

2002

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## Recommended Citation

Honeyman, Mark S. and Harmon, Jay D., "Three-Year Summary of Performance of Finishing Pigs in Hoop Structures and Confinement during Winter and Summer" (2002). *Iowa State Research Farm Progress Reports*. 1671.

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# Three-Year Summary of Performance of Finishing Pigs in Hoop Structures and Confinement during Winter and Summer

## **Abstract**

The objectives of the study were to document the performance of finishing pigs in hoops during the summer and winter as well as evaluate pig performance in hoops compared with pigs in a confinement housing system.

## **Keywords**

Animal Science, Agriculture and Biosystems Engineering

## **Disciplines**

Agricultural Science | Agriculture | Animal Sciences | Bioresource and Agricultural Engineering

# Three-Year Summary of Performance of Finishing Pigs in Hoop Structures and Confinement during Winter and Summer

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## Introduction

The objectives of the study were to document the performance of finishing pigs in hoops during the summer and winter as well as evaluate pig performance in hoops compared with pigs in a confinement housing system.

## Materials and Methods

The summer trials started in June, and the winter trials started in November. For each trial, three groups of pigs were placed in three 30 × 60 ft bedded hoop structures (150 pigs/hoop). A fourth group was placed in a mechanically ventilated modular confinement building with slotted floors, with six pens (22 pigs/pen). The three hoops and confinement were filled over a three-week period or less. Each unit was filled with pigs that were weaned at the same time. The pigs were injected with ivermectin and vaccinated for erysipelas at the beginning of the trials. The pigs were wormed with Safeguard in the feed at approximately 120 pounds. A total of 3,517 pigs was started in the trials. The pigs weighed approximately 35 pounds at the beginning of the trials (Table 1).

The stocking densities for finishing pigs in hoop structures was 12 ft<sup>2</sup>/pig and 8 ft<sup>2</sup>/pig in confinement. With 12 ft<sup>2</sup>/pig, each 30 × 60 ft hoop structure was designed to hold 150 pigs. The confinement pens (13.5 × 13 ft) were designed to hold 22 pigs/pen. In the trials, a hoop is defined as a pen. There were three pens of hoop pigs and six pens of confinement pigs for each of the six trials. All pigs were from terminal Duroc boars crossed on predominantly

white sows. The pigs were a mixture of barrows and gilts.

Pigs were fed five diets in phase *ad libitum* during the trials. All diets were corn and soybean meal-based and were fed in meal form. The diets were dispensed in each hoop by two round feeders with 12 feeding spaces each. The confinement pens contained a single round feeder with eight spaces. The hoops contained two waterers with two drinking spaces each, and the confinement contained four nipple waterers/pen.

## Results and Discussion

The hoop pigs ate more feed/day than the confinement pigs. The average daily feed intake (ADFI), which is the feed disappearance less the feed consumed by pigs that were not marketed (culls and mortalities), was 4.9% more for the hoop pigs ( $P < .001$ ) (5.31 vs. 5.06 lb/d). If the feed for the pigs not marketed (culls and mortalities) was included, the average daily feed intake (AllADFI) was 5% more for the hoop pigs ( $P < .001$ ) (5.45 vs. 5.19 lb/d) (Table 1).

The hoop pigs grew 1.7% faster than the confinement ( $P < .01$ ) (1.80 vs. 1.77 lb/d) (Table 1). However, the hoop pigs were less efficient in converting feed to liveweight gain. The feed efficiency with feed removed for culls and mortalities (F/G) was 3.5% poorer for the hoop pigs ( $P < .001$ ) (2.96 vs. 2.86 lb feed/lb gain). The feed efficiency with the feed for culls and mortalities included (AllF/G) was also 3.4% poorer for the hoop pigs ( $P < .01$ ) (3.04 vs. 2.94 lb feed/lb gain) (Table 1).

