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CODEN: IWSRBC(83) 1-20(1979)
US ISSN:0097-5125

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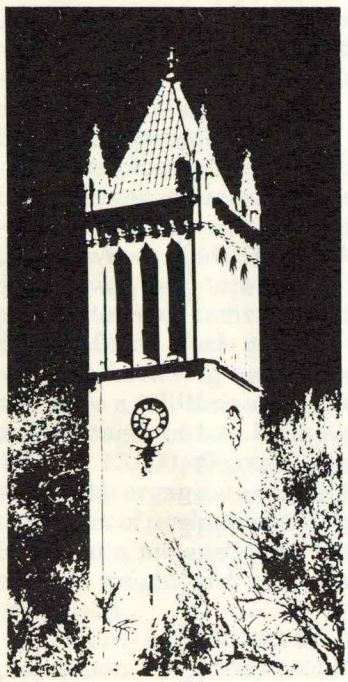

Development of Subsidiary Sow-Farrowing Firms in Iowa

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Special Report 83

Agriculture and Home Economics Experiment Station
Iowa State University of Science and Technology
Ames, Iowa ..... May 1979

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by Arnold Paulsen and Michael Rahm[2]

The pork industry has been modified by a series of innovations in production technologies and now may be modified by changes in the organizational form of ownership. Changes in *technology* have resulted in a movement of pork production from an uncontrolled to a controlled environment. Confinement structures are rapidly being adopted to house much of Iowa's livestock, especially hogs.

Not as physically obvious but perhaps also important is a new *organizational* form in pork production —the subsidiary sow-farrowing firm that is collectively owned. Since 1970, several hundred independent Iowa farm operators, agribusinessmen, and other interested individuals have formed more than 80 new firms. Each group of 2 to 22 members constructs a farrowing center, purchases breeding stock, and hires a full-time specialist to operate the facility and manage the sow herd. Each firm produces from 4,000 to 15,000 40-pound pigs. The pigs usually are sold to the organization shareholders at a price equal to the cost of production and finished on shareholders' farms. In a few instances, the feeder pigs are fed to butcher weight and marketed by the collective organization.

The firm is analogous to a factory with specialized production processes and corporate form of ownership. Large numbers and confinement technology enable the manager to establish routine production procedures similar to modern manufacturing processes. Ownership is vested in individuals different from those who do the management and labor. Owners provide capital, make policy, and invest in facilities, breeding stock, and equipment but make no day-to-day decisions. They take risk, accept profit or loss, and hire the manager, who, in turn, hires the required labor. Labor and management receive a guaranteed income while the owners accept any variation in prices, efficiency, and profit. Because owners usually are area farmers who purchase the feeder pigs to finish on their own farm, the factory is a subsidiary of several independent finishing firms. In this report, such a "pig manufacturing" unit will be called a subsidiary sow-farrowing firm.

This report analyzes only large, confinement sow-farrowing units that are collectively owned. To be included in this study the subsidiary sow-farrowing firm 1) had to be collectively owned by a group of two or more unrelated individuals, 2) had to consist of a centralized farrowing facility with a capacity of at least 350 sows, and 3) had to be operated by a full-time manager.

A regular corporation, a subchapter S corporation, or a cooperative all qualified as a legal form of "collectively owned entity." Association or cooperative marketing is common in U. S. agriculture, but a collectively owned production unit such as the subsidiary sow-farrowing firm is relatively rare.

This study does not treat family corporations with pork operations even if such firms overall were large, confinement sow-farowing facilities and had legally organized as a corporation. To be included in the sample, at least one member of the sow-farrowing firm had to be unrelated to other members of the firm. This criterion excluded several large, family-farm pork operations. The typical family operation is actually multiproduct in nature, and the separation between ownership, management, and labor is seldom distinct even though one family member may specialize in hog production.

The minimum capacity to qualify as a "centralized" farrowing facility in this study was set at 350 sows. This is approximately the minimum-scale requirement to justify a full-time manager. Finally, the full-time manager had to be directly responsible for the operation of the facility and have no other occupation.

With these criteria, 88 collectively owned sow-farrowing firms were identified in Iowa in early 1977. The list of qualified firms was accumulated by contacting area livestock extension specialists and county extension directors in Iowa. A survey was conducted in 1977 with two questionnaires, one for the board chairman and one for the manager. These were mailed to the board chairmen of all firms identified in Iowa. After two mail contacts, only 27 (31%) firms had completed questionnaires and returned them by mail. The remaining 61 board chairmen and managers who did not respond by mail were then contacted personally by interviewers. When the questionnaires were taken to the board chairmen and managers by Iowa State University interviewers, 38 of the 61 firms that did not respond by mail completed the interviews, but 23 of the 88 firms still refused to participate. Thus, of the 88 specialized sow-farrowing firms collectively owned in Iowa in the summer of 1977, 65 (73%) participated in the survey.

It seems to the authors by follow-up from secondary sources such as extension specialists and other board chairmen that the nonrespondents were randomly distributed among size, geographical location, and efficiency classes. It seems probable that this

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summary of a 73% sample represents the population in an unbiased manner on most characteristics.

The objective of this report is to describe the organizational, production, and managerial characteristics of the Iowa firms. The subsidiary sow-farrowing firm is a relatively recent development. Some characteristics important in explaining success, such as the manager's incentive plan, features of building design, and summer sow conception rates, were not evident to us until after the survey was taken. We believe the information reported about subsidiary sow-farrowing firms in Iowa will be helpful to those interested in this form of organization. We know that data with respect to several production variables are limited.

ORGANIZATIONAL CHARACTERISTICS

Date of organization and legal structure

The first sow-farrowing firm was organized and began production in 1970, but about 90% of the current firms were not organized until 1973 or after and did not begin production until after 1974. Thus, the sow-farrowing firm has become a significant component of Iowa pork production only in the last 4 years, from 1974 through 1977. The firm was organized typically about 1 year before the date the first feeder-pig was produced. The date of organization was specified either as the month and year when articles of incorporation were formed or as the month and year when equity capital was collected from the members and a loan was secured in the name of the organization. The date of first production was the month and year when the first pigs were born.

The average lag between the date of organization and the date of first production was 11 months. The length of this lag was as long as 2 years and as short as 6 months. Evidently, some boards were very decisive and quickly completed the construction, equipped the facility, and purchased bred sows timed to farrow shortly after completion of construction. Others took much more time to get into production. The number of firms organized each year and the number of firms beginning production each year are presented in Table 1.

Table 1. The Distribution of Firms by Year of Organization and Year of Initial Production.

Year	Number of firms organized	Number of firms that began production
1970	1	1
1971	1	0
1972	3	1
1973	19	5
1974	18	18
1975	7	17
1976	15	7
1977	1	16
TOTAL	65	65

Of the 65 firms surveyed, 54 (83%) were organized as subchapter S corporations. Nine firms were organized as regular corporations. The basic requirements for a subchapter S corporation, which can elect to be taxed as a partnership, are: 1) the corporation must have 10 or fewer shareholders; 2) all shareholders must be individuals, estates, grantor trusts, or voting trust; 3) no nonresident alien may be a shareholder; 4) the corporation may issue only one class of stock; and 5) no more than 20% of gross receipts may be from certain passive types of income such as renting land. The legal structure of the 65 Iowa firms responding to the survey is presented in Table 2.

Table 2. The Distribution of Firms by Legal Structure

Legal structure	Number of firms
Regular corporation	9
Subchapter S corporation	54
Cooperative	1
Partnership	1
TOTAL	65

Incentives for organization

These collective organizations didn't just happen, they usually were created by an easily identifiable individual. The individual who created the interest and recruited potential members remained an important individual in the firm and usually was the first board chairman. In most sow-farrowing firms, one person was readily recognized by all members as responsible for organizing the firm. Feed salesmen and farmers were primarily responsible for the organization of the firms in Iowa. Of the 65 firms surveyed, 20 were organized by a feed salesman, 18 were organized by a farmer or a group of farmers, and 18 were organized by a combination of all possible sources listed. Only one firm listed a breeding stock dealer or an equipment supplier as the organizer. The distribution of firms by source responsible for organization is presented in Table 3.

Collective swine production is not traditional in Iowa. Therefore we expect that strong incentives must have motivated individuals to form sow-farrowing firms. Each board chairman was asked to list and rank the three most important incentives among the members of his corporation for joining the group at the time of organization. Other incentives present among the members, but not ranked in the top three, also were requested. The most important incentives varied among individual members and among firms; hence, to aggregate important incentives across firms and find the most important for the creation of these firms in Iowa we had to weight each incentive by its rank of importance in the firm. Four points were given each reason ranked one, three

Table 3. The Distribution of Firms by Occupation of Individual Responsible for Organization

Occupation of organizer	Number of firms
Farmer	18
Breeding stock dealer	1
Equipment supplier	1
Feed salesman	20
Veterinarian	2
Banker	2
Agribusinessman (excluding feed salesmen)	3
Some combination of the above	18
TOTAL	65

points if ranked two, two points for three, and one point for a reason checked as important but not ranked. Table 4 summarizes the results from this ranking and weighting scheme.

