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Characteristics and Production Costs of U.S. Hog Farms, 2004

William D. McBride and Nigel Key



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A Report from the Economic Research Service

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Characteristics and Production Costs of U.S. Hog Farms, 2004

William D. McBride and Nigel Key

Abstract

Hog production in 2004 was characterized by wide variation in the types, sizes, and economic performance of operations. Operations specializing in a single production phase generated more than three times the product value, on average, of those using the traditional farrow-to-finish approach. Low-cost operations tended to be larger, located in the Heartland, and operated by farmers whose primary occupation was farming. Small and medium operations far outnumbered large and very large operations, but large and very large operations accounted for most of the production. Average production costs declined as the size of the hog operation increased, a result of reduced capital costs and more efficient input use. Hog production was highly concentrated in the Heartland, but the largest operations were specialized hog finishing units in the Southern Seaboard.

Keywords: Agriculture, swine, hogs, hog production, hog operations, Agricultural Resource Management Survey, production costs, economies of size

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Summary

The U.S. swine industry has undergone significant changes in the size and ownership structure of operations during the past two decades. Farm survey data on hog operations (locations with hogs) for 2004 reveal an industry characterized by wide variation in the types, sizes, and economic performance of operations. Once dominated by small, owner-operated crop-hog farms, hog ownership has become increasingly concentrated. The traditional approach of farrow-to-finish production, where all phases of production are performed on one operation, is being replaced by operations that specialize in a single production phase.

What Is the Issue?

Changes in the structure and performance of hog operations have important implications for those associated with the industry. Hog producers continually face decisions about adjusting the size, organizational structure, and technological base of their operations to improve economic performance and farm viability. The restructuring in the hog industry has given rise to many concerns: environmental risks and nuisance effects from large hog operations, social implications of a declining rural population, and food safety, nutrition, and animal welfare concerns. Consequently, information about structural characteristics and economic relationships in hog production and what they suggest for the future of hog farming is needed.

What Are the Major Findings?

A wide variation in the types, sizes, and economic performance of hog operations characterized the industry in 2004. Specialized farrowing, weanling, and hog finishing operations averaged nearly \$1 million or more of production value. By contrast, farrow-to-finish operations averaged about \$322,000 in production value.

Large specialized hog operations had been in business an average of no more than 13 years in 2004, compared with 20 years for the farrow-to-finish operations. The specialized operations also showed more recent investment in production facilities and equipment, and greater technical innovation, using such innovations as artificial insemination, terminal crossbreeding, and all-in/all-out management more often than did farrow-to-finish operations.

Hog farms with the lowest costs of production in 2004 tended to be large, located in the Heartland, and operated by farmers whose primary occupation was farming. Performance indicators—such as pigs per litter, death loss, and feed and labor efficiency—were also better on low-cost operations. The better performance may be due to their greater use of improved technologies in such areas as breeding, feeding, and facilities management.

Small and medium hog operations far outnumbered large and very large operations during 2004, but large and very large operations accounted for most of the production. The use of contracts for finishing hogs increased

with the size of the operation. Contracts were used by 75 percent or more of large and very large hog finishing operations compared with less than 50 percent of smaller operations. Operators of small and medium operations were generally older and more often reported plans to exit the hog industry in the next 5 years, suggesting that the trend toward fewer and larger operations will likely continue.

Most indicators of physical and economic performance improved as the size of operation increased. These differences may be partly due to less-than-full capacity utilization by small operations as well as to the superior technologies used on larger operations. Average production costs declined as the size of the hog operation increased, a result of spreading capital ownership costs over more units of production as well as more efficient input use.

Variation in production costs was most pronounced among the more diverse small operations, and fewer of these operations could cover their costs at a live market hog price of \$40 per hundredweight. Despite the higher average costs of small operations, several had costs competitive with those of larger operations.

Hog production was highly concentrated in the Heartland in 2004, but the largest operations were in the Southern Seaboard, where hog finishing operations averaged more than 12,000 head sold or removed per year. The larger hog finishing operations in the Southern Seaboard were more feed and labor efficient than those in other regions, but their production costs were higher than in the Heartland, where lower corn prices offset the better feed efficiency.

How Was the Study Conducted?

This report uses data from an in-depth survey of U.S. hog producers in 2004 as part of USDA's annual Agricultural Resource Management Survey (ARMS). The survey collected information from a cross section of U.S. hog operations, including measures of size, production costs, business arrangements, production facilities and practices, and farm operator and financial characteristics. Surveyed farms were first divided into the types of producers common to the U.S. hog industry, and differences among the producer types were evaluated. Differences among farrow-to-finish and feeder pig-to-finish operations were explored in-depth. Data on structural and farm characteristics and on hog production practices and costs were summarized for these producers in order to explore variations in production cost, economies of size, and regional diversity in U.S. hog production.

Introduction

The U.S. swine industry has undergone significant changes in the size and ownership structure of operations during the past two decades. These changes have had profound effects on industry performance and on appropriate strategies for dealing with change by virtually all associated with the industry. Hog producers have increasingly faced decisions about adjusting the size, organizational structure, and technological base of their operations. Confronted with these changes, many producers have chosen to cease production; during the past two decades, the number of hog operations has fallen about 75 percent (USDA, NASS, 2006). Even nonproducers have been affected by these changes due to environmental risks and nuisance effects, social implications of a declining rural population, and food safety, nutrition, and animal welfare concerns. As a result, information about structural characteristics and economic relationships in hog production and what these suggest for the future of hog farms has a broad appeal.

This report presents characteristics and production costs of U.S. hog operations emphasizing economic relationships that affect the size and ownership structure of production. The objective is to provide updated information on size, production costs, business arrangements, production facilities and practices, and farm operator and financial characteristics of the U.S. swine industry. The first section of this report describes the data used to develop the farm characteristics and hog production costs. The different producer types characterizing U.S. hog production are then described. Other sections explore production cost variation, economies of size, and regional diversity.

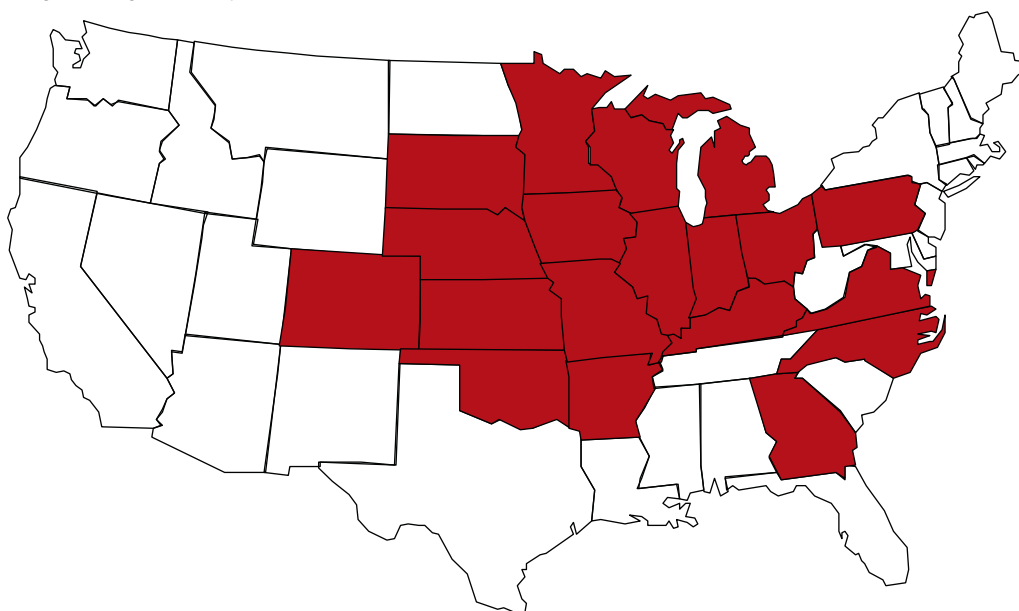
Data

This report uses data from an in-depth survey of U.S. hog producers in 2004 as part of USDA's annual Agricultural Resource Management Survey (ARMS). The survey collected information from a cross section of U.S. hog operations, including measures of size, production costs, business arrangements, production facilities and practices, and farm operator and financial characteristics. The sampling resulted in 1,198 responses from producers in 19 States (fig. 1). Hog producers in the Northeast and the Far West were not surveyed because of their minor share of hog production and because of limited survey funds.

Hog farms surveyed in the 2004 ARMS were chosen from a list of farm operations maintained by USDA's National Agricultural Statistics Service (NASS). The survey's target population was farms with 25 or more hogs on the operation at any time during 2004. A primary purpose of the hog producer survey was to collect the information necessary to estimate the average cost of production for hog operations. Farms with fewer than 25 hogs were screened out to exclude farms that raise hogs primarily for on-farm consumption and other noncommercial activities, such as youth projects. The sample included operations with hogs regardless of who owned the hogs and thus included producers who raised hogs under a production contract with the hogs' owner (see Glossary). This is a different sampling unit than used in other surveys that measure the characteristics and practices of hog owners regardless of where the hogs are located (see box, "Hog Producers Versus Hog Owners"). Differences in the numbers of hog operations defined in the two different samples (by location of the hogs and by hog ownership) are reported by NASS (USDA, NASS, 2006).

Figure 1
States surveyed in the 2004 ARMS of hog producers

Producers in the surveyed States (shaded) accounted for about 91 percent of the hog and pig inventory on U.S. farms at the end of 2004.



Source: USDA, 2004 Agricultural Resource Management Survey.

Hog Producers Versus Hog Owners

The rapid growth of contract production has increasingly separated hog production from hog ownership. Contract production is an arrangement whereby a hog owner (a contractor) engages a producer (a grower) to take custody of the pigs and care for them in the producer's facilities. The producer is paid a fee for the service provided. Contractors typically furnish inputs for growers, provide technical assistance, and assemble the commodity to pass on for final processing or marketing. Contractors often market hogs through marketing contracts or other arrangements with packers or processors. Packers or processors also act as contractors and have production contracts directly with producers.

The 2004 ARMS data summarized in this report targeted farms with 25 or more hogs located on the operation at any time during the year regardless of who owned the hogs. Therefore, the survey samples included operations where hog producers own their hogs as well as contract grower operations that are producing hogs owned by a contractor. Contractors are often large conglomerate or corporate organizations that contract with many growers to produce hogs. For example, Smithfield Foods, a packing company, was by far the largest contractor in 2004 with about 800,000 sows (*Successful Farming*, 2005). In the survey data, information about the hogs owned by contractors such as Smithfield Foods is collected by contacting their contract growers.

In evaluating the results of this study, it is important to recognize that hog industry surveys can have different target populations and hence provide complementary, rather than duplicate, information. For example, data reported by Boessen, Lawrence, and Grimes (2004), as well as data from an earlier survey administered by Lawrence and Grimes (2001), are based on a survey of packers and other hog owners. Owners may have their hogs raised on many different contract farms. The ARMS data are derived from a survey of sites with hog production facilities, which include farms where hogs are grown under contract for contractors, farms owned by contractors, and independent operations that grow their own hogs and sell them locally or directly to packers.

