KSU Applied Swine Nutrition Team

KANSAS STATE UNIVERSITY

SWINE INDUSTRY DAY

2007
Flank measurement to set feeding levels

\[ BW^{0.333} \text{ in kg} = 0.0511 \times \text{Flank-to-flank, cm} + 0.5687 \]
Using the weight tape
# Feeding level from d 0 to 101, lb/day

<table>
<thead>
<tr>
<th>Backfat at breeding, mm</th>
<th>9 to 11</th>
<th>12 to 14</th>
<th>15 to 17</th>
<th>&gt; 18</th>
</tr>
</thead>
<tbody>
<tr>
<td>&lt; 35.5</td>
<td>5.0</td>
<td>4.4</td>
<td>3.9</td>
<td>3.4</td>
</tr>
<tr>
<td>35.6 to 38.3</td>
<td>5.5</td>
<td>5.0</td>
<td>4.4</td>
<td>3.9</td>
</tr>
<tr>
<td>38.4 to 41.1</td>
<td>5.9</td>
<td>5.4</td>
<td>4.9</td>
<td>4.3</td>
</tr>
<tr>
<td>41.2 to 43.9</td>
<td>6.4</td>
<td>5.9</td>
<td>5.4</td>
<td>4.8</td>
</tr>
<tr>
<td>&gt; 44.0</td>
<td>6.9</td>
<td>6.4</td>
<td>5.8</td>
<td>5.3</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Flank to flank, inches</th>
<th>Estimated weight, lb</th>
<th>9 to 11</th>
<th>12 to 14</th>
<th>15 to 17</th>
<th>&gt; 18</th>
</tr>
</thead>
<tbody>
<tr>
<td>&lt; 35.5</td>
<td>250 to 325</td>
<td>5.0</td>
<td>4.4</td>
<td>3.9</td>
<td>3.4</td>
</tr>
<tr>
<td>35.6 to 38.3</td>
<td>325 to 400</td>
<td>5.5</td>
<td>5.0</td>
<td>4.4</td>
<td>3.9</td>
</tr>
<tr>
<td>38.4 to 41.1</td>
<td>400 to 475</td>
<td>5.9</td>
<td>5.4</td>
<td>4.9</td>
<td>4.3</td>
</tr>
<tr>
<td>41.2 to 43.9</td>
<td>475 to 550</td>
<td>6.4</td>
<td>5.9</td>
<td>5.4</td>
<td>4.8</td>
</tr>
<tr>
<td>&gt; 44.0</td>
<td>550 to 650</td>
<td>6.9</td>
<td>6.4</td>
<td>5.8</td>
<td>5.3</td>
</tr>
</tbody>
</table>

- Assumes diet with 1.5 Mcal ME/lb
- All sows fed additional 2 lb/d from d 102 to 115
- Sows maintained at or above 68°F
- All sows fed additional 2 lb/d from d 102 to 115
- Sows maintained at or above 68°F
Gestation Feeding

- Using the weight tape without the back fat measurements may be a less labor intensive method for feeding sows.
- No data on long term effects on sow weight and back fat gain.
Effects of Lactation Feeding Level and Creep Feeding on Pig ADG

<table>
<thead>
<tr>
<th>Sow feed intake</th>
<th>Pig average daily gain, lb</th>
<th>Creep feeding</th>
</tr>
</thead>
<tbody>
<tr>
<td>Limit fed</td>
<td>0.52&lt;sup&gt;a&lt;/sup&gt;</td>
<td>No</td>
</tr>
<tr>
<td>Ad libitum</td>
<td>0.56&lt;sup&gt;b&lt;/sup&gt;</td>
<td>Yes</td>
</tr>
</tbody>
</table>

Sulabo et al., 2007
Effects of Lactation Feeding Level on Litter Creep Feed Intake
(% of total litter creep intake in parentheses)

Sulabo et al., 2007

Days Post Farrowing

Sulabo et al., 2007
Predicted Daily Litter Creep Feed Intake

Litter creep intake (lb/d) = 0.00198 \times \text{Age, d}^2 - 0.0155 \times \text{Age, d} + 0.0442
R^2 = 0.22, P < 0.0001

