

## Productivity Drives Growth in U.S. Agriculture

Achieving higher productivity has been a driving force for growth in U.S. agriculture. The effects of productivity

growth over the second half of the 20th century were dramatic. Between 1950 and 2000, the average amount of milk produced per cow increased from 5,314 lbs/year to 18,201 lbs/year, the average yield of corn rose from 39 bushels/acre to 153 bushels/acre, and each farmer produced on average 12 times as much farm output per hour worked.

There are many reasons for these improvements in productivity. For example, corn yields have improved through greater use of agricultural inputs, such as fertilizers and machinery, per acre of land. However, yields were also improved through the development of new technology. For example, the development of precision agriculture has allowed farmers to target fertilizer more efficiently, achieving higher crop yield per amount of fertilizer applied. An index of Total Factor Productivity (TFP), developed by ERS, measures the contributions of changes in input use, technology, and other factors to agricultural output growth. The TFP index points to three

striking patterns in agriculture.

First, new technologies have strongly influenced agricultural output

growth. Between 1948 and 2004, total agricultural output grew 170 percent, while total input use fell by 2 percent. Therefore, growth in output per unit of inputs, or TFP, accounted for all output growth. Second, agricultural TFP has grown about twice as fast as the comparable Bureau of Labor Statistics measure for the U.S. non-farm business sector since the mid-1960s. Third, in agriculture, productivity growth has driven the expansion in production, while most other U.S. industries have relied primarily on input accumulation as a source of growth.

Between 1960 and 2004, the average growth rate in output from all industries was almost double that of agriculture, reflecting the shrinking share of the farm sector in the national economy. Growth in TFP accounted for 13 percent of industrial output expansion, compared with 117 percent of growth in agricultural output. High TFP growth in agriculture helped free farm labor for employment in the rest of the economy and also reduced the need for more nonlabor inputs like land and capital to sustain increases in agricultural production. Improvements in agricultural TFP also contributed significantly to the overall productivity growth of the U.S. economy. A 2006 Harvard University study found that while agriculture comprised only 1.8 percent of the Gross Domestic Product produced by private industry between 1960 and 2004, it accounted for 12.1 percent of total TFP growth in the private business economy over the same period.  $\mathbb{W}$

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

*Productivity Growth in U.S. Agriculture*, by Keith Fuglie, James MacDonald, and Eldon Ball, EB-9, USDA, Economic Research Service, September 2007, available at: [www.ers.usda.gov/publications/eb9/](http://www.ers.usda.gov/publications/eb9/)  
ERS Data on Agricultural Productivity in the United States, [www.ers.usda.gov/data/agproductivity/](http://www.ers.usda.gov/data/agproductivity/)

### Sources of growth in agriculture and all U.S. industries, 1960-2004

	Agriculture	All U.S. industries
	<i>Percent</i>	
Average annual growth in output	1.7	3.2
Share of output growth due to:		
Growth in nonlabor inputs	11.8	54.1
Growth in labor hours	-34.2	23.7
Growth in labor quality	5.6	8.8
Growth in Total Factor Productivity	116.8	13.4
	100.0	100.0

Sources: Statistics for agriculture, USDA, Economic Research Service; statistics for all U.S. industries, "The Industry Origins of the American Productivity Resurgence," in *Productivity, Volume 3: Information Technology and the American Growth Resurgence*, by Dale W. Jorgensen, Mun S. Ho, and Kevin J. Stiroh, The MIT Press, 2005, and subsequent updates.