Each surveyed farm represents a number of similar farms in the population as indicated by its expansion factor. The expansion factor, or survey weight, was determined from the farm's selection probability and thereby expands the sample to represent the target population. The sample represents approximately 91 percent of the hog inventory on U.S. farms at the end of 2004 (USDA, NASS, 2005) and 59 percent of U.S. farm operations that had any hogs or pigs during 2004 (USDA, NASS, 2006). The difference is due to the sample's excluding farms with fewer than 25 head. A comparison of hog farms and inventory by size category from the 2004 ARMS and 2004 NASS hog and pig statistics is shown in figure 2. Because farms with only a few hogs are screened out of the ARMS, the number of farms and the hog inventory on farms with fewer than 100 head is significantly lower in the ARMS. While these small hog operations represent about 60 percent of U.S. hog farms, they include only 1 percent of the U.S. hog inventory. The ARMS sample of hog inventory is distributed across the size categories much like that in the NASS statistics (fig. 2).

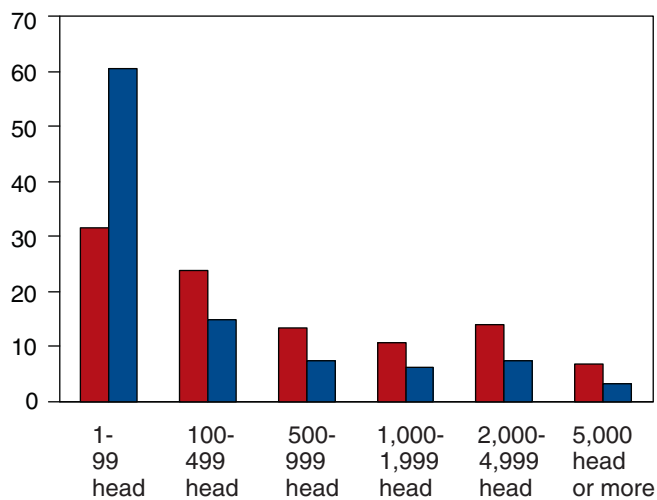
Figure 2

Survey coverage of U.S. hog farms and inventory by size of operation, 2004

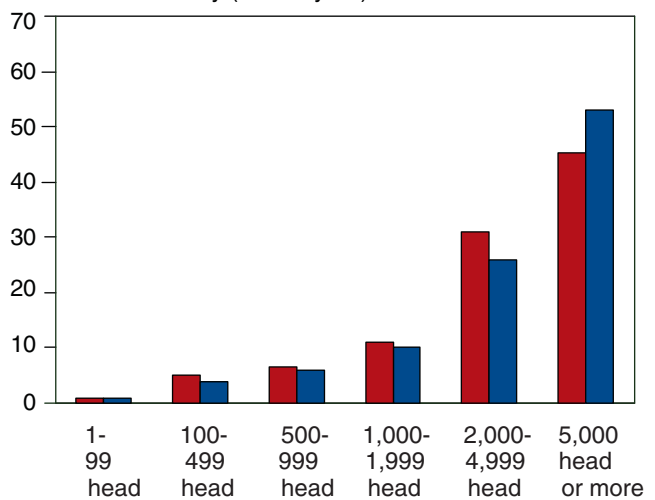
Because of screening, the ARMS represented a small portion of farms with fewer than 100 head.

However, ARMS and NASS statistics are similar for hog inventories in most size groups.

Percent of farms



Percent of inventory (end-of-year)



■ 2004 ARMS ■ 2004 NASS statistics

Sources: USDA, NASS, Farms, Land in Farms, and Livestock Operations, 2006 and the 2004 Agricultural Resource Management Survey.

Note: Both the ARMS and NASS estimates are based on surveys of farms with hogs on the operation and thus differences between the estimates are primarily due to the screening out of farms with fewer than 25 head of hogs in the ARMS, and the sampling and nonsampling error in each survey.

Types of Hog Producers

The traditional approach of farrow-to-finish production, where breeding and gestation, farrowing, nursery, and finishing phases (see box, “A Primer on U.S. Hog Production”) of production are performed on one operation, is being replaced by operations that specialize in a single production phase. The rapid growth of these large, specialized hog production units has been accompanied by increasing farm size and specialization in the hog enterprise. Specialized farrowing and weanling production occurred on farms with an average of over \$1 million of farm product value in 2004 (table 1). Of that total farm product value, hog production accounted for 96 percent of the value on farrow-to-wean operations and 74 percent on wean-to-feeder pig operations. Specialized hog finishing occurred on farms with an average production value of over \$900,000 in 2004, 72 percent of which came from hogs. By contrast, farm product value on farrow-to-finish operations was about \$322,000, with 59 percent coming from hog production. In addition, despite producing many more hogs, the specialized hog producers generally had much less acreage than the farrow-to-finish farms.¹

The trend toward specialized hog production is also apparent in the relative number of years these operations have been in the hog business. Farrow-to-finish producers had been in business an average of 20 years in 2004, compared with 13 years for specialized hog finishers and less for other specialized producers. Average operator age was also greater on farrow-to-finish farms, and significantly more of these operators were 65 years of age or more. Younger operators on the specialized operations tended to be more educated than farrow-to-finish operators, since much higher percentage had completed college.

¹This is not to say that farrow-to-finish operations more often use the land directly for hog production, rather that farrow-to-finish operations have control of more land on which to produce crops for hog feed and to dispose of hog manure than do specialized hog operations. Large specialized hog operations may have arrangements with nearby farms for spreading manure.

A Primer on U.S. Hog Production

The production of hogs to be slaughtered for pork is a process involving four phases: (1) breeding and gestation (breeding females and their maintenance during the gestation period), (2) farrowing (birth of baby pigs until weaning), (3) nursery (care of pigs immediately after weaning until about 30 to 80 pounds), and (4) finishing (feeding hogs from 30 to 80 pounds to a slaughter weight of 225 to 300 pounds). Hog producers are commonly classified into categories according to the number of production phases conducted on the operation into either: (1) farrow-to-finish (all four phases), (2) farrow-to-feeder pig (phases 1, 2, and 3), (3) feeder pig-to-finish (phase 4), (4) wean-to-feeder pig (phase 3), and (5) farrow-to-wean (phases 1 and 2).

The majority of U.S. hog production has historically occurred on farrow-to-finish operations located in areas with an abundant supply of corn. Hog farmers typically fed their hogs corn produced on their operation as a relatively inexpensive source of hog feed, and then sold their hogs at local markets. The restructuring of hog production began in the 1970s with the rapid transition of hog production into partial or totally confined housing. Since then, a continuing series of advances in technology and management have made a science of hog production in large specialized buildings staffed with specialized labor. As part of the restructuring of hog production, operations became more specialized, typically conducting only a single phase of production before the hogs are moved to another operation or to market.

Table 1

Characteristics and practices by type of hog producer, 2004

Item	Farrow-to-finish	Farrow -to-feeder pig	Feeder-to-pig finish	Farrow-to-wean	Wean-to-feeder pig	All hog and pig producers
Characteristics:						
Product value (\$1,000)	322	258	923	1,061	1,171	612
Percent from hogs	59	75	72	96	74	71
Farm acres operated	974	244	627	312	624	661
Years in hog business	20	9	13	11	9	15
20 yrs. or more (Percent)	55	14	27	14	7	33
Operator age (Years)	52	44	51	46	44	49
65 yrs. or more (Percent)	17	2	8	4	2	9
College degree (Percent)	17	36	25	30	27	25
Location (Percent)—						
Heartland	53	13	69	32	76	55
Northern Crescent	21	3	9	6	4	11
Eastern Uplands	4	9	1	33	2	4
Southern Seaboard	4	5	10	13	18	7
Western region	18	70	11	15	0	23
Practices:						
Facility age (years)—						
Farrowing	16	9	na	10	na	14
Nursery	14	13	na	na	9	11
Finishing	15	na	11	na	na	12
Percent of farms using—						
Artificial insemination	12	30	na	77	na	na
Terminal crossbreeding	22	28	na	57	na	na
Commercial seed stock	13	14	na	35	na	na
Split-sex feeding	17	na	34	na	na	na
Phase feeding	48	na	62	na	na	na
Fed four or more rations	43	na	61	na	na	na
ST antibiotics nursery ¹	64	30	na	na	76	na
ST antibiotics finishing ¹	52	na	65	na	na	na
All-in/all-out farrowing	43	67	na	56	na	na
All-in/all-out nursery	44	24	na	na	87	na
All-in/all-out finishing	20	na	79	na	na	na
Segregated early weaning	11	41	na	30	na	na

Notes: "na" indicates not applicable.

¹Indicates the feeding of sub-therapeutic antibiotics during the nursery and finishing phases, respectively. Use of sub-therapeutic (ST) antibiotics is defined as feeding antibiotics for the purpose of either growth promotion or disease prevention.

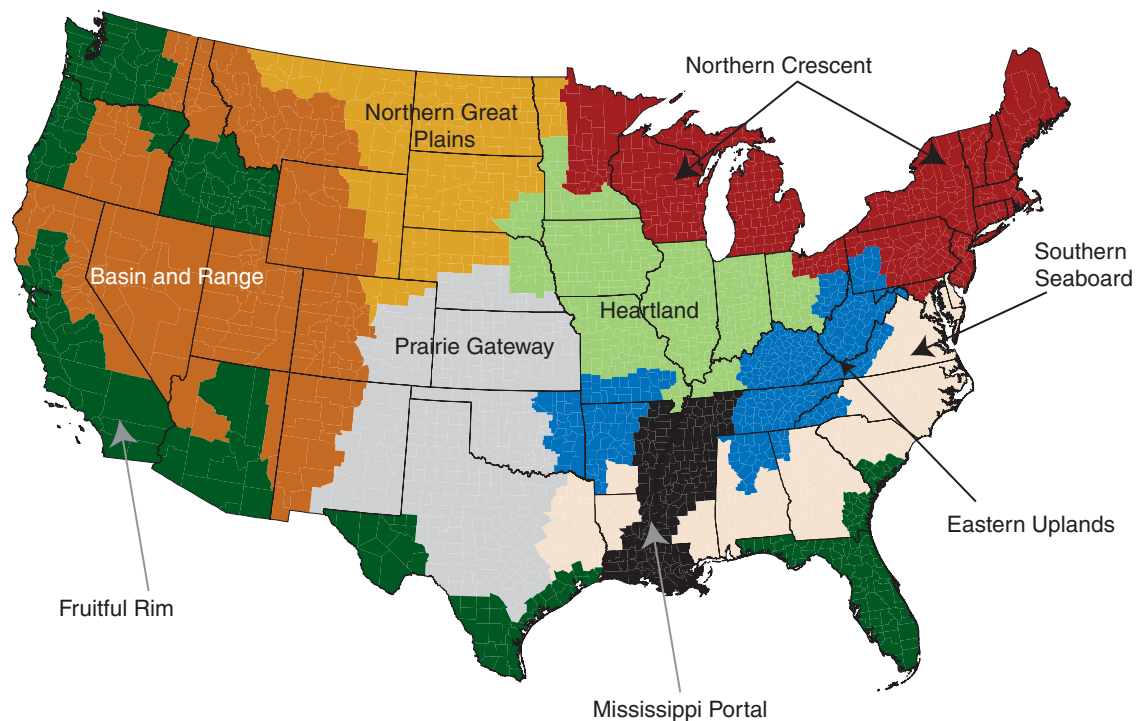
Source: USDA, 2004 Agricultural Resource Management Survey.

