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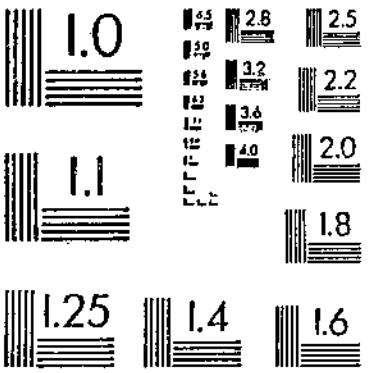

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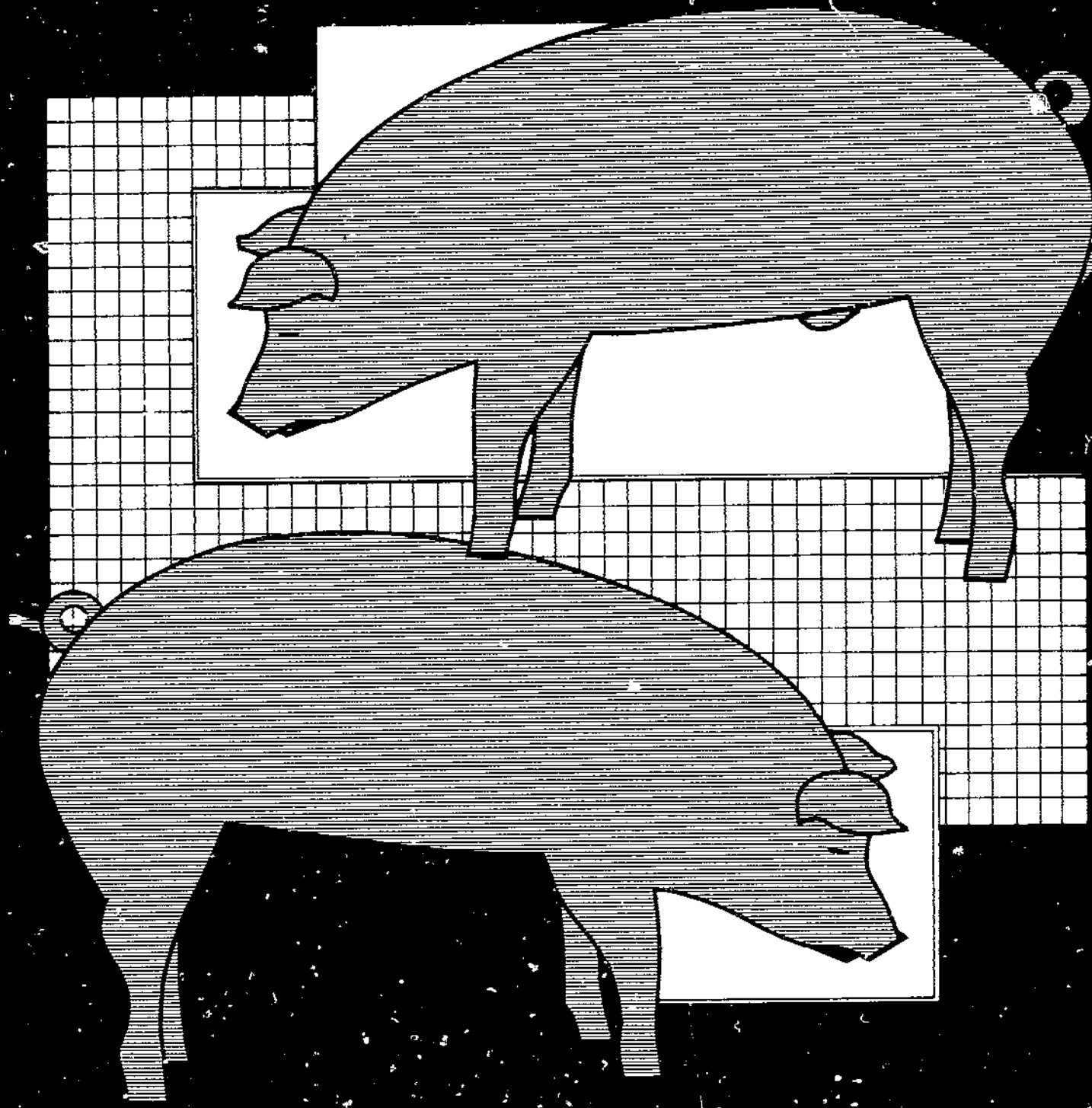
Economies of Size in Hog Production

Roy N. Van Arsdall
Kenneth E. Nelson



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Abstract

Large hog operations achieve economies of size over small hog operations through more intensive use of facilities, somewhat better feed conversion, lower feed costs, and lower unit labor use. Economies of size are large enough that in a year of low returns, some small enterprises may fail to cover cash costs, while large enterprises cover all costs, including capital replacement. Large producers' advantage is less when only shortrun cash costs are considered; as the planning period increases, so does the large producers' advantage. This report discusses economies of size in numerous aspects of hog production: inputs and costs, investments in depreciable assets, returns, income taxes, and physical, price, and economic performance measures in the North Central and Southeast regions, the major U.S. hog-producing areas.

Keywords: Hog production, economies of size, cost of production, farrow-to-finish, feeder pig production, feeder pig finishing

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Summary

Large hog operations achieve economies of size over small hog operations through more intensive use of facilities, somewhat better feed conversion, lower feed costs, and lower unit labor use. Economies of size are large enough that in a year of low returns, some small enterprises may fail to cover cash costs, while large enterprises cover all costs, including capital replacement. Large producers' advantage is less when only shortrun cash costs are considered; as the planning period lengthens, so does the large producers' advantage. This report discusses economies of size in numerous aspects of hog production for the North Central and Southeast regions, the major hog-production areas.

Specific findings of this report:

- Economies of size in hog production are substantial and continue to increase for operations producing up to at least 10,000 head, although performance varies among producers of all sizes.

- Large producers fared significantly better on pigs farrowed and weaned per litter, litters farrowed and pigs weaned per female year, death losses, and feed conversion rates. Smaller producers marketed hogs at higher weights. Of the eight physical performance measures studied, pounds of hogs produced per litter was the only measure on Illinois farms unrelated to size of operations.

- Large producers performed better on four of the five price performance measures studied—prices received for hogs, prices paid for feeds, ration costs, and labor costs. Performance varied significantly for all producers on total returns.

- Large producers fared better on all three economic performance measures: feed costs per hundredweight (cwt) of hogs produced, returns per $100 feed fed, and returns above feed cost.

- Large size of enterprise alone is no assurance of success. Performance varies widely among hog producers of similar size, but variability is greatest among small producers. Some small producers can do as well or better than their large counterparts, especially in physical terms, but competition will likely keep them from earning sufficient margins of returns per unit of production to make continued production attractive.

- Large hog enterprises realize more of the potential fertility value of hog manure through reduced expenditures for fertilizer than do small enterprises, but none realize more than one-sixth of their potential.

- Although the basic graduated income tax reduces the net income advantage of large hog producers, investment credit and incorporation allow large farms to recapture much, but not all, of the returns removed by these taxes

Hog production will likely continue to shift toward a smaller number of large, industrialized, and highly specialized operations, increasingly separate from crop production. As a result:

- Businesses associated with hogs will be affected during the shift toward larger hog enterprises in terms of the mix of the labor, goods, and services required by large rather than small producers. Resources will be both saved and wasted in the shift.

- Closed, more concentrated operations should retard the introduction and spread of hog diseases, but if depopulation of an enterprise due to disease becomes necessary, the impact could be severe.

- As hog production becomes increasingly separate from crops, alternative uses for manure will become important.

- Meat quality and consistency is likely to improve, while the cost to consumers should decline.

- Larger firms will have less flexibility in output, contributing to sticky supply response.

Economies of Size in Hog Production

Roy N. Van Arsdall and Kenneth E. Nelson*

Introduction

Economies of size were seldom considered seriously for U.S. hog production until recently. Some 2.1 million farmers produced and sold hogs as part of their farming operations in 1950. Over half of all farmers in the major corn-growing States produced some hogs, although most farmers limited production to the number they could handle with off-season labor. The largest enterprises seldom exceeded a few hundred head. Hogs justly earned the title of "mortgage lifters" when they were only a part of diversified crop-livestock farms because hogs usually added to net farm income. Farmers judged whether to produce hogs mostly by whether they expected more for their corn if fed to hogs or sold on the market. Not much else of cash value went into hog production.

Hog production, though cyclical, has stayed nearly constant since 1950 at around 20-22 billion pounds liveweight. Here, however, any similarity with early periods ends. Technology, most of it capital intensive, has moved into all aspects of hog production. Producers number less than one-sixth as many as in 1950. By the end of 1983, 51 percent of all U.S. hogs were produced on the 6 percent of the farms with the largest operations.

This report estimates the average costs and returns for varying sizes of hog enterprises. Analyses cover the major types of hog enterprises— farrow-to-finish, feeder pig production, and feeder pig finishing—in both of the major U.S. hog-producing regions, the North Central region and the Southeast (fig. 1).

Background

Hog producers compete with each other for a market which, year after year, is quite specific in terms of the pork supplies consumers want. Hogs as mortgage lifters of years past could become mortgage makers if producers make investments that hogs won't cover. If large-volume producers are more efficient than smaller ones, they will have a competitive advantage which will largely determine the size structure of U.S. hog production.

Economies of size is now a major issue for hog producers and all associated businesses. Lenders, suppliers of inputs and services, marketing agencies, and pork processors will all be affected by shifting economies in the production sector. Because pork is an important part of the American consumer's red meat supply, efficiencies in hog production are important to the public. Hog production takes substantial resources, and the production technology used affects the resource use in other farming activities.

About 8 of every 10 U.S. farmers raised hogs during the first half of this century. Even during the 1950's, half of all farmers continued to raise hogs (*39*).[1] Nearly all enterprises were quite small. Technologies permitting hog production in capital intensive systems were adopted during the 1960's, thus making larger, more specialized operations significant. Once begun, change took place rapidly.

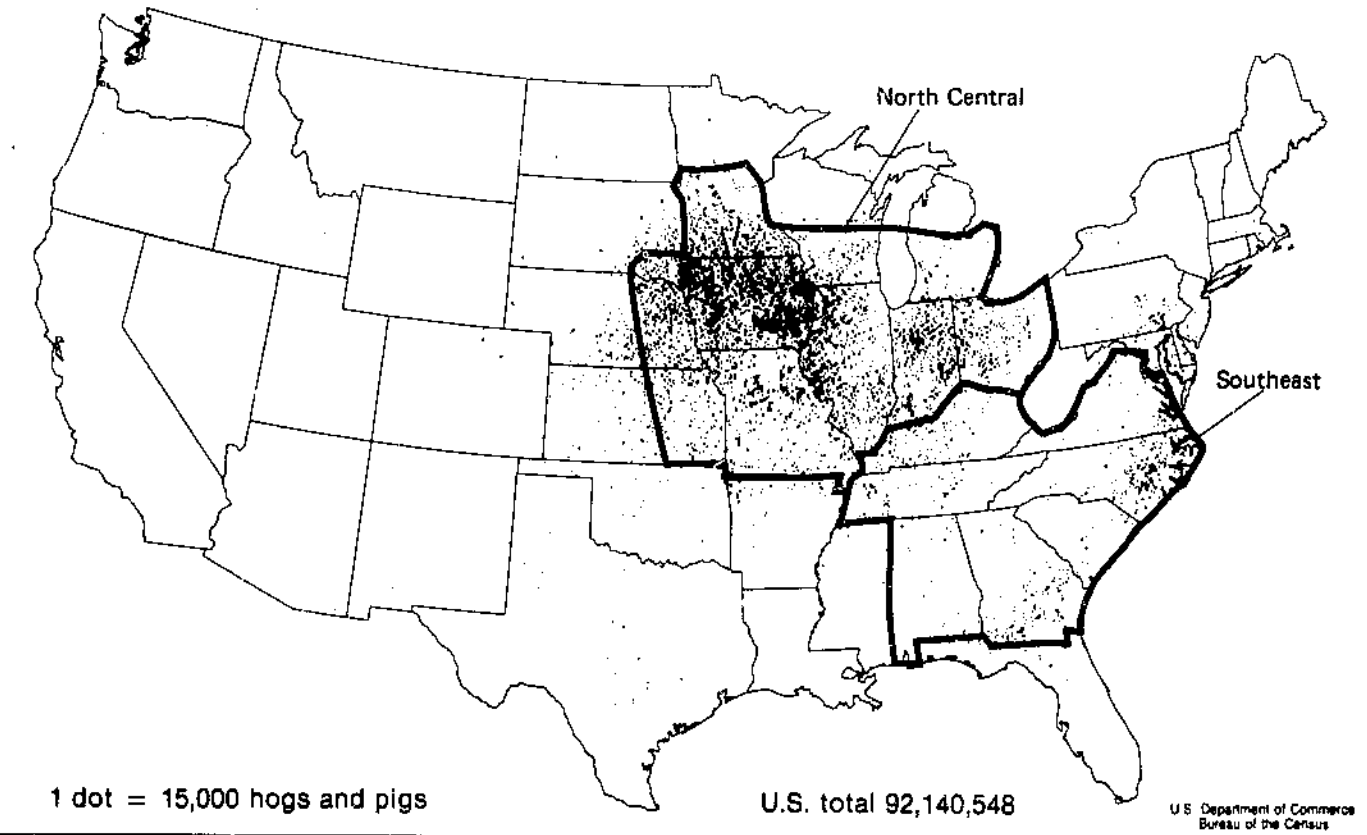
Producers selling 1,000 or more hogs annually—0.5 percent of all hog producers—accounted for only 7 percent of total hog production in 1964. Those with annual sales of fewer than 100 hogs accounted for 23 percent of all hogs sold, and two-thirds of all producers selling hogs. Producers with annual sales of 1,000 head or more sold 13 percent of the total in 1969, 25 percent in 1974, 34 percent in 1978, and 48 percent in 1982 (fig. 2) (*39*). Producers selling 5,000 or more hogs annually accounted for a larger share of total production in 1982 than did those selling 1,000 or more hogs 18 years earlier.

* The authors are agricultural economists (Van Arsdall now retired) in the Animal Products Branch, National Economics Division, Economic Research Service, U.S. Department of Agriculture.

[1] Italicized numbers in parentheses refer to items listed in the references.

Figure 1

Hogs and pigs sold, 1978



The most rapid shift to larger volume hog operations has occurred mostly since 1980 when total production was excessive relative to demand, and returns to producers were poor. Thousands of small producers gave way to larger ones between 1980 and 1984. The number of hog operations during this period dropped 34 percent nationally and 41 percent in the Southeast. By the end of 1984, the 6 percent of all producers who had 500 or more hogs in inventory (approximately equal to minimum annual sales of 1,000 head) held 52 percent of the total U.S. hog inventory (*38*).

In the late 1950's and early 1960's, Corn Belt producers achieved least cost per hundredweight (cwt) of hogs with around 60 sows in two-litter systems (spring and fall farrowing). The best individual records were often made by producers with half that number (*1, 2*). In the early 1960's, multiple farrowing (year-round rather than the more common two-litter systems) proved to be uneconomical (*20*). More intensive use of facilities cut housing costs per unit of production, but increases in other costs more than offset these savings. Producers had not yet learned the requirements of intensive production.

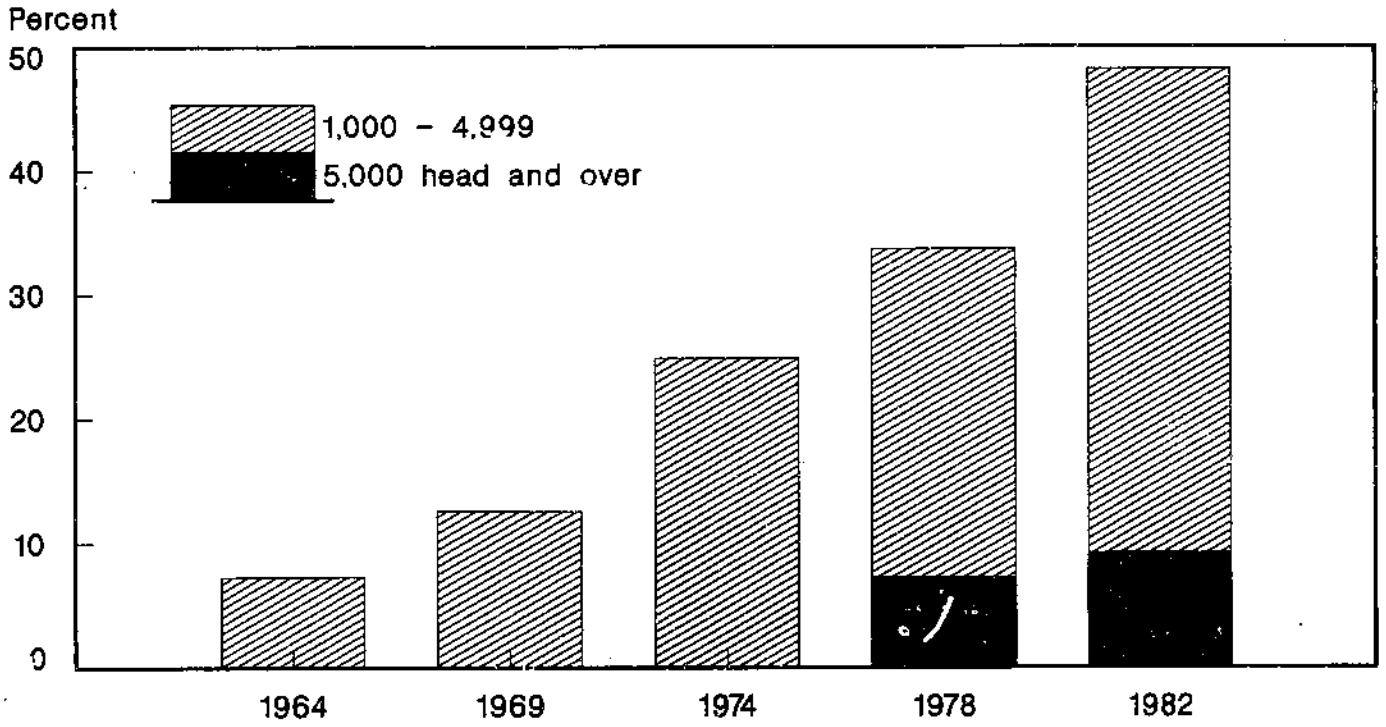
Research in the late 1960's indicated that two- or three-worker diversified hog-grain farms could achieve least cost per unit of output with hog production of around 140 litters per worker (*4, 7, 9, 28, 42*).

Researchers began to record the changing characteristics of expanded hog operations in the 1970's (*24, 25, 27, 41*). One study estimating economies of size synthetically (by economic engineering) generally showed average costs at a minimum for operations producing 5,000 to 15,000 hogs a year, but actual performance records for operations of this size were not available (*6*). Still, such levels of production sharply contrasted with the 30- to 60-sow operations holding the low-cost position 15 years earlier.

Producers marketing more than 1,000 hogs a year continue to gain shares in both major hog-producing

Figure 2

Hogs and Pigs Sold by Size of Operation



Source: 39.

regions (fig. 3). These producers accounted for 46 percent of total hog production in the North Central region and 57 percent in the southeast in 1982. Midsize enterprises (annual production of 200-1,999 head), however, were still prominent in the North Central region, accounting for nearly two-thirds of total regional production in 1982 (fig. 1 and app. table 1). Midsize enterprises in the Southeast accounted for 42 percent of total production in 1982, but those turning out 5,000 head or more had jumped to 22 percent of the total.

The distribution of hog production from operations with annual sales above 5,000 head is not known precisely. The usual U.S. Government statistical reports are prohibited from publishing information that might be tied to individual operations. By all present standards, however, some operations that can only be described as super-size are now producing hogs. One recent study indicates that the largest operations have the highest past and projected rates of growth (*10*). A farm magazine recently listed the 10 largest hog operations as having from 6,000 to 35,000 brood sows (*13*). Given usual rates of reproduction, the midsize operation in this group would turn out more than 150,000 hogs a year, the largest well over half a million.

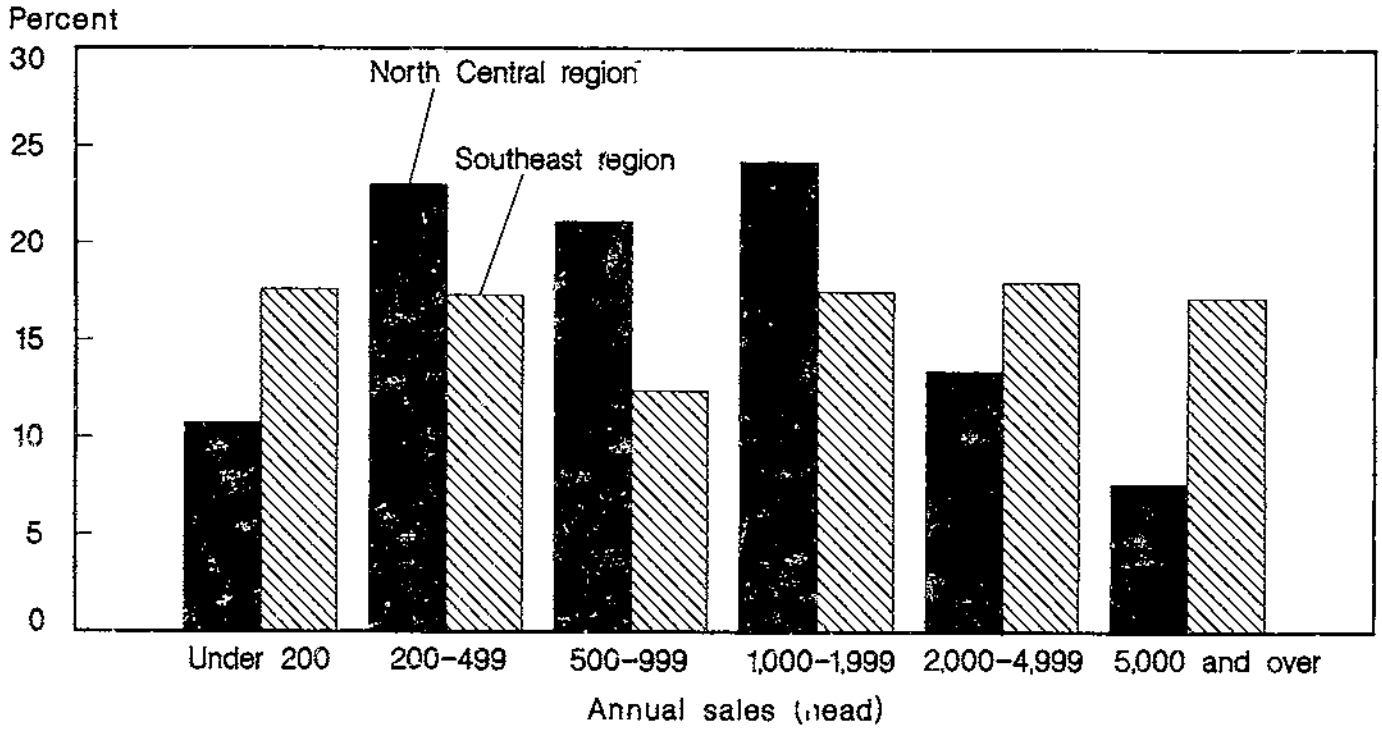
This report covers only operations with annual production under 10,000 head. Performance measures are not available for operations of super size. The fact that these operations exist is no assurance that they have a competitive edge over smaller operations, but that they have not yet encountered diseconomies that would force them to contract or go out of production. Estimates of costs and returns for operations of increasingly larger size to a maximum of 10,000 head can only suggest what the competitive status may be for still larger operations and the impact of future developments.

Methodology

Commercial hog production includes three types of enterprises: (1) farrow-to-finish operations in which all

Figure 3

Hog Production by Size of Operation, 1983



Source: Appendix table 1.

phases of slaughter hog production are carried out on one enterprise, (2) feeder pig production in which pigs are produced and sold to someone else for finishing to slaughter weight, and (3) feeder pig finishing, where pigs are bought from other producers and fed to slaughter weight. Economies of size are measured for each type of enterprise, emphasizing farrow-to-finish enterprises which account for most U.S. slaughter hog production.

Cost measurements reflect both physical efficiencies and the effect of volume on prices. The relationship between these two variables shows average costs producers face as they actually operate. No attempt is made to determine the least possible cost that producers could theoretically achieve.

Costs and returns are estimated for 3 separate years. Estimates for 1980 show the outcome for producers under unfavorable economic conditions. Estimates for 1982 represent one of the most favorable years on record for hog producers. The most recent estimates available are for 1983, when hog producers fared little better than in 1980.

Length of the planning period determines which costs of production are relevant to production decisions. Alternative planning periods are therefore examined for their effect on production decisions by producers with different sizes of enterprises under varying economic conditions.

Theoretical Measurements of Economies of Size

Measurement of economies of size seems deceivingly simple. Economies of size reveal the costs to produce a unit of product associated with increasing use of some or all the inputs. Costs of the inputs are added and divided by output (or gross income) to get the average cost per unit of output (or gross income).

To calculate economies of size, a series of firms from small to large is usually examined. Each size of firm is identified by a fixed amount of a resource—usually a

major resource, but it could be any resource or group of resources. Hog housing, for example, could be chosen with fixed supplies set at the recommended amount for 100 hogs, 200 hogs, and on to the largest operation to be examined. Next, each set of housing is combined with other inputs necessary for production, first with only enough other inputs to partly use the housing, then with successively larger amounts of other resources until the housing capacity becomes overtaxed. The costs for producing a hundredweight (cwt) of hogs will first decline as the fixed costs of housing are spread over more and more hogs, then eventually rise as excessive crowding cuts performance.

A series of these cost estimates for successively larger operations shows the relationship between size (or volume of production) and longrun average costs of production when all inputs are subject to change (or are variable). If all cost curves bottom at the same average total cost, then there are no economies of size; any one size of operation can do as well as any other. If the cost curves bottom at successively lower levels, however, then economies of size exist. Economies of size turn into diseconomies if at some point large-size operation costs do not drop to the level reached by smaller enterprises.

The lowest cost achieved by the entire series of firms of different sizes indicates the least possible longrun cost per unit of production. Over time, production will gravitate toward the size of enterprise that achieves this least cost per unit. Total production will eventually adjust so that product price is just high enough to cover all costs.

Empirical Measures of Economies of Size

The preceding view of an economies of size analysis provides a suitable conceptual framework for examining economies of size in hog production. Moving from theoretical cost estimates to the real world, however, destroys the simplicity of such an analysis. Many questions arise, including the various lengths of planning periods to consider, which inputs to include as costs of production and which to leave as residual claimants on returns, and the price to assign to inputs not purchased for cash. Other questions include whether measurements should be based on differences in physical efficiencies among operations of various sizes given the same prices for inputs and output (most past economies of size analyses have followed this procedure), or whether price differences should also be included in the outcome. Particular interests may hinge on comparisons before or after income taxes, the effect of tenure status, changing risks, or acquiring capital for an expanding business. Problems and alternative ways to measure economies of size are examined in a number of publications (*5, 12, 16, 18, 35*). Certainly no single method of analysis can answer all questions. This report is a static analysis of differing levels of efficiency actually observed in hog production and their conversion into estimated costs and returns, by size of enterprise, considering both physical and price relationships.

Large-volume producers may gain economic advantage over smaller ones through two basic avenues. First, they may have the knowledge and ability to get more output from their physical resources. For example, they may use fewer pounds of feed to produce a pound of gain, produce more hogs per unit of labor or machine time, raise more hogs per unit of housing, or save more pigs per litter. These efficiencies would give them economic advantages even if input prices were the same for businesses of all sizes. Second, prices may not be the same for everyone. Larger producers may use less costly inputs or get discounts simply because the large quantities they buy mean savings to the seller. The combination of physical efficiencies and input prices determine the level of costs for producers.

Product price may also affect the competitive status of producers with different sizes of operations. While product price has no bearing on costs per unit of production, it obviously affects the margin between costs and returns. Therefore, if larger volume producers either produce a better quality product or can bargain for a better-than-average price for a given quality of product, possibly both, they may have an economic advantage over smaller producers in both production and marketing.

Realistic evaluation of the competitive situation among hog producers of varying sizes requires measuring production and marketing, in terms of both physical quantities and money. Comparisons that consider only physical performance, when all inputs are priced the same regardless of volume, only partly reveal the competitive situation among firms.

The price of inputs is often more difficult to determine than physical measures of performance. Some inputs are bought for cash and their cost can be accurately recorded. Other inputs, like corn, are commonly produced in the same business and may be used in hog or other livestock enterprises or sold. What is the cost of feeding this corn to hogs? Unpaid operator and family labor still care for most hogs produced in the United

States, especially on smaller operations. What is the cost of this labor? Cost rates and prices which producers base their decisions on determine the real competitive position among producers of different sizes.

Measures of physical efficiencies, and a number of actual costs, were obtained for this report by type and size of hog operation through periodic producer surveys in the major hog-producing States. Some data from a survey conducted in 1976 (*41*) are used, but this analysis rests largely upon data from a 1981 survey that included identification of production characteristics, measures of physical performance, and some cost information by size of operation (*43*). Product prices and cost rates for inputs are from other sources (*37*).

The North Central region accounts for nearly four-fifths of total production, while the Southeast produces most of the remainder. Six sizes of hog enterprises are analyzed, not by any fixed set of resources as is the usual procedure, but according to annual production of 140, 300, 650, 1,600, 3,000 and 10,000 head of hogs. Detailed costs and returns are estimated for each enterprise reflecting actual performance as reported by producers. The makeup of each enterprise is representative of its size group and reflects both physical efficiencies and price differences. Thus, average costs and returns for each representative enterprise are shown rather than the best possible performance for an enterprise of that size. Differences among average or typical producers of different sizes instead of differences among the best producers thus reveal economies of size.

Planning Periods. Costs of production indicate probable producer decisions only when associated with a specific production or planning period. Planning periods are commonly identified as short run or long run, the first being a situation where some inputs are already committed to the enterprise (fixed costs) and others are yet to be committed (variable costs). The year ahead has traditionally been treated as short run by researchers and producers alike. Producers ignore fixed costs in production decisions because nothing can change them; those producers with all facilities in place need consider only the feed and other inputs to add during the year. Longrun planning periods have come to mean those long enough that every input must be replaced. This is equivalent to the decision setting for a person not yet in business, who must purchase all inputs to begin production.

Any one concept of planning period or length of run can lead to misunderstanding. Producers face a constantly changing and uncountable number of decisionmaking situations or lengths of run. When prices are falling, the issue may be whether to feed hogs for one day or sell them. Every prior input is a fixed cost. Only for those not yet in business are all possible costs relevant to decisionmaking. Hog operations of different sizes must be evaluated under alternative settings to understand their relative competitive positions and probable production decisions over time. Possibilities are limitless; only a few situations can be measured.

In this analysis, three situations are evaluated. The *first* counts only the cash costs of raising hogs. No charge is made for unpaid labor, and all facilities are assumed to be in place. The *second* stretches time a bit further, so that cash costs used for production to continue and unpaid labor are both covered. Again, all necessary facilities are considered in place. The *final case* further expands the time horizon, recognizing that not only will cash costs have to be paid and labor adequately rewarded, but all facilities will eventually have to be replaced at current prices. This last situation counts the cost of all inputs as they would be considered by a prospective entrant to hog production. In reality, ongoing producers never encounter a situation when all possible costs enter into their production decisions (as is true for a prospective entrant) because different kinds of depreciable assets have different useful lives.

Production Inputs and Costs

Hog producers' competitive position in terms of costs of production is determined by the kinds of resources they use, how well they use them, and what they pay for them. All costs are placed in four general categories in this analysis: variable cash expenses, fixed cash expenses, unpaid labor, and capital costs. Each category of costs affects producer decisions relative to production differently, and hence producer competitive positions. Each poses unique questions relative to pricing of inputs, since some are paid for in cash while others are paid for in foregone opportunity to use the input elsewhere. Input mixes (or production technologies) are those used by representative producers with each size and type of hog enterprise in the North Central and Southeast regions. Physical efficiencies reflect actual performance of representative producers, not the maximum achievable performance (*43*). Charges for inputs are based on actual expenditures for inputs that are purchased, opportunity costs for all others.

Variable Cash Costs

Inputs in the variable cash cost category are those purchased for immediate use plus farm-produced inputs

that could be readily sold were they not committed to hog production. These cash costs vary directly with the amount of hog production, and would cease if hog production stopped. They include feed, veterinary services and medicines, custom services, energy, bedding, repairs, hired labor, marketing costs, and interest on operating capital.

Feed, including additives and/or medications combined with feed, dominates variable cash expense for producing hogs. This expense averages almost four-fifths of all variable cash expenses in farrow-to-finish and pig finishing, two-thirds in pig production. The competitive position of producers in terms of variable cash costs is largely determined by their efficiency in acquiring and converting feed to pork.

Larger hog producers achieve better rates of converting feed into gain on hogs than do smaller producers, but their advantage is not great (*43*). Differences in feed costs per unit of production among various sizes of enterprises stem more from the mix of feed ingredients and prices paid for them than from differences in rates of conversion of feed into gain.

Corn is commonly used in hog rations in the major hog-producing regions. Much of the corn fed to hogs—about 85 percent in the North Central region and nearly 50 percent in the Southeast—is produced in the same farm business as the hogs. Only on the largest hog operations does purchased corn outweigh the amount grown on the same farm. Corn can be as readily sold as bought. Therefore, regardless of its source, corn's market price is considered its cash cost when fed to hogs in all types and sizes of enterprises.

High-protein feeds and other ingredients supplement corn to meet the nutritional requirements of hogs. Virtually all hog producers now feed complete rations, but make them in different ways (*43*). Small operators rely mostly on commercially formulated supplements, while larger operators commonly buy soybean meal and the ingredients which must be added to it. Producers who formulate their own rations incur processing costs and increased management responsibilities, but they save in ingredient costs. Price discounts for volume purchases must be considered for all supplementary ingredients.

Pastures are counted as a part of feed costs, but are limited to some smaller hog operations. Only variable cash costs of producing pasture go into the feed account; land and machinery ownership costs are capital costs.

Energy expenditures are for fuels (gasoline and diesel), oil, and grease for tractors, trucks, and other engine-driven equipment; electricity; and heating fuels. Outlays for electricity and heating fuel are the amounts reported by producers. Outlays for motor fuels, oil, and grease are based on engine sizes and hours of use as reported by hog producers, calculated fuel consumption, and average fuel prices adjusted for refundable Federal and State excise taxes (*34*).

Repairs on machinery, equipment, housing, and other facilities used in hog production are estimated with formulas developed by agricultural engineers. These formulas are based on long-term repair records for different assets (*34*).

Hired labor varies with differences in the amount of labor hired relative to total labor used, differences in labor productivity among operations, and differences in wage rates. The largest operations used only one-fourth to one-fifth as many hours of work per unit of production compared with the smallest due to capital-labor substitution, more effective work routines, and differences in worker abilities. Large operations, however, hire most of the labor they use and pay higher wages commensurate with the skill of their employees. Most work on small operations is done by the unpaid operator and family members (*43*).

Interest on operating capital (the cash expenditures for variable inputs in hog production) is treated as a variable cash cost of production regardless of how much money is borrowed for this purpose. Producers may use their own funds for operating expenses and thus make no cash interest payments, but they have a readily available opportunity to invest those funds elsewhere the same as they might sell rather than feed corn. The charge for operating capital is set at the relevant 6-month U.S. treasury bill interest rate (*31, 32*).

Several other inputs, such as veterinary services and medicines, custom services, and marketing fees, are also variable cash expenses. These costs are charged according to the amounts reported by hog producers.

Fixed Cash Costs

Hog producers have a number of cash expenses to meet during a specific period (commonly a year) which are not affected by what happens to hog production during that period. These fixed cash expenses fall into two general categories. First are the ordinary expenses facing any operation regardless of its equity position, including personal property and real estate taxes, property insurance, rent, and general business overhead

costs. The second category includes interest and principal payments on debt. Cash outlays in this latter category are determined entirely by the equity position of the business.

Taxes and insurance are determined by the value of the assets involved and the relevant cost rates.

General farm overhead costs include expenses for the many items not chargeable to a particular enterprise: telephone, office supplies, dues and fees, liability insurance, and other general business expenses. Total farm costs for these items are divided among a farm's various enterprises in proportion to their share of total farm receipts.

Fixed cash costs related to the equity of a business, the cash payments for interest, and principal on debt, affect a business's financial vulnerability. Equity may also affect shortrun management strategies, which are outside the scope of this report. Over time, however, equity is not a factor in determining a business's economies of size. Capital costs are not part of the recurring fixed cash costs associated with productivity and are treated (without regard to equity) in the capital costs section of this report.

Unpaid Labor

Like hired labor, unpaid labor is an input for hog production. Both labor types commonly work side by side performing the same activities. The cost (or value) of unpaid labor, however, cannot be determined with the same accuracy as for hired labor, which is largely paid for in cash.

Unpaid labor is a residual claimant, rewarded only if something is left after other costs have been paid. Unfortunately, measurement of the return necessary to keep unpaid labor engaged in hog production is clouded by other inputs—sunk capital, management, risk—which are also residual claimants. A business may operate for many years with less than full payment to all residual claimants, but just where the shortage is absorbed is indeterminate.

The least cost for unpaid labor is sometimes said to be the reservation price; if they receive lower earnings, unpaid workers would opt for alternative activities. Measurement of minimum acceptable earnings in actual operations is not possible, however, because of other factors which also stand with unpaid labor as residual claimants.

Opportunity cost—what unpaid workers could earn in other activities—is the more realistic way to price unpaid labor used in hog production. Unpaid workers are most likely to have the option of employment that pays at least the same wage as for the employees who work with them. Unpaid workers in small operations are thus assigned the same relatively low wage rates as their paid counterparts in this analysis; those in larger operations are valued according to the higher wage rates paid to employees in these operations.

Capital Costs

Differences in the kinds and costs of capital assets and how effectively they are used greatly determine the economies of size in hog production over time. Investments include outlays for depreciable assets such as machinery, equipment, buildings, and breeding stock, and the relatively small acreages of land used directly by the hog enterprise.

Capital investments are measured in terms of their current replacement cost. The basic question raised is whether operations of various sizes and systems of management can justify new investments on a competitive basis, not whether capital sunk at some earlier time is being recovered.

Cost estimates for each representative hog operation include the current investment costs of the kinds and amounts of facilities at the actual rates of use. Investment in general-use items such as tractors and trucks are charged to hog production in proportion to their use for hogs. A replacement reserve is charged for depreciable assets based on current investment costs and the assets' expected useful life. This extends measurement of the competitive status of operations into the future, adding capital replacement to cash costs and returns required for unpaid labor.

Producers may borrow for investments in hog production, and incur cash interest payments; use their own funds, and forego potential alternative earnings; or use a combination of these two sources of capital. Whatever the source, there is either a cash or foregone interest cost to committing capital to hog production for long periods of time. Investment values may also fluctuate over time due to price changes not reflected in depreciation or replacement reserve schedules. To minimize the impacts of changes in values, the Economic Research Service (ERS) of the U.S. Department of Agriculture (USDA) has determined that the interest costs charged for capital used in the production of all commodities are based on the rate earned by agricultural

production assets over the most recent 20-year period (*31, 32*).

Charging capital with an opportunity cost based on historical rates of return for agricultural assets avoids the problem of crediting an enterprise with capital gains on its assets or charging it with capital losses when prices change. This is particularly significant in crop production where anticipated capital gains on land may be as important as expected returns from crops, and applies to hog production in a much lesser way. The advantage of using average historical rates of return to reflect opportunity costs is that it allows comparison of the economic costs of enterprises regardless of equity or tenure.

