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Production systems of Iowa swine producers

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by

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I. OBJECTIVES

This thesis is one segment of a swine production and marketing study being conducted in the Iowa Agricultural Experiment Station by the Department of Economics.[1] The larger study was undertaken to furnish the farmer-producer guidelines for his production and marketing practices. Swine production systems have been shifting markedly from conventional programs using pasture to capital intensive systems which emphasize automation, controlled environment, and less labor. Many of the former guidelines for formulating farrowing and marketing schedules are no longer relevant. Production takes place the year around and one group of hogs must compete with another group for limited and costly production facilities. The input mix has changed considerably which has affected the structure of production costs. With systems designed for year around production and grade and yield pricing the economic optimum marketing weight may have shifted significantly. Prices paid for live hogs do not uniformly and accurately reflect carcass qualities and do not give clear signals to hog producers to improve quality. Production practices and the hog cycle causes intra- and inter-year fluctuations leading to marketing inefficiency and high costs. Procurement operations, size and location of processing plants, and merchandising are made more difficult and costly by the poor vertical coordination in the system.

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[1] Production and Marketing of Swine on Iowa Farms, Project 1854 and Hog-Pork Industry, Project 1822, both of the Iowa Agriculture and Home Economics Experimental Station.

Specifically, the major objectives of the large study which are related to this thesis are:

1. To obtain more reliable information about the input mix farmers are employing for swine production by system.
2. To study the most efficient combination, both as to type and capacity, of alternative facilities for farrowing, growing, and finishing market swine and maintaining the breeding herd.
3. To determine if farmers in different areas of the state receive different prices for hogs and to measure magnitudes and time lags of any existing price differentials.
4. To determine improvements in efficiency, in returns to capital and labor and in prices to farmers and consumers that could be achieved by improved vertical coordination.

One phase of this larger study was a survey of hog producers relative to their production and marketing practices. Through the Statistical Laboratory, Iowa State University, a survey was made of approximately 500 hog producers in 1972. The sample was limited in geographic location and stratified by size of production system. (The details of the sampling procedures will be presented later.) This thesis analyzes the swine production data from the survey. Other studies of the marketing segments of the survey are being made as well as the combined production-marketing aspects.

The overall objective of this thesis is to characterize the present hog production industry in Iowa. Specifically, the areas to be analyzed are:

1. the farm organization and operation within which swine are produced,
2. sources of breeding stock, feeder pigs, breeding practices, farrowing patterns and pigs weaned,
3. building types and facilities used for swine including the degree of confinement, construction and operation,
4. swine health problems and preventitive and treatment practices,
5. feeding practices, sources of feed and how the feed is processed and handled,
6. source of swine labor and time requirements,
7. changes in the swine enterprise in the recent past and near future.

This study should provide direct benefits to hog producers as well as furnishing useful and necessary data for future studies. Farmers should benefit directly by a knowledge of production practices and trends common to different size categories of producers. It is not apparent that any production system or method is best for all producers. However, an inventory of current production practices will provide information needed by producers in their decision-making activities. An inventory of the current production practices will also provide an indication of producer response to changing economic conditions.

II. SIGNIFICANCE OF SWINE IN IOWA AGRICULTURE

A brief review of hog production in Iowa will be presented to give background to the study which follows. For a more complete description of swine production trends in Iowa see "Trends in the Quantity, Efficiency and Costs of Iowa Swine Production" by James and Beneke (8).

Pork production historically has played a significant role in Iowa's agricultural economy. Total cash receipts from swine reached a historic high in 1972 of $1,263.2 million for the 20.80 million head of hogs marketed (18). This represents 39.6 percent of the total cash receipts from livestock and 27.9 percent of all farm products sold by commercial farmers in 1972.

The expansionary trend of Iowa's pig crop has been characterized by year-to-year fluctuations. Excluding wartime expansion, the pig crop increased from approximately 15.5 million in the early 1940's to approximately 20.0 million by the mid-1950's. The pig crop has mildly fluctuated at the 20.0 million level from the mid-1950's to the present. Iowa's share of the U.S. pig crop has the same growth path as the state's pig crop. Iowa's share of the pig crop gradually increased from approximately 17.5 percent in the early 1940's to approximately 22.0 percent by the mid-1950's (16). It has remained at near 22.0 percent from the mid-1950's to the present. Indications are that Iowa will remain the leading producer of swine and that total swine production will gradually increase.

As Iowa's pig crop and share of the U.S. pig crop have expanded and then leveled off since 1940, the number of farmers and the percent of farmers producing swine has declined. In 1940, 85.0 percent of Iowa's

213,315 farmers produced swine. By 1969, only 59.5 percent of the state's 140,354 farmers produced swine. This represents a 54.0 percent decline in the actual number of hog producers over a 30 year period. The percent of farmers farrowing sows declined from 76.0 percent to 52.3 percent over the same time period. This represents a 54.9 percent decline in the actual number of farmers farrowing sows over a 30 year period.

The offsetting trend which enabled the pig crop to grow by approximately 4.5 million over this 30 year period was the increased number of sows farrowed per farm on the remaining farms which produced swine. The percent of producers farrowing less than 20 litters per year has declined from 51.8 percent in 1959 to 15.9 percent in 1969 (19). Over the same time period the percent of farmers farrowing 50 or more litters increased from 5.1 percent to 42.7 percent. The average number of sows farrowed per producer has increased from 14.0 in 1940 to 51.0 in 1972.

The seasonal variation in farrowing has declined over the past two decades. The traditional spring quarter pasture farrowing season between March and May accounted for 63.7 percent of Iowa's total farrowings in 1950. The winter quarter farrowing, December through February, accounted for only 4.9 percent. In comparison, the respective spring and winter quarter farrowing levels for 1973 were 36.5 percent and 18.1 percent (18). The summer and fall quarter farrowing levels have increased from approximately 15 percent each in 1950 to approximately 23 percent each in 1973.

The more uniform seasonal distribution of farrowing was made possible by the shift from pasture and open-lot production systems to semi-confinement and confinement production systems. Technological

developments have made possible the production of swine in environmentally controlled facilities during seasons of the year when the opportunity costs of labor are relatively low. Also, confinement production, coupled with larger production units, has reduced the total labor requirement per unit of production. Adoption of labor saving devices has been encouraged by the higher opportunity costs of labor during seasons of the year when crop demands are large.

The shift to confinement and winter farrowing has had the effect of raising the average production costs of hogs and shifting the proportion of fixed to variable costs. A larger share of the production costs are now fixed costs which causes farm producers to be less responsive to shifting prices. Hence, swine production levels will be maintained over wider fluctuations in the price of variable inputs and slaughter hogs. Multiple and continuous farrowing are an attempt by producers to spread fixed charges per unit of capacity over more units of production. Consistency in the flow of production requires a longer production planning horizon for a highly capitalized continuous farrowing operation than for a low capitalized pasture system. Producers to a greater extent have become locked into a level and system of production.

The year-to-year fluctuation in the pig crop has been on the decline for the past 20 years. Changing cost structures resulting from the move from seasonal pasture production to year-round confinement production is felt to be a contributing factor to this greater stability in production.

III. STATISTICAL CONSIDERATIONS

This chapter discusses the sampling procedure used to collect the data for this thesis and the estimation techniques used to make population estimates. A farm survey using a multistage stratified random sampling procedure was conducted to obtain the production and marketing data from Iowa swine producers. This sampling procedure has two parts. A multistage sampling procedure clusters the geographic location of the sample units in an attempt to reduce sampling costs (23). A stratified random sampling procedure has three parts (14):

1. Strata: A subdivision or grouping of the population by a common characteristic such as size,

2. Random: A random sample is drawn independently in each strata,

3. Weighting: Estimates of population parameters require special weighting procedures when the sampling fractions differ between strata.

The multistage sampling procedure and the three stages of the stratified random sampling procedure incorporated in this survey are briefly described in this section. Following the discussion of sampling procedures a brief presentation on segmenting the sample into size classes and calculating variations will be presented.

A. Sampling procedure

The population for the study consisted of all farm operators in Iowa who were recorded in the 1970 state farm census as having sold some hogs in 1970. From this population a sample of operators was selected for interview, the sample operators were contacted, asked whether or not they had marketed any butcher hogs in 1971, and interviews were completed for

those answering affirmatively to this question. Thus, the population from which the sample was drawn consisted of those farm operators who in addition to being recorded in the 1970 state farm census as hog producers, also sold butcher hogs in 1971.

1. Multistage sampling procedure One-third of the 99 counties in the state were first selected with equal probability. In order to assure that the sample counties were scattered throughout the state, the counties were ordered geographically and a systematic sampling scheme used--every nth county on the list was sampled. Each sample county was then divided in 12, 16, or 20 subareas corresponding roughly to townships. One-fourth of the subareas in each sample county were selected to draw the sample from, again with equal probability and in a systematic manner.

This multistage sampling procedure was utilized to save on the cost of travel associated with the field interview. It is recognized that this procedure may tend to yield less new information per interview to the extent that the producers in a given township or county tend to follow the same production practices. Only the first producer provides completely new information. This loss of information is avoided in simple random sampling where each observation is independently drawn. Geographical arrangement of the counties prior to selecting the sample counties was an attempt to minimize this type of information loss while at the same time minimizing interviewing costs.

2. Stratified random sampling procedure Stratification is commonly employed in sampling where the population is heterogeneous. Forming strata in these cases is an attempt at dividing the population into parts, each of which is more homogeneous than the whole. This procedure is expected to gain precision over simple random sampling.

a. Dividing the population into strata (1) For the 33 sample counties, the total number of operators reporting sales of hogs in 1970 was broken down into 14 strata based on the number of hogs reported as sold. An estimate of the total number of hogs sold was obtained for each strata by multiplying the midpoint of the strata by the number of operators in the strata. The 14 size strata were then consolidated into 7 size strata as specified in Table 3.1.

Table 3.1. Strata for grouping operators by the number of swine marketed in 1970

Strata	Hogs Marketed[a]
1	1-99
2	100-249
3	250-349
4	350-499
5	500-999
6	1000-2499
7	2500 and over

[a]Hogs marketed was defined to include all slaughter hogs, feeder pigs, and breeding stock.

b. Random sample from each stratum (1) About 500 total interviews were desired to provide an adequate sample size for each strata. Since the interviewing was to take place approximately one year after the list of operators was compiled, allowance was made for the fact that some operators may have died, moved away, gone out of business, etc. in the meantime. Allowance was made also for other anticipated non-responses because of refusals, insufficient information to locate operator, inability to find operator at home, and the like. Consequently, it was decided to draw about 600 names. Rather than sample at a uniform rate, the 600 names were allocated to the 7 strata as follows (Table 3.2):

1. All 20 operators in stratum 7 in the sample counties were included in the survey.

2. The remaining 580 were allocated to the remaining 6 strata in proportion to the estimated total numbers of hogs sold in 1970. Since this procedure would have resulted in a very small sample from stratum 1 (which, although fairly large in terms of number of operators, was small in terms of number of hogs sold), the sample size in this stratum was doubled. The allocations to the other 5 strata were reduced accordingly.

The selection of sample operators from strata 1 through 5 was then limited to the selected sample subareas. Because of the small number of operators in stratum 6, it was not possible to follow this procedure in that stratum; consequently, the sample operators in stratum 6 could be located anywhere within the sample counties. The same was true of the operators in stratum 7.

Table 3.2 summarizes the results of the sampling and field work. To be eligible for the interview it was necessary for the operators to have sold hogs during 1971.

Table 3.2. Summary of the results of field survey work

Strata	Total number of operators (state farm census 1970)	Number of names selected	Number eligible for interview	Number interviewed
1	17,236	48	37	36
2	24,302	111	99	84
3	10,072	84	76	71
4	8,026	98	93	82
5	7,940	170	159	148
6	1,397	68	63	56
7	61	20	15	12
	69,034	599	542	489

c. Establishing the weighting system for use in calculating the population coefficients Since the sampling fractions differed in each strata, estimates of population parameters require special weighting procedures. The basis for weighting was established on the estimated number of eligible operators per size group for 1971. This figure was calculated for each size group by dividing the respective number of operators eligible for the interview (Table 3.2, column 3) by the number of names selected (Table 3.2, column 2). The resulting percentage was

multiplied by the respective total number of operators, as reported in the 1970 state farm census (Table 3.2, column 1) to get the estimated number of eligible operators for 1971 (Table 3.3, column 1).

The operator strata weights (the estimate of the average number of producers per producer interviewed (Table 3.3, column 2)), was calculated by dividing the estimated number of eligible operators per strata for 1971 (Table 3.3, column 1) by the respective number of operators on which an interview was completed (Table 3.2, column 4). The resulting operator strata weights are presented in Table 3.3, column 2.

Table 3.3. Estimated number of eligible operators, producer weighting and hog weighting per strata

Strata	Estimated no. of eligible operators (1971)	Estimate of the average no. of producers per producer interviewed (wj)	Estimate of the average no. of hogs per eligible operator (state farm census) (uj)
1	13,286	369.1	88.771
2	21,675	258.0	217.646
3	9,113	126.6	302.362
4	7,617	92.9	411.475
5	7,426	50.5	606.892
6	1,294	23.5	1066.482
7	46	3.8	2386.250
	60,457		

The estimated number of hogs marketed in each strata for each eligible operator likewise was obtained from the 1970 state farm census (Table 3.3, column 3).

Sample respondents retain their farm census designated weight for all estimates made of the population from the sample. For example, each sample respondent classified as a member of stratum 1 at the time the sample was taken was estimated to represent 369.1 of the state's hog producers each of which was estimated to have marketed 88.771 of the state's hogs, regardless of his actual level of production.

The above procedure was used to estimate the percent of the state's producers and hogs by strata as presented in Table 3.4. For example, each eligible producer classified in stratum 1 is estimated to represent .6111 percent of the state's producers and to have marketed .1841 percent of the state's hogs.

Table 3.4. Estimated percent of the state's producers per producer interviewed per strata, and estimated percent of the state's hogs per producer interviewed and per strata

Strata	Est. % of state's producers per producer interviewed	Est. % of state's producers	Est. % of state's hogs per producer interviewed	Est. % of state's hogs
1	.6111	22.000	.1841	6.628
2	.4271	35.880	.3155	26.504
3	.2096	14.881	.2151	15.271
4	.1538	12.611	.2148	17.613
5	.0836	12.374	.1722	25.487
6	.0389	2.179	.1408	7.886
7	.0063	.075	.0510	.611
		100.000		100.000

Implicit in the weighting procedure is an adjustment for nonresponse which assumes that, with respect to the characteristics under investigation, those selected in the sample but who declined to cooperate in the study did not differ as a group from those who did cooperate. The overall rate of nonresponse was approximately 10 percent.

B. Segmentating the sample into homogeneous size classes

For the purpose of analyzing the sample data the respondents were grouped by the number of slaughter hogs they marketed in 1971 rather than on the basis of the total hogs marketed as reported for the 1970 Census. Producer segmentation by number of hogs marketed is an attempt to determine if production unit size affect input mix and production techniques. Since the survey dealt with 1971 production practices, segmentation was done on 1971 marketings. Other schemes for segmenting the sample into homogeneous units (such as land tenure, number of sows farrowed, and type of buildings) may be used in subsequent studies. The only requirement in segmenting the sample is that each respondent retain his assigned weight. Following this procedure enables the researcher to make inferences about the population.

The respondents were grouped into six size classes according to the number of hogs marketed in 1971. The term, strata, is reserved for reference to sample selection. The six size classes of slaughter hogs marketed are presented in the first column of Table 3.5 with the number of respondents per size class in column 2. Each size class has respondents from several strata. Each respondent was assigned his designated

strata weight for calculating the estimated percent of Iowa producers and estimated percent of Iowa hogs marketed per size class.

Table 3.5. Sample segmentation into six size classes according to 1971 slaughter hogs marketed

Slaughter hogs marketed in 1971	Number of sample respondents (n_j)	Estimated No. of Iowa producers	Estimated Percent of Iowa producers	Estimated percent of Iowa hogs marketed
0-99 (1)	47	12,436	20.6	10.9
100-249 (2)	114	22,445	37.1	27.8
250-350 (3)	67	8,272	13.7	14.8
350-500 (4)	70	7,291	12.1	14.9
500-999 (5)	134	8,105	13.4	23.8
1000+	57	1,852	3.1	7.8
Total	489	60,401	100.0	100.0

Two general table forms are used throughout the balance of this presentation. The first table form is used where the response to a question is broken down into categories. Examples include yes or no responses and breakdowns into special practices being followed; i.e., building flooring types are divided into several materials used. These responses normally can be expressed as percentages or proportions of the population. This table form presents these producer weighted percentages or proportions (P_{jk}) for each size class according to the response categories. The overall producer weighted proportion (f_j) and the overall hog weighted proportion (r_j) for each category are also presented. Table 3.6 is a typical presentation of this table form.

Table 3.6. Typical table form of producer weighted percentage breakdowns of responses by size class, total producers and total hogs marketed

		Response Categories			
Slaughter hogs marketed in 1971		1	2	C	K
1-99	(1)	P_{11}	P_{12}	P_{1c}	P_{1k}
100-249	(2)	P_{21}	P_{22}	P_{2c}	P_{2k}
1000+	(3)	P_{61}	P_{62}	P_{6c}	P_{6k}
All Iowa hog producers		f_1	f_2	f_c	f_k
Standard error		a_1	a_2	a_c	a_k
All Iowa hogs		r_1	r_2	r_c	r_k
Standard error		b_1	b_2	b_c	b_k

P_{jk} = producer weighted proportion of farmers in the j-th size class whose answer to a particular question is classified in category k; j = 1, 2, ..., 6; k varies with question

f_c = estimated proportion of hog producers in Iowa whose answers would be category c

r_c = estimated proportion of hogs produced in Iowa whose answers would be category c

a_c = standard error of all Iowa hogs producers

b_c = standard error of all Iowa hogs

The formulas used for calculating these proportions are presented in Appendix A. These formulas incorporate the weights assigned to each producer in accordance with strata designation at the time the sample was taken. The overall producer weighted proportions (f_c) shall be labeled "All Iowa hog producers" and the overall hog weighted proportions (r_c) shall be labeled "All Iowa hogs" in the following appropriate tables as in Table 3.5.

The second typical table form used to present producer weighted mean responses and corresponding standard errors for each size class, for all producers and for all hogs is shown in Table 3.7. This table form is used when the producer's response to a survey question was quantitative; i.e., building capacity or total number of acres farmed.

Table 3.7. Typical table form of sample mean response with corresponding standard error by size class, producers and hogs marketed

Slaughter hogs marketed in 1971		Mean	Standard error
1-99	(1)	A_1	m_1
100-249	(2)	A_2	m_2
.			
.			
.			
1000+	(6)	A_6	m_6
Overall mean/farmer		A. .	m
Overall mean/hogs		b. .	

A_j = estimated weighted mean of producers in size class j; j = 1, 2,...6
m_j = estimated standard error of the mean for producers in size class j
A. .= estimated weighted mean for all Iowa hog producers
m = estimated standard error for the overall mean/farmer response
b. .= estimated weighted mean per hog produced in Iowa

The formulas used for calculating these proportions are presented in Appendix A. These formulas incorporate the weights assigned to each producer in accordance with the strata designation at the time the sample was taken. Labeling of the appropriate tables will follow the system set forth in Table 3.7.

C. Calculating standard error for sample proportions

A proportion can take on any of an infinite number of values from 0 to 1. Therefore, the probability that a proportion equals any specific value is (1/infinity) = 0. The standard error of a proportion for each response category is easy to calculate. The observations can be considered as those falling into the category of interest and those not falling into the category of interest. Therefore the standard error is independently tabulated for each category.

Let f_c be the overall producer weighted proportion falling in category c (Table 3.5). The standard error of f_c is:

$$a_c = \sqrt{\frac{f_c\ (1-f_c)}{n}} \qquad (3.1)$$

where n is found by summing the number of observations in each size class, and will typically equal 489, the number of respondents in the sample. The standard error of the overall producer weighted proportion shall be labeled "Standard error" in the appropriate tables as in Table 3.6. The standard error can be used for calculating a confidence interval for f_c. A α level confidence intervals for the true value of the proportion is:

$$f_c \pm Z\alpha \sqrt{\frac{f_c\ (1-f_c)}{n}} \qquad (3.2)$$

where Z_α is the normal deviate for confidence level α. Using this procedure we are $(1-\alpha)$ 100 percent certain that the population proportion of hog producers within the specified category is within the calculated interval. For a 95 percent confidence interval "Z_α" is equal to 1.96.

