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Agricultural
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Number 724

An Economic Research Service Report

U.S. Hog Production Costs and Returns, 1992

An Economic Basebook

William D. McBride



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Abstract

The U.S. hog production industry has experienced significant structural change during the past decade. Fewer and larger operations have more and more come to characterize the industry. Data from the Farm Costs and Returns Survey are used to describe the hog production industry in 1992 and to examine some of the issues resulting from structural change. Characteristics and production costs are presented for various types of hog operations. Also, the distribution of hog production costs, size relationships in hog production, regional changes in hog production, and production contract activity in the hog industry are examined.

Keywords: Hog production, industry structure, Farm Costs and Returns Survey, farm characteristics, production costs, contract production.

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Summary

The trend toward fewer and larger farms that characterized agricultural production during the 1980's was most dramatic in the hog production industry. U.S. farms selling 1,000 head or more increased from about 4 percent in 1978 to 15 percent in 1992, while total sales from these farms rose from 34 to nearly 70 percent. Likewise, sales from farms selling 5,000 head or more increased from 7 to 28 percent during the 1978-92 period. Change of this magnitude has significantly altered the types and sizes of hog farms and the methods used to produce hogs.

Data from the Farm Costs and Returns Survey are used to describe the hog production industry in 1992 and to examine some of the issues resulting from structural change. Hog producers in 20 States were included in the survey. Respondents to the hog version of the 1992 FCRS represent about 94 percent of 1992 U.S. hog and pig sales. Cost and return estimates conform to the current USDA item definitions and structure of accounts.

A majority of FCRS hog farms are classified as having farrow-to-finish operations, while 19 percent specialize in hog finishing and only 8 percent are specialized feeder pig producers. Feeder pig farms have larger hog operations, but total farm production is small relative to either farrow-to-finish or finished hog farms. Feed is the single largest cash cost item among all types of hog producers.

The distribution of cash and capital replacement costs of farrow-to-finish producers ranges from about \$20 to more than \$80 per hundredweight gain. Size of operation, animal performance, and hog production methods all distinguish low- from high-cost producers. Differences in feed and labor efficiency have the greatest influence on farrow-to-finish production costs. Consequently, the greatest reductions in production costs can be obtained by measures that improve feed and labor efficiency, such as improved breeding stock and environmentally controlled facilities.

Variable cash costs vary little by size of hog operation, but fixed cash costs and economic costs are significantly lower for farrow-to-finish producers with sales/removals of 1,000 head or more. Lower costs among larger producers can be attributed to investments in machinery, buildings, and equipment being spread over more units of output. Most physical and economic advantages of size occur on operations with sales/removals of 1,000 head or more. However, declining costs and increasing hog prices obtained by larger operations have important structural implications for the hog industry.

Farrow-to-finish producers in the emergent production area report greater reproductive performance and feed efficiency, but cash and economic costs are not significantly different than in the traditional area. However, specialized hog finishing operations in the emergent area use more contractual production arrangements, have greater feed and labor efficiency, and have lower production costs than producers in the traditional production area. Hog facilities on operations in the traditional area are much older than those in the emergent area, and producers will soon need to replace many of the existing facilities or exit the industry. This industry adjustment will likely continue the trend toward fewer and larger producers.

Contract hog operations are significantly larger than independent operations, but other farm structural and operator characteristics are much the same. Contract operations feed hogs with greater feed and labor efficiency and lower death

losses. Total economic costs are lower on contract operations because replacement, capital, and labor costs are spread over more units of output. Per-hundredweight returns above cash costs are highest for contractors, followed by independent operators, and lowest for contractees. However, per-farm returns are higher for contractees than for independent operators because of their much larger volume of production.

Glossary of Terms

Hog farms represent those selected in USDA's 1992 Farm Costs and Returns Survey, Hog Cost of Production version. Hog farms are defined as farm operations that had a hog inventory of 25 head or more at any time during 1992.

Farrow-to-finish operations are those on which pigs are farrowed and then finished to a slaughter weight of 200-250 pounds. Specifically, they are defined as farms on which more than 75 percent of pigs during 1992 came from on-farm farrowings and more than 75 percent of the value of hogs and pigs left through market hog sales or contract removals.

Farrow-to-feeder pig operations are those on which pigs are farrowed and then sold at or after weaning at a weight of 40-80 pounds. Specifically, they are defined as farms on which more than 75 percent of pigs during 1992 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 pigs are obtained from outside the operation, either purchased or placed under contract, and then finished to a slaughter weight of 200-250 pounds. Specifically, they are defined as farms on which more than 75 percent of pigs during 1992 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.

Feed cost includes costs for purchased grain and other feed additives and homegrown grain. Purchased grain and other feed additives are charged the price paid by each producer. Homegrown grain is charged the annual State-average market price received by farmers for each type of grain.

Variable cash costs represent the costs for purchased inputs that are consumed in one production period. Variable costs depend on the chosen production practices, input quantities, and input prices.

Fixed cash costs must be paid regardless of whether or not production occurs. Fixed cash costs do not depend on the chosen enterprises.

Economic costs are long-term costs that reflect the production situation as if the operation fully owned all production inputs. These include opportunity costs for all resources used in production.

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 1992, expressed as:

$$CWTGAIN = (CWTSR - CWTPP) + (CWTEINV - CWTBINV)$$

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, 1992, and CWTBINV is hundredweight of inventory on January 1, 1992.

Low-cost producers are the 25 percent of farrow-to-finish producers with the lowest total cash and capital replacement costs per hundredweight gain. Included are farrow-to-finish producers with costs less than \$40.52 per cwt gain.

High-cost producers are the 25 percent of farrow-to-finish producers with the highest total cash and capital replacement costs per hundredweight gain. Included are farrow-to-finish producers with costs more than \$60.06 per cwt gain.

Enterprise size categories are specified for farrow-to-finish operations with market hog sales and contract removals during 1992 under 500 head; 500-999 head; 1,000-2,999 head; and 3,000 or more head.

Traditional production area farms include those in Iowa, Illinois, and Minnesota.

Emergent production area farms include those in North Carolina, South Carolina, and Virginia.

Phase of production refers to one of four commonly used categories that describe the stages of hog production: 1) breeding and gestation--the breeding of females and their maintenance during gestation; 2) farrowing--birth of pigs; 3) nursery--care of pigs immediately after weaning until 40-80 pounds, and 4) finishing--feeding of hogs from 40-80 pounds to the slaughter weight of 200-250 pounds.

Production facilities refer to the various types of buildings used in each phase of production. The four classifications of facilities used in this report--total confinement, enclosed, open with outside access, and portable--are distinguished by their degree of environmental control. Total confinement facilities offer the most environmental control by reducing animal exposure to weather variations, although not necessarily maintaining a constant environment. In contrast, open and portable buildings offer the least environmental control and thus expose animals to much greater weather variations.

Production specialty is the farm production classification that represents the largest portion of gross commodity receipts from the farm operation.

Value of production is an estimate of the total value of all farm products produced on a farm, excluding the value of intermediate products such as corn fed to livestock.

Financial position describes the financial health of a farm business from a combination of calendar year income (net farm income) and end-of-year solvency (debt/asset ratio) measures. Farms are categorized into one of four classes:

- **Favorable**--positive income and debt/asset ratio less than 0.40. These farms are generally considered financially stable.
- **Marginal income**--negative income and a debt/asset ratio less than 0.40. Periods of negative income may not pose financial difficulties if these farms are carrying a low debt load and can either borrow against equity or obtain income from off-farm sources.

- **Marginal solvency**--positive income and a debt/asset ratio above 0.40. A high debt/asset ratio may be acceptable if these farms can generate enough income to service their debt and meet other financial obligations.
- **Vulnerable**--negative income and a debt/asset ratio above 0.40. These farms are generally considered financially unstable.

Major occupation is that occupation in which the operator reported the majority of his/her time spent during 1992.

Sales class is an economic classification of farm size. The classification is based on gross receipts, including gross annual sales of crops, livestock, poultry, and products; miscellaneous agricultural products; and all Government payments of the farm operation.

U.S. Hog Production Costs and Returns, 1992:

An Economic Basebook

William D. McBride

Introduction

Hogs are produced in all 50 States, but production is concentrated in the Corn Belt where abundant corn and soybean supplies provide a low-cost feed source. In 1992, four major hog-producing States--Iowa, Illinois, Minnesota, and Indiana--accounted for about half of all U.S. hog and pig sales. Iowa alone accounted for nearly one-fourth of sales. Hog production is also important in the Southeast: in 1992, North Carolina ranked second among all States in total hog and pig sales, accounting for about 10 percent of U.S. sales (U.S. Dept. of Commerce).

The trend toward fewer and larger farms that characterized agricultural production during the 1980's was most dramatic in the hog production industry. The total number of U.S. farms declined from about 2.26 million in 1978 to about 1.93 million in 1992, a 15-percent decline. However, the number of farms with hog sales fell by 56 percent, from about 425,000 farms to fewer than 190,000. Despite fewer hog farms, total head sold was 23 percent higher in 1992 than in 1978. The hog industry became increasingly concentrated among fewer and larger producers during the 1980's. In 1978, 89 percent of U.S. hog farms sold fewer than 500 head and accounted for nearly 44 percent of total hog and pig sales (U.S. Dept. of Commerce). By 1992, 72 percent of farms sold fewer than 500 head but accounted for only 15 percent of total sales. In contrast, U.S. farms selling 1,000 head or more increased from about 4 percent in 1978 to 15 percent in 1992, while the percent of total sales from these farms rose from 34 to nearly 70 (fig. 1). Likewise, sales from farms selling 5,000 head or more increased from 7 percent in 1978 to 28 percent in 1992.

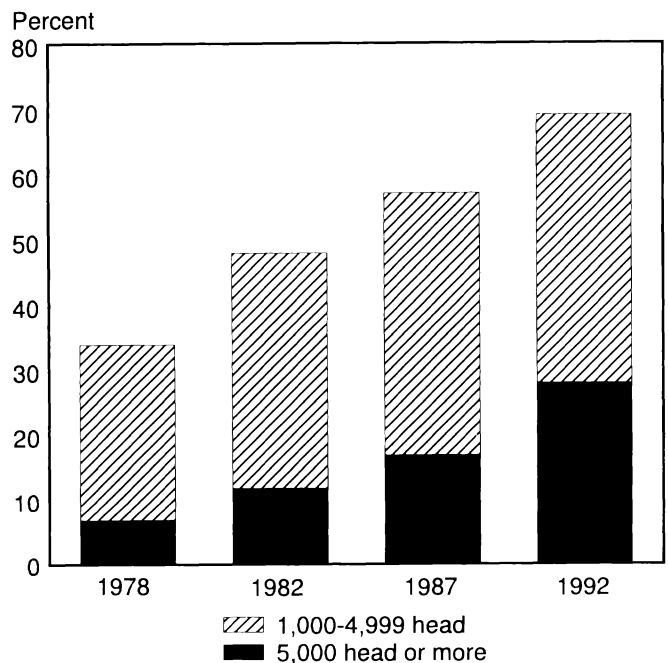
This report examines the structure and economics of U.S. hog production by comparing production costs and selected production and farm characteristics among U.S. hog producers. Producers are grouped according to enterprise types into farrow-to-finish,

farrow-to-feeder pig, and feeder pig-to-finish. The first part of this report describes the methods and procedures used in hog cost and return estimation. Characteristics and cost and return estimates of each type of hog producer are then presented. The third section includes a distributional analysis of production costs by identifying and measuring sources of cost variation. The influence of size of operation on production costs and performance measures is explored in section 4. Due to limited data about specialized feeder pig production and hog finishing operations, the analyses in sections 3 and 4 are

Figure 1

U.S. hog and pig sales by size of operation

Hog and pig sales from farms selling 1,000 head or more increased from 34 to 69 percent during 1978 to 1992, while sales from farms selling 5,000 head or more rose from 7 to 28 percent.



Source: Census of Agriculture, various issues

conducted only for farrow-to-finish producers. However, section 5 examines regional differences among hog producers by comparing traditional and emergent hog production areas for both farrow-to-finish and specialized feeder pig-to-finish operations. Also, the report concludes with a comparison of contract and independent operating arrangements on farms with specialized hog finishing operations.

Sections of this report include a comparison of group means and percents by various classifications. Comparisons of group means and percents were statistically tested for significant differences (see Appendix A). T-statistics between groups for selected, but not all, items in each section are presented. The discussions in each section emphasize comparisons among groups only when means are significantly different at the 90-percent level.

Measuring Hog Enterprise Costs and Returns

Hog production cost and return estimates are based on information obtained in USDA's 1992 Farm Costs and Returns Survey (FCRS) of U.S. hog producers. Cost and return estimates conform to the current USDA item definitions and structure of accounts.

The U.S. Department of Agriculture's Economic Research Service (USDA, ERS) annually estimates production costs and returns of major field crops and livestock enterprises (USDA, ERS, 1994). USDA estimates of production costs and returns are for production operations regardless of resource ownership, and include operator, landlord, and contractor costs and returns. Cost and return estimates reflect average production practices, yields, animal performance, and prices paid and received by farmers in each year. Costs can vary widely among farmers due to differences in location, size, inputs used, and production practices. This variability means that costs and returns for individual farmers may differ considerably from average estimates presented in this report. Consequently, users should be aware of the objectives and procedures used in constructing the USDA estimates.

Data Sources

Production cost estimates are based on information obtained from the Farm Costs and Returns Survey (FCRS), conducted annually by ERS and USDA's National Agricultural Statistics Service (USDA, NASS). Each year multiple versions of the FCRS are conducted, including an in-depth, whole-farm version,

and commodity cost-of-production (COP) versions. While all versions include questions about whole-farm income and expenses, each COP version gathers detailed information about input use and machinery, building and equipment use, and production costs of an individual enterprise. Because of survey costs, USDA cannot undertake detailed surveys of every commodity each year. Thus, the FCRS covers each commodity on a rotating basis about every 5 years.

Data used in this report are obtained from the hog cost-of-production version of USDA's 1992 Farm Costs and Returns Survey (FCRS). Hog producers in 20 States, mainly in the North Central and Southeast, were included in the survey (fig. 2). The FCRS uses a multiframe stratified sample in which each farm surveyed represents a number of similar farms. The 1,221 respondents to the hog version of the 1992 FCRS represent 105,021 farms and hog and pig sales of about 105 million head (94 percent of 1992 U.S. hog and pig sales; U.S. Dept. of Commerce). Hog producers in Northeastern and Western States were not surveyed because of their minor share of hog production and because of limited survey funds.

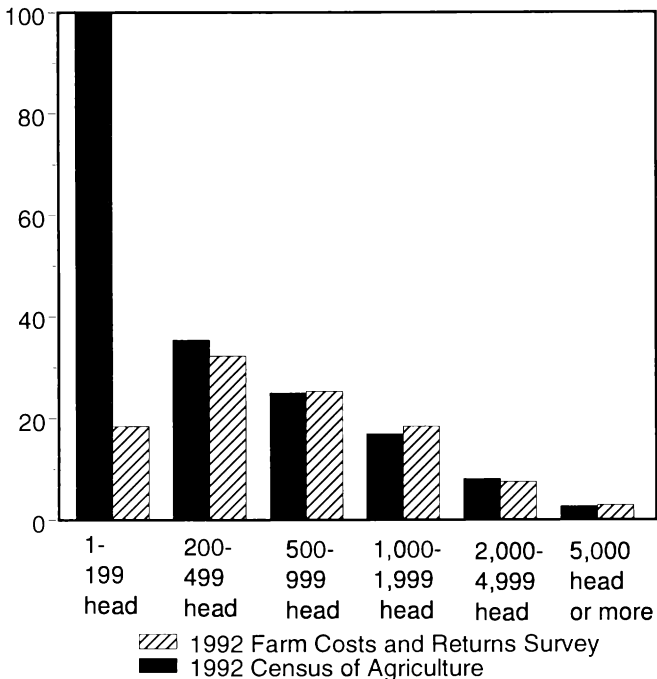
Farms surveyed in the 1992 FCRS of hog producers were chosen from a list of known hog producers maintained by the National Agricultural Statistics Service (NASS). Hog farms included in the FCRS are defined as farm operations that had a hog inventory of 25 head or more at any time during 1992. The purpose of the survey of hog producers was to collect information used to estimate the average cost of production for hog operations. Screening out farms with a hog inventory below 25 head is necessary to exclude farms with only a few hogs for on-farm consumption or club projects. A comparison of hog farms and hog sales by size group from the FCRS sample and the Census of Agriculture data is shown in figure 3. Hog operations in the FCRS ranged in size from 20 to about 15,000 head sold or removed under contract. Because extremely small hog farms are screened out of the FCRS, and because lists maintained by NASS typically include larger producers, farm numbers and head sold from farms with fewer than 200 head of sales are significantly lower in the FCRS than in the Census. However, while these small hog operations represent over half of all U.S. farms with hog sales, they include only 5 percent of hog sales. Among other size groups the FCRS sample of hog farms and sales is distributed much like that of the Census of Agriculture (fig. 3).

Figure 3

U.S. hog farms and sales in the Census of Agriculture and the Farm Costs and Returns Survey by size of operation, 1992

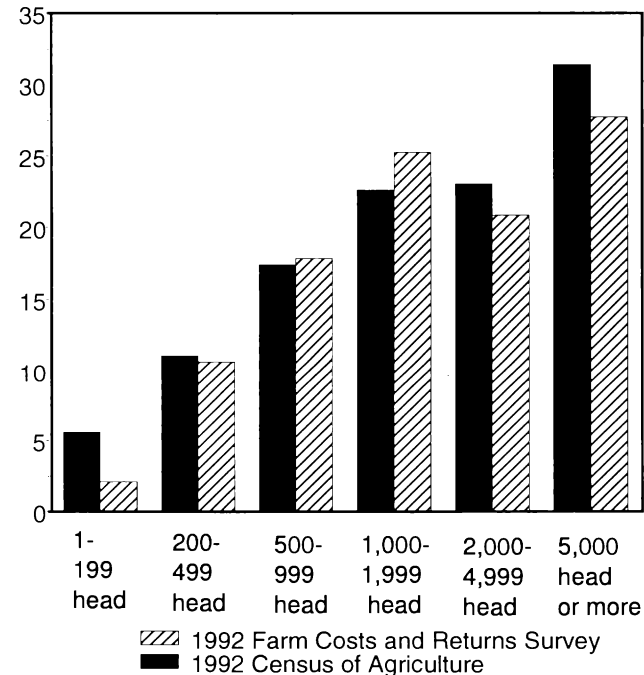
Because of screening and sample selection the FCRS included fewer small farms than the Census, but farm numbers in other size groups are much the same.

Number of farms (thousands)



Head sold is much the same in the FCRS and Census for size groups above 1-199 head, and total head sold from the FCRS is 94 percent of that in the Census.

Number of head sold (millions)



definitions and structure of accounts. Hog estimates are developed from measurements of costs and returns during the 1992 calendar year, and are presented on a per hundredweight gain basis. Hundredweight gain is measured as hundredweight of hogs sold or removed under contract, less hundredweight of hogs purchased or placed under contract, plus hundredweight of inventory change during 1992 (see Glossary of Terms). Measuring estimates per unit of gain, rather than per unit sold, is preferred because it allows the comparison of hog operations that were in various life stages during 1992, such as beginning, expanding, stable, contracting, and ending. Hog cost and return estimates are presented in the form of a commodity account that lists gross value of production, variable cash expenses, fixed cash expenses, economic costs, and two measures of returns.

Gross value of production. Gross value of hog production includes the value of market hog, feeder pig, cull stock, and breeding stock sales and contract removals, the value of hog inventory change, and other income from the hog enterprise. Quarterly sales/removals of market hogs and feeder pigs are valued at quarterly prices in each State. Cull and breeding stock sales/removals are valued at annual prices in each State. Head of market hogs and feeder pigs sold/removed in each quarter, and annual sales/removals of cull and breeding stock are reported in the FCRS. Quarterly and annual hog prices are obtained from *Agricultural Prices* (USDA, NASS). Breeding stock sales/removals are valued at the reported sales price in the FCRS.

The value of inventory change is included in gross value of production to account for the hog value added that is not reflected in hog sales. Including the value of inventory change offsets additional costs incurred on expanding hog operations, and additional revenues received on contracting hog operations. Annual average prices in each State are used to value the difference between hundredweight of beginning and ending hog inventory during 1992. Other income from hog production includes the nutrient value of manure production. The nutrient content of estimated annual manure production is valued using annual prices for nitrogen, phosphorus, and potassium in each State.

Variable cash expenses. Variable cash expenses are incurred only if production takes place. Feed is the largest component of variable cash expenses on hog operations, comprised of feed grains, protein sources, complete mixes, and other feed items. Costs of purchased feed items are taken directly from the FCRS. Quantities of homegrown feed grains are

valued according to annual average feed grain prices in each State obtained from *Agricultural Prices* (USDA, NASS).

Head of feeder pigs purchased or placed under contract in each quarter are valued according to quarterly feeder pig prices in each State. Feeder pig prices in each State are obtained from *Agricultural Prices* (USDA, NASS). Costs of other variable cash expenses, including veterinary and medicine, bedding and litter, marketing, custom services and supplies; fuel, lubrication and electricity; repairs, and hired labor, are taken directly from the FCRS.

