

## Summary

The increasing size and specialization of hog operations reflect significant structural change in U.S. swine production during the past two decades. Once dominated by small operations that practiced crop and hog farming, the industry has become increasingly concentrated among large operations that produce hogs on several different sites. Further, large operations that specialize in a single phase of production have replaced farrow-to-finish operations that performed all phases of production. Organizational change in hog production, particularly the widespread use of contracting, has enabled individual producers to grow by specializing in a single phase of production. Technological innovation has also been a driving force behind the changes and has contributed to substantial increases in farm productivity.

### ***What Is the Issue?***

As the industry has changed, hog producers have had to adjust the size, organizational structure, and technological base of their operations, or cease production. The effects of the changes have extended beyond the industry, as restructuring has heightened environmental risks and nuisance impacts, raised concerns about the integrity of rural communities in farming-dependent areas, precipitated controversy over animal welfare, and lowered pork prices for consumers. By providing information about changing structural characteristics and economic relationships in hog production, and what these suggest for the future of hog farms, this report provides context for these broader issues as well.

### ***What Did the Study Find?***

*Scale and organization* - The number of hog farms fell by more than 70 percent between 1992 and 2004, whereas the hog inventory remained stable. The average hog operation grew from 945 head in 1992 to 2,589 head in 1998 and to 4,646 head in 2004. The share of the hog inventory on operations with 2,000 or more head increased from less than 30 percent to nearly 80 percent. Operations with 5,000 or more head held more than 50 percent of the hog inventory in 2004.

Traditional farrow-to-finish production has given way to operations specializing in a single phase of production. Specialized finishing operations increased their share of output from 22 to 77 percent during 1992-2004, whereas the share of production from farrow-to-finish operations fell from 65 to 18 percent. Hog operations organized under production contracts grew from 3 percent of operations in 1992 to 28 percent in 2004 and accounted for more than two-thirds of hog production (sales and removals) in 2004. Operations producing under contract were larger than independent operations and were more likely to specialize in a single phase of production.

*Regional trends* - The rapid growth of hog operations along the east coast of the United States during 1992-98 slowed in subsequent years partly because the North Carolina State legislature placed a moratorium on expanded hog production in the State (a leading hog producer) in response to environ-

mental concerns. In contrast, the size of hog operations increased more rapidly in Midwestern hog-producing States during 1998-2004 as contract production expanded in those areas.

*Productivity gains* - Structural change in the industry coincided with substantial gains in efficiency for hog farms, particularly on specialized hog-finishing operations. Feeder-to-finish operations had annual reductions in the amount of feed and labor used per unit of output of 4.7 percent and 13.8 percent, respectively, between 1992 and 2004, while their real, or inflation-adjusted, production costs per hundredweight of gain declined at an average annual rate of 4.7 percent.

For feeder-to-finish farms, total factor productivity increased at an average annual rate of 6.4 percent from 1992 to 1998 and 6.3 percent from 1998 to 2004. Most of these productivity gains were attributable to increases in the scale of production (scale efficiency) and technological innovation. Increases in the size of production operations helped account for almost half of the total increase in farm productivity. Further increases in scale efficiency likely will be limited for large farms. However, there is greater scope for efficiency gains in the sector as a whole from further increases in scale.

Trends in farm productivity in two major hog-producing regions, the Southeast and the Heartland, mirrored trends in farm output: productivity increased more in the Southeast between 1992 and 1998 and increased more in the Heartland between 1998 and 2004. Growth in average farm size and the resulting improvements in scale efficiency accounted for most of the differences in productivity growth between the Heartland and Southeast since 1992. Farms in both regions had similar rates of technical advance over the study period.

The use of production contracts continues to be associated with higher farm productivity. The estimates of productivity gains associated with contracting suggest that these productivity advantages helped encourage the recent growth in contracting in the hog industry. Increases in hog farm productivity benefit society through lower food prices for consumers. Productivity gains contributed to about a 30-percent reduction in the price of hogs at the farm gate.

## ***How Was the Study Conducted?***

Data used in this report come from USDA surveys of U.S. hog producers conducted for 1992, 1998, and 2004. ERS used a regression analysis to measure hog farm total factor productivity growth between 1992 and 2004 and decompose it into changes in four components: (1) technical change, the increase in the maximum output produced from a given level of inputs; (2) technical efficiency, the farm's ability to achieve maximum output given its set of inputs; (3) scale efficiency, the degree to which a firm optimizes the scale of its operations; and (4) allocative efficiency, a farm's ability to select levels of inputs such that input price ratios equal the ratios of the corresponding marginal products. The study examined variation in economies of scale by farm size, analyzed how increases in scale contributed to productivity growth, and investigated whether scale economies have increased over time. The analysis took advantage of differences in regional growth rates of farm size to examine how limits on the scale of production can affect productivity change. ERS also estimated potential increases in retail pork prices had there been no change in farm productivity.