The same procedure will be used to calculate the standard error for the overall hog weighted proportion of responses falling in category c (r_c in Table 3.6). These standard errors shall be labeled "Standard error" in the following appropriate tables.

The same procedure could also be used to calculate standard errors for the producer weighted size class proportions (P_{jk} shown in Table 3.6). Caution need be taken to adjust "n" in equation 1 to "n_j".

D. Calculating standard error for sample means

A sample mean is the average response given by the group interviewed. The three sample means calculated in this study are presented in Table 3.7. They are the producer weighted mean response per size class ($A_j.$), the overall producer weighted response (A. .) and the overall hog weighted response (b. .). The sample means cannot be expected to equal the population means exactly. Therefore, it is necessary to calculate the sample error to be reasonably confident in making inferences about the population.

One expression of the sample error is the standard deviation. The standard error of the means can be calculated by dividing the standard deviation by the square root of the number of observations in the mean. The notation for the standard error of a producer weighted size class mean would be:

$$m_j = \frac{s_j}{\sqrt{n_j}} \qquad (3.3)$$

s_j = standard deviation of the mean for producers in size class j.

n_j = number of respondents in the j th size class whose answer to a particular question was included when calculating the j th size class mean and standard deviation.

The notation for the standard error of the overall producer weighted mean would be:

$$m = \frac{s}{\sqrt{\sum_{j=1}^{6} n_j}} \tag{3.4}$$

s = standard deviation of mean of all Iowa hog producers.

Standard errors for producer weighted size class means and the overall producer weighted mean shall be labeled "Standard error" in the following appropriate tables as in Table 3.7. The standard error can be used for calculating a confidence interval for the population means. A α level confidence interval for the true value of the mean is:

$$A_j. \pm t_{nj-1,\alpha} \cdot \frac{s_j}{\sqrt{n_j}} \tag{3.5}$$

where $t(n_j - 1), \alpha$ is the calculated "student t" value with $n_j - 1$ degrees of freedom at the α level of significance.

IV. CHARACTERISTICS OF IOWA HOG OPERATIONS (13)

In 1971 the typical Iowa hog producer was 48.5 years old, operated about 327 acres of land, and sold 286 slaughter hogs which provided nearly 40 percent of his gross farm sales (Table 4.1). Compared to this typical producer and to smaller producers, larger hog producers were younger, operated more acres, and relied on their larger hog enterprises to provide a higher percentage of their higher gross farm sales.

A. Gross farm sales from all products

For producers in all six size categories the hog enterprise was an important source of gross farm sales, but it was especially important for producers in the larger size categories. Table 4.2 shows gross farm sales from all products for Iowa hog producers in 1971, when hog prices on the interior market averaged about $18.00 per cwt. About 50 percent of all producers had gross sales of $29,999 or less and gross farm sales was closely related to the size of the hog enterprise. Most hog producers in the lower gross sales categories had small hog enterprises and most in the higher categories had large hog enterprises. Almost 70 percent of the hog producers in size class 1 had gross sales of less than $20,000 while sales of all products exceeded $100,000 for more than 58 percent in size class 6.

Large hog producers relied heavily on their hog enterprises to achieve these high levels of gross farm sales. Table 4.1 shows that for the average producer the hog enterprise provided 39 percent of gross farm sales, but for larger producers hogs provided over half of gross farm

Table 4.1. Characteristics of different sized Iowa hog operations, 1971

Slaughter hogs marketed in 1971	Average no. of butcher hogs sold[a]	Average acres operated	Percentage of gross farm sales from hogs	Average age of producers	Average years education[b]	Percentage of Iowa producers represented	Percentage of Iowa hogs represented
1-99 (1)	56	234	22	53.5	10.0	20.6	10.9
100-249 (2)	168	309	37	49.8	10.6	37.1	27.8
250-349 (3)	295	371	39	48.5	11.2	13.7	14.8
350-499 (4)	418	308	50	43.8	11.2	12.1	14.9
500-999 (5)	626	395	54	43.1	11.4	13.4	23.8
1000+ (6)	1390	744	52	41.8	11.7	3.1	7.8
Overall mean/ farmer	291	327	39	48.5	10.8		
Standard error	13.8	10.0	1.6	.52	.24		

[a]Sales during calendar year 1971.

[b]First grade and beyond.

Table 4.2. Gross farm sales from all products

Slaughter hogs marketed in 1971	Less than $10,000	$10,000 to $19,999	$20,000 to $29,999	$30,000 to $39,999
	-percent-			
1-99 (1)	25.2	44.2	15.9	6.4
100-249 (2)	6.3	21.6	27.3	19.2
250-349 (3)	--	14.5	21.8	13.8
350-499 (4)	--	7.2	37.0	23.3
500-999 (5)	--	1.8	7.5	25.1
1000+ (6)	--	5.0	--	1.3
All Iowa hog producers	7.7	20.5	21.8	16.5
Standard error	1.2	1.8	1.9	1.7

$40,000 to $49,999	$50,000 to $59,999	$60,000 to $69,999	$70,000 to $79,999	$80,000 to $99,999	$100,000 or more
			-percent-		
1.0	1.8	--	1.8	--	3.2
8.2	5.7	4.1	2.8	--	5.0
18.2	2.7	9.5	6.2	2.7	10.6
10.4	10.5	2.6	2.1	2.8	4.2
14.0	17.9	7.2	4.6	10.9	10.8
6.7	6.7	2.5	11.8	7.8	58.1
9.1	6.7	4.2	3.5	2.4	7.7
1.3	1.1	.9	.8	.7	1.2

sales. The largest size class of producers also relied heavily on cropping activities to attain high levels of gross farm sales. These producers operated more than twice the number of acres as the typical producer and almost 350 acres more than any other size class.

The success that producers in the larger size categories had in achieving high levels of hog production and gross farm sales cannot be attributed to age and experience. But, education may play a part. Table 4.1 shows that for the most part larger producers were younger and more highly educated than smaller producers. They also had less experience both as farmers and as hog producers than smaller producers. The average age of Iowa hog producers, 48.5 years, was exactly the same as the average age of all Iowa farmers reported in the 1969 census of agriculture (22).

These younger and larger producers are a minority of Iowa's hog producers, but they produce a majority of the hogs. From Table 4.1 it is apparent that the nearly 21 percent of the producers who are in the smallest size category, produce less than 11 percent of the hogs. On the other hand, producers in the largest three size categories represent less than 29 percent of the producers, but they produce more than 55 percent of the hogs.

B. Source of hogs for slaughter

Table 4.3 shows that more than 20 percent of all producers and, respectively, almost 40 and 30 percent of the smallest and largest producers did not farrow any of the hogs they sold for slaughter in 1971. Instead, they purchased feeder pigs or (as with almost 10 percent of the smallest size class) reduced their 1970 inventory of hogs on hand. In

Table 4.3. Source of hogs for slaughter

Slaughter hogs marketed in 1971	Percent of producers farrowing sows	Feeder pigs: % of producers: Purchasing feeder pigs	Feeder pigs: % of producers: Selling feeder pigs	Feeder pigs: Mean no. of feeder pigs: Purchased[a]	Feeder pigs: Mean no. of feeder pigs: Sold[b]
	-percent-				
1-99 (1)	60.3	29.8	10.0	74	239
100-249 (2)	78.0	29.8	14.3	132	151
250-349 (3)	88.5	30.0	8.2	231	79
350-499 (4)	90.7	25.4	12.3	244	190
500-999 (5)	91.4	24.7	15.0	380	91
1000+ (6)	71.3	34.6	20.4	934	228
All Iowa hog producers	78.9	25.8	12.6		
Standard error	1.8	2.0	1.5		
Overall mean/ farmer				204	158
Standard error				19.7	14.3

[a]Producers not purchasing feeder pigs excluded.

[b]Producers not selling feeder pigs excluded.

1971, Iowa was a net importer of feeder pigs. About 29 percent of the producers in the state purchased feeder pigs, and the average producer bought about 204 pigs. On the other hand, only 13 percent of the producers sold feeder pigs. The average number sold was about 158.

C. Farming operations

Characteristics of the farming operations of hog producers are summarized in Table 4.4. About 33 percent of the hog producers operated all the land they owned but no additional land (complete owner-operators). About 31 percent of the producers rented all of the land they operated (complete renters), and about 36 percent operated both owned and rented land. Approximately 8 percent of the producers leased some land to others.

Table 4.4 shows the average number of different crops grown by producers in each of the size categories. The four crops considered (corn, soybeans, oats, and hay or rotated pasture) the average number grown by producers in the first size category was 3.0. The average number of cropping activities per size class fluctuated without a size class trend being apparent. The average producer devoted about 40 percent of the land he operated to corn, and nearly all hog producers raised corn. About 60 percent of the producers raised soybeans, and on the average these producers devoted about 25 percent of their land to soybeans.

The average number of livestock enterprises the typical hog producer engaged in was 2.6, or 1.6 in addition to hogs. Table 4.4 shows that the largest producers had fewer livestock enterprises and the smallest hog producers had more livestock enterprises than the typical

Table 4.4. Characteristics of farming operations of Iowa hog producers, 1971

Slaughter hogs marketed in 1971	Percentage of producers: Complete owner-operators	Complete renters	Combination owner-renters	Average number of: Crop enterprises[a]	Livestock enterprises[b]
1-99 (1)	43.3	27.7	29.0	3.0	2.8
100-249 (2)	35.8	32.3	31.9	3.3	2.7
250-349 (3)	16.9	34.9	48.2	3.1	2.6
350-499 (4)	35.2	33.0	31.8	3.1	2.6
500-999 (5)	22.6	31.6	45.8	3.2	2.6
1000+ (6)	37.1	14.5	48.4	3.3	2.4
All Iowa hog producers	33.0	31.1	35.9		
Standard error	2.1	2.1	2.2		
Overall mean/ farmer				3.2	2.6

[a]Crop enterprises counted were corn, soybeans, oats and hay or rotated pasture.

[b]Livestock enterprises counted were hogs, dairy cows, beef cows, sheep, and cattle feeding.

hog producer. Half of the Iowa hog producers fed cattle, 45 percent had beef cow herds, 29 percent had dairy herds, and 15 percent had sheep enterprises. Beef cows, dairy herds, and sheep were most important among small hog producers. The largest producers were the most heavily involved in cattle feeding.

V. CHARACTERISTICS OF THE FARROWING OPERATION

This section analyzes the farrowing phase of hog production. Producers not farrowing sows in 1971 were excluded in most calculations. Thus, the figures which follow showing percentages and means (averages) relate to the subgroup of producers who were involved in both farrowing and finishing phases of hog production.

A. Characteristics of producers farrowing sows

About 80 percent of the farmers surveyed farrowed pigs. More of the producers in size classes 3, 4, and 5 than producers in size classes 1, 2, and 6 were involved in both farrowing and finishing phases of hog production (Table 5.1). As the number of slaughter hogs marketed increased the following observations were apparent: (1) producers increased the number of litters farrowed per year; (2) the average number of pigs weaned per litter increased; (3) producers farrowed more times per year; and (4) pigs were weaned at a younger age.

The average number of pigs weaned per litter by the farmers surveyed was 7.5. Producers in the size class 6 weaned one more pig per litter than producers in the size class 1. Size class 2, accounting for 25.5 percent of the total farrowings, had an average weaning age of 7.0 weeks compared to size class 5, accounting for 30.0 percent of the total farrowings, which weaned pigs at 5.7 weeks of age. The smallest size class of producers averaged farrowing sows less than two times per year. This indicates that a portion of these producers only farrowed one time per year. The typical producer farrowed sows in three months of the year.

Table 5.1. Characteristics of Iowa hog enterprises which farrowed sows, 1971

Slaughter hogs marketed in 1971	Producers farrowing sows	Average no. of litters farrowed[a]	Standard error	Percent of total litters farrowed
	(percent)			
1-99 (1)	60.3	16.0	3.02	5.1
100-249 (2)	78.0	35.0	2.13	25.5
250-349 (3)	88.5	46.5	2.85	14.4
350-499 (4)	90.7	55.6	2.90	15.5
500-999 (5)	91.4	96.3	3.32	30.0
1000+ (6)	71.3	170.0	11.88	9.5
All Iowa hog producers	78.9			
Standard error	1.8			
Overall mean/ farmer		50.0		
Standard error			2.06	

[a]Producers not carrying on a farrowing operation excluded.

Average no. of pigs weaned/litter	Average no. of mo. in which sows were farrowed[a]	Average age pigs weaned	Standard error
		(weeks)	
6.9	1.7	6.3	.32
7.0	2.8	7.0	.17
7.6	3.2	6.4	.22
7.6	3.4	6.1	.15
7.6	4.9	5.7	.13
7.9	6.4	5.5	.16
7.5	3.2	6.3	.08

A seasonal breakdown of farrowing patterns is presented in Table 5.2. The seasonal breakdown reveals that: (1) almost 75 percent of all producers farrowed in the Spring; (2) Spring farrowings accounted for nearly one-third (31.6) of the total farrowings with Fall the second highest period with 23.5 percent; (3) farmers in class 1 had over 75 percent of their total farrowings in the Spring and Summer quarters while producers in classes 5 and 6 had about 25 percent of their total farrowings in each quarter; (4) a large portion of producers in the classes 5 and 6 farrowed in every season (approximately 80 percent); (5) the average number of litters farrowed in each season per producer farrowing was about 22; and (6) the average number of pigs weaned per litter was largest in the Winter quarter when the smallest percent of size classes 1 and 2 farrowed sows which typically had a low average pigs weaned per litter.

B. Confinement farrowing and pig nursery facilities

Farrowing in confinement included any arrangement other than pasture or brush farrowing. This could be farrowing in complete confinement or partial confinement buildings or in small individual pens. Over 88 percent of the producers farrowing sows had some confinement farrowing (Table 5.3). More of the large producers (those marketing 250 or more slaughter hogs) than smaller producers had confinement farrowing.

Producers were asked to specify the method of providing confinement farrowed sows feed and water. Approximately 74 percent of the smallest size class, compared to approximately 16 percent of the largest size class, who did confinement farrowing, provided all feed and water for sows inside the pen (Table 5.3). The proportion of producers providing

Table 5.2. Seasonal farrowings and litter size[a]

Slaughter hogs marketed in 1971	Percent of producers farrowing	Percent of total farrowings	Average no. litters[b]	Average litter size
	Spring: March - May			
1-99 (1)	60.0	43.2	11.5	6.6
100-249 (2)	79.4	36.3	15.9	7.3
250-349 (3)	66.8	31.4	22.2	7.4
350-499 (4)	69.3	34.8	24.3	7.7
500-999 (5)	80.9	25.2	30.1	7.6
1000+ (6)	88.2	28.9	55.6	7.7
All Iowa hog producers	74.8	31.6		
Standard error	2.1	2.3		
Overall mean/ farmer			22.2	7.4
	Fall: September - November			
1-99 (1)	23.3	11.6	8.0	6.6
100-249 (2)	60.0	21.6	12.6	7.1
250-349 (3)	72.6	29.2	19.0	7.5
350-499 (4)	64.6	22.7	19.6	7.7
500-999 (5)	80.3	24.1	29.1	7.7
1000+ (6)	96.1	25.1	44.3	8.0
All Iowa hog producers	60.8	23.5		
Standard error	2.4	2.1		
Overall mean/ farmer			19.3	7.5

[a]Producers not carrying on a farrowing operation excluded.

[b]Average for producers farrowing in specified quarter.

Summer: June - August			
Percent of producers farrowing	Percent of total farrowings	Average no. litters[b]	Average litter size
44.9	33.0	11.8	7.3
54.6	29.1	18.6	6.7
54.2	20.0	17.3	7.9
55.4	24.3	24.4	7.4
76.5	25.1	31.7	7.6
85.3	24.0	47.7	7.8
57.4	25.5		
2.4	2.2		
		22.2	7.3
Winter: November - February			
10.8	12.2	18.2	7.2
31.1	13.0	14.5	7.0
48.4	19.4	19.0	7.6
51.3	18.2	19.8	7.9
81.8	25.6	30.3	7.6
90.1	22.0	41.5	8.2
42.9	19.4		
2.5	2.0		
		22.6	7.6

Table 5.3. Confinement farrowing

Slaughter hogs marketed in 1971	% of producers farrowing some sows in confinement[a]	Confinement farrowed sows provided with:[b] All feed inside pen	No feed inside pen	All water inside pen	No water inside pen
				-percent-	
1-99 (1)	79.6	74.1	15.0	74.1	15.0
100-249 (2)	85.3	29.6	37.0	32.8	37.9
250-349 (3)	93.9	23.6	57.6	28.7	52.5
350-499 (4)	91.5	21.5	60.4	23.3	64.9
500-999 (5)	94.2	14.6	61.4	14.5	62.8
1000+ (6)	92.3	17.0	62.3	15.0	62.3
All Iowa hog producers	88.1	30.9	45.4	33.1	45.8
Standard error	1.5	2.4	2.6	2.5	2.6
Overall mean/ farmer					
Overall mean/hog					

[a]Producers not carrying on a farrowing operation excluded.

[b]Producers not farrowing in confinement excluded.

Table 5.3. Continued

Slaughter hogs marketed in 1971	Average no. of weeks pigs held in facility: With sow	Standard error	Without sow	Standard error
1-99 (1)	5.7	.32	2.8	.58
100-249 (2)	5.0	.19	2.3	.26
250-349 (3)	5.2	.23	3.2	.35
350-499 (4)	5.0	.21	2.8	.31
499-999 (5)	4.8	.15	1.7	.14
1000+ (6)	4.9	.17	1.5	.26
All Iowa hog producers Standard error				
Overall mean/ farmer	5.1	.01	2.5	.01
Overall mean/hog	5.0		2.2	

no feed and water to confinement farrowed sows increased as the number of slaughter hogs increased. No apparent size class trends were apparent for the approximately 22 percent of producers who provide feed and water both inside and outside the confinement farrowing pens.

Producers on the average kept confinement farrowed pigs in the confinement facility with the sow for 5.1 weeks and another 2.5 weeks after weaning. Producers in the smaller size classes tied up confinement facilities with each group of pigs longer than producers in the larger size classes (8.5 weeks for size class 1 compared to 6.4 weeks for size class 6).

Moving pigs from the farrowing unit into a nursery unit allows grouping of sows and/or their litters for efficiency of space and care. Pig nurseries were used by 14.7 percent of the producers carrying on a farrowing operation (Table 5.4). Larger producers used pig nurseries more often than smaller producers. The three largest size classes held sows in nursery facilities for a shorter period than the three smaller size classes. All size classes of producers kept pigs in nursery facilities after weaning for about 3.3 weeks.

C. Mating practices and rebreeding schedule for sows

Producers were asked to specify the system they used to mate sows. Lot mating was most commonly used. Over 95 percent of the producers turned their boar(s) in with a group of sows (Table 5.5). No size class trend was apparent. A total of 4.3 percent of the producers hand mated or combined hand mating with lot mating. No respondent specified artificial insemination as a breeding procedure.

Table 5.4. Pig nursery

Slaughter hogs marketed in 1971	Percent of producers using a nursery[a]	Average no. of weeks pigs held in nursery: With sow	Standard error	Without sow	Standard error
			-percent-		
1-99 (1)	13.8	3.4	.95	3.5	
100-249 (2)	8.8	3.1	.68	3.3	.30
250-499 (3)	18.7	3.2	.84	2.6	.67
350-349 (4)	14.4	2.1	.72	3.3	.25
500-999 (5)	21.4	2.3	.37	3.6	.41
1000+ (6)	39.9	1.3	.31	3.7	.35
All Iowa hog producers	14.7				
Standard error	1.9				
Overall mean/ farmer		2.7	.04	3.3	.04
Overall mean/hog		2.4		3.4	

[a]Producers not carrying on a farrowing operation excluded.

The scheduling system for farrowing was broken down into the three categories specified in Table 5.5. Approximately 50 percent of the producers who farrowed sows had a schedule that included fixed number of farrowing periods and litters. The other 50 percent adjusted their farrowing activities to prevailing conditions. Almost 17 percent of the producers maintained a fixed number of farrowing periods but adjusted the number of litters farrowed to prevailing conditions. The remaining 32.8 percent of the producers adjusted both farrowing periods and number of litters farrowed to prevailing conditions.

The sow rebreeding schedules of producers affects the number of farrowings per sow per year. Over 50 percent of the producers specified that sows were rebred on the first estrus after weaning (Table 5.6). Rebreeding on the second estrus was the second most frequent response with 28.3 percent. Very little size class variation was apparent after allowing for the 33.4 percent of the producers in the smallest size class that did not rebreed.

