THE RELATIONSHIP BETWEEN BODY CONDITION SCORE AND BACKFAT IN GESTATING SOWS [1]

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Summary

Backfat and body condition score were measured on 731 sows in a commercial swine facility to assess the accuracy of feeding sows in gestation based on body condition score. Body condition score was poorly correlated ($r^2 = 0.19$) with backfat thickness. For example, sows assessed with a body condition of 3 ranged in backfat from 0.3 to 0.9 in. (7.5 to 23 mm). This illustrates the need to find a more objective method of measuring body condition (such as ultrasound) in order to properly adjust feeding levels and thus reduce variation in backfat of sows.

(Key Words: Sows, Backfat, Body Condition Score.)

Introduction

In many commercial swine production systems in North America, gilts and sows are fed based on a body condition score (BCS). Typically a scale of 1 to 5 is used, with 1 being very thin, 3 intermediate and 5 very fat. This is a very subjective system and varies from one assessor to the next. Body condition score (BCS) and backfat thickness appear to be poorly correlated. In a Canadian study, sows with a BCS of 3, ranged in backfat from 0.37 to 1.1 in. (9 to 28 mm). Additional data on backfat measurement and assessment of body condition of sows on three farms in Minnesota showed that between 18 to 40% of sows had backfat levels less than 0.51 in. (13 mm). Also, sows assessed on a body condition score of 3 had a range in backfat thickness from 0.37 to 0.98 in. (9 to 24 mm). Generally it is recommended that less than 20% of sows should be below 0.59 in. (15 mm) of backfat.

Our long-term goal is to develop a method to feed gestating sows based on backfat and body weight category. Our goal is to reduce the variability in backfat of sows in gestation and to farrow sows at approximately 0.75 in. (19 mm) of backfat at the last rib. The first step in this process is to determine the variability in backfat in commercial herds. Thus, our objective in this study was to determine the variability of sow backfat thickness in a commercial sow farm throughout gestation for sows fed based on a body condition scoring system.

Procedures

The study was conducted on a commercial swine operation in central Kansas. Sows were housed individually in stalls in environmentally regulated facilities. Gestation stalls were 24 in. × 7 ft over a completely slatted floor. Backfat was measured on all sows (1,306) at approximately 2.6 in. from the midline at the last rib using a lean-meater (Renco Corporation, Minneapolis, MN). Backfat was measured on both sides of the midline and averaged to determine backfat thickness. Girth was also measured directly behind the front legs on all sows and used to categorize sows into weight classes. A corre-

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lation for girth (body circumference) to body weight ($r^2 = 0.85$) was obtained, by weighing 90 sows and measuring their girth at the KSU swine teaching research center, and was used to categorize sows into classes.

Girth (in.)	Weight (lb)	Class
43 to 47	250 to 325	Very light
47.1 to 51	325 to 400	Light
51.1 to 54	400 to 475	Medium
54.1 to 60	475 to 600	Heavy

A total of 1,106 sows were in the gestating barn and 200 sows were in farrowing rooms. Sows were fed a milo-soybean meal diet containing 0.65% lysine, 1455 kcal/lb, 0.83% calcium and 0.49% available phosphorous in gestation. In lactation sows were fed a milo-soybean meal diet containing 1.10% lysine, 1458 kcal/lb, 0.9% calcium and 0.49% available phosphorous. In the gestation barn, sows had individual feed drop boxes and were fed once daily at 7:30 am. In the farrowing rooms, sows were fed 3 to 5 times daily to achieve maximum feed intake. Parity of all sows was recorded at the time of backfat measurements.

The farm manager scored the sows for body condition during the same week that backfat was measured. A scale of one to five was used, with one being very thin, three being intermediate, and five being very fat. Feeder box settings for all sows were documented and used to compare with sow backfat thickness and body condition scores. Correlation coefficients were calculated to determine the relationship between body condition score and backfat.

Results and Discussion

From Table 1 and Figure 1, there is a positive relationship between backfat thickness and body condition score, but the relationship was poor with an $r^2 = 0.19$. The sows with a body score of three had an average backfat thickness of 0.54 in. (13.7 mm) with a minimum of 0.30 in. (7.5 mm) and a maximum of 0.91 in. (23 mm). The sows with a body condition score of one had an average backfat thickness of 0.40 in. (10.1 mm), with a minimum of 0.28 in. (7 mm) and a maximum of 0.53 in. (13.5 mm). As backfat thickness increased the body condition score increased, but there was a wide range in backfat at each body condition score.

