Evaluation of Body Condition and Feet and Leg Soundness on Sow Productive Lifetime

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Evaluation of BCS & Soundness

- Are basic tools many producers from yester-year did as almost second nature

- More people entering the swine industry
  - Non-livestock backgrounds
  - Different cultures and languages
  - Differing learning types

- Basics needed within the industry more now than ever
Keys to High Sow Lifetime Productivity

◆ High degree of management over successive parities
  ■ Gestation
    ● Return to ideal condition
    ● Vaccinate for health issues
  ■ Lactation
    ● Nutrition to match production
    ● Lactation length
Effects of sow condition at weaning* on reproductive performance & herd longevity

<table>
<thead>
<tr>
<th>Trait</th>
<th>Liveweight at weaning</th>
<th>P2 backfat at weaning</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>High</td>
<td>Low</td>
</tr>
<tr>
<td>Weaning-estrus interval (d)</td>
<td>6.2</td>
<td>8.2</td>
</tr>
<tr>
<td>Sow wastage (%)**</td>
<td>11</td>
<td>37</td>
</tr>
<tr>
<td>Subsequent litter size (live)</td>
<td>10.9</td>
<td>9.8</td>
</tr>
</tbody>
</table>

* Measured in mature sows (parities 3-7) where High = top one-third and low = bottom one-third of total.

** Consisting of sows anoestrus, failing to conceive, aborting or non-pregnant at term.

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Gilt management to maximize lifetime productivity: Feeding from selection to culling. Dr. Paul Hughes, Pig & Poultry Production Institute, Aug. 2001.
# Condition Scores of Sows

**Patience and Thacker, 1989**

<table>
<thead>
<tr>
<th>Score</th>
<th>Condition</th>
<th>Body Shape</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Emaciated</td>
<td>Hip, backbone prominent to the eye</td>
</tr>
<tr>
<td>2</td>
<td>Thin</td>
<td>Hips, backbone easily felt without applying palm pressure</td>
</tr>
<tr>
<td>3</td>
<td>Ideal</td>
<td>Hips backbone felt only with firm palm pressure</td>
</tr>
<tr>
<td>4</td>
<td>Fat</td>
<td>Hips, backbone cannot be felt</td>
</tr>
<tr>
<td>5</td>
<td>Over fat</td>
<td>Hips, backbone heavily covered</td>
</tr>
</tbody>
</table>

*Source: Iowa State University, Department of Animal Science*
**BCS 1**
Excessively Thin
Backfat < 10 mm

Ribs, hips and backbone are easily visible and palpable.
Sow is in poor condition and needs large amounts of muscle and fat to maintain productivity.

**BCS 2**
Moderately Thin
Backfat 10 - 15 mm

Ribs, hips and backbone can be palpated with slight pressure.
A moderate increase in feed intake is required before the sow farrows next litter.

**BCS 3**
Ideal Condition
Backfat 15 - 22 mm

Ribs, hips and backbone can be palpated with firm pressure, but cannot be observed visually. Monitor feed intake to maintain this level of condition.

**BCS 4**
Moderately Fat
Backfat 23 - 29 mm

Ribs, hips and backbone cannot be palpated.
Reduce feed allowance slightly.

**BCS 5**
Excessively Fat
Backfat >30 mm

Ribs, hips and backbone cannot be palpated.
Reduce feed allowance to bring her into a more ideal body condition. Sows this fat perform poorly in lactation.

Photos by Dr. Locke Karriker & Dr. Alex Ramirez
Where do you evaluate condition?