D. Source of sows

The primary source of sows for all size classes was the producers own herd. Producers carrying on a farrowing operation specified that 87.4 percent of the sows were selected from their own herd (Table 5.7). Sows originating from purebred and crossbred or hybrid herds respectively accounted for 1.4 and 9.3 percent of the producers' sow herds. In contrast to producers raising their own sows, only 4.5 percent of the state's boars originated from within the producers' swine herd. The major source of boars was purebred herds from which 68.5 percent of the boars originated.

Table 5.5. Mating practices and farrowing schedules[a]

Slaughter hogs marketed in 1971	Mating practice: Lot mating	Mating practice: Hand mating	Mating practice: Combination of lot and hand mating	Scheduling system for farrowing: Fixed farrowing periods and litters	Scheduling system for farrowing: Fixed farrowing periods but variable no. of litters	Scheduling system for farrowing: No. fixed farrowing periods or litters
				-percent-		
1-99 (1)	100.0	--	--	52.1	11.8	36.1
100-249 (2)	93.7	4.3	2.0	48.9	17.8	33.3
250-349 (3)	97.0	1.7	1.3	60.7	11.6	27.7
350-499 (4)	95.7	--	4.3	36.7	25.7	37.5
500-999 (5)	92.5	.7	3.6	54.3	16.1	29.7
1000+ (6)	93.8	.3	5.9	53.4	15.0	31.6
All Iowa hog producers	95.3	2.0	2.3	50.5	16.7	32.8
Standard error	1.0	.7	.7	2.5	1.8	2.3
All Iowa hogs	94.3	1.5	3.3	50.2	18.4	31.4
Standard error	1.1	.6	.9	2.5	1.9	2.3

[a]Producers not carrying on farrowing operation excluded.

Table 5.6. Rebreeding schedule of sows after weaning[a]

Slaughter hogs marketed in 1971	Do not rebreed	1st estrus	2nd estrus	3rd estrus	Space according to desired farrowing	Combinations[b]
			-percent-			
1-99 (1)	33.4	36.8	16.5	8.4	4.9	--
100-249 (2)	9.0	50.1	32.1	3.7	2.9	2.2
250-349 (3)	3.5	56.1	21.9	4.8	--	13.7
350-499 (4)	2.8	62.6	28.1	.8	1.4	4.3
500-999 (5)	3.7	51.3	38.6	--	1.4	5.0
1000+ (6)	1.8	54.0	23.8	1.8	--	18.6
All Iowa hog producers	10.1	50.9	28.3	3.6	2.3	4.8
Standard error	1.5	2.5	2.2	.9	.7	1.1
All Iowa hogs	7.0	53.5	29.3	2.6	1.8	5.8
Standard error	1.3	2.5	2.3	.8	.7	1.2

[a]Producers not carrying on a farrowing operation excluded.

[b]Combinations of first, second and third estrus.

Table 5.7. Source of breeding stock[a]

Slaughter hogs marketed in 1971	Sows			Boars		
	Raised in own herd	Purchased from purebred herd	Purchased from crossbred or hybrid herd	Raised in own herd	Purchased from purebred herd	Purchased from crossbred or hybrid herd
	-mean percent-					
1-99 (1)	93.7	--	6.3	--	56.3	43.7
100-249 (2)	87.2	.6	8.1	6.8	74.3	17.6
250-349 (3)	81.8	3.2	13.4	8.1	63.0	26.7
350-499 (4)	82.1	3.4	14.5	--	63.5	22.9
500-999 (5)	92.3	.7	5.5	2.7	70.2	24.6
1000+ (6)	78.2	3.6	17.9	6.5	79.6	13.9
All Iowa hog producers	87.4	1.4	9.3	4.5	68.5	23.7
Standard error	1.46	.45	1.29	1.00	2.26	1.90

[a]Producers not carrying on farrowing operation excluded.

Almost one-fourth of the producers used boars from crossbred or hybred herds.

E. Selling sows

Farmers follow various practices in selling their sows. Producers who had a farrowing operation were asked to specify the average percent of sows which were marketed after each farrowing over the past five years. The size class 1 sold 52.2 percent of their sows after only one farrowing (Table 5.8). This compares to an overall farmer weighted mean of 19.4 percent. Sows were most frequently kept for two farrowings with approximately one-third of the sows sold after the second farrowing. Producers in the size classes 5 and 6 tended to keep about 20 percent more of their sows for four or more farrowings than producers in size class 1 and 2. Producers in the third and fourth size classes split the difference by keeping approximately 30 percent of their sows for four or more farrowings.

Table 5.8. Mean percent of sows kept for specified number of farrowings only[a]

Slaughter hogs marketed in 1971	1st farrowing	2nd farrowings	3rd farrowings	4th farrowings	5th farrowings	6 or more farrowings
			-mean percent-			
1-99 (1)	52.5	24.9	5.3	7.3	4.4	5.6
100-249 (2)	18.9	32.2	24.8	11.8	4.0	8.3
250-349 (3)	5.6	43.0	20.9	19.7	6.3	4.4
350-499 (4)	11.1	32.7	24.3	15.3	4.0	12.5
500-999 (5)	9.7	35.2	16.9	20.8	2.6	14.9
1000+ (6)	10.4	30.5	14.3	20.2	14.1	10.5
Overall mean/ farmer	19.4	33.2	19.5	14.4	4.5	9.0
Standard error	.10	.12	1.0	.08	.05	.08
Overall mean/hogs	15.1	33.4	19.6	16.8	5.6	9.5

[a]Producers not carrying on a farrowing operation excluded.

VI. BUILDING AND FACILITIES USED IN PRODUCING HOGS IN IOWA

There is no particular building type or combination of buildings that dominates swine production on Iowa farms. However, there are some noticeable differences in the types of buildings and facilities used as the size of the swine enterprise increases. These uses and differences are the subject of this chapter.

A. Building type description

The following definitions were used to distinguish building types on the farms surveyed.

Total-confinement (T.C.) facilities enclose the swine inside a building with four sides and a roof. They are large enough to accommodate several sows and/or litters at a time and may be used for any part of the production process. Growing pigs generally are not allowed outside. The breeding herd may be moved outside one or more times per day for eating, drinking and waste disposal. These buildings are built or remodeled specifically for swine.

Partial-confinement (P.C.) facilities include open front buildings with a relatively small open lot attached to the front. They are designed to accommodate several sows and/or litters at a time and may be used for any part of the production process. They have been built or remodeled specifically for swine.

Unimproved facilities (U.F.) generally are older buildings such as barns or chicken houses which were not built or remodeled specifically

for swine but are being used for swine. Normally the swine run loose in an open lot attached to or enclosing the building.

Small houses at a permanent central location usually accommodate only one or two sows per house and are used for farrowing, although other uses are possible. Usually there is a small open pen which encloses the facility or is attached to the front. They may be located on concrete or the open ground.

Portable houses normally are used on pasture for sows and growing pigs. Farrowing houses usually are made for only one sow and her small litter. Larger houses and shelters are used for growing pigs and the breeding herd. During the colder months they may be moved to a central location.

B. Distribution of buildings per farmer

Table 6.1 summarizes the distribution of the above described buildings on surveyed farms by the size of the swine operation. Many farmers have more than one type of building.

The major thing to observe is the increase in total confinement and partial confinement facilities as the number of hogs marketed increases. Small permanent buildings account for only a small part of the buildings at all size levels. Portable buildings are important at all size levels. In fact, a larger percentage of the large producers had portable buildings than the small producers.

The percentages of all buildings used for swine by building type on Iowa farms are shown in Table 6.2. These figures do not show which building types were used in the production of the greatest number of hogs.

Table 6.1. Percentage of farmers in each size category with each type of buildings

Slaughter hogs marketed in 1971	Building Types							
				Permanent		Portable		
	T.C.	P.C.	U.F.	1-2 Sow	3 Sow	1 Sow	2 Sow	3 Sow
	-percent-							
1-99 (1)	41.4	33.4	57.4	--	8.0	3.4	11.0	21.1
100-249 (2)	45.2	55.6	60.3	7.2	7.1	9.7	11.0	30.9
250-349 (3)	55.2	46.7	72.5	1.5	7.6	16.5	9.7	31.1
350-499 (4)	52.3	68.6	67.7	1.7	11.3	25.4	1.4	33.1
500-999 (5)	57.3	73.2	72.5	4.2	7.3	25.7	8.9	37.3
1000+ (6)	55.3	63.1	52.1	--	8.2	21.5	6.5	45.0
All Iowa hog producers	48.5	54.0	63.7	3.6	7.9	13.7	9.2	30.4
Standard error	2.3	2.3	2.2	.8	1.2	1.6	1.3	2.1

Table 6.2. Distribution of buildings on Iowa farms by type of building

T.C.	P.C.	U.F.	Permanent	Portable		
			1-2-3 Sow	1-Sow	2-Sow	3-Sow
-percent-						
10.2	14.0	18.2	4.6	32.2	5.3	15.0

The percentage comparisons are as revealing as the total percentages. For example, there were 8 percent more unimproved facilities used than total confinement facilities. Since many farmers use a combination of building types a tabulation was made of the number of buildings on farms by size class (Table 6.3). Very few farmers used small permanent building types. Even though building numbers increased with the number of hogs marketed, the increase was not proportional. Larger buildings were used as hog numbers increased. Building capacities will be discussed later in this chapter. Even in the larger size categories small portable buildings were important for many operations. The average number of buildings of a specific type found on farms that had that type of building is shown in Table 6.4. For example, size 1 farmers that had total confinement facilities, on the average had 1.13 total confinement buildings. Table 6.6 indicates that this most often was a farrowing facility.

C. Building use

Some buildings were used for only one purpose such as farrowing or finishing, whereas other buildings were more flexible and used for more than one purpose such as farrowing and finishing. Farmers were asked to list the primary use and secondary uses of each building. Table 6.5 shows the average number of uses to which each building type was put by size of operation. It can be seen that building use becomes much more specialized as size increases. The exception to this was small permanent and portable types.

Table 6.3. Average number of buildings found on farms by farm size and building size group

Slaughter hogs marketed in 1971	Average no. of T.C., P.C., U.F. per producer	S.E.	Average no. of small permanent bldgs. per producer	S.E.	Average number of small portable bldgs. per producer	S.E.
1-99 (1)	1.68	.13	.11	.06	.91	.26
100-249 (2)	2.47	.10	.33	.09	2.29	.49
250-349 (3)	2.96	.19	.41	.19	3.09	.72
350-499 (4)	3.38	.18	.31	.15	5.88	1.43
500-999 (5)	4.14	.15	.50	.20	7.50	1.05
1000+ (6)	5.41	.39	.25	.18	9.23	3.37
Overall mean/ farmer	2.80		.31		3.46	
Standard error		.07		.06		.40

Table 6.4. Average number of specified buildings per producer which had that specified building type

Slaughter hogs marketed in 1971	Building Types							
				Permanent		Portable		
	T.C.	P.C.	U.F.	1-2 Sow	3 Sow	1 Sow	2 Sow	3 Sow
	-percent-							
1-99 (1)	1.13	1.24	1.39	--	1.4	3.0	3.4	2.1
100-249 (2)	1.24	1.51	1.78	2.3	2.3	11.0	3.3	2.8
250-349 (3)	1.68	1.86	1.61	4.0	4.5	11.1	3.7	2.9
350-499 (4)	1.28	1.77	2.22	2.0	2.4	18.5	5.0	3.4
500-999 (5)	1.60	2.10	2.32	7.6	2.6	20.4	6.3	4.7
1000+ (6)	2.25	2.88	4.51	--	3.1	28.5	7.8	6.0
Overall mean/ farmer	1.39	1.71	1.89	3.2	2.5	15.5	3.8	3.2

Table 6.5. Average number of all uses indicated per producer for each building

Slaughter hogs marketed in 1971	Building Types							
				Permanent		Portable		
	T.C.	P.C.	U.F.	1-2 Sow	3 Sow	1 Sow	2 Sow	3 Sow
	-percent-							
1-99 (1)	2.10	1.49	1.38	--	1.00	1.00	1.19	1.41
100-249 (2)	1.69	1.27	1.30	1.00	1.34	1.22	1.54	1.40
250-349 (3)	1.58	1.54	1.20	1.00	1.41	1.00	1.06	1.04
350-499 (4)	1.40	1.34	1.13	1.00	1.31	1.05	1.00	1.04
500-999 (5)	1.27	1.15	1.08	1.45	1.50	1.24	1.56	1.37
1000+ (6)	1.07	1.11	1.00	--	1.02	1.06	1.00	1.29
Overall mean/ farmer	1.58	1.25	1.22	1.07	1.28	1.14	1.37	1.29

Tables 6.6 through 6.12 show the primary uses and all uses of buildings by building type broken down by farm size. Most (over 94 percent) total confinement buildings (Table 6.6) were used primarily for farrowing and growing-finishing. Over 70 percent of the total confinement buildings were used primarily for farrowing. Very few farmers marketing less than 250 hogs (size class 1 and 2) used their total confinement buildings for the gestation herd or for a pig nursery. Gestation and pig nursery use was the most popular for size class 6 which used 5.9 and 11.5 percent, respectively, of their total confinement facilities for these uses.

Partial confinement usage comparisons (Table 6.7) did not follow the same patterns as did total confinement. The total percent of these facilities used for farrowing and growing-finishing was almost 90 percent. But the proportion used primarily for farrowing declined from 71.3 percent to 32.2 percent, and the proportion used primarily for growing-finishing increased from 22.4 percent to 57.1 percent. Primary use percentages and all use percentages were nearly the same for all size categories. This indicates that buildings at all size levels generally were used for only one purpose.

Unimproved facilities (Table 6.8) showed much the same usage patterns as partial confinement. Farrowing and growing-finishing, as primary usage, continued to include the bulk (almost 85 percent) of these facilities. The proportion used for growing-finishing increased to 68.1 percent. Use of these facilities for gestation purposes increased to 10.0 percent which compares to 1.7 percent for total confinement buildings

Table 6.6. Usage of total confinement buildings for swine by size group

Slaughter hogs marketed in 1971	Gestation	Farrowing	Pig Nursery	Growing & Finishing
		Primary use -percent-		
1-99 (1)	--	74.7	--	25.3
100-249 (2)	2.1	68.1	2.8	26.9
250-349 (3)	2.4	68.3	6.0	23.4
350-499 (4)	1.1	78.7	6.0	14.3
500-999 (5)	.7	75.3	7.0	17.0
1000+ (6)	5.9	60.7	11.5	21.7
All Iowa hog buildings	1.7	71.3	4.7	22.4
Standard error	.6	2.2	1.0	2.0
		All uses -percent-		
1-99 (1)	21.5	89.9	35.2	63.8
100-249 (2)	16.0	78.1	30.3	43.2
250-349 (3)	18.0	74.8	24.5	33.7
350-499 (4)	5.1	81.8	22.2	31.3
500-999 (5)	6.2	76.3	19.9	24.4
1000+ (6)	5.9	61.7	16.9	21.8
All Iowa hog buildings	13.5	78.4	26.3	38.3
Standard error	1.6	2.0	2.1	2.3

Table 6.7. Usage of partial confinement buildings for swine by size group

Slaughter hogs marketed in 1971	Gestation	Farrowing	Pig Nursery	Growing & Finishing
		Primary use -percent-		
1-99 (1)	.5	36.8	11.8	50.9
100-249 (2)	8.4	32.7	1.9	57.0
250-349 (3)	5.0	31.9	--	63.1
350-499 (4)	1.2	39.3	11.1	48.4
500-999 (5)	6.0	27.8	9.0	57.2
1000+ (6)	.8	18.5	2.3	78.4
All Iowa hog buildings	5.1	32.2	5.6	57.1
Standard error	.9	1.9	1.0	2.1
		All uses -percent-		
1-99 (1)	7.6	41.8	36.1	63.1
100-249 (2)	15.2	38.3	8.3	64.7
250-349 (3)	5.0	33.7	8.6	65.4
350-499 (4)	4.9	44.4	22.9	62.1
500-999 (5)	9.7	29.9	12.8	62.6
1000+ (6)	1.5	21.0	8.0	80.1
All Iowa hog buildings	9.5	36.2	14.3	64.7
Standard error	1.2	2.0	1.5	2.0

Table 6.8. Usage of unimproved facilities for swine by size group

Slaughter hogs marketed in 1971	Gestation	Farrowing	Pig Nursery	Growing & Finishing
		Primary use -percent-		
1-99 (1)	4.2	20.0	9.2	66.6
100-249 (2)	13.8	23.8	5.2	57.2
250-349 (3)	14.3	10.4	6.2	69.1
350-499 (4)	4.5	10.7	.9	83.5
500-999 (5)	8.9	13.1	5.4	72.6
1000+ (6)	13.0	2.2	4.6	80.3
All Iowa hog buildings	10.0	16.6	5.3	68.1
Standard error	1.2	1.5	.9	1.9
		All uses -percent-		
1-99 (1)	8.0	23.1	24.4	82.0
100-249 (2)	19.7	30.9	14.6	62.9
250-349 (3)	20.7	15.2	10.1	74.1
350-499 (4)	7.5	12.0	7.1	86.1
500-999 (5)	10.0	14.4	6.6	76.7
1000+ (6)	13.0	2.2	4.6	80.4
All Iowa hog buildings	14.1	20.5	12.3	74.1
Standard error	1.4	1.6	1.3	1.7

and 5.1 percent for partial confinement buildings. The most notable difference between primary use and all uses was for pig nurseries and growing-finishing facilities in size class 1.

For all portable facilities the primary usage percentages and all use percentages were so nearly alike that only the primary uses are shown (Tables 6.9, 6.10 and 6.11 for one-sow, two-sow and three-sow facilities, respectively). One-sow units are used almost exclusively for farrowing. As the size of the portable facility increase so does, also, the number of uses. Gestation and pig nursery uses were common for three-sow facilities. The usage pattern appears erratic particularly for two-sow facilities, probably because the number of observations was small.

Table 6.12 reports the results of the usage patterns of the six major building types indicated in the survey. Total confinement and one-sow portable facilities are used primarily for farrowing. Two-sow and three-sow or more portable buildings exhibited a more balanced usage pattern with heavier emphasis in use for farrowing and growing-finishing.

