

Economics of Finishing Hogs in Hoop Structures and Confinement: Seasonal and Annual Comparison

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Summary and Implications

From June 30, 1998, to February 21, 2001, a study to compare swine production facility types was conducted at the Iowa State University Rhodes Research and Demonstration. The two types of pork grow-finish production facilities compared in this study were hoop and total confinement. This report summarizes results from six groups of hogs; three groups fed in during the winter and three groups fed during the summer.

The trial showed some large differences between the seasons. The hoop facilities showed an advantage of \$1.43 per hog net income over the confinement facility during the summer (Table 2), whereas the confinement facility showed a \$6.93 per hog net income advantage during the winter (Table 4). The result is a year round advantage of \$2.75 per hog for the confinement hogs (Table 6). The difference is a function of overall production and marketing advantages that the confinement showed during the trial. The production differences were large enough that the confinement facility offset the higher initial investment through lower variable costs. The confinement facility also had a significant advantage in marketing with almost a full percent advantage in yield and a lean premium of \$.24 per hundred weight over the hoop facilities. The trial also suggested that the hoop facilities had more variability. This may be due to their increased susceptibility to environmental conditions.

Introduction

The evolution of the swine industry has forced industry members to reevaluate their operations and use an increasing level of risk management. This has caused producers to examine how they are using their capital. A survey conducted in May 2001 showed that hoop buildings are becoming an important part of the swine industry. Hoop buildings became widely available during the mid-1990s and by the year 2001 their use had grown to represent approximately 4% of the market hogs finished in Iowa. The

growth in hoop facility usage prompted this ongoing study to help producers evaluate the effective use of capital in pork production facilities. The project compares hoop

facilities to confinement facilities and evaluates alternative management practices used in hoop production. This report provides results from groups of hogs finished during the June 30, 1998, to February 1, 2001, time period. It summarizes the seasonal differences between the systems and looks at some financial measurements that can be used to evaluate the attractiveness of each investment.

Materials and Methods

The report details six groups of hogs, which were on test during the June 30, 1998, to February 21, 2001, time period at the Rhodes Research Farm. Results are evaluated by using the actual production efficiency values while using the average or typical costs for feeder pigs, feed, etc., during the 1990–1999 time period. Average market hog prices during this time period also are used. This allows for comparison of expected costs and returns under average input costs and hog price conditions.

Two groups were finished in each facility per year with seasonal comparisons being made by starting hogs in the spring (summer group) and fall (winter group) of each year. In this way, hogs were finished under seasonal extremes. The seasonal groups were then averaged approximate the year round systems' average efficiencies and net incomes. During all but one of the groups the hogs were placed on feed over a 4-week period in which three hoops and the total confinement facility each received one week of production. The hogs were marketed to Excel with varied marketing dates in an attempt to market the hogs at similar marketing weights for each facility.

Results and Discussion

Summer Comparison

Summer Productivity

The summer production efficiencies are provided in Table 1. These efficiencies have a large effect on the economics of each facility type. Important efficiencies are the percentage of hogs marketed, feed efficiency, and average daily gain. The percent of hogs marketed is calculated by taking the hogs that are marketed as market hogs and dividing by the hogs that are placed on feed. This percentage has a direct effect on the system's returns because the hogs marketed need to cover the entire systems costs. During the summer trials marketing levels for the hoop facilities was 96.57% compared with 95.76% for the confinement facility, a difference of .81% more hogs marketed in favor of the hoop facilities. Feed efficiency is

calculated using the total feed consumed by the group on test. Feed efficiency was 2.96 for the hoop facility pigs as compared to 3.03 for the confinement facility pigs, a difference of .07 pounds additional feed required for each pound of gain in the confinement facility over the hoop facilities. Average daily gain showed similar results with the hoop facilities growing at a rate of 1.76 pounds per day and the confinement facility gaining at 1.73 pounds per day, a difference of an additional .03 pound of gain per day for the hoop facilities.