Fixed cash expenses. Fixed expenses must be paid regardless of whether or not production occurs. Fixed expenses include general farm overhead, taxes, insurance, and interest on loans. Overhead costs consist of expenses for utilities (excluding water and electricity for irrigation), farm shop and other supplies, accounting and legal fees, blanket insurance policies, fence maintenance and repair, motor vehicle registration, maintenance of farm roads and ditches, and any other general expenses attributable to the farm business. Taxes are those for real estate and personal property and not Federal or State income taxes. Insurance includes crop and livestock insurance other than Federal crop insurance and the farm share of motor vehicle liability and blanket insurance policies. Interest expenses include finance charges and service fees for loans on machinery, the farm share of motor vehicles, purchases of inputs, land contracts, mortgages, and any other loans secured by

real estate.

Unlike variable cash expenses, fixed costs associated with the hog enterprise are more difficult to obtain directly from farmer surveys, such as the FCRS. Most of these items are purchased for the farm as a whole, paid for or billed to the farm in a lump sum, or used in a wide range of farming activities. Consequently, these input costs must be divided among farm enterprises based on an allocation rule. Fixed cash expenses are allocated to the hog enterprise based on the share of total value of farm production attributed to the hog enterprise.

Economic (full-ownership) costs. Economic costs are long-term costs that reflect the production situation as if the operation fully owned all production inputs. An opportunity cost is calculated for all capital inputs and land, whether owned, rented, or financed. Economic costs include variable cash expenses, general farm overhead, taxes and insurance, capital replacement, an imputed cost of capital invested in the production process, unpaid labor, and land.

Capital replacement cost represents a charge sufficient to maintain production capacity through time. Information is collected on the FCRS to determine capital assets used in hog production, including their size, age, and hours used. These data are combined with current price information and engineering coefficients developed by the American Society of Agricultural Engineers. An annual capital replacement charge is computed by dividing the current purchase

Figure 4

Approaches used to estimate hog cost-of-production items

The choice among alternative approaches for cost of production estimation is dictated by the type and availability of data and economic theory, among other considerations.

Direct costing	Allocating whole-farm expenses	Valuing quantities of inputs	Indirect costing	Some combination of approaches
Purchased feed Veterinary and medicine Bedding and litter Custom services and supplies Marketing Fuel, lubrication, and electricity Repairs Hired labor	General farm overhead Interest Taxes and insurance	Homegrown feed Feeder pigs Unpaid labor Land	Capital replacement	Operating capital Other nonland capital

price less salvage value of each capital asset by years of life. Capital replacement includes a charge for purchased breeding stock, but not for replacement stock raised on the farm because costs of raising these replacements are included in other items of the account.

Opportunity costs are imputed from values of capital, land, and unpaid labor in alternative uses. The cost of operating capital is the cost of carrying input expenses from the time they are incurred until the time they are paid, assumed to be a 6-month period for hog operations. Operating capital cost is imputed using the 6-month U.S. Treasury bill rate. The cost of having capital invested in farm machinery, buildings, equipment, and breeding stock (nonland capital) is measured using the longrun rate of return to agricultural production assets from current income. Land cost includes a charge for land used as building sites, manure storage, and hog lots. Land is valued at its rental value minus real estate taxes. The value of unpaid labor is imputed using the wage rate for agricultural workers. Any additional value of unpaid labor, such as for management and entrepreneurial skill, is treated as a residual return.

Gross value of production less selected costs. Two returns are included in each account. Gross value of production less cash expenses is the net cash return that measures the shortrun cash-flow position. Gross value of production less economic costs is the residual return to management and risk that measures the longrun position of the enterprise.

Characteristics and Production Costs of U.S. Hog Producers

Most FCRS hog farms are classified as having farrow-to-finish operations, while 19 percent specialize in hog finishing and only 8 percent specialize in feeder pig production. Feeder pig farms have larger hog operations, but total farm production is small relative to either farrow-to-finish or finished hog production.

FCRS hog farms are classified by type of producer according to the number and age of hogs entering and exiting the operation during 1992.

Farrow-to-finish farm: more than 75 percent of pigs come from on-farm farrowings, and more than 75 percent of the value of hogs and pigs leave through market hog sales or contract removals.

Farrow-to-feeder pig farm: more than 75 percent of pigs come from on-farm farrowings, and more than 75

percent of the value of hogs and pigs leave through feeder pig sales or contract removals.

Feeder pig-to-finish farm: more than 75 percent of pigs enter the operation from feeder pig purchases or contract placements, and more than 75 percent of the value of hogs and pigs leave through market hog sales or contract removals.

Most FCRS hog farms surveyed (54 percent) are farrow-to-finish operations, while 19 percent are feeder pig-to-finish operations (table 1). Only 8 percent of farms are farrow-to-feeder pig operations. The remaining farms (19 percent) cannot be assigned to a specific producer type.¹

Farm Characteristics

Farrow-to-feeder pig producers have larger hog operations than other types of producers. Annual feeder pig sales on these operations average 1,433 head, compared with market hog sales of around 800 head on the operations that finished hogs (table 1). Farrow-to-feeder pig producers maintain a larger sow herd than farrow-to-finish growers, 95 versus 74 head. However, farrow-to-feeder pig production is generally associated with smaller farm operations than other types of hog enterprises. Farm acreage and value of production are lowest for farrow-to-feeder pig producers. More than a third of farms with feeder pig production operations have less than \$40,000 in farm sales, compared with just over 10 percent of farms with other types of hog operations. Conversely, about a fourth of farms with farrow-to-finish and feeder pig-to-finish operations have more than \$250,000 in farm sales, compared with only 14 percent of farms producing feeder pigs. With more hogs on smaller farms farrow-to-feeder pig producers are more specialized in hog production than other producers.

Farrow-to-feeder pig operations have a better farrowing and weaning record than farrow-to-finish operations. Feeder pig producers farrow nearly two litters per sow compared with 1.75 for farrow-to-finish producers and wean about two more pigs per sow (15.48 versus 13.22 pigs). Death rates are lower among feeder pig producers for pigs from birth to weaning and for the breeding herd. Greater reproductive performance of females on feeder pig farms may be attributed to greater attention on the part of operators to the farrowing and weaning stages of production.

¹Detailed characteristics and production costs among the producer groups are included in Appendix B, tables 1 through 3B.

Table 1--Characteristics of FCRS farms with alternative hog enterprise types, 1992

Specialized feeder pig operations produce more hogs, but have smaller overall farm operations than other producers. Specialized finishing operations more often produce hogs under contract production arrangements.

Item	Unit	Farrow-to-finish	Farrow-to-feeder pig	Feeder pig-to-finish
Share of FCRS hog:				
Farms	percent	54	8	19
Sales or contract removals	percent	61	6	12
Market hog sales/removals	head	858	7	804
Feeder pigs sales/removals	head	28	1,433	d
Market hog:				
Sales	percent	99	100	78
Contract removals	percent	d	0	22
Sow inventory	head	74	95	d
t-stat (farrow-to-finish)		-	(4.53)**	(13.35)**
t-stat (farrow-to-feeder pig)			-	(4.08)**
Total operated acreage	acres	634	291	556
t-stat (farrow-to-finish)		-	(6.64)**	(1.25)
t-stat (farrow-to-feeder pig)			-	(4.41)**
Sales class ¹ :				
\$0-\$39,999	percent of farms	11	34	12
t-stat (farrow-to-finish)		-	(4.18)**	(0.29)
t-stat (farrow-to-feeder pig)			-	(3.67)**
\$250,000 or more	percent of farms	23	14	24
t-stat (farrow-to-finish)		-	(1.70)*	(0.18)
t-stat (farrow-to-feeder pig)			-	(1.67)*
Homegrown grain	percent of grain fed	55	29	45
t-stat (farrow-to-finish)		-	(3.25)**	(1.69)*
t-stat (farrow-to-feeder pig)			-	(1.93)*

¹Data may not sum due to rounding or omission of possible categories.

**significantly different at the 5-percent level; *significantly different at the 10-percent level.

na=not applicable; d = insufficient data for disclosure.

Only 29 percent of grain fed on farrow-to-feeder pig operations is homegrown, compared with more than half on farrow-to-finish operations. Feeder pig producers have much less corn acreage than other growers and use more complete feed mixes. About 22 percent of feed use on farrow-to-feeder pig farms is from a complete purchased mix, compared with only 9 percent on farrow-to-finish farms. Feeder pig-to-finish operations also use more complete feed mixes (19 percent of feed). Many more feeder pig finishers are contract operations than are other producer types, with about 22 percent of finished hogs removed under contract (table 1). Contractors typically provide much of the feed to contractees in a complete mix form.

Hog Production Costs

Farrow-to-finish operations produce hogs with average cash costs of \$37 per cwt of gain and economic costs

of \$53. Cash costs are about \$69 and economic costs are \$105 per cwt of gain for farrow-to-feeder pig producers. On feeder pig-to-finish operations, cash costs are \$50 per cwt of gain while economic costs are \$61. Market hog prices averaged in the low- to mid-\$40's per hundredweight in 1992, down from \$50-\$60 hogs during 1990-91. Likewise, feeder pig prices averaged from about \$60-\$80 per hundredweight, down from \$90-\$130 pigs during the previous 2 years. Despite lower hog prices in 1992, all types of producers were able to cover cash costs. However, average economic costs exceed the value of hog production for each type of producer.

Feed cost is the single largest cash cost item among all types of hog producers. Feed includes nearly 70 percent of cash costs on farrow-to-finish operations, 54 percent on farrow-to-feeder pig farms, and 45 percent on feeder pig-to-finish farms (fig. 5). Less cash costs

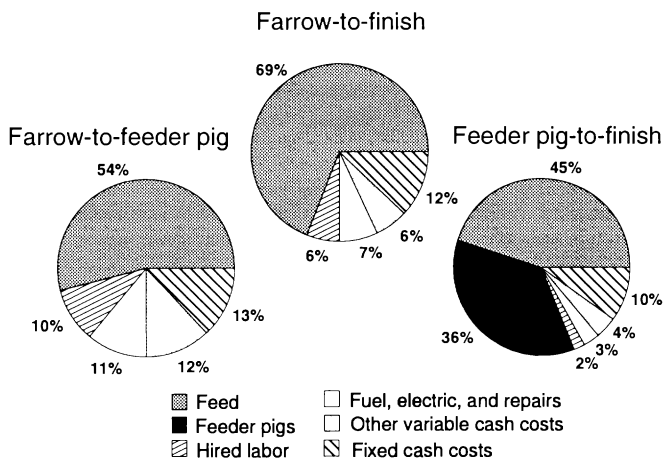
Figure 5

Distribution of cash and economic costs per cwt gain by type of hog producer, 1992

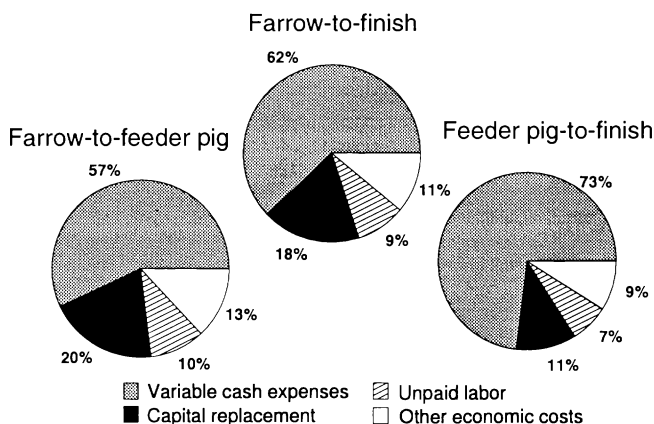
Feed is the single largest cash cost item among all types of hog producers, while feeder pigs comprise more than a third of cash costs on specialized hog finishing operations.

Variable cash expenses compose the majority of economic costs of all types of producers. Capital replacement is also a major cost item, especially among farrow-to-finish and feeder pig producers.

Cash costs



Economic costs



Source: 1992 Farm Costs and Returns Survey, USDA

are incurred for feed on farrow-to-feeder pig operations than on farrow-to-finish operations because the most intensive feed requirements are for finishing hogs. Relatively more is spent for labor and energy during farrowing and caring for baby pigs on feeder pig production operations. More than 80 percent of cash costs on feeder pig-to-finish operations are composed of feed and purchased feeder pig costs. Consequently, returns to feeder pig finishing are very sensitive to changes in hog and feed grain prices.

Variable cash expenses compose the majority of total economic costs of all types of hog enterprises, but its portion of economic costs varies by type of producer. Nearly three-fourths of economic costs on feeder pig-to-finish operations are variable cash expenses, compared with about 60 percent on the other types of hog operations (fig. 5). More of the economic costs on farrow-to-finish and feeder pig-to-finish operations are in capital replacement costs--around 20 percent. The operations that farrow pigs have more capital invested because of the specialized buildings and equipment often used for farrowing. In contrast, only 11 percent of economic costs on feeder pig-to-finish operations are for capital replacement. Finishing hogs generally requires less investment in specialized buildings and equipment than does farrowing pigs.

Distribution of Hog Production Costs

Size of operation, animal performance, and hog production methods all distinguish low- from high-cost farrow-to-finish hog producers. However, differences in feed and labor efficiency have the greatest influence on farrow-to-finish production costs.

Average hog production cost estimates presented in the preceding section provide only limited information about the economic performance of U.S. hog producers. Considerable production cost variability exists among hog producers. Average costs of production represent only a single point on the distribution of production costs. Analysis of the entire cost of production distribution enables the identification of sources of cost differences among producers, such as the effects of various farm organizations and management practices.

Production costs used in the distributional analysis include estimated cash costs and capital replacement costs. Cash costs represent actual out-of-pocket expenses incurred for hog production during 1992. Capital replacement costs represent a charge sufficient to maintain the production capacity of machinery, buildings, and equipment through time. Replacement costs may be postponed in any given year, but

ultimately must be paid for the operation to remain in business. Other economic costs represent opportunity costs of resources that are not as easily measured at the farm level, and thus are excluded from this analysis. Also, due to limited data on specialized farrowing and finishing hog operations, the distributional analysis is conducted only for farrow-to-finish operations.

Two procedures are used to examine the cost of production distribution of farrow-to-finish hog producers. First, estimated production costs per hundredweight gain for farrow-to-finish producers are ranked from lowest to highest to form a weighted cumulative distribution (fig. 6). The cumulative distribution is divided into quartiles with the bottom quartile representing the lowest-cost hog producers, and the top quartile representing the highest-cost hog producers. Sources of cost differences among producers are identified by comparing the farm structural and performance characteristics of low- and high-cost producers. The statistical difference in mean estimates for low- and high-cost producers is tested using a t-statistic (see Appendix A).

The relationship between costs of production and farm structural and performance characteristics is further tested using regression analysis. Multivariate regression analysis is used to examine the combined effect of key variables on production costs. To measure the extent to which each characteristic influences production costs, the sample variation of production cost is decomposed into the portion attributable to each characteristic (see Appendix A).

Low- and High-Cost Farrow-to-Finish Hog Producers

A quarter of farrow-to-finish hog farms surveyed have cash and capital replacement costs per hundredweight at \$40.52 or less. These low-cost producers account for about 33 percent of total hog sales and contract removals on FCRS farrow-to-finish farms (table 2). High-cost producers, with per-hundredweight cash and capital replacement costs of \$60.06 or more, account for only 11 percent of total sales and contract removals.²

Differences in animal performance are critical in determining whether producers are low- or high-cost. Average feed cost on high-cost operations is more than double that on low-cost farms (\$41.37 versus \$19.56 per hundredweight gain). However, average

price paid per ton of feed is about \$117 by low-cost producers, only \$9 below that of high-cost growers. Differences in animal feed efficiency have a much larger effect on feed costs. Low-cost producers feed 333 pounds of feed per hundredweight of gain compared with 658 pounds by high-cost producers (table 2). Greater feed efficiency on the part of low-cost producers may result from more intensive management of feeding systems and ration formulation as well as higher performance genetics. Low-cost producers are also more labor efficient than high-cost producers. Only 0.86 total labor hour is used for each 100 pounds of gain on low-cost operations, compared with 2.15 total hours on high-cost operations. High-cost operations use more of both hired and unpaid labor.

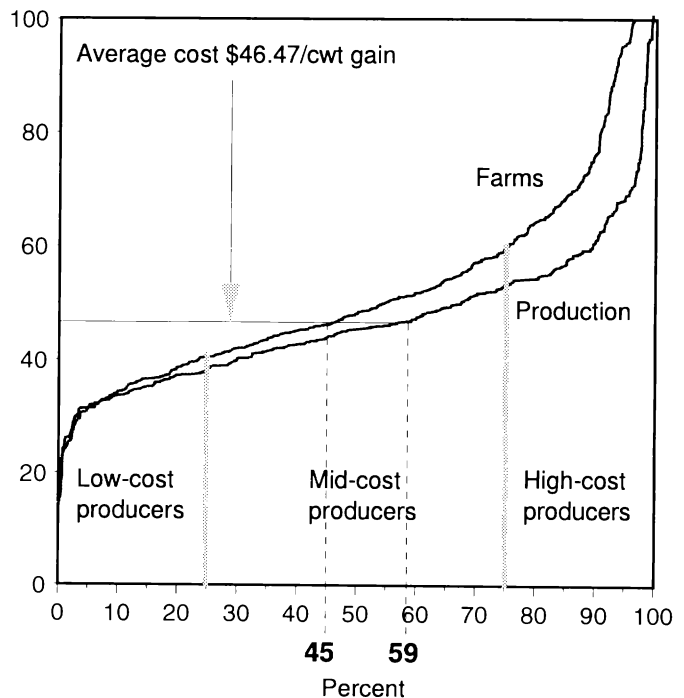
Low-cost producers have significantly larger hog operations than high-cost producers. Low-cost producers sold/removed an average of 1,140 head during 1992, more than 3 times the 377-head average from high-cost operations. Average sow herd size is

Figure 6

Cumulative distribution of farrow-to-finish cash and capital replacement costs per cwt gain, 1992

About 45 percent of FCRS farrow-to-finish hog operations had production costs at or below the average cost of \$46.67 per cwt gain, while 59 percent of total hog production was produced at or below the average cost.

Dollars per cwt gain



Source: 1992 Farm Costs and Returns Survey, USDA

²Detailed characteristics and production costs among the cost groups are included in Appendix B, tables 4 through 6B.

Table 2--Characteristics of FCRS farms with low- and high-cost farrow-to-finish hog operations, 1992

Low-cost farrow-to-finish producers are much larger, and more feed and labor efficient than high-cost producers. Greater environmental control during hog finishing likely contributes to the better performance of low-cost producers.

Item	Unit	Low-cost producers	High-cost producers	t-statistic
Share of FCRS farrow-to-finish hog:				
Farms	percent	25	25	na
Sales or contract removals	percent	33	11	na
Market hog sales/removals	head	1,140	377	6.86**
Sow inventory	head	83	40	4.32**
Feed efficiency	pounds per cwt gain	333	658	7.91**
Labor efficiency	hours per cwt gain	0.86	2.15	7.78**
Financial position: ¹				
Favorable	percent of farms	86	55	4.45**
Marginal income	percent of farms	9	35	4.53**
Marginal solvency	percent of farms	5	6	0.34
Vulnerable	percent of farms	d	3	1.10
Growing/finishing facilities: ¹				
Total confinement	percent of capacity	50	34	1.66*
Open with outside access	percent of capacity	30	48	1.98**
Feed costs	dollars per cwt gain	19.56	41.37	8.01**
Economic costs	dollars per cwt gain	39.89	87.19	14.82**

¹Data may not sum due to rounding or omission of possible categories.

**significantly different at the 5-percent level; *significantly different at the 10-percent level.

na=not applicable; d = insufficient data for disclosure.

also much larger on low-cost operations, more than twice that of high-cost producers (83 versus 40 sows). Farm acreage operated is not different between the cost groups, but average farm value of production is nearly twice as high among the low-cost producers. Moreover, 58 percent of high-cost producers have farm sales less than \$100,000, while 74 percent of low-cost producers have farm sales above \$100,000.

A greater proportion of producers in Southern States are in the high-cost group than are producers in Northern States. About 35 percent of farrow-to-finish operations in Southern States are in the high-cost group, compared with only 23 percent of operations in Northern States (fig. 7). Historically, hog producers in Southern States have had higher costs for feed because lower grain supplies require more feed to be imported from other regions.

The financial condition of low-cost producers is better than that of high-cost producers. More than 85 percent of low-cost producers are in a favorable financial position (see Glossary of Terms), compared with only

55 percent of high-cost producers (table 2). Many high-cost producers are in the marginal income category, indicating that while their debt/asset ratio was less than 0.40, farm income during 1992 was negative (see Glossary of Terms). Relatively low hog prices during 1992 and greater feed costs among the high-cost growers contributed to negative farm income. Differences in financial condition and production costs are also reflected in hog inventory changes of the cost groups, as some high-cost producers exit the industry while some low-cost producers expand production. The average hog inventory of high-cost producers declined by 50 head from 337 to 287. In contrast, low-cost producers expanded from a beginning inventory of 667 to an ending inventory of 704 head.

Low-cost producers more often use total confinement, environmentally controlled buildings for finishing hogs than do high-cost producers. Half of the hog-finishing building capacity on low-cost operations is in total confinement buildings, compared with only 34 percent of the finishing capacity on high-cost farms. More of the finishing capacity on high-cost operations is in

buildings that allow hogs outside access. Greater environmental control on low-cost operations likely contributes to the lower finishing death rates and greater feed and labor efficiency of these producers.

