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AGRICULTURAL OUTLOOK

Economics Editor
Dennis A. Shields
(202) 694-5331
dshields@econ.ag.gov

Associate Editors
Judith E. Sommer
(202) 694-5322

Anne B.W. Effland
(202) 694-5319

Managing Editor
Mary Reardon
(202) 694-5136

Art Director
Victor Phillips, Jr.

Assistant Editor
Carrie Ingoglia
(202) 694-5383

Design, Layout, Graphics
Cynthia Ray

Statistics Coordinator
David Johnson
(202) 694-5324

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Cover photo by Tania Tang, World Trade Organization

In This Issue . . .

Wheat Outlook . . . Tariff Bargaining . . . Crop & Revenue Insurance . . . Korea's Ag Imports . . . Reducing Greenhouse Gas Buildup

U.S. Wheat Supplies Remain Large In 1999/2000

Large beginning stocks of wheat will offset a forecast decline in U.S. production, leaving U.S. supplies at 3.4 billion bushels in 1999/2000, up slightly from last year and the highest since 1987/88. This year farmers planted an estimated 62.9 million acres, down 5 percent from last year and the lowest since 1973. Weather has been relatively favorable in several states, and the all-wheat yield in 1999 is forecast at 42.7 bushels per harvested acre, down slightly from last year's record 43.2 bushels.

Although global trade will pick up while world production declines moderately, little if any increase in world prices is expected because major wheat exporters' supplies are large. The average price received by U.S. farmers is projected at $2.45-$2.95 per bushel in 1999/2000, with the midpoint up 5 cents from last season.

Agriculture & the Evolution Of Tariff Bargaining

Preparations have already begun for the ninth round of international trade talks to be launched at the World Trade Organization Ministerial Conference in December. Over the previous eight rounds, countries successfully lowered tariffs for manufactured goods from a trade-weighted, most-favored-nation (MFN) average of over 40 percent to about 4 percent. While agriculture had been included in each round, it was not until the Uruguay Round of Multilateral Trade Negotiations (1986-94) that real progress was made in negotiating overall reductions in barriers to agricultural trade, particularly in reducing or eliminating export subsidies.

The weight of remaining agricultural trade protection has now shifted toward tariffs, some of which are extremely high. A review of how reduction in tariffs for manufactured goods was accomplished reveals some valuable lessons for future negotiations on agricultural tariffs, which are, on average, still much higher than for manufactured items.

Korea's Agricultural Imports Recovering from Financial Crisis

South Korea was the fourth-largest destination for U.S. agricultural products in 1997, buying 5 percent of U.S. agricultural exports. But beginning in late 1997 and extending into 1998, Korea experienced a major economic shock—including devaluation of its currency, a decline in the production of goods and services, and temporary inability to obtain credit. Agricultural imports fell by 28 percent in calendar-year 1998. The economy is now rebounding, following strong intervention by the government and the International Monetary Fund. Agricultural imports are rising again, particularly beef, soy oil and soymeal, and processed foods and beverages. The crisis appears to have only temporarily interrupted growth in a major U.S. agricultural market.

Facing the Methyl Bromide Phaseout

Public and private research programs are exploring alternatives to methyl bromide, a widely used agricultural pesticide that is being phased out by parties to the Montreal Protocol. Methyl bromide, used for over 50 years to control insects, pathogens, nematodes, and weeds in vegetable, fruit, and nut crops, is used for soil fumigation before planting crops and for post-harvest fumigation of agricultural products in storage and prior to shipment. In 1992, methyl bromide was classified as a substance that depletes the stratospheric ozone layer. Phaseout under the multilateral Montreal Protocol exempts some uses of the chemical. Many U.S. users of methyl bromide are concerned that alternative practices currently available to replace it will be less effective, resulting in financial losses. Some potential alternatives are fairly well developed while others are relatively new.

Reducing Greenhouse Gas Buildup: Impacts on Ag-Sector Returns

Efforts to reduce U.S. greenhouse gas (GHG) pollution come at a cost to all sectors of the economy, including agriculture. But a program to pay farmers to develop emissions-absorbing "carbon sinks" on agricultural land could add to farm income. Shifting cropland to forest and grasses and using conservation tillage could sequester (embed) atmospheric carbon in soil and above-ground biomass, reducing atmospheric GHG's. Private industry or government could pay farmers to engage in specific cultural practices that would remove GHG's from the air, reducing the need for more costly cuts in GHG emissions.

Crop & Revenue Insurance: Bargain Rates but Still a Hard Sell

Federal crop and revenue insurance subsidies alter the tradeoff between expected income and risk exposure, so operators may attain significant risk reduction at relatively low cost, while actually increasing expected (i.e., longrun) returns. Government outlays for insurance programs pay a portion of producers' premiums on approved policies, and reimburse private insurance carriers for the costs of selling and underwriting policies, adjusting losses, and processing policy data. Yet the rate of participation in insurance programs has remained significantly less than universal for a variety of reasons—for example, general lack of information about how insurance programs work, advantages they impart, and the true extent of farm-level risk.

Briefs

Field Crops

U.S. Soybean Acreage Increases For Ninth Consecutive Year

Planted area for the eight major U.S. field crops (corn, soybeans, wheat, barley, sorghum, oats, cotton, and rice) totals 251.8 million acres in 1999, down more than 4 million acres from last year when prices were higher for most crops at planting time. Declines in wheat and feedgrains more than offset gains in soybeans, cotton, and rice.

Estimates of planted and harvested acreage in USDA's *Acreage* report were based on surveys conducted during the first 2 weeks of June, while the March 31 USDA *Prospective Plantings* report indicated farmers' crop intentions for spring plantings in 1999. Compared with the *Prospective Plantings* report, planted area is nearly 2 percent higher for soybeans but 1 percent lower for corn. Total wheat area is essentially the same.

Harvested acreage and actual yield will be strongly influenced by weather conditions through the growing season. Normal weather would result in large output and stable or declining farm prices for most U.S. field crops in 1999/2000 compared with a year earlier (see *AO* June-July 1999). However, crop potential could be reduced in the Atlantic Coastal Plains and eastern Gulf Coast if current dry weather persists in the region.

U.S. farmers have planted 74.2 million acres of ***soybeans*** in 1999, a 3-percent increase over last year's record acreage. Planted acreage has steadily increased since 1990 when the soybean planted area totaled 57.8 million acres. Farmers are expected to harvest 73.3 million acres, up 4 percent from the 1998 record harvested acreage. Several factors are behind the rise in soybean plantings, including a soybean loan rate (under the government nonrecourse marketing assistance loan and loan deficiency payment program) that is favorable relative to other crops (*AO* May 1999).

For the second consecutive year, estimated soybean acreage increased in the Corn Belt and the Great Plains and declined in most of the South, Southeast, and mid-Atlantic states. The largest acreage increases were in Nebraska, South Dakota, Missouri, and Ohio. Farmers in the largest producing states, Iowa and Illinois, also increased soybean area this spring. States with the largest reductions in plantings included Louisiana, Tennessee, Alabama, and Texas.

In most of the western Corn Belt and Great Plains states, heavy and continuing storms during May kept producers from an early start in planting soybeans. More favorable and drier weather in the eastern Corn Belt and the southern U.S. allowed soybeans to be planted at a rapid pace. Despite some early delays, planting progress for the 1999 U.S. crop had advanced ahead of a year ago by the first week of June.

The increased soybean acreage has replaced some area formerly devoted to ***corn***. Corn plantings declined in 1999 to an estimated 77.6 million acres, down 3 percent from last year. Corn acreage to be harvested for grain is estimated to decrease to 71 million acres, down 2 percent from 1998. Total corn acreage for Corn Belt states, at 51.4 million acres, declined 2 percent from last year, due in part to increased soybean plantings (*AO* May 1999). Illinois and Indiana were the only two major states to show an increase in total planted acreage from last year.

Outside the Corn Belt, in Texas, Louisiana, and South Dakota, acreage decreased sharply from last year's high levels. Although rains soaked parts of the central and southern Great Plains and western Corn Belt in late April, weather

U.S. Field Crops—Market Outlook

	Area								
	Planted	Harvested	Yield	Production	Total supply	Domestic use	Exports	Ending stocks	Farm price
	Million acres		*Bu/acre*	*Million bu*					*$/bu*
Wheat									
1998/99	65.9	59.0	43.2	2,550	3,373	1,378	1,050	945	2.65
1999/2000	62.9	54.6	42.7	2,333	3,378	1,315	1,150	913	2.45-2.95
Corn									
1998/99	80.2	72.6	134.4	9,761	11,089	7,420	1,925	1,774	1.95
1999/2000	77.6	71.0	135.8	9,650	11,404	7,485	1,925	1,994	1.65-2.05
Sorghum									
1998/99	9.6	7.7	67.3	520	569	315	190	64	1.70
1999/2000	9.0	8.3	69.0	573	637	370	200	67	1.35-1.75
Barley									
1998/99	6.3	5.9	60.1	352	502	331	30	141	1.95
1999/2000	5.2	4.9	60.3	295	471	307	30	134	1.60-2.00
Oats									
1998/99	4.9	2.8	60.4	167	346	263	2	81	1.15
1999/2000	4.7	2.6	61.1	161	343	261	2	80	0.90-1.30
Soybeans									
1998/99	72.4	70.8	38.9	2,757	2,961	1,781	785	395	5.00
1999/2000	74.2	73.3	40.0	2,935	3,334	1,814	930	595	3.90-4.70
			Lbs./acre	*Million cwt (rough equiv.)*					*$/cwt*
Rice									
1998/99	3.35	3.32	5,669	188.1	225.7	109.8	85	30.9	8.70-8.80
1999/2000	3.60	3.58	5,902	211.0	252.2	112.6	84	55.6	5.50-6.50
			Lbs./acre	*Million bales*					*¢/lb.*
Cotton									
1998/99	13.39	10.68	625	13.9	18.2	10.5	4.1	3.6	61.1
1999/2000	14.56	13.5	665	18.7	22.4	10.6	5.7	6.0	*

Based on July 12, 1999 *World Agricultural Supply and Demand Estimates*.
*USDA is prohibited from publishing cotton price projections.

Economic Research Service, USDA

improved in early May, and by the end of the month 96 percent of the U.S. corn crop had been planted. USDA reported that 76 percent of the crop was in good or excellent condition as of July 4.

Sorghum plantings dropped again in 1999 to an estimated 9 million acres, down 6 percent from 1998, as acreage declined in most of the major producing states due to weak feedgrain prices. This is the lowest planted acreage since 1929. Texas, with 2.85 million acres, has the largest reduction, decreasing 20 percent from 1998. Kansas, the largest sorghum producing state, increased plantings 3 percent to 3.6 million acres.

Barley plantings also declined in 1999 to an estimated 5.24 million acres, the lowest on record. The largest declines are in North Dakota and Minnesota as farmers continue to shift away from barley to alternative crops with higher returns such as wheat, soybeans, and other oilseeds. Most of the 1999 barley crop was planted late because of a wet May.

Total ***wheat*** planted acreage for 1999 is estimated at 62.9 million acres, down 5 percent from last year. It is the lowest planted area since 1973, and area harvested for grain is the lowest since 1988. Relatively unfavorable returns encouraged producers to plant alternative crops such as soybeans and other crops or leave land fallow (see the *Commodity Spotlight* in this issue for more on the wheat outlook).

Cotton plantings for 1999 are estimated at 14.6 million acres, 9 percent above 1998 and 5 percent above the March *Prospective Plantings* report. All major producing states except Arizona and California increased 1999 cotton area. Although planting-time prices were down from a year earlier, expected returns were higher for cotton than for competing crops such as corn and soybeans.

Planting in the southeastern states started slowly due to a severely dry spring, and a majority of the crop was planted during late May and is progressing normally. However, portions of the crops in Georgia and North Carolina are still stressed from dry conditions that persisted during late May and early June. Delta producers completed plantings by June 1, with the crop developing near or ahead of normal.

Acreage Up for Soybeans, Down for Corn

	1998 acreage			1999 acreage		
	Prospective	Planted	Harvested	Prospective	Planted	Harvested
			Million acres			
Corn	80.8	80.2	72.6	78.2	77.6	71.0
Soybeans	72.0	72.4	70.8	73.1	74.2	73.3
Wheat	67.0	65.9	59.0	63.0	62.9	54.6
Sorghum	9.0	9.6	7.7	8.8	9.0	8.3
Barley	6.8	6.3	5.9	5.3	5.2	4.9
Oats	5.2	4.9	2.8	4.7	4.7	2.6
Rice	3.1	3.3	3.3	3.6	3.6	3.6
Cotton	13.2	13.4	10.7	13.9	14.6	NA
Total	257.1	256.0	233.1	250.6	251.8	NA

1999 harvested acreage forecast.
NA = Not available. The June *Acreage* report does not estimate cotton harvested acreage.
Economic Research Service, USDA

Crop conditions continue to be mostly good or excellent in all the Delta states.

Texas, the largest cotton producing state, completed most plantings by mid-June, although some replanting was necessary in the Texas High Plains on fields damaged by hail and high winds. At the end of June, 40 percent of the crop was rated in good or excellent condition, and 29 percent was rated in fair condition. In California, low temperatures and damp weather in early April kept plantings behind normal. However, warm temperatures during the second half of June provided good growing conditions. At the end of June, 60 percent of the California crop was rated in good condition. Prospects for a large U.S. crop led to a fall in cotton prices from May to June.

Rice plantings for 1999 are estimated at 3.6 million acres, up 3 percent from 1998, with long grain acreage up 4 percent from last year. Acreage was up from 1998 in all major producing states except California. Relative returns were higher than for competing crops (e.g., soybeans) when farmers made planting decisions in February and March. **AO**

Robert A. Skinner (202) 694-5313
rskinner@econ.ag.gov

For further information, contact:
Mack Leath, domestic wheat; Ed Allen, world wheat and feed grains; Allen Baker, domestic feed grains; Nathan Childs, rice; Mark Ash, oilseeds; Steve MacDonald, world cotton; Les Meyer, domestic cotton. All are at (202) 694-5300.

August Releases—USDA's Agricultural Statistics Board

The following reports are issued electronically at 3 pm (ET) unless otherwise indicated.

August

2 *Crop Progress (4 p.m.)*
3 *Egg Products*
4 *Broiler Hatchery*
5 *Dairy Products*
Poultry Slaughter
Basic Formula Milk Price (Wisconsin State Report)
6 *Dairy Products Prices (8:30 a.m.)*
9 *Crop Progress (4 p.m.)*
11 *Broiler Hatchery*
12 *Cotton Ginnings (8:30 a.m.)*
Crop Production (8:30 a.m.)
13 *Dairy Products Prices (8:30 a.m.)*
Turkey Hatchery
16 *Milk Production*
Crop Progress (4 p.m.)
17 *Cranberries (1 p.m.)*
18 *Broiler Hatchery*
Mushrooms
19 *Catfish Processing*
Citrus Fruits–Final Estimates 1992-97
Potatoes and Sweet Potatoes-Final Estimates 1992-97
20 *Dairy Products Prices (8:30 a.m.)*
Cattle on Feed
Cold Storage
Farm Labor
Livestock Slaughter
23 *Crop Progress (4 p.m.)*
NASS Facts Newsletter (4 p.m.)
24 *Chickens and Eggs*
25 *Broiler Hatchery*
26 *Turkeys*
27 *Dairy Products Prices (8:30 a.m.)*
Rice Stocks (8:30 a.m.)
Peanut Stocks and Processing
30 *Crop Progress (4 p.m.)*
31 *Agricultural Prices*

Briefs

Livestock, Dairy, & Poultry

U.S. Red Meat & Poultry Exports Plateau

U.S. red meat and poultry exports, after growing at double-digit rates since 1986, advanced only 1 percent in 1998, reaching 8.95 billion pounds. The level of exports may increase another 1-2 percent in 1999 due in part to food aid to Russia, but will likely decline about 2 percent in 2000. This would be the first drop since 1985. Three factors are contributing to the slowdown: the collapse of the Russian economy (affecting poultry and pork), the downturn and slow recovery of Asian economies, and currency devaluations for both importers and competitors.

U.S. ***pork*** exports will likely total 1.2 billion pounds in 2000, down slightly from the 1998 level and the 1999 forecast. The core U.S. markets— Japan, Canada, and Mexico—are each expected to register smaller gains in 2000 than in 1999. Secondary markets, such as Korea, Taiwan, and Hong Kong, likely will grow this year and remain steady in 2000 as U.S. pork prices rise. Export prospects have dampened from the rapid gains of recent years, because Japanese demand for U.S. pork appears to have leveled off, and Russia has largely dropped out of the commercial market.

U.S. imports of pork products are expected to rise about 11 percent in 1999, about the same as last year, leveling off in 2000. While a double-digit increase during a period of very plentiful domestic supplies and low prices seems paradoxical, it is explained by a strong dollar relative to the Canadian dollar (Canada accounts for 70 percent of U.S. imports) and high European Union export restitutions (Denmark accounts for 19 percent of U.S. imports). In addition, as the Canadian pork industry restructures, it is becoming more competitive with the U.S. In contrast to the U.S., Canadian producers continue to boost hog production, with January-March sow farrowings up 6 percent from a year ago and intentions for April-June up 4 percent.