On the other hand, the 20-year historical nominal rate of earnings averaged only about 4.4 percent for 1980-83 (*32*). This is only about one-third of the actual interest rate charged by lenders during these years. Using this rate places costs below amounts paid by producers who borrowed heavily. Using the same rate for all operations also ignores the possibility that borrowers of different amounts of capital may use different sources of capital, pay different rates of interest, and possibly have different rates of opportunity earnings depending on their abilities and how much capital they control. Average interest rates are nevertheless applied to capital investment in all operations regardless of size, pending more specific information.

Investments in Depreciable Assets

Corn and hog prices once dominated the economics of hog production and hog producer decisions. These two factors remain very important, but advances in technology, increased specialization, and greatly enlarged hog operations have increasingly made investments a major measure of economic performance. Effective use of capital is often the major determinant of success or failure in hog production.

The traditional small hog enterprise that was usually a supplementary part of a general crop-livestock farm required few additional investments for hog production. Hogs are now produced in farm business settings where investments in depreciable assets and their associated ownership costs (the fixed costs of depreciation, interest, taxes, and insurance) have become a major cost for hog production.

Investments in depreciable assets for hog production fall into three categories. First are the hog buildings and equipment such as farrowing houses, nurseries, growing-finishing buildings, feeders, and other such specialized facilities designed and acquired specifically for and chargeable wholly to hog production. Second are the investments in breeding stock also specific to hog production. The third category includes a wide array of general purpose machinery and equipment such as tractors, trucks, feed mills, manure spreaders, and the like, which may be used in crop, other livestock enterprises, or both.

Existing investments in depreciable assets, whether made 1 or 30 or more years ago, reflect sunk capital which the producer cannot change. The amounts of such past investments are not relevant to production decisions. Investment costs in this analysis thus reflect current replacement costs for all assets for all types and sizes of hog enterprises. Investments reflect the kinds of assets used and their actual rate of use (*43*).

Replacement cost of depreciable assets per unit of production reflects economies of size for all three types of enterprises in both major regions of hog production (fig. 4 and app. tables 2-4). Replacement investments per cwt of production are generally as high or higher for the smaller operations as for the larger ones, even though small producers use facilities with few if any of the technological advances used by large-volume producers. As operations increase from small to large, unit investments change in steps, declining for a time, then increasing before continuing to decline as size of enterprise grows. This step-wise process occurs as producers become large enough to exploit fully one level of technology, then encounter higher unit costs as they adopt the next higher level of technology, but do not have the size or farm enterprise mix to exploit their production capacity fully.

Unit investments drop as size of hog enterprise increases because of a number of factors, mostly pertaining to size. Given the type of building, a unit of space costs less in a large building than in a small one. For example, each sow space in a fully equipped 10-crate farrowing house cost over $2,500 in 1983. A sow-space in an equivalent 50-crate house cost less than $2,000 (app. table 5). Many items of equipment, such as a feed mill, have a relatively high initial cost for the smallest size available yet have the capacity to serve large operations. Their unit cost can be quite high when used below capacity.

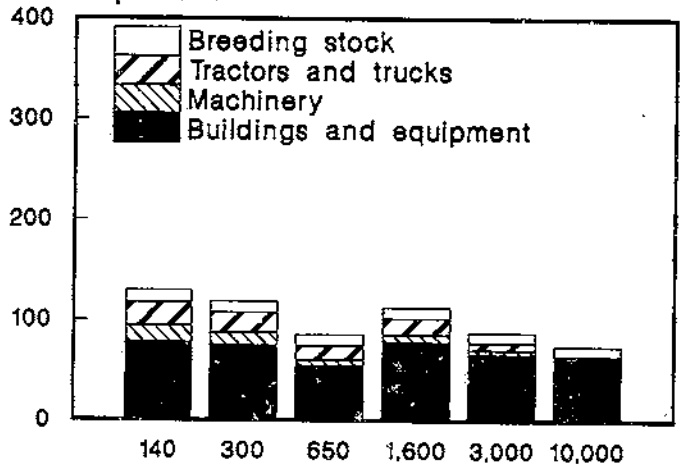
Differences in intensity of use of major facilities have the greatest effect on unit investments. Producers with small hog enterprises commonly turn out only 2 or 3 litters of pigs for each farrowing space annually while

Figure 4

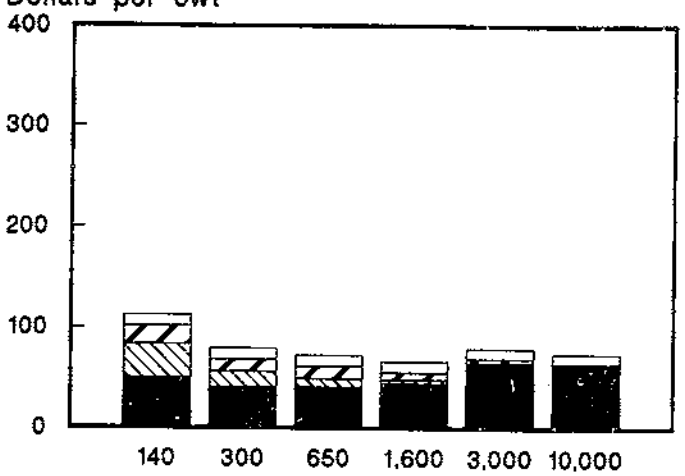
Replacement Cost of Depreciable Assets per CWT of Production, 1983

Farrow-to-Finish

North Central Region

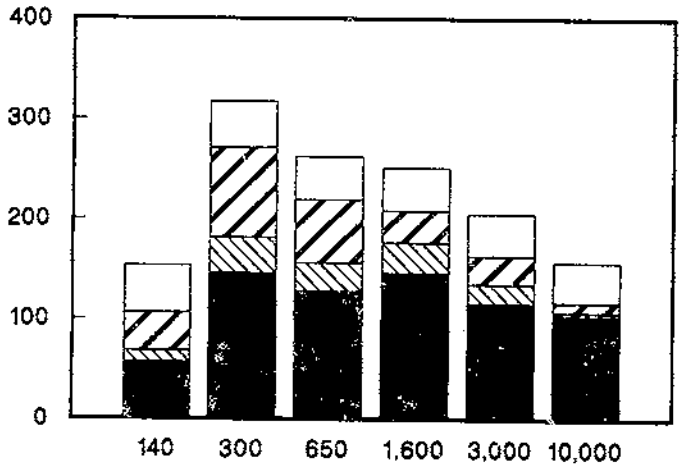


Southeast Region

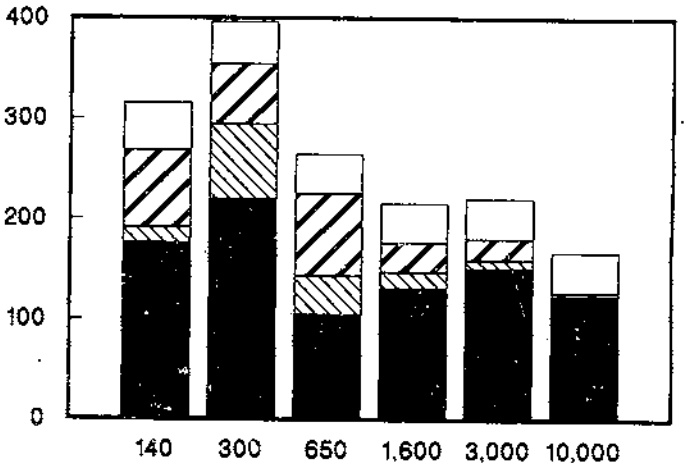


Feeder Pig Production

North Central Region

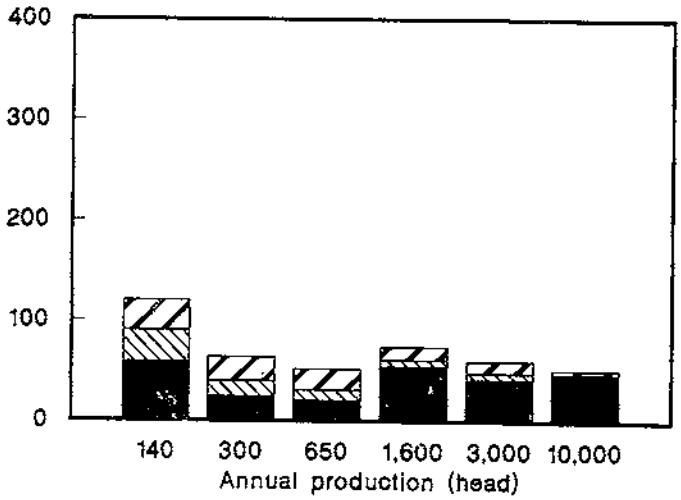


Southeast Region

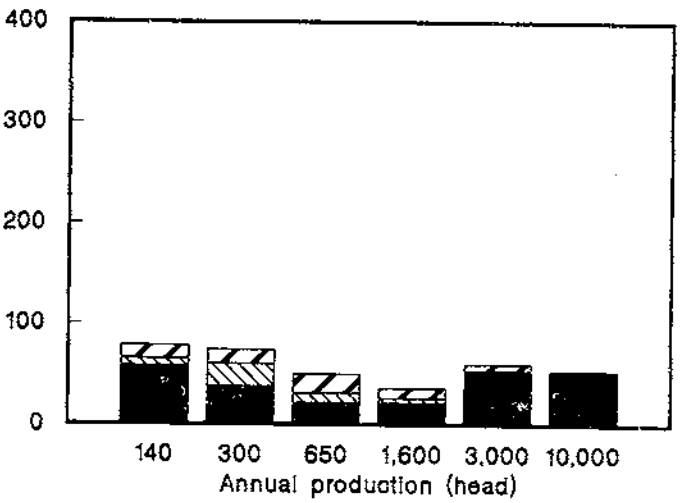


Feeder Pig Finishing

North Central Region



Southeast Region



Source: Appendix tables 2-4.

large ones get 12 litters or more. The same difference in capacity use occurs with other types of facilities and equipment (*43*). A simple facility for a small enterprise may therefore involve a greater investment per unit of production than does the most technologically advanced one for a large operation. This is common in diversified farm businesses where multiple demands on labor force mean a seasonal rather than continuous production of hogs.

Regional differences in investment costs are determined largely by level of technology and use. Producers in the North Central region commonly adopt the higher technologies and incur higher unit investment costs for smaller size operations than do producers in the Southeast. North Central producers typically invest in the most advanced facilities for operations producing around 1,600 hogs annually. Southeastern producers do not select such facilities until annual production is twice as large.

In farrow-to-finish production, Southeastern producers use their major facilities more intensively than do their North Central counterparts, thus achieving lower investment per unit of production, except in the largest operations where costs are similar (fig. 4). Southeastern producers use their facilities less intensively in feeder pig production than do North Central producers, while use is about the same in both regions in pig finishing. If use were same in both regions, differences in replacement investments would hinge on the size of enterprise at which producers upgraded technology.

Investments in general purpose machinery, tractors, and trucks have always posed an accounting problem. The problem is whether investment costs for equipment essential for one or more major farm enterprises would remain unchanged with or without the presence of the minor enterprise. Many smaller hog enterprises fall into the minor enterprise category, accounting for a small part of gross farm income (app. table 6).

The 1983 replacement cost of multiple purpose assets used in hog production is allocated to hogs according to their share of total use. For example, the total 1983 replacement investment for machinery, tractors, and trucks used in the smallest farrow-to-finish enterprises in the North Central region would have required $186 per cwt of production had they been used solely for hogs, $40 per cwt with investments apportioned according to hog use (app. table 3). Managers may allow hogs a "free" ride in some investment situations. Somewhere in the changing mix of enterprises, however, hogs might carry the full investment, with other enterprises getting the free ride. Investments divided according to use is the soundest measure of investments necessary for hog production. The share of total investments allocated to hog production also reveals the importance of enterprise diversification as well as volume of hog production alone.

Investments in tractors, trucks, and general crop-livestock machinery differ between the two regions for a number of reasons, sometimes with offsetting results. North Central producers do most of their own work with their own equipment, while Southeastern producers rely more on custom services, thus shifting a potential investment to an operating cost. Equipment for hauling manure and putting it on cropland is used by almost all North Central producers, while most hog producers in the Southeast practice manure disposal. Farms with both hogs and other livestock are more common in the North Central region; thus, these other livestock enterprises absorb a larger share of the investment costs of multiple-purpose machinery and equipment. When hog enterprises are large enough to have most of such investments chargeable to them, investment costs are lower in the Southeast because of the way producers operate.

Unit investments for breeding stock decline only slightly as operations become larger (app. tables 2-3). Larger operations use their sows and boars more intensively, particularly boars, and achieve greater reproductive efficiency. Prices paid for breeding stock, especially for boars which are usually purchased rather than raised (as is common for female replacements), increase on a head basis as enterprises become larger, however. The resulting modest gains in unit investments for the larger operations thus partly obscure the fact that higher priced (and presumably better quality) breeding stock are used more intensively in the larger operations.

Replacement cost of depreciable assets (land is not included) at 1983 prices generally ranged from $18,000 to $42,000 for the smallest enterprises. Farrow-to-finish enterprises cost the most to equip; feeder pig finishing cost the least, except for small feeder pig production enterprises in the North Central region, which are typically on pasture with minimum facilities. The share of investment cost for tractors, trucks, and general purpose machinery in these small hog operations accounted for one-third to one-half of the total investment, breeding stock for one-tenth to one-sixth, and hog buildings and equipment for usually one-half or more.

The largest operations for which data are available—those with annual production of 10,000 head—had

depreciable assets whose replacement costs were about $1.7 million for farrow-to-finish operations, around $0.9 million for pig production and pig finishing. The investment components were more important to these large operations. Breeding stock moved up to about 15 percent of the total in farrow-to-finish enterprises, 25 percent in pig production because their unit requirements stayed relatively constant while average investment costs for other assets fell. Investments for tractors, trucks, and general purpose machinery dropped to only 10 percent of the total in the North Central region and 5 percent in the Southeast. Specialized hog buildings and equipment accounted for about 70 percent of the total in pig production, 80 percent in farrow-to-finish, and 90 percent in pig finishing.

Capital-labor combinations provide a different perspective on investments in depreciable assets among various size operations. Replacement cost of nonlivestock depreciable assets at 1983 prices averaged a little over $100,000 per 1 year-equivalent of labor used in producing feeder pigs, two to three times as much in pig finishing where little manual work is performed (app. table 7). As size of operation increases, the investment associated with 1 year of labor rises with occasional discontinuities as technologies shift from one level to another and facilities are used more or less to capacity (fig. 5).

Generally, investments per year-equivalent of labor are higher in the North Central than in the Southeast region, regardless of enterprise size. Although part of this difference stems from higher investments per unit of production in the North Central region, most is due to lower labor productivity in the Southeast which cuts investment per unit of labor. The less-than-the-largest enterprises often have the largest investments per year of labor. Production capacity is not fully used in these operations even though level of technology and associated investment costs are both high. Gains in labor productivity rise as size of operation increases.

The relationship between capital and labor among all operations is stable when labor is measured on a cost rather than physical basis (fig. 6). Labor productivity increases along with size of operation, but so does the wage rate. Replacement of depreciable nonlivestock investments at 1983 prices thus cost around $10,000 per $1,000 of labor input in feeder pig production regardless of size of operation, except for the smallest where pastures were used extensively (app. table 8). Farrow-to-finish production had the same kind of stable relationship, with replacement cost of depreciable assets per $1,000 of labor input slightly higher than for pig production. Pig finishing is a labor-extensive activity, so capital was much more important relative to labor cost, but the relationship between the two still tended to be stable across all enterprises.

The ownership costs of depreciable assets—the replacement reserve (depreciation based on current investment costs), interest on investment, taxes, and insurance—express investments as annual production costs. These costs are fixed (or sunk) in an ongoing operation. In forward planning where investments are not yet committed, however, these ownership costs become part of total cost of production, as do all other inputs. Production must be expected to yield a return sufficient to cover both ownership costs and feed and other variable costs if an enterprise is to be initiated, replaced, or expanded.

Ownership costs of depreciable assets have become an increasingly important part of total hog production costs as producers continue shifting toward capital-intensive production. On the basis of 1983 replacement cost of depreciable assets, ownership costs averaged near $20 per cwt in feeder pig production, $7 to $9 in farrow-to-finish operations, and $6 in feeder pig finishing (app. table 9). These costs averaged about one-sixth of the total cost of production for these enterprises. If interest costs were computed at the 1983 market rate that a borrower would have to pay instead of the previous 20-year average rate of return to investments in agriculture, which was approximately 4.4 percent, the ownership costs would be near $30 per cwt in pig production, $13 in farrow-to-finish, and $9 in pig finishing (32).

Large-volume producers gain economies of size in ownership costs of depreciable assets in the same way as they do with investments. Ownership costs per production unit are less in large operations compared with small operations for the same reasons that unit investments decline. As producers make decisions on new investments for hog production facilities, the size economies in investments and their associated ownership costs will have as great a bearing on the enterprise size restructuring of hog production as any other economic aspect of the business.

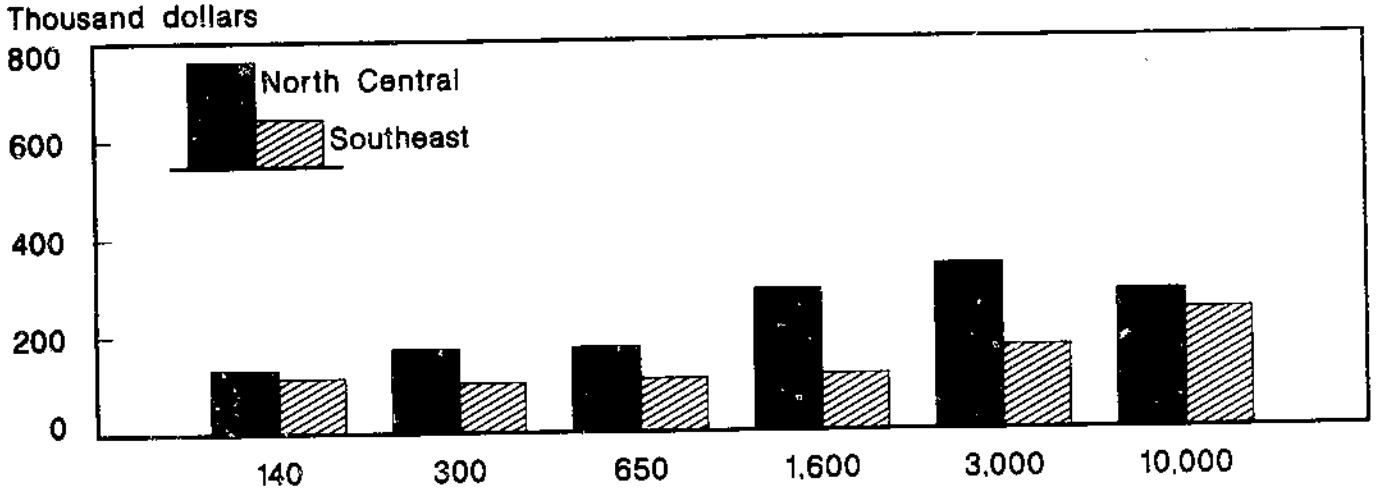
Returns

Sales of slaughter hogs, feeder pigs, and cull breeding stock account for nearly all the returns in commercial hog production. The mix of animals sold depends on the type of enterprise. Producers of breeding stock for sale are not considered in this analysis. Besides hog

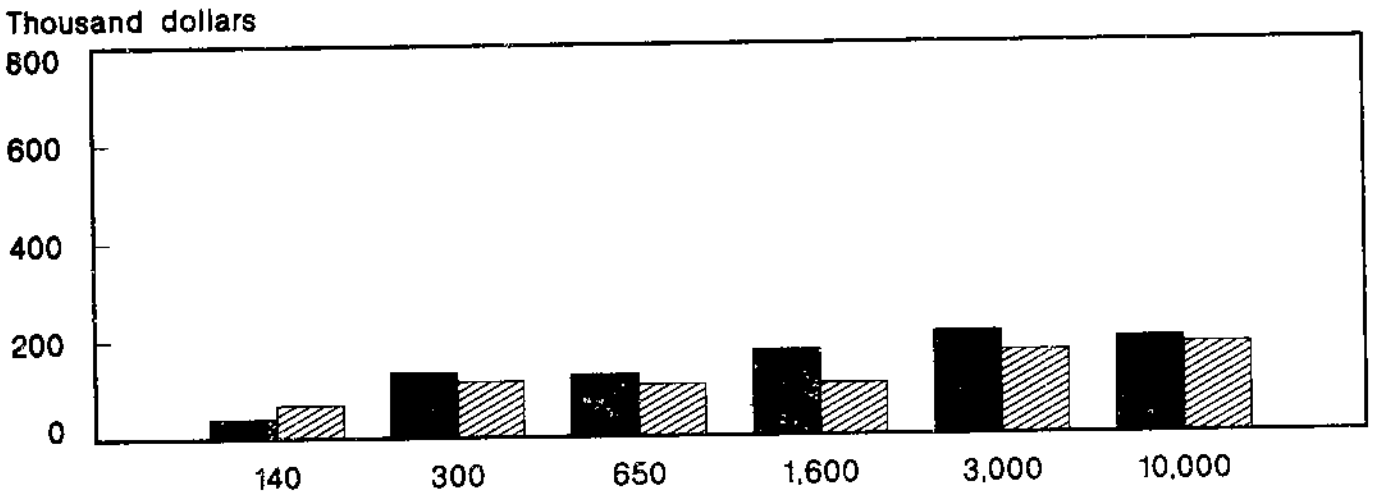
Figure 5

Replacement Cost of Nonlivestock Depreciable Assets Per Year of Labor Input, 1983

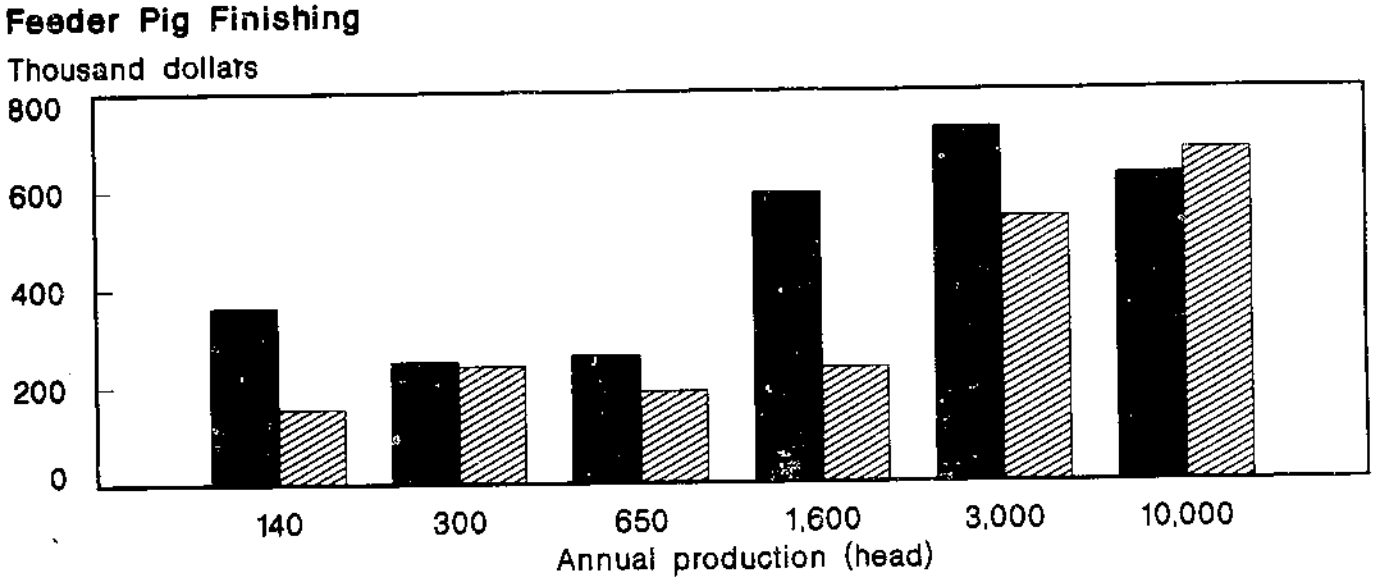
Farrow-to-Finish



Feeder Pig Production



Feeder Pig Finishing

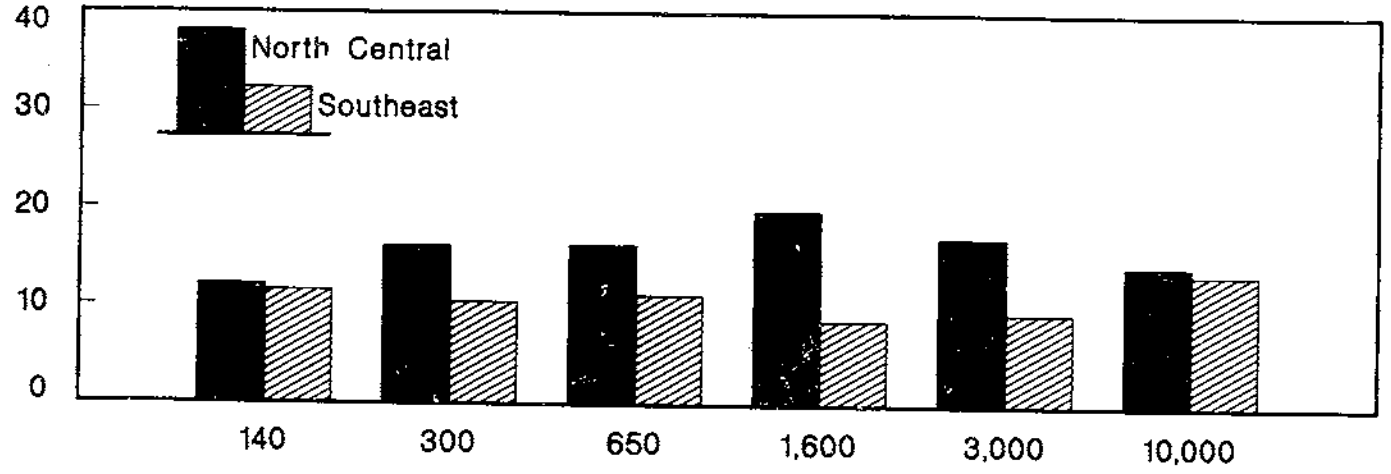


Source: Appendix table 7.

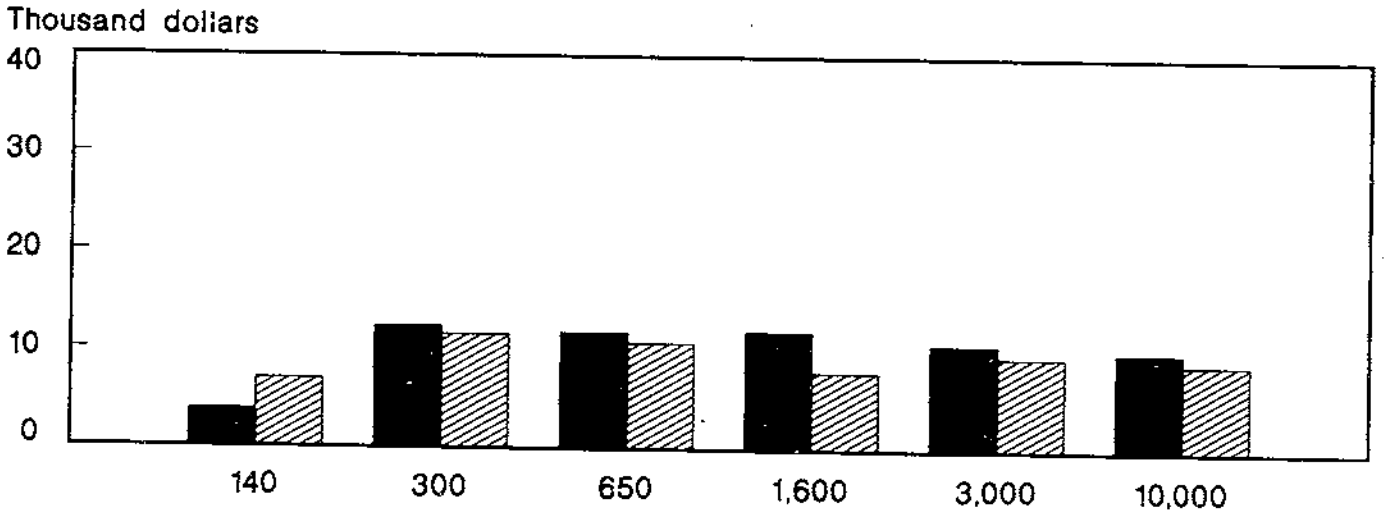
Figure 6

Replacement Cost of Nonlivestock Depreciable Assets Per $1,000 Labor Input, 1983

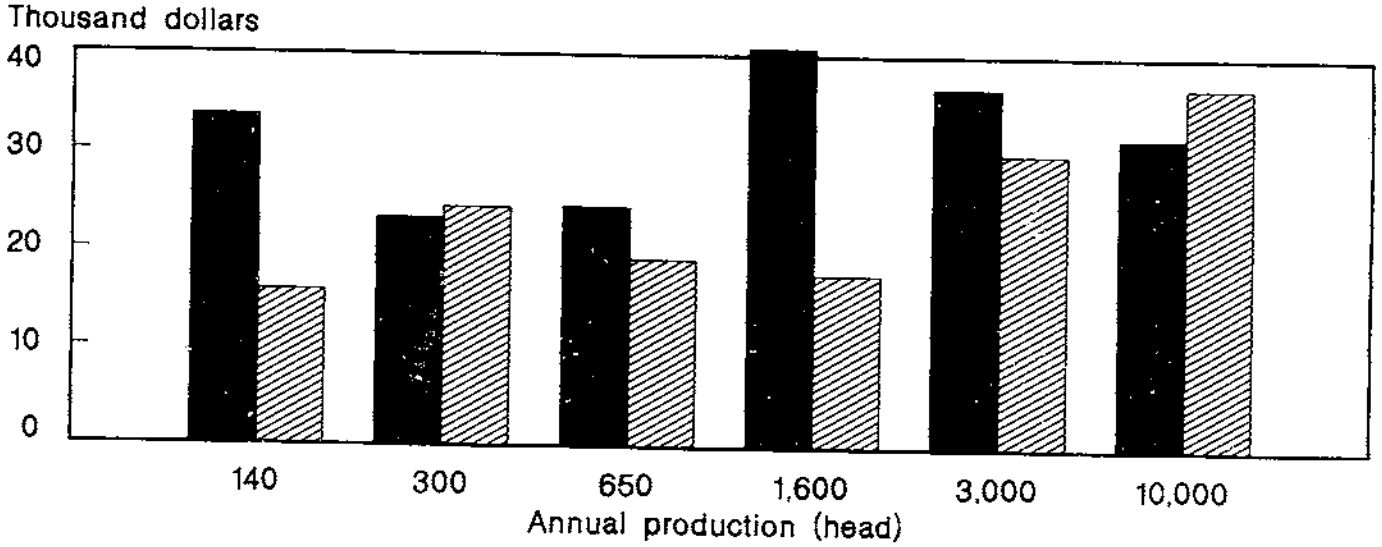
Farrow-to-Finish



Feeder Pig Production



Feeder Pig Finishing



Source: Appendix table 8.

sales, producers may realize byproduct values from manure produced in the hog operation.

Livestock Sales

Traditionally, economies of size analyses of agricultural operations proceed on the premise that product quality and price are independent of size of enterprise, that is, a unit of product has the same quality and commands the same price regardless of enterprise size or originating farm. In this analysis, quality and price of hogs remain constant in the traditional way across all hog enterprises. Market price varies only according to type and weight of hogs and time of marketing. Price thus affects the economic outcome of operations of various sizes only insofar as sales are seasonal (the smallest operations vary production seasonally, but the midsize and larger ones produce all year) and by the proportion that weight produced differs between the higher valued animals (slaughter hogs or feeder pigs) and the lower valued ones (cull breeding stock).

Crediting producers with hogs of the same quality and price regardless of size of operation, however, is a suspect premise. The quality of slaughter hogs has become markedly more uniform in recent years, moving from 50 percent of slaughter hogs graded U.S. No. 1 or 2 in 1968 to 96 percent in 1980 (*22*). U.S. grade standards however, still allow substantial variation within grades in the amount of fat, degree of muscling, and other characteristics (*30*).[2] In fact, the value of slaughter hogs graded U.S. No. 1 may easily vary by $1 to $2 per cwt as the hogs deviate from average (*36*). Just because nearly all slaughter hogs now fall into the top two grades is no assurance that quality does not vary substantially, nor that producers of all sizes turn out the same quality of hogs. The same situation applies for feeder pigs where measures of quality are even more subjective than for slaughter hogs (*30*).

Differences in quality of hogs produced and prices received cannot be quantified by size of operation with available data. Evidence, nevertheless, suggests that large producers likely do produce higher quality slaughter hogs than do small ones. As volume of production increases, producers sell an increasing proportion of their slaughter hogs on a grade and yield rather than liveweight basis (*43*). Although this does not assure that the larger operations produce hogs of above average quality, since these operations price their hogs according to quality, they expect the hogs to exceed the average and receive higher prices. Large-volume producers also consistently pay more for breeding stock, especially boars, than do small-volume producers.

Differences in breeding stock prices do not guarantee equivalent differences in quality, but do indicate producer expectations.

Price differences which occur because of size differences can result from a combination of differences in the quality of slaughter hogs and marketing economies. Some larger volume operations ship hogs directly to the packer on a regularly scheduled basis. Packers know high quality from reputation and past receipts, so hogs are not even graded on a regular basis. Packers are assured of a regular flow of high-quality hogs. Packer procurement costs are reduced, so packers pay more for the hogs than would be warranted on the basis of quality alone. Producers get a price advantage solely because of the volume and regularity of hog delivery.

Manure

Hog manure can contribute to returns through extracting the nutrient values for hog feed (*19*). Manure can also be used to produce methane gas for fuel. Currently, however, producers use manure almost exclusively for its nutrient values in crop production, so its value is measured in this report solely as a replacement for commercial fertilizer. In the North Central region, producers apply an estimated 90 percent or more of their hog manure, both solids and liquids, to lands that they operate. Most hog producers in the Southeast use some method of disposal, thereby foregoing any value from hog manure, but avoiding the cost of land application (*43*).

Hogs retain only a small portion of the plant nutrients contained in their feed. Most are passed through in the feces and urine. All nutrients, however, are subject to losses from the time the manure is produced until the nutrients are finally used on crops. Nitrogen is especially difficult to conserve.

The systems used for hog production, waste management, and land application of manure determine the amount of nutrients from manure that crops will recover (*17, 29*). Pasture systems of hog production yield the least in terms of recoverable manure values; confinement housing with liquid storage and subsequent soil injection of manure yields the most. Recoverable values of hog manure, based on typical production and waste management systems used by North Central hog producers and 1983 prices for commercial fertilizers, are significant. Values reach more than $5 per head for

[2]Reference is to the hog grades in effect prior to Jan. 1985.

the largest farrow-to-finish operations (app. table 10 and 11). The largest operations yield the highest recoverable value per unit of production due to the waste management and land application systems used.

Values of plant nutrients in hog manure can be realized only if producers grow sufficient crop acreages to use them. Few hog producers have been able to sell manure to other farmers; it is often not accepted even when offered free.

Most North Central hog producers raise substantial acreages of crops, chiefly corn and soybeans. These two crops were grown on up to 85 percent of total cropland in 1980 (*43*). The amounts of crop and hog production increase together, except on farms specializing in feeder pig production. Farms with the largest farrow-to-finish and feeder pig finishing operations typically produce over 800 acres of corn and soybeans.

Except on the largest hog operations, all crop-hog enterprise combinations could use all of the major plant nutrients recoverable from hog manure in 1980 (app. table 10) (*3*). Nitrogen recoverable from hog manure generally falls well short of crop needs, especially on smaller hog enterprises. Farmers producing slaughter hogs could realize an increasing proportion of their needs for nitrogen as size of hog enterprise reaches a maximum of four-fifths of crop needs on the largest farrow-to-finish farms. Larger feeder pig producers typically specialize in pig production, have little or no cropland, and hence have plant nutrients recoverable from manure far in excess of need.

Recoverable phosphorus and potassium balances show a pattern similar to the one for nitrogen with one important difference—they supply a much higher proportion of the maintenance needs for corn and soybeans than does the nitrogen from manure (fig. 7).

Recoverable phosphorus and potassium can meet half or more of the crop needs on farms with midsize farrow-to-finish operations. Farms with the largest farrow-to-finish enterprises have twice the amount of phosphorus and three times as much potassium as needed by corn and soybeans for maintenance of the assumed yields. Availability of these two nutrients also exceeds crop needs on farms with the largest pig finishing operations, and runs far above need in the large specialized pig-producing businesses. The supply of these two elements can exceed crop needs even on farms with small hog enterprises if manure is concentrated on only part of the cropland.

Fully coordinated hog waste management and crop fertility programs would allow typical hog producers in the North Central region to reduce expenditures for commercial fertilizers by the values of the recoverable nutrients for operations producing up to 3,000 head annually, regardless of type of hog enterprise. With hog enterprises of 10,000 head, however, the crop-hog enterprise mix is such that the typical feeder pig producer needs little of the nutrients for crops. Outlays for commercial fertilizers at 1983 prices could fall by about 60 percent of the nutrient values recoverable from manure on farms with 10,000-head farrow-to-finish operations, and by just over 80 percent on farms with the largest finishing operations. The surplus of recoverable phosphorus and potassium relative to crop needs cuts the realizable value of manure per hog on farms with the largest enterprises, but the potential reduction in expenditures for commercial fertilizers is still quite large.

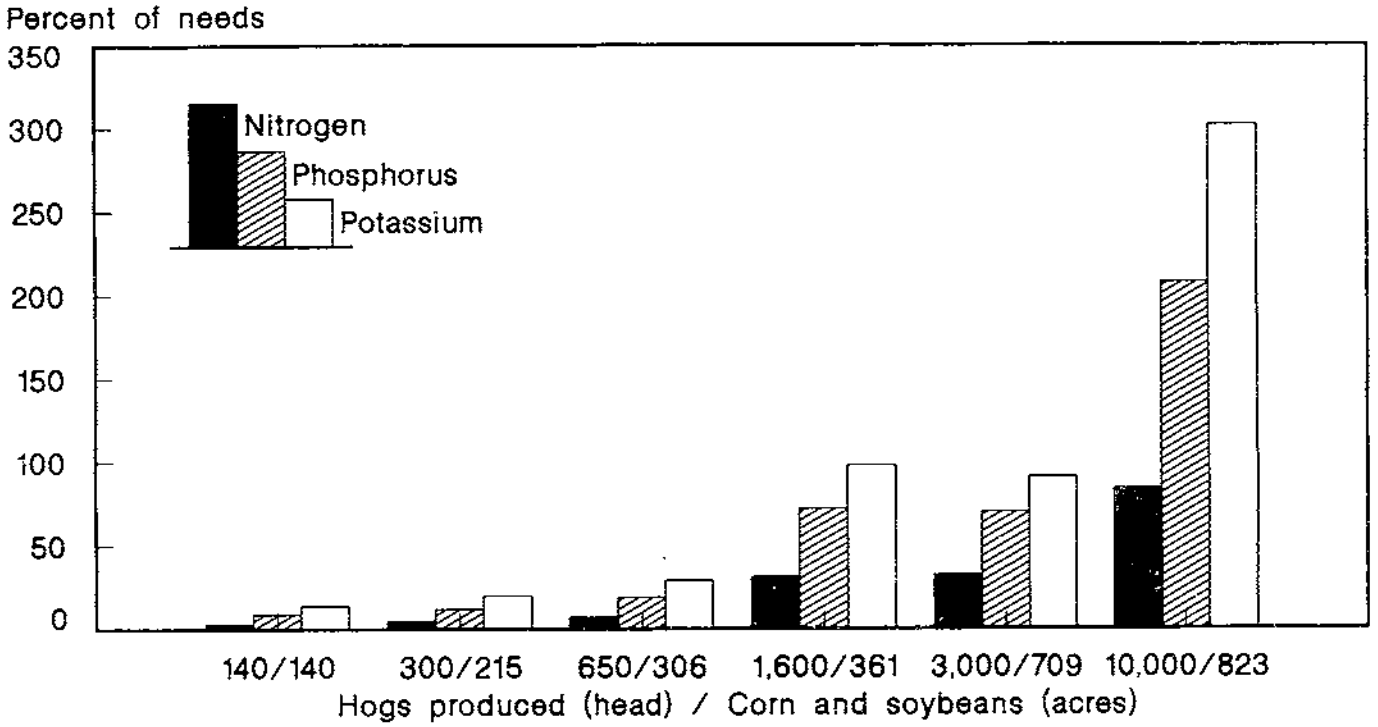
Potentials often differ greatly from realizations, particularly on North Central farms. An analysis of Illinois farm record data, covering over 500 farm businesses with farrow-to-finish hog enterprises for 1977-81 and including enterprises with annual production from 100 to over 10,000 head, revealed that only a small part of the recoverable value of hog manure was actually realized. Taking all variables into account in regression analyses, expenditures for commercial fertilizers were reduced by only 9 to 18 percent of the value of the recoverable nutrients in hog manure (fig. 8 and app. table 12). This result was supported by a similar analysis of farms with cattle feeding enterprises which revealed that outlays for commercial fertilizers were virtually unaffected by use of cattle manure on cropland of farms feeding fewer than 500 cattle a year.

