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Effect of Body Fat Measurement at Breeding and Gestation Energy Level on Farrowing and Lactation Performance of First Parity Sows

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Records kept by the swine industry reveal that a large percentage of females entering the sow herd are culled prior to reaching their peak reproductive performance expected in their fourth to sixth parity. In herds with low replacement rates over 30% of the females are culled and in herds with high replacement rates this figure exceeds 50% annually. Of those sows not culled for health or structural problems, most are removed because they fail to return to estrus or fail to maintain pregnancy after their first or second litter. Low feed intake and excessive weight loss during lactation have been associated with this problem, particularly with first parity sows from very productive genetic lines.

Many believe that selection of replacement females from lean genotypes and limit feeding the gilts during the development stage has exacerbated the problem. Thin sows are often prevalent among the sows that are culled. However, research has demonstrated that absolute body condition is not of itself associated with reproductive failure. Some feel that it is the amount of fat lost that is the problem, not the resulting body fat level after lactation. Sows with low feed intake and substantial body weight loss during lactation are among those most often culled due to failure to recycle. Sows with low feed intake are thinner than those with more desirable feed intake and have lost both body fat and body protein as they have lost weight. A feeding strategy that would increase lactation feed intake and allow sows to maintain body weight and condition during lactation, regardless of their starting body fat level, might allow more sows to reach their potential for reproductive efficiency.

The research reported herein was designed to evaluate the effect of body backfat level at breeding and the effect of gestation energy level on sow lactation feed intake, body weight change, and return to estrus of first parity sows.

(Key Words: First parity sow, Breeding backfat, Gestation energy, Lactation feed intake, Return to estrus.)

Experimental Procedure

Three groups of 40 replacement gilts (F1 Large White x Landrace) were purchased when they averaged 140 to 150 days of age. At 150 days of age, the gilts were weighed and ultrasonically measured for last rib backfat. Gilts were paired by weight and backfat thickness and each pair was assigned to two developmental treatments that consisted of feeding 2.5 kg per day of either a 10% or a 24% protein diet for 60 days (Table 1). The two feeding regimens were intended to produce gilts that were similar in weight but different in backfat levels. Gilts were housed two per pen in a slatted floor, environment-modified confinement barn that also served as an isolation unit. The two gilts in the pen received the same developmental diet and were fed once daily. Gilt weight and backfat were recorded at the end of the 60-day developmental period.

After the 60-day development period, gilts were moved to group housing and penned by developmental treatment in straw-bedded pens with an outside concrete slab and individual feeding stalls. Both treatment groups were fed a standard gestation diet (Table 1) for a 30-day adjustment period and during the breeding period at the rate of 2.5 kg in the summer and 2.7 kg in the winter. Gilts were hand-mated to F1 Hampshire x Duroc boars during a 14-day breeding period and immediately moved to a gestation facility.

Bred gilts were placed in gestation stalls with rubber sleeping mats in a naturally ventilated gestation room. Gilts were randomly assigned to two gestation feeding regimens within developmental treatment group to provide for two levels of gilt gestation gain. Those

TABLE 1. COMPOSITION OF EXPERIMENTAL DIETS (%)

Ingredients	Gilt developer[a] FAT	Gilt developer[a] LEAN	Gestation[b] HIGH-NORM	Lactation
Ground corn	78.26	52.58	80.32	69.20
Soybean meal, 44%	6.70	44.36	15.42	26.72
Dicalcium phosphate	2.37	1.43	2.57	2.33
Limestone	.62	.88	.70	.75
White salt	.25	.25	.50	.50
Choice yellow grease	11.30	–	–	–
Vitamin-TM premix	.50[c]	.50[c]	.50[d]	.50[d]
	100.0	100.0	100.0	100.0
Calculated nutrient levels, as fed (%)				
Crude protein	10.0	24.0	13.6	17.7
Lysine	.40	1.42	.65	.95
Calcium	.80	.80	.90	.90
Phosphorus	.70	.70	.80	.80
Analyzed nutrient levels, 90% DM (%)				
Crude protein	9.1	23.7	13.7	17.2
Ether extract	12.8	2.5	–	–

[a]Gilts were fed 2.5 kg of a 10% protein (FAT) or a 24% protein (LEAN) diet.