U.S. ***broiler*** exports are expected to total 4.6 billion pounds in 2000, down about 1 percent from the 1999 forecast level. Exports to the Baltic States are expected to decline from this year's exceptional growth. After growing rapidly since the late 1980's, broiler exports have hovered between 4.5 and 4.7 billion pounds since 1997 and the collapse of the Russian market.

U.S. ***turkey*** exports are forecast at 400 million pounds in 2000, about even with the 1999 forecast. Gains in sales to Mexico and some Asian countries, chiefly South Korea, are expected to offset reduced shipments to Russia and other Eastern European countries. Because Mexico is the leading buyer of U.S. turkey (56 percent of exports in 1998), its economy will largely determine the level of U.S. turkey exports. Mexico's Gross Domestic Product is forecast to grow a relatively healthy 2-3 percent in both 1999 and 2000. U.S. exports to Korea, which was a major market for U.S. turkey before economic adversity struck in 1998, could rebound sharply if the Korean economy continues to improve in 1999 and into 2000 (see ***World Agriculture and Trade***). Export prospects to South Korea are better for turkey than for pork—domestic turkey production is limited, and turkey imports are rebounding from the sharp declines in 1996 and 1997.

U.S. ***beef*** exports are projected at 2.3 billion pounds in 2000, down 6 percent from the 1999 forecast. The expected drop in U.S. beef production next year will be greater than the decline in domestic

U.S. Livestock and Poultry Products—Market Outlook

		Beginning stocks	Production	Imports	Total supply	Exports	Ending stocks	Consumption Total	Consumption Per capita	Primary market price
		Million lbs.							*Lbs.*	*$/cwt*
Beef	1999	393	25,978	2,705	29,079	2,449	370	26,260	67.4	63-65
	2000	370	24,206	2,800	27,376	2,300	365	24,711	62.8	70-76
Pork	1999	586	19,280	780	20,646	1,247	575	18,824	53.5	30-32
	2000	575	18,655	775	20,005	1,200	525	18,280	50.8	34-37
										¢/lb
Broilers	1999	711	29,323	4	30,038	4,612	800	24,627	77.5	57-59
	2000	800	30,709	4	31,513	4,575	800	26,138	81.6	54-58
Turkeys	1999	304	5,214	1	5,519	400	250	4,874	17.9	67-69
	2000	250	5,332	0	5,582	400	300	4,882	17.7	61-67
		Million doz.							*No.*	*¢/doz.*
Eggs*	1999	8.4	6,866.3	5.0	6,879.7	181.8	5.0	5,729.4	251.9	68-70
	2000	5.0	7,030.0	4.0	7,039.0	200.0	5.0	5,824.0	253.9	63-68

Based on July 12, 1999 *World Agricultural Supply and Demand Estimates*.
*Total consumption does not include eggs used for hatching.
See appendix tables 10 and 11 for complete definition of terms.

Economic Research Service, USDA

consumption, leaving less beef available for export. At the same time, demand for high-quality hotel/restaurant beef is likely to increase in Asia, Mexico, and some other foreign markets. The gap between increased demand in these markets and the reduced U.S. supply is likely to be filled by pulling beef out of the U.S. retail market and increasing U.S. imports from Canada and Argentina. Argentina is building up its fed-beef sector to compete with the U.S. in the Asian markets. Australia is also a major beef producer, but it has a small fed-beef sector, and its size is limited by feed grain availability.

Healthy economic growth will increase demand for U.S. beef in Mexico this year, continuing a rebound from lows in the mid-1990's when peso devaluation depressed sales. Mexico's domestic beef production is limited by declining cattle inventories caused by drought conditions in 1998 and 1999. Also limiting Mexican beef production are high interest rates, the indebtedness of Mexican producers, and the weak peso, which makes imported breeding cattle more expensive and increases the export value of domestic cattle.

Exports to Japan, the largest U.S. beef export market, are expected to remain steady in 1999 after rising 6 percent last year. Last year's gain came despite weakness of the Japanese yen against the U.S. dollar and strength against the Australian dollar, resulting in lower-valued U.S. cuts (and larger quantities) being marketed in Japan. Now that the yen has appreciated against the U.S. dollar since third-quarter 1998, and has begun to fall against the Australian dollar, higher priced U.S. beef cuts may compete more favorably against lower valued Australian beef. The quantity of total U.S. exports to Japan will likely remain steady in 1999 as gains in sales of higher valued beef offset losses in sales of lower valued beef.

The most rapidly growing market is South Korea, whose first-quarter 1999 U.S. beef imports were more than double those of a year earlier. The country's cash and credit crunch, along with higher U.S. beef prices, reduced beef imports 40 percent in 1998, causing Korea to fail to meet its World Trade Organization commitments for minimum imports. However, the economic situation has improved, and the won has regained about half its value against the U.S. dollar, making U.S. beef imports attractive again. Imports are expected to rise while Korea begins to rebuild its domestic beef supplies this year; its cattle herd had dropped by more than 20 percent, to 2.2 million head on March 1, 1999.

U.S. beef imports are expected to increase 2-3 percent in 1999 and in 2000, after rising 13 percent last year. In 1998, reduced Asian demand, a strong U.S. economy, and drought-induced slaughter in Australia and New Zealand (which resulted in lower processed beef prices) meant increased U.S. imports from these two countries. Imports from New Zealand are expected to decline significantly this year as herd rebuilding tightens beef supplies there. However, more product from Australia, Canada, and Argentina will be shipped to the U.S. to substitute for largely cyclical shortfalls of U.S. beef for processing, as fewer cows are slaughtered and more are kept for breeding. Prices for imported beef are expected to be relatively high, reflecting a tight world supply of processing beef.

Several South American countries are rapidly emerging as suppliers to the U.S. market. Argentina—declared free of foot-and-mouth disease—is exporting less cooked product and more uncooked product, which is more lucrative. Both Argentina and Uruguay are likely to come close to reaching their 44-million-pound U.S. import quota of fresh, chilled, and frozen product this year. U.S. imports beyond the quota are allowed, but would face a high tariff.

Brazil is supplying the U.S. with increasing amounts of cooked product formerly purchased from Argentina. The Brazilian currency, while it has recouped about half its losses since the 40-percent January devaluation, remains relatively weak, making Brazilian beef exports more price-competitive in world markets. **AO**

For further information, contact:
Leland Southard, coordinator; Ron Gustafson, cattle; Leland Southard, hogs; Mildred Haley, world pork; Jim Miller, domestic dairy; Richard Stillman, world dairy; Milton Madison, domestic poultry and eggs; David Harvey, poultry and egg trade, aquaculture. All are at (202) 694-5180.

For updated forecasts of farm income,
Turn to tables 29-31 on pages 54 and 55

For the analysis behind the numbers,
visit the **Farm Business Economics Briefing Room**
on the Economic Research Service website

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Briefs

Farm Finance

Rise in Interest Rates—An Unwelcome Prospect for Farm-Sector Borrowers

Despite interest rates on farm loans declining in first-quarter 1999, farm-sector borrowers seeking new loans may face somewhat higher interest rates later in the year. Increasing demand for loans plus a recent action by the Federal Reserve Board to raise short-term market interest rates—albeit a modest 0.25 percent—may reverse the downward trend of the last 2 years.

Changes in interest rates affect the farm sector's interest expenses and asset values, farmers' choices of loan maturities and repricing intervals—the period from the date the loan is made until the first date the interest rate may be adjusted—and their ability to restructure loans. Lower rates help to reduce farm expenses and encourage loan refinancing, allowing farmers to use equity built up over time in homes and farm real estate to provide liquidity. Increases in market interest rates raise farm lenders' cost of funds, which is passed on to farmers in the form of higher rates on new loans, and raise the indexes used to adjust outstanding variable-rate loans.

The market value of farm assets is inversely related to interest rates. A rise in market interest rates would not only increase farm business and household interest expenses, but also reduce the market value of farm-sector assets and farmer net worth, making it more difficult for farmers to qualify for new loans and refinance old loans. Real estate refinancing tends to fluctuate with changes in mortgage interest rates. Home mortgage refinancing is already slowing because of rising mortgage interest rates. Increases in farm real estate interest rates would reduce the potential for farm real estate refinancing needed by farmers experiencing financial stress.

The majority of farm real estate loans are balloon notes—loan payments are applied to interest only, leaving a large final principal payment—with a term of 5 years at most. Farmers who have balloon notes, and must pay off outstanding balances with lump-sum payments or else refinance, are especially vulnerable to the risk of rising interest rates.

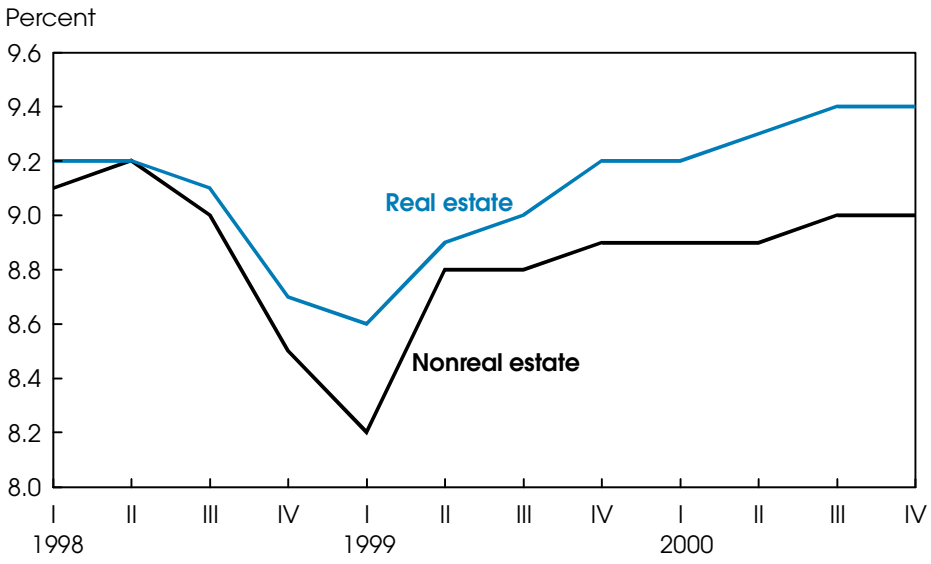
Any increase in interest rates would be especially unwelcome given the current situation in the farm economy. Trends in commodity prices and farmland values offer little optimism for the farm sector during the remainder of the year. Many areas are reporting stable or even declining farmland values, with expectations of further declines if commodity prices do not improve. Data on lending in the Upper Midwest show increased borrowing and loan renewals or extensions, as well as an increase in the percentage of farmers at their debt limit. Meanwhile, repayment on farm loans has slowed. In Iowa, about 20 percent of farm borrowers at agricultural banks, 10 percent of Farm Credit System borrowers, and about 30 percent of Farm Service Agency borrowers will require major loan restructuring in order to continue operations.

Another indication of the current farm financial stress in the Midwest is the increase in applications to Illinois' State Guarantee Program for Restructuring Agricultural Debt, which helps farmers refinance their loans. To qualify, a farmer must have a debt-to-asset ratio between 0.4 and 0.65 (a ratio above 0.4 is considered an indicator of potential financial stress, and over 0.65 indicates too high a risk of default). By mid-1999, applications to the Illinois program had already reached four times the total for last year.

About 10 percent of U.S. farmers in 1997 had debt-to-asset ratios at or above the 0.4 threshold, and higher interest rates could increase the proportion of heavily indebted farmers. Farmers with an income shortfall—unable to pay off old short-term loans or qualify for new ones if interest rates should rise—may be able to roll over unpaid operating loans into long-term debt, perhaps with FSA-guaranteed loans. However, some farmers who might not be able to project adequate cash flow to work out their indebtedness by restructuring may choose to risk drawing on assets not related to the farm business—e.g., personal savings or retirement funds—while others may choose instead to liquidate. AO

Ted Covey (202) 694-5344
tcovey@econ.ag.gov

Farm Lending Rates Are Rising This Year After First-Quarter Decline



Commercial bank farm lending rates. Rates for third-quarter 1999 and later are forecast. For real estate rate, second-quarter 1999 is also forecast.

Economic Research Service, USDA

Commodity Spotlight

Dennis Shields

U.S. Wheat Supplies Remain Large in 1999/2000

Large beginning stocks (up nearly one-third) will offset a forecast decline in U.S. wheat production, leaving U.S. supplies at 3.4 billion bushels in 1999/2000, up slightly from last year and the highest level since 1987/88. U.S. wheat production in 1999 is projected down 9 percent from last year because of lower harvested area and slightly lower yields.

Production and imports will almost satisfy projected domestic use and exports during 1999/2000. Relatively large carryover stocks will be reduced only slightly from 945 million bushels in 1998/99, the highest since 1987/88.

Domestic demand is projected down as weak corn prices and large corn supplies keep wheat feeding in check. Food use is expected to increase modestly after a year of stagnant use in 1998/99. Exports in 1999/2000 are expected to rise 10 percent from the disappointing 1998/99 total that included a substantial quantity of food aid.

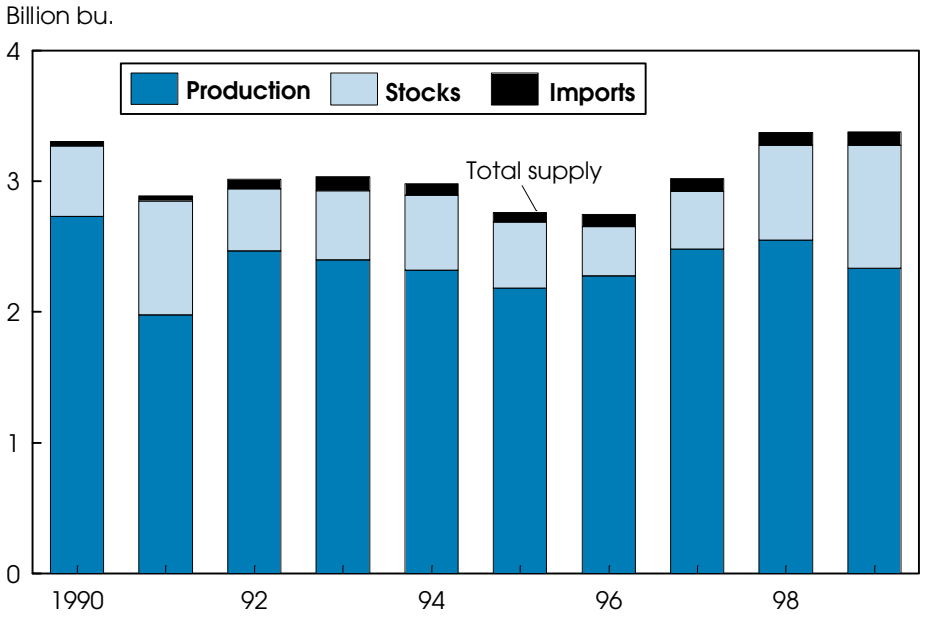
While wheat prices strengthened in fall 1998 as USDA announced donation programs, prices have weakened since the November peak. For 1999/2000, a more usual price pattern is expected, with prices reaching their seasonal low during harvest and increasing as the marketing season progresses. The average price received by farmers is projected to range from $2.45 to $2.95 per bushel. The $2.70 midpoint is up only 5 cents from the 1998/99 estimate, and down sharply from the 6-year average of $3.49 (1990/91-1996/97).

Lower acreage and yields are projected to reduce U.S. wheat output to 2.33 billion bushels in 1999. U.S. farmers planted an estimated 62.9 million acres, down 5 percent from last year and the lowest since 1973. Declining returns in recent years have encouraged producers to switch to other crops or leave more land fallow. The all-wheat yield in 1999 is forecast at 42.7 bushels per harvested acre, down from last year's record 43.2 bushels.

USDA forecasts 1999 U.S. **winter wheat** production at 1.67 billion bushels, down 11 percent from 1998. Harvested area totals 35.6 million acres, also down 11 percent from 1998. Based on conditions as of July 1, the U.S. winter wheat yield is forecast at a record 47 bushels per acre.