The most important incentive for organization was to provide shareholders with "a reliable source of quality feeder pigs at a price equal to the cost of production." Three subincentives actually were involved in this dominant motivation for members to form a sow-farrowing firm—reliability, quality, and cost. This incentive was ranked first by 40 of the 65 firms.

The second most important incentive for organizing the firm was to save the time spent with the intensive activity of farrowing pigs. Many of the members evidently thought they had a higher-valued use for this labor in grain production or more capital intensive livestock activities. Some just may have wanted to work fewer total hours.

The third most important incentive was related to specialization. Not only did members want to eliminate from their own schedule the sensitive job of farrowing, but they also wanted to place the task in the hands of a person who had proper training and interest and who could devote all his time and attention to farrowing sows.

Table 4. The number of Firms Ranking or Checking Each Incentive for Organization

Incentive for organization	Rank 1 (4 points)	2 (3 points)	3 (2 points)	Checked (1)	Total[a]
1. Reliable source of quality pigs at cost of production	40	11	3	4	203
2. Released labor from farrowing activities	7	28	11	6	140
3. Farrowing is done by a full-time specialist	8	14	24	5	127
4. Means to accumulate required capital	3	1	9	12	45
5. Provided an attractive tax shelter	1	3	3	15	34
6. Transferrable shares provided ownership flexibility	0	2	4	9	23
7. Agricultural investment for nonagricultural interests	1	0	1	3	9
8. Other	2	2	0	2	16

[a] The total for each incentive is the points for each rank multiplied by the number of firms assigning that rank.

Although 25 board chairmen acknowledged that the collective ownership of the sow-farrowing firm made it easier to accumulate the required amount of equity capital and borrowing potential, this was seldom ranked first. By the weighting scheme, the incentive to accumulate capital was less than about one-third as important as each of the first three reasons. Board chairmen also acknowledged that the firm provided an attractive tax shelter, but it evidently was a relatively unimportant incentive for organization. Nevertheless, many board chairmen thought that this may have been an important incentive for one or two members of the organization. Several other factors were mentioned by one or two firms, but played relatively minor roles in the development of the sow-farrowing firm movement in Iowa.

The number of members in each firm ranged from 2 to 22, with a mean of 8.6 members per firm. Of the 65 firms surveyed, 41 (63%) have from 8 to 10 members. Since subchapter S classification restricts the number of members to 10 or fewer, the distribution of firms is not balanced about the average of 8.6 members per firm. A distribution of firms by ranges of the number of members is presented in Table 5.

Table 5. The Distribution of the Firms by Number of Members per Firm.

Number of members per firm	Number of firms
Less than 5	4
5-7	16
8-10	41
Greater than 10	4

Occupational characteristics of members

There were 562 members in the 65 firms surveyed. As expected, farmers constituted 86% and nonfarmers 14% of all owners of sow-farrowing firms. Of the 562 total members, 483 (86%) were farmers. Feed salesmen were second most numerous with 36 (or 6%) of the 562 total members. Feed salesmen were relatively prominent in organizing sow-farrowing firms, but usually only one feed salesman was in each firm. A listing of members by occupation is presented in Table 6.

The corporate form of organization provides a facility for entry and exit of individual members without liquidation of the operation. Also a corporation affords a relatively easy method of changing the total number of owners. There were 562 current members in the 65 firms surveyed, but board chairmen revealed that these firms originally had 582 members. Of the sow-farrowing firms' original members, 552 (95%) still were members of the firms. Thus, 30 members have left sow-farrowing firms, and 10 new individuals have joined firms after the organization

Table 6. The Distribution of Members by Occupation

Occupation	Number of members	Percent of total
Farmers	483	86
Feed salesmen	36	6.4
Agribusiness (excluding feed salesmen)	12	2.1
Veterinarians	8	1.4
Medical doctors	4	0.7
Bankers	3	0.5
Building contractors	3	0.5
Lawyers	2	0.4
Other	11	2.0
TOTAL	562	100.0

was established. From this preliminary information, it seems that the sow-farrowing firms have ownership stability, but with somewhat more tendency to reduce the total number of members than to add or replace members. Most firms, however, have been established less than 4 total years, and thus relatively few membership changes due to retirement or change of occupation would be expected.

PRODUCTION AND MARKETING CHARACTERISTICS

Firm size

The size of firms surveyed, measured in terms of sow capacity of the facility, ranged from 350 to 1000, with an average capacity of 544. Of the 65 firms surveyed, 41 had capacities between 350 and 500. It seems that capacities of around 400, 500, and 700 are typical. The number of firms by capacity class is presented in Table 7. The number of firms by capacity of building and by year of organization is presented in Table 8.

Capital investment

Total capital investment per sow-farrowing firm ranged widely from $187,000 to $1,010,000 with an average total investment of $487,000. Average investment per firm contains five components. The largest investment item of $291,000, or 60% of total, is for building and equipment. Land at $23,000 is a minor input, 5% of total investment. Average investment per firm and percentage of total in buildings and equipment; breeding stock; operating capital; land; land leveling, lagoon, and well drilling are presented in Table 9.

Several components of capital investment per sow-farrowing firm—buildings, equipment, and breeding stock—have increased in cost substantially from 1973 to 1976. Capital investment also is nearly proportional with the capacity of the firm. Thus, the capital investment is analyzed for firms by year of organization and by capacity intervals to provide a more detailed description of capital outlays.

Table 7. The Distribution of Firms by Rated Capacity of Building

Sow Capacity	Number of firms
350-450	23
451-550	18
551-650	5
651-750	14
≥ 751	5
TOTAL	65

Table 8. The Distribution of Firms by Year of Organization and by Capacity.

Year	Sows 350-450	451-550	551-650	651-750	≥ 751	Yearly totals
1973	10	2	2	4	1	19
1974	7	4	1	4	2	18
1975	3	2	0	1	1	7
1976	2	9	0	3	1	15
Capacity totals	22	17	3	12	5	59

Table 9. The Average Capital Investment of All Sow-Farrowing Firms in Iowa.

Item	Average investment	Percent of total
Building and equipment	$291,000	60
Breeding stock	88,000	18
Operating capital	70,000	14
Land	23,000	5
Land leveling, lagoon and well	15,000	3
TOTAL	$487,000	100

Because only five firms were organized before 1973 and only one reported organizing in 1977, only the years 1973 through 1976 are considered in the investment analysis by year of organization. The average *amount* invested in a sow-farrowing firm has increased 49% (from $419,000 to $625,000) since 1973. The amount invested in facilities has increased 60%, and the amount invested in breeding stock has increased 21% since 1973. These changes, however, do not accurately reflect the year-to-year changes in prices of facilities and breeding stock. To more accurately identify the source of cost increases, the average investment per firm must be adjusted for the capacity of the facility. Yearly increases in the capital investment *per unit of sow capacity* give the most accurate estimates of changes in per-unit prices of construction and breeding stock. Average total investment by year of organization is presented in Table 10, and average investment per sow by year of organization is presented in Table 11.

Table 10. Original Capital Investment per Firm by Year of Organization.

Year	Firms	Avg. Total	Bldgs. & Equip.	Breeding Stock	Other
Unit	No.	$	$	$	$
1973	17	419,000	248,000	81,000	90,000
1974	16	472,000	295,000	97,000	80,000
1975	5	527,000	303,000	86,000	138,000
1976	15	625,000	397,000	98,000	130,000
Increase 1973 to 1976		49%	60%	44%	

Table 11. Original Capital Investment Per-Sow by Year of Organization of the Firm.

Year	Firms	Avg. Total	Bldgs. & Equip.	Breeding Stock	Other
	No.	$	$	$	$
1973	17	795	471	158	166
1974	16	855	533	175	147
1975	5	1094	628	181	285
1976	15	1176	741	186	249
Increase 1973 to 1976		48%	57%	50%	

Total original investment made to begin a sow-farrowing firm increased about 50% from 1973 to 1976. Average investment per firm increased from $419,000 to $625,000, and average investment per sow increased from $795 to $1176 from 1973 to 1976. All items of cost increased, but cost for buildings and equipment increased 57% per sow while breeding stock costs increased only 18% per sow. These estimates reflect only average increases in building and breeding stock costs as experienced by members organizing sow-farrowing firms and do not correct for any improvements in quality of facilities or quality of breeding stock over time. The 15 firms organized in 1976 averaged 531 sows in capacity, only slightly larger than the average capacity of 527 for the 17 firms organized in 1973.

Capital investment per firm also varied by capacity intervals. Total investment, investment in buildings and equipment, and investment in breeding stock per firm for five capacity classes are presented in Table 12. The average investment per sow for firms by capacity classes is presented in Table 13. To increase comparability, investment costs for firms organized in 1973, 1975, or 1976 were adjusted to 1974 prices. The adjustment factor was average per-sow cost in 1974 divided by cost in year organized.

Table 12. Capital Investment per Firm by Capacity Class (Costs Adjusted to 1974 Prices).