Most operator characteristics are not significantly different between low- and high-cost farrow-to-finish operations. Operators of farms in both groups are experienced hog producers with an average of 21 years. Operator age, educational attainment, and farm organization are also much the same for producers in each group. However, low-cost producers are more likely to consider farming their major occupation than are high-cost producers.

Total gross value of hog production per cwt gain is not different for the producer groups, but the value of individual components varies. The value of animal sales, including market hogs, feeder pigs, and other stock, is significantly greater on high-cost operations, while the value of inventory change is greater on low-cost operations. High-cost operations were reducing size during 1992 and thus selling more of inventory. In contrast, expansion by low-cost producers results in a positive value of inventory change.

Most variable cash cost items are significantly different between the groups. Average variable cash expenses are about \$25 per cwt gain for low-cost producers, less than half of the \$52 spent by high-cost producers, with the majority of cost savings attributed to lower feed costs (table 2). All economic cost items are different for the producer groups. In addition to lower variable costs, significantly lower machinery and equipment costs for capital replacement and nonland capital and lower unpaid labor costs account for most of the cost savings on low-cost operations. Total economic costs are nearly \$50 per cwt gain less among the low-cost producers.

The Influence of Farm Structural and Performance Characteristics

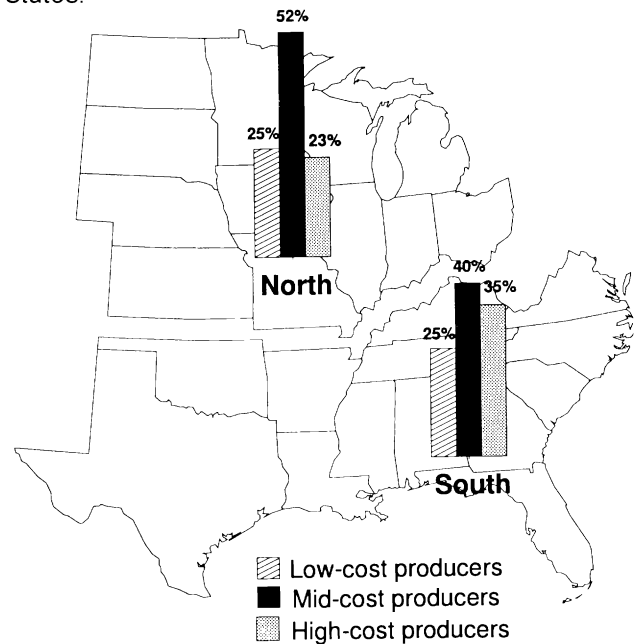
The influence of selected variables on the per cwt cash and capital replacement costs of U.S. farrow-to-finish hog producers was tested using regression analysis. Results of the cost distribution analysis were the basis for choosing explanatory variables in the regression analysis. Decomposing the sample variation of cash and capital replacement costs into the portion attributable to each variable gives a measure of the extent to which each variable influences hog production costs (see Appendix A).

Size of the hog operation, as measured by head of sales/removals, is expected to be inversely related to

Figure 7

Distribution of cost groups by region, 1992

Thirty-five percent of farrow-to-finish producers in Southern States were in the high-cost group, compared to only 23 percent of producers in Northern States.



Source: 1992 Farm Costs and Returns Survey, USDA

production costs. Larger farms typically have lower unit costs because costs of fixed inputs, such as for machinery, buildings, and equipment, can be spread over more units of output. Pigs weaned per sow is used as a measure of reproductive performance. Operations that wean more pigs per sow should have lower unit costs. The effect of weaning age on production costs is less apparent. Death losses after weaning can be reduced by extending the time before weaning so that pigs nurse for a longer period and become stronger with age. However, the sooner pigs are weaned, the sooner facilities can again be used for farrowing. Increasing the intensity of facility use should lower per unit costs.

Death rates should be positively related to production costs. Higher death rates from farrowing to weaning and from weaning to market result in higher production costs. Likewise, production costs should increase as both feed and labor use, measured as physical units used per cwt gain, increase. Feed cost comprises the largest share of hog production costs, and total unit costs will likely rise as feed consumption rises. Greater labor efficiency often results from improvements in hog production facilities and methods that tend to lower unit production costs. Unit production costs are expected to increase with finished

Table 3--Regression estimates of the unit cost equation for farrow-to-finish hog producers, 1992
Size, weaning age, death rate (weaning to market), feed efficiency, labor efficiency, farm debt-to-asset ratio, and operator experience in hog production all significantly influence farrow-to-finish production costs.

Variable	Unit	Coefficient estimate	t-statistic
Intercept	na	40.4988	2.65**
Size	1 / (finished hogs sold/removed)	929.5810	3.46**
Reproductive performance	pigs weaned per sow	-0.0060	-0.05
Weaning age	days	-0.1419	-2.35**
Death rate (farrow to wean)	percent of pigs farrowed	0.0166	0.26
Death rate (wean to market)	percent of pigs weaned	0.2050	2.32**
Finished hog weight	pounds per head	-0.0539	-0.88
Feed efficiency	pounds of feed per cwt gain	0.0515	18.18**
Labor efficiency	hours per cwt gain	3.3417	5.91**
Farm debt-to-assets	ratio	10.5343	3.13**
Major occupation	1=farming; 0=otherwise	-2.8170	-1.19
Education	1=less than high school; 0=otherwise	1.6961	0.60
Education	1=high school graduate; 0=otherwise	0.4481	0.29
Experience	years operator of hog operation	-0.1282	-2.58**
Hog records	1=kept; 0=not kept	-0.7504	-0.47
	F	64.95**	
	R ²	0.68	

**significant at the 5% level; *significant at the 10% level.
na = not applicable.

hog weight because more feed is required for each additional pound of gain, and animal maintenance requirements increase with weight.

The effect of farm financial condition on production costs is examined by including the farm debt-to-asset ratio. Farms with more debt relative to assets will likely have higher production costs than others. Farm operator characteristics include major occupation, education, and experience. Major occupation is defined as that job, farming or otherwise, on which the farm operator spent the majority of time during 1992. Farm operators whose major occupation is farming are expected to have lower production costs than others, as are operators with more education. Education is measured using binary variables for each of three groups: 1) operators not graduating from high school; 2) operators completing high school, but not college; and, 3) operators completing college. Experience is measured as the number of years that the operator has been the operator of the hog operation. Production costs should decline with operator experience as producers learn and develop the managerial details of their individual operations. Similarly, costs should be lower for producers who keep detailed hog enterprise records than for other producers.

Results of the regression analysis.

Regression coefficients and t-statistics for farrow-to-finish hog producers are presented in table 3. The estimated coefficients describe the change in

production costs from a unit change in each of the structural and performance variables. The t-statistics indicate which of the estimated coefficients are significantly different from zero. Size, weaning age, death rate (weaning to market), feed efficiency, labor efficiency, farm debt-to-asset ratio, and operator experience in hog production all significantly influence farrow-to-finish production costs. All significant coefficients have their expected sign.

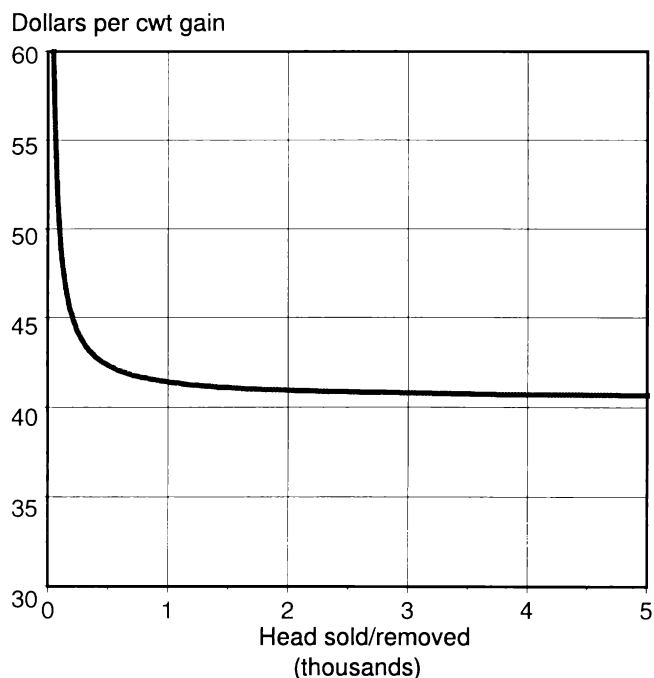
Alternative forms of the cost-size relationship were tested on the farrow-to-finish data and a reciprocal term for size best described the relationship (see Appendix A). Over the range of operation sizes in the FCRS data (20 to about 15,000 head sold/removed) cash and capital replacement costs tend to decline with size at a decreasing rate (fig. 8). As size increases, production costs decline and approach \$40.50 (the intercept of the estimated equation). Most of the effect of size on production costs occurs below 1,000 head of annual sales/removals. Costs decline from nearly \$50 per cwt gain on operations with 100 head, to \$41.43 on operations with 1,000 head of sales/removals, about \$8 per cwt gain. However, from 1,000 to 10,000 head of sales/removals costs decline by only about another \$1 per cwt gain.

The positive sign on the feed and labor efficiency variables indicates that production costs increase as more units of each input are required in the production of each 100 pounds of pork. Each additional pound of feed required to produce 100 pounds of pork adds

Figure 8

Estimated relationship between farrow-to-finish cash and capital replacement costs and size of hog operation, 1992

Over the range of operation sizes in the FCRS data, production costs decline with size at a decreasing rate and approach \$40.50 per cwt gain.



Source: 1992 Farm Costs and Returns Survey, USDA

about 5 cents to total per-cwt costs. An additional hour of labor increases costs by more than \$3 per cwt.

The coefficient on animal death rate from weaning to finish is significant on the farrow-to-finish operations. Lowering the death rate from weaning to market by 1 percent lowers production costs by about 21 cents per cwt gain. Production costs also decline as weaning age increases.

Other significant variables are the farm debt-to-asset ratio and operator experience. Greater farm debt-to-asset ratios raise farrow-to-finish production costs by increasing interest expenses. Operators with more experience have lower production costs. Costs decline by nearly 13 cents per cwt gain for each additional year of operator experience.

Results of the unit cost decomposition.

Table 4 includes the decomposition of unit cost variation into the variance effect of each explanatory variable. Variance effects indicate the amount of variation in unit costs that can be attributed to each explanatory variable. The percent of total variance

effects for each explanatory variable indicates the extent that each variable alone contributed to unit cost variation, relative to other variables.

Among all variables, feed efficiency has the greatest individual effect on unit cost variation, accounting for 79 percent of variance effects on farrow-to-finish farms. Labor efficiency accounts for about 10 percent of the variance effects. Together, feed and labor efficiency account for almost 90 percent of total variance effects. Size accounts for about another 6 percent of variance effects. No other variable contributes more than 1 percent to total variance effects.

Conclusions. A regression model examining cost variation among a cross-section of U.S. farrow-to-finish hog producers explains 68 percent of the variation in total cash and capital replacement costs. In a similar study using a cross-section of U.S. corn producers, only 13 percent of the cost variation could be explained by structural and performance variables (McBride). This finding suggests that while crop production performance measures are influenced by random factors largely beyond the control of producers, such as weather, pork production is influenced by variables more under the control of the producer. Consequently, measures taken to improve operators' management skills will likely have a greater influence on hog enterprises than on crop enterprises.

Table 4--Contribution of factors to unit cost variation for farrow-to-finish hog producers, 1992

Feed efficiency has the greatest individual effect on unit cost variation, accounting for 79 percent of variance effects. Therefore, it appears that the greatest reduction in production costs can be obtained by efforts to improve feed efficiency.

Variable ¹	Variance effects	Percent of variance effects
Size	17.6916	6.49
Sow performance	0.0009	0.00
Weaning age	2.5258	0.93
Death rate	0.0403	0.01
Death rate	1.4393	0.53
Finished hog weight	0.4113	0.15
Feed efficiency	215.6886	79.10
Labor efficiency	27.6070	10.12
Farm debt-to-assets	3.8238	1.40
Major occupation	0.6080	0.22
Education	0.3390	0.12
Education	0.0432	0.02
Experience	2.3756	0.87
Hog records	0.0966	0.04

¹Units for each variable are the same as those in Table 3.

Feed efficiency is the single most important factor influencing production costs among farrow-to-finish hog producers. This finding suggests that the greatest reductions in production costs can be obtained by efforts to improve feed efficiency. Improvements in feed efficiency may result from reducing losses associated with self-feeders, use of breeding stock with improved genetics, and use of environmentally controlled facilities to reduce temperature stress, appetite loss, and death loss from disease.

Labor per unit of output is closely related to the types of facilities and techniques used in hog production. Less labor per unit of output is required in modern, environmentally controlled, total confinement production facilities. Findings of this report indicate that improving labor efficiency is an important strategy for reducing pork production costs. Labor efficiency can be improved by greater capital investments in these labor-saving buildings and equipment.

Size Relationships in Hog Production

Variable cash costs vary little among enterprise size groups but fixed cash costs and economic costs are significantly lower for farrow-to-finish producers with 1,000 head or more of sales and contract removals. Most physical and economic advantages of size occur on operations with sales/removals of 1,000 head or more. However, declining costs and increasing hog prices obtained by larger operations have important structural implications for the hog industry.

Structural change in the U.S. hog industry was dramatic during the 1980's with fewer and larger operations becoming more and more characteristic of the industry. Technological advances and increasing integration and specialization in hog production have advanced this trend. The analyses done in this section examine how farm characteristics, hog performance and production methods, and hog production costs vary with size of the hog enterprise.

Two procedures are used to examine the influence of size on the hog industry. First, farrow-to-finish hog producers are divided into four size groups measured by total hog sales and contract removals. Differences among producers in the various size groups are examined by comparing farm structural and performance characteristics, hog production methods, and hog production costs among the groups. The statistical difference in mean estimates for producers in each size group is tested using a t-statistic (see Appendix A).

The relationship between hog operation size and the descriptive characteristics is further examined using regression analysis. Multivariate regression analysis is used to examine how physical and economic performance varies with size of hog operation. Forms of the relationships are examined using alternative specifications of the regression equations (see Appendix A).

Alternative Sizes of Farrow-to-Finish Hog Operations

Nearly 50 percent of FCRS farrow-to-finish hog farms sold/removed fewer than 500 head and account for only 14 percent of total sales and contract removals (table 5). The 3 percent of hog farms with sales/removals of 3,000 head or more account for 21 percent of total sales and contract removals³.

The degree to which farrow-to-finish farms are specialized in hog production increases with size of operation. Twenty-eight percent of total value of production on farms with fewer than 500 head of sales/removals is from hog production, compared with 70 percent on farms with 3,000 head or more of sales/removals. Farms with the largest hog operations have an average inventory of 526 sows and sell more than 5,700 head of market hogs (table 5). All of these operations have sales/removals of \$250,000 or more. In contrast, farms with the smallest hog operations have an average inventory of 25 sows and sales/removals of 256 market hogs. More than 60 percent of these farms have less than \$100,000 in total sales.

Litters farrowed per sow is not significantly different among the size groups. However, pigs farrowed and weaned per litter are higher on the larger farms. The largest farms farrow and wean an average of about 1.25 more pigs per litter than the smallest farms (table 5). Also, pigs are weaned younger on the largest farms (26 days old) than on the smallest farms (41 days old) and at 11 pounds less in weight. Earlier weaning at a lighter weight results in a higher death loss among weaned pigs on the largest compared with the smallest farms (5.6 versus 3.4 percent). However, a higher death loss from earlier weaning is offset by more intensive use of farrowing facilities on larger operations. Death losses among breeding stock are significantly lower on the largest farms.

³Detailed characteristics and production costs among the size groups are included in Appendix B, tables 7 through 9B.

Table 5--Characteristics of FCRS farms with alternative sizes¹ of farrow-to-finish hog operations, 1992

Larger hog operations wean more pigs per litter, produce more pork per 100 pounds of feed, and have lower total economic costs than smaller operations. However, most of the advantages attributed to size, as measured with the FCRS data, are obtained on 1,000-2,999 head operations.

Item	Unit	Fewer than 500 head	500-999 head	1,000-2,999 head	3,000 head or more
Share of FCRS farrow-to-finish hog:					
Farms	percent	48	26	23	3
Sales or contract removals	percent	14	21	44	21
Market hogs sales/removals	head	256	693	1,662	5,737
Sow inventory	head	25	61	131	526
Pigs weaned	pigs per litter	6.77	7.49	7.63	8.05
t-stat (fewer than 500 head)		-	(2.72)**	(3.67)**	(4.07)**
t-stat (500-999 head)		-	-	(0.54)	(1.69)*
t-stat (1,000-2,000 head)		-	-	-	(1.36)
Feed efficiency	pounds per cwt gain	515	445	395	360
t-stat (fewer than 500 head)		-	(2.45)**	(4.58)**	(4.28)**
t-stat (500-999 head)		-	-	(2.39)**	(2.60)**
t-stat (1,000-2,000 head)		-	-	-	(1.16)
Economic costs	dollars per cwt gain	69.02	57.83	48.68	46.43
t-stat (fewer than 500 head)		-	(3.36)**	(9.11)**	(6.57)**
t-stat (500-999 head)		-	-	(3.28)**	(2.98)**
t-stat (1,000-2,000 head)		-	-	-	(0.77)

¹Size is measured as total head sold or removed under contract during 1992.

**significantly different at the 5-percent level; *significantly different at the 10-percent level.

na=not applicable; d = insufficient data for disclosure.

Hog producers in the two mid-size groups are more financially secure than the smallest or largest producers. More than three-fourths of producers in groups with 500 to 2,999 head of sales/removals are in a favorable financial position. Twenty-three percent of the smallest farms are in the marginal income category indicating farm income during 1992 was negative. More than 20 percent of the largest hog farms are classified as either marginal solvent or vulnerable, the result of debt-to-asset ratios above 0.40. The largest producers had been in the hog business less time than other producers (less experience as operator of 1992 operation) and had borrowed more to meet the significant capital requirements of large-scale hog production. Larger producers are also the most educated--more than 25 percent of those with 1,000 head or more of sales/removals had graduated from college.

A majority of farrow-to-finish producers in each size group are located in Northern States. Producers in Northern States include more than 80 percent of the total producers in all groups below 3,000 head of sales/removals (fig. 9). However, many Southern producers are in the largest size group with 3,000 head

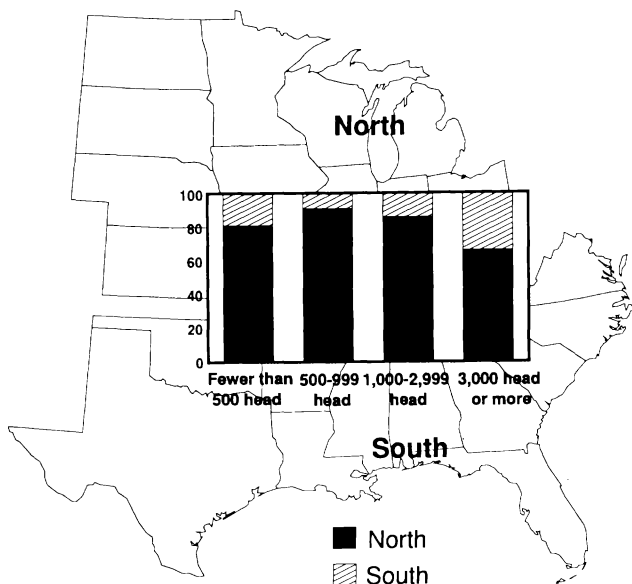
or more of sales/removals. Thirty-four percent of producers in the largest size group are in Southern States, compared with less than 20 percent in all other size groups. The presence of several large producers in Southern States is a sign of the recent growth in hog production that has characterized areas of the South.

Feed efficiency among farrow-to-finish producers improves significantly with size of the hog operation. The largest producers require about 150 pounds less feed for each 100 pounds of gain than the smallest producers (360 versus 515 pounds; table 5). Greater feed efficiency by larger producers may be due to better genetics and to newer, more environmentally controlled hog facilities that reduce waste in feed handling and reduce animal temperature stress and appetite loss. More than 60 percent of the hog finishing capacity on the largest farms is in total confinement, environmentally controlled buildings, compared with only 7 percent on the smallest farms. Better production facilities on the larger operations also contribute to improvements in labor efficiency with size of operation.

Figure 9

Distribution of size groups by region, 1992

Most farrow-to-finish producers are located in Northern States. However, 34 percent of producers in the largest size group are in Southern States, compared with less than 20 percent in all other size groups.



Source: 1992 Farm Costs and Returns Survey, USDA

Variable cash costs for feed are significantly less for operations with 1,000 or more head of sales/removals than for the smallest operations. Greater feed efficiency offsets the higher feed prices paid by larger producers. Feed prices range from \$113 per ton on the smallest farms to \$134 per ton on the largest farms. Relatively more of the larger farms are in Southern States, where higher feed prices result from lower grain supplies (fig. 9). Also, larger farms produce less of the grain fed in their hog operations and spend more on purchased grain. Nearly 70 percent of grain fed to hogs is homegrown on the smallest farms compared with only 30 percent on the largest farms. Because more homegrown grain is used, fuel and repair costs for on-farm feed processing are higher on the smaller farms. In contrast, larger farms spend more on veterinary and medicine, and labor. Despite the differences in individual cost items, total variable cash expenses vary little among the enterprise size groups.

