



AgEcon SEARCH
RESEARCH IN AGRICULTURAL & APPLIED ECONOMICS

The World's Largest Open Access Agricultural & Applied Economics Digital Library

This document is discoverable and free to researchers across the globe due to the work of AgEcon Search.

Help ensure our sustainability.

Give to AgEcon Search

AgEcon Search

<http://ageconsearch.umn.edu>

aesearch@umn.edu

*Papers downloaded from **AgEcon Search** may be used for non-commercial purposes and personal study only. No other use, including posting to another Internet site, is permitted without permission from the copyright owner (not AgEcon Search), or as allowed under the provisions of Fair Use, U.S. Copyright Act, Title 17 U.S.C.*



Economics of Animal Agriculture Production, Processing and Marketing

Michael D. Boehlje

JEL Classification: Q13

The North American livestock industry (beef, pork, dairy and poultry) has and continues to undergo major structural change due to rapid evolution in product characteristics, worldwide production and consumption patterns, technology, size of operation, and geographic location. Production, once dominated by independent, family-based, small-scale firms, is now led by larger firms that are tightly aligned across the production and distribution chain, as evidenced for U.S. pork production in Figure 1 and U.S. beef production in Table 1. Slaughter of livestock is also increasingly dominated by larger firms, as indicated for the United States in Table 2.

Contracts, vertical integration and other types of marketing arrangements are increasingly important across nearly every market level—from input supply and seed stock to finished food product markets, as reflected for U.S. pork in Figure 2. Niche markets for differentiated products that may command a premium from some consumers are growing. Similar trends characterize the Canadian and, to a lesser extent, the Mexican livestock industry. As the industry has become more industrialized, specialized and managerially intense, production and processing plant location options have expanded beyond traditional production regions, with increased emphasis on global sourcing and selling.

There is great diversity in how livestock is produced in North America and the world, but common themes are emerging. As in North America, many countries are experiencing major structural changes in their production sectors, and environmental concerns in production are nearly universal. Technology adoption is rapid, and a “world standard” is evolving to greater commonality of technology, size of production units, processing and quality, particularly in the case of pork and poultry. This is less so for

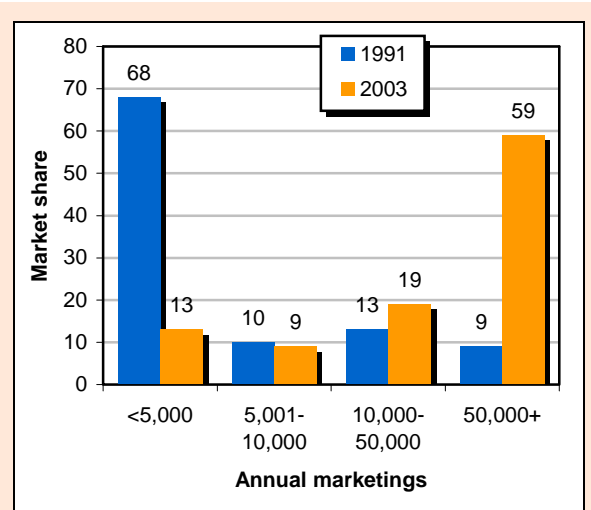


Figure 1. Change in market share by pork producer size for 1991 and 2003.

Source: Boessen, Lawrence and Grimes, 2004 Pork Industry Structure Study, June-July, 2004.

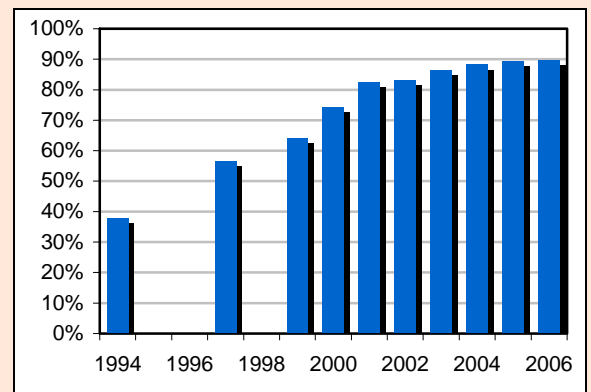


Figure 2. Percent of hogs sold under contract or vertical integration.