The hoop facilities exhibited a larger range of percentage of hogs marketed during the summer. The hoop facilities percentage of hogs marketed ranged from 98.00 to 95.18%, whereas the confinement ranged from 96.21 to 95.42%. This increased volatility may be a reflection of the

wide temperature change within the hoop facility, which adds additional stress and may cause disease pressure. The confinement facility had a larger range of feed efficiency. It ranged from 3.27 to 2.91, whereas the hoops ranged only from 3.12 to 2.96. This range difference as well as the higher feed needs and lower average daily gain may demonstrate the risk of high summer temperatures on the confinement system, which has a more difficult challenge to achieve lower temperatures during the higher temperature periods.

Table 1. Summer Productivity Information Table.

Item	Hoop			Confinement			Difference
	Average	High	Low	Average	High	Low	
Hogs (total)	1321			384			
Total bedding	31281	33431	27307	0	0	0	31281
Average start weight	34.07	35.65	31.10	35.77	37.70	32.60	-1.70
Death loss, %	2.15	2.93	1.54	3.25	4.58	2.27	-1.10
Cull loss, %	1.67	3.29	0.00	0.99	1.52	0.00	0.69
% Hogs marketed	96.57	98.00	95.18	95.76	96.21	95.42	0.81
Feed efficiency	2.96	2.96	2.96	3.03	3.27	2.91	-0.07
Average daily gain	1.76	1.82	1.72	1.73	1.83	1.68	0.03
Market weight	252.77	256.16	249.50	248.27	250.80	245.14	4.50
Average days on feed	125.12	128.26	123.12	123.18	127.40	116.95	1.94
Total facility days	140.11	146.33	134.00	136.67	144.00	126.00	3.44
Carcass yield, %	73.87	74.96	72.77	75.01	75.84	74.10	-1.14
Carcass weight	186.71	192.03	181.57	186.23	190.20	181.65	0.48

Another important factor is the pig marketing plan that impacts the pig weight and facility usage. The effect during the summer trials was that while the hoop facilities had a lighter start weight: (by 1.7 lb), the hoop facility pigs weighed 4.5 lb more at market and had a .48-lb larger carcass weight. This is impacted by a difference in average daily gain, average days on feed, and carcass yield values. On average, the hoop facilities had hogs on feed nearly two days longer during the summer. The yield is also very important in examining the net result of the systems. The hoop facility pigs had an average summer yield of 73.87% compared with a 75.01% yield for the confinement facility pigs, a difference of 1.14% in favor of the confinement. The result is that the difference in pounds of carcass weight is .48 pounds in favor of the hoop facilities after factoring in their 4.50-lb advantage in market weight.

The facility days are also an important number, which is impacted by the marketing pattern of the facilities. Facility days are calculated by determining the number of days from the day the hogs first went into the facility until the day that the final hog was removed plus eight days for

cleanup. The hoop facilities had an average of nearly three and a half more total facility days during the summer. This reduces the number of turns that can be made on the facilities during the year (Table 2). The difference between the two suggests that the confinement had a larger percentage of pigs on feed for the final market weight. This also suggests that the hoop facilities were under stocked during the later part of facility usage. It should be noted that net incomes of the hoop facility hogs may be have been increased by selling a larger percent during later marketing dates as was done with the confinement hogs. On the other hand net income for the confinement facility hogs may have been increased by increasing facility days and days on feed.

Summer Economic Results

Economic results per hog for the confinement and hoop facilities are compared using a cost, revenue, and net income evaluation. This is accomplished by using average input costs and actual production numbers. Costs are calculated and then compared with (subtracted from) revenue per hog to obtain net income per hog.

Facility costs are budgeted at \$180 per hog space for the confinement operation and a \$55 per hog space for the hoop facilities plus an additional \$36 per hog space for feed and manure handling (Table 2). Annual fixed costs were calculated at 13.2% of the investment for the confinement facility and 16.5% for the hoop facilities. The confinement facility is depreciated over 15 years, whereas the hoop facilities are depreciated over 10 years. Insurance and taxes represent 1.5% of the fixed investment with interest at 10% for both confinement and hoops. The confinement facility can be turned 2.63 times a year, whereas the hoop facilities can be turned 2.56 times a year.

Fuel, repairs, utilities, vet, medical, marketing, and miscellaneous are based on Iowa State University and Midwest Plan Service, Livestock Enterprise Budgets. Bedding for the hoop facility group was 188 pounds per hog marketed with a cost of \$20 per 1200 pounds. Labor was valued at \$10.00 per hour with .2 hours per head for the confinement hogs and .27 hours per head for the hoop hogs. Ration prices were set at \$.06 per pound, which was the average price during the 1990–1999 time period (\$2.35 corn per bu and \$190 per ton Soybean meal). Antibiotics, grind, mix, and delivery is included to the ration price at a rate of \$10.70 per ton. All the feed used was applied to the hogs that were marketed.

