# Sow and Litter Performance for Individual Crate and Group Hoop Barn Gestation Housing Systems: Progress Report III

## A.S. Leaflet R2171

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**Summary and Implications**

The effects of gestation system on sow and litter performance over a 2.5 year period were evaluated at the Iowa State University Lauren Christian Swine Research and Demonstration Farm near Atlantic, IA. Gestation housing system treatments were 1) individual gestation crates in a mechanically ventilated, partially slatted floor manure flush confinement building (C); and 2) group pens with individual feed stalls in deep-bedded, naturally ventilated hoop barns (H).

Sows were artificially inseminated in a mechanically ventilated, partially slatted floor confinement breeding barn. Sows were moved as a group to their assigned gestation housing treatment by the ninth day post-weaning. Sows were randomly assigned to gestation housing treatment when the project commenced. All first parity gilts were gestated in individual crates and randomly assigned to a gestation group after breeding for the second parity. Farrowing occurred throughout the year on a bi-weekly schedule. All sows received 2.04 kg per day of a corn-soybean meal diet. During the last trimester of gestation, feed allowance was increased to 2.72 kg. During the winter H sows were fed 25% more feed and C sows were fed 5% more feed.

Reproductive performance was summarized for 957 litters and analyzed using general linear models. Number born alive per litter was different for the two housing treatments ($P<0.001$) with H resulting in 0.8 more pigs born per litter. Parity differences were also noted ($P<0.01$), however there was no interaction between parity and treatment ($P>0.1$). H sows also weaned 0.4 pigs more per litter ($P<0.01$). Pre-wean mortality rates did not differ ($P=0.58$) between the two gestation housing treatments. Cross fostering occurred to approximately equalize litter size within a farrowing room. The effects of parity, farrowing season (quarterly), pig birth weight, and lactation length on pre-wean mortality were significant ($P<0.01$). There was a trend for C sows to have a 1-day shorter wean-to-conception interval ($P=0.07$). Farrowing rates for the two treatments were not different ($P=.66$). There was an interaction ($P<0.1$) between breeding season (quarterly) and treatment with H sows bred in summer and C sows bred in autumn having the lowest farrowing rate. There was no correlation between treatment and reason for culling ($P>0.1$). Failure to conceive was the leading reason for culling in both treatments. There was a trend for sows gestated in C to be culled for feet and leg unsoundness. H sows tended to be culled for poor body condition. Results indicate that gestating sows can be housed in deep-bedded hoop barns equipped with individual feeding stalls and achieve results comparable or superior to gestating sows housed in individual crated gestation systems.

### Introduction

Most gestation sows in the United States are housed in individual gestation crates in confinement barns with liquid manure systems. Hoop barns are versatile, low-cost structures that may be suitable for housing gestating sows. The objective of this study was to compare the productivity and longevity of group-housed sows in hoop barns with individually crated sows.

### Materials and Methods

The effects of gestation system on sow and litter performance over a 2.5 year period (March, 2001 through September, 2003) were evaluated at the Iowa State University Lauren Christian Swine Research and Demonstration Farm near Atlantic, IA. Gestation housing system treatments were 1) individual gestation crates in a mechanically ventilated, partially slatted floor manure flush confinement building (C); and 2) group pens with individual feed stalls in deep-bedded, naturally ventilated hoop barns (H). The sow genotypes were 1/4 Hampshire x 1/2 Yorkshire x 1/4 Landrace.

Farrowing occurred every 2 weeks throughout the year in one of four farrowing rooms on the farm. Farrowing rooms were in a mechanically ventilated building with raised crates and a manure flush system. Sows were moved as a group to farrowing rooms within 4 days of expected parturition. Sows were washed and disinfected prior to entry into the farrowing crates. Sow vaccinations were parvo/leptospirosis/erysipelas at weaning and *E.coli* and *clostridial* scours during lactation. Sows were de-wormed twice per year with ivermectin in the feed.

At farrowing, the number of pigs born alive, stillborn pigs, and mummified pigs were recorded. The birth weight of the live pigs was also recorded. Weaning occurred at 17-21 days of age. At weaning, the litter was counted and weighed prior to being moved to a hot nursery facility. Cross fostering within 24 hours of birth was permitted to equalize litter size. The majority of sows in a particular farrowing room were usually exclusively from one of the two housing treatments.

At weaning a group of sows were moved into the central slatted confinement breeding barn. Four days post-weaning, heat detection with a mature boar was performed daily. Sows were artificially inseminated 24 hours after estrus detection. A second insemination occurred 48 hours after estrus detection. Insemination occurred in the presence of a mature boar. Semen was delivered to the farm within 24 hours of collection and two to three times a week. All sows in the study were inseminated with terminal Duroc semen. Sows were moved as a group to their assigned gestation housing treatment by the ninth day post-weaning.

Sows were randomly assigned to gestation housing treatment when the project commenced. All first parity gilts were gestated in individual crates and randomly assigned to a gestation group after breeding for the second parity. This practice was followed to minimize sow size differential and sow aggression in the group housing system.