55% of creep feed consumed d 18-21

Sulabo et al., 2007
Effect of Varying Creep Feeding Durations on Percentage of Eaters

Sulabo et al., 2007
Influence of creep feed on post-weaning ADG and Total Gain (d 0 to 28)

Sulaboo et al., 2007
Creep Feeder Design

Sulabo et al., 2007
Effect of Creep Feeder Design on Percentage of Eaters

- **Rotary Feeder with Hopper**: 69% Eaters, 31% Non-eaters
- **Rotary Feeder without Hopper**: 47% Eaters, 53% Non-eaters
- **Pan Feeder**: 42% Eaters, 58% Non-eaters
Total Creep Feed Disappearance Between Different Creep Feeder Designs

Rotary feeder with hopper: 1.0
Rotary feeder without hopper: 2.6
Pan Feeder: 2.7

\(^{ab} P < .01\)

Sulabo et al., 2007
Nursery pig update
What to do with High Grain Prices?

- Other ingredients, DDGS and Glycerol
- Added Fat – right now, too expensive
- Dried whey and Corn, volatile

- Work with what you have: Improve F/G
  - Particle size & thorough mixing
  - Feed budgets
  - Feeder management
  - Genetics
  - Watch market weights
# Nursery feed budgets

<table>
<thead>
<tr>
<th>Weaning weight, lb</th>
<th>10</th>
<th>11</th>
<th>12</th>
<th>13</th>
<th>14</th>
<th>15</th>
<th>16</th>
</tr>
</thead>
<tbody>
<tr>
<td>SEW</td>
<td>2</td>
<td>1</td>
<td>1</td>
<td>.5</td>
<td>.5</td>
<td>.5</td>
<td>.5</td>
</tr>
<tr>
<td>Transition</td>
<td>5</td>
<td>4</td>
<td>3</td>
<td>2</td>
<td>1</td>
<td>--</td>
<td>--</td>
</tr>
<tr>
<td>Phase 2</td>
<td></td>
<td></td>
<td></td>
<td>-</td>
<td>-</td>
<td>12 to 15 lb</td>
<td></td>
</tr>
<tr>
<td>Phase 3</td>
<td></td>
<td></td>
<td></td>
<td>-</td>
<td>-</td>
<td>45 to 50 lb</td>
<td></td>
</tr>
</tbody>
</table>
Influence of lactose source on nursery performance (Day 7 to 21 after weaning)

Bergstrom et al., 2007
Influence of lactose source on nursery performance (Day 7 to 21 after weaning)

- Control: 3.69
- Edible: 3.39
- Feed grade: 2.99
- Lactose: 3.46
- Dextrose 1: 3.43
- Dextrose 2: 3.46

Bergstrom et al., 2007
Influence of whey source on nursery performance (Day 5 to 19 after weaning)

K-STATE

Bergstrom et al., 2007
Influence of whey source on nursery performance ($0.70 whey)

Margin over feed, $/pig

Control  A  B  C  D  E  F  G

3.14 a  3.06 ab  2.58 c  2.77 abc  2.56 c  2.95 abc  2.72 abc  2.66 bc

SE = 0.16
abc P<0.05

Whey source

Bergstrom et al., 2007
Influence of whey source on nursery performance ($0.35 whey)

<table>
<thead>
<tr>
<th>Whey source</th>
<th>Margin over feed, $/pig</th>
</tr>
</thead>
<tbody>
<tr>
<td>Control</td>
<td>3.14</td>
</tr>
<tr>
<td>A</td>
<td>3.58</td>
</tr>
<tr>
<td>B</td>
<td>3.09</td>
</tr>
<tr>
<td>C</td>
<td>3.29</td>
</tr>
<tr>
<td>D</td>
<td>3.05</td>
</tr>
<tr>
<td>E</td>
<td>3.49</td>
</tr>
<tr>
<td>F</td>
<td>3.23</td>
</tr>
<tr>
<td>G</td>
<td>3.19</td>
</tr>
</tbody>
</table>

SE = 0.16

abc P<0.05

Bergstrom et al., 2007
Effects of Biomin P.E.P. and Neoterra on growth performance of nursery pigs
(d 0 to 42 d after weaning)