1. Should blades
2. Backbone or spine
3. Tail head
4. Hip bones
Where do you evaluate condition?

3. Tail head

5. Top Shape

4. Hip bones

6. Width between legs
Minimum feed intake required to rebuild body reserves and support current pregnancy (assumes 400 lb. sow, adapted from Boyd et al., 2002)

<table>
<thead>
<tr>
<th>Body Condition Score</th>
<th>Average P2 Fat depth, mm</th>
<th>Minimum Intake, kg/d</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>8 to 10</td>
<td>3.5&lt;sup&gt;a&lt;/sup&gt;</td>
</tr>
<tr>
<td>2</td>
<td>12 to 14</td>
<td>2.8&lt;sup&gt;a&lt;/sup&gt;</td>
</tr>
<tr>
<td>3</td>
<td>16 to 18</td>
<td>2.2</td>
</tr>
</tbody>
</table>

Maintenance

Maintenance + Growth (20 kg)

Maintenance + Conceptus + Mammary + Growth

<sup>a</sup>Computed using NRC 98 Model. Assumed 2.0 kg fat = 1 mm fat depth. Corn-Soy diet.
Feed gestation sows based on weight and backfat (KSU, http://www.asi.k-state.edu/DesktopDefault.aspx?tabindex=1009&tabid=890)

<table>
<thead>
<tr>
<th>Flank to Flank, cm</th>
<th>Estimated weight, kg</th>
<th>Backfat at breeding, mm</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>8 - 11</td>
</tr>
<tr>
<td>&lt; 90</td>
<td>113 to 150</td>
<td>2.25 (1.13)</td>
</tr>
<tr>
<td>90 – 96.5</td>
<td>150 to 180</td>
<td>5.5 (2.8)</td>
</tr>
<tr>
<td>96.5 – 104</td>
<td>180 to 215</td>
<td>2.7 (1.35)</td>
</tr>
<tr>
<td>104 – 112</td>
<td>215 to 250</td>
<td>3.0 (1.5)</td>
</tr>
<tr>
<td>&gt;112</td>
<td>250 to 295</td>
<td>3.2 (1.6)</td>
</tr>
</tbody>
</table>

Feeding level from day of sow scan to 101 day of gestation, lb/day
Traits in which selection should occur on replacement gilts

◆ Feet and Leg Soundness
  ■ Feet and leg problems represent the second largest reason for sows leaving the breeding herd
    ● Particularly true of parity 1, 2 and 3 females

◆ Underline Soundness
  ■ Underlines should be visually evaluated and scored on ALL replacement females

◆ External genitalia
  ■ Involves visually evaluating the vulva for size, shape, and injuries
Feet and leg soundness

- Feet and leg problems are a major reason for sow culling
  - Particularly true of parity 1, 2, and 3 females

- Feet and leg soundness should be evaluated on ALL replacement females

- Evaluation can involve a scoring process
  - PIH-101 Feet and leg soundness in swine
  - NSIF Guidelines for uniform swine improvement

- Gilts that score poor or unacceptable should be sold
Systematic Evaluation of Replacement Gilts

- Pork producers need the tools to systematically evaluate groups of replacement gilts
  - Provide this training to their employees
Systematic evaluation of replacement gilts

1. Evaluate vulva and underlines first, all or nothing type of traits.

2. Evaluate feet and legs next, some all or nothing traits and other where decisions are made.

3. Evaluate top shape, rib shape, body depth and width, etc. where variation and only extremes are most critical.
Replacement Gilt Selection Guidelines

Conformation and Structural Soundness

The skeletal structures in Figure 1 and 2 are drawn in part from photographs provided by the Iowa State University Department of Animal Science. The gilts were placed on a platform similar to the one described in Figure 1. The pig in Figure 1, a four-month-old gilt, was raised under normal feed and water intake on a commercial diet. The pig in Figure 2, a two-month-old gilt, was raised under similar conditions.

Figure 1 shows the skeletal structure of a four-month-old gilt. The frame is well developed, with good muscular development and a well-proportioned body. The pig in Figure 2, a two-month-old gilt, has a more developed musculature, with a well-defined backbone and a strong, well-proportioned body.

Figure 3 shows the skeletal structure of a four-month-old gilt. The pig in Figure 3, a two-month-old gilt, has a more developed musculature, with a well-defined backbone and a strong, well-proportioned body.

