

# MU Guide

## Hoop Structures for Missouri Swine Finishing Facilities

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Many Missouri pork producers are looking for lower-cost structures in which to raise pigs. The search for low-cost animal housing has created a great interest in so-called hoop structures, or hoop shelters, as facilities in which to grow pigs from about 60 pounds to market weight. Hoop structures can be used successfully in such grow-finish operations, but producers need to be aware of the advantages and disadvantages of this type of housing. For detailed information about the construction and management of hoop structures, see the Midwest Plan Service publication entitled *Hoop Structures for Grow-Finish Swine* (Agricultural Engineers Digest – AED 41).

### Hoop structures

The purpose of this guide is to compare the efficiency and potential profitability of hoop structures and total confinement (slatted) facilities. Experience in Missouri shows that hoop structures allow producers to get into pork production with less capital commitment and financial risk than is required by confinement facilities. The best net return to investment in facilities comes from operations that result in low operational costs and consistent pig flow.

It is important to understand that hoop structures appear to be most beneficial to producers who demonstrate one or more of the following characteristics:

- View the swine industry as rapidly changing and need versatile facilities.
- Operate moderate-sized enterprises.
- Intend to be in operation for the short-term, but need improved facilities.
- Need a short-term structure that can be removed after use or adapted to other uses.
- Want to keep fixed costs low.
- Are not willing to accept additional financial risk.
- Want to get pigs out of outside lots or buildings.
- Need an area for overflow finishing pigs or gilt development.
- Need an isolation area for new sows or gilts.
- Need an area in which to hold “tail-enders,” the slowest-growing pigs, of a group when using an

all-in/all-out, high-capital confinement facility.

- Have the equipment and land resources for crop residue harvest and reapplication.

### Capital cost comparisons

By comparing different types of grow-finish facilities, swine producers can determine what style of facility best matches their needs and preferences.

Experience in Missouri shows that a 200-head hoop barn costs about \$14,000 to construct (including water, feeders and site development). Bedding costs will run near \$4.00/pig and feed efficiencies in well-managed facilities will be 3.53 in winter and 3.43 in the summer (3.48 average).

In Missouri a 200-head total slat grow-finish facility costs about \$42,000 to construct (including water, feeders, site development, and manure storage). Feed efficiency (FE) in well-managed buildings averages 3.1 pounds of feed per pound of gain.

Worksheet 1 will help producers determine potential net returns for a given grow-finish facility. It compares facility costs, operational costs, and returns from different grow-finish facilities and can be readily adapted to a spreadsheet application. Initial cost, design, management style and pig performance potential are evaluated.

The worksheet incorporates both facility-related and pig performance factors that affect returns for a given facility. Facility factors include both initial facility costs and operational variable costs. Pig performance factors and associated costs include average daily gain, feed efficiency, mortality, and veterinary costs per pig.

General economic factors include a feeder pig price of \$40 per head, market hog price of \$42 per hundredweight and an average feed price of \$140 per ton. General management inputs include initial feeder pig weight of 60 pounds and desired average market weight of 260 pounds. Facility costs have been amortized over seven years at an interest rate of 8 percent, resulting in an annual facility cost of \$30 per pig space for a totally slatted facility and \$10 per pig

space for a hoop facility.

The turn-around time required to complete marketing, clean the facility and restock is included because it determines the number of production cycles, or “turns,” per year for the facility. Labor and management requirements are combined and included as a cost per pig space per year. Bedding is a required input for some grow-finish facilities and is included as a cost per pig housed.

Performance of grow-finish facilities can be compared if the inputs for a given operation are known. Actual performance data provide the best information; however, data from the examples can also be used to provide an estimate for a typical operation. Tables 1 and 2 show typical expenses and returns associated with use of confinement and hoop structures in grow-finish operations. In the tables, fees associated with facilities, utilities, repairs, interest, taxes and net return are determined on a pig space per year basis. Bedding, veterinary and medical expenses are determined on a per pig basis.