Total fixed cash costs and total economic costs are significantly lower for producers in the two largest size groups compared with the smaller producers. Total economic costs on the largest farms are \$46 per cwt gain, more than \$20 less than for the smallest farms

(table 5). Lower costs among larger producers can be attributed to investments in machinery, buildings, and equipment being spread over more units of output. However, total economic costs are not significantly different for producers with 1,000-2,999 head and producers with 3,000 head or more of sales/removals. Similar costs among these producers suggest that most of the cost-reduction attributable to size, as measured with the FCRS data, is obtained on operations with 1,000-2,999 head of sales/removals.

Performance Variability with Size of Operation

Regression analysis is used to examine how physical and economic performance of the hog operation varies with size of operation. Selected variables are related to size using linear, reciprocal, and quadratic models (see Appendix A). The estimated equations reported in table 6 use the functional form that best fits each relationship according to goodness-of-fit measures and significance of the estimated coefficients.

The F-statistic of each estimated equation is used to evaluate the relationships. While t-statistics are used to test whether individual coefficient estimates are significantly different from zero, the F-statistic can be used to test whether any of the explanatory variables affects the dependent variable. In some cases, individual effects of variables may not be significant (insignificant t-statistics), but their combined effects are significant (significant F-statistic), especially if the explanatory variables are highly correlated (Kmenta, pg. 415). F-statistics in all estimated equations relating size to selected performance measures are significant. Individual coefficient estimates are also significant in most equations.

Physical performance. A reciprocal form best describes the relationship between litters farrowed per sow and size of operation among U.S. farrow-to-finish hog producers. Litters per sow increase with size, approaching 1.95 (fig. 10). However, most of the increase in litters per sow occurs at relatively small sizes, with 1.76 at 100-head, 1.93 at 1,000-head, and 1.94 at 10,000-head operations. The relationship between pigs weaned per litter and size is expressed as a quadratic relationship with pigs weaned per litter increasing at a decreasing rate toward a maximum. At 100 head of sales/removals estimated pigs weaned per litter is 6.96, at 1,000 head 7.42, and at 10,000 head 8.47 (fig. 11). The estimated number of pigs per litter reaches a maximum of 8.84 at nearly 7,000 head of sales/removals. Overall, 7,000-10,000-head operations wean about a pig more per litter than those with 1,000 head or less.

Table 6--Regression estimates¹ relating selected performance measures to size of the farrow-to-finish hog operation, 1992

The relationship between most physical and economic performance measures and size of the hog operation is best described using a nonlinear form with either a reciprocal or quadratic term. F-statistics in all estimated equations are significant.

Performance measure	Regression intercept	Coefficient on linear term	Coefficient on reciprocal term	Coefficient on quadratic term	F-statistic
Physical:					
Litters farrowed per sow	1.94666	na	-18.29556	na	11.39**
Pigs weaned per litter	6.90103	0.0005566	na	-0.0000004001	17.88**
Pigs weaned per sow	14.63023	na	-273.81347	na	55.11**
Days to weaning	40.71760	-0.00637046	na	0.00000043871	62.15**
Weight at weaning	29.21236	-0.0057133	na	0.00000039517	53.51**
Percent death of pigs farrowed	12.88692	na	302.88159	na	4.18**
Percent death of pigs weaned	3.64009	0.00030852	na	0.00000000757	5.01**
Finished hog weight	239.36403	-0.00029307	na	-0.00000002321	11.35**
Pounds of feed per cwt gain	429.3124	na	17051.940308	na	11.20**
Hours of labor per cwt gain	1.13275	na	195.95439	na	72.92**
Economic:					
Feed cost per cwt gain	25.79116	na	715.41853	na	10.65**
Farm debt-to-asset ratio	0.14900	0.00001513	na	na	6.57**
Fixed-to-total cash cost ratio	0.17027	-0.00003876	na	0.00000000268	20.66**
Finished hog price per cwt	41.63939	0.00029891	na	-0.00000001041	6.55**

¹Individual equation estimates are shown graphically in figures 10 through 23.

na = not applicable.

**significant at the 5% level; *significant at the 10% level.

Pigs weaned per sow and size of hog operation are related using the reciprocal form, with pigs weaned per sow increasing toward a maximum of 14.63. The major effects of size are apparent on operations with less than 1,000 head of sales/removals, with pigs weaned per sow of 11.89 on operations with 100 head, 14.08 with 1,000 head, and 14.60 with 10,000 head (fig. 12). Relationships of both weaning age and weight with size are expressed using a quadratic form. Weaning age declines as size of hog operation increases from about 40 days with 100 head, to 35 with 1,000 head, and 21 days with 10,000 head of sales/removals (fig. 13). Likewise, weaning weight declines with size from about 29 pounds with 100 head, to 24 pounds with 1,000, and to 12 pounds with 10,000-head operations (fig. 14). Both weaning age and weight reach a minimum on operations with sales/removals between 7,200 and 7,300 head. Larger operations wean more pigs per sow by weaning pigs earlier at a lower weight, and thus rebreed sows sooner and more intensely utilize production facilities.

Death rate from farrowing to weaning by size of hog operation is represented using the reciprocal form. The death rate of pigs farrowed declines with size, approaching a minimum of 12.89 percent (fig. 15). At 100 head of sales/removals the farrow-to-wean death

rate is nearly 16 percent but falls to about 13 percent at 10,000 head. In contrast, death rate from weaning to market increases with size of operation. The death rate for finishing hogs is about 7.5 percent on 10,000-head operations, but only about 3.7 percent on 100-head operations (fig. 16). Higher losses during hog finishing can be attributed to earlier weanings at lower weights among larger producers. Finished hog weight declines with size of operation, but only slightly. Estimated hog weight is 239 pounds on 100-head operations and falls to 234 pounds on operations with 10,000 head of sales/removals (fig. 17).

A reciprocal form is used to describe relationships between both feed and labor efficiency and size of hog operation. Most of the impacts of size on feed and labor efficiency are realized on operations with less than 1,000 head of sales/removals. However, improvements in both feed and labor efficiency are substantial up to 10,000 head. Feed efficiency is improved from about 600 pounds of feed per cwt gain on 100-head operations, to 446 pounds on 1,000-head operations, and to 431 pounds on 10,000-head operations (fig. 18). Pounds of feed per cwt gain declines to 429 as size increases. Similarly, labor efficiency is improved from about 3.09 hours per cwt gain on 100-head operations, to 1.33 hours on

Figure 10
Estimated relationship between farrow-to-finish litters farrowed per sow and size of hog operation, 1992

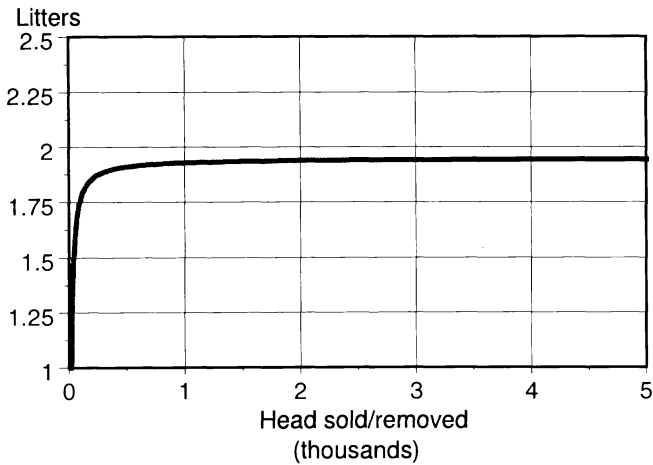


Figure 11
Estimated relationship between farrow-to-finish pigs weaned per litter and size of hog operation, 1992



Figure 12
Estimated relationship between farrow-to-finish pigs weaned per sow and size of hog operation, 1992

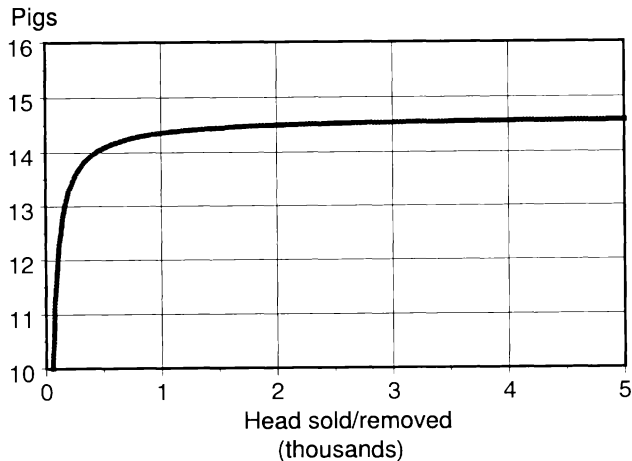


Figure 13
Estimated relationship between farrow-to-finish weaning age and size of hog operation, 1992

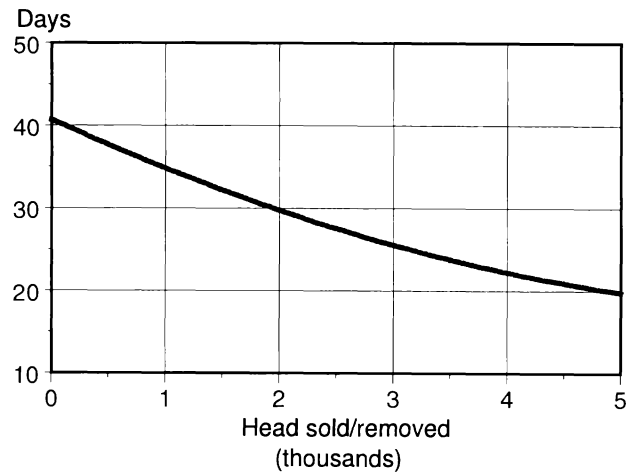


Figure 14
Estimated relationship between farrow-to-finish weaning weight and size of hog operation, 1992

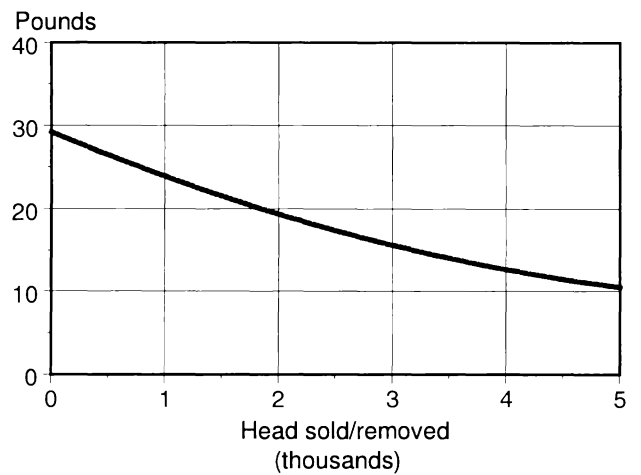


Figure 15
Estimated relationship between farrow-to-finish farrow-to-wean death loss and size of hog operation, 1992

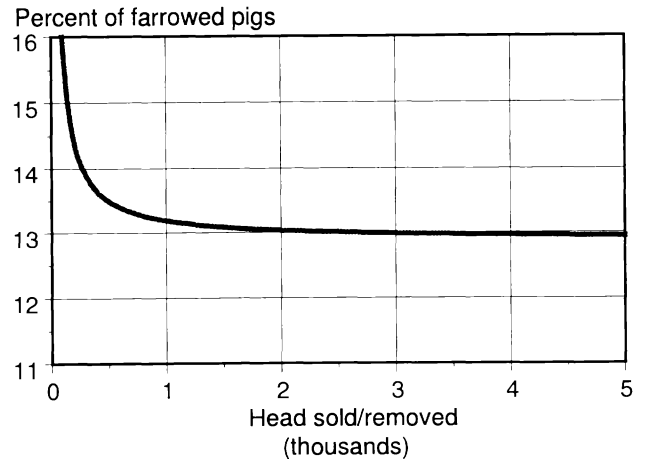


Figure 16

Estimated relationship between farrow-to-finish wean-to-market death loss and size of hog operation, 1992

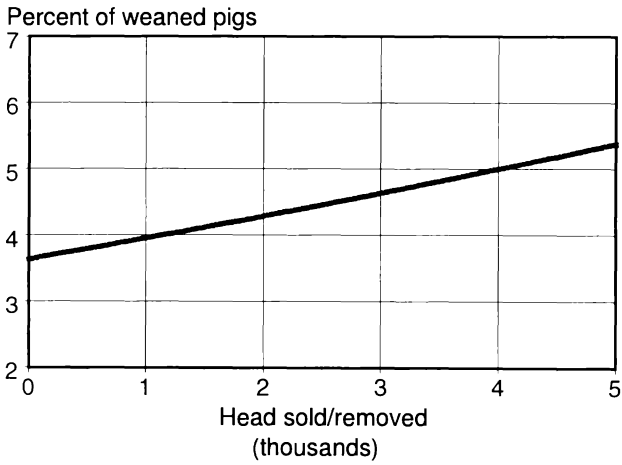


Figure 19

Estimated relationship between farrow-to-finish labor efficiency and size of hog operation, 1992

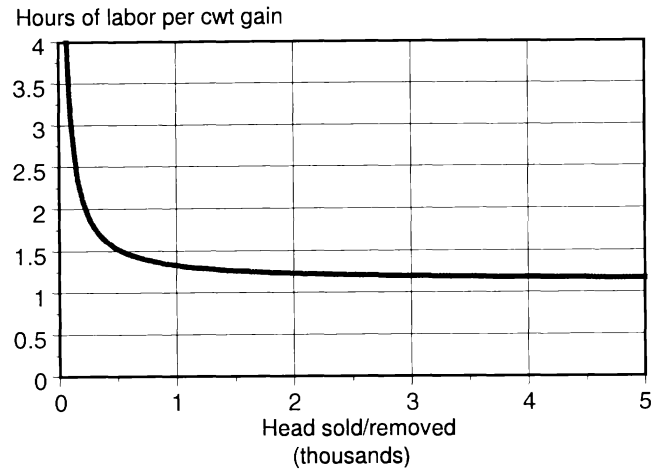


Figure 17

Estimated relationship between farrow-to-finish market hog weight and size of hog operation, 1992

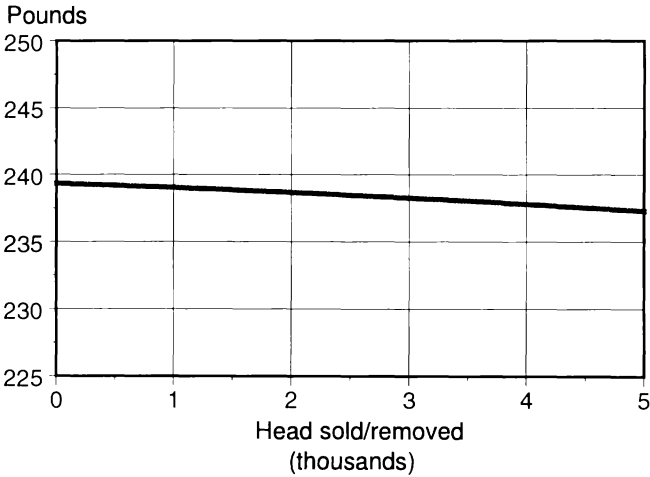


Figure 20

Estimated relationship between farrow-to-finish feed cost and size of hog operation, 1992

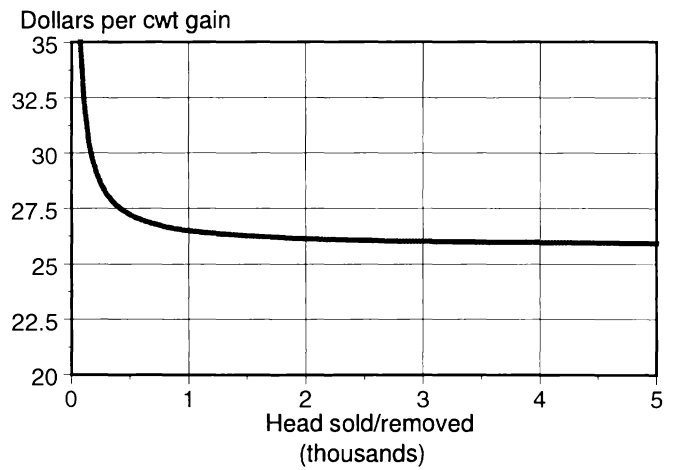


Figure 18

Estimated relationship between farrow-to-finish feed efficiency and size of hog operation, 1992

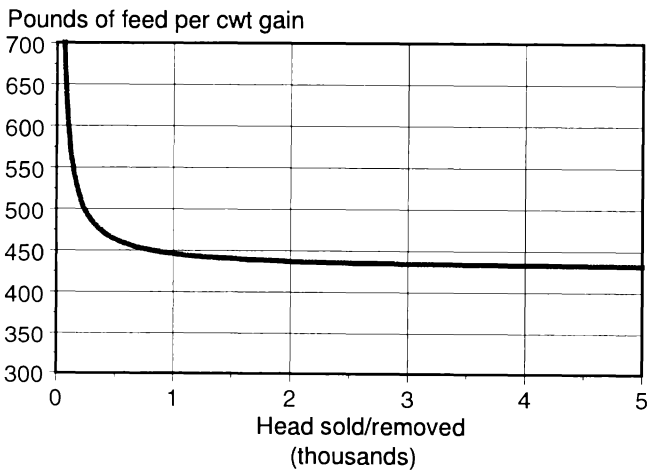


Figure 21

Estimated relationship between farrow-to-finish debt-to-asset ratio and size of hog operation, 1992

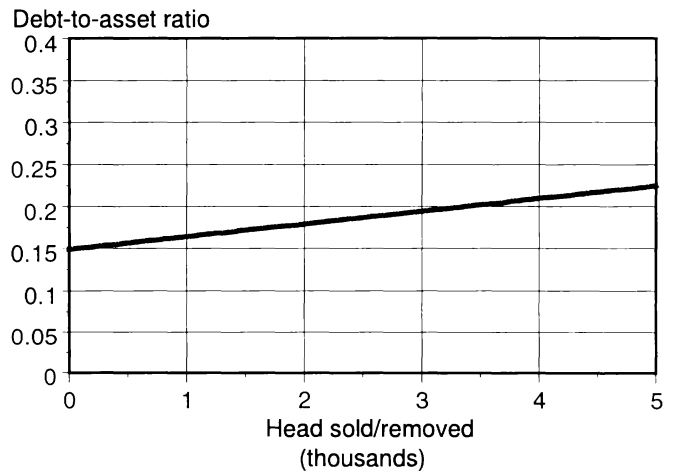
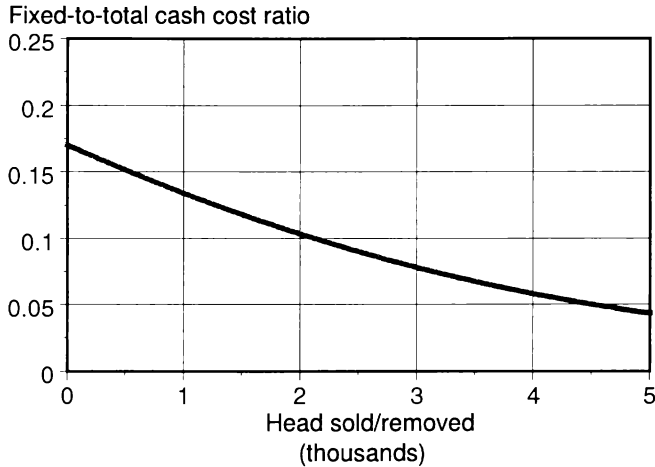


Figure 22

Estimated relationship between farrow-to-finish expense structure and size of hog operation, 1992



Source of figures 10 through 23: 1992 Farm Costs and Returns Survey, USDA

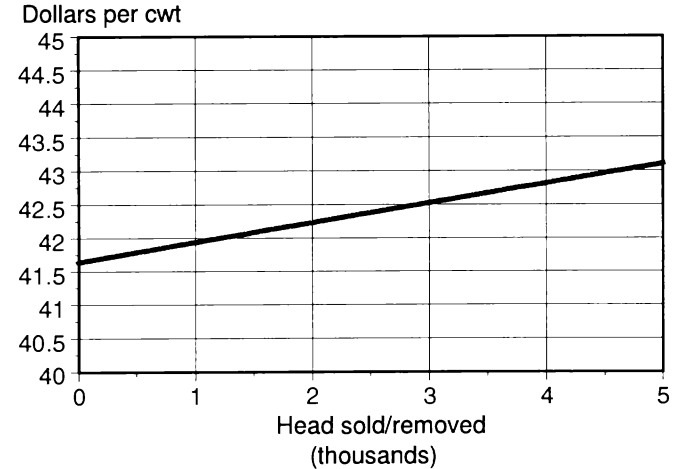
1,000-head operations, and to 1.15 hours on 10,000-head operations (fig. 19). Hours of labor per cwt gain decline to 1.13 as size increases. Better feed and labor efficiency among larger producers was likely influenced by the newer, more efficient production facilities utilized by these producers.

Economic performance. A reciprocal form is used to describe the feed cost-size relationship, with estimated feed cost declining with size to a minimum of \$25.79 (fig. 20). Most of the feed cost reduction with size of hog operation occurs on operations with less than 1,000 head of annual sales/removals. Estimated feed cost declines from \$32.95 on 100-head operations, to \$26.51 on 1,000-head operations, and to \$25.86 on 10,000-head operations. Lower feed costs among larger producers is primarily due to their improved feed efficiency.