More than half of all hog operations were located in the Heartland (fig. 3), but the location of different types of hog producers was somewhat related to the production phases characterizing the operations. For example, farms that finished hogs (farrow-to-finish and feeder pig-to-finish farms) were more often located in the Heartland where abundant and low-cost feed supplies are available to finish hogs. Farms that specialized in growing nursery pigs (wean-to-feeder pig) were also more likely to be in the Heartland. In contrast, farms that specialized in farrowing (farrow-to-feeder pig and farrow-to-wean operations) were more often located in other regions. These data suggest that many of the weanling and feeder pigs were then transported to the Heartland for finishing.

Figure 3

Farm Resource Regions

Hog production has traditionally been concentrated in the Heartland, but during the 1980s and 1990s expanded rapidly in the Southern Seaboard and, more recently, in the West, particularly in the Prairie Gateway and Basin and Range regions.



Source: USDA, ERS, 2006.

Technical innovation in U.S. hog production is reflected in the technologies and practices used by the different types of producers. Age of hog facilities is an indicator of the technology employed. On average, specialized hog operations tended to have newer hog production facilities in 2004 than did the farrow-to-finish operations (table 1). For example, farrowing facilities on farrow-to-finish operations averaged 16 years of age, compared with about 10 years on specialized farrowing operations. Nursery and finishing facilities were also of a more recent technology among the specialized producers. In addition, specialized producers were more likely to use improved technologies such as artificial insemination, terminal cross-breeding, and all-in/all-out management, among others (see Glossary).

Variation in Production Costs

Estimates of average costs of hog production reveal limited information about the economic performance of U.S. hog producers because of considerable production cost variability among producers (McBride and Key, 2003). This report examines cost variation among U.S. hog producers by dissecting the distribution of production costs (see box “Measuring Hog Production Costs”) for farrow-to-finish and specialized hog finishing operations.² Estimated production costs per hundredweight gain (see Glossary) for each type of producer were ranked from lowest to highest to form a weighted cumulative distribution. The cost estimates were expressed per unit of the primary product (i.e., market hogs) from each type of operation by deducting the value of secondary products (mainly cull or breeding stock) from costs.³ Thus costs can be directly compared with market hog prices.

Figures 4 and 5 illustrate the cumulative distributions of production costs for farrow-to-finish and feeder pig-to-finish operations. At a live market hog price of \$40 per hundredweight, about 67 percent of farrow-to-finish operations covered operating costs in 2004 (blue dashed line, fig. 4, left panel) while fewer than 10 percent covered total economic costs (red dashed line,

²These producer types were chosen for the analysis here and in the remainder of the report because of the relatively large number of these operations in the ARMS data. The ARMS data included 331 farrow-to-finish operations and 478 feeder pig-to-finish operations. Fewer than 100 observations were available for each of the other producer types.

³This method of presenting the unit cost of production has been referred to as the residual claimant method (Frank, 1998).

Measuring Hog Production Costs

Production costs are an important indicator of the potential financial success of hog enterprises. Business decisions, such as how much or whether to produce, are based on the relationship between production costs and expected product price, and the length of the planning period. In a short-term planning period, where production decisions are made about the number of sows to breed or feeder pigs to purchase, decisions are based only on the level of operating costs. During this time, other costs are fixed regardless of these decisions. As the length of the planning period increases and production decisions about replacing capital assets are faced, both operating and asset ownership costs need to be considered. Because of the substantial investment required in replacing hog production facilities, this is the point when most hog producers must decide whether to stay in business. Most hog producers make shorter term business decisions several times per year, whereas they make longer term decisions every 10 to 20 years as facilities need to be replaced.

This report uses production costs to evaluate the relative success of hog operations in terms of their ability to meet short-term obligations and to replace capital assets as needed, and thus stay in business over time. Therefore, both operating and asset ownership costs on hog operations are used in the analysis of costs. Operating costs include costs for feed; feeder pigs; veterinary and medical services; bedding and litter; marketing; custom services; fuel, lubrication, and electricity; repairs; hired labor; and operating interest. Ownership costs include the annualized cost of maintaining the capital investment (depreciation and interest) in hog facilities and equipment, and costs for nonreal estate property taxes and insurance. Total economic costs are the sum of operating and ownership costs, plus opportunity costs for unpaid labor and land, and costs for general farm overhead items. Costs for general farm overhead are farm costs allocated to individual enterprises and are not likely to influence enterprise decisions. The influence of opportunity costs on farm enterprise decisions varies significantly among producers because of the willingness of many producers to accept returns to these resources different from assumed charges. Lifestyle preferences and costs of switching occupations, among others, are likely reasons. Consequently, these costs are excluded in the cost analyses in this report.

The costs incurred by all participants in the production process—including farm operators, landlords, contractors, and growers—are included in the accounts. The 2004 ARMS survey of hog producers provides the primary data used to estimate the costs. All costs are computed using methods recommended by the American Agricultural Economics Association Task Force on commodity cost and return estimation.

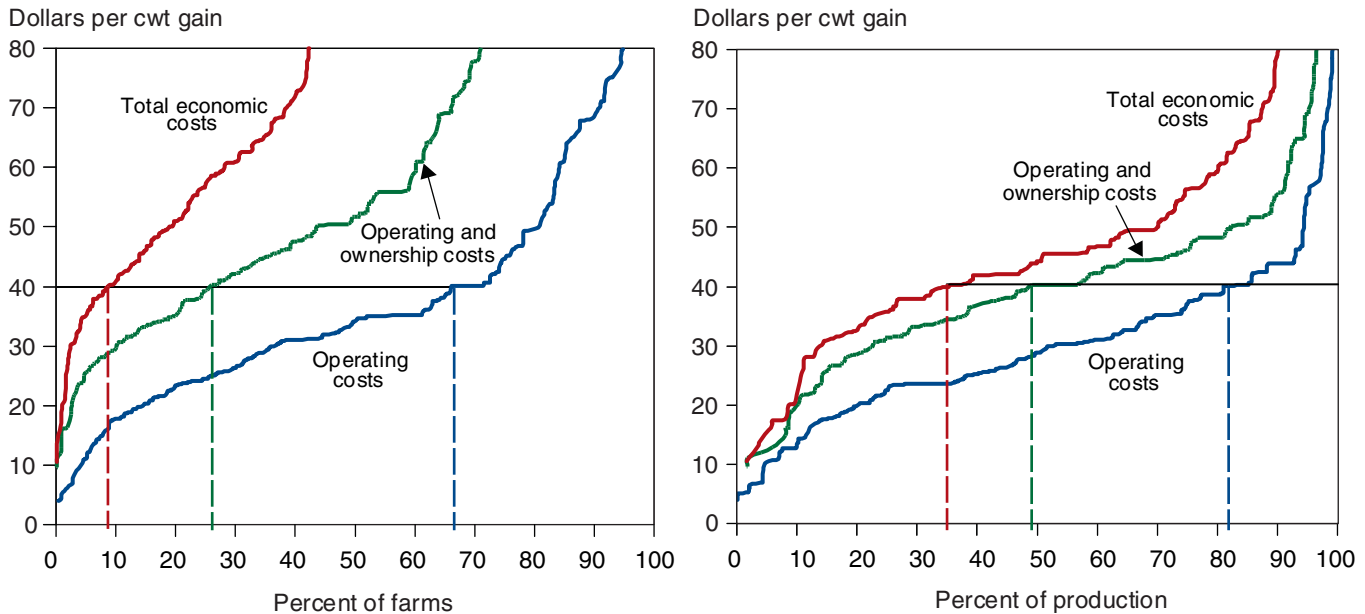
The hog cost estimates are developed from measurements taken during the 2004 calendar year and are presented on a hundredweight-of-gain basis (see Glossary). Gain is an indicator of the value added to the hogs during the year and reflects the output achieved for the inputs used during the year. More information on the methods and procedures used to develop the cost estimates can be found at <http://www.ers.usda.gov/Data/CostsAndReturns/>.

Figure 4

Cumulative distribution of farrow-to-finish production costs per cwt gain, 2004

At a live market hog price of \$40 per cwt, about two-thirds of farms covered operating costs, but fewer than 10 percent covered total economic costs.

Because low-cost farms tend to be large, those who covered total economic costs (in left panel, fewer than 10 percent) accounted for a third of total production.



Source: USDA, 2004 Agricultural Resource Management Survey.

fig. 4, left panel). Low-cost farms were generally much larger than other farms. The 67 percent of low-cost farms that covered operating costs accounted for more than 80 percent of total production (blue dashed line, fig. 4, right panel), and the fewer than 10 percent of farms that covered total economic costs accounted for more than a third of total production (red dashed line, fig. 4, right panel).

One sees the same trend in feeder-pig-to-finish operations, although less pronounced. The 42 percent of operations that covered operating costs (blue dashed line, fig. 5, left panel) accounted for 54 percent of production (blue dashed line, fig. 5, right panel), and the 23 percent that covered total economic costs (red dashed line, fig. 5, left panel) accounted for about 38 percent of production (red dashed line, fig. 5, right panel).

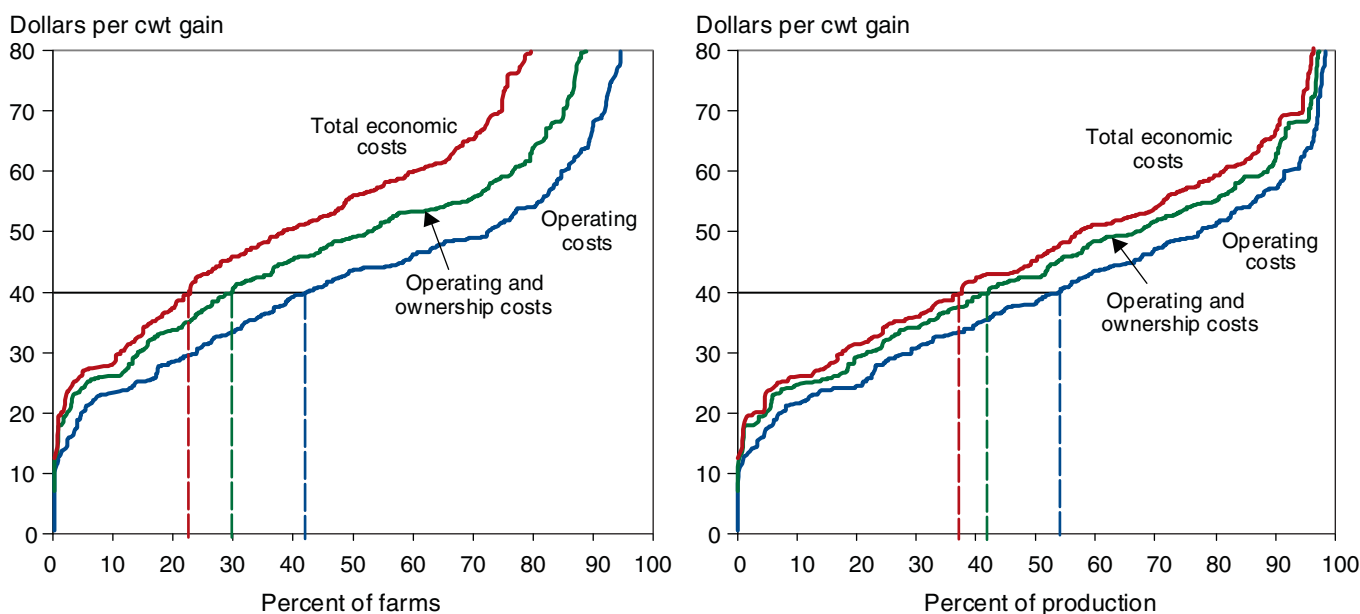
The difference between the proportion of farrow-to-finish and feeder pig-to-finish operations with operating costs below \$40 per hundredweight is largely due to the composition of operating and capital ownership costs for each producer type. Operating costs on feeder pig-to-finish farms include costs for obtaining the pigs, while much of the cost of producing these pigs on farrow-to-finish operations is reflected in the ownership costs of capital assets (i.e., facilities and breeding stock). This means that more of the total costs on pig finishing operations are operating costs and less are for capital investments. Another important difference between the cost distributions is their relative slope. The distributions for farrow-to-finish operations are much steeper, particularly those for operating and ownership costs and total economic costs, indicating more cost variation among the farms. Less slope