Capacity	Firms	Total	Bldgs. & equip.	Breeding stock
350-450	21	382,000	230,000	73,000
451-550	16	457,000	273,000	94,000
551-650	5	598,000	344,000	86,000
651-750	14	537,000	331,000	92,000
≥ 751	3	658,000	431,000	139,000
All	59	487,000	291,000	88,000

Table 13. Capital Investment Per Sow by Capacity Class (Costs Adjusted to 1974 Prices).

Capacity	No. of firms	Total invest.	Bldgs. & equip.	Breeding stock	Other
350-450	21	894	537	173	184
451-550	16	990	598	199	193
551-650	5	919	522	135	262
651-750	14	784	484	134	166
≥ 751	3	753	494	155	104

The smaller average investment per sow for the larger capacity classes indicates some economies of scale. Facilities for about 700 sows seem to be more efficient than smaller-sized facilities. Total investment, buildings and equipment, breeding stock, and "other" investment all decreased with increases in capacity from about 500 to 700 sows. Perhaps some items like manager's house, office, and well are not increased proportionately with size. Large and small facilities may differ with respect to confinement technology. If technology changes with size, decrease in the investment per sow as size of firm increases may be the result of both change in technology and economies of scale. Relatively large facilities not only may have lower per-sow investments in buildings and equipment, but also may have more or less facilities per sow built into the design (e.g., stalls automation, mechanization, and environmental control). Detailed observations on building design were not made.

The amount invested in breeding stock also seems to decrease with size. This is not very logical. We would expect breeding stock to vary more by years and also according to quality and original weight of gilts purchased than by capacity. Generally, mature or pregnant gilts mean more investment in breeding stock, but less time and operating cost before the first pigs are sold. It is probable that the seeming economies of scale in breeding stock are due to other factors.

Labor inputs

The board chairmen estimated the number of weeks worked and the number of hours per week worked for each employee of the firm. The total amount of labor used in the firm was measured in man-hours per year. Total man-hours per firm was calculated by multiplying the number of weeks worked by each employee by the average number of hours worked per week and summing the hours for all employees. The estimate of man-hours per sow-farrowing firm ranged from 2932 to 16,640, with an average of 7280 man-hours per year per firm. The number of firms by estimated man-hours per firm is presented in Table 14.

Table 14. The Distribution of Firms by the Number of Man-Hours Employed in 1976.

Number of man-hours per year	Number of firms
2000 - 4000	2
4001 - 6000	12
6001 - 8000	24
8001 - 10,000	8
10,001 - 12,000	6
more than 12,000	1

Obviously one would expect the small firms to have fewer man-hours employed per firm. But will man-hours vary directly and closely with capacity? The number of man-hours employed per sow indicates considerable variation in labor efficiency or work requirements per sow among the firms. For those firms in full production during 1976, the number of man-hours employed per sow ranged from 6.52 to 27.18, with the average labor use among the 38 firms estimated at 14.28 man-hours per sow per year. The distribution of firms by number of man-hours per sow annually is presented in Table 15.

Another indicator of labor or employees required by sow-farrowing firms is the number of sows per full-time employee. Several specialists use a "rule of thumb" of 200 sows for each full-time employee. If so, and using the average labor efficiency in the survey, each full-time equivalent employee must work 2856 hours (55 hours per week). To devote 14.28 hours per year to each of 200 sows requires 2856 hours of work per year. This rule of thumb conforms closely to the staffing practices of the firms reporting results from the survey. There is some variation in labor efficiency among facilities, but many sow-farrowing firm employees are working more than 40 hours per week.

The average sow-farrowing firm in 1976 maintained a 534-sow herd, weaned an average of 8.34 pigs per litter, and produced about 8000 feeder pigs at a cost of $27.55 per pig, not including a charge for interest and debt retirement. In 1976, 1.82 litters and 15.18 pigs were produced per sow annually. The average price charged members was $35.70 per pig. A positive difference between price charged to members and production cost per pig was needed to provide for debt retirement.

Table 15. The Distribution of Firms by Number of Man-Hours per Sow per Year Analyzed in 1976.

Man hours per sow	Number of firms
≤ 10	4
10 - 13	13
13 - 16	11
16 - 19	6
19 - 22	0
over 22	4
TOTAL	38

Reproduction efficiency

Production statistics collected include the average number of sows in the herd, the average weaned litter size, the total number of pigs produced, the cost of production per pig, and the price charged members for 40-pound pigs. These data were collected for each full year each firm had been in production. Debt repayment schedules were of great interest to members but differed widely. The variable cost of production, cost per pig, should not, in principle, include either debt retirement or interest charges. Some firms included high principle and interest payments as parts of costs used to determine charges per pig. The cost of production listed here is less than total. The number of pigs produced per sow per year was supposed to be variable costs only and calculated by dividing the total number of pigs produced by the average number of sows in the herd. The number of pigs produced per sow annually is the most comprehensive measure of reproduction efficiency. The number of litters produced per sow annually was calculated by dividing the number of pigs produced per sow by weaned litter size. Average values for all the firms and the minimum and maximum value for each statistic for the 1976 production year are presented in Table 16. Of the 65 firms surveyed, only 47 had completed at least one full year of production; i.e., had been in production during 1976. Some firms in production in 1976 did not report or have in an available form data on all production variables requested.

Table 16. 1976 Production Statistics.

Statistic	No. of firms	1976 average	Minimum value	Maximum value
Number of sows in herd	43	534	300	950
Weaned litter size	41	8.34	6.0	10.0
Number of pigs produced	39	8089	4800	15375
Per pig cost of production	38	$27.55	$16.00	$37.30
Price to members	38	$35.70	$27.00	$45.00
Litters per sow per year	38	1.82	1.40	2.30
Pigs per sow per year	39	15.18	11.52	21.60

Biological reproductive capacity increases as young gilts mature. Also, management probably learns from experience. The production efficiency statistics can be presented by first and second year of production. See Tables 17 and 18. It is possible to observe progress on average in technical and economic performance of sow-farrowing firms from the first to the second year. Of the 65 firms surveyed, 47 had completed at least one full year of production, and 38 had completed at least two full years of production. Only 15 firms had completed three full years of production. All "first" sequential production years do not of course correspond to the same calendar year for all firms. Therefore some factors influencing performance, such as disease conditions and cost of feed inputs associated with a particular calendar year, contribute to the variation among firms in the first or second year of performance. Even though

Table 17. Production Statistics for Firms' First Production Year.

Statistic	No. of firms	Average for first production year	Minimum value	Maximum value
Number of sows in herd	40	520	330	1000
Weaned litter size	38	8.07	5.0	9.9
Number of pigs produced	36	7352	3375	16500
Per pig cost of production	35	$27.95	$16.00	$53.00
Price to members	37	$36.69	$16.20	$50.00
Litters per sow per year	36	1.76	1.01	2.27
Pigs per sow per year	36	14.18	8.03	20.46

there is wide variation, improvements in all average production statistics are uniformly indicated from the first to the second production year.

On average, both technical and economic performance improved from the first to second production year. The average weaned litter size increased from 8.07 to 8.21, the number of litters produced per sow annually increased from 1.76 to 1.87, the number of pigs produced per sow annually increased from 14.18 to 15.31, and the per-pig cost of production decreased from $27.95 to $26.78 from the first to second production year. The most critical and comprehensive measure of technical performance is "pigs produced per sow annually." In this case the minimum, maximum, and average all increased from the first to the second year. Economic performance is best indicated by the cost of production per pig. This not only decreased on average, but also the maximum decreased. These two years of production statistics even with wide variation among firms within each year give some evidence that mature sow herds and older sow-farrowing firms perform better. The new firm may follow a "learning curve," at least the average data do suggest that the group of firms improved the second year. Further gains in average technical and economic efficiency may result in the third and fourth years as herds become better established and owners and managers become more proficient as a result of experience and learning. We would expect the gains to diminish in the third and fourth years and to be lost in wide individual or random variation.

Pricing of feeder pigs

Firms priced feeder pigs to members by one of two basic pricing processes. The price charged members was either set by the board on the basis of production costs and required debt retirement or determined on the basis of current market prices of feeder or butcher hogs. Of the 65 firms surveyed, 40 firms set the price charged to members in advance, 14 determined the price on the basis of current market prices, and 11 did not need to price feeder pigs to members. In 20 of the 65 firms surveyed, the base price charged members for 40-pound feeder pigs was set in advance by judgment by the board. The price was set rather arbitrarily by members at a level that they thought

Table 18. Production Statistics for Firms' Second Production Year.

Statistic	No. of firms	Average for second production year	Minimum value	Maximum value
Number of sows in herd	33	537	330	950
Weaned litter size	31	8.21	4.5	10.0
Number of pigs produced	29	8023	3500	15,375
Per pig cost of production	28	$26.78	$16.00	$40.00
Price to members	29	$40.99	$23.40	$45.00
Litters per sow per year	28	1.87	1.49	2.30
Pigs per sow per year	28	15.31	10.00	22.42

was high enough to cover costs and debt service. If reproduction was efficient and costs were low, extra debt was repaid. Recalculations were not necessary each production cycle. It seemed preferable to the board members to charge the pigs out to members at or above expected total cost of production. In 20 firms, the price of pigs was set by the board as low as possible—just enough to cover production costs and debt repayment. Recalculations were made for each production cycle.

