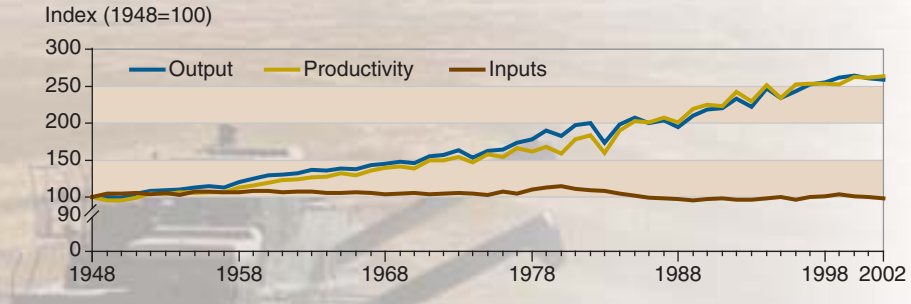
Ag Productivity Drives Output Growth

Increased use of inputs (such as capital, land, labor, and materials) has typically been the dominant source of economic growth for the U.S. economy as a whole and for most of its producing sectors. Agriculture is one of the few exceptions. Agricultural output in 2002 was 2.6 times as high as it was in 1948, but input use actually declined over the past half century. Increased productivity accounts for the difference. In recent years, however, productivity growth appears to have slowed, raising questions about future trends.

The singularly important role of productivity growth in agriculture is made all the more remarkable by the dramatic contraction in labor input in the sector since the end of World War II. Capital input increased initially but declined after 1981 as interest rates rose (raising the cost of capital). Land used in agriculture also declined over the period. Materials input, by contrast, increased over 1948-2002. But this positive contribution was not sufficient to outweigh the declines in land, labor, and capital inputs. The net contribution of all four inputs to growth in agricultural output was slightly negative, leaving output growth over the 1948-2002 period entirely attributable to productivity growth.

Increased use of agricultural inputs did contribute to output growth in some periods. Increases in materials fueled rapid output growth in the 1990s, and increases in both materials and capital boosted output growth in the 1970s. Growth in capital and materials inputs reduced the share of output growth derived from increased productivity during these periods. In spite of these anomalies, productivity growth was truly extraordinary over 1948-2002, averaging 1.8 percent per year. (By contrast, growth in private nonfarm business productivity averaged 1.2 percent per year over the same period.)

Agricultural productivity has driven output growth



While agricultural productivity has bounced up and down from year to year, typically driven by weather, it has generally trended upward over time. But productivity growth appears to have slowed since the mid-1990s. Does this reflect a change in trend? Productivity growth can arise from improvements in efficiency and technology as well as changes in the scale of production. A key source of productivity growth has historically been public investments in research. But those investments have been flat in real terms since the 1980s, raising questions about prospects for continued agricultural productivity growth in the future.

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This finding is drawn from . . .

The ERS Agricultural Productivity Database, available at: www.ers.usda.gov/data/agproductivity/

Production Shifting to Very Large Family Farms

U.S. farm production is shifting to larger operations at the same time that people are continuing to be involved with part-time, small-scale farming operations. Small family farms (annual sales below $250,000) still account for most of the Nation's farms, but their share of the value of U.S. agricultural production fell by nearly a third between 1993 and 2003. (Sales and production are adjusted for price changes and are reported in 2003 dollars.)

The number of small family farm operators who reported farming as their primary occupation has declined. In 1993, these farms accounted for 37 percent of all farms and 32 percent of the value of production. By 2003, their shares had fallen to 27 percent of all farms and 20 percent of production. By contrast, residential farms—or small farms whose operators report off-farm work as their primary occupation—rose from 36 percent of all farms in 1993 to 42 percent in 2003. But their average sales were very low ($12,000 in 2003), accounting for only 5 percent of production. In addition, small family

farms with retired operators also increased as a proportion of all farms over the last decade.

Where did production go? Between 1993 and 2003, the number of nonfamily farms, which include farms with hired managers as well as farms organized as nonfamily corporations and cooperatives, grew by about a fourth to 35,000, and their share of production rose from 10 to 14 percent. But the major production shift is attributed to very large family farms, which have at least $500,000 in annual sales. The number of very large family farms rose by nearly half to 66,600 over the period, while their share of production grew from 33 to 44 percent. Production of livestock and fruits and vegetables has long been concentrated among very large family farms; substantial shares of field crop production are shifting to those operations as well.

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This finding is drawn from . . .

Structural and Financial Characteristics of U.S. Farms: 2004 Family Farm Report, edited by David E. Banker and James M. MacDonald, AIB-797, USDA, Economic Research Service, March 2005, available at: www.ers.usda.gov/publications/aib797/

For more information on the characteristics of U.S. farms and changes in their size distribution, visit the ERS Briefing Room on Farm Structure: www.ers.usda.gov/briefing/farmstructure/

Ag Biotech Patents on the Move

FINDINGS

Innovation in agricultural biotechnology has recently flourished. Since the late 1980s and continuing into the 1990s, a variety of firms have secured key patents, from relatively small seed supply companies and research-oriented agbiotech firms to large multinational corporations. But beginning in the late 1990s, the larger companies began acquiring the smaller ones. Mergers among several of the large firms placed a majority of agbiotech patents in the hands of a dwindling number of large, international corporations.

This concentration of patent ownership means that an increasing share of future research will probably be done by companies with the large scale necessary to handle technology development, product marketing, and regulation compliance efficiently. But these companies might restrict research to complement their existing products. Small startup companies might still pursue innovative avenues of research, but probably with an eye toward becoming acquisition targets or benefiting from licensing revenue. Patents will play a key role in either of these strategies.

A recent study analyzed changes in patent ownership of more than 3,000 agbiotech patents owned by a sample of U.S. and European companies. Agricultural biotechnology patents issued between 1976 and 2000 were classified by their original patent holders and their 2002 owners. The study reveals that by 2002, fully 95 percent of patents originally held by seed or small agbiotech firms had been acquired by large chemical or multinational corporations.

Furthermore, none of the smaller firms acquired patents from the larger ones, and none of the patents changed hands among the different types of large firms. For instance, chemical companies retained all 651 patents for which they were the original owners, but also acquired 219 patents from agbiotech firms and 451 patents from seed companies. With key patents being held by fewer companies, intellectual property ownership will probably continue to affect agbiotech industry structure and the pace and direction of future research.

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For more information . . .

The ERS Agricultural Biotechnology Intellectual Property database, available at: www.ers.usda.gov/data/agbiotechip/

See also "Mergers, Acquisitions and Flows of Agbiotech Intellectual Property," by David Schimmelpfennig and John King, in *International Trade and Policies for Genetically Modified Products*, R.E. Evenson and V. Santeniello (eds.), CABI Publishing, 2005.

Agricultural biotechnology patents moving to larger companies

		Original patent holders, 1976-2000				
		Small companies		Large companies		
Final owners, 2002		Agbiotech	Seed	U.S. Chemical	Multinational	European
Small companies	Agbiotech	24 (5%)				
	Seed		31 (5%)			
Large companies	U.S. Chemical	219 (49%)	451 (69%)	651(100%)		
	Multinational	175 (39%)	175 (27%)		528 (100%)	
	European	31 (7%)				718 (100%)
Total		449	657	651	528	718