The average backfat thickness for the entire herd was 0.53 in. (13.6 mm), which is very similar to the average of sows with a body condition score of three. Sow backfat thickness was normally distributed, with 25% of sows less than 0.47 in. (12 mm), and 68% of sows less than the recommended goal of 0.59 in. (15 mm). In the first five weeks of gestation, sow backfat thickness was in a narrow range between 0.51 in. and 0.55 in. (13 to14 mm; Figure 3). There was a trend towards a slight increase in backfat in midgestation. However, this data must be interpreted with caution because the data was collected as a snapshot of the herd at one point in time and not through serial measurements on the same sows. In the last trimester of gestation, there is little change in backfat, with a small decline, if anything, to farrowing. In the last four weeks of gestation, the higher demand for fetal growth does not seem to be fully met from daily feed allowance, as sows seem to be drawing from there own body reserves to fully meet fetal growth requirements.

Although there was a relationship between backfat thickness and feeding level (Figure 4), the relationship was highly variable ($r^2 = 0.15$). For example, backfat ranged from 0.30 to 0.87 in. (7.5 to 22 mm) for sows that were being fed 4 lb per day. Approximately two weeks prior to backfat measurements, feeders had been adjusted upwards by the farm manager because he felt sow body condition was too low. Even with these adjustments, a large range in backfat at each feed level was still evident in Figure 4.

A regression equation (Weight (lb) = 20.94 × Girth (in.) ! 650; $r^2 = 0.85$) was developed to predict sow weight from girth. Girth was measured directly behind the front legs of sows. As sow parity increased, girth and predicted body weight increased steadily up to parity five, after which girth and weight continues to increase but at a more gradual rate to parity ten. The largest in-

crease in girth and predicted body weight was when sow parity increased from one to three, as this is the period where sows reach their mature physical size.

From this data, it is clear that body condition score is not an accurate method on which to base a sow feeding program. Body condition scoring of sows is subjective, and even with excellent farm managers, there is still too much variation in backfat at each condition score. These results emphasize the need to find a more accurate method of feeding sows in gestation to reduce the variation in sow backfat. We are in the process of testing a system of feeding sows in gestation based on ultrasonic measurement of backfat recorded shortly after breeding. We are currently validating this method on sow farms.

Table 1. Body Condition Score and Backfat Thickness for Sows[a]

	Backfat[b]					
	Average		Minimum		Maximum	
Body Condition Score	Inch	mm	Inch	mm	Inch	mm
1	0.40	10.1	0.28	7.0	0.53	13.5
2	0.47	11.9	0.28	7.0	0.87	22.0
3	0.54	13.7	0.30	7.5	0.91	23.0
4	0.62	15.8	0.47	12.0	0.93	23.5
5	0.70	17.8	0.35	9.0	0.83	21.0

[a]A total of 731 sows were measured.
[b]Backfat was measured at the approximately 2.6 in. from the midline on both sides of the mid-line and averaged.

Table 2. Average Sow Girth by Parity and Predicted Sow Weight

		Girth (in.)			Predicted Avg.
Parity	Number[a]	Average	Minimum	Maximum	Weight (lb)[b]
1	258	49.5	42.5	58.5	387
2	248	53.5	48.0	59.5	470
3	169	55.8	50.0	62.5	518
4	185	56.4	51.0	63.0	531
5	141	57.4	51.5	64.0	552
6	93	57.7	52.0	62.5	558
7	84	58.6	54.0	63.5	577
8	27	58.5	54.5	62.0	575
9	34	58.9	56.5	62.5	583
10	15	59.1	57.0	63.0	588
11	28	58.5	55.0	63.0	575
12	24	56.1	54.5	63.0	525

[a]Total number of sows 1,306.
[b]Predicted Avg. Weight (lb) = 20.94 (Avg. Girth, in.) ! 650.