In 14 of the firms, pigs were priced according to the market—i.e., by a formula based on the Iowa Department of Agriculture "pink sheet" of feeder pig prices or by a formula based on a specified local butcher hog market. Four firms sold most of their feeder pigs on a public market to nonmembers and did not need to price pigs to members. Seven firms finish feeder pigs and market them as butcher hogs and, thus, did not need to price feeder pigs. A distribution of firms by pricing schemes used is presented in Table 19.

Although the sow-farrowing firms are relatively young, the pricing scheme originally employed by most firms has remained unchanged. Only three firms changed the way in which feeder pigs were priced to members. It seems the scheme for pricing feeder pigs may have been an important element of the original agreement among members to cooperate with each other in the production of feeder pigs.

Table 19. The Distribution of Firms by Feeder Pig Pricing Schemes.

Pricing scheme	Number of firms using the pricing scheme	
Price set by board		40
Price set by board explicitly at cost of production plus debt repayment	20	
Price set by board, basis not specified	20	
Price based on market price		14
Price based on market price of feeder pigs	10	
Price based on market price of butcher hogs	4	
Feeder pigs sold directly by firm on open market		4
Feeder pigs are not priced but finished by firm and marketed as butcher hogs		7

MANAGEMENT OF THE FIRM

Characteristics of the board-manager relationship

Management and ownership are vested in different individuals. Thus the sow-farrowing firm requires an interpersonal board-manager relationship. The nature and quality of the manager-board relationship varies among firms in Iowa. Ownership and management are not distinct in typical farm firms or even in closely held farm corporations. Hence, there may have been little experience among the members of sow-farrowing firms in corporate-style relations between the board and the hired manager.

The definite separation between ownership and management in Iowa sow-farrowing firms is indicated by the fact that, of the 65 firms surveyed, 57 (87.7%) employed a manager who was not also a part owner of the firm he operated. Thus the manager is generally excluded from sharing as an owner in capital returns and appreciation. Nearly all members are farmers and agribusinessmen and very familiar with swine production. Thus most owners probably feel qualified to share in management and provide considerable day-to-day advice to the manager. In the typical case of industrial corporate board-manager relations, the board members would be unqualified and uninterested in affirming day-to-day management advice.

From a series of questions answered by both members and managers, it was determined that the relationship between members and manager varied from highly centralized (board controlled most management questions) to highly decentralized (manager controlled most features of the day-to-day management).

Board chairmen and managers each were asked who had responsibility for deciding and executing each of nine specific tasks. The board chairmen's perceptions of the division of responsibility are presented in Table 20. The managers' perceptions of the division of the same responsibilities are presented in Table 21. According to the majority of board chairmen, managers were largely responsible for 5 of the 9 operations; namely, culling sows, ordering feed, selecting boars, hiring labor, and keeping production records. Most board chairmen believed that the board had retained responsibility for 4 of the 9 activities; namely, purchasing major equipment, deciding sources of feed, pricing feeder pigs, and keeping the firm's financial records. The most frequently shared responsibility was for purchasing major equipment, with 29% of the board chairmen reporting that this activity was a shared responsibility. In a few firms, outside specialists had specific responsibilities, such as breeding stock companies for selecting boars or professional accountants to keep the firm's financial records.

In general, managers felt that they were responsible for executing more activities than board chairmen felt managers were responsible for executing. Clear division of responsibility and consistent understanding of shared responsibility is required for good board-manager relations. The potential exists for misunderstanding in Iowa sow-farrowing firms. The amount of authority and responsibility that the board evidently wanted to delegate and thought that it had delegated was less than the amount of delegation of authority perceived and accepted by the manager. Managers as a group seemingly were willing to accept more responsibility than members were willing to give them.

Part of the seeming discrepancy may be due to different conceptions or interpretations of the definition of an activity. For example, since no minimum dollar requirement was specified to constitute an equipment purchase it was not explicit what differentiated a minor equipment purchase from a major purchase. Ordering feed was intended to mean requesting feed delivery, but it may have been confused by board chairmen and managers with formulation of rations

Table 20. Board Chairmen's Perceptions of the Division of Responsibility.

The number and percentage of firms for which the board chairman reported the responsibility for executing selected activities was assigned to the manager or board.

Activity	Person responsible for activity							
	Manager		Board		Responsibility shared		Other	
	No.	%	No.	%	No.	%	No.	%
Culling sows	58	(89.2)	1	(1.5)	6	(9.2)	0	(0)
Ordering feed	43	(69.4)	14	(22.6)	4	(6.5)	1	(1.6)
Selecting boars	41	(63.1)	8	(12.3)	11	(16.9)	5	(7.7)
Hiring labor	38	(58.5)	18	(27.7)	8	(12.3)	1	(1.5)
Purchasing major equipment	5	(7.7)	40	(61.6)	19	(29.2)	1	(1.5)
Deciding sources of feed purchases	8	(12.3)	44	(67.7)	11	(16.9)	2	(3.0)
Keeping production records	56	(86.1)	4	(6.1)	4	(6.2)	1	(1.5)
Pricing feeder pigs	4	(6.4)	54	(87.1)	3	(4.8)	1	(1.6)
Keeping financial records	12	(18.5)	39	(60.0)	9	(13.8)	5	(7.6)

Table 21. Managers' Perceptions of the Division of Responsibility

The number and percentage of firms for which the manager reported responsibility for executing the selected activities was directly assigned to the manager.

Activity	Manager directly		Someone other than manager	
	No.	%	No.	%
Culling sows	62	(98.4)	1	(1.6)
Ordering feed	36	(57.1)	27	(42.9)
Selecting boars	45	(71.4)	18	(28.6)
Hiring labor	48	(76.2)	15	(23.8)
Purchasing major equipment	36	(57.1)	27	(42.9)
Deciding sources of feed purchases	19	(30.2)	44	(69.8)
Keeping production records	59	(93.7)	4	(6.3)
Pricing feeder pigs	10	(16.4)	51	(83.6)
Keeping financial records	23	(36.5)	40	(63.5)

or selection of a feed company as a continuing source of large quantities of feed, grain or supplement. Also, the definition of "responsibility" for an activity may have differed between board chairmen and managers. For example, the manager may be required to collect receipts of all financial transactions, but the secretary-treasurer may actually process all financial transactions. Thus since part of the activity is done by the manager and part by a board member, both may feel they are directly responsible for keeping financial records of the firm.

Firms used several methods of defining the responsibilities of the manager and board. In total, 53 managers felt that there was a clear definition of their responsibility. Of these, 21 indicated that their responsibilities were explicitly outlined in a written contract or personnel policy. The remaining 32 managers indicated that there was no written agreement between the board and manager. Nevertheless, they thought that both the board and manager had a good mutual understanding regarding the division of responsibility. Job descriptions and proceedings of board meetings were the most common channels for communicating the division of responsibility when there was no written contract or personnel policy.

Approximately half of the managers have written contracts with the firm. Of the 63 managers who responded, 31 did not have a contract with the firm. In addition, many written contracts did not specify the manager's responsibilities. Of the 32 managers with contracts, only 21 indicated that the contract explicitly outlined their responsibilities. Of the 32 board chairmen of firms that had contracts with their managers, only 23 indicated that the contract explicitly specified manager and board responsibilities. This indicates very close agreements between chairmen and managers at least on the explicitness of contracted duties. The contract usually specified the manager's base salary, other benefits, and the nature of the cash incentive plan.

Manager turnover

Although most of the firms are relatively young, less than half still employ the original manager hired when the firm was organized. Of the 65 firms surveyed, 30 have not made a management change while 35 have made at least one management change. Fifteen firms have made three or more management changes. Of the 42 firms organized before 1975, 11 employed the manager hired when the firm was organized. The number of different managers employed by all firms and the number employed by the older firms are presented in Table 22. Firms are classified by the number of different managers that they have employed and by their year of organization in Table 23. Clearly the proportion of firms with the original manager is less among those firms that have been organized longer.

In all, 56 management changes have occurred in the 65 Iowa firms. Thirty-eight of these changes were from the original manager to a second manager.

Table 22. The Distribution of Firms by Number of Different Managers Employed

Different managers	All firms	Firms organized before 1975
1	30	11
2	20	16
3	11	11
4	4	4
TOTAL	65	42

Table 23. The Distribution of Firms by Number of Different Managers Employed and by Year of Organization.

	No. of different managers			
Year organized	1	2	3	4
1972 and earlier	1	0	1	3
1973	7	8	3	1
1974	3	8	7	0
1975	5	2	1	0
1976	13	2	0	0

Board chairmen estimated that 17 of these 38 original manager changes resulted from the board's dissatisfaction with the original manager's performance. The original manager initiated 20 of the manager changes. In most instances, the manager left because he had an alternative job opportunity and (or) because he was dissatisfied with the job. In a few instances, the manager left because of health or personal reasons. Board chairmen estimated that 10 of 12 second management changes and three of four third management changes resulted from the board's dissatisfaction with the manager's performance. A larger proportion of the second and third management changes was initiated by the board of directors.