The winter wheat crop survived the winter well, and spring precipitation has been above average in several areas in the central and southern Plains. A mild winter followed by generally favorable spring weather pushed crop development slightly

Higher U.S. Wheat Stocks Offset Lower Production in 1999



1999 forecast. Marketing year begins in June.
Economic Research Service, USDA

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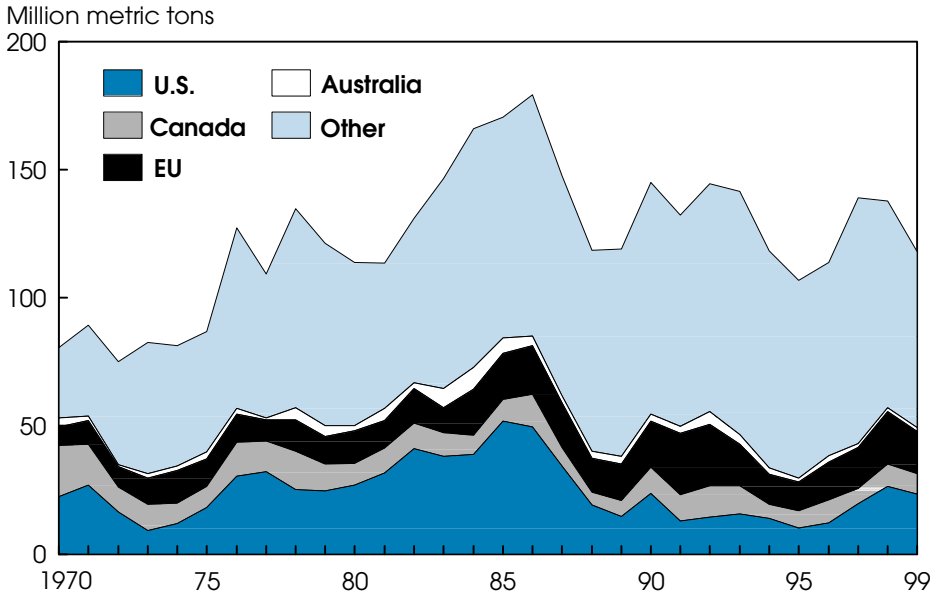
World Wheat Ending Stocks to Decline



Marketing year begins in June for U.S., August for Canada, July for European Union, and October for Australia.

Economic Research Service, USDA

ahead of normal. Above-average precipitation in many growing areas during June led to harvest delays and raised concerns about potential effects on protein levels and quality. Warm, dry weather allowed rapid harvest progress in early July, and as of July 11, 70 percent of the winter wheat had been harvested, compared with 74 percent on that date in 1998 and a 5-year average of 66 percent.

Hard red winter (HRW) wheat production is projected at 1.03 billion bushels, down 150 million from 1998. In Kansas, the largest wheat producing state, the crop is projected to total 423 million bushels, down from 495 million a year earlier. Forecast harvested acres are down 9 percent, while the forecast yield of 46 bushels per acre is down from the 1998 record of 49 bushels. Yields are projected to set records in Nebraska and Texas and match last year's record in Colorado.

Production of soft red winter (SRW) wheat is projected at 443 million bushels this year, slightly above last year. White winter (WW) wheat production is projected at 199 million bushels in 1999, down 22 percent from 1998 and the lowest since 1991. The WW wheat crop in the Pacific Northwest appears to be well below average, with projected yields down in Idaho, Oregon, and Washington.

Unlike other classes of wheat, **durum** plantings are up 9 percent in 1999 from the previous year to 4.05 million acres. An attractive crop revenue insurance program may have affected plantings. North Dakota is the leading durum producing state, accounting for about 85 percent of the acreage in 1999. Durum wheat production in 1999 is pegged at 132 million bushels, down 9 million bushels from 1998. If imports of durum and durum products reach the projected level of 32 million bushels, total supply will exceed projected use, and projected ending stocks will increase to 92 million bushels in 1999/2000, the highest since 1986/87.

Production of **other spring** wheat (i.e., nondurum) is projected at 527 million bushels in 1999, down marginally from last year. About 52 million bushels of this is white spring wheat, while the balance will fall in the hard red spring class. Plantings of other spring wheat are projected to total 14.96 million acres in 1999, down 1 percent from 1998. Minnesota, Montana, North Dakota, and South Dakota are the leading states for other spring wheat acreage, and together account for about 90 percent of the acreage in 1999.

The Northern Plains region, particularly North Dakota, has been plagued by excessive rainfall at many locations, causing delays in planting durum and other spring wheat crops. Due to excessive moisture, some fields in North Dakota will likely remain idle or be seeded to forage or cover crops. USDA plans to recheck some of the fields with unplanted acreage at the time of the June survey in North Dakota. Any updates will be published in the August *Crop Production*.

Mack N. Leath (202) 694-5302
mleath@econ.ag.gov

World Wheat Stocks to Drop In 1999/2000

World wheat stocks are forecast to drop 13 million tons in 1999/2000, the largest reduction since 1994/95. Since 1970, global wheat stocks have declined by more than that amount only five times. World wheat production is declining by 13 million tons at the same time that foreign consumption is relatively stable. The global ending-stocks-to-use ratio is expected to drop to 21 percent, almost as low as the 19.8 percent reached in 1996/97, and prices that season reached very high levels. However, little if any increase in world prices is expected in 1999/2000 because major wheat exporters' supplies are large.

World wheat production is projected down 2 percent from the previous year to 575 million tons in 1999/2000. Low wheat prices in the international market during 1998/99 have been a disincentive for producers in many countries. Additionally, the European Union (EU) increased its area set-aside from 5 to 10 percent.

The crop and marketing year for U.S. wheat supply and demand is June-May. The international trade marketing year is July-June. Marketing years vary by country. A metric ton equals 36.74 bushels.

Unfavorable weather has reduced production prospects in several countries. Drought has affected much of the Middle East, with reduced winter wheat production prospects in Turkey, across Jordan, Syria, Iraq, and into Iran. Additionally, drought has damaged wheat crops in Spain, Portugal, and Morocco.

Some countries expect to harvest larger crops in 1999/2000, partly offsetting these declines. In China, the world's largest wheat producer, a dry fall planting season was followed by the driest winter on record in parts of the North China Plain. But production is expected to increase slightly, as much of the crop is irrigated, limiting the damage done by drought. Despite dryness in key winter wheat areas, wheat production in the Newly Independent States (NIS) of the former Soviet Union is expected up 5 million tons, rebounding from the previous year's severe drought. India, the first country to harvest wheat during the marketing year, has enjoyed excellent growing conditions, and is reportedly harvesting record production.

Major exporters Argentina and Australia are expecting a modest increase in wheat production because of the low profitability of alternative uses for the land. Very low prices for oilseeds and feedgrains (also wool in Australia) are expected to support wheat plantings that were under way in June and early July.

The large beginning stocks held by exporters—Australia, Canada, the EU, and the U.S.—are expected to limit early-season price strength. While beginning stocks are down from a year earlier in the NIS, China, and Iran, wheat prices in these countries are generally isolated from world markets. Therefore, the tightening of world supplies only indirectly affects world prices.

World wheat consumption in 1999/2000 is projected at 588 million tons, down 2 million from a year earlier. Global food, seed, and industrial consumption of wheat in 1999/2000 is expected to grow slowly, gaining less than 1 percent, somewhat less than the 4-million-ton growth in 1998/99. Global feed and residual use is projected to fall by 5 million tons.

The Middle East & North Africa Region Suffering from Severe Drought

In 1999, a number of countries in the Middle East/North Africa region are suffering one of the worst droughts in decades. This has reduced grain crops in Iran, Iraq, Turkey, Jordan, Israel, and Syria and has devastated production in Morocco, where near-record grain imports are forecast. It has also affected production of other crops such as cotton and sugar cane, which are harvested in the fall.

Partly because of drought in this region, world wheat trade in 1999/2000 is expected to total 100 million tons, about the same level as estimated for 1997/98 but up slightly from last year. Imports by countries in the Middle East and North Africa are forecast to rise to 32 million tons in 1999/2000, up 3.5 million from 1998/99.

Western Iran's wheat producing area has received about 25 percent of its normal rainfall since September 1998. As a result, the Iranian wheat harvest is forecast at 8.5 million tons in 1999/2000, down from an estimated record 12 million in 1998/99 and the 1994-98 average of 11 million. Iran's wheat imports for 1999/2000 are likely to reach 6 million tons, double the amount imported in 1998/1999.

Iraq's wheat production is forecast down to 0.8 million tons, compared with an estimated 1.3 million in 1998/99. The shortage of herbicides and the means to spray them has exacerbated the effects of the drought. Imports are forecast at 2.5 million tons in 1999/2000, which may not be enough to maintain its rationing system, which provides 19 pounds of flour per capita per month.

The wheat crop in southwest Turkey also suffered from drought. Early forecasts of a second record 18.5 million-ton crop have now been scaled back to 16.5 million, closer to recent averages. Exports are expected to drop by 50 percent.

The drought impact in Jordan is so severe that the United Nations Food and Agriculture Organization has called for emergency food aid. Water consumption has been drastically cut, and Jordan is receiving supplementary water from Syria. The Jordanian wheat crop is expected to be less than half of last year's 55,000 tons. Imports are forecast up 7 percent from 1998 to a near-record 750,000 tons. In neighboring Israel, the wheat crop (at 80,000 tons) is the second smallest since 1964. Imports, mostly from the U.S., could reach 1.2 million tons, 12 percent above the 1994-98 average.

In Syria, drought conditions significantly reduced the wheat harvest, estimated at 2.5 million tons, 40 percent below 1998. While domestic consumption of wheat is forecast at 3 million tons, large stocks will be drawn down to offset the gap.

Morocco has been devastated by another drought, the fifth this decade. Production of wheat is forecast at 2 million tons, down from 4.4 million in 1998 and about half of average annual production in the last 5 years. Imports are estimated at 2.5 million tons, about 10 percent above last year. Consumption remains at 5.6 million tons, and stocks are expected to be drawn down by more than half to around 1 million tons in order to avoid larger imports.

Michael Kurtzig (202) 694-5152 and Edward W. Allen (202) 694-5288
mkurtzig@econ.ag.gov
ewallen@econ.ag.gov

The combination of large wheat supplies in major exporting countries, prices near historical lows (when adjusted for inflation), and tight supplies in several importing countries is expected to boost 1999/2000 world trade 1 percent to 100 million tons (July/June marketing year). The U.S. is expected to capture a significant part of the increased trade, with exports up 2.5 million tons to 31.5 million

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and share of world wheat trade up slightly to 31 percent.

During the first part of 1999/2000, U.S. exports will be boosted by large shipments of aid announced the previous year. Early-season commercial sales for 1999/2000 are running behind levels of a year earlier. There is little incentive for importers to forward contract for 1999/2000 shipments if they believe wheat prices will remain closer to the current cash price than to the futures contract price. Crop conditions look favorable in most exporting countries, and importers can wait for harvest-time lows to make purchases.

Australia and Canada are each projected to increase wheat exports in 1999/2000 because of higher supplies and growing world demand. Australia is expected to increase exports by 2 million tons to 17.5 million while Canada's exports are projected to rise 2.5 million tons to 16.5 million. Argentina's wheat exports are expected to decline 0.5 million tons to 8 million, despite increased production. Argentina's harvest does not begin until November, and the export pace from July 1999 until November is expected to be very light, because the reduced 1998 crop was shipped out rapidly.

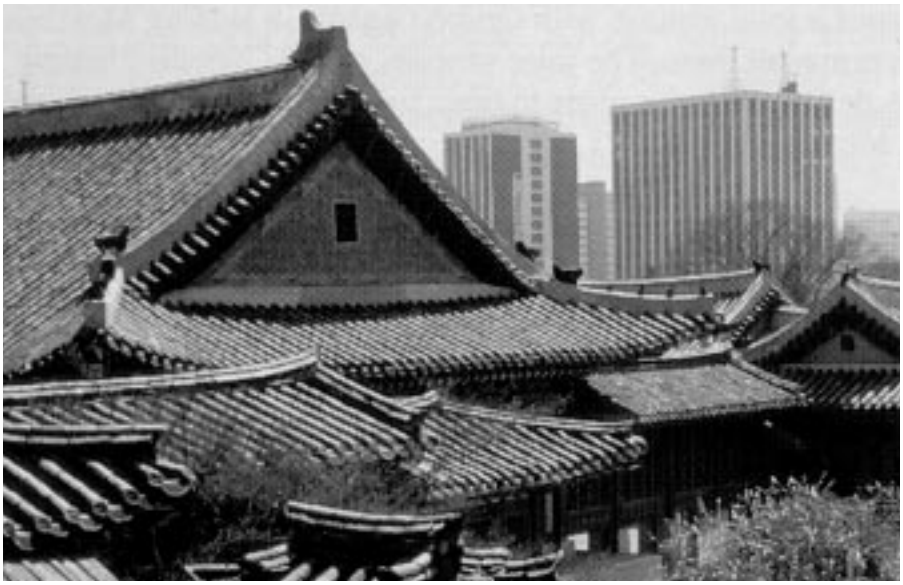
The EU is expected to maintain wheat exports at around 16 million tons in 1999/2000. Lower production and increased domestic use are expected to modestly tighten EU wheat supply and demand. But with large beginning stocks of over 20 million tons, the EU Commission is expected to maintain the pace of exports.

Kazakstan has had favorable rains to date and is expected to boost exports because of increased production. However, drought is expected to reduce exports from Turkey. Wheat exports out of Eastern Europe are expected to decline due to reduced production and to increased transportation costs as a result of war damage on the Danube River.

Reduced production is expected to drive Pakistan and Morocco to increase imports in 1999/2000, each by 0.3 million tons. Pakistan is not expected to match the previous year's record production, and Morocco suffered from drought this winter. Several countries, such as Egypt and the Philippines, are expected to increase imports slightly to maintain consumption growth. North Korea is projected to boost wheat imports by 0.4 million tons, continuing to draw on food aid.

Ending stocks held by the five largest wheat exporters (Argentina, Australia, Canada, the EU, and the U.S.) are projected to decline from 56 million tons in 1998/99 to 51 million in 1999/2000, but to remain more than 30 percent above the previous 5-year average. Despite a small rise in world wheat trade, the large ending stocks projected for these exporters in 1999/2000 would limit price increases. AO

Edward W. Allen (202) 694-5288
ewallen@econ.ag.gov



Korea National Tourism Organization

Korea's Agricultural Imports Reflect Emergence from Financial Crisis

In 1997, South Korea was the fourth-largest destination for U.S. agricultural products, buying 5 percent of U.S. agricultural exports. Beginning in late 1997 and extending into 1998, Korea experienced a major economic shock—including devaluation of its currency, a decline in the production of goods and services, and temporary difficulty in obtaining credit. What was the significance of the economic shock to Korea's agricultural trade, and what does the future hold?

Korea's financial crisis hit hard in November 1997, when the value of the won, and confidence in Korea's financial situation, went into free fall. By January 1998, the won lost more than 50 percent of its year-earlier value in U.S. dollar terms. Korean banks seemed close to insolvency, and credit from both Korean and foreign sources became extremely difficult to obtain. Interest rates more than doubled in January, to more than 25 percent. Without affordable access to credit, the economy began to stagger.

Strong intervention by the government and the International Monetary Fund, including measures to restore credit, gradually rebuilt confidence in the economy. Value of the won increased after January 1998, and currently lies 30 percent below its pre-crisis level. While gross domestic product (inflation-adjusted) declined 5.8 percent in 1998, it is expected to grow by more than 4 percent in 1999.

Despite containment of the crisis, total imports fell 35 percent in calendar-year 1998. The dollar value of Korea's agricultural imports fell by 28 percent, or $2.6 billion. The volume of most major agricultural imports also fell, but not by as much. U.S. agricultural exports to Korea dropped 22 percent (by about $640 million).

Several factors explain much of the decline in agricultural trade. The Korean economy, and most of its consumers, became poorer in 1998 because of rising unemployment, reduced asset value, and lower salaries. What money they had was worth less at the border, effectively raising the price of imported goods relative to domestic products. With most importers short on cash, inability to get credit severely limited transactions early in 1998.

The economic setback in Korea explains only part of the decline in the value of trade in 1998. Also contributing were weak global commodity prices, due mostly to bumper crops around the world, a supply-side result that had little to do with the financial crises. But in most cases, the loss in buying power of the won outweighed the dollar decreases in world commodity prices, and import unit values in won were higher in 1998 than in 1997.

The year-to-year drop in agricultural imports understates the full impact of the financial crisis because it fails to capture potential trade gains lost when Korea's economy plunged into recession. Korea was a rapidly expanding economy, and demand for imported agricultural products grew in most years. Before the crisis, for example, USDA projected that Korea's beef imports would rise 30,000 tons in 1998; instead, they dropped 92,000 tons. Pork imports were expected to double in 1998, the first year of liberalized trade in frozen pork. But imports fell 11,000 tons. Likewise, trade in processed and high-value agricultural products in general had been expected to increase rather than fall.

Examination of several of Korea's major commodity markets illustrates the ways in which economic weakness, global price changes, and other forces have affected Korea's agricultural imports in 1998 and 1999.

Imported Beef Demand Dropped Sharply

The financial crisis intensified what was already a cyclical downturn in Korean ***cattle*** prices that began in June 1997, with cattle farmers facing higher imported feed prices and high interest rates after November. Following devaluation, beef imports became more expensive and were arriving in a market where the domestic cattle price was in a downward spiral. With the price advantage of imported beef diminished and turmoil in the credit market making it difficult for private-sector importers to arrange for imports, beef trade dried up in early 1998.