<table>
<thead>
<tr>
<th></th>
<th>ADG, lb</th>
<th>Feed/gain</th>
</tr>
</thead>
<tbody>
<tr>
<td>Control</td>
<td>1.00</td>
<td>1.63</td>
</tr>
<tr>
<td>Biomin PEP</td>
<td>1.06</td>
<td>1.56</td>
</tr>
<tr>
<td>Neoterra</td>
<td>1.11</td>
<td>1.56</td>
</tr>
</tbody>
</table>

Sulabo et al., 2007
Effects of Natuzyme on growth performance of nursery pigs (all diets contained antibiotic) (d 0 to 35 d after weaning)

![Graph showing ADG, lb for Control, 0.84; Natuzyme, 0.91; Natuzyme, 0.87 with Quadratic P<0.04, SE = 0.03]

Bergstrom et al., 2007
Effects of arabinogalactan and antibiotics on growth performance of nursery pigs (d 0 to 28 d after weaning)

No interaction
Antibiotic P<0.05

Bergstrom et al., 2007
Effects of astaxanthin and antibiotics on growth performance of nursery pigs (d 0 to 28 d after weaning)

<table>
<thead>
<tr>
<th>Astaxanthin, ppm</th>
<th>ADG, lb</th>
</tr>
</thead>
<tbody>
<tr>
<td>Control</td>
<td>0.67</td>
</tr>
<tr>
<td>5</td>
<td>0.66</td>
</tr>
<tr>
<td>10</td>
<td>0.68</td>
</tr>
<tr>
<td>25</td>
<td>0.67</td>
</tr>
<tr>
<td>Antibiotic</td>
<td>0.75</td>
</tr>
</tbody>
</table>

Antibiotic P<0.05

Bergstrom et al., 2007
Effects of copper chloride and zinc oxide on growth performance of nursery pigs (d 0 to 14 after weaning)

![Graph showing the effects of copper chloride and zinc oxide on growth performance of nursery pigs.](image-url)

- **No CuCl**
- **CuCl, 150 ppm**

Shelton et al., 2008
Growing pig update
Effects of Increasing Dietary Lysine on ADG – 85 to 145 lb

Shelton et al., 2008
Effects of Increasing Dietary Lysine on F/G – 85 to 145 lb

Shelton et al., 2008
Effects of Increasing Dietary Lysine on $/lb Gain – 85 to 145 lb

Shelton et al., 2008
Effects of Increasing Dietary Lysine on MOF – 85 to 145 lb

Old Estimate

$\text{$/pig}$

TID,\% Total,\% Dietary Lysine

0.7 0.8 0.9 1.0 1.1 1.2

12.55 13.58 14.92 15.23 15.62 15.59

.80 .90 1.01 1.12 1.23 1.34

Shelton et al., 2008
Effects of Increasing Dietary Lysine on ADG – 185 to 245 lb

Shelton et al., 2008
Effects of Increasing Dietary Lysine on FG – 185 to 245 lb

Dietary Lysine

TID, %  Total, %  Old Estimate
0.54  0.62  3.07
0.61  0.69  2.96
0.68  0.77  2.89
0.75  0.85  2.73
0.82  0.92  2.69
0.89  1.00  2.58

Shelton et al., 2008
Effects of Increasing Dietary Lysine on $/lb gain – 185 to 245 lb

Shelton et al., 2008
Effects of Increasing Dietary Lysine on MOF – 185 to 245 lb

$\$/pig

Dietary Lysine

Shelton et al., 2008
Do we still recommend split sex feeding?

- Can you fill a room/barn (feed line) with less than 7 days of age spread of one sex?
  - If answer is no, you should minimize age spread rather than housing by sex.