Farm debt-to-asset ratio is related to size of hog operation in a linear fashion. The ratio of debt to assets increases with size by about 0.02 per 1,000 head sold/removed. Estimated debt-to-asset ratio increases from 0.16 on 1,000-head operations, to 0.22 on 5,000-head operations, and to 0.30 on 10,000-head operations (fig. 21). Greater debt is incurred by larger operations as more capital is necessary to finance large scale hog production. The relationship between the fixed-to-total cash cost ratio and size is best described with a quadratic form. Fixed cash costs comprise a decreasing share of total cash costs as size increases. Seventeen percent of cash costs were fixed on 100-head operations, declining to 13 percent on 1,000-head operations, and only 5 percent on 10,000-head operations (fig. 22). The ratio of fixed to

Figure 23

Estimated relationship between farrow-to-finish market hog price and size of hog operation, 1992



total cash costs reaches a minimum of less than 0.03 (3 percent) at around 7,200 head of sales/removals. The lower ratio of fixed expenses on larger operations results from fixed costs being spread over more units of output.

Market hog price is related to size of hog operation using a quadratic form that shows price received per cwt gain as increasing with size of operation. Estimated prices are \$41.66 on 100-head operations, \$43.11 on 1,000-head operations, and \$44.52 on 10,000-head operations (fig. 23). The estimated equation for market hog prices does not reach a maximum until a size of more than 14,000 head of sales/removals.

Conclusions. The relationship between most physical and economic performance measures and size of the hog operation is best described using a nonlinear form with either a reciprocal or quadratic term. Litters farrowed per sow, pigs weaned per litter, pigs weaned per sow, death rate from weaning to market, debt-to-asset ratio, and market hog price all increase with size over the size range that is most characteristic of the hog industry. Weaning age, weaning weight, market hog weight, pounds of feed per cwt gain, hours of labor per cwt gain, feed cost per cwt gain, and the fixed-to-total cash cost ratio all decrease with size over the typical size range.

Performance measures generally improved as size increased, indicating that several advantages accrue to larger operations. However, like the cost-size relationship examined previously, most of the advantages of size are obtained at relatively low levels

of output. For most performance measures, improvement is significant when size of operation increases from 100 head to 1,000 head of annual sales/removals. Improvements in performance are much less when size of operation increases from 1,000 to 10,000 head.

Despite most advantages of size being realized on operations with 1,000 head or more, cost-size and price-size relationships above this level have important structural implications for the hog industry. Per-unit cash and capital replacement costs (fig. 8) and feed costs (fig. 20) appear to decline continuously as size increases. Animal performance and input use efficiency increase with size, and fixed costs are spread over more units of output on larger operations. Also, it appears that larger hog operations are able to obtain higher hog prices than smaller operations (fig. 23). Higher hog prices may result from providing buyers with a larger volume and more uniform product, thereby contributing to lower processing costs. This widening margin between production cost and product price as size of operation increases is a major factor explaining the significant structural change in the hog industry and why it will likely continue.

Traditional and Emergent Hog Production Areas

Farrow-to-finish producers in the emergent production area report greater reproductive performance and feed efficiency, but cash and economic costs are not significantly different than in the traditional area. However, specialized hog finishing operations in the emergent area use more contractual production arrangements, have greater feed and labor efficiency, and have lower production costs than producers in the traditional production area.

Structural changes that have characterized the hog industry during the 1980's have not been uniform throughout the United States. While traditional hog production areas in Corn Belt States have seen a steady trend toward fewer and larger producers, Southeastern States along the Atlantic coast, led by North Carolina, have experienced a dramatic increase in both total volume of hog production and in the concentration of production among larger operations. For example, in Iowa, the leading hog-producing State, hog sales increased from about 22 million in 1978 to nearly 27 million in 1992 (U.S. Dept. of Commerce). However, Iowa's share of total U.S. hog sales remained about 24 percent. In contrast, hog sales

Figure 24

Traditional and emergent hog production areas

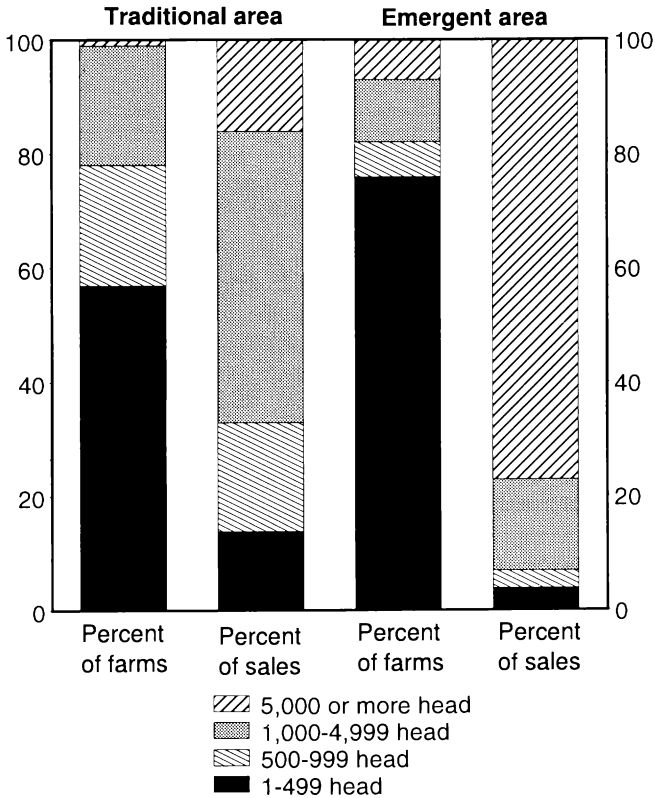
The traditional hog production area included 33 percent of U.S. hog farms and 42 percent of marketings in 1992. The emergent area had only 4 percent of U.S. hog farms, but accounted for 11 percent of marketings.



Figure 25

Hog farms and sales by size class for farms in the traditional and emergent areas, 1992

Nearly 80 percent of hog sales in the emergent area come from farms with 5,000 or more head of sales, compared with only 16 percent in the traditional area.



Source: 1992 Census of Agriculture

from North Carolina increased from about 3.4 million in 1978 to nearly 11 million in 1992, while the State's share of total U.S. hog sales increased from 4 to 10 percent. North Carolina ranked seventh in total hog sales in 1978 and second by 1992, surpassing such traditional hog-producing States as Illinois, Minnesota, and Indiana. In this section, traditional and emergent hog production areas are defined and compared. The traditional hog production area includes the States of Iowa, Illinois, and Minnesota (fig. 24). This area included about 33 percent of U.S. hog farms and 42 percent of U.S. hog sales in 1992 (U.S. Dept. of Commerce). The emergent hog production area includes the States of North Carolina, South Carolina, and Virginia. Only 4 percent of U.S. hog farms were in this area in 1992, but they accounted for 11 percent of total hog sales. This analysis includes both farrow-to-finish and feeder pig-to-finish operations in these areas and examines differences among producers by comparing farm structural and performance characteristics, hog production methods, and hog

production costs. The statistical difference of mean estimates for producers in each area is tested using a t-statistic (see Appendix A).

Structural differences in hog production between the traditional and emergent areas were apparent in 1992. The traditional area is characterized by more mid-sized hog operations, while the emergent area has more small and large operations. Forty-two percent of farms in the traditional area have hog sales between 500 and 5,000 head, and account for 70 percent of this area's total hog sales (fig. 25). In contrast, only 17 percent of farms in the emergent area have between 500 and 5,000 head, and comprise only 19 percent of area hog sales. More than three-fourths of hog farms in the emergent area have sales less than 500 head, but account for only 4 percent of sales. The 7 percent of emergent area farms with sales of 5,000 head or more comprise 77 percent of the area's total hog sales. Only 1 percent of farms in the traditional area have sales of 5,000 or more head, and account for 16 percent of the area's total sales.

Farrow-to-Finish Operations

Farrow-to-finish hog farms in the traditional production area account for more than 40 percent of U.S. farrow-to-finish operations and nearly 50 percent of U.S. hog sales/removals (table 7). Similar farms in the emergent production area comprise 6 percent of U.S. farrow-to-finish operations and 9 percent of hog sales/removals.

Farms in the emergent area have larger hog operations but differences in farm acreage and sales are not significant between the production areas. Average market hog sales/removals on farms in the emergent area were 1,203 head in 1992, compared with 947 on farms in the traditional area (table 7)⁴. More small farms are in the emergent area as nearly one-fourth of farms had sales of less than \$40,000. Forty-percent of farms in the traditional area had sales between \$100,000 and \$250,000. Both areas have about 30 percent of hog farms with sales of \$250,000 or more.

Reproductive performance is greater on hog operations in the emergent as opposed to the traditional area. Litters per sow, pigs per litter, and pigs per sow are all higher on emergent-area farms. Operations in the emergent area wean about three more pigs per sow than farms in the traditional area

⁴Detailed characteristics and production costs of farrow-to-finish producers in the traditional and emergent areas are included in Appendix B, tables 10 through 12B.

Table 7--Characteristics of FCRS farms with farrow-to-finish hog operations in the traditional and emergent hog production areas, 1992¹

Farrow-to-finish operations in the emergent area produce more hogs, wean more pigs per litter and per sow, and are more feed efficient than operations in the traditional area. However, neither cash nor economic costs are significantly different between the two areas.

Item	Unit	Traditional area	Emergent area	t-statistic
Share of FCRS farrow-to-finish hog:				
Farms	percent	44	6	na
Sales or contract removals	percent	49	9	na
Sales class:				
\$0-\$39,999	percent of farms	4	24	5.91**
Market hog sales/removals	head	947	1,203	1.69*
Weaning:				
Pigs	pigs per litter	7.34	8.36	3.64**
Pigs	pigs per sow	13.19	16.34	3.80**
Feed efficiency	pounds per cwt gain	418	384	1.68*
Feed cost	dollars per cwt gain	25.13	28.40	1.70*
Variable cash expenses	dollars per cwt gain	32.95	36.06	1.36
Fixed cash expenses	dollars per cwt gain	4.66	3.22	2.74**
Cash expenses	dollars per cwt gain	37.61	39.29	0.64
Economic costs	dollars per cwt gain	53.61	54.19	0.24

¹The traditional hog production area includes the States of Iowa, Illinois, and Minnesota. The emergent hog production area includes the States of North Carolina, South Carolina, and Virginia.

**significantly different at the 5-percent level; *significantly different at the 10-percent level.

na=not applicable; d = insufficient data for disclosure.

(table 7). Average weaning age is older and weaning weight is heavier in the emergent area. Also, death losses between birth and weaning are lower. Better reproductive performance and lower death rates may be attributed to more environmental control in the facilities used for farrowing pigs on farms in the emergent area. More than 80 percent of the farrowing building capacity on emergent-area hog operations is in total confinement structures, compared with 57 percent on traditional-area hog operations (fig. 26).

Feed efficiency is also better on farms in the emergent area where 384 pounds feed per cwt gain are fed, compared with 418 pounds on farms in the traditional area (table 7). As is the case with farrowing, more of the hog-finishing capacity includes total confinement with environmental control; that may reduce temperature stress and improve feed efficiency. More than 60 percent of the finishing capacity on emergent-area farms is in total confinement compared with only 32 percent on farms in the traditional area (fig. 26). Traditional-area farms more often have an older style of building that is open to allow hogs outside access. The average age of finishing buildings on farms in the traditional area is about 10 years older than on farms in the emergent area.

Farrow-to-finish farms in the traditional area have a significantly larger debt-to-asset ratio (0.19) than farms in the emergent area (0.07). Greater debt on traditional-area farms is reflected in a farm financial position that includes more marginally solvent and vulnerable farms. Operators in the two areas also differ according to age distribution. Operators in the emergent area are generally older than those in the traditional area, with a significantly larger percent at or above 65 years of age and a significantly lower percent below 35 years of age.

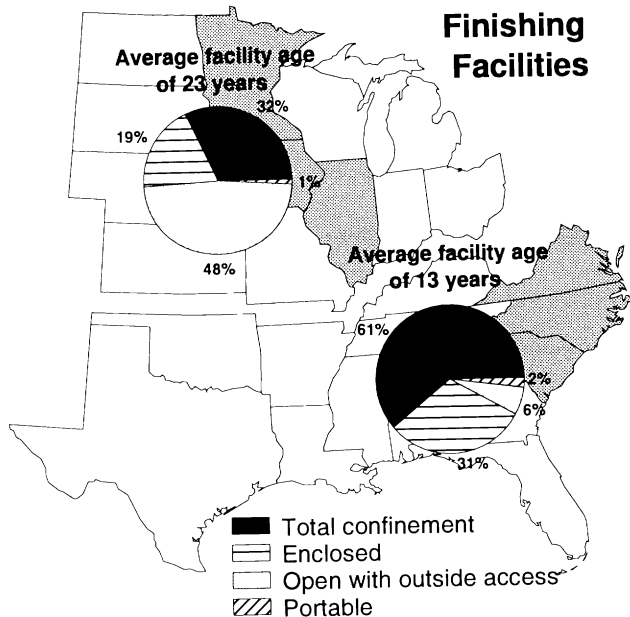
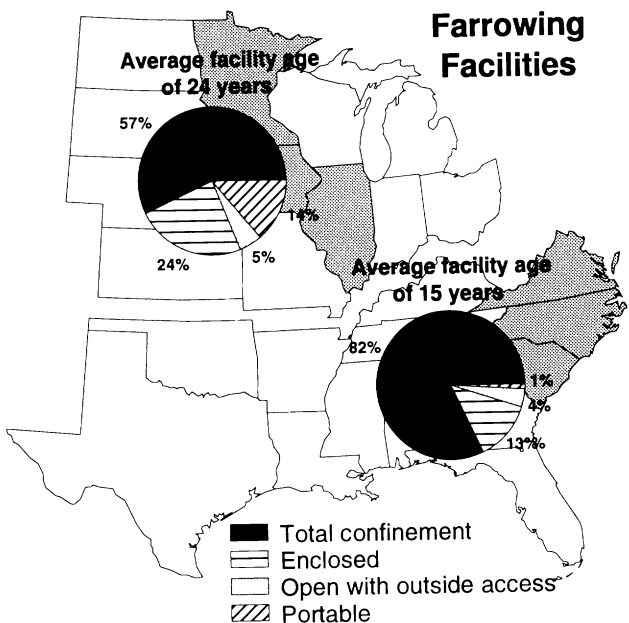
Despite the greater feed efficiency among emergent-area producers, total feed cost is lower on traditional-area farms. Producers in the traditional area use more homegrown feedgrains than do those the emergent area (57 versus 40 percent of feedgrain fed). Emergent-area producers spend more for purchased feedgrains and complete feed mixes. Average feed price per ton fed is \$120 in the traditional area, compared with \$148 in the emergent area. Among other cost items, fixed costs, capital replacement costs, and land costs are significantly lower on farms in the emergent area. Lower fixed and capital replacement costs among the emergent-area farms can be attributed to more hogs produced in greater

Figure 26

Distribution of farrowing and finishing capacity by type of facility in the traditional and emergent areas, 1992

More than 80 percent of farrow-to-finish producers in the emergent area use environmentally controlled total confinement for farrowing, compared with under 60 percent of traditional-area producers.

Nearly twice as many farrow-to-finish producers in the emergent area use environmentally controlled total confinement for finishing as in the traditional area, and average facility age is 10 years less.



Source: 1992 Farm Costs and Returns Survey, USDA

confinement, thus spreading these costs over more units of output. However, total variable, cash, and economic costs of production are not significantly different among farms in the two areas (table 7).

Feeder Pig-to-Finish Operations

Specialized hog-finishing farms in the traditional production area account for 44 percent of U.S. feeder pig-to-finish operations and 47 percent of hog sales/removals (table 8). Farms in the emergent production area that specialize in hog finishing include 12 percent of U.S. feeder pig-to-finish farms and 17 percent of hog sales/removals.

Operating arrangements used for finishing hogs in the two areas are significantly different. More farms in the emergent area finish hogs under contract than in the traditional area. Forty-percent of hog sales and removals on emergent-area farms are contract removals, compared with 16 percent in the traditional area (fig. 27).

Farms in the traditional hog production area are significantly larger in terms of acreage and sales than

farms in the emergent area. Average acreage operated on traditional-area farms is more than three times that operated on emergent-area farms (520 versus 153 acres).⁵ Likewise, 75 percent of farms in the traditional area have farm sales of \$100,000 or more, compared with only 30 percent of farms in the emergent area. Differences in the sales class distribution of farms in the two areas can be attributed to the significant amount of contract production in the emergent area. More hogs are removed under contract from emergent-area farms and are not counted as sales. Emergent-area farms have larger hog operations and are more specialized in hog production. Specialized hog-finishing operations in the emergent area averaged 1,107 head sold/removed during 1992, about 200 head more than from farms in the traditional area. Also, more than 70 percent of the value of farm production is from hogs on emergent-area farms compared with only about 30 percent on traditional-area farms.

⁵Detailed characteristics and production costs of feeder pig-to-finish producers in the traditional and emergent areas are included in Appendix B, tables 13 through 15B.

Table 8--Characteristics of FCRS farms with feeder pig-to-finish hog operations in the traditional and emergent hog production areas, 1992¹

Specialized hog-finishing operations in the emergent area are more feed and labor efficient than operations in the traditional area despite having older, less experienced operators. Both cash and economic costs are significantly lower on emergent-area operations.

Item	Unit	Traditional area	Emergent area	t-statistic
Share of FCRS feeder pig-to-finish hog:				
Farms	percent	44	12	na
Sales or contract removals	percent	47	17	na
Market hogs sales/removals	head	867	1,107	1.67*
Total operated acreage	acres	520	153	3.99**
Operator age: ²				
Less than 35 years	percent of farms	16	0	na
35 to 49 years	percent of farms	45	30	1.07
50-64 years	percent of farms	33	66	2.74**
65 years or more	percent of farms	d	4	0.63
Experience as operator	years	20	15	2.12**
Feed efficiency	pounds per cwt gain	368	320	2.30**
Labor efficiency	hours per cwt gain	1.00	0.51	1.68*
Feed cost	dollars per cwt gain	20.35	18.82	1.12
Cash expenses	dollars per cwt gain	48.27	42.15	2.19**
Economic costs	dollars per cwt gain	60.02	51.19	1.90*

¹The traditional hog production area includes the States of Iowa, Illinois, and Minnesota. The emergent hog production area includes the States of North Carolina, South Carolina, and Virginia.

²Data may not sum due to rounding or omission of possible categories.

**significantly different at the 5-percent level; *significantly different at the 10-percent level.

na = not applicable; d = insufficient data for disclosure.

Farm operators in the emergent area tend to be older but less experienced at hog production than farm operators in the traditional area. Seventy percent of operators in the emergent area are above 50 years of age while a majority of traditional-area producers are under 50 years of age (table 8). However, operators of farms in the traditional area have been in control of the current operation for 20 years, compared with only 15 years on emergent-area farms. Producers in the traditional area also average 7 years more experience in hog production than those in the emergent area. More older producers with less experience implies that operators in the emergent area started producing hogs later in life than operators in the traditional area. Possibly, the financial and risk reduction opportunities of contract hog finishing lured farmers in the emergent area from other farm enterprises or allowed them to expand into additional enterprises.

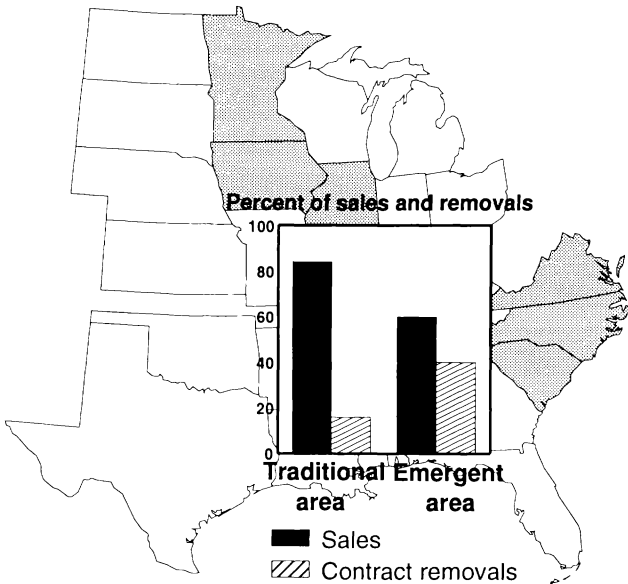
Feed efficiency is significantly better on specialized finishing operations in the emergent area than in the traditional area. Producers in the emergent area feed

320 pounds of feed for each 100 pounds of gain, compared with 368 pounds of feed in the traditional area (table 8). Growers in the traditional area use much more homegrown grain for feed while more feedgrains and complete feed mixes are purchased by emergent-area producers. Farm operations in the traditional area have more corn acreage for hog feed (237 acres) than those in the emergent area (41 acres). Labor efficiency is also significantly better on specialized finishing operations in the emergent area. Producers use about half the labor per cwt than in the traditional area (0.51 hours versus 1.00). Greater feed and labor efficiency among emergent-area growers is likely related to greater environmental control in confinement facilities that reduce animal stress and ease labor requirements. More than 90 percent of the finishing capacity on emergent-area farms is in total confinement or enclosed facilities, compared with just over 50 percent on farms in the traditional area. Also, average age of the finishing facilities on emergent-area farms is 10 years, compared with 27 years on traditional-area farms.

Figure 27

Distribution of market hog sales and contract removals in the traditional and emergent areas, 1992

Forty percent of market hogs from specialized finishing operations in the emergent area are removed under contract, compared with only 16 percent in the traditional area.



