumes of commodity within a critical timeframe. Also, facilities may require better sealing to prevent phosphine leakage and additional protection or replacement of electrical equipment because of the chemical's corrosive effects on some metals. Sulfuryl fluoride (trade name ProFume) is a promising alternative currently used to fumigate facilities, but residue tolerances must be established before it can be used on stored food commodities.

would no longer be permitted for crop production uses and that only current alternatives would be available. However, continuing research and development and registration of new pesticides may improve the effectiveness of available alternatives or introduce new alternatives that could reduce the effects. For example, the effects estimated by NCFAP and the University of Florida are lower than those from a 1994 USDA report because of progress in developing alternatives and a better understanding of their effects on yields.

USDA has been supporting research to develop alternatives to methyl bromide, spending $17.9 million in 2002. The Agricultural Research Service (ARS), the Cooperative State Research, Education, and Extension Service, and the cooperative Federal-State University IR-4 program fund research on alternatives for soil and postharvest treatments (see box, "Alternatives to Methyl Bromide"). Also, USEPA's Office of Pesticide Programs has given the registration of methyl bromide alternatives its highest priority.

## Critical Use Exemptions Will Help Some Users

Some methyl bromide users may be granted Critical Use Exemptions (CUEs) on a yearly basis starting in 2005 because the users may otherwise incur particularly severe losses (see box, "The Methyl Bromide Phaseout"). The CUEs also allow more time for alternatives to be developed and adopted.

The first application period for CUEs in the U.S. occurred in 2002, with many users submitting requests. Among these users were:

- Producers of fruits, vegetables, and other specialty crops,
- Operators of agricultural, ornamental, and forest tree nurseries,
- Firms that process and store dried fruit, nuts, grains, and other commodities.

The countries signing the Montreal Protocol decide which uses of methyl bromide qualify for exemption. Applications filed by U.S. users during 2002 for CUEs for 2005 (and later years) were reviewed by USEPA—with input from experts at USDA, State universities, and other organizations—against the Montreal Protocol criteria. In February 2003, the U.S. Government forwarded a package of CUE nominations to the Ozone Secretariat of the United Nations. The U.S. nominations totaled 21.9 million pounds for 2005 and 20.8 million pounds for 2006, 39 percent and 37 percent, respectively, of the 1991 baseline. The Methyl Bromide Technical Options Committee, an international committee of experts created under the Protocol, reviews the nominations from the U.S. and other developed countries. The signatory countries will authorize exemptions in the fall of 2003, and USEPA will formally allocate CUEs in the U.S. in 2004.

## This article is drawn from...

Osteen, Craig. *Economic Implications of the Methyl Bromide Phaseout*, AIB-756, USDA/ERS, 2000, available at: www.ers.usda.gov/publications/aib756.

Ferguson, Walter, and Armand Padula. *Economic Effects of Banning Methyl Bromide for Soil Fumigation*, AER-677, USDA/ERS, 1994.

Carpenter, Janet, Leonard Gianessi, and Lori Lynch. *The Economic Impact of the Scheduled U.S. Phaseout of Methyl Bromide*, National Center for Food and Agricultural Policy, 2000, available at www.ncfap.org/pesticide.htm

VanSickle, John, Charlene Brewster, and Thomas Spreen. *Impact of a Methyl Bromide Ban on the U.S. Vegetable Industry*, Agricultural Experiment Station Bulletin No. 333. University of Florida, Dept. of Food and Agricultural Economics, 2000.

# Consumer-Driven Agriculture

## Changing U.S. Demographics Influence Eating Habits

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Beyond our bustling cities, America's farmlands are ostensibly a Norman Rockwell picture of calm and stability. Red barns, majestic silos, rustic farmhouses, and pastures of grazing livestock are reassuring images that recall a seemingly simpler age. Yet just beyond the old-fashioned barn door are the products of a telecommunications age that have transformed farming into a modern and global business. We find tractors equipped with global positioning systems for precision preparation and management of fields, Internet access to keep farmers abreast of current events and minute-by-minute changes in commodity prices, and sophisticated systems to manage risk, finances, and decisionmaking in a dynamic global marketplace. Today's commercial farmer can be as connected to the modern world as the urban entrepreneur.

Technology brings the varied needs and evolving wants of modern consumers living thousands of miles away to the attention of farmers. Successful producers know that consumers are key to economic viability and growth and that consumers' preferences drive the evolution of the industry. Closer business ties and stricter quality controls throughout the food supply chain are hallmarks of *consumer-driven agriculture.*

Recent ERS research has identified three broad demographic trends that will shape future U.S. food markets: more mature consumers, more diversity, and more people to feed. These trends were translated into projections of growth in food expenditures and in demand for specific commodities between 2000 and 2020. The ERS models do not capture some of the subtler changes in our food system; they do, however, allow us to compare the importance of the different demographic trends to specific food and commodity market segments. Moreover, we may posit whether the character of America's farmlands and farm businesses will change as much as the profile of our population 20 years from now.



Photo: EyeWire


Photo by Ken Hammond, USDA

**Consumers with rising incomes are willing to pay more for convenience.**

## More Mature Consumers

The aging of the baby boom generation, born between 1946 and 1964, will accelerate growth in the number of Americans older than 65, who will number 54 million by 2020. Although the U.S. population under age 18 will increase by 7 million by 2020, it will decline as a share of the total population. Consequently, catering to the food preferences and eating habits of older Americans—who are likely to be more health conscious than younger Americans—will be an important marketing strategy for food suppliers.

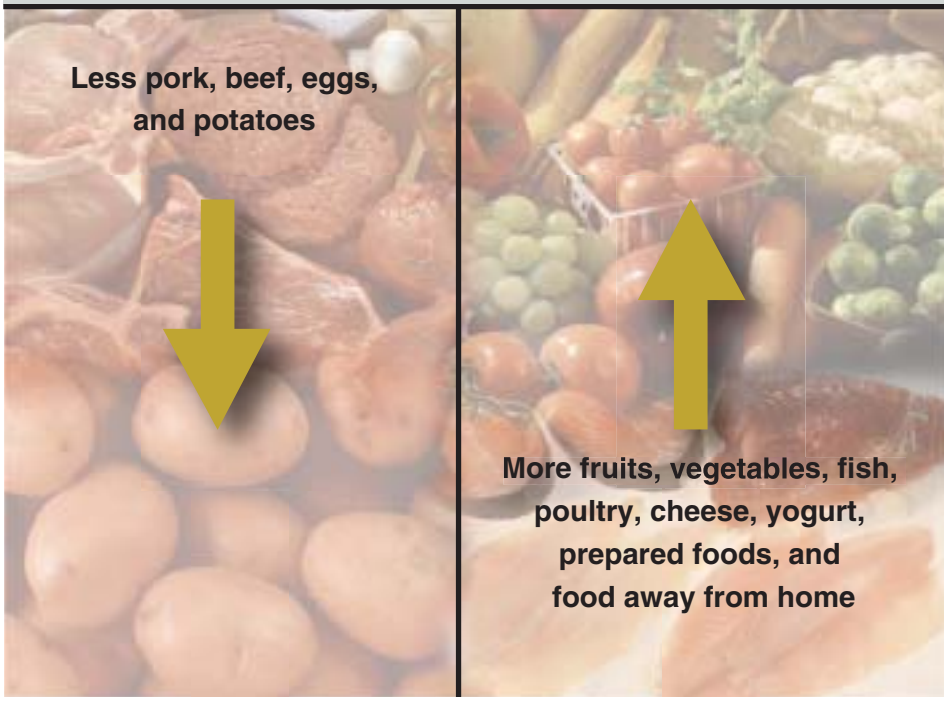
The growth of America's older population is likely to carry mixed messages for U.S. agriculture. Older Americans typically eat less food than younger ones due to lower activity levels and energy needs, and dine out less frequently. Hence, the aging trend may reduce the Nation's appetite for some foods and dampen the popularity of eating out. On the other hand, the demand for foods preferred by seniors will benefit from the age distribution shift. According to ERS projections, small declines in per capita consumption of fried potatoes, cheese, sugar, beef, and poultry are expected, while the increase in older consumers could signal an increase in per capita consumption of "other potatoes" (such as baked), eggs, fish, fruits, and vegetables.

## A Mature Market

American consumers participate in a food system that is characterized by the fulfillment, if not satiation, of basic needs—what is termed a mature market. Consumers of all ages and recent immigrants have higher standards of living now than in earlier times, and benefit from a highly productive agricultural sector. Consequently, most people are generally very well-fed and not apt to need or want larger quantities of food. However, rising incomes allow Americans to continue to upgrade their food choices to include, for example, more expensive cuts of meats, exotic vegetables, luxury food items, ready-to-eat meals, and higher priced restaurants.

Real per capita income grew 1.8 percent per year during 1978-88 and 1.2 percent per year during 1988-98. A conservative forecast of real per capita income growth is that it will continue to grow about 1 percent annually between 2000 and 2020. Of concern to suppliers of mature U.S. food markets is how much of their higher disposable incomes American consumers will spend on food and what food products will be demanded.

**Higher income households tend to consume slightly. . .**



Over the past few decades, Americans have dedicated a declining share of their household budgets to food. Consumers with rising incomes are, however, quite willing to increase food spending if it means acquiring more convenience, better quality, or more of other valued food attributes. In a sense, higher incomes allow food choices to become expressions of personal preferences, values, and lifestyles rather than necessities. Moreover, higher incomes allow Americans to spend more on meals away from home, whether for fast food or a candlelit dinner in an elegant restaurant. With per capita income growth projected at 1 percent annually between 2000 and 2020, per capita food expenditures in 2020 are expected to be about 6 percent above those in 2000 as a result of higher incomes.