The relatively small benefit realized from hog manure used on cropland in Illinois is believed to result from two common management practices. First, even when liquid manure is carefully stored, then injected into the soil (typical of larger producers and one of the most effective ways to conserve nutrients), the primary objective is to rid the production site of manure at low cost in a nonpolluting manner. The fertilizer value of the manure is a secondary consideration. Large farms are often in multiple tracts, however, especially those which are part owned and part rented. Crops are often grown on lands too distant to justify the expense of hauling manure there. Heavy and repetitive applications of manure to fields near the hog production site are therefore common.

Second, many farmers do not coordinate hog manure and commercial fertilizers in their overall crop fertility programs, applying commercial fertilizers at or near the

Figure 7

Recoverable Plant Nutrients from Manure Versus Crop Needs on North Central Farms with Farrow-to-Finish Hog Enterprises



Source: Appendix table 10.

same rates to all land whether or not manure has been applied. Application rates of commercial fertilizers are commonly set for high crop yields, so yields and expenditures are about the same for commercial fertilizers with or without manure. Remedial action is complicated. Producers have complete control over the plant nutrient content of commercial fertilizers, but the nutrient content of manure is variable and difficult to measure. Soil tests are necessary to monitor accumulations of nutrients.

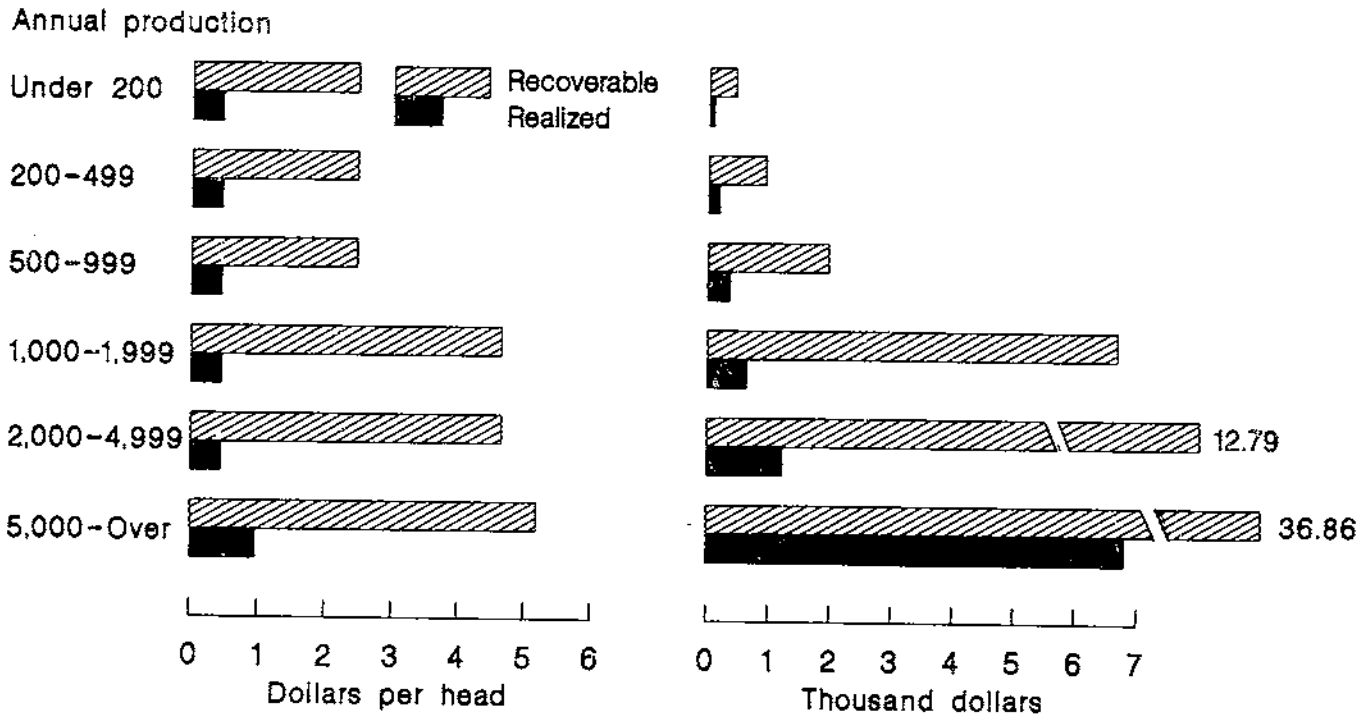
North Central hog producers follow essentially the same hog waste management programs as those used by Illinois farmers (*43*). Because North Central crop-hog enterprise and land tenure combinations are similar, the low value realized from cropland application of hog manure by Illinois farmers likely represents the situation throughout the region.

Applying hog manure to cropland may have a negative result. Soil-injected liquid manure can adversely affect crop growth, especially corn, resulting in plants with low nitrogen in soils with excessively high phosphorus. Concentration of manure on lands adjacent to hog production facilities or the yielding of far more manure nutrients than all crops on the farm can use (either of which can result in excess accumulation of phosphorus and potassium) may damage land in ways yet unknown. Research to discover the causes of plant growth problems under such situations is underway (*26*).

Presently, no one size of hog operation has an undisputed economic advantage over others in terms of returns from manure. The smaller hog producers lose the highest proportion of nutrients between production and field application, but then realize a higher percentage of the recoverable values. The mid- to large-size hog producers use management systems and equipment that preserve a higher proportion of the nutrients through land application, but then fail to realize any more of the recoverable values per unit than do the smaller producers. The largest hog producers do the best job of conserving the nutrients and coordinating their waste management and crop fertility programs, yet they realize less than one-fifth of the recoverable

Figure 8

Fertility Values of Hog Manure, Illinois Farms with Farrow-to-Finish Hog Enterprises, 1983



values. Also, the amount of phosphorus and potassium in the manure exceeds crop needs. This situation is aggravated by the fact that manure applications are concentrated on land near hog production facilities. Plant growth is suppressed in some cases. Hog wastes have potential values, but they also create problems which are currently more serious for large than for small hog producers.

Cost-Income Ratios

Economic outcomes are presented in this section for the three types of commercial hog enterprises by size and production region for 1980, 1982, and 1983. Costs are computed on an economic basis. This means that they include actual cash expenditures (or market value of readily salable inputs), except for interest (charged for all capital used in the operations regardless of source); assigned opportunity costs for nonpurchased inputs; and current replacement costs of all depreciable assets instead of depreciation charges based on past investments.

Cost-income ratios are used rather than actual costs and returns per cwt of production (see app. tables 13-30 for costs and returns per cwt) so that all operations have a common base of $100 of gross income. Costs are the expenditures (or value of the inputs) used to create $100 of gross income. Differences in both costs of production and receipts for hogs sold are reflected in the outcome. These cost-income ratios permit direct comparisons among all enterprises regardless of type, size, location, or year.

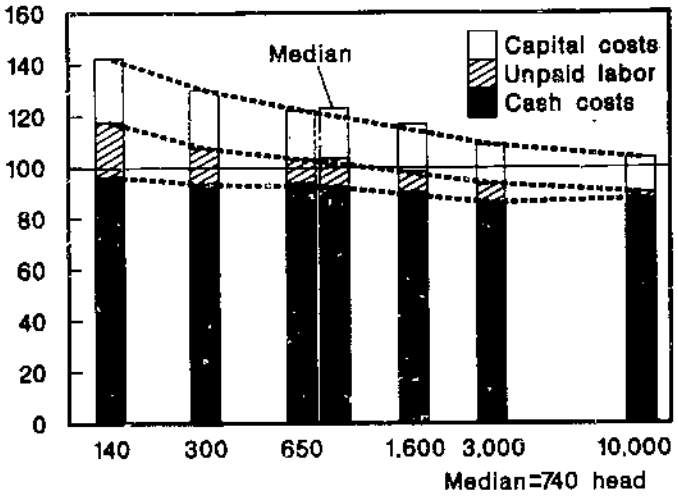
Results are shown for three successively longer planning periods (fig. 9-11). First, cash costs are related to gross income. Failure to cover cash costs causes strong pressure to halt production. Second, a charge is added for unpaid labor which must be rewarded over time in order to be kept in hog production rather than alternative activities. Finally, capital costs are added to determine whether enterprises earn enough to replace depreciable assets as they are used up, or are economically sustainable operations. The graphic presentations

Figure 9

Costs per $100 Gross Income, Farrow-to-Finish Hog Production

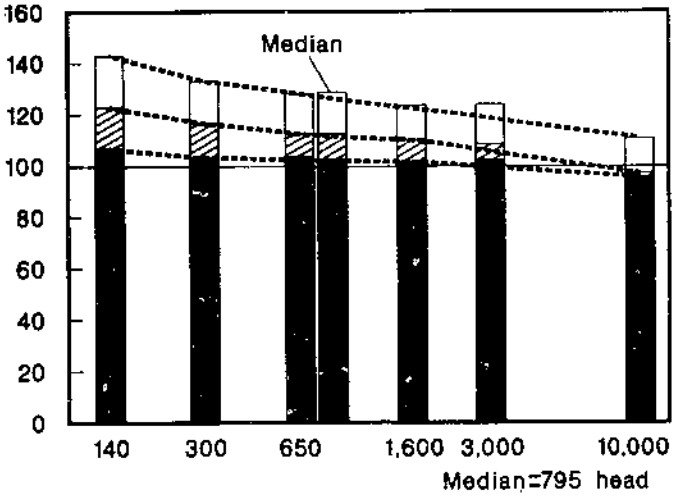
North Central Region, 1980

Cost per $100 gross income

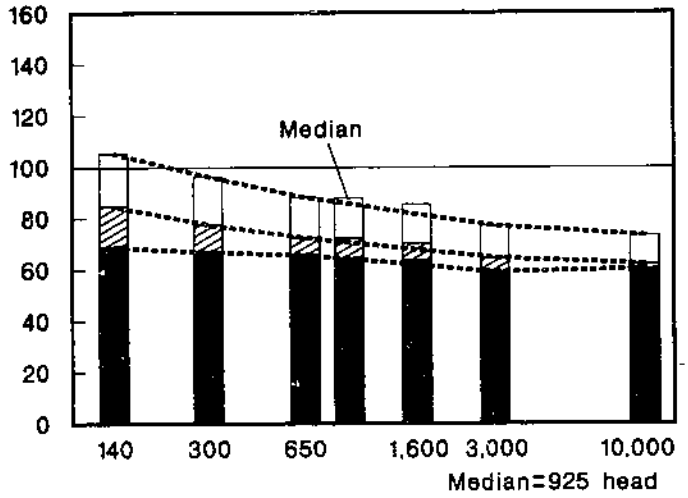


Southeast Region, 1980

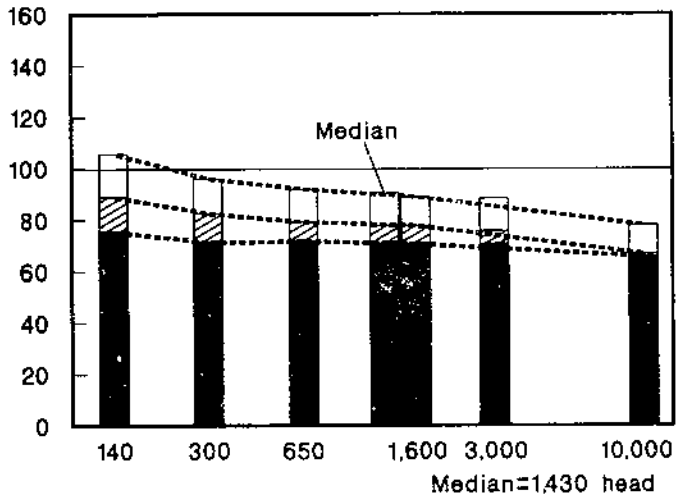
Cost per $100 gross income



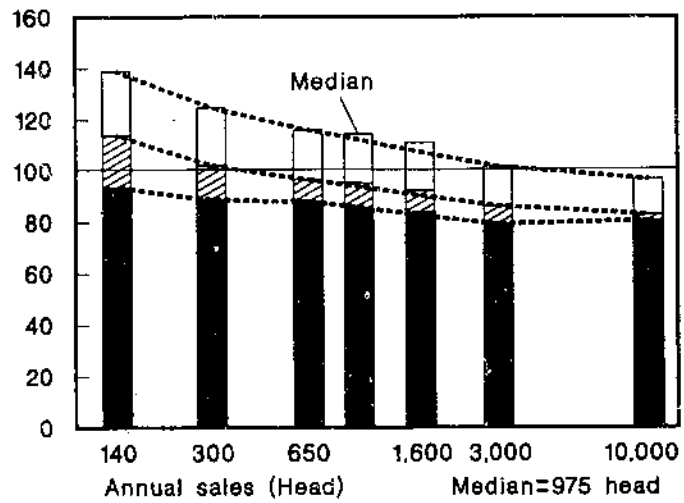
North Central Region, 1982



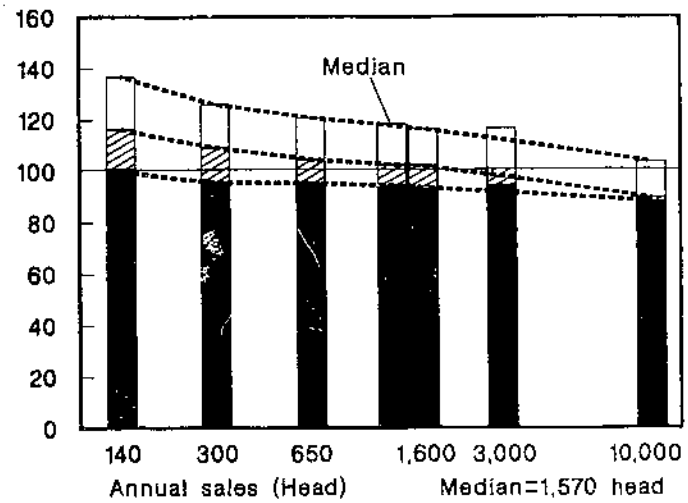
Southeast Region, 1982



North Central Region, 1983



Southeast Region, 1983

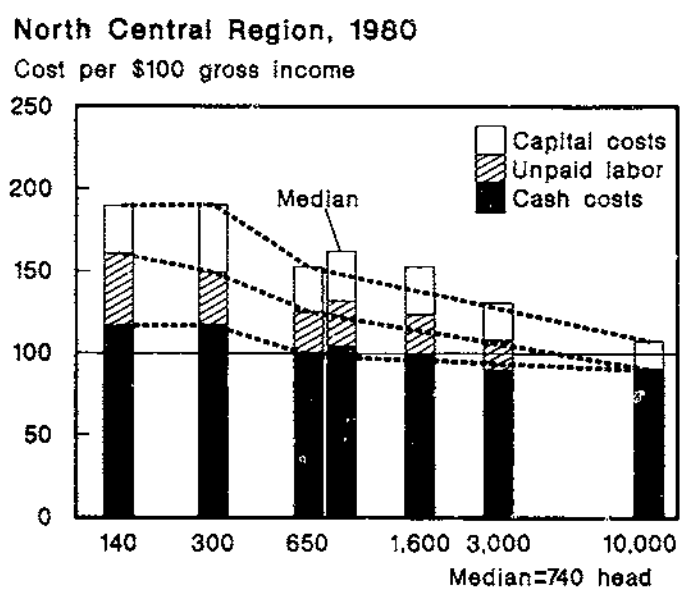


Source: Appendix tables 13-18

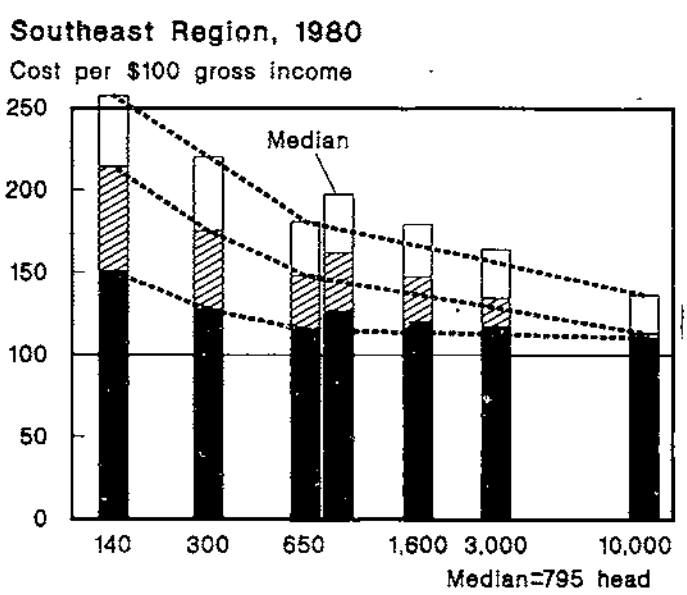
Figure 10

Costs per $100 Gross Income, Feeder Pig Production

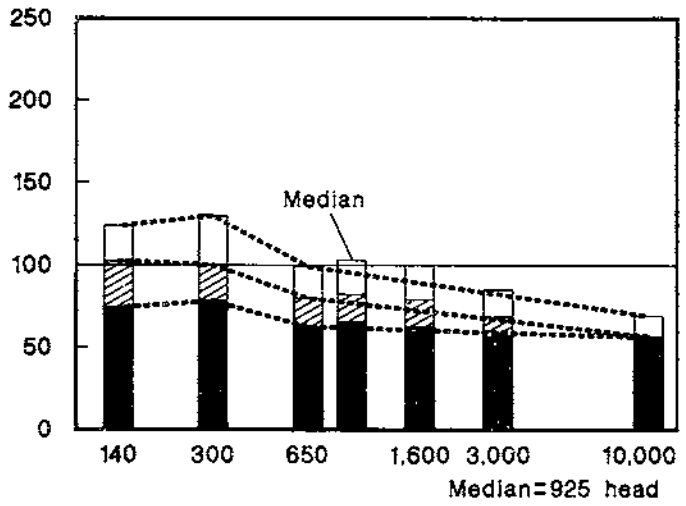
North Central Region, 1980



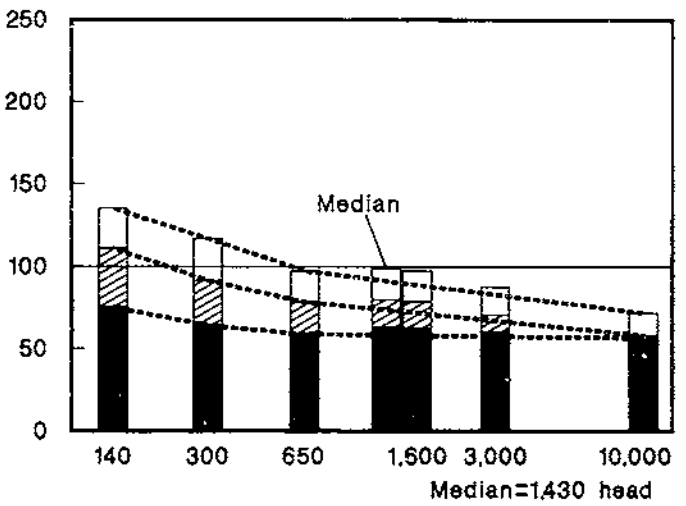
Southeast Region, 1980



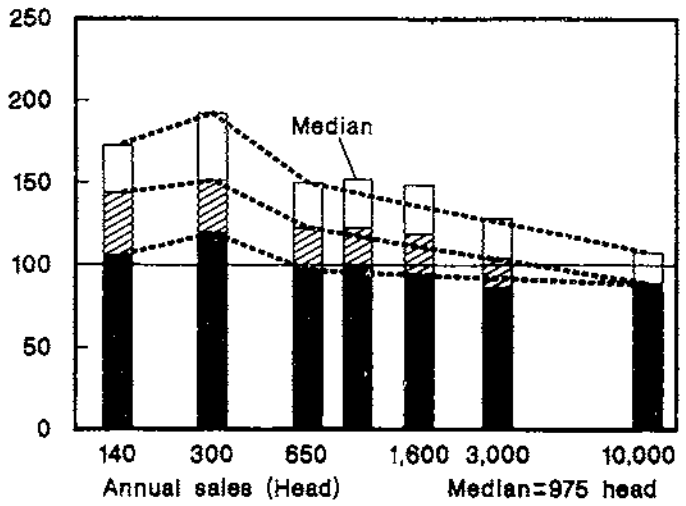
North Central Region, 1982



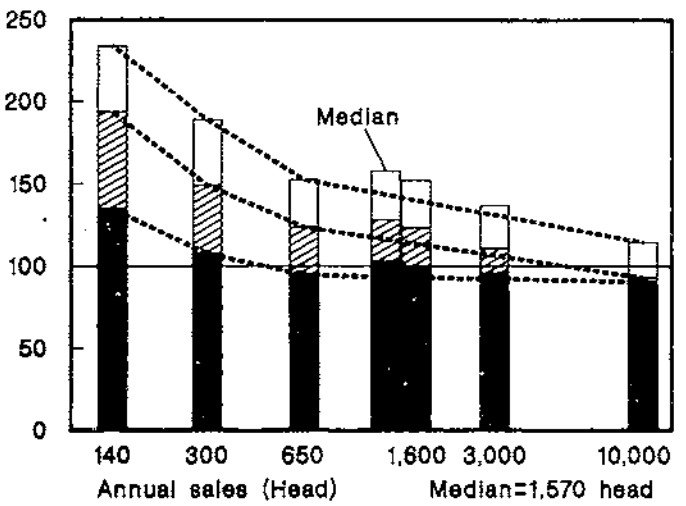
Southeast Region, 1982



North Central Region, 1983



Southeast Region, 1983

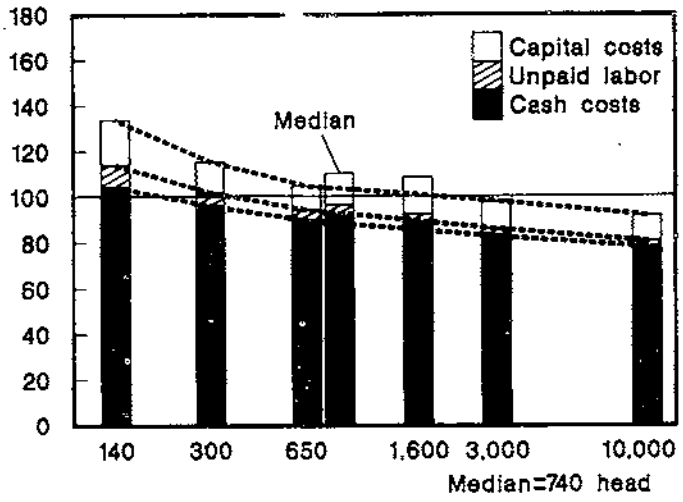


Source: Appendix tables 19-24

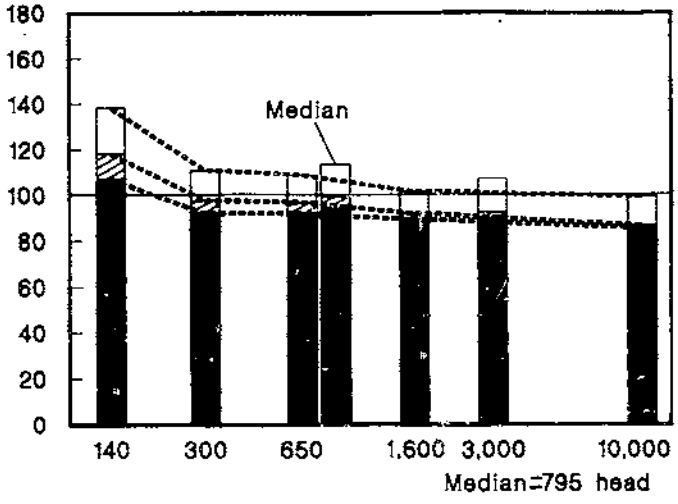
Figure 11

Costs per $100 Gross Income, Feeder Pig Finishing

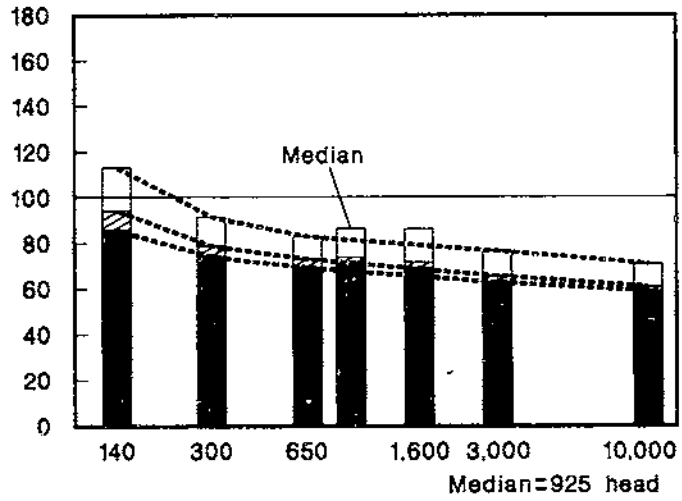
North Central Region, 1980



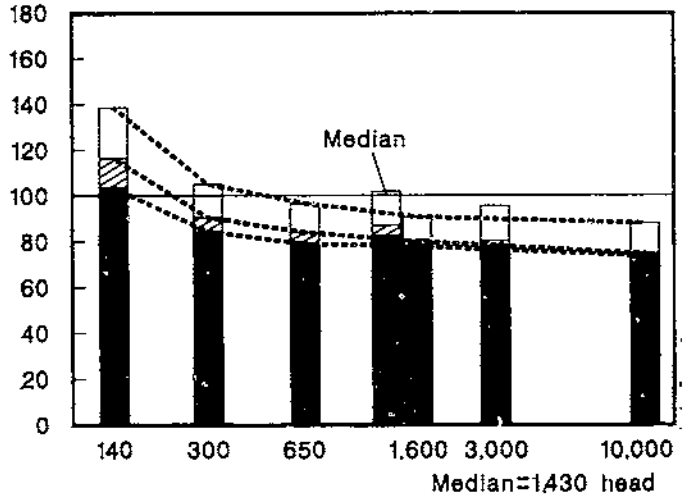
Southeast Region, 1980



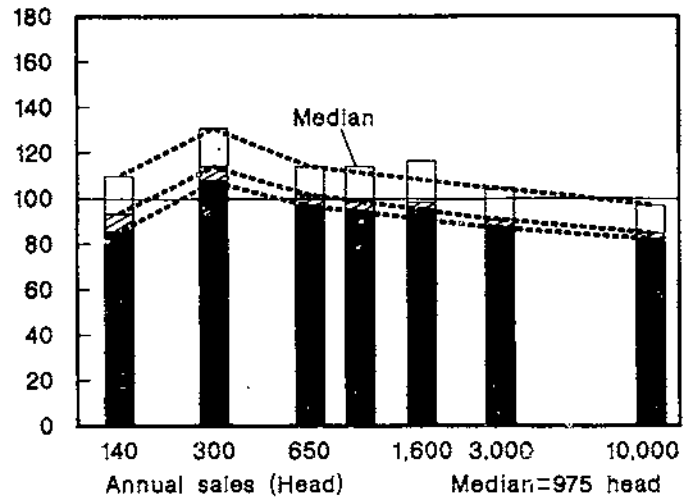
North Central Region, 1982



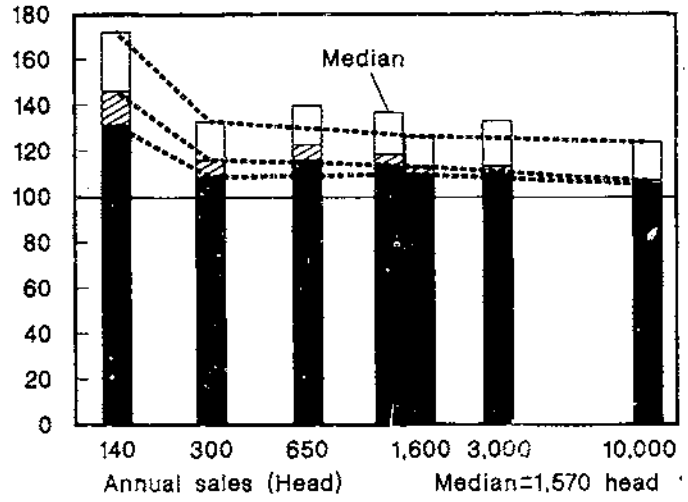
Southeast Region, 1982



North Central Region, 1983



Southeast Region, 1983



Source: Appendix tables 25-30

of the outcomes (figs. 9-11) measure the costs to produce $100 gross income in enterprises producing from 140 to 10,000 head annually.

All estimates reflect enterprises using the mix of resources and the level of performance representative of specific enterprise production sizes. The result is the outcome for each enterprise as it is actually operated, not the best that could be achieved. Some larger enterprises have higher cost-gross income ratios than do smaller ones due to lumpiness of inputs. This simply means that they have not fully exploited technologies in use at the annual production specified. The dotted lines in figs. 9-11 slide through protruding bars, indicating that units costs would be less if production were expanded beyond the specified output. These lines are good indicators of the average long-term relationship between costs and volume of production.

Each set of cost-income ratios also shows the average outcome for operations of all sizes combined. This average reflects total production rather than the average of producer accomplishments. Half of production occurs in operations smaller than those producing the average hog, and half occurs in larger ones. The median-size operation, which has the average hog, produced less than 800 hogs in 1980 and increased rapidly in size through 1983. The average operation turned out about 335 hogs in 1982 (app. table 1). Some 90 to 95 percent of all hog producers with smaller and higher-cost enterprises than the median account for half of total production. The 5 to 10 percent of producers with operations above median size produce the other half, with results superior to those for the median.

Technically, small-volume hog producers could come closer to the cost-income ratios of large-volume producers than shown in this analysis. It is physically possible for a small-volume producer, for example, to achieve the same high intensity of facility use as a large one, hence cutting capital costs per unit substantially. Small-volume producers could also realize some of the volume economies in input purchasing through buying groups or cooperatives. Such a synthetic approach would provide estimates of possible costs, but the result would be meaningless if a complex set of forces actually causes producers to do otherwise. This entire analysis reflects how producers are operating, not how they might operate.

Farrow-to-Finish

Farrow-to-finish producers with large enterprises achieved sizable economic advantages over small enterprises in 1980, 1982, and 1983, especially in a period long enough to count replacement of depreciable assets (fig. 9). The cost-income ratios by size of operation improved throughout the observable range, so size of the least cost operation was not yet identified. Profitability varied greatly over the period with returns exceeding all costs for nearly all producers in 1982, while income shortfalls hit nearly all producers in 1980 and 1983. Outcomes for 1981, though not presented in this analysis, were little better than in 1980 (*31*).

Variable cash costs for feed and other operating inputs, plus fixed cash expenses for taxes, insurance, and general farm overhead, accounted for about 75 percent of total cost for the average hog produced in the North Central region, and 80 percent in the Southeast region (app. tables 13-18). Cash costs were about 85 percent of total cost in the largest operations, nearly two-thirds in the smallest.

Large-volume hog producers achieve advantages over smaller ones in cash costs per $100 of gross income. Improved feed conversion rates plus lower feed prices contribute the most to size economies in cash expenses, but large operations use several other variable inputs more effectively. Fixed cash costs, while averaging only about 5 percent of all cash costs, drop as much as 75 percent on a unit basis between the smallest and largest operations.

Unpaid operator and family labor do nearly all the work in the smallest enterprises, but hired labor accounts for a progressively greater share of the workload as enterprises become larger. This shift to hired labor offsets much of the size advantage in cash costs. The larger operations encounter nearly stable or even rising cash costs per $100 gross income for this reason.

Price differences for hogs produced seasonally instead of year round (the two smallest enterprises in the North Central region and the smallest one in the Southeast region) dampen or exaggerate the differences in cash cost-gross income ratios from year-to-year, but large operations still hold an advantage in cash costs. Overall, differences in cash costs favor the largest compared with the smallest enterprises by $7 to $12 per $100 gross income during the 3 years included in this analysis. The largest operations surpassed median-size operations by $3 to $5 per $100 gross income in the North Central region, $5 to $7 in the Southeast region.

Large operations' advantage increases over small ones' in terms of costs versus income when a charge (or return) is allocated to unpaid labor. Wage rates for unpaid labor increase with size of operation, but unpaid

labor has a steadily decreasing share of the workload. As a result, cash costs plus the allocation for unpaid labor decline continuously as size of enterprise increases. The sum of cash and unpaid labor costs per $100 gross income is mostly around $25 less for the largest compared with the smallest operations, $11 to $15 less for the largest versus median-size operations.

Large operations use production facilities much more intensively than do small ones. Even though they invest in more costly facilities, size economies increase when capital costs are added to cash costs and allowances for unpaid labor. The largest operations generally have $30 to $40 lower total costs per $100 gross income on a long-term basis than do the smallest ones. Extreme differences are dictated by seasonal production of the smallest producers and whether they got more or less than average annual prices for their hogs. Median-size operations realized about half of the size economies achieved by those with annual production of 10,000 head.

Farrow-to-finish hog producers achieved similar economies of size in the North Central and Southeast regions. North Central producers, however, maintained an economic advantage over their Southeastern counterparts at all sizes of operations (fig. 9). Many small differences exist in both costs and returns between the regions, but higher feed prices pose a sizable disadvantage for Southeastern producers. When hog production was exceptionally unprofitable in 1980, for example, none of the representative enterprises in the Southeast covered cash costs except the largest. In 1983, another year of low returns, Southeastern producers met cash costs but did not earn enough both to reward unpaid labor fully and have something for capital replacement until production reached 3,000 head or more annually. By contrast, all North Central producers covered cash costs both years. The smaller ones earned enough to reward unpaid labor partly or fully, while the larger ones realized some margin for capital replacement. In fact, the 10,000-head operations in the North Central region essentially realized enough to replace capital on a current cost basis both years. In the extraordinarily profitable 1982, all except the smallest enterprise had returns above total costs in both regions. The margin was greater, however, for North Central producers.

Industry averages of costs and returns have long been used as the measure of hog production's profitability and as an indicator of aggregate future adjustments in hog supplies. This practice was acceptable when there were large numbers of producers with relatively small hog enterprises on diversified farms. Differences among hog producers are now so great that a single average can be misleading, result in erroneous conclusions, and possibly cause doubt about the accuracy of cost and return estimates or rationality of producer actions when production adjustments fall to conform to those industry averages.

The industry average was bleak indeed in both 1980 and 1983. The average hog (operation of median size) produced little or nothing for capital replacement, left unpaid labor less than fully compensated, and in the Southeast did not even cover cash costs (fig. 9). Yet in the growth sector of the industry (those producers with larger than median enterprises) there was economic justification for at least maintaining volume of production and even some for expanding the largest North Central operation in 1983.

Hog enterprises benefit a farm business for a time if they return something above cash costs. Depreciable assets can be used up without being replaced. Even when counting capital replacement against the enterprise, ongoing operations seldom need to replace much of their depreciable assets in any given year. Operator and family labor often have little alternative employment. Therefore, failure to cover total costs does not immediately halt production. Small enterprises keep going for a time even if they produce cash losses, as a small part of a diversified farm business. They may use farm-produced feedstuffs, thus cutting potential crop sales, but not creating direct cash losses. Hope for more profitable times often dies slowly. The economies of size recorded here, however, result in the gradual adjustments to fewer and larger operations which have occured at an increasing rate since 1950.

Feeder Pig Production

Large-volume feeder pig producers gain from economies of size compared with producers with small enterprises much the same as do farrow-to-finish producers (fig. 10). There are important differences, however, in terms of mix of resources and market prices.

Prices received for feeder pigs vary widely, both seasonally and year to year, as pig finishers adjust their bids to reflect finishing costs and prospective prices for slaughter hogs. During 1980, pig prices averaged $45 to $50 per cwt, increased to nearly twice that level in 1982, then fell back to around $60 in 1983. Prices hit a low of almost $37 per cwt in the second quarter of 1980, and a high of over $125 per cwt in the third quarter of 1982. Pig producers approached profitability only in 1982. Returns fell to near or below cash costs in 1980 and 1983 (app. tables 19-24).

Seasonal production is more common in feeder pig production than in farrow-to-finish operations. The two smallest enterprises in both regions operate seasonally. The two smallest North Central operations analyzed during the 3 years matched their production and marketings with better than average prices, thus offsetting some of their diseconomies on the cost side. The smallest enterprise even managed to generate $100 gross income for less cost than the next largest, but this was due to higher seasonal pig prices, not lower costs. The two small seasonal enterprises in the Southeast generally aggravated their inefficiencies on the cost side by selling pigs during the below-average prices of 1980 and 1983, while gaining only a slight price advantage in 1982.

As size of enterprise increased, cash costs per $100 gross income first declined, but then quickly leveled out as the workload shifted to hired labor (fig. 10). Cash costs per $100 gross income were only $4 to $5 higher in the 650-head operations compared with the 10,000-head operations in most situations; $6 to $16 higher for the overall average compared with the largest operation. Large feeder pig producers achieved better feed efficiencies, cut feed costs through volume purchases of feed, and used other cash inputs more effectively than did small operations—just as was true for farrow-to-finish operations. Reductions in these costs, however, did little more than keep pace with the increasing cash outlays for hired labor as operations became larger.

Labor accounts for a larger part of feeder pig costs than for either farrow-to-finish or pig finishing. Economies of size are brought sharply into focus when unpaid labor is assigned a value and added to cash costs. The sum of cash plus unpaid labor costs per $100 gross income falls sharply and continuously through the largest enterprise measured. Differences in costs per $100 gross income between the smallest and largest enterprises range from nearly $50 to $100. The 10,000-head operations beat those producing 650 head by $25 to $35 per $100 gross income and were from $25 to nearly $50 better than average.

Economies in the use of depreciable capital assets further increased the economic advantages of larger operations (fig. 10). The ratios of total costs to gross income improved continuously through 10,000-head operations with no indication of leveling or turning up. Differences in total costs per $100 gross income between the smallest and largest enterprises ranged to well above $100. The 10,000-head unit outperformed those producing 650 head by $25 to $45 per $100 gross income, and was $30 to $60 better than average.