Figure 4 shows the skeletal structure of a four-month-old gilt. The pig in Figure 4, a two-month-old gilt, has a more developed musculature, with a well-defined backbone and a strong, well-proportioned body.

Figure 5 shows the skeletal structure of a four-month-old gilt. The pig in Figure 5, a two-month-old gilt, has a more developed musculature, with a well-defined backbone and a strong, well-proportioned body.

Figure 6 shows the skeletal structure of a four-month-old gilt. The pig in Figure 6, a two-month-old gilt, has a more developed musculature, with a well-defined backbone and a strong, well-proportioned body.

Figure 7 shows the skeletal structure of a four-month-old gilt. The pig in Figure 7, a two-month-old gilt, has a more developed musculature, with a well-defined backbone and a strong, well-proportioned body.

Figure 8 shows the skeletal structure of a four-month-old gilt. The pig in Figure 8, a two-month-old gilt, has a more developed musculature, with a well-defined backbone and a strong, well-proportioned body.

Figure 9 shows the skeletal structure of a four-month-old gilt. The pig in Figure 9, a two-month-old gilt, has a more developed musculature, with a well-defined backbone and a strong, well-proportioned body.

Figure 10 shows the skeletal structure of a four-month-old gilt. The pig in Figure 10, a two-month-old gilt, has a more developed musculature, with a well-defined backbone and a strong, well-proportioned body.

Figure 11 shows the skeletal structure of a four-month-old gilt. The pig in Figure 11, a two-month-old gilt, has a more developed musculature, with a well-defined backbone and a strong, well-proportioned body.

Figure 12 shows the skeletal structure of a four-month-old gilt. The pig in Figure 12, a two-month-old gilt, has a more developed musculature, with a well-defined backbone and a strong, well-proportioned body.

Figure 13 shows the skeletal structure of a four-month-old gilt. The pig in Figure 13, a two-month-old gilt, has a more developed musculature, with a well-defined backbone and a strong, well-proportioned body.

Figure 14 shows the skeletal structure of a four-month-old gilt. The pig in Figure 14, a two-month-old gilt, has a more developed musculature, with a well-defined backbone and a strong, well-proportioned body.

Figure 15 shows the skeletal structure of a four-month-old gilt. The pig in Figure 15, a two-month-old gilt, has a more developed musculature, with a well-defined backbone and a strong, well-proportioned body.

Figure 16 shows the skeletal structure of a four-month-old gilt. The pig in Figure 16, a two-month-old gilt, has a more developed musculature, with a well-defined backbone and a strong, well-proportioned body.

Figure 17 shows the skeletal structure of a four-month-old gilt. The pig in Figure 17, a two-month-old gilt, has a more developed musculature, with a well-defined backbone and a strong, well-proportioned body.

Figure 18 shows the skeletal structure of a four-month-old gilt. The pig in Figure 18, a two-month-old gilt, has a more developed musculature, with a well-defined backbone and a strong, well-proportioned body.

Figure 19 shows the skeletal structure of a four-month-old gilt. The pig in Figure 19, a two-month-old gilt, has a more developed musculature, with a well-defined backbone and a strong, well-proportioned body.

Figure 20 shows the skeletal structure of a four-month-old gilt. The pig in Figure 20, a two-month-old gilt, has a more developed musculature, with a well-defined backbone and a strong, well-proportioned body.

Figure 21 shows the skeletal structure of a four-month-old gilt. The pig in Figure 21, a two-month-old gilt, has a more developed musculature, with a well-defined backbone and a strong, well-proportioned body.

Figure 22 shows the skeletal structure of a four-month-old gilt. The pig in Figure 22, a two-month-old gilt, has a more developed musculature, with a well-defined backbone and a strong, well-proportioned body.

Figure 23 shows the skeletal structure of a four-month-old gilt. The pig in Figure 23, a two-month-old gilt, has a more developed musculature, with a well-defined backbone and a strong, well-proportioned body.