[b]Sows were fed 2.0 and 2.2 kg (HIGH) or 1.8 and 2.0 kg (NORM) during summer and winter, respectively.

[c]Provided per kg of complete developer diet: 100 mg Zn, 75 mg Fe, 7.5 mg Cu, 25 mg Mn, 159 :g I, 300 :g Se, 16.5 IU vitamin E, 3.3 mg riboflavin, 22 mg niacin, 15 :g vitamin B_{12}, 2.2 mg vitamin K_3, 13.3 mg pantothenic acid, 3300 IU vitamin A, and 330 IU vitamin D_3.

[d]Provided per kg of complete gestation and lactation diet: 100 mg Zn, 75 mg Fe, 7.5 mg Cu, 25 mg Mn, 159 :g I, 300 :g Se, 16.5 IU vitamin E, 3.3 mg riboflavin, 22 mg niacin, 15 :g vitamin B_{12}, 2.2 mg vitamin K_3, 13.3 mg pantothenic acid, 570 mg choline, 5480 IU vitamin A, and 548 IU vitamin D_3.

feeding regimens (beginning on the day after breeding) were either 2.0 or 2.2 kg of the gestation diet (Table 1) during the winter and 1.8 or 2.0 kg of the gestation diet during the summer. Gilts remained in the gestation room until day 110 of gestation. At that point weights and backfat levels were recorded and gilts were moved to farrowing crates in the farrowing rooms where they continued to receive the gestation diet at their assigned level until they farrowed.

After farrowing, sow and litter and individual pigs were weighed. Sows were allowed free access to lactation feed (Table 1) that was weighed into the feeder twice a day to stimulate feed intake. Feed intake was recorded daily and compiled by week to day 21 and for the entire lactation period. Sow and pig weights were recorded at 7-day intervals and at weaning. The sow fat measurement taken at day 110 of gestation was considered the initial backfat for lactation and final sow backfat was recorded at day 21 of lactation.

The treatments resulting from the factorial arrangement of developmental and gestation treatments were:

Gilt development	Gestation (Summer/winter)
▪ (FAT) 10% protein	(HIGH) 2.0/2.2 kg
▪ (FAT) 10% protein	(NORM) 1.8/2.0 kg
▪ (LEAN) 24% protein	(HIGH) 2.0/2.2 kg
▪ (LEAN) 24% protein	(NORM) 1.8/2.0 kg

The experiment was analyzed as a randomized block design. Data from the developmental period were analyzed as two developmental treatments with three groups of sows as blocks. Data for all subsequent periods were analyzed as a factorial arrangement of the two developmental treatments and the two gestation treatments. The sow and her litter were considered the experimental unit.

TABLE 2. SOW WEIGHT AND BACKFAT READINGS AND CHANGES DURING THE GILT DEVELOPMENT PERIOD AS INFLUENCED BY NUTRITION MANAGEMENT STRATEGY

	Developmental strategy[a]			
Item	FAT	LEAN	SD	Prob.[b]
No. of sows	39	36		
Sow weight, kg				
Initial[c]	112.7	112.1	6.4	ns
60 days	149.9	143.8	9.8	**
60-day gain	37.3	31.7	7.6	**
Breeding	154.6	149.7	9.8	*
Developmental gain	41.9	37.6	7.9	*
Sow fat, mm				
Initial	12.8	12.5	2.7	ns
60 days	18.8	14.7	3.4	***
60-day gain	5.9	2.2	2.6	***
Breeding	18.1	15.4	3.4	***
Developmental gain	5.2	2.9	2.6	***

[a]Gilts were fed 2.5 kg of a 10% protein (FAT) or a 24% protein (LEAN) diet for 60 days followed by 2.5 kg (summer) or 2.7 kg (winter) of a gestation diet for 30 days.
[b]Probability of F: ns = P>.10, * = P<.05, ** = P<.01, and *** = P<.001.
[c]Sows averaged 150 days of age.