Figure 5

Cumulative distribution of feeder pig-to-finish production costs per cwt gain, 2004

At a live market hog price of \$40 per cwt, about 42 percent of farms covered operating costs, but only 23 percent covered total economic costs.

Low-cost operations tend to be larger than others. Those who covered their total economic costs (23 percent of producers —see left panel) accounted for 38 percent of production.



Source: USDA, 2004 Agricultural Resource Management Survey.

on the cost distributions for specialized hog finishing operations indicates much more uniformity.

A market hog price of \$40 per hundredweight roughly approximates the average live-weight price received in the United States for market hogs between 1996 and 2005 (USDA, NASS, 1996-2005). The following examines structural and performance differences between low-cost producers, i.e., hog operations that covered operating and ownership costs (see box, “Measuring Hog Production Costs”) during 2004 at a live market hog price of \$40 per hundredweight and those with higher costs. Segmenting the distribution of operating and ownership costs at \$40 per hundredweight places about 25 percent of farrow-to-finish and 30 percent of feeder pig-to-finish operations in the low-cost group (figs. 4 and 5).

Structural Characteristics by Cost Group

Low-cost farrow-to-finish operations were significantly larger than other operations. These operations accounted for 25 percent of farms and 47 percent of production (table 2). Low-cost farrow-to-finish operations averaged more than 2,700 head of market hogs per farm, compared with 1,038 head on other operations. Farms with low-cost hog operations were also more highly specialized in hog production. Sixty-six percent of the total production value on low-cost farrow-to-finish farms was from the hog enterprise, compared with 55 percent on other farms.

Table 2

Characteristics by cost group for hog producer types, 2004

Item	Low-cost producers	Other producers
Farrow-to-finish:		
Percent of farms/sales and removals	25/47	75/53
Hogs and pigs sold or removed (Head)	2,740	1,038*
Percent removed under contract	id	0
Farm acres operated	636	1,090**
Farm production value from hogs (Percent)	66	55
Operator age less than 50 years (Percent)	57	50
In the hog business (Percent)—		
Less than 5 years	14*	31*
20 years or more	63	53
Location (Percent)—		
Heartland	67	48
Northern Crescent	9**	25**
Southern Seaboard	1**	4
Western region	14**	20*
Typology (Percent)—		
Retirement	id	1*
Residential lifestyle	6**	23**
Farming occupation, lower sales	19*	29*
Farming occupation, higher sales	22*	19
Large family farm	29	18*
Very large family farm	22	9*
Feeder pig-to-finish:		
Percent of farms/sales and removals	30/38	70/62
Hogs and pigs sold or removed (Head)	6,026	4,184
Percent removed under contract	72	74
Farm land area (Acres operated)	658	614
Farm production value from hogs (Percent)	75	70
Operator age less than 50 years (Percent)	44	47
In the hog business (Percent)—		
Less than 5 years	21	21
20 years or more	22*	29
Farm location (Percent)—		
Heartland	86	62
Northern Crescent	2*	12*
Southern Seaboard	4*	13
Western region	8**	13*
Farm typology (Percent)—		
Retirement	id	id
Residential lifestyle	5*	13*
Farming occupation, lower sales	id	3*
Farming occupation, higher sales	18**	15*
Large family farm	18	25
Very large family farm	51	43

Notes: "id" indicates insufficient data for legal disclosure, and single and double asterisks (*) indicate that the standard error is between 25 and 50 and greater than 50 percent of the estimate, respectively. The standard errors on all other items are less than 25 percent of the estimate.

Source: USDA, 2004 Agricultural Resource Management Survey.

Low-cost farrow-to-finish producers were generally older than other producers and had considerably more experience in hog production. Fourteen percent of low-cost operations had been in the hog business less than 5 years, compared with about 33 percent of other operations. Sixty-three percent of the low-cost farrow-to-finish operations had been in business 20 years or more. The low-cost operations were also more often located in the Heartland (67 versus 48 percent for other producers), where feed prices are lower. Other producers tended to be spread among the other regions.

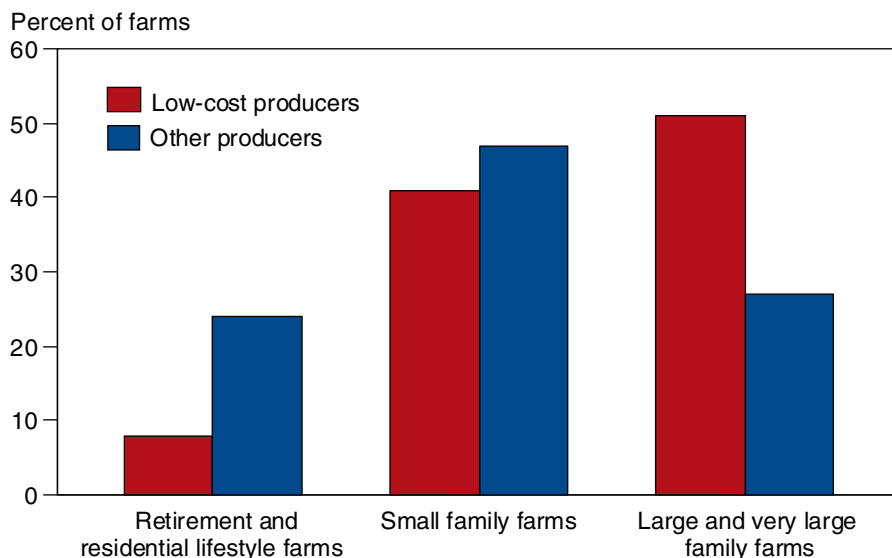
Differences in farm typology are a reflection of operators' expectations and goals from farming, their stage in life, and their dependence on agriculture, as well as the size of their operation (Hoppe, Perry, and Banker, 1999; see Glossary). Other farrow-to-finish producers were more often residential lifestyle farms (23 versus 6 percent for low-cost producers), while the low-cost producers were more often among the large and very large family farms (fig. 6). Because residential lifestyle operations depend relatively less on farming for income, they likely have less time for farming and different goals for the farm operation. Large farms tend to have a considerable time and financial investment in farming.

Feeder pig-to-finish operations showed fewer structural differences between low-cost and other operations than farrow-to-finish operations. Low-cost hog finishers tended to be larger (6,026 versus 4,184 head), but farm specialization, use of contract production, and operator characteristics were much the same. The low-cost producers were, however, more often in the Heartland (86 versus 62 percent), while other producers were more spread among the regions.

Figure 6

Distribution of farrow-to-finish producers by farm typology, 2004

More than half of low-cost operations were on large and very large family farms, while other operations were more often on residential lifestyle farms.



Source: USDA, 2004 Agricultural Resource Management Survey.

Performance and Practices by Cost Group

The number of pigs weaned per litter and per sow in 2004 was significantly higher, and death loss during finishing was lower on the low-cost farrow-to-finish operations than for other producers (table 3). Another important difference was that low-cost farrow-to-finish operations farrowed about twice the litters per sow capacity (see Glossary) than the other producers. This may have been achieved by weaning pigs earlier at a lower weight, freeing up facility space for more litters. Also, many of the other producers were likely using farrowing facilities well below capacity.

Feed and labor efficiency on low-cost operations were also significantly better than on other operations. Less feed per unit resulted in a considerable cost saving for the low-cost operations of both producer types. Better feed efficiency also meant that low-cost producers could finish hogs in fewer days—freeing up space to move more hogs through the finishing facilities—and/or could have allowed them to produce heavier hogs in the same number of days. Low-cost farrow-to-finish and finishing operations produced more hogs per head of finishing capacity (see Glossary) and had greater hog sale/removal weights than other operations. Because the farrowing and finishing facilities were used more efficiently on low-cost operations, asset ownership costs were lower, with fixed costs spread over more units of production.

Improved efficiency on low-cost operations was made possible by, among other factors, the practices and technologies used on these farms (table 3). Low-cost farrow-to-finish operations more often used artificial insemination, terminal crossbreeding, and commercial seed stock to enhance breeding and genetic performance (see Glossary). During hog finishing, low-cost producers of both types were more likely to use split-sex and phased feeding and all-in/all-out facility management. These operations also adjusted feed rations more often in order to match rations more closely with changing nutritional requirements. For example, 77 percent of low-cost feeder pig finishers reported feeding 4 or more rations during finishing, compared with 54 percent of other operations. Differences in the genetic potential of the hogs and other management practices contribute to a substantial advantage in the efficiency of low-cost producers.

Table 3

Performance and practices by cost group for hog producer types, 2004

Item	Low-cost producers	Other producers
Farrow-to-finish:		
Pigs weaned per litter (Head)	8.66	7.65
Pigs weaned per sow (Head)	17.24	14.62
Weaning age (Days)	31	34
Weaning weight (Pounds)	22	26
Death loss (Percent of weaned pigs)	3.51	6.75
Sale/removal weight (Pounds)	259	254
Feed efficiency (Pounds fed per cwt gain)	276	427
Labor efficiency (Hours per cwt gain)	0.39	0.68
Litters farrowed per sow capacity	6.90	3.58
Hogs finished per head capacity	2.82	2.13
Production costs (Dollars per cwt gain)—		
Feed costs	19.51	28.72
Operating costs	25.72	37.64
Ownership costs	7.15	13.95
Practices (Percent using)—		
Artificial insemination	21	9*
Terminal crossbreeding	30	19*
Commercial seed stock	25	9*
Split-sex feeding	20	16*
Phase feeding	52	46
Fed four or more rations	60	36*
Sub-therapeutic antibiotics, nursery	77	60
Sub-therapeutic antibiotics, finishing	60	49
All-in/all-out farrowing	66	35
All-in/all-out finishing	38	14*
Feeder pig-to-finish:		
Death loss (Percent of purchased/placed pigs)	3.35	3.03
Sale/removal weight (Pounds)	266	260
Feed efficiency (Pounds fed per cwt gain)	177	241
Labor efficiency (Hours per cwt gain)	0.11	0.17
Hogs finished per head capacity	2.65	2.56
Production costs (Dollars per cwt gain)—		
Feed costs	13.11	23.51
Operating costs	29.22	49.66
Ownership costs	3.38	5.09
Practices (Percent using)—		
Split-sex feeding	44	30
Phase feeding	72	58
Fed four or more rations	77	54
Sub-therapeutic antibiotics, finishing	59	67
All-in/all-out finishing	85	77

Notes: An asterisk (*) indicates that the standard error is between 25 and 50 and greater than 50 percent of the estimate, respectively. The standard errors on all other items are less than 25 percent of the estimate.