Of the original 65 managers, 29 are still employed with the original firm. Some of the original managers lacked swine-management experience, were forced to work with a herd of young gilts in a new facility with which they were unfamiliar, used untested production procedures, and tried to satisfy a board with higher-than-realistic expectations. It is not surprising that in many instances the actual performance of the firm did not match the performance expected by the owners or the manager himself. Several board members failed to anticipate the slow start-up of a new firm and the smaller-than-average number of pigs the first year. The manager may have been blamed or blamed himself for "poor" performance when, actually, performance was average but short of expectations. Often, after the first manager was replaced, the firm matured, performance improved, and board expectations were adjusted to a realistic level. Improved performance may have been more a result of maturation than of greater ability of the second manager. Of course, the ability, attention, and methods of managers do have a large influence on reproductive performance. Careful observation, attention to details, and good sanitation and sow nutri-

tion are key factors in both the technical and economic performance of the firm.

Manager's compensation

The total compensation of managers came in three forms—a guaranteed cash salary, noncash fringe benefits, and a cash incentive based on productivity. First, the guaranteed base salary paid to managers was typically $1000 or $1100 per month. A few firms had a base salary of less than $1000, usually because the firm provided fringe benefits such as a house and vehicle in lieu of cash. Second, most firms used an incentive plan under which the managers (or other employees) got $0.25 to $2.00 for each pig produced above a minimum number. Third, most firms provided the manager one or more fringe benefits such as housing, utilities, insurance, paid vacation, meat, or use of a pickup. Of course, the total compensation and real income to the manager was the sum of the value to him of all three components. The level of compensation and the mix of composition of income varied considerably among firms.

The yearly base salary paid to managers by Iowa firms ranged from $8,820 to $24,000, with an average yearly base salary of $12,970, or just over $1000 per month. The distribution of managers by base salary intervals is presented in Table 24.

Table 24. The Distribution of Managers by Intervals of Yearly Base Salary.

Base salary ($)	Number of managers
Under 10,000	7
10,001 - 12,000	23
12,001 - 14,000	13
14,001 - 16,000	7
16,001 - 18,000	4
Over 18,001	2
TOTAL	56

Base salaries of $1000 per month and $1100 per month were typical of Iowa firms. Of the 56 firms that responded, 18 paid managers a base salary of $1000 per month, and 5 firms paid managers $1100 per month. Base salaries paid to managers tended to be lowered if there were large fringe benefits and generous compensation potential in the incentive plan. Therefore, the base salary alone is a rather inaccurate indication of the manager's total compensation. Unfortunately the survey did not gather enough information to indicate the number of managers by intervals of total compensation.

Cash incentive plans

Most firms employed their manager under a cash incentive plan. Of the 64 firms that responded, 57 had an incentive plan for the manager. The boards were very concerned with creating an incentive for the manager to try hard to get the maximum number of pigs possible from the facility. The rate of return per dollar of investment by the board members is directly related to the number of pigs produced. Of the 57 firms with incentive plans, 45 based plans on the number of pigs produced annually. In 25 of these firms, managers received a fixed payment per pig for all pigs produced over a minimum number. In the remaining 20 firms, a larger payment per pig was made for all pigs produced above a second minimum.

Firms were asked to describe the provisions of their incentive plans. Of the 57 firms with incentive plans, 27 provided specific numbers regarding the minimum production standard, the base payment per pig, and the payment structure of the incentive plan. These three components determine compensation potential of the incentive plan or profit-sharing plan between the firm and the manager.

The incentive threshold is the minimum number of pigs that must be produced annually in the facility before the incentive plan becomes effective. Since firms vary in size of facility, the minimum number or threshold for each incentive plan was converted to the number of pigs to be produced per unit of rated capacity annually (i.e., pigs divided by rated capacity). For the 27 firms that sufficiently detailed their incentive plans, the threshold levels ranged from 6.2 to 18, with an average of 12.8 pigs per sow annually. Thus, the manager of a 500-sow unit with an incentive plan based on a 12.8-pig threshold would have to produce 6400 (12.8 x 500) pigs before the incentive plan would become effective. An incentive plan may have an attractive payment schedule per pig, but, if the threshold is high, the plan may seldom be in effect. If so the plan has little compensation potential or incentive for the manager. The threshold should be set at a break-even or below-average level for the incentive plan to be effective and reward above-average performance.

The second major component of the incentive plan is the per-pig payment for pigs produced above the threshold. For the 27 firms that sufficiently described their incentive plans, the per-pig payment for the first pigs above the threshold ranged from $0.15 to $2.25, with an average of $1.20 per pig. Among the incentive plans, the amount of the per-pig payment seemed to be larger if there was a relatively high threshold level and lower with relatively high manager's base salary. Thus, given equal base salaries, firms seemed to offer lower (higher) incentive payments per pig if they offered a bonus above a relatively lower (higher) threshold level. Furthermore given equal threshold levels, firms seemed to offer lower (higher) incentive payments per pig if they provided higher (lower) base salaries.

The third major component of the incentive plan is the rate structure of the payment per pig in the plan. Of the 45 firms that based incentive plans on the number of pigs produced annually, 25 firms had a fixed payment structure (i.e., paid the same amount per pig for *all* pigs produced over the threshold level), and 20 firms had a graduated payment structure (paid an increasing amount per pig for successive in-

crements of pigs produced over the threshold level). Not all plans with a progressive rate structure created the same incentive, however. Some thresholds were high, and the bracket was wide and the increment in payment per pig small, thus offering little bonus compensation potential even with a graduated payment schedule. If so, the total compensation would be not significantly different from the base pay even when reproduction is far above average. Other graduated incentive plans started at a threshold below the average of 15 pigs per sow per year and provided significant *increments* in payment per pig at 16, 17, 18, 19, and 20 pigs per sow per year. This led to substantial bonus payments and significant profit-sharing potential if the firm obtained high reproductive efficiency. All elements of the incentive plan—increments, production threshold, and payments per pig—varied for firms with graduated payment schedules. Several bonus thresholds began at 12 or 14 pigs per sow. Payment increments at every pig or every 2 pigs per sow per year were common. Per-pig bonuses starting at $0.25 and going up by increments of $0.25, $0.50, or $1.00 also were common.

Because the profitability of the firm depends on the number of pigs produced, the incentive plan based only on the number of pigs above a break-even point is a means by which the firm and manager share profits. If each pig over the break-even level is worth $30 or more, then $0.25 to the manager is a very low rate-of-profit share. Even 6 or 7 dollars for a few pigs at very high levels of efficiency is only 20 to 25% profit sharing. The compensation potential of an incentive plan indicates the degree to which the firm is willing to share profits with the manager.

The compensation potentials of three typical Iowa firms are examined to illustrate the difference in the compensation potential of alternative plans. The figures used are based on actual incentive plans of three Iowa firms, but a 500-sow unit is assumed for all three to facilitate comparison. Firm 1 pays the manager $0.25 per pig for all pigs produced over 7000 (14 pigs per sow annually). Firm 2 pays the manager $2.00 per pig for all pigs produced over 5000 (10 pigs per sow annually). Firm 3 pays the manager $1.00 per pig for the first 500 pigs over 6000 (12 pigs per sow), $2.00 per pig over 6500 (13 pigs per sow), $3.00 per pig over 7000 (14 pigs per sow), etc. Incentive payments by production levels for each plan are presented in Table 25.

Table 25. Manager's Annual Cash Incentive Payment Under Three Typical Incentive Plans Applied to a 500-Unit Firm with Production Levels from 12 to 20 Pigs Per Sow Annually.

Annual production level		Managers cash incentive (dollars)		
Total pigs	Pigs per sow	Firm 1	Firm 2	Firm 3
5,000	10	0	0	0
6,000	12	0	2,000	0
7,000	14	0	4,000	1,500
8,000	16	250	6,000	5,000
9,000	18	500	8,000	10,500
10,000	20	750	10,000	18,000

Firm 1 created little incentive because its plan has low compensation potential. The plan requires a relatively high production before any bonus (14 pigs per sow annually) and offers a relatively low per-pig payment ($0.25 per pig). The plan has a fixed per-pig payment structure even for the very profitable levels of performance. There is little variation in total compensation even with wide variation in production efficiency. The very profitable level of 20 pigs per sow annually would give the manager only $7.50 bonus. Thus, neither exemplary reproduction success in the facility nor financial disaster for the firm would have much effect on the manager's total compensation. Firm 2 creates more incentive, but the bonus is probably too large at lower levels of productivity when the firm would be unprofitable. The incentive plan of Firm 2 begins a bonus at the low production threshold of 10 pigs per sow per year, which is far below average. The high payment per pig of $2.00 would be paid out of capital not profit. At 10 pigs per sow, the manager probably should be fined rather than given a bonus. At 10 pigs most firms probably are very unprofitable; the profit to the firm on the 20th pig may be over $20,000, but the firm shares only 5% or $1000 with the manager (i.e., 500 pigs x $2.00). The graduated incentive plan of Firm 3 is characterized by a moderate production threshold (12 pigs per sow annually) and a moderate initial payment of $1.00 per pig, but the graduation rapidly increases the bonus. This plan shares $8.00 per pig for the very profitable production level of 19.5 to 20 pigs per sow per year.