PhotoDisc®

**Americans are spending more on meals away from home.**

According to ERS researchers, higher incomes drive up per capita food *expenditures* more rapidly than per capita *quantities consumed* for virtually all foods. Hence, more of the extra consumer dollar will go to "quality" than to quantity. More prosperous consumers prefer select cuts of meat, value-added products like lamb chops trimmed and dressed and ready to pop in the oven, premarinated fish, single-serving lunchbox snacks, and prewashed and bagged salad greens. Previous studies have found that as U.S. incomes rise, consumers spend more on expensive fresh foods, prepared foods, and dining out.

According to ERS projections, rising incomes will spur faster growth in per capita spending for dining out than for at-home food purchases. Food-away-from-home spending is expected to increase by almost 10 percent per capita, due to per capita income growth alone, while food-at-home spending is expected to increase by only 3 percent due to income growth. An aging population and increasing ethnic diversity may dampen the food-away-from-home trend. Americans in their thirties and early forties tended to spend the most on food away from home over the last two decades—more than both younger, less wealthy adults and those over age 50.

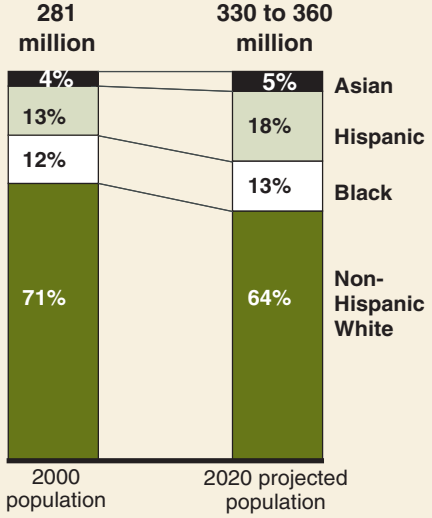
Higher consumer incomes are likely to engender small shifts in demand for particular foods and commodities due to different consumption patterns observed among those with different income levels. Higher income groups are likely to favor greater consumption of fruits, cheese, yogurt, fish, and vegetables (except potatoes), and slightly less consumption of pork, beef, other meats, and eggs. Interestingly, similar consumption preferences are seen among better educated consumers. According to ERS projections, the per capita consumption shifts due to higher incomes are on the order of 0.5 to 2 percent.

## A More Diverse Population

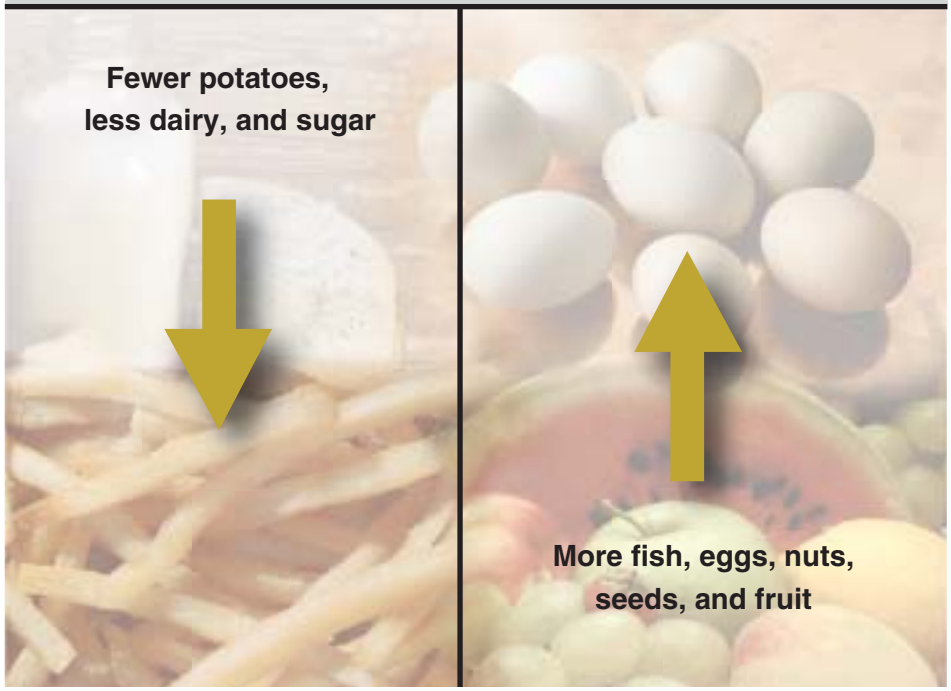
Over the next two decades, the Hispanic population is expected to grow by 1.2 million annually, compared with annual increases of 500,000 among non-Hispanic Whites and 400,000 each among Blacks and Asians. Growth among the Hispanic and Asian populations is due to both natural increase and immigration, while growth among Whites, Blacks, and Native Americans results mainly from natural increase (births minus deaths). Hispanics are expected to increase from 12.6 percent of the population in 2000 to 18 percent in 2020, and Asians are expected to increase from 3.9 percent to 5 percent.

Growing ethnic diversity has contributed to shifts in food preferences as well as a notable expansion of the American food repertoire. To profit from this diversity, U.S. food suppliers must be both cognizant of the differing preferences of population subgroups and able to creatively tap into Americans' love of novel taste experiences.

**Hispanics will be the fastest growing group**



**Ethnic populations tend to consume. . .**




Reflecting ethnic and racial dietary preferences, a more diverse population is likely to eat more fruit, nuts and seeds, eggs, and fish. Citrus fruits may see the largest per capita gain (about 2.5 percent), driven by taste preferences of today's Hispanic population. However, a greater proportion of Hispanics and Asians in the population may reduce per capita consumption of dairy products (by a little over 1 percent) unless these groups embrace dairy products as a more integral component of their diet. A preference for rice over potatoes among the recent immigrant-based population groups may dampen demand for potatoes.

ERS researchers project that the expanding ethnic population base will increase per capita beef consumption very slightly and poultry and fish consumption somewhat more. The ethnic influence on beef consumption contrasts directly with the preferences of an aging population and may moderate the downward pressure on per capita beef demand. Greater fish consumption is linked to Asian dietary preferences, and greater poultry consumption is linked to preferences of Blacks and Hispanics. Underlying these expectations is the strong assumption that ethnic populations in 2020 will have eating preferences similar to those of today's ethnic and immigrant-based populations.

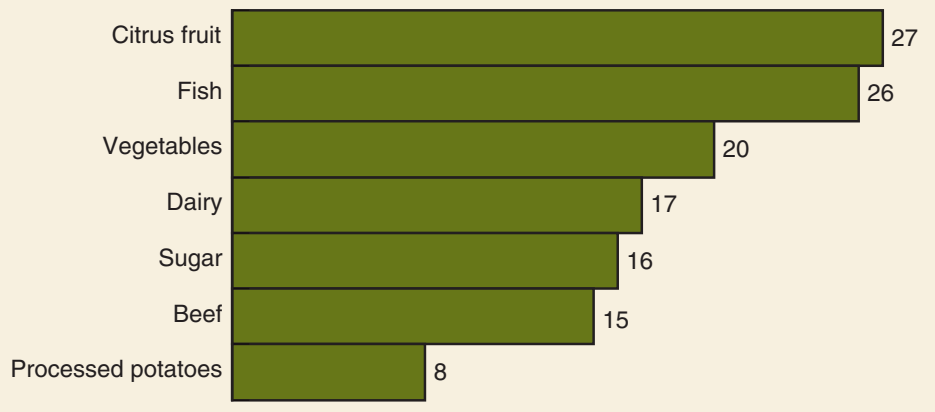
## More People To Feed

The United States is indeed growing, as seen in the 2000 census count of 281 million people, 54 million more than in 1980. A large share of U.S. population growth results from a high tide of immigration initiated in the 1960s and continuing at least into the near future. By 2020, the U.S. population will likely grow another 18-28 percent, implying another 50-80 million people to feed *just here at home*.

Conservatively assuming that in 2020 there will be 50 million more people to feed, we project that total household food spending will increase by over 26 percent between 2000 and 2020. Fueled by growth in per capita income, we project that food-away-from-home spending will increase 27.5 percent, compared with 24.3 percent for food-at-home spending.

In a mature market, population growth is the main source of increased demand for commodities that go into food production. However, population expansion will benefit some commodities more than others because of the changing population composition and related shifts in food preferences. For example, total quantities of beef and pork consumed are projected to increase by 14-15 percent, while

**U.S. projected consumption growth, 2000-2020**



quantities of fish and citrus fruit consumed would increase by 26-27 percent. These projections resemble the actual growth in food supplies to the U.S. market between 1980 and 2000, when beef supplies increased 11 percent, pork supplies increased 14 percent, and total fruit supplies increased about 28 percent.

## A Different Consumer, a Different Agriculture?

How important are these trends—older, wealthier, ethnically diverse consumers and more of them—to American agriculture?

First, because the U.S. market is a mature market, demand for farm products will grow at just about the same pace as the Nation's population. Fortunately for U.S. producers, the prospect of a growing population sets the United States apart from most other high-income countries where population growth rates are considerably lower. For those food producers who see this projected growth in U.S.-based demand as too slow, they will need to continue to secure new markets in middle-income countries (for example, Thailand and Mexico) where both populations and incomes are expanding more rapidly than in the U.S. Other Americans both on and off the farm may view the growing demand from the U.S. market as putting more pressure on environmentally sensitive agricultural areas.

Second, the demographic changes that are altering the composition of the American population imply at least moderate shifts in consumer preferences among food categories and individual products. Entrepreneurial growers will watch and attempt to tap into these shifts. For example, the growth in demand for chili peppers illustrates the growing influence of the Hispanic population as well as America's search for low-fat flavorings. We do not anticipate shifts in food preferences sufficient to transform agricultural composition of production or the profile of the American farm landscape by 2020.

