Economic Comparison of Pig Feedlot Housing Facilities in the Southern High Plains of Texas

R.I. Nicholson
J.J. McGlone*
R.T. Ervin

College of Agricultural Sciences and Natural Resources, Pork Industry Institute, Texas Tech University, Box 42141, Lubbock, TX 79409-2141

ABSTRACT

An economic analysis of two pig feedlot enterprises was conducted using low- and high-investment facilities. Pigs housed in the low-investment facility consumed 10% more feed and gained 13% more weight than pigs housed in the high-investment facility. Results indicate that pork producers in the Southern High Plains of Texas could increase rates of return by building a low-cost facility for finishing feeder pigs. The results were qualified, however, because only one seasonal production cycle was investigated.

Although cattle feeding is a major industry in the Southern High Plains of Texas (SHPT), there are few pig finishing facilities. Climate, land costs, and availability of feed grains in this area create an environment in which finishing feeder pigs should be a viable enterprise. A feeder pig finishing enterprise (rather than farrow-to-finish) requires relatively low amounts of labor while not requiring the special skills and facilities needed to manage a breeding herd. Feeder pig finishing, regardless of the type of facility used, requires substantial operating capital for the purchase of feeder pigs and feedstuffs.

Costs vary among types of finishing facility, but are relatively lower for a feeder pig operation than for a farrow-to-finish operation. Two basic options were considered for pig finishing facilities. The first option was a low-investment facility with a sheltered area on a dirt lot having an expected life of 10 years. The second option required a higher investment with a curtain-sided confinement building useful for 25 years.

Considering the potential differences in the pig growth performance and building investment costs, we were interested in determining which facility would be the better investment. To study this question, a joint project with Texas Tech University, the Texas Department of Agriculture, and the Texas Pork Producers was established. The study investigated pig growth in low- and high-investment facilities and developed economic data to compare the alternate investments.

Accepted 19 Dec 1994. Publication No. T-1-356, Texas Tech University College of Agricultural Sciences. This research was supported by the Texas Department of Agriculture, Texas Pork Producers Association, and the State of Texas line item for efficient pork production. The authors thank Billy G. Freeman, Phillip N. Johnson, and Kary Mathis for their assistance in the preparation of this paper. *Corresponding author.

MATERIALS AND METHODS

Facilities

The low-investment facility consisted of a shelter with a roof and a back wall enclosing a 10 X 10 ft area on a dirt lot measuring 10 X 64 ft. Wheat straw bedding (36 bales) was provided during the last 45 days of the trial when the average daily temperatures fell below 70°F.

The high-investment facility consisted of an enclosed finishing building with mechanical ventilation. Pens measured 14 X 12 ft with concrete slatted flooring throughout. Waste was removed using an automated flush system.

Pens in both types of facilities were provided with two, three-hole self-feeders and one nipple waterer. Pigs in the high-investment facilities had access to an additional nipple waterer as a result of pen modifications required to accommodate the pig group size selected for this study. All pens in each facility were equipped with a mist sprayer to cool the animals when the outdoor temperature exceeded 85°F. Each facility was equipped with an automatic feed system, thus labor requirements were similar. The only energy used in the low-investment facility was electricity for heat strips wrapped around the water lines to prevent freezing. The high-investment facility used propane heaters and electric fans and lights. Because the energy usage for each facility was not monitored for this study, it was assumed that each facility consumed similar levels of energy. Although the authors recognized that this assumption favors high-investment facilities, they proposed conducting a sensitivity analysis for this cost comparison if the results warranted. Both facilities were located at the Texas Tech Swine Farm near New Deal, Texas.

Animals

A total of 239 crossbred barrows and gilts from two genetic stocks were used to compare the performance of pigs raised in the different facilities. One hundred and twenty pigs, purchased from a commercial breeder, were from a three-way rotational cross involving Duroc, Hampshire and Yorkshire (DHY) breeds. Originating from the Texas Tech Swine Farm, 120 pigs resulted from a four-way rotational cross using Duroc, Hampshire, Yorkshire and Landrace (DHYL) breeds. A total of 119 pigs was assigned to the low-investment facility and 120 pigs were assigned to the high-investment facility. Twenty pigs were placed per pen with a total of six pens per facility. The integrity of each genetic source was maintained and represented by three pens in each facility. The average initial weight of the pigs was 53 lb with an average purchase cost of $95.21 per cwt. The trial was conducted from August through November of 1990.

