



**AgEcon** SEARCH  
RESEARCH IN AGRICULTURAL & APPLIED ECONOMICS

*The World's Largest Open Access Agricultural & Applied Economics Digital Library*

**This document is discoverable and free to researchers across the globe due to the work of AgEcon Search.**

**Help ensure our sustainability.**

Give to AgEcon Search

AgEcon Search

<http://ageconsearch.umn.edu>

[aesearch@umn.edu](mailto:aesearch@umn.edu)

*Papers downloaded from **AgEcon Search** may be used for non-commercial purposes and personal study only. No other use, including posting to another Internet site, is permitted without permission from the copyright owner (not AgEcon Search), or as allowed under the provisions of Fair Use, U.S. Copyright Act, Title 17 U.S.C.*

Swine - Cost of Prod.

MINNINI FOUNDATION OF  
AGRICULTURAL ECONOMICS  
LIBRARY

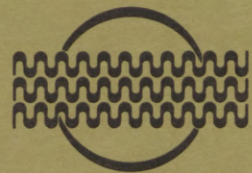
AC 13 1971

Input Requirements and Production Costs  
Complete Confinement Swine Rearing Operations  
Texas High Plains 1971



Department of Agricultural Economics  
Texas Tech University  
Lubbock, Texas

SPECIAL REPORT



NUMBER 46

INTERNATIONAL CENTER for ARID and SEMI-ARID LAND STUDIES

INPUT REQUIREMENTS AND PRODUCTION COSTS  
COMPLETE CONFINEMENT SWINE REARING OPERATIONS  
TEXAS HIGH PLAINS 1971

by

T. R. Owens, J. C. Snodgrass, and H. Y. Lee<sup>1</sup>

May 1971

ICASALS Special Report No. 46

Associate Professor, Research Associate,  
and Associate Professor of  
Agricultural Economics  
Texas Tech University  
Lubbock, Texas

## ACKNOWLEDGMENTS

The authors wish to acknowledge the assistance and cooperation of Lubbock Swine Breeders, Inc., Triangle Pork Producers, Inc., and High Plains Pork Producers, Inc. Specifically they wish to express their appreciation to Mr. Roy Pogue and Mr. Euel Liner of Lubbock Swine Breeders, Mr. Fred Brugel, Jr., of High Plains Pork Producers, Inc., and Mr. Bill Walden and Mr. Don Smith of Triangle Pork Producers, Inc. They also wish to express their appreciation to Mr. Robert Wadley of the Texas Tech University staff who developed the computer program for the plant modifications and to Dr. Leland Tribble for his assistance in developing the swine rations and for his critique of the manuscript. Finally, a note of appreciation is due Mr. James Osborn and Dr. Mark Fowler of the Department of Agricultural Economics, Texas Tech University for their comments and suggestions.

## TABLE OF CONTENTS

ACKNOWLEDGMENTS	ii
LIST OF TABLES	v
SUMMARY	ix
INTRODUCTION	1
Objectives	1
Methodology	2
Source of Data	2
Scope of Study	2
Basic Assumptions	3
PHYSICAL INPUTS AND PRICES	3
Land Requirements	3
Building Requirements and Costs	3
Equipment Requirements and Costs	5
Labor Requirements and Wage Rates	5
Utility Requirements and Rates	12
Electricity	12
Gas Consumption and Costs	12
Miscellaneous Expenses	14
Feed Consumption and Ration Costs	14
Distribution of Fixed Costs	14
Depreciation	14
Repair and Maintenance	14
Property Taxes	19
Insurance	19
Interest	19



TOTAL AND UNIT COSTS	21
Total Investment	21
Annual Costs	21
Unit Costs	21
Pay Off Period Estimates	29
MODIFICATION IN ASSUMPTIONS	31
Feed Requirements and Feed Cost Modifications	31
Farrowings Per Sow Per Year	34
Changes in the Number of Pigs Born, Pigs Weaned, and Pigs Marketed	34
Building Cost Modifications	34
Labor Cost Modifications	34
Labor Requirement Modifications	36
Interest Rate Modifications	36
Other Modifications	38
APPENDIX A	39
APPENDIX B	40

## LIST OF TABLES

1. Land, Water Well, and Fencing Requirements and Costs, Complete Confinement Swine Rearing Operations, Six Model Plants, Texas High Plains, 1970	4
2. Building Requirements and Cost Per Building Unit, Complete Confinement Swine Rearing Operations, Six Model Plants, Texas High Plains, 1970	6
3. Building Specifications and Construction Costs Per Unit, Complete Confinement Swine Rearing Operations, Texas High Plains, 1971	8
4. Building Investments by Operational Facilities, Complete Confinement Swine Rearing Operations, Six Model Plants, Texas High Plains, 1971	9
5. Equipment Investment, Complete Confinement Swine Rearing Operations by Major Equipment Categories, Six Model Plants, Texas High Plains, 1971	10
6. Labor Requirements in Man Equivalents, Complete Confinement Swine Rearing Operations, Six Model Plants, Texas High Plains, 1971	11
7. Annual Labor Costs, Complete Confinement Swine Rearing Operations, Six Model Plants, Texas High Plains, 1971	11
8. Electrical Power Costs Per Production Facility, Complete Confinement Swine Rearing Operations, Six Model Plants, Texas High Plains, 1971	13
9. Annual Gas Consumption Costs per Production Facility, Complete Confinement Swine Rearing Operations, Six Model Plants, Texas High Plains, 1971	13
10. Annual Miscellaneous Costs by Major Expense Categories, Complete Confinement Swine Rearing Operations, Six Model Plants, Texas High Plains, 1971	15
11. Growing and Lactation Ration, Principal Ingredients, Ingredient Costs and Cost Per Ton, Complete Confinement Swine Rearing Operations, Texas High Plains, 1971	16
12. Finishing Ration, Principal Ingredients, Ingredient Costs and Cost Per Ton, Complete Confinement Swine Rearing Operations, Texas High Plains, 1971	16

13. Creep Ration, Principal Ingredients, Ingredient Costs and Cost Per Ton, Complete Confinement Swine Rearing Operations, Texas High Plains, 1971	17
14. Gestation and Boar Ration, Principal Ingredients, Ingredient Costs and Cost Per Ton, Complete Confinement Swine Rearing Operations, Texas High Plains, 1971	17
15. Annual Feed Costs, Annual Depreciation Charges, Annual Tax Charges, and Annual Repair and Maintenance Charges, Complete Swine Rearing Operations, Six Model Plants, Texas High Plains, 1971	18
16. Annual Insurance Charges, Buildings, Equipment, Vehicles and Livestock, Complete Confinement Swine Rearing Operations, Six Model Plants, Texas High Plains 1971	20
17. Interest on Fixed Investment and Operating Capital, Complete Confinement Swine Rearing Operations, Six Model Plants, Texas High Plains, 1971	22
18. Total Investment, Annual Costs, Annual Costs Per Sow of Capacity, Costs Per Hundredweight of Market Hogs and Percentage Contribution by Major Expense Categories, 100 Sow Complete Confinement Swine Rearing Operation, Texas High Plains, 1971	23
19. Total Investment, Annual Costs, Annual Costs Per Sow of Capacity, Costs Per Hundredweight of Market Hogs and Percentage Contribution by Major Expense Categories, 400 Sow Complete Confinement Swine Rearing Operation, Texas High Plains, 1971	24
20. Total Investment, Annual Costs, Annual Costs Per Sow of Capacity, Costs Per Hundredweight of Market Hogs and Percentage Contribution by Major Expense Categories, 600 Sow Complete Confinement Swine Rearing Operation, Texas High Plains, 1971	25
21. Total Investment, Annual Costs, Annual Costs Per Sow of Capacity, Costs Per Hundredweight of Market Hogs and Percentage Contribution by Major Expense Categories, 800 Sow Complete Confinement Swine Rearing Operation, Texas High Plains, 1971	26
22. Total Investment, Annual Costs, Annual Costs Per Sow, Costs Per Hundredweight of Market Hogs and Percentage Contribution by Major Expense Categories, 1,000 Sow Complete Confinement Swine Rearing Operation, Texas High Plains, 1971	27



23. Total Investment, Annual Costs, Annual Costs Per Sow of Capacity, Costs Per Hundredweight of Market Hogs and Percentage Contribution by Major Expense Categories, 1,200 Sow Complete Confinement Swine Rearing Operation, Texas High Plains, 1971	28
24. Time Required for Pay Off with Selected Levels of Average Prices Received, Complete Confinement Swine Rearing Operation, Six Model Plants, Texas High Plains, 1971	30
25. Plant Modifications by Items Changed, Number of Changes and Magnitude of Changes Made, Six Model Plants, Complete Confinement Swine Rearing Operation, Texas High Plains, 1971	32
26. Feed Efficiency and Feed Price Modifications, Magnitude of Change and Effect on Unit Costs, Complete Confinement Swine Rearing Operation, Texas High Plains, 1971	33
27. Modifications in the Average Number of Farrowings Per Sow Per Year, and Effect on Unit Costs, Complete Confinement Swine Rearing Operation, Six Model Plants, Texas High Plains, 1971	33
28. Modifications in the Average Number of Pigs Born, Pigs Weaned, and Pigs Marketed Per Litter and Effect on Unit Costs, Complete Confinement Swine Rearing Operation, Six Model Plants, Texas High Plains, 1971	35
29. Building Cost Modifications and Effect on Unit Costs, Complete Confinement Swine Rearing Operation, Six Model Plants, Texas High Plains, 1971	35
30. Labor Cost Modifications and Effect on Unit Costs, Complete Confinement Swine Rearing Operation, Six Model Plants, Texas High Plains, 1971	37
31. Labor Requirement Modifications and Effect on Unit Costs, Complete Confinement Swine Rearing Operation, Six Model Plants, Texas High Plains, 1971	37
i. Appendix A. Equipment Items, Unit Cost and Total Cost, Complete Confinement Swine Rearing Operation, 200 Sow Capacity Model Plants, Texas High Plains, 1971	39

i.	Appendix B. Cost Per Hundredweight of Market Hogs with Selected Changes in Basic Assumptions, Factor Requirements and Factor Prices, Complete Confinement Swine Rearing Operation, 200 Sow Capacity Model Plant, Texas High Plains, 1971	40
ii.	Appendix B. Cost Per Hundredweight of Market Hogs with Selected Changes in Basic Assumptions, Factor Requirements and Factor Prices, Complete Confinement Swine Rearing Operation, 400 Sow Capacity Model Plant, Texas High Plains, 1971	41
iii.	Appendix B. Cost Per Hundredweight of Market Hogs with Selected Changes in Basic Assumptions, Factor Requirements and Factor Prices, Complete Confinement Swine Rearing Operation, 600 Sow Capacity Model Plant, Texas High Plains, 1971	42
iv.	Appendix B. Cost Per Hundredweight of Market Hogs with Selected Changes in Basic Assumptions, Factor Requirements and Factor Prices, Complete Confinement Swine Rearing Operation, 800 Sow Capacity Model Plant, Texas High Plains, 1971	43
v.	Appendix B. Cost Per Hundredweight of Market Hogs with Selected Changes in Basic Assumptions, Factor Requirements and Factor Prices, Complete Confinement Swine Rearing Operation, 1,000 Sow Capacity Model Plant, Texas High Plains, 1971	44
vi.	Appendix B. Cost Per Hundredweight of Market Hogs with Selected Changes in Basic Assumptions, Factor Prices, Complete Confinement Swine Rearing Operation, 1,200 Sow Capacity Model Plant, Texas High Plains 1971	45

## SUMMARY

The increasing interest in expanding pork production on the Texas High Plains has generated a need for more information on capital requirements and expected costs of and returns from swine production under complete confinement conditions. In addition, managers of existing complete confinement swine rearing operations need additional information on probable cost of production of larger enterprises, of the relationship between factor utilization and production costs, and on areas within the swine production enterprise where cost reductions are possible. The major objective of this study was to provide this needed information.