Feeder pig as well as market hog prices were calculated using a rounded average price from the 1990 to 1999 time period. Pig death loss is accounted for using actual percent, that died. An interest rate of 10% is charged against all expenses except labor and marketing costs. Market hog prices were adjusted to a carcass weight basis to take into account the yield differences and lean premiums. The yield premiums for the confinement hogs was higher by 1.14% and the lean premium was \$.25 higher per carcass hundred weight based on sales to Excel. It should be noted that these lean premiums can vary depending upon the packer that is used. The revenue per hundred weight of culled feeding hogs was estimated as half the per hundred weight live price for market hogs. A culled hog is any hog, which does not reach market weight before removed from the facility.

The result of the summer trials is that net income was \$1.43 per hog marketed greater for the hoop facilities. The net cost (adjusted for cull hog revenue) was \$1.85 lower per hog marketed in the hoop facilities (Table 2). Operating costs, were \$3.65 per hog higher in the hoop facilities while fixed costs were \$5.28 lower per hog. With the hoop facilities' bedding representing an operating cost difference of \$3.55 per hog. The confinement facilities received an additional \$.42 in total revenue per hog. Revenue was calculated by using the average carcass weight of the average hog for each facility type on trial and multiplying it

Table 2. Summer Swine Grow Finish Production Budget.

Item	Hoop	Confinement	Difference
Facility investment			
Building (per hog space)	\$55.00	\$180.00	-\$125.00
Feed & manure handling	\$36.00	\$36.00	\$0.00
Total initial investment	\$91.00	\$216.00	-\$125.00
Turns/year	2.56	2.63	-0.07
Total initial investment per turn	\$35.63	\$82.53	-\$46.90
Fixed cost			
% Interest taxes, depreciation, insurance	16.5	13.2	3.3
Facility cost per hog marketed	\$6.09	\$11.37	-\$5.28
Fixed cost per cwt marketed	\$2.41	\$4.58	-\$2.17
Operating costs			
Feeder pigs	\$38.00	\$38.00	\$0.00
Feeder pig death loss	\$1.48	\$1.80	-\$0.32
Interest on feeder pig	\$1.31	\$1.33	-\$0.01
Fuel repairs utilities	\$1.04	\$1.39	-\$0.36
Bedding	\$3.55	\$0.00	\$3.55
Feed (\$.06/lb)	\$38.99	\$38.92	\$0.06
Vet/med	\$1.55	\$1.57	-\$0.01
Interest on mixed costs	\$0.78	\$0.73	\$0.05
Marketing costs	\$1.51	\$1.52	-\$0.01
Labor	\$2.80	\$2.09	\$0.71
Total operating cost	\$91.01	\$87.35	\$3.65
Operating costs/cwt marketed	\$24.16	\$23.20	\$0.95
Total cost (per hog marketed)	\$96.98	\$98.73	-\$1.74

Table 2. continued....

Total cost per cwt	\$38.37	\$39.70	-\$1.34
Revenue from cull hogs per head	\$0.75	\$0.97	-\$0.21
Net cost (per hog marketed)	\$96.23	\$98.08	-\$1.85
Net cost per cwt	\$38.07	\$39.44	-\$1.37
Lean premium difference (per hot cwt)	\$0.00	\$0.25	-\$0.25
Revenue from \$60 per hundred carcass weight	\$112.02	\$112.44	-\$0.42
Net income per hog marketed	\$15.79	\$14.36	\$1.43

during the 1990 to 1999 time period, \$60. The confinement hogs also had a \$.25 per carcass hundred pounds added value due to the lean premium advantage over the hoop hogs.