Tables 1 and 2 show that hoop structures can be constructed at a lower capital outlay per pig space per year. However, hoop structures do not allow pigs to convert feed to pounds of pork as efficiently as totally slatted, environmentally controlled confinement facilities. The tables indicate that the best performance that can be expected with hoop barns is comparable to poor performance in a total slat facility.

The tables may suggest that total slat facilities that are not managed all-in/all-out and sanitized between groups will result in decreased average daily

gain and poorer feed efficiency. However, a well-managed hoop barn with a strict all-in/all-out protocol can also pass pathogen contamination from one production cycle to the next as a result of dirt floors and wooden walls. The example values given in the tables represent expected differences between the two production systems that have been observed in Missouri.

### “Tail-ender” facilities

Hoop barns can be used in conjunction with total slat facilities by placing the slowest-growing 15 percent of pigs (tail-enders) in hoop structures to increase the number of “turns” that the slatted barn will allow in a year’s time. Increasing the number of turns from 2.86 to 3.1 in a total slat barn will increase the net return per pig space by \$4.85 (see Table 3).

However, the sort loss (market price discount assessed by the packer for excessive weight variation) associated with this practice must be less than \$0.71 per hundredweight (\$1.56/head) or the producer will lose additional revenue associated with selling all hogs after 17 weeks of finishing. When the sort loss exceeds \$ 0.71/cwt, then a producer can afford to consider an additional 30-day finishing time in the total slat facility. The sort loss for tail-ender pigs will need to be greater than \$1.75 per cwt before the net return per space in a hoop structure will provide additional revenue to the value of the market hog (see Table 4). In this example, one 200-head hoop structure could finish the tail-enders from six 600-head total slat confinement facilities.

**Table 1. Costs and returns for slatted, confinement grow-finish facilities.**

Facility charge	Utility cost	RIT	Bedding	Vet & Med	Mort. (%)	ADG (lb)	FE (lb <sub>r</sub> /lb <sub>g</sub> )	Net return
\$30.00	\$1.50	\$2.00	\$0.00	\$0.40	1	1.7 (good)	3.1 (good)	\$10.15
\$30.00	\$1.50	\$2.00	\$0.00	\$0.50	3	1.4 (poor)	3.4 (poor)	(\$14.45)
PAID	\$1.50	\$2.00	\$0.00	\$0.40	1	1.7 (good)	3.1 (good)	\$40.15

**Table 2. Costs and returns for hoop-structure grow-finish facilities.**

Facility charge	Utility cost	RIT	Bedding	Vet & Med	Mort. (%)	ADG (lbs)	FE (lb <sub>r</sub> /lb <sub>g</sub> )	Net return
\$10.00	\$0.00	\$2.00	\$4.00	\$0.40	1	1.5 (good)	3.4 (good)	\$4.46
\$10.00	\$0.00	\$2.00	\$4.00	\$0.50	3	1.3 (poor)	3.7 (poor)	(\$13.43)
PAID	\$0.00	\$2.00	\$4.00	\$0.40	1	1.5 (good)	3.4 (good)	\$14.46

**Note:** In Tables 1 and 2 it is assumed that the fees associated with facilities, utilities, repairs, interest, taxes and net return are on a pig space per year basis. Bedding, veterinary and medical expenses are on a per pig basis.

Additional assumptions include:

1. Facility size = 200 head
2. Feeder pig purchase price of \$40 per head
3. Market hog price of \$42 per hundredweight
4. 200 pounds of gain/pig with a feed cost of \$140 per ton
5. Return to labor and management set at \$14 per pig space/year
6. RIT = repairs, interest and taxes

**Table 3. Removal of 15% “tail-enders” increases number of turns in total slat grow-finish facilities.**

Facility charge	Utility cost	RIT	Turns	Vet & Med	Mort. (%)	ADG (lb)	FE (lb <sub>f</sub> /lb <sub>g</sub> )	Net return
\$30.00	\$1.50	\$2.00	2.86	\$0.40	1	1.7	3.1	\$10.15
\$30.00	\$1.50	\$2.00	3.10	\$0.40	1	1.7	3.1	\$15.00

**Note:** Assumes that the fees associated with facilities, utilities, repairs, interest, taxes and net return are on a pig space per year basis. Bedding, veterinary and medical expenses are on a per pig basis. Additional assumptions include:

1. At the end of 118 days, all hogs weighing 260 pounds are sold, and the expected 15% weighing an average of 220 pounds are then transported to a hoop structure.
2. This reduces finishing days in the total slat barn from 128 days to 118 days.
3. This will now allow the manager to turn the facility 3.1 times vs. 2.86 times.