Imports by the government trading entity continued, but Korea's WTO-mandated quota of beef imports was not filled in 1998, and import volume dropped by about 45 percent from 1997 levels. U.S. beef exports to Korea dropped 41 percent. Imports have been rebounding strongly in 1999, but are not equal to the pace of pre-crisis imports in the January-May period.

South Korea's Economy: Reviewing the Rebound

Korea's battered economy has bottomed out. After a drop of almost 6 percent in output in 1998, the Korean economy is expected to grow more than 4 percent in 1999 and in 2000. Several factors are responsible for recovery, including improved credit availability, easing of monetary policies, and renewed investor confidence. The value of the Korean won also has risen more than 40 percent since the early stages of the financial crisis in January 1998, as foreign capital has started to flow back into the country. The government budget deficit is expected to increase to 5.5 percent of Gross Domestic Product, with government spending further stimulating the economy. With a stronger economy and increased investor confidence, Korean foreign reserves now stand at $61 billion, compared with $18 billion at the end of 1997 when the crisis hit.

Financial and corporate restructuring is proceeding, although restructuring of the five largest chaebols (large conglomerates) is slow. Another concern is high unemployment, about 6.4 percent this year. Whether this recovery will be sustained depends on progress in these as well as other areas of the economy.

Suchada Langley (202) 694-5227; slangley@econ.ag.gov

Growth should increase through the rest of 1999, since credit issues are resolved, demand is rising, and Korean production is now falling after the intense slaughter of 1997/98.

The economic crisis may have strengthened Korea's ***pork*** sector. Before the crisis, Korea's industry was preparing for a possible doubling of imports after frozen pork trade was liberalized in July 1997. However, devaluation dramatically changed the industry's prospects as pork imports became more expensive and pork exports more competitive.

Korea had enjoyed some success in filling the gap left in Japan's supply when Taiwan ceased pork exports after a foot-and-mouth disease outbreak in early 1997. The won's devaluation in late 1997 and 1998 meant that Korea's pork was cheaper in Japan relative to domestic Japanese product and U.S. product. While Korean feed costs were higher because of devaluation, the cost of labor and processing (in terms of foreign currencies) declined, and the volume of Korean exports grew by 65 percent.

Unlike the cattle industry, there was no sharp cyclical downturn for swine, nor did pork imports confront sharply declining domestic prices. Imports of frozen pork were virtually unchanged in quantity, although they dropped in dollar value. In the first 5 months of 1999, pork imports soared to record levels, finally reflecting the liberalization of trade in frozen pork that took place in mid-1997. Korea will import and export different cuts of pork, based on the disparity of preferences between Korea and its trading partners.

Total consumption of the three main meats declined by 2 percent in 1998. Poultry meat, consumed heavily in restaurants, declined by 12 percent. Beef, the most expensive meat, dropped 10 percent (despite sharply lower prices), while pork consumption grew by over 8 percent. Although pork prices fell less than beef prices, pork was still the cheaper meat. In 1999, a recovery in consumer confidence is expected to send people back to restaurants, benefiting meat consumption, especially poultry and beef.

Grain used for feed in the October 1997-September 1998 marketing year is estimated down only 5 percent. Korea's imports of grains for feed in January-December 1998 actually rose slightly over 1997 levels. This level of use and trade, given the financial difficulties that traders faced, might not have been possible without the allocation of guarantees by the U.S. government early in the crisis. U.S. credit guarantees for 3.2 million tons of corn enabled Korean importers to overcome a lack of affordable credit, especially in the first half of 1998. Chinese corn exports to Korea declined in 1998 because credit could not be arranged.

Because Korea's animal producers are almost totally dependent on imported feedgrains, they would have to reduce herd sizes if grain import flows are interrupted. Feed use for Korea's swine industry was stable, partially offsetting declining feed use for beef cattle. Prospects for 1999 and later years are mixed. Recovering poultry meat consumption will be partly satisfied by domestic production and therefore imported feeds, but much of Korea's consumption growth will be satisfied by imported meats and dairy products rather than domestic production. Feed wheat from Eastern Europe continues to displace some corn in early 1999.

Crisis Altered Structure Of Oilseed Industry

The crisis has made it more likely that Korea will import ***vegetable oils and meals*** in the future, rather than oilseeds. Two out of the three Korean soybean crushing companies went into bankruptcy protection in early 1998. The crushing companies terminated credit sales, and Korea's feedmills, unable to import meal freely because of a general lack of credit, were left with reduced prospects for domestic and imported supplies. When U.S. government credits enabled them to buy U.S. meal, imports from the U.S. soared to over 300,000 tons, compared with almost no trade in 1996 and 1997.

Now it will be more difficult for Korean soybean crushers to convince feedmillers to buy domestic meal at prices higher than import prices, since domestic supplies failed at a critical moment. Increasingly, Korea is turning to meal imports, which exceeded domestic production in 1996 and 1998. Korea's imports of soymeal increased by over 25 percent in 1998. Similarly, soy oil imports are replacing domestic production. Korea's soy oil imports rose 8 percent in 1998 despite the difficult economic climate and higher world prices (in dollar and won terms). Imports of soybeans for crushing declined by 12 percent. So far in 1999, imports of soy oil and soymeal are up dramatically from the high levels of 1998, and soybean imports have dropped by another 17 percent. The profitability of crushing is likely to decrease in the coming years, given

agreed-on annual reductions of soy oil tariffs between now and 2004.

Wheat for milling, raw ***sugar*** for refining, ***corn*** for sweetener production, and ***soybeans*** for food use together represented 13 percent of Korea's total agricultural import value in 1997. When the economic crisis hit, GSM guarantees restored Korea's access to U.S. wheat, corn, and soybeans. Australia and Canada also provided credit assistance. The import volume of these commodities changed very little in 1998, although world price declines reduced the dollar value of imports. In early 1999, volumes lagged behind those in the same period in 1998, but should end the year at levels similar to recent years.

Inputs for nonfood manufacturing accounted for about a quarter of the value of all agricultural imports in 1997: hides for tanning; cotton, wool, and silk to be spun into yarn; natural rubber; and raw furs. In 1998, the import volume of all these input commodities declined due to credit problems both for Korean importers and for domestic and export buyers of Korean products made from these raw materials. Manufacturers reportedly drew down stocks as much as possible to avoid new purchases.

Korea is one of the world's largest importers of hides, and the largest market for U.S. hide exporters. Despite GSM credit assistance, U.S. export volume of whole cattle hides to Korea dropped 35 percent in 1998, a contributing factor in the very low prices for hides at U.S.

Settling a Beef Between the U.S. & Korea

In April 1999, the U.S. government requested a dispute settlement panel from the World Trade Organization, stating that Korea had failed to implement parts of earlier agreements. The request cited several areas of concern, including restrictions on retail sales of imported beef, markups applied to imported beef prices by the government, restrictions on which private-sector groups could import, delays in soliciting bids to buy under the quota, establishment of minimum import prices, manipulation of imported beef volume allowed to go to market, and denial of import approvals. The request also stated that Korea's government support to domestic cattle producers exceeded limits established in the Uruguay Round Agreement on Agriculture.

Korea accounted for almost 15 percent of U.S. beef exports in 1995, and its 1998 share (under 8 percent) was well below what would have been expected if trade barriers fell. High potential domestic consumption and a poor resource base for cattle raising in Korea make it likely that free trade would result in large amounts of beef imports from major producers like the U.S.

Value of South Korea's Agricultural Imports Fell by More Than a Fourth in 1998

	Value			Volume			Unit value		
	1996	1997	1998	1996	1997	1998	1996	1997	1998
	US$ million			*1,000 tons**			*$/ton**		
Total agricultural imports	10,504	9,357	6,701	—	—	—	—	—	—
Selected commodities									
Feedgrains									
Corn	1,217	965	667	6,802	6,524	5,335	179	148	125
Wheat	192	154	271	958	1,096	2,349	201	141	115
Meats									
Beef	496	464	249	162	166	92	3,053	2,793	2,705
Pork	143	220	138	40	61	53	3,621	3,585	2,599
Oilseed complex									
Soybeans, for crush	372	407	293	1,166	1,244	1,089	319	327	269
Soymeal	294	224	207	1,113	731	930	264	306	223
Palm oil	103	110	98	185	197	151	558	556	644
Inputs to food industry									
Wheat, milling	531	440	392	2,219	2,229	2,345	239	197	167
Sugar, raw	443	420	375	1,399	1,437	1,378	317	293	272
Corn, industrial use	350	283	240	1,870	1,787	1,774	187	159	135
Soybeans, food use	102	108	86	299	324	324	340	332	266
Inputs to nonfood manufacturing									
Cattle hides	806	813	482	13,350	12,478	8,698	60,393	65,166	55,426
Cotton	714	583	522	346	315	303	2,060	1,853	1,725
Consumer-ready products									
Juices	112	110	66	63	75	45	1,778	1,459	1,454
Chocolate	78	81	46	25	28	18	3,168	2,943	2,607

*For hides, volume is in 1,000 pieces and unit value is per 1,000 pieces. — = not available.
Source: World Trade Atlas, Korean Republic Edition, GTI, Inc.

Economic Research Service, USDA

GSM Credits Spur U.S. Agricultural Exports

Late in December 1997, USDA offered a $1-billion allocation of credit guarantees under the GSM-102 program (GSM is General Sales Manager at USDA). These guarantees are used by importers to secure credit so that they can buy U.S. agricultural products. While GSM's relatively long repayment period (up to 2 years) held some attraction for Korea in the pre-crisis years, use had been declining as commercial credit became more plentiful.

In the past, GSM credits had been assigned to bulk input commodities, such as cotton and corn. In 1998, the program was designed with portions of the total allocated to meats and other consumer items, in addition to bulk commodities. By the end of fiscal-year 1998, applications for GSM guarantees totaled $1.38 billion out of $1.5 billion available for Korea—a high rate of use. The 1997/98 financial crisis demonstrated how useful the program could be when other credit sources are not available.

slaughter plants. Imports have grown slightly in 1999, but remain far below 1997 levels. U.S. exports of cotton to Korea increased both in volume and value, aided by the GSM program. Total cotton imports fell in 1998, but not as dramatically as imports of other industrial inputs. Imports in 1999 have increased somewhat, but the long-term trend is toward continued decline.

The value of Korea's imports of ***processed foods and beverages*** fell by over 40 percent in 1998. Although relatively new to Korea, these products accounted for 11 percent of total agricultural imports in 1997. Imports of processed foods and beverages had been insignificant until Korea began reducing trade barriers in 1989. Since then, imports have grown quickly, including items such as fruit juices, chocolate products, wine, beer, sausages, noodles, dairy foods, frozen french fries, cola bases, seasoning mixtures, tomato paste, ketchup, and canned vegetables and fruits.

Declining volume accounted for most of the decrease in total value of processed food and beverage imports in 1998. During the crisis, supermarket sales held up well while consumption in restaurants fell as consumers stayed home to save money. In addition, imports regarded as luxuries, or as discretionary purchases, declined sharply in volume: wine (73 percent), beer (84 percent), mineral and aerated water (58 percent), jams and jellies (78 percent), ice cream (69 percent), and biscuits (70 percent).

Imports of almost all processed foods and beverages have grown in the early part of 1999, but had not reached 1997 levels through May. Processed food imports, the most income-sensitive, are closely tied to modernization of the food retailing sector, which stalled during the crisis. As investment in hyper- and supermarkets resumes, consumer demand for diversity and convenience will lead to strong growth in imports of processed foods and beverages.

For more information on Korea's agricultural trade, policies, and outlook, visit the Economic Research Service briefing room at
www.econ.ag.gov/briefing/region/korea

Agricultural Imports to Rebound

With economic growth resuming and credit becoming widely accessible, Korea's agricultural imports are rebounding sharply in 1999 and are expected to grow in coming years. Trade barriers, such as quotas, tariffs, and technical barriers, have recently fallen and are scheduled to fall even more. The crisis delayed many initiatives to increase imports in response to the new opportunities, but Korea's recovery of stability and prospects for growth will allow new imports to emerge rapidly.

The lower level of Korea's won helps domestic production and hurts imports. As long as Korea's currency buys less than it did two years ago, Korea's imports will be less than previously expected. However, the cost of agricultural production in Korea is still so much higher than in exporting countries that imports are viable. Many foods will be more efficiently produced outside Korea, stimulating imports.

Parts of Korea's manufacturing sector will again slip in international competitiveness as it regains economic vitality and lowers trade barriers. Higher income implies higher labor costs, and any industry heavily dependent on relatively unskilled labor will consider leaving Korea. The impact on agricultural imports will be mixed. Spinning and tanning will continue a gradual shift out of Korea, following footwear and textile production to other parts of Asia, Latin America, and Africa, reducing demand for cotton and hide imports. Soybean imports for crushing are likely to continue falling, replaced by meal and oil imports.

Other commodities have strong prospects for rapid growth. Meat consumption is still growing, and several factors indicate that the market for meats has not yet matured. Domestic prices are still relatively high, especially for beef, and meat marketing still faces infrastructural and legal constraints, such as government restrictions on the location of retail sales and on the choice of firms that can import beef. As prices decline and marketing practices modernize, meat consumption—and imports—will increase. Greater reliance on meat imports will reduce growth in Korea's feed imports, but this simply shifts the location of animal feeding to major producers like the U.S.—with little effect on the amount of feed necessary to provide Korea with increasing amounts of meat.

In addition to favorable prospects for meat imports, Korea's imports of fish are rising as catches of the domestic fleet decline. They rebounded by 90 percent over 1998 levels in the January-May period and will continue to grow, as strong demand confronts weakening domestic supply. The outlook for imports of processed products and beverages is bright, and shipments will tend to come from competitive producers such as the U.S., as trade barriers fall and the consumer economy once again prospers. **AO**

John Dyck (202) 694-5221 and
Sophia Huang (202) 694-5225
jdyck@econ.ag.gov
sshuang@econ.ag.gov

Based in part on information and analysis from USDA's Foreign Agricultural Service in Seoul, Korea.

Dennis Shields

Crop & Revenue Insurance: Bargain Rates but Still a Hard Sell

Risk management in agriculture is aimed, in general, at attaining a desired combination of risk and return. Some producers strive to obtain the highest possible return for an acceptable level of risk, while others may seek to minimize the risk associated with a desired level of return. The ability of different strategies to reduce risk, and the cost of adopting different risk management strategies, varies with each individual situation. But whatever approach is taken, implementation of most risk-reducing strategies involves some tradeoff between expected income and risk exposure.

Federal subsidization of crop and revenue insurance programs alters the tradeoff so that operators may attain significant risk reduction at relatively low cost, while actually increasing expected (i.e., longrun) returns. Yet the rate of participation in insurance programs has remained significantly less than universal, with about 61 percent of eligible acres insured in 1998. This may be because the potential benefit of insurance is largely unrecognized and undervalued, or other factors may be at work in the farm operator's decisionmaking process.

In agriculture, as in most other industries, the activities associated with the highest expected returns are often associated with the greatest level of risk. As a result, a producer may be forced to forego those activities with the most potential for profit in favor of other activities with lower but less risky returns.

For example, corn production might promise a farm the highest net returns per acre if favorable weather is combined with heavy input use. However, unfavorable weather could result in low yields and large losses, and gambling on favorable weather by putting all the farm's acreage into corn may be a perilous undertaking for all but the most financially secure operations. A risk-averse producer confronting this situation may be inclined to opt for lower potential profit by partially diversifying the acreage into soybeans and some other grains with lower input costs (e.g., oats, wheat, or sorghum). If, instead, that risk-averse producer faces price prospects that are particularly poor and off-farm employment opportunities exist, renting out or fallowing a large portion of the acreage and devoting a share of household labor time to earning off-farm wages may be a preferred strategy.

The level of risk an individual is willing or able to bear varies with the person's financial situation, attitude toward risk, availability of other opportunities, and ease of transitioning to alternative activities. A variety of strategies is available to enable agricultural producers to achieve an acceptable balance between expected return and risk.

But some risk-reducing strategies may involve substantially lower expected net returns—for example, diversifying production to grow some commodities where returns per acre may be lower but less variable. On the other hand, competitive risk transfer markets—e.g., futures and options exchanges or agricultural insurance programs provide a means of lowering risk with little change in expected net returns. Purchasing crop or revenue insurance is a risk transfer strategy that can be used to obtain varying degrees of revenue-risk reduction at very low cost. A distinguishing feature of this strategy is the Federal subsidies available to crop and revenue insurance market participants.

Subsidies Lower Premiums for Crop & Revenue Insurance

Crop and revenue insurance are low-cost tools to help farmers guard against risk of revenue losses due to yields and prices that fall short of planting-time expectations. Crop yield insurance provides payments to producers when realized yield falls below the producers' insured yield level, whereas crop revenue insurance pays indemnities based on revenue shortfalls that result from yield or price shortfalls (*AO* April 1999). But unlike most other risk management tools, crop and revenue insurance also provide a special case where income risk is reduced *and* expected returns are increased because of Federal government intervention in premiums charged to farmers. The Federal Crop Insurance Corporation (FCIC) provides subsidies to private companies, eliminating much of the delivery cost and underwriting risk from premiums, and helping to ensure that premiums are a close representation of longrun expected indemnities. In addition, the FCIC subsidizes producer premiums to lower the cost of acquiring insurance so that, in the aggregate, total

This article continues *Agricultural Outlook's* series on risk management.