Source: 1994 and 1997 studies by University of Missouri, Pork Magazine, PIC, DeKalb Choice Genetics, National Pork Producers Council, Land O'Lakes. 1999-2006 studies by University of Missouri, NPPC, National Pork Board. 2002-06 USDA/AMS data.

Table 1. Cattle marketings by size of feedlot.

Head	2004	2005
	% of Annual Slaughter	
<1000	14.7	14.0
1-16,000	33.7	16.2
16-24,000	9.0	8.6
24-32,000	9.0	9.2
32-50,000	16.7	26.2
50,000 or greater	16.9	25.8

Source: USDA Cattle on Feed, NASS, February 2006.

Table 2. Four (4) firm concentration ratio for cattle, sheep, and hog slaughter.

	1980	1990	2000	2004
	% of Annual Slaughter			
Cattle	28.4	58.6	69.6	70.9
Sheep	55.9	70.2	69.8	66.9
Hogs	33.6	40.3	57.1	61.3

Source: USDA, Packers and Stockyards Statistical Report, G1PSA SR-06-01, February 2006.

beef, in large part because of its reliance on forage. Differences do exist across species and parts of the world that differentiate competing suppliers of animal proteins.

This article draws on a much longer report, *The Future of Animal Agriculture in North America* (Farm Foundation, 2006). It summarizes the implications of the fundamental forces of consumer demand, cost drivers, changes in market structure, and government policy and regulation for the competitiveness of the North American livestock industry during the next decade. Initial emphasis is on the expected future that would result from no major changes in public policy or private sector business strategies. Then alternative futures are described which would require public sector intervention or new private sector initiatives. Finally, some of the critical future challenges and opportunities are identified and discussed.

The Expected Future

The trend to fewer and larger livestock and poultry production, processing and marketing firms is expected to continue. The economies of scale in production and processing are significant and will drive larger scale optimal size of the facility, as well as the firms. Firm-level economies will be captured through effective supply chain management that improves cost efficiency and control, food safety and quality, and the ability to respond to consumer demands.

Quality concerns will also drive more systematic, micro-managed production and distribution processes to reduce product variability, and improve conformance with quality standards and consumer expectations of uniform product attributes. Technology, including genomics, nutritional advances, RFID and other tracing systems, will provide new efficiencies and information to better manage the system. Concerns about food safety and a drive to qualified suppliers and traceback will increase pressures for and payoffs of

tighter coordination along the production and distribution chain.

Successful small and mid-sized producers face serious survival challenges in determining how they fit into integrated supply chain structures. Higher revenue may be possible in value-added niche markets where consumers pay high enough premiums for differentiated products to offset the increased cost of producing, processing and distributing in small quantities. Small and mid-sized producers may be able to capture the market access and cost advantages of larger producers by joining a network or alliance that acts like a large producer. Both these options require a high level of cooperation and interdependence among producers.

The larger scale processing plants that will continue to be the norm require significant capital outlays and adequate supplies of live animals for efficient operations. Producers and their lenders are not expected to invest in production capacity if access is not assured to processing plants that can pay competitively for products. This interdependence will result in development of production-processing centers and supporting infrastructure as the optimal strategy for growth and expansion in the industry. The geographic location of such expansion will continue to be influenced by economics of scale and scope and the logistics of bringing feedstuffs to livestock and shipping livestock products to retailers. But capital and technology are increasingly mobile, and global livestock firms that locate production-processing capacity in different countries will increasingly dominate the industry. The implication is that the North American livestock industry will face even more competition in the future.

Alternative Futures

Alternative futures for the North American livestock industry include:

- changed global cost competitiveness resulting from regulatory reform;
- greater emphasis on differentiated animal protein products, rather than commodity production and distribution; and
- less concentrated, smaller firms, independent, open-market coordination, and more diversified production/distribution systems.

Regulatory Reform. Regulatory reform might include added restrictions on business models such as contract production or vertical integration, more restrictive immigration policies or worker safety rules, increased environmental regulation, or restrictions on use of feed ingredients/additives – all of which would generally increase costs for the North American livestock industry. Regulations can create benefits, as well as costs. For example, increased inspection, individual animal identification and other measures to monitor animal health and food safety will likely increase costs, but are increasingly critical to maintain and expand foreign market access. In general, regulatory reform that limits economic activity and/or increases private-sector costs will be disadvantageous to small-scale firms; decrease the innovation and adaptability of the industry to a changing business climate; discourage the private sector from investing and expanding; and undermine the industry's global competitiveness unless other countries or locales adopt similar regulations.