The mortality rate was similar (2.8 vs. 2.5%) for hoops and confinement. The combined percentage of pigs that were culled and those

that did not weigh 220 pounds at marketing (lights) was 4.0% for hoops and 2.5% for confinement. This may be due to the larger number of pigs/pen in the hoops.

The carcass and scan performance of the pigs in hoops and in confinement is shown in Table 2. The pigs were scanned at approximately 247 pounds after 120 days on feed. The hoop pigs were 4.9% fatter ( $P<.05$ ) (.85 vs. .81 in.) and had 4.8% smaller loin muscle areas ( $P<.001$ ) (6.32 vs. 6.64 sq. in.) (Table 2). When the values were adjusted to 250 pounds, the backfat was 4.9% more ( $P<.01$ ) and the loin muscle areas were 3.9% less ( $P<.001$ ) for the hoop pigs.

The carcasses from the hoop pigs had one percentage unit less lean ( $P<.001$ ) (51.1 vs. 52.1%) and lower yield ( $P<.001$ ) (74.9 vs. 75.8%) than the confinement pig carcasses. The rate of lean gain was slightly less ( $P<.05$ ) and efficiency of lean gain was 6.8% more ( $P<.001$ ) (7.56 vs. 7.08 lb lean gain/lb of feed) for the hoop pigs than the confinement pigs (Table 2).

The seasonal interactions of pig performance in hoops and confinement for summer and winter are shown in Table 3. Each season had three trials, one for each year. Bedding use was 204 lb/pig in summer and 32% more or 270 lb/pig in winter.

The pigs in hoops ate 3% more feed during the summer and 6.7% more feed in the winter than the pigs in confinement ( $P<.01$ ), with the feed removed for the mortalities and culls (ADFI) (Table 3). When the feed for the mortalities and culls was included (AllADFI), there was no difference in feed intake in the summer; but during the winter, the hoop pigs ate 7.9% more feed than the confinement pigs ( $P<.001$ )

(Table 3). Presumably the cold environment encouraged the hoop pigs to eat more feed.

The hoop pigs grew 4% faster in the summer than the confinement pigs ( $P<.001$ ), but there was no difference in the winter.

The feed efficiency of hoop pigs was 8–9% poorer than the confinement pigs in the winter (F/G,  $P<.05$ ) (AllF/G,  $P<.001$ ). This probably is because more of the feed nutrients were used for maintenance, i.e., to maintain body temperature. During the summer, the feed efficiency (F/G and AllF/G) was similar (Table 3).

Compared with confinement, pig mortality in the hoops was lower in the summer (1.8 vs. 2.7%) but higher in the winter (3.8 vs. 2.3%). This difference may be related to the colder and more variable environment in the hoops during the winter. The total percentage of pigs that were culled and those that did not reach 220 pounds at market (lights) was higher in the hoops than in confinement during the winter and about the same in the summer (Table 3).

The seasonal interaction of carcass and scan data for summer and winter is shown in Table 4. The hoop pigs had 7.1% thicker backfat in the summer ( $P<.01$ ) but did not differ in the winter compared with the confinement pigs. When adjusted to 250 pounds, there was no difference in backfat or loin muscle areas. The efficiency of lean gain did not differ in the summer, but was 11.8% poorer in the winter for the hoop pigs ( $P<.01$ ) (Table 4).

For a complete report of this project, contact M.S. Honeyman, 515-294-4621, honeyman@iastate.edu, or visit the website <http://www.extension.iastate.edu/ipic/subjects.html>.

