U.S. agriculture charts a new course for the 1990s

By Mark Drabenstott and Alan D. Barkema

Farmers entered the 1980s expecting a golden decade, but instead encountered the worst recession in 50 years. The ensuing financial problems raised farm foreclosures to postwar highs, lifted farm bank failures to the highest levels since the Great Depression, and prompted a federal bailout of the Farm Credit System. Following significant financial restructuring and considerable assistance from Washington, agriculture embarked on a strong recovery in 1987.

The three-year-old farm recovery appears likely to continue in 1990. Crop prices may slump in the year ahead as crop production rebounds from two years of drought. Nevertheless, strong export prospects will lend support to crop prices. Lower feed prices along with record meat production point to a good year for livestock producers. Overall, farm income in 1990 may decline modestly, but will remain at a high level. Farm financial conditions should continue to improve, as farmland values rise and farmers add modest amounts of debt to already strong balance sheets.

Despite agriculture's favorable position entering 1990, a number of fundamental issues could transform the farm economy over the next several years. In 1990, a new farm bill will be written and the Uruguay Round of GATT (General Agreement on Tariffs and Trade) negotiations will conclude. Bold new agricultural technologies emerging here and abroad will pose new competitive challenges for U.S. producers. And mounting concerns about agriculture's effect on the environment could lead to new limits on long-standing farming practices.

This article considers the outlook for agriculture in the year ahead and examines the issues likely to shape the agricultural economy in the coming decade. First, it reviews the farm recession and recovery of the 1980s. Next, it considers the farm outlook for 1990. Finally, it identifies the issues likely to influence the farm outlook in the 1990s and explores the possible impacts.

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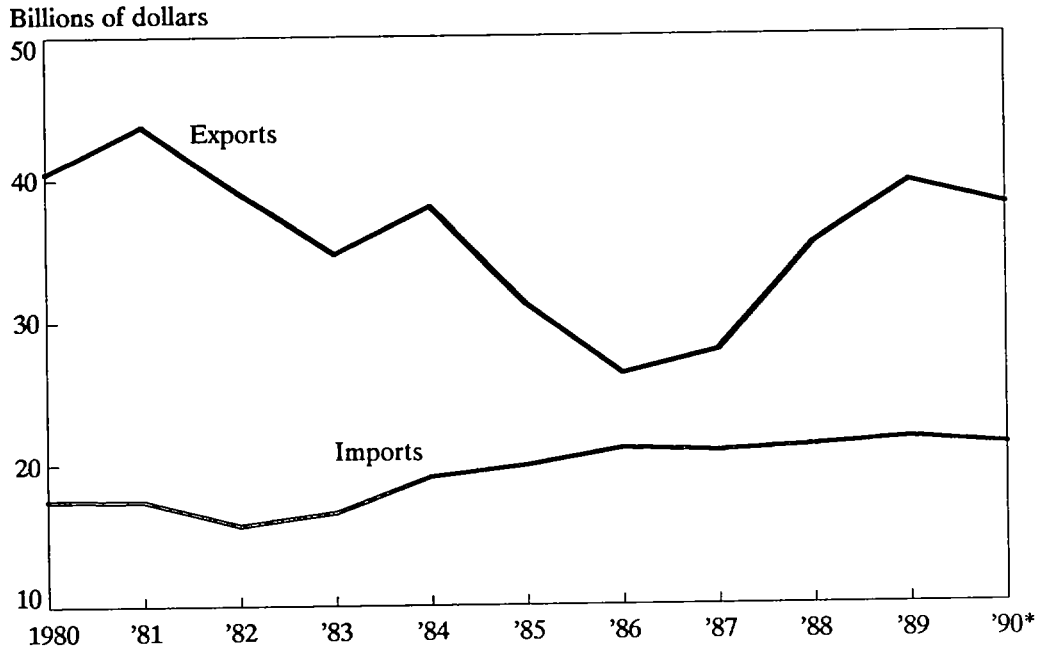
CHART 1
Agricultural trade balance



*Forecast.

Source: U.S. Department of Agriculture, *Agricultural Outlook.*

I. The 1980s: A Decade to Remember

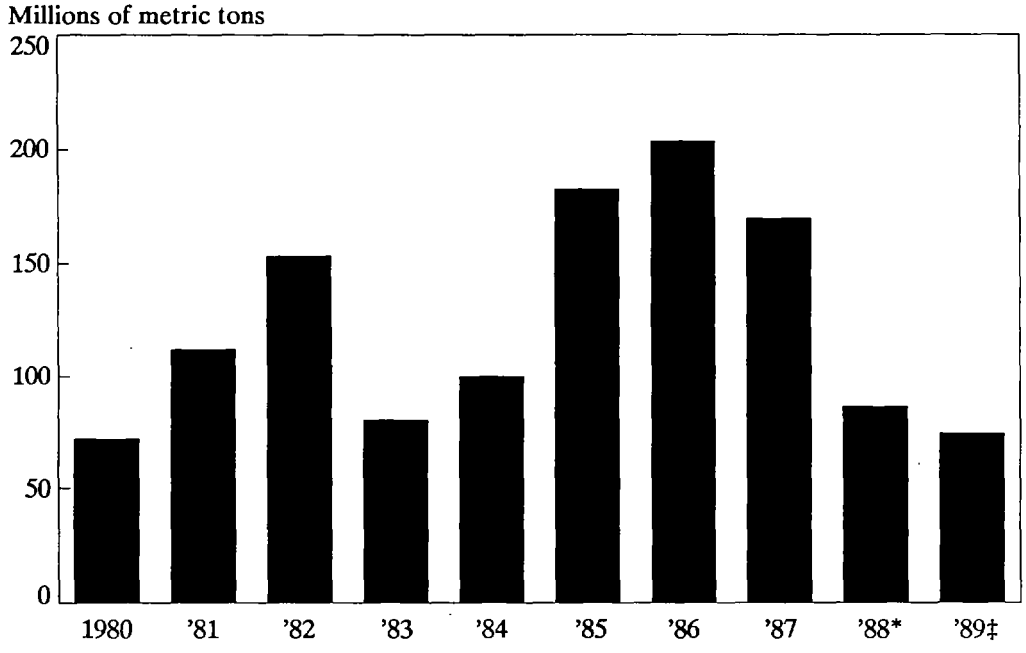
U.S. agriculture will not soon forget the 1980s. Rarely has an entire industry been more surprised by events than agriculture during the past decade. The 1970s proved to be wildly successful for most farmers and agribusinesses, initiating a boom in farm investment. Industry participants anxiously awaited the 1980s, expecting hefty investment returns. Instead, a long farm recession began in 1981. After five years of painful financial adjustment, farm recovery took hold in 1987 and has continued to the present.