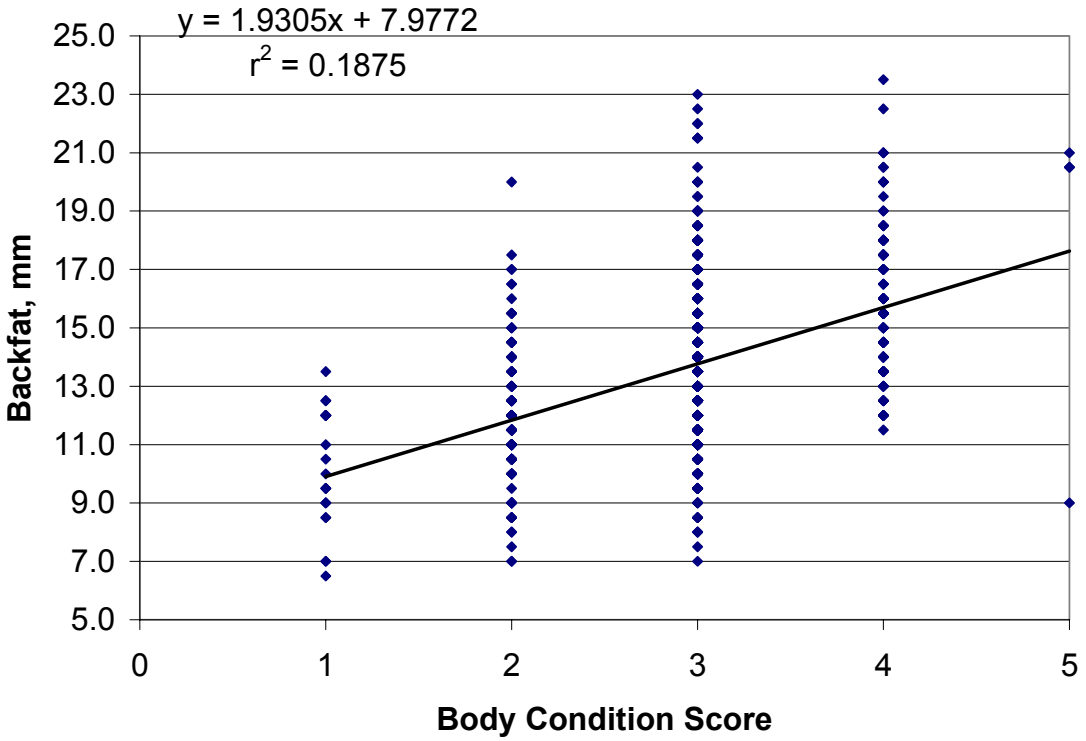

Figure 1. The Relationship Between Body Condition and Backfat Thickness for Gestating Sows. A total of 731 sows were ultrasonically scanned at the last rib and correlated with a body condition score (1 = thin; 5 = fat) that was assigned by the farm manager.

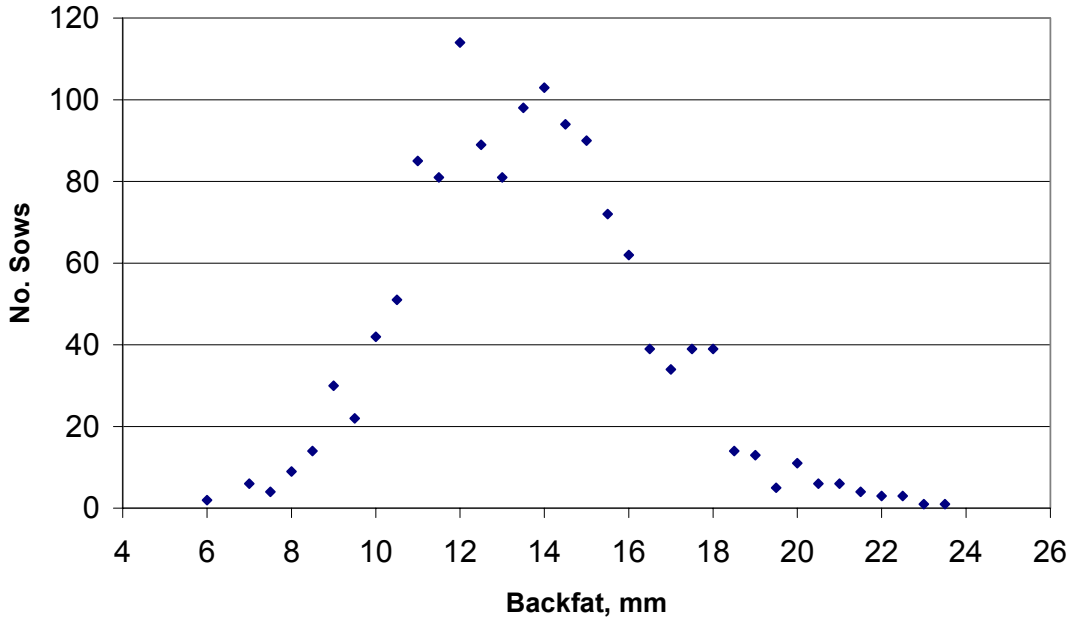

Figure 2. Frequency Distribution of the Number of Sows at Each Backfat Thickness. A total of 1,306 sows were ultrasonically scanned for backfat thickness at the last rib.

