Strengthening the Foundation for Future Growth in U.S. Agriculture

September 2006

I. Introduction

This paper is the fifth and final in a series of briefing papers that assess general themes advanced at the 2007 Farm Bill Forums held during 2005 by Secretary Mike Johanns as well as related issues that have emerged in recent months. The first four papers focused on production agriculture and its links to risk management, conservation, rural development, and energy. This final paper provides an overview of the changing agricultural marketplace and the key forces that underlie the competitiveness of American farmers.

The first section provides an overview of the major trends in the food marketplace and the strategies that farmers have employed to remain competitive in this changing environment. The next three sections provide a discussion of issues related to international trade, the research and development that leads to new technologies, and the protection of agriculture from pests and diseases—three of the key driving forces shaping the agricultural marketplace. The final section of the paper discusses challenges and issues in preparing new farmers for this competitive marketplace, especially the next generation of farmers. Each section concludes with a discussion of some key issues and challenges for the 2007 Farm Bill debate.

II. The Changing Agricultural Marketplace

Farmers in the United States benefit from a rich natural resource base, a long history of investments in research and infrastructure, and a large consumer market for their products. They have long been considered among the world's most competitive. Rising exports from competitors and ongoing structural change across the entire food and agricultural system have raised questions about future prosperity in agriculture.

Markets and the Competitiveness of American Farmers

A farmer in the 21st century produces for an increasingly complex and competitive marketplace driven by today's varied consumer demands and supplied by highly competitive producers from around the globe. Consumers seek tasty food that is convenient, nutritious, and inexpensive. American farmers have responded to these opportunities through changes in the types of crops and animals produced, closer links with food manufacturers, and by adopting new technology and management practices to meet the market's cost and quality dictates.

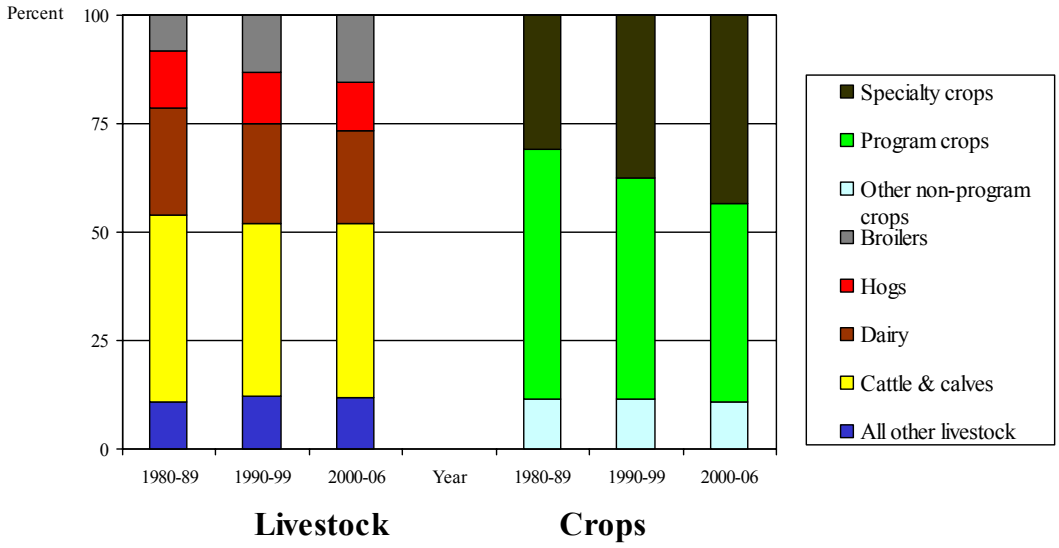
Consumer-driven agriculture. American consumers have high expectations for the food they eat: variety, taste, nutrition, and safety represent just the basics. In addition, consumers

increasingly purchase food for other attributes such as convenience or organic production practices. Against this backdrop of varied demands for food, price still matters. With low food prices and increasing affluence, American consumers spend on average only 10 percent of their disposable income on food, the lowest percentage in the world.

Consumers' high expectations for their food have driven change across the entire food system. Their varied preferences for price and quality support multiple business models in food retailing, manufacturing, and farming. One strategy is to develop tighter supply chains so that signals from consumers are directed quickly to farmers. For example, the pork industry has become highly integrated and delivers an ever evolving array of convenience products such as marinated tenderloins and ribs. Another strategy is to focus on niche markets including providing environmental services. Producing crops for energy markets represents yet another opportunity for farmers. Farmers also engage increasingly in other farm-related businesses such as custom work and tourism.

Farmers respond to market opportunities. To remain competitive farmers have followed diverse paths that include changes in the crops and livestock produced, size of operation, types of business arrangements, and increased participation in off-farm jobs. The mix of crops and livestock has evolved in line with consumer demands as seen by the growing share of broilers in livestock receipts and similarly the growth in specialty crops in crop receipts (Figure 1). For the first time, revenues in 2006 from specialty crops are forecast to slightly exceed those from

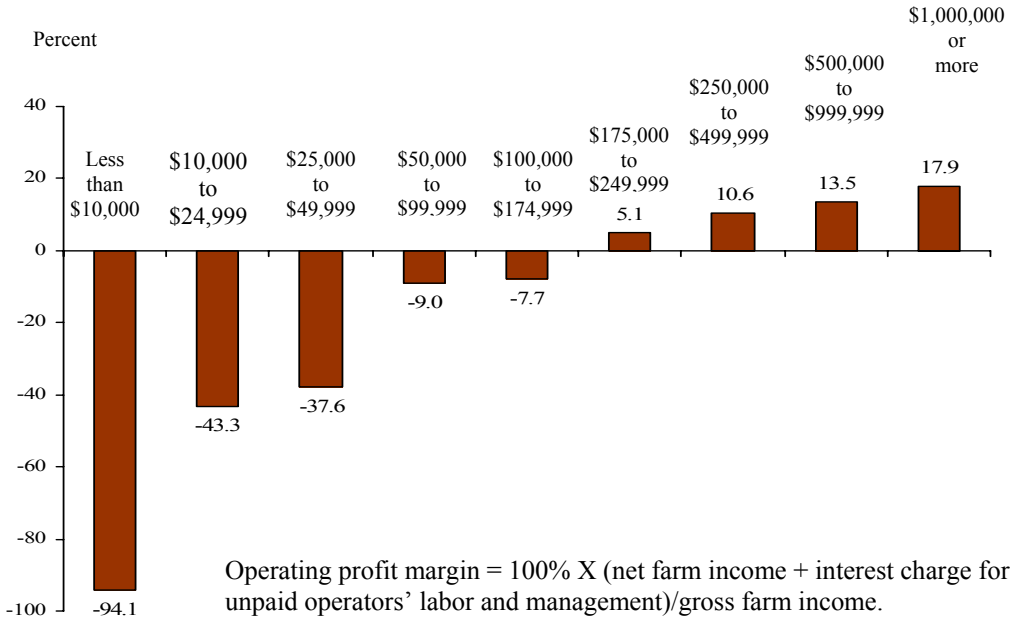
Figure 1. Distribution of Cash Receipts by Livestock and Crop, U.S., 1980-2006



farm program crops (grains, oilseeds, cotton). Specialty crops include fruits and vegetables, but also the rapidly growing category of nursery products where farmers have taken advantage of the booming housing market.

In the past 100 years, getting bigger has been a widely adopted strategy to remain competitive. Technological advances such as mechanization, hybrid seeds, and chemicals for weed and pest control have all permitted a single farmer to produce more. The pressures to increase the size of operations remain today because on average, larger farms (as defined by sales) are more profitable (Figure 2). Economies of size enable these large commercial farms to have low unit costs. By contrast, most intermediate and rural-residence farms do not cover production costs from farm income.

Figure 2. Farm Operating Profit Margin by Annual Sales

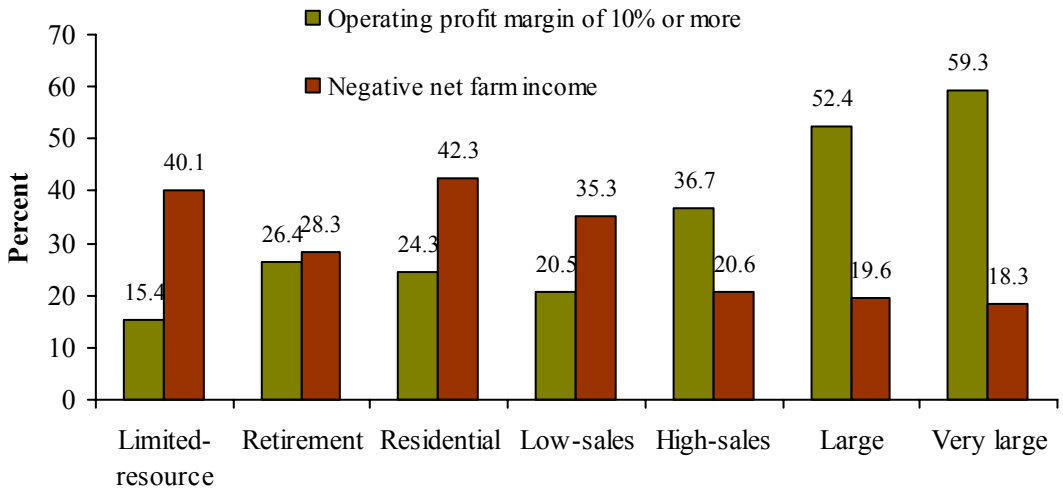


Operating profit margin = 100% X (net farm income + interest charge for unpaid operators' labor and management)/gross farm income.

*Standard error is between 25 percent and 50 percent of the estimate.
**Standard error is between 51 and 100 percent of the estimate.
***Standard error is between 126 percent and 150 percent of the estimate.

While higher sales appear to explain farm profitability, the actual story is much more complex. As shown in Figure 3, the percent of both profitable farms and those who lose money is broken out into the groups defined by the Economic Research Service (ERS) Farm Typology. At all sizes—including the generally small rural residential farms where farming is a secondary occupation—some farms are profitable.

Figure 3. Selected Measures of Farm Financial Performance, 2003



What explains the competitiveness of small- and medium-size farms against a long-term trend towards increasing size? The varied consumer marketplace provides one part of the answer where niche and local markets provide opportunities for small farms. In addition, a farmer's varied business strategies also explain the pattern of profitability.

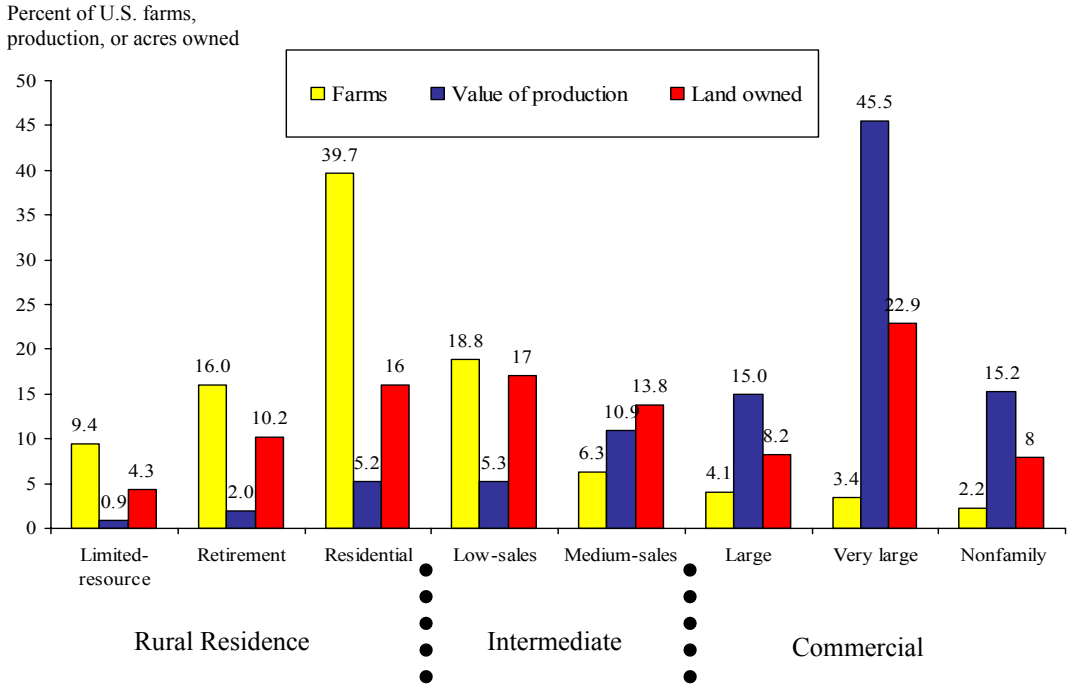
Diversity of U.S. Agriculture

Farming today consists of enormously different farms growing numerous crop and livestock products for sale in markets that range from their immediate neighbors to consumers worldwide. Farms differ in size, type, and value of commodities produced, technology used, resource endowment, financial status, and other attributes. Farmers differ in time commitment, management abilities, business goals, and financial resources. Grouping farms into three types—commercial, intermediate and rural residence—based on both their size of sales and primary occupation reveals key differences in terms of their numbers, shares of production, land holdings and reliance on off-farm income (Figure 4).

In 2004, there were 205,000 commercial farms. This group consists of large family farms with sales above $250,000 and nonfamily farms. This small proportion of farms, just under 10 percent of all farms, accounted for about 75 percent of total output. These farms have business goals that include containing costs and increasing sales and they are generally profitable. Despite their large share of farm production, they only own about 29 percent of farmland.

Figure 4. Distribution of Farms, Value of Production, and Land Owned, 2004

Small farms account for 24 percent of production, but 90 percent of farms and 60 percent of land owned by farmers



A second group of farms, nearly 1.4 million rural-residence farms, represent about two-thirds of all farms but only 8 percent of total output. They own nearly one-third of all farmland. These farm operators combine nonfarm jobs with farming. They include retired individuals and those who view farming as an investment and/or a way to enjoy rural amenities. For most of these farms there is little dependence on the farm economy for their income. Even though most of these farms are not profitable as stand-alone farm businesses, these rural-residence farm households typically have incomes comparable to or exceeding those of nonfarm households.

A third group of about 528,000 farmers consider farming their primary occupation and share goals with both commercial farms and rural-residence farms. These intermediate farms account for about 16 percent of total production and own about 31 percent of all farmland. Some emphasize economic and financial objectives much like the larger, more commercial farms and compete with their commercial competitors. Others have goals that align them more closely with smaller, less commercial operations. Those without substantial off-farm earnings often rely on alternative uses of agricultural resources to generate income. Many use farm equipment to provide custom work to other farms, some rent land to other farmers, and some provide hunting and other outdoor recreation as a way of generating additional income.