Results

Table 2 summarizes the effects of the developmental nutrition strategy on gilts until the time of breeding at 180 days of age. The table includes only the 75 gilts that were chosen to breed and that successfully farrowed. Although 120 gilts were introduced into the developmental stage (40 per group), limitation in farrowing space dictated a goal of 24 sows in each of the three farrowing groups (blocks) of sows. Actual numbers farrowing were 27, 24, and 24 for the three respective groups. The replacement gilts utilized in this study were of the high lean gain type with day 150 weights at approximately 112 kg and last rib backfat at approximately 12.5 mm. As designed, initial gilt weights and initial gilt backfat were the same (P>.10) between the two development treatment groups. Gilts fed the 10% protein diet with 11.3% added fat (FAT) increased (P<.001) in backfat during the first 60 days by 5.9 mm compared to an increase in backfat of 2.2 mm for the gilts fed the 24% protein diet (LEAN). After the 30-day standardization period on the common gestation diet, the gilts had breeding backfat levels (P<.001) of 18.1 and 15.4 mm for the FAT and LEAN groups, respectively. During the same period, 60-day gilt weights were increased (P .01) 37.3 kg and 31.7 kg for FAT and LEAN gilts, respectively. At breeding at 180 days of age, gilt weights were 154.6 and 149.7 kg for FAT and LEAN sows, respectively. Thus, the goal of maintaining one group of gilts as a lean group and the other group of gilts as a much fatter group at breeding was accomplished. Gilt weight differences between the two treatment groups were minimized but not eliminated.

The interaction means for the effects of developmental and gestation nutrition treatments on gilt weights and backfat levels are shown in Table 3. No interactions (P>.10) were observed. Therefore, the main effects of developmental treatments and gestation treatments on gilt weights and backfat levels are shown in Table 4. Gilts developed as FAT were heavier (P<.01) at day 110 of gestation than those developed as LEAN. However, since gestation weight gain to 110 days was not affected (P>.10) by developmental treatment, differences in gilt 110-day weights were a function of the differences (P<.05) in weights at breeding. Postpartum weight of sows and net gestation gain was not affected (P>.10) by developmental treatment. Gilt backfat, which was greater for the FAT gilts at breeding, was similar (P>.10) for gilts of the FAT and LEAN

TABLE 3. SOW WEIGHT AND BACKFAT READINGS AND CHANGES DURING THE GESTATION PERIOD AS INFLUENCED BY DEVELOPMENT MANAGEMENT STRATEGY AND BY GESTATION ENERGY LEVEL (INTERACTION MEANS)

Gilt development[a]	FAT		LEAN		
Gestation energy[b]	HIGH	NORM	HIGH	NORM	SD
No. of sows	17	22	20	16	
Sow weight, kg[c]					
Developmental gain	41.8	42.0	36.7	38.5	7.9
Breeding	155.8	153.6	150.7	148.2	10.0
110 days	211.9	202.9	202.6	196.1	12.4
Gestation gain	56.1	49.3	51.9	47.9	9.2
Postpartum	190.0	182.9	186.2	178.2	11.1
Net gestation gain	34.2	29.3	35.5	30.2	7.8
Sow fat, mm[c]					
Developmental gain	4.81	5.59	2.89	2.92	2.6
Breeding	17.58	18.38	15.27	15.54	3.4
110 days	16.72	16.31	16.34	15.9	13.5
Gestation gain	-.85	-2.07	1.07	.38	2.5

[a]Gilts were fed 2.5 kg of a 10% protein (FAT) or a 24% protein (LEAN) diet for 60 days followed by 2.5 kg (summer) or 2.7 kg (winter) of a gestation diet for 30 days.
[b]Sows were fed 2.0 and 2.2 kg (HIGH) or 1.8 and 2.0 kg (NORM) during summer and winter, respectively.
[c]No interactions (P>.10) were observed.