Source: USDA, 2004 Agricultural Resource Management Survey.

Economies of Size

Cost variation among U.S. hog producers was also examined in terms of the cost-size relationship. Census of Agriculture statistics show that the number of farms with hogs dropped from nearly 330,000 in 1982 to fewer than 80,000 in 2002, while the number of hogs per farm increased from 168 to 766 (fig. 7). Furthermore, the number of hogs per farm increased at an increasing rate with each successive census between 1982 and 2002. This trend toward increasingly fewer and larger hog farms suggests the existence of significant economies of size in hog production.

To evaluate the relationship between hog costs of production and size of operation, surveyed producers were divided into size groups, and differences in hog production costs and farm structural and performance characteristics were compared among the groups. The size groups were assigned according to the reported peak hog inventory on the operation during 2004 into: (1) small operations (1-499 head), (2) medium operations (500-1,999 head), (3) large operations (2,000-4,999 head), and (4) very large operations (5,000 head or more). Nearly 13,000, or 20 percent, of small hog operations likely went out of business between 2000 and 2004,⁴ while the number of large and very large operations increased slightly (USDA, NASS, 1995-99 and 2005; fig. 8). Despite the sharp decline, more than 52,000 small hog operations remained in business in 2004, representing 75 percent of all U.S. hog operations.

⁴Some small operations could have grown and moved to the larger size categories. However, the precipitous decline in the number of total hog operations between 2000 and 2004 indicates that most of the small operations went out of business.

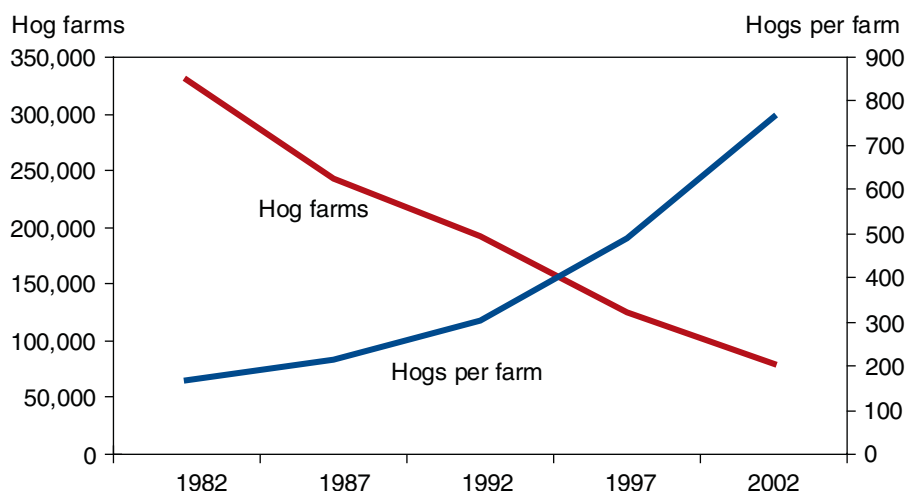
Structural Characteristics by Size Group

Small and medium hog operations far outnumbered large and very large operations during 2004 but produced a disproportionately small share of total production. More than half of farrow-to-finish operations were small, and these operations produced 8 percent of production (table 4). Three

Figure 7

Farms and hogs per farm, 1982-2002

The number of hog farms declined by more than 250,000 between 1982 and 2002, while the average number of hogs per farm rose by nearly 600 head.

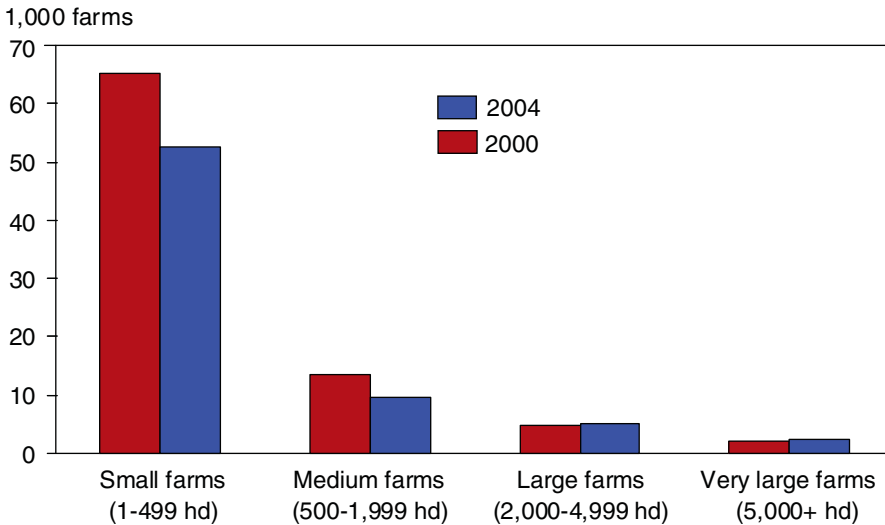


Source: USDA, Census of Agriculture, various years.

Figure 8

Distribution of hog farms by size, 2000 and 2004

The number of small hog operations fell 20 percent between 2000 and 2004, but small farms still accounted for 75 percent of all hog farms.



Source: USDA, NASS, *Hogs and Pigs; Farms, Land In Farms, and Livestock Operations*, 1995-99 and 2006.

percent of farrow-to-finish operations were classified as very large, and these operations accounted for nearly half of production. Feeder pig-to-finish farms were more evenly distributed across the size groups, but 82 percent of production came from the large and very large farms. The use of contract production for hog finishing increased with size of operation. About 33 percent of production on small hog-finishing operations was under contract in 2004, compared with more than 80 percent on the very large operations.

Farm specialization in hog production increased with size for both types of producers, with the value from hogs ranging from around 20 percent of total farm product value on small operations to between 80 and 90 percent on very large operations. Greater diversity among small operations is also apparent in typology classes that show significantly more producers generating much of their household income from off-farm sources. More than a quarter of the operators of small hog operations were classified as residential lifestyle farms, meaning that their major occupation was off-farm. Operators of small hog enterprises were also generally older, particularly among feeder pig-to-finish producers, and carried less debt in relation to assets than larger operations.

Forty percent of small farrow-to-finish and feeder pig-to-finish producers and about 25 percent of medium producers reported that they would be out of hog production in 5 years or less (table 4). This compares with less than 10 percent of very large producers whose high debt-to-asset ratios, particularly among farrow-to-finish producers, suggests that they have made recent investments in hog facilities. These findings suggest a continuation in the trend toward fewer and larger hog operations observed over the last two decades (fig. 7).

Table 4

Characteristics by size of operation for hog producer types, 2004

Item	Small	Medium	Large	Very large
Farrow-to-finish:				
Percent of farms/sales and removals	60/8	31/28	6/16	3/47
Hogs and pigs sold or removed (Head)	198	1,308	4,356	22,296
Percent removed under contract	0	id	0	0
Farm production value from hogs (Percent)	23	49	70	83
Operator age less than 50 years (Percent)	48	60	55	40
Location (Percent)—				
Heartland	47*	59*	65	72
Northern Crescent	28**	9**	14**	12*
Southern Seaboard	5*	1**	7**	id
Western region	14**	29**	6**	13**
Typology (Percent)—				
Retirement	2**	0	0	0
Residential lifestyle	30**	2**	0	0
Farming occupation, lower sales	42*	4**	0	0
Farming occupation, higher sales	15*	31*	10**	0
Large family farm	6**	51	18**	0
Very large family farm	3**	11**	72	100
Farm debt-to-asset ratio	0.09	0.16*	0.11	0.38**
Exiting industry in 5 years or less (Percent)	41*	23*	19**	5**
Feeder pig-to-finish:				
Percent of farms/sales and removals	25/2	36/15	26/36	13/46
Hogs and pigs sold/removed (Head)	449*	2,016	6,645	17,055
Percent removed under contract	36*	47	75	82
Farm production value from hogs (Percent)	21	54	77	88
Operator age less than 50 years (Percent)	25*	49	58	56
Location (Percent)—				
Heartland	50*	85	73	52*
Northern Crescent	19**	7*	5*	2**
Southern Seaboard	2**	3*	17	31*
Western region	29*	4**	4**	10**
Typology (Percent)—				
Retirement	0	id	id	0
Residential lifestyle	26**	11	0	0
Farming occupation, lower sales	14**	id	id	0
Farming occupation, higher sales	42*	12*	id	0
Large family farm	9*	44	18	2
Very large family farm	8**	31	76	98
Farm debt-to-asset ratio	0.13	0.18	0.22	0.20
Exiting industry in 5 years or less (Percent)	41*	25*	13*	8**

Notes: "id" indicates insufficient data for legal disclosure, and single and double asterisks (*) indicate that the standard error is between 25 and 50 and greater than 50 percent of the estimate, respectively. The standard errors on all other items are less than 25 percent of the estimate.

Source: USDA, 2004 Agricultural Resource Management Survey.

Performance and Practices by Size Group

Feed, labor, and capital—the three major inputs in hog production—were all used more efficiently on larger farrow-to-finish operations (table 5). Very large farrow-to-finish operations were about 40 percent more feed efficient, on average, than small operations. The labor requirement on the largest farrow-to-finish operations was a fraction of that used by the smallest. Differences in capital efficiency by size, as indicated by pigs weaned per sow and by production per unit of facility capacity, were also significant. Very large operations weaned about six more pigs per sow in 2004 and obtained about five times more litters per sow capacity and three times the market hogs per unit of finishing capacity than the small operations. Differences in feed efficiency were generally less pronounced among the feeder pig-to-finish size groups, but the differences in measures of labor and capital use efficiency were significant.

Such differences in performance by size of operation can be attributed in part to less-than-full capacity utilization by small operations, but also to differences in production practices used on the operations. For example, larger farrow-to-finish operations weaned pigs earlier at lighter weights than smaller operations. That practice may have increased pig mortality rates, but it also allowed facilities to be used more efficiently. The larger operations more often used breeding technologies such as artificial insemination, terminal crossbreeding, and commercial seed stock (see Glossary). Larger operations of both farrow-to-finish and feeder pig-to-finish farms more often used technologies during finishing that included split-sex and phase feeding and all-in/all-out facility management.