Differentiated Product Focus. Consumers have diverse preferences. Many affluent consumers are demanding extrinsic food attributes above and

beyond food safety or federal grading standards. These attributes include animal welfare, organic, social responsibility, environmental responsibility, free-range production, locally-grown, and no use of antibiotics, synthetic growth hormones, or genetically modified organisms. Many of these differentiated production practices increase production costs relative to traditional commercial production methods. Differentiated markets and different pricing/product valuation structures are necessary to encourage such production practices.

In general, differentiated product or process markets originate as niche markets. These are generally small markets meeting particular consumer demands. Success in developing niche markets may provide market-based opportunities for some, but is unlikely to accommodate a large number of growers. Public support for the development and implementation of certification and verification programs (i.e., USDA Organic and PVP) may provide the necessary infrastructure. Niche markets may offer growth opportunities for independent, small producers and processors; however, at some volume or margin, these markets will likely attract investment from large-scale operators.

Maintaining Open Markets and Industry Diversity. There are concerns that marketing agreements, contracts and similar business arrangements are more conducive to larger operations; reduce spot market liquidity; reduce the availability of market information needed for efficient price discovery; and adversely affect smaller operations. The substantial horizontal contracting growth in hog production, for example, suggests contracts enable large production operations to get

larger. However, numerous other factors contribute to horizontal (as well as vertical) integration in livestock production, including profits that attract external capital, and advances in genetics, health, nutrition and production management that increase economies of scale.

Contracting has enabled many smaller operations to remain viable by focusing on production and allowing integrators to provide services, capital, and risk management. For small and modest-sized operations, networking with other producers in a cooperative or other form of alliance is one way to increase competitiveness; increase access to markets and market premiums; and access high-quality genetics and other inputs, including genetics and better information and management skills. Public-sector interventions that limit business arrangements or size would make it difficult to capture the efficiency and other benefits of these business strategies.

A key argument for public-sector interventions is concern about monopoly or monopsony power in the livestock industry value chains. Assessments of market power in the U.S. livestock industry have generally been inconclusive, or indicate limited impacts. If the structural changes are the documented result of market power or similar behavior, aggressive pursuit of remedies under anti-trust or other regulations is appropriate.

There is a compelling argument that consolidation and vertical coordination in the livestock industry are driven by fundamental economic forces. Government regulations or interventions to recreate a smaller scale, independent firm, diversified livestock industry are likely to be ineffective unless carefully crafted and quite restrictive. If effective, the objectives or anticipated benefits of

consolidation and coordination will not be achieved, undermining the global competitiveness of the North American livestock industry.

Future Challenges and Opportunities

We identify here some key issues that will impact the global competitiveness of the North American livestock industry and merit further analysis and research.

Coordination and Value Chain Structures.

Development of value chain coordination strategies and systems is a costly, time-consuming endeavor, requiring considerable cooperation among vertical partners and customers. More information is needed regarding attributes of effective coordination strategies; anticipated customer demands; and implications of various forms of vertical coordination strategies on economic efficiency, competitiveness, market access, and risk shifting.

Source Verification, Identity Preservation and Food Traceability Systems. It is critical to better understand the benefits, costs and functionality of food product traceability and identity preservation systems. In the absence of government edicts, economics will dictate the type of traceability system used in each segment of each industry. Developing technology continues to reduce costs and increase the technical feasibility of enhancing information collection and product and animal tracking. Increased assessment of market implications of government mandated vs. market-driven animal and/or meat product traceability systems is needed.

New Markets/Niche Markets. The scope of niche and highly differentiated markets for meat products is yet

uncertain. Understanding consumers' willingness to pay for extrinsic attributes is critical to assess the implications of differentiated product markets on the competitive position and growth opportunities for North American producers and processors.

Regulatory Costs. The significant impact that regulatory costs have on cost competitiveness, relative to size of firm and location, is essential to understanding the global competitiveness of the North American livestock industry. Uniform regulations are not size-neutral because it is generally less costly per unit of output for larger firms to comply than it is for small firms. Different regulations in various communities or locales will differentially impact costs. Empirical estimates of regulatory costs by size and geographic location are generally unavailable; further work is clearly needed.

Cross Border Animal/Product Movement.