TABLE 4. SOW WEIGHT AND BACKFAT READINGS AND CHANGES DURING THE GESTATION PERIOD AS INFLUENCED BY DEVELOPMENT MANAGEMENT STRATEGY AND BY GESTATION ENERGY LEVEL (MAIN EFFECT MEANS)

	Gilt development[a]			Gestation energy[b]			
	FAT		LEAN	HIGH		NORM	SD
No. of sows	39		36	37		38	
Sow weight, kg							
Developmental gain	41.9	*	37.6	39.3		40.3	7.9
Breeding	154.7	*	149.4	153.3		150.9	10.0
110 days	207.4	**	199.4	207.3	**	199.5	12.4
Gestation gain	52.7		49.9	54.0	*	48.6	9.2
Postpartum	186.5		182.2	188.1	**	180.5	11.1
Net gestation gain	31.7		32.9	34.9	***	29.7	7.8
Sow fat, mm							
Developmental gain	5.20	***	2.90	3.85		4.25	2.6
Breeding	17.98	**	15.40	16.42		16.96	3.4
110 days	16.52		16.13	16.53		16.11	3.5
Gestation gain	-1.46	***	.72	.11		-.85	2.5

[a]Gilts were fed 2.5 kg of a 10% protein (FAT) or a 24% protein (LEAN) diet for 60 days followed by 2.5 kg (summer) or 2.7 kg (winter) of a gestation diet for 30 days.
[b]Sows were fed 2.0 and 2.2 kg (HIGH) or 1.8 and 2.0 kg (NORM) during summer and winter, respectively.
*Means differ within main effect (P<.05).
**Means differ within main effect (P<.01).
***Means differ within main effect (P<.001).

groups at day 110 of gestation. Change in backfat during gestation differed P<.001) due to developmental treatment. Gilts that were developed as LEAN added backfat and those developed as FAT lost backfat during gestation even though they were fed the same daily level of gestation feed. Thus, after farrowing, the two groups of sows were of similar weights and backfat thickness (P>.10), regardless of developmental regimen The effects of gestation energy level on sow weights and backfat from breeding to farrowing are also shown in Table 4. Since gestation treatments were assigned across developmental treatment, sow weights at breeding were similar (P>.10). Both 110-day and postpartum weights were greater (P<.01) for sows which had received the HIGH level of energy during gestation compared to those receiving the NORM level with similar effects on gestation gain (P<.05) and net gestation gain (P<.001). Sow backfat, which was similar at breeding (P>.10), remained similar (P.10) at day 110 of gestation with no difference (P>.10) in backfat gain during gestation for sows receiving the HIGH and NORM levels of gestation energy.

The interaction means for the effects of developmental and gestation nutrition treatments on sow weights and backfat levels as well as feed intake during lactation are shown in Table 5. No interactions were found (P>.10) for sow weights and sow backfat. However, interactions among developmental treatments and gestation treatments were found for sow feed intake during lactation. Feed intake during week 2 (P .10), week 3 (P<.05), and for the 21-day (P<.01) and total lactation period (P<.05) was greater for FAT sows if they had received the HIGH gestation energy compared to the NORM gestation energy. LEAN sows consumed similar feed during gestation regardless of their gestation energy treatment. The main effects of developmental treatment and gestation energy levels on sow weight, backfat, and feed intake during lactation are shown in Table 6. The treatments that developed FAT and LEAN sows had no effect (P>.10) on sow weight postpartum or at day 21 of lactation or at weaning. FAT sows tended (P<.10) to lose more weight during the lactation. Backfat levels postpartum and at 21 days of lactation were similar (P>.10) between FAT and LEAN sows. Developmental treatment affected feed intake during all stages of lactation. FAT sows consumed less feed (P<.01) than LEAN sws each week and for the entire lactation period.