Regional advantages do not consistently favor North Central pig producers over their Southeastern counterparts as in farrow-to-finish production. When the demand for feeder pigs is weak and prices are low, as in 1980 and 1983, feed price and transportation cost disadvantages confronting Southeastern producers combine to favor North Central producers. Strong demand and high prices for feeder pigs such as in 1982, however, can more than offset cost disadvantages for Southeastern producers, placing them in an equivalent or even more profitable situation than North Central producers.

The high risk of feeder pig production largely due to fluctuations in feeder pig prices is readily apparent in the results for 1980, 1982, and 1983. In the 2 poor years, 1980 and 1983, all North Central producers except the largest had returns near or below cash costs. The 10,000-head units did better than smaller ones, but still could cover only about half of capital replacement. Southeastern producers were all mired below cash costs in 1980 and did only slightly better in 1983. Large producers in both regions in 1982 had returns above total costs, but the small ones did not.

Small-volume pig producers are not penalized much in terms of cash costs per unit of production versus what can be achieved by large-volume producers. Even under favorable conditions such as in 1982, however, the small producers did not earn enough to reward unpaid labor and replace depreciable assets. Increasing requirements for herd testing to ensure disease-free pigs pose a potential cost added for all pig producers. This could be especially costly on a unit basis for small producers in pig-shipping States to finishers in other States, usually requiring more rigid health certification than for feeder pigs shipped within a State. Conditions indicate a probable acceleration in the shift to larger volume feeder pig enterprises, or even a decline in pig production as a separate hog enterprise unless larger, specialized pig producers fill the gap.

Feeder Pig Finishing

Economies of size favored feeder pig finishers with 10,000-head operations, and perhaps larger, as costs per $100 gross income were still declining at that level (fig. 11). Large-volume finishers gained from increased efficiencies and price advantages much the same as did large-volume producers with other types of hog enterprises.

Cash costs account for more than four-fifths of all costs of putting gain on feeder pigs (app. tables 25-30).

Efficient use of cash inputs is therefore much more important to the economic outcome of finishing operations than in pig production and farrow-to-finish where effectiveness in the use of depreciable assets and labor dominates. Half or more of all economies of size in pig finishing were generally realized in cash costs which continued to decline on a unit basis throughout the observable size range. Cash costs to generate $100 gross income were mostly $20 to $26 less for the largest compared with the smallest enterprises. Cash costs for the largest finishers were $7 to $13 less per $100 gross income than for the average hog produced. Additional charges for unpaid labor pushed the cost advantage for the largest producers per $100 gross income up another $3 to $5, and efficiencies in the use of capital gave them another $2 to $3. The largest finishers had a $13 to $19 cost advantage in terms of total costs over the average hog produced for each $100 gross income.

The dominance of cash costs in pig finishing lessens the pressure on producers to operate year-round. Economies in investments in depreciable assets and their associated capital costs are achieved by large producers, but impact on total costs is relatively small. Thus seasonal operation is more common in pig finishing than in other types of hog production. Many farmers still fit finishing into their farm business according to projected profitability and resource availability. Seasonal finishing characterizes the two small-size enterprises in the North Central region and all three Southeastern enterprises below the median size.

Seasonal operation adds variation in prices paid for pigs to the variation in prices received for slaughter hogs compared with the averages for year-round continuous production. Seasonal production hurt small-volume North Central finishers in both 1980 and 1982, especially during the latter year when prices paid for pigs were higher and prices received for slaughter hogs were lower than the annual averages. The situation reversed in 1983, allowing the smallest North Central finishers to generate $100 gross income for less cost than most larger ones. These smallest producers were at a cost disadvantage for inputs, but received favorable prices. Seasonal Southeast finishers paid and received near average annual prices for pigs and slaughter hogs in 1980, were squeezed by both in 1982, then some fared better than average on prices in 1983.

The same discontinuities appear in the cost-income ratios for typical finishers of various sizes as they do for producers with other types of hog enterprises (fig. 11). Seasonal production causes much of the variation among smaller producers, as previously noted. Among the larger producers, however, the increases in costs occur when producers invest in more sophisticated capital-intensive technologies without increasing production accordingly. For example, cost per $100 gross income are higher for 1,600-head enterprises in the North Central region and 3,000-head enterprises in the Southeast region than for either smaller or larger operations. This outcome reflects typical investments and production practices, but unit costs drop as expansion occurs and practices better match production capacities.

The cash outcome for pig finishers is determined largely by feeding and price margins. The feeding margin is the price received per cwt of slaughter hogs minus the feed cost per cwt of gain. The price margin is the price received per cwt of slaughter hogs minus the price paid per cwt of feeder pigs. Pig finishers thus gauge their prospects for profit much the way cattle feeders do. The importance and magnitude of the two margins, however, are much different in pig finishing than in cattle feeding. The weight of pigs bought relative to gain is quite small compared with cattle feeding where the weight of feeder animals bought is typically equal to or greater than the amount of gain.

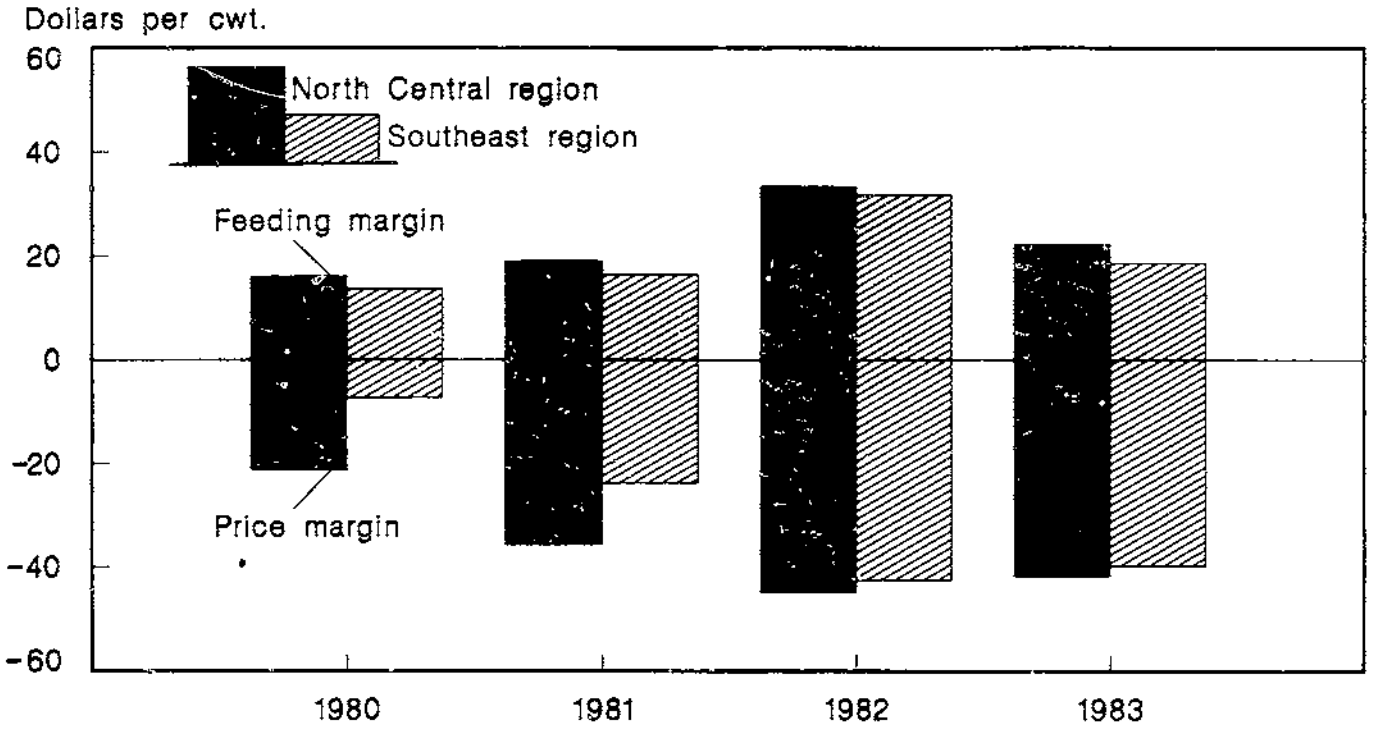
Price margins in pig finishing reached levels of almost minus $45 during 1980-83, always staying greater in the North Central than in the Southeast region (fig. 12 and app. table 32). Southeast finishers hold an advantage in price margins, especially when the hog market was depressed as in 1980 and pig prices fell more sharply there than in the North Central region. Southeastern finishers typically buy heavier pigs than do North Central finishers, purchasing an average of 35 pounds of feeders per cwt of gain versus 28 pounds by North Central finishers. The different weight purchased to weight gained ratios maintained by producers in the two regions are consistent with differences between the two regions in price margins.

Feeding margins reached levels of more than plus $33, with North Central finishers consistently having larger margins because of lower prices for feed. Producers in both regions receive about the same price for slaughter hogs. To dampen their disadvantage in the feeding margin, Southeastern finishers not only buy heavier pigs to capitalize on their price margin advantage, but also market slaughter hogs at lower weights. This is done to lessen the gain fraction where poorer feeding margins place these finishers at a disadvantage relative to North Central finishers.

North Central finishers had only a slight economic advantage over their Southeastern counterparts in 1980,

Figure 12

Price and Feeding Margins in Feeder Pig Finishing



Source: Appendix table 32.

when the hog market was exceptionally poor and the latter had a large price margin advantage. The difference in feeding margins between the two regions, though only about $3 in favor of North Central finishers, affects total sales so much that North Central producers did much better in 1982 and 1983 than their Southeastern counterparts when the latter held only small price margin advantages. Finishers have an added element of risk in variability of price margins which other types of hog producers do not have. On the other hand, finishers can compensate somewhat for low feeding margins by cutting prices paid for feeder pigs.

Impact of Taxes

Performance measurements of various size operations have thus far dealt solely with outcomes resulting from technical and pecuniary economies of size in production and marketing. The competitive status of producers is also affected by income taxes, however.

Typical hog enterprises are part of crop-livestock farms. Income taxes apply to an entire farm business, and cannot be determined for one of its enterprises. Performance before and after taxes is therefore examined on a whole-farm basis. Six representative farms in the North Central region are compared (app. table 33). These farms include farrow-to-finish hog enterprises producing from 140 to 10,000 head annually and associated crop production as reported by farmers in a survey of the region (*43*). Analyses focus on the results for 1982 because the farms incurred no income tax liabilities in 1983 and only a small amount of taxes in 1980. Hog production reflects the economies of size presented earlier for 1982. Crop yields, prices, and costs also reflect 1982 outcomes. Economies of size exist in both crop and hog production, but differences in unit costs and returns from crop production are quite small over the acreage range on these representative farms (*15, 16*). Estimated crop production costs and returns per acre are therefore the same for all farms.

Farms are first evaluated based on economic costs and returns as were hog enterprises earlier in this report

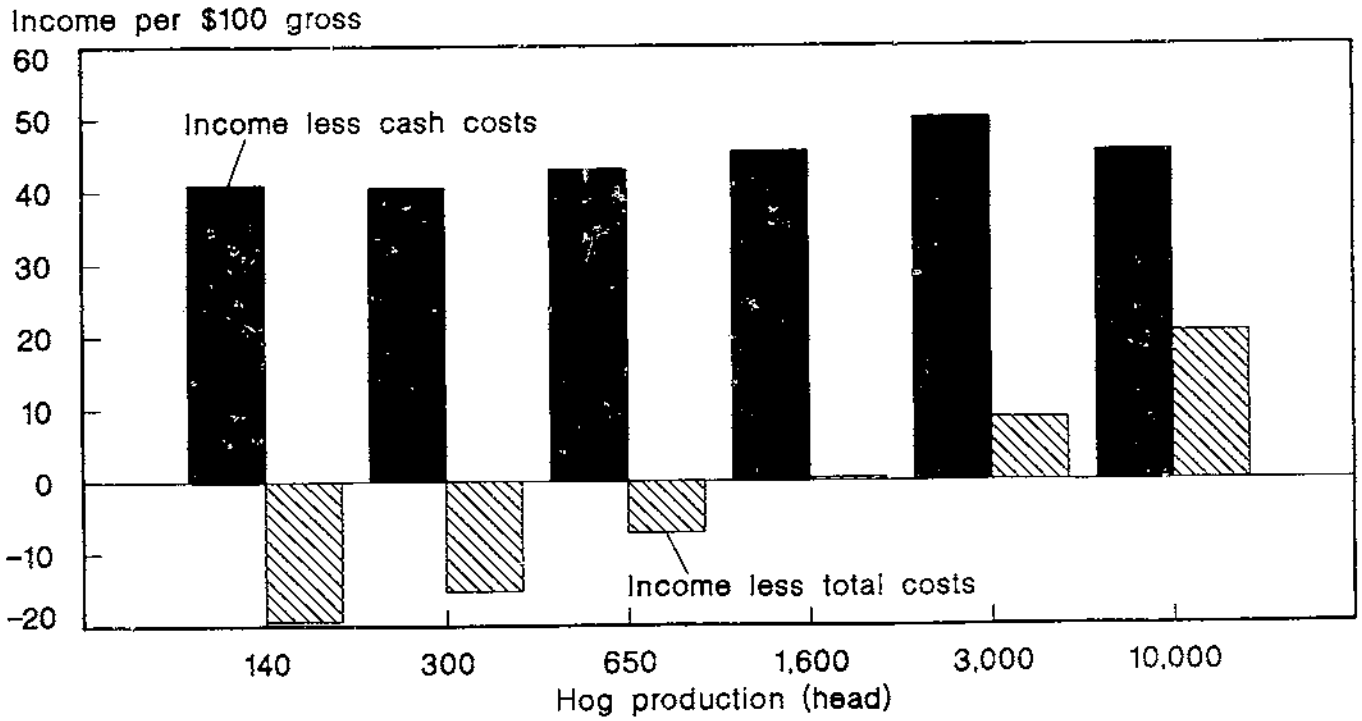
(app. tables 34-36). Gross income includes sales of crops, market hogs, and cull breeding stock. Costs are determined as for the hog enterprise accounts, moving sequentially from cash through total costs with one major exception. All corn is charged to hogs at market price in the hog enterprise accounts. In these whole farm analyses, corn fed to hogs is chargeable to the farm business at market price only when purchased. All farms except those with the largest farrow-to-finish enterprises produced more than enough corn to meet their hog enterprises' needs in 1982. Farms producing all corn fed to hogs incurred only the costs of producing corn.

How these farms fared economically was determined by a combination of the profitability of corn, soybean, and hog production, and the relative importance of these enterprises in the farm businesses. Returns from corn and soybeans deteriorated steadily from 1980 through the low of 1982. Conversely, hog production created losses in both 1980 and 1981, but exceptionally high returns in 1982. Differences in returns between small and large farms therefore resulted from a combination of economies of size in hog production and hogs' replacing crops as income producers as farm size increased. The smallest farm grossed $63,000 in 1982, with 28 percent coming from hog sales. The largest farm grossed just over $1.3 million, 98 percent from hog sales.

Measuring the economic performance of these farms without considering income taxes strongly favored the larger farms in 1982. Income over cash costs per $100 gross income rose from $41 for the smallest farm to $50 on the farm producing 3,000 hogs, falling back to $45 for the largest farm which brought substantial amounts of corn for feed in addition to using all home-produced corn (fig. 13). The margin of returns per $100 gross income stretched to $40 in favor of the largest compared with the smallest farm when all costs were taken into account. The three smaller farms fell short of covering total costs, the smallest by more than $19 per $100 gross income. The three largest had returns above total costs, the largest by more than $20 per $100 gross income.

Figure 13

Total Farm Income, Economic Basis, Farms with Farrow-to-Finish Operations, North Central Region, 1982



Source: Appendix table 39

The income tax liabilities of these farms cannot be precisely calculated because their complete financial situation is unknown. There are also many tax management plans and options farmers may choose. The general impacts of income taxes on these businesses can be illustrated, however. All farms are treated as sole proprietorships using the cash basis of accounting and straight-line depreciation with asset life equal to economic (useful) life the same as for the economic comparisons of costs and returns. Basic taxes are estimated according to the 1984 Federal income tax rate schedule, the 1984 rate for self-employment taxes, and assumed State taxes (*8*). None of the special tax reduction or deferral measures are used in the initial estimate of basic tax liabilities and income available after taxes.

Gross income is the same for both the economic and tax analyses, but is divided between ordinary income and capital gains in the tax analysis. Cash costs are the same in both analyses with one major exception. Cash costs include a calculated charge for interest on operating capital in the economic analysis; in the tax analysis, cash costs include the actual cash interest payments for all business purposes.

The cash basis of accounting used for tax computations results in lower income after cash expenses than does the economic analysis because all interest payments are included in the cash basis accounts. The relationships among farms, however, remains the same. The smallest farm has a cash residual of nearly $29 per $100 gross income, increasing to $38 for the farm producing 3,000 hogs, then dropping to $33 for the largest farm which buys much of its corn (fig. 14).

Depreciation allowable as an expense in determining taxable income differs from the capital replacement costs in the economic analysis. Amounts would be the same for both purposes only if all investments were made in 1982. In these ongoing operations, the average commitment of capital to depreciable assets occurred prior to 1982. The basis for depreciation for tax purposes is thus smaller than 1982 replacement values and may even be exhausted. On the smallest hog enterprises, depreciable hog facilities average over 30 years old (app. table 33). Although replacement cost is quite high, original investments have already been fully counted in determining past taxable incomes; only machinery has allowable depreciation remaining. Depreciable hog production facilities averaged only 3 years old on farms producing 10,000 hogs, so that allowable depreciation for taxes is much closer to the current replacement cost.

The six representative farms produced taxable incomes in 1982 ranging from just over $7,000 to $261,000 (app. table 37). Federal income tax rates for 1984 rise from 11 percent of taxable incomes of $3,400-$5,500 for married persons filing jointly to 50 percent of taxable incomes exceeding $162,400 (*8*). Basic taxes before any adjustments therefore substantially lessen the large farms' advantage before taxes. Cash income per $100 gross income available after basic taxes drops a little more than $3 below the before-tax income for the smallest farm. The self-employment tax accounts for two-thirds of total taxes. Basic taxes cut about $9 off the residual per $100 gross income for the largest farms (fig. 14). The difference between farms capturing the smallest and largest cash incomes per $100 gross income narrows from around $10 before basic taxes to about $3.50 after.

Large farms can lessen the tax liabilities imposed on their efficiencies by Federal income tax rates. Federal regulations for 1984 contain a number of provisions which farms can use to reduce or defer taxes. Although any farmer can use them, they are not equally beneficial to all farmers. Only highlighted examples are provided here.

Investment Credits

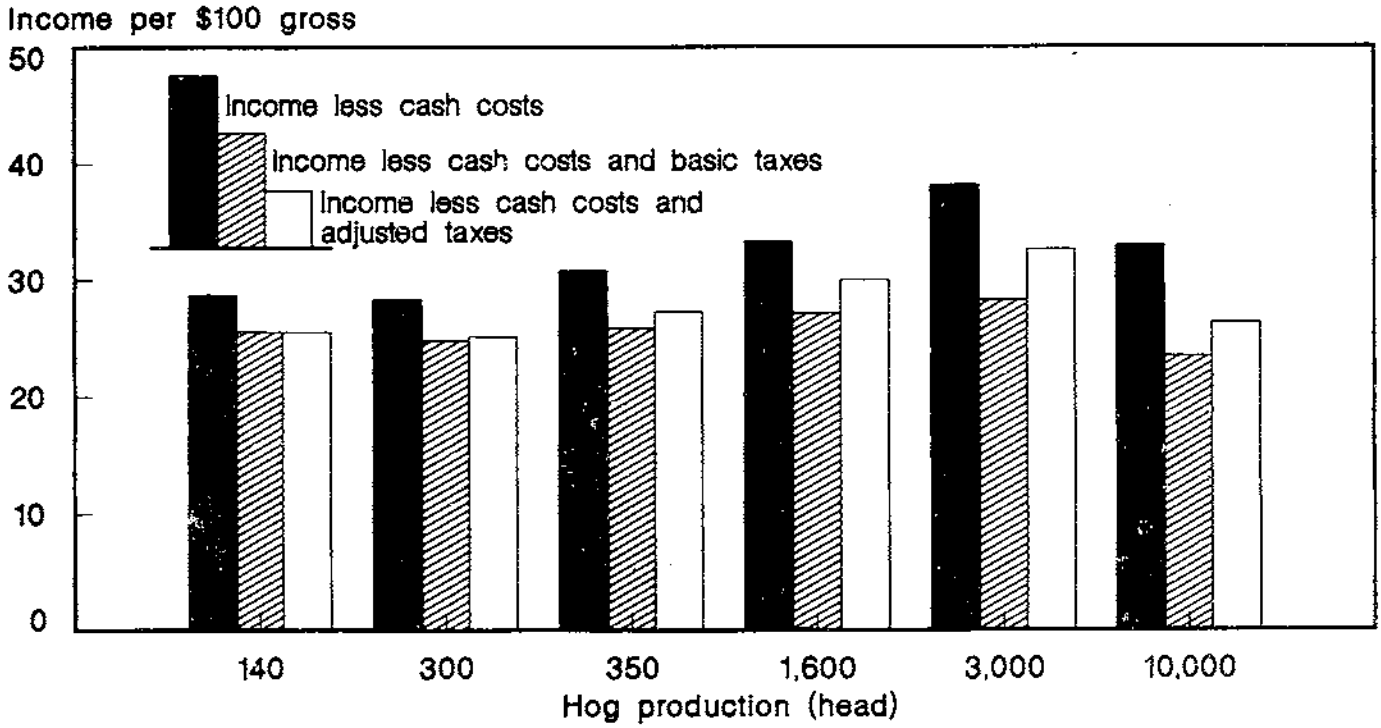
Investment credit is perhaps the most useful tax-reducing measure available to farmers. Allowable investment credit reduces Federal income tax liabilities dollar for dollar. The annual share of capital replacement at 1982 prices ranged from almost $8,700 for the smallest farm to $147,000 for the largest (app. table 38). If all investments qualified for investment credit, annual capital replacement would create 1982 investment credits at the 8-percent rate ranging from nearly $700 for the smallest farm to almost $12,000 for the largest.

Two conditions are necessary for investment credit to affect income after taxes. First, the business must be profitable enough to incur a Federal income tax liability. The smallest farm had only a small tax liability in 1982. If farming provides the sole source of income for the operator, only part of the allowable investment credit is useable unless the credit can be applied during carry back or forward years when Federal income tax liabilities may be larger.

Another condition for using investment credit is that investments must be made to earn the credit. Cash income available after taxes must serve both farm and family needs. While family expenditures differ widely among families, Illinois farm families spent an average of $24,644 in 1982, ranging from $19,898 for those on

Figure 14

Total Farm Income, Cash Basis, Farms with Farrow-to-Finish Operations, North Central Region, 1982



Source: Appendix table 39.

farms with less than 320 tillable acres to $27,645 for those with more than 650 acres (*44*). If family living expenses are set at $20,000, the smallest farm runs a deficit and can neither retire debt nor replace capital without incurring more debt. The next two larger farms have enough cash above basic family expenses to replace only part of their annual capital replacement needs, thus earning only a share of the potential investment credit. The two largest farms have sufficient cash reserves in 1982 to replace depreciable assets at the maintenance rate and invest an equal or greater amount in expanding depreciable assets. Money could be borrowed to replace depreciable assets and create investment credits. The 1982 balances simply show what farm earnings would support in terms of capital replacement barring claims for repayment of existing debt.

In reality, small farm operators probably replace much or all of their depreciable capital assets (except for hog production facilities which age 20 to 30 years or more) and earn and use the associated investment credit even though available cash is insufficient to replace depreciable assets. Since they cannot do this with farm income alone, they must draw on nonfarm income. During 1980-82, U.S. farm operators earned the following share of net income from farming (*33*):

Farm sales ($1,000)	Net income from farming
	Percent
Under 40	0
40-99.9	36
100-199.9	66
200-499.9	81
500 and over	96

None of the farms with sales below $40,000 annually had any effect on net family income (neither increasing or decreasing income by at least 1 percent in any size class). The two smaller representative farms would earn about two-thirds of their net income from nonfarm sources during 1982 if they conform to the national

average. Nonfarm income thus provides a source of investment capital and a chance to use investment credits that the farm businesses alone would not allow.

Incorporation

Organizing a farm business as a corporation offers another possibility for reducing Federal income taxes. Farmers may choose the corporate form of business organization for many sound reasons other than taxes (such as continuity of the business or ease of transfer of ownership), but tax savings can be substantial if taxable income is large enough (*11*).

Incorporation offers little or no tax advantage over a sole proprietorship under 1984 Federal tax regulations until taxable income reaches $35,000 to $40,000. Thereafter, the tax advantage of incorporation is sizable (app. table 38). For example, a sole proprietorship combined with one corporation (the operator might hold the land as a sole proprietor with crops and livestock produced in a corporation) with incomes allocated between the two to minimize taxes results in only a $41 gross tax advantage for the combination compared with a sole proprietorship at a taxable income of $20,000. Gross tax savings for incorporation exceed $24,000, however, when taxable income reaches $225,000 (*14*).

The three smaller representative farms could gain little or no tax advantage from incorporation with returns at 1982 levels. The fourth farm could cut taxes about $4,400 were it incorporated, while savings for the largest farm jump to over $26,000 if incorporated.

Actual business organizations of these farms are close to being compatible with minimizing income taxes (*43*). The first four farms are chiefly operated as sole proprietorships. Incorporation would have reduced income taxes considerably in 1982 for the fourth largest farm, but lower incomes in other years on balance make this farm about as well off staying a sole proprietorship. Farmers are using several different types of business organizations for the second largest farm, which would gain substantial tax advantages from incorporation versus a sole proprietorship. General partnerships are most common. Because the partners and not the partnership share both taxes and income, these farms have much the same net income taxes as do the smaller sole proprietorships. The largest farms also employ different types of business organization, but are typically operated as standard "C" family corporations and thus benefit from the tax reductions discussed.

The two major tax-saving measures, investment credit and incorporation, allow the larger farms to recapture much but not all returns taken away by basic Federal taxes (app. table 39). Cash income left after cash expenses differed by $10 per $100 gross income between the least and most profitable operations in 1982. Basic taxes cut the difference to $3.50. Investment credits and incorporation pushed the spread back to $7.50 (fig. 14). Other measures, such as energy credits, also help reduce taxes directly and increase cash available after taxes. The larger operations had the most to gain from using additional credits in 1982.

Present income can be protected at the expense of future income through various means of deferring taxes. Investments in depreciable assets were recovered for tax purposes in the previous analyses via the straight-line method of depreciation. Asset life ranged up to 20 years for major buildings. Faster writeoff methods have been allowed for many years, such as the declining balance method which permits a large portion of the depreciable base to be written off in the early years of use. Farmers can now opt for an accelerated cost recovery system (ACRS) for new property purchased after 1980 as well as certain used property (*8*). Most depreciable assets purchased by farmers fall into the 3- to 5-year category, so the allowable deduction per year for depreciation under this system would be at least 3 times the amount taken under the straight-line method in the preceding analyses.

Accelerated methods of capital recovery are useful for deferring taxes and enhancing present cash income only for farms successful enough to create an income tax liability. The smaller farms were hard pressed for more cash income in 1982, but accelerated depreciation would have done them little good; they had little tax liability to defer after counting investment credit based on average annual capital replacement.

The larger farms faced a much different situation in 1982. The farm producing 10,000 hogs had a taxable income of $261,000 after assessing depreciation of $117,000 by the straight-line method at ordinary life of the assets. The ACRS would allow approximately 3 times as much depreciation to be counted in the computation of 1982 taxable income, thus postponing most of the large tax liability. This opportunity to defer taxes may also be attractive to producers with large tax liability from nonfarm income.

Deferral of taxes by the ACRS or other accelerated capital cost recovery methods protects current cash income for investments or other uses. Such measures may allow profitable operations to regain the superior

cost-income ratios they held over less profitable operations before taxes. Continued investments must be made as depreciable assets are rapidly written off, however, or a higher proportion of future incomes will be taxable, likely at higher rates. Such tax deferral measures therefore encourage continued expansion. This does not apply to expansion through purchase of land because land investments are neither depreciable nor eligible for tax credits.

Self-employment retirement plans also offer farmers a way to defer taxes. Federal income tax regulations for 1984 allowed farmers to contribute the lesser of $30,000, or 25 percent of earned income, to a retirement plan. Such contributions are deductible from taxable income, but are useful only if the farm business has created a tax liability. Shifting money to a retirement account may actually hurt a farm business because it draws cash away from other uses.

The small representative farms were near or below the maintenance level in 1982. They had no margin of cash available for other purposes. Only the large farms had both sufficient incomes plus associated tax liabilities to defer taxes through a self-employment retirement plan.

Large farms earned a much higher margin of returns over costs in 1982 than did smaller farms due to economies of size in hog production and increasing specialization. Hogs were much more profitable than crops in 1982. Larger operations would have lost much of their before-tax advantage over smaller operations as sole proprietorships, but special provisions of the tax regulations allowed them to retain their basic position. Incomes were low for all farms in 1980 and 1983. Income taxes generally affected the competitive positions of farms during these years only to the extent that the larger farms might gain from income averaging in 1982 (app. tables 40-45).

Small farm businesses do not have the combination of efficiency and volume to produce sizable income tax liabilities. The flat rate self-employment tax is their major tax liability. They can use some tax-saving measures such as investment credit, but typical small-volume hog producers allowed hog facilities to age without replacement. Economic obsolescence of these facilities is accelerated by producers who do replace or expand depreciable assets and realize a price discount through investment credit.

Businesses with taxable incomes between $35,000-$40,000 can recoup some of their before-tax economic advantages over those with smaller incomes through incorporation. They can also use various means of tax deferral to maximize year-to-year cash reserves. This encourages continued growth and can be especially attractive to anyone with sizable tax liabilities, regardless of income source.

Variability in Performance

Economies of size are substantial and continue to increase for operations producing up to 10,000 head of hogs. Large size alone, however, is no assurance of success. Performance varies greatly among hog producers both in physical and monetary terms, and among operations of both similar and different sizes. This is shown in the detailed records kept by hog producers enrolled in the Illinois Farm Business Farm Management Association, which publishes summaries annually (*45, 46, 47, 48*). Farmers who enroll to use the recordkeeping service are voluntary cooperators who pay a fee for the service. Farmers included in this analysis account for about 10 percent of all hogs produced in Illinois and cover the range of enterprise sizes considered in this report. The Illinois farm record data are based on standard definitions.

According to Illinois farm record data from about 1,000 farms during 1980-83, farrow-to-finish hog enterprise sizes ranged from a minimum of 100 hogs produced annually (farms producing fewer than 100 hogs were omitted) to more than 5,000 head (app. tables 46, 47). Pig production and finishing operations were not recorded by enough farmers to allow analysis of these types of hog enterprises.

The farm record data do not allow computation of complete enterprise accounts because recordkeepers do not allocate nonfeed inputs among enterprises. The farm records do provide information, however, for a number of the most important physical, price, and economic performance measurements related to farrow-to-finish hog production. All are first expressed as ratio measurements for each farm, and then are related to size of hog operation measured in liveweight of hogs produced annually. The averages of the ratio measurements indicate the performance of each size class of producers (app. tables 48-52). Hog production on Illinois recordkeeping farms is more concentrated in midsize hog enterprises than is production in the North Central region in general. The average performance ratios for each size class of Illinois producers are thus weighted by the size distribution of production in the region to produce overall averages representative of all producers rather than the sample of recordkeepers (app. tables 48-52). The means in the regression analyses are

averages of the performance ratios achieved by the recordkeepers (app. table 53).

Physical Performance

Eight measures of physical performance were computed from the farm records: pounds of hogs produced per litter, pigs farrowed and weaned per litter, litters produced and pigs weaned per female year, death loss, weight of hogs sold, and pounds of concentrate feeds fed per cwt of production. These measurements conform to those commonly used in the hog industry (*21*). When they are related to size of enterprise measured by cwt of hogs produced, two results are readily apparent.

First, performance varies substantially among producers regardless of the measure considered. Outcomes for 1983 (other years' results are similar) show the greatest differences among smaller producers, with performance increasingly more uniform but still variable as size of enterprise increases. Some small producers do better than their large counterparts, but many do far worse.

These measures of physical performance reflect both efficiency of the operation and uniqueness of the individual farm operations. Outcomes at the extremes are due largely to the latter. For example, some farms may be expanding, contracting, entering, or exiting hog production, with their actions thus affecting one or more performance measures. These farms are generally farrow-to-finish enterprises, but some pigs may be bought or sold for finishing. Debilitating diseases or parasites may adversely affect some; catastrophic death losses hit a few. Exceptionally high performance in one area may be achieved at the expense of low performance in another. A small producer may save more pigs per litter than a large operator, for example, but provide an extraordinary amount of individual care to do so. The scatter maps show the general variation among farms, but exclude 1 to 3 percent of the farms with extreme outcomes (see figs. 15-31). Mean results bounded by one standard deviation measure probable variation among farms within each size class more precisely (app. tables 48-52).

Second, despite considerable variation among farms, average performance consistently improved as size of hog operation increased for all physical performance measures except pounds of hogs produced per litter. Larger operations achieved better performance than smaller ones each year during 1980-83, and all 4 years combined (app. tables 47-53). The outcomes for 1983 are indicated by the regression lines on the scatter maps (see figs. 15-31). Improvements in performance were not always great as size of enterprise increased, but they were always highly significant, that is, not due to chance alone. Performance cannot continue to improve at a constant rate without limit as size of enterprise increases (as the linear regressions imply), but rates of improvement did not diminish within the size range of this group of hog enterprises.

Production Per Litter. Pounds of hogs produced per litter farrowed was the only measure of physical performance on Illinois farms that was unrelated to size of operation (fig. 15). Producers averaged 1,741 pounds of hogs per litter for the 4 years combined (app. table 53). Result were the same for each year individually as well, except for 1981, when weight per litter was 38 pounds lower than the other years. The Illinois farm record system uses the commonly accepted definition of production: the weights of ending inventory, sales, home use, and post-weaning death loss minus the weights of beginning inventory and purchased hogs (*21*). Large producers weaned more pigs per litter and had lower death losses than did small producers, thus increasing weight produced per litter. But large producers also marketed slaughter hogs at lighter weights, and sold a smaller percentage of their total sales as cull breeding stock, both of which cut weight produced per litter. Equality in weight of hogs produced per litter does not signify economic comparability among operations of different sizes because higher valued slaughter hogs accounted for a greater share of weight produced in the larger operations.

Variation in production per litter was much greater among small producers than large ones. In 1983, two-thirds of the smallest producers varied by a spread of 1,166 pounds of production per litter (average production plus and minus 583 pounds). Two-thirds of the largest producers were within 233 pounds of average production.