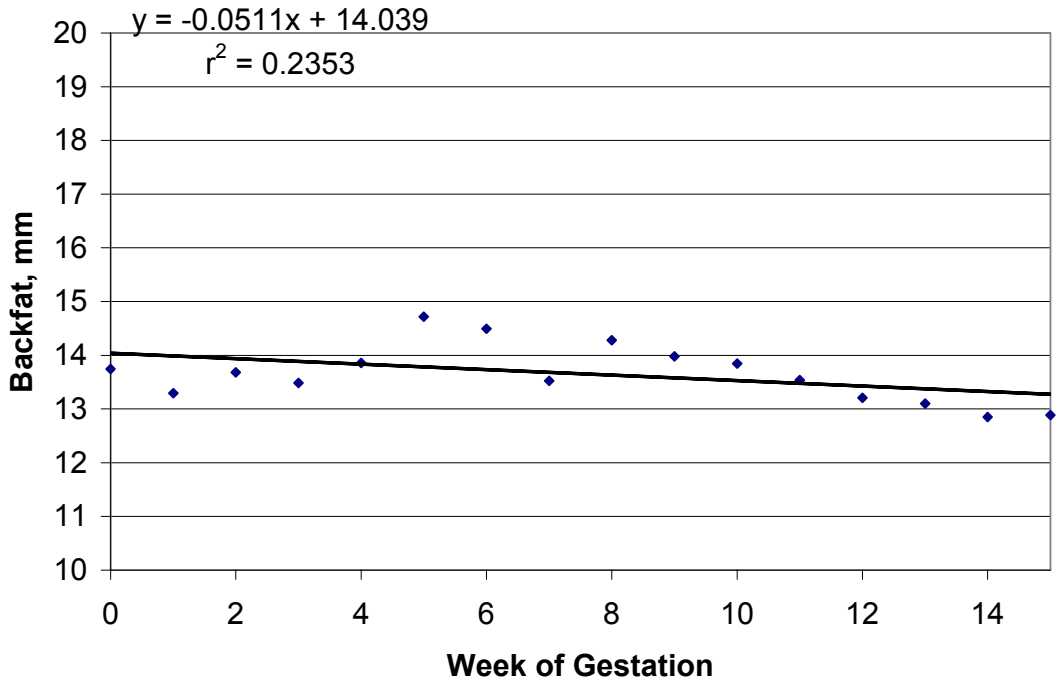

Figure 3. Backfat Thickness at Each Week of Gestation in Sows. Values represent approximately 65 sows for each week of gestation. All sows were scanned on the same day.

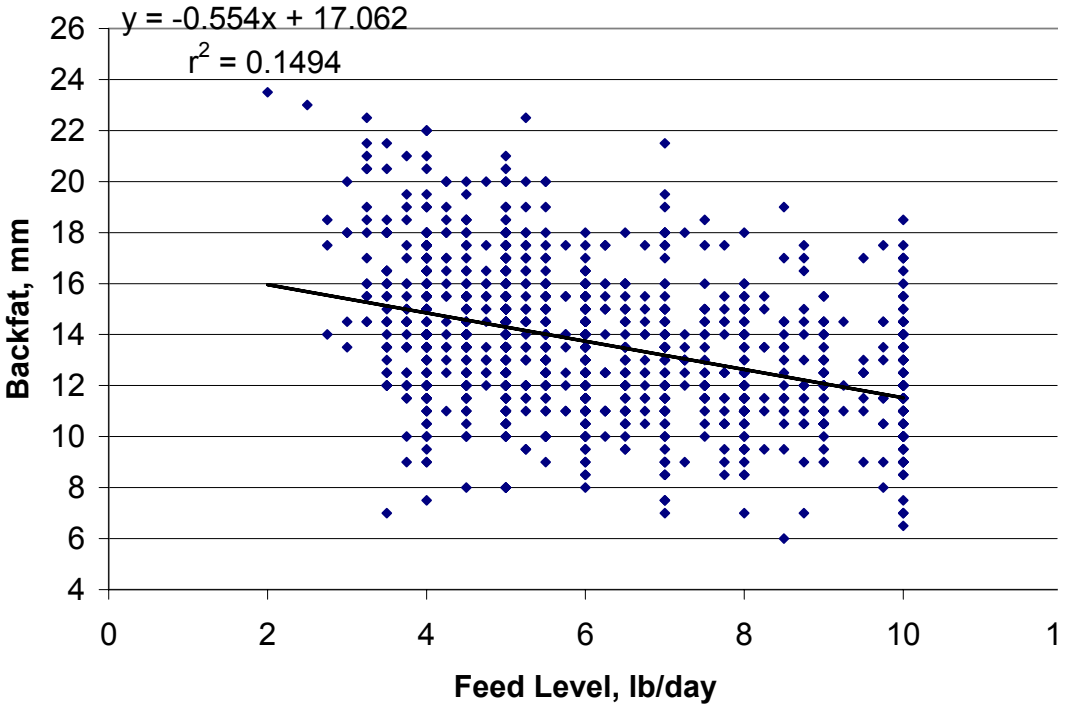

Figure 4. The Relationship Between Feeding Level and Backfat Thickness for Gestating Sows. A total of 1,306 sows were scanned and correlated with their feed intake.