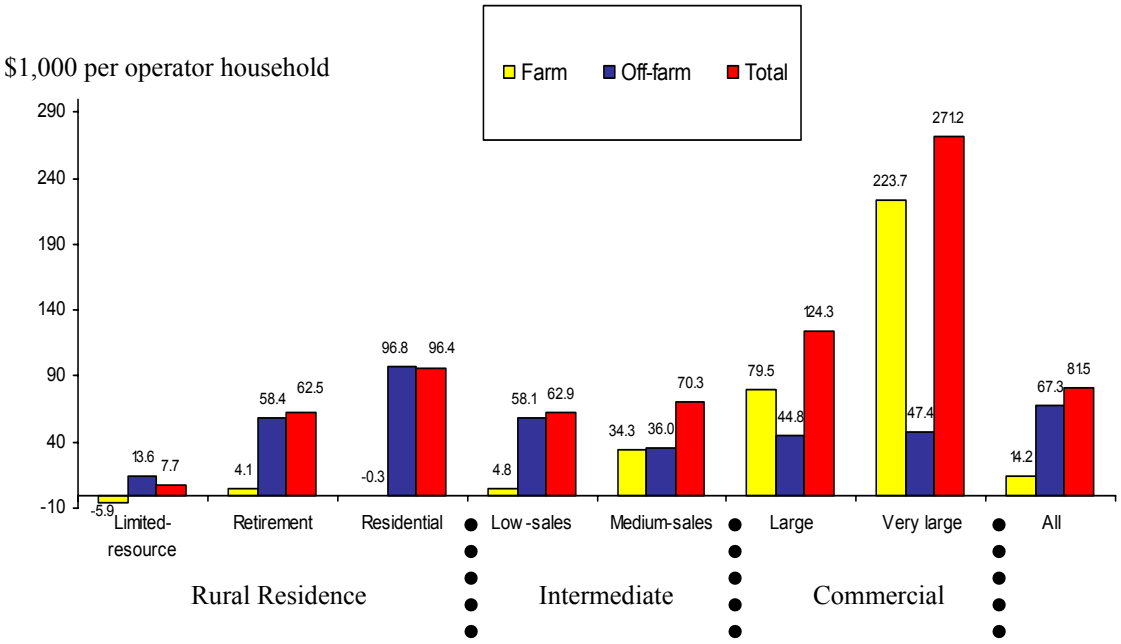
Role of Off-farm Income

In 1970, only about 52 percent of farms had off-farm income. Today, virtually all farms report some off-farm income as fewer farmers are full time with many choosing to merge both farm and nonfarm employment.

Off-farm income is increasingly important to the economic well-being of most farm operator households. In 2004, average farm operator household income for all farm operators was $81,500. While income from farming, as measured by net farm income averaged only $14,200, off-farm sources contributed on average $67,300 (Figure 5). As might be expected, the data show that the importance of off-farm income decreases as farm size increases.

Figure 5. Mean Farm, Off-Farm and Total Operator Household Income, 2004

Most farm operator household income for small family farms comes from off-farm sources.



Off-farm income is especially important for rural-residence farms, which on average regularly generate little or no income from the farm, with many actually reporting negative net farm incomes. Not surprisingly, most rural-residence farms subsidize their farming activities as part of a rural lifestyle. Off-farm income is also critical for many intermediate farms, especially for those with sales under $100,000 (low sales), but contributes only a small share of total income to commercial farm households. On many larger commercial farms, family members work off-farm. Even on very large farms, income from off-farm sources in 2004 averaged $47,400. The widespread importance of off-farm income and related benefits, such as health insurance, illustrates that for the majority of farm households, the economic state of the general economy may be more important to their economic well-being than the level of commodity prices or the overall conditions in the farm economy.

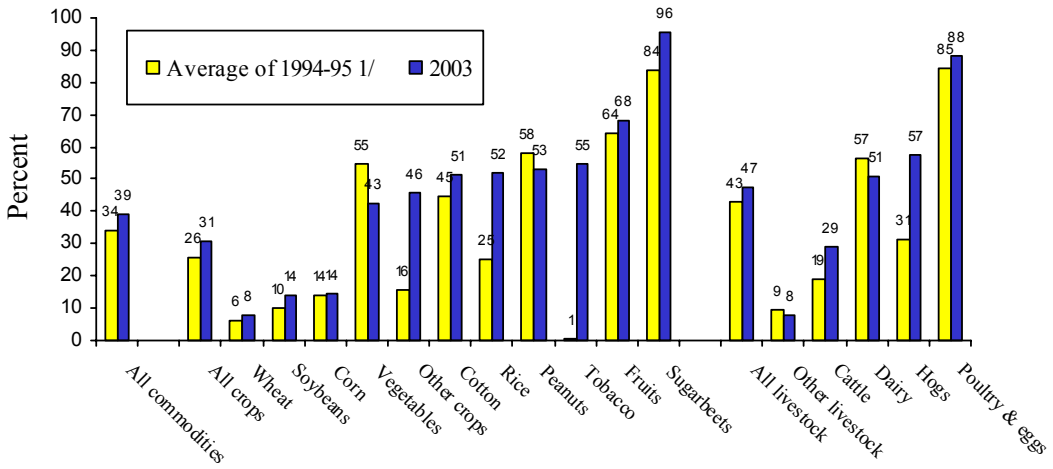
Farm Management Strategies and Business Arrangements

Farmers use a variety of business arrangements to link themselves to other firms and individuals. These links vary by farm type and include arrangements to access the control of productive resources and to market the commodities they produce.

The key to agricultural production is the control of land and other assets. This control can be accomplished through renting or leasing rather than purchasing. Farms can also use hired labor, contract labor or custom work rather than family labor. Today, almost one-half of the acreage in production is rented. Three-fourths of all commercial family farms and intermediate farms with sales over $100,000 rent land as part of their farm production strategy.

A growing management strategy is the use of marketing or production contracts which are used by all sizes of farms, although more extensively by large farms. Farmer use of contracts depends partly on the type of product produced (Figure 6). Contracting remains at a relatively low rate for grains, which remains a bulk commodity business. In contrast, contracting is the dominant marketing method for horticultural products and has grown for hogs at the same time integration has increased across the marketing chain.

Figure 6. Production Under Marketing or Production Contracts for Selected Commodities



*Standard error is between 25 percent and 50 percent of the estimate.
[1]An average of 1994 and 1995 was used to provide a more statistically reliable estimate.

Issues and Challenges for the 2007 Farm Bill

The complexity and diversity of the farm sector suggests a wide divergence in the realities of farming across the country. The issues, concerns, and opportunities of larger, commercially oriented farms differ substantially from those of smaller rural-residence and most intermediate

farms, regardless of location. Moreover, the challenges of commercial farms in one region may be vastly different from those in another. Farms in the Corn Belt, for example, may be most concerned about eroding competitiveness from rising land prices and rental rates and gaining greater access to global grain markets. Increasing competition for farmland both from neighbors looking to expand and from relocating farmers that are looking to reinvest proceeds from the sale of higher valued land near urban areas have contributed to significant increases in farmland values. Rising rental rates are also a concern as these farmers increasingly look to rent land as a means to farm additional acreage and spread fixed costs over a larger scale of operation.

In contrast, the more diversified farms in the western and southern coastal areas that primarily produce fruit, vegetable, nursery, and other high-value crops may be most concerned about increasing competition from imports and the cost and availability of farm labor. These labor intensive farms hire a majority of the farm workers and accounted for over half of the $20.6 billion in farm labor expenses for all farms in 2004. These farmers, along with many farm-related industries, have increasingly relied upon foreign born workers, especially for entry level jobs. The outcome of the ongoing immigration reform debate could have significant implications for the cost and availability of farm labor that will affect the ability of farm operators to maintain or expand planted acreage of these labor-intensive crops.

Farmers of all types are faced with multiple sources of risk. Traditionally farmers have proven resilient to a host of natural and market challenges, including weather-caused production losses, diseases and pests, and variable prices. The "Risk Management" paper characterized these risks. Some of these risks can be addressed through innovative management strategies and research and development (R&D). For example, R&D can lead to new varieties that are resistant to diseases or innovative biological control methods for pests. This type of R&D is important as the U.S. agricultural sector faces increasing pressures from plant and animal pest introductions, many of which pose significant economic, environmental, and societal threats.

II. The Role and Contribution of International Trade

Major changes in the world's population and economy in coming decades will offer the prospect for greatly expanded agricultural trade. More people, with greater disposable income, will get their food and fiber from a constantly changing global production, processing, and marketing system. For many nations, the best way to meet increasing demand for agricultural products will be through trade, because agricultural resources are not always located in the same areas where populations and food markets are the largest or growing the most rapidly.

The world's population is projected to increase from 6.3 billion in 2003 to 7.5 billion in 2020, or by 1.2 billion people. More than 95 percent of this increase will be in developing countries. Consumer incomes also will grow in the next two decades. Incomes in developing countries are projected to grow at twice the rate of wealthier countries. Stronger income growth will raise the amount that households in many poorer countries spend on food. Food consumption in developed countries will also continue to change as consumers shift the composition of their food spending to realize greater dietary variety, health benefits, and convenience.

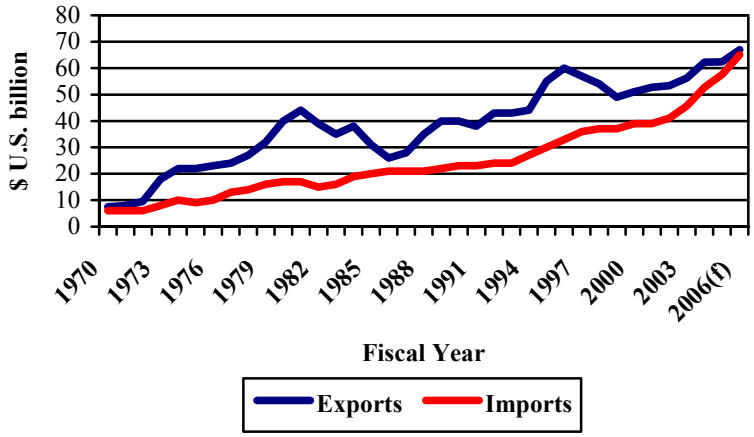
Supplying food requires more than just agricultural production. Transportation is essential for farm goods to reach markets and consumers. A sound legal system, finance for commodity transactions, food quality and safety, and a physical infrastructure for processing, packaging, and storing are all parts of the supply chain that brings food to consumers.

USDA recently projected that, assuming countries' agricultural policies remain as they were in 2005, population and income changes over just the next 10 years would lead to increases of 15 to 20 percent in the global import volume of coarse grains, wheat, and almost 40 percent for soybeans. Global increases in imports of meats will also be robust, ranging from almost 20 percent for beef to almost 40 percent for pork. This increased trade will be very important to the livelihoods of farmers in exporting countries, including the United States.

The Role of Agricultural Trade in the U.S. Farm Economy

International trade is a key part of the U.S. agricultural and food economy. U.S. consumers are only a small part of the world's population, and expanding foreign demand has boosted U.S. food and agricultural exports from $7 billion in 1970 to a projected $68 billion in fiscal year (FY) 2006. At the same time, U.S. consumer demand for variety and year-round product availability has led to increased food imports, projected at $64.5 billion in FY 2006 (Figure 7).

Figure 7. U.S. Agricultural Trade



Exports are critical for U.S. agriculture. Over many decades, U.S. agriculture has shown an ability to increase output while reducing cost per output. Without any change in demand, this growth in productivity would cause prices to fall. For many agricultural products, the main opportunity for further growth in demand has been in export markets. Continued growth in output will require maintaining and increasing access to foreign markets.

Compared with the rest of the U.S. economy, the agricultural sector depends much more heavily on global markets. For example, on average, U.S. farmers export 49 percent of their wheat, 35 percent of their soybeans, and 15 percent of their poultry (Table 1). For many high-valued products, export dependency is even higher—over 70 percent for almonds, over 60 percent for sunflower oil, almost 40 percent for grapefruit, and over 40 percent for walnuts. The prices

farmers receive and income they earn from these products would be sharply reduced if producers lost access to export markets.

Measuring the Importance of Trade

There are several ways to measure the importance of trade to agriculture, none of which are perfect. A typical approach is to compare the value of exports to the value of agricultural production or to farm cash receipts, which use prices received by farmers. This figure is 23 percent for 2005. But a major shortcoming is that exports are valued at the point of export, which includes the value of farm-to-port transportation and other costs. It is also difficult to measure the value of processed products at the farm gate, which account for a large share of U.S. agricultural exports. Another factor affecting export share that is not captured in this measure is the increasing amount of corn, soybeans, and other feeds that are exported indirectly in the form of meat rather than directly as bulk commodities.

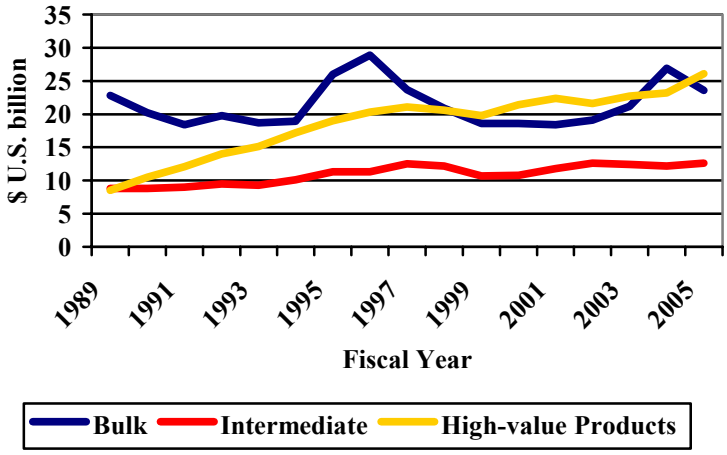
Table 1. U.S. Farm Exports

Share of U.S. Production Exported								
	Wheat	Cotton	Rice	Corn	Soybeans	Broilers	Beef	Pork
Average over								
1961-69	53.8%	34.4%	51.0%	12.3%	37.9%	2.0%	0.2%	0.5%
1970-79	57.8%	44.1%	58.9%	24.6%	38.0%	2.3%	0.4%	1.5%
1980-89	58.9%	47.6%	52.5%	26.2%	38.8%	4.3%	1.8%	1.3%
1990-99	48.7%	39.8%	46.0%	20.8%	34.4%	13.1%	6.9%	4.2%
2000-05	49.2%	62.8%	49.7%	18.3%	35.3%	15.5%	7.0%	9.3%
Share of World Production								
	Wheat	Cotton	Rice	Corn	Soybeans	Broilers	Beef	Pork
Average over								
1961-69	13.3%	23.9%	1.4%	44.4%	67.6%	28.5%	26.8%	18.1%
1970-79	13.4%	19.4%	1.4%	44.6%	67.5%	23.6%	24.8%	15.0%
1980-89	13.0%	16.4%	1.5%	41.4%	55.5%	22.2%	21.4%	11.6%
1990-99	11.4%	19.4%	1.5%	40.3%	46.8%	24.3%	20.5%	10.1%
2000-05	9.6%	19.9%	1.7%	40.8%	39.4%	22.8%	20.2%	9.3%
Share of World Exports								
	Wheat	Cotton	Rice	Corn	Soybeans	Broilers	Beef	Pork
Average over								
1961-69	42.3%	24.7%	19.0%	52.4%	87.6%	16.4%	1.0%	6.3%
1970-79	43.2%	19.7%	21.5%	67.8%	87.8%	12.4%	1.2%	9.5%
1980-89	37.4%	20.4%	20.1%	67.4%	74.7%	16.5%	4.1%	4.2%
1990-99	30.1%	25.0%	13.8%	67.2%	62.8%	40.0%	11.6%	9.1%
2000-05	25.5%	37.9%	12.2%	63.1%	46.1%	30.9%	10.6%	13.9%

Agricultural exports also play an important role in the overall U.S. economy. In 2004, every dollar of direct export sales generated another $1.48 in supporting economic activity, creating jobs not only on farms, but also in processing, transportation, and supporting activities. Some 825,000 jobs were generated from agricultural exports in 2004—388,000 on farms and 437,000 in assembling, processing, and distributing products for export. These export-related jobs and other business-related gains benefited all regions and sectors of the U.S. economy.

