Essentials for extensive swine production systems

Vermont Pig and Pork Field Day, August 26, 2013

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Michigan State University, East Lansing, United States

Essential #1 – Farm Goals

- Goals result in a chosen management
- Feral hog populations tell us that pigs do not need farmers!

Flash Grazing/Disrupting Plum Curculio

Plum Curculio Feeding Injury to Apples

Grazed Not Grazed

MSU Student Organic Farm

- Experiential Learning
- MSU Culinary Services
- Community Supported Agriculture
  - Local butchers
- Public
  - MSU Meats Lab

The State Room Restaurant

**P < 0.05


Niche Pork Chain through Harvest

- Market Access
- Earn a Living
  - Do I need to?
  - Do I want to?
  - Can I?

Essential #2 – Growth Management

- Variation in growth is acceptable
  - Nutrition
    - Use of pastures
    - Type, durability, palatability, nutritional value
    - Supplementation
    - By-products
      - Whey
  - Environment
  - Health
    - Parasite control

Growth Performance

<table>
<thead>
<tr>
<th></th>
<th>Average Market Weight, lb</th>
<th>Lifetime ADG, lb</th>
<th>Average Hot Carcass Weight, lb</th>
<th>Percent Yield</th>
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<tbody>
<tr>
<td>Group 1</td>
<td>215</td>
<td>0.64</td>
<td>136.7</td>
<td>63.6</td>
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<td>Group 2</td>
<td>222</td>
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<td>3.8</td>
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</table>
Nutrient Analysis of ‘Orchard’ Feedstuffs

<table>
<thead>
<tr>
<th>Protein</th>
<th>Taurine</th>
<th>Hydroxyproline</th>
<th>Aspartic Acid</th>
<th>Threonine</th>
<th>Serine</th>
<th>Glutamic Acid</th>
<th>Proline</th>
<th>Lanthionine</th>
<th>Glycine</th>
<th>Alanine</th>
<th>Cysteine</th>
<th>Valine</th>
<th>Methionine</th>
<th>Isoleucine</th>
<th>Leucine</th>
<th>Tyrosine</th>
<th>Phenylalanine</th>
<th>Hydroxylysine</th>
<th>Ornithine</th>
<th>Lysine</th>
<th>Histidine</th>
<th>Arginine</th>
<th>Tryptophan</th>
<th>Moisture</th>
<th>CP %</th>
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<tbody>
<tr>
<td>Apple Pulp Yellow</td>
<td>0.09</td>
<td>0.04</td>
<td>0.35</td>
<td>0.12</td>
<td>0.13</td>
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<td>0.16</td>
<td>0.17</td>
<td>0.04</td>
<td>0.17</td>
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<td>0.23</td>
<td>0.06</td>
<td>0.13</td>
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<td>0.21</td>
<td>0.07</td>
<td>0.07</td>
<td>0.37</td>
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<td>0.01</td>
<td>0.01</td>
<td>0.05</td>
<td>0.02</td>
<td>0.00</td>
<td>0.01</td>
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<td>0.02</td>
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<td>0.00</td>
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<td>0.06</td>
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<td>0.59</td>
<td>4.17</td>
<td>1.35</td>
<td>0.00</td>
<td>0.70</td>
<td>0.58</td>
<td>0.31</td>
<td>0.17</td>
<td>0.21</td>
<td>0.49</td>
<td>0.97</td>
<td>0.43</td>
<td>0.69</td>
<td>0.01</td>
<td>0.00</td>
<td>0.48</td>
<td>0.13</td>
<td>0.21</td>
<td>0.15</td>
<td>11.84</td>
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<td>HWC</td>
<td>0.07</td>
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<td>0.84</td>
<td>0.00</td>
<td>0.57</td>
<td>0.72</td>
<td>0.31</td>
<td>0.17</td>
<td>0.19</td>
<td>0.48</td>
<td>1.02</td>
<td>0.38</td>
<td>0.62</td>
<td>0.12</td>
<td>0.01</td>
<td>0.63</td>
<td>0.19</td>
<td>0.19</td>
<td>0.57</td>
<td>11.20</td>
<td></td>
</tr>
</tbody>
</table>

Classes

- New experiential learning opportunities for 9 classes
  - Natural Science, Philosophy, Integrative Studies in Arts and Humanities, Animal Science, Lyman Briggs, and Community, Agriculture, Recreation and Resource Studies
  - Over 300 students

Year 1 - 2009

- Five crossbred barrows
  - Moved from MSU Swine Farm to MSU Student Organic Farm at 110 kg
  - Mid-September
    - 42 days
  - Supplemented with a corn-soybean meal diet
    - 2.72 kg/d for 32 d
    - 4.0 kg/d for 10 d