Average production costs of hog production declined as size of operation increased (fig. 9). The greatest cost reduction with size was made between the small and medium farrow-to-finish operations. Average operating and ownership costs (see Glossary) on medium farrow-to-finish operations were about 36 percent less than on small operations (table 5). Significant cost efficiencies were also gained in moving from the medium to very large farms, as average costs declined 9 percent between these groups. Most of the average cost reduction with size resulted from spreading capital ownership costs over more units of production, but more efficient input use on larger farms also lowered operating costs. On feeder pig-to-finish operations, average costs declined the most between the medium and large farms, as production costs on large and very large farms averaged about 10 percent less than on small and medium farms. Average operating and ownership costs on large and very large finishing operations were not significantly different.

Cost variation among the farrow-to-finish operations in each size group is illustrated in figure 10. The variation in cost was greatest among the small hog operations and least among the large and very large operations, as indicated by the relative slopes of the distributions. This result coincides with the greater diversity among the small producers. In addition, many more large and very large operations covered operating and ownership costs at a

Table 5

Performance and practices by size of operation for hog producer types, 2004

Item	Small	Medium	Large	Very large
Farrow-to-finish:				
Pigs weaned per litter (Head)	7.17	7.31	8.79	8.72
Pigs weaned per sow (Head)	12.46	13.12	17.49	18.73
Weaning age (Days)	37	29	24	18
Weaning weight (Pounds)	28	21	16	12
Death loss (Percent of weaned pigs)	3.05	5.55*	4.51	5.77
Sale/removal weight (Pounds)	251	257	258	256
Feed efficiency (Pounds fed per cwt gain)	516	355	423	299
Labor efficiency (Hours per cwt gain)	2.15	0.75	0.41	0.17
Litters farrowed per sow capacity	1.75	5.12	3.61	9.52
Hogs finished per head capacity	1.15	2.32	2.41	3.03
Production costs (Dollars per cwt gain)—				
Feed costs	32.23	25.29	22.49	22.86
Operating costs	40.10	31.43	30.47	31.16
Ownership costs	26.54	11.29	9.93	7.68*
Practices (Percent using)—				
Artificial insemination	4*	12	51	92
Terminal crossbreeding	11*	38	43	73
Commercial seed stock	5*	24*	36*	26*
Split-sex feeding	17**	8*	41*	74
Phase feeding	42*	53*	61	84
Fed four or more rations	28*	60*	78	81
Sub-therapeutic antibiotics, nursery	56	73	93	81
Sub-therapeutic antibiotics, finishing	46*	55*	75	82
All-in/all-out farrowing	35*	51	58	85
All-in/all-out finishing	14*	20*	54	83
Feeder pig-to-finish:				
Death loss (Percent of purchased/placed pigs)	1.70*	3.00	3.42	3.06
Sale/removal weight (Pounds)	256	261	261	263
Feed efficiency (Pounds fed per cwt gain)	199	249	206	210
Labor efficiency (Hours per cwt gain)	0.56*	0.26	0.15	0.08
Hogs finished per head capacity	1.94	2.11	2.55	2.91
Production costs (Dollars per cwt gain)—				
Feed costs	22.26**	20.94	18.08	19.20
Operating costs	43.96	44.11	39.84	40.85
Ownership costs	7.38	6.18	3.98	3.93
Practices (Percent using)—				
Split-sex feeding	8**	31	49	67
Phase feeding	51*	60	72	72
Fed four or more rations	38*	67	77	57
Sub-therapeutic antibiotics, finishing	41*	72	74	73
All-in/all-out finishing	66	80	86	92

Notes: Single and double asterisks (*) indicate that the standard error is between 25 and 50 and greater than 50 percent of the estimate, respectively. The standard errors on all other items are less than 25 percent of the estimate.

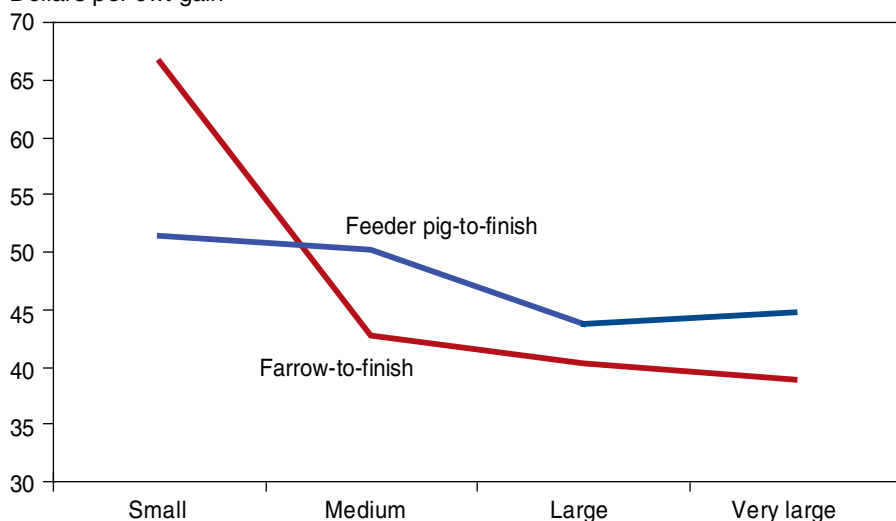
Source: USDA, 2004 Agricultural Resource Management Survey.

Figure 9

Production costs by size of operation for hog producer types, 2004

Average operating and ownership costs declined as size increased, with the greatest decline occurring between small and medium farrow-to-finish operations.

Dollars per cwt gain



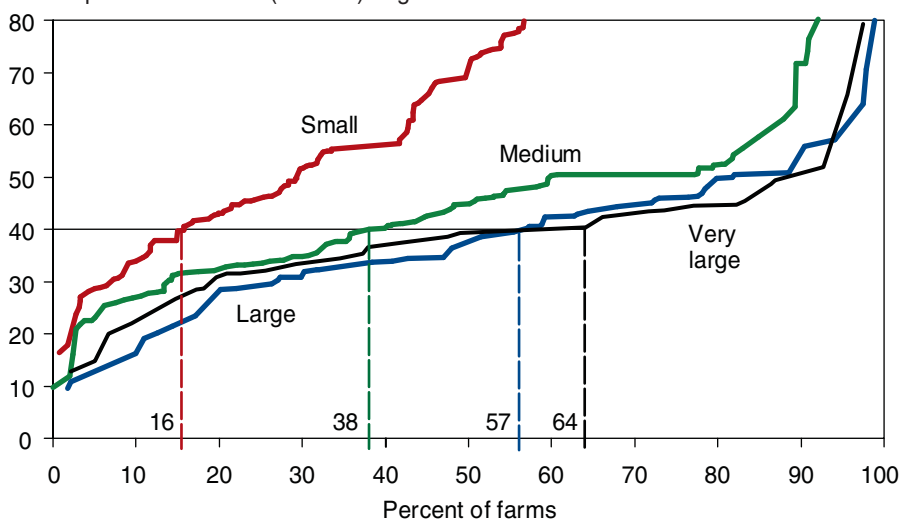
Source: USDA, 2004 Agricultural Resource Management Survey.

Figure 10

Farrow-to-finish production cost distribution by size of operation, 2004

The variation in production costs was greatest among the small operations and least among the large and very large farrow-to-finish operations.

Dollars per cwt of market (finished) hogs



Source: USDA, 2004 Agricultural Resource Management Survey.

live market hog price of \$40 per hundredweight (57 and 64 percent, respectively) than did small and medium operations (16 and 38 percent, respectively). Cost distributions among the size groups of feeder pig-to-finish operations are not as different as on the farrow-to-finish operations, but those among the small and medium operations again indicated greater cost variation (fig. 11). At \$40 per hundredweight, 25 percent of small operations and 19 percent of medium operations covered costs, compared with 47 and 37 percent, respectively, of the large and very large operations.

Despite higher average costs among the small and medium groups, many of these operations produce at a cost that is competitive with larger operations. For example, there were about 37,000 small and medium farrow-to-finish and feeder pig-to-finish producers in 2004. Of these, we estimate that more than 10,000 operations produced at \$40 per hundredweight or less.⁵ This estimate suggests that while much of the variation in production costs can be attributed to size of operation, other factors, like the managerial ability of individual hog producers, also influence costs of production.

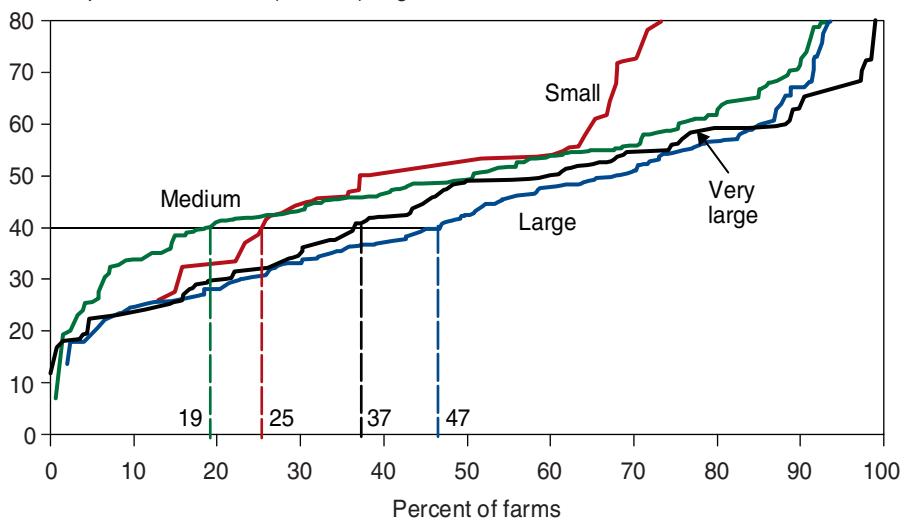
⁵This estimate is based on 69,500 hog operations in 2004 (USDA, NASS, 2006) distributed among the types, size groups, and cost levels described in this report.

Figure 11

Feeder pig-to-finish production cost distribution by size of operation, 2004

Production cost variation was greatest among small and medium feeder pig-to-finish operations and fewer covered production costs at \$40 per cwt.

Dollars per cwt of market (finished) hogs



Source: USDA, 2004 Agricultural Resource Management Survey.

Regional Diversity

As the structure of the hog industry has changed, so has its geography. Hog production historically has been concentrated in the Corn Belt States, where an abundant supply of corn provided a relatively cheap source of hog feed. However, during the 1980s and 1990s, the growth and concentration of hog production was most dramatic in nontraditional areas. For example, in North Carolina, the inventory of hogs and pigs more than doubled between 1987 and 1992 as the State rank went from 6th to 2nd in total hog inventory, and nearly doubled again between 1992 and 1997 (fig. 12). Since 1992, the hog industry has been moving into Western States, where the combined inventory of Oklahoma, Colorado, Utah, and Texas grew from 1.2 million to about 4.7 million head between 1992 and 2002.