**Table 4. The profitability of placing the 15% “tail-enders” in a hoop structure depends on the sort loss associated with the 220-pound hog.**

Facility charge	Bedding cost	Sort Loss/cwt	Value of 220 lb pig	Turns	ADG (lb)	FE (lb <sub>f</sub> /lb <sub>g</sub> )	Net return
\$10.00	\$1.00	\$1.00	\$90.20	9.10	1.0	5.1	-\$17.46
\$10.00	\$1.00	\$1.25	\$89.65	9.10	1.0	5.1	-\$12.53
\$10.00	\$1.00	\$1.50	\$89.10	9.10	1.0	5.1	-\$7.61
\$10.00	\$1.00	\$1.75	\$88.55	9.10	1.0	5.1	-\$2.68
\$10.00	\$1.00	\$2.00	\$88.00	9.10	1.0	5.1	\$2.24

**Note:** Assumes that the fees associated with facilities, utilities, repairs, interest, taxes and net return are on a pig space per year basis. Bedding, veterinary and medical expenses are on a per pig basis. Additional assumptions include:

1. Facility size = 200 head
2. Sort loss associated with a 220-pound pig = \$1.00 to \$2.00
3. Market hog price of \$42 per hundredweight for 250- to 260-pound hog
4. 39 pounds of gain/pig with an average daily gain (ADG) of 1.3 and feed efficiency (FE) of 5.1 (feed cost \$140 per ton)
5. Return to labor and management set at \$24 per pig space/year in the hoop barn
6. Pigs fed an additional 30 days and 10 days allowed for market, cleanup and restock

### Worksheet 1: Grow-Finish Facility Evaluation

Scenario \_\_\_\_\_

**Inputs**

- |   |         |       |                              |                 |       |
|---|---------|-------|------------------------------|-----------------|-------|
| 1. Facility capacity                      | head    | _____ | 2. Market, clean and restock | days            | _____ |
| 3. Weight of feeder pigs                  | lb      | _____ | 4. Average market weight     | lb              | _____ |
| 5. Average daily gain                     | lb/day  | _____ | 6. Feed efficiency           | lb feed/lb gain | _____ |
| 7. Market hog price                       | \$/cwt  | _____ | 8. Mortality (per turn)      | %               | _____ |
| 9. Feeder pig price                       | \$/head | _____ | 10. Feed price/ton           | \$              | _____ |
| 11. Veterinary & medical cost/pig         | \$      | _____ | 12. Bedding cost/pig         | \$              | _____ |
| <i>Input costs per pig space per year</i> |         |       |                              |                 |       |
| 13. Facility charge (payments)            | \$      | _____ | 14. Utilities (elec. & fuel) | \$              | _____ |
| 15. Repairs, taxes, insurance             | \$      | _____ | 16. Labor and management     | \$              | _____ |

**Facility performance**

17. Turns per year = 365 days ÷ [((item 4 – item 3) ÷ item 5) + item 2] \_\_\_\_\_
18. Number of feeder pigs purchased/year (item 1 × item 17) \_\_\_\_\_
19. Number of finished hogs sold per year [((100 – item 8) ÷ 100) × item 18] \_\_\_\_\_

20. **Total revenue per year** [(item 19 × item 4 ÷ 100) × item 7] \$ \_\_\_\_\_

**Expenses per year**

21. Facility charges [item 1 × (item 13 + item 14 + item 15)] \$ \_\_\_\_\_
22. Feed costs [((item 4 – item 3) × item 6 × item 18 × item 10) ÷ 2,000] \$ \_\_\_\_\_
23. Feeder pig costs (item 18 × item 9) \$ \_\_\_\_\_
24. Veterinary costs (item 18 × item 11) \$ \_\_\_\_\_
25. Bedding costs (item 18 × item 12) \$ \_\_\_\_\_
26. Labor and management costs (item 1 × item 16) \$ \_\_\_\_\_
27. Total expenses per year (sum items 21, 22, 23, 24, 25 and 26) \$ \_\_\_\_\_