D. Building capacity

The capacities, measured by primary use, for total confinement, partial confinement and unimproved facilities are shown in Table 6.13. For all three types of facilities the capacities were much more uniform for farrowing than other uses. Also, a comparison of capacities for each size category show remarkably similar numbers. For example, the mean farrowing capacity for total confinement facilities was 14.7 compared to 13.6 for partial confinement and 14.5 for unimproved facilities. The size of the farrowing facility did not increase appreciably as the

Table 6.9. Primary usage of one-sow portable facilities for each size group

Slaughter hogs marketed in 1971	Gestation	Farrowing	Pig Nursery	Growing & Finishing
		-percent-		
1-99 (1)	--	100.0	--	--
100-249 (2)	--	100.0	--	--
250-349 (3)	--	100.0	--	--
350-499 (4)	--	90.4	6.8	2.7
500-999 (5)	8.0	76.2	--	8.7
1000+ (6)	18.6	75.5	--	--
All Iowa hog buildings	3.0	90.5	1.5	2.9
Standard error	.5	.8	.3	.4

Table 6.10. Primary usage of two sow portable facilities for each size group

Slaughter hogs marketed in 1971	Gestation	Farrowing	Pig Nursery	Growing & Finishing
		-percent-		
1-99 (1)	--	73.0	--	27.0
100-249 (2)	25.3	48.7	10.4	15.5
250-349 (3)	22.1	39.0	11.6	27.4
350-499 (4)	50.0	50.0	--	--
500-999 (5)	12.9	45.4	10.3	24.3
1000+ (6)	--	80.6	19.4	--
All Iowa hog buildings	17.0	53.5	8.0	20.6
Standard error	2.5	3.3	1.8	2.7

Table 6.11. Primary usage of three-sow or more portable facilities for each size group

Slaughter hogs marketed in 1971	Gestation	Farrowing	Pig Nursery	Growing & Finishing
1-99 (1)	--	37.3	14.1	38.8
100-249 (2)	14.8	36.9	11.7	36.3
250-349 (3)	24.4	48.9	1.8	25.0
350-499 (4)	36.1	41.3	4.6	18.0
500-999 (5)	27.8	15.5	14.3	42.4
1000+ (6)	45.7	30.1	.4	23.9
All Iowa hog buildings	20.9	35.2	9.5	32.9
Standard error	1.6	1.9	1.1	1.8

Table 6.12. Summary of primary uses of buildings used for swine production on Iowa farms

	Gestation	Farrowing	Pig Nursery	Growing & Finishing
		-percent-		
Total confinement	1.7	71.3	4.7	22.4
Partial confinement	5.1	32.2	5.6	57.1
Unimproved facilities	10.0	16.6	5.3	68.1
One-sow portable	3.0	90.5	1.5	2.9
Two-sow portable	17.0	53.5	8.0	20.6
Three-sow or more portable	20.9	35.2	9.5	32.9

Table 6.13. Capacity of large permanent buildings by primary use

Slaughter hogs marketed in 1971	Gestation Mean capacity	Farrowing Mean capacity	Pig Nursery Mean capacity	Growing & Finishing Mean capacity
		Total confinement		
1-99 (1)	--	11.5	--	122.5
100-249 (2)	6.0	13.9	134.1	145.5
250-349 (3)	12.0	13.1	174.7	99.5
350-499 (4)	50.0	16.3	173.4	101.9
500-999 (5)	30.0	17.0	138.3	222.8
1000+ (6)	69.5	21.2	391.5	310.7
Overall mean/ farmer	25.4	14.7	187.7	149.2
Standard error	9.38	.38	23.1	12.9
Overall mean/hogs	43.0	16.3	226.8	184.6
		Partial confinement		
1-99 (1)	20.0	8.5	87.7	76.8
100-249 (2)	25.8	11.1	191.4	130.0
250-349 (3)	20.6	16.1	--	154.7
350-499 (4)	40.0	14.4	166.2	153.2
500-999 (5)	47.0	17.2	162.3	171.0
1000+ (6)	108.3	22.2	150.0	217.0
Overall mean/ farmer	31.6	13.6	151.5	147.6
Standard error	4.04	.61	15.50	4.41
Overall mean/hogs	40.7	15.2	159.0	166.0
		Unimproved facilities		
1-99 (1)	13.0	14.0	60.8	125.7
100-249 (2)	25.4	12.4	112.7	109.3
250-349 (3)	29.3	15.3	120.1	154.2
350-499 (4)	47.0	14.6	250.0	141.2
500-999 (5)	37.8	20.8	124.1	169.2
1000+ (6)	56.9	18.0	197.6	192.7
Overall mean/ farmer	30.3	14.5	109.2	139.6
Standard error	2.25	1.09	11.80	4.00
Overall mean/hogs	36.5	15.8	130.1	149.4

number of hogs marketed increased. Most farrowing units housed under 25 sows with the most frequent size housing 16-20 sows.

The mean capacity for all building types typically increased as the number of hogs marketed increased. The overall mean/hogs was always greater than the overall mean/farmer. This is because the larger size categories accounted for the majority of hogs marketed whereas the majority of farmers were represented by the smaller sized categories.

VII. FLOORING, BEDDING, HEATING-COOLING AND WASTE DISPOSAL SYSTEMS FOR SWINE FACILITIES AT FIXED LOCATIONS

Farmers visited in the survey were asked to describe their buildings used for swine. This chapter describes the type of flooring installed, what bedding was used, how animal wastes were disposed of, and how the buildings were heated and cooled. Since these systems are related mostly to the large facilities at a fixed location, only total-confinement, partial-confinement and unimproved facilities will be discussed. The primary uses of these three building types are summarized in Table 7.1. Since over 85 percent of the uses for all three building types were for farrowing and growing-finishing only these two building uses will be discussed.

Table 7.1. Summary of the primary uses of total confinement, partial confinement and unimproved facilities

All Iowa hog buildings	Primary use			
	Gestation	Farrowing	Pig Nursery	Growing-Finishing
1. Total Confinement	1.7	71.3	4.7	22.4
2. Partial Confinement	5.1	32.2	5.6	57.1
3. Unimproved	10.0	16.6	5.3	68.1

A. Flooring

The principal material used for flooring was concrete for all buildings types (Table 7.2, 7.3, and 7.4). Total-confinement buildings had over 87 percent with concrete floors and over 8 percent with wood floors. The percentage comparisons among size groups varied some, but no trends were apparent.

The use of total-confinement buildings did appear to affect the type of flooring used (Table 7.2). Concrete flooring was more common in growing-finishing units than in farrowing units (93.7 percent versus 85.7 percent). Wood flooring was found in less than 1 percent of the growing-finishing facilities but in 10.7 percent of the farrowing facilities. Other floor types (dirt, steel or tile and other combinations) were in less than 5 percent of the remaining total-confinement buildings.

Even though the majority of partial-confinement buildings had concrete floors (over 75 percent) the percentage was less than for total-confinement buildings. Size did not appear to be a factor in the decision to use concrete floors. The percent of all partial-confinement buildings with wood floors (9.3 percent) was nearly the same as for total-confinement buildings (8.4 percent). Wood floors were more common in farrowing facilities than in growing-finishing facilities (18.6 and 4.2 percent, respectively (Table 7.3)). A larger percentage of partial-confinement buildings (13 percent) had dirt floors than did total-confinement buildings (2 percent). When growing-finishing was the primary use of the facility dirt floors were more common (16.0 percent) than wood floors (4.2 percent).

Table 7.2. Type(s) of flooring material used for large permanent total-confinement swine buildings

Slaughter hogs marketed in 1971	Flooring material				
	Concrete	Wood	Dirt	Steel or tile	Other combi-nations[a]
	Total-confinement buildings primarily used for farrowing				
			-percent-		
1-99 (1)	93.0	7.0	--	--	--
100-249 (2)	81.9	9.0	4.6	4.4	--
250-349 (3)	85.8	14.2	--	--	--
350-499 (4)	88.5	11.5	--	--	--
500-999 (5)	80.6	14.8	2.7	--	1.8
1000+ (6)	98.3	--	--	--	1.7
All Iowa hog buildings	85.7	10.7	1.9	1.3	.4
Standard error	2.0	1.8	.8	.7	.4
	Total confinement primarily used for growing-finishing				
			-percent-		
1-99 (1)	100.0	--	--	--	--
100-249 (2)	94.6	1.5	3.9	--	--
250-349 (3)	94.3	--	2.8	--	2.8
350-499 (4)	92.7	--	--	7.3	--
500-999 (5)	81.2	--	--	18.8	--
1000+ (6)	100.0	--	--	--	--
All Iowa hog buildings	93.7	.6	2.0	3.2	.6
Standard error	2.6	.8	1.5	1.9	.8

[a]Other combinations include: dirt and concrete; wood (slats) and concrete; concrete and tile; wood (slats) and steel.

Table 7.3. Type(s) of flooring material used for large permanent partial-confinement swine buildings

Slaughter hogs marketed in 1971	Flooring material				
	Concrete	Wood	Dirt	Steel or tile	Other combi-nations[a]
	Partial-confinement primarily used for farrowing				
	-percent-				
1-99 (1)	66.9	33.1	--	--	--
100-249 (2)	70.7	23.2	6.1	--	--
250-349 (3)	93.6	6.4	--	--	--
350-499 (4)	83.3	11.2	--	2.7	2.7
500-999 (5)	74.2	21.0	3.2	--	1.6
1000+ (6)	100.0	--	--	--	--
All Iowa hog buildings	77.3	18.6	2.7	.5	.8
Standard error	3.5	3.2	1.3	.6	.7
	Partial-confinement primarily used for growing-finishing				
	-percent-				
1-99 (1)	85.0	.9	14.1	--	--
100-249 (2)	71.5	6.2	18.2	2.4	1.7
250-349 (3)	78.8	4.4	16.8	--	--
350-499 (4)	78.8	3.0	18.1	--	--
500-999 (5)	73.9	4.1	14.8	2.2	5.0
1000+ (6)	87.8	1.0	6.4	--	4.9
All Iowa hog buildings	76.5	4.2	16.0	1.3	2.0
Standard error	2.2	1.0	1.9	.6	.7

[a]Other combinations include: dirt and concrete; wood (slats) and concrete; concrete and tile; wood (slats) and steel.

Table 7.4. Type(s) of flooring material used for large permanent unimproved swine buildings

Slaughter hogs marketed in 1971	Flooring material				
	Concrete	Wood	Dirt	Steel or tile	Other combi-nations[a]
	Unimproved buildings primarily used for farrowing				
			-percent-		
1-99 (1)	50.3	--	31.1	--	18.6
100-249 (2)	66.4	11.6	10.5	--	11.5
250-349 (3)	90.4	--	9.6	--	--
350-499 (4)	77.8	--	--	--	22.2
500-999 (5)	91.2	2.9	5.7	--	--
1000+ (6)	100.0	--	--	--	--
All Iowa hog buildings	70.7	6.0	12.2	--	11.1
Standard error	5.1	2.7	3.7	--	3.5
	Unimproved buildings primarily used for growing-finishing				
			-percent-		
1-99 (1)	37.7	14.8	39.7	--	7.8
100-249 (2)	38.5	4.7	50.8	--	6.0
250-349 (3)	63.2	3.6	27.2	--	6.0
350-499 (4)	48.7	3.8	34.5	--	12.9
500-999 (5)	61.3	2.1	25.5	3.9	7.3
1000+ (6)	70.9	4.1	23.7	--	1.4
All Iowa hog buildings	49.7	5.2	36.5	.8	7.7
Standard error	2.4	1.1	2.3	.4	1.3

[a]Other combinations include: dirt and concrete; wood (slats) and concrete; concrete and tile; wood (slats) and steel.

Only 54.1 percent of the unimproved buildings had concrete floors. The percentage with concrete floors increased as the number of swine marketed increased. Concrete floors were more often found in facilities primarily used for farrowing (70.7 percent) as compared to those primarily used for growing-finishing (49.8 percent (Table 7.4)). Nearly one-third (30.0 percent) of the unimproved buildings had dirt floors. This group of facilities was primarily used for growing-finishing purposes.

The percent of producers by size group, facility type and primary use that had slatted floors is shown in Table 7.5. Unimproved facilities by definition did not have slatted floors. Very few (less than 2 percent) of the partial-confinement buildings had slatted floors. Total-confinement building floors were mainly unslatted but the percentage with slats increased for producers marketing 350 or more hogs (size classes 4 to 6). Of those that had slatted floors most were partial (7 percent) and not complete (3 percent). Both partial and complete slatting was more commonly used in growing-finishing facilities (10.6 and 5.2 percent, respectively) than in farrowing facilities (5.5 and 1.1 percent, respectively). Over 50 percent of the total confinement facilities primarily used for growing-finishing were equipped with slats.

B. Bedding

Straw was predominantly the bedding material used but many other materials were used (Table 7.6, 7.7, and 7.8). Corn products (cobs and/or stalk combinations) were the second most used material. Straw only was used in 60.7, 73.2 and 76.9 percent of all the total-confinement, partial-confinement and unimproved buildings, respectively.

Table 7.5. Slatting of large improved permanent facilities

Slaughter hogs marketed in 1971	Total-confinement facilities Degree of slatting None	Partial	Complete	Partial-confinement facilities Degree of slatting None	Partial	Complete
	Facilities primarily used for farrowing					
	-percent-					
1-99 (1)	98.9	1.1	--	100.0	--	--
100-249 (2)	91.4	7.1	1.5	100.0	--	--
250-349 (3)	92.3	5.9	1.8	100.0	--	--
350-499 (4)	90.5	9.5	--	96.3	3.7	--
500-999 (5)	94.6	4.5	.9	100.0	--	--
1000+ (6)	94.1	2.2	3.6	100.0	--	--
All Iowa hog buildings	93.4	5.5	1.1	99.3	.7	--
Standard error	1.4	1.3	.6	.7	.7	--
	Facilities primarily used for growing & finishing					
	-percent-					
1-99 (1)	91.4	8.6	--	99.1	.9	--
100-249 (2)	100.0	--	--	98.8	1.2	--
250-349 (3)	100.0	--	--	97.9	2.1	--
350-499 (4)	47.8	44.8	7.3	100.0	--	--
500-999 (5)	45.7	25.4	28.9	99.2	--	.8
1000+ (6)	49.9	39.1	11.0	100.0	--	--
All Iowa hog buildings	84.2	10.6	5.2	99.0	.8	.2
Standard error	3.9	3.3	2.4	.5	.5	.2

Table 7.6. Type(s) of bedding used in large permanent total-confinement swine buildings

Slaughter hogs marketed in 1971	None	Straw	Cobs	Shavings or sawdust	Straw and cobs	Other combi-nations[a]
	Total-confinement primarily used for farrowing					
				-percent-		
1-99 (1)	.5	64.6	16.9	8.5	--	9.5
100-249 (2)	4.2	80.4	1.5	4.6	7.7	1.5
250-349 (3)	7.7	49.2	16.1	8.5	11.3	7.2
350-499 (4)	10.6	63.1	16.1	6.2	1.3	2.7
500-999 (5)	5.0	48.0	18.9	9.9	15.5	2.7
1000+ (6)	10.9	42.0	19.3	13.6	5.3	8.9
All Iowa hogs buildings	5.6	61.8	12.7	7.6	7.7	4.6
Standard error	1.3	2.8	1.9	1.5	1.5	1.2
	Total-confinement primarily used for growing-finishing					
				-percent-		
1-99 (1)	8.6	73.9	17.5	--	--	--
100-249 (2)	10.7	69.9	--	--	7.9	11.6
250-349 (3)	--	52.9	10.8	--	29.1	7.1
350-499 (4)	52.2	47.8	--	--	--	--
500-999 (5)	50.3	25.2	20.5	--	--	4.0
1000+ (6)	50.1	35.1	--	--	10.1	4.7
All Iowa hog buildings	19.1	57.3	7.9	--	9.2	6.5
Standard error	4.2	5.3	2.9	--	3.1	2.6

[a]Other combinations includes: cornstalks; indoor-outdoor carpet; straw and shavings; straw and cornstalks; straw and hay; straw and cobs and shavings; cobs and cornstalks; straw and cobs and cornstalks and hay; straw and fine sand.

Table 7.7. Type(s) of bedding used in large permanent partial-confinement swine buildings

Slaughter hogs marketed in 1971	None	Straw	Cobs	Shavings or sawdust	Straw and cobs	Corn-stalks	Other combi-nations[a]
	Partial-confinement primarily used for farrowing						
	-percent-						
1-99 (1)	--	86.4	--	--	13.6	--	--
100-249 (2)	12.8	63.0	12.8	--	11.4	--	--
250-349 (3)	--	79.8	15.7	--	4.5	--	--
350-499 (4)	--	59.1	7.6	13.1	20.2	--	--
500-999 (5)	--	41.8	14.9	13.2	22.6	--	7.5
1000+ (6)	8.4	65.2	8.4	8.4	--	--	9.7
All Iowa hog buildings	4.7	63.2	11.0	5.3	14.1	--	1.7
Standard error	1.7	4.0	2.6	1.8	2.9	--	1.1
	Partial-confinement primarily used for growing-finishing						
	-percent-						
1-99 (1)	--	85.9	--	14.1	--	--	--
100-249 (2)	4.7	82.8	5.9	--	6.5	--	--
250-349 (3)	3.2	82.3	4.2	--	7.4	--	2.9
350-499 (4)	5.7	81.2	2.4	--	6.1	--	3.4
500-999 (5)	3.5	72.6	10.8	--	7.6	2.8	.8
1000+ (6)	6.4	70.0	5.6	2.0	1.0	3.0	7.2
All Iowa hog buildings	4.1	79.6	5.7	1.4	5.8	.8	2.6
Standard error	1.0	2.1	1.2	.6	1.2	.5	.8

[a]Other combinations includes: cobs and shavings; straw and cornstalks; straw and hay; straw and cobs and shavings; straw and indoor-outdoor carpet; straw and cobs and cornstalks; cobs and cornstalks.

Table 7.8. Type(s) of bedding used in large permanent unimproved swine buildings

Slaughter hogs marketed in 1971	None	Straw	Cobs	Shavings or sawdust	Straw and cobs	Straw & corn-stalks	Other combi-nations[a]
	Unimproved facilities primarily used for farrowing						
	-percent-						
1-99 (1)	--	74.0	--	13.0	--	13.0	--
100-249 (2)	--	71.6	7.1	4.8	7.1	2.3	7.0
250-349 (3)	--	54.8	13.1	--	5.2	--	26.8
350-499 (4)	--	100.0	--	--	--	--	--
500-999 (5)	--	66.5	2.9	14.9	10.3	--	5.4
1000+ (6)	--	100.0	--	--	--	--	--
All Iowa hog buildings	--	72.9	5.0	6.9	5.4	3.4	6.5
Standard error	--	5.0	2.5	2.9	2.5	2.0	2.8
	Unimproved facilities primarily used for growing-finishing						
	-percent-						
1-99 (1)	1.4	81.3	7.8	--	--	3.9	5.6
100-249 (2)	2.0	88.9	--	--	6.0	2.2	1.0
250-349 (3)	2.0	71.1	6.0	--	6.8	13.7	.4
350-499 (4)	6.5	84.0	.6	--	5.7	1.6	1.7
500-999 (5)	.2	79.0	7.9	.5	2.6	2.3	1.5
1000+ (6)	2.7	66.8	20.9	1.4	--	1.4	6.8
All Iowa hog buildings	2.5	81.5	4.5	.2	4.3	3.9	3.2
Standard error	.7	1.9	1.0	.2	1.0	.9	.8

[a]Other combinations includes: hay; straw and shavings; cobs and shavings; cobs and cornstalks; straw and fine sand; straw and lime; straw and peat; straw and hay.

The percent of buildings using bedding decreased as the degree of confinement increased (90.0 percent for total-confinement compared to 98.3 percent for unimproved facilities). Also, the percent of buildings using bedding was negatively correlated with slatted floors. As the number of hogs marketed increased the percent using bedding decreased, particularly for total-confinement facilities primarily used for growing-finishing. Nearly half of these total-confinement buildings in size classes 4, 5, and 6 used no bedding.

Only minor substitutions of bedding materials was apparent when building types were broken down by primary use. Cobs were more commonly used in farrowing facilities while cornstalks were more commonly used in growing-finishing facilities.

C. Manure disposal

Many automated, semi-automated, and other labor saving systems have been developed for cleaning swine facilities. Despite this over 80 percent of the total-confinement facilities, 67 percent of the partial-confinement facilities, and 59 percent of the unimproved facilities in Iowa were cleaned by hand. Cleaning with tractors is more feasible in partial-confinement and unimproved facilities than in total-confinement facilities. Tractor cleaning accounted for 23 and 29 percent, respectively, of partial-confinement facilities and unimproved facilities.

The primary use of facilities (Table 7.1) greatly influenced the method of waste disposal. Cleaning by hand was more common in farrowing facilities than growing-finishing facilities (Tables 7.9, 7.10 and 7.11). The difference was near 20 percent for total-confinement facilities and

Table 7.9. Method(s) of disposing of manure for large permanent total-confinement swine buildings

Slaughter hogs marketed in 1971	Natural drain	Hand clean	Tractor clean	Holding pit	Hand and tractor clean	Other combi-nations[a]
	Total-confinement primarily used for farrowing					
	-percent-					
1-99 (1)	1.1	93.0	5.9	--	--	--
100-249 (2)	4.6	88.1	4.6	2.6	--	--
250-349 (3)	6.7	87.2	2.7	1.0	--	2.4
350-499 (4)	--	83.4	3.3	8.2	3.8	1.3
500-999 (5)	.9	82.0	4.5	3.1	7.2	2.2
1000+ (6)	.3	80.2	2.0	3.6	7.2	6.7
All Iowa hog buildings	2.9	86.5	4.2	2.8	2.3	1.4
Standard error	1.0	2.0	1.2	1.0	.9	.7
	Total-confinement primarily used for growing-finishing					
	-percent-					
1-99 (1)	--	73.9	17.5	8.6	--	--
100-249 (2)	--	84.4	7.9	--	7.7	--
250-349 (3)	--	83.0	17.0	--	--	--
350-499 (4)	7.3	47.8	--	44.8	--	--
500-999 (5)	8.0	21.4	18.5	27.7	20.5	3.7
1000+ (6)	10.9	9.4	14.3	24.3	4.7	9.4
All Iowa hog buildings	2.3	66.6	14.0	10.1	5.9	1.0
Standard error	1.6	5.0	3.7	3.2	2.5	1.1

[a]Other combinations include: natural drain and tractor clean; holding pit and aerobic lagoon; natural drain and hand clean; natural drain and hand clean and tractor clean; hand clean and holding pit; hand clean and floor drain with solids by hand; anaerobic lagoon; tractor clean and holding pit.