Pigs Farrowed Per Litter. Illinois producers farrowed an average of 9.06 pigs per litter (app. table 53) with a significant difference of 0.05 pig for each 1,000 cwt (about 400 hogs) change in amount of production in favor of the larger operations during 1980-83 (fig. 16). The farrowing rate was slightly better in 1983 than in earlier years. Two-thirds of the smallest producers in 1983 farrowed within 1.4 pigs of the average for their size class, but the same proportion of the largest producers fell within half a pig of the higher average rate

Figure 15
Pounds of hogs produced per litter, 1983

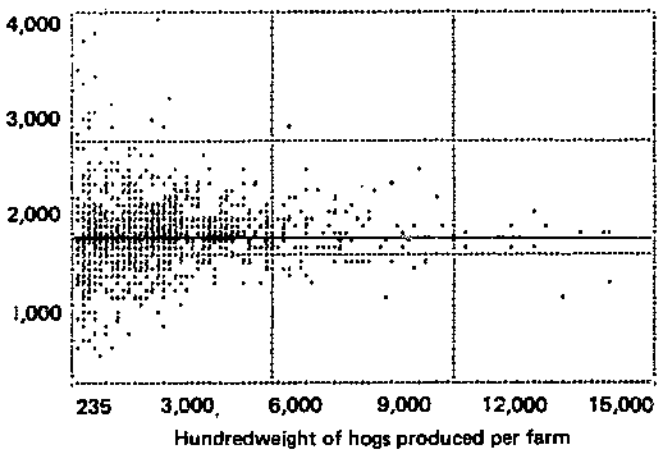


Figure 16
Pigs farrowed per litter, 1983

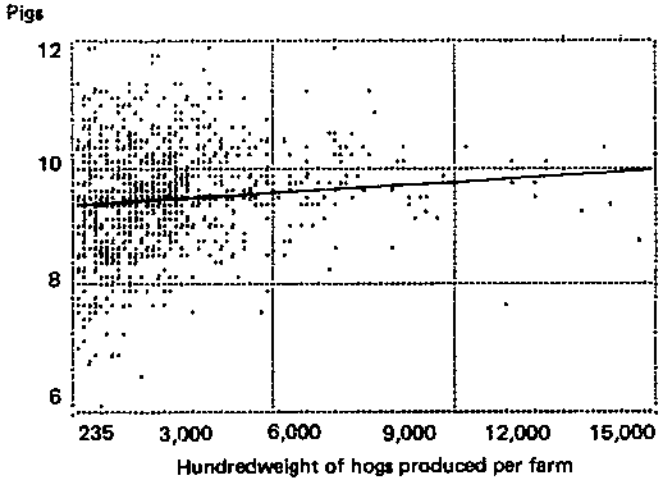


Figure 17
Pigs weaned per litter, 1983

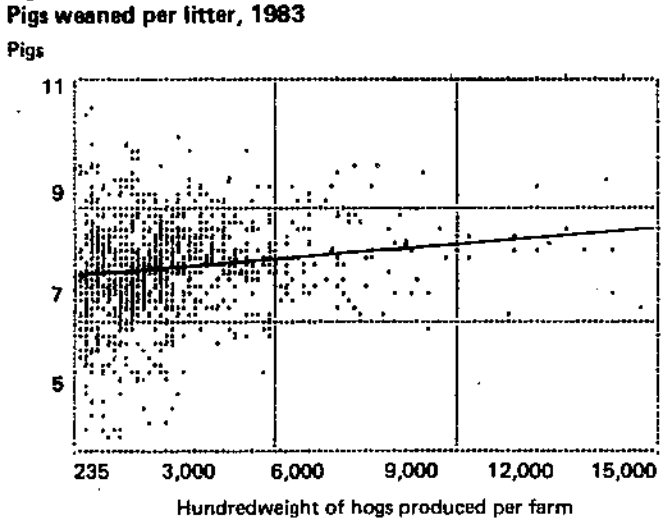


Figure 18
Litters farrowed per female year, 1983

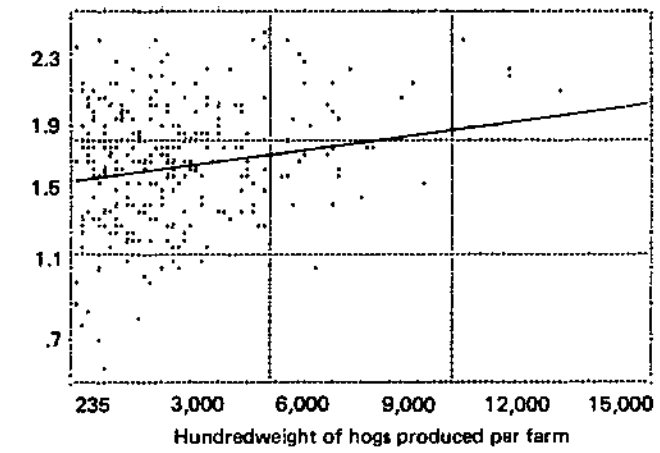


Figure 19
Pigs weaned per female year, 1983

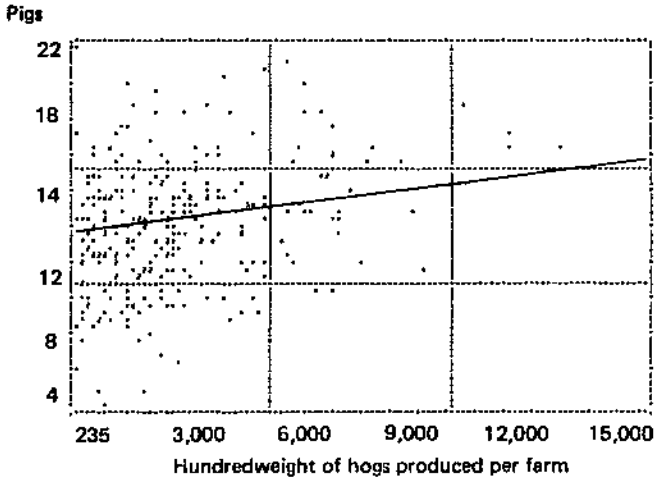


Figure 20
Death loss as percent of pounds, 1983

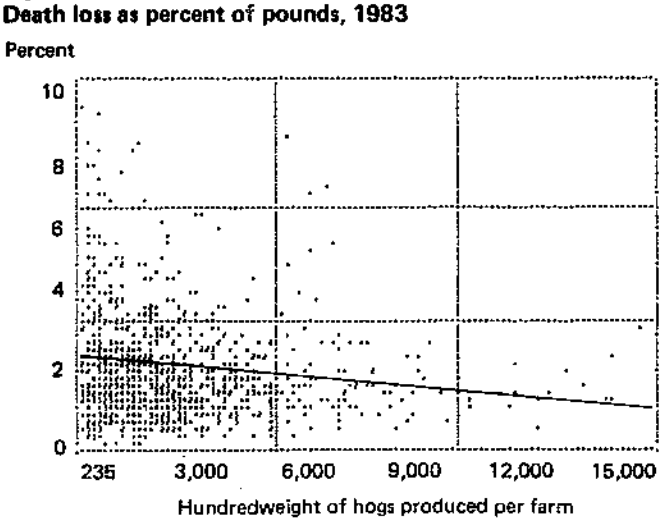


Figure 21
Weight per hog sold, 1983

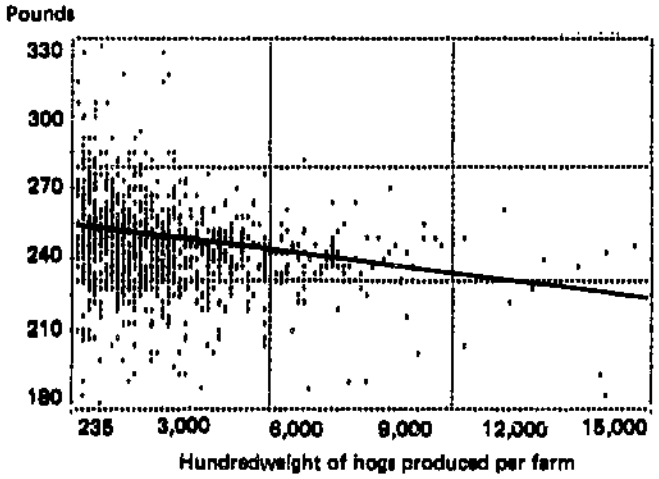


Figure 22
Concentrate feeds fed per 100 pounds of hogs produced, 1983

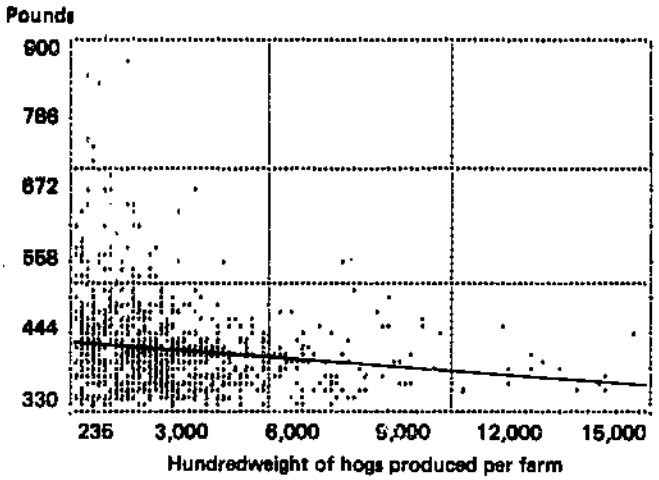


Figure 23
Price per 100 pounds of hogs sold, 1983

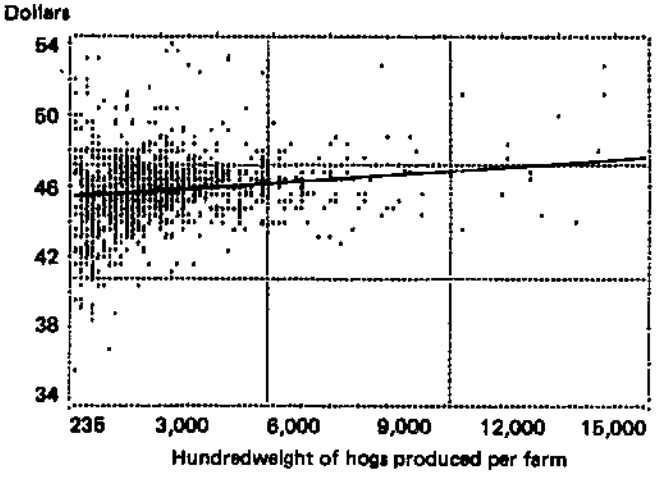


Figure 24
Total returns per 100 pounds of hogs produced, 1983

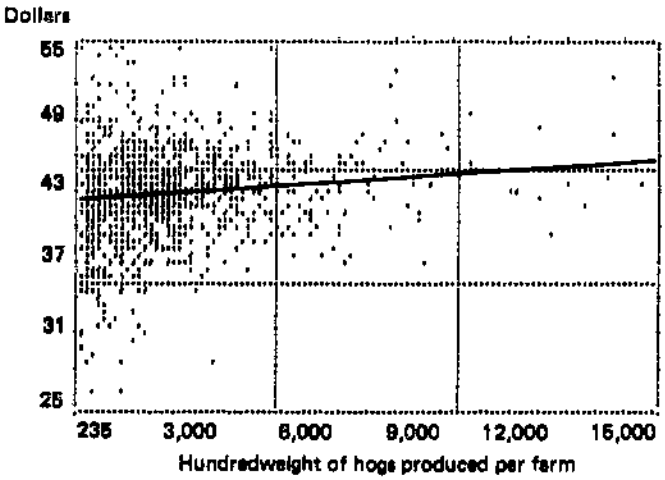


Figure 25
Cost per 100 pounds of commercial feeds fed, 1983

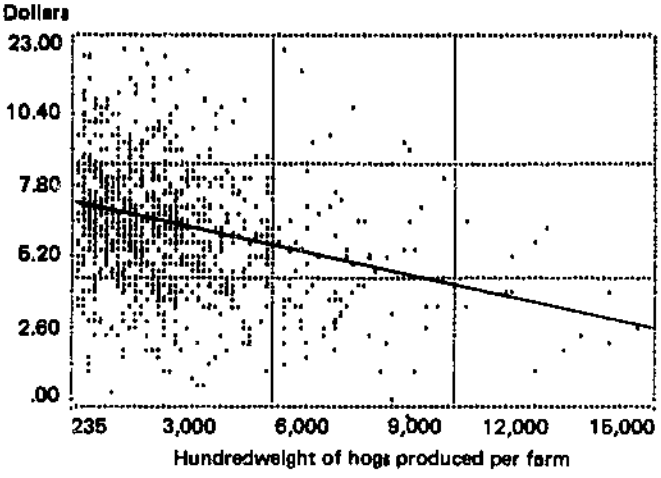


Figure 26
Cost per 100 pounds of concentrate feeds fed, 1983

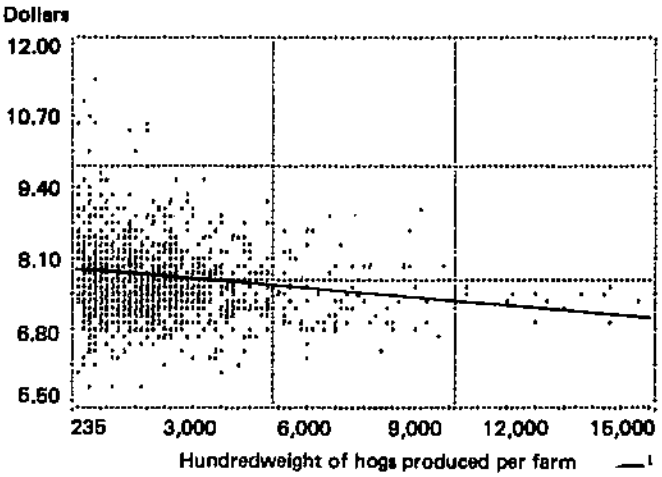


Figure 27
Average payment per month per employee, 1983

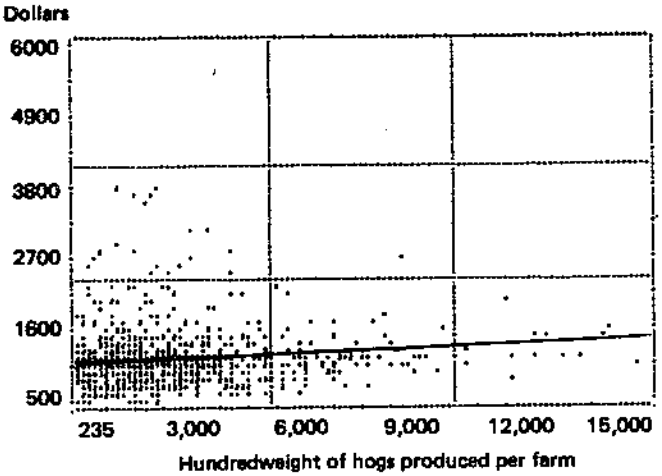


Figure 28
Feed cost per 100 pounds of hogs produced, 1983

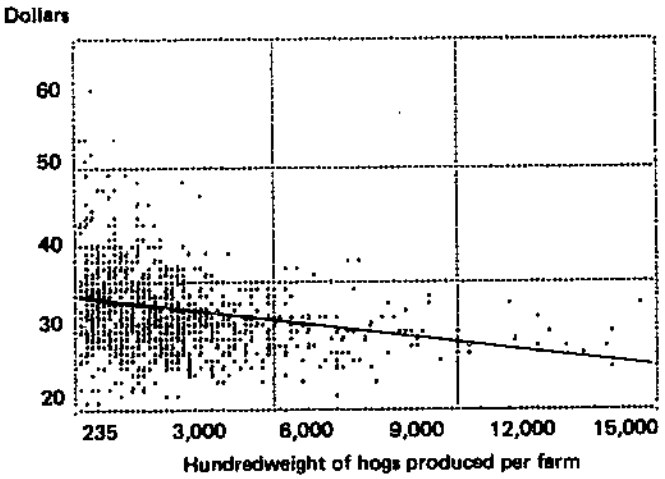


Figure 29
Returns per 100 dollars feed fed, 1983

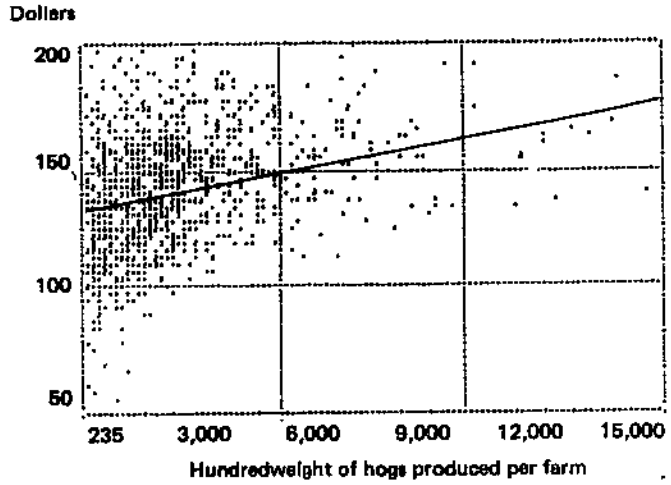


Figure 30
Return above feed costs per 100 pounds of hogs produced, 1983

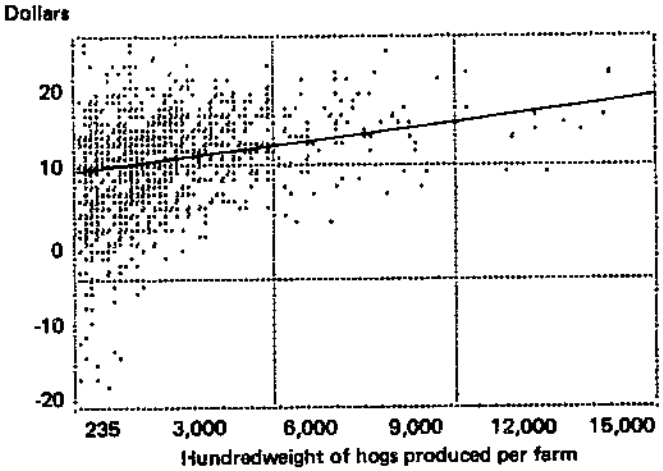
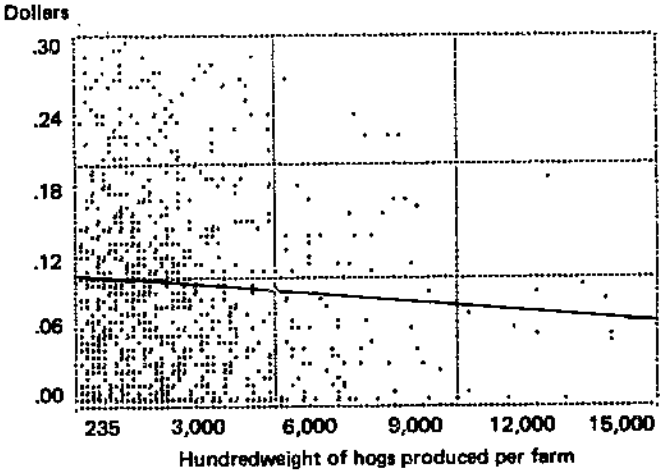


Figure 31
Cash interest paid per dollar of cash income, 1983



their group achieved. Once placed in the farrowing house, the Illinois record system counts a female as having farrowed a litter even if no pigs are farrowed alive.

Pigs Weaned Per Litter. Producers weaned an average of 7.33 pigs per litter during 1980-83 (app. table 53). The weaning rate improved by 0.06 pigs per litter per added 1,000 cwt of production from smallest to the largest operations (fig. 17). Overall, weaning rates improved slightly in 1982 and 1983. Performance differed more among small than large producers.

Litters Farrowed Per Female Year. Producers farrowed an average of 1.67 litters of pigs per female year during 1980-83, with a difference of 0.03 litters for each 1,000

cwt of production in favor of the larger producers (fig. 18 and app. table 53). Result were the same for all years except for 1981 when the rate was slightly higher. Two-thirds of the smallest producers were within plus or minus 0.45 litters of their group average in 1983. The deviation from average tightened to only 0.11 litters for the largest producers. Illinois recordkeepers count a female as part of the breeding herd when she is selected for that purpose, usually near 6 months of age or 200 pounds in weight. Only some of the farmers record production on the basis of a female year.

Pigs Weaned Per Female Year. Farmers weaned an average of 12.67 pigs per female year over the 4 years of record (app. table 53). The number weaned shifted by 0.31 pigs for each 1,000 cwt of production in favor of the larger producers (fig. 19). Overall, performance in 1983 was higher by 0.64 pigs per female year; performance in other years was the same as in 1980.

Large producers weaned more pigs per litter than did small ones; they also farrowed more pigs per female year than did small producers. This combination gave large producers a decided advantage over small ones in pigs weaned per female year, averaging under 12 on farms with the smallest enterprises in 1983, but approaching 17 on farms with the largest enterprises. Again, variability was greatest among the smallest operations with a deviation of more than four pigs above and below average required to include two-thirds of the smallest producers; two-thirds of the largest operations produced within 1.5 pigs of average.

Death Loss. Death losses for Illinois farrow-to-finish producers averaged 2.03 percent without significant variation among the 4 years (app. table 53). Death loss in the Illinois record system is the weight of post-weaning death loss divided by production, counting death loss as part of production. Producers cut death losses by 0.07 percent per 1,000 cwt of increased production (fig. 20). Death losses among small producers varied more than among large ones.

Weight of Hogs Sold. Hogs sold by Illinois farmers during 1980-83 weighed an average of 244 pounds per head (app. table 53). Weight per hog changed by 1.7 pounds per 1,000 cwt of production, with larger producers marketing at the lower weights (fig. 21). This resulted partly from the larger producers marketing slaughter hogs at lower weights, and partly from cull breeding stock being a smaller part of their sales compared with sales of small producers (app. table 52). Weights per head sold in 1982 and 1983 were up approximately 3 pounds. Variations in sale weights were greatest among farms with small hog enterprises, but the difference in variation between the small and large farm groups was less than for most other physical performance measures.

Rate of Feed Conversion. Producers fed an average of 427 pounds of concentrate feeds for each cwt of hogs produced during 1980-83 (app. table 53). This outcome is an average of producer achievements as is the average for all other ratio measurements discussed in the section. Average performance weighted by production is superior to that of the average producer because of better performance by the larger producers and their much greater share of production.

Concentrate feeds include all grains and manufactured feeds plus all ingredients such as sweeteners, vitamins, minerals, and medicines used in hog rations for all hogs and pigs including the breeding herd. Nutrients derived from pastures are not counted. The feed-conversion ratio (pounds of feed fed per cwt hogs produced) shifted 5.9 pounds per 1,000 cwt produced with the larger producers doing the better job (fig. 22) The ratio held steady during 1980-82, then improved by nearly 10 pounds in 1983. The smallest producers used 454 pounds of feed per cwt of hogs produced in 1983, with a deviation of 87 pounds from this average required to include two-thirds of the smallest producers. The largest achieved a 383-pound average, with two-thirds of the largest producers within 25 pounds of average. Much of the advantage achieved by the larger producers stems from the increased production they get per female.

Price Performance

The Illinois farm records provided five measures of performance that were essentially determined by price either for inputs purchased or hogs sold. The measures included prices received for hogs sold, gross returns for hogs produced, prices paid for purchased commercial feeds, the cost of all concentrate feeds, and payments to employees. Although quality differences can affect prices for each, the level of quality could not be determined from the farm records.

Prices varied among farms to the same degree as for measures of physical performance. Changes in prices relative to size of operation, though sometimes small, were highly significant for all 4 years combined, and for each year in most cases. Overall averages noted are for the average producer rather than the average hog produced, just as for the physical performance measures.

Prices Received. Illinois producers recorded an average of $45.05 received per cwt for all hogs sold during 1980-83 (app. table 53). Over this period, prices were higher by $0.14 per cwt with each 1,000 cwt of added production per enterprise (fig. 23). The largest producers had a 4-year average price advantage of nearly $2 per cwt of sales, compared with prices recorded by the smallest producers.

Factors such as higher prices paid for breeding stock, direct selling to packers, and more hogs priced according to grade and yield suggest that larger operations produce better quality slaughter hogs and cut costs in marketing compared with smaller operations (*43*). Results from the Illinois farm records, showing that the larger producers did gain a price advantage during 1980-83, support this premise, but precise differences in prices could not be determined from the record data. Seasonality of production and marketing, differences in the kinds and weight of hogs sold, types of market outlets, quality of slaughter hogs, and uniqueness of the recordkeeping system all contribute to differences in the price per cwt of hogs sold.

The wide variation among smaller producers in prices received is more indicative of seasonal production and marketing than any other factor. Small seasonal producers may fare better or worse than the average realized by larger continuous producers. Large producers included in the Illinois farm accounts should have recorded higher average prices for hogs sold than did small producers due to product mix. A higher proportion of their receipts came from slaughter hogs versus cull breeding stock than on farms with small hog enterprises. Conversely, uniqueness of the Illinois recordkeeping system tends to deflate prices received by large compared with small hog producers. Most large hog producers employ custom haulers whose charge is deducted directly from market receipts in the farm record system. Smaller producers typically do their own hauling to market, receive and record the full market hog prices, and record the costs of transportation equipment in the machinery section of their farm accounts. Precise measurement of how size of operation relates to quality of hogs, marketing economies, and prices received requires more information than is available in the Illinois farm records.

Total Returns. Recordkeepers measure annual hog production on the accrual basis. This involves counting both physical amounts and values of inventories as well as purchases, sales, death loss, and home use. Differences among farms in returns per cwt of hogs produced are thus influenced by factors other than hog prices, especially among farms with small hog enterprises (fig. 24). For the 4 years combined, the relationship between total returns per cwt of hogs produced and size of operation was essentially the same as for price of hogs sold, but returns were unrelated to size of operation in 1980 and 1982 (app. table 53).

Price Paid for Commercial Feeds. Commercial feeds include all kinds of purchased feedstuffs except grains, plus nonfeedstuffs purchased for use in hog rations. Producers typically either purchase manufactured protein supplements which are added to grain, mostly corn, or they buy soybean meal plus additives necessary to form a complete ration with corn. The 4-year average cost of the composite was $15.78 per cwt with a reduction of $0.25 per cwt of feed per 1,000-cwt increase in production (app. table 53). Producers spent an average of $16.32 per cwt in 1983, with costs averaging over $4 more for the smallest compared with the largest producers (fig. 25). Variability in prices paid was also greater among the smaller producers. Substantial variations occur largely because of differences in materials purchased, the number of services included in the cost of the material, and volume. The larger producers obtained lower prices largely because of volume purchases and a shift to soybean meal as the protein source.

Ration Cost. Cost of all feed averaged $7.18 per cwt for the 4 years (app. table 53). Costs per cwt of ration changed about $0.04 for each 1,000 cwt of production to favor larger producers (fig. 26). All the cost advantage came from differences in the prices and proportions of commercial feeds. All enterprises in the farm record system were charged the same price for grain regardless of size of operation or source of grain. Variation in ration cost among farms is likewise determined solely by the prices and amounts of purchased materials other than grain that were included in the ration. If the cost for grain were measured by actual farmer proficiency in the purchasing or selling of it, or by the cost of producing grain, the relationship between feed cost and size of enterprise would be affected.

Payments to Employees. Illinois hog producers paid their employees an average of nearly $1,100 per month during 1980-83 (app. table 53). Payments included cash salaries, employer contributions to Social Security, and all items purchased for employees such as medical insurance, but not the value of noncash perquisites such as housing on the farm nor the amount of any profit

sharing. Average monthly payments changed by $25 for each 1,000 cwt of hog production, with larger producers paying more. Payments were steady in 1980 and 1981, increased 8 percent in 1982, and another 5 percent in 1983.

Payments to employees varied more among the large rather than the small operations, the opposite of all other price measures (fig. 27). Two-thirds of the smallest operators in 1983 paid within $366 of the average monthly payments for their size class; the similar spread from average was $875 for the largest size class. Some of the high monthly payments associated with small hog enterprises came from large farms which had small hog enterprises; some resulted from the difficulty recordkeepers have in converting hourly payments to part-time workers into monthly equivalents. Overall, however, the larger hog operations had higher quality employees if payment to employees is used as a measure of their worth.

Economic Performance

The farm record data provide three measures of economic performance which combine physical with price performance; all pertain to the amount or value of hogs produced relative to feed cost. They include feed cost per cwt of hogs produced, returns per $100 feed fed, and return over feed costs per cwt of production. Any one of these measures provides a basis for approximating costs and returns. Economic performance cannot be measured on the basis of total costs and returns because Illinois recordkeepers do not allocate nonfeed costs among enterprises.

Economic performance varied widely among farms. Extremes were exaggerated as producers gained or lost from differences both in physical performance and prices. Despite the large variations, however, the larger operations averaged significantly better economic performance than the smaller ones, regardless of the performance measure or year of operation. Averages reflected producer performance rather than the aggregate of all hogs produced, as was true for measures of physical and price performance.

Feed Cost Per Cwt of Hogs Produced. Feed costs averaged $29.79 per cwt of hogs produced during 1980-83, with a change of $0.44 per 1,000 cwt produced in favor of the larger producers (app. table 53). Changes in feed prices, coupled with differences in physical production efficiency, kept feed costs per cwt of production from shifting more than $2.00 within the period, with increases recorded in 1981 and 1983, and a decrease in 1982.

Physical production performance and prices paid for purchased feeds both varied more among small than large producers. Feed cost per unit of production thus varied even more among small compared with large producers (fig. 28). Feed cost for the smallest producers in 1983 averaged just over $34 per cwt of production, but a nearly $15 spread was needed to include two-thirds of the producers. By contrast, the largest producers got the job done for $27.50, and two-thirds of them kept within about $2.50 of the group average.

Returns Per $100 Feed Fed. This measure provides the added dimension of the value of hogs produced. Illinois farms averaged just over $155 per $100 feed fed for the 4 years (app. table 53). Large producers benefited by a difference of $2.56 per 1,000 cwt of hogs produced (fig. 29). Only 1982 stood significantly above the other 3 years, with a return $72 greater due largely to higher prices for hogs and lower prices for feed that year. Again, farms with the smallest enterprises varied the most.

The margin of returns above feed costs is the amount available for all other costs and profit. Each $100 expended for feed on Illinois farms during 1980-83 generated $55 for other purposes. Put another way, feed costs took 65 percent of the return. Feed costs incurred by hog producers in the North Central region over these years averaged about three-fourths of total cash costs of production, exclusive of capital replacement and interest on capital assets (app. tables 13-18). Producers therefore needed returns of $133 per $100 feed fed to cover cash costs. Feed costs averaged about 55 percent of total costs on North Central farms during this period, requiring returns of $182 per $100 feed fed to cover all costs.

Feed costs account for a smaller share of total costs of production on small than on large operations, so returns per $100 feed fed needed to break even on small operations are higher than for the average operation. The opposite applies for producers with larger than average size operations. Some small Illinois producers had returns of less than $100 per $100 feed fed in 1983. The least effective large producers earned enough to cover all cash costs.

Returns Above Feed Costs. Returns above feed costs measures the amount available to pay for other inputs

and profit, if any. It is a common economic gauge used by many producers. Differences in both physical and price performance are combined in determining returns above feed costs as they are in returns per $100 feed fed. Only the perspective differs.

Illinois producers realized $14.93 above feed costs per cwt of production during 1980-83, with a change of $0.54 per 1,000 cwt of production in favor of the larger operations (fig. 30 and app. table 53). The smallest producers in 1983 averaged only a little over $6 above feed cost per cwt of hogs produced. The spread needed to include two-thirds of them exceeded $16. Returns over feed costs increased to more than $16 for the largest, with much less variation in the results amount them.

Financial Vulnerability

Many factors combine to determine the financial soundness of a farm business. The only gauge provided by Illinois farm records is the proportion of operator cash income from all farm sources spent for cash interest on farm debts. This indicator alone, however, shows that financial strength among farms varies widely, and that a number of farms may be in a tenuous financial position (fig. 31).

Illinois hog producers spent 9.2 cents of every dollar of cash income for cash interest payments in 1983 (app. table 53). Farmers with small hog operations spent a slightly larger proportion of their cash income for interest than did those with large hog enterprises. The relationship between the proportion of income spent for interest and size of operation, however, was far overshadowed by large differences among farms in the amount of income spent on interest.

Variation in the proportion of cash income going to pay interest was especially great in 1983 among small hog enterprises. These producers also had the smallest farm businesses in terms of total income from all farm sources. Cash interest averaged only $0.12 of $1 of cash income on these small farms, but ranged upward to $0.28 before two-thirds of the small farms were included.

The pressure on cash flow and probability of business survival with cash interest payments at this level or higher depend partly on the extent that cash interest payments go for operating loans versus capital purchases. The type of debt and associated interest cost both affect length of commitment and amount of principal-relative-to-interest payments.

Farm financial analysts commonly consider that when cash interest payments reach 25 percent or more of cash income, the financial survival of the firm is at risk. If 25 percent of income spent on interest is the danger signal, then at least 74 of the 977 farms included in 1983 Illinois records were in some trouble. Forty-one of these farms, mostly the smaller ones, paid out $0.25 to $0.30 of each dollar of cash income for interest. An additional 33 farms put more than 30 percent of their cash income into interest payments. The extent of off-farm income these farmers may have had to support their farm business is unknown.

Implications

Economic analyses and the record of past adjustments in hog production both indicate that large-volume hog producers have achieved economies not realized by small-volume producers regardless of type of hog enterprise. Performance measurements by size of operation are imprecise, and knowledge gaps remain, especially concerning extremely large hog operations. Available evidence, nevertheless, indicates a continued restructuring of the hog industry to fewer, larger, and more specialized operations even more rapidly than before.

Both technical and market economies of size are restructuring the hog industry as they have already changed other farm enterprises (*23*). Large commercial hog producers do not yet dominate production as in cattle feeding (where about 2 percent of all feedlots produce nearly 80 percent of all fed cattle in specialized, single-enterprise operations), but they are fast approaching a dominant position. Hogs were kept on some 432,000 places in the United States in 1984, but this large number masks the fact that three-fourths of these locations held less than 100 hogs each and accounted for only 11 percent of the total hog inventory. Six percent of the largest hog operations had over half the total hogs in 1984. Few and large thus already characterize hog enterprises.

Exit of small hog enterprises is only a matter of time under existing conditions. Small farm enterprises are maintained by full and part-time farmers for both economic and noneconomic reasons. Hogs are produced primarily to make money. Analyses show the economic weaknesses of small hog enterprises, as their numbers dwindle rapidly. As small hog enterprises dwindle, so does the support structure providing them with supplies and markets, making it even more difficult for hogs to be moneymakers. Hogs have become insignificant as enterprises for home use, as have other live-

stock and poultry enterprises. There are few reasons, other than economic, for keeping hogs. Hogs require regular attention and work, produce offensive odors, and damage land and facilities unless properly controlled. They cannot feed from pasture nor control weeds around the farmstead, reasons people often give for keeping small numbers of other livestock such as sheep.

Perpetuation of small hog enterprises rests almost completely on economic incentive. The combination of superior performance of large producers and their continued pressure on hog supplies virtually eliminates the chance for small hog enterprises to make significant returns. Small hog enterprises should be able to generate returns over cash costs, but returns sufficient to justify replacement of depreciable assets even as a hedge against risk by diversification will be unlikely. As farmers gradually become aware that small hog enterprises have limited net farm earnings, they will adjust their operations accordingly, some expanding hog production, but most dropping the enterprise. This applies particularly to operations with annual production under 500 head of hogs, which accounted for 78 percent of all hog operations in the North Central region in 1982 and 92 percent of those in the Southeast region. Least attractive in economic terms will be those producing fewer than 200 head annually, which accounted for 55 and 83 percent of all producers in the two regions, respectively, in 1982.

Economies of size and realizable efficiencies will be exploited. They can be achieved at least in part in various ways. Cooperatives, formal and informal, are one approach. Some cooperatives already exist, particularly those for producers who have banded together to purchase inputs. Most, however, are composed of large producers seeking to enhance their already sizable advantages. Traditional farmer reluctance to relinquish control of their operations to others stands as a deterrent to extensive cooperative ventures among smaller producers. Integration such as now characterizes the broiler industry can generate the capacity to deal in large volumes and capture the ensuing economic advantages of size. A small part of hog production is now integrated. For extensive integration of the industry to occur, however, there must be substantial, unexploited opportunities in one or more sectors from basic inputs to product marketing. So far, such openings have not been sufficient to attract extensive integration. Increasingly larger independent hog operations have accounted for most of the adjustments that have taken place. These operations are leaving no obvious gaps for others to fill and seem most likely to dominate the industry in the future.

The eventual size of hog operations cannot be determined, but the potential shift from the present size structure is great. If additional economies can be obtained, operations will grow larger. Further growth in size of operation will occur even after economies of size are fully realized, so long as diseconomies do not set in. Present measurements indicate that economic performance is still improving for operations of 10,000 head, and that some operations already produce 100,000 head or more annually.

Further separation of crop and hog production will occur as hog enterprises become larger and more specialized. The two may be completely divorced as components of the same farm business, as has largely occurred in commercial cattle feeding, poultry, and some dairy production. Most grain fed to hogs is still produced in the same farm business as the hogs, but large hog operations are purchasing an increasing share of their feed. Technologies now allow hog production to be largely separated from land except for building sites and waste management.

Loss of the option to profitably fit hogs and other livestock into a farm business produces a creeping negative impact on land use. Farmers formerly planned their businesses to include a mix of crops and livestock, adjusting both to the land and other resource capabilities and income goals. Hogs were most reliable income producers. Many farmers have now dropped hogs and other livestock enterprises as they have acquired more land, hence maintaining or increasing income through specialization in crop production. Many others, however, have and will continue to drop hogs and other livestock enterprises because competition has rendered them unprofitable.

The extra land necessary to maintain income through crop production is not always available. Pressure to maintain income forces some farmers into cropping programs much too intensive for the capability of their land. Resultant soil losses through erosion far exceeds the tolerable level on some land. The separation of hog and other livestock enterprises from crop production brought about by internal efficiencies in these enterprises indirectly threatens soil conservation and water quality.

Resources will be both saved and wasted in the shift to larger and more specialized hog operations. An aggregate increase will occur in the efficiency of use of many resources over time, as indicated by the superior performance achieved by large versus small producers. These efficiencies range from increased feed efficiency

to inputs purchased in volume directly from manufacturers to farm-to-packer marketing. At the same time, some resources will be used less efficiently or will be idled. Many hog production facilities will continue to be abandoned because of economic rather than technical obsolescence or poor condition. The cost of tractors, trucks, and other general purpose farm machinery will have to be borne by crops alone. The same holds for general purpose livestock equipment. Farm operator and family labor will lose potential employment. Little or none of the fertility elements taken off land in harvested crops will go back to the land in manure. Similar inefficiencies in use or idling of resources during the adjustment process will extend to encompass the inputs, services, and marketing sectors.

Prevention, control, or eradication of hog diseases should be simpler in a more concentrated production sector. Some indigenous hog diseases have already been eradicated; efforts are directed at others. Exotic hog diseases continue to threaten the industry. Their eventual introduction is likely due to increasing mobility of people and materials. Hog production concentrated into a relatively small number of large operations, typically with closed facilities, should retard the introduction and spread of diseases. Large operations should also facilitate the isolation and eradication of diseases, compared with the same problem in large numbers of small operations. The economic impact could be more severe on both individual businesses and aggregate pork supply, however, if disease control or eradication required depopulation of many large operations. Hogs in large, closely confined production systems are also threatened more by some diseases, especially those aggravated by stress, than are hogs produced in extensive systems. Potential bans on the use of antibiotics in feed, if enacted, might affect large operations for this reason.

Hog wastes pose both problems and opportunities for hog operations of all sizes. Prevention of pollution will be an increasingly pressing issue for operators as they become larger. Land application of hog manure for fertilizer will become much less attractive than on general crop-hog farms due to volume, distances, and often, lack of sufficient land on which to use the wastes. Alternative uses for hog wastes, such as for generation of methane gas or for recycling nutrients into the feed supply, are more likely to be options for large than for small hog producers, but are not yet economically feasible. Large-volume hog producers will most likely opt for least-cost waste disposal systems pending new technologies for processing hog wastes or changes in cost-price relationships.

Amounts and sources of capital become more important as hog operations shift to confinement facilities and grow larger. Capital-intensive production now requires investments for depreciable assets near $200 per head of annual sales in farrow-to-finish operations. Capital requirements thus run into millions of dollars on large operations. Such large sums are difficult for farmers to acquire, and even more difficult to preserve intact through family generation transfers. If the capital necessary to exploit economies of size in hog production is not or cannot be provided within the existing system, others will make the investments. Control of an industry rests largely with those who provide the capital, so source of financing will help determine the future structure of the hog and pork industry.

Improvement in the meat quality of hogs will be spurred by the competitive struggle among producers for superior performance. Prior to the revision of hog grades effective Jan. 14, 1985, nearly all slaughter hogs were already graded U.S. No. 1 or 2, but even the No. 1 grade still permitted wide variation in quality characteristics. Hog producers, especially the larger ones, are already targeting quality improvement and increased efficiency in the use of inputs. Evaluating and paying for slaughter hogs according to carcass merit still poses problems which retard improvement in quality. As packers compete for better hogs, however, the now heterogenous system of grade and yield pricing will evolve into a system better reflecting true quality differences. Appropriate price incentives will accelerate improvement in hog quality.

Instability in hog supply and price will continue to be a troublesome issue. Cycling production creates major problems for hog producers and all associated with them from input suppliers to consumers. Historically, hog production has varied in rather regular 4-year cycles. During the 1970's, however, production adjustments took longer and reached greater extremes than previously, coinciding with the rapid shift to fewer and larger operations. Although the extreme results of this period may have been a one-time outcome, this experience may result in a better understanding of future conditions.

Whether a smaller number of relatively large hog producers will lead to a more stable supply-price situation or will aggravate the boom-bust outcomes of the past remains uncertain. Large, specialized hog producers are in a better position than small ones to get information and to gauge economic conditions. Whether they can or will adjust aggregate production to increase supply-price stability is another matter.

A hog industry increasingly dominated by large, highly specialized individual producers has a cost structure that could worsen the year-to-year variation in supplies and prices. Short-term production response is determined by income relative to variable cash expenses. Production continues so long as variable expenses are covered.

The largest farrow-to-finish operations evaluated, those with annual sales of 10,000 head, have an advantage in variable cash expenses over the smallest producers of about $2 per cwt of production. Large producers in the past could consistently maintain production during periods of excess hog supplies and low prices, knowing that small producers with higher costs would cease production and change the supply-price imbalance before the cash position of the large producers was seriously threatened for long. Larger producers then expanded into the supply gap left by the quitters.

As fewer small producers remain, downward adjustments in supply will become increasingly sticky. Exit trigger points will move closer to the variable cash cost levels of the larger producers. Specialized hog producers vary production by exceeding the standard capacity of their facilities when returns are favorable and moderating their use when returns are low, but basically they have two options: produce near capacity or shut down. Once an operation closes and loses skilled employees, a return to production is difficult. The importance of keeping the workforce intact thus forces management to consider employees as fixed rather than variable cash expenses so long as recovery seems probable, especially if employees are under contract. Variable cash expenses are little affected by whether small producers include the costs of hired labor in their operation decision because they do nearly all the work themselves. When the largest producers remove cash costs of labor from their operation decision, however, the return that would close the business is about $4 less per cwt of production than when hired labor costs are included.

Larger producers' increased resistance to reduce production when hog supply is excessive will put more economic pressure on the smaller and/or less efficient producers. When those who can turn most easily to alternative activities are gone, the staying power of some large operations may force other large ones out of business. Extremes in supplies and prices could widen. Certainly, a halt in production by a number of large firms would be traumatic, not only for the firms involved but for all associated with pork, including consumers. Recovery of production could be equally damaging.

Adjustments in hog supply must take a different course than in the past. The thousands of small hog producers who have long provided downward adjustment of supply by ceasing production are largely out of the industry. Large-volume producers' action will soon determine the supply of pork. Their past production adjustments have consisted mostly of varying the market weights of hogs according to profitability, putting more or less pressure on facility capacity, and periodically expanding production capacity in sizable increments. Such adjustment patterns cannot continue indefinitely.

Increasing economic damage will occur at all levels if instability increases. Incentive will be great to find ways to reduce variation in production and prices, with the industry sector hurt the most by variability taking the initiative. Various sectors may use formal integration, production under contract, and perhaps other means to lessen instability. Some effort in this direction can be expected even if fewer and larger hog producers hold variability to past levels. Cycling hog production is costly to every sector of the hog industry.