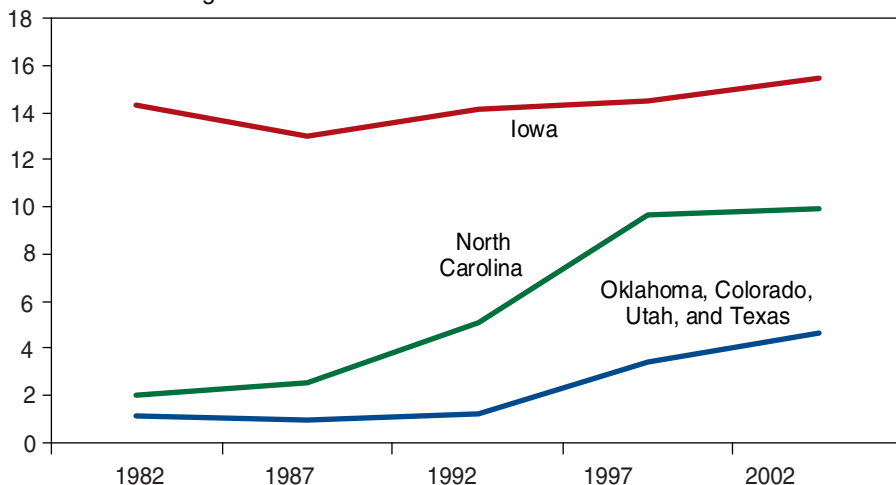
Rapid growth and concentration in the North Carolina hog industry between 1987 and 1997 was followed by little growth between 1997 and 2002. That slowdown can be attributed to a law enacted in August 1997 that placed a moratorium on the construction of new and expanded hog operations with 250 or more hogs (North Carolina General Assembly, 1997).⁶ The purpose of the moratorium was to provide State and local governments time to adopt zoning ordinances and to allow research on environmental impacts and alternative waste technologies. The moratorium was put in effect in 1997 and was extended for 4 more years in 2003. Restricted growth in North Carolina due to environmental concerns may be why industry growth has been particularly rapid in Western States. The presence of open space and a relatively low population density in Oklahoma, Colorado, Utah, and Texas likely provides greater flexibility in managing animal waste. More information about the changing structure and location of U.S. hog production can be found in Key and McBride (2007).

⁶The title of the act is the Clean Water Responsibility and Environmentally Sound Policy Act.

Figure 12
Hog inventories in selected States, 1982-2002

Hog numbers grew rapidly in North Carolina between 1982 and 1997 but little since that time. Hog numbers have grown steadily in Western States since 1992.

Million head of hogs



Source: USDA and U.S. Department of Commerce, Census of Agriculture, various years.

We explored regional diversity in hog production by comparing characteristics of different producer types in the major production regions during 2004. Farm Resource Regions defined by the Economic Research Service (USDA, ERS, 2006) were used as the basis for the regional delineation (see fig. 3). Among these, the Heartland, which includes the Corn Belt, is where hog production has traditionally been concentrated, while the Southern Seaboard includes the areas of rapid growth during the 1980s and 1990s. The Western region—defined to include the Prairie Gateway, Northern Great Plains, and the Basin and Range—is where expansion in hog production has been most recent.

Structural Characteristics by Region

Farrow-to-finish hog production in 2004 was highly concentrated in the Heartland, with about half of farms and two-thirds of production (table 6). The Western region had about 18 percent of farrow-to-finish operations, and the Southern Seaboard about 4 percent. Recent growth in the share of hog production from the Western region is reflected in the large proportion of young operators in this region (53 percent under 50 years of age) and the large proportion (30 percent) of operations that had been in business less than 5 years. Farrow-to-finish production in the Western region also occurred on farms with much more acreage than those in the other regions.

Nearly 70 percent of feeder pig-to-finish farms were in the Heartland in 2004, where hog finishing operations averaged more than 4,000 head sold/removed. The largest operations were in the Southern Seaboard, which averaged more than 12,000 head per farm. The proportion of hogs finished under contract was 60 percent or more in all regions and 100 percent of finished hogs in the Southern Seaboard.

The distribution of farrow-to-finish operations by typology group in each region shows many small and large farms in the Southern Seaboard and Western region but few mid-size operations. For example, 52 percent of Southern Seaboard operations were in either the residential lifestyle or lower sales categories, while 29 percent were very large farms (table 6). A similar pattern occurs with farrow-to-finish operations in the Western region, but Heartland operations are much more evenly distributed across the size categories. That distribution may change in the next 5 years, since about 40 percent of operators of farrow-to-finish farms in the Heartland and Western region say they plan to exit the industry by then. Feeder pig-to-finish operations are heavily concentrated among the large and very large farm categories. More than 80 percent of hog finishing operations in the Southern Seaboard are among the very large farms.

Performance and Practices by Region

Differences in performance measures among farrow-to-finish producers were mixed across the regions. Heartland and Southern Seaboard operations weaned more pigs per litter and per sow and had lower death losses than in the Western region, but Southern Seaboard and Western producers were more feed efficient than those in the Heartland (table 7). Labor efficiency was greatest on Heartland farms, while the efficiency of facility use

Table 6

Characteristics by region for hog producer types, 2004

Item	Heartland	Southern Seaboard	Western region ¹
Farrow-to-finish:			
Percent of farms/sales and removals	53/66	4/3	18/18
Hogs and pigs sold or removed (Head)	1,851*	1,068*	1,454**
Percent removed under contract	0	0	0
Farm acres operated	636	442*	3,038**
Farm production value from hogs (Percent)	59	46*	57*
Operator age less than 50 years (Percent)	39*	35**	53**
In the hog business (Percent)—			
Less than 5 years	20	18*	32**
20 years or more	66	48*	58*
Typology (Percent)—			
Retirement	2**	3**	0
Residential lifestyle	6*	7*	10**
Farming occupation, lower sales	21	45**	38**
Farming occupation, higher sales	28	4**	9**
Large family farm	23	12*	36**
Very large family farm	18	29**	8**
Farm debt-to-asset ratio	0.16**	0.10*	0.19*
Exiting industry in 5 years or less (Percent)	39*	20**	41**
Feeder pig-to-finish:			
Percent of farms/sales and removals	69/61	10/26	11/8
Hogs and pigs sold or removed (Head)	4,152	12,057	3,255**
Percent removed under contract	61	100	71*
Farm acres operated	717	550*	433*
Farm production value from hogs (Percent)	67	87	75
Operator age less than 50 years (Percent)	52	44	25**
In the hog business (Percent)—			
Less than 5 years	25	9*	7**
20 years or more	29	22*	22**
Typology (Percent)—			
Retirement	id	id	0
Residential lifestyle	9*	5*	0
Farming occupation, lower sales	id	0	26**
Farming occupation, higher sales	14*	1**	42**
Large family farm	29	11*	Id
Very large family farm	46	82	25**
Farm debt-to-asset ratio	0.21	0.08	0.18*
Exiting industry in 5 years or less (Percent)	28*	13**	19**

Notes: "id" indicates insufficient data for legal disclosure, and single and double asterisks (*) indicate that the standard error is between 25 and 50 and greater than 50 percent of the estimate, respectively. The standard errors on all other items are less than 25 percent of the estimate.

¹Includes the Prairie Gateway, Northern Great Plains, and the Basin and Range (see fig. 3).

Source: USDA, 2004 Agricultural Resource Management Survey.

Table 7

Performance and practices by region for hog producer types, 2004

Item	Heartland	Southern Seaboard	Western region ¹
Farrow-to-finish:			
Pigs weaned per litter (Head)	8.46	8.29	6.78*
Pigs weaned per sow (Head)	16.02	15.76	14.66*
Weaning age (Days)	32	40	36
Weaning weight (Pounds)	23	27	31
Death loss (Percent of weaned pigs)	4.96	4.70*	6.48*
Sale/removal weight (Pounds)	258	249	256
Feed efficiency (Pounds fed per cwt gain)	354	300*	304
Labor efficiency (Hours per cwt gain)	0.47	0.69*	0.52*
Litters farrowed per sow capacity	4.34	5.40*	4.58
Hogs finished per head capacity	2.30	2.02*	2.86
Production costs (Dollars per cwt gain)—			
Feed costs	24.18	29.77	23.49
Operating costs	32.24	38.94	28.60
Ownership costs	10.31	10.21*	9.03
Practices (Percent using)—			
Artificial insemination	15	13**	10**
Terminal crossbreeding	23	52	22**
Commercial seed stock	18	1**	12**
Split-sex feeding	14*	4**	7**
Phase feeding	50	40**	23**
Fed four or more rations	55	21*	25**
Sub-therapeutic antibiotics, nursery	74	25*	29**
Sub-therapeutic antibiotics, finishing	51	36**	51**
All-in/all-out farrowing	51	9*	23**
All-in/all-out finishing	26	7*	16**
Feeder pig-to-finish:			
Death loss (Percent of purchased/placed pigs)	3.09	3.20	4.09**
Sale/removal weight (Pounds)	264	255	271
Feed efficiency (Pounds fed per cwt gain)	225	182	253
Labor efficiency (Hours per cwt gain)	0.16	0.10	0.16*
Hogs finished per head capacity	2.47	2.84	3.63*
Production costs (Dollars per cwt gain)—			
Feed costs	16.90	22.72	24.68
Operating costs	37.14	48.81	46.68
Ownership costs	4.42	4.65	3.15
Practices (Percent using)—			
Split-sex feeding	38	23*	12**
Phase feeding	70	39	31**
Fed four or more rations	71	29	33**
Sub-therapeutic antibiotics, finishing	69	65	35**
All-in/all-out finishing	80	83	68*

Notes: Single and double asterisks (*) indicate that the standard error is between 25 and 50 and greater than 50 percent of the estimate, respectively. The standard errors on all other items are less than 25 percent of the estimate.

¹Includes the Prairie Gateway, Northern Great Plains, and the Basin and Range (see fig. 3).

Source: USDA, 2004 Agricultural Resource Management Survey.

was much the same among the regions. Despite being less feed efficient, the average feed cost on farrow-to-finish operations in the Heartland was lower than in the Southern Seaboard and about the same as that in the Western region. This pattern may be attributed to regional differences in corn prices, which, in 2004, were nearly 50 cents per bushel higher in North Carolina and Oklahoma—two feed-deficit States—than in Iowa (fig. 13).

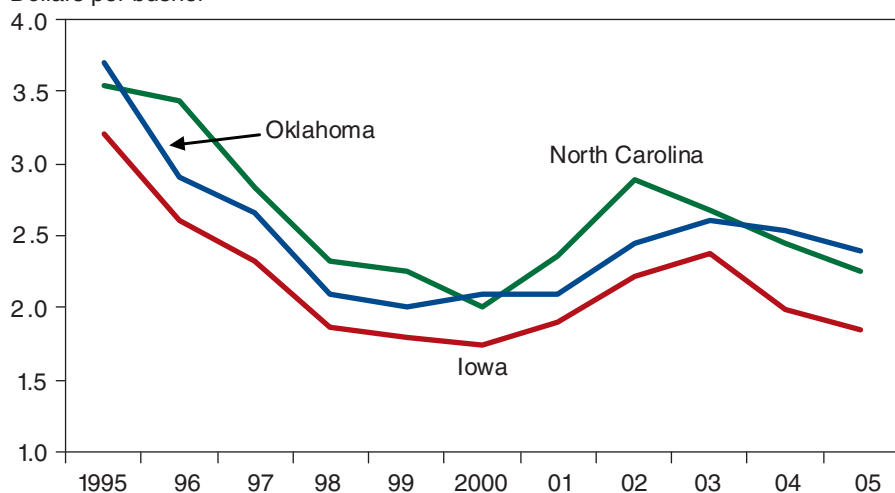
The large feeder pig-to-finish operations in the Southern Seaboard were more efficient in their use of feed and labor than operations in the other regions, but production costs were higher than in the Heartland (table 7). Lower corn prices in the Heartland offset the higher feed efficiency of Southern Seaboard operations and resulted in feed costs almost \$6 per hundredweight less. Feeder pig-to-finish production costs in the Heartland were also significantly less than in the Western region. Lower feed costs are the main reason why total production costs were lowest in the Heartland.