A total of six model swine enterprises were budgeted and total and unit production costs estimated for each operation. The model plants ranged in size from 200 to 1,200 sow capacity in increments of 200 sows. The initial budgets assumed a feeding efficiency of 3.56 : 1, a farrowing rate of 2.23 times per year, an average of 8.5 pigs born, 8.2 pigs weaned, and 8.0 pigs raised per litter. Market weights were assumed to be 225 pounds.

The study indicated a range in capital requirements from \$216,990 for a 200 sow capacity model plant to \$1,061,483 for a 1,200 sow capacity model plant. Capital requirements per sow capacity for each model plant amounted to \$1,085 (200 sows), \$996 (400 sows), \$918 (600 sows), \$900 (800 sows), \$887 (1,000 sows), and \$885 (1,200 sows).

Costs per hundredweight of hogs marketed ranged from a high of \$18.30 for the 200 sow capacity model plant to a low of \$16.41 for the 1,000 sow capacity model plant. Substantial economies of size were indicated between the 200 sow capacity model plant, the 400 sow capacity model plant, and the 600 sow capacity model plant. As capacity was increased from 200 to 400 sows, costs per hundredweight of hogs marketed was reduced by \$0.98 per hundredweight, and as capacity increased from 400 to 600 sows, costs were reduced by \$0.53 per hundredweight. Additional increases in sow capacity from 600 to 800 sows and above had only a minor effect on unit costs.

The time period required to pay off investment in the model plants was estimated on the basis of assumed or selected average prices received per hundredweight of hogs, given costs per hundredweight of hogs produced, expected annual output, and total investment in each plant as estimated in this study. These estimates indicated that the 200-sow capacity model plant would require 10.7 years to pay off the investment, given the average price received over the last five years. This particular time period was, however, extremely profitable for swine producers. At a \$20 per hundredweight average price it would require 16.7 years, and at a \$19 per hundredweight average price it would require 42 years. On the basis of the average price per hundredweight received over the last 5 years, pay off periods for the 400, 600, 800, 1,000, and 1,200 sow capacity model plants were estimated at 6.8, 5.5, 5.4, 5.0, and 5.1 years, respectively. At an average price of \$19 per hundredweight the pay off periods for the 400, 600, 800, 1,000, and 1,200 sow capacity model plants were estimated at 14.5, 10.1, 10.1, 8.6, and 9.3 years, respectively.

In summary, the model plant analysis indicates that production costs for the smallest plant (200 sow capacity) are of such a magnitude that expected profit margins are relatively narrow for hog prices of \$20 per hundredweight or below. For the larger plants (400 sow capacity and above) expected profit margins are broader and hence are sufficient to pay off invested capital in a relatively short time (8.6 to 14.5 years) even when average hog prices are at a level of \$19 per hundredweight.

The initial budgets for each of the six model plants were subsequently modified to take into consideration changes in the basic assumptions as to feeding efficiency, farrowing rates, and the number of pigs born, weaned, and marketed per litter. Other situations considered were changes in feed prices, labor costs, labor utilization, utility costs, construction costs, interest rates, and depreciation rates. In all, a total of 39 situations were considered.

## INTRODUCTION

Traditionally, pork production in the U.S. has been concentrated in the corn producing states of the Midwest. Pork production enterprises in these areas were generally operated as an integral part of a companion feed grain production operation and in the main constituted an alternative method of marketing feed grain and of efficiently utilizing family labor. These operations were relatively small with low or modest capital requirements. In more recent years, the development of S.P.F. (specific pathogen-free) hog production techniques, together with the development of complete confinement swine rearing operations, has magnified capital and labor requirements both quantitatively and qualitatively. Large capital investments require intensive use of facilities in order to reduce unit costs. This development has necessitated the introduction of continuous farrowing techniques in order to operate these expensive facilities at an economic level of use. Similarly, the quality of both management and ordinary labor required by the new techniques necessitates relatively full utilization of these necessarily higher priced production factors to reduce unit costs. The new technology has thus resulted in a trend toward more specialization in pork production and the development of larger and larger producing firms. Today, 200 and 300 sow enterprises are not uncommon and a smaller number of even larger firms of 1,000 sows or more are in operation or have been planned.

Recent growth in the fed beef cattle industry in Texas, which has raised the state to third place nationally as a producer of fed cattle, has directed attention toward potential advantages which the state may have as a major pork producer. These advantages may be summarized as follows: (1) major producer and net exporter of milo (310,000,000 bushels produced in 1968 or 41.69 percent of total U.S. production), (2) an excellent road network which facilitates the assembly and marketing of livestock and feed grain and the distribution of pork and pork products, (3) a deficit state market and an advantageous location with respect to supplying other deficit pork producing areas in the Southwest and far West, (4) a moderate climate, and (5) a forward-looking institutional framework with experience in serving the service needs of large-scale commercial agriculture.

The 42 county West Texas area is admirably suited to become a center for these relatively new pork production operations. This area is a large feed grain surplus area. In 1968 this area produced 171,000,000 bushels of grain sorghum or approximately 55.2 percent of the state production of this feed grain.

Swine producers need information on expected costs and possible returns from swine production under complete confinement conditions. Banks and other credit institutions require information on the economic feasibility of various sizes of hog production operations in order to properly evaluate loan applications of their patrons who are contemplating entry into hog production or the expansion of an existing hog enterprise. A major purpose of this study was to supply this needed information.

### Objectives

The major objective of this study was to determine costs of production for various sizes of complete confinement swine production operations on the Texas High Plains. Specifically the objectives of this study were

- (1) to determine physical input requirements for 200, 400, 600, 800, 1,000, and 1,200 sow complete confinement swine operations;

- (2) to determine capital requirements and total costs for 200, 400, 600, 800, 1,000, and 1,200 sow complete confinement swine operations; subsequently, to determine capital requirements per sow capacity, costs per hog marketed, and costs per hundredweight of pork produced;
- (3) to modify the initial assumptions of pigs born, weaned, and marketed per sow; farrowings per year; feed efficiency; feed prices; labor rates; investment costs; utility rates and other factors;
- (4) to recompute costs per hundredweight of pork produced and per hog marketed under the modified assumptions; and
- (5) to identify those areas where changes in the basic assumptions have the largest effect on unit costs.

### Methodology

The technique followed in this study was the synthetic model procedure. This technique attempts to create, within an assumed framework, model plants of specific capacity, equipment and labor force. The framework in which these elements are incorporated consists of the prevailing managerial techniques, market practices, and other institutional aspects common to the industry. The totality of inputs plus the framework make up the production complex termed the swine production firm. Once such a complex has been organized into an efficient and workable organization it becomes possible to attach monetary coefficients to the various factors and hence to calculate total and unit costs. Subsequently, modifications in both input requirements and prices can be made and their effect on total and unit costs recomputed under the new set of conditions.

### Source of Data

Data on inputs and prices used in the study were developed through consultation with swine producers, animal science specialists, building contractors, equipment suppliers, feed processors, and others familiar with various aspects of swine productions. Labor requirements were developed through a work sampling study of three complete confinement swine production operations on the Texas High Plains conducted in the fall of 1971.<sup>1</sup>

### Scope of Study

Six complete confinement swine production operations of 200, 400, 600, 800, 1,000, and 1,200 sow capacity were budgeted in this study. Complete confinement was defined as a production system wherein each animal unit is totally maintained in buildings on solid floors or slats with varying amounts of environmental control during each phase of the production process. More specifically, the production process used in the study specified the construction and utilization of the following four types of functionally planned facilities: (1) gestation barns, (2) farrowing houses, (3) nurseries, and (4) finishing houses. A feed mill and office were also included for each operation.

---

<sup>1</sup>Owens, T. R., Snodgrass, Carter, and Lee, Hong Y., *Labor Utilization Confinement Rearing of Swine, Texas High Plains*, ICASALS Special Report No. 45, Texas Tech University, Lubbock, Texas, March 1971.

Input requirements were specified separately for each size of firm. However, except for management, input prices were assumed equal for all firms. In the case of management it was assumed that the larger firms would require higher quality management commensurate with the increase in responsibility and hence would pay higher management salaries.

Following the development of the basic budgets for the 200, 400, 600, 800, 1,000, and 1,200 sow capacity model firms a computer program was developed for the purpose of introducing a total of 39 changes in the assumptions, input requirements and/or factor prices of the basic budgets. The major changes involved were average farrowings per sow, average number of pigs born, weaned, and marketed per litter, construction costs, wage rates, labor utilization, ration costs, feed requirements, utility rates, and interest rates.

### **Basic Assumptions**

The production process assumed that all livestock were S.P.F. Purchase price of the initial breeding stock was estimated at \$175 per head for sows and \$350 per head for boars. The sow-boar ratio was assumed 16 : 1 or 12 boars for each 200 sows. The productive life of both sows and boars was estimated at 3 years. Sale weights of both cull sows and boars were assumed to average 360 pounds with a salvage value of \$0.18 per pound.

It was assumed that with good management sows would average 2.23 farrowings per year. On the average, it was assumed that there would be 8.5 pigs per litter, 8.2 pigs weaned, and 8.0 pigs marketed. It was assumed further that pigs would spend 35 days in the farrowing house, 35 days in the nursery, and 94 days in the finishing house for a total of 164 days from farrowing to market. Market weights were assumed to average 225 pounds per hog marketed.

## **PHYSICAL INPUTS AND PRICES**

### **Land Requirements**

Land requirements were estimated on the basis of the space requirements for all buildings, including the feed mill and office, with an allowance for necessary service and access roads and the sewage collection lagoon. Land requirements and investment for each of the model plant production units are shown in Table 1. Land prices were estimated at \$300 per acre. It was assumed that each of the model plant production units, 200 through 1,200 sows, would be totally enclosed by a wire mesh fence (See Table 1). Fencing costs were estimated at \$1.25 per foot. Water supplies for each unit were obtained from wells developed at each location.

### **Building Requirements and Costs**

Industry sources indicated a rather wide difference in opinion as to the optimum size, type, and arrangement of the various functional units of the confined swine production enterprise. The basic unit utilized in this study consisted of a 200 sow gestation barn, 3 farrowing houses with 20 farrowing spaces per house, 3 nursery houses to accommodate the output of 3 farrowing houses, and 5 finishing floors to accommodate the output of the 3 nurseries. Model plants larger than 200 sows were specified as multiples of this same basic design size. Management considerations, specifically animal health problems,



Table 1

Land, Water Well, and Fencing Requirements and Costs, Complete Confinement Swine Rearing Operations, Six Model Plants, Texas High Plains, 1970.

Plant Capacity <sup>1/</sup>	Land Required	Land Cost <sup>2/</sup>	Water Wells Required <sup>3/</sup>	Cost of Wells	Fencing Required	Total Fence Cost <sup>4/</sup>
	Acres	Dollars	No.	Dollars	Feet	Dollars
200	6.8	2,040	1	2,700	2,100	2,625
400	9.8	2,940	1	2,700	2,360	2,950
600	12.9	3,870	1	2,700	2,760	3,450
800	19.0	4,500	2	5,400	3,020	3,775
1,000	17.1	5,130	2	5,400	3,300	4,125
1,200	20.1	6,030	2	5,400	3,680	4,600

<sup>1/</sup>All model plant capacities are described in terms of the number of sows maintained.

<sup>2/</sup>Land cost \$300.00 per acre

<sup>3/</sup>Based on a need of 5,000 gallon/100 sows/day. Pumps were assumed to be 3 HP submersible with a pumping capacity of 80 G.P.M. and a lift of 120 ft. Includes cost of drilling, casing, developing, pump and control panel installed.

<sup>4/</sup>Fencing cost \$1.25/ft. including all materials and labor.

suggested a limit of 20 sows per farrowing house. This limitation was relaxed in a few instances to provide for a farrowing house with 22 spaces where this change would best meet the industry criteria of one farrowing space per 3.5 sows per year. Building requirements for each of the model plants are shown in Table 2.