**Supermarket sushi counters help satisfy Americans' demand for variety.**

Photo by Ken Hammond, USDA

Third, and most salient, the anticipation that increasing income will have a larger impact on demand for *quality and variety* of foods than on *quantity* will continue to transform agriculture into a sophisticated business venture along the lines of other American businesses. Growth in demand for value-added food products at the supermarket and in restaurants is likely to increase the share of food dollars that go to processors and retailers, and further diminish the share to providers of basic commodity inputs. However, growers are also positioning themselves to capture a larger share of the value added. Some strategies include diversifying into high-quality or specialty crops that may carry price premiums, such as tofu-grade soybeans and vine-ripened tomatoes, and developing branded products that are more readily linked by the consumer with a particular food company, production region, or even individual farm.

Food suppliers also know that catering to the modern consumer means adopting new ways of doing business, such as accepting closer business links through contractual relationships with others in the supply chain, and using information technology systems that help monitor and control quality from the farm to retail level. Such business and technology links, though far from visible as landmarks in America's farmlands, are the new hallmarks of *consumer-driven agriculture.*

**This article is drawn from. . .**

*FoodReview: Consumer-Driven Agriculture*, Vol. 25, Issue 1, Spring 2002, USDA/ERS, articles by Nicole Ballenger, Noel Blisard, John Cromartie, David E. Davis, Elise Golan, J. Michael Harris, Biing-Hwan Lin, Steve Martinez, Greg Pompelli, Anita Regmi, Hayden Stewart, and Jayachandran N. Variyam, available at: www.ers.usda.gov/publications/FoodReview/May2002/.

Blisard, Noel, John Cromartie, and Jayachandran Variyam. *Food Expenditures by U.S. Households: Looking Ahead to 2020*, AER-821, USDA/ERS, February 2003, available at: www.ers.usda.gov/publications/aer821.

Lin, Biing-Hwan, Jayachandran Variyam, Jane Allshouse, and John Cromartie, *Food and Agricultural Commodity Consumption in the United States: Looking Ahead to 2020*, AER-820, USDA/ERS, February 2003, available at: www.ers.usda.gov/publications/aer820.


Photo by Ken Hammond, USDA



# WEIGHING INCENTIVES FOR FOOD SAFETY IN MEAT AND POULTRY

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Two massive recalls of ground beef and turkey luncheon meats linked to foodborne illnesses in the Midwest and Northeast in the fall of 2002 put food safety concerns back in the headlines. These unusually large recalls are part of an increasing number of meat and poultry recalls over the past several years (see box, "Recalls on the Rise").

Despite these troubling signs about the safety of meat and poultry products, industry and government regulators have been taking steps to improve food safety and, in fact, the increase in recalls signals more diligence and better detection technology. Market mechanisms, such as product branding and stricter food safety requirements imposed on suppliers by large buyers, are bolstering the levels of food safety in some cases above those required under regulation.

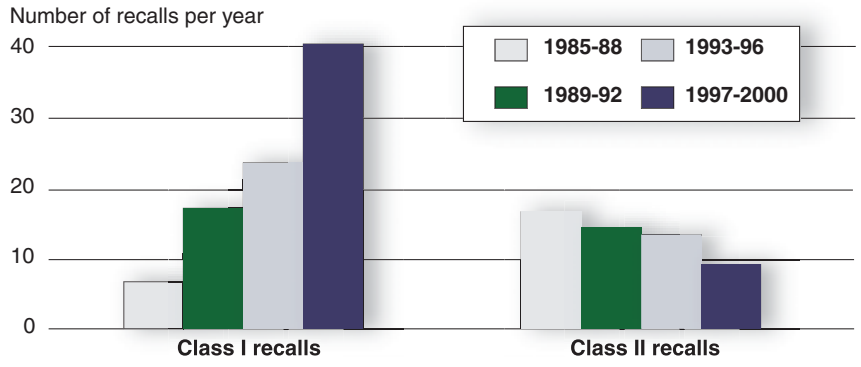
## Recalls on the Rise

The number and size of recalls have increased dramatically over the last decade. During 1993-96, the number of meat and poultry Class I recalls averaged about 24 per year and amounted to 1.5 million pounds annually. During 1997-2000, Class I recalls averaged 41 per year and reached 24 million pounds annually. Class I recalls involve meat or poultry products that could, especially without cooking to safe temperatures, cause serious illness or death. Class II and III recalls have little chance of being harmful.

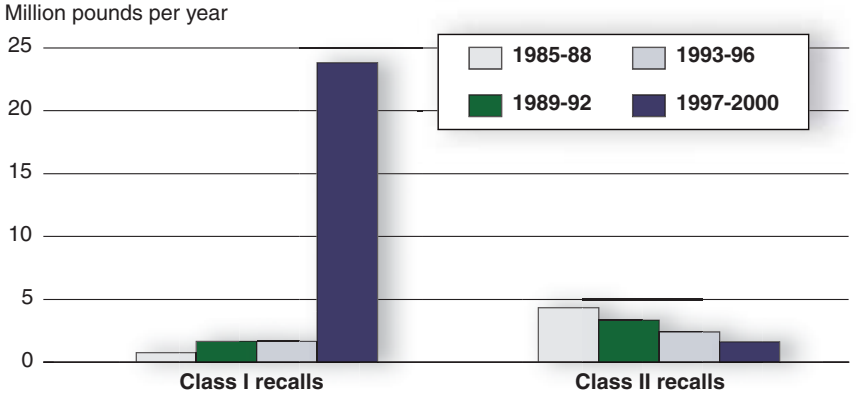
Three regulatory changes help explain why recalls have increased. First, in 1989, USDA's Food Safety and Inspection Service (FSIS) declared *Listeria monocytogenes* in ready-to-eat meat and poultry to be an adulterant, adopted a zero tolerance policy (no detectable level permitted), and began testing meat and poultry for this pathogen. In 1994, FSIS took the same action for *E. coli* O157:H7 in ground beef. These pathogens account for most of the Class I recalls. Second, FSIS began testing a larger sample of meat and poultry for pathogens in 1997 and introduced a new, more sensitive testing technology in 1999. Third, the Centers for Disease Control and Prevention (CDC) is becoming more adept at identifying foodborne illness outbreaks as it gains more experience in tracking such diseases.

These regulatory changes are reflected in recent recall trends. Class II recalls—for which there were minimal regulatory changes—declined both in number and pounds of output during the same period that Class I recalls skyrocketed.

**Class I recalls rose dramatically in 1997-2000 but Class II recalls declined. . .**




**And volume of recalls followed the same pattern**




## Branding Encourages Food Safety...

Consumers surely want safe food every bit as much as they want food that looks appealing, tastes good, and is convenient to prepare. However, unlike fat content, consumers cannot accurately measure food safety. For example, many consumers who experience food-related illnesses believe their illness is due to a virus or to some other nonfood source. Even if consumers connect an illness with a particular food—such as hamburger—they may not know which company's hamburger to avoid because many meat products bear only store labels. Although consumers could stop purchasing meat or poultry (or all their groceries) from a particular store, consumers know that this action does not likely punish the producer.

Stores often have many suppliers of meat and poultry products, so they cannot simply withdraw business from low-quality producers because they cannot always identify them. Or, the store may be a small customer of a large producer, making it difficult to elicit change.

Food suppliers recognize that some consumers will pay premiums for branded products because they are perceived to be of better quality. Oscar Mayer in luncheon meats, Tyson Foods in poultry, and Smithfield Farms in pork are companies that have developed branded products connoting better quality.

The downside for these companies is that the brand may also be used to more readily identify the company as the source of a foodborne illness. Producers of branded products invest a lot of money into promoting product quality and will see that investment evaporate if a serious food safety breach occurs. Bil Mar foods, producer of Ball Park hotdogs, for example, spent more than $100 million during 1998-2000 to improve food safety and convince con-

**Consumers will pay premiums for branded products because they perceive the products to be of better quality.**

Photo by Ken Hammond, USDA

sumers of its products' safety after USDA's Food Safety and Inspection Service (FSIS) determined that it was producing products contaminated by the pathogen *Listeria monocytogenes.* Researchers at the University of Arkansas found that food recall announcements by publicly traded companies cause stock prices of affected firms to decline.

As a consequence, producers of branded products must invest more in food safety than producers of unbranded products, suggesting that recent trends toward higher sales of branded fresh meat cuts, such as pork roasts, should enhance food safety. Unfortunately, lower cost ground meats have the highest likelihood of pathogen contamination and, except for irradiated meats, these are less likely to be branded.

## ...As Do Customer Requirements

Food processors are not alone in the quest for safer food. Large restaurant chains spend millions of dollars promoting an image of tastiness, convenience, restaurant cleanliness, and product safety. Losing this image can be very costly. Jack In The Box, McDonald's, other major restaurant chains, and an increasing number of grocery stores and wholesalers routinely set strict food safety controls for their suppliers, and cease contractual arrangements with those that do not comply. Burger King, for example, terminated a contract with Hudson Meats, forcing that company to exit the industry, after it underwent a huge recall of its meat products due to *E. coli* O157:H7 contamination.

Export markets are another lucrative market for meat and poultry companies. Like other major customers, many importing countries impose strict standards and pathogen testing on sellers. For example, South Korea rejected U.S. hot dogs in 1999 because they were contaminated with *Listeria monocytogenes*, and Russia voiced persistent concerns over the food safety of U.S. poultry throughout 2002.

ERS researchers recently completed a survey of almost 1,000 meat and poultry slaughter and processing plants. The survey covered numerous aspects of food safety controls and their costs. Among other findings, it provides new evidence that contractual arrangements covering food safety standards between meat and poultry plants and their buyers result in higher levels of food safety in five categories: equipment, testing, dehiding, sanitation, and operating procedures.

## Legal Liability Provides Limited Incentives

The legal liability system forces producers to make food safety investments up to the point at which the probability that the plant's products would be identified as the cause of an illness would be a very low. However, the incentives of the legal system limit food safety investment. Litigation is costly and most foodborne illnesses result in relatively minor gastrointestinal distress, such as diarrhea, that is either not recognized as food-related or not thought to be serious enough to pursue in court. Also, ERS research has shown that plaintiffs are unlikely to receive awards in foodborne illness trials, even in the case of a major illness, because rarely can the plaintiff make a certain link between a particular food and the sickness.