- If split sex feeding, same diets can be used for both sexes with different feed budgets to account for higher F/G of barrows
With current SBM prices, low protein amino acid fortified diets are beginning to price in for some

<table>
<thead>
<tr>
<th>Ingredient</th>
<th>Price, $</th>
</tr>
</thead>
<tbody>
<tr>
<td>Corn</td>
<td>3.20</td>
</tr>
<tr>
<td>Soybean meal</td>
<td>280</td>
</tr>
<tr>
<td>L-Lysine</td>
<td>0.97</td>
</tr>
<tr>
<td>DL-Methionine</td>
<td>1.35</td>
</tr>
<tr>
<td>L-Threonine</td>
<td>1.15</td>
</tr>
</tbody>
</table>

Savings per pig with AA fortified diet, $ 0.46
Effects of glycerol and DDGS on growth performance of finishing pigs (70 to 217 lb)

Duttlinger et al., 2008
Influence of DDGS level on iodine value

Benz et al. 2007

Linear (P < .05)
Effect of DDGS and EESM on Jowl Fat Iodine Value

Benz et al. 2007
Impact of DDGS on iodine value

- Increase in IV for each 10% DDGS
  - Backfat 2.4 g/100 g
  - Jowl fat 1.6 g/100 g
  - Belly fat 3.0 g/100 g

Benz et al. 2007
Effects of DDGS on Percent Yield

Whitney et al., Univ. MN
<table>
<thead>
<tr>
<th>DDGS Value Calculator with no performance change</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Corn, $/bu</strong></td>
</tr>
<tr>
<td><strong>SBM, $/ton</strong></td>
</tr>
<tr>
<td><strong>Monocal, $/ton</strong></td>
</tr>
<tr>
<td><strong>Limestone, $/ton</strong></td>
</tr>
<tr>
<td><strong>Lysine HCl, $/lb</strong></td>
</tr>
<tr>
<td><strong>DDGS, $/ton</strong></td>
</tr>
<tr>
<td><strong>DDGS, %</strong></td>
</tr>
<tr>
<td><strong>Change in diet cost, $/ton</strong></td>
</tr>
<tr>
<td><strong>Approximate savings, $/pig</strong></td>
</tr>
<tr>
<td><strong>Breakeven price, $/ton</strong></td>
</tr>
</tbody>
</table>
### DDGS Value Calculator with Carcass Yield Impact

<table>
<thead>
<tr>
<th>Pig Carcass weight, lb</th>
<th>200.0</th>
</tr>
</thead>
<tbody>
<tr>
<td>Carcass price, $/cwt</td>
<td>$54.00</td>
</tr>
<tr>
<td>Yield reduction for each 10% DDGS</td>
<td>0.5%</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>DDGS, %</th>
<th>10%</th>
<th>20%</th>
<th>30%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Yield cost per pig</td>
<td>$0.54</td>
<td>$1.08</td>
<td>$1.62</td>
</tr>
<tr>
<td>Approximate savings, $/pig</td>
<td>$0.55</td>
<td>$0.68</td>
<td>$0.50</td>
</tr>
<tr>
<td>Breakeven price, $/ton</td>
<td>$158.47</td>
<td>$151.41</td>
<td>$145.60</td>
</tr>
</tbody>
</table>

**Calculator for determining the value of DDGS in your diets**

www.KsuSwine.org
Effect of DDGS withdrawal time on dressing percent

- Control
- 30% DDGS

<table>
<thead>
<tr>
<th>Withdrawal before market</th>
<th>Control</th>
<th>None</th>
<th>3 wk</th>
<th>6 wk</th>
</tr>
</thead>
<tbody>
<tr>
<td>Yield, %</td>
<td>77.1</td>
<td>75.9</td>
<td>76.5</td>
<td>77.1</td>
</tr>
</tbody>
</table>

JBS United, 2007
Effects of glycerol and soy oil on pelleting energy use

Glycerol > Soy oil > Blend P < 0.01

Groesbeck et al., 2008
Effects of glycerol and soy oil on pellet durability

Soy oil, quadratic $P < 0.01$, blend, linear $P < 0.01$

<table>
<thead>
<tr>
<th>Soy Oil, %</th>
<th>Glycerol, %</th>
<th>Soy/glycerol blend, %</th>
</tr>
</thead>
<tbody>
<tr>
<td>Control</td>
<td>92.60</td>
<td>85.40</td>
</tr>
<tr>
<td>3</td>
<td>81.60</td>
<td>80.30</td>
</tr>
<tr>
<td>6</td>
<td>58.30</td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>94.70</td>
<td></td>
</tr>
<tr>
<td>6</td>
<td>95.50</td>
<td></td>
</tr>
<tr>
<td>6</td>
<td></td>
<td></td>
</tr>
<tr>
<td>12</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Groesbeck et al., 2008
Effects of glycerol and soy oil on growth performance of growing pigs (25 to 55 lb)