**Table 1. Performance of pigs fed in hoops and confinement (6 trials, 3 years).**

Measure	Hoops		Confinement		
	Mean	SEM	Mean	SEM	
Start weight, lb	34.7	.05	35.1	0.4	
End weight, lb <sup>1</sup>	261.0	1.2	257.6	0.8	*
Weight gain, lb	226.3	1.3	222.5	0.9	*
Days on feed	127.1	0.9	126.0	0.6	
Adjusted days to 250	175.8	0.6	175.7	0.4	
Bedding use per pig, lb <sup>2,3</sup>	237	---	0.0	---	
ADFI, lb/day <sup>4</sup>	5.31	.03	5.06	.02	***
ADG, lb/day	1.80	.01	1.77	.01	**
Feed/Gain, lb feed/lb gain <sup>5</sup>	2.96	.02	2.86	.01	***
AllADFI, lb/day <sup>6</sup>	5.45	.04	5.19	.03	***
AllF/G, lb feed/lb gain <sup>7</sup>	3.04	.02	2.94	.02	**
Mortalities, % <sup>2,8</sup>	2.8	---	2.5	---	
Culls, % <sup>2,9</sup>	1.7		1.0		
Lights, % <sup>2,10</sup>	2.3	---	1.5	---	

<sup>1</sup>End weight is the liveweight at the farm before shipping to the plant.

<sup>2</sup>No statistical analysis performed on data.

<sup>3</sup>Bedding use = total bedding ÷ no. of pigs at start of trial.

<sup>4</sup>ADFI = Feed disappearance less the feed consumed by pigs that were not marketed ÷ number of pigs marketed ÷ days on feed.

<sup>5</sup>F/G = ADFI ÷ ADG.

<sup>6</sup>AllADFI = Feed disappearance ÷ pigs marketed ÷ days on feed.

<sup>7</sup>AllF/G = AllADFI ÷ ADG.

<sup>8</sup>Mortalities are defined as pigs that died or were euthanized at the farm. The number of pigs at start of trial is the divisor in calculating percentage.

<sup>9</sup>Culls are defined as pigs that were marketed alternatively because of their detrimental condition, e.g., lameness, hernia, etc. The number of pigs at start of trial is the divisor in calculating percentage.

<sup>10</sup>Lights are defined as pigs not weighing 220 lb at marketing. The number of pigs at start of trial is the divisor in calculating percentage.

\*P<.05, \*\*P<.01, \*\*\*P<.001.

**Table 2. Carcass and scan performance of pigs fed in hoops and confinement (6 trials, 3 years).**

Measure	Hoops		Confinement		
	Mean	SEM	Mean	SEM	
Scan liveweight, lb	245.3	1.4	248.5	1.0	
Test period, days	118.8	0.9	120.8	0.7	
Backfat, in.	0.85	.01	0.81	.01	*
Loin muscle area, sq. in.	6.32	.04	6.64	.03	***
Adjusted backfat, in. <sup>a</sup>	.86	.01	0.82	.01	**
Adjusted LMA, sq. in. <sup>a</sup>	6.40	.04	6.66	.03	***
Lean, lb/pig	92.5	.5	95.6	.4	***
Lean, % <sup>b</sup>	51.1	.2	52.1	.1	***
Lean gain, lb/day on test <sup>b</sup>	.69	.01	.70	.01	*
FFLI, % <sup>c</sup>	47.7	.1	48.0	.1	*
Efficiency of lean gain, lb feed/lb lean gain	7.56	.06	7.08	.04	***
Yield, %	74.9	.1	75.8	.1	***

<sup>a</sup>Adjusted to 250 lb liveweight.

<sup>b</sup>Includes 0% fat, calculated with NPPC formula by using scan data.

<sup>c</sup>Includes 0% fat, from slaughter data sheets.

\*P<.05, \*\*P<.01, \*\*\*P<.001.