Different facility arrangements involving other building sizes and technologies are possible and are currently being utilized. For example, a number of producers are currently employing a larger gestation barn; other combine farrowing and nursery buildings; and still others build fewer and larger nurseries and finishing barns to accommodate the output of a number of farrowing houses. Consequently, costs developed in this study apply only to the situations assumed since other facility arrangements may result in either higher or lower costs. A diagrammatic layout of a 200 sow capacity model plant is illustrated in Figure 1.

Building specifications and construction costs for each unit of the model plants are shown in Table 3.

Construction costs based on the specifications shown in Table 3 were developed through interviews with producers, contractors, and equipment suppliers. Total investment in buildings for each production phase for the six model plants are summarized in Table 4.

#### Equipment Requirements and Costs

Equipment requirements for the model plants included such items as the feed mill, plant vehicles such as feed truck, livestock trucks and trailers, feed storage tanks, and office, shop, and locker room equipment and furniture. Total investment in equipment for each of the model plants is summarized in Table 5. The various items included in the plant equipment category for the 200 sow capacity model plant are shown in Table i, Appendix A.

#### Labor Requirements and Wage Rates

Labor requirements for the model plants were based on standards developed in the work sampling study of High Plains swine producers.<sup>2</sup> These standards indicated that the 200, 400, 600, 800, 1,000, and 1,200 sow capacity model plants could be operated with crews of 2.25, 4.5, 7, 9, 11, and 14 men, respectively. The estimates included both salaried managerial labor, other salaried employees, hourly labor and office help. For the smaller plants (200 and 400 sow capacity) office help was considered part-time employment on a monthly fee basis. Labor requirements for each labor category for the model plants are shown in Table 6.

Managerial salaries were estimated on the basis of consultations with firms currently employing paid managers for complete confinement swine production operations. These salaries were then adjusted upward for the largest of the model plants commensurate with the added managerial responsibility and ability required for the larger plants. Other salaried labor was priced at \$660 per month and hourly labor at \$1.65 per hour on a 50 hour week with no allowance for overtime. Salaried office labor was estimated at \$310 per

---

<sup>2</sup> *Ibid.*

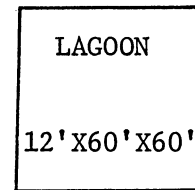
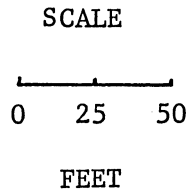
Table 2

Building Requirements and Costs Per Building Unit, Complete Confinement Swine Rearing Operations, Six Model Plants, Texas High Plains, 1970.

Building	Size of Plant						Cost Per Unit
	200	400	600	800	1,000	1,200	
	-----Number of Units-----						Dollars
Gestation	1	2	3	4	5	6	28,000
Farrow I <sup>1/</sup>	3	6	2	7	11	16	10,500
Farrow II	0	0	6	4	3	1	11,500
Nursery	3	5	7	10	12	15	7,500
Finish	5	10	15	19	24	29	10,500
Auxiliary <sup>2/</sup>	1	1	1	1	1	1	3,600
Office	1	1	1	1	1	1	2,800

<sup>1/</sup>Farrow I buildings have a capacity of 20 sows and Farrow II buildings a capacity of 22 sows.

<sup>2/</sup>The Auxiliary building consists of a repair shop and equipment storage area.



250'

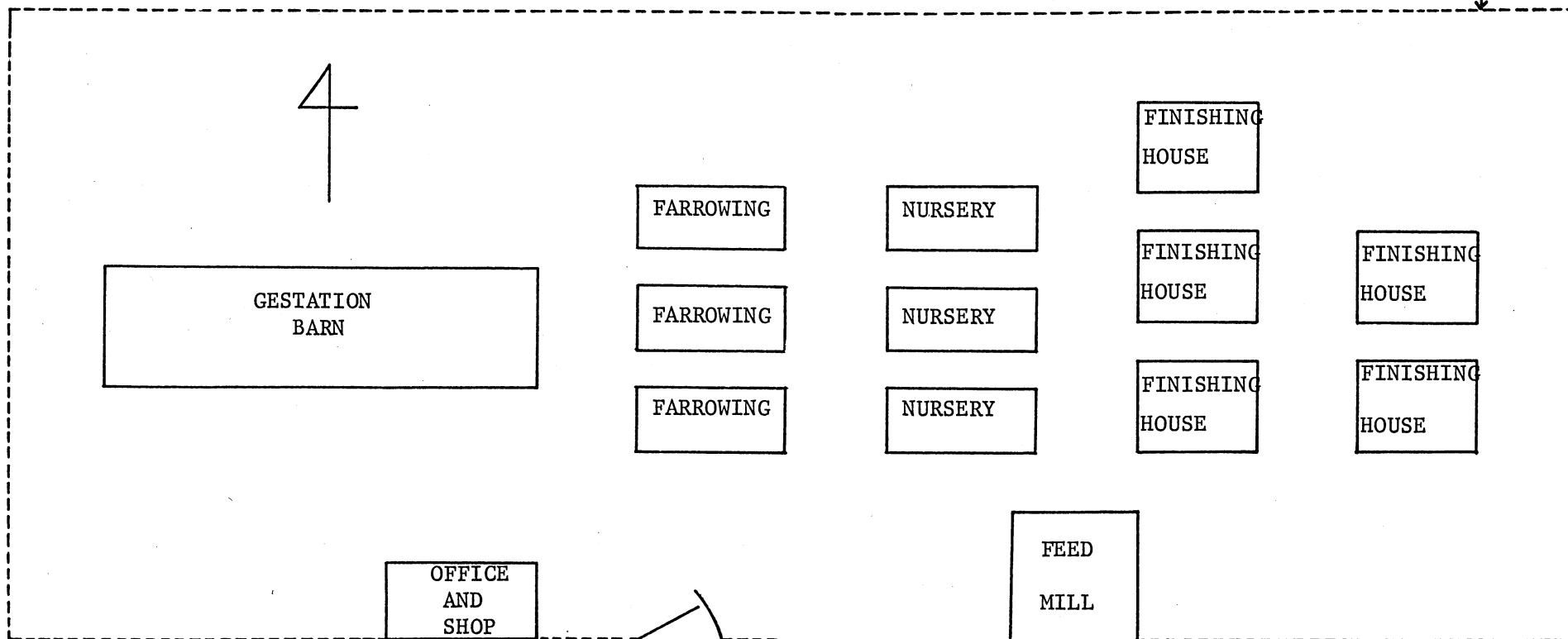


FIGURE 1

MODEL LAYOUT FOR A 200 SOW COMPLETE CONFINEMENT OPERATION

Table 3

Building Specifications and Construction Costs Per Unit, Complete Confinement Swine Rearing Operations, Texas High Plains, 1971.<sup>1/</sup>

Building	Capacity and Dimensions	Construction	Flooring	Equipment	Cost/Unit
					Dollars
Gestation	200 sows 48' x 173'	steel frame, aluminum covered, 4' wide ventilation doors on all sides, insulated ceiling.	1/4 - aluminum slotted, 1/3 open sand pit, remainder-solid concrete.	feeding stalls, concrete feeding troughs, spray cooling system, feed storage.	28,000
Farrowing	20 sows 24' x 60'	steel frame, corrugated aluminum siding outside, aluminum panels inside, 2" fiber glass insulation walls and ceiling, concrete lagoon.	aluminum slotted	farrowing crates 140,000 BTU/hr. forced air heater, 4,000 CFM evaporative cooler, 4 exhaust fans, 10 brooder heating units.	10,500
Nursery	20 litters 25' x 60'	steel frame, corrugated aluminum siding outside, aluminum panels inside, 2" fiber glass insulation walls and ceiling, concrete lagoon.	aluminum slotted	125,000 BTU/hr. heater, spray fogging system, feed storage, pig feeders.	7,500
Finishing	200 pigs 36' x 48'	steel frame, aluminum siding, insulated ceiling, concrete lagoon, ventilation doors on all sides.	aluminum slotted	hog feeders, feeder auger system, feed storage, spray fogging system.	10,500

<sup>1/</sup>Building specifications include complete sewage, water, and electrical connections for all buildings plus connections for natural gas for the farrowing house.

Table 4

Building Investments By Operational Facilities, Complete Confinement  
Swine Rearing Operations, Six Model Plants, Texas High Plains, 1971.

Production Facility	Size of Plant					
	200	400	600	800	1,000	1,200
	-----Dollars-----					
Gestation	28,000	56,000	84,000	112,000	140,000	168,000
Farrow	31,500	63,000	90,000	119,500	150,000	221,500
Nursery	22,500	37,500	52,500	75,000	90,000	112,500
Finish	52,500	105,000	157,500	199,500	252,000	304,500
Auxiliary <sup>1/</sup>	3,600	3,600	3,600	3,600	3,600	3,600
Office	2,800	2,800	2,800	2,800	2,800	2,800
Total	140,000	267,900	390,400	512,400	638,400	812,900

<sup>1/</sup>The Auxiliary building consists of a repair shop and equipment storage area.

Table 5

Equipment Investment, Complete Confinement Swine Rearing Operations By Major Equipment Categories, Six Model Plants, Texas High Plains, 1971.

Equipment Categories	Size of Plant					
	200	400	600	800	1,000	1,200
	-----Dollars-----					
Office and Locker Room	3,120	3,320	3,830	4,160	4,495	4,720
Shop	1,080	1,080	1,080	1,080	1,080	1,080
Mill and Hauling	9,625	10,325	11,175	12,775	13,175	14,125
Vehicles	12,200	13,200	13,200	15,700	15,700	15,700
Total	26,025	27,925	29,285	33,715	34,450	35,625



Table 6

Labor Requirements in Man Equivalents, Complete Confinement Swine Rearing Operations, Six Model Plants, Texas High Plains, 1971.

Labor Classification	Size of Plant					
	200	400	600	800	1,000	1,200
	-----Number-----					
Manager	1	1	1	1	1	1
Other Salaried	1	2	2	3	3	4
Hourly	0	1	3	4	6	7
Office <sup>1/</sup>	.25	.5	1	1	1	2
Total Employees	2.25	4.5	7	9	11	14

<sup>1/</sup>Assumes office work for the 200 and 400 sow capacity model plants will be performed by .25 and .5 man equivalents, respectively, on a monthly fee basis.

Table 7

Annual Labor Costs, Complete Confinement Swine Rearing Operations, Six Model Plants, Texas High Plains, 1971.

Labor Classification	Size of Plant					
	200	400	600	800	1,000	1,200
	-----Dollars-----					
Manager	8,400	10,000	10,000	12,000	12,000	14,000
Other Salaried	7,200	14,400	14,400	21,600	21,600	28,800
Hourly	-0-	3,900	11,700	15,600	23,400	27,300
Office	600	1,200	3,600	3,600	3,600	7,200
Total	16,200	29,500	39,700	52,800	60,600	77,300

month. All labor salaries including managerial salaries and the basic labor rate included a 10 percent allowance for social security, paid holidays, and vacations and other fringe benefits. Labor costs for the six model plants are shown in Table 7.

## Utility Requirements and Rates

### ELECTRICITY

Electricity is utilized in confined swine production operations for heat, light, and power. A substantial amount of electricity is required by the pig brooders in the farrowing houses. A second major use involves operation of ventilating fans, evaporative coolers, and space heaters in the farrowing house.

Two different computation procedures were utilized to arrive at an estimate of electrical requirements. The first computation involved listing the various power, heat, and light requirements of each facility, converting all requirements to kilowatts and subsequently estimating the number of operating hours for each power consumption unit. Kilowatts used multiplied by hours of use yielded kilowatt hours consumption. Subsequently, total kilowatt hours consumed were costed at prevailing power rates furnished by a local utility company.

Total power consumption and cost estimates obtained by the above procedure were then checked against power consumption and costs of two complete confinement swine production operations. Total power costs derived from the theoretical calculations were approximately 25 percent higher than costs obtained from the two sample plant operations.

In view of this discrepancy, electrical power costs for the model plants were based on annual costs experienced by the two sample plants. Data obtained from the theoretical calculations were then used to distribute these costs among the various productive facilities in order to arrive at a power cost for each operational facility. Power costs for any specific model plant were then calculated as the sum of the costs for each power consuming production facility. Electrical power costs for each model plant are summarized in Table 8.

