Alternative swine housing and production: Lessons from Iowa and beyond

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Pig Environment

What does a pig need to grow well?

• Temperature control
• Fresh air (ventilation)
• Space
• Water
• Feed
Late 1980’s, early 1990’s

Concentration and Specialization
- Lack of accessible capital
- Environmental concerns
- Lifestyle choices

→→→ small-to-medium producers seeking options for raising pigs
Hoop Barns

Polyvinyl tarp
Hoop frame
Ratchet tie-downs (See figure 10 for detail)
Treated posts
Treated boards
Treated tongue and groove 2" lumber
Arrangement of bedded barn for growing pigs

- Walls built in 6 ft sections
- Typical for Iowa = 84 ft long, 30 ft wide
- 18-24 inches raised concrete pad for feed & water
- 150-200 pigs/barn (12-18 ft²/pig)
122°F in areas of composting bedding pack
Greenhouses for Pigs

Variation of hoop barn
Cover is transparent material
Include thermal mass to store heat
Greenhouse/Hoop Alternatives

Benefits...
- HUGE building cost savings (33-50%/pig)
- Flexible floor plan, multiple use building
- Energy use largely eliminated
- Pleasant work conditions

Negatives...
- Pigs eat 3-5% more feed
- Requires bedding
  ~ 200-275 lb/pig
Nursery pig performance

Dec 1999 - Aug 2000
18-22 d weaning
1440 pigs, 12 pens

Hot nursery versus
6 x 10.8 m mini hoops
Week 1-2:
Hoops grew slower
consumed more feed
Week 3-5:
Similar Average daily gain, feed intake, gain to feed ratio
Wk1-5, all seasons: Hoops equal or better feed efficiency
21 d pigs in hoops
Thermal challenge in winter and spring
Clear advantage in summer
Refinement potential
Extended lactation
Finishing Pig Performance

8 seasonal trials, summer and winter
3, 30 x 60 ft hoops vs. confinement finisher
Entered at 35 lb, marketed at 260 lb
Identical diets, *ad libitum*
Summer: hoop pigs had greater average daily gain similar gain-to-feed ratio for both treatments
Winter: similar average daily gain for both treatments hoop pigs less efficient gain
Finishing Pig Performance

- Performance in hoops more variable by season but within normal range
- Finishing pigs in hoop barns perform similar to finishing pigs in confinement systems
- Trading feed for concrete/capital
Hoop barns and meat quality:
Carcass characteristics of hoop vs confinement pigs

• Similar carcass composition and fresh pork quality
• Similar loin muscle area and backfat firmness for both treatments
• Hoop pigs: more efficient lean gain
• Confinement pigs: increased marbling of loin
Obstacles

Bedding management
  Equipment needs different
  Composting ↓ volume
  Re-integrating crops and livestock

Labor and management is different, not necessarily more or less, but different
Pigs on Pasture

- Well drained soil
- Shade and lots of space
- Move the pigs regularly
- A pig is not a cow!
  - Forages poorly utilized by growing pigs
  - Young legume pasture best
  - Historic source of vitamins
Pig Housing Options

Pigs are highly adaptable
No one RIGHT answer
Optimal performance =
  best combination of trade-offs for your situation

Bedding and 3-5% more feed vs
  50-70% more capital and energy inputs
The Gestating Sow

Extremely robust and adaptable animal
Need housing that allows us to
1. Control body condition
2. Detect open sows and rebreed or cull easily
3. Keep sows comfortable (not difficult)
Gestation Housing

- Sows spend 85% of life in gestation
- 64% of US herd kept in stalls
- Alternatives are being sought
  - Capital cost
  - Performance
  - Worker environment
  - Customer preference... many niche markets prohibit gestation stalls
Gestation Comparison

Crated Gestation

Hoop Gestation
Gestation Comparison

Individual Crates

Hoop gestation

957 litters: bi-weekly farrowing
2.5 year study completed Nov 2004
Gilts added at second parity
2.04 kg/day corn-soy, 2.72 kg/day last trimester
Gestation Comparison

- Hoop system = more pigs born alive
- Similar pre-wean mortality rates
- Hoop barn costs 1/3 as much as cratered gestation
- 1 ton/bedding/sow space
Feeding Stalls are Key

• 2 ft × 7 ft individual pen for sows
• Lock sows in at feeding
• Feed and check sows, release
Controlling Body Condition

• Sow needs 4-8 lb of corn-soybean meal/day

• Sow would like to eat 12-20 lb of feed/day

• Most alternative pig farms have gestating sows that are over-fat...
Over-conditioned sows are very expensive!