The farm recession

The farm recession began in 1981. The farm investment boom of the 1970s was leading to excess capacity in U.S. agriculture. Agriculture's problems were exacerbated by a dramatic increase in interest rates, especially in real, or inflation-adjusted, terms. Farm loan interest rates increased sharply, squeezing the ability of farmers to repay the mountain of debt accumulated when income expectations were higher during the 1970s. The higher interest rates contributed to deep recession in the global economy, trimming demand for U.S. farm exports. And the higher interest rates contributed to a stronger dollar, further hurting farm exports.

After peaking in 1981, U.S. farm exports fell by a third through 1986 (Chart 1). Despite the sluggish demand caused by the strong dollar and the world recession, rising U.S. support

CHART 2
Inventory of total grains



*Estimated.
‡Projected.

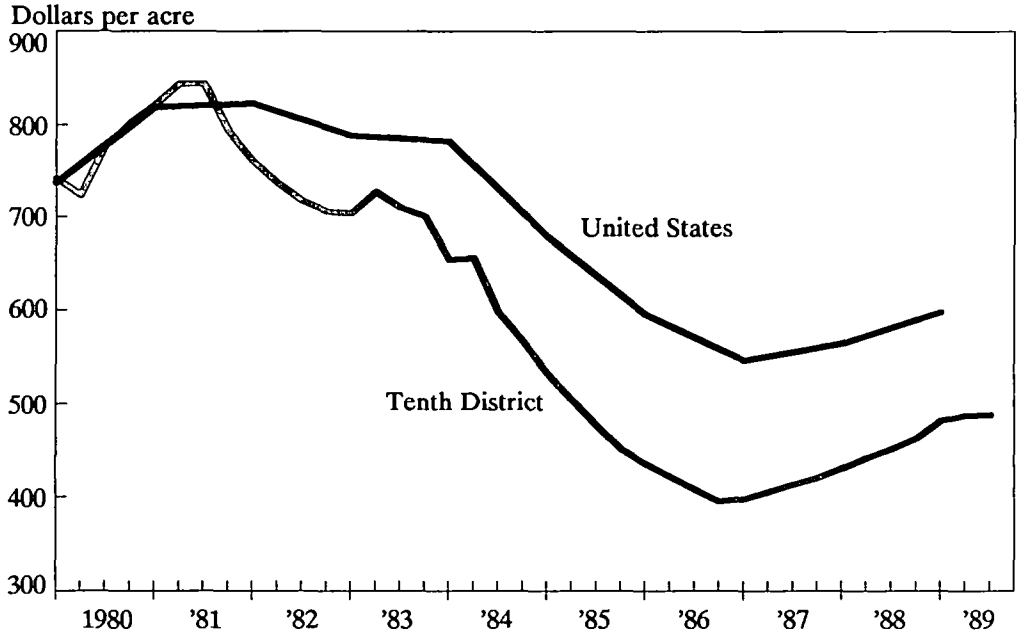
Source: U.S. Department of Agriculture, *World Agricultural Supply and Demand Estimates.*

prices encouraged production by U.S. farmers and competing nations. The agricultural trade surplus declined sharply, falling from $26.5 billion in 1981 to just $5.5 billion in 1986. While exports fell, agricultural imports increased steadily in the 1980s. Thus, agriculture's contribution to the nation's trade accounts fell sharply.

As exports fell, grain surpluses mounted, becoming a hallmark of agriculture's recession. With world markets weak and U.S. farm programs still encouraging U.S. farmers to produce, grain surpluses swelled to record levels (Chart 2). The government ended up holding most of the surplus, at great cost to the public. The rise in grain stocks was interrupted only by the introduction of the PIK (Payment-In-Kind) program in 1983. The PIK program paid farmers government-owned grain to idle a third of the nation's cropland and, combined with a mild drought that year, cut annual crop output roughly in half. But despite the PIK program, by 1986 total grain carryover stocks in the United States topped a record 203 million metric tons, roughly 70 percent of annual use. Correspondingly, farm commodity prices dropped to 15-year lows.

By 1981, farmland values had risen to record heights, as farmers and other investors bid aggressively on the belief that the 1980s would bring continued good times to agriculture (Chart 3). In reality, though, land values were above levels that the cash flow would support. Thus,

CHART 3
Farmland values



Source: U.S. Department of Agriculture, *Agricultural Resources: Agricultural Land Values and Markets, Situation and Outlook Report;* Federal Reserve Bank of Kansas City, Agricultural Credit Survey.

when price expectations fell and farm mortgage rates soared, farmland values plummeted. Between 1981 and 1986, farmland values in the Tenth District fell 55 percent. Nationally, farmland values fell about a third.