### GAS CONSUMPTION AND COSTS

The estimation of gas requirements and costs for the model plants utilized the same procedures followed in the determination of power requirements and costs. That is, a theoretical requirement was calculated on the basis of heat requirements in B.T.U.'s, heat losses and gains in B.T.U.'s from various sources, and the B.T.U. output and gas consumption per unit of time of the heating equipment. Total gas consumption for each facility was then priced at the prevailing gas rate utilizing a price schedule provided by a local gas utility company.

The theoretical estimates were then compared to actual consumption as determined from monthly billings of consumption and costs for two sample plant operations. In this case, the difference between the two sources amounted to less than 5 percent of total gas costs. These data were then adjusted to arrive at gas consumption and costs per operational facility to develop gas costs for each of the model plant operations. Gas costs are summarized for each model plant in Table 9.

Table 8

Electrical Power Costs Per Production Facility, Complete Confinement Swine Rearing Operations, Six Model Plants, Texas High Plains, 1971.

Production Facility	Size of Plant					
	200	400	600	800	1,000	1,200
-----Dollars-----						
Gestation	47.50	95.00	142.50	190.00	237.50	285.00
Farrowing	541.50	1,083.00	1,444.00	1,985.00	2,327.00	3,068.50
Nursery	114.00	110.00	266.00	380.00	456.00	570.00
Finishing	142.50	285.00	427.50	541.50	684.00	826.50
Well	28.50	42.75	57.00	85.50	114.00	142.50
Mill	28.50	57.00	85.50	114.00	142.50	171.00
Others <sup>1/</sup>	47.50	57.00	66.50	76.00	85.50	95.00
Total	950.00	1,809.75	2,489.00	3,372.00	4,246.50	5,158.50

<sup>1/</sup>Others include office, shop, and outside lights.

Table 9

Annual Gas Consumption Costs Per Production Facility, Complete Confinement Swine Rearing Operations, Six Model Plants, Texas High Plains, 1971.

Production Facility	Size of Plant					
	200	400	600	800	1,000	1,200
-----Dollars-----						
Farrowing	731.25	1,462.50	1,950.00	2,681.25	3,412.50	4,143.75
Nursery	97.50	195.00	292.00	390.00	487.50	585.00
Others	146.25	146.25	146.25	146.25	146.25	146.25
Total	975.00	1,803.75	2,388.75	3,217.50	4,046.75	4,875.00

## MISCELLANEOUS EXPENSES

This expense category included such items as veterinary expense, office supplies and plant consumables such as motor fuel and oils. It also included such items as telephone and telegraph expense, dues and subscriptions, legal and audit, and miscellaneous license fees. Costs for these items for the most part were developed on the basis of consultations with managers of existing confined swine rearing enterprises. Veterinary expenses for these latter operations were examined and subsequently converted to a cost per sow. These latter expenses amounted to \$7.96 per sow per year. Fuel expenses for over the road hauling were based on estimated travel in miles for each vehicle at a specified gas consumption rate per mile. These two items, veterinary expense and fuel constituted the largest single expense items in this cost category. Total miscellaneous expenses for each of the model plants are shown in Table 10.

## FEED CONSUMPTION AND RATION COSTS

Feed costs make up the largest single cost item in total production costs. Consequently, optimum ration formulation for maximum feed efficiency or least cost performance (L.C.P.) is an item of major importance to all pork producers. The model plant analysis envisioned the formulation and use of 4 different rations: (1) a growing and lactation ration for nurse pigs (40-125 lbs) and lactating sows, (2) a finishing ration (125-225 lbs), (3) a creep ration (farrowing to 40 lbs), and (4) a gestating sow and boar ration. Principal ingredients in each ration and total and unit cost for each ingredient in each ration are shown in Tables 11 through 14. Milo, the principal ingredient in each ration was priced at \$2/cwt in these formulations. Costs for the four rations were as follows: ration 1 - \$58.46/ton, ration 2 - \$54.46/ton, ration 3 - \$62.80/ton, and ration 4 - \$66.34/ton.

The basic budgets for the model plants assumed an overall feeding efficiency of 3.56 : 1. This ratio was computed on the basis of the total hundred weight of hogs marketed. The feed efficiency ratio assumed for the model plants was based on data obtained under experimental conditions; consequently, it is probably too optimistic for most commercial hog operations. However, in a later section of the report the effect of other and perhaps more appropriate feed efficiency levels are considered. Total feed costs for the model plants are summarized in Table 15.

## Distribution of Fixed Costs

### DEPRECIATION

Depreciation on plant buildings was estimated at 10 percent per year and assumed no salvage value at the end of the 10-year period. Depreciation on equipment varied according to the particular equipment item concerned. Depreciation rates for equipment items in most cases were abstracted from other studies and assumed no salvage value. Depreciation rates for plant vehicles assumed a 5-year life, or 20 percent per year depreciation rate, with an allowance of 10 percent of the initial cost for salvage. Annual depreciation charges for each of the model plants are summarized in Table 15.

### REPAIR AND MAINTENANCE

Repair and maintenance on buildings was estimated at 1 percent of the initial investment cost per year. This standard was taken from other studies and represents

Table 10

Annual Miscellaneous Costs By Major Expense Categories, Complete Confinement Swine Rearing Operations, Six Model Plants, Texas High Plains, 1971.

Expense Category	Size of Plant					
	200	400	600	800	1,000	1,200
	-----Dollars-----					
Veterinary Service	1,592.22	3,184.44	4,776.66	6,368.88	7,961.10	9,553.32
Other Expendable Supplies	600.00	1,200.00	1,800.00	2,400.00	3,000.00	3,600.00
Insurance on Animals	443.35	886.70	1,330.05	1,773.40	2,216.75	2,660.10
Other Expenses <sup>1/</sup>	3,502.56	5,382.47	5,547.86	8,199.28	9,893.72	11,587.59
Total	6,138.13	10,653.61	13,454.57	18,741.56	23,071.57	27,401.01

<sup>1/</sup>Other Expenses included gasoline, oil, travel, telephone, dues and subscriptions, legal fees, etc.

Table 11

Growing and Lactation Ration, Principal Ingredients, Ingredient Costs and Cost Per Ton, Complete Confinement Swine Rearing Operations, Texas High Plains, 1971.

Ingredients	Ration Contribution	Unit	Cost/Unit	Units Req.	Cost/Ton Ration
	Percent		Dollars	No.	Dollars
Milo	73.75	cwt.	2.00	14.75	29.50
Soybean Meal	23.00	cwt.	4.50	4.60	20.70
Salt	0.50	cwt.	0.50	0.10	0.05
Poly Phos	1.25	cwt.	4.05	0.25	1.01
Vitamin and Mineral Pre-Mix	1.50	cwt.	24.00	0.30	7.20
Total	100.00	cwt.	2.92	20.00	58.46

Table 12

Finishing Ration, Principal Ingredients, Ingredient Costs and Cost Per Ton, Complete Confinement Swine Rearing Operations, Texas High Plains, 1971.

Ingredients	Ration Contribution	Unit	Cost/Unit	Units Req.	Cost/Ton Ration
	Percent		Dollars	No.	Dollars
Milo	81.75	cwt.	2.00	16.35	32.20
Soybean Meal	15.00	cwt.	4.50	3.00	13.50
Salt	0.50	cwt.	0.50	0.10	0.05
Poly Phos	1.25	cwt.	4.05	0.25	1.01
Vitamin and Mineral Pre-Mix	1.50	cwt.	24.00	0.30	7.20
Total	100.00	cwt.	2.72	20.00	54.46

Table 13

Creep Ration, Principal Ingredients, Ingredient Costs and Cost Per Ton, Complete Confinement Swine Rearing Operations, Texas High Plains, 1971.

Ingredients	Ration Contribution	Unit	Cost/	Units	Cost/
	Percent		Unit	Req.	Ton Ration
			Dollars	No.	Dollars
Milo	65.90	cwt.	2.00	13.18	26.36
Soybean Meal	31.00	cwt.	4.50	6.20	27.90
Salt	0.50	cwt.	0.50	0.10	0.05
Poly Phos	1.00	cwt.	4.50	0.20	0.81
Vitamin and Mineral Pre-Mix	1.60	cwt.	24.00	0.32	7.68
Total	100.00	cwt.	3.14	20.00	62.80

Table 14

Gestation and Boar Ration, Principal Ingredients, Ingredient Costs and Cost Per Ton, Complete Confinement Swine Rearing Operations, Texas High Plains, 1971.

Ingredients	Ration Contribution	Unit	Cost/	Units	Cost/
	Percent		Unit	Req.	Ton Ration
			Dollars	No.	Dollars
Milo	71.30	cwt.	2.00	14.26	28.52
Soybean Meal	24.00	cwt.	4.50	4.80	21.60
Salt	0.50	cwt.	0.50	0.10	0.05
Poly Phos	1.00	cwt.	4.05	0.20	0.81
Vitamin and Mineral Pre-Mix	3.20	cwt.	24.00	0.64	15.36
Total	100.00	cwt.	3.32	20.00	66.34



Table 15

Annual Feed Costs, Annual Depreciation Charges, Annual Tax Charges, and Annual Repair and Maintenance Charges, Complete Confinement Swine Rearing Operations, Six Model Plants, Texas High Plains, 1971.

Annual Costs	Size of Plant					
	200	400	600	800	1,000	1,200
	-----Dollars-----					
Feed	81,586.06	163,172.25	244,758.50	326,344.69	407,930.94	489,517.13
Depreciation	15,387.20	28,152.18	40,502.18	53,539.40	66,209.40	79,554.40
Taxes	3,260.15	5,657.27	7,090.44	10,368.39	12,727.70	15,215.70
Repair and Maintenance	1,541.75	2,794.50	4,034.50	5,291.25	6,561.75	7,901.00

normal maintenance requirements for farm buildings of a similar type. Repair and maintenance on equipment was specified at 5 percent of the initial investment cost per year. The 5 percent of initial investment repair and maintenance rate was also applied to plant vehicles (Table 15).

## PROPERTY TAXES

Tax rates were obtained from the Lubbock County Tax Assessor. These rates were \$3.71 per \$100 of assessed value. Assessed value was estimated at 50 percent of acquisition cost. This rate was applied to the total investment in land, buildings, and equipment and represented the total assessment for county, state, water, and hospital district taxes (Table 15).

## INSURANCE

It was assumed that buildings and equipment would be insured against fire and extended coverage. The insurance program specified the application of an 80 percent coinsurance clause. Fire insurance and extended coverage rates on plant facilities amounted to \$0.48 and \$1.50 per \$100 of insurance, respectively.

Plant vehicles were insured against fire and theft, property damage liability, and bodily injury liability. Liability limits on over-the-road vehicles were specified at \$50,000 and \$100,000 for bodily injury liability and \$25,000 for property damage liability. Liability limits on tractors and other in-plant vehicles were specified at \$10,000 and \$20,000 for bodily injury and \$5,000 property damage liability. General liability coverage was also specified for each of the model plants with liability limits of \$25,000 and \$250,000 for bodily injury, \$500 medical payment, and coverage against animal collision.

Model plant specifications provided for insurance on livestock against the perils of fire, lightning, windstorm, building collapse, riot, theft, shooting, drowning, suffocation, dogs, etc. This insurance was written on a monthly reporting form basis with a \$50 deductible clause. Rates and insurance provisions were obtained from a local insurance agent. The applicable rate of \$0.0485 per hundred dollars valuation was applied to the average estimated value of all livestock in each of the model plants. For purposes of computation, sows were valued at \$175 each, boars \$350 each, gilts retained for breeding \$75 each, pigs up to 5 weeks old \$10 each, pigs up to 10 weeks old \$20 each, and pigs over 10 weeks old \$30 each.

Total insurance costs for each of the model plants are summarized in Table 16.