**Table 3. Seasonal interactions of pig performance measures fed in hoops and confinement (6 trials, 3 seasons, 3 years).**

Measure	Summer		Winter		SEM		
	Hoop	Conf	Hoop	Conf	Hoop	Conf	
Start wt., lb	34.0	35.8	35.4	34.4	.7	.5	
End wt., lb <sup>1</sup>	259.3	254.8	262.7	260.4	1.7	1.2	
Weight gain, lb	225.3	219.1	227.3	226.0	1.9	1.3	
Days on feed	122.9	124.3	131.3	128.5	1.2	.9	
Adjusted days to 250	174.9	178.5	176.7	172.9	.9	.6	**
Bedding use, lb/pig <sup>2,3</sup>	203.7	---	269.8	---	---	---	
ADFI, lb/day <sup>4</sup>	5.18 <sup>g</sup>	5.03 <sup>f</sup>	5.44 <sup>h</sup>	5.10 <sup>f,g</sup>	.05	.03	**
ADG, lb/day	1.84 <sup>i</sup>	1.77 <sup>j</sup>	1.75 <sup>j</sup>	1.77 <sup>j</sup>	.01	.01	***
Feed/gain, lb feed/lb gain <sup>5</sup>	2.81 <sup>a</sup>	2.84 <sup>a</sup>	3.11 <sup>c</sup>	2.89 <sup>b</sup>	.02	.02	*
AllADFI, lb/day <sup>6</sup>	5.29 <sup>i</sup>	5.19 <sup>i</sup>	5.60 <sup>j</sup>	5.19 <sup>i</sup>	.06	.04	***
ALLF/G, lb feed/lb gain <sup>7</sup>	2.88 <sup>i</sup>	2.93 <sup>i</sup>	3.21 <sup>j</sup>	2.94 <sup>i</sup>	.03	.02	***
Mortalities, % <sup>2,8</sup>	1.8	2.7	3.8	2.3	---	---	
Culls, % <sup>2,9</sup>	1.7	1.0	1.8	1.0	---	---	
Lights, % <sup>2,10</sup>	.8	1.7	3.8	1.3	---	---	

Means in the same row with the same superscript do not differ. Superscripts a, b, and c, are used for .05 significance, f, g, and h for .01, and i and j for .001.

Superscripts 1–10 are the same as for Table 1.

\*P<.05, \*\*P<.01, \*\*\*P<.001.

**Table 4. Seasonal interactions of carcass and scan performance measures of pigs fed in hoops and confinement (6 trials, 3 seasons, 3 years).**

Measure	Summer		Winter		SEM		
	Hoop	Conf	Hoop	Conf	Hoop	Conf	
Scan wt, lb	247.2	246.9	243.4	250.1	2.0	1.4	
Test period, days	117.3	119.7	120.2	122.0	1.3	.9	
Backfat, in.	.91 <sup>h</sup>	.84 <sup>g</sup>	.78 <sup>f</sup>	.78 <sup>f</sup>	.02	.01	**
Loin muscle area, sq. in.	6.29	6.50	6.36	6.78	.06	.04	
Adj. backfat, in. <sup>1</sup>	.92	.85	.80	.78	.01	.01	
Adjusted LMA, sq. in. <sup>1</sup>	6.34	6.55	6.46	6.78	.06	.04	
Lean, lb/pig	91.7	93.8	93.2	97.3	.7	.5	
Lean, % <sup>2</sup>	50.3	51.4	51.9	52.7	.2	.2	
Lean gain, lb/day on test <sup>2</sup>	.69 <sup>g</sup>	.69 <sup>g</sup>	.69 <sup>g</sup>	.71 <sup>f</sup>	.01	.01	**
FFLI, % <sup>3</sup>	46.8	47.3	48.5	48.8	.2	.1	
Eff. of lean gain, lb feed/lb gain <sup>2</sup>	7.36 <sup>g</sup>	7.22 <sup>g</sup>	7.75 <sup>h</sup>	6.93 <sup>f</sup>	.09	.06	**
Yield, %	73.9	75.0	76.0	76.6	.2	.1	

Means in the same row with the same superscript do not differ. Superscripts f, g, and h are used for .01 significance.

<sup>1</sup>Adjusted to 250 lb liveweight.

<sup>2</sup>Includes 0% fat, calculated with NPPC formula using scan data.

<sup>3</sup>Includes 0% fat, from slaughter data sheets.

\*\*P<.01