Figure 13

Corn prices in selected States, 1995-2005

Average corn prices in Iowa are consistently lower than in North Carolina and Oklahoma and were nearly 50 cents per bushel lower during 2004.

Dollars per bushel



Source: USDA, NASS, Agricultural Prices, various years.

Conclusions

Wide variation in the types, sizes, and economic performance of hog operations characterized the industry in 2004. Specialized farrowing, weanling, and finishing hog production occurred on operations with nearly \$1 million or more of production value. By contrast, farrow-to-finish operations averaged about \$322,000 in production value. The large specialized hog operations had been in business an average of no more than 13 years in 2004, compared with 20 years for the farrow-to-finish operations. The more recent investment and greater technical innovation characterizing specialized operations is reflected in an average age of hog facilities that is much less than on farrow-to-finish operations. Also, operations specializing in a single production phase have tended, more than farrow-to-finish operations, to adopt technologies such as artificial insemination, terminal crossbreeding, and all-in/all-out management.

Low-cost hog operations tended to be larger than higher cost operations, to be located in the Heartland, and to be operated by farmers whose primary occupation was farming during 2004. These differences were most apparent among farrow-to-finish operations, and farrow-to-finish production costs varied much more than those of specialized hog finishing operations because of these structural differences. Performance indicators—such as pigs per litter, death loss, and feed and labor efficiency—were also better on low-cost operations. Better performance may be due to their greater use of improved technologies in such areas as breeding, feeding, and facilities management.

Small and medium hog operations far outnumbered large and very large operations during 2004, but large and very large operations accounted for most of the production. The use of contracts for finishing hogs increased with the size of the operation. Contracts were used by 75 percent or more of large and very large operations compared with less than 50 percent of smaller operations. Operators of small operations were generally older than other operators and more often worked off-farm in their primary occupation. Also, operators of small and medium operations more often reported plans to exit the hog industry in the next 5 years, suggesting that the trend toward fewer and larger operations will likely continue.

Most indicators of physical and economic performance, including feed, labor, and capital efficiency, improved as the size of the operation increased. These differences can be attributed in part to less-than-full capacity utilization by small operations as well as to the superior technologies used on larger operations. Average production costs declined as the size of the hog operation increased, a result of spreading capital ownership costs over more units of production as well as more efficient input use. Variation in production costs was most pronounced among the more diverse small operations, and fewer of these operations could cover their costs at a live market hog price of \$40 per hundredweight. Despite the higher average costs of small operations, several had costs competitive with those of larger operations.

Hog production was highly concentrated in the Heartland in 2004, but the largest operations were in the Southern Seaboard. The average size of

farrow-to-finish operations was between 1,000 and 2,000 head sold or removed in each region, whereas the specialized hog finishing operations averaged more than 3,000 head in the Heartland and West and more than 12,000 head in the Southern Seaboard. Hog finishing operations in the Southern Seaboard were more efficient in their use of feed and labor than those in other regions, but their production costs were higher than in the Heartland, where lower corn prices offset a disadvantage in feed efficiency.

Glossary

All-in/all-out housing means pigs are commingled only with pigs of a similar age and weight, and they are kept together as they move through each production phase. Marketing is done a room at a time, and rooms are washed and disinfected between groups of pigs in order to help reduce the spread of infectious diseases.

Commercial seed stock producers are hog producers who specialize in the production and sale of high-quality breeding animals.

Contract production is an arrangement between a pig owner (**contractor**) who engages a producer (**grower**) to take custody of the pigs and care for them in the producer's facilities with other inputs often furnished by the pigs' owner. The producer is paid a fee for the service provided. This is different from **contract marketing**—an arrangement under which a pig owner agrees to sell pigs to a buyer, often a slaughterhouse, at a predetermined price or price formula.

Farm Resource Regions portray the geographic distribution of U.S. farm production by identifying areas where similar types of farms intersect with areas of similar physiographic, soil, and climatic traits (USDA, ERS, 2006).

Farm typology is a farm classification that categorizes farms according to a measure of size, operators' expectations from farming, stage in the life cycle, and dependence on agriculture. The typology measure used in this report is:

Retirement farms are those with sales less than \$250,000 whose operators report that they are retired.

Residential lifestyle farms are those with sales less than \$250,000 whose operators report a major occupation other than farming.

Farming occupation/lower sales farms are those with sales less than \$100,000 whose operators report farming as their major occupation.

Farming occupation/higher sales farms are those with sales between \$100,000 and \$249,999 whose operators report farming as their major occupation.

Large farms are those with sales between \$250,000 and \$499,999.

Very large farms are those with sales of \$500,000 or more.

Feed efficiency is the pounds of all feed items fed, expressed per hundred weight of gain. Therefore, hog operations with lower values were more feed efficient than hog operations with higher values.

Hog operations are represented by those selected in a targeted sample of hog farms as part of USDA's 2004 Agricultural Resource Management Survey (ARMS). Hog operations are defined as farms that had a hog inventory of 25 head or more on the acres operated at any time during 2004. This means that hog operations include independent hog producers and growers who produced hogs under a production contract.

Hogs finished per head capacity is the number of hogs that were finished during the year for each unit of finishing capacity on the operation. Therefore, hog operations with higher values were using the capital invested in finishing facilities more efficiently than hog operations with lower values.

Hundredweight gain equals hundredweight of hogs sold or removed under contract less hundredweight of hogs purchased or placed under contract, plus hundredweight of inventory change during 2004, expressed as:

$$\text{CWTGAIN} = (\text{CWTSR} - \text{CWTPP}) + (\text{CWTEINV} - \text{CWTBINV}),$$

where CWTGAIN is hundredweight gain, CWTSR is hundredweight of sales and contract removals, CWTPP is hundredweight of purchases and contract placements, CWTEINV is hundredweight of inventory on December 31, 2004, and CWTBINV is hundredweight of inventory on January 1, 2004.

Labor efficiency is the hours of labor used in production, expressed per hundredweight of gain. Therefore, hog operations with lower values were more labor efficient than hog operations with higher values.

Litters farrowed per sow capacity is the number of litters that were farrowed during the year for each unit of farrowing capacity on the operation. Therefore, hog operations with higher values were using the capital invested in farrowing facilities more efficiently than hog operations with lower values.

Low-cost producers are defined as hog operations with total operating and ownership costs less than \$40 per hundredweight gain.

Operating costs are the costs for purchased input items that are consumed during one production period. These are feed; feeder pigs; veterinary and medical services; marketing; custom services and supplies; fuel, lubrication, and electricity; repairs; hired labor; and operating capital.

Ownership costs are the costs associated with the ownership of depreciable assets, such as farm tractors and hog production facilities. These are depreciation, interest, property taxes, and insurance.

Phase feeding means that hogs or pigs are fed diets of varying protein and energy content at different stages, or phases, of their life in order to more closely match the diet with their changing nutritional requirements.

Phase of production refers to one of four commonly used categories that describe stages in the hog production process: (1) breeding and gestation—the breeding of females and their maintenance during the gestation period, (2) farrowing—the birth of baby pigs until weaning, (3) nursery—the care of pigs immediately after weaning until about 30 to 80 pounds, and (4) finishing—the feeding of hogs from 30 to 80 pounds to the slaughter weight of 225 to 300 pounds.

Segregated early weaning systems wean piglets between 5 and 21 days of age. At weaning, the piglets are placed in a nursery that is biologically secure (i.e., segregated within the limitations of the farm) from the breeding herd.

Size groups for hog operations are specified according to the largest number of hogs and pigs on the farm at any time during 2004, and divided into:

Small operations (1 to 499 head),

Medium operations (500 to 1,999 head),

Large operations (2,000 to 4,999 head), and

Very large operations (5,000 head or more).

Split-sex feeding means that pigs are separated by sex by the time they reach 70 pounds and fed different diets. This is done to improve the whole-herd feed conversion because male and female pigs develop differently after reaching 50 to 70 pounds.

Sub-therapeutic antibiotics are low levels of antibiotics fed to hogs for growth promotion, disease prevention, or both. This is different from feeding therapeutic levels of antibiotics to treat disease.

Terminal crossbreeding programs concentrate on using all possible heterosis of the breeds and thus capitalize on breed strengths. These programs use 2-, 3-, or 4-breed first-cross females that excel in maternal traits bred to boars from breeds that are superior for growth and carcass traits. All the progeny from these matings are marketed and not kept for replacement gilts.

Total economic costs are the full ownership costs (cash and noncash) for being engaged in the enterprise. This includes operating and ownership costs, plus opportunity costs for unpaid labor and land, and general farm overhead items costs.

Type of hog producer is a classification that defines the hog operation according to the phases of production conducted on the operation and the type of product produced in 2004. Some operations in the survey could not be classified using the following criteria:

Farrow-to-finish operations are those on which pigs are farrowed and then finished to a slaughter weight of 225 to 300 pounds. Using the survey data, they were defined as farms on which more than 75 percent of pigs came from on-farm farrowings and more than 75 percent of the value of hogs and pigs left the operation through market hog sales or contract removals.

Farrow-to-feeder pig operations are those on which pigs are farrowed and then sold or removed under contract at or after weaning at a weight of about 30 to 80 pounds. Using the survey data, they were defined as farms on which more than 75 percent of pigs came from on-farm farrowings and more than 75 percent of the value of hogs and pigs left through feeder pig sales or contract removals.

Feeder pig-to-finish operations are those on which feeder pigs are obtained from outside the operation, either purchased or placed under contract, and then finished to a slaughter weight of 225 to 300 pounds. Using the survey data, they were defined as farms on which more than 75 percent of pigs came from feeder pig purchases or contract placements and more than 75 percent of the value of hogs and pigs left through market hog sales or contract removals.

Wean-to-feeder pig operations are those on which weanlings (10 to 20 pounds) are obtained from outside the operation, either purchased or placed under contract, and then fed to a feeder pig weight of about 30 to 80 pounds. Using the survey data, they were defined as farms on which more than 75 percent of pigs came from weanlings purchased or were placed under contract and more than 75 percent of the value of hogs and pigs left through feeder pig sales or contract removals.

Farrow-to-wean operations are those on which pigs are farrowed and then sold or removed under contract after an early weaning at a weight of about 10 to 20 pounds. Using the survey data, they were defined as farms on which more than 75 percent of pigs came from on-farm farrowings and more than 75 percent of the value of hogs and pigs left through weanling sales or contract removals.

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