January 1998

# Effects of Gestation Housing System on Productivity of Three Genetic Lines of Sows

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## Summary and Implications

*A trial was conducted to compare the effects of gestation housing system (outside dirt lots versus inside gestation stalls) and sow genetic line (n=3) on number born alive, litter weaning weight, daily lactation feed disappearance and lactation feed conversion. All sows farrowed and lactated in confinement. No significant interactions were detected between genetic line and gestation housing system. There were no differences between the two gestation housing systems for number born alive and litter weaning weight. However, there were significant differences between sows housed indoors and outdoors for daily lactation feed disappearance and lactation feed conversion. Sows housed outside had a greater daily lactation feed disappearance (1.1 lb/day; P<.01) than those gestated inside. Additionally, outside-housed sows had a poorer lactation feed conversion than inside-gestation sows, the difference being greatest during the summer farrowing season (3.93 versus 3.17; P<.05). Although this trial did not address the added labor and gestation feed costs often associated with housing sows outside during gestation, it did demonstrate some of the fluctuations in efficiency producers may incur housing sows outside during gestation. These points need to be considered when producers consider changes to their current operation.*

## Introduction

With the numerous changes that have and continue to occur in the domestic pork industry, many producers are re-evaluating all aspects of their operations. Many Nebraska pork producers gestate their sows outside in dirt lots. There is variation among outdoor housing systems for gestating sows in design or layout, number of sows/group and the amount of shelter provided. However, a number of outdoor housing systems share two common features: 1) group feeding of sows and 2) a greater exposure to temperature extremes. As the industry moves towards leaner genetic sow lines in response to consumer demand for leaner pork, the adequacy of outside gestation housing systems for these new lines is questioned. The objective of this study was to compare productivity traits of three genetic lines of sows housed indoors or outdoors during gestation.

## Materials and Methods

In this trial, 195 first parity sows from three genetic lines were used. Lines were chosen to represent a range in body compositional makeup (lean and fat growth rates) and reproductive rates for current genetics available in Nebraska. The three genetic lines were: 1) a Large White-Landrace $F_1$, 2) a three-breed specific cross containing Large White, Landrace and Duroc and 3) a rotational cross comprised mainly of Yorkshire and Hampshire. After weaning their first litter, sows were rebred and assigned across genetic lines to one of two gestation housing systems. The gestation housing systems were: 1) individual gestation stalls, 2 feet x 7 feet, in a climate-controlled breeding/gestation building or 2) outside dirt lots in which 20 sows were housed per pen with access to a straw-bedded shelter. The outside lots contained 20 feeding stalls/pen without lock-in capabilities. During the summer months, mud wallows were made for sows in the outside dirt lots. Sows were maintained in these assigned gestation housing systems through four parities. The primary criteria for culling sows from the trial were failure to rebreed and feet and leg soundness.

**Table 1. Number of sows in the trial by genetic line/gestation housing system subclass**

| | Gestation system | |
|---|---|---|
| Genetic Line | Inside | Outside |
| A | 17 | 18 |
| B | 21 | 23 |
| C | 57 | 59 |
| Total | 95 | 100 |

The number of sows in each genetic line/housing system subclass is shown in Table 1.

During gestation, sows were fed a .57 percent lysine corn-soybean meal based diet once daily. The amount of feed given to the sows during gestation was adjusted to achieve a similar body condition in all sows. Sows from each gestation housing system were moved to a common farrowing building at approximately 112 days of gestation. After farrowing, sows were fed a common lactation diet (.80 percent lysine) twice daily. The amount of feed given/feeding was increased as rapidly as possible (dependent on the sow's consumption at each feeding) to give sows access to as much feed as they wanted. During lactation, sows were fed in the mornings and late afternoons except during summer farrowing when the second daily feeding was done in the evenings. Season of farrowing was defined as: 1 - (December, January and February), 2 - (March, April and May), 3 - (June, July and August), and 4 - (September, October and November).

Piglets were weighed and weaned, on average, at 21 days of age. Litter weight was adjusted for number after transfer and age at weighing using adjustment factors in the 1996 Guidelines for Uniform Swine Improvement Programs, National Swine Improvement Federation (NSIF). Following weaning, sows were rebred and returned to their gestation housing system. Traits investigated were number born alive (NBA), adjusted 21-day litter weight (A21WT), daily lactation feed disappearance (DF) and lactation

Table 2. **Effects of genetic line, gestation housing system, parity, season of farrowing and the gestation housing system x season interaction on sow productivity traits (NBA-number born alive; A21WT- adjusted 21-day litter weight, lb; DF- daily lactation feed disappearance, lb; LFC- lactation feed conversion)[g]**