Border disruptions in the North American animal and animal product markets change margins, and thus have an impact on investment location, production levels and trade patterns. Such changes are frequently more permanent than temporary. Reopening borders is a lengthy and complicated process, even when the foundation for international agreement is science-based. New rules and planning for such disease-related events are important to facilitate rapid restoration of trade, efficient investment decisions, and greater certainty in returns.

Energy Costs and Ethanol Production.

Rising energy costs will have a significant impact on the North American livestock industry. Higher energy costs increase costs of livestock pro-

duction, but also increase the value of manure as a fertilizer source. Energy from manure may be feasible. Another unknown is what will happen to corn prices and net feed costs as ethanol production increases. The potential for distiller's grains as a competitively priced and effective feed ingredient is substantial. Transportation costs for grain, distiller's grain and ethanol will be important factors impacting the location of both energy plants and the animal agriculture industry.

A Final Comment

North America enjoys highly efficient livestock production systems that have adapted and evolved to meet changing conditions. New products are available to meet changing consumer preferences. New production systems reduce costs. Contracts are replacing open markets and redefining the relationships among the stakeholders in the system. Technological developments increase farm-level productivity, processing efficiency, distribution systems and marketing. Every facet of the animal food chain—from genetics to retail and food services outlets—is adjusting to the rapid pace of change. The North American animal agriculture industry remains competitive today in the world market, but the competitive pressures will increase with the evolution of increasingly global livestock production, processing and marketing firms and systems.

For More Information

Dickinson, D.L., & Bailey, D. (2002). Meat traceability: Are U.S. consumers willing to pay for it? *Journal of Agricultural and Resource Economics*, 27, 348-364.
Farm Foundation. (2006). *The future of animal agriculture in North*

- America*. Available Online: <http://www.farmfoundation.org/projects/04-32ReportTranslations.htm>. Oak Brook, IL.
- Grimes, G., & Plain, R. (2005, January). U.S. Hog Marketing Contract Study. Department of Agricultural Economics Working Paper No. AEWP 2005-01, University of Missouri. Available online: <http://agebb.missouri.edu/mkt/vertstud05.htm>.
- Herath, D.P., Weersink, A.J., & Carpentier, C.L. (2005). Spatial and temporal changes in the U.S. hog, dairy, and fed-cattle sectors, 1975-2000. *Review of Agricultural Economics*, 27(1), 49-69.
- Lawrence, J.D., & Hayenga, M. (2002, June). The U.S. pork and beef sectors: Divergent organizational patterns, paradoxes and conflicts. In J.H. Trienekens and S.W.F. Omta (Eds.), pp. 512-521. *Paradoxes in Food Chains and Networks*, Proceedings of the Fifth International Conference on Chain and Network Management in Agribusiness and the Food Industry. Noordwijk, The Netherlands: Wageningen Academic Publishers.
- Ochoa, V., & Zahniser, S. (2003). The Mexican hog industry: Moving Beyond 2003. Paper prepared for the Policy Disputes Information Consortium's Ninth Agricultural and Food Policy Workshop *Farm Policy Developments and Tensions with NAFTA*, Montreal, Quebec.
- Purdue University Cooperative Extension. (1997). *Food System 21*. Purdue University Cooperative Extension. Available online: http://www.agecon.purdue.edu/cab/research/articles/FS%2021%20Hog_Pork%20Sector.pdf.
- Schroeder, T.C., & Kovanda, J. (2003). Beef alliances: Motivations, extent, and future prospects. *The Veterinary Clinics of North America Food Animal Practice*, 19, 397-417.
- Sutton, A.L., Kephart, K.B., Versteegen, M.W.A., Canh, T.T., & Hobbs, P.F. (1999). Potential for reduction of odorous compounds in swine manure through diet modification. *Journal of Animal Science*, 77, 430-439.
- Tonsor, G.T., & Schroeder, T.C. (2005). Livestock Identification: Lessons for the U.S. Beef Industry from the Australian System. Working Paper, Department of Agricultural Economics, Kansas State University, Manhattan, KS.
- Michael D. Boehlje (Boehlje@purdue.edu) is Professor, Department of Agricultural Economics, Purdue University, West Lafayette, IN. The author wishes to thank Mike Duffy, Joseph Molnar, Janet Perry, Warren Preston, Ted Schroeder, Alan Sutton, and Doug Hedley for their assistance in the drafting of the original report from which this synopsis was developed.*