Businesses associated with hog production will be affected by the continued shift to fewer and larger operations, since large hog producers use different services and markets than do small enterprises. Veterinarians, supply firms, feed mills, local banks, and hog markets will all be affected. Businesses that have traditionally serviced farmers with small operations may be phased out, adding to the difficulties of maintaining small hog operations. Many agribusiness firms adjust their operations according to future clientele, thus ensuring in part that their expectations will be realized. This is not unique to hog production, as the structural shifts in this industry are just one of many agricultural adjustments lessening the need for businesses serving small agricultural operations.

Technology will continue to affect the structure of hog production. Technology contributed much to past changes. A number of known technologies await possible introduction into commercial production, such as artificial insemination, embryo transplants, genetic engineering in both animal production and disease control, growth regulators, synthetically produced amino acids, processes for converting hog wastes into usable products, and more. All can affect the level of hog production and economic outcomes. New technologies may sometimes be equally advantageous to hog operations of all sizes, but larger operations will probably benefit more than small ones, either because of high fixed costs or requirements for special skills to use the new technology. Technology rarely provides a greater advantage to small operations than to large ones.

Consumers should benefit directly from the new technologies in hog production and the shift to fewer and larger hog operations. Total costs of production in farrow-to-finish hog operations with annual production of 10,000 head during 1980-83 were about $8.50 per cwt less than the industry average. Size of enterprise will, therefore, continue to shift toward this size or larger. Total pork production will be high enough to depress prices near the lower level of cost of production over time. Consumers will thus benefit directly, as at least part of the lower costs will be passed along to them. A better quality of pork will also directly benefit consumers. The poultry industry in the past supplied increasing amounts of high-quality broilers at a declining real cost to consumers as the industry shifted to a small number of large producers, adopted new technologies, and cut costs.

Hog production will eventually be industrialized, breaking away from the traditional crop-livestock farm setting, as have fed beef and poultry, if the results of this analysis hold. A small number of the large, highly specialized operations will carry most of the production at small margins of returns per unit. Small hog enterprises which served as mortgage lifters in years past will not earn enough to justify their continuation, even when well managed.

Performance among hog producers varies widely. Some small producers can do as well or better than their large counterparts, especially in physical terms. While it will be possible for small producers to produce hogs efficiently, it is unlikely that competition will allow them sufficient economic incentive to do so. The hog industry is now departing from its traditional structure through the use of cumulative technologies, dictated by economics. This course is alterable to a degree by future public policies.

References

(1) Bauman, R. H. *How Big Should the Swine Enterprise Be?* Unnumbered Rpt., Col. Agr., Coop. Ext. Ser., Purdue Univ. 1958.

(2) Bauman, R. H., L. M. Eisgruber, R. E. Partenheimer, and P. A. Powlen. *Economies of Size and Economic Efficiency in Hog Enterprises.* Res. Bul. 699., Agr. Exp. Sta., Purdue Univ. Sept. 1961.

(3) Beverman, R. A. and others. *Illinois Agronomy Handbook 1983-84.* Cir. 1208. Col. Agr., Coop. Ext. Ser., Univ. Ill., Urbana. Dec. 1982.

(4) Blosser, R. H. and D. H. Doster. *Costs of Producing Hogs in Ohio.* Res. Bul. 1001, Ohio Agr. Reg. & Dev. Center, Wooster. July 1967.

(5) Bullock, J. B., and Allen Beals. *Economic Size and Diseconomies of Specialization in North Carolina Pork Production.* Econ. Info. Rpt. 44, Col. Agr., N.C. St. Univ., Raleigh. 1975.

(6) Croll, Terry, E. O. Heady, and Craig Fulton. *Economies of Size in Swine Production Under Different Methods and Phases.* CARD Rpt. 61, Iowa St. Univ., Ames. 1975.

(7) Dirks, Harlan and D. F. Fienup. *Vertical Integration in the Hog Industry.* Tech. Bul. 249, Agr. Exp. Sta., Univ. Minn., St. Paul. 1965.

(8) *Federal Tax Handbook, 1984.* Prentice Hall, Inc. Englewood Cliffs, N.J.

(9) Finley, Robert, Noel Devisch, and Robert Ratzlaff. *Economies of Size in Hog Production.* Res. Bul. 1013, Agr. Exp. Sta., Univ. Mo., Columbia. 1967.

(10) Gonzalez, J., V. J. Rhodes, and G. Grimes. *U. S. Hog Producers: Size Comparisons.* SR-299, Agr. Exp. Sta., Univ. Mo., Columbia. June 1983.

(11) Harris, P. E., R. E. Brown, Jr., and W. A. Tinsley. *Income Tax Management for Farmers.* N.C. Reg. Pub. No. 2, Coop. Ext. Ser., Univ. Wisc., Madison. Oct. 1982.

(12) Heady, E. O. and others. *Economies of Size Studies: A Collection of Papers.* Ctr. for Agr. & Rur. Dev., Iowa St. Univ., Ames. Feb. 1984.

(13) Houghton, D. and K. McMahon. "The $50 Million Hog Farm," *Farm Journal.* Farm Journal, Inc., Washington Square, Philadelphia, Pa. Oct. 1984.

(14) Krause, K. R. *Corporate Farming—Importance, Incentives, and State Restrictions.* AER-506, U.S. Dept. Agr., Econ. Res. Ser. Dec. 1983.

(15) Krause, K. R. and L. R. Kyle. *Midwestern Corn Farms: Economic Status and the Potential for Large and Family-Sized Units.* AER-216, U.S. Dept. Agr., Econ. Res. Ser. Nov. 1971.

(16) Madden, J. P. *Economies of Size in Farming.* AER-107, U.S. Dept. Agr., Econ. Res. Ser. Feb. 1967.

(17) Midwest Plan Service. *Livestock Waste Facilities Handbook.* MWPS-18, Iowa St. Univ., Ames. July 1975.

(18) Miller, T. A., G. E. Rodewald, and R. G. McElroy. *Economies of Size in U.S. Field Crop Farming.* AER-472, U.S. Dept. Agr., Econ. & Stat. Ser. July 1981.

(19) Miner, J. R. and R. J. Smith. *Livestock Waste Management with Pollution Control.* No. Cent. Reg. Pub. 222, Neb. Agr. Exp. Sta., Lincoln. June 1975.

(20) Mueller, A. G. *Is Multiple Farrowing Better Than a Two-Litter System of Hog Production?* Illinois Research, summer 1964, Agr. Exp. Sta., Univ. Ill., Urbana. 1964.

(21) National Pork Producers Council. *Generally Accepted Terms and Formulas for the Pork Industry.* National Pork Producers Council, P.O. Box 10383, Des Moines, Ia. 1984.

(22) Parham, K. D., and D. B. Agnew. *Improvements in Grades of Hogs Marketed.* ERS-675, U.S. Dept. Agr., Econ. Res. Ser. Dec. 1982.

(23) Reimund, D. A., J. R. Martin, and C. V. Moore. *Structural Change in Agriculture: The Experience for Broilers, Fed Cattle, and Processing Vegetables.* Tech. Bul. 1648, U.S. Dept. Agr., Econ. & Stat. Ser. April 1981.

(24) Rhodes, V. J., R. M. Findley, and G. Grimes. *A 1974 Survey of Large-Scale Hog Production in the U.S.* SR-165, Agr. Exp. Sta., Univ. Mo., Columbia. Aug. 1974.

(25) Schertz, L. P., and others. *Another Revolution in U.S. Farming?* AER-441, U.S. Dept. Agr., Econ., Stat., & Coop. Ser. Dec. 1979, pp. 190-254.

(26) Schmitt, M. A. *Effect of Injected Liquid Manure on Corn Growth in Northwest Illinois.* 1984 Illinois Swine Seminar Papers, Col. Agr., Coop. Ext. Ser., Univ. Ill., Urbana. Jan. 1984.

(27) Schupp, Alvin. *Size and Vertical Integration in Louisiana Swine Production: A Budgetary Analysis.* Rpt. No. 50, Dept. Agr. Econ. Res., La. St. Univ., Baton Rouge. 1973.

(28) Sims, F. M., R. A. Hinton, and D. E. Erickson. *Your Hog Business-How Big? How Good?* AE-4089, Dept. Agr. Econ., Univ. Ill., Urbana. Sept. 1965.

(29) Sutton, A. L., S.W. Melvin, and D. H. Vanderholm. *Fertilizer Value of Swine Manure.* PIH-25, Col. Agr., Coop. Ext. Ser., Univ. Ill., Urbana. Nov. 1983.

(30) U.S. Dept. Agr., Cons. & Markt. Ser. *USDA Grades for Slaughter and Feeder Pigs.* Mkt. Bul. 51. 1970.

(31) U.S. Dept. Agr., Econ. Res. Ser. *Economic Indicators of the Farm Sector—Costs of Production, 1982.* ECIFS 2-3. Dec. 1983.

(32) _____. *Economic Indicators of the Farm Sector—Costs of Production, 1983.* ECIFS 3-1. July 1984.

(33) _____. *Economic Indicators of the Farm Sector: Income and Balance Sheet Statistics.* ECIFS 2-2. Oct. 1983.

(34) _____. *Users Manual, Livestock Budget Generator, Firm Enterprise Data System.* July 1975.

(35) U.S. Dept. Agr., Econ., Stat., & Coop. Ser. *Estimating Agricultural Costs of Production.* ESCS-56. June 1979.

(36) U.S. Dept. Agr., Pack. & Stock. Admn. *Grade and Yield Marketing of Hogs.* 1984.

(37) U.S. Dept. Agr., Stat. Rpt. Ser. *Agricultural Prices.* 1980-83.

(38) _____. *Hogs and Pigs.* 1978-84.

(39) U.S. Dept. Comm., Bur. Cen. *Census of Agriculture.* 1950-82.

(40) Van Arsdall, R. N. *Hog Enterprise Budgets, 1983.* File Nos. 720-755, U.S. Dept. Agr., Econ. Res. Ser. Feb. 1984.

(41) _____. *Structural Characteristics of the U.S. Hog Production Industry.* AER-415, U.S. Dept. Agr., Econ., Stat., & Coop. Ser. Dec. 1978.

(42) _____ and W. A. Elder. *Economies of Size of Illinois Cash Grain and Hog Farms.* Bul. 733, Agr. Exp. Sta., Univ. Ill., Urbana. Feb. 1969.

(43) Van Ardsall, R. N., and K. E. Nelson. *U.S. Hog Industry.* AER-511, U.S. Dept. Agr., Econ. Res. Ser. June 1984.

(44) Wilken, D. F. *Summary of Farm and Family Source and Uses of Dollars-1982.* Unnumbered Rpt. Dept. Agr. Econ., Univ. Ill., Urbana. May 1983.

(45) _____. R. P. Kesler, and C. E. Cagley. *Summary of Illinois Farm Business Records-1980.* Cir. 1193, Col. Agr., Coop. Ext. Ser., Univ. Ill., Urbana. Aug. 1981.

(46) _____. *Summary of Illinois Farm Business Records-1981.* Cir. 1204. Col. Agr., Coop. Ext. Ser., Univ. Ill., Urbana. Aug. 1982.

(47) _____. *Summary of Illinois Farm Business Records-1982.* Cir. 1214. Col. Agr., Coop. Ext. Ser., Univ. Ill., Urbana. Aug. 1983.

(48) _____, and Irene Chow. *Summary of Illinois Farm Business Records-1983.* Cir. 1229, Col. Agr., Coop. Ext. Ser. Univ. Ill., Urbana. Aug. 1984.

Appendix table 1—Distribution of hog production by annual sales and region[1]

Item, region, and year	Total	Annual sales (head)							
		Under 100	100-199	200-499	500-999	1,000-1,999	2,000-4,999	5,000 and over	Total
	No.	*Percent*							
Hog and pigs sold:									
North Central—									
1978	71,041,419	6.7	10.0	26.5	24.2	17.4	9.7	5.5	100
1982	75,648,508	4.1	6.3	19.4	23.8	22.5	14.5	9.4	100
Southeast—									
1978	12,360,978	18.6	12.4	18.1	13.1	12.5	12.9	12.4	100
1982	11,166,656	10.0	7.1	13.0	13.0	15.9	19.0	22.0	100
Farms selling hogs and pigs:									
North Central—									
1978	272,475	44.8	18.7	22.5	9.4	3.5	.9	.2	100
1982	205,333	38.7	16.7	23.1	12.8	6.3	2.0	.4	100
Southeast—									
1978	102,183	77.2	11.1	7.4	2.4	1.1	.6	.2	100
1982	53,321	71.6	11.0	9.1	4.0	2.5	1.4	.4	100

[1]States included in the North Central region are Illinois, Indiana, Iowa, Kansas, Michigan, Minnesota, Missouri, Nebraska, Ohio, South Dakota, and Wisconsin. States in the Southeast region are Alabama, Georgia, Kentucky, North Carolina, South Carolina, Tennessee, and Virginia.
Source: (*39*).

Appendix table 2—Replacement cost of depreciable assets used in feeder pig production, 1983[1]

Region and annual sales (head)	Annual production[2]		Investment[3]							
			Building and equipment	Machinery		Truck and tractor		All nonlivestock investment		Breeding stock
	Litters	Weight		Total	Hog share	Total	Hog share	Total	Hog share	
	No.	*Cwt*	*Dollars/cwt of production*							
North Central:										
140	21	79	56	29	12	349	38	434	106	47
300	44	166	145	44	36	250	90	439	271	46
650	90	356	127	42	29	196	63	365	219	43
1,600	222	878	145	33	31	79	32	257	208	43
3,000	395	1,634	115	22	20	63	28	200	163	42
10,000	1,235	5,366	103	4	4	11	10	118	117	40
All	123	487	121	31	26	156	50	308	197	44
Southeast:										
140	21	79	175	29	16	349	77	552	268	47
300	42	172	219	84	75	241	60	544	354	42
650	85	372	104	41	39	187	82	332	225	39
1,600	208	905	130	17	17	58	29	205	176	39
3,000	400	1,686	150	9	9	38	21	197	180	40
10,000	1,334	5,589	120	3	3	10	4	133	127	40
All	150	653	148	28	26	137	44	313	218	41

[1]All investments are for replacement cost at 1983 prices for assets typically used by producers and average rate of use. Value of land is not included. [2]Production is the liveweight produced as feeder pigs or slaughter hogs plus the weight of cull brood sows where applicable. Production is the same as sales in feeder pig production and farrow-to-finish enterprises, but is gain only in feeder pig finishing. [3]Buildings and equipment include investments specifically for hog production. Total investments per cwt of hog production reflect the unit investment if hogs were the sole user of these assets. The hog share divides investments between hogs and other enterprises based on actual farm use (43). Breeding stock includes the value of both boars and sows.

Appendix table 3—Replacement cost of depreciable assets used in farrow-to-finish hog production, 1983[1]

Region and annual sales (head)	Annual production[2]		Investment[3]							
			Building and equipment	Machinery		Truck and tractor		All nonlivestock investment		Breeding stock
	Litters	Weight		Total	Hog share	Total	Hog share	Total	Hog share	
	No.	*Cwt*	*Dollars/cwt of production*							
North Central:										
140	22	328	77	43	17	143	23	263	117	12
300	42	706	74	25	13	87	20	186	107	11
650	92	1,528	54	12	6	49	14	115	74	11
1,600	222	3,758	77	11	8	34	16	122	101	11
3,000	406	7,043	65	6	5	19	7	90	77	10
10,000	1,351	23,494	59	2	2	6	3	67	64	10
All	126	2,092	67	15	9	53	15	135	91	11
Southeast:										
140	20	314	49	45	34	88	18	182	101	11
300	42	671	40	21	16	41	12	102	68	11
650	92	1,454	40	11	9	40	12	91	61	11
1,600	222	3,576	44	4	4	16	7	64	55	11
3,000	406	6,704	64	2	1	7	4	73	69	10
10,000	1,299	22,329	61	1	1	3	2	65	64	10
All	180	2,578	49	13	11	30	9	92	69	11

Note: See appendix table 2 for footnotes.

Appendix table 4—Replacement cost of depreciable assets used in feeder pig finishing, 1983[1]

Region and annual sales (head)	Annual production[2]	Investment[3]						
		Building and equipment	Machinery		Truck and tractor		All nonlivestock investment	
	Liveweight		Total	Hog share	Total	Hog share	Total	Hog share
	Cwt	*Dollars/cwt of production*						
North Central:								
140	250	58	56	32	166	30	280	120
300	537	24	38	16	151	24	213	84
650	1,165	20	17	11	69	21	106	52
1,600	2,867	54	14	7	40	13	108	74
3,000	5,376	41	8	7	27	12	76	60
10,000	17,919	45	2	2	8	4	55	51
All	1,595	37	22	12	76	18	135	87
Southeast:								
140	229	57	34	8	128	13	219	78
300	490	37	31	23	117	14	185	74
650	1,063	21	15	10	54	19	90	50
1,600	2,616	21	6	5	26	10	53	36
3,000	4,905	51	3	2	11	7	65	60
10,000	16,532	50	1	1	3	2	54	53
All	1,866	39	14	8	53	10	108	57

Note: See appendix table 2 for footnotes.

Appendix table 5—Replacement cost for selected types and sizes of hog buildings, 1983[1]

Type of building	Small	Medium	Large
		Dollars/head space	
Farrowing house, slotted floor, fully equipped	2,535	2,210	1,915
Nursery, slotted floor, fully equipped	152	132	114
Finishing buildings:			
Enclosed, slotted floor, fully equipped	280	245	212
Open, slotted floor, fully equipped	248	216	186
Enclosed, paved floor, no equipment	64	51	46
Open, paved floor, no equipment	57	45	42

[1]The sizes of buildings are 10-, 20-, and 50-crate farrowing houses; 750-, 1,500-, and 3,000-square-foot nurseries; and 1,000-, 3,000-, and 6,000-square-foot finishing buildings. Costs per head space are per sow, pig, or finishing hog according to type of building. A list of current purchase or construction costs for most machinery, equipment, and buildings used in hog production are available in (*40*).

Appendix table 6—Percentage of gross farm income and of gross livestock income from hogs, 1980

Enterprise and region	Annual sales (head) 100-199	200-499	500-999	1,000-1,999	2,000-4,999	5,000 and over	All sizes
				Percent			
Gross farm income from hogs:							
Feeder pig production—							
North Central	35	18	45	55	69	98	33
Southeast	34	41	67	62	67	91	54
Farrow-to-finish—							
North Central	22	32	34	57	69	86	38
Southeast	28	38	47	65	70	82	46
Feeder pig finishing—							
North Central	18	11	29	31	61	81	20
Southeast	15	20	44	48	68	90	33
Gross livestock income from hogs:							
Feeder pig production—							
North Central	40	82	70	92	90	99	75
Southeast	57	89	96	97	96	98	86
Farrow-to-finish—							
North Central	39	53	47	76	92	93	57
Southeast	76	75	84	90	86	94	82
Feeder pig finishing—							
North Central	56	42	62	53	84	98	54
Southeast	23	74	67	89	85	97	62

Source (*43*).

Appendix table 7—Replacement cost of nonlivestock depreciable assets chargeable to hog production per year equivalent of labor, 1983[1]

Type of enterprise and region	Annual sales (head) 140	300	650	1,600	3,000	10,000	All
				1,000 dollars			
Feeder pig production:							
North Central	40	133	127	174	210	195	126
Southeast	68	114	106	105	170	182	103
Farrow-to-finish:							
North Central	130	172	173	288	337	281	197
Southeast	113	102	108	114	169	242	119
Feeder pig finishing:							
North Central	361	249	261	591	722	625	359
Southeast	155	239	188	234	540	675	237

[1]All labor used in hog production is converted to year equivalents at the rate of 2,500 hours per year. The replacement cost of depreciable assets includes the hog enterprise share of buildings, equipment, machinery, tractors, and trucks at 1983 replacement cost, but excludes investments in land and breeding stock.

Appendix table 8—Replacement cost of nonlivestock depreciable assets chargeable to hog production per $1,000 labor cost, 1983[1]

Type of enterprise and region	Annual sales (head)						
	140	300	650	1,600	3,000	10,000	All
	1,000 dollars						
Feeder pig production:							
North Central	3.8	12.4	11.8	12.0	10.7	10.0	10.2
Southeast	7.0	11.6	10.8	7.9	9.5	10.1	8.9
Farrow-to-finish:							
North Central	12.1	16.1	16.2	19.8	17.1	14.3	15.8
Southeast	11.5	10.4	11.0	8.6	9.4	13.5	10.4
Feeder pig finishing:							
North Central	33.6	23.2	24.4	40.7	36.7	31.7	29.2
Southeast	15.8	24.3	19.1	17.6	30.0	36.9	20.9

[1]Labor cost includes payments for hired labor plus the value of unpaid labor used in hog production. The replacement cost of depreciable assets includes the hog enterprise share of buildings, equipment, machinery, tractors, and trucks at 1983 replacement cost, but excludes investments in land and breeding stock.

Appendix table 9—Ownership costs of depreciable assets per cwt of hogs produced, replacement cost basis, 1983[1]

Annual sales (head)	Feeder pig production		Farrow-to-finish		Feeder pig finishing	
	North Central	Southeast	North Central	Southeast	North Central	Southeast
	Dollars/cwt of production					
140	22.74 (8.24)	23.95 (6.89)	11.66 (3.01)	8.95 (2.47)	7.45 (2.03)	8.49 (2.08)
300	24.86 (6.88)	27.76 (7.85)	10.85 (2.69)	7.78 (2.18)	6.03 (1.56)	5.62 (1.29)
650	19.72 (5.59)	20.08 (5.57)	9.36 (2.35)	7.98 (1.99)	4.78 (1.23)	6.06 (1.36)
1,600	22.81 (6.48)	21.25 (5.73)	9.50 (2.55)	7.20 (1.92)	7.00 (1.78)	4.82 (1.11)
3,000	18.40 (5.05)	19.56 (5.44)	7.81 (2.10)	8.14 (2.15)	5.22 (1.37)	7.24 (1.86)
10,000	14.39 (4.01)	16.16 (4.54)	7.07 (1.86)	7.19 (1.88)	4.80 (1.22)	6.28 (1.62)
All	18.10 (4.00)	20.18 (4.77)	9.21 (2.15)	7.35 (1.62)	5.85 (1.46)	6.07 (1.82)

[1]Ownership costs include depreciation on a 1983 replacement cost basis plus taxes, insurance, and interest. Interest on investment is charged at the average rate of earnings of all investments in U.S. agriculture for the previous 20 years. That rate is approximately 4.4 percent (32). The amount charged for interest is shown in parenthesis for the benefit of new investors who would have had to pay about three times as much for money borrowed in 1983. The cost of interest on the investment in land and operating capital is not included. The basis of these ownership costs is cwt of production in pig production and farrow-to-finish; cwt of gain in pig finishing.

Appendix table 10—Nutrients available from hog manure after application and nutrient maintenance requirements of corn and soybeans produced on farms with hog enterprises, North Central region, 1980[1]

Type of enterprise and annual sales (head)	Corn	Soybeans	Nitrogen (N)			Phosphate (P_2O_5)			Potash (K_2O)		
			Available	Crop need	Balance	Available	Crop need	Balance	Available	Crop need	Balance
	Acres		*1,000 pounds*								
Feeder pig production:											
140	12	12	0	2.4	-2.4	0	1.2	-1.2	0	1.1	-1.1
300	121	97	0.2	24.0	-23.8	0.2	11.1	-10.9	0.2	10.2	-10.0
650	57	56	.4	11.3	-10.9	.4	5.6	-5.2	.5	5.4	-4.9
1,600	123	85	3.7	24.4	-20.7	3.5	10.8	-7.3	4.1	9.7	-5.6
3,000	200	59	6.7	39.6	-32.9	6.3	14.9	-8.6	7.4	11.5	-4.1
10,000	21	1	35.7	4.2	31.5	32.0	1.4	30.6	34.3	.9	35.2
Farrow-to-finish:											
140	105	35	.7	20.8	-20.1	.7	7.9	-7.2	.9	6.3	-7.2
300	154	61	1.4	30.5	-29.1	1.4	12.0	-10.6	1.9	9.7	-7.8
650	204	102	3.0	40.4	-37.4	3.1	16.6	-13.5	4.1	14.0	-9.9
1,600	271	90	16.4	53.7	-37.3	14.7	20.5	-5.8	15.8	16.2	-.4
3,000	487	222	30.5	96.4	-65.9	27.3	38.9	-11.6	29.3	32.2	-2.9
10,000	685	138	113.5	135.6	-22.1	101.6	48.7	52.9	109.0	36.1	72.9
Feeder pig finishing:											
140	57	68	.4	11.3	-10.9	.4	5.0	-4.6	.6	6.0	-5.4
300	304	243	.9	60.2	-59.3	.9	28.0	-27.1	1.2	25.6	-24.4
650	311	115	1.9	61.6	-59.7	2.0	23.9	-21.9	2.6	19.2	-16.6
1,600	377	167	9.9	74.6	-64.7	8.9	30.0	-21.1	9.5	24.7	-15.2
3,000	330	134	18.6	65.3	-46.7	16.6	25.8	-9.2	17.8	21.0	-3.2
10,000	582	226	62.0	115.2	-53.2	55.5	45.2	10.3	59.5	36.4	23.1

[1]Corn acreages, which include grain sorghum at about 5 percent of the acreages of the two crops combined, and soybeans are the average plantings on farms with hog enterprises in 1980 (*43*). These crops occupied about four-fifths of all cropland on the farms. Plant nutrients available from hog manure are amounts available to crops after accounting for losses in production, storage, handling, and land application in systems ranging from hog production on permanent pasture yielding no crop fertility value from manure to maximum realizable values from systems using liquid storage and soil injection (*17*). Crop maintenance requirements are based on assumed target yields of 150 bushels for corn (N, P_2O_5, K_2O needs of 198-64-42 pounds per acre) and 41 bushels of soybeans (needs of 0-35-53 pounds per acre for the same elements) (*3*). A negative balance indicates that crop needs exceed nutrients available from hog manure.

Appendix table 11—Values of nitrogen, phosphorus, and potassium recoverable from hog manure after land application, by type of enterprise, North Central region, 1983[1]

Annual sales (head)	Feeder pig production		Farrow-to-finish		Feeder pig finishing	
	Total	Per head	Total	Per head	Total	Per head
			Dollars			
140	0	0	360	2.59	215	1.55
300	100	0.33	735	2.45	470	1.57
650	210	.33	1,600	2.47	1,025	1.58
1,800	1,800	1.12	7,500	4.69	4,530	2.83
3,000	3,240	1.08	13,930	4.64	8,475	2.83
10,000	16,320	1.63	51,840	5.18	28,310	2.83

[1]Values are based on the amounts of nutrients available for plant use after accounting for losses during production, storage, handling, and land application (*17*). Hog production and waste management systems are representative of programs followed by hog producers in the North Central region (*43*). Fertility elements are valued at 1983 prices paid for the same nutrients in commonly used commercial fertilizers. Unit values that are close to the same differ only because of rounding.

Appendix table 12—Recoverable and realized values of the nitrogen, phosphorus, and potassium in hog manure, farms with farrow-to-finish hog enterprises, Illinois[1]

Item	Unit	Annual sales (head)					
		100-199	200-499	500-999	1,000-1,999	2,000-4,999	5,000 and over
Hog production	Head	168	380	791	1,423	2,755	7,109
Tillable land	Acres	76	178	265	368	496	846
Fertility value recoverable from hog manure[2]	Dol.	430	930	1,950	6,670	12,790	36,860
Reduction in expenditures for commercial fertilizers[3]	do.	75	170	350	630	1,220	6,800

[1]Based on an analysis of Illinois farm record data for 1977-81.
[2]Values of the fertility elements recoverable from hog manure after land application at 1983 prices for commercial fertilizers.
[3]The realized value of hog manure in terms of reduced expenditures for commercial fertilizers.

Appendix table 13—Farrow-to-finish hog production costs and returns per cwt of sales, North Central region, 1980[1]

Item	Annual sales (head)						
	140	300	650	1,600	3,000	10,000	All sizes
	Dollars/cwt						
Gross income: [2]							
Market hogs	37.63	37.85	37.28	37.35	37.40	37.32	37.50
Cull sows	1.93	2.16	2.08	2.03	1.98	2.05	2.05
Total	39.56	40.01	39.36	39.38	39.38	39.37	39.55
Variable cash costs: [3]							
Feed	29.03	28.94	28.67	28.15	27.20	25.92	28.34
Other	6.89	6.37	6.58	6.09	5.75	7.64	6.44
Total	35.92	35.31	35.25	34.24	32.95	33.56	34.78
Fixed cash costs[4]	2.19	1.99	1.69	1.30	.89	.87	1.63
Total cash costs	38.11	37.30	36.94	35.54	33.84	34.43	36.41
Returns over cash costs	1.45	2.71	2.42	3.84	5.54	4.94	3.14
Unpaid labor	8.42	5.66	3.60	3.09	2.97	.96	4.42
Cash costs plus unpaid labor	46.53	42.96	40.54	38.63	36.81	35.39	40.83
Returns over cash costs and unpaid labor	-6.97	-2.95	-1.18	.75	2.57	3.98	-1.28
Capital costs:[5]							
Replacement	6.25	6.10	5.10	5.06	4.14	3.70	5.32
Interest	3.55	3.00	2.46	2.18	1.83	1.61	2.59
Total	9.80	9.10	7.56	7.24	5.97	5.31	7.91
Total all costs	56.33	52.06	48.10	45.87	42.78	40.70	48.74
Returns over total costs	-16.77	-12.05	-8.74	-6.49	-3.40	-1.33	-9.19

[1]Itemized costs and returns appear in detailed enterprise budgets, FEDS hog budget file numbers 720-725 for 1980 (*40*). Production and sales are seasonal in the two smallest enterprises; all others operate year round. Representative enterprises are weighted by their share of total hog production to create the outcomes for all sizes of enterprises. Average prices for selected products and inputs appear in appendix table 31.

[2]Boars are included in the capital account as a depreciable asset.

[3]Feed costs include the market value of grains, the purchase cost of protein supplements and feed additives, and the cash costs of producing hog pastures. Other costs include veterinary and medicine, custom services, fuels and electricity, repairs, bedding, hired labor, marketing charges, and a computed interest on operating capital, less any credit for manure used in crop production.

[4]The hog enterprise share of taxes, insurance, and general farm overhead costs.

[5]Capital replacement is the annual share of the replacement cost of all depreciable assets, including boars, at current prices. The value of land is not included. Interest is computed on the replacement cost of all capital assets, including land, at the average rate of return to capital assets used in agriculture for the previous 20 years (which ranged from 4.2 to 4.4 percent during 1980-83 (*32*).

Appendix table 14—Farrow-to-finish hog production costs and returns per cwt of sales, Southeast region, 1980[1]

Item	Annual sales (head)						
	140	300	650	1,600	3,000	10,000	All sizes
				Dollars/cwt			
Gross income: [2]							
Market hogs	38.67	38.29	38.31	38.39	38.41	38.49	38.46
Cull sows	1.59	1.49	1.46	1.40	1.38	1.31	1.46
Total	40.26	39.78	39.77	39.79	39.79	39.80	39.92
Variable cash costs: [3]							
Feed	31.91	31.64	32.26	31.46	30.10	28.76	31.10
Other	7.78	6.37	6.35	7.13	9.18	8.02	7.50
Total	39.69	38.01	38.61	38.59	39.28	36.78	38.60
Fixed cash costs[4]	3.28	2.98	2.47	1.76	1.35	1.21	2.31
Total cash costs	42.97	40.99	41.08	40.35	40.63	37.99	40.91
Returns over cash costs	-2.71	-1.21	-1.31	-.56	-.84	1.81	-.99
Unpaid labor	6.52	5.38	3.63	3.40	2.49	.60	4.01
Cash costs plus unpaid labor	49.49	46.37	44.71	43.75	43.12	38.59	44.92
Returns over cash costs and unpaid labor	-10.21	-6.59	-4.94	-3.96	-3.33	1.21	-5.00
Capital costs:[5]							
Replacement	4.53	3.87	4.22	3.70	4.28	3.77	4.11
Interest	3.60	2.61	1.97	1.67	1.85	1.61	2.38
Total	8.13	6.48	6.19	5.37	6.13	5.38	6.49
Total all costs	57.62	52.85	50.90	49.12	49.25	43.97	51.41
Returns over total costs	-17.36	-13.07	-11.13	-9.33	-9.46	-4.17	-11.49

[1]Itemized costs and returns appear in detailed enterprise budgets, FEDS hog budget file numbers 726-731 for 1980 (*40*). Production and sales are seasonal in the smallest enterprise; all others operate year round. See appendix table 13 for other footnotes.

Appendix table 15—Farrow-to-finish hog production costs and returns per cwt of sales, North Central region, 1982[1]

Item	Annual sales (head)						
	140	300	650	1,600	3,000	10,000	All sizes
	Dollars/cwt						
Gross income:[2]							
Market hogs	51.45	51.21	51.54	51.62	51.89	51.58	51.51
Cull sows	2.71	3.02	2.91	2.84	2.78	2.88	2.87
Total	54.16	54.23	54.45	54.46	54.47	54.46	54.38
Variable cash costs:[3]							
Feed	26.80	26.71	26.45	26.11	24.70	23.52	25.93
Other	7.85	7.16	7.34	6.94	6.34	6.28	7.21
Total	34.65	33.87	33.79	33.05	31.04	31.80	33.14
Fixed cash costs[4]	2.51	2.30	1.88	1.52	1.05	1.01	1.74
Total cash costs	37.16	36.17	35.67	34.57	32.09	32.81	34.89
Returns over cash costs	17.00	18.06	18.78	19.89	22.38	21.65	19.50
Unpaid labor	8.65	5.83	3.71	3.68	3.05	.99	4.27
Cash costs plus unpaid labor	45.81	42.00	39.38	38.23	35.14	33.80	39.16
Returns over cash costs and unpaid labor	8.35	12.23	15.07	16.23	19.33	20.66	15.22
Capital costs:[5]							
Replacement	7.24	6.87	5.84	5.78	4.74	4.25	5.86
Interest	3.93	3.28	2.72	2.47	2.07	1.82	2.72
Total	11.17	10.15	8.56	8.25	6.81	6.07	8.58
Total all costs	56.98	52.15	47.94	46.48	41.95	39.87	47.74
Returns over total costs	-2.82	2.08	6.51	7.98	12.52	14.59	6.64

[1]Itemized costs and returns appear in detailed enterprise budgets, FEDS hog budget file numbers 620-625 for 1982 (*40*). Production and sales are seasonal in the two smallest enterprises; all others operate year round. See appendix table 13 for other footnotes.

Appendix table 16—Farrow-to-finish hog production costs and returns per cwt of sales, Southeast region, 1982[1]

Item	Annual sales (head)						
	140	300	650	1,600	3,000	10,000	All sizes
	Dollars/cwt						
Gross income: [2]							
Market hogs	52.94	53.10	53.24	53.24	53.28	53.38	53.21
Cull sows	2.21	2.07	2.03	1.94	1.91	1.83	1.98
Total	55.15	55.17	55.27	55.18	55.19	55.21	55.19
Variable cash costs: [3]							
Feed	28.88	28.58	29.51	28.73	26.84	25.58	27.79
Other	8.87	7.25	7.19	8.15	10.45	9.12	8.68
Total	37.75	35.83	36.70	36.88	37.29	34.70	36.47
Fixed cash costs[4]	3.78	3.46	2.84	2.06	1.58	1.40	2.40
Total cash costs	41.53	39.29	39.54	38.94	38.87	36.10	38.87
Returns over cash costs	13.62	15.88	15.73	16.24	16.32	19.11	16.33
Unpaid labor	7.49	6.17	4.16	3.90	2.86	.68	3.94
Cash costs plus unpaid labor	49.02	45.46	43.70	42.84	41.73	36.78	42.81
Returns over cash costs and unpaid labor	6.13	9.71	11.57	12.34	13.46	18.43	12.39
Capital costs:[5]							
Replacement	5.26	4.52	4.88	4.27	4.91	4.34	4.69
Interest	4.01	2.97	2.20	1.92	2.09	1.82	2.46
Total	9.27	7.49	7.08	6.19	7.00	6.16	7.15
Total all costs	58.29	52.95	50.78	49.03	48.73	42.94	49.95
Returns over total costs	-3.14	2.22	4.49	6.15	6.46	12.27	5.24

[1]Itemized costs and returns appear in detailed enterprise budgets, FEDS hog budget file numbers 626-631 for 1982 (*40*). Production and sales are seasonal in the smallest enterprise; all others operate year round. See appendix table 13 for other footnotes.

Appendix table 17—Farrow-to-finish hog production costs and returns per cwt of sales, North Central region, 1983[1]

Item	Annual sales (head)						
	140	300	650	1,600	3,000	10,000	All sizes
	Dollars/cwt						
Gross income: [2]							
Market hogs	44.19	44.80	44.52	44.59	44.65	44.56	44.58
Cull sows	2.21	2.47	2.37	2.32	2.26	2.34	2.34
Total	46.40	47.27	46.89	46.91	46.91	46.90	46.92
Variable cash costs: [3]							
Feed	31.65	31.54	31.52	30.70	29.39	28.04	30.67
Other	7.69	7.05	7.31	6.96	6.42	8.59	7.21
Total	39.34	38.59	38.83	37.66	35.81	36.63	37.87
Fixed cash costs[4]	4.01	3.29	2.38	1.65	1.22	1.04	2.21
Total cash costs	43.35	41.88	41.21	39.31	37.03	37.67	40.09
Returns over cash costs	3.05	5.39	5.68	7.60	9.88	9.23	6.84
Unpaid labor	9.43	6.35	4.04	4.00	3.33	1.08	4.54
Cash costs plus unpaid labor	52.78	48.23	45.25	43.31	40.36	38.75	44.62
Returns over cash costs and unpaid labor	-6.38	-0.96	1.64	3.60	6.55	8.15	2.30
Capital costs: [5]							
Replacement	7.71	7.35	6.29	6.14	5.05	4.58	6.22
Interest	3.89	3.26	2.75	2.60	2.14	1.90	2.73
Total	11.60	10.61	9.04	8.74	7.19	6.48	8.95
Total all costs	64.38	58.84	54.29	52.05	47.55	45.23	53.57
Returns over total costs	-17.98	-11.57	-7.40	-5.14	-0.64	1.67	-6.65

[1]Itemized costs and returns appear in detailed enterprise budgets, FEDS hog budget file numbers 720-725 for 1983 (*40*). Production and sales are seasonal in the two smallest enterprises; all others operate year round. See appendix table 13 for other footnotes.

Appendix table 18—Farrow-to-finish hog production costs and returns per cwt of sales, Southeast region, 1983[1]

Item	Annual sales (head)						
	140	300	650	1,600	3,000	10,000	All sizes
	Dollars/cwt						
Gross income:[2]							
Market hogs	45.42	45.01	45.05	45.14	45.16	45.25	45.19
Cull sows	1.79	1.87	1.64	1.57	1.55	1.48	1.60
Total	47.21	46.88	46.69	46.71	46.71	46.73	46.79
Variable cash costs:[3]							
Feed	34.32	34.07	34.79	33.99	32.07	30.63	33.00
Other	8.80	7.13	7.16	8.22	10.64	9.31	8.78
Total	43.12	41.20	41.95	42.21	42.71	39.94	41.77
Fixed cash costs[4]	3.94	3.29	2.40	1.51	1.28	1.09	2.08
Total cash costs	47.06	44.49	44.35	43.72	43.99	41.03	43.85
Returns over cash costs	.15	2.19	2.34	2.99	2.72	5.70	2.94
Unpaid labor	7.73	6.37	4.30	4.03	2.95	.71	3.94
Cash costs plus unpaid labor	54.79	50.86	48.65	47.75	46.94	41.74	47.79
Returns over cash costs and unpaid labor	-7.58	-4.18	-1.96	-1.04	-.23	4.99	-1.01
Capital costs:[5]							
Replacement	5.63	4.83	5.29	4.62	5.26	4.68	5.03
Interest	4.06	3.05	2.30	2.01	2.18	1.89	2.50
Total	9.69	7.88	7.59	6.63	7.44	6.57	7.53
Total all costs	64.48	58.74	56.24	54.38	54.38	48.31	55.33
Returns over total costs	-17.27	-12.06	-9.55	-7.67	-7.67	-1.58	-8.54

[1]Itemized costs and returns appear in detailed enterprise budgets, FEDS hog budget file numbers 726-731 for 1983 (*40*). Production and sales are seasonal in the smallest enterprise; all others operate year round. See appendix table 13 for other footnotes.