The incentive plan should reflect, in the manager's compensation, differences in labor productivity and should not shift the entrepreneurs' risk to the employee. That means, the manager should not be charged for large pig losses over which he had no control such as losses that might result from a tornado. Nor should the manager have his income influenced by the price of hogs or feeder pigs on the open market, an important variable but one over which the manager has no influence. The incentive plan should reward and motivate high facility output and high labor productivity.

The effect of the incentive plan on reproductive performance is important to owners and investors. Nevertheless, many firms in our survey were reluctant to specifically detail their incentive plans. Thus because of lack of data and wide year-to-year variation, the direct, precise relationship between incentive plan and reproductive performance could not be established.

Fringe benefits

Manager's total compensation also varied by the value of fringe benefits received from the firm. Only eight of the 65 firms surveyed provided the manager with *no* fringe benefits. Forty-seven firms provided the manager with at least housing. Good-quality housing is attractive to a manager and his wife. Housing can be a tax-free form of compensation to the

manager if he is required by the board to live there as part of his job.

A total of 44 firms provided free of charge all household utilities for the manager. Nine firms provided medical and health insurance. Eight firms provided meat (usually pork) for the manager. Some firms provided travel expenses for the manager to attend meetings and swine clinics. Some provided the use of a pickup truck owned by the firm for his personal transportation.

Of the 61 firms that responded, 47 had an explicit vacation and sick leave policy. The mean number of paid vacation days provided by the 44 firms that reported an explicit number of days was 11 per year. The mean number of sick leave days for the 15 firms that specified an explicit number of days was four per year. Many more firms provided sick leave but were not explicit as to the maximum number of days allowed per year. The manager could take sick leave as needed, and the board chairman did not believe the manager would abuse the policy. In a few firms, there was no explicit vacation or sick leave policy because the manager was free to take sick or annual leave as he chose, but was responsible to hire replacement labor and pay for such replacement labor out of his total income.

Human-capital characteristics of managers

Capital can be broadly defined as anything put in place at a current sacrifice to provide a stream of useful future services. If so, human capital is the ability or capacity of people, acquired at some sacrifice, that can provide a stream of useful services. Human-capital investment activities include formal and informal learning, experience on a similar job, physical fitness, skill development, and information accumulation from reading and conversing. All may add to the ability of a swine farm manager to increase the number of pigs produced. The amount and type of human capital possessed by the manager should influence his ability to organize the "pig factory" and effectively execute daily work routines. If he is able and motivated to detect nutritional and health problems early, he may be able to take appropriate action shortly after problems arise and thus reduce death loss. Most observers and owners of sow-farrowing firms agree that managerial ability and incentive are the key factors in determining the number and quality of pigs produced. The reproductive efficiency of the sow herd (i.e., the output of the facility and, hence, the rate of return on the investment made by owners) is very dependent on the activities of the manager. But good management is complicated to define and difficult to identify. The formal education, informal education, and training of managers are the only objective indicators of human capital examined in this section.

Formal education varied widely among managers of Iowa firms. The years of schooling completed by managers ranged from 8 to 18, with an average of 13 years of formal education. The distribution of managers by years of formal education is presented in Table 26.

Table 26. The Distribution of Managers by Years of Formal Education.

Years of formal education	Number of managers
Less than 12	5
12 (high school)	30
13	3
14 (junior college)	12
15	1
16 (college)	10
18 (graduate work)	4
TOTAL	65

Only five managers have completed less than 12 years of formal education. Of the remaining 60, 30 completed high school, and 30 went beyond high school. Ten were college graduates, and four managers took postgraduate work in areas related to swine production.

Two methods of informal education or human-capital formulation are considered—experience and communication. Relevant knowledge and skills can be acquired by the manager from working on another livestock farm. The most relevant experience is operating another large-scale hog operation. An experienced manager has increased ability to design the best production techniques in operating the firm. Most of the managers did have previous experience in swine production. Of the 64 managers who responded, 54 (74%) were raised on a livestock farm, and 38 (59%) had previously managed another large hog operation. However, 26 firms hired managers that had no previous swine-farm managerial experience. The average number of years of experience for the 38 that had previously managed a hog operation was 5 years. The average number of litters farrowed annually per manager with previous swine-farm experience was 960 per year, a relatively large size. Twenty-seven of the 38 experienced managers had less than 5 years of experience.

The ages of managers ranged from 19 to 51 years, with the average age being 30 years. Most of the managers were in their 20s. The distribution of managers by age groups is presented in Table 27.

Table 27. The Distribution of Managers by Age Groups.

Manager's age	Number of managers
Under 20	4
21 - 25	20
26 - 30	18
31 - 35	5
36 - 40	7
41 - 45	5
Over 46	5
TOTAL	64

The second method of informal education concerns the channels of communication used by the managers to provide themselves with information on pork-production technology and disease control. Of the 65 managers surveyed, 51 received at their home at least one swine journal or magazine, 51 attended at least one short course on swine production and disease control within the previous year, 47 received technical guidance from a private consultant, 42 used information from sales representatives of different pork-related industries, 54 used information from interaction with other managers, and 8 used services of the Iowa Cooperative Extension Service. On average, the managers of the Iowa sow-farrowing firms received three swine journals, regularly attended approximately three short courses or clinics per year, and received technical guidance from a private consulting service approximately once a month.

Job training is the final human-capital characteristic examined in this section. Two forms of job training are used by Iowa firms. The first type of training is formal preservice. Firms send managers to relatively short, but intensive, training sessions that cover many aspects of confined swine management. A breeding stock company and a feed company usually conduct such 1- or 2-week training sessions at or near the company's home office. Of the 65 managers surveyed, 15 participated in a special sow-farrowing firm management training program.

The second type of training is on the job. Several firms directly or indirectly hired a private consulting service to design production techniques and guide day-to-day procedures for the manager to follow in the operation of the facility. Feed or breeding stock companies will contract to provide such an in-service training for a specified period. In addition, the feed or breeding stock of the company must be purchased by the firm. A private consultant visits the operation on a regular basis, and he is on call whenever a special problem arises in the firm. Although all private consulting services were considered a source of informal education, perhaps there should be a distinction between the more intensive training and supervisory services for the inexperienced manager and the less intensive consulting services for the experienced manager. The more intensive training services tend to structure the production process, whereas consulting services are more "trouble shooting" and directed only at specific problems of the firm.

Many managers regularly receive some kind of consulting or technical guidance. Of the 65 managers surveyed, 45 received guidance on disease prevention and treatment, 38 received guidance on feeding practices, 30 received guidance on breeding practices, and 16 received guidance on waste-handling procedures. A local veterinarian or feed salesman usually was the source of consultation, but in many instances, breeding stock companies and (or) feed companies provided a regular consulting service. The frequency of the guidance usually was once or twice a month, plus a right to call on an as-needed basis.

A summary of the human-capital characteristics of managers in Iowa sow-farrowing firms is presented in Table 28.

Table 28. Human-Capital Characteristics of Managers in Iowa Sow Farrowing Firms.

Human-capital characteristic	Number of managers	Percent of total
1. Years of formal education completed		
Less than 12	5	8
12	30	46
More than 12	30	46
2. Informal education		
Farm background	54	83
Swine management experience	38	58
Communication channels		
Received swine journal	51	78
Attended short courses on swine production	51	78
Received consulting services	47	72
3. Job training		
Received specialized preservice training	15	23

Sources of manager's job satisfaction and dissatisfaction

Managers were asked to report the principal sources of job satisfaction and dissatisfaction that they experienced in operating the sow-farrowing facility. The independence of the work, the financial compensation, and the knowledge of swine production acquired from operating the facility were the three major sources of job satisfaction. The lack of days off, the long hours, and the rather unpleasant working environment were the three major sources of dissatisfaction. The numbers of managers mentioning or giving a specific rank to each source of job satisfaction and dissatisfaction are presented in Tables 29 and 30. Managers varied considerably in the ranking of sources of satisfaction and dissatisfaction. To obtain the general or overall average rank of the sources of satisfaction and dissatisfaction for all managers, a weighted index was devised. Each manager ranking a

Table 29. The Number of Managers by Rank of Each Source of Job Satisfaction.

Source of satisfaction	Rank 1	2	3	Checked	Index of overall rank [a]
Independence of work	25	7	12	12	157
Salary and other benefits	12	25	8	11	150
Knowledge acquired	10	13	14	18	125
Employ specialized skills	3	9	9	25	82
Working environment	3	2	10	25	63
Other	4	4	1	1	31

[a] The value of the index for each source is the weighted sum of the number of managers ranking that source. A rank 1 was weighted 4, a 2 was weighted 3, a 3 was weighted 2, and a check only registered 1.

Table 30. The Number of Managers by Rank of Each Source of Job Dissatisfaction.