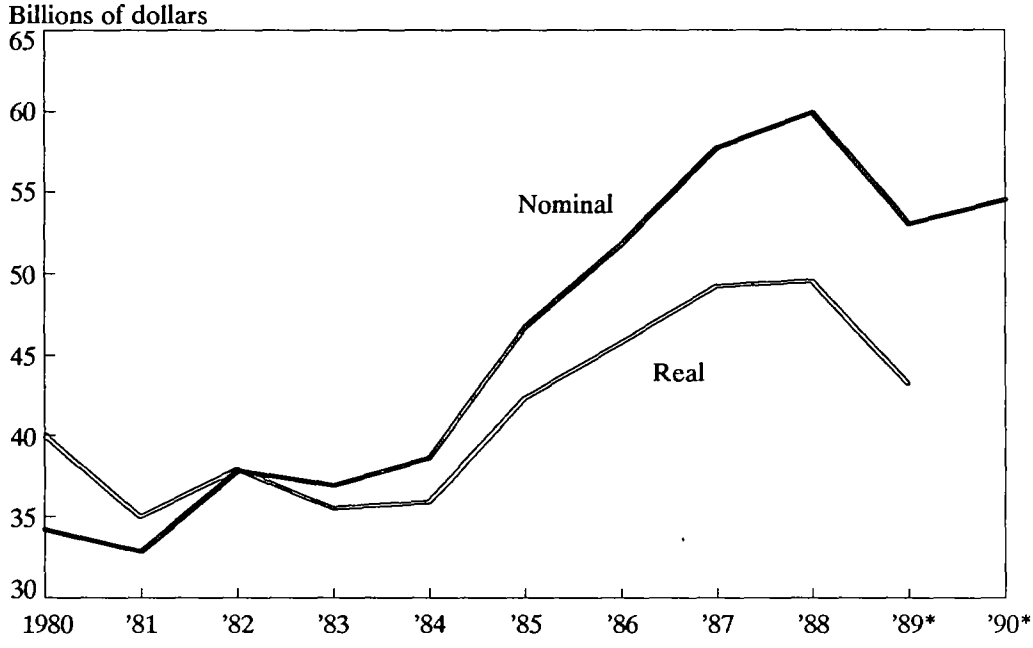
The farm recovery

Farm recovery began in earnest in early 1987. The recovery was spawned by heavy government spending on farm programs and a constellation of favorable market developments. Under the provisions of the Food Security Act of 1985, U.S. farm support prices were cut—making U.S. farm products cheaper in world markets—while income support for producers was held high. As a result, federal outlays for farm programs were a record $26 billion in 1986 and $22 billion in 1987. A declining dollar also helped make U.S. farm products more competitive. Finally, a more favorable mix of macroeconomic policy led to lower interest rates, easing farm debt problems.

Rebounding farmland values were the clearest indicator of the farm upturn. Land values began to recover in early 1987 and continued to climb, despite a large inventory of land held by lenders. In the Tenth District, land values increased 23 percent from the trough in the fourth quarter of 1986 to the third quarter of 1989. The rebound in U.S. farmland values was a more modest 10 percent.

Also signaling a farm recovery was an export turnaround. Exports improved modestly

CHART 4
Net cash income



*Forecast.
Source: U.S. Department of Agriculture, *Agricultural Outlook.*

in 1987 as government export subsidies and the cheaper dollar spurred foreign demand. But improving economic growth in key U.S. markets—Asia and Latin America, in particular—began to boost sales further in 1988 and 1989. By 1989, farm exports had increased 50 percent from the recession low.

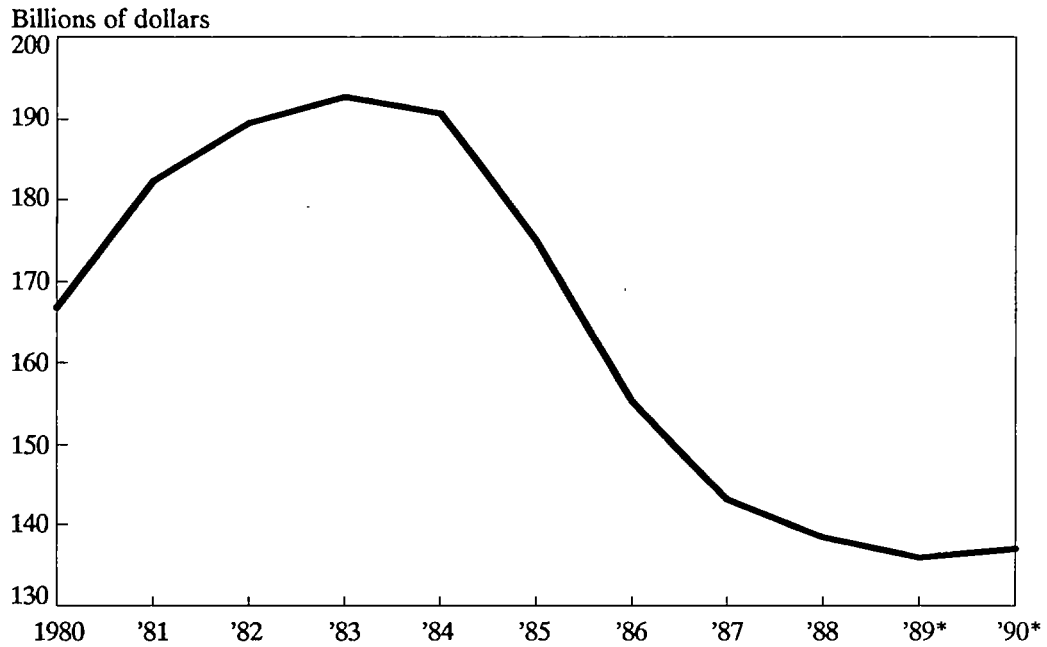
Throughout the farm recovery, farm incomes also moved smartly higher. Farm incomes actually began to improve in 1985, but producers were under so much financial stress then that the gains seemed marginal at best (Chart 4). But beginning in 1986, a combination of record government spending and improving commodity markets pushed farm cash income to a record high. New records were also set in 1987 and 1988. Income remained strong in 1989, although slightly below the record set in 1988.

An important feature of the income strength throughout the recovery was how broadly it was shared. Livestock and crop producers shared about equally. Livestock prices were cyclically strong at the same time that government programs were boosting crop income.

Farm debt proved to be a lagging signal of both recession and recovery in the 1980s, but it graphically describes agriculture's journey through the decade. Farm debt was high as the 1980s began, yet farmers continued to add more debt, believing that agriculture was passing through a temporary downturn (Chart 5). About $25 billion in debt was added from 1980 to 1983, when farm debt peaked at $192 billion.

U.S. agriculture underwent a historic finan-

CHART 5
Farm debt



*Forecast.
Source: U.S. Department of Agriculture, *Agricultural Outlook.*

cial restructuring from 1983 to 1988, as more than a quarter of farm debt was trimmed. The debt reduction was broadly shared. Lenders absorbed as much as a third in principal write-downs. As loan losses mounted, many agricultural banks failed, and the Farm Credit System required federal assistance. And as pressures to repay delinquent farm loans increased, perhaps 10 to 15 percent of the farms that entered the 1980s failed—the most since the Depression. Many bad loans ended up with the Farmers Home Administration, the government lender of last resort to agriculture. And, the strong farm incomes of the past four years enabled many farmers to pay off debts to more manageable levels.

Following three years of strong farm recovery and dramatic financial restructuring, agriculture appears to be entering the 1990s with solid financial foundations. Both farm assets and farm liabilities have now adjusted to a more competitive global agricultural market.

U.S. agriculture's odyssey of the 1980s offers many lessons. First, even though financial restructuring proved painful, agriculture proved relatively resilient to the economic shocks of the early 1980s. Second, agriculture learned its share of the world market is not guaranteed—it must compete effectively with many other nations. Third, agriculture became even more fully integrated into national and international markets, making it more susceptible to macroeconomic developments. Fourth, as annual farm program costs swelled to more than $20 billion,

agriculture learned its programs can be very expensive and are likely to come under greater budget scrutiny by policymakers. Finally, persistent rural economic weakness, even in the face of strong farm recovery, shows that agriculture is no longer the economic mainstay for much of rural America.