Gestation energy level affected sow weight postpartum (P<.01) with sows receiving HIGH weighing more than sows receiving NORM. This difference in weight was maintained until weaning (P<.05). However, no difference (P>.10) in lactation weight loss was observed due to gestation feed intake. Backfat levels and changes were similar (P>.10) between sows in the HIGH and LEAN groups. Feed intake during lactation was unaffected (P>.10) by gestation energy intake.

Interaction means for litter performance during lactation and sow return to estrus as affected by developmental treatment and gestation energy treatment are shown in Table 7. No interactions (P>.10) for these criteria were observed. Table 8 summarizes the results for these criteria on the basis of treatment main effects. Neither developmental treatments nor gestation energy treatments affected (P>.10) litter size at birth or at weaning. Litter size at weaning averaged 10 pigs. Litter and individual pig weights were not different at birth or weaning for FAT and LEAN sows. Litter gain during lactation and litter weaning weight were influenced (P<.05) by gestation energy level, favoring sows that had received HIGH gestation energy. This difference can be explained by a numerical, but not statistical, difference in litter size at birth and weaning for the HIGH group. Individual pig weights were not affected (P>.10) by gestation energy level. Days required for sows to return to estrus after weaning are also shown in Tables 7 and 8. Days to return to estrus ranged from 5.2 to 5.6 for the interaction means and did not differ for the main effects of FAT and LEAN or HIGH and NORM (P>.10). Lactation length was just short of 24 days.

Summary

At 150 days of age, three groups of 40 gilts were paired by weight and backfat thickness and each pair was assigned to one of two developmental treatments intended to produce gilts that were similar in weight but different in backfat levels. The two feeding regimens consisted of gilts fed 2.5 kg/day of either a 10%or a 24% protein diet for 60 days. Both groups were then fed a standard gestation diet for a 30-day adjustment period and during the

groups at day 110 of gestation. Change in backfat during gestation differed $P<.001$) due to developmental treatment. Gilts that were developed as LEAN added backfat and those developed as FAT lost backfat during gestation even though they were fed the same daily level of gestation feed. Thus, after farrowing, the two groups of sows were of similar weights and backfat thickness ($P>.10$), regardless of developmental regimen The effects of gestation energy level on sow weights and backfat from breeding to farrowing are also shown in Table 4. Since gestation treatments were assigned across developmental treatment, sow weights at breeding were similar ($P>.10$). Both 110-day and postpartum weights were greater ($P<.01$) for sows which had received the HIGH level of energy during gestation compared to those receiving the NORM level with similar effects on gestation gain ($P<.05$) and net gestation gain ($P<.001$). Sow backfat, which was similar at breeding ($P>.10$), remained similar (P.10) at day 110 of gestation with no difference ($P>.10$) in backfat gain during gestation for sows receiving the HIGH and NORM levels of gestation energy.

The interaction means for the effects of developmental and gestation nutrition treatments on sow weights and backfat levels as well as feed intake during lactation are shown in Table 5. No interactions were found ($P>.10$) for sow weights and sow backfat. However, interactions among developmental treatments and gestation treatments were found for sow feed intake during lactation. Feed intake during week 2 (P .10), week 3 ($P<.05$), and for the 21-day ($P<.01$) and total lactation period ($P<.05$) was greater for FAT sows if they had received the HIGH gestation energy compared to the NORM gestation energy. LEAN sows consumed similar feed during gestation regardless of their gestation energy treatment. The main effects of developmental treatment and gestation energy levels on sow weight, backfat, and feed intake during lactation are shown in Table 6. The treatments that developed FAT and LEAN sows had no effect ($P>.10$) on sow weight postpartum or at day 21 of lactation or at weaning. FAT sows tended ($P<.10$) to lose more weight during the lactation. Backfat levels postpartum and at 21 days of lactation were similar ($P>.10$) between FAT and LEAN sows. Developmental treatment affected feed intake during all stages of lactation. FAT sows consumed less feed ($P<.01$) than LEAN sws each week and for the entire lactation period.

