# Hooped Structures with Deep Bedding for Grow-finish Pigs

M. S. Honeyman, associate professor of animal science

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### Summary and Implications

Hooped structures are a viable alternative for feeding grow-finish pigs. They offer versatility, reduced fixed costs, and reduced risk but require more feed and a plentiful, low-cost supply of bedding. Several research questions need to be answered, but it appears that hooped structures have a place in Iowa swine production.


### Introduction

An alternative housing system is available for grow-finish swine that consists of arched or hooped pipes in a Quonset-shaped structure covered with polyethylene fabric tarp. The ends are open most of the year. A concrete pad is at one end with the feeder and waterer. The remaining area is deep bedded and cleaned after each group of pigs is marketed.

The structures were developed in Manitoba, Canada and several manufacturers are based there. Work by Connor (1993 to 1994) reported that pigs fed in hooped structures, when compared with pigs fed in partially slatted confinement units, had 1) excellent health, 2) similar rates of gain, 3) similar feed efficiency except during cold winter months (10 to 20% poorer), 4) lower pig mortality, and 5) straw bedding use of 270 lb. per pig. The structures are widely used in Manitoba for finishing pigs. In the last year interest in these structures for pig production has escalated in Iowa and surrounding states.

### Materials and Methods

In 1993, a 30 ft. x 60 ft. hooped structure was erected at the Iowa State University (ISU) Rhodes Research and Demonstration Farm, near Rhodes, Iowa in Marshall County. The structure was donated by AmCan Inc.[1], Bloomington, Illinois, as part of a gestating sow project, which is now complete.

The structure is oriented northwest southeast with the southeast end open year-round. The structure has 6 ft. wooden side walls. The southeast end has an 18 ft. concrete slab with feeders and nipple waterers. A 4 ft. high plywood barrier is across the southeast end. During winter the northwest end is covered with a large flap or tarp. Plywood is used to cover the pie-shaped areas not covered by the tarp and the opening at the top of the arch is kept open at all times. During the summer the tarp is rolled up to allow maximum ventilation. Tubular gates are used on the ends. The remainder of the building has a dirt floor and is bedded with cornstalks. A sprinkler system was installed over the bedded area for hot weather.

Two groups of pigs were fed during the winter of 1995-96 and the summer of 1996, respectively. The winter of 1995-96 was colder then usual with several blizzards. The summer of 1996 was milder than normal. The pigs were fed ad libitum corn and soybean meal diets in four dietary phases. Tylosin was added to the feed as a growth promotant.

The pigs were delivered from nurseries and placed in the structure as one group. The buildings were bedded with about 12 in. of cornstalks. Big round bales of cornstalks were placed on end as needed and the pigs were allowed to unravel them. The pigs were fed to similar average backfat thickness (about 1 in.).

### Results and Discussion

The results of feeding the two groups of grow-finish pigs in the hooped structure are shown in table 1. It should be noted that these results are from two groups of pigs fed in the same facility during different seasons. The information reported is not replicated, but it is a comparison. Some important information can be gleaned from the results, particularly because hooped structures are new and undocumented in Iowa.

Performance was similar to pigs reared in conventional confinement. Pig mortality was consistently low (2.6 to 2.7%). Average daily gain was similar for both groups and acceptable (1.78 to 1.87 lb./day). The two groups differed in their liveweight, carcass weight, and days on feed to reach the 1 in. backfat target. The first group reached the target sooner and at a lighter weight than the second group. This difference is attributed to different genetics rather than a seasonal effect.

Feed efficiency was 8% poorer for the pigs fed during the winter. This difference is attributed to a seasonal effect. The performance of these two groups of pigs is consistent with the Canadian results. The poorer feed efficiency for winter-fed groups (8% poorer) is also consistent with the low end of the Canadian range (10% poorer).

The pigs soon chose sleeping and dunging areas in the building. During the winter the sleeping area was near the closed back (northern) end of the structure. During the summer the sleeping area was in the center of the building with dunging at the sides and north end, which was open.

Summer bedding use was about one-half of the amount of bedding used during the winter, even though

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[1] Mention of company or product names is for presentation clarity, and does not imply endorsement by the authors or Iowa State University, nor exclusion of any other products that also may be suitable for application.

the summer pigs were fed two weeks longer. Overall average use was about 200 lb. of cornstalks per pig. The summer group required about one-third less labor per pig than the winter group because of less bedding and less manure to haul. The summer group was also the second experience for the manager to feed pigs in the structure so labor probably was expended more effectively. Based on the labor expended per pig data, feeding pigs in a hooped structure is no more labor intensive than conventional pig finishing. However, the labor activities are distinct for a hooped structure. Labor is spent checking pigs (e.g., walking through the bedded area). Sick pigs tend to stay burrowed in the bedding. Time also is spent moving big round bales and loading and hauling solid manure.

*Cost implications*

Using the results of these two groups of pigs, and based on the reports of Iowa farmers who have fed pigs in these structures and the Canadian data, a cost comparison can be projected. Individual farms will vary. The ISU Livestock Enterprise Budgets also were used. A cost comparison projection is shown in table 2.

The cost projections assume confinement building cost of $160 per pig space. It also is assumed that there is no difference in veterinary, medical, marketing, or feed and manure handling equipment costs between the two systems. Interest, taxes, insurance, and depreciation are assumed to be 13% of investment for each system. Bedding use is 200 lb. of cornstalks per pig at 3/4¢ per lb. or $12 for a 1,600 lb. bale. Fuel, repairs, and utilities are much less for hooped structures and are estimated at $.50 per pig versus $2.00 per pig in confinement. Feed efficiency is assumed to be similar except for four winter months when it is estimated to be 9% poorer than other times of the year. Over a twelve-month period this is 3% poorer feed efficiency for the hooped structure. These assumptions are based on the 8% poorer feed efficiency of the winter group, and the Canadian work (10 to 20% poorer).