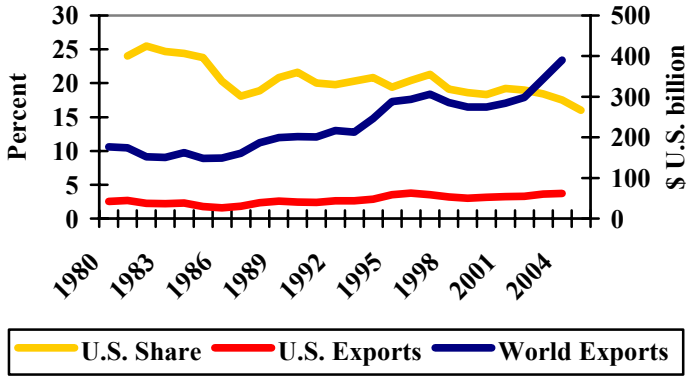
Throughout much of the 1970s and 1980s, U.S. agricultural export growth was centered on bulk commodities to food- and feed-deficit markets such as Japan, South Korea, Taiwan, and the former Soviet Union. But global trade in consumer-oriented/high-value products also grew rapidly during that period, as consumers in high-income countries demanded more foreign food products. U.S. exports of high-value products—meats, fruits and vegetables, dairy products, and processed foods—expanded rapidly. Through the mid-1990s, these products accounted for an increasing share of growth in U.S. agricultural exports. However, since the mid-1990s, growth in both global and U.S. processed food trade has slowed, and bulk agricultural commodities still account for almost 40 percent of U.S. agricultural exports (Figure 8).

Figure 8. Composition of U.S. Exports



Despite being the world's largest single country agricultural exporter, and a leading exporter for many commodities and products, the U.S. market share of export value has slipped over the past two decades (Figure 9). This development reflects export growth of traditional suppliers such as Canada, Australia, Argentina, and New Zealand, as well as increasing competitiveness of newer actors, including Brazil, Thailand, and Vietnam. Regional trading arrangements, such as EU enlargement, have encouraged regional trade growth and cut into U.S. export opportunities.

Figure 9. U.S. Share of World Exports



Agricultural imports also provide benefits. Imports of goods and services also benefit U.S. consumers and the economy. Despite its agricultural bounty, the United States is the world's second-largest importer of agricultural goods in value behind the EU. U.S. demand for food imports is driven by strong purchasing power, low import barriers, and tastes and preferences for food products not widely produced in the United States. About 11 percent of the value of U.S food consumption is imported.

Over the last 20 years, the mix of U.S. imports has broadened to include a wider range of fruits, vegetables, beer, wine, and livestock products in addition to tropical products, such as cocoa and bananas. More reliable supplies from foreign sources, improved shipping and storage technology, and wider ethnic diet preferences have contributed to these increases. Imports, together with domestic output, make fresh produce available year-round.

Given the fluctuation in exports and the rapid growth in imports, the agricultural trade balance has shrunk since 1996. Although the agricultural trade balance is a closely watched measure, it is not an indicator of competitiveness or import dependence. Trade is a means of providing for the needs and wants of consumers that are not satisfied domestically (such as bananas and coffee) or are produced more cheaply elsewhere (such as fresh cut flowers and pineapples). A lower U.S. agricultural trade surplus does not signal reduced competitiveness of the U.S. farm sector, but rather U.S. consumers' preference for a wide variety of foods and beverages. In the future, such factors as U.S. competitiveness, foreign economic growth, U.S. consumer demand, and exchange rates will determine the shape and size of the U.S. agricultural trade balance.

Role and Importance of Trade Agreements

The value and diversity of U.S. agricultural exports is tremendous, with major export flows of grains, oilseeds, meats, fruits, vegetables, fibers, and processed food products. On the import side, the large, wealthy, and diverse U.S. population buys large quantities of a wide range of products. U.S. exports and imports together give the United States a significant interest in agricultural products produced and traded around the world, and explain the long-held U.S. interest in the rules governing world trade. The United States has a big stake in fair, orderly, and open agricultural trade.

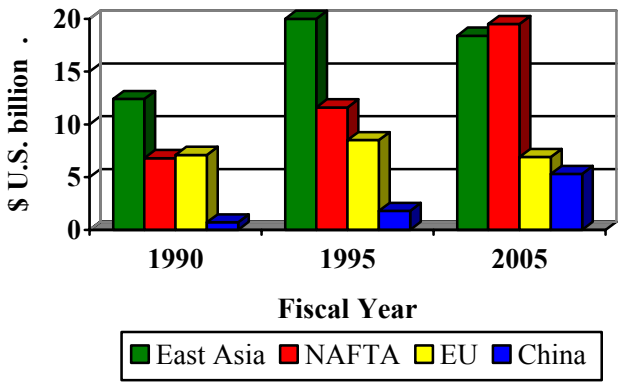
Current levels of trade, as well as future growth, depend not only on commercial considerations but also on the rules that countries follow. Over the past half century, the United States has worked with other countries to reduce barriers to trade in various ways. The most significant has been a series of multilateral negotiations, originally under the auspices of the General Agreement on Tariffs and Trade (GATT, 1947-94), and more recently under the GATT's successor, the World Trade Organization (WTO, 1995-present). The United States has also negotiated a number of regional and bilateral trade agreements. The most prominent of these is the North American Free Trade Agreement (NAFTA, 1994-present) with Canada and Mexico.

U.S. agriculture benefits from multilateral and regional trade agreements. Multilateral trade negotiations have improved the international trading system by lowering trade barriers, making the system more transparent, and establishing rules for dispute settlement. During the first seven rounds of GATT negotiations, however, the agricultural sector was exempted from many of the agreements that applied to industrial goods. The Uruguay Round (UR, 1986-94) represented a major shift by lowering agricultural tariffs and establishing disciplines on export subsidies and domestic support programs that distort agricultural trade.

The United States has also negotiated agreements for freer trade with regional and bilateral partners. While NAFTA is the most well-known, the United States has implemented free trade agreements with Israel, Chile, Jordan, Singapore, Australia, Morocco, and the Dominican Republic and five Central American countries (although Costa Rica has not yet implemented the agreement), and signed or completed agreements with Bahrain, Oman, Peru, and Columbia. Similar agreements are being pursued with Panama, Malaysia, South Korea, and other countries.

The importance to U.S. agricultural exports of trade agreements can be seen in changes in the destinations of exports over the last 30 years (Figure 10). In 1976, Europe was the destination for about one-third of U.S. agricultural exports; by 2005, Europe accounted for less than 11 percent. Trade barriers and subsidies kept the EU market for many U.S. farm products from growing, and U.S. exports have declined. The share of Canada and Mexico rose from 8 percent in 1976 to 31 percent in 2005, partly because of lower trade barriers resulting from NAFTA. China has become a growing market, particularly following its accession to the WTO in 2001.

Figure 10. Destination of U.S. Agricultural Exports



Barriers to agricultural trade. Despite the success of the UR, many barriers to U.S. agricultural exports remain. High tariffs add to the cost and decrease the competitiveness of many U.S. agricultural exports both to wealthier, industrialized countries and to developing countries. ERS has estimated average agricultural tariffs of WTO members at 62 percent, compared to a U.S. average of 12 percent. U.S. exports compete against subsidized production of farm commodities in certain countries, especially in the EU, Japan, and other developed countries. Some export competitors—notably the EU—still provide substantial export subsidies for key products.

Even though tariffs and other border measures have been reduced, foreign governments increasingly rely on sanitary and phytosanitary (SPS) measures and technical standards that do not have sound scientific justification, such as food safety regulations and plant and animal disease requirements, to block U.S. products.

Benefits from trade reform. Economic analysis from many sources concludes that the costs of agricultural support and protection are high and that reform would bring substantial gains to both developed and developing countries (see suggested readings). An ERS study indicates that present levels of global agricultural tariffs and subsidies depress world agricultural prices by about 12 percent and lower the volume of world agricultural trade by 15 percent. Full elimination of global agricultural policy distortions would boost world welfare by $56 billion, or 0.2 percent of world GDP. Most of the market distortions are accounted for by tariffs (52 percent of the total), with additional welfare losses from domestic subsidies (31 percent) and export subsidies (13 percent).

The outlook for trade reform. The continuing importance of trade to the U.S. agricultural economy, and the remaining restrictions and protection in global agricultural markets, has made the United States a strong proponent for continuing the multilateral reform process started by the UR. To this end, the United States was instrumental in kicking off the Doha Development Agenda in November 2001.

WTO members, under the auspices of the Doha Round, are seeking to improve upon the gains made under the three pillars of the UR—market access, export subsidies, and domestic support. Although reaching a final agreement remains elusive and negotiations were suspended in August, WTO members have preliminarily agreed to eliminate export subsidies by 2013, make substantial cuts in tariffs through a tiered process, and reduce and harmonize trade-distorting domestic support. In addition, members have agreed to reach new disciplines on food aid, government export credit programs, state-trading enterprises, tariff-quota administration, and other measures that continue to limit global trade.

USDA International Programs

USDA has a variety of international programs that support the expansion of U.S. agricultural exports, provide technical assistance to developing countries, and support international development objectives. The 2002 Farm Bill expanded funding for these programs and established several new programs. The programs are primarily administered by the Foreign

Agricultural Service (FAS) and fall into five broad categories: market development, export subsidies, commercial export financing, international development, and food aid.

Market development programs include:

- The Market Access Program assists cooperatives, small businesses, and non-profit trade organizations to finance promotional and marketing activities for U.S. agricultural products.
- The Foreign Market Development Program supports technical assistance, trade servicing, and market research activities that are designed to remove long-term impediments to U.S. exports.
- The Emerging Markets Program provides funding for technical assistance activities to address technical barriers to U.S. exports in emerging markets.
- The Quality Samples Program helps U.S. agricultural trade organizations provide samples of their agricultural products to provide a better understanding of their characteristics and quality to potential markets.
- The Technical Assistance for Specialty Crops program provides funding for projects that address phytosanitary and related technical barriers that restrict exports of U.S. specialty crops.

Export subsidy programs include the Dairy Export Incentive Program and the Export Enhancement Program (EEP). The EEP has not been active for many years and the DEIP has not been used for over two years.

Commercial export financing programs include the GSM-102 program and the Supplier Credit Guarantee Program (SCGP), which provide federal government guarantees of commercial lending for imports of U.S. agricultural products, at varying rates of coverage and tenor. The SCGP is not currently operational. The Facilities Guarantee Program (FGP) provides payment guarantees to finance commercial exports of U.S. manufactured goods and services that will be used to improve agriculture-related facilities in emerging markets where inadequate storage, processing, or handling capacity limit trade potential.

USDA international food aid programs include Public Law 480 Title I credit sales, the McGovern-Dole International Food for Education and Child Nutrition program, Section 416(b) donations, and Food for Progress grants. In addition, USDA has administered commodity procurement for the P.L. 480 Title II program, and manages the Bill Emerson Humanitarian Trust. In recent years, the programming focus has increasingly shifted to meeting emergency and humanitarian needs.

International development programs include a wide range of technical assistance, education and outreach programs for emerging markets and developing countries that are designed to support the development of science-based regulatory policies and promote food security. USDA international development programs are increasingly focused on trade capacity-building, or trade-related technical assistance, to support U.S. trade policy objectives by enhancing developing countries' ability to trade.

For many years the United States has had programs to assist firms and workers in adjusting to import competition. A new program aimed at farmers, Trade Adjustment Assistance (TAA) for Farmers, was established by the Trade Act of 2002 for FYs 2003 to 2007. Under the program, the USDA provides technical assistance and cash benefits to eligible farmers and fishermen if increased imports have contributed importantly to a price decline of at least 20 percent.

Issues and Challenges for the 2007 Farm Bill

International trade has been an important contributor to U.S. agriculture's prosperity. Food imports have provided consumers with low cost, diverse, and nutritious products. U.S. trade policies have focused on removing barriers to U.S. exports, and USDA market development and export promotion programs have helped U.S. exporters compete in existing markets or tap into new ones. But as U.S. world export market share shrinks, the volume of bulk commodity exports stagnates, and exports are increasingly subject to unpredictable and often arbitrary SPS restrictions and other technical barriers to trade, a discussion about the future role of trade in the U.S. agricultural economy—and the appropriate programs and policies with respect to export promotion or import adjustment—is timely.

Competing effectively with more open trade. Many U.S. agricultural products will continue to rely on global markets, even as trade barriers and subsidies continue to characterize agricultural markets around the globe. The ability of U.S. agriculture to access foreign markets remains highly dependent on trade negotiations to remove these distortions, which is beyond the specific purview of USDA policy. Substantial reductions in global tariffs and subsidies will provide opportunities for U.S. products to compete favorably in international markets, but only if products are of high quality and reasonable cost. USDA policies affecting risk management, research, technology, plant and animal diseases, and infrastructure will continue to play a major role in ensuring that U.S. products remain competitive in world markets.

Facilitating transition to greater global competition. Conversely, substantial reductions in U.S. tariffs and domestic subsidies could expose some U.S. products and sectors to greater global competition. Policy reforms may be needed to ease the transition, such as changing production-distorting farm payments to less distorting, decoupled forms, strengthening the economic infrastructure and vital services for the rural sector, and providing adjustment assistance to those who lose income. TAA for Farmers, although not part of the 2002 Farm Act, will expire at the end of FY 2007. To date, the program has made small payments to agricultural producers, with most payments going to salmon and shrimp. A review of whether this program is meeting its objectives and providing effective import adjustment is timely.

Enhancing market orientation. Export subsidies, export credit guarantee programs, and food aid are subject to the current WTO disciplines, and depending on the outcome of the Doha Round negotiations, could be subject to new disciplines. WTO members have tentatively agreed to eliminate export subsidies. Since the EEP is not currently active, and the DEIP has not been used for over two years, eliminating export subsidies would not materially affect U.S. exports. The United States recently changed the GSM-102 program, has discontinued use of the GSM-103 program, and has legislative proposals before the Congress to authorize additional changes. The Administration has proposed no funding for FY2007 for long-term, concessional sales under

Title I of P.L. 480. All of these changes would enhance the market orientation of U.S. exports and are consistent with the objectives of trade reform in the Doha negotiations.