This is not to say that court actions are completely ineffective, however. Besides the costs associated with a rare loss in court, a highly publicized trial can severely harm a firm's image. To reduce this threat, companies often make out-of-court settlements.

## Evolving Regulations Buttress Economic Incentives

Food safety regulation in the United States dates to 1890 when *trichinae*, tiny worms in hogs, emerged as a public and animal health problem (see box, "Milestones in Food Safety Regulation"). *The Jungle*, Upton Sinclair's 1906 exposé of the brutal working conditions and unsanitary practices in Chicago meatpacking plants, led to the passage of the Federal Meat Inspection Act of 1906. Legislation in 1967 and 1968 addressed the use of inexpensive nonmeat fillers in meat products and extended FSIS's regulatory jurisdiction over a wider array of meat and poultry plants. Regulations based

on the legislation also established cooking times, temperature minimums, and other processing standards.

Regulatory changes occurring after the 1968 legislation greatly increased FSIS inspection requirements and forced FSIS to shift inspection priorities. One key change was implementation of voluntary process control programs that reduced some FSIS tasks. However, industry did not widely adopt the programs, most likely because companies calculated the added costs of the programs to be greater than the expected market benefits.

By 1980, some of the earlier problems addressed by regulation had receded from public view because regulatory, technological, and industrial changes resolved them. Public attention turned to *Salmonella* and other human pathogens, such as *E. coli* O157:H7, that lived in an animal's gastrointestinal tract without causing noticeable disease in the animal.

Food safety regulation entered a new era in 1989 when *Listeria monocytogenes* was declared an adulterant with a zero tolerance. Later, FSIS used the voluntary process control program framework as a model for a system of preventive controls known as Hazard Analysis and Critical Control Point (HACCP) program. Under a HACCP program, plants monitor points in their processing system that engender potential food safety hazards and take corrective actions when they suspect that a critical level of one of these points has been breached.

The 1996 Pathogen Reduction/HACCP rule mandated that meat and poultry plants develop and implement a system of standard operating procedures for sanitation and a HACCP program. Additionally, plants producing raw ground products or slaughtering animals have to adhere to *Salmonella* performance standards. Finally, slaughter plants have to also conduct *E. coli* testing to verify the adequacy of their process controls. PR/HACCP sanitation and process control requirements followed regulations mandated after the enactment of the 1967 and 1968 legislation. These regulations required plants to perform commonly accepted food safety practices, such as preventing contact between raw and cooked products and enforcing employee handwashing.

## Plants Perform Required Tasks

A team of FSIS process control inspectors enforces regulations by determining whether sanitation and process control systems are working to prevent adulteration. Inspectors examine recorded information and conduct scheduled and unscheduled spot checks of various plant procedures. If an inspector together with a FSIS compliance officer determine that a plant is not properly performing tasks critical for safe food, they can decide that the task is out of compliance. In 1999, noncompliant HACCP tasks ranged from a high of about 5.5 percent in poultry slaughter plants to less than 2 percent for frozen meal/other food processors and for retailers and wholesalers.

These low noncompliance levels may lead one to believe that FSIS secures compliance through the exercise of strong

**Meat and poultry plants had less than 6 percent of HACCP tasks in noncompliance in 1999**

| Industry | Noncompliant tasks |
|---|---|
| | *Percent* |
| Red meat slaughter | 2.6 |
| Meat processing | 1.4 |
| Poultry slaughter and processing | 5.5 |
| Frozen meals and other packaged products containing some meat | 1.5 |
| Retailers and wholesalers | 1.2 |

Source: U.S. Department of Agriculture, Food Safety and Inspection Service files and Enhanced Facilities Database.

USDA photo

enforcement powers. However, FSIS has used its enforcement powers infrequently. If a plant has a chronic problem with sanitation or HACCP tasks, an inspector can impose a maximum penalty of temporarily shutting down the contaminated equipment or responsible department. Records for 1999-2001 indicate that FSIS issued an average of one of these types of penalties per 75 plants. Although a stronger action—plant closure by removal of inspection services—is possible, protracted court proceedings in the past have led FSIS to rarely use this enforcement tool. The high performance of sanitation and HACCP tasks in relation to the level of enforcement powers suggests that plants and their customers believe that these tasks are important to business performance.

## Food Safety Costly for Plants, But Barely Noticed by Consumers

Understanding food safety costs helps regulators to evaluate how the industry may receive new regulations or amendments to existing regulations, and to assess the pros and cons for industry and consumers of regulatory changes.

In 2002, ERS extensively studied the costs of food safety regulation by estimating the cost of sanitation and process controls and of the PR/HACCP rule. ERS estimates that, before the PR/HACCP program began, required sanitation and process control tasks increased total production costs by a little more than 1 percent, or about $850 million, per year for the meat and poultry industry. This compares to a gross margin of about 5 percent between value of shipments (or output) and animal, labor, and capital costs in red meat packing plants. For small plants, this margin is much smaller and may approach the cost of sanitation and process control. To the average supermarket shopper, the added cost is so small as to have an almost unobservable impact on retail prices.

**Added cost to consumers from food safety measures is small**

| Product | Increase in retail price |
|---|---|
| | *Percent* |
| Ground beef | 0.8 |
| Sirloin steak | .3 |
| Chuck roast | .6 |
| Center cut pork chops | .4 |
| Ham[1] | 1.8 |
| Pork sausage[1] | 1.3 |
| Chicken breast | .3 |
| Whole turkey | .6 |

[1]Includes costs from slaughter and processing operations.

Corbis

Interestingly, costs did not vary with plant size. Large plants had no special economic advantage in food safety process control. Costs were clearly lower for plants with poor sanitation and process control performance and higher for those with better performance.

ERS then estimated that PR/HACCP required another 1 percent of total costs on top of those incurred earlier for sanitation and process control tasks, which were still required. Plants that had advanced quality control programs before PR/HACCP paid significantly less to implement the new requirements than plants with minimal controls. The combined costs translate into about 4 percent of the costs that plants can control—additional costs that are, once again, insignificant for retail prices but significant from the point of view of the plant's balance sheet.

The $850 million in costs to plants due to PR/HACCP is likely passed on to consumers in the form of about a 1-percent increase in retail prices. As a point of contrast, consumers can now purchase irradiated meat products that supply near-perfect food safety. But irradiated products are not acceptable to all consumers and are

considerably more expensive than their untreated counterparts. Lancaster Farming reported that irradiated ground beef in October 2002 was priced 10-30 cents, or 5-10 percent, higher per pound than nonirradiated ground beef at Wegmans Food Markets in Pennsylvania. Other stores likely have similar price premiums.

## Poor Food Safety Performance Doesn't Pay in the Long Run

If food safety controls cost plants money, it might seem that plants could do better economically with more lax sanitation and process controls. To the contrary, our studies indicate that, especially for certain types of plants, poor food safety performance does not pay over the long haul. ERS researchers found that sausage makers and other companies that further process raw bulk meat and poultry, along with larger-than-average slaughter plants, with poor quality control records had 3-8 percent higher rates of exit from the industry than plants with better records. Only small slaughter plants appear to have benefited from skimping on food safety efforts.

It's easy to explain these results. Firms that make further processed meat and

**Exit rates were higher for large and medium-size plants with poor process control**

| Process control performance[1] | Plant size[2] | | | |
|---|---|---|---|---|
| | Small | Medium | Large | All sizes |
| | *Percent exits, 1992-96* | | | |
| **Slaughter plants:** | | | | |
| Good | 8.3 | 0 | 0 | 8.2 |
| Average | 9.6 | 7.4 | 2.9 | 8.5 |
| Poor | 4.0 | 15.0 | 7.1 | 7.1 |
| All | 8.9 | 8.6 | 4.1 | 8.3 |
| **Processing plants:** | | | | |
| Good | 11.8 | 0 | 0 | 11.4 |
| Average | 10.0 | 8.7 | 4.8 | 9.2 |
| Poor | 15.0 | 14.8 | 7.3 | 12.8 |
| All | 10.7 | 9.3 | 5.4 | 9.9 |

[1]A plant with a good level of process control has a process control record that is superior to 90 percent of all the other plants, and a plant with poor process control has a record that is worse than 90 percent of all other plants in the industry. Plants that fall into neither one of these categories have an average rating.

[2]Small plants have less than one-half the average plant's output, large plants have twice the average plant's output, and medium plants are in between.

USDA photo

## Milestones in Food Safety Regulation

**Meat Inspection Act of 1890 and various amendments during the 1890s**

Ushered in microbiological testing and changes in animal husbandry as a way to fight *trichinae*, a tiny worm, in pork that is harmful to both animals and people. Also mandated that USDA inspect animals and meat to prevent the sale of sickened animals and rotten meat.

**Federal Meat Inspection Act of 1906**

Mandated that all plants engaged in interstate commerce be subject to Federal inspection of live cattle, hogs, sheep, and goats just before slaughter and the carcasses afterward. Also required plants to use proper sanitation and labels on domestically shipped products.

**Poultry Products Act of 1957**

Mandated that poultry plants be subject to inspection by the Federal Government.

**Wholesome Meat Act of 1967 and Wholesome Poultry Products Act of 1968**

Extended FSIS oversight over State inspection agencies because of unsanitary conditions in some of those plants. Also extended FSIS oversight to include formerly unregulated plants in order to prevent the use of inexpensive fillers instead of meat or poultry in frozen meals, soups, and other packaged products that include meat or poultry as one component.


USDA photo

**Voluntary Quality Control Programs, 1980-85**

Total Quality Control and Partial Quality Control programs shift some mundane inspection tasks and more responsibility for sanitation and process controls to industry. This frees FSIS inspectors from carcass inspection to pursue process control inspection.

***E. coli* O157:H7 and *Listeria monocytogenes* declared adulterants, 1989-94**

Because the two organisms can cause serious illness in humans, FSIS declared *E. coli* O157:H7 in ground beef and *Listeria monocytogenes* in ready-to-eat meat and poultry to be adulterants and adopted a zero tolerance policy.