How Are Insurance Premium Rates Set & Subsidies Applied?

An ***insurance premium*** is the amount an individual or business pays for purchase of insurance. For crop and revenue insurance, premiums are generally expressed on a dollars-per-acre basis, but are calculated as a percent of the total liability. ***Total liability*** is the maximum loss exposure of the insurer—the amount of indemnity payment required if yield were to fall to zero.

Because premiums for crop and revenue insurance are designed to cover losses over time, insurers project yield and revenue distributions to show expected losses and payouts at different levels of insurance guarantees. Premium rates are determined by several factors:

- the type of crop, size of insured unit, and coverage level selected;
- the farm's loss experience and APH (actual production history) yield; and
- the county yield and its historical variability.

For a given crop at a given price, premium rates are highest for land where risk of production loss is greatest—i.e., where yields are the most variable.

USDA's Risk Management Agency (RMA) subsidies encourage participation in crop insurance by reducing producer premiums. The amount of the subsidy depends on the type of insurance and the coverage level in accordance with the 1994 Federal Crop Insurance Reform Act. For minimum CAT (catastrophic) coverage—i.e., 50-percent yield coverage at 55 percent of the expected harvest-time price—the premium is entirely subsidized, and a policy may be purchased for a small processing fee. At higher levels of coverage—referred to as "buy-up" coverage—subsidies are calculated in accordance with yield/price rules:

Calculation of "buy-up" coverage subsidy:

- Yield/price guarantees below the 65/100 level (65-percent yield coverage at a 100-percent price coverage election) are subsidized at a rate equivalent to CAT coverage.
- Yield/price guarantees at or above 65/100 level are subsidized at a rate equivalent to a 50/75 guarantee.
- For each of the above two ranges the subsidy is first calculated as a fixed amount. That amount is then applied to the higher premiums associated with higher coverage levels.

Thus the *subsidy share* of the premium rate declines as coverage rises, with the exception of a kink at the 65/100 coverage break-point where the subsidy share attains a maximum value of nearly 42 percent of the premiums. Premium subsidies are also available for revenue insurance but are based strictly on the yield portion of coverage. As a result, revenue insurance subsidies are generally a lower proportion of total premiums than their yield-based crop insurance counterparts.

expected returns over the long term are greater than farmers' total actual premium costs. In other words, a dollar's worth of expected return can be purchased for less than a dollar of premium.

Substantial taxpayer dollars have been expended over the years to make insurance available on a widespread basis and to increase producer participation in insurance programs. Between 1981 and 1998, Federal risk management outlays included $5.7 billion in producer premium subsidies, $3.9 billion in administrative reimbursements to private insurance deliverers (plus another $1.6 billion in other administrative costs), and $3 billion in net underwriting losses which, in the absence of Federal risk sharing, would have been borne by the private companies selling the policies.

Since passage of the 1994 Federal Crop Insurance Reform Act, total insurance-related outlays have averaged nearly $1.4 billion per year, with premium subsidies comprising the bulk of the transfer. The premium subsidy share of those outlays has also increased. The larger outlays are due in large part to a significant rise in participation. Insured acreage peaked at 75 percent of eligible acres in 1995 when participation in crop insurance was mandatory for farmers to be eligible for other Federal program benefits—e.g., deficiency payments. The mandatory participation requirement was dropped for 1996 and subsequent years, and as a result, participation has declined.

Under most private insurance policies:
Total premiums = expected indemnities + administrative costs + profit margin

What makes government-subsidized insurance such a good deal? Under most private insurance programs—e.g., automobile, homeowners, health—premiums are set to include all expected ***indemnities*** (payments made on qualifying losses), plus all the costs of administering the policies, plus a reasonable profit. If premiums fall short of this goal, the company loses money and must either raise premiums or go out of business. Competition among private companies helps to minimize increases in profit margins, keeping premium increases down.

Under FCIC-backed crop insurance:
Total premiums = expected indemnities

Under the FCIC-backed crop insurance program, government payments to insurance carriers are used to ensure that total premiums are set to cover expected indemnities only, which reduces the premiums paid by farmers. Federal crop insurance subsidies are designed, in large part, to equate premium rates with the long-term chance of loss.

To achieve this objective, USDA's Risk Management Agency (RMA), through the FCIC, subsidizes private insurance companies that sell and deliver crop and revenue insurance, by reimbursing them for the costs of selling and underwriting policies, adjusting losses, and processing policy data. The government also lowers the risk associated with underwriting crop and revenue insurance by sharing the risk of loss (and the possibility of gain) on policies sold by private companies.

To encourage producer participation in agricultural insurance markets, the government also pays a portion of producers'

premiums on FCIC-approved policies, ranging from 13 to 100 percent depending on the type of insurance and the coverage option chosen. Premium subsidies are based only on the yield portion of federally backed insurance policies. Subsidies on revenue insurance plans are limited to the amount payable if the producer had elected the yield-based coverage. From 1981 to 1994 these subsidies averaged about 25 percent of total premiums. Beginning with the Federal Crop Insurance Reform Act of 1994, government subsidies have averaged about 50 percent of total premiums across all policies—comprised of a 100-percent share of premiums for minimum catastrophic coverage (CAT) and a 40-percent share of premiums for additional yield loss "buy-up" protection.

Under actuarially fair insurance rate setting—where total premiums equal indemnities paid out, and the insurance program "breaks even"—the premium subsidies represent a positive expected benefit to producers who purchase insurance. In other words, with the government paying part of farmers' insurance premiums, expected net returns per acre are greater with insurance than without.

How does this work? If the insurance company writing the policy and the producer buying the policy have equal information about risk, and if the insurance premium is set to correctly reflect that risk, then the premium should exactly equal the expected indemnity. With no government subsidy, the producer would pay the full premium and no expected benefit would ensue beyond being able to transfer some production risk. However, when the government subsidizes a portion of an actuarially fair premium, the producer pays less than the full premium but still can expect to obtain the full indemnity. Thus, a dollar of a farmer's premium returns more than a dollar of expected benefit over the long run.

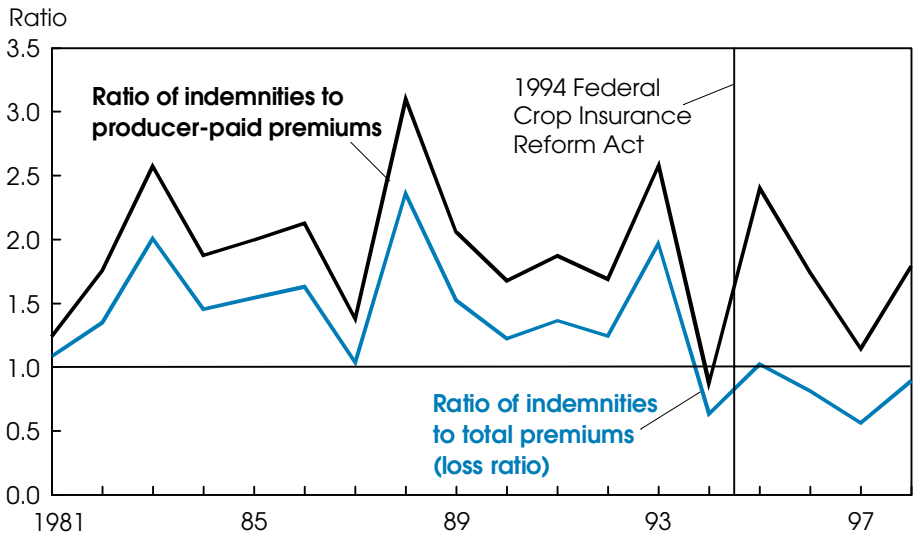
A measure of the actuarial success of premium rating for crop insurance is the ***loss ratio***—total indemnities paid divided by total premiums received. Because rates are set to reflect the longrun chance of loss, actuarial fairness equates to a loss ratio of approximately 1.0. However, in any given year, the loss ratio for a crop in a specific area is unlikely to equal exactly 1.0, due to variations in weather. In a year with extremely unfavorable weather, the sum of crop and revenue insurance policies would be expected to show a loss ratio greater than 1.0, implying net underwriting losses (although reimbursement subsidies to private companies for administrative costs could potentially make up for the losses). In years with more normal weather, a loss ratio less than 1.0 may result, with net underwriting gains.

From 1981 through 1993, annual loss ratios (based on total premiums, including subsidies to producers) exceeded unity, suggesting that ratings on subsidized insurance were not actuarially sound. Since 1990, many features of the FCIC-backed crop insurance program have been improved in an "actuarial" sense. For example, rates have been raised, and more stringent penalties for yield data inadequacies have been imposed on insured farmers. These changes, in combination with several years of moderate weather, have helped to improve loss ratio performance significantly since 1993. In addition, private companies have been asked to bear a greater share of the underwriting risk, while reimbursement for administrative costs has declined.

From the producers' point of view, the relevant ratio is based on actual premiums they pay—the farmers' cost after subtracting out the Federal subsidy portion of the premium. The ratio based on the producer-paid premium has exceeded unity in every year since 1981 with the exception of 1994 when it dipped below unity. Since 1995 the national aggregate producer-paid indemnity/premium ratio has averaged nearly 1.77, implying that $1 of premium has bought $1.77 of expected indemnity benefit "on average," plus some additional unquantified "benefit" from risk reduction.

If federally subsidized crop and revenue insurance is such a good deal, why don't all eligible producers take advantage of it? While the answer to this question is debatable, there are several possible reasons why participation in crop and revenue insurance programs is less then universal (in 1998 about 65 percent of acreage planted to major field crops was insured). A key to understanding these reasons rests on the premise that risk-averse farmers can be expected to purchase correctly rated insurance (where the premium accurately reflects the true risk of loss), and both insurer and insured regard the premium as accurately reflecting risk.

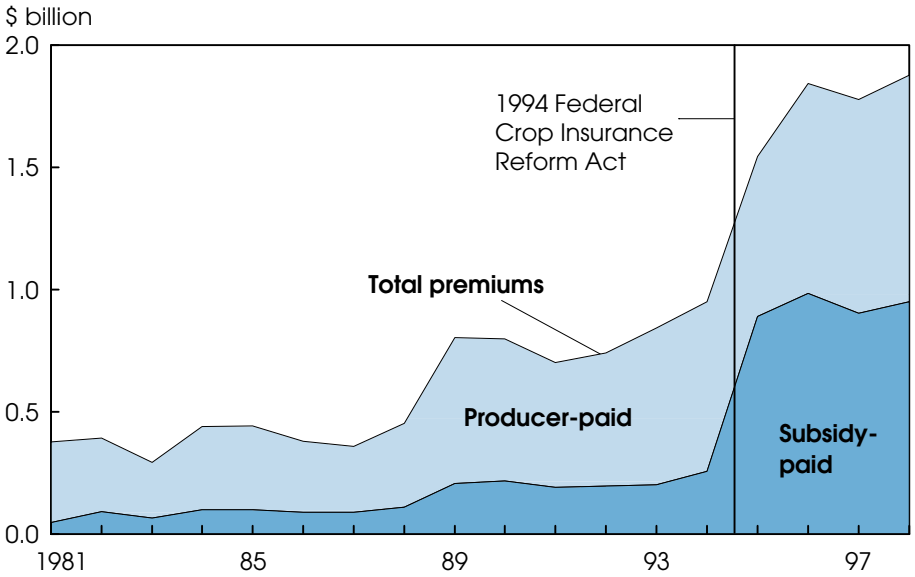
Since the 1994 Reform, Total Crop and Revenue Insurance Premiums Have Generally Exceeded Indemnities Paid Out



Total premiums = Producer-paid premiums plus Federal Crop Insurance Corporation (FCIC) premium subsidy. A longrun average loss ratio of 1.0 implies actuarial soundness–i.e., an insurance program "breaks even" with regard to premiums and indemnities.
Source: Risk Management Agency, USDA.

Economic Research Service, USDA

Subsidy-Paid Share of Crop and Revenue Insurance Premiums Increased Sharply in 1995



Premium subsidies are paid by the Federal Crop Insurance Corporation (FCIC).
Source: Risk Management Agency, USDA.
Economic Research Service, USDA

Under this premise, there are several characteristics of crop and revenue insurance programs that help explain less-than-universal participation. First and foremost, it is likely that many farmers simply do not believe expected indemnities exceed their producer-paid share of the premium. These farmers believe (rightly or wrongly) that premium rates fail to reflect their specific situation. In other words, many farmers feel that the premium rates they face (or the processing fee in the case of CAT coverage) overstate their risk of loss. Imperfections in the rate setting scheme probably make this true for some, while others may be poorly informed about the true extent of farm-level risk.

There may also be some misunderstanding or general lack of information concerning how crop and revenue insurance programs work and the advantages they impart. This problem is compounded by the growing array of available insurance products, which strengthens the perception that crop and revenue insurance programs, like many other risk management programs, are too complicated to understand and use correctly.

Other reasons that are frequently cited as contributing to less-than-universal participation in subsidized crop insurance include:

1) An operator's overall level of wealth can have a strong bearing on risk decision-making. For many large commercial operations with substantial equity values, the potential magnitude of a crop loss relative to the equity base may be very small, so the incentive to buy insurance is low.

2) Management objectives such as profit maximization or enterprise growth may supersede risk management goals and diminish the demand for insurance.

3) Many farmers have some ability to reduce yield and revenue risk through the use of alternative strategies—stable off-farm wage opportunities or diversification of on-farm activities—which may be more cost-effective under some circumstances. Some farms may reduce yield risk simply by altering cultivation and crop management practices, at lower cost than the producer-paid share of the premium on a crop insurance policy.

Finally, many researchers have cited the frequent use of Federal ad hoc disaster assistance payments (from 1988 through 1994 and again in 1998) as a principal deterrent to purchasing crop insurance. Why pay a premium for something that you would likely get for free?

Do FCIC Subsidies Alter Producer & Carrier Behavior?

The goal of FCIC subsidies is to alter behavior—namely, increase participation in crop and revenue insurance markets. If successful, this contributes to the higher goal of encouraging farmers to reduce their risks, thereby increasing the viability of agriculture and reducing the need for publicly funded disaster assistance programs. But do FCIC subsidies have other consequences? The answer appears to be yes, for several reasons.

First, when viewed as an increase in expected revenue, the subsidy provides not only an incentive to purchase insurance, but also to marginally expand area under crop production, since a producer's total expected return increases with every insured acre.

Second, since premium subsidies are calculated as a percent of total premium, and premiums are higher for production on riskier land, the subsidies are weighted in favor of production on land with the greatest yield variability. As a result, subsidies may encourage production on land that might otherwise not be planted. And to the extent that yield risk varies across both crops and fields, distortions are likely to occur across both regions and commodities.

Third, in the absence of FCIC subsidies, crop insurance premiums would include markups for the insurance companies' administrative costs and profit margin. These added costs could make premium rates prohibitively expensive in high-risk areas. If the higher premium rates discourage participation, such areas would be less attractive markets to private companies selling the policies. To this extent, Federal subsidies increase the likelihood of insurance delivery, and consequently production, in high-risk areas, such as various locations in the Great Plains. **AO**

Randy Schnepf (202) 694-5293 and
Richard Heifner (202) 694-5297
rschnepf@econ.ag.gov
rheifner@econ.ag.gov

Deere & Company

Reducing Greenhouse Gas Buildup: Potential Impacts On Farm-Sector Returns

International concern that human activities have enhanced the natural greenhouse effect of the earth's atmosphere by substantially increasing concentrations of greenhouse gases, and that additional warming of the Earth's surface and atmosphere may adversely affect natural ecosystems and humankind prompted negotiation of the United Nations Framework Convention on Climate Change (UNFCCC). The UNFCCC was ratified by the U.S. on October 15, 1992 and put in force on March 21, 1994. The U.S. and other developed countries that were parties to the treaty were committed to "...adopt national policies and take corresponding measures on the mitigation of climate change, by limiting its anthropogenic [manmade] emissions of greenhouse gases and protecting and enhancing its greenhouse gas sinks and reservoirs" (Article 4, paragraph 2a).

Concern that the voluntary approach under the UNFCCC has not resulted in sufficient greenhouse gas (GHG) emissions reduction or development of adequate emissions-absorbing terrestrial sinks could lead to further clarification in subsequent international agreements or national-level programs to control emissions without any additional treaty.

Several key features that national-level programs or international agreements would likely include are:

- national GHG emission reduction targets, particularly for carbon dioxide (CO_2), the most prominent GHG;
- programs to encourage development of emissions-absorbing land "sinks" to sequester carbon; and
- an emissions permit trading system for meeting emissions reduction targets.