Winter Comparison

Winter Productivity

Production efficiencies for the winter hogs are provided in Table 3. The winter results are different from the summer results. They show that the hogs raised in hoop facilities are far less efficient than those raised in the confinement facility during the winter. The hoop facilities again showed a lower percentage of hogs marketed. The hoop facilities marketed 95.36% compared with 96.19% for the confinement facility, a difference of .84% more hogs marketed for the confinement facilities. Feed efficiency was 3.39 for the hoop facilities compared with 3.05 for the confinement facility, a difference .34 pounds of additional feed required for each pound of gain in the hoop facilities over the confinement facility. Average daily gain showed similar

results with the hoop facilities growing at a rate of 1.67 pounds per day and the confinement facility gaining at 1.71 pounds per day, a difference of an additional .04 pounds of gain per day for the confinement facility.

The hoop facilities showed a larger variability in all of the key production efficiencies. The percentage of hogs marketed ranged from 98.01 to 93.68% whereas the confinement facility ranged from 97.73 to 94.70%. This range difference reflects the effects of wide temperature changes within the hoops causing increased stress on the pigs. The feed efficiency in the hoop facilities ranged from 3.58 to 3.05, whereas the confinement facility ranged from 3.15 to 2.85. The average daily gain in the hoop facilities ranged from 1.83 to 1.46 compared with 1.81 to 1.56 for the confinement facilities. The increase in feed usage and decreased average daily gain as well as the increased variability of both efficiency measurers may demonstrate the risk of lower temperatures during the winter, which causes the hoop facilities' hogs to consume more feed to combat the lower temperature.

Table 3. Winter Productivity Information.

Item	Hoop			Confinement			Difference
	Average	High	Low	Average	High	Low	
Hogs	1143			379			
Total bedding	39265	51420	33107	0			39265
Average start weight	35.45	39.95	31.67	34.47	37.90	31.90	0.98
Death loss, %	3.88	5.62	1.66	3.05	3.85	2.27	0.83
Cull loss, %	0.76	1.96	0.00	0.76	2.27	0.00	0.01
% Hogs marketed	95.36	98.01	93.68	96.19	97.73	94.70	-0.84
Average daily gain	1.67	1.83	1.46	1.71	1.81	1.56	-0.04
Feed efficiency	3.39	3.58	3.05	3.05	3.15	2.85	0.34
Market weight	254.09	262.32	248.07	253.73	263.28	247.13	0.35
Average days on feed	132.32	149.56	113.41	128.52	136.09	123.46	3.81
Total facility days	142.83	169.00	125.50	139.00	155.00	134.00	3.83
Carcass yield, %	75.82	76.60	75.34	76.65	76.90	76.34	-0.83
Carcass weight	192.65	200.93	186.90	194.50	202.46	188.67	-1.84

During the winter trials the hoop hogs had a heavier start weight by nearly a pound. However, they only had a higher market weight by less than one half a pound and a lower carcass weight by 1.84 lbs. This is related to the difference in average daily gain as well as average days on feed and yield values. The hoop facilities had hogs on feed nearly 4 days longer during the winter. Carcass yield is important in examining the net production result of the

systems. The hoop facilities had an average winter yield of 75.82% compared with a 76.65% yield for the confinement facility, a difference of .83% in favor of the confinement hogs. Pounds of carcass weight is 1.84 pounds in favor of the confinement facility after factoring in the .35-lb disadvantage in market weight.

The hoop facilities again had more facility days. However, the difference in the facility days and the

difference in days on feed were nearly the same during the winter. This suggests that the percentage of hogs marketed on the final marketing was similar between groups.

Winter Economic Results

The result of the winter trials is that net income was \$6.93 per hog marketed greater for the confinement facility. The net cost was \$4.89 lower per hog marketed in the confinement facility (Table 4). During the winter season the confinement facility could turn the facilities 2.54 times a

year, whereas the hoops could be turned 2.51 times a year. The yield and lean premium for the confinement hogs was greater by .83% and \$.22 per carcass hundred weight, respectively. Operating costs, were \$10.18 per hog greater in the hoop facilities while fixed costs were \$5.30 lower per hog. Bedding and feed costs differences were the largest differences in operating costs representing \$4.83 and \$4.33 differences in favor of the confinement, respectively. The confinement facility also received an additional \$2.04 in revenue per hog.

Table 4. Winter Swine Grow Finish Production Budget.