Gestation energy level affected sow weight postpartum ($P<.01$) with sows receiving HIGH weighing more than sows receiving NORM. This difference in weight was maintained until weaning ($P<.05$). However, no difference ($P>.10$) in lactation weight loss was observed due to gestation feed intake. Backfat levels and changes were similar ($P>.10$) between sows in the HIGH and LEAN groups. Feed intake during lactation was unaffected ($P>.10$) by gestation energy intake.

Interaction means for litter performance during lactation and sow return to estrus as affected by developmental treatment and gestation energy treatment are shown in Table 7. No interactions ($P>.10$) for these criteria were observed. Table 8 summarizes the results for these criteria on the basis of treatment main effects. Neither developmental treatments nor gestation energy treatments affected ($P>.10$) litter size at birth or at weaning. Litter size at weaning averaged 10 pigs. Litter and individual pig weights were not different at birth or weaning for FAT and LEAN sows. Litter gain during lactation and litter weaning weight were influenced ($P<.05$) by gestation energy level, favoring sows that had received HIGH gestation energy. This difference can be explained by a numerical, but not statistical, difference in litter size at birth and weaning for the HIGH group. Individual pig weights were not affected ($P>.10$) by gestation energy level. Days required for sows to return to estrus after weaning are also shown in Tables 7 and 8. Days to return to estrus ranged from 5.2 to 5.6 for the interaction means and did not differ for the main effects of FAT and LEAN or HIGH and NORM ($P>.10$). Lactation length was just short of 24 days.

Summary

At 150 days of age, three groups of 40 gilts were paired by weight and backfat thickness and each pair was assigned to one of two developmental treatments intended to produce gilts that were similar in weight but different in backfat levels. The two feeding regimens consisted of gilts fed 2.5 kg/day of either a 10%or a 24% protein diet for 60 days. Both groups were then fed a standard gestation diet for a 30-day adjustment period and during the consumed more feed during all stages of lactation. The two groups of sows weighed the Gestation energy level was of no consequence for sows developed as the LEAN group in this study. However, some benefit to higher gestation energy was observed for the FAT group of sows. Sows of the NORM group were lighter at weaning than sows of the HIGH group, largely as a function of lower lactation feed consumption within the FAT group not the LEAN group. Sows of the NORM group also weaned lighter litters than sows of the HIGH group. gain, the disadvantage of the lower level of gestation energy occurred within the FAT group only, probably related to lactation feed consumption. This group of sows had experienced the largest gain of backfat during development and the largest loss of backfat during gestation and during lactation. This would suggest a higher energy requirement during gestation for first-parity sows that are fatter at breeding.

TABLE 6. SOW WEIGHT AND BACKFAT READINGS AND CHANGES AND SOW FEED INTAKE DURING THE LACTATION PERIOD AS INFLUENCED BY DEVELOPMENT MANAGEMENT STRATEGY AND BY GESTATION ENERGY LEVEL (INTERACTION MEANS)

	Gilt development[a]			Gestation energy[b]			
	FAT		LEAN	HIGH		NORM	SD
No. of sows	39		36	37		38	
Sow weight, kg							
Post farrowing	186.5		182.2	188.1	**	180.5	11.1
21 days	178.2		179.0	182.5	*	174.7	13.1
Weaning	175.8		177.2	179.9	*	173.2	13.2
21-day lactation change	-8.3	!	-3.8	-5.6		-6.5	9.8
Sow fat, mm							
110 days	16.52	***	16.13	16.53		16.11	3.5
21 days	14.27		14.35	14.51		14.12	3.0
21-day lactation change	-2.24		-1.77	-2.02		-1.99	2.1
Feed intake, kg/day							
Week 1	4.05	**	4.58	4.43		4.21	.82
Week 2	5.03	**	5.92	5.65		5.30	1.12
Week 3	5.77	***	6.43	6.27		5.93	.98
21 days	4.95	***	5.64	5.57		5.29	.76
Lactation	5.12	**	5.74	5.57		5.29	.77
Days of lactation	24.0		23.5	23.6		23.9	1.8

[a]Gilts were fed 2.5 kg of a 10% protein (FAT) or a 24% protein (LEAN) diet for 60 days followed by 2.5 kg (summer) or 2.7 kg (winter) of a gestation diet for 30 days.
[b]Sows were fed 2.0 and 2.2 kg (HIGH) or 1.8 and 2.0 kg (NORM) during summer and winter, respectively.
!Means differ within main effect (P<.10).
*Means differ within main effect (P<.05).
**Means differ within main effect (P<.01).
***Means differ within main effect (P<.001).