Soy oil, quadratic P < 0.07, glycerol and blend linear P < 0.06

Groesbeck et al., 2008
Effects of glycerol and fat on growth performance of finishing pigs
(170 to 220 lb)

Duttlinger et al., 2008
Fresh Glycerol on arrival

Glycerol after 3 months in refrigerator
Marketing

KANSAS STATE UNIVERSITY

SWINE INDUSTRY DAY

2007

K-State
Watch Marketing Weights: Hormel $40/cwt

Diff from Optimal

Including Facility cost

Opportunity, $/pig

Weight, lb
Watch Marketing Weights: Farmland $40/cwt

Graph showing the relationship between weight (lb) and price ($/pig) for different scenarios:
- **Diff from Optimal**
- **Including Facility cost**

The graph indicates that the optimal weight for maximizing profit is around 290 lb, with a price of approximately $3/pig.
Watch Marketing Weights: Tyson $40/cwt
Watch Marketing Weights: Triumph $40/cwt

![Graph showing the relationship between weight and cost for Triumph marketing. The graph includes two curves: one for Loss on Tops and another for Including Facility cost. The x-axis represents weight in pounds, ranging from 230 to 330, while the y-axis represents cost per pig, ranging from $0 to $7.]
KSU Market Weight Tape

- Measure flank measurement on 30 pigs
- Average values to determine average weight of group
New Items

- 2007 Swine Industry Day
  - Swine Day Report available at: KSUSwine.org
- 2007 Swine Nutrition Guide
  - Latest recommendations, nursery pigs, grow-finish pigs, and the sow herd
### KSU Swine Farm New Building Plan

#### Pen Layout

<table>
<thead>
<tr>
<th>Pen 1</th>
<th>Pen 2</th>
<th>Pen 3</th>
<th>Pen 4</th>
<th>Pen 5</th>
<th>Pen 6</th>
<th>Pen 7</th>
<th>Pen 8</th>
<th>Pen 9</th>
<th>Pen 10</th>
<th>Pen 11</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pen 12</td>
<td>Pen 13</td>
<td>Pen 14</td>
<td>Pen 15</td>
<td>Pen 16</td>
<td>Pen 17</td>
<td>Pen 18</td>
<td>Pen 19</td>
<td>Pen 20</td>
<td>Pen 21</td>
<td>Pen 22</td>
</tr>
<tr>
<td>Pen 20</td>
<td>Pen 19</td>
<td>Pen 18</td>
<td>Pen 17</td>
<td>Pen 16</td>
<td>Pen 15</td>
<td>Pen 14</td>
<td>Pen 13</td>
<td>Pen 12</td>
<td>Pen 11</td>
<td></td>
</tr>
<tr>
<td>Pen 40</td>
<td>Pen 39</td>
<td>Pen 38</td>
<td>Pen 37</td>
<td>Pen 36</td>
<td>Pen 35</td>
<td>Pen 34</td>
<td>Pen 33</td>
<td>Pen 32</td>
<td>Pen 31</td>
<td></td>
</tr>
</tbody>
</table>

#### Feed Room

- Pen 1
- Pen 2
- Pen 3
- Pen 4
- Pen 5
- Pen 6
- Pen 7
- Pen 8
- Pen 9
- Pen 10

- Pen 20
- Pen 19
- Pen 18
- Pen 17
- Pen 16
- Pen 15
- Pen 14
- Pen 13
- Pen 12
- Pen 11

- Pen 40
- Pen 39
- Pen 38
- Pen 37
- Pen 36
- Pen 35
- Pen 34
- Pen 33
- Pen 32
- Pen 31
KSU Swine Farm New Building

- Research projects funded by Kansas Pork Association have helped establish initial funding for facility
  - Commitment of $250,000
  - An additional $200,000 has been pledged through producers, allied industry, graduate student alumni and the KSU Livestock and Meat Industry Council
- Estimated cost is $650,000
  - We need additional support from producers and allied industry to complete the project
Pork License Plates being sold by KSU Collegiate Cattlewomen
Thank you!

KANSAS STATE UNIVERSITY

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