Year 1 Outcomes

- Growth
  - ADG of 0.62 kg/d gain
- Grazing activity increased slowly over the first 7 to 10 d
- Plant material consumption was about 9.2 kg/d (wet weight)
- At harvest there was no indication of parasite infection

Year 2 - 2010

- 12 Yorkshire x Duroc barrows
  - Born - raised to 22.7 kg live wt at the MSU Swine Farm
  - Moved to the MSU Student Organic Farm May 2010
  - Impact on future crops
    - Flash grazing study
    - Randomized plot design
Year 2 Outcomes

- Growth
  - ADG 0.74 kg/d
- Supplement with a complete feed
- Rotated through 7 fields of clover, rye, post-harvest brassicas, and fallow plots
- Flash grazing of swine in 2010, increased sweet corn yields in 2011 by 35%


Year 3 Outcomes

- Achieved Organic Certification of pork
- Growth Wean-to-Finish
  - ADG 0.73 ± 0.10 kg
  - ADFI 2.1 kg
  - F:G 3:1
  - Self-feeder
- An ethogram was derived from behavioral observations made from weaning to harvest


Carney, Stephen, Allison Bunting, Laurie Thorp, Dale Rozeboom. 2011. Behavioral indicators used to assess the welfare of piglets raised on a rotational pasture. Summer Research Opportunities Program (SROP), Michigan State University.

Year 4 Outcomes

- Growth
  - 100 kg at 150 d of age
- 26 head is too many for SOF operation
  - 12 head flash-grazed
  - 16 head reared in dry lot, with self-feeder
- Marketing challenges

Year 5 Outcomes

Management Solutions

Essential #3 – Reproduction
Body condition scores

1  2  3  4  5
<table>
<thead>
<tr>
<th>Ingredient</th>
<th>Gestation</th>
<th>Lactation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Corn</td>
<td>1380</td>
<td>1311.2</td>
</tr>
<tr>
<td>Soybean meal 48%</td>
<td>270.2</td>
<td>536</td>
</tr>
<tr>
<td>Wheat bran</td>
<td>200</td>
<td>-</td>
</tr>
<tr>
<td>Choice white grease</td>
<td>60</td>
<td>60</td>
</tr>
<tr>
<td>Limestone</td>
<td>13.3</td>
<td>10.4</td>
</tr>
<tr>
<td>Ca Phos Monocal 21%</td>
<td>38.5</td>
<td>42.4</td>
</tr>
<tr>
<td>White salt</td>
<td>10</td>
<td>10</td>
</tr>
<tr>
<td>Vitamin Premix</td>
<td>12</td>
<td>12</td>
</tr>
<tr>
<td>Trace Mineral Premix</td>
<td>10</td>
<td>10</td>
</tr>
<tr>
<td>Sow pack</td>
<td>6</td>
<td>6</td>
</tr>
<tr>
<td>Total</td>
<td>2000</td>
<td>2000</td>
</tr>
</tbody>
</table>

Calculated analysis

- Lysine, %: 0.65 (Gestation) vs. 1.0 (Lactation)
- Calcium, %: 0.9 (Gestation) vs. 0.9 (Lactation)
- Total phosphorus, %: 0.8 (Gestation) vs. 0.8 (Lactation)

**Red line = 4 # CSBM / d; 25 MJ**

**Shaded area = 4.8# CSBM = 30 MJ**

**Shaded area = 3.2# CSBM = 20 MJ**

**Pregnancy**

- About 15 to 20 lb of CSBM diet

**Overfeeding in gestation**

- Cost – too much feed for excessively fat sows
- Constipation – dystocia, ↓ feed intake
- MMA (Mastitis, metritis, agalactia)
- Fat sow syndrome
  - Laid-ons
  - Stillbirths
- Decrease lactational feed intake
- Decreased longevity - more feet and leg problems, too much weight

**Underfeeding in gestation**

- Low birth weights
- Poor milk production
  - Small amounts of body tissue reserves; sows with more than 9 pigs always use body stores to produce milk
- Delayed return-to-estrus (rte) – thin sow syndrome
- Parity 2 slump – decrease NBA in second litter
- Decreased longevity – no body reserves, in catabolic state too long, inability to withstand repeated reproductive cycles
Total feed (lb. CSBM) to meet maintenance needs of pregnant sow under cold stress