## INTEREST

Interest on capital invested in buildings and equipment was calculated at 6 percent of the average investment. Interest on investment in vehicles and breeding stock was calculated on the basis of the formula

$$\frac{AC + SV}{2}$$

where AC represents the acquisition cost and SV represents the salvage value. Annual interest charges on investment in land were computed on the basis of 6 percent of the

Table 16

Annual Insurance Charges, Buildings, Equipment, Vehicles, and Livestock, Complete Confinement Swine Rearing Operations, Six Model Plants, Texas High Plains, 1971.

Item and Coverage	Size of Plant					
	200	400	600	800	1,000	1,200
-----Dollars-----						
Building Fire and ECE <sup>1/</sup>	1,941.87	3,632.74	5,266.17	6,926.50	8,604.43	10,370.34
Equipment Fire and ECE	183.60	195.55	210.95	241.28	252.37	267.64
Vehicles <sup>2/</sup> BI and PD	415.08	445.08	445.08	527.94	527.94	527.94
Gen. Liability	54.00	54.00	54.00	54.00	54.00	54.00
Livestock <sup>3/</sup>	443.35	886.20	1,330.05	1,773.40	2,216.75	2,260.10
Total	3,037.90	5,213.57	7,306.25	9,523.12	11,655.49	13,480.02

<sup>1/</sup>ECE - Extend Coverage Endorsement to the fire insurance policy insures against wind-storm, hail, smoke damage, vehicle damage, etc.

<sup>2/</sup>BI and PD - Bodily injury and property damage liability insurance

<sup>3/</sup> Specified risks including fire, lightning, windstorms, building collapse, riot, theft, shooting, drowning, suffocation, etc.

acquisition cost of the land. Annual interest charges for each of the major investment components are summarized for the model plants in Table 17.

## TOTAL AND UNIT COSTS

Production cost studies provide a useful tool in analyzing existing plant operations and in estimating the probable economic feasibility of new enterprises. They should not be used, however, as an illustration of the costs experienced by a particular firm or a particular industry. For example, costs derived from statistical studies of existing plants are representative only of average costs experienced by those plants in the statistical sample. Hence, they cannot be representative of actual costs experienced by any particular firm in the group of sample plants or in the universe of plants represented by the statistical sample. Similarly, costs developed by synthetic or budget procedures such as those utilized in this study are not representative of costs experienced by any particular firm in the industry. Differences in the basic assumptions, differences in facility arrangement and construction, differences in managerial ability, and other factors between the model plants and existing firms make direct comparisons between production costs inappropriate. Total and unit cost data presented in the following section should be used only with these limitations in mind.

### Total Investment

Total investment, annual costs, cost per hundredweight of hogs marketed, and percentage distribution by major cost categories are shown in Tables 18 through 23. Total investment in facilities and breeding stock for the model plants amounted to \$216,990 (200 sows), \$386,315 (400 sows), \$550,605 (600 sows), \$720,244 (800 sows), \$887,259 (1,000 sows), and \$1,061,483 (1,200 sows). Capital requirements ranged from a low of \$884.57 per sow for the 1,200 sow capacity model plant to a high of \$1,084 per sow for the 200 sow capacity model plant.

### Annual Costs

Annual production costs for each model plant amounted to \$146,936 (200 sows), \$278,164 (400 sows), \$404,382 (600 sows), \$534,755 (800 sows), \$658,624 (1,000 sows), and \$794,673 (1,200 sows) (Tables 18 through 23). Feed costs were the most important component of total costs for all of the model plants, ranging from a low of 56.0 percent of annual costs for the 200 sow capacity model plant to a high of 61.9 percent of annual costs for the 1,000 sow capacity model plant. Building costs not including interest on investment in buildings were the second most important cost component ranging from 14.1 to 14.7 percent of annual costs for the model plants. Labor was the third most important component of annual costs, ranging from a high of 13.4 percent of annual costs for the 200 sow capacity plant to a low of 11.1 percent of annual costs for the 1,000 sow capacity plant. Together these three cost components ranged from a low of approximately 84.1 percent of annual costs for the 200 sow capacity model plant to a high of 87.3 percent of annual costs for the 1,200 sow capacity model plant.

### Unit Costs

Production costs per hundredweight of market hogs excluding cull sows and boars for each of the model plants were as follows: 200 sows (\$18.30), 400 sows (\$17.32), 600 sows (\$16.79), 800 sows (\$16.65), 1,000 sows (\$16.41), and 1,200 sows (\$16.51),

Table 17

Interest on Fixed Investment and Operating Capital, Complete Confinement Swine Rearing Operations, Six Model Plants, Texas High Plains, 1971.

Annual Charge	Size of Plant					
	200	400	600	800	1,000	1,200
	-----Dollars-----					
Fixed Capital	7,030.06	12,551.88	17,920.54	23,448.18	28,889.60	34,555.42
Operating Capital	1,201.92	2,344.32	3,442.37	4,571.20	5,638.83	6,825.33
Total	8,231.98	14,796.20	21,362.91	28,019.38	34,528.43	41,380.75

Table 18

Total Investment, Annual Costs, Annual Costs Per Sow of Capacity, Costs Per Hundredweight of Market Hogs and Percentage Contribution by Major Expense Categories, 200 Sow Complete Confinement Swine Rearing Operation, Texas High Plains, 1971.

Expense Items	Total Investment	Annual Cost	Annual Cost Per Sow	Cost Per Cwt Market Hogs	Percent Annual Cost
-----Dollars-----					
Land and Building	148,265.00	21,170.18	105.85	2.64	14.6
Equipment	13,825.00	2,031.70	10.16	.25	1.4
Vehicle	15,700.00	3,993.31	19.97	.50	2.7
Labor	X	19,616.52	98.08	2.44	13.3
Breeding Stock	39,200.00	2,243.22	11.21	.28	1.5
Utilities					
Electricity	X	950.00	4.75	.12	.7
Natural Gas	X	975.00	4.88	.12	.7
Ration	X	81,586.06	407.93	10.16	55.3
Other Expenses <sup>1/</sup>	X	6,138.13	30.69	.76	4.2
Interest <sup>2/</sup>	X	8,231.98	41.16	1.03	5.6
Total	216,990.00	146,936.11	734.68	18.30	100

<sup>1/</sup> Veterinary services, insurance on animals, other expendable supplies, and miscellaneous expenses.

<sup>2/</sup> Interest on operating capital included.

Table 19

Total Investment, Annual Costs, Annual Costs Per Sow of Capacity, Costs Per Hundredweight of Market Hogs and Percentage Contribution by Major Expense Categories, 400 Sow Complete Confinement Swine Rearing Operation, Texas High Plains, 1971.

Expense Items	Total Investment	Annual Cost	Annual Cost Per Sow	Cost Per Cwt Market Hogs	Percent Annual Cost
-----Dollars-----					
Land and Building	276,490.00	39,267.67	98.17	2.45	14.2
Equipment	14,725.00	2,122.68	5.31	.13	.8
Vehicle	16,700.00	4,271.86	10.68	.27	1.6
Labor	X	35,680.47	89.20	2.22	12.8
Breeding Stock	78,400.00	4,486.44	11.22	.28	1.6
Utilities					
Electricity	X	1,809.75	4.52	.11	.6
Natural Gas	X	1,803.75	4.51	.11	.6
Ration	X	163,172.25	407.93	10.16	58.6
Other Expenses <sup>1/</sup>	X	10,653.61	26.63	.66	3.8
Interest <sup>2/</sup>	X	14,896.20	37.24	.93	5.4
	386,315 <sup>m</sup>	278,164 <sup>68</sup>	695 <sup>74</sup>	17.32	100.00



ERRATA

Page 9, Table 4: Total for the 200 size plant should read 140,900 instead of 140,000.

Page 10, Table 5: The following table should replace the table in the text.

Table 5

Equipment Categories	Size of Plant					
	200	400	600	800	1,000	1,200
-----Dollars-----						
Office & Locker Room	3,120	3,320	3,630	4,060	4,495	4,695
Shop	1,080	1,080	1,080	1,080	1,080	1,080
Mill and Hauling	9,625	10,325	11,175	13,029	13,429	14,379
Vehicles	15,700	16,700	16,700	19,200	19,200	19,200
<b>Total</b>	<b>29,525</b>	<b>31,425</b>	<b>32,585</b>	<b>37,369</b>	<b>38,204</b>	<b>39,354</b>

Page 11, Table 7: The following table should replace the table in the text.

Table 7

Labor Classification	Size of Plant					
	200	400	600	800	1,000	1,200
-----Dollars-----						
Manager	9,240	11,000	11,000	13,200	13,200	15,400
Other Salaried	7,920	15,840	15,840	23,760	23,760	31,680
Hourly	-0-	4,290	12,870	17,160	25,740	30,030
Office	673	1,307	3,960	3,960	3,960	7,920
<b>Sub-Total</b>	<b>17,833</b>	<b>32,437</b>	<b>43,670</b>	<b>58,080</b>	<b>66,660</b>	<b>85,030</b>
Allowance for OASI and Fringe Benefits	1,783	3,244	4,367	5,808	6,666	8,503
<b>Total</b>	<b>19,616</b>	<b>35,681</b>	<b>48,037</b>	<b>63,888</b>	<b>73,326</b>	<b>93,533</b>

Page 13, Table 8: Row 3, Column 3 should be "190.00" instead of "110.00."

Page 15, Table 10: Row 4, Column 4 should be "7,362.38" instead of "5,547.86."

Row 5, Column 4 should be "15,269.09" instead of "13,454.57."

Page 24, Table 19: Add a row for Total as 386,315.00; 278,164.68; 695.41; 17.32; 100.0 for columns 2, 3, 4, 5, and 6, respectively.

Table 20

Total Investment, Annual Costs, Annual Costs Per Sow of Capacity, Costs Per Hundredweight of Market Hogs and Percentage Contribution by Major Expense Categories, 600 Sow Complete Confinement Swine Rearing Operation: Texas High Plains, 1971.

Expense Items	Total Investment	Annual Cost	Annual Cost Per Sow	Cost Per Cwt. Market Hogs	Percent Annual Cost
Land and Building	400,420.00	56,772.75	94.62	2.36	14.2
Equipment	15,885.00	2,302.54	3.84	.11	.7
Vehicle	16,700.00	4,271.86	7.12	.17	1.0
Labor	X	48,037.00	80.06	1.99	11.9
Breeding Stock	117,600.00	6,729.66	11.21	.28	1.7
Utilities					
Electricity	X	2,489.00	4.15	.10	.6
Natural Gas	X	2,388.75	3.98	.10	.6
Ration	X	244,758.50	407.93	10.16	60.7
Other Expenses <sup>1/</sup>	X	15,269.08	25.45	.63	3.3
Interest <sup>2/</sup>	X	21,362.91	35.60	.88	5.3
Total	550,605.00	404,382.05	673.96	16.79	100.0

<sup>1/</sup>Veterinary services, insurance on animals, other expendable supplies, and miscellaneous expenses.

<sup>2/</sup>Interest on operating capital included.

Table 21

Total Investment, Annual Costs, Annual Costs Per Sow of Capacity, Costs Per Hundredweight of Market Hogs and Percentage Contribution by Major Expense Categories, 800 Sow Complete Confinement Swine Rearing Operation: Texas High Plains, 1971.

Expense Items	Total Investment	Annual Cost	Annual Cost Per Sow	Cost Per Cwt. Market Hogs	Percent Annual Cost
-----Dollars-----					
Land and Building	526,075.00	74,660.13	93.33	2.32	14.1
Equipment	18,169.00	2,563.13	3.20	.08	.5
Vehicle	19,200.00	4,976.09	6.22	.15	1.0
Labor	X	63,888.00	79.86	1.99	11.9
Breeding Stock	156,800.00	8,972.88	11.21	.28	1.7
Utilities					
Electricity	X	3,372.00	4.22	.11	.6
Natural Gas	X	3,217.50	4.02	.10	.6
Ration	X	326,344.69	407.93	10.16	60.9
Other Expenses <sup>1/</sup>	X	18,741.56	23.43	.59	3.5
Interest <sup>2/</sup>	X	28,019.38	35.02	.87	5.2
<b>Total</b>	<b>720,244.00</b>	<b>534,755.36</b>	<b>668.44</b>	<b>16.65</b>	<b>100.0</b>

<sup>1/</sup>Veterinary services, insurance on animals, other expendable supplies, and miscellaneous expenses.