Appendix table 19—Feeder pig production costs and returns per cwt of sales, North Central region, 1980[1]

Item	Annual sales (head)						
	140	300	650	1,600	3,000	10,000	All sizes
	Dollars/cwt						
Gross income: [2]							
Feeder pigs	49.77	53.39	52.92	52.79	53.25	54.19	52.67
Cull sows	8.03	7.64	7.12	7.22	6.99	6.50	7.35
Total	57.80	61.03	60.04	60.01	60.24	60.69	60.02
Variable cash costs: [3]							
Feed	41.70	41.70	40.45	40.05	37.00	32.00	39.95
Other	21.86	25.02	15.21	15.55	14.46	21.05	19.01
Total	63.56	66.72	55.66	55.60	51.46	53.05	58.96
Fixed cash costs[4]	3.90	4.56	3.59	3.32	2.47	1.48	3.55
Total cash costs	67.46	71.28	59.25	58.92	53.93	54.53	62.51
Returns over cash costs	-9.66	-10.25	.79	1.09	6.31	6.16	-2.49
Unpaid labor	25.40	19.87	15.99	15.36	11.13	.32	16.69
Cash costs plus unpaid labor	92.86	91.15	75.24	74.28	65.06	54.85	79.20
Returns over cash costs and unpaid labor	-35.06	-30.12	-15.20	-14.27	-4.82	5.84	-19.18
Capital costs:[5]							
Replacement	11.01	12.00	10.04	11.43	9.29	7.22	10.68
Interest	5.78	12.91	6.26	5.85	4.42	3.28	7.38
Total	16.79	24.91	16.30	17.28	13.71	10.50	18.06
Total all costs	109.65	116.06	91.54	91.56	78.77	65.35	97.26
Returns over total costs	-51.85	-55.03	-31.50	-31.55	-18.53	-4.66	-37.24

[1]Itemized costs and returns appear in detailed enterprise budgets, FEDS hog budget file numbers 732-737 for 1980 (*40*). Production and sales are seasonal in the two smallest enterprises; all others operate year round. Average prices for selected products and inputs appear in appendix table 31. See appendix table 13 for other footnotes.

Appendix table 20—Feeder pig production costs and returns per cwt of sales, Southeast region, 1980[1]

Item	Annual sales (head)						
	140	300	650	1,600	3,000	10,000	All sizes
				Dollars/cwt			
Gross income: [2]							
Feeder pigs	45.09	44.65	45.10	45.72	46.07	46.38	45.28
Cull sows	4.74	5.08	5.03	4.69	4.44	4.24	4.70
Total	49.83	49.73	50.13	50.41	50.51	50.62	49.98
Variable cash costs: [3]							
Feed	42.77	38.39	37.67	36.93	37.26	32.94	38.15
Other	27.24	19.89	15.42	19.50	18.54	21.10	20.96
Total	70.01	58.28	53.09	56.43	55.80	54.04	59.11
Fixed cash costs[4]	5.05	5.18	4.63	4.05	3.45	2.00	4.19
Total cash costs	75.06	63.46	57.72	60.48	59.25	56.04	63.30
Returns over cash costs	-25.23	-13.73	-7.59	-10.07	-8.74	-5.42	-13.32
Unpaid labor	31.73	23.78	16.69	14.01	8.83	1.37	17.79
Cash costs plus unpaid labor	106.79	87.24	74.41	74.49	68.08	57.41	81.09
Returns over cash costs and unpaid labor	-56.96	-37.51	-24.28	-24.08	-17.57	-6.79	-31.11
Capital costs:[5]							
Replacement	12.25	13.94	10.18	10.81	9.97	8.10	11.17
Interest	9.29	8.40	6.16	5.20	4.79	3.74	6.53
Total	21.54	22.34	16.34	16.01	14.76	11.84	17.70
Total all costs	128.33	109.58	90.75	90.50	82.84	69.25	98.79
Returns over total costs	-78.50	-59.85	-40.62	-40.09	-32.33	-18.63	-48.81

[1]Itemized costs and returns appear in detailed enterprise budgets, FEDS hog budget file numbers 738-743 for 1980 (*40*). Production and sales are seasonal in the smallest enterprise; all others operate year round. See appendix table 13 for other footnotes.

Appendix table 21—Feeder pig production costs and returns per cwt of sales, North Central region, 1982[1]

Item	Annual sales (head)						
	140	300	650	1,600	3,000	10,000	All sizes
				Dollars/cwt			
Gross income: [2]							
Feeder pigs	80.93	82.67	84.80	84.52	85.24	86.71	84.16
Cull sows	11.30	10.68	10.01	10.14	9.80	9.12	10.19
Total	92.23	93.35	94.81	94.66	95.04	95.83	94.35
Variable cash costs: [3]							
Feed	38.61	38.63	37.72	37.43	34.57	29.34	36.68
Other	25.24	29.10	17.49	17.88	16.26	22.97	20.97
Total	63.85	67.73	55.21	55.31	50.83	52.31	57.65
Fixed cash costs[4]	4.57	5.35	4.14	3.91	2.90	1.74	3.96
Total cash costs	68.42	73.08	59.35	59.22	53.73	54.05	61.61
Returns over cash costs	23.81	20.27	35.46	35.44	41.31	41.78	32.74
Unpaid labor	26.07	20.48	16.46	15.81	11.45	.32	15.85
Cash costs plus unpaid labor	94.49	93.56	75.81	75.03	65.18	54.37	77.46
Returns over cash costs and unpaid labor	-2.26	-.21	19.00	19.63	29.86	41.46	16.89
Capital costs:[5]							
Replacement	13.11	13.89	11.32	13.23	10.74	8.31	12.07
Interest	6.67	13.90	6.87	6.67	5.05	3.75	7.61
Total	19.78	27.79	18.19	19.90	15.79	12.06	19.68
Total all costs	114.27	121.35	94.00	94.93	80.97	66.43	97.14
Returns over total costs	-22.04	-28.00	.81	-.27	14.07	29.40	-2.79

[1]Itemized costs and returns appear in detailed enterprise budgets, FEDS hog budget file numbers 632-637 for 1982 (*40*). Production and sales are seasonal in the two smallest enterprises; all others operate year round. See appendix table 13 for other footnotes.

Appendix table 22—Feeder pig production costs and returns per cwt of sales, Southeast region, 1982[1]

Item	Annual sales (head)						
	140	300	650	1,600	3,000	10,000	All sizes
				Dollars/cwt			
Gross income: [2]							
Feeder pigs	94.96	92.71	91.13	92.22	92.98	93.59	93.06
Cull sows	6.48	7.08	7.01	6.52	6.18	5.90	6.45
Total	101.44	99.79	98.14	98.74	99.16	99.49	99.51
Variable cash costs: [3]							
Feed	39.10	34.93	34.89	34.09	34.41	29.57	34.23
Other	31.48	23.10	17.69	22.89	21.55	24.44	23.80
Total	70.58	58.03	52.58	56.98	55.96	54.01	58.02
Fixed cash costs[4]	5.81	6.08	5.35	4.74	4.04	2.34	4.52
Total cash costs	76.39	64.11	57.93	61.72	60.00	56.35	62.54
Returns over cash costs	25.05	35.68	40.21	37.02	39.16	43.14	36.97
Unpaid labor	36.41	27.27	19.15	16.08	10.12	1.57	17.09
Cash costs plus unpaid labor	112.80	91.38	77.08	77.80	70.12	57.92	79.62
Returns over cash costs and unpaid labor	-11.36	8.41	21.06	20.94	29.04	41.57	19.88
Capital costs:[5]							
Replacement	14.07	16.35	11.63	12.53	11.46	9.31	12.26
Interest	10.31	9.15	6.85	5.93	5.44	4.27	6.76
Total	24.38	25.50	18.48	18.46	16.90	13.58	19.02
Total all costs	137.18	116.88	95.56	98.26	87.02	71.50	98.64
Returns over total costs	-35.74	-17.09	2.58	2.48	12.14	27.99	.86

[1]Itemized costs and returns appear in detailed enterprise budgets, FEDS hog budget file numbers 638-643 for 1982 (*40*). Production and sales are seasonal in the smallest enterprise; all others operate year round. See appendix table 13 for other footnotes.

Appendix table 23—Feeder pig production costs and returns per cwt of sales, North Central region, 1983[1]

Item	Annual sales (head)						
	140	300	650	1,600	3,000	10,000	All sizes
	Dollars/cwt						
Gross income: [2]							
Feeder pigs	64.53	60.40	61.45	61.25	61.77	62.83	61.68
Cull sows	9.21	8.71	8.16	8.27	7.99	7.44	8.28
Total	73.74	69.11	69.61	69.52	69.76	70.27	69.96
Variable cash costs: [3]							
Feed	45.37	45.35	43.91	43.51	40.30	34.45	42.71
Other	24.61	28.86	17.18	16.80	16.39	25.48	20.63
Total	69.98	74.21	61.09	60.31	56.69	59.93	63.34
Fixed cash costs[4]	7.71	8.28	6.23	5.06	3.34	2.05	5.60
All cash costs	77.69	82.47	67.32	65.37	60.03	61.98	68.94
Returns over cash costs	-3.95	-13.36	2.29	4.15	9.73	8.29	1.02
Unpaid labor	28.45	22.26	17.91	17.20	12.47	.35	16.90
Cash costs plus labor	106.14	104.73	85.23	82.57	72.50	62.33	85.84
Returns over cash costs and unpaid labor	-32.40	-35.62	-15.62	-13.05	-2.74	7.94	-15.88
Capital costs:[5]							
Replacement	14.41	14.96	12.25	14.16	11.75	9.22	13.01
Interest	6.99	13.12	6.96	6.94	5.33	4.04	7.55
Total	21.40	28.08	19.21	21.10	17.08	13.26	20.56
Total all costs	127.54	132.81	104.44	103.67	89.58	75.59	106.39
Returns over total costs	-53.80	-63.70	-34.83	-34.15	-19.82	-5.32	-36.43

[1]Itemized costs and returns appear in detailed enterprise budgets, FEDS hog budget file numbers 732-737 for 1983 (*40*). Production and sales are seasonal in the two smallest enterprises; all others operate year round. See appendix table 13 for other footnotes.

Appendix table 24—Feeder pig production costs and returns per cwt of sales, Southeast region, 1983[1]

Item	Annual sales (head)						
	140	300	650	1,600	3,000	10,000	All sizes
				Dollars/cwt			
Gross income: [2]							
Feeder pigs	58.48	61.45	62.39	63.14	63.66	64.07	62.42
Cull sows	5.25	5.73	5.68	5.28	5.00	4.78	5.21
Total	63.71	67.18	68.07	68.42	68.66	68.85	67.63
Variable cash costs: [3]							
Feed	45.81	41.19	40.49	39.74	40.21	35.00	39.96
Other	31.60	23.03	17.43	23.07	21.91	24.96	23.89
Total	77.41	64.22	57.92	62.81	62.12	59.96	63.85
Fixed cash costs[4]	8.35	8.09	6.37	4.93	3.48	2.33	5.14
Total cash costs	85.76	72.31	64.29	67.74	65.60	62.29	68.99
Returns over cash costs	-22.05	-5.13	3.78	.68	3.06	6.56	-1.36
Unpaid labor	37.59	28.15	19.78	16.61	10.43	1.62	17.01
Cash costs plus unpaid labor	123.35	100.46	84.07	84.35	76.03	63.91	86.00
Returns over cash costs and unpaid labor	-59.64	-33.28	-16.00	-15.93	-7.37	4.94	-18.37
Capital costs:[5]							
Replacement	15.06	17.38	12.63	13.60	12.35	10.20	13.12
Interest	10.58	9.42	7.14	6.24	5.72	4.56	6.93
Total	25.64	26.80	19.77	19.84	18.07	14.76	20.05
Total all costs	148.99	127.26	103.84	104.19	94.10	78.67	106.05
Returns over total costs	-85.28	-60.08	-35.77	-35.77	-25.44	-9.82	-38.42

[1]Itemized costs and returns appear in detailed enterprise budgets, FEDS hog budget file numbers 738-743 for 1983 (*40*). Production and sales are seasonal in the smallest enterprise; all others operate year round. See appendix table 13 for other footnotes.

Appendix table 25—Feeder pig finishing costs and returns per cwt of gain, North Central region, 1980[1]

Item	Annual sales (head)						
	140	300	650	1,600	3,000	10,000	All sizes
	Dollars/cwt						
Gross income:[2]							
Receipts per cwt of sales	37.37	39.04	39.63	39.63	39.63	39.63	39.16
Cost of feeders per cwt of sales	13.63	13.04	13.38	13.39	13.39	13.39	13.34
Return over cost of feeders per cwt of gain	30.60	33.42	33.69	33.68	33.68	33.68	33.15
Variable cash costs:[3]							
Feed	23.45	23.41	23.31	23.07	22.36	21.67	23.07
Other	6.82	7.05	5.54	5.77	4.66	4.01	5.93
Total	30.27	30.46	28.85	28.84	27.02	25.68	29.00
Fixed cash costs[4]	1.67	1.67	1.33	1.19	.85	.68	1.35
Total cash costs	31.94	32.13	30.18	30.03	27.87	26.36	30.35
Returns over cash costs	-1.34	1.29	3.51	3.65	5.81	7.32	2.80
Unpaid labor	3.03	1.96	1.58	1.13	1.16	.83	1.70
Cash costs plus unpaid labor	34.97	34.09	31.76	31.16	29.03	27.19	32.05
Returns over cash costs and unpaid labor	-4.37	-.67	1.93	2.52	4.65	6.49	1.10
Capital costs:[5]							
Replacement	4.01	3.11	2.49	3.80	2.81	2.63	3.18
Interest	2.04	1.44	1.10	1.61	1.24	1.12	1.42
Total	6.05	4.55	3.59	5.41	4.05	3.75	4.60
Total all costs	41.02	38.64	35.35	36.57	33.08	30.94	36.65
Returns over total costs	-10.42	-5.22	-1.66	-2.89	.60	2.74	-3.50

[1]Itemized costs and returns appear in detailed enterprise budgets, FEDS hog budget file numbers 744-749 for 1980 (*40*). Production and sales are seasonal in the two smallest enterprises; all others operate year round. Representative enterprises are weighted by their share of total hog production to create the average outcomes for all sizes of enterprises. Average prices for selected products and inputs appear in appendix table 31.

[2]Purchased feeder pigs, after an allowance for death loss, account for 22.4 pounds of each cwt of sales in the smallest enterprise, 22.2 pounds in the next, and 22.1 pounds for all others, including the average for all sizes. The smallest enterprise has a return over the cost of feeder pigs of $30.06 per cwt of gain. Each cwt of sales includes 77.6 pounds of gain and 22.4 pounds of purchased weight, so 28.86 pounds of feeders must be bought to have a cwt of gain (100 ÷ 77.6 = 128.86). The cost of purchased feeders associated with a cwt of gain is $17.56 ($13.63 ÷ 22.4 lbs. = pig price of $60.85 per cwt × 28.86 pounds purchased). Gross return associated with a cwt of gain is $48.16 (128.86 pounds sold × market price of $37.37). Return per cwt of gain over the cost of feeders is therefore $30.60 ($48.16 - $17.56).

[3]All costs are based on cwt of gain. Feed costs include the market value of grains, the purchase cost of protein supplements and feed additives, and the cash costs of producing hog pastures. Other costs include veterinary and medicine, custom services, fuels and electricity, repairs, bedding, hired labor, marketing charges, and a computed interest on operating capital, less any credit for manure used in crop production.

[4]The hog enterprise share of taxes, insurance, and general farm overhead costs.

[5]Capital replacement is the annual share of the replacement cost of all depreciable assets at current prices. The value of land is not included. Interest is computed on the replacement cost of all capital assets, including land, at the average rate of return to capital assets used in agriculture for the previous 20 years which ranged from 4.2 to 4.4 percent in the 1980-83 period (*32*).

Appendix table 26—Feeder pig finishing costs and returns per cwt of gain, Southeast region, 1980[1]

Item	Annual sales (head)						
	140	300	650	1,600	3,000	10,000	All sizes
	Dollars/cwt						
Gross income:[2]							
Receipts per cwt of sales	40.38	40.26	39.64	40.00	40.00	40.00	40.09
Cost of feeders per cwt of sales	12.14	12.42	11.85	12.18	12.18	12.17	12.17
Return over cost of feeders per cwt of gain	37.95	37.52	37.40	37.45	37.45	37.46	37.58
Variable cash costs:[3]							
Feed	27.14	26.96	26.46	26.77	25.81	25.15	26.47
Other	10.45	4.90	5.56	4.93	6.24	5.85	6.66
Total	37.59	31.86	32.02	31.70	32.05	31.00	33.13
Fixed cash costs[4]	3.08	2.71	2.41	1.80	1.64	1.14	2.23
Total cash costs	40.67	34.57	34.43	33.50	33.69	32.14	35.36
Returns over cash costs	-2.72	2.95	2.97	3.95	3.76	5.32	2.22
Unpaid labor	4.30	2.13	1.86	1.00	.98	.39	2.02
Cash costs plus unpaid labor	44.97	36.70	36.29	34.50	34.67	32.53	37.38
Returns over cash costs and unpaid labor	-7.02	.82	1.11	2.95	2.78	4.93	.20
Capital costs:[5]							
Replacement	4.69	3.17	3.31	2.63	3.89	3.35	3.59
Interest	2.92	1.82	1.18	.97	1.61	1.43	1.79
Total	7.61	4.99	4.49	3.60	5.50	4.78	5.38
Total all costs	52.58	41.69	40.78	38.10	40.17	37.31	42.76
Returns over total costs	-14.63	-4.17	-3.36	-.65	-2.72	.15	-5.18

[1]Itemized costs and returns appear in detailed enterprise budgets, FEDS hog budget file numbers 750-755 for 1980 (*40*). Production and sales are seasonal in the three smallest enterprises; all others operate year round.

[2]Purchased feeder pigs account for 25.6 pounds of each cwt of sales in the smallest enterprise, 25.8 pounds in the next, and 25.7 pounds for all others, including the average for all sizes.

Note: See appendix table 25 for other footnotes.

Appendix table 27—Feeder pig finishing costs and returns per cwt of gain, North Central region, 1982[1]

Item	Annual sales (head)						
	140	300	650	1,600	3,000	10,000	All sizes
	Dollars/cwt						
Gross income:[2]							
Receipts per cwt of sales	51.89	54.67	54.77	54.77	54.77	54.77	54.45
Cost of feeders per cwt of sales	23.45	22.00	21.62	21.64	21.64	21.64	21.89
Return over cost of feeders per cwt of gain	36.65	41.99	42.56	42.53	42.53	42.53	41.82
Variable cash costs:[3]							
Feed	21.52	21.48	21.37	21.16	20.32	19.65	21.05
Other	8.01	7.71	6.55	6.75	5.43	4.64	6.63
Total	29.53	29.19	27.92	27.91	25.75	24.29	27.68
Fixed cash costs[4]	1.96	1.94	1.57	1.44	1.00	.80	1.50
Total cash costs	31.49	31.13	29.49	29.35	26.75	25.09	29.17
Returns over cash costs	5.16	10.86	13.07	13.18	15.78	17.44	12.65
Unpaid labor	3.14	2.01	1.63	1.16	1.20	.85	1.62
Cash costs plus unpaid labor	34.63	33.14	31.12	30.51	27.95	25.94	30.79
Returns over cash costs and unpaid labor	2.02	8.85	11.44	12.02	14.58	16.59	11.03
Capital costs:[5]							
Replacement	4.64	3.70	2.95	4.40	3.24	3.01	3.65
Interest	2.28	1.65	1.27	1.82	1.41	1.25	1.59
Total	6.92	5.35	4.22	6.22	4.65	4.26	5.24
Total all costs	41.55	38.49	35.34	36.73	32.60	30.20	36.03
Returns over total costs	-4.90	3.50	7.22	5.80	9.93	12.33	5.79

[1]Itemized costs and returns appear in detailed enterprise budgets, FEDS hog budget file numbers 644-649 for 1982 (*40*). Production and sales are seasonal in the two smallest enterprises; all others operate year round.

[2]Purchased feeder pigs account for 22.4 pounds of each cwt of sales in the smallest enterprise, 22.2 pounds in the next, and 22.1 pounds for all others, including the average for all sizes.

Note: See appendix table 25 for other footnotes.

Appendix table 28—Feeder pig finishing costs and returns per cwt of gain, Southeast region, 1982[1]

Item	Annual sales (head)						
	140	300	650	1,600	3,000	10,000	All sizes
				Dollars/cwt			
Gross income:[2]							
Receipts per cwt of sales	54.73	54.86	55.50	55.48	55.48	55.48	55.27
Cost of feeders per cwt of sales	25.78	25.72	25.40	24.76	24.76	24.75	25.14
Return over cost of feeders per cwt of gain	38.91	39.28	41.73	41.35	41.35	41.36	40.72
Variable cash costs:[3]							
Feed	24.45	24.24	23.70	24.28	22.93	22.25	23.53
Other	12.37	5.86	6.56	5.93	7.36	6.96	7.60
Total	36.82	30.10	30.26	30.21	30.29	29.21	31.13
Fixed cash costs[4]	3.57	3.11	2.81	2.09	1.94	1.35	2.38
Total cash costs	40.39	33.21	33.07	32.30	32.23	30.56	33.51
Returns over cash costs	-1.48	6.07	8.66	9.05	9.12	10.80	7.21
Unpaid labor	4.96	2.45	2.09	1.13	1.10	.44	1.92
Cash costs plus unpaid labor	45.35	35.66	35.16	33.43	33.33	31.00	35.43
Returns over cash costs and unpaid labor	-6.44	3.62	6.57	7.92	8.02	10.36	5.29
Capital costs:[5]							
Replacement	5.38	3.65	3.90	3.08	4.44	3.86	4.08
Interest	3.28	2.04	1.38	1.12	1.84	1.62	1.89
Total	8.66	5.69	5.28	4.20	6.28	5.48	5.97
Total all costs	54.01	41.35	40.44	37.63	39.61	36.48	41.40
Returns over total costs	-15.10	-2.07	1.29	3.72	1.74	4.88	-.69

[1]Itemized costs and returns appear in detailed enterprise budgets, FEDS hog budget file numbers 650-655 for 1982 (*40*). Production and sales are seasonal in the three smallest enterprises; all others operate year round.

[2]Purchased feeder pigs account for 25.6 pounds of each cwt of sales in the smallest enterprise, 25.8 pounds in the next, and 25.7 pounds for all others, including the average for all sizes.

Note: See appendix table 25 for other footnotes.

Appendix table 29—Feeder pig finishing costs and returns per cwt of gain, North Central region, 1983[1]

Item	Annual sales (head)						
	140	300	650	1,600	3,000	10,000	All sizes
	Dollars/cwt						
Gross income:[2]							
Receipts per cwt of sales	50.21	46.37	47.31	47.31	47.31	47.31	47.40
Cost of feeders per cwt of sales	17.21	20.31	19.84	19.86	19.85	19.86	19.70
Return over cost of feeders per cwt of gain	42.52	33.49	35.26	35.24	35.25	35.24	35.59
Variable cash costs:[3]							
Feed	25.64	25.59	25.49	25.24	24.23	23.50	25.07
Other	7.69	7.46	6.27	6.59	5.29	4.55	6.37
Total	33.33	33.05	31.76	31.83	29.52	28.05	31.44
Fixed cash costs[4]	2.85	2.90	2.18	1.49	1.08	.80	1.90
Total cash costs	36.18	35.95	33.94	33.32	30.60	28.85	33.34
Returns over cash costs	6.34	-2.46	1.32	1.92	4.65	6.39	2.24
Unpaid labor	3.40	2.19	1.77	1.26	1.31	.94	1.72
Cash costs plus unpaid labor	39.58	38.14	35.71	34.58	31.91	29.79	35.07
Returns over cash costs and unpaid labor	2.94	-4.65	-.45	.66	3.34	5.45	.52
Capital costs:[5]							
Replacement	4.82	3.92	3.12	4.58	3.36	3.12	3.80
Interest	2.26	1.66	1.28	1.82	1.41	1.23	1.58
Total	7.08	5.58	4.40	6.40	4.77	4.35	5.38
Total all costs	46.66	43.72	40.11	40.98	36.68	34.14	40.45
Returns over total costs	-4.14	-10.23	-4.85	-5.74	-1.43	1.10	-4.86

[1]Itemized costs and returns appear in detailed enterprise budgets, FEDS hog budget file numbers 720-725 for 1983 (*40*). Production and sales are seasonal in the two smallest enterprises; all others operate year round.

[2]Purchased feeder pigs account for 22.4 pounds of each cwt of sales in the smallest enterprise, 22.2 pounds in the next, and 22.1 pounds for all others, including the average for all sizes.

Note: See appendix table 25 for other footnotes.

Appendix table 30—Feeder pig finishing costs and returns per cwt of gain, Southeast region, 1983[1]

Item	Annual sales (head)						
	140	300	650	1,600	3,000	10,000	All sizes
	Dollars/cwt						
Gross income:[2]							
Receipts per cwt of sales	46.82	47.26	46.59	47.03	47.03	47.03	46.97
Cost of feeders per cwt of sales	21.48	21.72	22.72	22.51	22.51	22.50	22.28
Return over cost of feeders per cwt of gain	34.06	34.42	32.13	33.00	33.00	33.02	33.23
Variable cash costs:[3]							
Feed	29.26	29.11	28.60	28.99	27.62	26.96	28.25
Other	12.24	5.60	6.38	5.77	7.26	6.84	7.39
Total	41.50	34.71	34.98	34.76	34.88	33.80	35.65
Fixed cash costs[4]	3.17	2.68	2.25	1.37	1.29	.96	1.81
Total cash costs	44.67	37.39	37.23	36.13	36.17	34.76	37.46
Returns over cash costs	-10.61	-2.97	-5.10	-3.13	-3.17	-1.74	-4.23
Unpaid labor	5.11	2.53	2.19	1.18	1.16	.47	1.92
Cash costs plus unpaid labor	49.78	39.92	39.42	37.31	37.33	35.23	39.39
Returns over cash costs and unpaid labor	-15.72	-5.50	-7.29	-4.31	-4.33	-2.21	-6.16
Capital costs:[5]							
Replacement	5.60	3.83	4.15	3.27	4.68	4.02	4.27
Interest	3.26	2.02	1.40	1.14	1.89	1.63	1.88
Total	8.86	5.85	5.55	4.41	6.57	5.65	6.15
Total all costs	58.64	45.77	44.97	41.72	43.90	40.88	45.53
Returns over total costs	-24.58	-11.35	-12.84	-8.72	-10.90	-7.86	-12.31

[1]Itemized costs and returns appear in detailed enterprise budgets, FEDS hog budget file numbers 726-731 for 1983 (*40*). Production and sales are seasonal in the three smallest enterprises; all others operate year round.

[2]Purchased feeder pigs account for 25.6 pounds of each cwt of sales in the smallest enterprise, 25.8 pounds in the next, and 25.7 pounds for all others, including the average for all sizes.

Note: See appendix table 25 for other footnotes.

Appendix table 31—Average prices for selected products sold and inputs used in hog production by region[1]

Item	Unit	1980		1982		1983	
		North Central	South-east	North Central	South-east	North Central	South-east
				Dollars			
Slaughter hogs	Cwt	39.63	40.00	54.77	55.48	47.31	47.03
Cull sows	do.	35.23	34.68	49.42	46.21	40.30	39.02
Feeder pigs:							
Bought	do.	60.61	47.41	97.96	96.39	89.88	87.65
Sold	do.	66.45	52.84	106.33	106.64	77.05	73.01
Corn	Bu.	2.66	3.05	2.34	2.61	2.97	3.37
Soybean meal	Cwt	13.03	13.99	12.69	13.75	13.55	14.37
Hog feed (38-42% protein)	do.	15.04	14.83	14.79	14.49	15.85	15.33
Labor	Hr.	3.84	3.32	3.94	3.81	4.30	3.93
Gasoline	Gal.	1.075	1.040	1.185	1.150	1.135	1.070
Diesel	do.	.950	1.010	1.100	1.170	.950	1.050
L.P. Gas	do.	.590	.650	.590	.730	.660	.790
Electricity	Kwh.	.049	.045	.066	.064	.064	.069

[1]Prices for hogs and feeds are State averages weighted by hog production in each State to determine region averages. Purchases of feeder pigs for finishing are lagged one quarter into the previous year. Sales of feeder pigs are in calendar year specified. Energy prices and wage rates are averages for the dominant hog producing State in each region—Iowa and North Carolina.

Source: (*37*).

Appendix table 32—Average price and feeding margins in feeder pig finishing[1]

Year	Price margin[2]		Feeding margin[3]	
	North Central	South-east	North Central	South-east
		Dollars		
1980	-21.20	-7.26	16.09	13.62
1981	-35.64	-23.80	19.02	16.38
1982	-44.83	-42.55	33.40	31.74
1983	-41.74	-39.72	22.33	18.72

[1]Based on the average performance of feeder pig finishers in the North Central and Southeast regions. Prices paid for purchased feeder pigs are lagged one quarter. All other data apply to the calendar year. See appendix tables 25-30.

[2]Price margin is the price received for 100 pounds of slaughter hogs sold minus the price paid for 100 pounds of feeder pigs.

[3]Feeding margin is the price received for 100 pounds of slaughter hogs sold minus feed cost for 100 pounds of gain.

Appendix table 33—Selected characteristics of representative farms with farrow-to-finish hog enterprises, North Central region[1]

Year and item	Unit	Annual sales (head)					
		140	300	650	1,600	3,000	10,000
1980:							
Corn produced	Bu.	12,805	20,685	24,132	32,505	50,728	73,382
Corn sold	do.	10,726	16,229	14,485	9,313	6,890	0
Corn bought	do.	0	0	0	0	0	68,080
Soybeans produced	do.	2,987	2,987	4,315	4,315	8,298	5,476
Gross income—							
Hogs	Dol.	12,975	28,245	60,139	147,979	277,371	925,048
Corn	do.	32,607	49,336	44,034	28,312	20,946	0
Soybeans	do.	22,762	22,762	32,878	32,878	63,227	41,730
Total	do.	68,344	100,343	137,051	209,169	361,544	966,778
1982:							
Corn produced	Bu.	15,701	25,364	29,591	39,857	62,202	89,981
Corn sold	do.	13,622	20,908	19,944	16,665	18,364	0
Corn bought	do.	0	0	0	0	0	51,481
Soybeans produced	do.	3,274	3,274	4,729	4,729	9,095	6,003
Gross income—							
Hogs	Dol.	17,790	38,268	83,180	204,670	383,626	1,279,446
Corn	do.	28,470	43,698	41,683	34,830	38,381	0
Soybeans	do.	16,534	16,534	23,881	23,881	45,930	30,315
Total	do.	62,794	98,500	148,744	263,381	467,937	1,309,761
1983:							
Corn produced	Bu.	10,603	17,128	19,982	26,915	42,003	60,762
Corn sold	do.	8,524	12,672	10,335	3,723	0	0
Corn bought	do.	0	0	0	0	1,835	80,700
Soybeans produced	do.	2,643	2,643	3,818	3,818	7,342	4,846
Gross income—							
Hogs	Dol.	15,243	33,354	71,635	176,277	330,428	1,101,911
Corn	do.	27,021	40,170	32,762	11,802	0	0
Soybeans	do.	21,173	21,173	30,583	30,583	58,813	38,817
Total	do.	63,437	94,697	134,980	218,662	389,241	1,140,728
All years:							
Hog produced	Cwt.	328	706	1,528	3,758	7,043	23,494
Corn fed	Bu.	2,079	4,456	9,647	23,192	43,838	141,462
Corn grown	Acres	130	210	245	330	515	745
Soybeans grown	do.	90	90	130	130	250	165
Business organization	Type	Sole proprietorship	Sole proprietorship	Sole proprietorship	Sole proprietorship	General partnership	Family "C" corporation
Average age of hog facilities[2]	Years	30+	18	15	7	6	3

[1]Acres of crops grown and amount of hogs produced are representative of farm organizations in 1980 (*43*) except that acres of corn equal the acres of all grain crops, acres of soybeans equal all remaining cropland, and livestock enterprises other than hogs are omitted. Yields, prices, purchases, and sales are averages for the year specified with crops not fed to hogs sold at harvest (*31, 32*).

[2]Machinery has an average age of 4 years on all farms.

Appendix table 34—Costs and returns for farms with farrow-to-finish hog enterprises, North Central region, 1982[1]

Item	Annual sales (head)					
	140	300	650	1,600	3,000	10,000
	Dollars					
Gross income	62,794	98,500	148,744	263,381	467,937	1,309,761
Cash costs:						
Operating expenses	29,348	47,302	69,869	122,401	200,601	647,914
Fixed cash costs	7,714	11,245	14,780	20,520	31,790	53,656
Total cash costs	37,062	58,547	84,649	142,921	232,391	701,570
Returns over cash costs	25,732	39,953	64,095	120,460	235,546	608,191
Unpaid labor	6,075	8,460	11,133	20,412	32,590	36,239
Cash costs plus unpaid labor	43,137	67,007	95,782	163,333	264,981	737,809
Returns over cash costs and unpaid labor	19,657	31,493	52,962	100,048	202,956	571,952
Capital costs:						
Replacement	8,660	13,939	21,243	39,775	64,608	146,912
Interest	22,643	31,764	41,313	56,154	92,942	140,671
Total	31,303	45,703	62,556	95,929	157,550	287,583
Total all costs	74,440	112,710	158,338	259,262	422,531	1,025,392
Returns over total costs	-11,646	-14,210	-9,594	4,119	45,406	284,369

[1]Enterprise combinations in these farm businesses are simplified as described in appendix table 33. Economic costs include actual cash operating expenses and fixed cash costs for property taxes, insurance, and general farm overhead plus a calculated interest on operating capital. Corn fed to hogs is charged to the farm business at market price only when purchased. A return is allocated to unpaid labor. Capital costs include the annual share of replacing depreciable assets at current costs plus interest at 4.2 percent of the replacement cost of depreciable assets and land at current market value.

Appendix table 35—Costs and returns for farms with farrow-to-finish hog enterprises, North Central region, 1980[1]

Item	Annual sales (head)					
	140	300	650	1,600	3,000	10,000
	Dollars					
Gross income	68,344	100,343	137,051	209,169	361,544	966,778
Cash costs:						
Operating expenses	26,167	42,337	62,888	109,765	183,639	669,621
Fixed cash costs	7,317	10,580	13,956	18,996	29,553	48,853
Total cash costs	33,484	52,917	76,842	128,761	213,192	718,474
Returns over cash costs	34,860	47,426	60,209	80,408	148,352	248,304
Unpaid labor	5,578	7,765	10,251	17,374	30,574	33,752
Cash costs plus unpaid labor	39,062	60,682	87,093	146,135	243,766	752,226
Returns over cash costs and unpaid labor	29,282	39,661	49,958	63,034	117,778	214,552
Capital costs:						
Replacement	7,001	11,396	17,259	32,504	52,341	120,843
Interest	22,327	31,231	40,487	54,379	90,117	133,773
Total	29,328	42,627	57,746	86,883	142,458	254,616
Total all costs	68,390	103,309	144,839	233,018	386,224	1,006,842
Returns over total costs	-46	-2,966	-7,788	-23,849	-24,680	-40,064

[1]See appendix table 34 for footnotes.

Appendix table 36—Costs and returns for farms with farrow-to-finish hog enterprises, North Central region, 1983[1]

Item	Annual sales (head)					
	140	300	650	1,600	3,000	10,000
	Dollars					
Gross income	63,437	94,697	134,980	218,662	389,241	1,140,728
Cash costs:						
Operating expenses	28,071	45,509	68,772	121,529	206,280	783,571
Fixed cash costs	8,352	12,211	15,841	21,434	33,625	55,393
Total cash costs	36,423	57,720	84,613	142,963	239,905	838,964
Returns over cash costs	27,014	36,977	50,367	75,699	149,336	301,764
Unpaid labor	6,145	8,552	11,309	21,248	33,887	36,868
Cash costs plus unpaid labor	42,568	66,272	95,922	164,211	273,792	875,832
Returns over cash costs and unpaid labor	20,869	28,425	39,058	54,451	115,449	264,896
Capital costs:						
Replacement	8,761	14,060	21,348	39,503	63,691	147,925
Interest	21,477	29,764	39,085	53,458	88,547	134,988
Total	30,238	43,824	60,433	92,961	152,238	282,913
Total all costs	72,806	110,096	156,355	257,172	426,030	1,158,745
Returns over total costs	-9,369	-15,399	-21,375	-38,510	-36,789	-18,017

[1]See appendix table 34 for footnotes.

Appendix table 37—Cash income available after basic taxes for representative farms with farrow-to-finish hog enterprises, North Central region, 1982[1]

Item	Annual sales (head)					
	140	300	650	1,600	3,000	10,000
	Dollars					
Gross income						
Ordinary incomes[2]	61,904	96,365	144,296	252,706	448,367	1,242,154
Capital gain	890	2,135	4,448	10,675	19,570	67,607
Total	62,794	98,500	148,744	263,381	467,937	1,309,761
Cash expenses[3]						
Operating costs	27,917	45,008	66,491	116,288	190,178	621,812
Fixed cash costs	7,714	11,245	14,780	20,520	31,790	53,656
Cash interest	9,105	14,282	21,568	38,190	66,148	189,915
Total	44,736	70,535	102,839	174,998	288,116	865,383
Depreciation[4]	5,161	8,678	13,067	27,281	44,840	117,296
Total farm expense	49,897	79,213	115,906	202,279	332,956	982,679
Net farm profit[5]	12,007	17,152	28,390	50,427	115,411	259,475
Total income less cash expenses	18,058	27,965	45,905	88,383	179,821	444,378
Total income less total expenses	12,897	19,287	32,838	61,102	134,981	327,082
Personal deductions[6]	5,197	5,357	5,696	6,403	8,250	13,052
Taxable income[7]	7,166	12,649	24,473	48,294	114,989	273,466
Taxes:[8]						
Federal	431	1,205	3,437	10,720	39,369	118,133
State	197	357	696	1,403	3,250	8,052
Self-employment	1,357	1,938	3,208	4,271	4,271	4,271
Total	1,985	3,500	7,341	16,394	46,890	130,456
Cash available after taxes[9]	16,073	24,465	38,564	71,989	132,931	313,922

[1]Based on a simplified organization of farms (appendix table 33); yields, prices, and cost rates for year specified; and the Federal income tax regulations in effect for 1984 for sole proprietorships (*8*). These estimates include none of the special provisions for reducing or deferring Federal income taxes, such as investment credit, accelerated recovery of investments, individual retirement accounts, or alternative forms of business organization.

[2]Ordinary income is sales of corn, soybeans, and slaughter hogs. Capital gain is sales of cull breeding stock.

[3]Cash expenses include all cash operating costs for producing corn, soybeans, and hogs; the fixed cash costs for property taxes, insurance, and general farm expenses not tied directly to a specific enterprise; and cash interest payments for all farm purposes.

[4]Depreciation is computed by the straight-line method applied to original investment costs and full economic life of the assets. The ACRS is not used.