Source of dissatisfaction	Rank 1	2	3	Checked	Index of overall rank [a]
Lack of days off	19	11	3	6	121
Long hours	7	16	3	4	86
Working environment	13	5	8	3	86
Too many bosses	3	1	1	5	22
Practices too specialized	0	0	4	1	9
Other	2	3	1	1	20

[a] The value of the index for each source is the weighted sum of the number of managers ranking that source. A rank 1 was weighted 4, a 2 was weighted 3, a 3 was weighted 2, and a check only registered 1.

source first was given a 4, and each manager ranking a source second was given a 3, and so on.

The rankings of each source, the weights assigned to the rank, and a total point calculation are contained in Tables 29 and 30.

"Other" sources of satisfaction usually included "the challenge to make the firm successful" or "the enjoyment derived from working with livestock." "Other" sources of dissatisfaction usually included "the responsibility and pressure involved in making the unit successful" or "the monotonous routines involved in the work."

Manager's estimation of hours worked

The manager's estimate of hours worked per week ranged from 43 to 95, with an average of 60 hours per week. Of the 63 managers who responded, 22 reported that the number of hours worked did not vary significantly from week to week. The remaining 41 managers reported weekly variations resulting from scheduling problems. These managers reported working an average of 70 hours for 16 weeks of the year as a result of clustered farrowings.

The allocation of hours among certain activities is presented in Table 31.

Because a number of firms were just beginning production, some managers had been spending an unusually large amount of time supervising the breeding of young gilts. The number of hours spent in this activity is expected to decrease as young firms develop controlled production cycles. The miscellaneous category includes such activities as maintaining the physical plant, moving and sorting of hogs, observing pig behavior, supervising labor, and processing baby pigs. In a number of the larger units, the manager functions as the overall coordinator of the operation. He has subordinates in charge of the gestation, farrowing, and nursery activities of the operation. The number of hours he worked per week was not broken down for specific activities, but was classified in the miscellaneous category under the supervisory activity. This may account for the large number of hours per week in the miscellaneous category. Managers emphasized that the allocation of hours among the activities listed varied from week to week.

Table 31. The Allocation of Manager's Hours.

Activity	Hours worked per week
Supervision of breeding	11.7
Supervision of farrowing	9.5
Feeding	9.0
Cleaning	8.7
Medical treatment	4.6
Record keeping	4.6
Miscellaneous	11.9
TOTAL	60.0

Because both the board chairman and the manager were asked to estimate the number of hours that the manager worked, the discrepancy in perceptions of hours worked can be calculated. The difference in estimated hours worked by the manager ranged from 0 to 33, with an average discrepancy of 7.8 hours per week. Only seven board chairmen estimated that the manager worked more hours per week than what managers reported; the remaining managers estimated they worked more hours per week than what board chairmen had reported. However, 27 firms had discrepancies of less than 5 hours per week.

Of the 65 managers surveyed, 15 reported that their wives directly assisted in the operation of the facility on a full-time basis. The most common activities performed by the manager's wife were the processing of baby pigs (clipping teeth and giving baby pig shots), assisting sows in farrowing, and keeping production records. The managers estimated that their wives worked an average of 43 hours per week. Some promoters and organizers of sow-farrowing firms believe that there is high effectiveness in the man-wife management team, but other sow-farrowing firm consultants feel it is not better for both the husband and wife to work in the facility.

Several managers reported that their wives were part-time participants in the operation of the facility (worked less than 20 hours per week). Those wives participating part-time most often assisted the manager in keeping production records.

BOARD CHAIRMEN'S ASSESSMENT OF THE INVESTMENT

Investment decision criteria

The formation of a sow-farrowing firm is one of many investment alternatives available to individual farmers and agribusinessmen. Presumably, the investor's decision to form or join a sow-farrowing firm is based upon a judgment or calculation of the rate of return on his investment or the value of shares in the firm relative to their cost. However, before-the-fact evaluation of the investment in a sow-farrowing firm is complicated. Because sow-farrowing firms usually

price pigs at cost of production, the firm can only have gross revenue enough to cover production costs and required debt retirement. Thus the firm generates no profit and pays no explicit return to shareholders' equity capital. Most of the sow-farrowing firms seem to be run as nonprofit subsidiaries. Investors seem to participate not to make a profit on producing feeder pigs but to realize a return on feeding out the pigs. Thus their expected or realized return on their investment is proportionate to the number of low-cost, high-quality pigs that they receive from the firm. An implicit net return to each farm making an investment in a sow-farrowing firm can be calculated only by evaluating the difference between that farm's alternative cost of obtaining feeder pigs and the price paid to the sow-farrowing firm. The number of pigs received from the sow-farrowing firm times the reduction in cost per pig is the gross return on the sow-farrowing firm investment.

In general, there are two alternative sources of feeder pigs. The first is the open market of auctions or private sales. Owners could directly purchase feeder pigs in the open market. One could calculate an implicit net return to the sow-farrowing firm by subtracting the month-by-month amount paid to the sow-farrowing firm from the month-by-month open-market price of similar-quality feeder pigs. The "price of similar *quality* pigs," however, is not readily determinable. In addition, one must add to the auction price the cost of search, transactions, additional death loss, and loss of tax shelter from income tax by investment in a depreciable asset. Some of the values of the sow-farrowing firm are that the pigs are high-quality, not stressed, locally available, and consistently sold to members at a price equal to the cost of production. Thus, sow-farrowing firm members avoid the large variations in open-market feeder pig prices, the uncertainty of health, and variability in grade and finishing costs associated with variation in quality of open-market pigs. For several members of Iowa sow-farrowing firms, the open market was their relevant alternative, and the certainty of price, quality, and finishing cost was an important consideration in joining a sow-farrowing firm.

The second alternative source of feeder pigs is the farmer himself. The cost of pigs from this source is what it would cost the owner to produce his own feeder pigs. This cost is somewhat subjective since it is the value to the specific producer of what he would have to give up to produce the same quantity and quality of feeder pigs on his own farm. The challenge in estimating the sacrifice to produce feeder pigs at home is to accurately identify the true labor and capital costs of producing feeder pigs in a multienterprise firm. Calculation of sacrifices would have to be comprehensive and the value of sacrifices both objective and subjective. The alternate use return or opportunity cost that a producer places on his own labor and capital inputs in a multiproduct firm and household can vary widely. If the data were available, the implicit net return on sow-farrowing shares could be calculated by dividing the investment in the sow-farrowing firm into the difference between the farmer's estimate of what it would cost him to produce the pigs and the cost of pigs received from the sow-farrowing firm. The gain from the investment is directly related to the quantity, quality, and cost of pigs that he received from the sow-farrowing firm. Thus, each investor, to get a high return of his shares, wants the sow-farrowing firm to produce as many quality pigs as possible at the lowest possible price.

Satisfactory and unsatisfactory elements of the investment

Board chairmen were asked to evaluate satisfactory and unsatisfactory elements of the investment. The quality of pigs produced and the stability of supply of feeder pigs were the two most satisfactory elements of the investment.

Members who were satisfied with the firm's production efficiency also liked obtaining pigs at cost of production. The cost of production is more stable than the market prices for feeder pigs. Shareholders reported that escape from the work and the close daily attention required for efficient sow farrowing also was an important source of satisfaction from their sow-farrowing firm investment. Four board chairmen reported no satisfactory elements from the investment. Four chairmen reported that it was too early in the life of the firm to make an assessment of the investment.

Breeding problems were the most frequently mentioned unsatisfactory element of the investment. Low conception rates, especially during the summer and among gilts, resulted in fewer pigs than expected and caused overcrowding when too many sows got pregnant and farrowed in the same week. Unsatisfactory management, slow start-up of the firm, disease and health problems, and investment cost overruns were less significant, but unsatisfactory, elements of the investment. A few board chairmen reported poor-quality breeding stock and inflexible building designs as unsatisfactory elements of the investment. Five board chairmen reported no unsatisfactory elements of the investment. The number of board chairmen reporting and ranking each satisfactory and unsatisfactory element is presented in Tables 32 and 33.

Table 32. The number of Board Chairmen Reporting and Ranking Each Satisfactory Element of the Investment and "Rank Points" of Each Element

Elements	Rank Points- One 4	Two 3	Three 2	Reporting only	Total rank points [a]
Quality of pigs produced	20	14	7	9	145
Stability of supply of pigs	17	17	4	9	136
No direct involvement by shareholders	8	7	11	13	88
Stability of price of pigs	3	5	15	5	62
Other	2	0	1	1	11

[a] Rank points are obtained by multiplying the number of firms under each rank times the points per rank and summing across all ranks for the element.

Table 33. The number of Board Chairmen Reporting and Ranking Each Unsatisfactory Element of the Investment and "Rank Points" of Each Element.

Elements	Rank Points- 4	One 3	Two 2	Three	Reporting only	Total rank points [a/]
Breeding problems		19	24	6	7	167
Management of firm		9	2	7	5	61
Slow start-up		8	5	2	6	57
Disease and health problems		8	2	6	7	57
Investment overruns		3	5	5	5	42
Cost of pigs produced		2	2	3	5	25
Quality of pigs produced		0	0	1	3	5
Other		5	1	0	4	27

[a/] Rank points are obtained by multiplying the number of firms under each rank times the points per rank and summing across all ranks for the element.