Item	Hoop	Confinement	Difference
Facility investment			
Building (per hog space)	\$55.00	\$180.00	-\$125.00
Feed & manure handling	\$36.00	\$36.00	\$0.00
Total initial investment	\$91.00	\$216.00	-\$125.00
Turns/year	2.51	2.54	-0.03
Total initial investment per turn	\$36.86	\$85.22	-\$48.36
Fixed cost			
% Interest taxes, depreciation, insurance	16.5	13.2	
Facility cost per hog marketed	\$6.39	\$11.69	-\$5.30
Fixed cost per cwt marketed	\$2.52	\$4.62	-\$2.10
Operating costs			
Feeder pigs	\$38.00	\$38.00	\$0.00
Feeder pig death loss	\$1.88	\$1.51	\$0.37
Interest on feeder pig	\$1.33	\$1.29	\$0.04
Fuel repairs utilities	\$1.05	\$1.38	-\$0.33
Bedding	\$4.83	\$0.00	\$4.83
Feed (\$.06/lb)	\$44.51	\$40.17	\$4.33
Vet/med	\$1.57	\$1.56	\$0.01
Interest on mixed costs	\$0.91	\$0.75	\$0.16
Marketing costs	\$1.54	\$1.53	\$0.01
Labor	\$2.83	\$2.08	\$0.75
Total operating cost	\$98.45	\$88.28	\$10.18
Operating costs/cwt marketed	\$25.88	\$23.07	\$2.80
Total cost (per hog marketed)	\$104.85	\$99.97	\$4.88
Total cost per cwt	\$41.24	\$39.45	\$1.78
Revenue from cull hogs per head	\$0.37	\$0.58	-\$0.20
Net cost (per hog marketed)	\$104.48	\$99.58	\$4.89
Net cost per cwt	\$41.43	\$39.31	\$2.12
Lean premium difference (per hot cwt)	\$0.00	\$0.22	-\$0.22
Revenue from \$60 per hundred carcass	\$115.60	\$117.64	-\$2.04
Weight			
Net income per hog marketed	\$11.12	\$18.05	-\$6.93

Full-Year Comparison**Full-Year Productivity**

The year-round production efficiencies are provided in Table 5. They were calculated by averaging the results of the three summer and three winter trials. The results show that the hoop facilities are less efficient than the confinement facility. The hoop facilities marketed 95.96% compared with 95.98% for the confinement facility, a difference of .02% more hogs marketed for the confinement facility. Feed efficiency was 3.17 for the hoop facilities compared with 3.04 for the confinement facility, a difference of .13 pounds of additional feed required for each pound of gain in the hoop facilities over the confinement facility. Average daily gain showed similar results with the hoop facilities growing at a rate of 1.71 pounds per day and the confinement facility gaining at 1.72 pounds per day, a difference of an additional .01 pounds of gain per day for the confinement facility.

The hoop facilities showed a larger variability in the key production efficiency. Percentage of hogs marketed ranged from 98.01 to 93.68%, whereas the confinement facility ranged from 97.73 to 94.70%. This range difference reflects the effects of wide temperature changes within the hoops causing increased stress on the pigs. The feed efficiency in the hoop facilities ranged from 3.58 to 2.96, whereas the confinement facility ranged only from 3.27 to 2.85. The average daily gain in the hoop facilities ranged from 1.83 to 1.46 compared with 1.81 to 1.56 for the confinement. The increase in feed usage and decreased average daily gain as well as the increased variability of both efficiency numbers may demonstrate the risk of lower temperatures during the year round, which causes the hoop facilities' hogs to consume more feed to combat the lower temperature.

Table 5. Full-Year Productivity Information.

Item	Hoop			Confinement			Difference
	Average	High	Low	Average	High	Low	
Hogs	2464			763			
Total bedding	35273	51420	27307				35273
Average start weight	34.76	39.95	31.10	35.12	37.90	31.90	-0.36
Death loss, %	3.02	5.62	1.54	3.15	4.58	2.27	-0.13
Cull loss, %	1.22	3.29	0.00	0.87	2.27	0.00	0.35
% Hogs marketed	95.96	98.01	93.68	95.98	97.73	94.70	-0.02
Feed efficiency	3.17	3.58	2.96	3.04	3.27	2.85	0.13
Average daily gain	1.71	1.83	1.46	1.72	1.83	1.56	-0.01
Market weight	253.43	262.32	248.07	251.00	263.28	245.14	2.43
Average days on feed	128.72	149.56	113.41	125.85	136.09	116.95	2.87
Total facility days	142.81	169.00	125.50	139.17	155.00	126.00	3.64
Carcass yield, %	74.85	76.60	72.77	75.83	76.90	74.10	-0.99
Carcass weight	189.68	200.93	180.53	190.34	202.46	181.65	-0.66

