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Mark S. Honeyman
Iowa State University, honeyman@iastate.edu

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Keywords
Hoops and alternative livestock systems

Disciplines
Agriculture | Animal Sciences | Bioresource and Agricultural Engineering

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Abstract: Many Iowa hog farmers are interested in alternative systems for producing pigs. This project demonstrated an approach to profitable pork production designed to be compatible with the pigs’ natural behaviors. It has been used successfully in Sweden, and was transplanted to Iowa with generally favorable results.

Background

Swedish hog farmers must operate under restrictive animal welfare laws as well as a rigid ban on the use of subtherapeutic antibiotics. In response, they have developed a management-intensive system of pig production based on straw, the pigs’ natural behavior, group housing dynamics, and keen husbandry skills. The results have been positive: the pigs perform well, the housing is simple and versatile, and farrowing and gestation crates are not used.

This system is called “Västgötmodellen” after the region in western Sweden where it was devised in the 1980s. Today the system is used successfully on approximately 100 Swedish farms to produce 50- to 60-pound feeder pigs for feeding in more conventional European-style finishing units. One version of the system features deep-bedding, group-housed gestating sows, farrowing cubicles, and group lactation.

This deep-bedded Swedish system has been successful in a northern climate and represents a dramatic contrast to conventional U.S. swine production. But what are the possible applications to Midwestern agriculture? This project sought to

- demonstrate the deep-bedded Swedish system in Iowa, and
- identify key factors of the Swedish system which are critical to its success when practiced under U.S. conditions.

Approach and methods

The Iowa demonstration used the Swedish system known as the Thorstensson version of Västgötmodellen where the producer must keep exact records of breeding. Sows are housed in groups in deep straw during breeding and gestation. Sows are fed daily in individual feeding stalls with rear gates that the farmer closes after the sows have entered the stalls and front access gates that open into the feeding alleys. These stalls offer the advantages of individual feeding, control of the sow for vaccinations and artificial insemination, and easy sorting of sows. Group housing stimulates estrus and reduces stress on the sows, who prefer group living. Fighting is minimized by using feeding stalls and introducing new sows to the groups at optimum times, such as at farrowing. Conception rates are high, sow longevity is increased, sow mortality rates are low, and sow culling rates are low.

Pregnant sows are moved from the gestation area to a lactation room as a group. Pregnant gilts are added to the group at this time. Temporary farrowing cubicles are set up in the lactation room. The cubicles are removed when the pigs are 14 days old.

The large, quiet lactation rooms have solid concrete floors, a large access door for delivering straw and removing manure, automatic waterers, and a raised feeding platform. Generally no supplemental heat is provided in these rooms because animal heat, bedding
pack heat, and the straw bedding provide a good environment for the pigs. The two-to five-week old pigs occupy the lactation rooms with the sows. During that time, the sows are allowed free access to feed and water and pigs begin consuming feed alongside the sows. Pig mortality is low, around 6 percent. Straw is usually added daily when the pigs are inspected. The ages of pigs within the group varies by only three to five days and the quiet room allows for good sow-pig communication. Sow lactation problems (e.g., mastitis, metritis, and agalactia) are almost nonexistent, probably because the sow has plenty of exercise, consumes some straw as a fiber source, and has lowered stress levels. The sows’ high feed intake and milk output promote rapid pig growth.

At five or six weeks, the pigs are weaned by moving the pigs back to the breeding/gestation area. Weaning stress is minimized by removing the sows rather than the pigs. The piglets are fed in the lactation rooms as a group until they reach about 55 pounds or 14 weeks of age, when they are moved to a finishing unit, usually at a different location.

Results and discussion

The demonstration was located at the ISU Armstrong Research and Demonstration Farm near Lewis in southern Iowa. The area experiences extremes in summer heat and humidity and provided a good test of how heat affects animals in the system.

Breeding and gestation phase swine are housed in a hooped structure, 37 ft. by 70 ft., erected by farm staff in autumn 1995. The floor plan followed the Swedish concepts of lockable feeding stalls with front access doors, a feeding and service alley, a deep-bedded area for the group-housed sows, bedded boar pens nearby, and pen partitions that could be raised or lowered to match the height of the bedding pack. The feeding stall and waterers were placed on an 18-in. concrete platform. A wooden observation deck was built along the outside of the north end of the structure to accommodate visitors. All floor areas of the hooped structure were concrete. Large, round bales of cornstalks were used for bedding. Swedish bedded space guidelines of 27 sq. ft. per gestating sow were followed. The structure is naturally ventilated and drippers for cooling were installed over the feeding stalls.

Hogs were placed in the gestation unit in March 1996 and bred using natural service and artificial insemination (AI) in May 1996. A second group of hogs arrived in June 1996 with breeding taking place two months later.