II. The Farm Outlook for 1990

After a tumultuous decade, U.S. agriculture appears ready to make a solid entrance into the 1990s. All indicators point to a continuation of the three-year-old farm recovery in the year ahead. The upcoming year will probably bring further farm financial gains, nearly steady farm exports in a more competitive world market, and recovery of farm production from two consecutive years of drought. Crop prices may be weak, but livestock profits are expected to increase. Consumers will benefit from slower food price inflation.

Farm income and financial conditions

After three years of buoyant recovery, agriculture's financial condition may stabilize on a relatively high plateau in 1990. Livestock returns, fueled by steady livestock prices and cheaper feed prices, will be the dominant source of farm income strength. While a further rebound in feedgrain and soybean production translates into cheaper feed for livestock producers, lower feedgrain and soybean prices could limit returns for cash grain farmers. Greater quantities of somewhat higher priced crop production inputs will be required to plant larger acreage in 1990, but cash farm expenses are likely to remain steady as higher crop expenses are offset by lower feed costs. On balance, net cash farm income—equal to the difference between cash receipts and cash expenditures—is expected to increase about 3 percent, and at $52 to $57 billion will exceed $50 billion for the fifth consecutive year (Chart 4). Net farm income—which includes depreciation charges and changes in inventory values—could slip slightly to $44 to $49 billion, as prices for the 1990 feedgrain and soybean crops edge down.[1]

Continued farm income strength should support further improvement in the farm balance sheet in 1990. Farm asset values, supported by further gains in farmland values, are likely to increase slightly more than 4 percent (Table 1). In many areas, farmland values appear to have risen at least to the level supported by the land's cash return. Following the strong rebound of the past three years, however, further gains are not likely to exceed the rate of price inflation in the economy as a whole—about 4 percent in 1990. On the other side of the farm balance sheet, farm debt could edge up as confidence in agriculture's repayment capacity is gradually restored by strong farm incomes and steady gains in farmland values.

Although the tone of the farm financial outlook for 1990 is generally positive, the industry's continued reliance on federal support remains a major concern. Scrutiny of agriculture's government support is likely to intensify as pressure builds to reduce the federal budget deficit. Direct government payments of $9 to $10 billion, down slightly from 1989, will remain a bothersome reminder of Washington's role in the industry's recovery.

Food price outlook

The drought's lingering effects on food prices will diminish in 1990. Following sharp increases in meat and poultry prices in 1989, larger meat and poultry production will limit gains in red meat prices to 1 to 3 percent and lead to lower poultry prices. Despite lower grain prices, strong consumer demand for high-fiber cereal products will cause cereal and bakery product prices to rise 5 to 7 percent, down from an 8.5 percent gain in 1989. Dairy product prices

TABLE 1
Farm balance sheet excluding operator households and CCC loans
(Billions of dollars)

	1987	1988	1989	1990*
Assets	765	810	849	885
Liabilities	143	138	136	137
Proprietor's equity	622	672	713	745

*Forecast.
Source: U.S. Department of Agriculture. Economic Research Service. Agricultural Outlook Conference.

will stabilize as improved forage quality boosts milk production. In 1989, poor forage quality—another effect of the 1988 drought—reduced milk supplies and helped boost dairy product prices about 6 percent. In sum, consumer food prices are likely to rise 3 to 5 percent in 1990, down from a 6 percent increase in 1989, but slightly above the 3 to 4 percent annual increase in food prices during most of the 1980s.

Export outlook

Exports of U.S. farm products are likely to slip slightly in both volume and value in 1990. After rising for four consecutive years, export value is likely to be pushed down slightly to about $38 billion by lower feedgrain and soybean prices (Chart 2). A slight decline in export volume is expected as gains in coarse grain and soybean exports are offset by a decline in wheat exports.

Coarse grain exports will be fueled by larger corn imports by the Soviet Union and South Korea. But despite a larger export volume, lower prices are likely to push down the value of coarse grain exports about 10 percent. U.S. soybean exports will face stiff competition from soybeans produced in Argentina, Brazil, and Paraguay, where production increased 10 percent in 1989. Although the volume of U.S. soybean exports could rise significantly in 1990, soybean exports will remain well below the 700 to 800 million bushels exported annually during most of the 1980s. The limited rebound in U.S. export volume will not be sufficient to offset lower soybean prices, and U.S. soybean sales are likely to edge lower.

In contrast to the growth expected in U.S. corn and soybean exports, the volume of U.S. wheat exports is expected to fall sharply in 1990. Surging production in China, India, and the Soviet Union will constrain demand for wheat imports, while larger production in Argentina, Canada, and the European Community will boost competing wheat supplies. Although a continued decline in U.S. and world wheat inventories will boost wheat prices, the price gain will not be sufficient to offset the decline in export tonnage. As a result, the value of U.S. wheat exports is expected to fall.

Continued strength in high-value exports rounds out the farm export outlook for 1990. Spurred by larger beef exports to Japan, exports of U.S. livestock, dairy, and poultry products are expected to equal the record set in 1989. In sum, a slight decrease in U.S. farm exports and nearly steady farm imports are expected to maintain a U.S. farm trade surplus of about $17 billion in 1990.

Crop outlook

The lingering effects of two consecutive

years of drought are clearly evident in the wheat outlook for 1990. But the drought's impact on the outlook for corn and soybeans has been diminished by a rebound in corn and soybean production in 1989. Thus, wheat prices are likely to remain strong, but the mid-1988 surge in corn and soybean prices will fade further as prospects for large crops and recovering inventories weigh down corn and soybean prices in 1990.

Continued drought in 1989 partially thwarted attempts to boost wheat production. A reduction in the percentage of wheat base acres idled for participation in the government farm program contributed to an increase of nearly a sixth in 1989 wheat plantings. Despite a rebound in northern Plains wheat yields, low yields and a high rate of abandonment in the drought-stricken central Plains states limited production gains from the larger plantings. At only 32.9 bushels per harvested acre, the national average wheat yield in 1989 was the lowest in more than a decade. As a result, the U.S. wheat crop was only an eighth larger than the drought-reduced 1988 crop.