Supporting market and international development. USDA has five market development programs and a host of international development programs. A review of the effectiveness of these programs could be part of the 2007 Farm Bill process. Among other things, this review could consider whether the current structure and authorities for these programs provide sufficient resources and flexibility to address emerging issues related to trade competitiveness, particularly SPS measures and technical barriers to trade. Because most of the demand for food and agricultural products in the future will come from developing countries, increasing trade-capacity building activities that strengthen developing countries' agricultural institutions and regulatory systems, encourage compliance with international norms, and foster adoption of modern approaches to agricultural policy and regulatory procedures could facilitate U.S. agricultural trade with these future markets. Given the critical role of agriculture in the economies of developing countries, the next farm bill process could consider the benefits of appropriations for international development activities, which are currently undertaken on a reimbursable basis at the request of outside agencies.

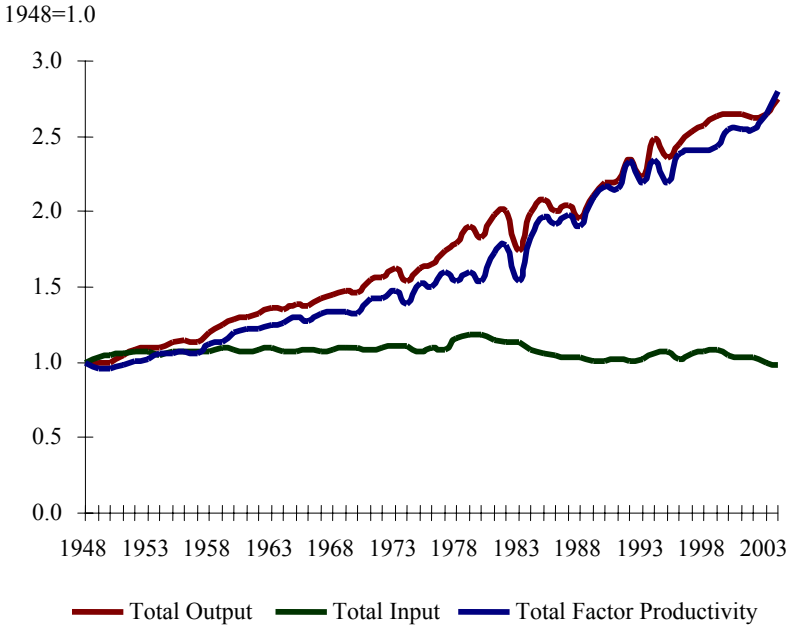
III. Enhancing Competitiveness and Efficiency

Title VII of the 2002 Farm Bill, Research and Related Matters, provides the impetus and financial basis for supporting public agricultural research and development (R&D). Funding for public research has been an important role of USDA for over a hundred years. Research performed and supported by USDA funding has played a fundamental role in enhancing agricultural productivity, increasing agricultural output, and expanding agricultural exports. Productivity and efficiency growth has made the United States a strong competitor in agricultural markets. This section looks at some of the benefits of R&D, highlights trends in agricultural research funding, addresses questions regarding future trends in agricultural research, and considers the direction of research.

The Role of Science and Technology (S&T) in Economic Growth

Historically, productivity growth has been one of the most important determinants of economic growth in the U.S. economy (Figure 11). Productivity measures the ability to achieve more output from a given bundle of inputs. Technological advances that save scarce resources and enable producers to produce more output with fewer inputs has been a critical source of income growth, wealth creation, and international competitiveness. In U.S. agriculture, virtually all the growth in agricultural output over the last 50 years was derived by growth in agricultural productivity. Despite growth in agricultural output, the growth in the total amount of inputs used has been quite modest.

Figure 11. Total Output, Input, and Productivity, 1948-2004



Technological change drives growth in agricultural output and results in new products and new processes or ways of doing things. Investments in science and technology (S&T) are what lead to these product and process enhancements. New fundamental knowledge about cell structure and DNA is what leads to advanced plant and animal breeding techniques producing higher yielding crops and leaner safe meat. Investments by USDA and the Land Grant University system result in advances in fundamental knowledge. These kinds of investments require continued and sustained support because the pay-off is uncertain and is not observed, except in the long run. Public research institutions also undertake research efforts that benefit farmers and consumers in the near term. For example, new agricultural practices are developed by USDA supported efforts that result in less soil erosion and better water quality.

USDA research efforts need to continue to be current and timely as well as forward looking. Public sector support for both long-term and near-term research efforts that work hand-in-hand work to increase agricultural productivity, improve the well-being of farmers and consumers, and enhance our international competitiveness. While a key role of publicly supported research is to undertake scientific discovery and the creation of new knowledge, public research also addresses key issues facing the public on a national, rather than a local or region basis. Homeland security, bioterrorism, and invasive species are prime examples where USDA supported research addresses critical national information needs.

Benefits of S&T Investments

Investments in science and technology have resulted in benefits to farmers and consumers alike. Farmers benefit from improved seed like hybrid corn varieties. Measures of the return on public investment in agricultural research have varied widely but are always very high, indicating additional investment is warranted. Conventional estimates of the return on investment in agricultural research have ranged from 35 to 70 percent. Returns reflect the benefits to producers

and consumers of agricultural products. These benefits are shared widely—producers have benefited from things like higher yielding seed varieties, improved production technologies and cultivation practices, and resource-saving methods like drip irrigation and more efficient delivery of plant nutrients and pest control. Advances in livestock research and veterinary medicine have enabled livestock producers to produce higher yielding cattle, hogs, and poultry that are also leaner and grow more rapidly.

Consumers are also key beneficiaries of agricultural research. Food in the United States is abundant, safe, and affordable. All Americans benefit from advances in agricultural productivity through increased access to food. Given this abundance, what may be more important for consumers is research that seeks to maintain the safety of food within the supply chain and to provide information regarding food nutrition and food choice. But public research efforts have increasingly recognized the growing importance of addressing human health and nutrition issues. Obesity has become a chronic public health problem in the United States and the USDA is undertaking research to address this and other consumer issues.

Measuring the Benefits of Agricultural Research.

Measuring agricultural research benefits involves solving a number of conceptual and empirical problems, as benefits may appear in different forms. Some research may tend to benefit society generally, and thus be harder to measure, such as the informational benefits associated with more basic research, the benefits resulting from the development of research tools, the benefits from more risky research, and the benefits from research with a longer time horizon. On the other hand, benefits that relate to a particular commodity, area, or need may be somewhat easier to define and measure. Direct benefits observable in a commodity market may also be easier to measure than indirect benefits such as environmental protection or increased food safety. Unlike many other areas of scientific research, some agricultural research is geoclimatically specific, and so benefits may at times be measured in a geographically disaggregated manner. And, as the discussion in the main text indicates, another important way of disaggregating the benefits of agricultural research is to do so among producers, consumers, and agricultural input firms.

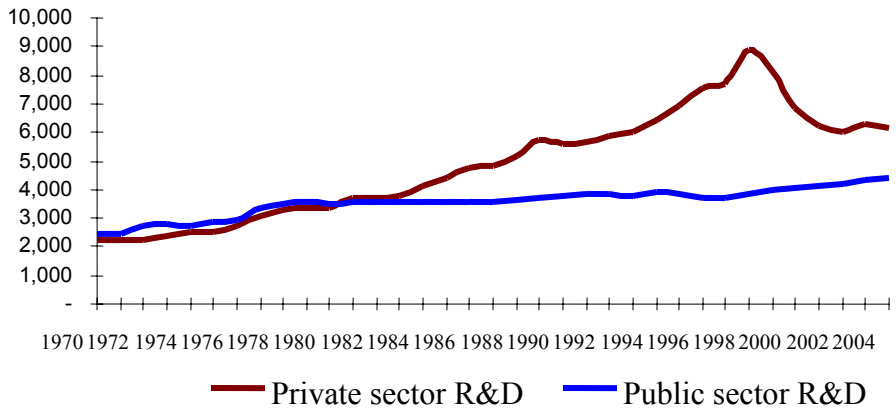
Recent Trends in S&T Investments and Productivity Growth

Investments in public R&D, while continuing upward, have grown at a very slow rate. Preliminary estimates of both public and private inflation-adjusted investments in R&D suggest the private sector is spending considerably more on R&D than the public sector (Figure 12). The rapid growth in private sector investments has been attributed to changes in patent law permitting patenting of biological inventions, advances in biotechnology products, and a general growth in the agri-chemical and pharmaceutical companies. The recent down-turn in private investments is due in part to a retraction by the private sector from biotech investment strategies.

While it is clear that investments in S&T lead to an increase in productivity growth, output and competitiveness, the reverse is also true—reductions in investments can lead to a slowdown in productivity growth. The slowdown in the level of real S&T investments by the public sector during the early 1980s may have contributed to the eventual slowdown in productivity growth

experienced during the late 1990s. Through the later part of the 1990s productivity barely grew at all. The decline in investment by the private sector since 2000 may also lead to future productivity declines. Productivity growth has been shown to occur long after investments are made because it takes time for research discoveries arising from the investments to work their way into the market place and become embodied in inputs that producers use. Investments by the private sector tend to be for "near-market" research, i.e., research that results in commercializable products not long after the investments are made. That is a fundamentally different type of research that relies ultimately on scientific discoveries often made in public sector labs.

Figure 12. Public and Private Sector Investments in R&D



Role of Publicly Funded Research

The Federal government plays a unique and critical role in science. Disease eradication, resource conservation, and environmental protection are all results of national efforts from Federally funded and performed research. The Federal government has the unique capacity to identify national needs and coordinate research efforts to address these needs—both for short-term and long-term goals.

While the Federal government is by far the single largest source of public agricultural research funding, not all of the advances in agricultural productivity are derived from the public sector. As figure 12 suggests, private firms produce and market most agricultural inputs, from seeds to pesticides and farm machinery. Some of the underlying research into producing those inputs is undertaken by the private sector. The key difference between the public and private sectors regarding their roles in research is the marketability of the research. The private sector pursues research efforts in areas for which there is a market—the production of goods for which there is commercial value. The public sector, on the other hand, produces research that is valuable to society but which may not have direct or obvious commercial value or an existing market and therefore the private sector is unwilling to undertake it. The best example of this is basic or fundamental research—research on topics that expand human knowledge, solve fundamental

problems in, for example, soil chemistry or plant pathology, that may eventually be embodied in some new production input or technology. Other examples include research on means of protecting the environment and production practices that conserve natural resources. Because of the lack of markets for goods such as environmental quality, there is little incentive for the private sector to invest in R&D that will produce these non-market goods and services more efficiently. Also, this research can be too costly and long-term for industry to undertake without strong market-driven forces. Food safety and human nutrition are also areas where there is often insufficient incentive for the private sector to undertake this research.

Publicly Supported Data Collection

A necessary component of the research system, and important to decision-making, is the continual need for public sector provision of objective and consistent data. Data are critical to undertaking all kinds of research, and the lessons learned from data analysis inform decision-making and policy development. The data, information, and scientific collections that the public research system maintains and provides are critical for both researchers and policymakers. Freely available data and information is vital to all kinds of research whether bio-physical or socio-economic. Scientists throughout the world rely on the wealth of data and scientific information and materials maintained by USDA and other public science sources. This includes the resources available through the National Agricultural Library, USDA's systematics collections, and the National Germplasm System, as well as the socio-economic analyses, and the statistical data USDA makes publicly available to researchers.

USDA Research and USDA-Supported Research

The public agricultural research system in the United States comprises a Federal-State partnership. The Federal government funds both intramural research through USDA agencies—the Agricultural Research Service (ARS), Forest Service (FS), and ERS—and extramural research at State institutions. The State institutions—the State Agricultural Experiment Stations (SAES) that are housed at Land-Grant Universities, 1890s Institutions, Forestry Schools, and Veterinary Colleges—are funded by a combination of Federal, State, and private sources.

This decentralized State-led structure has tended to result in successful geographically-specific applied research, but Federal research funding is intended at least in part to promote more basic research and interstate research spillovers. For this reason, the Federal government maintains a strong intramural research program focused on research problems that are important nationally and that may receive too little attention from SAES. USDA also helps provide regional and interregional research coordination with the State-led system to avoid duplication of efforts and facilitate sharing of results.

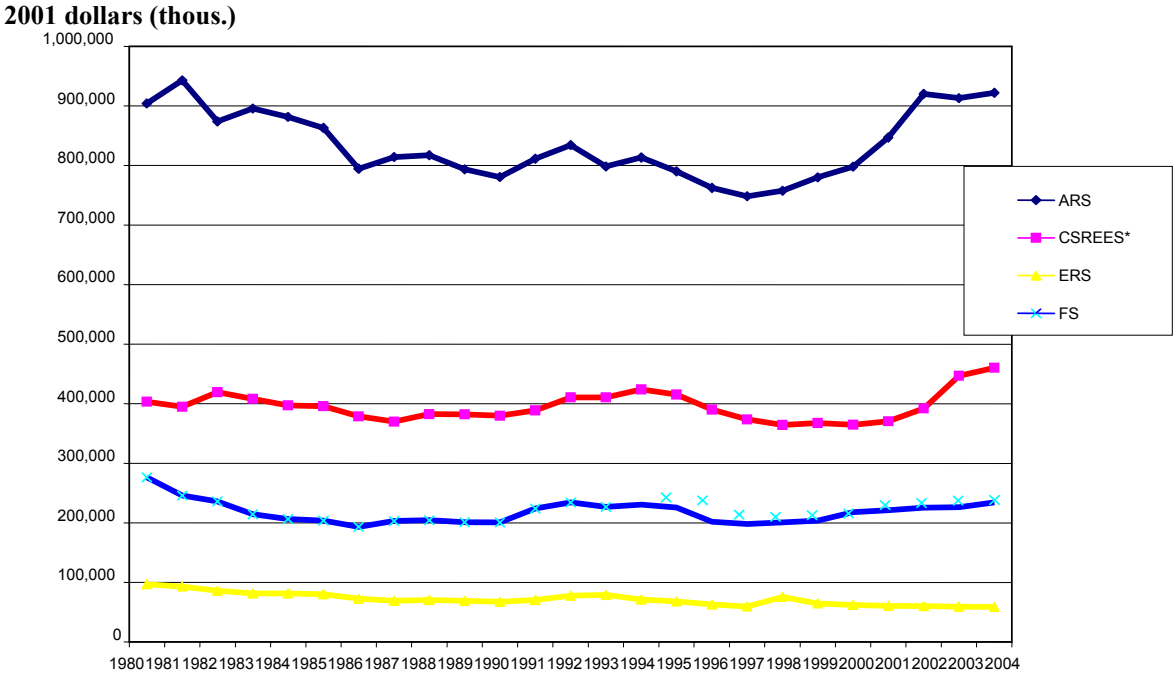
In inflation-adjusted dollars, USDA research funding declined until about 1999, when total spending fell to about $1.4 billion (Figure 13). Since that time, inflation-adjusted spending increased to about $1.7 billion in 2004.