The hoop hogs had, an average, a start weight that was .36 pounds heavier and a market weight that was heavier by 2.43 pounds. However their carcass weight was -.66 less than the confinement hogs. This is related to the difference in average daily gain as well as average days on feed and yield values. The hoop facilities had hogs on feed 2.87 more days for the average group. Yield information is important in examining the net production result of the systems. The hoop facilities had an average yield of 74.85% compared with a 75.83% yield for the confinement facility, a difference of .99% in favor of the confinement facility. The result is that the difference in pounds of carcass weight is .66 pounds in favor of the confinement facility after factoring in their 2.43-lb disadvantage in market weight.

The hoop facilities also used more facility days. The difference in the facility days was 2.87 and the difference in days on feed was 3.64. This suggests that a larger

percentage of the confinement hogs were marketed during the last marketing day. Again it should be noted that under these conditions the hoops may have had a slight increase in net income by holding earlier marketing dates and selling more hogs in later periods.

Full-Year Economic Results

The full-year results shows that net income was \$2.75 per hog marketed greater for the confinement facility; the net cost was \$1.52 lower per hog marketed in the confinement facility (Table 6). With the year analysis the confinement facility could turn the facilities 2.59 times a year, whereas the hoops could be turned 2.54 times a year. The yield and lean premium for the confinement hogs was greater by .99% and \$.24 per carcass hundred weight respectively. Operating costs, were \$6.91 per hog greater in the hoop facilities, whereas fixed costs were \$5.29 lower per hog. Bedding and feed costs differences were the largest differences in operating costs representing \$4.19 and \$2.20,

respectively, in favor of the confinement. The confinement facility had higher fixed cost per hog; \$5.29 higher per hog. The confinement facility received an additional revenue of \$1.23 per hog.

Acknowledgements

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Table 6. Full-Year Swine Grow Finish Production Budget.

Item	Hoop	Confinement	Difference
Facility investment			
Building (per hog space)	\$55.00	\$180.00	-\$125.00
Feed & manure handling	\$36.00	\$36.00	\$0.00
Total initial investment	\$91.00	\$216.00	-\$125.00
Turns/year	2.54	2.59	-0.05
Total initial investment per turn	\$36.24	\$83.87	-\$47.63
Fixed cost			
% Interest taxes, depreciation, insurance	16.5	13.2	3.3
Facility cost per hog marketed	\$6.24	\$11.53	-\$5.29
Fixed cost per cwt marketed	\$2.46	\$4.60	-\$2.13
Operating costs			
Feeder pigs	\$38.00	\$38.00	\$0.00
Feeder pig death loss	\$1.68	\$1.66	\$0.02
Interest on feeder pig	\$1.32	\$1.31	\$0.01
Fuel repairs utilities	\$1.04	\$1.39	-\$0.35
Bedding	\$4.19	\$0.00	\$4.19
Feed (\$.06/lb)	\$41.75	\$39.55	\$2.20
Vet/med	\$1.56	\$1.56	\$0.00
Interest on mixed costs	\$0.85	\$0.74	\$0.11
Marketing costs	\$1.53	\$1.53	\$0.00
Labor	\$2.82	\$2.08	\$0.73
Total operating cost	\$94.73	\$87.82	\$6.91
Operating costs/cwt marketed	\$25.02	\$23.14	\$1.88
Total cost (per hog marketed)	\$100.92	\$99.35	\$1.57
Total cost per cwt	\$39.80	\$39.58	\$0.22
Revenue from cull hogs per head	\$0.56	\$0.77	-\$0.21
Net cost (per hog marketed)	\$100.35	\$98.83	\$1.52
Net cost per cwt	\$39.75	\$39.38	\$0.37
Lean premium difference (per hot cwt)	\$0.00	\$0.24	-\$0.24
Revenue from \$60 per hundred carcass	\$113.81	\$115.04	-\$1.23
Weight			
Net income per hog marketed	\$13.46	\$16.21	-\$2.75