



United States
Department
of Agriculture

Electronic
Information
Bulletin
Number 43

January 2009



A Report from the Economic Research Service

www.ers.usda.gov

The Transformation of U.S. Livestock Agriculture: Scale, Efficiency, and Risks

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Abstract

U.S. livestock production has shifted to much larger and more specialized farms, and the various stages of input provision, farm production, and processing are now much more tightly coordinated through formal contracts and shared ownership of assets. Important financial advantages have driven these structural changes, which in turn have boosted productivity growth in the livestock sector. But structural changes can also generate environmental and health risks for society, as industrialization concentrates animals and animal wastes in localized areas. This report relies on farm-level data to detail the nature, causes, and effects of structural changes in livestock production.

Keywords: Livestock, dairy, broilers, hogs, fed cattle, farm structure, scale economies, contract agriculture, CAFOs, growth-promoting antibiotics

Acknowledgments

We thank Don Blayney and Mark Ribaldo of ERS, Jeremy Foltz of the University of Wisconsin, Rita Hansberry of USDA's Grain Inspection, Stockers and Packyards Administration, and Sherry Wise of USDA's Agricultural Marketing Service for comments on earlier drafts. Erik O'Donoghue, Richard Nehring, Carmen Sandretto, and Nigel Key, all of ERS, also contributed to the research reported on in this report. Dale Simms provided editing support.

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Summary

Livestock agriculture has undergone a series of striking transformations. Production is more specialized—farms usually confine and feed a single species of animal, often with feed that has been purchased rather than grown onsite, and they typically specialize in specific stages of animal production. Today's livestock farms tend to be tightly linked to other stages of production and processing through formal contracts. While the farms are usually owned and operated by a family, they rely increasingly on hired labor. And the farms that account for most production are much larger than they were in the past.

What Is the Issue?

Strong financial pressures have driven the industrialization of U.S. livestock farms. Larger operations are able to realize lower costs and higher returns, while tighter coordination among firms at different processing stages can reduce financial risks. But growing to a more efficient scale also concentrates livestock in a limited area, and excess concentrations of manure-based nutrients can lead to increased air and water pollution. Large operations are also more prone to use antibiotics intensively in order to pre-empt the spread of animal disease and to accelerate animal growth. Extensive antibiotic use in livestock raises concerns about increased pathogen resistance and related risks to human health. This report assesses the driving forces behind structural change in fed-cattle, dairy, hog, and broiler production, and describes the effects on productivity, prices, and pollution/health risks. It concentrates on changes in the size structure of farms, their organization and production practices, and their contractual links with processors and integrators.

What Did the Study Find?

U.S. livestock production is shifting to much larger enterprises, in part because of scale economies. Between 1987 and 2002, the production locus (the farm size, in annual sales, at which one half of national production comes from larger farms and half from smaller) increased by 60 percent in broiler, 100 percent in fed-cattle, 240 percent in dairy, and 2,000 percent in hog production. Recent surveys indicate that production has continued to shift to larger operations since 2002.

While most large livestock and poultry farms are family owned and operated businesses, they are becoming more closely linked to input providers and processors through formal contracts, joint ownership of animals, and vertical integration. Tighter vertical coordination can ease management of financial risks and speed the diffusion of innovations.

Structural change has led to increased productivity and, through that, to lower commodity costs of production. For example, the largest dairy farms (1,000 cows or more) had average costs of \$13.59 per hundredweight in 2005, 15 percent below the average for farms in the next largest size class (500-999 head) and 35 percent below the costs for farms with 100-199 head (estimated \$20.82 per cwt). Lower costs of production typically lead to lower

wholesale and retail prices. However, structural change in livestock agriculture has had less felicitous effects as well.

Livestock wastes are becoming more geographically concentrated in the United States, and excessive applications of the nutrients contained in manure pose risks to air and water resources. There is a clear association between farm size and the concentration of manure—larger operations are more likely to ship manure to other operations and apply manure to their own fields more intensively. However, the cost to large farms of removing manure is still modest in relation to their production cost advantages, and there are a variety of ways to mitigate the risks from the concentration of manure. One such example is to reformulate the feed to reduce the amount of nutrients excreted by the animals.

Many hog and broiler operations provide subtherapeutic doses of antibiotics routinely in feed and water to promote animal growth and to prevent disease. The commercial value of such practices appears to be substantial in some stages of production, like nursing in hogs, but marginal in others. Other technologies, including expanded sanitation and testing procedures, can be substituted for subtherapeutic antibiotics in some stages of production.

Individual producers may have little incentive to take costly actions to mitigate the harmful effects of livestock industrialization. Livestock production is highly competitive, and operations with high costs may jeopardize their own survival in policing themselves. However, steps can be taken, at modest cost, that preserve the benefits of industrialized livestock production while limiting its harmful effects.

How Was the Study Conducted?

This report draws on recent ERS reports, which in turn rely on farm-level data drawn from the Census of Agriculture and from the annual Agricultural Resource Management Survey (ARMS). The Census provides an indepth source of information on levels and changes in farm size, specialization, and location, while ARMS surveys the financial conditions and production practices of farm businesses, and the well-being of farm households. Some ARMS versions contain detailed questions on the production and marketing practices, expenses, and revenues associated with specific commodities. This report draws on surveys of producers of hogs (in 1992, 1998, and 2004), dairy products (in 2000 and 2005), and broilers (2006).