<sup>2/</sup>Interest on operating capital included.

Table 22

Total Investment, Annual Costs, Annual Costs Per Sow, Costs Per Hundredweight of Market Hogs and Percentage Contribution by Major Expense Categories, 1,000 Sow Complete Confinement Swine Rearing Operation: Texas High Plains, 1971.

Expense Items	Total Investment	Annual Cost	Annual Cost Per Sow	Cost Per Cwt. Market Hogs	Percent Annual Cost
-----Dollars-----					
Land and Building	653,055.00	92,622.25	92.62	2.31	14.1
Equipment	19,004.00	2,659.89	2.66	.07	.4
Vehicle	19,200.00	4,976.09	4.98	.12	.7
Labor	X	73,325.94	73.32	1.83	11.2
Breeding Stock	196,000.00	11,216.09	11.22	.28	1.7
Utilities					
Electricity	X	4,246.50	4.25	.11	.7
Natural Gas	X	4,046.25	4.05	.10	.6
Ration	X	407,930.94	407.93	10.16	61.9
Other Expenses <sup>1/</sup>	X	23,071.57	23.07	.58	3.5
Interest <sup>2/</sup>	X	34,528.43	34.53	.86	5.2
<b>Total</b>	<b>887,259.00</b>	<b>659,322.99</b>	<b>658.62</b>	<b>16.41</b>	<b>100.0</b>

<sup>1/</sup>Veterinary services, insurance on animals, other expendable supplies, and miscellaneous expenses.

<sup>2/</sup>Interest on operating capital included.

Table 23

Total Investment, Annual Costs, Annual Costs Per Sow of Capacity, Costs Per Hundredweight of Market Hogs and Percentage Contribution by Major Expense Categories, 1,200 Sow Complete Confinement Swine Rearing Operation: Texas High Plains, 1971.

Expense Items	Total Investment	Annual Cost	Annual Cost Per Sow	Cost Per Cwt. Market Hogs	Percent Annual Cost
-----Dollars-----					
Land and Building	786,930.00	111,539.00	92.95	2.32	14.1
Equipment	20,154.00	2,833.33	2.36	.07	.4
Vehicle	19,200.00	4,976.09	4.15	.10	.6
Labor	X	93,532.94	77.94	1.94	11.7
Breeding Stock	235,200.00	13,459.32	11.21	.28	1.7
Utilities					
Electricity	X	5,158.50	4.30	.11	.7
Natural Gas	X	4,875.00	4.06	.10	.6
Ration	X	489,517.13	407.93	10.16	61.5
Other Expenses <sup>1/</sup>	X	27,401.01	22.84	.57	3.5
Interest <sup>2/</sup>	X	41,380.75	34.49	.86	5.2
<b>Total</b>	<b>1,061,483.00</b>	<b>794,673.07</b>	<b>662.23</b>	<b>16.51</b>	<b>100.0</b>

<sup>1/</sup>Veterinary services, insurance on animals, other expendable supplies, and miscellaneous expenses.

<sup>2/</sup>Interest on operating capital included.

(Tables 18 through 23). These data indicate relatively important economies of size between the largest and smallest of the model plants. As plant size increased from 200 to 400 sow capacity, costs per hundredweight of hogs marketed declined from \$18.30 to \$17.32 or a difference of \$0.98 per hundredweight. As size of firm increased from 400 to 600 sow capacity, unit costs were reduced by \$0.53 per hundredweight. Similarly, an increase in plant size from 600 to 800 sow capacity resulted in a reduction of \$0.14 per hundredweight, and from 800 to 1,000 sow capacity a reduction of \$0.24 per hundredweight. However, a further increase from 1,000 to 1,200 sow capacity resulted in an increase of \$0.10 per hundredweight. An examination of the budgets for the 1,000 and 1,200 sow model plants indicates that the increase in unit costs between these two large volume model plants may be attributed to some lumpiness in facility specifications. This effect resulted from a model plant building specification which created some excess capacity in the finishing facilities for the 1,200 sow capacity model.

In summary, the model plant data indicate substantial economies of size between the 200 and 400 sow capacity plants (\$0.98 per hundredweight of market hogs) and appreciable economies of size between the 400 and 600 sow capacity model plants. For larger plants, i.e., those in excess of 600 sow capacity, reductions in average costs with increases in size of plant are of minor importance.

In interpreting and/or utilizing these findings several additional reservations should be made. Facility specifications and arrangements and the productive technology used in this study tend to limit the cost reducing effects of increased volumes. A different facility specification which would permit an increase in the size of each productive facility to match an incremental change in volume hence reducing facility costs per unit of capacity would probably result in lower unit costs. Furthermore, increases in the size of each productive facility could conceivably reduce labor requirements and hence labor costs. The facility specifications and technology used in this study were recommended by industry sources as appropriate, given the general level of plant management available. Other facility arrangements, sizes, and technologies are undoubtedly feasible and could result in a different set of cost relationships with more substantial economies of size for large volume operations.

A second reservation relates to the level of unit costs exhibited by the larger model plants. All cost coefficients for the model plants with the exception of managerial labor were maintained at a constant level between model plants of different capacities. Consequently, the model plant assumptions would not indicate the existence of any external economies or diseconomies due to size if such were available. For example, larger plants purchasing items in larger volumes could conceivably experience lower costs on some items because of volume discounts. These discounts which could result in lower unit costs, termed external economies of size, were not considered in this study.

#### Pay Off Period Estimates

Swine producers and credit agencies are often interested in the expected pay off period required to liquidate a given investment in facilities and other fixed items. This estimation requires knowledge of both expected costs and expected revenues. Given the total investment, annual output, and expected costs for each plant as developed in the model plant analysis, estimated pay off periods were calculated for each model plant on the basis of selected average prices for market hogs. These estimates are shown in Table 24.

Table 24

Time Required for Payoff with Selected Levels of Average Prices Received, Complete Confinement Swine Rearing Operations, Six Model Plants, Texas High Plains, 1971.

Average Price Hogs/cwt. (Dollars)	Size of Plant					
	200	400	600	800	1,000	1,200
	Payoff Period -----Years-----					
23.00	5.8	4.3	3.6	3.6	3.4	3.4
22.00	7.4	5.2	4.3	4.2	4.0	4.0
21.00	10.2	6.6	5.4	5.2	4.8	4.9
20.88 <sup>1/</sup>	10.7	6.8	5.5	5.4	5.0	5.1
20.00	16.5	9.0	7.0	6.8	6.2	6.5
19.00	42.2	14.5	10.1	10.1	8.6	9.3

<sup>1/</sup> Average price received by farmers per cwt. of hogs U. S., 1966-1970.

These estimates indicate that the smallest plant (200 sow capacity) will be capable of paying off the fixed investment in a reasonable length of time only if average hog prices are \$20 per hundredweight or more. In contrast, larger plants (400 sow capacity and above) are capable of paying off the fixed investment in a relatively short period of time with hog prices of \$19 per hundredweight, and with average hog prices of \$20 per hundredweight and above the pay off period is considerably reduced.

#### MODIFICATIONS IN ASSUMPTIONS

The level of total and unit costs developed in the preceding sections of this report are dependent on the initial assumptions, the magnitude of resource requirements and resource costs and the procedures used in distributing or converting fixed costs to annual costs. Consequently, in their initial form the total and unit cost data are applicable only to a limited number of situations, i.e., those matching the conditions conceptualized for the model plants. Since these conditions are at least partially subjective it was considered appropriate to modify the initial conditions, resource requirements, and resource costs over a selected range of possible situations to increase the usefulness of the study.

A total of 39 changes were incorporated in the model plant modifications and a new set of total and unit costs developed for each modification. All changes are summarized in Table 25, except for changes in the average number of pigs born, weaned, and marketed. The average number of pigs born, weaned, and marketed per litter were modified by selected increments or decrements to conform to experience reported by operating plants. The average number of pigs born was reduced to 8.0 per litter and subsequently successively increased to 9.0, 9.5, and 10 per litter. The average number of pigs weaned was reduced to 7.8 per litter and subsequently successively increased to 8.6, 9.0, and 9.4 per litter. Finally, the average number of pigs marketed was reduced to 7.7 per litter and subsequently successively increased to 8.3, 8.6, and 8.9 per litter.

#### Feed Requirements and Feed Cost Modifications

Costs for the initial budgets (Tables 18 through 23) were based on a feed efficiency of 3.56 : 1. This ratio is a relatively optimistic estimate of attainable efficiency. Consequently, changes in feed requirements were increased in 4 increments of 3 percent each to provide more realistic feed efficiency ratios.

Average feed prices utilized in the initial budgets for the model plants amounted to \$2.852 per hundredweight. This average cost figure represented the weighted average cost of feed in all four rations utilized in the farrow to finish operation. Four modifications were made in the initial prices in increments + 10, + 5, and decrements of - 5 and - 10 percent and changes in average unit costs computed.

Changes in feed efficiency and changes in feed costs affect average unit costs of each of the six model plants in the same absolute amount. Consequently, the effect of these changes may be shown irrespective of the size of the plant involved (Table 26).

The data indicate that a 3 percent reduction in feed efficiency, (3.670 : 1) over that assumed for the initial budgets (3.563 : 1), will increase unit costs by \$0.31 per hundredweight and a 12 percent reduction (3.991 : 1) will increase unit costs by \$1.22 per hundredweight. A 10 percent increase in feed costs over those estimated for the model plant (\$2.852 per hundredweight) will increase unit costs by \$1.01 per



Table 25

Plant Modifications by Items Changed, Number of Changes and Magnitude of Changes Made, Six Model Plants, Complete Confinement Swine Rearing Operations, Texas High Plains, 1971.

Item Changed	Number of Changes <sup>1/</sup>	Magnitude of Changes in Percent
Feed Price	4	+ 5 + 10 - 5 - 10
Feed Requirements	4	+ 3 + 6 + 9 - 12
Farrowings Per Sow Per Year	3	+ 5 - 5 - 10
Building Costs	4	+ 10 + 5 - 5 - 10
Wage Rates	3	+ 10 + 5 - 5 - 10
Labor Requirements	4	+ 2 + 1 - 1 - <sup>2/</sup> <sub>3/</sub>
Utility Rates	4	- 20 - 10 + 10 + 20
Interest Rates	6	+ 25 + 16.67 + 8.33 - 8.33 - 16.67 - 25
Building Depreciation	3	- 37.5 - 25 - 12.5
Total	35	

<sup>1/</sup>Four changes involving pig mortality rates were computed in addition to the 35 changes shown above.

<sup>2/</sup>Changes in labor requirements were made in the form of whole man equivalents.

<sup>3/</sup>Magnitude of changes for 800, 1,000, and 1,200 sow units are + 3, + 2, - 2, - 3 man units.

Table 26

Feed Efficiency and Feed Price Modifications, Magnitude of Change and Effect on Unit Costs, Complete Confinement Swine Rearing Operations, Texas High Plains, 1971.

Modification	Magnitude of Change	Change in Unit Cost
	-Percent-	-Dollars-
Feed Efficiency <sup>1/</sup>		
3.991 : 1	- 12	1.22
3.884 : 1	- 9	0.91
3.777 : 1	- 6	0.61
3.670 : 1	- 3	0.31
Feed Prices <sup>2/</sup>		
3.137	+ 10	1.01
2.995	+ 5	0.53
2.709	- 5	- 0.52
2.567	- 10	- 1.01

<sup>1/</sup> Feed efficiency of the initial budgets assumed at 3.563 : 1.

<sup>2/</sup> Average feed prices of the initial budget estimated at \$2.852/cwt.

Table 27

Modifications in the Average Number of Farrowings Per Sow Per Year, and Effect on Unit Costs, Complete Confinement Swine Rearing Operations, Six Model Plants, Texas High Plains, 1971.