For the first 30 days the pigs were fed a 16% crude protein (CP) grower ration. All diets were based on sorghum-soybean meal, which met or exceeded NRC (1988) recommendations. After the initial 30 days, the pigs started the finishing phase, weighing an average of 94.35 lb. The pigs were fed a 14% CP finishing ration for this phase and feed intake was measured. All pigs were weighed in groups every 30 days. After 86 days on the finishing diet, all pigs were taken off trial and each pig was individually weighed. A uniform group, of 166 pigs with an average weight of 244.8 lbs was sold to a commercial packer. The remaining pigs were marketed locally within a 41 day period when they weighed an average of 248 lb.

Statistical analyses were conducted on the finishing performance data. The data were analyzed as a two-factor factorial: genetic source and investment facility. The pen was the experimental unit. Data were analyzed using the General Linear Model (SAS, 1990).

RESULTS AND DISCUSSION

Performance and carcass data are presented in Table 1. Pigs from the two sources (DHY vs. DHYL) did not differ in performance, regardless of facility ($P > 0.05$). Death loss was similar ($P > 0.10$) among pigs in the two housing systems with four deaths (3.4%) in the low-investment facility and three deaths (2.5%) in the other facility. Because of environmental factors (e.g., low temperatures), animals housed in the low-investment facility consumed significantly more feed (6.1 vs. 5.5 lb day^{-1}). Higher consumption resulted in a heavier finished pig ($P < 0.01$) (243.9 lb. vs. 223.7 lb) in the low-investment facility.

Table 1. Performance and carcass data for pigs in two types of facilities (low or high-investment).

Performance†	Low	High	Standard Error
Number	119.0	120.0	-
Starting wt, lb‡	52.8	52.8	-
Start of finishing, lb§	94.4	94.3	2.53
Final weight, lb¶#	243.9	223.7	4.72
Average daily gain, lb#	1.7	1.5	0.02
Feed intake, lb per day††	6.1	5.5	0.11
Feed:gain ratio	3.5	3.7	0.10

†Collected on the finishing phase for all pigs with pens as experimental units.
‡Grower phase was 30 days.
§Finishing phase was 86 days.
¶Carcass data were collected on 166 head consisting of pigs that weighed an average of 244.8 lb. Carcass data were not available for pigs marketed locally.
#Difference between facilities, $P < 0.01$.
††Difference between facilities, $P < 0.05$.

Using the information contained in Table 1, returns for feeding 239 pigs during a production period in the low- and high-investment facilities are reported in Tables 2 and 3. Because pigs are rough on buildings, we assumed an annual repair cost of 2% of the building cost (Boehlje and Eidman, 1984). Each production period consisted of 116 days in which the pigs were housed in the facilities and 30 days in which the facilities were cleaned and quarantine measures taken. Thus, each production period consists of 146 days. Death loss of 3% resulted in 232 pigs

marketed, but it was assumed that all 239 pigs which began the production period consumed feed throughout the period. The average price received for barrows and gilts in Omaha, Nebraska at the time of sale was $53.71 per cwt (USDA, 1992).

Table 2. Net returns for feeding 239 pigs in a low-investment facility for one production period.†

Revenue from sale of pigs		
(232 pigs * 2.44 cwt * $53.71/cwt) =		$30,404.16
Costs		
Variable:		
Purchased pigs (239 pigs * 53 lb/pig * $0.9521/lb) =		$12,060.25
Feed (84.56 ton * $123.26/ton) =		$10,422.87
Bedding-wheat straw bales (36 bales * $2.50/bale) =		$90.00
Building repairs (assumes 2% of building cost) =		$282.20
	sub-total =	$22,855.32
Fixed:		
Building dep. ($14,110.18 * 1/10 years * 1/2.5 periods) =		$564.40
Equipment dep. ($8,332.16 * 1/8 years * 1/2.5 production periods) = 416.61		
	sub-total =	$981.02
Interest‡		
@ 4% on Direct Expenses (0.04 * $22,855.32 * 0.5) =		$457.11
@ 4% on Indirect Expenses (0.04 * $981.01 * 0.5) =		$19.62
	sub-total =	$476.73
@ 8% on Direct Expenses (0.08 * $22,855.32 * 0.5) =		$914.21
@ 8% on Indirect Expenses (0.08 * $981.01 * 0.5) =		$39.24
	sub-total =	$953.45
@ 12% on Direct Expenses (0.12 * $22,855.32 * 0.5) =		$1,371.32
@ 12% on Indirect Expenses (0.12 * $981.01 * 0.5) =		$58.86
	sub-total =	$1,430.18
Net returns		
@ 4% ($30,404.16 - $22,855.32 - $981.01 - $476.73) =		$6,091.09
@ 8% ($30,404.16 - $22,855.32 - $981.01 - $953.45) =		$5,614.37
@ 12% ($30,404.16 - $22,855.32 - $981.01 - $1,430.18) =		$5,137.64

†Labor and utility expenses are not considered. A death loss of 3% is assumed for marketing purposes. From the estimates presented in Table 1. Based on a uniform feeding period of 116 days. Salvage value is assumed to be zero (Boehlje and Eidman, 1984).