**Pathogen Reduction/Hazard Analysis and Critical Control Point rule (promulgated in 1996 and fully implemented by January 2000)**

Flexible but mandatory quality control program intended to focus plant food safety on preventing harmful pathogens from contaminating meat and poultry products.

poultry products typically produce branded products that allow buyers to more easily associate product quality with a particular producer. Slaughter plants, on the other hand, generally produce generic ground hamburger, pork chops, and other raw meat products, making producer identification difficult. It is easier, however, for the market to identify and implicate large slaughter plants than small ones. Large plants are more likely to be exclusive suppliers to buyers that require strict food safety standards such as quality-conscious supermarkets, large-volume restaurant chains, and export markets. Large plants are also more likely to be caught producing off-quality products because more consumers eat their products, making the likelihood of sickness greater.

Market mechanisms in the form of more widespread use of brands and contracting for food safety, government oversight embodied in the PR/HACCP rule, and more stringent enforcement indicate that industry and FSIS are putting forth a great deal of effort to ensure the safety of meat and poultry products. A way to enhance food safety still further is to strengthen market forces by making information about a plant's food safety performance as readily available to consumers as the amount of fat and other commonly reported product attributes. Market forces could be further extended through greater product testing, the provision of test results to the public, and improvements in scientific methods that link foodborne illnesses to the producer.

**This article is drawn from. . .**

Buzby, Jean, Paul D. Frenzen, and Barbara Rasco. *Product Liability and Microbial Foodborne Illness,* AER-799, USDA/ERS, 2001, available at: www.ers.usda.gov/publications/aer799/.

Ollinger, Michael, and Valerie Mueller. *Managing for Safer Food: The Economics of Sanitation and Process Controls in Meat and Poultry Plants,* AER-817, USDA/ERS, March 2003, available at: www.ers.usda.gov/publications/aer817/.

Ollinger, Michael, and Stephanie Chin. "Product Recalls and Plant Survival in the U.S. Meat and Poultry Industries," Unpublished working paper, USDA/ERS, 2002.

See also "Calculating the Cost of Foodborne Illness—A New Tool To Value Food Safety Risks," in this issue.

For more information on ERS' food safety research, visit: www.ers.usda.gov/Emphases/SafeFood/.

Updates of *Agricultural Outlook's* statistical tables are just a click away at www.ers.usda.gov/publications/AgOutlook

## Farm, Rural, and Natural Resources Indicators

| | 1990 | 1995 | 2000 | 2001 | 2002 | 2003 | Annual percent change 1990-2000 | 2001-02 | 2002-03 |
|---|---|---|---|---|---|---|---|---|---|
| Cash receipts ($ billion) | 169.5 | 188.0 | 193.7 | 202.8 | 193.5f | 200.5f | 1.3 | -4.6 | 3.6 |
| Crops | 80.3 | 100.8 | 94.1 | 96.4 | 97.6f | 101.6f | 1.6 | 1.3 | 4.0 |
| Livestock | 89.2 | 87.2 | 99.6 | 106.4 | 95.9f | 98.9f | 1.1 | -9.9 | 3.2 |
| Direct government payments ($ billion) | 9.3 | 7.3 | 22.9 | 20.7 | 13.1f | 17.6f | 9.4 | -36.6 | 33.7 |
| Gross cash income ($ billion) | 186.9 | 205.9 | 230.4 | 238.5 | 222.5f | 234.9f | 2.1 | -6.7 | 5.6 |
| Net cash income ($ billion) | 52.7 | 52.5 | 58.4 | 59.7 | 46.3f | 51.3f | 1.0 | -22.5 | 11.0 |
| Net value added ($ billion) | 80.8 | 74.8 | 92.1 | 90.9 | 76.5f | 90.8f | 1.3 | -15.9 | 18.7 |
| Farm equity ($ billion) | 702.6 | 815.0 | 1,022.3 | 1,059.0 | 1,086.6f | 1,099.7f | 3.8 | 2.6 | 1.2 |
| Farm debt-asset ratio | 16.4 | 15.6 | 15.3 | 15.4 | 15.7f | 16.0f | -0.7 | 1.7 | 2.2 |
| Farm household income ($/farm household) | 38,237 | 44,392 | 61,947 | 64,117p | 62,515p | 65,095f | 4.9 | -2.5 | 4.1 |
| Farm household income as a percentage of U.S. household income (%) | 103.1 | 98.8 | 108.6 | 110.2p | na | na | 0.5 | na | na |
| Nonmetro-metro poverty gap (%) | 3.6 | 2.2 | 2.6 | 3.1 | na | na | -3.2 | na | na |
| Cropland harvested (million acres) | 310 | 302 | 314 | 311p | 307p | na | 0.1 | -1.3 | na |
| USDA conservation program expenditures ($ bil.)[1] | 3.0 | 3.5 | 3.4 | 3.7 | 3.5q | na | 1.3 | -5.4 | na |

## Food and Fiber Sector Indicators

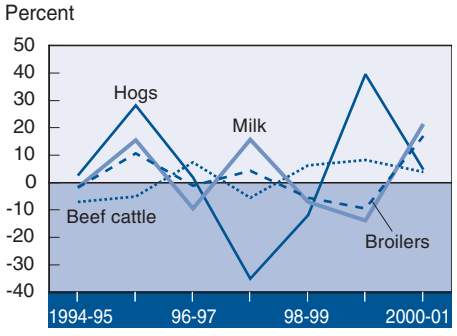
| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| U.S. gross domestic product ($ billion current) | 5,803 | 7,401 | 9,825 | 10,082 | 10,446f | 10,843f[2] | 5.4 | 3.6 | 3.8 |
| Food and fiber share (%) | 15.1 | 14.2 | 12.6 | 12.3 | na | na | -1.8 | na | na |
| Farm sector share (%) | 1.4 | 1.0 | 0.8 | 0.8 | 0.8 | na | -5.4 | 0.0 | na |
| Total agricultural imports ($ billion)[1] | 22.7 | 29.8 | 38.9 | 39.0 | 41.0 | 43.0f | 5.5 | 5.1 | 4.9 |
| Total agricultural exports ($ billion)[1] | 40.3 | 54.6 | 50.7 | 52.7 | 53.3 | 57.0f | 2.3 | 1.1 | 6.9 |
| CPI for food (1982-84=100) | 132.4 | 148.4 | 167.8 | 173.1 | 176.2 | 179.5f | 2.4 | 1.8 | 1.9 |
| Personal expenditures on food as a percentage of disposable income (%) | 11.6 | 10.6 | 10.1 | 10.2 | 10.2p | na | -1.4 | 0.0 | na |
| Share of total food expenditures for at-home consumption (%) | 54.9 | 53.7 | 53.1 | 53.3 | 52.6p | na | -0.3 | -1.3 | na |
| Farm-to-retail price spread (1982-84=100) | 144.5 | 174.5 | 210.3 | 215.4 | 221.2 | na | 3.8 | 2.7 | na |
| Total USDA food and nutrition assistance spending ($ billion)[1] | 24.9 | 37.9 | 32.6 | 34.2 | 38.0 | na | 2.7 | 11.1 | na |

f = Forecast. p = Preliminary. q = 2002 Administration request. na = Not available.

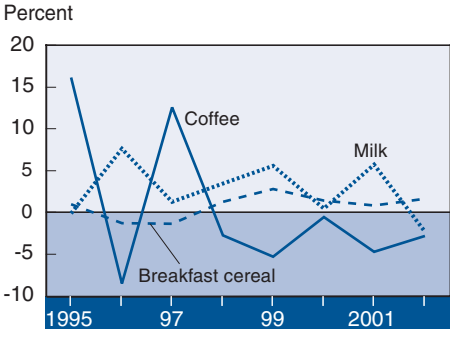
[1] Based on October-September fiscal years ending with year indicated.

[2] Forecast for 2003 based on March 2003 forecasts from the Office of Management and Budget.

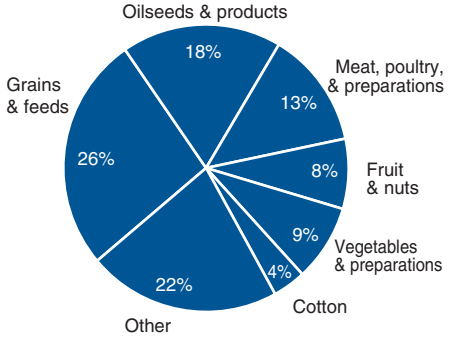
**Annual change in prices received by farmers: Livestock and milk**




**Annual change in Consumer Price Index for selected foods**




**Major U.S. agricultural exports in 2002**




For a complete list of data sources and contact persons, see *www.ers.usda.gov/AmberWaves*

## Behind the Data

### Estimating Consumption of Caloric Sweeteners

Since 1941, ERS has estimated annual U.S. total and per capita consumption of caloric sweeteners. The data series comprises dry-weight consumption estimates of refined cane and beet sugar, corn sweeteners, honey, and edible syrups.

The estimates are based on deliveries of sweeteners by processors, refiners, and importers to U.S. food and beverage manufacturers, institutional users, wholesalers, and retailers. Food and beverage manufacturers use the sweeteners in processed products ranging from candy and soft drinks to catsup, yogurt, peanut butter, and boxed rice mixes. Food wholesalers and retailers distribute refined sugar, honey, maple syrup, and molasses for individual and household use.

ERS relies on estimates of refined cane and beet sugar deliveries published by USDA's Farm Service Agency (FSA) in *Sweetener Market Data.* These estimates include sugar refined from domestic and imported raw sugar as well as refined sugar imports. As required by law (currently, the Farm Security and Rural Investment Act of 2002), all sugar beet processors and sugar cane refiners in the United States and Puerto Rico provide FSA with monthly reports on deliveries of refined sugar. USDA's Foreign Agricultural Service provides FSA with estimates of refined sugar imports.