Despite a 10 percent decline in wheat exports, projected wheat use will again be larger than the drought-shortened crop. As a result, wheat inventories will be drawn down for the fourth consecutive year to the smallest level since 1974 (Table 2). The narrow wheat inventories are likely to encourage a large expansion in production in 1990, which could eventually drive wheat prices lower. But any production shortfall resulting from continued adverse weather could cause wheat prices to surge even higher. Thus, dry early-winter growing conditions across much of the Great Plains wheat belt lends a large measure of uncertainty to wheat price projections. Nevertheless, the further drawdown of wheat inventories may boost average farm-level wheat prices during the 1989-90 marketing year almost to the $4.10 target price (Table 3).

In contrast to the drought's continued impact on the wheat crop, feedgrain (corn, sorghum, barley, and oats) production bounced back in 1989. Production of corn, the principal feedgrain, rebounded by more than half. Nevertheless, corn use is expected to be larger than the 1989 crop due to a modest rebound in domestic feed use and continued strong export demand. But the projected drawdown in corn inventories during the 1989-90 marketing year is slight compared with the huge drawdown of a year earlier. The production rebound, limited inventory drawdown, and prospects for a larger crop in 1990 are expected to result in an average corn price during the 1989-90 marketing year well above the $1.65 loan rate, but well below the average price of a year earlier.

Soybean production rebounded more than a fourth in 1989. The larger crop, limited gains in domestic use, and an export-constraining surge in foreign production are expected to boost U.S. soybean inventories to pre-drought levels. Strong domestic feed demand by expansion-minded hog and poultry feeders and steady soybean meal exports are expected to support slightly larger soybean meal production. Although the larger meal production will increase soybean oil production, soybean oil stocks will be drawn down sharply by plummeting imports and larger domestic use. The recovery in soybean inventories is expected to weigh down average prices for both soybeans and soybean meal, while the drawdown in soybean oil inventories supports soybean oil prices.

Livestock outlook

The drought's impact on the livestock sector will also diminish in 1990 as the recovery in feedgrain and soybean production pushes feed prices lower and feeding margins higher. Lower feed costs could help boost total production of red meat and poultry about 3 percent to a new record. Beef and pork production are both expected to increase about 1 percent, while poultry output may surge nearly 7 percent.

TABLE 2

U.S. agricultural supply and demand estimates on December 12, 1989

(Millions of bushels or metric tons)

	Corn (bu.) Sept. 1-Aug.31			Feedgrains (mt.) June 1-May 31		
	1987-88	1988-89	1989-90	1987-88	1988-89	1989-90
Supply						
Beginning stocks	4,882	4,259	1,930	152.1	133.6	65.9
Production and imports	7,076	4,926	7,593	216.5	150.6	224.2
Total supply	11,958	9,185	9,523	368.6	284.3	290.0
Demand						
Domestic	5,967	5,195	5,475	182.3	156.3	166.2
Exports	1,732	2,060	2,150	52.6	62.1	62.8
Total demand	7,699	7,255	7,625	234.9	218.4	229.0
Ending stocks	4,259	1,930	1,898	133.6	65.9	61.0
Stocks-to-use ratio	55.32	26.60	24.89	56.88	30.17	26.64
	Soybeans (bu.) Sept. 1-Aug. 31			**Wheat (bu.) June 1-May 31**		
	1987-88	1988-89	1989-90	1987-88	1988-89	1989-90
Supply						
Beginning stocks	436	302	182	1,821	1,261	698
Production and imports	1,923	1,548	1,937	2,124	1,834	2,062
Total supply	2,359	1,850	2,119	3,945	3,095	2,760
Demand						
Domestic	1,255	1,141	1,204	1,092	973	1,042
Exports	802	527	580	1,592	1,424	1,275
Total demand	2,057	1,668	1,784	2,684	2,397	2,317
Ending stocks	302	182	335	1,261	698	443
Stocks-to-use ratio	14.68	10.91	18.78	46.98	29.12	19.12

Source: U.S. Department of Agriculture, Foreign Agricultural Service, *World Agricultural Supply and Demand Estimates.*

TABLE 3
U.S. farm product price projections

Crops	Marketing years 1988-89*	1989-90†	Percent Change
Wheat	$3.72/bu.	$3.80-3.95/bu.	4.17
Corn	$2.54/bu.	$2.10-2.40/bu.	−11.42
Soybeans	$7.35/bu.	$5.25-5.75/bu.	−25.17
Livestock	**Calendar years 1989***	**1990†**	**Percent Change**
Choice steers	$71.94/cwt.	$71-77/cwt.	2.86
Barrows & gilts	$41.84/cwt.	$43-49/cwt.	9.94
Broilers	$.61/lb.	$.50-.56/lb.	−13.11
Turkeys	$.66-.67/lb.	$.57-.63/lb.	−9.77

*Estimated.
†Projected.
Source: U.S. Department of Agriculture, Foreign Agricultural Service, *World Agricultural Supply and Demand Estimates.*

Poultry will continue to increase its share of U.S. meat consumption in 1990. Total per capita consumption of red meat and poultry may increase nearly 5 pounds to 223 pounds, the fourth consecutive year of record meat and poultry consumption. Poultry will account for nearly all of the consumption gain, as per capita broiler consumption surges more than 4.5 pounds to 69.6 pounds. For the first time, broiler consumption may overtake per capita beef consumption, which is expected to drop to less than 68 pounds. Pork consumption is expected to edge up to about 63 pounds.

The cattle outlook is favorable in 1990, especially for ranchers. The nation's cow herd has shrunk nearly a fourth in the last 15 years. Continued strong market demand for the limited supply of calves produced by the shrunken breeding herd promises to maintain high feeder cattle prices well into 1990. Despite strong feeder cattle prices, expansion in the nation's cattle herd has been slow, and prospects for immediate expansion appear limited. During the past two years, expansion plans have been partially frustrated by the withered pastures and higher feed costs caused by drought. Continued dry pasture conditions in several Great Plains and Rocky Mountain states may limit expansion of herds or force some modest reductions in herds in some areas this winter. But over the next year or two, strong returns to cattle ranchers suggest a continued, gradual expansion in the size of the nation's cattle herd and in future beef production.

In 1990, continued strong feeder cattle prices could push the breakeven price for fed cattle to nearly $80 per hundredweight for at least part of the year. Continued strength in retail beef prices—which have risen to new records in each of the last three years—will be required to support fed cattle prices at profitable levels. But large competing supplies of pork and poultry are likely to limit any further gains in retail beef prices in 1990. As a result, profits for cattle feeders may be limited.

Pork production in 1990 will continue to recover from the effects of the 1988-89 drought.