<table>
<thead>
<tr>
<th>Sow body weight, lb.</th>
<th>EET, Fº</th>
<th>250</th>
<th>275</th>
<th>300</th>
<th>325</th>
<th>350</th>
<th>375</th>
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<tbody>
<tr>
<td>65</td>
<td>3.41</td>
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<td>50</td>
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<tr>
<td>40</td>
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<tr>
<td>30</td>
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<td>5.68</td>
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<td>6.32</td>
<td>6.63</td>
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<tr>
<td>20</td>
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<td>6.99</td>
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</tr>
<tr>
<td>10</td>
<td>6.46</td>
<td>6.87</td>
<td>7.27</td>
<td>7.67</td>
<td>8.05</td>
<td>8.44</td>
<td></td>
</tr>
</tbody>
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Year 3 - 2011
- 2 P3
  - Moved mid-gestation
- Pursue “Organic”
- 18 Berkshire x Yorkshire
- Behavioral observation from weaning to harvest

Year 4 - 2012
- 3 P1
  - 50% Berkshire
- Offspring
  - 26 head
- Added Livestock Manager position
  - 2 days per week
- Determine maximum production capability

Year 5 – 2013
- 2 P1 females
  - ¾ Berkshire
  - Bred to Duroc
  - Litter sizes 4, 5

Signs of farrowing
- Nervousness
- Nesting behavior
- Frequent urination
- Presence of milk (18 to 24 hrs before farrowing)
- Final stages
  - lie down
  - quiet state
- Increased respiration rate
- Increased temperature
  - 38.7º C or 101.6º F is normal during gestation
  - 39.0º C or 102.2º F day before farrowing
  - 40.0º C or 104.0º F day after farrowing
  - 39.3º C or 102.7º F during lactation
- If 40.5º C or 105.0º F or greater during lactation – indication of infection, will also be “off feed”, sow will lose some or all of her milking ability, pigs should be “cross-fostered”
Lactating sow nutrition

Three most important feeding management concerns for sows in lactation:
  - Quick recovery to full health
  - Rapid increase in appetite
  - Sustained appetite

Goal - to maximize feed intake and minimize body tissue loss
  - Highly productive sows cannot eat enough feed to maintain body condition and make milk for litter, so they catabolize body tissue stores

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Calculated analysis

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- Calcium, %: 0.9 (gestation) - 0.9 (lactation)
- Total phosphorus, %: 0.8 (gestation) - 0.8 (lactation)

Method of spread

- Direct contact
- Fomites (non-living objects)
  - Feed bags
  - Coveralls
  - Boots
- Aerosol
- Food and water
- Insects and vermin

Biosecurity

- Procedures for visitors & staff:
  - Site - location
  - "24 to 48 hour rule"
  - Clean clothing
    - All apparel is provided
  - Clean vehicles hauling pigs, feed, mortality, and equipment
  - Sound mortality program
  - Birds and rodents
  - No pets brought to unit
Veterinarian

- Effective (prompt, solution providing, cost benefit) relationship
  - Slaughter checks
  - Parasite checks
  - Post-mortem exams
  - Serology
  - Tissue cultures
  - Histopathology
  - PCR

Establish vaccination program

- Herd Health Calendar
  - Breeding animals
    - Parvovirus, leptospirosis, erysipelas
  - Growing pigs
    - Must: Erysipelas and rhinitis
    - Maybe: Mycoplasmal and actinobacillus pneumonias, e. coli, cl. perfringens, rotavirus, salmonellosis

Diseases of breeding herd

- Most cause decrease farrowing rates, abortions, immunity builds with consistent exposure of breeding herd, gilts can be problems
- Lactation failure – Mastitis, Metritis, Agalactia (MMA)
- PRRS - porcine reproductive and respiratory syndrome - mortality 15%, morbidity 70%, present in 80% of US herds, sows experience abortions, reabsorption (late repeats), several strains, vaccines give variable results, expose gilts
- Lameness
- PRV - pseudorabies herpesvirus - US eradication in commercial production; feral swine

Diseases of neonates

- Scours - fever, dehydration, loss of appetite, and weight loss.
  - E. coli –sudden onset, 1 to 35 d of age, vaccinate, no loss of appetite.
  - TGE (transmissible gastroenteritis virus) – no vaccine, pig to pig spread, green watery smelly feces, vomiting, 1 to 7 d of age, all ages if no immunity, "feed back"
  - Rotavirus – creamy to yellow feces, 1 to 35 d of age, vaccinate
  - Clostridium perfringens type C – watery bloody feces, 1 to 21 d of age, sudden death
  - Salmonellosis – white to brown feces, may contain blood, sudden death in 70 to 180 days of age
  - Swine dysentery - white to brown feces, may contain blood, little or no death loss, 70 to 180 d of age
  - Anemia - iron injections, fast growing piglets
  - PRV - fever and death, nearly 100%

Essential #5 – Protect Environment
History Repeats Itself