ERS estimates deliveries of corn sweeteners (high-fructose corn syrup, glucose, and dextrose) for domestic food and beverage uses (excluding nonfood uses), using information from industry contacts, consulting firms, and U.S. Census Bureau import data.

ERS divides total deliveries of various sweeteners by population to estimate per capita deliveries. Estimates of per capita delivery help determine whether Americans, on average, are consuming more or less added sugars over time. The delivery estimates, however, overstate the actual human intake of caloric sweeteners by not excluding amounts lost to human use through food spoilage, plate waste, and other losses in the home and marketing system. To obtain a measure of actual intake per capita, ERS subtracts estimated losses of caloric sweeteners from per capita deliveries. Average losses at the retail/institutional level total 11 percent, while those at the consumer level total 20 percent.

Estimates of per capita intake of caloric sweeteners made using this procedure may provide more accurate measures of average intake than estimates based on food intake surveys, particularly if some survey respondents underreport consumption of foods containing added sugars.

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**Steven Haley**, shaley@ers.usda.gov

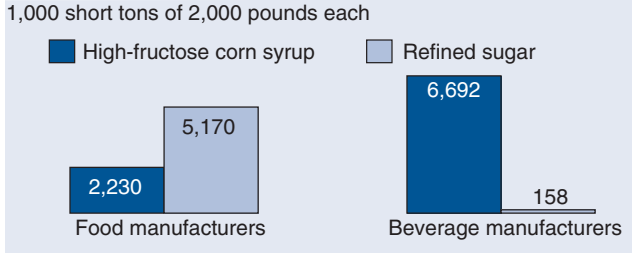
### Caloric sweetener deliveries for domestic foods and beverages and estimated human intake, 2001

| Sweetener type | Annual deliveries: Volume | Annual deliveries: Share of total | Annual deliveries: Per capita | Intake per capita[1]: Annual | Intake per capita[1]: Daily |
|---|---|---|---|---|---|
| | *1,000 short tons* | *Percent* | *—Pounds—* | | *Teaspoons[2]* |
| Refined sugar | 9,201 | 43.8 | 64.6 | 46.0 | 13.6 |
| Corn sweeteners | 11,623 | 55.4 | 81.6 | 58.1 | 17.2 |
| High-fructose corn syrup | 8,922 | 42.5 | 62.6 | 44.6 | 13.2 |
| Glucose syrup | 2,231 | 10.7 | 15.7 | 11.1 | 3.3 |
| Dextrose | 470 | 2.2 | 3.3 | 2.3 | 0.7 |
| Honey | 135 | 0.6 | 0.9 | 0.7 | 0.2 |
| Edible syrups | 50 | 0.3 | 0.4 | 0.2 | 0.1 |
| Total | 21,008 | 100.0 | 147.4 | 105.0 | 31.1 |

Totals may not add exactly due to rounding. Numbers are dry weight.
[1]Excludes losses averaging 11 percent at the retail/institutional level and 20 percent of the new subtotal at the consumer level (the two totaling to about 29 percent of initial deliveries).
[2]Daily intake in teaspoons = average annual intake in pounds / 365 days per year x 16 ounces per pound x 28.3495 grams per ounce / 4.2 grams per teaspoon.

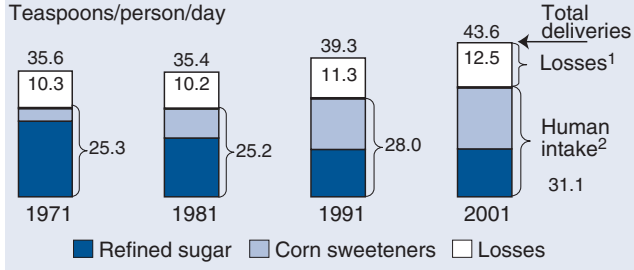
Source: Economic Research Service, Farm Service Agency, and Foreign Agricultural Service, USDA.

### Deliveries of major caloric sweeteners to U.S. food and beverage manufacturers in 2001




Source: Farm Service Agency and Foreign Agricultural Service, USDA.

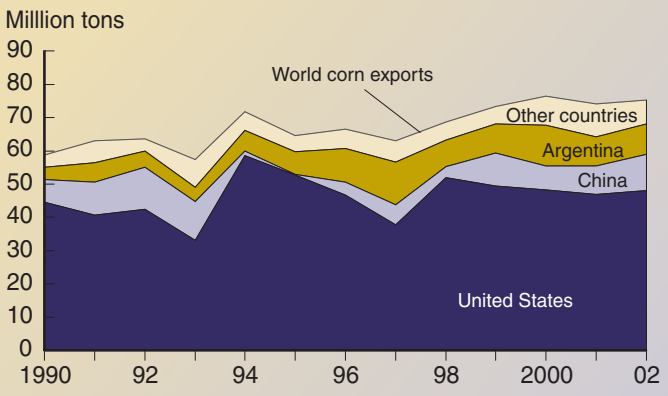
### Intake levels represent the difference between total deliveries of caloric sweeteners for food and beverage use and estimated losses




[1]Losses include retail and institutional losses as well as household plate waste and spoilage. [2]USDA's Food Guide Pyramid recommends limiting intake of added sugars to 6 teaspoons a day for diets of 1,600 calories, 12 teaspoons for diets of 2,200 calories, and 18 teaspoons for diets of 2,800 calories.

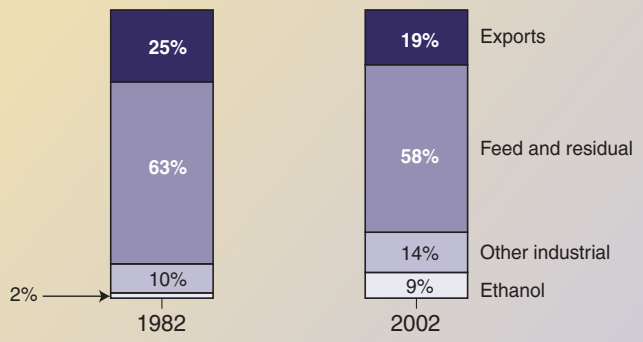
## Markets and Trade

### China captures growth in corn market in 2002




Source: Foreign Agricultural Service, USDA.

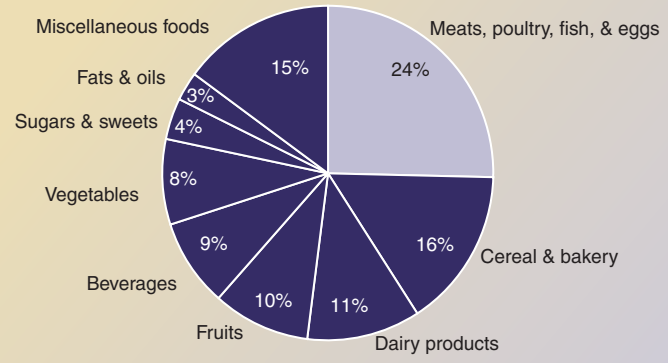
### Share of U.S. corn converted to ethanol and other industrial uses continues to climb




Sources: U.S. Department of Commerce and various USDA agencies.

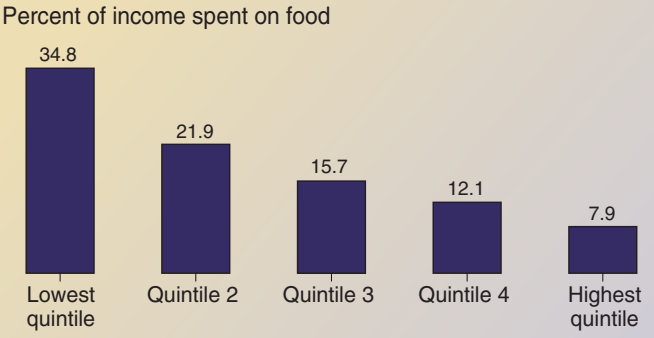
## Diet and Health

### Americans spent a quarter of their at-home food budget in 2002 on meats, poultry, fish, and eggs




Source: Based on Bureau of Labor Statistics' Consumer Expenditure Survey.

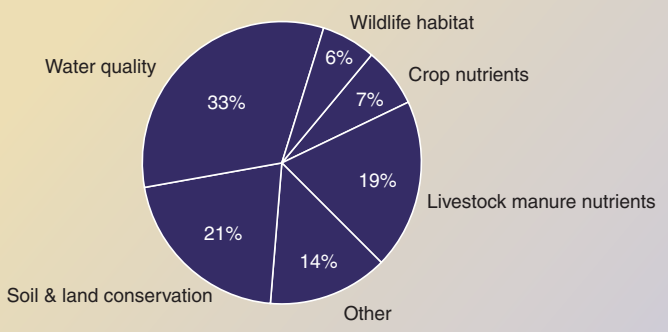
### Lowest income families spent over a third of their incomes on food in 2002, while the highest income families spent less than a tenth




Source: Based on Bureau of Labor Statistics' Consumer Expenditure Survey.

## Natural Resources and Environment

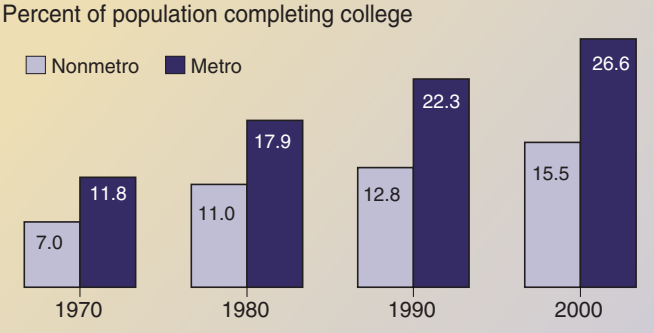
### Funding for USDA's Environmental Quality Incentives Program (EQIP) addresses various environmental concerns




Source: Based on 1997-2000 data from the Farm Service Agency, USDA.