‡Interest per year = (purchase price + salvage value)/2 * interest rate.

Table 3. Net returns for feeding 239 pigs in a high-investment facility for one production period.†

Revenue from sale of pigs		
(232 pigs * 2.24 cwt * $53.71/cwt) =		$27,912.01
Costs		
Variable:		
Purchased pigs (239 pigs * 53 lb/pig * $0.9521/lb) =		$12,060.25
Feed (76.24 ton * $123.26/ton) =		$9,397.34
Building repairs (assumes 2% of building cost) =		$806.19
	sub-total =	$22,263.78
Fixed:		
Building dep. ($40,309.30 * 1/25 years * 1/2.5 periods) =		$644.95
Equipment dep. ($8,332.16 * 1/8 years * 1/2.5 production periods) =		$416.61
	sub-total =	$1,061.56
Interest‡		
@ 4% on Direct Expenses (0.04 * $22,263.78 * 0.5) =		$445.28
@ 4% on Indirect Expenses (0.04 * $1,061.56 * 0.5) =		$21.23
	sub-total =	$466.51
@ 8% on Direct Expenses (0.08 * $22,263.78 * 0.5) =		$890.55
@ 8% on Indirect Expenses (0.08 * $1,061.56 * 0.5) =		$42.46
	sub-total =	$933.01
@ 12% on Direct Expenses (0.12 * $22,263.78 * 0.5) =		$1,335.83
@ 12% on Indirect Expenses (0.12 * $1,061.56 * 0.5) =		$63.69
	sub-total =	$1,399.52
Net returns		
@ 4% ($27,912.01 - $22,263.78 - $1,061.56 - $466.51) =		$4,120.17
@ 8% ($27,912.01 - $22,263.78 - $1,061.56 - $933.01) =		$3,653.66
@ 12% ($27,912.01 - $22,263.78 - $1,061.56 - $1,399.52) =		$3,187.16

†Labor and utility expenses are not considered. A death loss of 3% is assumed for marketing purposes. From the estimates presented in Table 1. Based on a uniform feeding period of 116 days. Salvage value is assumed to be zero (Boehlje and Eidman, 1984).

‡Interest per year = (purchase price + salvage value)/2 * interest rate.

Feed consumption data were not collected during the grower phase of the trial. Because feed costs are a major factor in the cost of pig production, the expected feed intake listed in the NRC (1988) was used to estimate the amount of feed consumed during this phase. Actual feed consumption data were used to calculate the cost of feed during the finishing phase. The price of the grower diet was $133.20 per ton and the finishing diet cost $121 per ton. The grower diet accounted for 18.5% of total feed costs, with the finishing diet accounting for the remainder. Thus, a weighted average was used to obtain an average feed price of $123.26 per ton over

the entire trial period. Given the feed intake values reported in Table 1, 239 pigs during the 116 day grower and finisher phases consumed 84.56 and 76.24 tons in the low- and high-investment facilities, respectively.

Fixed costs reflect the depreciation of buildings and equipment. The low-investment facility was expected to last 10 years while the high-investment facility was expected to last 25. Equipment such as waterers, feeders, and an automated feeding system were depreciated over 8 years for both facilities. The automated feeding system consisted of one bulk feed tank and an auger system for each facility. By allowing 146 days for one cycle of 239 pigs to reach market weight, 2.5 cycles of pigs could go through the facilities per year. For each year of depreciation, it was assumed that 598 pigs would be marketed. The actual cost of the low-investment facility (building = $14,110.18; equipment = $8,332.16) was used because the facility was built within the last two years. The cost of the high-investment facility (building = $40,309.30; equipment = $8,332.16) was estimated at 1992 prices.

Simple interest charges were calculated for variable and fixed costs at three annual rates of 4, 8 and 12%. The 4% interest rate was used to represent the opportunity cost of those producers who spend cash to invest in facilities. Because the future cost for borrowing funds to invest in facilities is unknown, the 8% and 12% interest rates were included for comparison purposes. Given the costs and revenues presented in Tables 2 and 3, the net returns for the low-investment facility were greater than those for the high-investment facility by 47.8% to 61.2%, depending on the interest rate used.