• Fewer pigs born
• Increased farrowing difficulty
• Reduced milk production when nursing
• Higher piglet mortality due to crushing
• Increased difficulty in re-breeding
• Not to mention the added feed cost...
Controlling Sow Body Condition

Limit feed intake

1. Feed sows in small groups (1-3)
2. Feed large groups of sows many (>5) very small meals/day
3. Feed very high fiber diets... high fiber = low energy, pig feels full without becoming fat
4. Use feeding stalls
Farrowing Pigs

• Balancing needs...
Farrowing Pigs
Farrowing Options

• Some markets prohibit farrowing crates... *Does yours?*
• Piglet mortality is higher without crates... 12-25%
• Alternatives require bedding
• Need to be careful with heat lamps and bedding = fire risk
Sows on Pasture

• Sow best animal for pasture
• Dry, sandy soil best for pigs
• Movable electric fencing for flexibility
• Keep moving pigs to avoid rooting and bare soil
• 1 hut/sow, move hut between farrowings
Pasture Farrowing
Farrowing Huts

• 7 × 7 ft metal structures
• Commonly used on pasture
• Brought inside during cold months
Summer Farrowing:

- Pastures work great!
- Protect young pigs from crushing
- Dry, sandy soil works best
- Move huts between groups
Farrowing Pigs

May-October... pastures work great in Iowa
Historically, seasonal pig production

Consumers want to buy pork year-round
Winter farrowing outside possible
Most farms farrow indoors during winter
Farrowing Pens

8 × 8 ft pen
Includes escape area for pigs
- **Entry**
- **Alley**
- **Creep area for pigs**
- **Sow feeding area**
- **Gate**
- **Windows**
- **Exterior walls, sliding door for manure removal and straw bale entry**
- **Water source and drain**
- **Interior doors and gates, edge of feeding platform**
- **Individual 6' x 8' temporary farrowing boxes, with closeable door above 1.25' threshold, inclusive of roller topping**
Group Lactation
2-3 wks post farrowing
Stalls removed

5–7 day max.
age spread/room
Farrowing Huts

Confined Space

Smaller space = less air to heat
Modified Crates
Modified Farrowing Crates
Winter Farrowing:

- Preferred bedded alternative not identified
- Protect young pigs from crushing
- Warm pigs without fire hazard
- Wood chips, bio-deck
At weaning, pigs often stay in warm barn, sows removed
Alternative Systems for Farrowing in Cold Weather

• Primary heat source to maintain room temperature ~50°F
• Warmer microclimate for young pigs
• Minimize draft
• Adequate space and bedding use
• Tight breeding schedule – group farrowing, lactation
Desirable Pig Production Model

• Profitable
• Quality pork
• Environmentally sound
• Positive quality of life—a system people want to work in and live near
Hoop-based production model

Breeding and Gestation:
Deep-bedded hoop barn with individual feeding stalls

Farrowing and Early Lactation:
Insulated, thermally controlled farrowing rooms with crates

Late Lactation, Weaning, and Finishing:
Group lactation in deep-bedded hoop barn with portable warm creep areas
Growing pigs remain in same hoop until market

Sows return to breeding/gestation
Key features of system

- Limited time in farrowing crates
  - Facility costs ~6 times hoop nursery
  - Rapid turnover of capital intense segment
- Extended lactation
  - Simplified diets
  - Reduced thermal stress
Key features of system

• Portable, warm creep areas
  ➢ Regulate temperature, reduced draft

• Adequate, high-quality bedding supplies
  ➢ Regulate temperature
  ➢ Enriched environment ➔ reduced stress
Obstacles

Bedding management
  Equipment needs different
  Composting ↓ volume
  Re-integrating crops and livestock

Labor and management is different, not necessarily more or less, but different
Pig Environment

What does a pig need to grow well?

- Temperature control
- Fresh air (ventilation)
- Space
- Water
- Feed
Figure 1. Thermal climate for growing pigs with access to bedding
Airflow and flooring matter!