This projection shows a tradeoff of lower fixed costs for higher operating costs when hooped structures are compared to confinement housing. Or when hooped structures are used to finish pigs, the costs of interest, insurance, taxes, depreciation, fuel, repairs, and utilities are lower. These lower costs are offset partially by higher feed and bedding costs. The prices and projections vary for individual circumstances, but this fixed cost/operating cost trade-off is intrinsic when comparing hooped structures with conventional confinement buildings for finishing pigs.

This cost budget projection estimates a $3.50 per pig advantage for hooped structure-fed pigs. If income is equal and the life of the structures similar, then the cost advantage is also a net income advantage.

*Other considerations*

For diversified, moderate-sized swine producers, hoop structures offer some additional considerations. The structures are versatile and could be used for alternative purposes (e.g., hay, machinery, or grain storage). The hooped structures easily can be constructed with on-farm labor. The versatility, production flexibility, and low capital costs result in reduced risk. The structures must be managed as all-in/all-out units because they are not subdivided into many small pens. The quality of the work environment is generally good with no liquid manure and a large volume of naturally-ventilated air inside the building. Odor is less than liquid manure systems. Manure can be stockpiled for spreading at other times.

However, there is an increased volume of manure because of the added bedding. Also, flies may be a problem during warm months. Some bedding may need to be stored inside for use late in the year. Low-cost, high-quality bedding must be a high priority for the system. Also, it is unclear whether pathogens build up in the soil floor over long periods of use. Ultimate life of the structure is undocumented.

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**Table 1. Performance of two groups of grow-finish pigs in a hoop structure.**

| Group | Winter | Summer |
|---|---|---|
| Breeding | HxYxD | PIC |
| Start (head) | 151 | 150 |
| Start (date) | 11/16/95 | 4/15/96 |
| Start wt. (lb.) | 55 | 51 |
| Market (head) | 147 | 146 |
| Market (date) | Feb. & Mar., 1996 | Aug. & Sept, 1996 |
| Days to market (days) | 108 | 122 |
| Market wt. (lb.) | 246 | 265 |
| Backfat (in.) | 1.01 | .99 |
| FFLI (% lean) | 46.7 | 47.6 |
| Hot carcass weight (lb.) | 185 | 200 |
| Mortality (%) | 2.6 | 2.7 |
| ADG (lb./day) | 1.78 | 1.87 |
| FE (lb. feed/lb. live gain)* | 3.53 | 3.27 |
| Bedding | cornstalks, large round bales | |
| Total bedding used (lb.) | 39,600 | 18,600 |
| Bedding/pig (lb./pig) | 262 | 124 |
| Total manure produced | 100 tons est. | 36 tons est. |
| Total labor (hr.)** | 90 | 62 |
| Labor/pig (hr./pig) | .61 | .42 |
| Marketing interval (days)*** | 28 | 31 |

*Feed efficiency was calculated by dividing marketed liveweight gain for the trial by feed disappearance.

**Labor includes daily inspection of pigs, adding bedding, sorting and loading market pigs, and manure cleanout and hauling. It does not include feed preparation and delivery or hauling pigs to market.
***Days from the first sale to the last sale of pigs.

**Table 2. Swine grow-finish cost comparison projections.**

| Item | Confinement* | Hooped** | Difference |
|---|---|---|---|
| Facility Investment | | | |
| Cost/pig space | $160 | $50 | - |
| Building (2.8 turns per year) | 57 | 18 | - |
| Feed & manure handling equip. | 36 | 36 | - |
| Total investment | 93 | 54 | - |
| Fixed Costs/Pig/Year | | | |
| Interest, taxes, depreciation, & insurance (13%) of investment | 12.11 | 7.02 | 5.09 |
| Total Fixed Costs | $12.11 | $7.02 | $5.09 |
| Operating Costs | | | |
| Feeder pig | $38.00 | $38.00 | 0 |
| Fuel, repairs, utilities | 2.00 | .50 | 1.50 |
| Bedding - 200 lb./pig @ 3/4¢/lb.*** | 0 | 1.50 | -1.50 |
| Interest on pig, feed, etc. | 2.37 | 2.37 | 0 |
| Feed | | | |
| *Confinement* 200 lb. gain @ 3.25 F/G @ 8¢/lb. of feed | 52.00 | | |
| *Hooped* 200 lb. gain @ 3.35 F/G @ 8¢/lb. of feed (assumes 9% poorer F/G for 4 month/year) | | 53.60 | -1.60 |
| Vet/medical | 1.50 | 1.50 | 0 |
| Labor .75 hr. at 7.50 | 5.63 | 5.63 | 0 |
| Marketing/Misc. | 2.00 | 2.00 | 0 |
| Total operating costs | $103.50 | $105.10 | -$1.60 |
| Total overall (costs/pig) | $115.61 | $112.12 | $3.49 |
| Total costs/cwt.live | $46.24 | $44.85 | - |

*All costs except feed follow the 1996 ISU Livestock Enterprise Budgets for finishing pigs, Fm 1815, Jan. 1996.
**Based on Canadian trials that showed no difference in labor. Assumes no difference in veterinary, medical, marketing interest, or feed and manure handling equipment costs.
***Assumes a 1,600 lb. corn stalk bale worth $12.