Farrowings Per Year <sup>1/</sup>	Magnitude of Change	Change in Unit Costs					
		Size of Plant					
		200	400	600	800	1,000	1,200
	-Percent-	-Dollars-					
2.34	5	-0.38	-0.33	-0.31	-0.30	-0.30	-0.31
2.12	- 5	0.43	0.38	0.35	0.34	0.32	0.32
2.01	- 10	0.90	0.79	0.73	0.72	0.69	0.69

<sup>1/</sup> Assumes initial farrowing rate of 2.23 times per year.

hundredweight and, conversely a 10 percent reduction will result in a decrease of \$1.01 per hundredweight.

Feed prices in the initial budgets assumed \$2 per hundredweight milo as the primary ration ingredient. Although price changes incorporated in the plant modifications were applied to the total ration, these changes can also be related to changes in the price of milo if all feed price changes are born by milo and the price of other ingredients remain unchanged. For example, a 5 percent change in the total ration cost is equivalent to a change of \$0.18 per hundredweight in milo prices or an increase from \$2 per hundredweight to \$2.18 per hundredweight. Similarly, a 10 percent increase in ration costs is equivalent to \$0.36 per hundredweight increase in milo prices or an increase from \$2 per hundredweight to \$2.36 per hundredweight.

#### **Farrowing Per Sow Per Year**

The initial budgets assumed that each sow in the model plants would farrow on the average 2.23 times per year. Subsequently, this assumption was modified to 2.34 farrowings per year (an increase of 5 percent), 2.12 farrowings per year (a reduction of 5 percent), and 2.01 farrowings per year (a reduction of 10 percent). The results of these modifications are summarized in Table 27.

#### **Changes in the Number of Pigs Born, Pigs Weaned, and Pigs Marketed**

The initial budgets assumed that out of an average 8.5 pigs born per litter, 8.2 pigs would be weaned, and 8.0 pigs would be marketed. The effects of a number of selected changes in these assumptions on unit costs are shown in Table 28. Changes in unit costs from this modification are a combination of the effect of changes in ration requirements and costs and of changes in output for the relatively fixed complement of all other factors. Changes in variable cost items such as veterinary costs, labor, utilities, and other factors as the result of changes in pig mortality were assumed to have only a minor effect on unit production costs.

#### **Building Cost Modifications**

Building costs were modified in increments of + 10, + 5, - 5, and - 10 percent of the initial estimates. The effect of these changes on unit costs are shown in Table 29. These data indicate that a 5 percent increase in building costs will increase unit costs between \$0.13 and \$0.16 per hundredweight for all the model plants. Similarly, a 10 percent increase in building costs will increase unit costs between \$0.27 and \$0.32 per hundredweight. Differences in unit cost changes between model plants of different capacities as a result of these modifications were relatively minor. Reductions in unit costs as the result of successive reductions in building costs by 5 and 10 percent were also of minor importance.

#### **Labor Cost Modifications**

Wage rates utilized in the initial budgets amounted to \$1.65 per hour for hourly labor, \$660 per month for regular salaried employees, and \$330 per month for office help. Managerial salaries were assumed to vary directly with the size of each model plant hence each manager was assigned a specific salary in each plant. Labor cost modifications involved successive increases and decreases in both salaries and hourly wages. A total

Table 28

Modifications in the Average Number of Pigs Born, Pigs Weaned, and Pigs Marketed Per Litter and Effect on Unit Costs, Complete Confinement Swine Rearing Operations, Six Model Plants, Texas High Plains, 1971.

Pigs Born	Pig Mortality Modification <sup>1/</sup>		Change in Unit Costs					
	Pigs Weaned	Pigs Marketed	Size of Plant					
	200	400	600	800	1,000	1,200		
-----Number-----			-----Dollars-----					
10.0	9.4	8.9	-0.95	-0.85	-0.80	-0.78	-0.76	-0.78
9.5	9.0	8.6	-0.66	-0.59	-0.55	-0.54	-0.53	-0.54
9.0	8.6	8.3	-0.34	-0.30	-0.29	-0.28	-0.27	-0.29
8.0	7.8	7.7	0.37	0.33	0.31	0.31	0.29	0.29

<sup>1/</sup>Initial assumption 8.5 pigs born, 8.2 pigs weaned, and 8.0 pigs marketed.

Table 29

Building Cost Modifications and Effect on Unit Costs, Complete Confinement Swine Rearing Operations, Six Model Plants, Texas High Plains, 1971.

Building Cost Modification	Change in Unit Costs					
	Size of Plant					
	200	400	600	800	1,000	1,200
-Percent-	-----Dollars-----					
+ 10	0.32	0.32	0.29	0.28	0.28	0.27
+ 5	0.16	0.15	0.14	0.14	0.14	0.13
- 5	-0.15	-0.14	-0.14	-0.14	-0.14	-0.15
- 10	-0.32	-0.29	-0.28	-0.28	-0.28	-0.29

of four changes were considered, a 5 percent increase, a 10 percent increase, a 5 percent decrease, and a 10 percent decrease. The effect of these labor cost modifications on unit costs are shown in Table 30.

These data indicate that a 10 percent increase in wage rates and salaries will increase unit costs of the model plants between \$0.18 and \$0.25 per hundredweight of live hogs produced, and a 5 percent increase in wage rates and salaries will change unit costs between \$0.09 and \$0.13 per hundredweight. Wage rate and salary reductions of 10 and 5 percent for all model plants had approximately the same effect in reducing unit costs. However, the cost effect of these modifications was greatest for the 200 sow capacity model plant indicating the relatively larger contribution of labor costs to total costs for the smallest (200 sow capacity) model plant.

### **Labor Requirement Modifications**

Although it is conceivable that plants may be able to reduce labor costs by reducing the number of hours worked by hourly employees, these savings are likely to be quantitatively unimportant. For the operating plant, important gains in labor efficiency are most likely to occur when the total number of employees can be reduced. Consequently, the labor requirement modifications considered changes in unit costs resulting from changes in the total number of employees by 1, 2, and 3 man units. The effect of these changes on unit costs for each of the model plants are summarized in Table 31.

The data indicate that an increase in the labor complement of the 200 sow model plant by 1 and 2 man units would increase unit costs by \$0.60 and \$1.19 per hundredweight of hogs produced, respectively. Also, an increase in the labor complement of 1 and 2 man units for the 400 sow model plant results in an increase in unit costs of \$0.30 and \$0.60 per hundredweight of hogs, respectively.

Modifications in the labor complement of the larger plants (800 through 1,200 sow capacities) involved a maximum change of 3 man units. This modification resulted in an increase in unit costs of \$0.45 and \$0.35 for the 800 and 1,000 sow capacity model plants, respectively, for an increase of 3 man units. Similarly, a decrease of 3 man units resulted in a reduction in unit costs of \$0.44 and \$0.36 for the 800 and 1,000 sow capacity model plants, respectively. Other changes in the labor complement appeared quantitatively unimportant from the standpoint of the magnitude of their effect on unit costs.

### **Interest Rate Modifications**

A 6 percent interest rate on the average investment was charged against plant operations in the initial budgets. The rate was subsequently modified to reflect interest rates ranging from 4.5 percent to 7.5 percent in increments of 0.5 percent. The maximum change in unit costs as the result of these modifications was experienced by the 200 sow capacity model plant. This change amounted to a \$0.22 increase in unit costs at the 7.5 percent interest rate and a \$0.22 reduction in unit costs at the 4.5 percent interest rate. Other changes in unit costs for all of the model plants as the result of changes in the interest rate were smaller in magnitude and hence were considered quantitatively unimportant.

Table 30

Labor Cost Modifications and Effect on Unit Costs, Complete Confinement Swine Rearing Operations, Six Model Plants, Texas High Plains, 1971.

Labor Cost Modification	Change in Unit Costs					
	Size of Plant					
	200	400	600	800	1,000	1,200
-Percent-	-----Dollars-----					
+ 10	0.25	0.23	0.20	0.20	0.18	0.18
+ 5	0.13	0.12	0.10	0.10	0.09	0.09
- 5	-0.12	-0.11	-0.10	-0.10	-0.09	-0.11
- 10	-0.24	-0.22	-0.20	-0.20	-0.19	-0.21

Table 31

Labor Requirement Modifications and Effect on Unit Costs, Complete Confinement Swine Rearing Operations, Six Model Plants, Texas High Plains, 1971.

Labor Requirement Modification	Change in Unit Costs					
	Size of Plant					
	200	400	600	800	1,000	1,200
Number of Employees	-----Dollars-----					
+ 3				0.45	0.35	0.29
+ 2	1.19	0.60	0.40	0.30	0.24	0.19
+ 1	0.60	0.30	0.20	-	-	-
- 1	<u>a/</u>	-0.29	-0.20	-	-	-
- 2	<u>a/</u>	<u>a/</u>	-0.40	-0.29	-0.24	-0.21
- 3	<u>a/</u>			-0.44	-0.36	-0.31

a/ Assumes that 2 employees were the minimum number which could operate any model plant.

## Other Modifications

The initial budgets considered a 10 year life for all building facilities. It is probable, however, that given the superior character of the initial construction, the facilities specified for the model plants have an effective operating life in excess of 10 years. Accordingly, the depreciation rate was reduced to 5 percent per year to conform to an expected operating life of 20 years. This change resulted in a reduction in units costs ranging from a high of \$0.94 per hundredweight for the 200 sow capacity model plant to a low of \$0.82 per hundredweight for the 1,000 sow capacity model plant.

A second modification in the other modification category involved changing utility costs successively by 10 and 20 percent increments. This modification resulted in a maximum increase in unit costs of \$0.05 per hundredweight for any model plant. Consequently, it can be concluded that within the limits of the changes in utility costs contemplated in this analysis, the levels of utility costs are of minor importance.

Each of the 39 changes were considered separately with respect to the magnitude of the change in unit costs which resulted from a specific modification. However, for any given situation a number of simultaneous modifications can be considered relative to their combined effect on the level of unit costs. A measure of the effect of two simultaneous changes in the basic assumptions, levels of factor use, or factor prices on the level of unit costs for each model plant is provided by Tables i through vi, Appendix B. Only the effect of changes in the assumptions, levels of factor use, or factor prices of the largest magnitudes considered in the analysis are shown in these tables to avoid complicating the presentation. Other modifications and more than two simultaneous modifications are, however, possible.

Appendix A

Table i

Equipment Items, Unit Cost and Total Cost, Complete Confinement Swine Rearing Operation, 200 Sow Capacity Model Plant, Texas High Plains, 1971.

Item Description	Units	Cost/Unit	Total Cost
	No.	-----Dollars-----	
<b>Office and Locker Room:</b>			
Typewriter	1	200	200
Adding machine	1	150	150
Calculator	1	700	700
Air conditioner	1	300	300
Washer	1	250	250
Dryer	1	195	195
Refrigerator	1	150	150
Office desk	1	150	150
Office chair	1	80	80
Filing cabinets	2	110	220
Cabinets	2	75	150
Benches	2	25	50
Lockers	2	50	100
Safe	1	125	125
Other chairs	2	25	50
Miscellaneous Furniture and Fixtures	4	25	100
<b>Shop:</b>			
Welder	1	225	225
Grinder	1	75	75
Drill press	1	150	150
Power hack saw	1	130	130
Miscellaneous tools	1	500	500
<b>General Plant:</b>			
Feed mill	1	6,200	6,200
Feed storage tank	1	2,000	2,000
Bulk feed wagon	1	825	825
Hog scale	1	250	250
Hot water pump	1	350	350



.Appendix B

Table i

Cost Per Hundredweight of Market Hogs with Selected Changes in Basic Assumptions, Factor Requirements and Factor Prices, Complete Confinement Swine Rearing Operation, 200 Sow Capacity Model Plant, Texas High Plains, 1971.