Higher feed costs following the severe drought of 1988 cut sharply into returns for pork producers. The result was a rapid cutback in the size of the U.S. hog breeding herd. In the year ending September 1, 1989, the breeding herd shrank 3 percent. With the rebound in feedgrain production in 1989 and larger crops in prospect for 1990, however, lower feed costs are likely to contribute to improved returns and an expansion in breeding herds during the coming year. With continued strong demand, hog prices may be steady to slightly higher in 1990. Although hog prices may average above the 1989 average for the year as a whole, prices will likely fall below year-ago levels in the third and fourth quarters as production increases.

The steady expansion in poultry production of the 1980s is likely to continue in 1990, but at a slightly lower rate than in 1989. Broiler production, supported by continued positive returns, surged 7 percent in 1989 and is expected to increase an additional 7 percent in 1990. Sluggish profits, however, are expected to slow the expansion in turkey production from 6 percent growth in 1989 to 4 to 5 percent growth in 1990. Large supplies of red meats, combined with the seemingly relentless expansion in poultry production, may push broiler and turkey prices lower in 1990.

Summary

Another strong performance in the coming year will usher U.S. agriculture into the new decade. Continuing the farm recovery begun in 1987, farm incomes will be high and farm financial conditions will remain strong. Crop prices may weaken as grain stocks increase. Nevertheless, farm export prospects remain strong and grain stocks will be much less than the burdensome levels of the mid-1980s. With feed prices falling, livestock producers look forward to improving profit margins in the year ahead. Overall, another solid year in 1990 will enable U.S. agriculture to build an even stronger foundation to meet the changing markets of the coming decade.

III. Agriculture's Challenges In the 1990s

While agriculture looks forward to a solid outlook in 1990, what course will agriculture follow throughout the remainder of the decade? Even though the farm recovery is well established, the 1990s will pose great challenges for U.S. agriculture. No one expects the deep recession of the 1980s to repeat itself, but the coming decade may bring changes that, in some cases, could be even more sweeping than the financial adjustments of the 1980s.

Four issues stand out as challenges to agriculture in the decade ahead. Competing in what may be a more open world market will remain a critical factor determining agriculture's performance. Environmental concerns will become more important in agricultural policy decisions. New agricultural technologies may dramatically boost farm productivity, although the public may harbor suspicions about the safety of biotechnology breakthroughs. And in response to all these developments, new agricultural policy will evolve.

Competing in the world market

U.S. agriculture appears to be in a strong position to compete in world food markets in the 1990s. A loss of market share in the 1980s forced the United States to cut costs—from farm gate to export terminal. Yet the U.S. position in world markets in the decade ahead is not assured and will depend on policy developments and growth in the world food market.

The outcome of current trade negotiations under the auspices of the GATT (General Agreement on Tariffs and Trade) will be central to U.S. agriculture's outlook in world markets in

the coming decade. The Uruguay Round of GATT talks, scheduled to end in 1990, have made agriculture a critical subject from the outset of the round in 1986. So far, progress toward more liberalized trade in agriculture has been stymied. The United States, believing it will benefit from free world trade, has steadfastly maintained that agricultural trade should be completely liberalized. But the U.S. position has been blocked by the EC and Japan, who are more reluctant to phase out current agricultural subsidies and farm trade restrictions.[2]

Many observers fear the opportunity for constructive compromise on agriculture in the Uruguay Round may be passing. The final U.S. proposal, offered in October, included four main elements: 1) convert all agricultural trade restrictions to tariffs and then phase them out in ten years, 2) eliminate export subsidies in five years, 3) harmonize farm and food sanitary standards, and 4) phase out all internal farm supports that distort world trade. The U.S. plan has not been warmly received by the EC or Japan. The basic problem is that the other nations perceive the U.S. proposal as ideologically correct but insensitive to the social realities embedded in Japanese farm trade restrictions and the EC's Common Agricultural Policy.

If the Uruguay Round fails to produce an agreement on agriculture, the specter of continuing agricultural trade wars emerges as a distinct possibility for the 1990s. Although rising incomes are stimulating food demand in world markets, continued high levels of agricultural subsidies will elicit supplies sufficient to rebuild large surpluses. Such an outcome would prove expensive to taxpayers in the United States, Europe, and Japan. Under such an outcome, U.S. agriculture's current share of the world market could be maintained only with large government subsidies.

U.S. agriculture will be most competitive in the 1990s under a combination of freer trade and strong growth in world markets. The United States has learned in the 1980s that a sluggish world market provides easy access to producers such as Brazil and Argentina. These countries have relatively low costs of production, but only at relatively low levels of output. When world demand is great, U.S. unit costs of production remain low while costs in South America rise sharply. In addition, strong growth in the world market plays to the strength of U.S. agriculture's substantial infrastructure. No other producing nation can match the grain-handling network of highways, railroads, and waterways in the United States. But that network provides a competitive advantage only if it is used to capacity.

In short, U.S. agriculture may improve its market position in the 1990s. It has first-class soils, leading technology, and unmatched infrastructure. But for those competitive assets to be of value, the Uruguay Round must prevent escalation of agricultural subsidies and trade restrictions, and growth must continue in world food markets.

Addressing environmental concerns

Environmental issues loom large for the United States in the 1990s, and agriculture promises to be a key arena for debate on environmental reform. Agriculture is increasingly perceived by the general public as causing serious harm to the environment. Those concerns are at least partly justified. The use of chemical fertilizers, herbicides, and pesticides has led to groundwater contamination in nearly half of all U.S. counties, three-fourths of them rural (Holmes, Nielsen, and Lee 1988). Agricultural runoff is a serious problem that reduces the productivity of some key estuaries (Crutchfield 1987). And conversion of land to agricultural use has been a leading cause of the loss of wetlands. As these environmental problems have become better known, agriculture has come under greater public criticism. Such criticism stands in contrast to the traditional perception that farmers are

responsible stewards of the soil.