The assessment of the satisfactory and unsatisfactory elements of the investment by board chairmen is consistent with initial investor goals as expressed in Table 4. The most frequently mentioned incentive for organization was "to obtain a reliable supply of quality feeder pigs at cost of production." The most frequently mentioned satisfactory element of the investment was quality of pigs and the second was stability of supply, both of which indicate that the most widely held goals were met.

Breeding problems

The dominance of "breeding problems" as the most unsatisfactory element of the investment prompted further examination of this problem. Board chairmen were asked if technical production (i.e., the number of pigs produced per sow annually) had matched their expectation. Of the 65 board chairmen surveyed, 30 felt that technical production had matched their expectations, 30 felt that technical production had not met their expectations, and 5 felt that it was too early to make any assessment. If technical production had *not* met their expectations, board chairmen were asked to identify specific production problems that had caused the poor performance. Only 8 of the 30 dissatisfied board chairmen identified the number of *born* pigs per litter as a production problem, and only 14 of the 30 identified the number of *weaned* pigs per litter as a serious problem. However, 23 of the dissatisfied board chairmen identified poor conception rates (i.e., low numbers of litters per sow annually) as a production problem. Finally, only 5 of the 30 dissatisfied board chairmen identified poor disease control as a production problem.

Analysis of the data indicates that an unsatisfactory number of pigs produced per sow annually more often results from low conception rates rather than from small weaned litter sizes. The number of litters produced per sow annually and the average weaned litter size are plotted against each other for the 38

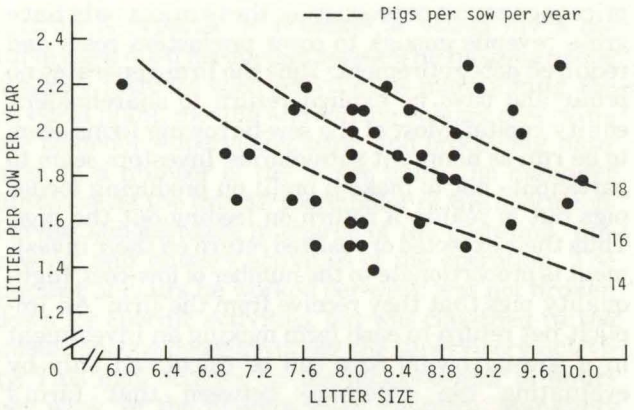

Figure 1. Litters per sow per year versus weaned litter size for 1976.

firms reporting 1976 production statistics in Figure 1.

A given number of pigs per sow can be produced annually by different combinations of litter size and litters per sow annually. For example, 16 pigs per sow can be produced from a litter size of 8.0 and two litters per sow annually, from a litter size of 7.5 and 2.13 litters per sow annually, or from a litter size of 8.5 and 1.88 litters per sow annually. If fewer pigs per sow are produced than expected, the problem may result from a small litter size and (or) a low number of litters produced per sow annually. The graph indicates that relatively few firms had average litter sizes of less than 7.5. Of the 65 firms surveyed, 47 had completed one full year of production (i.e., had been in production in 1976). Of the 47 firms in production in 1976, 41 reported their average litter size. For the 41 firms, the average weaned litter size was 8.34. These data suggest that weaned litter size of sow-farrowing firms is above average and not considered a serious production problem by board members of most firms in Iowa.

Iowa firms, however, averaged only 1.82 litters per sow annually in 1976, which was considered unsatisfactory. Animal scientists calculate that, in a stable-size breeding herd with a gilt population of 25 percent, it is reasonable to expect 2.1 litters per sow annually. This assumes mating on the first post-weaning estrus after a 3-week lactation period. The survey data suggest that the most serious reproduction problem in sow-farrowing firms is poor conception rates, excessive weeks between farrowing and conception, which result in a relatively low number of litters per sow annually. A number of factors may cause poor conception rates in confinement structures. High temperatures will reduce the quantity and quality of boar semen as well as the regularity of sows coming in heat. In addition, environmental characteristics such as floor surface, light intensity, sound levels, and odor may affect conception rates. Thus, the building or facility design may significantly affect production efficiency. Temperature, ventilation, floor material, space, and location all affect breeding environment and may be important aspects of building design. Not enough information on building design was collected to associate breeding environment with conception rates.

SUMMARY

The adoption of subsidiary sow-farrowing firms by more than 500 Iowa members indicates that farmers and other rural residents are willing to work within this nontraditional organization form to produce feeder pigs. The sow-farrowing firms were subsidiaries and organized as subchapter S corporations among 8 to 10 area farmers and other businessmen. The principal incentive was not profit from the sow-farrowing firm but to provide a reliable source of quality feeder pigs at a price equal to production costs. Other incentives for participation were to release labor from farrowing activities and to hire a manager for the farrowing house who would be a full-time specialist. Nonfarmers have been only a minority in the ownership but relatively important in the organization of sow-farrowing firms in Iowa.

A hypothesis of the study was that corporate structure and hired management of sow-farrowing firms might lead to nonfarmer and nonlocal participation and financing for pork production. The existing sow-farrowing firms in Iowa, however, are almost exclusively made up of local farmers using their own capital and local credit. There is no evidence that sow-farrowing firms have attracted significant outside investment to rural areas. Sow-farrowing firms are not a substitute for manufacturing branch plants in securing outside capital and management to create local jobs. It is not likely that much rural industrialization (i.e., growth in area employment and value added) will result from sow-farrowing firms.

Sow-farrowing firms are rather large enterprises. They provided an average of $290,000 worth of pigs to members in 1976. Initial investment per firm was about $419,000 in 1973 but increased 50% to $625,000 in 1976. Buildings and equipment, breeding stock, and land improvements and start-up costs account for 95% of total investment. Land is only 5% of total initial investment. Most of the investment items are wholly or partly produced in Iowa.

The average sow-farrowing firm employed 7280 man-hours per year, kept 534 sows, and used 14.3 hours per sow per year. Two full-time employees, i.e., a manager and assistant manager, usually operate the typical sow-farrowing firm except for occasional or supplementary part-time labor totaling less than one more full-time equivalent. The sow-farrowing firm is a rather capital intensive enterprise requiring more than $200,000 of investment per full-time employee.

In 1976, Iowa sow-farrowing firms weaned about 8000 pigs, or an average of 8.34 pigs per litter, at an average cost of $27.55 per pig. On the average, the firms secured 1.82 litters per sow annually and 15.18 feeder pigs per sow annually. When first- and second-year production statistics are compared for all firms, it seems that, on average, production efficiency has improved as the firms matured. Members were most often disappointed by the number of litters per sow per year.

The manager was hired and did not participate in ownership in most Iowa sow-farrowing firms. The relationship between the manager and board varied from highly centralized, where the board controlled the operation, to highly decentralized, where the manager controlled the operation. Managers quit or were fired for poor performance, but most expressed relatively little dissatisfaction with board-manager relations.

Generally in the Iowa firm, the manager controlled most of the input variables critically influencing reproduction efficiency. Seldom did the manager control all the variables critical to profit or have incentive to minimize the operating cost per month. Most firms used an incentive plan based on reproduction efficiency rather than on financial success.

More than half of the firms had employed more than one manager. Those firms with more pigs per sow annually had fewer managers per year. Reproduction efficiency, on average, improved from the first to the second year. The reproduction performance of the new firm under control of the first manager frequently did not equal the board's expectations nor satisfy the manager.

The manager's total compensation depended on the base salary, cash incentive plan, and the number of fringe benefits he received from the firm. Base salaries varied widely among managers, but the base salary was not an accurate indication of total compensation. Cash bonuses based on the number of pigs produced per sow annually were commonly used by the firm to share profits with the manager. The compensation potential of cash incentive plans varied widely because of variation in the threshold level, the per-pig payment, and the change in per-pig payment. Most firms provided the manager with several fringe benefits. Housing and utilities usually were provided.

The manager's knowledge, ability, and effort were critical factors in the technical efficiency of sow-farrowing firms. Managers frequently engaged in several self-improvement or human-capital investment activities at the expense of the firm. Most managers wanted to develop their abilities to operate the firm efficiently. There is a wide variation in formal education and experience of managers, but on-the-job training and learning was extensive and universal.

The independence of the work, financial compensation, and the knowledge of swine management to be acquired from operating the facility were major sources of job satisfaction to the managers. The lack of days off, the long hours, and the unpleasant working environment were the major sources of dissatisfaction.

An implicit net return on the investment in a

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sow-farrowing firm is the difference between the alternative cost and the price paid by members for the pigs received from the firm. Traditional feeder pig markets and on-farm production are the two most common alternative sources of feeder pigs. Simple net returns must be adjusted for pig quality and differences in the opportunity cost of labor.

The high quality of the feeder pigs produced and the stability of supply of feeder pigs were the two most satisfactory elements of the investment. Breeding problems, especially low conception rates, were the most unsatisfactory or troublesome elements of the investment.

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