Source: 1992 Farm Costs and Returns Survey, USDA

While various component items of total feed cost are different between the production areas, total feed cost is much the same. The greater feed efficiency of producers in the emergent area is offset by higher feed prices. Emergent-area producers spend more on purchased feedgrains and complete feed mixes; in the traditional area much of the feedgrain is homegrown. Among other variable cost items, bedding and litter, and veterinary and medicine costs are significantly higher on farms in the traditional area. Interest costs are also higher among farms in the traditional area because of higher debt loads. The average farm debt-to-asset ratio is 0.18 on traditional-area farms and only 0.06 on emergent-area farms. Total variable, fixed, and cash costs are significantly lower on emergent-area farms. Likewise, the total economic cost of \$51.19 per cwt gain on emergent-area farms is significantly lower than the \$60.02 of traditional-area farms (table 8). Lower economic costs result from lower variable cash costs and lower unpaid labor costs.

Conclusions

Traditional-area producers have had the historic advantage of greater feedgrain supplies and thus lower feed costs for hog production. Analysis of the FCRS data indicates a feed cost advantage for farrow-to-finish producers in the traditional area over those in the emergent area, but not for specialized hog-finishing operations. Hog producers in the emergent area are able to compete with traditional-area producers by improvements in managerial techniques and production methods that result in greater feed and labor efficiency and more weaned pigs. Also, cost advantages are obtained by producers in the emergent area from using larger, more environmentally controlled production facilities, which spread costs over more units of output and improve animal performance.

Hog facilities used on both farrow-to-finish and feeder pig-to-finish operations in the traditional area are much older than those in the emergent area. According to the average age of facilities, much of the hog facility investment in the traditional area was apparently made during the early 1970's. Buildings of this era are now technologically obsolete and near the end of their useful life. Many producers in the traditional area will soon need to replace existing facilities with modern production units or exit the hog industry. This industry adjustment will likely continue the trend toward fewer and larger producers. In contrast, many of the facilities on emergent-area farms are newer, more modern units with several more years of useful life.

Contract and Independent Operating Arrangements for Finishing Hogs⁶

Contract hog operations are significantly larger than independent operations, but other farm structural and operator characteristics are much the same. Contract operations feed hogs with greater feed and labor efficiency and lower death losses. Total economic costs are lower on contract operations because replacement, capital, and labor costs are spread over more units of output.

A significant change in the hog industry has been the emergence and growth of contract operating arrangements. On contract hog operations, a producer, known as the contractee, enters a

⁶Much of this section is taken from McBride, W.D. *A Comparison of Contract and Independent Operating Arrangements for Finishing Hogs*, a paper presented at the Southern Agricultural Economics Meetings, New Orleans, LA, Jan. 1995.

Table 9--Characteristics of FCRS farms with contract and independent feeder pig-to-finish hog operations, 1992

Contract hog-finishing operations are significantly larger than independent operations and perform better in terms of animal death loss and feed and labor efficiency. Despite using less feed, feed costs are not significantly different between the groups, but contract operations have lower total economic costs.

Item	Unit	Contract operations	Independent operations	t-statistic
Share of FCRS feeder pig-to-finish:				
Farms	percent	11	89	na
Sales or contract removals	percent	22	78	na
Market hogs sales/removals	head	1,696	696	3.37**
Death loss (feeder pig to market)	percent	1.35	2.29	2.38**
Feed efficiency	pounds per cwt gain	323	402	3.00**
Homegrown grain	percent of grain fed	3	56	9.51**
Labor efficiency	hours per cwt gain	0.29	1.06	4.25**
Feed costs	dollars per cwt gain	24.32	21.95	0.80
Cash expenses	dollars per cwt gain	48.94	49.77	0.22
Economic costs	dollars per cwt gain	55.85	63.16	1.66*

**significantly different at the 5-percent level; *significantly different at the 10-percent level.

na = not applicable; d = insufficient data for disclosure.

contractual arrangement with another party, known as the contractor, to provide hog production services. In typical contractual agreements, the contractor provides the animals, feed, and medication, while the contractee provides the housing, utilities, and labor. According to recent survey evidence from producers selling 1,000 head or more per year, the share of hog marketings from contract hog operations more than doubled from 8 to 20 percent during 1986 to 1992 (Miller). Several reasons may explain the trend toward more contract hog operations. With declining returns to crop production in many areas, livestock contracts provide a way to stay in farming with limited background and training, and with limited risk. Arrangements with large contractors often assist contractees in obtaining the financing necessary to construct swine buildings. Also, contract production allows the contractor to grow rapidly with less investment in facilities and equipment.

The primary objective of this section is to compare and contrast structural and operator characteristics, hog performance characteristics, and production costs of contract and independent hog-finishing operations. Differences between contract and independent producers are identified by testing for a statistical difference of group means. A secondary objective is to examine the contractor/contractee arrangement by measuring the contribution of costs from each participant and the distribution of returns. Information about the similarities and differences between contract

and independent hog operations and the nature of the contractor/contractee relationship may provide insight about the emergence and growth potential of contract hog production.

Farms are designated as having contract hog finishing operations if any market hogs were removed under contract during 1992. For the comparison of contract and independent operations, estimates of costs and returns are for the contractor and contractee combined, as if they were one business. The combined contractor-contractee account means that estimates of cash expenses do not include fees paid by the contractor to the contractee. Fees paid by the contractor are exactly canceled as an income to the contractee. To accomplish the second objective, contractor and contractee costs and returns are divided to examine the operating arrangement. Gross value of production for contractees is augmented with the contract fees paid by contractors. Likewise, contract fees are deducted from gross value of production for contractors.

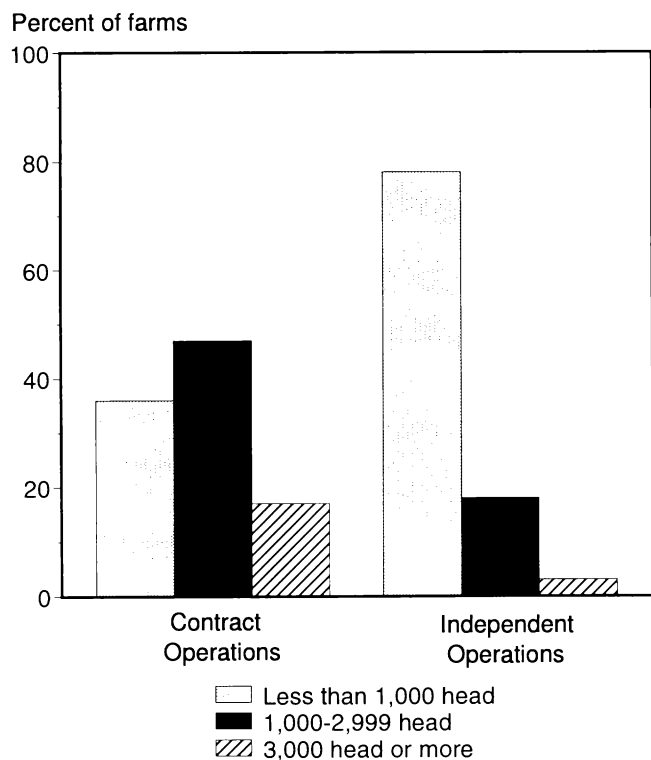
Farm Structural and Operator Characteristics

Only 11 percent of hog-finishing operations in the FCRS used contracts for hog production during 1992, but these farms account for 22 percent of total sales

Figure 28

Distribution of farms by size class for contract and independent hog-finishing operations, 1992

About 80 percent of independent operations sell less than 1,000 head, while more than 60 percent of contract operations have removals of 1,000 head or more, and 17 percent have removals of 3,000 head or more.



Source: 1992 Farm Costs and Returns Survey, USDA

and contract removals (table 9). Contract hog operations are significantly larger than independent hog operations. Average hog inventory on contract hog-finishing operations is more than double that on the independent operations (608 versus 289 head).⁷ Average hog inventory on contract hog operations increased by about 50 head during 1992, while inventory changed little on independent operations. Contract operations averaged 1,000 more head sold or removed during 1992 than independent operations (1,696 versus 696 head). Only about 20 percent of independent operations sell 1,000 head or more, while over 60 percent of contract operations have removals of 1,000 head or more, and 17 percent have removals of 3,000 head or more (fig. 28). Finishing operations using contracts depend on the contracts for nearly all

⁷Detailed characteristics and production costs of contract and independent feeder pig-to-finish producers are included in Appendix B, tables 16 through 18B.

of their hog production. Of total market hogs sold and removed from contract operations, 97 percent are removed under contract.

Total acreage operated is not significantly different on the contract and independent hog-finishing operations, each averaging around 500 acres. However, farms with independent hog operations own an average of nearly 150 more acres of land than farms with contract operations. Average acreage rented by either cash or share leases does not differ between the operations. Likewise, acreage of the major crops grown on these farms, corn and soybeans, is not significantly different between the groups.

Most operator characteristics are similar for farms with contract versus independent hog-finishing operations. About 90 percent of producers in both groups report farming as the occupation in which most of their time is spent. Operators of farms in both groups are experienced hog producers with an average of 19 years spent as the operator of the 1992 hog operation. Average age is about 50 years for operators of both contract and independent hog operations. The only significant difference between groups in educational attainment is that more independent operators had graduated from college than had contract operators.

Hog Performance Characteristics

Average feeder pig purchase/placement weights and market hog sale/removal weights are nearly identical for the contract and independent hog finishers. Producers in both groups added an average of about 194 pounds to feeder pigs during 1992. Death losses from feeder pig purchase/placement to market hog sale/removal are significantly different between each type of producer. The death rate on independent operations is about 1 percentage point higher than on contract operations (2.29 versus 1.35 percent).

Feed efficiency is significantly different between contract and independent hog finishers. Independent operations use more than 400 pounds of feed for each 100 pounds of gain, compared with only 323 pounds of feed on contract operations (table 9). Independent growers more often obtain individual feed items separately with much of the feedgrain homegrown (56 percent), and use on-farm processing to prepare hog feed. More than 70 percent of independent hog finishers use a portable grinder mixer for feed processing and handling. In contrast, contract operations most often obtain feed in a complete mix form. Very few of the contract finishers have equipment for on-farm feed processing.

Contract hog finishers are significantly more labor efficient than are independent finishers. Only 0.29 total labor hour is used for each 100 pounds of gain on contract operations, compared with 1.06 total hours on independent operations. Much of the labor savings likely results from less time spent processing and handling feed. Less feed is ground and mixed and more feed is handled with conveying equipment on contract operations.

Contract hog finishers have a much larger finishing building capacity (698 head) than independent growers (389 head), with more of their capacity in total confinement, environmentally controlled buildings. Nearly 50 percent of the finishing building capacity on contract operations is in total confinement buildings compared with about 31 percent on independent operations. More of the capacity on independent operations is in open buildings, allowing animals outside access. Greater use of environmentally controlled confinement buildings on contract operations likely contributes to the lower death losses and the greater feed and labor efficiency of these producers.

Hog Production Costs

Total cash costs are not significantly different for contract and independent hog finishers but the composition of cash costs varies. Among feed expense items, contract operations spend more on complete feed mixes while independent operations spend more on feed grains. Despite the much greater feed efficiency of contract operations, total feed cost is not significantly different between the groups. Costs for complete feed mixes, used primarily on contract operations, reflect the feed processing (grinding and mixing) costs. Most of the feed processing is done on-farm by independent producers, resulting in significantly greater fuel and repair costs for machinery and equipment.

The total economic cost of finishing hogs on contract operations is \$55.85 per 100 pounds of gain, significantly lower than the \$63.16 on independent operations (table 9). Lower economic costs among contract growers result from lower capital replacement, nonland capital, and unpaid labor charges. Part of the reason for lower capital replacement and nonland capital costs is less feed storage and processing equipment on contract operations. Also, contract operations produce more hogs in larger buildings and thus spread replacement and capital costs over more units of output. Less labor is used on contract operations due to less feed handling and labor-saving hog facilities. With the value of production per unit about the same for each group, lower economic costs

on contract operations result in a significantly higher residual return to management and risk.

The Contractor/Contractee Arrangement

On average, contractors contribute about 95 percent of total variable cash costs on contract operations (table 10). Major expense items provided by the contractor include feed, mainly complete feed mixes, and feeder pigs. Contractors also pay most of the expenses for veterinary and medicine, marketing, and custom services and supplies. Among variable cash cost items, contractees pay all expenses for energy, repairs, and hired labor. Contractees also pay nearly all expenses for fixed cash cost items, including farm overhead, taxes and insurance, and interest.

Gross value of production less variable cash expenses is much the same, around \$4.00 per hundredweight gain, for contractors and contractees. On a per-farm basis, each earned about \$13,000. However, because nearly all fixed costs are paid by the contractee, gross value of production less cash expenses per hundredweight of gain is \$3.89 for contractors and only \$2.79 for contractees. Higher returns among contractors reflect their greater risk exposure compared with contractees. Per-farm returns average about \$9,000 for contractees, versus nearly \$13,000 for contractors. Contractees earn less per unit than independent operators (\$2.79 versus \$3.05), but because of their greater volume of production, per-farm earnings are about \$5,000 higher for contractees.

Conclusions

The most compelling reason for the emergence and growth of finishing hogs under contract appears to be the greater technical and economic efficiency of these operations compared with independent operations. Much of this improved efficiency stems from larger operations using more current production technologies that take advantage of economies of size. Also, greater feed efficiency and lower death losses may be attributed to contract fees that are paid according to animal performance.

Hog producers considering contract production arrangements should carefully evaluate the sharing of costs and returns in the agreement. Since contractors generally provide most variable cost items, contractee returns (fees) above variable costs may look promising. However, the amount of fixed costs contributed by the contractee will ultimately determine his/her level of earnings to contract hog production.

Table 10--Cash costs and returns to hog production on FCRS farms for contractors, contractees, and independent operators of feeder pig-to-finish operations, 1992

Per-unit returns above cash costs are highest for contractors, followed by independent operators, and lowest for contractees. However, per-farm returns are higher for contractees than for independent operators because of their much larger volume of production.

Item	Contractors	Contractees	Independent operators
	Dollars per hundredweight gain		
Gross value of production:			
Market hogs	50.23	1.60	53.09
Feeder pigs	0.00	0.04	0.05
Cull stock	0.00	0.04	0.01
Breeding stock	0.00	0.00	0.01
Inventory change	1.01	0.08	-0.19
Contract fees	-4.56	4.56	na
Total gross value of production	46.68	6.32	52.97
Cash expenses:			
Feed--			
Grain	4.31	0.06	10.89
Protein sources	3.82	0.06	6.01
Complete mixes	15.51	0.52	4.57
Other feed items	0.04	0.00	0.48
Total feed costs	23.68	0.64	21.95
Other--			
Feeder pigs	17.57	0.56	18.03
Veterinary and medicine	0.73	0.06	0.69
Bedding and litter	0.01	0.21	0.08
Marketing	0.44	0.01	0.37
Custom services and supplies	0.34	0.06	0.33
Fuel, lube, and electricity	0.00	0.35	0.96
Repairs	0.00	0.26	1.00
Hired labor	0.00	0.14	1.23
Total variable cash expenses	42.77	2.29	44.64
General farm overhead	0.00	0.24	1.35
Taxes and insurance	0.02	0.17	0.81
Interest	0.00	0.83	3.12
Total fixed cash expenses	0.02	1.25	5.27
Total cash expenses	42.79	3.53	49.92
Gross value of production less:			
Variable cash expenses	3.91	4.03	8.33
Total cash expenses	3.89	2.79	3.05
	Dollars per farm ¹		
Gross value of production less:			
Variable cash expenses	12,946	13,343	11,220
Total cash expenses	12,880	9,238	4,108

¹Total hundredweight gain averaged 3,311 on farms with contract operations, and 1,347 on farms with independent operations.

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Appendix A: Statistical Procedures

Testing for Statistical Differences

Decomposing Cost Variation

Alternative Specifications of the Regression Equations

Testing for Statistical Differences

The statistical difference between mean estimates for various groups of U.S. hog producers are tested using a t-statistic. The null and alternative hypotheses to be tested are:

$$H_0: \mu_1 = \mu_2$$

$$H_A: \mu_1 \neq \mu_2$$

where μ_1 is the population mean of group 1 and μ_2 is the population mean of group 2. Evidence allowing rejection of the null hypothesis indicates a significant difference between population means of farms in the two groups. The t-statistic used for hypothesis testing is (see Kmenta, pg. 137 and 145):

$$t \sim \frac{\bar{X}_1 - \bar{X}_2}{\sqrt{\text{VAR}(\bar{X}_1) + \text{VAR}(\bar{X}_2)}}$$

where X_1 and X_2 are sample means, and $\text{VAR}(X_1)$ and $\text{VAR}(X_2)$ are variance estimates of the sample means⁸. If the estimated t-statistic exceeds the critical-t value for the chosen level of significance then the null hypothesis can be rejected and the group means are deemed significantly different⁹. At a 5-percent level of significance, this means that from infinite samples of both populations, only 5 percent of the time would the estimates lead to an incorrect rejection of the null hypothesis.

Decomposing Cost Variation

The statistical association between cost of production and several farm structural and performance characteristics is tested using a regression equation. The empirical model for cost of production is:

$$y_i = \alpha + X_i\beta' + \epsilon_i$$

where y_i is the unit production cost of the i^{th} individual, and x_i is a vector of farm structural and performance characteristics assumed to influence production costs. The error term, ϵ_i , is assumed to have the usual

⁸The FCRS uses a multiframe stratified sample. The formula used to compute variance estimates of sample means from FCRS data can be found in Dillard.

⁹For the sample sizes used in this study the critical-t value for a 5-percent level of significance is 1.96 and for a 10-percent level of significance is 1.65.

desirable properties. Parameters of the model, α and β' , are estimated using weighted least squares.

The measure of production cost variation is the variance of unit production cost, y_i . The variance of unit production cost can be expressed as the sum of the variation explained by the model and the variation in the error term:

$$\sigma_y^2 = \beta'\Sigma\beta + \sigma_\epsilon^2$$

where β' is a vector of parameter estimates, and Σ is the variance-covariance matrix of explanatory variables, and σ_ϵ^2 is the residual variation. To measure the extent to which each explanatory variable influences the variation of production costs, the sample variation can be decomposed into its various components (Kmenta, p.410). Consider a partition of $x_i = [x_{1i} \ x_{2i}]$, with the corresponding partition $\beta = [\beta_1 \ \beta_2]$. The variance of unit production cost can be written as:

$$\sigma_y^2 = \beta_1'\Sigma_{11}\beta_1 + \beta_2'\Sigma_{22}\beta_2 + 2\beta_1'\Sigma_{12}\beta_2 + \sigma_\epsilon^2$$

where Σ_{11} and Σ_{22} are matrices of variances for x_{1i} and x_{2i} , and Σ_{12} is the matrix of covariances between x_{1i} and x_{2i} . The first term on the right-hand side represents the amount of variation in unit production cost that can be attributed solely to x_{1i} ; the second term is the variation in unit production cost explained solely by x_{2i} (variance effects). The third term arises from the covariance of x_{1i} and x_{2i} , and cannot be separated into parts due only to x_{1i} or only to x_{2i} , but is attributed to the influence of the two groups of variables together (covariance effects).

Alternative Specifications of the Regression Equations

Three alternative specifications of regression equations are used to examine the various relationships presented in this report, linear, reciprocal, and quadratic.

The most commonly used and easiest to interpret is the linear form:

$$Y = \alpha + \beta X$$

Estimated parameters of this equation, α and β , indicate the intercept and slope, respectively, of the estimated equation. The estimate of β describes the unit change in Y with a unit change in X.

The reciprocal form is expressed as:

$$Y = \alpha + \beta \frac{1}{X}$$

The intercept estimate of the reciprocal form, α , represents the value of Y that is approached as X grows infinitely large. The estimate of β describes the unit change in Y with a unit change in $1/X$. If β is negative, α represents a maximum value that is approached from below but never reached. Conversely, a positive value of β implies that α is a minimum that is approached from above but never reached.

The quadratic form includes the linear term plus a squared term:

$$Y = \alpha + \beta X + \delta X^2$$

The estimated value of α represents the intercept. The estimate of β describes the unit change in Y with a unit change in X and δ describes the unit change in Y with a unit change in X^2 . If both β and δ are positive (negative), Y increases (decreases) at an increasing rate with X. If β is positive and δ is negative Y increases at a decreasing rate and eventually reaches a maximum. Likewise, if β is negative and δ is positive Y decreases at a decreasing rate and eventually reaches a minimum. The level at which a maximum or minimum occurs can be identified by setting the first derivative of the estimated equation to zero and solving for the value of X.