Table 7.10. Method(s) of disposing of manure for large permanent partial-confinement swine buildings

Slaughter hogs marketed in 1971	Natural drain	Hand clean	Tractor clean	Holding pit	Hand and tractor clean	Other combi-nations[a]
	Partial-confinement primarily used for farrowing					
			-percent-			
1-99 (1)	--	100.0	--	--	--	--
100-249 (2)	--	95.7	4.3	--	--	--
250-349 (3)	--	88.5	11.5	--	--	--
350-499 (4)	--	86.3	2.7	--	11.0	--
500-999 (5)	--	92.8	--	--	7.2	--
1000+ (6)	--	89.6	1.4	--	9.0	--
All Iowa hog buildings	--	92.7	3.6	--	3.7	--
Standard error	--	2.1	1.5	--	1.6	--
	Partial-confinement primarily used for growing-finishing					
			-percent-			
1-99 (1)	--	85.9	14.1	--	--	--
100-249 (20	3.6	68.1	24.7	1.2	2.4	--
250-349 (3)	1.1	44.4	37.3	2.1	15.1	--
350-499 (4)	--	44.9	43.8	1.2	10.1	--
500-999 (5)	1.1	46.4	37.1	.8	5.1	9.5
1000+ (6)	--	19.5	60.6	3.1	16.7	.2
All Iowa hog buildings	1.7	54.7	33.6	1.3	6.7	2.0
Standard error	.7	2.6	2.5	.6	1.3	.7

[a]Other combinations includes: natural drain and tractor clean; natural drain and hand clean; natural drain and hand clean and tractor clean; tractor clean and holding pit.

Table 7.11. Method(s) of disposing of manure for large permanent unimproved swine buildings

Slaughter hogs marketed in 1971	Natural drain	Hand clean	Tractor clean	Hand & tractor clean	Other combi-nations[a]
	Unimproved facilities primarily used for farrowing				
			-percent-		
1-99 (1)	31.6	26.0	18.6	18.6	5.1
100-249 (2)	--	86.5	2.3	11.2	--
250-349 (3)	--	68.0	26.8	5.2	--
350-499 (4)	--	100.0	--	--	--
500-999 (5)	5.8	76.3	--	17.9	--
1000+ (6)	--	50.0	50.0	--	--
All Iowa hog buildings	6.4	74.0	6.9	18.8	.9
Standard error	2.8	4.9	2.9	3.6	1.1
	Unimproved facilities primarily used for growing-finishing				
			-percent-		
1-99 (1)	3.9	52.9	42.5	--	.8
100-249 (2)	2.0	52.5	41.8	3.7	2.0
250-349 (3)	--	56.3	39.0	2.8	--
350-499 (4)	4.2	57.9	32.3	5.6	--
500-999 (5)	1.6	55.9	35.0	7.6	--
1000+ (6)	--	24.6	51.8	23.6	--
All Iowa hog buildings	2.2	53.8	38.6	5.0	.4
Standard error	.7	2.4	2.3	1.0	.3

[a]Other combinations includes: pasture; pasture and hand clean.

unimproved facilities and near 38 percent for partial-confinement facilities. Growing-finishing units were more often tractor cleaned than were farrowing units. For each building type tractor cleaning of growing-finishing units increased to nearly 50 percent as the size group increased. At the same time hand cleaning of these units decreased.

Between 1 and 3 percent of producers let their building facilities drain naturally without using any liquid holding systems. This did not change recognizably with facility or size of producer. Holding pits and lagoons were not used by many farmers. The percent using them did not increase greatly as the size of operation increased except for total-confinement facilities.

D. Heating

The primary use of facilities (Table 7.1) greatly influenced the kind and amount of artificial heating used in all three building types (Tables 7.12 and 7.13). Farrowing units were more often heated than were facilities used for other purposes. More than two-thirds of the total confinement facilities had some type of heating system. By comparison only about one-third of partial-confinement and unimproved facilities had heating systems. Over 75 percent of total-confinement and over 90 percent of partial-confinement and unimproved facilities used primarily for growing and finishing had no heating systems. As the size of the swine operation increased more total-confinement facilities primarily used for farrowing were heated. To a lesser degree this held for partial-confinement and unimproved facilities.

Table 7.12. Heating systems for large permanent total-confinement swine buildings

Slaughter hogs marketed in 1971	None	Heat lamp	Space heater	Furnace	Heat lamp & space heater	Heat lamp & furnace	Floor heat[a]	Catalytic	Infra red & infra ray	Other combi-nations[b]
	Total confinement primarily used for farrowing									
	-percent-									
1-99 (1)	42.7	13.0	38.4	--	5.9	--	--	--	--	--
100-249 (2)	30.4	25.8	12.7	8.3	16.8	4.6	.3	--	--	1.1
250-349 (3)	14.1	26.6	30.1	10.4	11.1	--	--	6.7	--	1.0
350-499 (4)	2.5	14.9	46.2	9.8	12.1	3.8	1.3	--	6.8	2.7
500-999 (5)	5.0	13.3	27.5	25.0	18.7	2.2	2.1	1.3	.9	3.9
1000+ (6)	.3	13.9	40.4	16.4	.6	10.9	10.6	--	3.4	3.6
All Iowa hog buildings	19.2	19.6	28.4	11.3	13.0	2.8	1.2	1.5	1.2	1.8
Standard error	2.3	2.3	2.6	1.8	2.0	1.0	.6	.7	.6	.8

[a] Floor heat includes: electric floor and hot water floor.

[b] Other combinations includes: heat lamps and space heaters and infra-red and infra-ray; heat lamps and gas-radiant heat; furnace and infra-red and infra-ray; heat lamps and furnace and hot water; heat lamps and space heaters and furnace; heat lamps and electric floor; space heater and infra-red and infra-ray; space heater and electric floor; heat lamps and space heaters and electric floor; furnace and electric floor.

Table 7.12. Continued

Slaughter hogs marketed in 1971	None	Heat lamp	Space heater	Furnace	Heat lamp & space heater	Heat lamp & furnace	Floor heat[a]	Catalytic	Infra red & infra ray	Other combi-nations[b]
	Total confinement primarily used for growing-finishing									
	-percent-									
1-99 (1)	82.5	--	17.5	--	--	--	--	--	--	--
100-249 (2)	65.8	22.5	3.9	7.9	--	--	--	--	--	--
250-349 (3)	92.0	--	8.0	--	--	--	--	--	--	--
350-499 (4)	35.5	--	64.5	--	--	--	--	--	--	--
500-999 (5)	88.2	--	9.9	--	--	--	1.9	--	--	--
1000+ (6)	64.8	--	18.8	10.9	--	--	.8	4.7	--	--
All Iowa hog buildings	74.5	8.2	13.2	3.5	--	--	.3	.3	--	--
Standard error	4.6	2.9	3.6	2.0	--	--	.6	.6	--	--

Table 7.13. Heating systems for large permanent partial confinement and unimproved swine buildings

Slaughter hogs marketed in 1971	None	Heat lamps	Space heaters	Furnace	Heat lamps and space heater	Other combi-nations[a]
	Partial-confinement primarily used for farrowing					
	-percent-					
1-99 (1)	33.1	53.3	13.6	--	--	--
100-249 (2)	43.4	21.3	18.8	--	16.5	--
250-349 (3)	30.8	29.5	31.8	2.3	--	5.7
350-499 (4)	34.6	48.8	7.2	4.2	5.2	--
500-999 (5)	16.9	5.5	49.2	10.4	13.2	4.8
1000+ (6)	23.5	--	68.1	--	4.2	4.2
All Iowa hog buildings	33.4	27.7	24.8	3.0	9.3	2.0
Standard error	3.9	3.7	3.6	1.4	2.4	1.2
	Unimproved facilities primarily used for farrowing					
	-percent-					
1-99 (1)	44.7	50.3	--	--	5.1	--
100-249 (2)	44.7	20.3	24.8	4.8	2.3	--
250-349 (3)	20.1	39.9	13.1	26.8	--	--
350-499 (4)	20.3	44.4	30.9	--	4.3	--
500-999 (5)	14.6	14.6	31.4	14.9	13.7	10.8
1000+ (6)	--	--	50.0	--	50.0	--
All Iowa hog buildings	36.7	28.8	21.2	6.9	4.8	1.6
Standard error	5.4	5.1	4.6	2.9	2.4	1.4

[a]Other combinations includes: hot water; gas-radiant heat; infra-red and infra-ray heat; catalytic; space heater and furnace; heat lamps and space heater and infra-red and infra-ray; heat lamps and furnace.

Heat lamps and space heaters were the principal means of heating swine facilities. Heat lamps were used more often than space heaters in partial-confinement and unimproved facilities but for total-confinement facilities space heaters were used more often than heat lamps. In no case did any heating system other than heat lamps, space heaters, furnaces or combinations of these three systems account for the heating system in more than two percent of the swine buildings.

E. Cooling systems

Cooling system data were collected for only improved permanent facilities (Tables 7.14 and 7.15). The results show that Iowa hog producers do not feel a great need for cooling systems. This was particularly the case in facilities primarily used for growing-finishing. Respectively, only 23.2 and 6.4 percent of the state's total-confinement and partial-confinement units primarily used for growing and finishing were equipped with a cooling system. For farrowing units the percentages are larger with 31.7 and 27.2 percent of total-confinement and partial-confinement facilities, respectively, with cooling systems. In the case of total-confinement facilities used for farrowing and growing-finishing, cooling systems were used increasingly more often as the number of hogs marketed increased.

For both total and partial-confinement facilities, the most often used mechanical cooling system was fan-forced air. This mechanism was used in approximately 84 percent of the total-confinement units and 93 percent of the partial-confinement units with cooling systems. Farrowing facilities with cooling systems were almost entirely fan cooled. Water

Table 7.14. Type(s) of cooling systems for large permanent total-confinement swine buildings

Slaughter hogs marketed in 1971	None	Fan-forced air	Water spray	Other combinations[a]
	Total-confinement primarily used for farrowing			
			-percent-	
1-99 (1)	83.3	14.6	2.1	--
100-249 (2)	77.7	22.7	--	--
250-349 (3)	65.1	28.2	4.9	1.8
350-499 (4)	56.9	40.6	2.5	--
500-999 (5)	63.1	36.0	--	.9
1000+ (6)	29.8	66.0	3.6	.6
All Iowa hog buildings	68.3	29.5	1.7	.5
Standard error	2.7	2.7	.8	.4
	Total-confinement primarily used for growing-finishing			
			-percent-	
1-99 (1)	91.4	8.6	--	--
100-249 (2)	88.3	7.9	3.9	--
250-349 (3)	50.5	20.7	28.9	--
350-499 (4)	92.7	--	7.3	--
500-999 (5)	63.8	17.4	14.8	4.0
1000+ (6)	64.0	35.2	--	.8
All Iowa hog buildings	76.8	12.8	9.8	.6
Standard error	4.5	3.6	3.2	.8

[a]Other combinations includes: refrigerated air, evaporation cooler, fan-forced air and water spray.

Table 7.15. Type(s) of cooling systems for large permanent partial-confinement swine buildings

Slaughter hogs marketed in 1971	None	Fan-forced air	Water spray	Other combinations[a]
	Partial-confinement primarily used for farrowing			
			-percent-	
1-99 (1)	100.0	--	--	--
100-249 (2)	64.7	35.3	--	--
250-349 (3)	78.5	21.5	--	--
350-499 (4)	83.6	16.4	--	--
500-999 (5)	62.4	36.9	--	.7
1000+ (6)	40.2	59.8	--	--
All Iowa hog buildings	72.8	27.0	--	.2
Standard error	3.7	3.7	--	.4
	Partial-confinement used for growing-finishing			
			-percent-	
1-99 (1)	96.5	--	3.5	--
100-249 (2)	93.6	6.4	--	--
250-349 (3)	92.6	7.4	--	--
350-499 (4)	98.8	1.2	--	--
500-999 (5)	90.8	5.5	2.9	.7
1000+ (6)	91.0	7.1	1.0	1.0
All Iowa hog buildings	93.6	5.2	1.0	.2
Standard error	1.3	1.2	.5	.2

[a]Other combinations include: refrigerated air, evaporation cooler, fan-forced air and water spray.

spraying devices were the only other cooling system popular among Iowa hog producers. This system was used in 9.8 percent of the state's total-confinement facilities primarily used for growing and finishing. Water spray systems were not used by the larger producers.

VIII. THE OCCURRENCE OF DISEASE ON IOWA HOG FARMS AND PREVENTATIVE PRACTICES

A. Swine diseases

Disease often robs the farmer of profits from his swine herd. Some diseases cause more difficulty than others. The survey respondents were asked to rank the diseases that gave them the most difficulty. The most difficult disease was given four points; second most difficult, three points; third most difficult, two points; and all other diseases one point. Few respondents encountered a large enough variety of diseases in the year surveyed to use the entire ranking system. The average number of diseases found on the survey farms by size category is shown in Table 8.1. The second column shows the percent of responses which were given a four rating. Producers with small swine herds generally experienced fewer diseases and thus the percentages are larger for these groups.

Tables 8.2 to 8.4 summarize the diseases found on the survey farms by size category. For each disease the percentage of occurrence and the difficulty index are shown. The bottom lines of the table present averages for all farms in Iowa. The first tabulation is on the basis of all farms that produce hogs and the second figure is on the basis of all hogs produced.

Diseases which affect only baby pigs and sows are shown in Table 8.2. The most troublesome baby pig diseases all cause diarrhea. They include scours, TGE, and dysentery. The average difficulty factors were near 3.3 for all three diseases. Disregarding gut edema, which was encountered by only 1 percent of Iowa producers, diarrhea associated diseases were rated

Table 8.1. The number of diseases ranked by the farmers as being important in the survey

Slaughter hogs marketed in 1971	Average number of diseases experienced per producer	Percent of diseases which were ranked 4[a]
1-99 (1)	1.06	59.1
100-249 (2)	1.76	43.1
250-349 (3)	1.47	38.2
350-499 (4)	1.86	33.8
500-999 (5)	1.72	36.1
1000+ (6)	1.94	34.4

[a]The disease giving the most difficulty was given a rank of 4 with the disease causing the second most difficulty ranked 3, etc.

0.4 higher than the next most troublesome disease category, and 0.6 higher than most all other diseases. This high ranking reflects the potentially high degree of death loss or sustained poor performance of baby pigs who come in contact with these highly contagious diseases.

Baby pig scours are infections caused by E. Coli, Salmonella, Vibris or Clostridia bacteria. This disease complex affected approximately 42 percent of farms producing baby pigs and received a difficulty index of 3.3.

TGE (transmissible gastro-enteritis) was encountered by 10.9 percent of Iowa pig producers or in the herds from which were marketed 14.2 percent of the hogs for slaughter. This highly contagious viral disease was much more prevalent for those producers marketing 1000 or more swine per year (size class 6). Producers gave TGE an average difficulty rating of 3.37 which is consistent with the potential of this disease to claim almost 100 percent mortality among pigs under 10 days of age.

Swine dysentery or bloody scours was reported to have given difficulty to about 8.9 percent of Iowa pig producers. Survey results showed this disease was as troublesome for small producers as for large producers.

The two most troublesome diseases to affect the sow herd were mastitis and SMEDI (Table 8.2). Mastitis, which may have included metritis and agalactia (MMA), was specified as the fourth most prevalent and fourth most difficult disease. This disease occurred in 27.3 percent of the herds from which were marketed 30.9 percent of the hogs for slaughter. Mastitis, when it did occur, was of major concern and appeared to be a more difficult problem for those producers marketing

Table 8.2. The occurrence of diseases which affect baby pigs on over five percent of the surveyed[a]

Slaughter hogs marketed in 1971	Baby Pig Scours		TGE		Swine Dysentary (bloody)	
	Percent of occurrence	Difficulty[b] rating	Percent of occurrence	Difficulty[b] rating	Percent of occurrence	Difficulty[b] rating
1-99 (1)	26.5	3.48	10.3	3.33	4.1	4.00
100-249 (2)	35.9	3.04	9.1	3.70	9.8	2.95
250-349 (3)	51.1	3.28	11.0	3.55	4.2	3.17
350-499 (4)	62.6	3.42	5.6	2.57	13.3	3.12
500-999 (5)	46.9	3.51	16.2	3.40	8.9	3.57
1000+ (6)	43.1	3.40	35.7	2.60	30.0	3.85
All Iowa hog producers	42.4	3.29	10.9		8.9	
Standard error	2.4		1.5		1.4	
All Iowa hogs	45.8		14.2		8.8	3.31
Overall mean/ farmer		3.29		3.37		3.35
Standard error		.06		.12		.20
Overall mean/ hogs		3.33		3.27		3.31

[a]Producers not carrying on farrowing operation excluded.

[b]The disease giving the most difficulty was given a rank of 4 with the disease causing the second most difficulty ranked 3, etc.

Table 8.2. Continued

Slaughter hogs marketed in 1971	Mastitis		SMEDI	
	Percent of occurrence	Difficulty[b] rating	Percent of occurrence	Difficulty[b] rating
1-99 (1)	4.1	3.67	5.2	3.88
100-249 (2)	29.8	3.33	14.2	1.84
250-349 (3)	26.7	2.57	13.5	3.64
350-499 (4)	36.7	2.86	14.9	2.26
500-999 (5)	35.3	2.51	6.7	2.67
1000+ (6)	35.4	2.73	9.4	1.81
All Iowa hog producers	27.3		11.5	
Standard error	2.2		1.6	
All Iowa hogs	30.9		10.3	
Overall mean/ farmer		2.96		2.46
Standard error		.09		.19
Overall mean/hogs		2.87		2.48

less than 250 hogs per year (size classes 2 and 1) than for those marketing 250 or more hogs per year (size classes 3 to 6).

The disease complex referred to as SMEDI (stillbirth, mummification, embryonic death and infertility) was encountered by 11.5 percent of pig producers. Occurrences by size groupings were variable with no trends evident. The difficulty rating for all farmers was 2.46 with no trends evidenced by size group.

Table 8.3 reports the survey results of diseases which may affect swine at all age levels. These diseases were divided into two groups--respiratory diseases and diseases which cause arthritis. The most troublesome respiratory diseases were pneumonia and atrophic rhinitis. Arthritic diseases causing the most difficulty were PPLO and Erysipelas.

Swine respiratory diseases have the potential to cause considerable death loss or poor performance in chronically infected animals. Included within the disease complex referred to as pneumonia is enzootic pneumonia (SEP), bacterial pneumonia, swine influenza, and verminous pneumonia. A second respiratory related disease is atrophic rhinitis. The shrinking of the nasal terminals which this disease causes is not a direct cause of death and does not result in loss of efficiency for the animal. The resulting loss from atrophic rhinitis is in the form of higher susceptibility of the respiratory system to infectious bacteria organisms. The lower difficulty factor associated with respiratory diseases reflects the lower percent of death loss encountered with respiratory diseases compared with diarrhea diseases and the greater difficulty of calculating losses caused by decreased feed efficiency compared with losses caused by death.

Table 8.3. The occurrence of diseases which affected swine of all age levels on over 5 percent of the farms surveyed

Slaughter hogs marketed in 1971	Respiratory Diseases			
	Pneumonia		Atrophic Rhinitis	
	Percent of occurrence	Difficulty[a] rating	Percent of occurrence	Difficulty[a] rating
1-99 (1)	19.5	3.47	--	--
100-249 (2)	25.3	2.89	15.1	3.39
250-349 (3)	27.9	3.19	13.7	2.58
350-499 (4)	34.6	2.73	21.8	2.54
500-999 (5)	38.1	2.50	21.2	2.92
1000+ (6)	33.6	2.44	21.5	2.05
All Iowa hog producers	27.6		13.7	
Standard error	2.0		1.6	
All Iowa hogs	29.3		16.7	
Overall mean/ farmer		2.90		2.95
Standard error		.09		.12
Overall mean/hogs		2.74		2.80

	Infectious Arthritis Diseases			
	PPLO (arthritis)		Erysipelas	
1-99 (1)	13.1	3.35	13.7	3.11
100-249 (2)	18.4	2.91	21.3	3.33
250-349 (3)	24.3	3.09	13.3	2.34
350-499 (4)	38.0	2.00	18.4	2.10
500-999 (5)	29.6	2.44	16.9	2.17
1000+ (6)	39.3	2.57	12.0	1.69
All Iowa hog producers	22.7		17.5	
Standard error	1.9		1.7	
All Iowa hogs	25.6		16.3	
Overall mean/ farmer		2.70		2.85
Standard error		.10		.12
Overall mean/hogs		2.63		2.66

[a]The disease giving the most difficulty was given a rank of 4 with the disease causing the second most difficulty ranked 3, etc.