How to Reduce U.S. GHG's at Lowest Cost

Two strategies to lower atmospheric concentrations of GHG's are abatement (reducing GHG emissions into the air) and sequestration (taking GHG's out of the air and retaining carbon in the soil or in above-ground biomass). Because carbon dioxide accounts for over 80 percent of U.S. GHG's, carbon compounds are a logical policy target. National policies to reduce carbon emissions could include regulation of fuel and other fossil energy use, or a system of tradable carbon emissions permits that would be issued by the government to manufacturers of energy and energy-intensive products—such as fuel, electricity, and selected chemicals. National policies to mitigate GHG's could include a program to establish GHG sinks, whereby carbon would be accumulated in agricultural soils through land use changes and forestry practices. A system of tradable carbon permits would increase agricultural input prices and decrease farm income, while carbon sequestration could provide a valuable role for agriculture to play in an overall national GHG reduction policy.

Any GHG reduction strategy would come at a cost to all sectors of the economy, but a system of tradable carbon emissions permits would be a relatively flexible approach, still meeting the goal of lower GHG emissions, but at less cost. Key to determining the magnitude of carbon permit prices in the U.S. would be the initial allocation of carbon permits consistent with desired GHG emission reduction, and the extent of allowable carbon permit trading. Prices of carbon permits (1 permit = 1 allowable ton of carbon emissions) would be higher with fewer permits issued, reflecting greater reductions in acceptable GHG emissions.

If a permit system is implemented within the U.S., an initial emissions permit allocation that reflects the national reduction target could be made to manufacturers of energy and energy-intensive products. Then, a mechanism could be created for firms to trade CO_2 emissions permits in order to lower the costs of reducing net GHG emissions. With permit trading allowed, companies with the ability to reduce emissions at relatively lower cost could sell their excess emissions rights to those whose costs of reducing emissions exceed the permit purchase price. Permit trading would help achieve emissions reduction at the least cost per ton of carbon and at least cost to the overall economy. But permit prices would be lower if international permit trading were allowed and if opportunities to manage resources for carbon sequestration were broadened.

Studies suggest that agricultural sinks could sequester about 60-64 mmt of

A System of Carbon Permits Would Cut Net Returns for Crop and Livestock Producers

	2010 base	Carbon permit price		
		$14/mt	$100/mt	$200/mt
	$ billion	*----------Percent change----------*		
Crops:				
Total value of production	100.5	0.1	0.6	1.1
Total variable costs	55.0	0.5	3.5	6.8
Net cash returns	50.4	-0.4	-2.7	-5.2
Livestock:				
Total value of production	117.3	0.2	1.1	2.2
Total variable costs	93.6	0.2	1.7	3.2
Net cash returns	23.8	-0.1	-0.9	-1.6
Crops and Livestock:				
Total value of production	217.9	0.1	0.9	1.7
Total variable costs	148.6	0.3	2.3	4.5
Net cash returns	74.2	-0.3	-2.1	-4.1

The carbon permit price would be determined, in part, by the level of emissions permit trading. The $14/mt carbon permit price assumes full international emissions permit trading; the $100/mt carbon permit price assumes limited international emissions permit trading; and the $200/mt carbon permit price assumes no international emissions permit trading.

Based on estimates from the ERS U.S. regional agricultural sector model for 2010.

Economic Research Service, USDA

carbon at an annual cost of about $1.5 billion. Private industry could arrange to pay farmers to sequester carbon, allowing a firm to stay within its emissions limit or meet a portion of its emissions reduction by purchasing a certifiable ton of sequestered carbon to offset a ton of emitted carbon. Credits for carbon sequestration in agricultural land sinks could also be established as a marketable commodity to be traded along with carbon emissions permits.

Farm policy could also be key to providing incentives to develop carbon sinks. The government could provide financial and technical assistance to farmers who wish to establish carbon sinks. In addition, a government carbon sequestration program could be devised to contract with landowners to engage in specific cultural practices that would remove GHG's from the air, thus reducing the need for more costly cuts in GHG emissions.

Agriculture Would Share GHG Reduction Costs

The net economic impact of a GHG reduction strategy on U.S. farmers would depend on the mix of policies and programs chosen to achieve GHG reduction goals. For example, implementation of a carbon permit system would raise fuel prices and add to farm production costs, although payments to manage farmland as carbon sinks would add to farm revenue. In 1996, farmers spent $28.7 billion (about 18 percent of total cash expenses) for carbon-intensive manufactured inputs—fuels, oils, electricity, fertilizer, and pesticides–for which prices would likely increase with carbon permit prices. In addition, U.S. farmers spent $11.5 billion (7 percent of cash expenses) on machine hire and custom work and on marketing, storage, and transportation—all services with significant energy requirements.

USDA's Economic Research Service (ERS) used a regional agricultural sector model to analyze the economic impact of an illustrative set of carbon emissions permit prices on U.S. agriculture. A carbon emissions permit program is assumed to raise input prices according to carbon embodied in the inputs and the carbon permit prices. Effects of energy cost increases on agriculture—livestock and 10 selected major crops—are estimated for three scenarios of carbon permit prices that would be determined, in part, by three levels of emissions permit trading: 1) a carbon permit price of $14 per metric ton of carbon, assuming full international emissions permit trading; 2) a carbon permit price of $100 per metric ton, assuming limited international emissions permit trading; and 3) a carbon permit price of $200 per metric ton, assuming no international emissions permit trading. With increased possibilities for permit trading and with increased incentives to reduce GHG emissions and sequester carbon, the carbon permit price would be expected to be on the low side.

A system of carbon permits would increase agricultural production costs, reduce commodity supplies, and increase prices and value of production. The negative effects of cost increases on income are partially offset by commodity price and revenue increases. The estimated impact on agricultural income is minimal under the lowest carbon permit price of $14 per metric ton. At this level, net cash returns are estimated to decline less than a half percent, and commodity prices increase by a half percent or less.

A System of Carbon Permits Would Reduce Soybean Acreage by Less Than 1 Million Acres

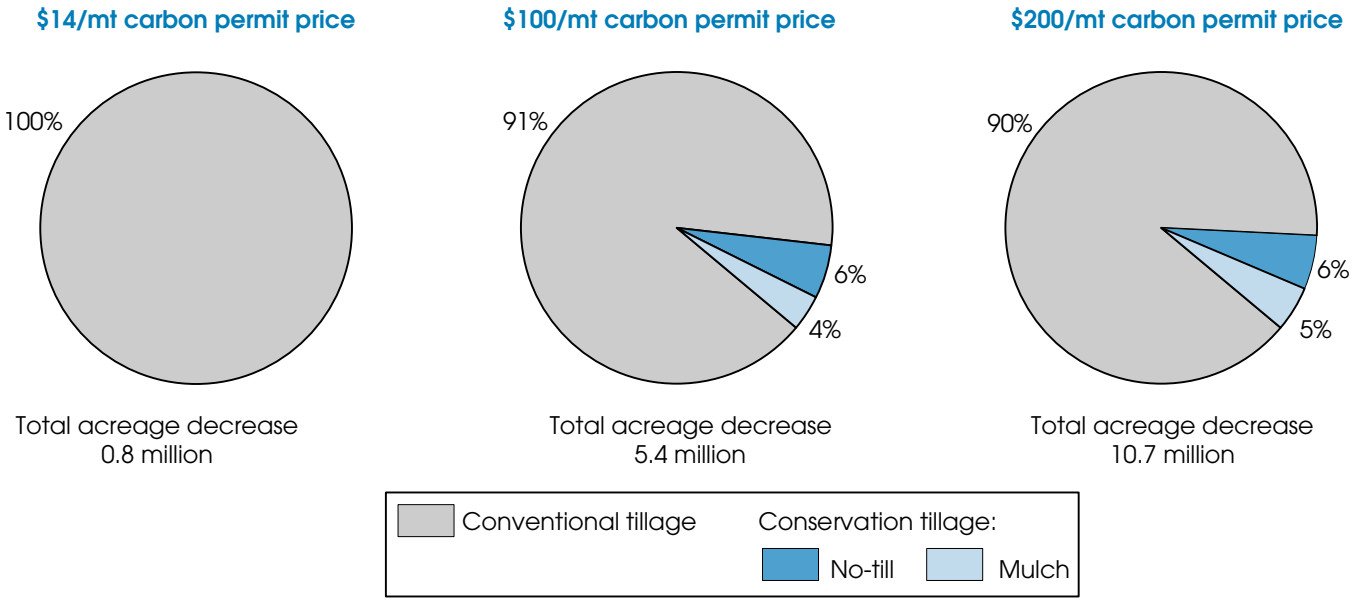
	2010 base	Carbon permit price		
		$14/mt	$100/mt	$200/mt
	----------Million acres----------			
10 major field crops	342.1	-0.8	-5.4	-10.7
Feedgrains	107.7	-0.2	-1.8	-3.6
Wheat	77.5	-0.2	-1.4	-2.9
Soybeans	70.3	-0.1	-0.4	-0.8
Hay	62.5	-0.2	-0.8	-1.3
Cotton, rice, and silage	24.1	-0.1	-1.0	-2.1

Feed grains include corn, sorghum, barley, and oats. The carbon permit price would be determined, in part, by the level of emissions permit trading. The $14/mt carbon permit price assumes full international emissions permit trading; the $100/mt carbon permit price assumes limited international emissions permit trading; and the $200/mt carbon permit price assumes no international emissions permit trading.

Based on estimates from the ERS U.S. regional agricultural sector model for 2010.

Economic Research Service, USDA

Conventionally Tilled Land Would Account for Most of the Acreage Removed from Production In a System of Carbon Permits



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Acreage projections for 2010 for 10 major field crops from the ERS U.S. regional agricultural sector model.

Economic Research Service, USDA

As the carbon permit price increases, the impact on income is more pronounced, particularly for irrigated and chemical-intensive cropping systems. With a $100 carbon permit price, net cash returns decline about 2 percent. Price increases range from less than a half percent for soybeans, to 1 percent for wheat, about 3 percent for feed grains, and 3.5 percent for rice. Prices for milk, hogs, and broilers increase by about 1 percent, and beef prices increase by about 2.5 percent. With a $200 carbon permit price, net income and price effects are about double the effects of the $100 price.

With a carbon permit price of $14, land planted to the 10 selected crops declines by about 800,000 acres, about 0.2 percent. Plantings of three commodities—feed grains, wheat, and hay—fall by about 200,000 acres each; about 100,000 acres of soybeans are taken out of production; and land planted to rice, cotton, and silage drops a total of 100,000 acres. As the carbon permit price increases, soybean and hay acreage reductions decrease in relative importance because other crops higher in energy content (requiring more fuel and fertilizer inputs) incur greater cost increases. With carbon permit prices of $100 and $200, total planted acreage is reduced by 5.4 million and 10.7 million acres. Almost all land taken out of production is land that has been tilled conventionally (with or without moldboard plows); the costs of conventional tillage are more affected by a carbon permit system than are the generally less energy-intensive conservation tillage systems.

In the long term, economic adjustment would dampen the effect of production cost increases arising from a system of carbon permits. Results of the analysis indicate that the sector would respond to increases in energy costs by reducing input use, by altering management practices to include less energy-intensive practices, by changing crop mix, and by taking marginal (less profitable) land out of production.

Farmland Management: A Tool for GHG Reduction

Most U.S. agricultural soils have the potential to accumulate or sequester carbon through changes in land use and management. During the first 20-40 years under conventional tillage, the original carbon level of soil declines by 30-60 percent and then stabilizes at a new lower equilibrium. Because a great majority of U.S. cropland has been in production for many decades, large initial releases of carbon from that land have already occurred, and current releases are very low—estimates range between 2.7 and 15 million metric tons (mmt) annually. On land with carbon-depleted soil, shifting from conventional tillage to permanent grasses or no-till systems can result in soil carbon accumulation of up to 2,000 lbs. per acre per year. To return soils to their maximum carbon-carrying capacity takes about 50 years.

Conversion of marginal cropland and pasture to forest offers potential for agricul-

How ERS Estimates Ag-Sector Costs From a Carbon Permit System

To estimate cost increases from a system of carbon permits, ERS uses a U.S. regional agricultural sector model designed for general-purpose economic, environmental, and policy analysis of the U.S. agricultural sector. The model represents agricultural markets and production enterprises in considerable detail and all elements of the model are calibrated to the latest available baseline, geographic, and cost of production data. The model is linked with regularly updated USDA production practice surveys, and geographic information system (GIS) databases, such as the National Resources Inventory.

The model predicts how changes in farm resources, environmental or trade policy, commodity demand, or technology will affect supply and demand of crops and livestock, farm prices and income, use of production inputs, participation rates and government expenditures for farm programs, and environmental indicators (such as erosion, nutrient and pesticide loadings, greenhouse gases, and others).

To calculate the increase in input prices caused by a carbon permit system, ERS multiplies the carbon embodied in each input by the carbon permit price, and then applies the increased input prices to each of the nearly 1,000 production systems contained in the model. The model determines how supply and use adjust to return commodity and input markets to equilibrium. The resulting changes in supply, use, acreage, price and other market indicators form the basis for determining the impacts of a carbon permit system on the agriculture sector.

tural carbon sinks. One study estimates that establishing a forest incentive program for reducing GHG's, patterned after the Conservation Reserve Program (CRP), could sequester about 44 mmt of carbon on some 22 million acres at a cost of $456 million annually at about $10/mt of carbon. More land could be converted and carbon sequestered, but at increasing cost per metric ton. Pastureland would be the source of most of the land converted to forest.

Although forests generally sequester more carbon and above-ground biomass than grassland, grassland soils are often higher in carbon content than forest soils. Grassland soil carbon is primarily a function of root mortality. Grass roots are thin, compact, and can extend to a depth of a meter or more. Forest soil carbon, on the other hand, is primarily a function of tree litter and fine root turnover near the surface. On land that was once prairie or is otherwise ill-suited to forestation, converting cropland to grasses sequesters carbon more economically and efficiently than forestation.

Studies of cropland conversion suggest that a 25-million-acre CRP-like program to plant marginal cropland to grasses could sequester about 8.6 mmt of carbon per year in the Great Plains. In the 18th CRP sign-up period (October-December 1998), mean land rental payments for states in the Great Plains ranged from about $32 to $40 per acre. With a similar payment rate for creating carbon sinks, a rough cost estimate of government outlays to shift 25 million acres from cropland to grasslands would be $800 million-$1 billion per year.

Use of conservation tillage, particularly no-till, can increase carbon levels in cultivated soil. Shifting 20 million acres from conventional tillage into no-till would annually sequester between 6.9 mmt and 11.3 mmt of carbon, according to soil scientists Kern and Johnson. ERS estimates that, between 1989 and 1996, planted cropland using conservation tillage increased from 71.7 million acres (26 percent of planted acres) to 103.8 million acres (35 percent of planted acres), with no-till accounting for nearly all the increase. In 1996, acreage under no-till alone accounted for 15 percent of total planted acreage.

The cost of providing farmers with incentives to shift an additional 20 million acres into no-till is speculative, because sorting out the relative importance of multiple factors contributing to use of no-till is difficult. An incentive provided in the Food Security Act of 1985 (and continuing through the 1996 Farm Act) links agricultural program payment eligibility to adoption of conservation systems on highly erodible land (HEL). "Conservation compliance" requires farmers with HEL to implement conservation plans—such as the adoption of conservation tillage—if they wish to receive USDA program benefits.

Conservation tillage can be more profitable than conventional tillage under some conditions. But factors such as the higher level of management skills needed, capital outlays for new machinery, and the long-term nature of the decision appear to be hindering further adoption. So it is likely that the mitigation of GHG emissions via expanded use of conservation tillage would require additional economic incentives.

Farmers Could Bank On Carbon Sinks

Agriculture could benefit from a national greenhouse gas emissions reduction strategy that includes a significant role for terrestrial (land) carbon sinks. Carbon sinks require land, and farms account for almost half of all U.S. land in the 48 contiguous states. Given appropriate economic inducements, significant areas could be managed to increase carbon stored in soils and in above-ground biomass.

The role of terrestrial carbon sinks in mitigating GHG emissions is in the early stages of development. If carbon sinks are to be established by planting cropland to forest or grass or by expanding adoption of conservation tillage, then policies to promote agricultural carbon sinks must provide producers with incentives to enter into longrun land management commitments. Studies by both ERS and other observers conclude that the changes would have to remain in effect for extended periods of time (perhaps a minimum of 20 years) to prevent re-release of carbon sequestered in soils or biomass.

To assess how government policies might address carbon sequestration through agriculture, it is helpful to view land owner-

ship as a bundle of separate interests (claims), each conveying the right to use a parcel of land in a particular way (e.g., a utility easement or mineral rights). The set of interests associated with any given parcel may be held by one agent (e.g., the farm operator or landowner) or may be distributed among multiple agents (public and private). The market value of any interest reflects expectations about the present value of all current and future uses the interest allows.