Funding of ARS programs, the largest USDA intramural research agency, has followed a similar pattern. Inflation-adjusted funding declined until about 1999, when spending began to increase

from about $750 million to just over $900 million by 2002. Spending has been essentially level in real terms since then.

Extramural funding—funds administered by the Cooperative State Research, Education, and Extension Service (CSREES) for the Land-Grant and SAES system—also declined in real terms from the mid-1990s up to 2002 and increased after that. Funds awarded competitively through the National Research Initiative (NRI) also saw modest growth in 2003.

Figure 13. USDA Research Funding



*CSREES research funds are funds used to support SAES research.

Public Agricultural Research as a Federal-State Partnership

Public funding of agricultural research (not adjusted for inflation) grew modestly in each of the last 25 years, but in real terms, funding remained basically level. Public research funding increased in real terms starting in the late 1990s, partly from increases in non-USDA Federal sources and industry funding to SAES continued to increase. The SAES performs the majority of public agricultural research. Total real expenditures by the SAES have trended upward since 1980. Even with the recent increase in intramural spending in 2004, SAES invested more than twice as much in research ($2.9 billion vs. $1.2 billion) as did the Federal intramural agencies. While State appropriations are still the largest source of SAES expenditures, they have fallen in real terms by 10 percent since 2000 and are now lower than in 1980. Part of the explanation for this could be that a portion of the State appropriation is a match with Federal formula funds that are administered by CSREES. CSREES formula funds, the largest source of USDA support for the SAES, declined from $270 million in 1991 to $197 million by 2003 (2001 dollars).

Issues and Challenges for the 2007 Farm Bill

The key roles of public investments in S&T remain that of scientific discovery and problem solving for the benefit of society. The Federal government has played a unique and critical role in S&T and will remain a key player. USDA plays a part in overall Federal research goals and priorities. Therefore, it is of critical importance that USDA research be coordinated with other Federal agencies in areas of shared responsibility, such as bioenergy. Within this relationship, the specific direction of research needs to be evaluated in light of the issues faced by producers and consumers now and in the future. Are we adequately anticipating and addressing the issues society will face in the future? Several issues emerge as especially important for prioritizing research to benefit agricultural producers and consumers in the near and distant future. Key priorities for consideration for 2007 Farm Bill funding include:

Consumers, food safety, and biosecurity. Agriculture continues to be consumer driven. Consumers want safe, high quality food. Biosecurity threats from plant and animal pests and diseases and invasive species, whether intentionally or accidentally introduced, heighten our awareness of a new kind of food safety concern and challenge our research to ensure these threats are countered with good science. Important efforts are underway in this area but continued and enhanced efforts are needed as well as an ability to respond quickly to rapidly changing concerns.

Bioenergy and biobased products from agriculture. Agriculture is both a consumer and producer of energy. Our national energy security requires that we look for alternative and sustainable sources of energy. Agriculture has the potential to be an important source of bioenergy. In addition, there is potential to use agricultural materials that may currently be wasted or not used effectively in order to develop new products. More research is needed to explore and develop these biological possibilities as well as to understand the nature of the markets, both domestic and international, for energy sources.

Genomics and informatics. The tremendous growth in information technology during the last fifteen years or so has created an explosion of S&T possibilities. Mapping genomes provides enormous potential for enhancing crop and livestock production and creating more safe and nutritious food. The growth in informatics enhances the potential to take advantage of research in genomics.

Agriculture and the environment. Agriculture's relation to the environment continues to be an important area for research. Mitigating agriculture's impact on the environment and as well agriculture's role in lessening the impact of climate change on society are areas where social returns from investments in agricultural S&T could be high. Linking bio-physical and economic data from farms will greatly enhance our understanding of not only the effectiveness of conservation programs but will also give us better insight into why producers participate in conservation and other types of programs. Linking this information will aid in addressing issues such as the impact agriculture has on the environment and how conservation programs can help farmers enhance their relation to the environment.

Human Nutrition. Improvements in the nutritional well being of the population can lead to significant improvements in life style and savings to the economy, both directly and through cost avoidance. Research can provide information on how to improve diets as well as how to encourage changes in consumption patterns.

Public research system. The advances in science and technology in U.S. agriculture are due in part to the USDA and partnership with the Land Grant Universities. This partnership provides the scientific foundation and knowledge base for improving our food, fiber, and energy foundation. Continued success of this research system requires that we should seek ways to improve the efficiency and effectiveness of our research programs, strengthen linkages, communication, and coordination among USDA and Land Grant Universities, and enhance the quality of USDA-conducted and supported science. It is therefore critical that Federal funding should emphasize high quality research through peer-reviewed competitive awards that seek an appropriate balance between National priorities and regional and local needs.

IV. Protecting Agriculture

U.S. agriculture is complex, diverse, open, and affected by both local and global events, making it vulnerable to natural, unintentional, or intentional attacks from diseases, pests, and other agents that can result in significant production and economic consequences. Farm policy plays an essential role in strengthening and safeguarding America's agriculture and in doing so protects the health and well-being of domestic and global consumers. Policies designed to protect U.S. agriculture and markets work together with other policies aimed at reducing vulnerabilities and promoting the development of capabilities to detect and respond to agricultural threats, mitigate events, enhance response and recovery procedures, and apply the lessons learned from previous experiences with pest and disease threats and events both here and abroad.

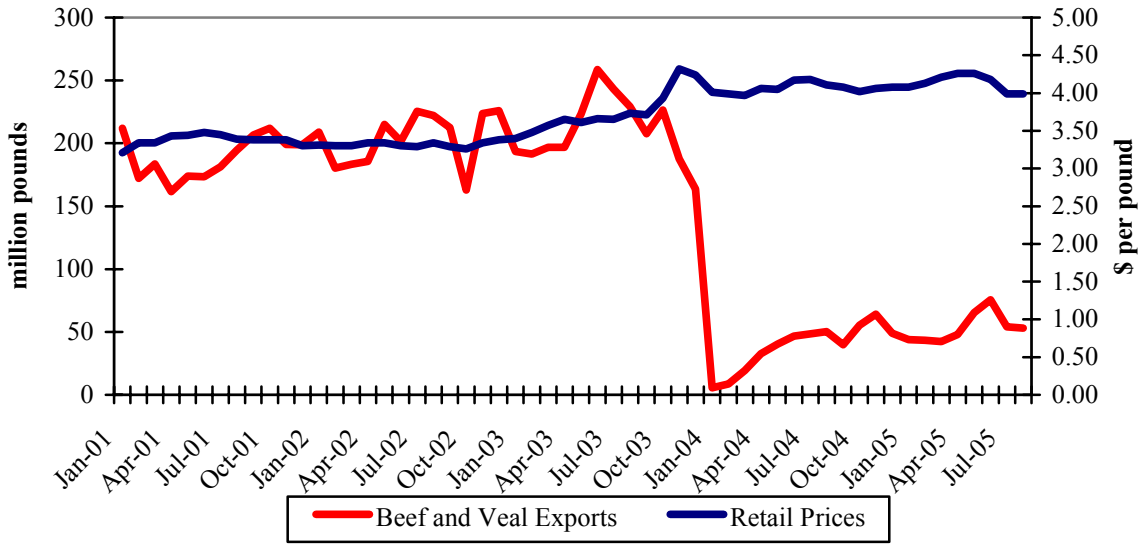
U.S. agriculture faces two general types of threats: those limited to production effects (e.g., soybean rust) and those that affect consumer confidence and, potentially, human health (e.g., avian influenza). Concerns surrounding the impacts on human health are clear. However, the consequences of changes in consumer confidence on crop and livestock production due to events or mitigation efforts are spread along multiple paths, most of which are financial or economic in nature. Crop or livestock losses and related mitigation efforts can reduce competitiveness of parts or all U.S. agriculture by raising the cost of production or distribution. For example, in an effort to assess the possible economic impacts of soybean rust in the United States, ERS published a report on the economic implications of soybean rust in the United States. The study concluded that during the first year of soybean rust introduction, the expected value of the economic losses ranges from $640 million to $1.3 billion, depending on the geographic extent and severity of initial entry. As farmers adjust to the presence of soybean rust, annual expected economic losses range from $240 million to $2 billion, again, depending on the severity and extent of subsequent outbreaks.

The effect on markets of pest or disease outbreaks would depend upon the proximity of the outbreak to major production areas and whether foreign country bans on trade were regionalized or covered the entire United States. For example, the most significant recent U.S. outbreak of

high path avian influenza (HPAI) occurred in 1983 and 1984 in Pennsylvania, Maryland, New Jersey, and Virginia. That outbreak affected mainly layer flocks and resulted in the depopulation of 17 million birds and loss of 1.2 million dozen eggs between November 1983 and August 1984. While the amount of eggs and birds destroyed were small relative to annual U.S. production, the impacts of the loss of the breeder and laying flock had a greater impact than implied by the destruction of the birds and eggs since they represent future production. In contrast, the 2004 outbreak of HPAI in Gonzales County, Texas was quickly found and eradicated, lasting only five weeks. This outbreak was confined to one flock of 6,600 birds that were depopulated and another 12,000 birds tested.

Even confined events, such as the U.S. experience with BSE, can cause dramatic reductions in international trade opportunities because of trading partners' phytosanitary regulations or related consumer concerns. For example, after the U.S. discovery of BSE in a Canadian-born cow in Washington State in December 2003, more than 50 countries suspended imports of U.S. ruminant and ruminant products. The discovery of BSE caused beef and veal exports to drop dramatically and retail prices to fall slightly but remain above earlier levels (Figure 14).

Figure 14. Effect of the December 2003 Finding of BSE on U.S. Beef Exports and Prices



While the remedies for financial and economic consequences may be costly, they can be much less difficult to address than the consequences associated with a loss in consumer confidence. Consumers and producers are joint beneficiaries of activities in agricultural markets. The loss of trust in safety and integrity of agricultural markets leads to constraints and additional costs that are felt, if not borne, by both parties and the affected communities. Changes in consumer confidence can have a much larger and possibly more lasting impact on agricultural markets than supply shocks. As a result, critical policy issues include determining how information affects consumer confidence, who should supply the information, and under what conditions consumers are more apt to respond rationally and act based on actual risks given the uncertainty that so often initially surrounds events or disease outbreaks.

USDA Efforts to Protect Agriculture

USDA plays a major role in protecting U.S. agriculture and consumers. Two key objectives of USDA's FY 2007 Budget Summary and Annual Performance Plan include: (1) reducing the incidence of foodborne illnesses related to meat, poultry, and egg products in the United States and (2) reducing the number and severity of agricultural pests and disease outbreaks. To advance these objectives, total USDA program level funding is estimated to be $2.7 billion in FY 2006, with $1.2 billion directed toward reducing the incidence of foodborne illness and $1.5 billion directed toward reducing the number and severity of agricultural and pest and disease outbreaks. This section focuses on protecting agriculture from pest and disease outbreaks. To improve program planning, APHIS is developing performance measures that will demonstrate the impact of its pest and diseases programs on the economy, e.g. on losses due to plant and animal diseases.

While USDA has always endeavored to ensure a safe and plentiful food supply, events since the last farm bill have expanded the Department's mission to include addressing broader security concerns in concert with both public and private partners. USDA works with the Department of Homeland Security (DHS) and the Department of Health and Human Services' Food and Drug Administration (FDA) to ensure that Homeland Security Presidential Directives related to protecting US agriculture are effectively implemented. In particular, USDA works through and closely with the White House Homeland Security Council and DHS on agriculture and food threat issues. The Department has developed dedicated mechanisms for addressing security and emergency response policy matters through the formation of its Homeland Security Council and the Food and Agriculture Government Coordinating Council that is jointly supported by DHS, USDA, and HHS/FDA, and State, and local officials and reports to the Office of the Secretary.

Programs that contribute to the protection of agriculture appear throughout USDA mission areas. However, major responsibility for directly protecting agriculture lies with the programs of the Animal and Plant Health Inspection Service (APHIS). Total program level funding for APHIS is estimated at $1 billion for FY 2006. APHIS carries out its mission to protect agriculture under provisions of the Plant Protection Act, the Animal Health Protection Act, and the Agricultural Bioterrorism Protection Act of 2002. APHIS is the key responder to plant and animal health emergencies and works with other Federal agency partners and foreign governments to exclude pests and diseases that could harm American agriculture. The agency maintains surveillance systems for early detection of animal and plant diseases, for example, avian influenza and soybean rust. APHIS also seeks to facilitate safe trade per the international Agreement on the Application of Sanitary and Phytosanitary Measures and works in international forums such as the Office International des Epizooties (OIE) and International Plant Protection Convention (IPPC) to develop protocols to protect animal and plant health. APHIS and cooperating partners have response plans and surveillance programs with the goal of quick detection, containment, and eradication of pests and diseases. Under the Agricultural Bioterrorism Protection Act of 2002, APHIS restricts access to pathogens capable of creating plant or animal diseases.

Research programs of ARS and CSREES also contribute to protection of agriculture by providing knowledge and technology to prevent or reduce damage to livestock, poultry, and plants. For example, ARS's livestock protection program produces knowledge and technology to reduce economic losses from infectious, genetic, and metabolic diseases of livestock and poultry

and to eliminate the losses to animal production and products. This research also reduces the risk to humans of zoonotic diseases and enhances the safety of animal products. Program level funding for the ARS livestock protection program is estimated at $71 million for FY 2006. ARS's crop protection program provides the knowledge to reduce losses caused by plant diseases by defining practices that are effective, affordable, and maintain environmental quality. Research also provides the technology to manage pest populations below economic damage thresholds based on an increased understanding of the pest's biology and ecology. Program level funding for the ARS crop protection program is estimated at $162 million for FY 2006.

The CSREES-supported programs include grants to support basic and applied research in areas of direct applicability to protecting agriculture. CSREES is creating a functional nationwide network of public agricultural institutions. The network is designed to quickly detect animal and plant diseases that are deliberately or unintentionally introduced into our farmland, livestock, or natural ecosystems. This network will allow land-grant university diagnosticians and faculty, State regulatory personnel, and first detectors to communicate information, images, and methods of detection throughout the system in a timely and efficient manner. CSREES programs are helping to monitor and prevent disease outbreaks, avoiding economic losses, and preserving consumer confidence.

The Food Safety and Inspection Service (FSIS) is the public health agency in USDA. FSIS protects consumers by ensuring meat, poultry, and egg products are safe, wholesome, and correctly labeled, and packaged. FSIS programs protect the food supply and preserve consumer confidence by focusing on preventing food with microbial pathogens and other contaminates from entering commerce. Within FSIS, the Office of Food Defense and Emergency Response (OFDER) develops and coordinates all FSIS activities to prevent, prepare for, respond to, and recover from non-routine emergencies resulting from intentional and non-intentional contamination affecting meat, poultry, and egg products.