[5]Ordinary income less cash costs and depreciation.

[6]Assumes standard personal deductions plus the computed State income tax and personal exemptions of $5,000 for a family of five.

[7]Ordinary income, plus 40 percent of capital gain, minus total farm expenses and personal deductions.

[8]Federal income taxes are based on the 1984 Federal income tax regulations applicable to a sole proprietorship with no allowances for the special provisions available for tax reductions or deferral (*8*). The State income tax is 2.5 percent of total farm income less total farm expense and a $5,000 deduction for a family of five. The self-employment tax for the operator is 11.3 percent of net farm profit to a maximum profit of $37,800.

[9]Total income less cash expenses, Federal and State income taxes, and self-employment taxes. Barring use of any special provisions available to reduce or defer income taxes, this is the cash available for all purposes including family living, savings, principal payments on debts, and new investments.

Appendix table 38—Impact of investment credit and incorporation on cash income after basic taxes for representative farms with farrow-to-finish hog enterprises, North Central region, 1982[1]

Item	Annual sales (head)					
	140	300	650	1,600	3,000	10,000
				Dollars		
Federal income tax[2]	431	1,205	3,437	10,720	39,369	118,133
Cash available after basic taxes[2]	16,073	24,465	38,564	71,989	132,931	313,922
Family living expenses[3]	20,000	20,000	20,000	20,000	20,000	20,000
Annual capital replacement cost[4]	8,660	13,939	21,243	39,775	64,608	146,912
Cash available after living expenses[5]	-3,927	4,465	18,564	51,989	112,931	293,922
Investment credit: [6]						
Potential	693	1,115	1,699	3,182	5,169	11,753
Creatable	0	357	1,485	3,182	5,169	11,753
Applicable	0	357	1,485	3,182	5,169	11,753
Tax savings from incorporation[7]	0	—	600	4,500	15,400	26,700
Total tax savings	0	357	2,085	7,682	20,569	38,453
Revised cash available after taxes[8]	16,073	24,822	40,649	79,671	153,500	352,375

— = Less than $50.

[1]Costs and returns are for year specified with Federal income taxes computed according to the 1984 Federal income tax regulations (*8*).

[2]See appendix tables 37, 40, or 43.

[3]Assumed family living expenses for all purposes (*44*).

[4]Annual share of the cost of replacing depreciable assets at prices for the year specified.

[5]Cash available after basic taxes and family living expenses may be used for retirement of debt, purchase of land replacement or expansion of depreciable assets, or other purposes. Available cash is set as the maximum amount for replacement of depreciable assets on a maintenance basis.

[6]Potential investment credit is the amount that could be earned were depreciable assets replaced at the average annual rate and all investments were eligible for investment credit at 8 percent which leaves the basis for depreciation unaffected. Creatable investment credit depends on cash available relative to the annual cost of replacing capital. Applicable investment credit is limited to the amount of the Federal income tax liability.

[7]Gross savings in Federal income tax liabilities for a sole proprietorship (*14*). Possible differences in expenses for legal and accounting fees and self-employment taxes are not considered.

[8]Cash available after use of investment credit and incorporation. Additional cash available after tax savings could be used to replace depreciable assets and earn additional investment credit. Federal income tax regulations for 1984 contain other provisions for tax reduction or deferral that would further increase retained cash for businesses with tax liabilities.

Appendix table 39—Residual income per $100 gross income on farms with farrow-to-finish hog enterprises, economic and cash basis, North Central region, 1982[1]

Income measure	Annual sales (head)					
	140	300	650	1,600	3,000	10,000
	Dollars					
Economic basis:						
Income less cash costs	40.98	40.56	43.09	45.74	50.34	46.44
Income less cash costs and unpaid labor	31.30	31.97	35.61	37.99	43.37	43.67
Income less total costs	-18.55	-14.43	-6.45	1.56	9.70	21.71
Cash basis:						
Income less cash expenses	28.76	28.39	30.86	33.56	38.43	33.93
Income less cash expenses and basic taxes	25.60	24.84	25.93	27.33	28.41	23.97
Income less cash expenses and taxes adjusted for investment credit and business organization	25.60	25.20	27.33	30.25	32.80	26.90

[1]See appendix table 34 for costs and returns on an economic basis, appendix tables 37 and 38 for costs and returns on a cash basis.

Appendix table 40—Cash income available after basic taxes for representative farms with farrow-to-finish hog enterprises, North Central region, 1980[1]

Item	Annual sales (head)					
	140	300	650	1,600	3,000	10,000
	Dollars					
Gross income						
Ordinary income[2]	67,710	98,821	133,880	201,559	347,593	918,583
Capital gain	634	1,522	3,171	7,610	13,951	48,195
Total	68,344	100,343	137,051	209,169	361,544	966,778
Cash expenses:[3]						
Operating costs	24,803	40,124	59,534	103,697	173,104	642,580
Fixed cash costs	7,317	10,580	13,956	18,996	29,553	48,853
Cash interest	8,715	13,497	19,909	34,157	60,536	149,248
Total	40,835	64,201	93,399	156,850	263,193	840,681
Depreciation[4]	4,362	7,176	11,120	22,452	37,580	94,615
Total farm expense	45,197	71,377	104,519	179,302	300,773	935,296
Net farm profit[5]	22,513	27,444	29,361	22,257	46,820	-16,713
Total income less cash expenses	27,509	36,142	43,652	52,319	98,351	126,097
Total income less total expenses	23,147	28,966	32,532	29,867	60,771	31,482
Personal deductions[6]	5,454	5,599	5,888	5,622	6,394	5,662
Taxable income[7]	17,313	22,454	24,941	19,679	46,006	-3,097
Taxes:[8]						
Federal	1,977	2,993	3,550	2,403	9,850	0
State	454	599	688	622	1,394	662
Self-employment	2,544	3,101	3,318	2,515	4,271	0
Total	4,975	6,693	7,556	5,540	15,515	662
Cash available after taxes[9]	22,534	29,449	36,096	46,779	82,836	125,435

[1]See appendix table 37 for footnotes.

Appendix table 41—Impact of investment credit and incorporation on cash income after basic taxes for representative farms with farrow-to-finish hog enterprises, North Central region, 1980[1]

Item	Annual sales (head)					
	140	300	650	1,600	3,000	10,000
	Dollars					
Federal income tax[2]	1,977	2,993	3,550	2,403	9,850	0
Cash available after basic taxes[2]	22,534	29,449	36,096	46,779	82,836	125,435
Family living expenses[3]	20,000	20,000	20,000	20,000	20,000	20,000
Annual capital replacement cost[4]	7,001	11,396	17,259	32,504	52,341	120,843
Cash available after living expenses[5]	2,534	9,449	16,096	26,779	62,836	105,435
Investment credit: [6]						
Potential	560	912	1,381	2,600	4,187	9,667
Creatable	203	756	1,288	2,142	4,187	8,435
Applicable	203	756	1,288	2,142	4,187	0
Tax savings from incorporation[7]	100	400	600	200	4,000	0
Total tax savings	303	1,156	1,888	2,342	8,187	0
Revised cash available after taxes[8]	22,837	30,605	37,984	49,121	91,023	125,435

[1]See appendix table 38 for footnotes.

Appendix table 42—Residual income per $100 gross income on farms with farrow-to-finish hog enterprises, economic and cash basis, North Central region, 1980[1]

Income measure	Annual sales (head)					
	140	300	650	1,600	3,000	10,000
	Dollars					
Economic basis:						
Income less cash costs	51.01	47.26	43.93	38.44	41.03	25.68
Income less cash costs and unpaid labor	42.85	39.53	36.45	30.14	32.58	22.19
Income less total costs	-.07	-2.96	-5.68	-11.40	-6.83	-4.14
Cash basis:						
Income less cash expenses	40.25	36.02	31.85	25.01	27.20	13.04
Income less cash expenses and basic taxes	32.97	29.35	26.34	22.36	22.91	12.97
Income less cash expenses and taxes adjusted for investment credit and business organization	33.41	30.50	27.72	23.48	25.18	12.98

[1]See appendix table 35 for costs and returns on an economic basis, appendix tables 40 and 41 for costs and returns on a cash basis.

Appendix table 43—Cash income available after basic taxes for representative farms with farrow-to-finish hog enterprises, North Central region, 1983[1]

Item	Annual sales (head)					
	140	300	650	1,600	3,000	10,000
	Dollars					
Gross income						
Ordinary incomes[2]	62,712	92,956	131,353	209,957	373,282	1,085,598
Capital gain	725	1,741	3,627	8,705	15,959	55,130
Total	63,437	94,697	134,980	218,662	389,241	1,140,728
Cash expenses[3]						
Operating costs	26,927	43,657	65,950	116,372	197,468	760,815
Fixed cash costs	8,352	12,211	15,841	21,434	33,625	55,393
Cash interest	12,302	19,486	28,920	50,558	89,523	225,369
Total	47,581	75,354	110,711	188,364	320,616	1,041,577
Depreciation[4]	5,494	9,219	14,030	29,252	48,612	126,952
Total farm expense	53,075	84,573	124,741	217,616	369,228	1,168,529
Net farm profit[5]	9,637	8,383	6,612	-7,659	4,054	-82,931
Total income less cash expenses	15,856	19,343	24,269	30,298	68,625	99,151
Total income less total expenses	10,362	10,124	10,239	1,046	20,013	-27,801
Personal deductions[6]	5,134	5,128	5,131	5,000	5,375	5,000
Taxable income[7]	4,793	3,951	2,932	-9,177	5,063	-65,879
Taxes:[8]						
Federal	153	61	0	0	183	0
State	134	128	131	0	375	0
Self-employment	1,089	947	747	0	458	0
Total	1,376	1,136	878	0	1,016	0
Cash available after taxes[9]	14,480	18,207	23,391	30,298	67,609	99,151

[1]See appendix table 37 for footnotes.

Appendix table 44—Impact of investment credit and incorporation on cash income after basic taxes for representative farms with farrow-to-finish hog enterprises, North Central region, 1983[1]

Item	Annual sales (head)					
	140	300	650	1,600	3,000	10,000
	Dollars					
Federal income tax[2]	153	61	0	0	183	0
Cash available after basic taxes[2]	14,480	18,207	22,981	30,298	67,609	99,151
Family living expenses[3]	20,000	20,000	20,000	20,000	20,000	20,000
Annual capital replacement cost[4]	8,761	14,060	21,348	39,503	63,691	147,925
Cash available after living expenses[5]	-5,520	-1,793	2,981	10,298	47,609	79,151
Investment credit: [6]						
Potential	701	1,125	1,708	3,160	5,095	11,834
Creatable	0	0	238	824	3,809	6,332
Applicable	0	0	0	0	183	0
Tax savings from incorporation[7]	0	0	0	0	0	0
Total tax savings	0	0	0	0	183	0
Revised cash available after taxes[8]	14,480	18,207	22,981	30,298	67,792	99,151

[1]See appendix table 38 for footnotes.

Appendix table 45—Residual income per $100 gross income on farms with farrow-to-finish hog enterprises, economic and cash basis, North Central region, 1983[1]

Income measure	Annual sales (head)					
	140	300	650	1,600	3,000	10,000
	Dollars					
Economic basis:						
Income less cash costs	42.58	39.05	37.31	34.62	38.37	26.45
Income less cash costs and unpaid labor	32.90	30.02	28.94	24.90	29.66	23.22
Income less total costs	-14.77	-16.26	-15.84	-17.61	-9.45	-1.58
Cash basis:						
Income less cash expenses	24.99	20.43	17.98	13.86	17.63	8.69
Income less cash expenses and basic taxes	22.82	19.23	17.33	13.86	17.37	8.69
Income less cash expenses and taxes adjusted for investment credit and business organization	22.82	19.23	17.03	13.86	17.42	8.69

[1]See appendix table 36 for costs and returns on an economic basis, appendix tables 43 and 44 for costs and returns on a cash basis.

Appendix table 46—Sample of farms with records of farrow-to-finish hog enterprises, Illinois Farm Business Farm Management Association[1]

Year	Hogs produced (head)[2]						
	100-199	200-499	500-999	1,000-1,999	2,000-4,999	5,000 and over	All sizes
	Number of farms						
1980	113	261	313	296	115	7	1,105
1981	72	231	278	268	114	10	973
1982	67	212	293	246	109	11	938
1983	70	183	275	296	135	18	977

[1]Data from these records provided measures of physical, price, and economic performance in hog production. Most farmers recorded data for all measures of performance for the hog enterprise, but many did not record special information such as litters farrowed and pigs produced per female year.

[2]Hog production is measured in the farm records by weight produced, then converted to an estimate of head at an average weight of 235 pounds.

Source: Data summarized by the authors from records kept by the Department of Agricultural Economics, U. of Ill., in cooperation with the Illinois Farm Business Farm Management Association, Urbana, Ill.

Appendix table 47—Selected characteristics of Illinois farm recordkeepers with farrow-to-finish hog enterprises, by size of hog enterprise, 1980-1983

Item	Unit	Annual production (head)						
		100-199	200-499	500-999	1,000-1,999	2,000-4,999	5,000 and over	All sizes[1]
Hog production[2]	Cwt	356	799	1,735	3,292	6,477	16,690	2,581
Litters farrowed[3]	No.	24	50	103	193	380	977	153
Sales of market hogs[4]	Dol.	14,083	31,158	69,550	131,853	259,883	645,081	102,982
Sales of other hogs[4]	do.	2,310	4,594	8,431	14,321	26,424	67,111	11,524
Total returns from hogs[5]	do.	15,593	35,504	78,115	147,811	292,783	738,252	115,946
Gross farm returns[6]	do.	142,354	149,192	180,755	237,833	336,687	622,240	210,014
Operator cash income[7]	do.	116,947	133,650	173,334	247,171	371,279	843,105	211,587
Operator cash interest[7]	do.	11,420	13,826	17,979	23,026	29,890	61,996	19,843
Paid labor[8]	Months	3	4	5	8	16	51	7

[1]Means of the sample. See appendix table 46 for size of the sample.

[2]Production is the sum of ending inventory, sales, home use, and post weaning death loss minus the sum of beginning inventory and purchases.

[3]A female is counted as having farrowed a litter whether pigs are born dead or alive.

[4]Market hogs are barrows and gilts intended for slaughter. Other hogs are mostly cull breeding stock intended for slaughter, but may also include any other kinds of hogs or pigs except market hogs.

[5]Farmers compute total returns by assigning dollar values to the weights of hogs in the production equation.

[6]Gross farm returns are the sum of income from the sales of crops, including government payments, livestock and livestock products, other farm receipts such as custom work performed by the operator and patronage refunds, adjusted for change in inventory and accounts receivable, less purchased feed and livestock. They may be less than the total returns from hogs because of the deduction of purchased feed.

[7]Operator cash income is the operator's share of cash receipts without deduction of purchases. Operator cash interest is the cash interest paid by the operator for all farm purposes.

[8]Includes hired workers, but not hired managers.

Source: Data summarized by authors from records kept by the Department of Agricultural Economics, U. of Illinois, in cooperation with the Farm Business Management Association, Urbana, Ill.

Appendix table 48—Selected measures of performance in farrow-to-finish hog production, Illinois farm recordkeepers, 1980[1]

Measure of performance	Unit	Annual production (head)						
		100-199	200-499	500-999	1,000-1,999	2,000-4,999	5,000 and over	All sizes[2]
Physical:								
Pounds of hogs produced per litter	Lbs.	1,761 (565)	1,739 (521)	1,775 (372)	1,728 (311)	1,703 (286)	1,747 (223)	1,747
Pigs farrowed per litter	No.	8.67 (1.48)	8.77 (1.20)	9.03 (1.13)	9.16 (1.23)	9.20 (.90)	9.37 (1.26)	8.97
Litters farrowed per female year	do.	6.99 (1.72)	6.95 (1.23)	7.29 (.95)	7.47 (.85)	7.47 (.90)	7.61 (.41)	7.23
Litters farrowed per female year	do.	1.47 (.40)	1.60 (.41)	1.62 (.31)	1.65 (.26)	1.78 (.29)	—	1.62
Pigs weaned per female year	do.	9.72 (4.08)	11.50 (3.12)	12.35 (3.01)	12.53 (2.46)	13.97 (3.79)	—	12.15
Death loss as a percent of production	Pct.	2.16 (1.62)	2.48 (2.21)	2.04 (1.65)	1.80 (1.24)	1.86 (1.29)	2.08 (.34)	2.10
Weight per hog sold	Lbs.	253.40 (23.98)	247.93 (20.69)	242.90 (16.49)	239.22 (15.85)	234.96 (14.76)	231.39 (9.69)	243.54
Feed fed per cwt of hogs produced	do.	457.66 (104.43)	453.86 (89.99)	432.39 (72.35)	414.46 (62.96)	403.09 (52.28)	396.35 (39.91)	433.36
Price:								
Price received per cwt of hogs sold	Dol.	38.78 (4.73)	38.90 (3.61)	38.93 (2.54)	39.01 (1.89)	39.19 (2.06)	38.89 (.86)	38.95
Total returns per cwt of hogs produced	do.	39.66 (6.25)	39.12 (4.80)	39.89 (4.15)	39.74 (3.38)	39.80 (2.77)	38.43 (1.55)	39.61
Cost per cwt of commercial feeds fed	do.	16.53 (2.62)	15.63 (2.35)	15.49 (2.16)	14.96 (2.25)	14.02 (2.04)	12.68 (1.02)	15.36
Cost per cwt of concentrate feeds fed	do.	7.18 (.91)	7.06 (.82)	7.04 (.68)	7.03 (.62)	6.86 (.50)	6.64 (.81)	7.04
Average payment per month per employee	do.	941 (253)	1,023 (499)	1,004 (396)	1,044 (443)	1,134 (482)	1,427 (313)	1,025

See footnotes at end of table.

Continued

Appendix table 48—Selected measures of performance in farrow-to-finish hog production, Illinois farm recordkeepers, 1980[1]—continued

Measure of performance	Unit	Annual production (head)						
		100-199	200-499	500-999	1,000-1,999	2,000-4,999	5,000 and over	All sizes
Economic:								
Feed cost per cwt of hogs produced	Dol.	30.99 (7.14)	30.70 (6.45)	29.89 (4.83)	28.44 (4.21)	27.38 (3.69)	26.27 (3.50)	29.66
Returns above feed cost per litter farrowed	do.	155.54 (180.20)	147.79 (149.48)	177.15 (108.37)	197.00 (92.13)	215.61 (85.72)	211.58 (72.02)	174.88
Returns above feed cost per cwt of hogs produced	do.	8.75 (8.12)	8.75 (7.40)	10.01 (5.70)	11.30 (4.84)	12.31 (4.40)	12.16 (3.99)	10.05
Returns per $100 feed fed	do.	134.06 (34.42)	133.10 (29.52)	136.95 (24.75)	142.34 (21.76)	147.81 (20.78)	148.70 (22.22)	137.76
Other:								
Cash interest paid per dollar of cash income	do.	.085 (.080)	.079 (.079)	.087 (.081)	.082 (.078)	.067 (.068)	.064 (.075)	.082
Percent of hog sales from market hogs	do.	87.6 (7.4)	88.3 (6.6)	89.5 (5.8)	90.6 (5.2)	90.2 (5.0)	91.1 (5.1)	89.4

— = Insufficient observations.

[1]Includes only farms with farrow-to-finish hog enterprises and annual production of 23,500 pounds of hogs or more. Numbers in the first row for each measure are means, standard deviations are in the second row in parenthesis.

[2]Performance by producers in the separate size classes is weighted by the distribution of production by size of operation for the North Central region for the appropriate year to create an approximation of overall performance by producers in Illinois and the North Central region. A higher proportion of production by Illinois recordkeepers occurs on farms with midsize hog enterprises than for all producers in the State or North Central region.

Source: Data summarized by the authors from records kept by the Department of Agricultural Economics, U. of Ill., in cooperation with the Illinois Farm Business Farm Management Association, Urbana, Ill.

Appendix table 49—Selected measures of performance in farrow-to-finish hog production, Illinois farm recordkeepers, 1981[1]

Measure of performance	Unit	Annual production (head)						
		100-199	200-499	500-999	1,000-1,999	2,000-4,999	5,000 and over	All sizes[2]
Physical:								
Pounds of hogs produced per litter	Lbs.	1,660 (572)	1,691 (405)	1,714 (345)	1,724 (290)	1,721 (272)	1,544 (194)	1,692
Pigs farrowed per litter	No.	8.58 (1.27)	8.92 (1.15)	9.04 (1.11)	9.27 (1.01)	9.35 (1.02)	8.80 (.58)	9.03
Pigs weaned per litter	do.	6.92 (1.28)	7.07 (1.18)	7.29 (1.02)	7.49 (.82)	7.64 (.80)	7.35 (.63)	7.29
Litters farrowed per female year	do.	1.65 (.41)	1.65 (.38)	1.71 (.31)	1.66 (.28)	1.89 (.27)	—	1.70
Pigs weaned per female year	do.	11.28 (3.93)	12.28 (4.01)	12.73 (2.69)	12.73 (2.79)	14.67 (2.19)	—	12.70
Death loss as a percent of production	Pct.	2.76 (2.24)	2.19 (1.88)	1.72 (1.15)	1.86 (1.42)	1.79 (1.39)	1.84 (1.37)	2.00
Weight per hog sold	Lbs.	251.23 (24.83)	249.45 (22.28)	243.92 (17.73)	240.76 (16.58)	235.56 (17.19)	233.08 (13.11)	243.42
Feed fed per cwt of hogs produced	do.	476.98 (156.28)	441.53 (87.47)	423.21 (67.70)	408.97 (55.31)	402.19 (47.65)	392.62 (27.23)	425.70
Price:								
Price received per cwt of hogs sold	Dol.	41.86 (3.81)	42.75 (3.09)	43.20 (1.96)	43.23 (1.57)	43.70 (2.26)	44.13 (1.07)	43.08
Total returns per cwt of hogs produced	do.	39.95 (6.54)	40.63 (4.79)	40.96 (3.83)	41.46 (2.96)	41.68 (4.00)	42.86 (1.54)	41.11
Cost per cwt of commercial feeds fed	do.	17.56 (2.93)	16.86 (2.63)	16.35 (2.37)	15.75 (2.21)	15.39 (2.30)	14.08 (1.46)	16.18
Cost per cwt of concentrate feeds fed	do.	7.73 (1.30)	7.65 (.86)	7.45 (.67)	7.46 (.67)	7.38 (.64)	6.89 (.49)	7.48
Average payment per month per employee	do.	990 (375)	1,079 (499)	1,017 (489)	1,073 (339)	1,148 (381)	1,590 (419)	1,102

See footnotes at end of table.

Continued—

Appendix table 49—Selected measures of performance in farrow-to-finish hog production, Illinois farm recordkeepers, 1981[1]—continued

Measure of performance	Unit	Annual production (head)						
		100-199	200-499	500-999	1,000-1,999	2,000-4,999	5,000 and over	All sizes[2]
Economic:								
Feed cost per cwt of hogs produced	Dol.	30.71 (8.02)	32.32 (5.85)	30.73 (4.66)	29.87 (4.50)	28.94 (3.98)	27.53 (2.81)	30.41
Returns above feed cost per litter farrowed	do.	158.37 (190.25)	142.66 (145.80)	179.66 (101.32)	202.62 (92.52)	222.59 (91.74)	253.91 (89.17)	185.26
Returns above feed cost per cwt of hogs produced	do.	9.35 (9.59)	8.28 (6.74)	10.23 (5.31)	11.59 (4.84)	12.92 (4.73)	13.80 (6.10)	10.62
Returns per $100 feed fed	do.	136.81 (42.74)	128.83 (26.84)	136.28 (23.35)	141.59 (21.89)	147.15 (22.46)	161.96 (23.14)	139.29
Other:								
Cash interest paid per dollar of cash income	do.	.087 (.088)	.099 (.092)	.102 (.092)	.090 (.085)	.090 (.082)	.068 (.054)	.093
Percent of hog sales from market hogs	do.	88.4 (7.1)	88.0 (6.7)	88.9 (6.2)	90.1 (5.2)	91.0 (4.6)	91.6 (3.2)	89.4

— = Insufficient observations.

[1]See appendix table 48 for footnotes.

Appendix table 50—Selected measures of performance in farrow-to-finish hog production, Illinois farm recordkeepers, 1982[1]

Measure of performance	Unit	Annual production (head)						
		100-199	200-499	500-999	1,000-1,999	2,000-4,999	5,000 and over	All sizes[2]
Physical:								
Pounds of hogs produced per litter	Lbs.	1,721 (587)	1,721 (478)	1,749 (351)	1,747 (299)	1,739 (277)	1,612 (248)	1,726
Pigs farrowed per litter	No.	8.86 (1.54)	8.98 (1.26)	9.05 (1.19)	9.16 (1.11)	9.34 (.93)	9.38 (.76)	9.11
Pigs weaned per litter	do.	7.20 (1.30)	7.18 (1.18)	7.31 (1.07)	7.48 (.94)	7.67 (.76)	7.55 (.78)	7.39
Litters farrowed per female year	do.	1.55 (.36)	1.54 (.31)	1.60 (.33)	1.74 (.27)	1.83 (.30)	—	1.65
Pigs weaned per female year	do.	10.60 (3.66)	11.95 (3.35)	11.93 (3.25)	13.35 (2.71)	14.25 (2.77)	—	12.50
Death loss as a percent of production	Pct.	2.69 (2.08)	2.52 (2.28)	1.85 (1.52)	1.76 (1.08)	1.92 (1.22)	1.77 (1.29)	2.05
Weight per hog sold	Lbs.	256.08 (26.94)	251.81 (20.67)	246.97 (19.03)	241.79 (18.33)	237.40 (13.97)	231.13 (13.65)	244.81
Feed fed per cwt of hogs produced	do.	474.20 (113.57)	448.73 (95.69)	434.29 (76.53)	415.86 (59.53)	405.18 (52.25)	409.88 (44.10)	430.58
Price:								
Price received per cwt of hogs sold	Dol.	52.56 (4.48)	52.63 (3.95)	53.40 (2.30)	54.01 (2.14)	54.28 (1.93)	52.82 (5.94)	53.37
Total returns per cwt of hogs produced	do.	56.61 (7.59)	56.80 (5.33)	56.87 (4.36)	57.19 (4.17)	56.71 (4.11)	55.42 (11.44)	56.74
Cost per cwt of commercial feeds fed	do.	16.28 (2.62)	15.94 (2.73)	15.54 (2.38)	14.94 (2.19)	14.32 (2.40)	13.34 (1.77)	15.18
Cost per cwt of concentrate feeds fed	do.	6.65 (.82)	6.60 (.77)	6.56 (.72)	6.56 (.65)	6.37 (.52)	6.27 (.50)	6.52
Average payment per month per employee	do.	1,163 (698)	1,048 (409)	1,063 (467)	1,150 (432)	1,198 (346)	1,584 (507)	1,159

See footnotes at end of table.

Continued—

Appendix table 50—Selected measures of performance in farrow-to-finish hog production, Illinois farm recordkeepers, 1982[1]—continued

Measure of performance	Unit	Annual production (head) 100-199	200-499	500-999	1,000-1,999	2,000-4,999	5,000 and over	All sizes[2]
Economic:								
Feed cost per cwt of hogs produced	Dol.	29.74 (5.00)	28.91 (5.35)	27.94 (4.63)	26.91 (3.68)	25.50 (3.50)	25.34 (2.26)	27.49
Returns above feed cost per litter farrowed	do.	466.61 (206.01)	477.86 (157.82)	509.90 (148.15)	526.70 (120.87)	539.69 (101.56)	533.92 (100.11)	509.54
Returns above feed cost per cwt of hogs produced	do.	26.20 (8.74)	28.00 (6.48)	28.95 (5.58)	30.29 (5.07)	31.20 (4.70)	33.32 (5.22)	29.52
Returns per $100 feed fed	do.	197.47 (46.92)	203.34 (35.18)	208.74 (33.94)	216.51 (31.00)	225.71 (30.44)	231.87 (28.41)	212.90
Other:								
Cash interest paid per dollar of cash income	do.	.104 (.104)	.107 (.098)	.105 (.097)	.093 (.087)	.083 (.082)	.066 (.083)	.096
Percent of hog sales from market hogs	do.	85.2 (8.0)	87.7 (6.7)	89.2 (5.5)	90.2 (5.3)	91.1 (4.4)	91.0 (3.6)	89.2

— = Insufficient observations.

[1]See appendix table 48 for footnotes.

Appendix table 51—Selected measures of performance in farrow-to-finish hog production, Illinois farm recordkeepers, 1983[1]

Measure of performance	Unit	Annual production (head)						
		100-199	200-499	500-999	1,000-1,999	2,000-4,999	5,000 and over	All sizes[2]
Physical:								
Pounds of hogs produced per litter	Lbs.	1,705 (583)	1,756 (457)	1,773 (372)	1,803 (310)	1,773 (274)	1,681 (233)	1,761
Pigs farrowed per litter	No.	8.78 (1.41)	8.89 (1.36)	9.08 (1.11)	9.27 (1.02)	9.36 (.82)	9.24 (.54)	9.12
Pigs weaned per litter	do.	7.05 (1.21)	7.16 (1.22)	7.37 (1.08)	7.58 (.84)	7.64 (.80)	7.82 (.73)	7.44
Litters farrowed per female year	do.	1.51 (.45)	1.65 (.37)	1.64 (.31)	1.70 (.29)	1.80 (.34)	2.12 (.11)	1.72
Pigs weaned per female year	do.	11.85 (4.01)	12.20 (2.92)	12.58 (3.16)	13.30 (2.76)	14.28 (3.18)	16.56 (1.49)	13.26
Death loss as a percent of production	Pct.	2.58 (2.15)	2.67 (2.35)	2.04 (1.58)	1.75 (1.11)	1.87 (1.39)	1.54 (.82)	2.06
Weight per hog sold	Lbs.	254.18 (29.32)	252.49 (20.96)	246.25 (18.27)	242.22 (17.26)	238.35 (15.95)	231.07 (18.23)	244.43
Feed fed per cwt of hogs produced	do.	453.71 (87.36)	446.93 (93.70)	426.00 (72.62)	401.65 (51.34)	396.19 (45.03)	382.62 (25.05)	417.73
Price:								
Price received per cwt of hogs sold	Dol.	44.74 (4.75)	45.44 (3.90)	45.88 (2.61)	46.19 (2.21)	46.47 (2.25)	47.30 (2.74)	46.00
Total returns per cwt of hogs produced	do.	40.46 (6.05)	41.77 (6.00)	42.08 (5.14)	42.84 (3.74)	43.47 (3.77)	43.60 (3.97)	42.42
Cost per cwt of commercial feeds fed	do.	17.44 (2.63)	17.12 (2.52)	16.48 (2.42)	16.02 (2.37)	15.06 (2.29)	13.17 (1.67)	16.03
Cost per cwt of concentrate feeds fed	do.	7.83 (.98)	7.80 (.87)	7.83 (.73)	7.83 (.65)	7.51 (.58)	7.18 (.35)	7.82
Average payment per month per employee	do.	1,028 (366)	1,123 (460)	1,197 (574)	1,172 (463)	1,172 (359)	1,606 (875)	1,200

See footnotes at end of table.

Continued—

Appendix table 51—Selected measures of performance in farrow-to-finish hog production, Illinois farm recordkeepers, 1983[1]—continued

Measure of performance	Unit	Annual production (head)						
		100-199	200-499	500-999	1,000-1,999	2,000-4,999	5,000 and over	All sizes[2]
Economic:								
Feed cost per cwt of hogs produced	Dol.	34.07 (7.46)	33.21 (6.18)	31.76 (4.85)	30.12 (4.00)	29.43 (3.51)	27.51 (2.46)	31.07
Returns above feed cost per litter farrowed	do.	101.57 (199.97)	154.03 (161.89)	189.55 (129.97)	232.89 (107.32)	252.96 (111.41)	270.07 (94.62)	202.98
Returns above feed cost per cwt of hogs produced	do.	6.26 (8.25)	8.59 (8.61)	10.39 (6.36)	12.72 (5.31)	13.99 (4.78)	16.09 (5.08)	11.35
Returns per $100 feed fed	do.	121.41 (33.41)	129.58 (30.97)	135.75 (24.07)	144.63 (22.77)	152.55 (33.38)	160.00 (23.30)	140.41
Other:								
Cash interest paid per dollar of cash income	do.	.116 (.165)	.096 (.100)	.101 (.090)	.092 (.096)	.077 (.074)	.083 (.063)	.094
Percent of hog sales from market hogs	do.	85.3 (7.3)	88.6 (6.8)	90.0 (5.6)	91.3 (4.9)	90.7 (4.4)	91.3 (2.8)	89.9

[1]See appendix table 48 for footnotes.

Appendix table 52—Selected measures of performance in farrow-to-finish hog production, Illinois farm recordkeepers, average for 1980-83[1]

Measure of performance	Unit	Annual production (head)						
		100-199	200-499	500-999	1,000-1,999	2,000-4,999	5,000 and over	All sizes[2]
Physical:								
Pounds of hogs produced per litter	Lbs.	1,717	1,725	1,753	1,751	1,736	1,648	1,731
Pigs farrowed per litter	No.	8.72	8.88	9.05	9.22	9.32	9.21	9.06
Pigs weaned per litter	do.	7.03	7.08	7.31	7.51	7.60	7.62	7.34
Litters farrowed per female year	do.	1.54	1.61	1.64	1.69	1.82	2.00	1.69
Pigs weaned per female year	do.	10.86	11.96	12.37	13.02	14.29	15.42	12.77
Death loss as a percent of production	Pct.	2.50	2.45	1.91	1.79	1.86	1.74	2.04
Weight per hog sold	Lbs.	253.62	250.18	244.97	240.97	236.64	231.56	243.93
Feed fed per cwt of hogs produced	do.	464.31	448.01	429.21	410.03	401.38	393.05	426.21
Price:								
Price received per cwt of hogs sold	Dol.	43.54	44.49	45.25	45.29	45.85	46.71	45.10
Total returns per cwt of hogs produced	do.	43.37	44.25	44.96	44.86	45.21	45.54	44.69
Cost per cwt of commercial feeds fed	do.	16.89	16.32	15.94	15.43	14.72	13.33	15.63
Cost per cwt of concentrate feeds fed	do.	7.33	7.25	7.16	7.19	7.06	6.82	7.16
Average payments per month per employee	do.	1,015	1,064	1,070	1,111	1,163	1,570	1,126
Economic:								
Feed cost per cwt of hogs produced	Dol.	31.34	31.21	30.04	28.90	27.90	26.82	29.63
Returns above feed cost per litter farrowed	do.	208.06	225.16	264.88	279.96	302.74	320.75	263.07
Returns above feed cost per cwt of hogs produced	do.	11.97	13.18	14.95	15.96	17.31	18.80	15.10
Returns per $100 feed fed	do.	145.26	148.10	154.67	159.27	166.96	175.89	156.66
Other:								
Cash interest paid per dollar of cash income	do.	.096	.094	.098	.089	.079	.073	.090
Percent of hog sales from market hogs	do.	86.8	88.2	89.4	90.6	90.7	91.3	89.4

[1]See appendix table 48 for footnotes.

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Appendix table 53—Results of regression analyses for selected dependent variables regressed on weight of hogs produced per farm, Illinois farm recordkeepers, 1980-83[1]

Measure of performance	Unit	Sample mean	Regression intercept (1980)	Value of significant intercept shifters (.01)			Regression slope coefficient[2]
				1981	1982	1983	
Physical:							
Hogs produced per litter	Lbs.	1,740.55	1,747.63	-37.95	—	—	-1.18[2]
Pigs farrowed per litter	No.	9.06	8.86	--	--	.12	05
Pigs weaned per litter	do.	7.33	7.10	—	.10	.14	.06
Litters farrowed per female year	do.	1.67	1.57	.06	--	—	.03
Pigs weaned per female year	do.	12.67	11.56	—	—	.64	31
Death loss as a percent of production	Pct	2.03	2.23	—	—	—	-.07
Weight per hog sold	Lbs.	244.45	247.27	—	3.05	2.95	-1.74
Feed fed per cwt of hogs produced	do	426.70	445.50	—	—	-9.66	-5.90
Price.							
Price received per cwt of hogs sold	Dol.	45.05	38.60	4.12	14.44	6.93	.14
Total returns per cwt of hogs produced	do.	44.68	39.31	1.39	17.22	2.67	.13
Cost per cwt of commercial feeds fed	do.	15.78	15.90	99	—	1.07	-.25
Cost per cwt of concentrate feeds fed	do.	7.18	7.12	.48	-.48	.63	-.04
Average payments per month per employee	do.	1,096.56	973.82	—	78.00	126.96	25.44
Economic:							
Feed cost per cwt of hogs produced	Dol.	29.79	30.55	1.20	1.74	1.99	-0.44
Returns above feed costs per litter farrowed	do.	260.94	153.40	—	328.15	19.26	9.72
Returns above feed costs per cwt of hogs produced	do.	14.93	8.91	—	18.92	.63	.54
Returns per $100 feed fed	do.	155.44	132.43	—	72.10	--	2.56
Other:							
Cash interest paid per dollar of cash income	do.	.092	.087	.014	.018	.015	-.002
Percent of hog sales from market hogs	Pct.	89.5	88.7	—	--	—	003

-- = Not significant.

[1]Includes only farms with farrow-to-finish hog enterprises and annual hog production of 23,500 pounds of hogs or more.
[2]Slope represents units of change in the dependent variable for each 1000-hundredweight increase in hog production. Slope coefficients are significant at the .01 level for all except the first dependent variable which is not significantly related to size of enterprise. All R^2s are below 0.1.

Source: Data summarized by authors from records kept by the Department of Agricultural Economics, U. of Ill., in cooperation with the Illinois Farm Business Farm Management Association, Urbana, Ill.

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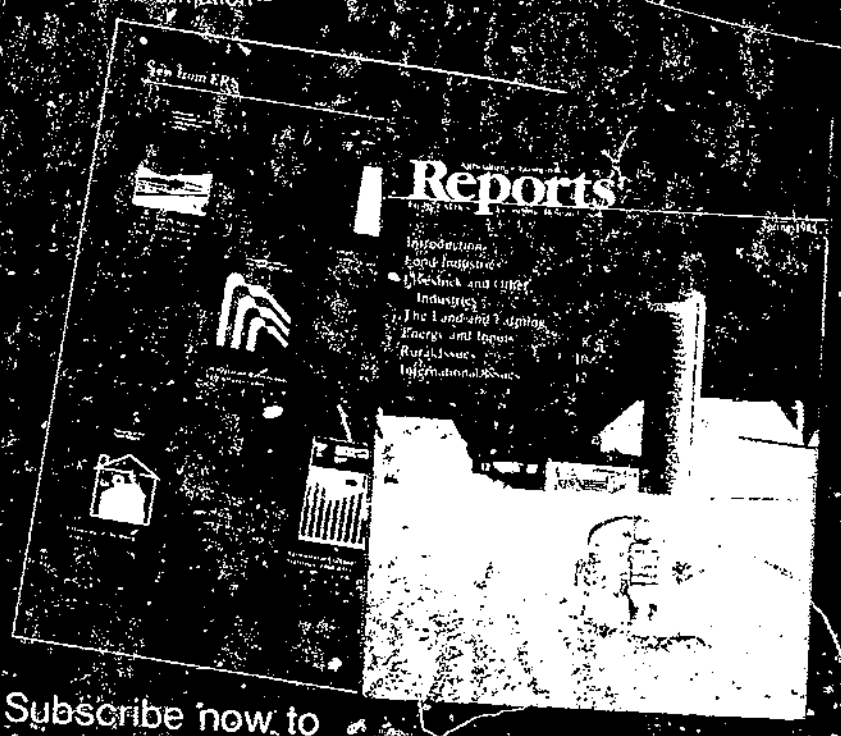

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