Figure 24 shows the skeletal structure of a four-month-old gilt. The pig in Figure 24, a two-month-old gilt, has a more developed musculature, with a well-defined backbone and a strong, well-proportioned body.
Selecting for Feet and Leg Soundness in Replacement Gilts

Front Feet and Toe Size

Rear Foot and Toe Size

Rear Feet and Leg Injuries
Reproductive soundness

- Underline evaluation is another critical step in the evaluation of replacement gilt candidates.
- Sows must have functional nipples to raise pigs.
- Role that genetics plays in determining the spacing, prominence, and location is not well understood.
- Traits do have a direct impact on production. It is recommended that all replacement gilts are evaluated.
Selecting for Reproductive Trait Soundness in Replacement Gilts

Underline Soundness

All females should have a prominent umbilicus that is not easily palpable. The elevation should be uniform and consistent throughout the animals. The ratio of the umbilicus to the body should be approximately 1:4. If the ratio is lower, the animal should be reared. If the ratio is higher, the animal should be rejected.

External Genitalia Soundness

All females should have a prominent umbilicus that is not easily palpable. The elevation should be uniform and consistent throughout the animals. The ratio of the umbilicus to the body should be approximately 1:4. If the ratio is lower, the animal should be reared. If the ratio is higher, the animal should be rejected.

Sponsored by: Pork Checkoff, Iowa State University, National Swine Registry, National Hog Farmer
Designed to be taken in the barn to assist with gilt selection training

Pocket Guide for the Evaluation of Structural, Feet, Leg, and Reproductive Soundness in Replacement Gilts

IOWA STATE UNIVERSITY
Department of Animal Science
What does the ideal gilt look like?
Other genetic conditions to avoid

- Gilts producing offspring with or who are from litters where the following conditions occurred should not be selected as a replacement
  - Scrotal Hernia
  - Atresia Ani
  - Cryptorchidism
  - Hermaphrodites
  - Tremors
  - Splayleg
  - Bent legs
  - Polydactly
  - Syndactyly
  - Thickened forelegs
Culling of replacement gilt candidates

- The more traits that are evaluated and culling is practiced on, increases the number of replacement gilt candidates

- May not be a large problem if producers are purchasing their replacement females
  - Hopefully much if not all of the culling has occurred prior to a commercial producer receiving the replacement gilts
  - However, purchased gilts should still be carefully scrutinized before producers enter them into the breeding herd

- Number of gilts retained can have a great impact on the number of grand-parent females needed in an internal multiplication system.
To calculate the number of replacement gilts needed

<table>
<thead>
<tr>
<th>Item</th>
<th>Example</th>
</tr>
</thead>
<tbody>
<tr>
<td>Average Sow Inventory</td>
<td>(A)</td>
</tr>
<tr>
<td>Annual Replacement Rate</td>
<td>(B)</td>
</tr>
<tr>
<td>Number Needed / Year</td>
<td>A x B = (C)</td>
</tr>
<tr>
<td>Number of Days in Isolation</td>
<td>(D)</td>
</tr>
<tr>
<td>Percent of Number Purchased that Farrow a Litter</td>
<td>(E)</td>
</tr>
<tr>
<td>Time Needed to Clean Isolation Facility, Days</td>
<td>(F)</td>
</tr>
<tr>
<td>Number of Replacement Females to Purchase</td>
<td>C / E = (G)</td>
</tr>
<tr>
<td>Number of Replacement Female Groups</td>
<td>365 days / (D + F) = (H)</td>
</tr>
<tr>
<td>Number of Females Purchased per Group</td>
<td>G / H</td>
</tr>
</tbody>
</table>

Example:

- Average Sow Inventory: 2500
- Annual Replacement Rate: .50
- Number Needed / Year: 1250
- Number of Days in Isolation: 60
- Percent of Number Purchased that Farrow a Litter: .90
- Time Needed to Clean Isolation Facility, Days: 7
- Number of Replacement Females to Purchase: 1389
- Number of Replacement Female Groups: 5.45
- Number of Females Purchased per Group: 255
Replacement Gilt Needs

- Assuming 1389 replacement gilts are needed annually whether they are purchased or internally multiplied.