Protecting agriculture is also critical from a homeland security viewpoint. Homeland Security Presidential Directive-9 (HSPD-9) established a national policy to defend agriculture and the food system against terrorist attacks, major disasters, and other emergencies. APHIS and other USDA agencies share responsibility with other Federal agencies to develop awareness and early warning capabilities to recognize threats, to mitigate vulnerabilities, enhance screening procedures for domestic and imported products, and enhance response and recovery capability. Among the specific charges falling to USDA under HSPD-9 are development of a National Veterinary Stockpile of animal vaccine and development of a National Plant Disease Recovery System. HSPD-9 directs USDA to develop comprehensive and fully coordinated monitoring and surveillance systems to provide early warning of disease, pests, and poisonous agents by using information on animal, plant, and wildlife disease.

Under HSPD-9, USDA is also directed to develop a system to track individual plants and animals. The National Animal Identification System is currently being implemented on a voluntary basis through a cooperative State-Federal-industry partnership. This identification system will enhance the speed and efficiency of disease trace backs by standardizing animal movement recordkeeping and using newer technologies. Upon full NAIS implementation, the

goal is to be able trace the movements of all exposed or infected animals entered in the NAIS within 48 hours of a disease diagnosis.

In addition to these new responsibilities under HSPD-9, the Secretary may declare an "extraordinary emergency" upon finding a new plant pest, noxious weed, bio-control agent, animal disease, or animal pest in the United States. This declaration triggers an increased degree of inspection of articles in inter- and intrastate commerce as well as federal assistance programs targeted at livestock producers, growers, conservation activities, and assistance to rebuild agricultural infrastructure.

As part of its effort to protect agriculture, USDA has identified five objectives: intelligence and warning, border and transportation security, protecting critical infrastructure and key assets, defending against catastrophic threats, and emergency preparedness and response. The allocation of USDA spending across each of those objectives is presented in Table 2. Over half of USDA spending is directed toward intelligence and warning and border and transportation security for pest detection, animal health monitoring, and greater border inspection.

Table 2. USDA Homeland Security Initiative

Item	Fiscal Year				
	2003	**2004**	**2005**	**2006**	**2007**
	Actual	**Actual**	**Actual**	**Estimate**	**Budget**
	Million dollars				
Objective					
Intelligence and Warning	139	148	199	209	287
Border and Transportation Security	143	148	163	165	165
Protecting Critical Infrastructure 1/	168	37	151	93	46
Defending Against Catastrophic Threats	16	21	30	36	78
Emergency Preparedness and Response	48	57	57	60	75
Total, by Objective	514	410	600	563	651
Agency					
FSIS	9	13	19	23	39
ARS	166	31	151	94	81
CSREES	32	39	40	41	48
ERS	0	1	1	1	1
APHIS	289	303	368	381	453
Other	18	24	21	24	28
Total, by Agency	514	410	600	563	651

1/ Variability is due to funding for the construction of the national animal disease research and diagnostic facility at Ames, which was fully funded as of FY 2006.

Lessons Learned

The lessons gained over many years of experience with animal and plant disease outbreaks (e.g., Avian Influenza, BSE, Exotic Newcastle Disease, Medfly, Soybean Rust, or Citrus Canker) both in the United States and abroad provide an excellent foundation for strengthening existing programs and designing programs to fill important gaps in our capacity to prevent or recover from disease outbreaks or other disruptive events.

Recent experiences also highlight the limits of government intervention and the need to foster the private sector's ability to adapt to new pressures while facing competing demands for resources. These experiences emphasize the need to continue to support research on detection methods and the development of better outbreak management strategies and tools that can be applied domestically and internationally. A recurring theme of recent events is the increasing recognition of the importance of economic factors on management and control decisions.

One of the clearest lessons learned is the importance of maintaining confidence in the safety of U.S. agriculture by both domestic and international customers. Recent experiences highlight the importance of potential gains that can be achieved by working with both foreign governments and international organizations and institutions, such as the OIE, to design the protocols used during disease events, especially as they relate to the determination of risk status and resulting trade conventions. Those processes must be supported by current, science-based analysis that is accepted by both the international organizations responsible for carrying out trade-affecting disease management and recovery protocols and by our trading partners. Given the importance of international trade to the United States and the interdependence that trade relations engender, the U.S. agricultural sector cannot ignore that it is part of an international system of agricultural systems. Given the global nature of diseases and agricultural commerce, continuing efforts to improve policies implemented by international institutions and the use of scientifically sound protocols by our trading partners represent important opportunities for reducing disease risks and minimizing the subsequent consequences of disruptions in world markets.

Recognizing Public and Private Roles

Underlying almost all security lessons is the U.S. agricultural sector's reliance on private initiative and the importance of public/private partnerships that are most successful when guided by producer, processor, and consumer interests. Successful partnerships require sustained commitment of both private (producers and consumers) and governmental partners. Although public and private objectives are not always compatible, acknowledging and addressing the differences enables all parties to make better choices about where to allocate the resources needed to improve the readiness and resilience of the sector.

Defining the appropriate roles for enhancing the security of U.S. agriculture should reflect basic responsibilities and shared risks and burdens. While private interests are largely responsible for protecting property, proprietary information, and workers and customers through measures that manage risk and help ensure more resilient operations, public authorities are responsible for coordinating policies nationally and internationally and for filling those security gaps that cannot be effectively addressed by the private sector. Public/private partnerships are valuable aspects of

any protection plan. These partnerships require the acceptance that successfully protecting agriculture from pests and diseases is a common effort and a shared responsibility between the Federal government and State, local, and private entities. These efforts should be fostered to help coordinate and implement actions that will enhance our ability to effectively detect and respond to threats to the agricultural sector.

The foundation for the success of this approach is that market-directed responses are typically more effective and lead to greater resilience of individual firms and industries within the U.S. agricultural sector. A key objective for developing effective policy efforts is to match the economic incentives of producers and consumers to the extent possible. Toward that end, market-driven incentives should be the preferred means wherever possible so that the implementation of security enhancing measures will dovetail with consumer and producer interests and complement other privately-led security efforts.

In all cases, the provision of sound and accurate information is a critical element for protecting the public's and sector's security interests. The outcry arising from the use of incorrect, uncertain, or emotionally-charged information unnecessarily amplifies the sense of potential distress and hinders the development of effective responses. Whether it is a more accurate appraisal about contracting a disease or losing one's livelihood as a result of an event, consumers and producers benefit from the provision of science-based information that minimizes the sensationalism that wastes resources and impedes the execution of sound public policy.

The delivery of accurate information also plays a critical role in the formation of consumer confidence. As a result, answers to questions about who is responsible for providing information and the best way to provide that information to the public are critically important to designing policies that best serve the public interest. The benefits of information designed to better inform producers and consumers may go beyond meeting the immediate needs of producers, owners, or even just the consumers residing in a particular region. As a result, protecting consumer confidence may warrant expanding investment in new information technologies through partnerships that effectively use limited public and private funding to improve information resources and foster the provision of accurate and timely information needed by everyone affected by an event.

Improving Deterrence and Prevention

Despite past successful efforts, U.S. agriculture faces increasing pressures from plant and animal pest introductions, many of which pose the threat of significant economic, environmental, and societal impacts. Given that recent outbreaks of plant and animal diseases have cost hundreds of millions of dollars to address, the public and private payoff for policies aimed at avoiding introductions and significant subsequent disruptions is substantial.

Since 2002, USDA has embarked on a number of efforts to improve deterrence and prevention measures. One example of these efforts is the development of the Food and Agriculture Biosecurity Information System (FABIS), which combines information collected by FSIS and APHIS and allows both agencies to more quickly identify naturally occurring or intentional acts affecting agriculture and USDA-regulated food products. This system benefits from the strength

of USDA's laboratory networks advances the Department's biosurveillance capacity and analysis of global information streams on animal and plant health issues. Information from this program will also feed into the Department of Homeland Security's National Biosurveillance Integration System (NBIS).

As highlighted by the FABIS, dynamic deterrence and prevention measures require significant investments in laboratory networks, and legitimate partnerships between federal and state laboratories to share resources and data. These efforts lead to the early detection of plant and animal disease outbreaks and determine the disease origins, which are critical to improved response efforts and reduced event impacts. Since the last farm bill, USDA has invested in enhanced and established detection and response capabilities using the national networks of Federal and State laboratories and other laboratory networks.

Two examples of these networks are the National Animal Health Laboratory Network (NAHLN) operated by APHIS, CSREES, and State collaborators, and National Plant Diagnostic Network (NPDN), in which APHIS collaborates with CSREES and supports five regional coordination laboratories and one satellite lab. NAHLN currently consists of 49 state and university veterinary laboratories across the country that with staff who are trained to detect emerging foreign animal diseases. The NPDN network provides a similar level of laboratory support to APHIS' Plant Protection and Quarantine (PPQ) program, which also supports training sessions and funds emergency programs, such as those leading the fight against Sudden Oak Death.

USDA's Highly Pathogenic Avian Influenza (HPAI) H5N1 Preparedness and Surveillance program, which is part of the U.S. National Strategy for Avian and Pandemic Influenza, represents another example of the Department's capacity to respond to disease threats and to work closely with other Federal, State, and international partners to help prevent the further spread of this dangerous disease abroad. This APHIS-led effort includes a CSREES funded a project develop tests and vaccines for detection and disease transmission and control, and provide educational programs.

Surveillance and monitoring efforts are critical as trade and environmental conditions can aid the spread of diseases across international borders. Collaboration with international institutions and agencies in the development of disease protocols, cooperation, and partnerships is critical to improve our capacity to deter or prevent the introduction of diseases and pests. Work with international partners and other entities is best served when prevention measures are developed that incorporate lessons learned from other countries' experiences, share threat or risk information, and foster an environment that speeds the exchange of information.

The Security and Prosperity Partnership of North America represents a good example of collaboration with two of our most important trading partners to help eradicate animal and plant pests and diseases, and to improve security within the food and agriculture sector. This partnership, established in 2005, by President Bush, Canadian Prime Minister Paul Martin, and Mexican President Vicente Fox, recognizes North America's common agricultural security interests and has led to the creation of two multi-agency working groups led by DHS and the Department of Commerce on which USDA's participation is key. In coordination with DHS

APHIS and FSIS work with Canadian and Mexican counterparts to identify areas of mutual interest and concern.

One efficient way to improve U.S. agricultural protection is to support efforts to manage and study locally endemic diseases and pests abroad. USDA has invested in overseas facilities because of the conviction that the best strategy for fighting potentially invasive species is to learn about them before they arrive. Similarly, many agri-businesses have also invested in foreign facilities that play critical roles in their risk-mitigation strategies. As should be expected, the potential gain from the use of these facilities relies heavily on cooperation with foreign and private sector partners.

Continued collaboration across departments within the federal government is also critical as the DHS is responsible for establishing and maintaining a comprehensive deterrence and prevention system at our ports. This effort is designed to prevent the accidental or intentional introduction of pests and diseases through those points of entry. This shared dependence and responsibility heightens the importance of sharing sensitive information, developing the systems and mechanisms needed to more effectively coordinate efforts to protect U.S. agriculture and maintain an accurate assessment of the potential threats.

Improving Detection and Response

Protecting agriculture is a national priority. Historically, USDA has raised awareness of vulnerabilities within U.S. agriculture and sought to improve its ability to detect and respond to threats or disease outbreaks. Most would probably agree that more can be done to promote an agricultural sector that is more nimble in its ability to detect events earlier and more resilient when events occur.

Advances in detection and response efforts are hallmarks of extension and Land Grant systems and the public/private partnerships, including professional associations that have formed in response to pest or disease introductions. Integrating and exploiting the surveillance and laboratory capabilities of these investments strengthens detection and response capabilities. Monitoring potential plant and animal disease threats is also strengthened by continued support of education and training programs that ensure a steady supply of skilled professionals and that partnerships and alliances are able to more quickly and effectively undertake prevention efforts.

Continuing research on disease mechanisms and pathways is important. More needs to be learned about how the establishment, spread, and persistence of pathogens, diseases, and pests could affect production and competitiveness of U.S. agriculture nationally and within regions for specific production systems. The main Federal contribution is ability to coordinate and support private efforts to enhance preparation and response to animal and plant disease introductions.

Within USDA, CSREES, ARS, RMA, APHIS are working with the private sector to develop new monitoring tools for crop-based agriculture. One day this system will provide a critical real-time information mapping system that will allow disease experts to monitor crop disease developments and develop their own forecast tools. One achievement of this collaboration was the development and implementation of crop disease and risk management monitoring tools used

to provide producers and their industry partners with soybean rust information they could use to make more informed decisions. This system saved soybean growers up to $300 million dollars during the 2005 growing season by preventing unnecessary pesticide applications, according to ERS estimates. This system can also be used by farmers to document good farming practices for insurance purposes.

Several universities are also working with ARS as part of the Regional Dairy Quality Management Alliance. Programs in this alliance support efforts to monitor pathogen presence and help dairy producers assure product safety. This collaboration can be used to provide the data to identify and implement best management practices for commercial dairy cattle herds. Alliances such as these rely on trust between partners as sharing data and business information is critical to the success of the efforts to evaluate and mitigate bio-security concerns.

Many public/private partnerships, while still under development, provide important lessons about future policy directions. This is especially true when these programs are used to help determine and evaluate best practices and identify critical research security needs. In those cases the burdens and benefits of research efforts can be shared. As noted in the soybean rust case, cooperation and information sharing reduced the potential impact of the disease and allowed farmers to benefit from the adoption of better farming practices. Additional gains can be achieved by expanding these efforts to other crop and livestock production and processing industries, if the new initiatives share burdens and benefits of joint efforts and seek to identify improvements that provide the greatest benefit throughout the food supply chain and not just to limited aspects of the production system.

Improving Recovery and Management

The aim of recovery and mitigation policies should be to offer improved management options that reflect sound biological and economic considerations. The aim is not to return the affected industry to the point it was before an event, as that may be impossible and costly. Rather, the goal of recovery efforts should be to work within and around new production and market constraints to use public and private resources on actions that offer the most benefit for any given expenditure and are market-driven.

Determining the expected benefits for any recovery effort begins with understanding the recovery goals and trade-offs from sector, industry, international, and consumer perspectives. The effect of recovery efforts on consumer demand and confidence, crop and livestock production, competitiveness, and international markets should be measured. It is within this context that the tensions of divergent recovery goals or even the attainability of those goals becomes apparent. It is also at this stage that the uncertainty surrounding possible outcomes, including the possibility that an event cannot be contained or fully mitigated once introduced (e.g., karnal bunt), should weigh on recovery or relief decisions. Uncertainty and blind spots, if overlooked, could seriously affect future competitiveness and influence subsequent shifts in production and reactions of trading partners.

Compensation historically has been used to “make right” those harmed by disease outbreaks or natural disasters. Paragraph (e) of section 414 of the Plant Protection Act (7 U.S.C. 7715[e])

provides that the Secretary may pay compensation to any person for economic losses incurred by the person as a result of action taken by the Secretary in connection with the Secretary's determination that an extraordinary emergency exists because of the presence of a plant pest or noxious weed that is new to or not known to be widely prevalent in or distributed within and throughout the United States and that the presence of the plant pest or noxious weed threatens plants or plant products of the United States.