Closely related to environmental concerns are rising concerns about food safety. Highly publicized scares in 1989 over pesticide residue in apples, cyanide in Chilean grapes, and hormone residue in U.S. beef exports sparked new debate on food safety standards. One difficulty is that advanced detection methods can now spot levels of chemical residues that may be too minute to pose any danger to consumers.[3] Such scientific precision begs the more difficult question of what is an acceptable level of risk for pesticide residue. The question remains open to debate. The Food and Drug Administration, the Environmental Protection Agency, and the U.S. Department of Agriculture recently joined in proposing new food safety guidelines that seek a new balance between consumer benefits and consumer risks. Regardless of what regulations are finally adopted, alternative farm production techniques, notably Low Input Sustainable Agriculture, will receive greater attention from policymakers and researchers as alternatives to current chemical usage.[4]

Weighing policy choices concerning agriculture and the environment promises to be a thorny process involving many interest groups that are new to the farm policy arena. Indeed, environmental issues are bringing many new players to an agricultural policy process that historically has included just farmers. Such groups as the Audubon Society, Natural Resources Defense Council, and the Sierra Club now have staff devoted to agricultural policy analysis. The new diversity of interests will make the difficult task of assessing the economic and social costs and benefits of environmental solutions even more complex. While increased regulation of agricultural chemical use is possible, existing farm programs are more likely to be altered and new programs added to encourage a reduction in chemical use and protection of the environment.

Adopting new agricultural technology

Even as environmental concerns mount, the prospect for bold new technological advances increases. The 1990s may well be the decade of biotechnology.[5] The 1970s were a decade when growth in agricultural productivity was thought to have slowed sharply; food shortage was the chief concern. The 1980s were a decade when new productivity growth was found throughout the world, and even greater potential was suggested—in the form of biotechnology. The 1990s may finally see that potential realized.

Genetic engineering appears likely to boost the productivity of both livestock and crop production. To date, most biotechnology advances have occurred in livestock production techniques. The development of gene-insertion and embryo-transfer techniques and the mass production of growth hormones and vaccines promise to enhance animal productivity and disease resistance. For example, biotechnology has enabled BST (bovine somatotropin), a growth hormone that boosts productivity of dairy cows, and PST (porcine somatotropin), a growth hormone that boosts productivity of hogs, to be manufactured in mass quantities. These products are now on the verge of commercialization.

In the 1990s, further livestock gains are expected, and even larger potential appears for biotechnology applications to crop production and utilization. Biotechnology may make plants more hardy, more fruitful, and more resistant to disease and pests. Genetic changes that boost natural crop resistance to disease and pests also have the potential to dramatically reduce dependence on agricultural chemicals.

Biotechnology may also unlock new industrial uses for U.S. farm products. Crops may be altered, for example, to provide a higher yield of a particular oil, amino acid, or other compound with industrial applications. Such developments would benefit agriculture by boosting overall demand for farm products. But unlike

recent applications of biotechnology to animal production, the new plant breakthroughs appear to be years in the future.

How quickly biotechnology in any of its forms will be adopted in the coming decade is uncertain. Some environmental groups are attempting to slow or even stop the introduction of genetically altered plants or animals. Such arguments will probably be overridden when policymakers recognize that genetic engineering is, at least in part, a laboratory shortcut to the lengthy genetic selection process that has long been practiced in plant and animal breeding. Nevertheless, prudent regulatory oversight and a limited federal budget for research suggest a slow, cautious path to introducing biotechnology into the mainstream of U.S. agriculture. Farmers, however, appear willing to adopt biotechnology as soon as it becomes available. Due to greater concentration of farm production among larger producers, biotechnology may be adopted more quickly than previous technology advances, such as mechanization and agrichemicals.

Charting new directions for agricultural policy

The 1990 farm bill will be written with all of the above issues in mind. But unlike 1985, when farm financial stress and uncompetitive U.S. farm exports argued for a substantial redirecting of farm programs, 1990 brings a strong consensus for continuing the major focus of the existing legislation. The Food Security Act of 1985 is widely regarded as having met its goals of spurring a farm recovery and restoring export sales. Thus, both the administration and Congress have indicated a desire to use the 1985 legislation as the broad blueprint on which some modest policy corrections will be made.

The policy changes most likely to be made are greater flexibility in planting crops, reforms in federal crop insurance, new environmental provisions, and increased funding for agricultural research.

Flexibility is the leading policy issue for 1990. The problem is that the 1985 legislation encouraged farmers to maintain cropping patterns, in spite of changing market signals. The problem is best illustrated by the trade-off in planting soybeans or corn. U.S. soybean plantings have remained relatively low the past four years despite the fact that soybean prices have been high relative to corn prices. Two features of existing farm programs explain the anomaly. First, subsidies paid to corn growers are sufficiently large to encourage corn production at the expense of soybean production. And second, a shift out of corn production lowers a farm's corn base acreage eligible for subsidized production, thus reducing the farm's claim on future corn program benefits. While discouraging U.S. soybean plantings, U.S. farm policy encouraged aggressive expansion in South American soybean production with only limited competition from the United States.

Several policy innovations are under discussion to give farmers greater flexibility in their cropping decisions. Senators Richard Lugar and Patrick Leahy recently proposed the establishment of a normal crop acreage farm base (NCAFB), a concept similar to the normal crop acreage provision of the 1977 farm legislation. Under the NCAFB, any mix of approved crops could be planted on a farm's program base acreage to receive program benefits and preserve the base. The list of approved crops is uncertain.

Another proposal for enhancing flexibility is the so-called triple base, put forward by Congressman Charles Stenholm. Under this plan, a farm's base acreage would be divided into three parts: program base, flexible base, and idle acres. The program base would be planted to a specified crop that would be eligible for program payments. The flexible base would receive no program benefits, but could be planted to any crop. The plan reduces commodity program costs

while encouraging farmers to make decisions based on market prices.

Nearly all policymakers favor greater crop flexibility, but few agree on how to achieve it. To compete effectively in a rapidly changing world market, U.S. farmers must have incentives to respond quickly to market developments. Thus, more flexible commodity program provisions of one form or another are desirable and probably will be implemented.

Crop insurance may be reformed in the 1990 agricultural legislation due to mounting budget concerns over disaster assistance. Fully ten years ago, lawmakers redesigned the subsidized federal crop insurance program to serve as a viable long-term alternative to ad hoc disaster assistance. But in 1988, less than 30 percent of eligible acreage was enrolled in the crop insurance program. One reason most farmers opt out of insurance is their belief that federal disaster assistance will be granted if their crops are ruined. That belief has been well founded. Responding to drought, Congress authorized $4.0 billion in disaster aid in 1988 and another $897 million in 1989.

The lack of coordination between crop insurance and disaster assistance is costly to the public. Taxpayers end up underwriting periodic disaster aid as well as the ongoing losses of the federal crop insurance program. In 1988, federal crop insurance losses were estimated at $586 million.