## Rural America

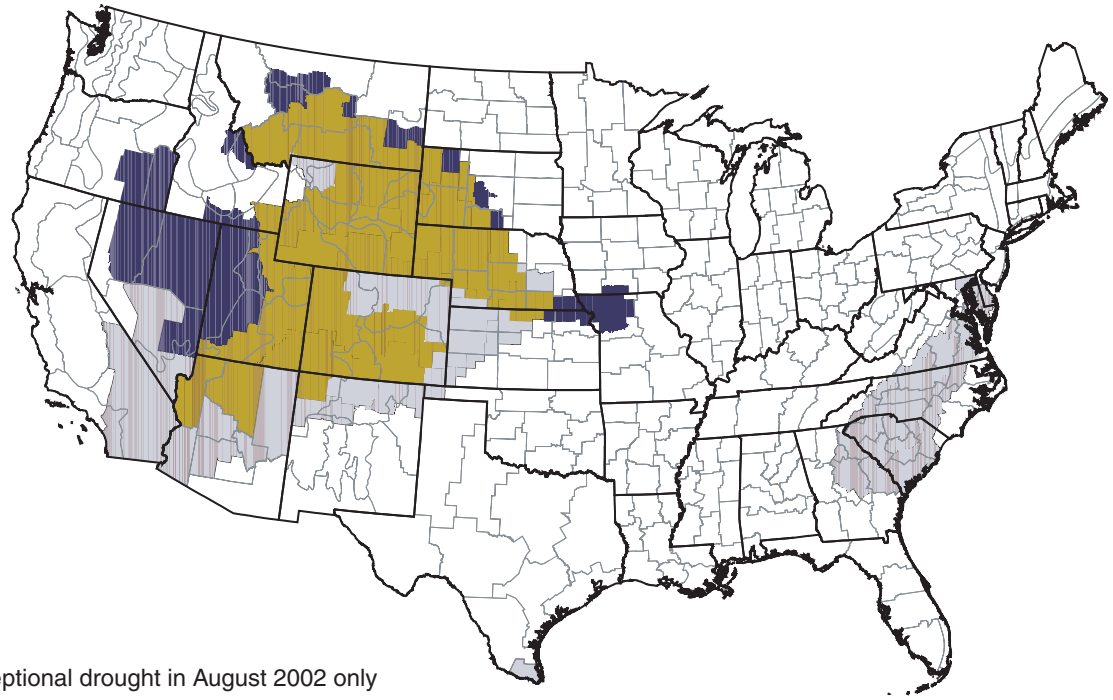
### While a higher proportion of the population is completing college, the nonmetro-metro gap in college completion is widening




Note: For all years, metro and nonmetro areas are defined using the 1990 Census.
Source: Calculated using data from the Census Bureau's Censuses of Population.

## On the Map

As of March 11, 2003, extreme or exceptional drought conditions continued or had emerged in much of the Rockies, but had retreated from the Southeast and parts of the Plains and Southwest.



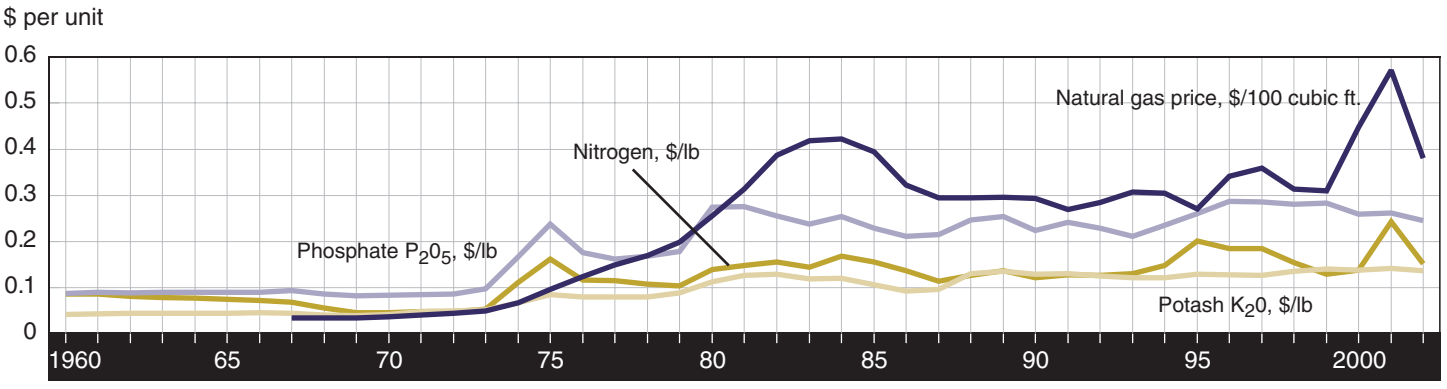
Drought Indicator

- Extreme or exceptional drought in August 2002 only
- Extreme or exceptional drought in March 2003 only
- Extreme or exceptional drought in both periods

Based on U.S. Drought Monitor for August 6, 2002, and March 11, 2003 (www.drought.unl.edu/dm/monitor/html)

## In the Long Run

Natural gas is the primary input to ammonia production, which, in turn, is the major input to production of nitrogen fertilizer. In recent years, increasing demand for natural gas and variations in supply have caused shortrun fluctuations in natural gas prices, affecting nitrogen fertilizer production costs and prices. Phosphate and potash fertilizers are mined, with prices reflecting increased mining costs and annual variations in demand. The long-term upward trends in natural gas and fertilizer prices are expected to continue as production costs increase.




Source: Fertilizer prices are from National Agricultural Statistics Service, USDA. Natural gas prices are from Energy Information Administration, U.S. Department of Energy.

# Current Activities

### Are Food Safety and International Trade Compatible?

Global trade in meats, grain, fruit and vegetables, and seafood is increasing, but each of those sectors has experienced food safety episodes that have, at least temporarily, impeded trade and resulted in economic loss. ERS is studying the nexus between international food trade and food safety, focusing on how different approaches to regulating food safety affect trade, and how the private and public sectors have responded to enhance the compatibility of trade and food safety. The ERS study will include an economic framework for understanding linkages between trade and food safety, commodity case studies to demonstrate the effects of food safety issues in international markets, an overview of global trends in food safety regulation, and an assessment of the role of international institutions in mitigating trade disputes. **Jean Buzby, jbuzby@ers.usda.gov**

### Environmental Review of Free Trade Agreements

U.S. Executive Order 13141 as well as the Trade Act of 2002 mandate a review of the environmental impacts of new free trade agreements. ERS economists **Joseph Cooper (jcooper@ers.usda.gov)** and **Roy Darwin (rdarwin@ers.usda.gov)** are working with the U.S. Trade Representative (USTR) on conducting a quantitative analysis of the potential environmental effects of free trade agreements. If the interagency process is approved, ERS will be one of two U.S. Government agencies to provide the USTR with such a quantitative analysis. The initial targets of analysis are the proposed Free Trade Area of the Americas and a free trade agreement among member countries of the World Trade Organization.

### How a Nation's Income Growth Affects Its Food Consumption Patterns

ERS research corroborates that lower income countries spend a larger share of their additional income on food than wealthier countries do. ERS economist **Anita Regmi** and Professor James Seale at the University of Florida have examined food expenditure responses to income and price changes across 110 low-, middle-, and high-income countries. Their findings also demonstrate that income growth leads to larger increases in expenditures on higher valued food products (such as meats and dairy products) than on staple food products (such as cereals). Food expenditures in poorer countries are also more responsive to price changes. The results from the study are being used in ERS and Global Trade Analysis Project (GTAP) models to analyze the impacts of various policy changes on food demand and trade, as well as to forecast future food demand. **Anita Regmi, aregmi@ers.usda.gov**

### How Rural Areas Differ

ERS is constructing new county classifications to capture current aspects of the broad economic and social diversity among rural areas. Some earlier typologies developed by ERS have been widely used by policy analysts and public officials to determine eligibility for and effectiveness of Federal programs to assist rural America. Others have served research needs in and outside of USDA. Rapid advancements in technology, changes in population growth patterns, and devolution of government services during the 1990s have led ERS to take a fresh look at rural diversity. **Linda Ghelfi, lghelfi@ers.usda.gov**

### The Market for Commodity-Based Agricultural Information

ERS, the World Agricultural Outlook Board, and other USDA agencies are working with Booz Allen Hamilton to explore the potential for a one-stop shopping portal for commodity-related information on the USDA website. The Booz Allen Hamilton analysts have been examining the costs and benefits of such an effort, and have had extensive interactions with private sector users and generators of commodity-related data and information within USDA. In addition to this effort, ERS is developing a comprehensive report on the market for commodity market information, which will draw on a 2000 survey of private sector information users, several cooperative agreements with researchers at the University of Illinois, the University of California-Berkeley, and other universities, and the Booz Allen Hamilton findings. **Joy Harwood, jharwood@ers.usda.gov**

# Recent Meetings

### Education and Local Economic Development

ERS cosponsored the conference "Promoting the Social and Economic Vitality of Rural America: The Role of Education" with the Southern Rural Development Center in April 2003. The conference brought together social scientists and education specialists from academia, government, and policy centers to discuss such topics as the impact of local schools on economic growth, school-employer partnerships, at-risk school populations, and the links between academic achievement and rural workforce outcomes. **Robert Gibbs, rgibbs@ers.usda.gov**

### Performance-Based Environmental Policies

ERS cosponsored a workshop with the Farm Foundation, Winrock's Henry A. Wallace Center, the UC-Berkeley Center for Sustainable Development, and Defenders of Wildlife in March 2003. The workshop reconciled theoretical benefits of performance-based policies for cost-effective improvements in agricultural water quality with the realistic constraints on their use. Participants included people working with performance-based approaches in the field, local stakeholders, scientists involved with monitoring and measuring environmental performance, economists, policymakers, and regulators. For watersheds actively pursuing such approaches in Iowa, California, New York, Oregon, and Florida, the workshop participants defined factors influencing performance-based policies for their agricultures, identified strategies for alleviating obstacles to implementation, and designed specific policy approaches for future pilot testing and analysis. **Ralph Heimlich, heimlich@ers.usda.gov**