Appendix B: Tables

1. Characteristics of FCRS farms with alternative hog enterprise types, 1992
2. Performance and production practices of FCRS farms with alternative hog enterprise types, 1992
- 3A. Cash costs and returns of hog production on FCRS farms with alternative hog enterprise types, 1992
- 3B. Economic costs and returns of hog production on FCRS farms with alternative hog enterprise types, 1992
4. Characteristics of FCRS farms with low-, mid-, and high-cost farrow-to-finish hog operations, 1992
5. Performance and production practices of FCRS farms with low-, mid-, and high-cost farrow-to-finish hog operations, 1992
- 6A. Cash costs and returns of hog production on FCRS farms with low-, mid-, and high-cost farrow-to-finish operations, 1992
- 6B. Economic costs and returns of hog production on FCRS farms with low-, mid-, and high-cost farrow-to-finish operations, 1992
7. Characteristics of FCRS farms with alternative sizes of farrow-to-finish hog operations, 1992
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- 9A. Cash costs and returns of hog production on FCRS farms with alternative sizes of farrow-to-finish operations, 1992
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10. Characteristics of FCRS farms with farrow-to-finish hog operations in the traditional and emergent production areas, 1992
11. Performance and production practices of FCRS farms with farrow-to-finish hog operations in the traditional and emergent production areas, 1992
- 12A. Cash costs and returns of hog production on FCRS farms with farrow-to-finish operations in the traditional and emergent production areas, 1992
- 12B. Economic costs and returns of hog production on FCRS farms with farrow-to-finish operations in the traditional and emergent production areas, 1992
13. Characteristics of FCRS farms with feeder pig-to-finish operations in the traditional and emergent production areas, 1992
14. Performance and production practices of FCRS farms with feeder pig-to-finish operations in the traditional and emergent production areas, 1992
- 15A. Cash costs and returns of hog production on FCRS farms with feeder pig-to-finish operations in the traditional and emergent production areas, 1992
- 15B. Economic costs and returns of hog production on FCRS farms with feeder pig-to-finish operations in the traditional and emergent production areas, 1992
16. Characteristics of FCRS farms with contract and independent feeder pig-to-finish hog operations, 1992
17. Performance and production practices of FCRS farms with contract and independent feeder pig-to-finish hog operations, 1992
- 18A. Cash costs and returns of hog production on FCRS farms with contract and independent feeder pig-to-finish operations, 1992
- 18B. Economic costs and returns of hog production on FCRS farms with contract and independent feeder pig-to-finish operations, 1992

Appendix table 1--Characteristics of FCRS farms with alternative hog enterprise types, 1992

Item	Unit	Farrow-to-finish	Farrow-to-feeder pig	Feeder pig-to-finish	All hog farms
Share of FCRS hog:					
Farms	percent	54	8	19	100
Sales or contract removals	percent	61	6	12	100
Size:					
Total operated acreage	acres	634	291	556	548
Sales class ¹ :					
\$0-\$39,999	percent of farms	11	34	12	16
\$40,000-\$99,999	percent of farms	27	26	25	28
\$100,000-\$249,999	percent of farms	39	27	39	34
\$250,000 or more	percent of farms	23	14	24	22
Hog production value					
Hog production value	dollars	92,577	61,852	80,383	88,997
Farm production value	dollars	194,158	128,393	228,238	194,674
Hog and pig inventory:					
Beginning	head	593	386	324	523
Ending	head	593	394	323	524
Production specialty: ¹					
Cash grains	percent of farms	19	10	24	19
Other crops	percent of farms	4	4	4	4
Livestock	percent of farms	77	86	72	77
Corn acres harvested	acres	180	71	175	157
Financial position: ¹					
Favorable	percent of farms	72	58	58	64
Marginal income	percent of farms	17	31	27	22
Marginal solvency	percent of farms	8	6	12	9
Vulnerable	percent of farms	3	5	3	4
Farm debt-to-assets	ratio	0.15	0.16	0.16	0.16
Major occupation:					
Farming	percent of farms	92	83	88	87
Other	percent of farms	8	17	12	13
Farm organization: ¹					
Individual	percent of farms	82	86	79	83
Partnership	percent of farms	12	11	16	12
Corporations and cooperatives	percent of farms	7	d	5	6
Operator age: ¹					
Fewer than 35 years	percent of farms	11	21	15	14
35-49 years	percent of farms	45	37	40	44
50-64 years	percent of farms	33	29	34	32
65 years or more	percent of farms	11	12	10	11
Experience in hog production					
Operator of 1992 operation	years	22	18	19	20
Work on any operation	years	27	23	24	26
Operator education: ¹					
Less than high school	percent of farms	14	18	13	14
Completed high school	percent of farms	47	43	53	48
Attended college	percent of farms	21	23	21	24
Completed college	percent of farms	18	15	13	17

¹Data may not sum due to rounding or omission of possible categories.
d = insufficient data for disclosure.

Appendix table 2--Performance and production practices of FCRS farms with alternative hog enterprise types, 1992

Item	Unit	Farrow-to-finish	Farrow-to-feeder pig	Feeder pig-to-finish	All hog farms
Feeder pigs:					
Sales and contract removals	head	28	1,433	d	236
Sales	percent	98	92	d	95
Contract removals	percent	2	8	d	5
Weight	pounds	41	48	d	48
Price	dollars per cwt sold	85	83	d	81
Market hogs:					
Sales and contract removals	head	858	7	804	709
Sales	percent	99	100	78	95
Contract removals	percent	d	0	22	5
Weight	pounds	238	248	241	239
Price	dollars per cwt sold	42	41	41	42
Breeding Herd Size:					
Sow inventory	head	74	95	d	64
Boar inventory	head	4	5	d	4
Farrowing:					
Litters	litters per sow	1.75	1.92	d	1.76
Pigs	pigs per litter	8.72	9.08	d	8.85
Pigs	pigs per sow	15.27	17.43	d	15.61
Weaning:					
Pigs	pigs per litter	7.54	8.07	d	7.70
Pigs	pigs per sow	13.22	15.48	d	13.59
Age	days	36	37	d	29
Weight	pounds	25	25	d	20
Death rates:					
Birth to weaning	percent of pigs farrowed	13.48	11.21	d	12.97
Weaning to market	percent of pigs weaned ¹	4.35	1.94	2.07	3.62
Breeding stock	percent of herd	5.07	3.71	d	4.86
Feed efficiency:²					
Grain	pounds per cwt gain	311	346	268	300
Protein sources	pounds per cwt gain	68	61	42	64
Complete mixes	pounds per cwt gain	37	116	73	53
Other feed items	pounds per cwt gain	1	4	*	1
Total	pounds per cwt gain	416	527	383	419
Homegrown grain	percent of grain fed	55	29	45	49
Labor efficiency:					
Paid labor	hours per cwt gain	0.38	1.08	0.17	0.41
Unpaid labor	hours per cwt gain	0.75	1.73	0.71	0.79
Total	hours per cwt gain	1.13	1.81	0.89	1.21
Farrowing facilities:²					
Total confinement	percent of capacity	59	76	0	63
Enclosed	percent of capacity	21	16	d	20
Open with outside access	percent of capacity	7	3	d	6
Portable	percent of capacity	13	6	d	11
Average age	years	21	15	d	19
Growing/finishing facilities:²					
Total confinement	percent of capacity	36	d	34	37
Enclosed	percent of capacity	22	41	26	22
Open with outside access	percent of capacity	41	45	38	40
Portable	percent of capacity	1	d	1	1
Average age	years	21	15	21	20

¹Includes percent of weaned pigs and purchased feeder pigs.

²Data may not sum due to omission of possible categories or more than one relevant alternative.

d = insufficient data for disclosure.

* = less than 1.

Appendix table 3A--Cash costs and returns of hog production on FCRS farms with alternative hog enterprise types, 1992

Item	Farrow-to-finish	Farrow-to-feeder pig	Feeder pig-to-finish	All hog farms
<i>Dollars per cwt gain</i>				
Gross value of production:				
Market hogs	39.75	0.89	52.80	38.44
Feeder pigs	0.39	63.94	0.05	4.43
Cull stock	2.27	5.67	0.02	2.39
Breeding stock	0.19	0.11	0.01	2.17
Inventory change	-0.15	2.43	0.10	-0.03
Other income	1.14	1.20	0.95	1.11
Total, gross value of production	43.58	74.25	53.93	48.50
Cash expenses:				
Feed--				
Grain	11.51	13.75	9.39	11.17
Protein sources	9.57	8.84	5.52	8.87
Complete mixes	3.90	14.00	7.20	5.34
Other feed items	0.55	0.79	0.38	0.59
Total feed cost	25.53	37.37	22.50	25.97
Other--				
Feeder pigs	0.14	0.04	18.05	3.24
Veterinary and medicine	1.12	4.37	0.71	1.28
Bedding and litter	0.06	0.18	0.11	0.08
Marketing	0.43	2.44	0.39	0.52
Custom services and supplies	0.37	1.14	0.34	0.43
Fuel, lube, and electricity	1.56	4.90	0.82	1.65
Repairs	1.19	2.64	0.83	1.22
Hired labor	2.36	6.89	0.98	2.62
Total, variable cash expenses	32.75	59.98	44.74	37.00
General farm overhead	1.27	2.54	1.23	1.43
Taxes and insurance	0.76	1.68	0.80	0.83
Interest	2.31	4.77	2.81	2.58
Total, fixed cash expenses	4.34	8.99	4.84	4.84
Total, cash expenses	37.08	68.97	49.58	41.84
Gross value of production less cash expenses	6.50	5.28	4.35	6.66

Appendix table 3B--Economic costs and returns of hog production on FCRS farms with alternative hog enterprise types, 1992

Item	Farrow-to-finish	Farrow-to-feeder pig	Feeder pig-to-finish	All hog farms
<i>Dollars per cwt gain</i>				
Gross value of production:				
Market hogs	39.75	0.89	52.80	38.44
Feeder pigs	0.39	63.94	0.05	4.43
Cull stock	2.27	5.67	0.02	2.39
Breeding stock	0.19	0.11	0.01	2.17
Inventory change	-0.15	2.43	0.10	-0.03
Other income	1.14	1.20	0.95	1.11
Total, gross value of production	43.58	74.25	53.93	48.50
Economic (full ownership) costs:				
Variable cash expenses	32.75	59.98	44.74	37.00
General farm overhead	1.27	2.54	1.23	1.43
Taxes and insurance	0.76	1.68	0.80	0.83
Capital replacement	9.39	21.22	6.75	9.69
Operating capital	0.58	1.07	0.80	0.66
Other nonland capital	3.30	6.87	2.50	3.38
Land	0.24	0.48	0.11	0.24
Unpaid labor	4.82	10.97	4.54	5.06
Total, economic (full-ownership) costs	53.10	104.81	61.47	58.28
Residual returns to management and risk	-9.51	-30.56	-7.54	-9.78

Appendix table 4--Characteristics of FCRS farms with low-, mid-, and high-cost farrow-to-finish hog operations, 1992

Item	Unit	Low-cost producers	Mid-cost producers	High-cost producers
Share of FCRS farrow-to-finish hog:				
Farms	percent	25	50	25
Sales or contract removals	percent	33	56	11
Size:				
Total operated acreage	acres	620	634	647
Sales class ¹ -				
\$0-\$39,999	percent of farms	8	6	22
\$40,000-\$99,999	percent of farms	18	27	36
\$100,000-\$249,999	percent of farms	49	40	28
\$250,000 or more	percent of farms	25	27	14
Hog production value	dollars	120,711	104,173	41,296
Farm production value	dollars	234,944	207,954	125,894
Hog and pig inventory:				
Beginning	head	667	683	337
Ending	head	704	690	287
Production specialty: ¹				
Cash grains	percent of farms	16	16	29
Other crops	percent of farms	3	3	8
Livestock	percent of farms	81	81	63
Corn acres harvested	acres	182	195	150
Financial position: ¹				
Favorable	percent of farms	86	74	55
Marginal income	percent of farms	9	12	35
Marginal solvency	percent of farms	5	11	6
Vulnerable	percent of farms	d	3	3
Farm debt-to-assets	ratio	0.11	0.17	0.16
Major occupation:				
Farming	percent of farms	94	93	86
Other	percent of farms	6	7	14
Farm organization: ¹				
Individual	percent of farms	73	85	83
Partnership	percent of farms	18	9	11
Corporations or cooperatives	percent of farms	9	6	6
Operator age: ¹				
Less than 35 years	percent of farms	16	11	8
35 to 49 years	percent of farms	51	43	45
50-64 years	percent of farms	23	36	35
65 years or more	percent of farms	10	11	13
Experience in hog production:				
Operator of 1992 operation	years	21	23	21
Work on any operation	years	26	28	26
Operator education: ¹				
Less than high school	percent of farms	13	14	13
Completed high school	percent of farms	44	47	53
Attended college	percent of farms	20	23	19
Completed college	percent of farms	23	16	15

¹Data may not sum due to rounding or omission of possible categories.
na = not applicable; d = insufficient data for disclosure.

Appendix table 5--Performance and production practices of FCRS farms with low-, mid-, and high-cost farrow-to-finish hog operations, 1992

Item	Unit	Low-cost producers	Mid-cost producers	High-cost producers
Market hogs:				
Sales and contract removals	head	1,140	958	377
Sales	percent	100	99	100
Contract removals	percent	*	1	0
Sale/removal weight	pounds	239	238	236
Breeding herd size:				
Sow inventory	head	83	86	40
Boar inventory	head	5	5	3
Farrowing:				
Litters	litters per sow	1.82	1.74	1.68
Pigs	pigs per litter	8.76	8.78	8.34
Pigs	pigs per sow	15.92	15.25	14.05
Weaning:				
Pigs	pigs per litter	7.74	7.51	7.25
Pigs	pigs per sow	14.08	13.04	12.20
Age	days	35	36	38
Weight	pounds	24	24	28
Death losses:				
Birth to weaning	percent of pigs farrowed	12	15	13
Weaning to market	percent of pigs weaned ¹	3	5	4
Feed efficiency:²				
Grain	pounds per cwt gain	254	308	510
Protein sources	pounds per cwt gain	59	73	67
Complete mixes	pounds per cwt gain	19	39	77
Other feed items	pounds per cwt gain	*	1	4
Total	pounds per cwt gain	333	421	658
Homegrown grain	percent of grain fed	53	53	66
Labor efficiency:²				
Paid labor	hours per cwt gain	0.27	0.41	0.55
Unpaid labor	hours per cwt gain	0.59	0.70	1.60
Total	hours per cwt gain	0.86	1.10	2.15
Farrowing facilities:²				
Total confinement	percent of capacity	57	59	60
Enclosed	percent of capacity	25	18	27
Open with outside access	percent of capacity	3	8	7
Portable	percent of capacity	15	15	6
Average age	years	20	21	22
Growing/finishing facilities:²				
Total confinement	percent of capacity	50	31	34
Enclosed	percent of capacity	20	24	18
Open with outside access	percent of capacity	30	43	48
Portable	percent of capacity	1	2	1
Average age	years	18	20	27

¹Includes percent of weaned pigs and purchased feeder pigs.

²Data may not sum due to rounding or omission of possible categories.

na = not applicable; d = insufficient data for disclosure.

Appendix table 6A--Cash costs and returns of hog production on FCRS farms with low-, mid-, and high-cost farrow-to-finish operations, 1992

Item	Low-cost producers	Mid-cost producers	High-cost producers
<i>Dollars per cwt gain</i>			
Gross value of production:			
Market hogs	39.14	39.67	42.19
Feeder pigs	0.18	0.51	0.43
Cull stock	1.98	2.32	2.93
Breeding stock	0.10	0.21	0.38
Inventory change	0.95	-0.05	-4.31
Other income	1.00	1.16	1.54
Total, gross value of production	43.34	43.80	43.15
Cash expenses:			
Feed--			
Grain	9.37	11.45	18.78
Protein sources	7.37	10.27	12.84
Complete mixes	2.33	3.95	8.75
Other feed items	0.49	0.51	1.01
Total feed cost	19.56	26.18	41.37
Other--			
Feeder pigs	0.12	0.13	0.30
Veterinary and medicine	0.83	1.26	1.27
Bedding and litter	0.04	0.06	0.09
Marketing	0.36	0.45	0.56
Custom services and supplies	0.29	0.38	0.51
Fuel, lube, and electricity	1.08	1.68	2.44
Repairs	0.84	1.19	2.31
Hired labor	1.63	2.62	3.24
Total, variable cash expenses	24.75	33.96	52.09
General farm overhead	0.98	1.28	2.10
Taxes and insurance	0.55	0.78	1.30
Interest	1.28	2.57	4.25
Total, fixed cash expenses	2.81	4.63	7.65
Total, cash expenses	27.56	38.59	59.74
Gross value of production less cash expenses	15.78	5.22	-16.59

Appendix table 6B--Economic costs and returns of hog production on FCRS farms with low-, mid-, and high-cost farrow-to-finish operations, 1992

Item	Low-cost producers	Mid-cost producers	High-cost producers
<i>Dollars per cwt gain</i>			
Gross value of production:			
Market hogs	39.14	39.67	42.19
Feeder pigs	0.18	0.51	0.43
Cull stock	1.98	2.32	2.93
Breeding stock	0.10	0.21	0.38
Inventory change	0.95	-0.05	-4.31
Other income	1.00	1.16	1.54
Total, gross value of production	43.34	43.80	43.15
Economic (full ownership) costs:			
Variable cash expenses	24.75	33.96	52.09
General farm overhead	0.98	1.28	2.10
Taxes and insurance	0.55	0.78	1.30
Capital replacement	6.86	9.84	15.07
Operating capital	0.44	0.61	0.93
Other nonland capital	2.39	3.48	5.20
Land	0.14	0.28	0.39
Unpaid labor	3.78	4.47	10.11
Total, economic (full-ownership) costs	39.89	54.70	87.19
Residual returns to management and risk	3.45	-10.89	-44.03

Appendix table 7--Characteristics of FCRS farms with alternative sizes¹ of farrow-to-finish hog operations, 1992

Item	Unit	Fewer than 500 head	500-999 head	1,000-2,999 head	3,000 head or more
Share of FCRS farrow-to-finish hog:					
Farms	percent	48	26	23	3
Sales or contract removals	percent	14	21	44	21
Size:					
Total operated acreage	acres	568	679	683	896
Sales class ² -					
\$0-\$39,999	percent of farms	22	d	0	0
\$40,000-\$99,999	percent of farms	41	25	d	0
\$100,000-\$249,999	percent of farms	32	52	44	0
\$250,000 or more	percent of farms	5	22	54	100
Hog production value	dollars	27,612	75,004	176,755	637,561
Farm production value	dollars	99,965	205,963	282,681	916,302
Hog and pig inventory:					
Beginning	head	210	487	1,111	3,665
Ending	head	203	511	1,104	3,610
Production specialty: ²					
Cash grains	percent of farms	26	20	3	13
Other crops	percent of farms	6	2	2	d
Livestock	percent of farms	67	77	94	85
Corn acres harvested	acres	123	222	226	384
Financial position: ²					
Favorable	percent of farms	66	80	78	58
Marginal income	percent of farms	23	10	11	20
Marginal solvency	percent of farms	9	8	7	14
Vulnerable	percent of farms	2	d	4	9
Farm debt-to-assets	ratio	0.16	0.13	0.15	0.20
Major occupation:					
Farming	percent of farms	89	92	95	100
Other	percent of farms	11	8	5	0
Farm organization: ²					
Individual	percent of farms	91	78	69	60
Partnership	percent of farms	7	10	21	27
Corporations and cooperatives	percent of farms	2	2	10	12
Operator age: ²					
Fewer than 35 years	percent of farms	7	21	7	24
35-49 years	percent of farms	39	52	53	32
50-64 years	percent of farms	40	17	35	37
65 years or more	percent of farms	14	10	6	d
Experience in hog production:					
Operator of 1992 operation	years	24	20	22	18
Work on any operation	years	29	24	27	22
Operator education: ²					
Less than high school	percent of farms	17	13	8	d
Completed high school	percent of farms	52	47	39	36
Attended college	percent of farms	16	24	27	29
Completed college	percent of farms	14	16	26	28

¹Size is measured as total head sold or removed under contract during 1992.

²Data may not sum due to rounding or omission of possible categories.

d = insufficient data for disclosure.

Appendix table 8--Performance and production practices of FCRS farms with alternative sizes¹ of farrow-to-finish hog operations, 1992

Item	Unit	Fewer than 500 head	500-999 head	1,000-2,999 head	3,000 head or more
Market hogs:					
Sales and contract removals	head	256	693	1,662	5,737
Sales	percent	100	100	100	98
Contract removals	percent	0	0	d	2
Weight	pounds	240	240	238	235
Price	dollars per cwt sold	41	42	42	43
Breeding Herd Size:					
Sow inventory	head	25	61	131	526
Boar inventory	head	2	4	8	26
Farrowing:					
Litters	litters per sow	1.74	1.85	1.78	1.61
Pigs	pigs per litter	7.98	8.53	8.82	9.30
Pigs	pigs per sow	13.88	15.75	15.72	15.01
Weaning:					
Pigs	pigs per litter	6.77	7.49	7.63	8.05
Pigs	pigs per sow	11.78	13.83	13.59	12.99
Age	days	41	33	31	26
Weight	pounds	29	23	20	18
Death rates:					
Birth to weaning	percent of pigs farrowed	15.13	12.22	13.56	13.47
Weaning to market	percent of pigs weaned ²	3.40	3.03	4.79	5.56
Breeding stock	percent of herd	6.32	4.57	5.87	3.15
Feed efficiency:³					
Grain	pounds per cwt gain	405	331	297	253
Protein sources	pounds per cwt gain	58	60	63	91
Complete mixes	pounds per cwt gain	49	53	34	15
Other feed items	pounds per cwt gain	3	*	1	1
Total	pounds per cwt gain	515	445	395	360
Homegrown grain	percent of grain fed	69	62	57	30
Labor efficiency:					
Paid labor	hours per cwt gain	0.19	0.32	0.35	0.62
Unpaid labor	hours per cwt gain	1.80	1.05	0.54	0.17
Total	hours per cwt gain	1.99	1.36	0.89	0.79
Farrowing facilities:³					
Total confinement	percent of capacity	37	63	71	69
Enclosed	percent of capacity	35	21	14	14
Open with outside access	percent of capacity	13	7	2	2
Portable	percent of capacity	16	9	13	15
Average age	years	24	20	19	18
Growing/finishing facilities:³					
Total confinement	percent of capacity	7	33	43	64
Enclosed	percent of capacity	17	16	27	26
Open with outside access	percent of capacity	72	50	30	9
Portable	percent of capacity	3	1	1	0
Average age	years	29	24	17	15

¹Size is measured as total head sold or removed under contract during 1992.