	Feed Require. Percent		Feed Price Percent		Farrowings Per Year Percent		Pig Mortality		Building Costs Percent		Labor Costs Percent		Labor Requirement Man Equiv. <sup>1/</sup>	
	+12	+10	-10	+ 5	-10	A	B	+10	-10	+10	-10	+2	-2	
-----Dollars-----														
Base 18.30	19.53	19.32	17.28	17.92	19.20	17.35	18.67	18.62	17.98	18.55	18.06	19.49	18.30	
Feed Requirement														
12 percent increase	X	20.55	18.51	19.15	20.43	18.58	19.90	19.85	19.11	19.88	19.29	20.72	19.53	
Feed Prices														
10 percent increase		X	X	18.94	20.22	18.37	19.69	19.64	19.00	19.52	19.08	20.51	19.32	
10 percent decrease		X	X	16.90	18.18	16.33	17.65	17.60	16.96	17.53	17.04	18.47	17.28	
Farrowings Per Year														
5 percent increase				X	X	16.97	18.29	18.24	17.60	18.17	17.68	19.11	17.92	
10 percent decrease				X	X	18.25	19.57	19.52	18.88	19.45	18.96	20.39	19.20	
Pig Mortality <sup>2/</sup>														
A						X	X	17.67	17.03	17.60	17.11	18.54	17.35	
B						X	X	18.99	18.35	18.92	18.43	19.86	18.67	
Building Costs														
10 percent increase								X	X	18.87	18.38	19.81	18.62	
10 percent decrease								X	X	18.23	17.74	19.17	17.98	
Labor Costs														
10 percent increase										X	X	19.74	18.55	
10 percent decrease										X	X	19.25	18.06	

<sup>1/</sup>Assumes reductions in whole man equivalents are not possible.

<sup>2/</sup>Pig mortality figures represent pigs born - pigs weaned - pigs marketed; A = 10.0 - 9.4 - 8.9, B = 8.0 - 7.8 - 7.7.

Appendix B

Table ii

Cost Per Hundred weight of Market Hogs with Selected Changes in Basic Assumptions, Factor Requirements and Factor Prices, Complete Confinement Swine Rearing Operations, 400 Sow Capacity Model Plant, Texas High Plains, 1971.

	Feed Require.	Feed Price		Farrowings Per Year		Pig Mortality		Building Costs		Labor Costs		Labor Requirement		
	Percent	Percent		Percent				Percent		Percent		Man Equiv.		
	+12	+10	-10	+ 5	-10	A	B	+10	-10	+10	-10	+2	-2	
-----Dollars-----														
Base	17.32	18.55	18.34	16.30	16.99	18.11	16.47	17.65	17.62	17.03	17.55	17.10	17.92	17.03
Feed Requirement														
12 percent increase	X	19.57	17.53		18.22	19.34	17.70	18.88	18.85	18.26	18.78	18.33	19.15	18.26
Feed Price														
10 percent increase		X	X		18.01	19.13	17.49	18.67	18.64	18.05	18.57	18.12	18.94	18.05
10 percent decrease		X	X		15.97	17.09	15.45	16.63	16.60	16.01	16.53	16.08	16.90	16.01
<sup>41</sup> Farrowings Per Year														
5 percent increase				X	X		16.14	17.32	17.29	16.70	17.22	16.77	17.59	16.70
10 percent decrease				X	X		17.26	18.44	18.41	17.82	18.34	17.89	18.71	17.82
Pig Mortality <sup>1/</sup>														
A							X	X	16.77	16.18	16.70	16.25	17.07	16.18
B							X	X	17.95	17.36	17.88	17.43	18.25	17.36
Building Costs														
10 percent increase									X	X	17.85	17.40	18.20	17.33
10 percent decrease									X	X	17.26	16.81	17.63	16.74
Labor Costs														
10 percent increase											X	X	18.15	17.26
10 percent decrease											X	X	17.70	16.81

<sup>1/</sup>Pig Mortality - figures represent pigs born - pigs weaned - pigs marketed; A = 10.0 - 9.4 - 8.9, B = 8.0 - 7.8 - 7.7.

Appendix B

Table iii

Cost Per Hundredweight of Market Hogs with Selected Changes in Basic Assumptions, Factor Requirements and Factor Prices, Complete Confinement Swine Rearing Operations, 600 Sow Capacity Model Plant, Texas High Plains, 1971.

	Feed Require.		Feed Price		Farrowings Per Year		Pig Mortality		Building Costs		Labor Costs		Labor Requirement	
	Percent		Percent		Percent				Percent		Percent		Man Equiv.	
	+12		+10	-10	+ 5	-10	A	B	+10	-10	+10	-10	+2	-2
-----Dollars-----														
Base	16.79	18.02	17.81	15.77	16.48	17.52	15.99	17.10	17.08	16.51	16.99	16.59	17.21	16.39
Feed Requirement														
12 percent increase	X	19.04	17.00		17.71	18.75	17.22	18.33	18.31	17.74	18.22	17.82	18.44	17.62
Feed Price														
10 percent increase			X	X	17.50	18.54	17.01	18.12	18.10	17.53	18.01	17.61	18.23	17.41
10 percent decrease			X	X	15.46	16.50	14.97	16.08	16.06	15.49	15.97	15.57	16.19	15.37
Farrowings Per Year														
5 percent increase					X	X	15.68	16.79	16.77	16.20	16.68	16.28	16.90	16.08
10 percent decrease					X	X	16.72	17.83	17.81	17.24	17.72	17.32	17.94	17.12
Pig Mortality <sup>1/</sup>														
A							X	X	16.28	15.71	16.19	15.79	16.41	15.59
B							X	X	17.39	16.82	17.30	16.90	17.52	16.70
Building Costs														
10 percent increase									X	X	17.28	16.88	17.50	16.68
10 percent decrease									X	X	16.71	16.31	16.93	16.11
Labor Costs														
10 percent increase											X	X	17.41	16.59
10 percent decrease											X	X	17.01	16.19

<sup>1/</sup>Pig Mortality - figures represent pigs born - pigs weaned - pigs marketed; A = 10.0 - 9.4 - 8.9, B = 8.0 - 7.8 - 7.7.

Appendix B

Table iv

Cost Per Hundredweight of Market Hogs with Selected Changes in Basic Assumptions, Factor Requirements and Factor Prices, Complete Confinement Swine Rearing Operations, 800 Sow Capacity Model Plant, Texas High Plains, 1971.

	Feed Require.		Feed Price		Farrowings Per Year		Pig Mortality		Building Costs		Labor Costs		Labor Requirement	
	Percent		Percent		Percent		A B		Percent		Percent		Man Equiv.	
	+12	+10	-10	+ 5	-10	A	B	+10	-10	+10	-10	+2	-2	
-----Dollars-----														
Base	16.65	17.88	17.67	15.63	16.35	17.37	15.87	16.96	16.93	16.37	16.85	16.45	17.10	16.24
Feed Requirement														
12 percent increase	X	18.90	16.86		17.58	18.60	17.10	18.19	18.16	17.60	18.08	17.68	18.33	17.47
Feed Price														
10 percent increase		X	X		17.37	18.39	16.89	17.98	17.95	17.39	17.87	17.47	18.12	17.26
10 percent decrease		X	X		15.33	16.35	14.85	15.94	15.91	15.35	15.83	15.43	16.08	15.22
Farrowings Per Year														
5 percent increase				X	X		15.57	16.66	16.63	16.07	16.55	16.15	16.80	15.94
10 percent decrease				X	X		16.59	17.68	17.65	17.09	17.57	17.17	17.82	17.95
Pig Mortality <sup>1/</sup>														
A							X	X	16.15	15.59	16.07	15.67	16.32	15.46
B							X	X	17.24	16.68	17.16	16.76	17.41	16.55
Building Costs														
10 percent increase									X	X	17.13	16.73	17.38	16.52
10 percent decrease									X	X	16.57	16.17	16.82	15.96
Labor Costs														
10 percent increase											X	X	17.30	16.44
10 percent decrease											X	X	16.90	16.04

<sup>1/</sup>Pig Mortality - figures represent pigs born - pigs weaned - pigs marketed; A = 10.0 - 9.4 - 8.9, B = 8.0 - 7.8 - 7.7.

Appendix B

Table v

Cost Per Hundredweight of Market Hogs with Selected Changes in Basic Assumptions, Factor Requirements and Factor Prices, Complete Confinement Swine Rearing Operation, 1,000 Sow Capacity Model Plant, Texas High Plains, 1971.

	Feed Require. Percent	Feed Price		Farrowings Per Year		Pig Mortality		Building Costs		Labor Costs		Labor Requirement		
		Percent	Percent	Percent	Percent	A	B	Percent	Percent	Percent	Percent	Man Equiv.	Man Equiv.	
	+12	+10	-10	+ 5	-10			+10	-10	+10	-10	+2	-2	
-----Dollars-----														
Base	16.41	17.63	17.43	15.39	16.11	17.10	15.65	16.70	16.69	16.13	16.59	16.21	16.76	16.05
Feed Requirement														
12 percent increase	X	18.66	16.62	17.34	18.33	16.88	17.93	17.92	17.36	17.82	17.44	17.99	17.28	
Feed Prices														
10 percent increase		X	X	17.13	18.12	16.67	17.72	17.71	17.15	17.61	17.23	17.78	17.07	
10 percent decrease		X	X	15.09	16.08	14.63	15.68	15.67	15.11	15.57	15.19	15.74	15.03	
Farrowings Per Year														
5 percent increase				X	X	15.35	16.40	16.39	15.83	16.29	15.91	16.46	15.75	
10 percent decrease				X	X	16.34	17.39	17.38	16.82	17.28	16.90	17.45	16.74	
Pig Mortality <sup>1/</sup>														
A						X	X	15.93	15.37	15.83	15.45	16.00	15.29	
B						X	X	16.98	16.42	16.88	16.50	17.05	16.34	
Building Costs														
10 percent increase								X	X	16.87	16.49	17.04	16.33	
10 percent decrease								X	X	16.31	15.93	16.48	15.77	
Labor Costs														
10 percent increase										X	X	16.94	16.23	
10 percent decrease										X	X	16.56	15.85	

<sup>1/</sup>Pig Mortality - figures represent pigs born - pigs weaned - pigs marketed; A = 10.0 - 9.4 - 8.9, B = 8.0 - 7.8 - 7.7.

Appendix B

Table vi

Cost Per Hundredweight of Market Hogs with Selected Changes in Basic Assumptions, Factor Requirements and Factor Prices, Complete Confinement Swine Rearing Operations, 1,200 Sow Capacity Model Plant, Texas High Plains, 1971.

	Feed Require.		Feed Price		Farrowings Per Year		Pig Mortality		Building Costs		Labor Costs		Labor Requirement	
	Percent		Percent		Percent				Percent		Percent		Man Equiv.	
	+12		+10	-10	+ 5	-10	A	B	+10	-10	+10	-10	+2	-2
	-----Dollars-----													
Base	16.51	17.73	17.52	15.48	16.20	17.20	15.73	16.80	16.78	16.22	16.69	16.30	16.80	16.20
Feed Requirement														
12 percent increase	X		18.74	16.70	17.42	18.42	16.95	18.02	18.00	17.44	17.91	17.52	18.02	17.42
Feed Prices														
10 percent increase			X	X	17.21	18.21	16.74	16.81	17.79	17.23	17.70	17.31	17.81	17.21
10 percent decrease			X	X	15.17	16.17	14.70	15.77	15.75	15.19	15.66	15.27	15.77	15.17
Farrowings Per Year														
5 percent increase					X	X	15.42	16.49	16.47	15.91	16.38	15.99	16.49	15.89
10 percent decrease					X	X	16.42	17.49	17.47	16.91	17.38	16.99	17.49	16.89
Pig Mortality <sup>1/</sup>														
A							X	X	16.00	15.44	15.91	15.52	16.02	15.42
B							X	X	17.07	16.51	16.98	16.59	17.09	16.49
Building Costs														
10 percent increase									X	X	16.96	16.57	17.07	16.47
10 percent decrease									X	X	16.40	16.01	16.51	15.91
Labor Costs														
10 percent increase											X	X	16.98	16.38
10 percent decrease											X	X	16.59	15.99

<sup>1/</sup>Pig Mortality - figures represent pigs born - pigs weaned - pigs marketed; A = 10.0 - 9.4 - 8.9, B = 8.0 - 7.8 - 7.7.