The hoop barns were orientated N-S with a 4.5 m wide raised concrete pad spanning the length of the western wall of the building. Standard (2.1 x 0.76 m) feeding stalls were set on the concrete pad and an access alley ran the length of the building in front of the stalls. The feeding stalls were equipped with gates at the rear that were closed at the time of feeding to prevent sows from stealing another's ration. The feed stalls also opened at the front, allowing the removal of individual animals from the building to be bred or placed in the farrowing facility. The concrete pad was 0.76 m above the finished grade of the bedding area, allowing the stalls to remain bedding free. During the summer months, various sprinkler systems were employed to periodically wet the concrete pad. Sows could cool themselves through contact with the concrete and the evaporation of water. A bedding pack of corn stover was always maintained in the eastern portion of the building. Sows were observed to maintain isolated areas for lounging and defecation. A water fountain was placed on a raised platform along the eastern wall of the hoop barns. Semi-permanent fencing was set E-W at the midpoint of the barn subdividing the 25.6 m hoop barns into two pens housing 30-35 sows each. There was an individual feeding stall for each sow in a given pen.

During gestation all sows received 2.04 kg per day of a corn-soybean meal diet. During the last trimester of gestation, feed allowance was increased to 2.72 kg. During the winter, H sows were fed 25% more feed and C sows were fed 5% more feed. Winter was defined as November through March. Individual sow feed adjustments occurred and were recorded. During lactation sows received an *ad libitum* corn-soybean diet formulated for lactation.

Sows remained in the study until culling. Culling occurred due to poor performance, disposition, failure to conceive by third estrus, fitness (body condition, lameness) and death. Sows were not culled due to age or parity. Culling cause was recorded and cull events (120) that occurred during the study were analyzed for correlations between housing treatment and reason for culling.

In all, 957 litters were analyzed using general linear models. The experimental unit for litter performance traits was the individual litter. Models included housing treatment, parity, breeding season, litter weight, and lactation length as independent variables when appropriate. Sow culling data were summarized by housing treatments and analyzed for correlations by culling reason.

## Results and Discussion

Litter performance data are summarized in Table 1. Means reported are LS means. Number born alive per litter was different for the two housing treatments ($P<.001$) with H resulting in 0.8 more pigs born per litter. Parity differences were also noted ($P<.01$), however there was no interaction between parity and treatment ($P>.10$). H sows also weaned 0.4 pigs more per litter ($P<.01$). The rate of pre-wean mortality did not differ ($P=.58$) for the two housing treatments. The effects of parity, farrowing season (quarterly), pig birth weight, and lactation length on pre-wean mortality were significant ($P<.01$).

Wean-to-conception interval and farrowing rates are measures of the sow's ability to repeatedly perform within a gestation system. Sow performance statistics are included as table 2. Means reported are LS means. There was a trend for C sows to have a 1-day shorter wean-to-conception interval ($P=.07$). Farrowing rates for the two treatments were not different ($P=.66$). There was an interaction ($P<0.10$) between breeding season (quarterly) and housing treatment with H sows bred in summer and C sows bred in autumn having the lowest farrowing rate.

Culling events (120) that occurred during the study were analyzed for correlations between housing treatment and reason for culling. There was no correlation between gestation housing treatment and reason for culling ($P>.10$). Failure to conceive was the leading reason for culling in both treatments. There was a trend for C sows to be culled for feet and leg unsoundness. H sows tended to be culled for poor body condition. A summary of the percentage of culls by reason for culling and gestation housing treatment has been included as table 3.

Further analysis of collected data remains to be completed. However preliminary results indicate that gestating sows can be housed in deep-bedded hoop barns equipped with individual feeding stalls and achieve results comparable or superior to gestating sows housed in individual crated gestation systems. Additionally the hoop barns for gestation as described in this report can be built at about half the cost of a confinement gestation barn with individual gestation crates. Thus hoop barns are a viable alternative for producers seeking less capital-intense housing options for gestation sows.

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**Table 1. Litter performance in individual gestation crates and group housing in deep-bedded hoop barns.**

| | Gestation Housing Treatment | | |
|---|---|---|---|
| Performance Measure | CRATE | HOOP | Prob >F |
| Litters | 552 | 405 | |
| Sows | 173 | 131 | |
| Pigs born alive/litter | 9.5 | 10.3 | <0.0001 |
| Pigs weaned/litter | 8.5 | 8.9 | <0.01 |
| Prewean mortality % | 13 | 13 | 0.58 |

**Table 2. Sow performance by individual gestation crates and group housing in deep-bedded hoop barns.**

| | Gestation Housing Treatment | | |
|---|---|---|---|
| Performance Measure | CRATE | HOOP | Prob >F |
| Litters | 552 | 405 | |
| Sows | 173 | 131 | |
| Days wean-to-service | 4.9 | 5.9 | 0.07 |
| Farrowing Rate | 76.8 | 74.6 | 0.66 |

**Table 3. Summary of culling reason for individual gestation crates and group housing in deep-bedded hoop barns.**

| | Gestation Housing Treatment | |
|---|---|---|
| | CRATE | HOOP |
| Total number of sows culled | 76 | 44 |
| Reason for Cull (%[1]) | | |
| Failure to conceive | 37 | 43 |
| Feet and leg unsoundness | 20 | 14 |
| Body condition | 17 | 23 |
| Death | 26 | 20 |

[1] Percentage of culled sows from housing treatment (C or H) that were culled for each reason.