²Includes percent of weaned pigs and purchased feeder pigs.

³Data may not sum due to omission of possible categories or more than one relevant alternative.

d = insufficient data for disclosure.

* = less than 1.

Appendix table 9A--Cash costs and returns of hog production on FCRS farms with alternative sizes¹ of farrow-to-finish operations, 1992

Item	Fewer than 500 head	500-999 head	1,000-2,999 head	3,000 head or more
<i>Dollars per cwt gain</i>				
Gross value of production:				
Market hogs	39.66	40.03	40.05	38.87
Feeder pigs	0.26	0.42	0.25	0.75
Cull stock	2.42	2.06	2.19	2.55
Breeding stock	0.37	0.15	0.22	0.05
Inventory change	-0.62	0.66	-0.36	-0.21
Other income	1.32	1.26	1.17	0.86
Total, gross value of production	43.40	44.57	43.51	42.86
Cash expenses:				
Feed--				
Grain	14.67	12.07	11.21	9.36
Protein sources	8.66	9.32	9.10	11.47
Complete mixes	5.10	4.69	3.60	2.89
Other feed items	0.65	0.49	0.60	0.44
Total feed cost	29.08	26.58	24.50	24.16
Other--				
Feeder pigs	0.25	0.24	0.08	0.09
Veterinary and medicine	0.80	1.02	1.03	1.63
Bedding and litter	0.06	0.10	0.05	0.02
Marketing	0.43	0.32	0.39	0.63
Custom services and supplies	0.25	0.30	0.36	0.53
Fuel, lube, and electricity	2.00	1.51	1.48	1.47
Repairs	1.46	1.27	1.15	0.98
Hired labor	1.00	1.80	2.16	4.31
Total, variable cash expenses	35.33	33.14	31.20	33.83
General farm overhead	1.92	1.53	1.13	0.82
Taxes and insurance	1.13	0.87	0.68	0.53
Interest	3.70	2.55	1.97	1.82
Total, fixed cash expenses	6.74	4.95	3.79	3.17
Total, cash expenses	42.07	38.09	34.99	36.99
Gross value of production less cash expenses	1.33	6.48	8.52	5.87

¹Size is measured as total head sold or removed under contract during 1992.

Appendix table 9B--Economic costs and returns of hog production on FCRS farms with alternative sizes¹ of farrow-to-finish operations, 1992

Item	Fewer than 500 head	500-999 head	1,000-2,999 head	3,000 head or more
<i>Dollars per cwt gain</i>				
Gross value of production:				
Market hogs	39.66	40.03	40.05	38.87
Feeder pigs	0.26	0.42	0.25	0.75
Cull stock	2.42	2.06	2.19	2.55
Breeding stock	0.37	0.15	0.22	0.05
Inventory change	-0.62	0.66	-0.36	-0.21
Other income	1.32	1.26	1.17	0.86
Total, gross value of production	43.40	44.57	43.51	42.86
Economic (full ownership) costs:				
Variable cash expenses	35.33	33.14	31.20	33.83
General farm overhead	1.92	1.53	1.13	0.82
Taxes and insurance	1.13	0.87	0.68	0.53
Capital replacement	13.55	10.98	8.37	6.98
Operating capital	0.63	0.59	0.56	0.60
Other nonland capital	4.66	3.81	2.97	2.51
Land	0.44	0.22	0.27	0.07
Unpaid labor	11.36	6.69	3.50	1.09
Total, economic (full-ownership) costs	69.02	57.83	48.68	46.43
Residual returns to management and risk	-25.61	-13.26	-5.18	-3.56

¹Size is measured as total head sold or removed under contract during 1992.

Appendix table 10--Characteristics of FCRS farms with farrow-to-finish hog operations in the traditional and emergent production areas¹, 1992

Item	Unit	Traditional area	Emergent area
Share of FCRS farrow-to-finish hog:			
Farms	percent	44	6
Sales or contract removals	percent	49	9
Size:			
Total operated acreage	acres	551	527
Sales class ² -			
\$0-\$39,999	percent of farms	4	24
\$40,000-\$99,999	percent of farms	29	15
\$100,000-\$249,999	percent of farms	40	28
\$250,000 or more	percent of farms	27	32
Hog production value	dollars	105,046	121,980
Farm production value	dollars	207,237	256,866
Hog and pig inventory:			
Beginning	head	664	844
Ending	head	672	788
Production specialty: ²			
Cash grains	percent of farms	22	3
Other crops	percent of farms	0	34
Livestock	percent of farms	78	63
Corn acres harvested	acres	211	126
Financial position: ²			
Favorable	percent of farms	77	77
Marginal income	percent of farms	12	20
Marginal solvency	percent of farms	9	2
Vulnerable	percent of farms	3	d
Farm debt-to-assets	ratio	0.19	0.07
Major occupation:			
Farming	percent of farms	94	94
Other	percent of farms	6	6
Farm organization: ²			
Individual	percent of farms	84	81
Partnership	percent of farms	10	14
Corporations or cooperatives	percent of farms	7	5
Operator age: ²			
Less than 35 years	percent of farms	14	4
35 to 49 years	percent of farms	46	35
50-64 years	percent of farms	31	38
65 years or more	percent of farms	9	23
Experience in hog production:			
Operator of 1992 operation	years	22	25
Work on any operation	years	27	28
Operator education: ²			
Less than high school	percent of farms	9	20
Completed high school	percent of farms	48	44
Attended college	percent of farms	26	20
Completed college	percent of farms	18	16

¹The traditional hog production area includes the States of IA, IL, and MN. The emergent hog production area includes the States of NC, SC, and VA.

²Data may not sum due to rounding or omission of possible categories.
na = not applicable; d = insufficient data for disclosure.

Appendix table 11--Performance and production practices of FCRS farms with farrow-to-finish hog operations in the traditional and emergent production areas¹, 1992

Item	Unit	Traditional area	Emergent area
Market hogs:			
Sales and contract removals	head	947	1,203
Sales	percent	100	100
Contract removals	percent	0	0
Sale/removal weight	pounds	241	229
Breeding herd size:			
Sow inventory	head	81	86
Boar inventory	head	5	6
Farrowing:			
Litters	litters per sow	1.80	1.95
Pigs	pigs per litter	8.56	9.32
Pigs	pigs per sow	15.38	18.20
Weaning:			
Pigs	pigs per litter	7.34	8.36
Pigs	pigs per sow	13.19	16.34
Age	days	34	38
Weight	pounds	23	28
Death losses:			
Birth to weaning	percent of pigs farrowed	14	10
Weaning to market	percent of pigs weaned ²	5	4
Feed efficiency:³			
Grain	pounds per cwt gain	307	271
Protein sources	pounds per cwt gain	73	43
Complete mixes	pounds per cwt gain	37	69
Other feed items	pounds per cwt gain	1	14
Total	pounds per cwt gain	418	384
Homegrown grain	percent of grain fed	57	40
Labor efficiency:³			
Paid labor	hours per cwt gain	0.37	0.51
Unpaid labor	hours per cwt gain	0.66	0.59
Total	hours per cwt gain	1.03	1.11
Farrowing facilities:³			
Total confinement	percent of capacity	57	82
Enclosed	percent of capacity	24	13
Open with outside access	percent of capacity	5	4
Portable	percent of capacity	14	1
Average age	years	24	15
Growing/finishing facilities:³			
Total confinement	percent of capacity	32	61
Enclosed	percent of capacity	19	31
Open with outside access	percent of capacity	48	6
Portable	percent of capacity	1	2
Average age	years	23	13

¹The traditional hog production area includes the States of IA, IL, and MN. The emergent hog production area includes the States of NC, SC, and VA.

²Includes percent of weaned pigs and purchased feeder pigs.

³Data may not sum due to rounding or omission of possible categories.

na = not applicable; d = insufficient data for disclosure.

Appendix table 12A--Cash costs and returns of hog production on FCRS farms with farrow-to-finish operations in the traditional and emergent production areas¹, 1992

Item	Traditional area	Emergent area
	<i>Dollars per cwt gain</i>	
Gross value of production:		
Market hogs	40.04	40.55
Feeder pigs	0.44	0.50
Cull stock	2.64	1.76
Breeding stock	0.18	0.23
Inventory change	-0.12	-1.48
Other income	1.23	0.86
Total, gross value of production	44.40	42.41
Cash expenses:		
Feed--		
Grain	10.93	11.66
Protein sources	9.97	7.24
Complete mixes	3.56	9.30
Other feed items	0.67	0.20
Total feed cost	25.13	28.40
Other--		
Feeder pigs	0.18	0.04
Veterinary and medicine	1.35	0.90
Bedding and litter	0.08	0.01
Marketing	0.39	0.33
Custom services and supplies	0.43	0.47
Fuel, lube, and electricity	1.60	1.88
Repairs	1.18	1.14
Hired labor	2.62	2.89
Total, variable cash expenses	32.95	36.06
General farm overhead	1.31	1.09
Taxes and insurance	0.74	0.78
Interest	2.61	1.35
Total, fixed cash expenses	4.66	3.22
Total, cash expenses	37.61	39.29
Gross value of production less cash expenses	6.79	3.12

Appendix table 12B--Economic costs and returns of hog production on FCRS farms with farrow-to-finish operations in the traditional and emergent production areas¹, 1992

Item	Traditional area	Emergent area
	<i>Dollars per cwt gain</i>	
Gross value of production:		
Market hogs	40.04	40.55
Feeder pigs	0.44	0.50
Cull stock	2.64	1.76
Breeding stock	0.18	0.23
Inventory change	-0.12	-1.48
Other income	1.23	0.86
Total, gross value of production	44.40	42.41
Economic (full ownership) costs:		
Variable cash expenses	32.95	36.06
General farm overhead	1.31	1.09
Taxes and insurance	0.74	0.78
Capital replacement	9.94	8.65
Operating capital	0.59	0.64
Other nonland capital	3.46	3.53
Land	0.28	0.10
Unpaid labor	4.34	3.33
Total, economic (full-ownership) costs	53.61	54.19
Residual returns to management and risk	-9.21	-11.78

¹The traditional hog production area includes the States of IA, IL, and MN. The emergent hog production area includes the States of NC, SC, and VA.

Appendix table 13--Characteristics of FCRS farms with feeder pig-to-finish hog operations in the traditional and emergent production areas¹, 1992

Item	Unit	Traditional area	Emergent area
Share of FCRS feeder pig-to-finish hog:			
Farms	percent	44	12
Sales or contract removals	percent	47	17
Size:			
Total operated acreage	acres	520	153
Sales class ² :			
\$0-\$39,999	percent of farms	14	4
\$40,000-\$99,999	percent of farms	11	65
\$100,000-\$249,999	percent of farms	45	17
\$250,000 or more	percent of farms	30	13
Hog production value	dollars	88,831	99,229
Farm production value	dollars	270,184	139,554
Hog and pig inventory:			
Beginning	head	350	287
Ending	head	356	319
Production specialty: ²			
Cash grains	percent of farms	35	7
Other crops	percent of farms	0	7
Livestock	percent of farms	65	85
Corn acres harvested	acres	237	41
Financial position: ²			
Favorable	percent of farms	68	78
Marginal income	percent of farms	19	22
Marginal solvency	percent of farms	12	0
Vulnerable	percent of farms	d	0
Farm debt-to-assets	ratio	0.18	0.06
Major occupation:			
Farming	percent of farms	93	90
Other	percent of farms	d	10
Farm organization: ²			
Individual	percent of farms	85	46
Partnership	percent of farms	7	d
Corporations or cooperatives	percent of farms	8	d
Operator age: ²			
Less than 35 years	percent of farms	16	0
35 to 49 years	percent of farms	45	30
50-64 years	percent of farms	33	66
65 years or more	percent of farms	d	4
Experience in hog production:			
Operator of 1992 operation	years	20	15
Work on any operation	years	25	18
Operator education: ²			
Less than high school	percent of farms	10	7
Completed high school	percent of farms	55	67
Attended college	percent of farms	22	22
Completed college	percent of farms	12	5

¹The traditional hog production area includes the States of IA, IL, and MN. The emergent hog production area includes the States of NC, SC, and VA.

²Data may not sum due to rounding or omission of possible categories.
na = not applicable; d = insufficient data for disclosure.

Appendix table 14--Performance and production practices of FCRS farms with feeder pig-to-finish hog operations in the traditional and emergent production areas¹, 1992

Item	Unit	Traditional area	Emergent area
Market hogs:			
Sales and contract removals	head	867	1,107
Sales	percent	84	60
Contract removals	percent	16	40
Sale/removal weight	pounds	242	237
Death losses:			
Weaning to market	percent of pigs weaned ²	2	1
Feed efficiency:³			
Grain	pounds per cwt gain	287	151
Protein sources	pounds per cwt gain	40	19
Complete mixes	pounds per cwt gain	40	149
Other feed items	pounds per cwt gain	*	*
Total	pounds per cwt gain	368	320
Homegrown grain	percent of grain fed	56	9
Labor efficiency:³			
Paid labor	hours per cwt gain	0.20	0.06
Unpaid labor	hours per cwt gain	0.80	0.45
Total	hours per cwt gain	1.00	0.51
Growing/finishing facilities:³			
Total confinement	percent of capacity	30	44
Enclosed	percent of capacity	22	51
Open with outside access	percent of capacity	47	5
Portable	percent of capacity	*	0
Average age	years	27	10

¹The traditional hog production area includes the States of IA, IL, and MN. The emergent hog production area includes the States of NC, SC, and VA.

²Includes percent of weaned pigs and purchased feeder pigs.

³Data may not sum due to rounding or omission of possible categories.

na = not applicable; d = insufficient data for disclosure.

* = less than 1.

Appendix table 15A--Cash costs and returns of hog production on FCRS farms with feeder pig-to-finish operations in the traditional and emergent production areas¹, 1992

Item	Traditional area	Emergent area
	<i>Dollars per cwt gain</i>	
Gross value of production:		
Market hogs	53.23	52.19
Feeder pigs	0.08	0.06
Cull stock	0.00	0.05
Breeding stock	0.00	0.00
Inventory change	0.38	0.44
Other income	1.02	0.43
Total, gross value of production	54.71	53.17
Cash expenses:		
Feed--		
Grain	9.99	4.27
Protein sources	5.53	2.84
Complete mixes	4.23	11.67
Other feed items	0.60	0.04
Total feed cost	20.35	18.82
Other--		
Feeder pigs	18.64	17.64
Veterinary and medicine	0.85	0.23
Bedding and litter	0.21	0.01
Marketing	0.30	0.33
Custom services and supplies	0.32	0.50
Fuel, lube, and electricity	0.77	0.71
Repairs	0.83	0.42
Hired labor	1.25	0.27
Total, variable cash expenses	43.51	38.92
General farm overhead	1.15	0.82
Taxes and insurance	0.78	0.77
Interest	2.83	1.64
Total, fixed cash expenses	4.76	3.22
Total, cash expenses	48.27	42.15
Gross value of production less cash expenses	6.44	11.02

Appendix table 15B--Economic costs and returns of hog production on FCRS farms with feeder pig-to-finish operations in the traditional and emergent production areas¹, 1992

Item	Traditional area	Emergent area
	<i>Dollars per cwt gain</i>	
Gross value of production:		
Market hogs	53.23	52.19
Feeder pigs	0.08	0.06
Cull stock	0.00	0.05
Breeding stock	0.00	0.00
Inventory change	0.38	0.44
Other income	1.02	0.43
Total, gross value of production	54.71	53.17
Economic (full ownership) costs:		
Variable cash expenses	43.51	38.92
General farm overhead	1.15	0.82
Taxes and insurance	0.78	0.77
Capital replacement	6.22	5.10
Operating capital	0.78	0.69
Other nonland capital	2.18	2.31
Land	0.15	0.06
Unpaid labor	5.24	2.52
Total, economic (full-ownership) costs	60.02	51.19
Residual returns to management and risk	-5.31	1.98

¹The traditional hog production area includes the States of IA, IL, and MN. The emergent hog production area includes the States of NC, SC, and VA.

Appendix table 16--Characteristics of FCRS farms with contract and independent feeder pig-to-finish hog operations, 1992

Item	Unit	Contract operations	Independent operations
Share of FCRS feeder pig-to-finish:			
Farms	percent	11	89
Sales or contract removals	percent	22	78
Hog and pig inventory:			
Average	head	608	289
Beginning	head	581	293
Ending	head	635	286
Total operated acreage	acres	454	568
Land tenure:			
Owned	acres	114	262
Cash rented	acres	250	177
Share rented	acres	93	136
Crop acres:			
Corn	acres	195	172
Soybeans	acres	156	124
Major occupation:			
Farming	percent of farms	90	88
Other	percent of farms	10	12
Experience in hog production:			
Operator of 1992 operation	years	19	19
Work on any operation	years	27	24
Operator age ¹ :			
Fewer than 35 years	percent of farms	13	16
35-49 years	percent of farms	28	42
50-64 years	percent of farms	30	35
65 years or more	percent of farms	29	8
Average age	years	52	47
Operator education: ¹			
Less than high school	percent of farms	13	13
Completed high school	percent of farms	58	52
Some college	percent of farms	24	20
Completed college	percent of farms	5	14

¹Data may not sum due to rounding or omission of possible categories.
na = not applicable; d = insufficient data for disclosure.

Appendix table 17--Performance and production practices of FCRS farms with contract and independent feeder pig-to-finish hog operations, 1992

Item	Unit	Contract operations	Independent operations
Market hogs:			
Sales and contract removals	head	1,696	696
Sales	percent	3	100
Contract removals	percent	97	0
Hog weights:			
Purchase/contract placement	pounds	46	46
Sale/contract removal	pounds	239	241
Death loss (feeder pig to market)	percent	1.35	2.29
Feed efficiency:¹			
Grain	pounds per cwt gain	123	311
Protein source	pounds per cwt gain	28	46
Complete mixes	pounds per cwt gain	172	44
Other feed items	pounds per cwt gain	d	d
Total	pounds per cwt gain	323	402
Homegrown grain	percent of grain fed	3	56
Feed processing and handling:			
Portable grinder mixer	percent of farms	3	71
Stationary grinder mixer	percent of farms	d	4
Other grinder mixers	percent of farms	3	7
Feed conveying system	percent of farms	57	15
Labor efficiency:¹			
Paid labor	hours per cwt gain	0.03	0.22
Unpaid labor	hours per cwt gain	0.27	0.85
Total	hours per cwt gain	0.29	1.06
Finishing building capacity	head	698	389
Finishing building:¹			
Total confinement	percent of capacity	49	31
Enclosed	percent of capacity	25	26
Open with outside access	percent of capacity	26	41
Portable	percent of capacity	0	5
Average age	years	17	22

¹Data may not sum due to rounding or omission of possible categories.
na = not applicable; d = insufficient data for disclosure.

Appendix table 18A--Cash costs and returns of hog production on FCRS farms with contract and independent feeder pig-to-finish operations, 1992

Item	Contract operations	Independent operations
	<i>Dollars per cwt gain</i>	
Gross value of production:		
Market hogs	51.83	53.09
Feeder pigs	0.04	0.05
Cull stock	0.04	0.01
Breeding stock	0.00	0.01
Inventory change	1.09	-0.19
Total gross value of production	53.00	52.97
Cash expenses:		
Feed--		
Grain	4.37	10.89
Protein sources	3.88	6.01
Complete mixes	16.03	4.57
Other feed items	0.04	0.48
Total feed costs	24.32	21.95
Other--		
Feeder pigs	18.13	18.03
Veterinary and medicine	0.78	0.69
Bedding and litter	0.22	0.08
Marketing	0.45	0.37
Custom services and supplies	0.40	0.33
Fuel, lube, and electricity	0.35	0.96
Repairs	0.26	1.00
Hired labor	0.14	1.23
Total, variable cash expenses	45.05	44.64
General farm overhead	1.05	1.29
Taxes and insurance	0.65	0.85
Interest	2.19	2.99
Total, fixed cash expenses	3.89	5.13
Total, cash expenses	48.94	49.77
Gross value of production less cash expenses	4.06	3.20

Appendix table 18B--Economic costs and returns of hog production on FCRS farms with contract and independent feeder pig-to-finish operations, 1992

Item	Contract operations	Independent operations
	<i>Dollars per cwt gain</i>	
Gross value of production:		
Market hogs	51.83	53.09
Feeder pigs	0.04	0.05
Cull stock	0.04	0.01
Breeding stock	0.00	0.01
Inventory change	1.09	-0.19
Total gross value of production	53.00	52.97
Economic (full-ownership costs):		
Variable cash expenses	45.05	44.64
General farm overhead	1.05	1.29
Taxes and insurance	0.65	0.85
Capital replacement	4.73	7.35
Operating capital	0.80	0.80
Other nonland capital	1.83	2.71
Land	0.05	0.13
Unpaid labor	1.69	5.39
Total, economic (full-ownership) costs	55.85	63.16
Residual returns to management and risk	-2.85	-10.19