Establishing agricultural GHG sinks within a market framework for carbon emissions permits would create a new economic interest in farmland—the right to manage it for increased carbon content. Landowners and farmers could then choose to sequester carbon if its net returns exceed those from other uses over some relevant time horizon. The general idea is that firms with high emissions reduction costs, such as electric power generators, would mitigate the environmental impacts of their emissions by contracting with other firms (such as farms) to engage in specific sequestration activities. If the price of carbon emissions permits were sufficiently high, it is conceivable that firms would find it economical to pay farmers to sequester enough carbon to significantly offset national GHG emissions. In the case of lower-than-desired levels of carbon sequestration, the government could assess whether or not the social benefits of sequestering carbon are sufficient to justify government expenditures to increase land in agricultural carbon sinks.

If government outlays are determined to be justified, carbon sequestration could become an explicit conservation objective of farm policy, implemented with new or existing programs. Conservation programs authorized in the 1996 Farm Act encourage farmers and ranchers to reduce soil erosion, protect wetlands, improve water quality, and enhance wildlife habitat. USDA conservation program incentives for farm owners and operators include annual rental payments to landowners for retiring environmentally sensitive lands, cost-share assistance to establish practices that reduce environmental damage, and opportunities for education and technical assistance.

If promoting carbon sequestration were to become an explicit goal of USDA conservation policy, these tools could be modified or expanded to encourage the adoption of agricultural practices that increase the quantity of carbon stored in soils and biomass, and to help satisfy possible emissions reduction requirements. Unlike other conservation programs, all of which are either short-term or contain release clauses, any policies promoting the exit of agricultural land from production for as long as 25 years would need to be further evaluated under different future global food security and price scenarios. **AO**

Howard McDowell (202) 694-5485, Jan Lewandrowski (202) 694-5522, Robert House (202) 694-5480, and Mark Peters (202) 694-5487
howardm@econ.ag.gov
janl@econ.ag.gov
rhouse@econ.ag.gov
mpeters@econ.ag.gov

In upcoming issues of *Agricultural Outlook*

* trading with the EU—consumer and food safety issues
* overabundant supplies in the global soybean market
* NAFTA–the record to date
* U.S.-Mexico trade dispute over sweeteners
* the U.S. greenhouse vegetable industry

Marvin Pritts, Cornell University

Facing the Phaseout Of Methyl Bromide

With the agricultural pesticide methyl bromide being phased out by parties to the Montreal Protocol, public and private sector efforts are underway to develop effective alternatives. Methyl bromide is an agricultural pesticide that has been used for over 50 years to control insects, pathogens, nematodes, and weeds in vegetable, fruit, and nut crops. It is used for soil fumigation before planting, post-harvest fumigation of agricultural products in storage and prior to shipment, and for government-required quarantine treatment of commodities to prevent the spread of pests.

Methyl bromide has been classified as a substance that depletes the stratospheric ozone layer. The ozone layer protects the earth against the most harmful types of radiation from the sun, so depletion of this layer may increase the incidence of skin cancer, sunburn, eye damage, and other adverse effects. To address these potential dangers, an international agreement, the Montreal Protocol, was reached in 1987 to control or phase out use of chemicals that may be contributing to loss of the ozone layer. Methyl bromide was included in this agreement in 1992 and is now subject to an international phaseout.

Many U.S. users, including growers and the food industry, are concerned that alternative practices currently available to replace methyl bromide use will be less effective, resulting in financial losses. In response to these concerns, USDA, the Environmental Protection Agency, state universities, and private firms are working to develop new alternatives. As part of USDA's contribution to this effort, the Economic Research Service has cooperated with the National Center for Food and Agricultural Policy (NCFAP) and the University of Florida in analyzing the economic tradeoffs of these alternatives and of the phaseout itself.

U.S. Use Heaviest In Florida & California

Most methyl bromide is used in the U.S. for soil fumigation prior to planting crops to control a broad spectrum of insects, pathogens, nematodes, and weeds. NCFAP estimates that about 35 million pounds of active ingredient are used for that purpose annually. Use on tomatoes accounts for 30 percent of the total, strawberries for 19 percent, and peppers for 14 percent. Another 16 percent is used on perennial crops such as almonds, grapes, peaches, nectarines, plums, prunes, and walnuts. Ornamentals and nursery crops, including strawberry and fruit tree transplants, rose plants, and tobacco seedlings, account for 6 percent. The remainder is used on other vegetable crops.

California and Florida are the states with the largest methyl bromide use in the U.S. Over 90 percent of Florida's acreage in fresh-market tomatoes, strawberries, and peppers was treated in 1996, the most recent year for which data are available. Cucumbers, squash, and watermelons that are double-cropped with tomatoes or peppers in Florida also benefit from this use of methyl bromide. Over 75 percent of eggplant acres in Florida was treated in 1996, although this accounts for only a small amount of the methyl bromide used in the state.

In California, growers treated 90 percent of strawberry acres in 1996. Methyl bromide is also widely used to control soil pests from previously planted perennials before replanting orchards and vineyards. Agricultural nurseries use the pesticide to produce vigorous transplants of strawberries, perennials, and other crops, and to meet a California requirement that transplants be pest-free for transporting. Most producers of organic strawberries in California use transplants grown in soil treated with methyl bromide.

Post-harvest treatments with methyl bromide protect the quality of commodities in storage and allow handlers to meet FDA sanitary standards. Large quantities of dates, figs, raisins, almonds, and walnuts produced in California are routinely treated before and periodically during storage. Walnuts exported for European holiday markets are treated to meet import standards. Methyl bromide is also used to treat mills, ships, and structures for pest control.

Many governments require quarantine treatments with methyl bromide for imports of food and other commodities to prevent the spread of damaging pests. Fresh fruit imported from Chile, including grapes, peaches, nectarines, and kiwifruit, accounted for over 85 percent of the value of food imports required to receive methyl bromide quarantine treatments for entry into the U.S. in fiscal year 1996. Methyl bromide is also used as a domestic quarantine treatment for such crops as citrus

produced in Florida and Texas and for blueberries produced in the Southeast before shipment to western states.

In recent years, some U.S. exports of sweet cherries, peaches, nectarines, plums, prunes, apricots, dates, dried prunes, walnuts, oak logs, cotton, rice, and tobacco were treated to meet the requirements of importing countries. In addition, California strawberries exported to Japan are treated for quarantine pests not found in that country.

Montreal Protocol Controls Phaseout

Under the Montreal Protocol, methyl bromide consumption is being phased out internationally. The treaty, signed by over 160 countries, controls the global production and trade of ozone-depleting substances. Methyl bromide was classified as an ozone-depleting substance in 1992. In 1997, parties to the Montreal Protocol agreed that methyl bromide consumption (defined in the Protocol as production plus imports minus exports) should be phased out by 2005. The reduction will take place in stages: a 25-percent reduction from a 1991 baseline in 1999; a 50-percent reduction in 2001; a 70-percent reduction in 2003; and a 100-percent reduction in 2005. Developing countries agreed to freeze methyl bromide use in 2002 at a 1995-98 average and to reduce consumption from that baseline by 20 percent in 2005. Developing countries will reach 100-percent reduction in 2015.

The treaty exempts quarantine and preshipment uses from the phaseout. It remains unclear which post-harvest uses will be classified as preshipment—this term and its temporal limitations have yet to be defined. The treaty also allows countries to exempt critical uses after 2005, if a country determines that no technically and economically feasible alternative is available with acceptable health and environmental effects and that significant market disruption would occur if methyl bromide were unavailable. The country would have to take technically and economically feasible steps to minimize methyl bromide use and emissions and conduct research on developing and deploying alternatives.

In the U.S., the Montreal Protocol is implemented through the Clean Air Act. In December 1993, EPA issued a regulation under the Clean Air Act that would terminate U.S. production and importation of methyl bromide by January 1, 2001. The regulation required a more rapid elimination schedule than the Montreal Protocol and did not exempt preshipment, quarantine, or critical uses. U.S. grower and industry groups argued that the regulation gave foreign competitors an unfair advantage in growing and storing crops, which would disrupt international trade. Many agricultural scientists argued that developing cost-effective alternatives required more time. As a result, Congress amended the Clean Air Act in October 1998 to harmonize the U.S. phaseout with the Montreal Protocol.

Limited Alternatives Concern Users

Public and private research programs, including potential suppliers, are examining a variety of potential alternatives, some fairly well developed and others relatively new. Studies of preplant uses that measure performance in terms of yield have focused on Florida tomatoes and California strawberries; fewer studies have been conducted for other vegetables, orchard crops, vineyards, ornamentals, and nursery crops, leaving uncertainty about the relative performance of potential alternatives for these crops. These studies also have focused on older, registered pesticides; less yield performance information is available for other alternatives. Uncertainties also continue about weed control alternatives that might complement practices that control other pests to achieve the broad-spectrum control offered by methyl bromide use.

Based on available performance studies and researcher judgments, the most likely chemical alternative for most preplant uses is Telone (1,3-D and chloropicrin) or chloropicrin in combination with a pesticide such as pebulate (Tillam), napropamide (Devrinol), or metam sodium (Vapam). Metam sodium might be used where preplant use of Telone is restricted. To provide better pest control, a year of fallow may be needed with chemical alternatives for some California perennial crops.

U.S. Preplant Use of Methyl Bromide Is Greatest for Tomatoes

Crop	Quantity*
	(1,000 lbs.)
Tomatoes	10,383
Strawberries	6,601
Peppers	4,741
Grapes	2,511
Nurseries	2,115
Almonds	1,070
Lettuce	936
Carrots	795
Tobacco	657
Nectarines	546
Watermelons	545
Peaches	520
Plums/prunes	513
Cucumbers	441
Sweet potatoes	393
Eggplants	262
Walnuts	260
Citrus	89
Asparagus	75
Cantaloupes	66
Cherries	62
Broccoli	50
Onions	45
Cauliflower	41
Raspberries	26
Apples	10
Brussels sprouts	4
Avocados	2
Apricots	1
Other	639
Total, preplant uses	34,399

Annual use
*Active ingredient.
Source: National Center for Food and Agricultural Policy, 1999.
Economic Research Service, USDA

Agricultural scientists have been examining a variety of nonchemical methods, and some may have an important role in the future. Currently, scientists at the University of Florida and USDA's Agricultural Research Service indicate that solarization, a technique that traps solar heat with transparent film to suppress soil pests, may be feasible on limited acreage for fall tomato production. Steam, which requires boilers and other equipment to heat the soil, may be a feasible alternative for greenhouse production of some ornamentals.

In most cases, researchers expect currently available alternatives to be less effective than methyl bromide. Researchers expect lower yields for tomatoes, strawberries, peppers, eggplants, second

Impact of Banning Methyl Bromide for Preplant Use Varies by Crop

U.S. crop	Annual net impact	Impact as share of crop value[1]
	$ million	*Percent*
Annuals[2]		
Eggplants	3.5	25
Strawberries	131.5	19
Squash	5.8	16
Peppers	16.1	6
Tomatoes	30.4	4
Watermelons	9.8	4
Cucumbers	2.4	3
Total, annuals	199.5	
Perennials[3]		
Nectarines	8.0	7
Almonds	45.7	4
Grapes	75.4	3
Peaches	5.7	2
Prunes	4.9	2
Walnuts	3.4	1
Total, perennials	143.2	
Nurseries and ornamentals[4]		
Sod (GA, FL, CA)	59.6	33
Rose plant nurseries (CA)	6.3	18
Perennial nurseries (CA)	18.6	15
Strawberry nurseries (CA)	2.9	15
Tobacco seedlings (FL, GA, TN)	5.7	10
Caladium (FL)	1.2	7
Cut flowers (FL, CA)	14.4	5
Total, nurseries and ornamentals	108.7	
Total, preplant uses	451.4	

1. Percent of value in selected major producing states. 2. Sum of annual impacts on U.S. producers and consumers. 3. Net present value of impact, over life of orchard, on acres treated in 1 year. 4. Net present value of impact for rose plants and sod. Partial budgeting impact (change in producer net income, assumes constant price) for other nurseries and ornamentals.
Source: National Center for Food and Agricultural Policy, 1999.

Economic Research Service, USDA

crops in Florida double-cropping systems (cucumbers, watermelons, or squash), perennials, ornamentals, and nursery crops. Over time, increasing infestations of pests currently controlled by methyl bromide could lead to larger yield losses.

In addition, Federal and state regulations could limit or ban the use of currently available chemical pesticides, forcing growers to use less effective alternatives. California currently has township-level use restrictions for Telone and may limit chloropicrin use due to concerns about air quality. California nursery industry representatives and researchers indicate that if neither methyl bromide nor Telone were available, growers could not sell nursery stock when nematodes are found in the soil, making orchards less productive and profitable.

In 31 Florida counties, Telone use is restricted to certain soil conditions to protect groundwater. Where Telone use is allowed, the high cost of personal protective equipment required for working with Telone, and the difficulty of recruiting labor to wear the equipment in hot weather, might cause growers to use a broadcast application system, which could be less effective than more labor-intensive traditional methods. Moreover, napropamide and pebulate, herbicides that could be used with Telone to replace the weed control provided by methyl bromide, have Federal label restrictions that could prevent their use in Florida. Several new chemical alternatives that might reduce the financial impacts of methyl bromide loss, such as basamid (already registered for nonfood use), methyl iodide, and propargyl bromide must await registration under the Federal Insecticide, Fungicide, and Rodenticide Act (FIFRA).

For post-harvest uses on dried fruits and nuts that might not be exempt from the phaseout, phosphine is the most likely alternative, but phosphine treatments require more time than methyl bromide to be effective, which could lead to lost marketing opportunities. For example, walnut industry representatives argue that if currently available alternatives such as phosphine were used, some walnuts could not be processed quickly enough for holiday-season shipment to European markets. This would result in a loss of high-value sales and would divert these walnuts to domestic markets, increasing the supply and thereby reducing domestic prices.

Phosphine may also have a detrimental impact on the flavor of walnuts. Adding further to the costs of phosphine as a methyl bromide alternative, storage facilities using the chemical require better sealing to prevent leakage and require protection of electrical equipment from the corrosive effects of phosphine.

EPA has proposed restrictions on phosphine that could prevent use in some storage facilities, in response to concerns about acute toxicity and the danger of worker and bystander exposure. EPA extended its review schedule to consider public input and examine more options to reduce risks and intends to revise the proposal in August 1999.

Economic Estimates Help Target Mitigation Efforts

Based on current knowledge about alternatives to methyl bromide, the planned phaseout will cause substantial short-term losses to U.S. producers and consumers of crops treated with methyl bromide. This situation will last until more cost-effective alternatives are available. NCFAP researchers estimate that the net annual loss from banning methyl bromide for preplant use on selected crops would be about $450 million—$200 million for annuals (strawberries, tomatoes, and other vegetables), $140 million for perennial crops, and $110 million for ornamental and nursery crops.

NCFAP also estimates that phosphine use for post-harvest treatments that might not be exempt from the phaseout would increase costs for dates, figs, prunes, raisins, and walnuts by $2 million. Impacts on these post-harvest uses would actually be greater than that amount because the estimate doesn't include costs of retrofitting storage facilities, increasing storage time or altering processing to accommodate longer treatment times, or for losses from missed market opportunities or detrimental flavor impacts on walnuts.

In estimating the costs of phasing out methyl bromide, University of Florida and NCFAP researchers modeled markets for strawberries, tomatoes, and other vegetable crops—commodities that are among the largest users of methyl bromide. They estimated that if currently available alternatives were used, U.S. production of tomatoes, peppers, eggplants, and strawberries would decline, especially in states dependent on methyl bromide use. The University of Florida study estimated that Florida and California would each lose about $200 million in f.o.b. (gross shipping point) revenues. As a consequence, U.S. consumers would face higher prices and reduced supply.

The models also estimated the U.S. would increase imports of Mexican-produced tomatoes, peppers, and eggplants. While Mexico does not currently have a large share of the U.S. fresh strawberry market, the methyl bromide phaseout could create opportunities for Mexico or other countries to increase production for the U.S. market. Mexico is much less reliant on methyl bromide for producing these crops than Florida or California, and as a developing country, is not required under the Montreal Protocol to phase out methyl bromide completely until 2015. Thus, the phaseout will have little immediate effect on Mexican costs and yields. For consumers, increased imports from Mexico would have a positive effect, by reducing U.S. price increases and supply losses.

These estimates can help target efforts to mitigate the economic impact of phasing out methyl bromide uses by showing which reductions in use will cause the greatest losses. Focusing on the larger aggregate impacts emphasizes the effects on such crops as strawberries, tomatoes, peppers, and perennials, which use relatively large quantities of methyl bromide. Since the proportional impact on smaller uses could be severe despite small absolute losses, calculation of returns per pound of methyl bromide, and comparison to the next best alternative, also helps identify significant potential problems.

For preplant uses, NCFAP researchers estimated the highest returns per pound of methyl bromide for strawberries in Florida and California; wine grapes, almonds, perennial nurseries, sod and flowers in California; tomatoes or peppers double-cropped with watermelons, cucumbers, or squash in Florida; and tomatoes in southern California. Estimates of impacts for these uses range from about $10 to $95 per pound of methyl bromide. (An impact of $0 per pound means that there is an equally cost-effective alternative.) Post-harvest uses, which account for relatively small quantities of methyl bromide, are also particularly valuable if commodities left untreated would be excluded from high-priced markets or face discounted prices because of poor quality.