| Item | NBA | SE[h] | A21WT | SE | DF | SE | LFC | SE |
|---|---|---|---|---|---|---|---|---|
| Line | | | | | | | | |
| A | 10.9 | .34 | 153.1[a*] | 2.4 | 14.7[a] | .40 | 2.96[a*] | .09 |
| B | 10.7 | .27 | 135.1[c*] | 1.9 | 13.7[b] | .32 | 3.25[b] | .07 |
| C | 10.8 | .22 | 144.8[b*] | 1.5 | 14.4[a,b] | .25 | 3.33[b*] | .06 |
| Gestation | | | | | | | | |
| Inside | 10.9 | .22 | 143.8 | 1.5 | 13.7[a*] | .26 | 3.03[a] | .06 |
| Outside | 10.7 | .24 | 144.8 | 1.7 | 14.8[b*] | .29 | 3.32[b] | .07 |
| Season[i] | | | | | | | | |
| 1 | 11.1[a] | .24 | 148.3[a*] | 1.7 | 14.9[a*] | .28 | 3.10[b*] | .07 |
| 2 | 10.6[a,b] | .30 | 148.8[a*] | 2.1 | 13.9[b,c] | .36 | 2.86[a*] | .08 |
| 3 | 10.1[b] | .35 | 132.0[b*] | 2.4 | 13.5[c*] | .42 | 3.55[c*] | .10 |
| 4 | 11.4[a] | .33 | 148.2[a*] | 2.3 | 14.7[a,b] | .39 | 3.21[b*] | .09 |
| Parity | | | | | | | | |
| 2 | 10.1[a] | .23 | 137.8[a*] | 1.6 | 13.5[a*] | .27 | 3.08 | .06 |
| 3 | 11.0[b] | .25 | 147.0[b*] | 1.8 | 14.6[b*] | .30 | 3.15 | .07 |
| 4 | 11.2[b] | .34 | 148.2[b*] | 2.4 | 14.7[b*] | .40 | 3.31 | .09 |
| Gestation x Season | | | | | | | | |
| Inside 1 | 11.2 | .34 | 146.5[a,b] | 2.4 | 14.6 | .40 | 3.02[a,b,c] | .09 |
| 2 | 10.8 | .41 | 144.2[b] | 2.8 | 13.5 | .48 | 2.82[a] | .11 |
| 3 | 9.8 | .48 | 134.6[c] | 3.3 | 12.8 | .57 | 3.17[b,c] | .13 |
| 4 | 11.8 | .44 | 149.9[a,b] | 3.0 | 14.1 | .52 | 3.12[b,c] | .12 |
| Outside 1 | 11.0 | .33 | 150.2[a,b] | 2.4 | 15.2 | .40 | 3.18[c] | .09 |
| 2 | 10.5 | .44 | 153.4[a] | 3.2 | 14.3 | .53 | 2.89[a,b] | .12 |
| 3 | 10.4 | .46 | 129.4[c] | 3.3 | 14.2 | .55 | 3.93[d] | .13 |
| 4 | 11.0 | .48 | 146.4[a,b] | 3.4 | 15.3 | .56 | 3.29[c] | .13 |

[g]Estimates with different superscripts differ (P<.05); * = differences P<.01.
[h]Standard error.
[i]1 - (December, January and February), 2 - (March, April and May), 3 - (June, July and August), and 4 - (September, October and November).

feed conversion (LFC). Lactation feed conversion was estimated as lactation feed disappearance from farrowing to 21 days divided by the difference between the litter weight at 21 days and the born alive litter weight. The model for analysis included the effects of genetic line, gestation housing system, parity, season of farrowing and two-way interactions. For the analysis of LFC, number after transfer and age at weighing were also included as covariates in the analysis.

### Results and Discussion

Results from this study are presented in Table 2. No significant genetic line x gestation housing system interaction effects were found, indicating the genetic lines would perform/rank similarly relative to each other in the indoor and outdoor housing systems. For NBA, the only significant differences were for parity and season of farrowing. Third and fourth parity sows had more ($P < .05$) pigs born alive than second parity sows and sows farrowing in the summer had less ($P < .05$) pigs born alive than sows in other farrowing seasons. Significant effects for 21-day litter weight included genetic line, season of farrowing, parity, and the gestation housing system x season interaction. This significant interaction illustrates the seasonal effect on the two systems of housing for weight of litter produced. During spring, sows housed outside produced heavier ($P < .05$) litters than sows housed inside, the difference being 9.2 lb. Assuming an economic value of $0.50/lb of 21-day litter weight (NSIF Guidelines, 1996), this difference equaled $4.60/litter in favor of outside-gestated sows.

Significant effects for DF included genetic line, gestation housing system, season of farrowing and parity. Sows housed outside had greater ($P < .05$) lactation feed disappearance than sows housed inside. Significant effects for LFC were genetic line, gestation housing system, season of farrowing and the interaction between gestation housing system and season. Sows gestated outside were less ($P < .05$) efficient at using feed for litter weight gain (LFC) than sows housed inside. This was especially true during the summer farrowing season. Outside-housed sows in the farrowing house during the summer used .76 lb more feed per pound of 21- day litter weight gain than inside-gestated sows. Assuming an average weaning weight of 130 lb and $0.07/lb lactation feed costs, this loss in efficiency would be $6.92/litter.

### Conclusion

These results suggest producers can attain similar output levels from the sow herd (as measured by NBA and A21WT) with either outdoor and indoor gestation accommodations. This trial did not address the added labor and gestation feed costs often associated with housing sows outside during gestation, but it did indicate some of the fluctuations in efficiency producers could face gestating sows outside and the effects season can have on sow reproductive performance.

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