**Net returns per year**

28. Total net return (item 20 – item 27) \$ \_\_\_\_\_
29. Net return per finished hog sold (item 28 ÷ item 19) \$ \_\_\_\_\_
30. Net return per cwt [item 29 ÷ (item 4 ÷ 100)] \$ \_\_\_\_\_

## Worksheet Definitions

1. **Facility capacity** - Number of pigs housed in the grow-finish facility being evaluated.
2. **Market, clean and restock** - The number of days to complete marketing plus the number of days required to clean and restock facility with feeder pigs.
3. **Weight of feeder pigs** - The average weight in pounds of pigs entering the facility at the beginning of the finishing period.
4. **Average market weight** - The target market weight of hogs leaving the facility at the completion of the finishing period.
5. **Average daily gain** - The average daily gain of the pigs produced in the facility. The style and effectiveness of the facility have direct influences on the average daily gain. A more effective production facility will have a higher average daily gain than a less effective production facility.
6. **Feed efficiency** - Feed efficiency is the ratio of pounds of feed consumed to pounds of live weight gain in swine. Higher-value numbers indicate less efficient use of feed. Average feed efficiency depends on both the genetic quality of the pig and the production environment provided by the finishing facility. Pigs that perform poorly usually exhibit feed utilization traits that result in a higher feed efficiency value. Facility type, design and operation will determine a minimum value of feed efficiency that can realistically be expected from that facility.
7. **Market price of finished hogs** - Average market price per hundredweight (cwt) of hogs raised in the facility. Some facilities provide a growth environment that causes genetically identical hogs to produce more fat.
8. **Mortality** - Average mortality or death loss for a given facility per finishing period.
9. **Feeder pig price/head** - Average price per feeder pig entering finishing facility. This can be the market price for feeder pigs for pigs produced in the operation or the purchase price for purchased pigs. Input of a fixed price while comparing different scenarios will remove price effect from the analyses.
10. **Feed price/ton** - Average feed price per ton of grow-finish feed. Fixing the feed price while comparing different scenarios will remove feed price effect from the analyses.
11. **Veterinary and medical cost per pig** - Average veterinary and medical costs per pig raised within a given facility. Lower performance facilities tend to have higher veterinary and medical costs per pig produced.
12. **Bedding cost/pig** - The cost of bedding per pig produced if bedding is required in the grow-finish facility being evaluated. The finishing enterprise is charged for the cost of the bedding even if the farming operation produces the bedding.
13. **Facility charge (payments)** - The payment per pig per year for the facility being evaluated. The facility charge is payment of debt service plus principal payment for a facility. This charge could also be lease payments if the facility is being rented.
14. **Utilities (electricity & fuel)** - The average cost per pig space per year for electricity and heating fuel used in a given facility. If the facility does not require electricity or supplemental heating, no cost is input.
15. **Repairs, insurance, taxes** - Costs (such as repairs, insurance and taxes) to own and maintain the grow-finish facility being evaluated. The amount in this input is based on the facility design and initial cost of construction. This value was held constant in the examples because increased repair costs for the low capital cost structures were assumed to be equivalent to the increased tax and insurance costs of the high capital cost facilities.
16. **Labor and management** - The labor and management are an input cost per pig space per year to raise pigs within a given facility. The actual number of hours and type of management capability will depend on facility type. The value of this input incorporates both quantity and quality of labor requirements. Return to labor and management is held constant in this analysis and is based on a return per pig space per year.

### For further information

*Hoop Structures for Grow-Finish Swine*  
(Agricultural Engineers Digest – AED 41)

*Hoop Structures for Gestation Swine*  
(Agricultural Engineers Digest – AED 44)

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