Results of NCFAP and University of Florida studies point to progress in developing alternatives that will reduce the impacts of methyl bromide loss for some uses. The NCFAP impact estimate of $450 million for preplant use, for example, is considerably less than an estimate of about $800 million for the same uses made in 1993 by the National Agricultural Pesticide Impact Assessment Program. Similarly, University of Florida researchers estimated a decline in f.o.b. revenues from Florida tomatoes in 1995 of about $400 million, but currently estimate a decline of about $70 million. The reductions in yield loss estimates are the result of new research that showed the relative effectiveness of the Telone-plus-pebulate combination as an alternative to methyl bromide, but pebulate might not be available unless regulatory issues are resolved. However, the current University of Florida study also indicates that alternatives for fruit and vegetable crops must be even more cost-effective than currently expected if methyl bromide-reliant regions are to maintain market shares within 10 percent of their current levels. This result shows a need for further research to develop alternatives.

Several efforts are underway to design transition strategies that will help producers adjust to the methyl bromide phaseout and mitigate its economic impact. Research to develop new alternatives—as well as new methods for using currently available alternatives more effectively—continues. To address regulatory issues, USDA and EPA conducted a series of meetings with researchers and users in the spring and summer of 1999 to assess which pesticide alternatives might need label or registration changes in order to make them available to growers. In the end, if economically feasible and environmentally acceptable alternatives are not available for some uses in 2005, those that meet the criteria for critical uses might be exempted from the phaseout. However, efforts to reduce methyl bromide use and emissions and to develop alternatives would have to continue. **AO**

Craig Osteen (202) 694-5547 and Margriet Caswell
costeen@econ.ag.gov

Upcoming Reports—USDA's Economic Research Service

The following reports will be issued electronically on dates and at times (ET) indicated.

August

12	*World Agricultural Supply and Demand Estimates (8:30 am)*
13	*Cotton and Wool Outlook (4 p.m.)***
	*Oil Crops Outlook (4 p.m.)***
	*Rice Outlook (4 p.m.)***
16	*Feed Outlook (9 a.m.)***
	*Wheat Outlook (9 a.m.)***
20	*Agricultural Outlook**
24	*Livestock, Dairy, and Poultry (4 p.m.)***
	U.S. Agricultural Trade Update (3 p.m.)
30	*Outlook for U.S. Agricultural Trade**

*Release of summary, 3 pm
**Available electronically only

Special Article

Agriculture & the Evolution of Tariff Bargaining

Preparations have already begun for the ninth round of international trade talks, which will be launched at the World Trade Organization (WTO) Ministerial Conference in Seattle this December. While agriculture had been included in each of the previous rounds, it was not until the Uruguay Round of Multilateral Trade Negotiations (1986-94) that real progress was made in negotiating overall reductions in barriers to agricultural trade. The Uruguay Round created the WTO, which replaces the General Agreement on Tariffs and Trade (GATT) as an institutional framework for overseeing trade negotiations and adjudicating trade disputes.

Over the course of the previous eight rounds, countries successfully lowered tariffs for manufactured goods from a trade-weighted, most-favored-nation (MFN) average of over 40 percent to about 4 percent. A review of how this was accomplished reveals some valuable lessons for future negotiations aimed at achieving similar cuts in agricultural tariffs, which are, on average, still much higher than those on manufactured items.

Tariff Bargaining in Previous Rounds

A variety of bargaining approaches has been used in previous trade rounds. In the first round (***Geneva***, 1947), negotiations took a bilateral approach, despite the multilateral setting.

Each country drafted request-and-offer lists that contained the tariffs it would like other countries to reduce and/or bind and the concessions it was willing to make in exchange. (Tariffs are "bound" when a country agrees not to raise them above a certain level, subject to a penalty). Negotiations were conducted country-by-country and item-by-item, focusing on products for which the two countries were mutual principal import suppliers. Early on, countries agreed that they would extend concessions to all participants, whether or not those countries made any reciprocal concessions, thus ensuring that the negotiations achieved some of the benefits of multilateralism. This practice, now codified in the GATT's most-favored-nation clause, ensured that concessions between principal suppliers would not discriminate against other suppliers.

The first round reduced average U.S. industrial tariffs by almost 20 percent. About 54 percent of U.S. dutiable imports were subjected to tariff cuts, with the weighted-average reduction equal to 35 percent. Even though the MFN practice meant that the benefits of concessions could not be restricted to principal suppliers, they were kept largely among the negotiating parties. For example, an estimated 84 percent of U.S. imports subjected to tariff cuts came from the 22 other participants in the negotiations.

This is the first of two articles on tariffs and the World Trade Organization (WTO). The second will profile tariff schedules of selected WTO members.

Tania Tang, World Trade Organization

Measured in terms of trade volume subjected to tariff concessions and the average depth of tariff reduction achieved, the next four rounds of negotiations yielded disappointing results. For the U.S., these rounds achieved average tariff reductions between just 2 and 4 percent on dutiable imports. Among the reasons for the poor outcomes were the limited objectives of some of the rounds and the limited authority accorded to U.S. negotiators by Congress.

The request-and-offer form of negotiating also largely inhibited the success of these rounds. As more countries joined the talks, negotiating item-by-item with principal suppliers proved to be increasingly slow and cumbersome, making further cuts in tariffs more difficult to achieve. It also became increasingly difficult for negotiators to monitor the multilateral balancing possibilities on thousands of items for dozens of countries.

Many of the tariffs that had been cut in the early rounds continued to be high enough to provide a comfortable cushion against import competition. As this cushion was slowly removed, the protected industries, which had come to rely on the higher prices generated by tariffs, began vigorously to resist further tariff reductions.

By continuing the strategy of negotiating reciprocal concessions with other main trading partners, governments sought to assure their constituents that the economy as a whole would not lose by binding or lowering tariffs. The principal-supplier method of negotiating supported the pervasive belief that every dollar increase in imports should be balanced with a dollar

increase in exports. Reducing one's trade barriers was considered a concession that had to be compensated by equivalent concessions from other countries, a tenet that continues to influence today's negotiations.

While tariffs on industrial goods were whittled away during the first five rounds, the issue of agricultural trade barriers was scarcely touched. Agricultural trade was subject mainly to nontariff barriers (NTB's) such as quotas, many of which were tied to specific domestic policy objectives. Their removal or reduction would have required changes in domestic policies as well, something few countries were willing to address in what essentially were trade talks.

The sixth round, dubbed the ***Kennedy Round*** (1963-67), saw the first serious attempt to subject agricultural products to disciplines that had been applied to trade in other goods for many years. Before the round began, the U.S. suggested that all NTB's in agriculture be converted to tariffs, which would then be reduced by 50 percent and bound. This position—which never made it into the U.S. proposal—was considered a nonstarter by the European Economic Community because it was incompatible with the use of variable levies (under which the import duty is the difference between a fixed reference price and a fluctuating import price). In the end, even though agriculture had been given high priority during the Kennedy Round, little was accomplished in liberalizing agricultural trade.

In contrast to the efforts for agriculture, negotiations to reduce tariffs on industrial goods were highly successful, in large part because of a major shift from a bilateral to a multilateral negotiating approach. Early in the round, participants agreed to a 50-percent across-the-board reduction in industrial tariffs for all but a bare minimum of protected products. They then negotiated further exceptions.

This approach gave an early boost to the negotiations by providing an initial major step forward, then focused the round on negotiating minor steps backward. Compared with the modest cuts achieved by the principal-supplier, item-by-item approaches of the previous rounds, this approach, even after all the exceptions were negotiated, succeeded in reducing industrial country tariffs on manufactured items by an impressive 35 percent on average.

In the seventh round, the **Tokyo Round** (1973-79), the across-the-board reduction technique (with exceptions) was continued, although considerable debate surrounded the choice of tariff-cutting formula to be used. One of the problems, whose roots could be traced in part to the principal-supplier approach to negotiating tariff reductions, was that many countries now had significant dispersion across their industrial tariff rates, meaning a low overall average coupled with occasional very high rates, or tariff peaks. In the past, when a country had tariffs that were sufficiently high to preclude any trade taking place, there was no principal-supplier with which to negotiate reductions. And since countries tended to be strongly influenced in their negotiations by the amount of actual trade subject to the tariff barrier being discussed, these high tariffs might escape any cuts. Actual, rather than potential, trade was much more influential in determining which tariffs would be targeted for reduction, since it provided a convenient way to estimate costs and benefits of the negotiations.

To address the tariff dispersion that existed, the European Community proposed that, instead of a linear cut as imposed by the Kennedy Round, a nonlinear "harmonization formula" be used. This formula yielded small average cuts, but included deeper cuts for higher tariff rates. The U.S., however, preferred a larger, but equal cut in tariffs. The Tokyo Round languished for over 2 years, until a compromise tariff-cutting formula (the Swiss formula) reduced tariff disparities between and within countries. As a result of this compromise, the Tokyo Round succeeded in cutting global industrial tariffs an estimated 30-35 percent, and the MFN tariff rates on imports of manufactured items were estimated to average 4.9 percent in the U.S., 6 percent in the European Community, and 5.4 percent in Japan.

The Tokyo Round was notable in several other respects. It was the first round to formally recognize that trade flows are affected by the close link between domestic and trade policies. Acknowledging this connection laid the groundwork for steps that would be taken in the Uruguay Round to begin reducing protection in the agricultural sector. It also introduced the sectoral approach to negotiating, in which barriers to trade affecting a particular sector would be discussed in isolation rather than in conjunction with all sectors. This approach, while not successful in reducing agricultural trade barriers during the Tokyo Round, would be used again in the **Uruguay Round** (1986-94) to finally subject agricultural trade to the sorts of disciplines that had applied to other traded goods for many years.

The success of the Uruguay Round is predicated largely on its treatment of NTB's in the agricultural sector. Since the early years of the GATT, NTB's had been regarded as much more trade restricting in agriculture than tariffs. More than 30 years had passed since the U.S. had first proposed in the GATT that agricultural NTB's be converted to tariffs before the signatories to the Uruguay Round Agreement on Agriculture (URAA) agreed to do just that. Countries further agreed that these new tariffs, as well as any other existing tariffs, would be progressively reduced to a final, bound rate.

The guidelines used, both for calculating the tariff equivalent of existing NTB's and for reducing tariffs, offered broad accommodations for countries to design tariff structures that would provide ample protection for politically sensitive commodities while concentrating cuts on commodities which they themselves were not producing or were not producing on a competitive basis. (For an explanation of how "tariffication" was achieved, see AO December, 1998). Nevertheless, simply replacing NTB's with nondiscriminatory bound tariffs was a huge step forward. It served to renew and affirm each member country's commitment to GATT principles and set the stage for negotiation of further cuts in agricultural tariffs.

Special Article

Highlights of Tariff Negotiations Through the Uruguay Round

Round, date	*Main accomplishments*	*Agricultural milestones*
Geneva (1947), Annecy (1949), Torquay (1950-51), Geneva (1955-56)	During the first four rounds, negotiations are based on request-and-offer lists, with countries first negotiating bilaterally with principal suppliers then exploring possible multilateral balancing opportunities.	In the fourth round, the U.S. obtains a waiver to impose quantitative restrictions for commodities covered under Section 22 of the Agricultural Adjustment Act.
Dillon Round (1960-62)	The first round after the formation of the European Community (EC), this was the last round to use the request-and-offer approach to negotiating.	The EC makes concessions to allow duty-free bindings (setting tariffs that cannot be increased without notification and compensation) on soybeans, soymeal and corn gluten feed and low-duty bindings on soybean oil, other oilseeds and products, and cotton.
Kennedy Round (1963-67)	For first time, tariff negotiations are conducted across-the-board, rather than item-by-item. Participants agree early on to an overall linear tariff-cutting formula of 50% and then negotiate exceptions. The contentious issue of tariff disparities is left for the next round.	Ag negotiations center on basic mechanisms of the EC's Common Agricultural Policy. EC suggests binding margins of producer price support in relation to world reference prices. This approach is rejected and ag negotiations end stalemated. The International Wheat Council and the Food Aid Convention are created.
Tokyo Round (1973-79)	Debate is considerable on tariff-cutting formula to be used to reduce disparity across tariffs. EC proposes a nonlinear formula designed to combine small average cuts with larger cuts for higher tariff rates. U.S. prefers larger but equal percentage cuts. A compromise, the Swiss formula, is applied to reduce tariff disparities between and within countries, with negotiated exceptions.	In a significant departure from previous rounds, agriculture is identified as a separate agenda item. Several countries favor subjecting it to the same disciplines as the industrial sector. In the end, this is not done. The only improvement in market access is a limited number of small tariff concessions and import quota enlargements resulting from traditional request-and-offer negotiations.
Uruguay Round (1986-94)	This is the most comprehensive round to date. Major players agree that the results for nonagricultural tariffs aim to be at least as ambitious as the Tokyo Round (i.e., one-third reduction). The most ambitious agreement is to completely eliminate tariffs in certain sectors (including pharmaceuticals; steel; furniture; beer; spirits; and agricultural, construction, and medical equipment) and to harmonize tariffs on chemicals.	Nontariff barriers are converted to tariffs equal to the difference between internal and external prices existing during 1986-88. All tariffs are bound and cut by a minimum of 15%,with the average reduction over all agricultural tariffs to equal 36%, on a simple average (unweighted) basis for developed countries.

Maintaining Momentum for the Next Round

Although the scope of the next round of talks is yet to be defined, agriculture will once again have a central place on the agenda. As part of the URAA, countries agreed to begin negotiations by the end of 1999 in order to continue the process of substantially reducing support and protection in the agricultural sector. Agricultural negotiations are expected to focus on continuing the reform process which began under the Uruguay Round by expanding market access, reducing or eliminating export subsidies, and further disciplining the use of trade-distorting domestic subsidies.

In the area of market access, the weight of remaining protection has now shifted toward tariffs, some of which are extremely high (although there is growing concern about technical barriers to trade). Negotiators will confront the task of addressing these high tariffs. Of course, not all countries have high agricultural tariffs, nor are all agricultural commodities subject to high tariffs. So, while the overall level of protection is high relative to that in manufacturing sectors, it is also highly uneven across countries and commodities.

Based on the level of cuts in tariffs on manufactured goods achieved in past rounds, an across-the-board approach has achieved the greatest success. If all parties were to make an early commitment to a significant across-the-board cut in tariffs—no country has done so—negotiators would likely concentrate on other issues of contention in the agricultural sector. Some observers have suggested simply repeating the level of tariff cuts of the last round, which equaled 36 percent on average. Early acceptance of such a proposal might allow cuts to be implemented soon enough to provide a seamless continuation of the URAA reforms. (The last installments of tariff reductions are in 2000 for developed countries.)

Tariff escalation—when tariffs are low or zero on primary products, then increase as the product undergoes additional processing—can be a significant bias against trade of the processed product. If countries cut the rates on raw materials by a greater amount than the processed product, this could increase the level of tariff escalation. Should countries agree to an initial across-the-board cut in tariffs but then negotiate exceptions, minimizing exceptions in those cases where tariffs are already very high is another option.

Some observers have advocated that tariff dispersion and escalation be reduced through a harmonization formula, as used in the Tokyo Round, to subject higher tariffs to larger percentage cuts. However, past experience shows that reaching agreement on a formula would also require a great deal of negotiation.

One drawback to a linear tariff cut is that it does not reduce the dispersion of tariffs. On the other hand, it does reduce dispersion of import prices. For example, a 50-percent cut in tariffs yields a 2.4-percent cut in the import price when the initial tariff equals 5 percent, and yields a 16.7-percent cut in the import price when the tariff equals 50 percent. Therefore, the potential increase in imports is likely to be proportionately larger for countries with high tariffs than for those with low tariffs when both groups reduce tariffs by the same percentage. The exception is when even a large cut in a tariff still results in a rate high enough to prohibit imports from taking place.

The history of past GATT rounds reveals how negotiating approaches have changed through the years. The earliest rounds adopted a bilateral negotiating stance conducted on an item-by-item basis. As the number of countries participating in negotiations increased, the focus switched from resolving issues that mainly affected mutual trade between principal suppliers, to achievement of a multilateral balance of concessions. At the same time, the negotiating approach changed from item-by-item to an across-the-board basis. Later talks experimented with sector-by-sector approaches to bargaining.

Unlike the early rounds, which benefited from an overriding objective to reduce and bind tariffs, later rounds have been increasingly broad and complex, encompassing more participants and issues. What all rounds have had in common, however, is a tendency for the pursuit of reciprocity to govern the size and extent of tariff cuts countries are willing to concede.

The URAA would have been less successful if it had not been part of an overall package of results addressing a wide range of issues and sectors. The challenge this time will be to set up a broad-based but manageable process that yields results in a short time period (e.g., 3 years) in order to avoid losing the momentum of reforms generated by the Uruguay Round. **AO**

John Wainio (613) 759 7452
jwainio@econ.ag.gov