Difficulty with pneumonia was encountered by 27.6 percent of Iowa's hog producers from which were marketed 29.3 percent of the hogs for slaughter. Producers in size class 1 indicated a slightly higher difficulty rating for the pneumonia complex than medium and larger scale producers. The difficulty rating was less than 3 for the groups marketing over 350 hogs (size classes 4 to 6).

Atrophic rhinitus affected 13.7 percent of Iowa swine herds from which 16.7 percent of Iowa's 1971 slaughter hogs were marketed. Producers marketing less than 100 slaughter hogs (size class 1) did not indicate any occurrence of this disease. The 15 percent for size class 2 who encountered this disease also specified a high difficulty rating of 3.4. The average producer difficulty factor was 2.95 compared to the hog weighted difficulty factor of 2.80.

The most troublesome of the diseases causing arthritis are PPLO (mycroplasma granularum) and erysipelas. PPLO causes slower and less efficient weight gains with only minor chronic effects after a short recovery period. Erysipelas can occur in three degrees of difficulty. Acute erysipelas generally results in sudden death of the animal. Subacute erysipelas is less severe than the acute stage and recovery generally follows. Chronic erysipelas results in enlargement of the joints, stiffness, and continued poor gain efficiency. Both types of arthritis result in condemnation of parts of carcasses and of whole carcasses. Another loss is the inefficiency of the animal while on feed. Except for the death loss, much of the economic loss associated with swine arthritis is hidden from the typical pork producer. This fact results in lower

difficulty ratings for arthritic diseases than for many of the other disease groupings.

PPLO was indicated as the third most prevalent swine disease. The disease was deemed a difficult problem by 22.7 percent of the pork producers or in the herds from which 25.6 percent of Iowa hogs were marketed. Occurrence was moderately higher for those producers marketing 250 or more hogs (size classes 3 to 6). The average level of difficulty of 2.70 reflects the tendency for the disease to be considered of secondary importance.

Erysipelas was encountered by 17.5 percent of Iowa's swine producers or in the herds from which 16.3 percent of Iowa hogs were marketed. The average difficulty factor was 2.85 for this disease. Producers marketing less than 250 hogs (size classes 1 and 2) tended to encounter greater difficulty than larger producers.

Table 8.4 reports diseases which affected less than five percent of the farmers surveyed. These diseases include leptospiroses, gut edema, brucelloses, and yellow pig disease.

B. Disease control

Farmers were asked about preventative practices and disease treatment. One preventative practice was to purchase disease-free breeding stock, commonly called SPF (specific pathogen free). The SPF program breaks the atrophic rhinitis and mycoplasma pneumonia cycles which respectively affected 13.7 percent and 27.6 percent of Iowa's 1971 swine producers. Table 8.5 reports the percent of producers in the survey who purchased part or all of their breeding stock from SPF herds. In 1971,

Table 8.4. Summary of diseases occurring on less than five percent of the farms surveyed.

Disease	Estimated occurrence for all Iowa hog producers	Estimated occurrence for all Iowa hogs	Average degree of difficulty[a]
	-percent-		
Leptospiroses	3.4	3.8	2.78
Gut edema	1.0	.8	3.55
Brucellosis	.2	.2	1.00
Yellow pig disease	.6	.2	1.00

[a]The disease giving the most difficulty was given a rank of 4 with the disease causing the second most difficulty ranked 3, etc.

7.7 percent of the state's producers purchased some or all of their breeding stock from SPF herds. This figure compares to 4.4 percent of the state's producers who purchased all SPF breeding stock. Those producers marketing 1000 head or more (size class 6) tended to use the SPF program to a much greater extent than other producers.

Baby pig anemia is not a disease but rather a symptom of iron deficiency. Farmers were asked about their anemia prevention program and the results are shown in Table 8.5. Nearly 80 percent of the farmers surveyed who farrowed sows followed an anemia prevention program. A higher percent of farmers with large herds followed an anemia preventative program than farmers with small herds.

Another disease preventative practice was the feeding of antibiotics in the ration. This will be discussed in Chapter 9 and is illustrated in Table 9.2. Table 9.2 shows the percent of farmers who fed antibiotics to their swine by age category. It is informative to observe in this chapter that the majority of farmers fed antibiotics to their swine at all age levels. Over 92 percent of the farmers fed antibiotics to their suckling pigs and nearly 60 percent were still feeding antibiotics when their pigs were being fed for marketing (finishing). Over 76 percent of the producers fed nursing sows antibiotics. There appeared not to be any trends in the use of antibiotics by size category.

The services of a veterinarian are used both for disease prevention and treatment. Visits of a veterinarian to the farm and of the farmer to the veterinarian are shown in Table 8.6. Less than 2 percent of Iowa's swine producers had a veterinarian visit their farm over 24 times in 1971. And, 38.0 percent of the farmers did not have a veterinarian visit at all.

Table 8.5. The percent of producers who purchased SPF breeding stock and who maintained an anemia prevention program[a]

Slaughter hogs marketed in 1971	Percent of producers purchasing part or all SPF breeding stock	Percent of producers pruchasing all SPF breeding stock	Percent of producers maintaining an anemia prevention program
	-percent-		
1-99 (1)	4.9	--	51.7
100-249 (2)	9.3	5.8	73.8
250-349 (3)	6.1	3.5	92.2
350-499 (4)	4.8	1.4	91.1
500-999 (5)	8.7	8.0	95.3
1000+ (6)	21.3	11.3	90.0
All Iowa hog producers	7.7	4.4	79.6
Standard error	1.3	1.0	2.0
All Iowa hogs	8.4	4.9	84.2
Standard error	1.4	1.1	1.8

[a]Producers not carrying on farrowing operation excluded.

Table 8.6. Percent of swine producers requiring the services of a veterinarian.

Slaughter hogs marketed in 1971	No. of times farmers took swine to veterinarian					Number of times a veterinarian made a swine related visit to the farm							
	0	1	2	3-5	6-8	0	1	2	3-5	6-9	10-14	15-24	25-60
	-percent-					-percent-							
1-99 (1)	97.2	--	2.8	--	--	64.6	12.0	16.2	.4	.4	--	--	--
100-249 (2)	91.7	5.5	2.8	--	--	40.0	10.3	16.8	15.1	7.0	7.2	3.2	.4
250-349 (3)	91.8	4.9	1.7	--	1.5	29.7	15.1	8.2	13.0	17.0	9.8	1.5	5.6
350-499 (4)	88.3	2.7	4.3	1.7	3.0	28.1	15.0	9.6	17.8	12.4	13.3	2.5	1.3
500-999 (5)	83.2	3.4	7.2	5.7	.6	17.3	5.4	16.1	19.3	18.6	11.4	8.1	3.9
1000+ (6)	80.2	10.8	5.1	2.5	1.3	12.2	15.2	8.8	30.7	13.5	11.2	5.5	2.9
All Iowa hog producers	90.9	3.9	3.5	1.1	.7	38.0	11.3	14.3	14.6	9.5	7.6	3.0	1.7
Standard error	1.3	.9	.8	.5	.4	2.2	1.4	1.6	1.6	1.3	1.2	.8	.6
All Iowa hogs	87.4	4.8	4.2	2.1	1.6	31.4	9.8	12.9	15.0	11.8	10.1	4.6	1.6
Standard error	1.5	1.0	.9	.6	.6	2.1	1.3	1.5	1.6	1.5	1.4	.9	.6

As swine herds increased in size, however, the number of visits by a veterinarian increased so that 87.8 percent of the farms marketing over 1000 hogs in 1971 (size class 6) had at least one visit by a veterinarian compared to 35.4 percent for size class 1. Even fewer farmers, about 10 percent, took their diseased swine to the veterinarian. This proportion increased to almost 20 percent for the size class 6.

Sow and/or feeder pig treatment for mange and lice was practiced by 79.5 percent of the state's swine producers (Table 8.7) having 84.1 percent of the state's hogs. Those producers marketing less than 250 head (size classes 1 and 2) had a 10 percent lower treatment level. Seventy-six percent of the producers carrying on a farrowing operation treated their sows for mange and lice while 74.5 percent of the producers treated their feeders for mange and lice.

A worming program for sows and/or feeders was practiced by 92.5 percent of the producers representing 93.8 percent of 1971 hog marketings (Table 8.7). Seventy-four percent of the producers carrying on a farrowing operation treated their sows for worms while 90.3 percent of the producers treated their feeders for worms.

Tabel 8.7. Percent of swine producers treating their swine for mange, lice and worms.

Slaughter hogs marketed in 1971	Treating swine for mange and lice		
	Percent treating sows and/or feeders	Percent treating sows[a]	Percent treating feeders
	-percent-		
1-99 (1)	72.4	71.7	66.1
100-249 (2)	74.8	71.9	69.1
250-349 (3)	87.8	84.0	86.1
350-499 (4)	85.4	76.0	82.0
500-999 (5)	86.9	79.6	81.7
1000+ (6)	91.6	81.1	83.6
All Iowa hog producers	79.5	75.7	74.5
Standard error	1.8	2.1	2.0
All Iowa hogs	84.1	78.2	77.2
Standard error	1.7	2.0	1.9

Slaughter hogs marketed in 1971	Worming swine		
	Percent worming sows and/or feeders	Percent worming sows[a]	Percent worming feeders
	-percent-		
1-99 (1)	79.7	64.4	75.3
100-249 (2)	95.1	74.4	92.9
250-349 (3)	96.9	72.9	96.9
350-499 (4)	96.5	78.5	95.8
500-999 (5)	95.7	76.5	94.2
1000+ (6)	95.5	86.7	93.0
All Iowa hog producers	92.5	73.8	90.3
Standard error	1.2	2.2	1.3
All Iowa hogs	93.8	77.1	92.5
Standard error	1.1	2.1	1.2

[a]Producers not carrying on farrowing operation excluded.

IX. SWINE FEEDING PRACTICES

The farmers surveyed were asked to describe the systems they used to process and handle the feed fed to their swine and the nature of the ration. The responses to these questions are summarized in this section.

A. Source and composition of feed

Most farmers (near 85 percent for growing-finishing pigs and 80 percent for sows) fed their swine a basic corn ration to which a supplement (including a premix) was added (Table 9.1). The other farmers fed a commercially prepared complete ration. Differences between size groups were inconclusive. However, the following differences were observed: (1) growing pigs were fed a higher percentage of commercially prepared feed than finishing pigs (19 percent compared to 12 percent); (2) suckling pigs were generally fed a commercially prepared feed (70 percent); and (3) about the same percentage of gestating sows were fed a commercial feed as nursing sows.

There were a few producers who did not feed a protein supplement to their swine (Table 9.1). This was only about 4 percent for growing-finishing swine and 8 to 9 percent for sows. Nonprotein rations were the most common for size class 1 where 17.4 and 27.4 percent of producers fed their gestating and nursing sows, respectively, nonprotein rations A higher proportion of producers in this size class also fed nonprotein rations to their growing and finishing pigs.

Nearly 90 percent of producers over all swine classes, included both vitamins and trace minerals in their feed (Table 9.2). For suckling pigs this percentage was near 95.

Table 9.1. Source of feed fed

Slaughter hogs marketed in 1971	Type of Swine				
	Sows		Pigs		
	Gestating[a]	Nursing[a]	Suckling[a]	Growing	Finishing
	-percent-				
	Producers feeding a complete ration prepared by a commercial business				
1-99 (1)	5.6	5.6	66.2	17.4	16.6
100-249 (2)	17.6	16.2	68.3	21.5	12.4
250-349 (3)	9.9	12.6	79.3	13.6	5.5
350-499 (4)	27.8	24.8	63.4	19.6	10.4
500-999 (5)	28.1	29.6	79.1	21.8	10.3
1000+ (6)	27.8	22.9	79.5	22.6	16.2
All Iowa hog producers	17.9	17.4	70.0	19.5	11.9
Standard error	1.9	1.9	2.3	1.8	1.5
All Iowa hogs	19.1	20.1	72.8	20.0	10.8
Standard error	1.9	2.0	2.2	1.8	1.4
	Producers feeding a ration of corn to which a supplement has been added.				
1-99 (1)	77.7	72.8	40.6	77.4	80.6
100-249 (2)	80.1	81.5	44.1	85.1	90.4
250-349 (3)	87.1	84.4	38.9	90.0	92.8
350-499 (4)	74.3	79.8	43.0	88.9	92.1
500-999 (5)	79.5	77.7	39.5	89.3	93.4
1000+ (6)	80.9	86.1	38.0	92.7	95.4
All Iowa hog producers	79.9	79.9	41.7	85.6	89.5
Standard error	2.0	2.0	2.4	1.6	1.4
All Iowa hogs	81.4	81.4	41.2	86.7	91.5
Standard error	1.9	1.9	2.4	1.5	1.3

[a]Producers not carrying on farrowing operation excluded.

Table 9.1. Continued

Slaughter hogs marketed in 1971	Type of Swine				
	Sows		Pigs		
	Gestating[a]	Nursing[a]	Suckling[a]	Growing	Finishing
	-percent-				
	Producers feeding only grain (mostly corn) and roughages of their swine				
1-99 (1)	17.4	27.2	4.9	6.7	9.3
100-249 (2)	7.2	8.7	3.7	4.0	4.0
250-349 (3)	3.0	3.0	1.3	2.7	2.7
350-499 (4)	4.1	2.9	2.2	2.0	2.0
500-999 (5)	8.7	6.8	.7	.6	.6
1000+ (6)	9.6	2.3	4.3	2.9	1.7
All Iowa hog producers	8.0	9.5	2.8	3.6	4.1
Standard error	1.3	1.5	.8	.8	.9
All Iowa hogs	4.2	4.6	1.2	1.9	1.9
Standard error	1.0	1.0	.5	.6	.6

Table 9.2. Producers who included a vitamin supplement and trace minerals in their feed

Slaughter hogs marketed in 1971	Type of Swine				
	Sows		Pigs		
	Gestating[a]	Nursing[a]	Suckling[a]	Growing	Finishing
	-percent-				
	Producers who included a vitamin supplement				
1-99 (1)	89.5	84.6	100.0	86.3	87.0
100-249 (2)	90.2	89.4	97.5	94.2	89.2
250-349 (3)	92.6	92.6	93.2	91.9	86.0
350-499 (4)	90.3	87.8	94.4	85.2	75.1
500-999 (5)	85.5	90.9	94.3	89.3	83.2
1000+ (6)	91.0	92.7	92.7	89.6	83.0
All Iowa hog producers	89.7	89.2	96.2	90.4	85.6
Standard error	1.5	1.5	.9	1.3	1.6
All Iowa hogs	90.2	90.7	95.7	90.1	85.9
Standard error	1.5	1.4	1.0	1.4	1.6
	Producers who include trace minerals in ration				
1-99 (1)	89.1	89.1	94.9	86.8	87.5
100-249 (2)	90.2	88.7	96.1	91.9	90.7
250-349 (3)	95.0	95.0	95.7	95.6	92.4
350-499 (4)	93.4	93.4	92.0	91.5	89.8
500-999 (5)	87.0	86.3	89.6	89.0	88.4
1000+	100.0	100.0	100.0	100.0	97.3
All Iowa hog producers	91.0	90.4	94.4	91.2	90.1
Standard error	1.4	1.5	1.1	1.3	1.4
All Iowa hogs	91.8	91.1	93.9	91.5	90.8
Standard error	1.4	1.4	1.2	1.3	1.3

[a]Producers not carrying on farrowing operation excluded.

Table 9.2. Continued

Slaughter hogs marketed in 1971	Type of Swine				
	Sows		Pigs		
	Gestating[a]	Nursing[a]	Suckling[a]	Growing	Finishing
	-percent-				
	Producers who included antibiotics in their feeding				
1-99 (1)	65.8	77.4	86.7	70.4	52.7
100-249 (2)	69.5	73.6	97.5	85.8	69.4
250-349 (3)	70.0	80.5	92.3	88.5	57.9
350-499 (4)	72.6	78.8	89.2	84.2	62.0
500-999 (5)	56.2	83.5	97.1	85.8	52.4
1000+ (6)	66.6	90.1	96.0	90.6	66.3
All Iowa hog producers	67.3	78.0	93.7	83.1	61.1
Standard error	2.3	2.1	1.2	1.7	2.2
All Iowa hogs	65.4	79.1	93.5	82.5	58.6
Standard error	2.4	2.0	1.2	1.7	2.2

Antibiotics were included in 94 and 83 percent of the rations for suckling and growing pigs, respectively (Table 9.2). This percentage dropped to near 60 for finishing hogs. Nursing sows received antibiotics 10 percent more often than gestating sows.

B. Feed handling and processing systems

Nearly 50 percent of producers fed their sows with an auger wagon or grinder mixer (Table 9.3). This percentage was near 80 for growing-finishing swine. In contrast only about 1 percent and 4 percent of producers fed their sows and growing-finishing pigs, respectively, with a system of conveyors and augers. The percent of producers using auger wagons and grinder mixers to feed growing-finishing swine gradually and consistently increased as the number of slaughter hogs marketed increased. The increased use of conveyors and augers was noticeable only for size class 6. For size class 6 approximately 15 and 12 percent of these producers respectively feed growing and finishing pigs with a system of conveyors or augers.

Whether or not farmers processed their own swine feed is shown in Table 9.4. Nearly 20 percent did not process their own feed. As the number of hogs marketed increased the percent that processed their own feed increased. Most farmers who processed their own feed owned the feed mill. Under 10 percent used custom operated mills. The percent that used custom mills did not change noticeably as size increased.

Most (70 percent of Iowa farmers producing swine) had their feed processed by portable feed mills (Table 9.5). Stationary feed mills

Table 9.3. Feed handling systems

Slaughter hogs marketed in 1971	Type of Swine				
	Sows		Pigs		
	Gestating[a]	Nursing[a]	Suckling[a]	Growing	Finishing
	-percent-				
	Producers who use a system of conveyers or augers				
1-99 (1)	--	--	--	1.1	1.0
100-249 (2)	--	1.3	--	2.7	2.9
250-349 (3)	3.0	4.3	3.0	3.3	5.9
350-499 (4)	--	.8	--	4.9	4.9
500-999 (5)	.7	1.3	1.4	6.2	5.8
1000+	.6	.3	.3	14.8	12.5
All Iowa hog producers	.6*	1.4	.7*	3.6	3.8
Standard error	.4	.6	.4	.8	.9
All Iowa hogs	.8*	2.1	1.0	5.9	6.1
Standard error	.4	.7	.5	1.1	1.1
	Producers who use an auger wagon or grinder-mixer				
1-99 (1)	46.8	46.8	45.6	72.0	71.2
100-249 (2)	53.5	51.2	54.0	78.0	78.0
250-349 (3)	44.3	51.8	43.9	82.1	81.6
350-499 (4)	37.3	46.3	47.1	85.2	85.9
500-999 (5)	49.0	49.9	42.0	89.9	90.2
1000+ (6)	75.4	77.1	51.3	92.7	95.4
All Iowa hog producers	48.7	50.5	48.2	80.3	80.2
Standard error	2.5	2.5	2.5	1.8	1.8
All Iowa hogs	51.0	54.0	48.0	83.8	84.8
Standard error	2.5	2.5	2.5	1.7	1.6

[a]Producers not carrying on farrowing operation excluded.

Table 9.4. Sources used for processing swine feed by size

Slaughter hogs marketed in 1971	Do not process own feed	Custom operated mill	Farmer operated mill	Custom & farmer-operated mills
		-percent-		
1-99 (1)	27.1	10.4	60.4	2.1
100-249 (2)	21.9	9.3	65.0	3.9
250-349 (3)	20.3	11.8	66.4	1.5
350-499 (4)	12.3	7.1	79.9	.7
500-999 (5)	12.0	8.2	78.9	.9
1000 + (6)	8.1	10.6	80.0	1.3
All Iowa hog producers	19.8	9.5	68.4	2.3
Standard error	1.8	1.3	2.1	.7
All Iowa hogs	17.3	9.6	70.4	1.7
Standard error	1.7	1.3	2.1	.6

Table 9.5. Mill types used to process swine feed

Slaughter hogs marketed in 1971	Stationary mill	Portable mill	Portable and stationary
		-percent-	
1-99 (1)	12.4	57.5	2.1
100-249 (2)	3.4	72.8	1.7
250-349 (3)	7.8	65.4	6.2
350-499 (4)	7.0	79.7	.7
500-999 (5)	7.6	77.8	2.7
1000+ (6)	8.7	81.9	1.3
All Iowa hog producers	7.0	70.5	2.4
Standard error	1.2	2.1	.7
All Iowa hogs	7.3	71.4	2.3
Standard error	1.2	2.0	.7

were used by only about 7 percent of Iowa swine producers. The distribution by size of swine operation of these mills on farms did not change appreciably.