Other factors affecting the profit margin of a finishing pig operation are feed costs and pig purchase price. Net returns, with varying feed cost and the pig purchase price, are reported in Tables 4 and 5. In Table 4 the price of feed is varied at $20 increments from $100 per ton to $200 per ton. Table 5 reports net returns as the purchase price of feeder pigs is varied at $.10 increments from $.75 per lb to $1.15 per lb. Additionally, net returns are reported in Table 6 at 8% interest rates when varying both feed cost and pig purchase price. Results found in Tables 4, 5, and 6 indicate that the low-investment facilities generated the higher revenue whether feed cost, initial purchase price of the pigs, or both were varied. While selling price also affects the profit or loss margin, unless a producer uses marketing options, little control over selling price can be exerted and therefore selling price was not varied.

Table 4. Net returns for both facilities with varying feed costs and interest rates†.

Feed Cost	Low			High		
($/ton)	4%	8%	12%	4%	8%	12%
100	8097	7660	7223	5929	5498	5067
120	6372	5901	5430	4374	3912	3451
140	4647	4142	3637	2818	2326	1834
160	2922	2383	1845	1263	741	218
180	1197	625	52	(292)	(845)	(1398)
200	(528)	(1134)	(1741)	(1848)	(2431)	(3015)

†From estimates presented in Tables 2 and 3. Purchase price was $0.9521 per lb.

Table 5. Net returns for both facilities with varying purchase price of weaned pigs and interest rates†.

Purchase Price ($/lb)	Low			High		
	4%	8%	12%	4%	8%	12%
0.75	8702	8277	7851	6731	6316	5901
0.85	7410	6959	6509	5439	4999	4558
0.95	6118	5642	5166	4147	3681	3215
1.05	4826	4325	3823	2855	2364	1873
1.15	3534	3007	2480	1563	1047	530

†From estimates presented in Tables 2 and 3. Feed cost was $123.26 per ton.

Table 6. Net returns at 8% interest rate for both facilities with varying purchase price of weaned pigs and feed costs†.

Feed Cost	Low					High				
	0.75	0.85	0.95	1.05	1.15	0.75	0.85	0.95	1.05	1.15
$/ton	$/lb									
100	10322	9005	7688	6370	5053	8160	6843	5526	4208	2891
120	8563	7246	5929	4611	3294	6575	5257	3940	2622	1305
140	6805	5487	4170	2853	1535	4989	3671	2354	1037	(281)
160	5046	3728	2411	1094	(224)	3403	2086	768	(549)	(1867)
180	3287	1970	652	(665)	(1983)	1817	500	(818)	(2135)	(3452)
200	1528	211	(1107)	(2424)	(3741)	231	(1086)	(2403)	(3721)	(5038)

†From estimates presented in Tables 2 and 3.

CONCLUSIONS

Pigs housed in low-investment facilities consumed more feed while gaining proportionately more weight than similar pigs housed in high-investment facilities. Given the feed efficiency observed in the low-investment facility, producers will increase their investment returns by investing in low cost facilities. Additionally, we found that by varying the interest rate, feed cost, or initial purchase price of the pigs, the low-investment facility continued to produce the greatest net revenue. Three price variables which are important for producers to monitor are purchase price of pigs, feed costs, and the price received for market hogs. A change of any of these prices could change the results of this study.

Caution is suggested in the use of the economic data. First, some expenses were assumed constant, in particular, utilities. Also, the season of the year that pigs are fed may greatly influence production data. Perhaps the pigs fed in the low-investment facility will be less efficient in feed conversion during the winter. Previous research (Tribble and Orr, 1978) compared the performance of pigs raised in confinement with those raised on dirt lots. In a trial conducted from December to March, pigs in confinement grew 15% faster and had a 7% improvement in feed

efficiency than those pigs raised on dirt lots. Death and morbidity losses may also be greater in pigs fed in the low-investment facility in the winter. These factors could potentially reverse the present findings, and therefore deserve study.

REFERENCES

Boehlje, M.D., and V.R. Eidman. 1984. Farm management. p. 159-160. John Wiley & Sons, New York.

National Research Council. 1988. Nutrient requirements of swine. National Academy Press, Washington, DC.

Statistical Analysis System. 1990. SAS user's guide. SAS Institute. Cary, NC.

Tribble, L. F., and D. E. Orr, Jr. 1978. Confinement versus outside lot for growing-finishing. Proc. 26th Annual Swine Short Course, Texas Tech University, Lubbock.

USDA. 1992. Agricultural Statistics, 1991. p. 267. US Gov. Print. Office, Washington, DC.