Even if the Secretary does not declare an extraordinary emergency, APHIS may provide payments for the recovery of lost production income if appropriated funds are made available for that purpose. Such funds have been made available in:

- The Consolidated Appropriations Act for FY 2000 (Pub. L. 106-113)
- The Agricultural Risk Protection Act of 2000 (Pub. L. 106-224) and
- The Department's 2001, 2003, 2004, and 2005 appropriations (Pub. L. 106-387, Pub. L. 108-7, Pub. L. 108-199, and Pub. L. 108-447)

From FY 2000 to May 2006, APHIS has provided $428 million in indemnity funding (Table 3). Funding for compensation from citrus canker represents almost 80 percent of total APHIS indemnity funding. Citrus canker is a bacterium that disfigures and weakens citrus trees. The pathogen was initially detected in Florida near the Miami airport in 1995. Prior to the 2004 and 2005 hurricanes, citrus canker was nearly eradicated. However, the 2004 and 2005 hurricanes spread citrus canker so extensively that it was determined that the established eradication program was no longer a scientifically feasible option to address citrus canker. The existing program was modified to stop destroying healthy trees and to eliminate the compensation provision. USDA has provided a total of approximately $374 million in compensation to producers and nursery owners affected by citrus canker. In addition, on June 7, 2006, USDA announced that an additional $100 million in funding to compensate commercial citrus growers in Florida for eligible losses resulting from the citrus canker eradication program is available, making USDA's contribution for indemnity payments for citrus canker in excess of $536 million.

Table 3. APHIS Indemnity Funding, FY 2000 - Present

	Fiscal Year							
Programs	**2000**	**2001**	**2002**	**2003**	**2004**	**2005**	**2006 As of 5/02/06**	**Total**
	Thousand dollars							
Citrus Canker	14,571	52,654	10,064	11,801	15,997	29,224	239,874	374,185
Karnal bunt	0	122	39	2	0	0	0	163
Brucellosis	432	283	563	39	430	585	50	2,382
Tuberculosis	158	16	2,846	21,299	9,002	5,293	8,969	47,582
Scrapie	8	70	1,081	1,010	545	1,021	182	3,916
Total	15,169	53,145	14,592	34,151	25,974	36,122	249,074	428,228

Compensation remains an important policy options and may include insurance. Given the potential for significant economic losses, all compensation approaches must be assessed on their ability to enhance recovery while being cost-effective and actuarially sound. Whatever approach is used, it should ensure that producers and consumers are responsible for protecting their interests through measures that enable them to most effectively manage the risks they face.

The availability and use of accurate information is essential to keep costs under control and prevent the introduction of policies that unintentionally reduce the long-term economic sustainability of sectors within U.S. agriculture. Where appropriate, the use of incentive-based programs should be implemented to encourage actions that speed recovery or improve the management of disruptive events. In general, the role of policy in this area is to promote the recognition of basic responsibilities, best practices, and to share risks and burdens equitably.

One difference between the risks associated with crop and animal diseases and other risks faced by producers is that unlike price/marketing risks, individual producer disease management practices change the risks faced by all producers in their communities or even industries. As a result, many standard approaches to government involvement in production, such as insurance programs or disaster payments that may ignore basic responsibilities may not be as effective or necessarily lead to the improved bio-security in US agriculture. More needs to be learned about differences between public and private interests as market oriented approaches may mean that producers' observance of best practices may be a condition for future compensation.

Similarly, the need for greater accountability applies to the development and evaluation of programs designed to protect US agriculture. These evaluations should include assessments of the impacts of government intervention on surrounding communities, consumers, producers, and related industries. Though difficult choices will have to be made, these assessments will provide great perspective and information about the factors that led to specific mitigation or prevention actions. While views among stakeholders may vary, more transparent assessments of policy actions are an important element in the development of trust and serve to recognize that in national security issues a broader range of stakeholders and interests exist.

Issues and Challenges for the 2007 Farm Bill

Farm policy and programs historically have played an essential role in strengthening and safeguarding U.S. agriculture. The 2007 Farm Bill discussion should consider ways to improve existing programs and institutions, and new efforts that more effectively address the challenges faced by U.S. agriculture.

Emphasizing sound science and private action. The most effective policies are likely to be those that utilize public/private partnerships and those crafted using the benefit of sound scientific information and analysis. One clear policy lesson of recent years is that the underlying economic incentives and pressures of private sector partners often place them in the best position to address their own needs, which in turn places them in a preeminent role of protecting U.S. agriculture. One way to assure that policies use those incentives and address the pressures faced across the sector is to ensure that protection programs provide incentives that are market-based.

Strengthening international organizations and capacities in foreign countries. Protection policies must also recognize the importance of cross-border and international vulnerabilities, and acknowledge the importance of strengthening the international institutions that develop and oversee the protocols that affect our trade opportunities. International institutions and collaborative opportunities should be fostered to protect U.S. agriculture by addressing risks and problems before they have a chance to reach our shores. A key strategy would be to focus sufficient resources to continue efforts to improve policies implemented by international institutions, promote the use of scientifically sound protocols by our trading partners, and assist resource-constrained foreign nations in addressing disease risks to minimize subsequent disruptions in world markets.

Investing in research and education. Another way to strengthen U.S. agriculture is to integrate and exploit the continued government investment in education and training programs. New investments should be based on filling the greatest gaps in understanding pathogens, diseases and pests that affect the competitiveness of U.S. agriculture. As elsewhere, policies should be designed to coordinate and support, rather than supersede, private efforts to enhance our ability to prepare for and respond to animal and plant disease introductions.

Providing accurate information. Finally, given that consumers largely drive the economic prospects of U.S. agriculture, consumer confidence is a critical element of U.S. agriculture's current and future success. Though it is impossible to prevent all disease and supply disruptions, and simply providing "correct" information may not be enough, the availability and delivery of accurate information to the public should be a foremost consideration. New educational information delivery technologies should be applied to advance the most effective means for providing timely and accurate information.

V. Preparing the Next Generation of Farmers and Ranchers

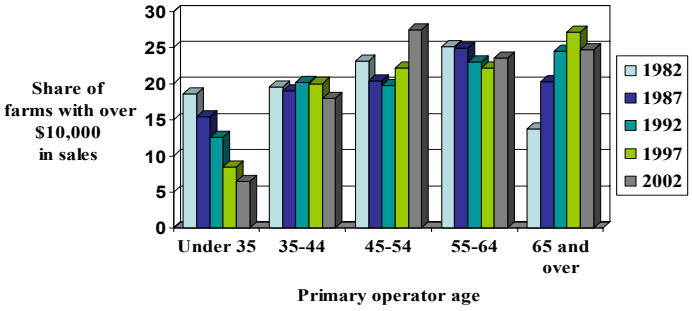
Issues which have been raised about the adequacy of the future workforce needed to farm the nation's agricultural lands include: (1) a potential divergence between the level of younger, new farm entrants into production agriculture and the exit of older retiring farmers, (2) the potential barrier to entry for new farmers created by rising farmland values and their effect on the capital costs of acquiring an efficient farm operation, (3) the rising complexity of farm production caused by changing markets, globalization, new technologies, economies of scale, environmental concerns, and other factors, and (4) uncertainties about the supply of future hired farm workers. This section examines the issue of the adequacy of a sufficient number of capable farmers and other farm workers for the future and the role of "beginning farmer" and related programs in addressing concerns about the future farm workforce.

Background

Fewer Young Farm Entrants and Aging Farmers. The average age of primary farm operators continues to rise, increasing by nearly 5 years from 50.5 in 1982 to 55.3 in 2002. For nearly one-fourth of all farms with over $10,000 in annual sales, the primary operator was over 65 years of age in 2002. The rise in the average age of primary operators is both a reflection of a decline in

the number of young farmers and a rise in the number of older farmers. From 1982 to 2002, the number of primary operators under 35 years old declined while the number of farmers 65 and older increased. Farms with over $10,000 in annual sales and that were operated by those under 35 years of age accounted for less than 7 percent of all farms in 2002, as compared to 19 percent in 1982 (Figure 15). Meanwhile, the share of farms with over $10,000 in sales operated by farmers over 65 increased from 14 to 25 percent. The sharp decline in young farmers has raised concerns that an insufficient pool of new entrants will be available to replace a large and growing pool of retiring farmers.

Figure 15. Farm Primary Operators by Age



There is no evidence, however, that a shortage of farm operators and farm workers has caused or will cause reduced production and higher prices of U.S. farm commodities. An Economic Research Service study released in 2006 on farm exits (farms going out of business) indicated that while the total number of U.S. farms declines very little in the 5 years between each Census, about 9-10 percent of farms go out of business each year, which was slightly greater than the entry rate. Thus, the apparent stability in the number of U.S. farms masks a rather dramatic turnover. Turnover rates are highest for smaller farms, but even for farms with sales of $250,000 or more, 6-7 percent go out of business each year. Thus, U.S. agriculture has been facing a substantial number of exits for many years, and as these farms have been sold to new businesses or existing farms, farms have gradually increased in size.

There is also evidence that there are a substantial number of young farmers present on farms, though not as the primary operator. Data indicate that many commercial-sized farms with older operators also have younger operators involved in their operations. These secondary operators in many cases represent future primary operators. A high percentage of these farms are operated as partnerships and as family corporations. The 2002 Census indicated there were 194,000 farms that have multiple operators with operators across different generations.

Finally, the rising average age of primary operators may also reflect technology change that has enabled older farmers to more readily meet the physical demands of farm labor. Technology has reduced the time needed for field operations, allowing farm sizes to increase over time and operators to spend more time on other farm management tasks. Improving health, reflected in longer lives, also enables the workforce in general to work to a much older age.

While there is no apparent crisis of farm production likely to result from the advancing age of principal operators, there are concerns about how upcoming intergenerational transfers may affect the future structure of agriculture. Older farmers hold a large share of farm assets. Primary operators over the age of 65 owned over one-fourth of farm assets in 2004. Collectively, landowners over age 65 owned over one-third of the total acres of land in farms. Ultimately, this pool of assets will either be sold or passed on to heirs. To the extent these assets are sold or leased to existing operators, this transfer raises concerns about consolidation and its effects on the structure of agriculture, local economies, and rural landscapes. Middle-sized family farms with annual sales of between $50,000 and $500,000 fell from 526,000 farms in 1982 to 380,000 in 2002. Meanwhile the number of large farms with over $500,000 in sales increased form 43,000 to 71,000 farms. This decline in middle-sized farms is one factor behind policies to encourage entry into agriculture or assist in the intergenerational transfer of farm assets. The concern about structure must be balanced against the economic effects of technology advancement and economies of scale, which enable agricultural demand to be met by larger, more efficient, and fewer farms.

Barriers to Entry. Another factor likely to affect the transfer of farm assets is the cost of farm production assets. In 2002, the value of land and buildings averaged $710,000 for U.S. farms that were principally engaged in agriculture. For farms where the principal operator was less than 35 years old, the value of land and buildings averaged $595,000. Farmland values have been increasing rapidly for many years, but surged ahead by 15 percent in 2005 after a 21 percent increase in 2004, adding to the cost of entering farming (Table 4). Thus, these figures represent a significant hurdle for many young farmers. However, renting land is a key option for young farmers, as nearly half of land in production is now rented. Moreover, while the average value of farm real estate increased 57 percent between 2002 and 2006, the average rental rate on crop land rose 10 percent.

Table 4. Average Value of Farm Real Estate, 2002-2006

Region	2002	2003	2004	2005	2006	% Change from '05-'06
			$/Acre			
Northeast	3,000	3,200	3,550	4,110	4,550	10.7
Lake States	1,870	2,010	2,220	2,520	2,840	12.7
Corn Belt	2,030	2,130	2,300	2,720	3,040	11.8
Northern Plains	576	594	632	735	834	13.5
Appalachian	2,250	2,370	2,560	3,110	3,470	11.6
Southeast	2,140	2,270	2,420	3,530	4,420	25.2
Delta States	1,390	1,460	1,580	1,790	1,950	8.9
Southern Plains	755	788	832	1,000	1,190	19.0
Mountain	500	523	550	698	944	35.2
Pacific	2,240	2,350	2,480	3,120	3,290	5.4
48 States	1,210	1,270	1,360	1,650	1,900	15.2

Farm workers. Although 1.2 million workers were employed on farms and ranches during July 2006 (0.8 percent of the total U.S. employment), U.S. agricultural production overall is not heavily reliant on hired labor. Labor costs are only about 13 percent of total farm production expenditures. However, some segments of the agricultural economy and some regions of the country rely more heavily on hired labor. Labor costs approach or exceed 30 percent of total production costs for many horticultural crops, and labor costs exceed 20 percent of total farm production expenses in Arizona, California, Florida, Oregon, Washington, and many Northeastern States.

Farms that hire labor may use workers without proper documentation. The U.S. Department of Labor (DOL) reported that, in 2001-02, 53 percent of hired workers in the crop sector lacked work authorization. If that percentage is applied to the total hired workforce in agriculture, as many as 650,000 hired farm workers may lack proper documentation. As concerns over homeland security and efforts to deter illegal immigration have increased, some farmers, particularly in the West, have indicated that hiring farm workers has become more difficult and costly. Farm labor use in California, a state heavily reliant on immigrant workers, has declined compared with the rest of the United States. Farm labor use in California has fallen from about 380,000 workers in 2002 to less than 340,000 in 2005. In the rest of the United States, the amount of farm labor has remained relatively stable at about 1 million hired workers.

USDA programs and activities

While farm succession does not represent a crisis to the production of food and fiber, and legislative activity may address concerns over the hired farm workforce, uncertainty over these outcomes has motivated a number of programs to encourage Americans to take up careers as farmers and ranchers and help them succeed. The Agricultural Credit Improvement Act of 1992 was the first law that required USDA to provide special assistance to beginning farmers and ranchers. The law required the Secretary to establish: (1) beginning farmer loan programs; (2) Federal-State Beginning Farmer Partnerships for the purpose of providing joint financing to beginning farmers and ranchers; and (3) an Advisory Committee on Beginning Farmers and Ranchers. The Act also required that loan funds be targeted to beginning farmers and ranchers.

Credit programs. USDA implemented beginning farmer and rancher loan programs in FY 1994. From then through June 2006, the Farm Service Agency (FSA) has made more than 96,000 loans to beginning farmers and ranchers, totaling $8.5 billion. In FY 2006, 34 percent of all FSA direct and guaranteed loans have gone to beginning farmers and ranchers. FSA has also created Federal-State Partnerships by signing Memorandums of Understanding with 20 State beginning farmer programs, agreeing to provide joint financing to beginning farmers and ranchers. The Farm Security and Rural Investment Act of 2002 (2002 Farm Bill) authorized the Secretary to establish a Beginning Farmer and Rancher Land Contract Guarantee Pilot Program in not fewer than five states during FYs 2003-2007. The program, implemented in September 2003, provides FSA guarantees on loans made by private sellers of a farm or ranch on a contract land sales basis to qualified beginning farmers and ranchers. The program is available in nine states. Two guaranteed loans have been made since implementation.