C. Feeding practices

Some producers limit feed their swine as a means of controlling the lean to fat ratio of finished hogs or the size of sows. This practice was surveyed and the results are shown in Table 9.6. Less than 4 percent of producers limit fed their growing-finishing swine. On the other hand nearly 89 percent limit fed their gestating sows and 63 percent limit fed their nursing sows. There were no observable trends with respect to number of hogs marketed except for gestating sows. It appears that as the number of sows farrowed increased beyond the first size class the practice of limit feeding the gestating sows increased.

The practice of wet feeding is shown in Table 9.7. This practice was common for a few producers in the smallest size class. For all size groups this practice was more common for sows than for growing-finishing pigs.

D. Sources of corn fed to swine

Table 9.8 shows whether the corn fed to the swine was raised on the farm or purchased, by size of swine operation. For all hog operations nearly 51 percent purchased no corn at all and 74 percent purchased less than 40 percent of the corn they fed. Only about 5 percent purchased all of the corn they fed.

Table 9.6. Limit feeding of swine

Slaughter hogs marketed in 1971	Type of Swine				
	Sows		Pigs		
	Gestating[a]	Nursing[a]	Suckling[a]	Growing	Finishing
	-percent-				
1-99 (1)	78.4	52.5	28.7	8.9	8.4
100-249 (2)	90.7	66.9	19.0	2.8	3.9
250-349 (3)	84.1	57.7	14.1	3.1	3.1
350-499 (4)	95.3	68.4	19.3	3.5	--
500-999 (5)	92.9	65.1	12.7	.9	--
1000+ (6)	95.9	47.8	10.8	--	--
All Iowa hog producers	88.9	62.6	18.6	3.8	3.6
Standard error	1.6	2.4	1.9	.9	.8
All Iowa hogs	90.3	60.0	14.0	2.3	2.0
Standard error	1.5	1.2	1.7	.7	.6

[a]Producers not carrying on farrowing operation excluded.

Table 9.7. Wet feeding of swine

Slaughter hogs marketed in 1971	Type of Swine				
	Sows		Pigs		
	Gestating[a]	Nursing[a]	Suckling[a]	Growing	Finishing
	-percent-				
1-99 (1)	13.3	16.7	4.9	4.2	4.0
100-249 (2)	--	--	--	--	--
250-349 (3)	--	6.5	1.7	--	--
350-499 (4)	.8	6.1	--	--	.7
500-499 (5)	.3	1.0	1.6	.9	2.2
1000+ (6)	--	--	--	2.7	2.7
All Iowa hog producers	2.2	4.6	1.3	1.0	1.3
Standard error	.7	1.0	.6	.4	.5
All Iowa hogs	1.3	3.5	.9*	.9	1.4
Standard error	.6	.9	.5	.4	.5

[a]Producers not carrying on farrowing operation excluded.

Table 9.8. Percent of producers who purchased the corn which was fed to their swine

Slaughter hogs marketed in 1971	Percent of corn fed that was purchased						Mean percent of corn purchased by each size group for those purchasing corn	Standard error
	0	1-20	21-40	41-60	61-80	81-100		
	-percent-							
1-99 (1)	70.7	8.9	4.6	7.9	.2	7.9	14.0	4.07
100-249 (2)	44.2	17.6	8.9	17.9	3.1	8.2	23.7	2.94
250-349 (3)	57.8	7.0	11.2	13.0	6.1	5.1	20.6	3.67
350-499 (4)	43.6	20.0	13.0	11.6	4.8	7.0	22.6	3.56
500-999 (5)	42.6	19.0	7.7	16.0	7.8	7.0	25.9	2.65
1000+ (6)	32.6	13.1	9.8	27.1	9.4	8.1	33.3	4.11
All Iowa hog producers	50.9	14.7	8.7	14.5	3.9	7.4		
Standard error	2.3	1.6	1.3	1.6	.9	1.2		
All Iowa hogs	48.6	15.6	9.5	14.0	4.5	7.8		
Standard error	2.3	1.6	1.3	1.6	.9	1.2		
Overall mean/ farmer							21.7	1.38
Overall mean/ hogs							22.7	

Only small differences in the mean percent of corn purchased by the middle range of producers (classes 2 through 5) were apparent. As with the overall farmer and hog weighted mean, these size classes indicated they purchased about 22 percent of all corn fed to swine. The smallest and largest size classes purchased 14 and 33 percent, respectively, of the corn fed to their swine.

X. CHARACTERISTICS OF LABOR USED FOR SWINE PRODUCTION (10)

Farmers in the survey were asked to describe the labor used on their farms and the labor used with the swine herd. Their responses are reported in this section.

A. Farm labor sources

Many farm operators work on their farms only part-time while having one or more jobs off the farm. The farmers in this survey who worked off their farms are reported in Table 10.1. It can be seen for all Iowa swine producers that the percent of farm operators who worked off their farms full-time (40 or more hours per week) was 10.0 and part-time 16.0 (10 to 40 hours per week). Size classes 1 and 4, respectively, had 14.4 and 17.4 percent of their producers working full-time off the farm. Full time off-farm employment dropped to 4.0 percent for size class 6. Part-time off-farm work was defined to include doing custom work. The percent of producers doing part-time work did not show a size class trend. Excluding the 5.3 percent of size class 3 farmers who worked 52 weeks a year full-time off the farm, the average number of weeks spent working full-time off the farm declined as the number of hogs marketed increased. Farmers who worked off their farms full-time worked an average of only 12.2 weeks for those marketing over 1000 hogs per year (size class 6) compared to 40.4 weeks for those marketing 1-99 hogs (size class 1). Even though there was some variation in the pattern of full-time off-farm work as size increased, it is clear that as the number of hogs marketed

per year increased the weeks worked off the farm full-time declined. However, it does not appear that the average number of weeks worked off the farm by those working off the farm part-time decreased as the number of hogs marketed increased. The average number of hours farm operators spend working on their farms while employed off their farms is shown in Table 10.2. It can be seen that the number of hogs marketed did not affect greatly the amount of time spent doing farm work while working full or part-time off the farm. The average number of hours spent working on the farm ranged between three and four hours per day for full-time off-farm farmers and four and seven for part-time off-farm farmers. This contrasts with 9 to 10 hours spent working on the farm when not working off the farm.

In addition to the operator other people worked on the farms surveyed. The percent of farms using other sources of labor and the number of people involved are shown in Tables 10.3, 10.4 and 10.5. Business partners were only a very minor source of labor at all size levels (Table 10.3). Wives and children were an important source of farm labor at all levels of hog marketings. Over 50 percent of the wives helped with the farm work and nearly 50 percent of the operators had children who worked on the farm. The greatest deviations from these levels was that nearly two-thirds of the wives in size class 1 did farm work, compared to about half for other size classes, and only about 40 percent of the producers in size classes 3 and 6 had children who worked on the farm compared to 50 percent or more for other size classes. The number of children who worked on the farm averaged near one and did not change as hog marketings increased.

Table 10.1. Percent of farmers producing swine who worked off their farms and the amount of time they spent working off their farms

Slaughter hogs marketed in 1971	% of producers who worked off their farms		Average no. of weeks worked off their farms	
	Full-time	Part-time	Full-time	Part-time
1-99 (1)	14.4	13.9	40.4	9.1
100-249 (2)	8.9	17.2	37.9	9.7
250-349 (3)	5.3	19.1	52.0	4.5
350-499 (4)	17.4	13.5	21.9	5.2
500-999 (5)	4.8	16.8	17.4	6.7
1000+ (6)	4.0	9.3	12.2	10.0
All Iowa hog producers	10.0	16.0	34.6	7.9
Standard error	1.4	1.7	2.2	1.2

Table 10.2. Average number of hours spent per day doing farm work by producers who were employed off the farm

Slaughter hogs marketed in 1971	Avg. no. of hours spent per day doing farm work while employed off farm		Avg. no. of hours per day spent doing farm work by farmers while not employed	
	Full-time	Part-time	On farm	S.E.
	-hours-			
1-99 (1)	2.4	3.9	8.7	.40
100-249 (2)	3.9	4.4	9.5	.17
250-349 (3)	3.4	3.9	9.6	.21
350-499 (4)	2.6	4.1	9.6	.22
500-999 (5)	4.4	4.7	9.4	.15
1000+ (6)	4.4	6.4	10.1	.31
Overall mean/ farmer	3.1	4.3	9.4	
Standard error				.09

The proportion of farmers who hired full-time employees was less than 10 percent for size classes 1 to 5. Almost 50 percent of size class 6 hired full-time employees. Part-time help was hired by 26.9 percent of the state's producers. Producers in size classes 1 and 4 indicated the lowest proportion of full-time and/or part-time employees hired. These size classes also indicated the largest combined percent of producers who worked full-time and/or part-time off the farm. There are no explanations given for this. It is interesting that not all farmers who marketed over 1000 hogs hired laborers from off the farm. The percent of farmers hiring labor, both full and part-time, was not tabulated but at no size level did the sum of the percentages of full and/or part-time employees add to 100. On the average for all hog producers in Iowa only about 8 percent hired full-time employees and only about 27 percent hired part-time employees.

The individuals who worked with the swine are specified in Table 10.4. All producers with partners had those partners work with the swine. Approximately 80 percent of the producers with wives, children, or full-time employees used these sources of labor to work with the swine. Few (about 30 percent) part-time employees worked with the swine.

The total number of persons, including the operator, who worked on the surveyed farms is shown in Table 10.5. The average was near 3.4 for all Iowa hog producers. A big increase is not shown until size class 6. It should be realized that the average number of hogs marketed per year could be several times larger for this size class than for the next smaller class as this size class is open ended. The number that worked

Table 10.3. Sources of farm labor by size of swine operation

Slaughter hogs marketed in 1971	Partners	Wives	Children	Other relatives	Full-time hired	Part-time hired
1-99 (1)	--	66.3	55.1	9.0	3.8	16.4
100-249 (2)	1.8	46.3	48.6	23.9	9.2	29.4
250-349 (3)	6.9	51.4	41.5	12.7	7.9	30.0
350-499 (4)	--	54.7	52.9	19.8	4.6	24.8
500-999 (5)	3.7	58.3	60.9	15.9	8.1	31.5
1000+ (6)	14.3	48.4	37.7	29.9	48.4	29.0
All Iowa hog producers	2.6	53.2	50.8	17.9	8.4	26.9
Standard error	.7	2.3	2.3	1.7	1.3	2.0

Table 10.4. Percent of farm labor sources who worked with swine[a]

Slaughter hogs marketed in 1971	Partners	Wives	Children	Other relatives	Full-time	Part-time
1-99 (1)	--	64.0	68.9	88.7	73.5	12.6
100-249 (2)	100.0	81.3	86.1	49.3	82.6	23.1
250-349 (3)	100.0	85.7	88.4	86.4	61.3	50.9
350-499 (4)	--	93.2	100.0	59.2	100.0	20.5
500-999 (5)	100.0	78.5	95.0	90.4	78.6	45.1
1000+ (6)	100.0	52.6	76.1	82.4	99.6	40.7
All Iowa hog producers	100.0	77.9	85.5	64.9	82.7	30.2
Standard error	0.0	2.6	2.2	4.8	4.8	3.9

[a]Producers without specified labor source excluded.

Table 10.5. Average total number of persons who worked on the farm and who helped with the swine

Slaughter hogs marketed in 1971	On the farm	Standard error	With the swine	Standard error
1-99 (1)	3.3	.22	2.3	.17
100-249 (2)	3.4	.19	2.5	.14
250-349 (3)	3.3	.23	2.5	.15
350-499 (4)	3.4	.16	2.8	.16
500-999 (5)	3.6	.14	2.9	.11
1000+ (6)	5.0	.52	3.6	.43
Overall mean/ farmer	3.4		2.6	
Standard error		.09		.06

with the swine was nearly eight-tenths of a person less than the number who worked on farms producing swine. This did not change greatly as the number of hogs marketed increased.

B. Hours worked by each labor source

The average number of hours worked on farms per unit of each labor source is shown in Table 10.6. Operators on the average worked about 3100 hours per year (258 hours per month or 60 hours per week). There was a slight increase at the largest size class with operators working about 350 hours more per year than the average. This is partially accounted for by a smaller amount of off-farm employment by operators with more swine (Table 10.1). Business partners worked about the same number of hours as their counterparts for most size categories. Wives worked an average of about 732 hours per year but the amount worked did not appear to be related to the number of hogs marketed. Children worked an average of 711 hours per year but the hours worked per child varied greatly. There were 784 hours difference in the number of hours children worked between the smallest and largest sized classes; however, the pattern was not consistent.

Full and part-time labor hours were 1970 and 149, respectively. The pattern of hours worked by these employees is not consistent and does not increase in proportion to the number of hogs marketed.

Table 10.6. Average number of hours worked by labor source on those farms that used that source of labor

Slaughter hogs marketed in 1971	Labor Source						
	Operators	Partners	Wife	Children	Relatives	Full-time hired	Part-time hired
1-99 (1)	2862	--	790	364	833	1400	201
100-249 (2)	3108	2174	705	776	830	2100	149
250-349 (3)	3260	2290	675	1003	1319	1370	156
350-499 (4)	3111	2906	951	850	457	2240	74
500-999 (5)	3185	--	578	715	1286	1924	189
1000+ (6)	3447	3224	621	1148	2029	2206	120
Overall mean/ farmer	3101	2918	732	711	933	1970	149
Standard error	33.3	478.0	50.8	100.2	191.3	265.2	41.7

C. Farm and swine labor requirements

The average total number of hours spent doing farm related work is shown in Table 10.7. The 20.6 percent of the state's hog producers who marketed less than 100 slaughter hogs specified 4006 as the average number of total hours worked. This is over 800 hours below the overall mean per farmer of 4825 hours. The total hours worked fluctuated mildly above the overall mean per farmer for producers in size classes 2 to 5. Size class 6 (which is open-ended in hog production and which also specified an average number of total acres farmed of 744 compared to a state average of 327 (Table 4.1) indicated an average of 8316 total hours worked on farm related activities.

The average number of total hours worked with the swine for all sources is also presented in Table 10.7. This figure tended to increase as the number of hogs marketed increased with the exception of size class 4. The typical producer spent 23.1 percent of this total farm labor doing swine related activities. This percentage was about 30 percent for producers marketing 500 or more hogs per year and below 20 percent for producers marketing less than 250 hogs. The typical producer spent 898 hours doing swine related chores which represented 87.6 percent of the total time spent on swine. The total number of hours spent doing swine related chores tended to increase (except for size class 4) as the number of hogs marketed increased. The proportion of total swine time spent doing swine related chores varied little among swine classes.

The average number of hours spent with the hogs per slaughter hog marketed was 6.5. This figure is influenced greatly by the 20.6 percent of the state's hog producers in the smallest size class who required 15.5

Table 10.7. Average total hours worked on the farm and with the swine

Slaughter hogs marketed in 1971	Total on the farm	Standard error	Total with swine	Standard error	Average percent spent on swine	Standard error
1-99 (1)	4006	261.8	611	70.1	16.9	2.26
100-249 (2)	4840	188.5	871	44.9	20.6	1.35
250-349 (3)	4964	266.7	1305	104.2	28.3	1.91
350-499 (4)	4883	228.4	1056	61.0	24.1	1.61
500-999 (5)	5013	182.6	1466	72.7	31.4	1.35
1000+ (6)	8316	580.8	2230	173.3	30.1	2.29
Overall mean/ farmer	4825		1025		23.1	
Standard error		101.0		33.2		.71

Slaughter hogs marketed in 1971	On regular swine chores	Standard error	Average percent spent on regular swine chores	Standard error	Labor per hog marketed	Standard error
1-99 (1)	540	62.0	88.3	1.76	15.5	4.33
100-249 (2)	768	41.9	88.2	1.42	5.5	.31
250-349 (3)	1139	69.2	87.3	1.14	4.5	.38
350-499 (4)	927	49.7	87.8	1.43	2.5	.15
500-999 (5)	1243	62.7	84.8	1.43	2.3	.11
1000+ (6)	1949	142.4	87.4	1.71	1.8	.15
Overall mean/ farmer	898		87.6		6.5	
Standard error		26.2		.62		.65

hours per slaughter hog marketed. The average labor per hog marketed declined gradually from 5.5 hours in size class 2 to 1.8 hours in size class 6. It should be recognized that these labor estimates were not carefully measured but rather were memory estimates. The relationships among size categories probably are more realistic than the actual numbers. It is clear that there are labor economies related to size and may amount to as much as three hours per hog marketed between the small and large producers.

The average number of hours worked per day with swine by season is presented in Table 10.8. Summer was the only season that had a lower labor requirement for all size classes.

Table 10.8. Average number of hours worked per day with swine for the seasons

Slaughter hogs marketed in 1971	Spring		Summer		Fall		Winter	
1-99 (1)	1.6	.20	1.4	.18	1.4	.18	1.4	.21
100-249 (2)	2.3	.12	1.9	.12	2.1	.12	2.2	.13
250-349 (3)	3.5	.30	2.8	.24	3.1	.27	3.3	.26
350-499 (4)	2.8	.16	2.2	.13	2.5	.13	2.7	.15
500-999 (5)	3.5	.19	2.8	.14	3.3	.18	3.9	.22
1000+ (6)	5.4	.40	4.6	.35	5.2	.42	5.8	.44
Overall mean/ farmer	2.6		2.2		2.4		2.6	
Standard error		.09		.07		.08		.09

XI. ANTICIPATED CHANGES

Farmers were asked how much they could expand production with their present facilities and what changes they planned making in their swine production practices and if they planned to add, or remodel, their production plant. These questions were asked to determine the flexibility of production and farmer outlook about the technological changes taking place and the future of swine production.

A. Potential to increase hogs produced

Over 45 percent of producers said that they could increase production without increasing or changing their facilities or hiring more labor (Table 11.1). More producers in the smaller sized classes indicated excess capacity than in the larger sized categories. Of those that indicated they had room and labor for expansion 80 percent (36.4 percent of all hog producers) said they could increase farrowings and nearly 100 percent said they could feed out more market hogs. The average number of litters that could be added was 27.2 with the larger sized classes showing nearly twice as many as the smaller sized classes. The average capacity increase in market hogs was 224.8 with the larger sized classes showing the greatest capacity potential.

The standard error terms were all relatively low indicating uniformity in the excess capacity built into the production plants that indicated they could farrow and/or finish more pigs.

Table 11.1. Potential to increase swine enterprise without adding new facilities or hiring any more labor

Slaughter hogs marketed in 1971	Percent of producers who could increase swine enterprise	Litters farrowed: Percent of producers who could increase litters farrowed/yr.	Litters farrowed: Avg. no. of more litters that could farrowed/year[a]	Hogs marketed: Percent of producers who could increase hogs marketed/yr.	Hogs marketed: Avg. no. of more hogs that could be marketed/year[b]
1-99 (1)	57.7	48.6	16.7	57.7	193.4
100-249 (2)	52.9	41.7	24.5	52.8	235.3
250-349 (3)	27.0	19.1	29.1	27.0	268.5
350-499 (4)	38.1	30.9	49.8	36.8	295.0
500-999 (5)	36.2	29.6	42.9	35.0	366.0
1000+ (6)	29.3	19.8	48.6	29.3	599.2
All Iowa hog producers	45.6	36.4		45.3	
Standard error	2.3	2.1			
Overall mean/farmer			27.2		224.8
Standard error			2.45		13.96

[a]Producers not able to increase farrowings per year excluded.

[b]Producers not able to increase hogs marketed per year excluded.

B. Remodeling buildings

Only 15 percent of the producers planned to do any remodeling of present facilities within the next three years (Table 11.2). The largest percentages of those that planned to remodel were in the upper middle sized classes. This is probably because more of the smaller sized classes will be reducing swine production if history repeats itself, and the largest class of producers had made all of the conversions in older buildings thought profitable. Most (46.6 percent) of the remodeling planned was with unimproved facilities with partial confinement next (32.9 percent) and total confinement with only 16.8 percent. After the remodeling about half (44.8 percent) of the facilities would be total confinement and about half (48.0 percent) partial confinement.

Following the remodeling 55.2 percent of the total confinement buildings would be used for farrowing and 9.7 percent for nurseries. The other 35 percent were for growing-finishing or combined uses (Table 11.3). Those buildings that were to be remodeled to partial confinement were mostly for growing-finishing (50.4 percent) or combined uses (18.7 percent). Only 26.8 percent were for farrowing.