TABLE 7. LITTER PERFORMANCE DURING LACTATION AND SOW RETURN TO ESTRUS AS INFLUENCED BY DEVELOPMENT MANAGEMENT STRATEGY AND BY GESTATION ENERGY LEVEL (INTERACTION MEANS)

Gilt develoment[a]	FAT		LEAN		
Gestation energy[b]	HIGH	NORM	HIGH	NORM	SD
No. of sows					
Bred	22	26	21	20	
Farrowed	17	22	20	16	
Farrowing percentage	77.3	84.6	95.2	80.0	
No of pigs[c]					
Born alive	11.6	11.0	10.9	10.9	1.6
Weaned	10.1	9.8	10.2	9.8	1.7
Survival percentage	87.1	89.1	93.6	89.9	
Litter weight, kg[c]					
Birth	17.5	15.8	16.1	16.1	3.2
21 days	61.6	55.2	58.3	55.6	9.4
Gain	44.2	39.4	42.2	39.5	7.7
Pig weight, kg[c]					
Birth	1.51	1.44	1.48	1.49	.24
21 days	6.09	5.71	5.79	5.76	.81
Gain	4.58	4.26	4.30	4.26	.71
Days to estrus[c]	5.5	5.4	5.3	5.6	1.1
Days of lactation[c]	24.2	23.9	23.0	24.0	1.8

[a]Gilts were fed 2.5 kg of a 10% protein (FAT) or a 24% protein (LEAN) diet for 60 days followed by 2.5 kg (summer) or 2.7 kg (winter) of a gestation diet for 30 days.
[b]Sows were fed 2.0 and 2.2 kg (HIGH) or 1.8 and 2.0 kg (NORM) during summer and winter, respectively.
[c]No interactions (P>.10) were observed.

TABLE 8. LITTER PERFORMANCE DURING LACTATION AND SOW RETURN TO ESTRUS AS INFLUENCED BY DEVELOPMENT MANAGEMENT STRATEGY AND BY GESTATION ENERGY LEVEL (MAIN EFFECT MEANS)

	Gilt development[a]		Gestation energy[b]		
	FAT	LEAN	HIGH	NORM	SD
No. of sows					
Bred	48	41	44	45	
Farrowed	39	36	37	38	
Farrowing percentage	81.3	887.8	86.0	82.6	
No of pigs					
Born alive	11.3	10.9	11.3	10.9	1.6
Weaned	10.0	10.0	10.2	9.8	1.7
Survival percentage	88.5	91.7	90.3	89.9	
Litter weight, kg					
Birth	16.6	16.1	16.7	15.9	3.2
21 days	58.4	56.9	60.0 *	55.4	9.4
Gain	41.8	40.9	43.2 *	39.4	7.7
Pig weight, kg					
Birth	1.47	1.48	1.50	1.47	.24
21 days	5.90	5.77	5.94	5.73	.81
Gain	4.42	4.28	4.44	4.26	.71
Days to estrus	5.5	5.5	5.3	5.7	1.1
Days of lactation	24.0	23.5	23.6	23.9	1.8

[a]Gilts were fed 2.5 kg of a 10% protein (FAT) or a 24% protein (LEAN) diet for 60 days followed by 2.5 kg (summer) or 2.7 kg (winter) of a gestation diet for 30 days.
[b]Sows were fed 2.0 and 2.2 kg (HIGH) or 1.8 and 2.0 kg (NORM) during summer and winter, respectively.
*Means differ within main effect (P<.05).