While not a USDA agency, the Farm Credit System (FCS) also makes loans to young farmers and ranchers (35 years old and younger) and beginning farmers and ranchers (operating for not more than 10 years). For example, in 2005, FCS institutions made 55,000 loans with a total loan dollar value of $8 billion to beginning farmers and ranchers. This lending represented 21 percent of the total number of new loans and 18 percent of total dollar volume of new loans made by FCS institutions in 2005. As of December 31, 2005, loans to beginning farmers and ranchers accounted for almost 24 percent of the total number of loans outstanding and 19 percent or almost $22 billion of the dollar value of loans outstanding in the FCS.

Advisory Committee. USDA established the Advisory Committee on Beginning Farmers and Ranchers (Advisory Committee) in 1998. The Advisory Committee provides advice to the Secretary on methods of maximizing opportunities for beginning farmers and ranchers. Members include representatives of FSA; CSREES; State beginning farmer programs; commercial lenders; private nonprofit organizations with active beginning farmer and rancher programs; community colleges or other educational institutions with demonstrated experience in training beginning farmers and ranchers; other entities or persons providing lending or technical assistance to beginning farmers and ranchers; and farmers and ranchers. The Advisory Committee meets annually, and USDA has implemented numerous recommendations that the Advisory Committee has submitted to the Secretary.

Conservation programs. The 2002 Farm Bill authorized the Secretary to provide higher payments to beginning farmers and ranchers in some of USDA's conservation programs. It also authorized the Secretary to provide incentives to beginning farmers and ranchers to participate in conservation programs to foster new farming and ranching opportunities and enhance environmental stewardship over the long term. Since FY 2003, the Natural Resources Conservation Service (NRCS) has approved $183 million in Environmental Quality Incentives Program (EQIP) contracts for beginning farmers and ranchers. In FY 2005 and 2006, NRCS invested $6.8 million and $10 million, respectively, in EQIP funds to assist limited resource and beginning farmers and ranchers to implement conservation practices on their land. NRCS has also encouraged their State offices to give extra points in their Farm and Ranch Protection Program ranking criteria for farms with succession plans.

Education. The 2002 Farm Bill also authorized the Secretary to establish a Beginning Farmer and Rancher Development Program to provide training, education, outreach, and technical assistance initiatives for beginning farmers and ranchers. No funds have been allocated to implement this program. However, CSREES provides grants to organizations that assist beginning farmers and ranchers through the (1) Outreach and Assistance for Socially Disadvantaged Farmers and Ranchers Program (Section 2501) and (2) National Research Initiative Grants Program (Agricultural Prosperity for Small and Medium-Sized Farms). The 2002 Farm Bill authorized $25 million in annual appropriations for FY 2002 through 2007. Annual allocations have been approximately one-fourth of that amount.

Risk management. New entrants into agriculture can participate in price and income support programs and crop insurance on the same terms as other producers. However, the Risk Management Agency (RMA) provides grants to organizations to assist beginning farmers and ranchers in risk management. Following recommendations of the Advisory Committee, RMA

has targeted grant applicants that were sensitive to the needs of beginning farmers and ranchers and those that planned to partner with organizations that assist beginning farmers and ranchers. Seven organizations assisting beginning farmers and ranchers received grants in the first solicitation in 2003. Since then, RMA has continued to include beginning farmer and rancher language in their annual grant solicitations, including the Community Outreach and Assistance Partnership Program Announcement published March 1, 2006. On June 16, 2006, RMA also announced a rural initiative for new farmers, making available $500,000 to fund educational programs to teach refugees and other low-income individuals who produce specialty crops about risk management and good business practices.

Departmental Policy. In 1999, USDA implemented Departmental Regulation (DR) 9700-1, "Small Farms Policy". The Advisory Committee recommended USDA develop and implement a mission focus to heighten awareness and coordinate beginning farmer and rancher opportunities, similar to that established in DR 9700-1 for small farms. On August 3, 2006, DR 9700-1 was amended to become a "Small Farms and Beginning Farmers and Ranchers Policy." This has resulted in a Small Farms and Beginning Farmers and Ranchers Council, and requires beginning farmers and ranchers policy to be reflected in all USDA mission area and agency statements, strategic plans, performance plans, and performance goals.

Farm workers. The Department of Labor (DOL) administers, in consultation with USDA, the Temporary Nonimmigrant Worker Program (H-2A) that allows farmers to legally use workers from outside the United States. Farmers must recruit domestic workers and demonstrate that domestic workers are not available. Farmers must pay transportation costs and provide housing and meals or cooking facilities for the temporary workers. They must also pay a wage rate that is established by the DOL so that it will not depress wages of similarly employed domestic workers. The program is not widely used because of its complexity, cost, and historical lack of enforcement against individuals without proper documentation. In FY 2005, DOL certified requests for 48,000 workers under the H-2A program.

The Administration has proposed a comprehensive immigration reform program that includes securing U.S. borders, enforcing immigration laws at the worksite, resolving the status of illegal immigrants currently in the United States, and creating a temporary worker program. The program would alleviate many of the concerns about the farm work force by providing temporary legal residency for willing workers that are matched with willing employers. The House and the Senate each passed immigration reform legislation in 2006 that has yet to be reconciled.

USDA's Rural Development administers the Farm Labor Housing Loan and Grant Program which provides financing for housing for domestic farm workers. Loans are made to farmers, associations of farmers, family farm corporations, Indian tribes, nonprofit organizations, public agencies, and associations of farm workers. Grants are made to farm worker associations, nonprofit organizations, Indian tribes, and public agencies. Funds may be used in urban areas for nearby farm labor. The loans and grants may be used to buy, build, improve, or repair housing for farm laborers and those engaged in on-farm processing. Funds can be used to purchase a site or a leasehold interest in a site; to construct housing, day care facilities, or community rooms; to pay fees to purchase durable household furnishings; and to pay construction loan interest.

Issues and Challenges for the 2007 Farm Bill

The primary forces for assuring an adequate supply of farmers are market incentives. If agricultural production provides a sufficient rate of return, capital investment and people will enter farm production. Low rates of return will discourage investment and cause farm failures. Competition will drive successful producers to adopt technology and achieve efficient operations, while inefficient producers will exit agriculture. The operation of these market forces is critically important for growth, productivity gains, and ensuring affordable food for Americans. Nevertheless, the structural changes that have accompanied the growth in agriculture have led policymakers in recent years to support specific federal programs and policies that aid new farm formation or the successful succession of farms from one generation to the next. These specific policies are delivered directly through government programs or indirectly through the tax code.

The 2007 Farm Bill could consider current or new programs to assist in the transition of retiring and exiting farmers and the entry of beginning farmers. Efforts to encourage farm transfers could be considered, including working with and supporting state governments and community organizations that would provide the front-line interaction with producers to facilitate transition. Targeted financial assistance, such as continued or expanded credit assistance, and other financial incentives, such as in risk management and conservation programs, represent options to assist in transition of farm assets. An initiative in research, education and outreach to address the needs of farmers in transition could also be beneficial. Such efforts can help production assets pass from one generation of farmers to a new generation and assist the new generation in getting started effectively.

However, assistance to targeted groups of producers must be balanced against budget limits and not offset market incentives. Little good is accomplished by helping someone enter agriculture that does not have the capacity to succeed. Excessive support may also be inequitable to producers who do not quite qualify for eligibility in the targeted group. Some general alternative approaches follow.

Facilitating the transfer of farms to new farmers. Increasing the USDA's statutory loan limits would enable direct programs to serve broader clientele and meet beginning farmers' financing needs. Direct operating loan (OL) caps were last increased in 1984 and direct farm ownership (FO) loan caps were last increased in 1978. Consequently, the credit needs of many full-time young farmers exceed the $200,000 maximum direct loan. However, increases in statutory loan authority would limit loan fund availability for smaller operations if budget authority was not increased. Also, the increased debt load would result in higher potential risk exposure. In addition to higher loan limits, young or beginning farmers who buy land could be provided flexible repayment schedules such as graduated payment, ballooned, or interest-only mortgages. However, each of these options would increase credit risk relative to current programs and thus require an increase in budget authority.

Reducing reliance on direct loans. Young and beginning farmers rely heavily on direct lending, which has high administrative and loan subsidy costs. Incentives could be considered

which encourage lenders to make greater use of the guaranteed program in financing young or beginning farmers, thus reducing the need for more costly direct loans. In addition, interest rate subsidies could be provided to beginning farmers receiving guaranteed loans. Another option would be to expand the guarantee to include annual payments. For guaranteed loans made to beginning farmers to purchase farmland, FSA could agree to advance one annual payment during the first five years of the loan, should the borrower's financial condition ever preclude them from meeting their obligations. As this would increase risk exposure, higher subsidy rates would result, requiring greater budget authority.

Another alternative would be to encourage State, community, or other non-government organizations (NGOs) to become involved in programs to assist new or beginning farmers. Matching loan funds could be provided to State lending programs or NGOs making loans to qualified beginning farmers. If these lenders also service the account, Federal government delivery costs would be reduced.

Rather than direct loans, grants may be considered as a method of delivering benefits to new or beginning farmers. With grants, there is no continuing loan servicing costs and no risk of additional financial losses occurring due to unexpected declines in incomes or asset values. Beginning farmer grants could be used to purchase land, procure financial or technical training, or buy down interest rates on commercial loans. The grant could also be used to match a farmer's savings in a Beginning Farmer and Rancher Individual Development Account Program that would establish a pattern of savings to promote a new generation of farmers and ranchers.

Providing research, education, and outreach to address the needs of farmers in transition. Many socially disadvantaged, limited resource, and small and beginning farmers may lack technical expertise to achieve financially sound farming operations. There are many non-Federal groups with the expertise to accomplish these objectives. Through continuation of programs such as the Outreach and Technical Assistance for Socially Disadvantaged Farmers & Ranchers (Section 2501), and the Beginning Farmer Development Program, USDA can leverage resources with those provided by States and NGOs to provide technical assistance to new farm entrants.

Enhancing benefits under USDA risk management programs. Financial enhancements have been suggested for beginning or young farmers acquiring farmland with base acres and who meet pre-determined requirements with respect to farm size or wealth. As examples, the percentage of enrolled base acres that are ineligible for direct and counter-cyclical payments may be reduced from the current 15 percent to something less, certain beginning farmers could be made eligible for higher farm program payment limitations, and enhancements could be provided to certain young or beginning farmers purchasing crop insurance. However, there are several important concerns with such farm program enhancements that should be considered, including their budgetary impacts, whether providing high farm program benefits per unit of production to one group of producers over another is equitable, and that such subsidization may be inconsistent with resource allocation signals that market forces may be sending.

VI. Suggestions for Further Reading

The following is a list of USDA publications related to the issues raised in this paper:

Ahearn**,** Mary**,**, Jet Yee, Eldon Ball, and Rich Nehring**.** Agricultural Productivity in the United States Agriculture Information Bulletin No. (AIB740) 32 pp, January 1998**.**
http://www.ers.usda.gov/Publications/aib740/

Anderson, Kym and Will Martin, ed. Agricultural Trade Reform and the Doha Development Agenda. The World Bank and Palgrave Macmillan, Washington, D.C., 2005.

Blayney, D. P. "Disease-Related Trade Restrictions Shaped Animal Product Markets in 2004 and Stamp Imprints on 2005 Forecasts." USDA Economic Research Service Outlook Report No. (LDPM13301) 16 pp, August 2005.
http://www.ers.usda.gov/Publications/LDP/Aug05/ldpm13301/

Burfisher, Mary E., ed. 2001. Agricultural Policy Reform in the WTO: The Road Ahead. Economic Research Service, USDA. Agricultural Economic Report 802.
http://www.ers.usda.gov/publications/aer802/

Fuglie, Keith, Nicole Ballenger, Kelly Day, Cassandra Klotz, Michael Ollinger, John Reilly, Utpal Vasavada, and Jet Yee. Agricultural Research and Development: Public and Private Investments Under Alternative Markets and Institutions. Agricultural Economics Report No. (AER735) 88 pp, May 1996.
http://www.ers.usda.gov/Publications/aer735/

Hahn, W. F. , M. Haley, D. Leuck, J. J. Miller, J. Perry, F. Taha, and S. Zahniser, "Market Integration of the North American Animal Products Complex" USDA Economic Research Service Outlook Report No. (LDPM13101) 21 pp, May 2005.
http://www.ers.usda.gov/Publications/ldp/may05/ldpm13101/

Hoppe, Robert A. and David Banker. Structure and Finances of U.S. Farms: 2005 Family Farm Report. Economic Research Service, USDA. Economic Information Bulletin (EIB-12), May 2006. http://www.ers.usda.gov/publications/EIB12/

Hoppe, Robert A. and Penni Korb. Understanding U.S. Farm Exits. Economic Research Service, USDA. Economic Research Report No. (ERR-21), June 2006.
http://www.ers.usda.gov/publications/ERR21/

Huang, Sophia Wu *et al*. Global Trade Patterns in Fruits and Vegetables. Economic Research Service, USDA. Agriculture and Trade Report No. WRS0406, June 2004.
http://www.ers.usda.gov/Publications/WRS0406/

Mathews, K.H . Jr., M. Vandeveer, and R. A. Gustafson, "An Economic Chronology of Bovine Spongiform Encephalopathy in North America." USDA Economic Research Service Outlook Report No. (LDPM-14301) 18 pp, June 2006.

http://www.ers.usda.gov/Publications/LDP/2006/06Jun/LDPM14301/

Office of the Chief Economist, U.S. Department of Agriculture. 2006. USDA Agricultural Baseline Projections to 2015. http://www.ers.usda.gov/publications/oce061/

Organization for Economic Cooperation and Development. Agricultural Policy and Trade Reform: Potential Effects at Global, National, and Household Levels. Paris, France. June 2006.

Regmi, Anita and Mark Gehlhar. New Directions in Global Food Markets. Economic Research Service, USDA. Agriculture Information Bulletin No. (AIB794), February 2005.

Regmi, Anita; Mark Gehlhar; John Wainio; Thomas Vollrath; Paul Johnston; and Nitin Kathuria. Market Access for High-Value Foods. Economic Research Service, USDA. Agricultural Economic Report No. (AER840), February 2005.
http://www.ers.usda.gov/publications/AER840/

Roberts, M.J., D. Schimmelpfennig, E. Ashley, M. Livingston, M. Ash, and U. Vasavada, "The Value of Plant Disease Early-Warning Systems: A Case Study of USDA's Soybean Rust Coordinated Framework." Economic Research Report No. (ERR-18) 46 pp, April 2006.
http://www.ers.usda.gov/Publications/ERR18/

Rubenstein**,** Kelly Day, Paul Heisey, Robbin Shoemaker, John Sullivan, and George Frisvold. Crop Genetic Resources: An Economic Appraisal Economic Information Bulletin No. (EIB2) 47 pp, May 2005**.** http://www.ers.usda.gov/Publications/eib2/