<table>
<thead>
<tr>
<th>Situation</th>
<th>Ideal Temperature</th>
</tr>
</thead>
<tbody>
<tr>
<td>With bedding, no draft</td>
<td>60°F</td>
</tr>
<tr>
<td>With bedding, moderate draft</td>
<td>68°F</td>
</tr>
<tr>
<td>Wet floor, no draft</td>
<td>90°F</td>
</tr>
<tr>
<td>Wet floor, moderate draft</td>
<td>100°F</td>
</tr>
</tbody>
</table>

During winter...
provide pigs with dry and draft free conditions.
Bedding

• Less heat input is needed with bedding
• Pigs nestle into bedding like a blanket
• Bedding absorbs urine = dry surface
• Bedding + manure decomposes = produces heat

Bedding rate depends on the material...

1 lb of bedding : 1 lb of body weight gain
Well managed barns

• Pigs kept warm and dry
• Air quality good
• Pigs grow well

• The question is which type of barn allows you to meet the above requirements most effectively?
Types of Barns

Mechanical ventilation = air moved through the use of fans and heaters
Natural ventilation = air moved through adjustable and fixed openings... windows, doors, chimneys, ridge vents

1. Cold barns = indoor temps 1-2°C above outdoors
2. Modified = heaters and insulation to keep warmer
Ventilation for Pig Barns

1. Maintain air quality
2. Remove moisture from air in winter
3. Reduce heat stress in pigs during hot weather
Things to look for...

- Walls and ceiling of buildings should not be dripping wet
- Pigs should not be coughing
- Pigs should not have runny discharge from eyes
- You should not have headache after walking through pig barn
Rule of thumb

If you walk into a room of young pigs (≤65 lb) and you are not comfortable in a t-shirt:

The pigs are probably cold

...unless pig has bedding and/or supplemental heat.
Supplemental Heating
Heating Pads
Supplemental Heating

- 250 W infrared light bulbs
  NOT energy efficient/
  Compact Fluorescent...
- Confined space
Space

• Area for daily activities... resting, socializing, defecating, et cetera

• Space for feeders and waterers

• Room for workers to work
Space for pigs in alternative systems

<table>
<thead>
<tr>
<th>Pig Size</th>
<th>Minimum floor area (ft²/pig)</th>
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<tbody>
<tr>
<td>Sow and litter</td>
<td>48</td>
</tr>
<tr>
<td>&lt; 65 lb</td>
<td>3.2</td>
</tr>
<tr>
<td>&lt; 200 lb</td>
<td>8.0</td>
</tr>
<tr>
<td>225 lb</td>
<td>11.0</td>
</tr>
<tr>
<td>Breeding sow</td>
<td>21–32</td>
</tr>
<tr>
<td>Breeding boar</td>
<td>80–110</td>
</tr>
</tbody>
</table>

*Based on Animal Welfare Approved Standards, Fall 2011*

- When pigs are standing, 50% floor area visible
- When pigs are lying down 33% floor area visible
### Ventilation Rates for Mechanically Ventilated Barns

<table>
<thead>
<tr>
<th>Type of pig</th>
<th>Cold Weather Ventilation Rate*</th>
<th>Hot weather ventilation Rate</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sow and litter</td>
<td>20 cfm/sow</td>
<td>50 cfm/sow</td>
</tr>
<tr>
<td>35–65 lb pig</td>
<td>2 cfm/pig</td>
<td>35 cfm/pig</td>
</tr>
<tr>
<td>65-132 lb pig</td>
<td>7 cfm/pig</td>
<td>74 cfm/pig</td>
</tr>
<tr>
<td>132–200 lb pig</td>
<td>10 cfm/pig</td>
<td>120 cfm/pig</td>
</tr>
<tr>
<td>330 lb sow</td>
<td>12 cfm/sow</td>
<td>148 cfm/sow</td>
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*cfm = cubic feet per minute

If unvented heaters are used to heat barns, provide additional 2.5 cfm airflow per 1,000 BTU's
Pigs and Hot Summer Months

Pigs do not have sweat glands
Seek out mud and water to cool body
To keep pigs cool

Increase airflow
Periodically spray with water...
1 minute on 10 minutes off
Limit spraying if airflow is limited
Air Requirements

• Normal air = 78% Nitrogen, 21% Oxygen, 0.03% Carbon Dioxide, ≥1% Other…

• Breathing ↑ CO₂, ↓ Oxygen

• Urine and feces release gases...

• To keep pigs healthy and growing well we must keep air quality high