### ERS Hosts Meeting on Organic Sector Data

On February 25, ERS hosted "Briefing and Roundtable: USDA Surveys and Organic Sector Data Needs." USDA managers of several major agricultural surveys in the Agricultural Marketing Service, National Agricultural Statistics Service, and ERS discussed their surveys and opportunities for expanding them to include more information on organic production and marketing. Representatives from USDA agencies and several organic interest groups, including the Organic Trade Association and the Organic Farming Research Foundation, attended. A budget initiative to enhance organic data collection is planned, as well as incremental changes in existing surveys to get better data on organic production. **Utpal Vasavada, vasavada@ers.usda.gov**

# New Releases

### Race and Ethnicity in Rural Areas

A new briefing room on the ERS website, "Race and Ethnicity in Rural America," describes the demography, geographic dispersion, household structure, educational attainment, labor force activity, and economic well-being of rural Asians, Blacks, Hispanics, Native Americans, and Whites. Policy implications and related sites are also included. **William Kandel, wkandel@ers.usda.gov**


### Understanding Rural Population Loss and Growth

In the Winter 2002 issue of *Rural America*, ERS's recently retired magazine of rural economics, ERS researchers take a new look at rural population change based on 2000 census data. The lead article shows that the counties most likely to lose people in the 1990s had low population densities and few amenities and were distant from metro centers—all characteristics that discourage development. A companion article discusses 330 recreation counties, many with high amenities, that have grown faster than most county types, largely from inmigration. Most can be classified according to their principal attraction, such as casinos, reservoir lakes, or ski resorts. Other articles examine regional rural development efforts, such as the Delta Regional Authority created in 2000, and review the most recent data on nonmetro migration, rural poverty, and rural earnings. **Carolyn Rogers, crogers@ers.usda.gov**

### Future Food Expenditures

In *Food Expenditures by U.S. Households: Looking Ahead to 2020* (AER-821), ERS researchers estimate that projected demographic shifts combined with an assumed increase in inflation-adjusted incomes of 1 percent per year in the United States will increase per capita food spending by 7.1 percent and total food spending by 26.3 percent by 2020. The study uses recent Bureau of Census data, incorporating demographic factors such as age, race, income, region of residence, diet-health knowledge, and household size and composition. **Noel Blisard, nblisard@ers.usda.gov**

### Future Food Consumption

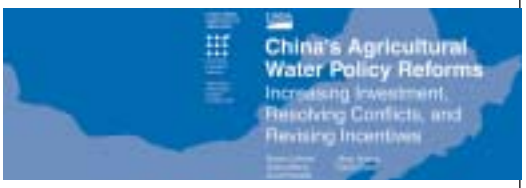
As the American population becomes older and more racially and ethnically diverse, the volumes and types of foods preferred can be expected to shift. *Food and Agricultural Commodity Consumption in the United States: Looking Ahead to 2020* (AER-820) examines the volume of individual foods eaten by Americans between 1994 and 1998, and projects what those volumes will be by the year 2020, taking into account population and demographic shifts as well as trends in economics and immigration. The researchers used a food-commodity translation database to convert food consumption to commodity consumption for 25 food groups and 22 commodity groups. **Biing-Hwan Lin, blin@ers.usda.gov**

### U.S. Organic Farming Small, But Growing

U.S. farmland managed under organic systems expanded rapidly over the last decade as farmers strove to meet consumer demand in both local and national markets. USDA implemented national standards on organic production and processing in October 2002, and the new standards are expected to facilitate further growth in organic farming. While less than 3 million acres of cropland use organic practices, an increasing number of U.S. farmers are adopting these systems. *U.S. Organic Farming in 2000-2001: Adoption of Certified Systems* (AIB-780) updates USDA estimates of land farmed with organic practices during 1997 with estimates for 2000 and 2001, and provides new estimates on the number of certified organic operations in each State. **Catherine Greene, cgreene@ers.usda.gov**

### Demand for Farm Credit Expands, But Farm Lenders Remain Cautious

Commercial banks, the Farm Credit System, the Farm Service Agency (FSA), and life insurance companies provide credit to the farm sector and keep a cautious eye on farm debt trends, interest rates, and farm debt repayment capacity. According to the recently released *Agricultural Income and Finance* (AIS-80), all major lender groups, including FSA, report low levels of delinquencies and loan problems. The stability of their farm loan portfolios is benefiting from large government payments, off-farm income, and an enhanced crop and revenue insurance program. Total farm business debt increased 5.1 percent in 2002. The expected 3.9-percent increase in 2003 will be the 11th consecutive annual increase. Despite price and weather problems facing some commodities, the supply of farm credit remains adequate, and lenders appear confident about most of their farm customers. **Jerome Stam, jstam@ers.usda.gov**




### China's Water Policies: Effects on Production and Trade

ERS is embarking on a collaborative project with China's Ministry of Water Resources and the Australian Bureau of Agricultural and Resource Economics, among others, to examine how China's water policies might affect agricultural production potential and trade. This collaboration builds on the recently released ERS publication *China's Agricultural Water Policy Reforms: Increasing Investment, Resolving Conflicts, and Revising Incentives* (AIB-782). The central component of the collaboration will be to assist the Ministry of Water Resources to build a hydrological-economic model of the Yellow River Basin to predict the effects of water policies on crop production. This effort will serve to increase our understanding of how water allocation policy reform will affect China's ability to maintain self-sufficiency in grains. **Bryan Lohmar, blohmar@ers.usda.gov**

### Competing in the 21st Century

The presentations given at USDA's annual Outlook Forum in February can be accessed at **www.usda.gov/oce/waob/oc2003/program.htm** The forum was attended by over 1,300 industry, academic, and government analysts. ERS developed, or helped develop, 9 of the Forum's 31 sessions, which ranged in content from "Competition in the Asian Marketplace" to "What's Happening in the Retail Food Sector?"

### Commodity Markets and Trade

ERS Outlook reports provide timely analysis of major commodity markets, farm income and finance, and trade, including special reports on hot topics. All reports are available electronically and can be found at **www.ers.usda.gov/publications/outlook** along with a calendar of future releases. **Joy Harwood, jharwood@ers.usda.gov**

**See information on all new ERS releases at www.ers.usda.gov/Calendar/**

# Mark Gehlhar and Anita Regmi

Photo by Dana Rayl West, USDA/ERS

Changing consumer preferences are driving changes in the way food is produced, marketed, and traded. With world economies growing more integrated and both capital and technology moving more freely across national boundaries, the welfare of U.S. food producers is increasingly tied to foreign consumers. That's where ERS's Mark Gehlhar and Anita Regmi come in.

Three years ago, together with other researchers in ERS, they began to investigate changes in food consumption and its implications for international trade. Since then, as public interest has grown, they have broadened their analyses to cover new market developments, including how retailing, cost-reducing technologies, and foreign manufacturing are changing the global landscape of food markets. They are now probing international retail sales and trade data to identify different strategies employed by food suppliers in meeting consumer demand in the global marketplace.

Their work illustrates that the U.S. food industry is a unique combination of export-dependent sectors and less trade-oriented firms that often own foreign assets and global brands. As such, trade numbers and financial performance of the U.S. food sector do not always align, since U.S. food companies sell five times more through sales via foreign affiliates in overseas markets than through U.S. export sales.

Mark and Anita contend that growing income, shifting diets, and restructuring in food retailing will largely shape global food trade in the coming years. Early work from their project is presented in *Changing Structure of Global Food Consumption and Trade*, WRS-01-1 (www.ers.usda.gov/publications/wrs011/). Along with a team of ERS researchers, they are also working on "Global Markets for High-Value Foods," which will be released later this year. In February 2003, Mark and Anita organized a workshop on the same topic to generate a discussion on the changes taking place in the global food economy and examine its relevance for policymakers (proceedings will be posted at www.farmfoundation.org).

Mark has had a longstanding interest in trade and economic development, and has been involved in the Global Trade Analysis Project, a collaborative effort among national and international universities and research institutions to build a global policy and trade analysis tool. Much of his research has focused on structural shifts in global trade and impacts of policy, technical change, and economic growth. Anita's research interests have been wide and varied, ranging from groundwater pollution, integrated pest management, and trade in developing countries to changing food preferences and the global food market. In addition to conducting research, Anita has policy experience from her 4-year stint with USDA's Foreign Agricultural Service (FAS). While at FAS, Anita focused on international agricultural commodity markets and bilateral/multilateral trade agreements. As a member of the FAS team in charge of World Trade Organization negotiations, she oversaw agricultural issues concerning developing countries.

# Global Consumer Markets Team

Recognizing the need to meld the expertise of many people in order to address the research questions related to global food markets comprehensively, Mark and Anita are now leading a newly formed research team. A wide array of emerging issues are on the agenda for further research. For example, how does market coordination between retailing and processing firms affect global and intraregional food trade? And how do government policy and technological change influence the location of food production and manufacturing? Several researchers in ERS's Market and Trade Economics Division (MTED) have investigated aspects of these issues. The 15-person team draws expertise from different branches within MTED. Several researchers have country- or industry-specific knowledge, while others are experts in theories of trade, foreign investment, and consumer behavior. The diversity of the group is a great asset for the project, which will help USDA and its stakeholders confront the maturing markets in industrialized countries while tapping the growing middle-class demand in developing countries.

Photo by Dana Rayl West, USDA/ERS

Front row (left to right): Anita Regmi, Delmy Salin, Suchada Langley, Agapi Somwaru
Second row (left to right): Shiva Makki, Stefan Osborne, Chris Bolling, Carlos Arnade, Thomas Vollrath
Third row (left to right): James Cash, Christopher Davis, John Wainio, Mark Gehlhar, Greg Price, James Hansen