C. New buildings

Nearly 14 percent of the producers planned to build new facilities within the next three years (Table 11.4). Larger producers planned to build more new buildings than smaller producers. Under 3 percent of the smallest class of producers planned to build new swine housing compared to 28.8 and 20.0 percent, respectively, for classes 5 and 6. Most (41.7 percent) of the new buildings planned were partial confinement types.

Table 11.2. Plans for remodeling swine housing over the next three years

Slaughter hogs marketed in 1971	% of producers who plan to remodel present buildings	Type of building				
		Total confinement	Partial confinement	Unimproved	Small permanent	Portable
		Type of facility before remodeling				
		-percent-				
1-99 (1)	6.0	51.7	--	48.3	--	--
100-249 (2)	12.7	13.0	39.3	47.7		
250-349 (3)	10.2	11.1	41.8	36.1	11.1	--
350-499 (4)	24.0	14.8	55.8	26.5	--	2.9
500-999 (5)	30.9	13.3	18.1	60.8	7.7	--
1000+ (6)	18.9	23.3	20.1	56.6	--	--
All Iowa hog producers	15.0					
All Iowa hog buildings		16.8	32.9	46.6	3.2	.6
Standard error		4.0	5.0	5.3	1.9	.8

Table 11.2. Continued

Slaughter hogs marketed in 1971	Type of building				
	Total confinement	Partial confinement	Unimproved	Small permanent	Portable
	Type of facility after remodeling				
	-percent-				
1-99 (1)	69.0	31.0	--	--	--
100-249 (2)	48.3	51.7	--	--	--
250-349 (3)	17.1	82.9	--	--	--
350-499 (4)	38.2	58.9	2.9	--	--
500-999 (5)	48.7	31.9	15.3	4.0	--
1000+ (6)	37.7	55.6	--	6.7	--
All Iowa hog buildings	44.8	48.0	4.8	1.4	--
Standard error	5.3	5.4	2.3	1.3	--

Table 11.3. Primary use of remodeled total and partial confinement buildings

Slaughter hogs marketed in 1971	Gestation	Farrowing	Pig nursery	Growing-finishing	Combined uses
	Primary use of remodeled total confinement buildings				
			-percent-		
1-99 (1)	--	67.1	--	32.9	--
100-249 (2)	--	62.8	--	9.2	28.0
250-349 (3)	--	--	64.8	35.2	--
350-499 (4)	--	46.2	38.7	--	15.2
500-999 (5)	--	50.0	1.9	42.0	6.0
1000+ (6)	--	94.1	5.9	--	--
All Iowa T.C. buildings	--	55.2	9.7	20.8	14.3
Standard error	--	8.7	5.2	7.1	6.1
	Primary use of remodeled partial confinement buildings				
			-percent-		
1-99 (1)	--	--	--	100.0	--
100-249 (2)	8.6	35.1	--	38.8	17.5
250-349 (3)	--	--	--	49.7	50.3
350-499 (4)	--	42.6	4.9	43.4	9.0
500-999 (5)	--	17.6	--	69.5	12.6
1000+ (6)	--	25.9	--	74.1	--
All Iowa P.C. buildings	2.9	26.8	1.2	50.4	18.7
Standard error	2.4	6.4	1.6	7.2	5.6

Table 11.4. Plans for new swine housing over the next three years

Slaughter hogs marketed in 1971	% of producers who plan to build or buy new swine housing	Type of new housing built[a]			
		Total confinement	Partial confinement	Small permanent	Portable
			-percent-		
1-99 (1)	2.9	8.2	8.2	83.6	--
100-249 (2)	13.8	34.1	49.5	--	16.5
250-349 (3)	13.1	29.5	28.0	--	42.5
350-499 (4)	15.5	25.1	47.8	10.8	15.7
500-999 (5)	28.8	33.9	45.7	1.9	18.5
1000+ (6)	20.0	60.0	33.6	--	6.3
All Iowa hog producers	13.9				
Standard error	1.6				
All Iowa hog buildings	--	32.3	41.7	7.6	18.4
Standard error	--	4.3	4.5	2.4	3.6

[a]Producers not planning to build or buy new swine housing excluded.

Total confinement accounted for 32.3 percent of the new buildings with portable buildings 18.4 percent and small permanent buildings 7.6 percent.

Nearly 55 percent of the new total confinement buildings planned were for farrowing (Table 11.5) compared to 11.3 percent for new partial confinement buildings. The second most important use for new facilities was for growing-finishing which accounted for 33.0 percent of total confinement buildings and 76.3 percent of partial confinement buildings. Other uses were combined to include growing-finishing, nurseries and farrowing. Few new facilities were planned for gestating sows.

D. Feeding systems

Only 6.3 percent of the farmers planned to change their feeding system in the next three years (Table 11.6). Of those that planned to change 41.3 percent were going to add an automated feeding system, 34.9 percent were going to start mixing their own ration and 19.0 percent were going to add a grinder-mixer unit. Other minor changes planned included going to a commercial ration, add self-feeders and start feeding high moisture corn. The larger producers planned to make more changes in th their feeding systems than the smaller producers.

E. Manure disposal

Seven and six-tenths percent of the producers planned to change their manure disposal systems in the next three years (Table 11.7). Nearly 65 percent of these were slatted floors and 68 percent holding pits. Most of the slatted floors were planned for the growing-finishing units. Other changes mentioned included lagoons, tractors and loaders,

Table 11.5. Primary use of new total and partial confinement buildings

Slaughter hogs marketed in 1971	Gestation	Farrowing	Pig nursery	Growing-finishing	Pig nursery & growing-finishing	Combined uses
		Primary use of new total confinement buildings				
				-percent-		
1-99 (1)	--	100.0	--	--	--	--
100-249 (2)	--	65.1	--	34.9	--	--
250-349 (3)	--	55.3	--	44.7	--	--
350-499 (4)	--	60.0	--	20.0	--	20.0
500-999 (5)	--	47.1	4.0	31.7	--	17.2
1000+ (6)	--	10.6	12.3	33.3	43.8	--
All Iowa T.C. buildings	--	54.9	2.0	33.0	3.9	6.1
Standard error	--	8.1	2.3	7.6	3.1	3.1
		Primary use of new partial confinement buildings				
1-99 (1)	--	100.0	--	--	--	--
100-249 (2)	--	8.2	83.5	--	--	8.2
250-349 (3)	--	16.6	41.7	41.7	--	--
350-499 (4)	8.9	--	91.1	--	--	--
500-999 (5)	7.7	10.5	75.7	--	1.9	4.2
1000+ (6)	--	59.4	40.6	--	--	--
All Iowa P.C. buildings	3.8	11.3	76.3	3.3	.6	4.7
Standard error	2.8	4.6	6.1	2.6	1.1	3.1

Table 11.6. Plans for changes in feeding systems over the next three years

	Percent of producers who plan to change feeding system	Go to complete commercial rations	Start mixing own ration	Add automatic feed system	Add grinder-mixer unit	Start feeding high moisture corn	Add self feeders
			- percent -				
(1)	1.4	1.0	--	--	.4	--	--
(2)	5.8	--	1.6	2.8	.8	--	--
(3)	6.5	--	4.2	5.4	--	--	1.1
(4)	8.9	--	4.3	2.7	1.3	.7	1.3
(5)	11.0	--	2.2	2.7	4.1	.6	--
(6)	13.5	2.7	5.3	5.5	4.0	--	--
All Iowa hog producers	6.3	.3	2.2	2.6	1.2	.2	.3
Standard error	1.1	.2	.7	.7	.5	.2	.2

Table 11.7. Plans for changes in manure disposal system over the next three years

	Percent of producers who plan to change manure disposal system	Add slatted floors to:									
		Gestation	Farrowing	Pig nursery	Growing-finishing	Holding Pit	Lagoon	Tractor and Loader	Add Concrete	Terrace	Automatic gutter cleaner
		- percent -									
(1)	2.7	--	2.3	--	--	2.3	--	--	.4	--	--
(2)	4.8	--	1.6	--	2.1	2.9	.8	.2	--	--	--
(3)	9.2	--	.6	.6	4.4	7.1	--	.6	--	--	--
(4)	9.9	--	1.4	.7	1.4	5.1	--	1.7	--	1.7	.7
(5)	17.5	.6	3.6	1.5	5.3	13.0	.6	--	.6	--	1.8
(6)	14.9	--	1.3	2.7	6.7	10.9	--	--	--	--	2.7
All Iowa hog producers	7.6	.1	1.9	.5	2.4	5.2	.4	.4	.2	.2	.4
Standard error	1.2	.1	.6	.3	.7	1.0	.3	.3	.2	.2	.3

concrete, terracing and automatic gutter cleaners.

F. Breeding and farrowing

Nearly one-fourth of the producers planned to change their breeding or farrowing practices within the next three years (Table 11.8). No overall pattern could be observed by size class. Some (5.5 percent) planned to farrow later in the fall and some (4.6 percent) planned to farrow earlier in the spring. Five percent planned to start cross breeding. Two percent planned to start buying SPF breeding stock and 0.2 percent planned to stop buying SPF breeding stock. Only 1.1 percent planned to start purchasing hybrid or purebred breeding stock. Whereas 3.7 percent planned to decrease the number of farrowing periods per year, 15.7 percent planned to increase the number. Nineteen and three-tenths percent of producers planned to increase the number of litters farrowed. Of these 81 percent planned to make the increase by including additional farrowing periods whereas the other 19 percent planned to make the increase without increasing the number of farrowing periods.

Table 11.8. Plans for changes in breeding or farrowing practices over next three years

	Percent of producers who plan to change breeding or farrowing practices	Farrow earlier in spring	Farrow later in fall	Start cross breeding	Purchase SPF breeding stock	Get out of SPF breeding stock	Purchase hybrid or purebred breeding stock	Decrease No. of farrowing periods/yr.
				- percent -				
(1)	17.1	4.1	7.1	7.2	--	--	--	--
(2)	27.0	7.1	7.1	3.3	2.3	--	1.1	5.0
(3)	20.9	5.4	5.4	2.7	3.3	1.5	--	3.8
(4)	22.3	--	3.0	3.5	3.5	--	--	5.5
(5)	35.9	3.1	1.9	9.7	1.2	--	4.1	3.8
(6)	21.5	--	2.7	5.3	3.8	--	2.7	5.5
All Iowa hog producers	24.6	4.6	5.5	5.0	2.0	.2	1.1	3.7
Standard error	1.9	.9	1.0	1.0	.6	.2	.5	.9

Table 11.8. Continued

	Increase no. of farrowing periods/ year	Increase total no. of litters farrowed	No. of farrowing periods/ year now[a]	No. of farrowing periods/ year after change[a]	Increase no. of litters farrowed but not no. of farrowing periods
			- percent -		
(1)	17.1	17.1	1.7	3.5	--
(2)	15.3	20.9	2.2	3.5	5.6
(3)	12.3	12.9	1.8	4.1	0.6
(4)	14.8	16.8	2.8	4.1	2.0
(5)	21.5	28.5	4.6	7.3	7.0
(6)	6.5	12.0	4.3	7.6	4.2
All Iowa hog producers	15.7	19.3			3.5
Standard error	1.6	1.8			0.8
Overall mean/farmer			2.9	4.9	
Standard error			.18	.25	

[a]Producers not increasing number of farrowing periods excluded.

XII. BIBLIOGRAPHY

1. Baker, H. D. Sample design for study of swine production and marketing. Unpublished report. Ames, Iowa, Department of Statistics, Iowa State University. 1973.

2. Bundy, Clarence E., and Diggins, Ronald V. Swine production. 2nd ed. Englewood Cliffs, New Jersey: Prentice-Hall, Inc. c1963.

3. Burnham, Nathan F. The effect of the hog-corn ratio on swine production in Iowa. Unpublished M.S. thesis. Ames, Iowa, Library, Iowa State University. 1971.

4. Carroll, W. E.; Krider, J. L.; and Andrews, F. N. Swine production. 3rd ed. New York, New York: McGraw-Hill Book Co., Inc. 1962.

5. Crall, Terry E. Economics of size in swine production, a normative approach. Unpublished M.S. thesis. Ames, Iowa, Library, Iowa State University. 1972.

6. Harper, Joseph B. Competencies in swine production needed by farmers. Unpublished M.S. thesis. Ames, Iowa, Library, Iowa State University. 1968.

7. Howell, H. B. Present and future changes in Iowa agriculture. Iowa Farm Science 25(4):7-10. January, 1971.

8. James, S. C., and Beneke, R. R. Trends in the quantity, efficiency and costs of Iowa swine production. Iowa Agriculture and Home Economics Experimental Station, M-1154. 1973.

9. James, S. C., and Trede, L. D. Swine production systems on thirty-eight north central Iowa farms. Unpublished report. Ames, Iowa, Department of Economics, Iowa State University. 1969.

10. James, S. C., and Williams, W. N. Characteristics of labor used for swine production. Unpublished report. Ames, Iowa, Department of Economics, Iowa State University. 1973.

11. Kenneth, Raymond K. Influence of farm resources on the choice of a hog production system. Unpublished M.S. thesis. Ames, Iowa, Library, Iowa State University. 1959.

12. Midwest Plan Service. Structure and environment handbook. Ames, Iowa, Iowa State University. September, 1973.

13. Raikes, R. Characteristics of Iowa hog operators. Unpublished report. Ames, Iowa, Department of Economics, Iowa State University. 1973.

14. Snedecor, George W., and Cochran, William G. Statistical methods. 6th ed. Ames, Iowa, Iowa State University. 1967.

15. A study of swine production and marketing - a survey of Iowa swine producers. Ames, Iowa, Department of Economics, Iowa State University. 1971.

16. Trede, Larry E. Swine production systems as related to business management on north central Iowa farms. Unpublished M.S. thesis. Ames, Iowa, Library, Iowa State University. 1968.

17. U.S. Department of Agriculture. Iowa Crop and Livestock Reporting Service. Iowa annual farm census - 1940-1971. Des Moines, Iowa: Iowa Department of Agriculture. 1940-1971.

18. U.S. Department of Agriculture. Agricultural statistics, 1936-1972. Washington, D.C.: U.S. Government Printing Office. 1936-1972.

19. U.S. Department of Agriculture. Iowa Crop and Livestock Reporting Service. Hogs and pigs - Iowa. Des Moines, Iowa: Iowa Department of Agriculture. 1969.

20. U.S. Department of Agriculture. Iowa Crop and Livestock Reporting Service. Number and size of farms - Iowa. Des Moines, Iowa: Iowa Department of Agriculture. 1967.

21. U.S. Department of Agriculture. Iowa Crop and Livestock Reporting Service. Unpublished data. Des Moines, Iowa: SRS, USDA. 1971.

22. U.S. Department of Commerce. Bureau of the Census. U.S. Census of Agriculture - Iowa, 1930-1969. Washington, D.C.: U.S. Government Printing Office. 1930-1969.

23. Wonnacott, Thomas H., and Wonnacott, Ronald J. Introductory statistics for business and economics. New York, New York: John Wiley and Sons, Inc. 1972.

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XIV. APPENDIX

An appendix is used to present equations developed by the researcher for calculating population estimates. These equations incorporate the weights assigned to each producer in accordance with strata designation at the time the sample was taken (Table 3.3). Estimates of population parameters requires special weighting procedures when the sampling fractions differ by strata.

A. Glossary of symbols

P_{jc} = producer weighted proportion of farmers in the j th size class whose answer to a particular question is classified in category c.

f_c = estimated proportion of hog producers in Iowa whose answers would be category c.

r_c = estimated proportion of hogs produced in Iowa whose answers would be category c.

$A_{j\cdot}$ = estimated weighted mean of producers in size class j; j = 1, 2, ..., 6.

$A_{\cdot\cdot}$ = estimated weighted mean for all Iowa hog producers.

$b_{\cdot\cdot}$ = estimated weighted mean per hog produced in Iowa.

s_j = standard deviation of the answers of producers in size class j.

s = standard deviation of the answers of all producers.

i = strata designation; i = 1, 2, ..., 7.

j = size class designation; j = 1, 2, ..., 6.

k = response category; the range of k varies from question to question; $k = 1, 2, \ldots, c\ldots, k$.

c = specific response category.

h_i = total number of respondents in sample in $\underline{i}$ th stratum (Table 3.2).

H_i = the statewide counterpart for $_j$, the total number of farmers in state in $\underline{i}$ th stratum (Table 3.3).

w_i = $H_i / _i$ = number of farmers in $\underline{i}$ th stratum in state represented by one respondent in the $\underline{j}$ th stratum in sample (Table 3.3).

u_i = average number of hogs marketed by farmers in the $\underline{i}$ th stratum in sample (Table 3.3).

h_{ijk} = number of farmers in the $\underline{i}$ th strata and in the $\underline{j}$ th size class whose answer to a particular question is classified in category k.

n_{jk} = number of respondents in the $\underline{j}$ th size class whose answer to a particular question is classified in category k.

A_{jkp} = response given by the $\underline{p}$ th producer in the $\underline{k}$ th response category by a producer in the $\underline{j}$ th size class.

B. Equations for calculating population parameters

$$P_{jc} = \frac{\sum_{i=1}^{7} w_i h_{ijc}}{\sum_{k=1}^{k} \sum_{i=1}^{7} w_i h_{ijk}} \qquad (A.1)$$

$$f_c = \frac{\sum_{j=1}^{6} \sum_{i=1}^{7} w_i h_{ijc}}{\sum_{k=1}^{k} \sum_{j=1}^{6} \sum_{i=1}^{7} w_i h_{ijk}} \tag{A.2}$$

$$r_c = \frac{\sum_{j=1}^{6} \sum_{i=1}^{7} w_i u_i h_{ijk}}{\sum_{k=1}^{k} \sum_{j=1}^{6} \sum_{i=1}^{7} w_i u_i h_{ijk}} \tag{A.3}$$

$$A_{j\cdot} = \frac{\sum_{k=1}^{k} \sum_{i=1}^{7} w_i h_{ijk} \sum_{p=1}^{n_{jk}} A_{jkp}/n_{jk}}{\sum_{k=1}^{k} \sum_{i=1}^{7} w_i h_{ijk}} \tag{A.4}$$

$$A_{\cdot\cdot} = \frac{\sum_{k=1}^{k} \sum_{j=1}^{6} \sum_{i=1}^{7} w_i h_{ijk} \sum_{p=1}^{n_{jk}} A_{jkp}/n_{jk}}{\sum_{k=1}^{k} \sum_{j=1}^{6} \sum_{i=1}^{7} w_i h_{ijk}} \tag{A.5}$$

$$b_{\cdot\cdot} = \frac{\sum_{k=1}^{k} \sum_{j=1}^{6} \sum_{i=1}^{7} w_i u_i h_{ijk} \sum_{p=1}^{n_{jk}} A_{jkp}/n_{jk}}{\sum_{k=1}^{k} \sum_{j=1}^{6} \sum_{i=1}^{7} w_i u_i h_{ijk}} \tag{A.6}$$

$$s_j = \left[\frac{\sum_{k=1}^{k} \sum_{i=1}^{7} w_i h_{ijk} \sum_{p=1}^{n_{jk}} (A_{jkp}/n_{jk})^2}{\sum_{k=1}^{k} \sum_{i=1}^{7} w_i h_{ijk}} - \frac{\left(\sum_{k=1}^{k} \sum_{i=1}^{7} w_i h_{ijk} \sum_{p=1}^{n_{jk}} A_{jkp}/n_{jk} \right)^2}{\sum_{k=1}^{k} \sum_{i=1}^{7} w_i h_{ijk}} \right]^{\frac{1}{2}} \Bigg/ \sum_{k=1}^{k} \sum_{i=1}^{7} w_i h_{ijk} \tag{A.7}$$

$$s = \left[\frac{\sum_{k=1}^{k} \sum_{j=1}^{6} \sum_{i=1}^{7} w_i \, h_{ijk} \sum_{p=1}^{n_{jk}} (A_{jkp}/n_{jk})^2}{\sum_{k=1}^{k} \sum_{j=1}^{6} \sum_{i=1}^{7} w_i \, h_{ijk}} - \frac{\left(\sum_{k=1}^{k} \sum_{j=1}^{6} \sum_{i=1}^{7} w_i \, h_{ijk} \sum_{p=1}^{n_{jk}} A_{jkp}/n_{jk} \right)^2}{\sum_{k=1}^{k} \sum_{j=1}^{6} \sum_{i=1}^{7} w_i \, h_{ijk}} \right]^{\frac{1}{2}} \Bigg/ \sum_{k=1}^{k} \sum_{j=1}^{6} \sum_{i=1}^{7} w_i \, h_{ijk}$$

(A.8)