A number of insurance reforms have been proposed. Crop insurance could be made a requisite for receiving commodity program benefits. A problem with compulsory insurance, however, is that such an approach overlooks numerous nonprogram crops. Alternatively, crop insurance could be subsidized further, or even provided free, to program participants. Again, this approach overlooks nonprogram crops and could encourage too much production on marginal land. Finally, the current farm program could be modified to provide protection against abnormally low yields as well as low prices, thus eliminating the need for other types of crop insurance. In this approach, the deficiency payments of the current farm program would be replaced by some guaranteed level of "target revenue," based on historical crop yields and some target price. The merit of this program would depend heavily on the level of target revenue. A low target would discourage participation in the program and probably increase demands for ad hoc assistance if a weather disaster occurred. A high target would inflate program costs. Regardless of the alternative chosen, crop insurance is a better long-run solution to crop production risks than expensive ad hoc disaster programs.

Environmental provisions almost certainly will be included in 1990 agricultural legislation. In keeping with the spirit of the 1985 farm bill, sodbuster and swampbuster provisions will continue. But the 1990 farm bill may tighten the wetlands provisions to aim more precisely at President Bush's publicly stated goal of no loss of wetlands. After much debate, new agricultural chemical regulations probably will not be enacted. The base of scientific information on groundwater contamination is limited, and much research remains to be done on underground migration of agricultural chemicals. Nevertheless, Congress is likely to increase research funding for alternatives to current cropping practices.

Agricultural research will be an important topic in the 1990 farm bill and beyond. Following the intense competition U.S. agriculture faced in the 1980s, Congress may be more willing to invest public dollars in agricultural research. The National Academy of Sciences (NAS) recently proposed an aggressive new public agenda for agricultural research. Under the proposal, federal spending on biotechnology and other basic agricultural research would be increased by $500 million. Currently, the federal government spends approximately $1.2 billion on agricultural research. The NAS proposal has some support

in Congress, but the full $500 million is unlikely to be funded given ongoing concerns about the budget deficit.

In sum, 1990 appears to be a year when agricultural policy will be fine-tuned. Unlike 1985, when a major change of course was legislated, most lawmakers in 1990 appear content with the major features of the existing farm bill. Nevertheless, modifications can be expected in crop flexibility, crop insurance, environmental provisions, and funding of agricultural research.

In some respects, 1991 could be a more eventful year for agricultural policy. If the Uruguay Round produces a new agreement on agriculture in December 1990, Congress would have to revise U.S. farm programs accordingly the next year. Members of Congress appear willing to make revisions if lawmakers in the European Community, Japan, and elsewhere are doing the same. Until then, Congress is equally willing to maintain pressure for reform by retaining relatively high target prices to protect farm incomes and by countering foreign export subsidies with the Export Enhancement Program.

IV. Conclusions

Agriculture enters the 1990s in sound condition. Following steep recession earlier in the 1980s, agriculture is in strong recovery. A historic financial restructuring of the industry is largely complete, and farm asset values are on the rebound. Rounding out the improvement in agriculture is a significant recovery in U.S. farm exports and stronger commodity markets in general.

U.S. agriculture can expect another strong year in 1990. Diminished wheat inventories resulting from two consecutive years of drought promise to support relatively high wheat prices while pushing open the planting restrictions of the government farm program. Rebounding feedgrain and soybean production may push down corn and soybean prices. But the attendant decrease in feed costs, record-setting meat production, and strong livestock prices will boost incomes for livestock producers. At more than $50 billion for the fifth consecutive year, cash farm income will be sufficient to sustain a modest increase in farmland values and bolster the industry's debt-carrying capacity. Despite stiffer competition from foreign wheat and soybean producers and lower feedgrain and soybean prices, the U.S. farm trade surplus will slip only slightly while remaining far above the meager level of the mid-1980s.

Beyond 1990, agriculture's course will be shaped by several issues. The competitiveness of U.S. agriculture will depend on the outcome of the Uruguay Round of GATT negotiations and the rate of growth in world food markets. Environmental concerns promise to bring change to some agricultural practices, either through regulation or incentive. Biotechnology could increase crop and livestock productivity dramatically, while opening up innovative uses for traditional commodities. And agricultural policy will evolve in response to changes in the industry and global markets. Modest corrections are expected in the 1990 farm bill, but a new GATT accord would lead to more sweeping change in 1991.

Endnotes

[1] Net cash farm income and net farm income are useful measures of the farm sector's financial performance. Net cash farm income is a cash-flow measure that reflects the sector's ability to meet its annual cash obligations. Net farm income provides a more accurate reflection of the financial progress that is due to the current year's production.

[2] The EC and Japanese objections to the U.S. proposal are unfounded, since the U.S. proposal allows continued farm income support. The United States does insist, however, that any support be provided in such a way that production and trade decisions are not affected.

[3] Scientists can now detect traces of some chemicals in concentrations of less than one part per trillion. Food safety legislation, however, has not kept pace with advances in detection methods. For example, the Delaney Clause, part of the 1958 Food Additives Amendment to the Food, Drug, and Cosmetic Act, specifies a zero tolerance for any food additive that may be carcinogenic. At the time this legislation was enacted, however, minimum detectable concentrations were far higher than today.

[4] The term "low-input, sustainable agriculture" actually embodies two separate concepts: low input and sustainable. Low input generally refers to farming systems that rely less on external purchased inputs, such as chemical fertilizers and pesticides, and more on internal resources, such as land and management. Sustainable agriculture defines farming systems capable of maintaining their productivity and usefulness to society indefinitely. Sustainable agriculture should be resource conserving, socially supportive, commercially competitive, and environmentally sound (Ikerd 1989).

[5] Biotechnology is a broad term, but generally applies to the use of molecular genetic techniques to improve plants or animals or to develop micro-organisms for specific uses. For a more complete definition and description of emerging biotechnologies, see U.S. Congress, Office of Technology Assessment 1986.

References

Crutchfield, Stephen R. 1987. "Controlling Farm Pollution of Coastal Waters," U.S. Department of Agriculture, Economic Research Service, *Agricultural Outlook*, November, pp. 24-25.

Holmes, Thomas, Elizabeth Nielsen, and Linda Lee. 1988. "Managing Groundwater Contamination in Rural Areas," *Rural Development Perspectives*, October, pp. 35-40.

Ikerd, John E. 1989. "Sustainable Agriculture." Paper presented at the U.S. Department of Agriculture Outlook Conference, Washington, D.C., November 29.

U.S. Congress, Office of Technology Assessment. 1986. *Technology, Public Policy, and the Changing Structure of American Agriculture*, OTA-F-285, Washington, D.C.: U.S. Government Printing Office.