- How many gilts will be required once selection takes place?

<table>
<thead>
<tr>
<th>Gilts needed for Breeding Purposes</th>
<th>Percentage of Gilts Selected</th>
<th>Total Number of Gilts to Produce</th>
</tr>
</thead>
<tbody>
<tr>
<td>1389</td>
<td>80%</td>
<td>1736</td>
</tr>
<tr>
<td>1389</td>
<td>65%</td>
<td>2137</td>
</tr>
<tr>
<td>1389</td>
<td>50%</td>
<td>3472</td>
</tr>
</tbody>
</table>
Replacement Gilt Needs

- Assume that 8 offspring reach market weight for each grand-parent female in production in an internal gilt multiplication system.
- Of the 8 offspring each grand-parent female produced 4 (one-half of offspring) are females and each female has 2.2 litters per year (8.8)

<table>
<thead>
<tr>
<th>Percentage of Gilts Selected</th>
<th>Total Number of Gilts to Produce</th>
<th>Grand-Parent Sows Needed (Assuming a 80% farrowing rate of GP females)</th>
<th>Percentage of Herd Devoted to Replacement Gilt Production</th>
</tr>
</thead>
<tbody>
<tr>
<td>80%</td>
<td>1736</td>
<td>246</td>
<td>9.8%</td>
</tr>
<tr>
<td>65%</td>
<td>2137</td>
<td>303</td>
<td>12.1%</td>
</tr>
<tr>
<td>50%</td>
<td>3472</td>
<td>494</td>
<td>19.8%</td>
</tr>
</tbody>
</table>
Replacement Gilt Needs

- Does not account for any disease outbreak, fluctuations in farrowing rate (summer vs. other season)
- Also must produce replacement grand-parent females
- It is clear that the cost of producing the replacement gilt in an internal multiplication system can vary quite easily

<table>
<thead>
<tr>
<th>Grand-Parent Sows Needed (Assuming a 80% farrowing rate of GP females)</th>
<th>Percentage of Herd Devoted to Replacement Gilt Production</th>
<th>Grand-Parent Females Needed to Replace GP females (Assumes 50% replacement and 75% conception)</th>
<th>Total number of GP sows and % of herd</th>
</tr>
</thead>
<tbody>
<tr>
<td>246</td>
<td>9.8%</td>
<td>75</td>
<td>321 (12.8%)</td>
</tr>
<tr>
<td>303</td>
<td>12.1%</td>
<td>92</td>
<td>395 (15.8%)</td>
</tr>
<tr>
<td>494</td>
<td>19.8%</td>
<td>132</td>
<td>626 (25.0%)</td>
</tr>
</tbody>
</table>

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Department of Animal Science
Evaluation for Genetic Improvement

- Development of a series of drawings to help producers and breeders better visualize traits important to sow productive lifetime.

- Drawing professionally drawn by a “cartoonist”

- Use in current NPB project
  - Identify important traits
  - Use the information for commercial producers and swine breeders
Additional needs

◆ Gilt selection curriculum
  ■ Under development
  ■ Poster photos are the basis of a PowerPoint
  ■ PowerPoint with script
    ● Use as stand alone presentation with voice over
    ● Use of presentation with a script
    ● Use of the presentation alone
    ● Could add information from your own system

◆ Standardized scoring sheets to evaluate groups of replacement gilts

◆ Other ideas ??
I would like to thank the National Hog Farmer magazine for their contributions and for allowing use of the photos as well as the National Pork Board and National Swine Registry for Funding.
Thank You For Your Time and Attention!

Do you Have any Questions?