The breeding/gestation unit worked well. The big, round cornstalk bales were easy to use and were unraveled by the gilts into absorbent bedding. During the mild summer of 1996, ventilation and sow comfort were adequate at all times and the sows appeared quiet and content.

An existing 1950s style hog house (32 ft. by 48 ft.) was retrofitted for farrowing and nursery use in summer 1996. Insulation was added and Swedish guidelines were followed by installing a “breathable” ceiling for the air inlet and variable speed exhaust fans. The Swedish system employs this style of ventilation system to minimize drafts and noise in the lactation room. The existing cement floor was used as the original building was in good shape. Twelve farrowing cubicles, 6 ft. by 8 ft., were built of plywood and the openings equipped with 3 in. PVC rollers (placed 15 to 16 in. above the floor) to help keep the piglets in their cubicles. The entire room was bedded with oat straw.

Overall, the Swedish feeder pig production system worked well. Conception rate was excellent, above 95 percent. The hoop struc-
ture with cornstalk bedding and individual lockable feeding stalls provided an excellent environment for the sows, combining the best aspects of group housing with individual management opportunities. At the daily feeding, the group-housed sows were easily managed as individuals for A.I., pregnancy checking, vaccination, etc. Also, the sows did not fight for feed.

Performance of the sows in the remodeled building used for farrowing and lactation is shown in Table 1. Average number of pigs born alive per litter and average birth weight were excellent. The farrowing interval was acceptable. A short farrowing interval is critical for group lactation to succeed. Large litters of heavy pigs born in a short time reflect an excellent breeding and gestation environment in the hoop structure.

The weakest part of the overall system was farrowing, particularly pre-wean mortality which ranged from 18 to 24 percent, which is about double the industry standards. Most of the piglet deaths occurred in the first few days after birth. The sows proved to be better mothers in the second parity.

Weaning occurred at about 4.5 weeks of age. An average of 8.5 pigs per litter were weaned and weaning weights ranged from 17 to 28 lb. per pig. Heavier weights were found in the second parity and with longer lactation.

After weaning, the sows were removed and the pigs spent about 30 days in the deep-bedded lactation room which became a nursery. No subtherapeutic doses of antibiotics were used in the nursery phase and pig health was excellent. Death loss in the nursery was less than .5 percent.

Nursery pig performance is detailed in Table 2. The pigs were removed from the nursery and sold at about two months of age. The average selling weight was 51 to 61 lb., reflecting an average daily gain (ADG) of 1.6 lb./day to 1.35 lb./day.

Conclusions

This demonstration successfully showed a viable alternative method of swine production for Iowa—breeding, gestation, farrowing, and nursery. The deep-bedded Swedish system is

| Table 1. Farrowing phase results (deep-bedded) of a Swedish system. |
|----------------------|--------|--------|--------|--------|
|                      | Group  |        |        |        |
| No. of litters       | A-1    | 14     | 14     | 11     | 13     |
| Farrowing rate, (%)  | A-1    | 100    | 93     | 100    | 100    |
| No. pigs born alive  | A-1    | 149    | 134    | 136    | 130    |
| No. pigs born alive/litter (ave.) | A-1    | 10.6   | 9.6    | 12.4   | 10.0   |
| Ave. birth weight (lb.) | A-1    | 3.5    | 3.8    | 3.8    | 4.4    |
| No. pigs weaned      | A-1    | 113    | 105    | 111    | 106    |
| No. pigs weaned/litter (ave.) | A-1    | 8.1    | 7.5    | 10.1   | 8.2    |
| Ave. weaning weight (lb.) | A-1    | 17.4   | 18.4   | 26.0   | 28.0   |
| Ave. age at weaning (days) | A-1    | 31.8   | 29.3   | 35.0   | 32.0   |
| No. pigs weaned/born alive (%) | A-1    | 75.8   | 78.4   | 81.6   | 81.5   |
| Farrowing interval (days) | A-1    | 13     | 7      | 5      | 7      |
| Parity               | A-1    | 1      | 1      | 2      | 2      |
Table 2. Nursery phase performance (deep-bedded) of a Swedish system.

<table>
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<th>B-1</th>
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<td>18.4</td>
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<td>Ave. selling age (days)</td>
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<td>59</td>
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<tr>
<td>Ave. selling wt. (lb.)</td>
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<td>Ave. nursery ADG (lb/day)</td>
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<td>1.25</td>
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<td>1.27</td>
</tr>
</tbody>
</table>

a dramatic contrast to conventional confinement practices which are the subject of current controversy in Iowa. This demonstration showcased an alternative system that generated ideas and hope for many small- and medium-sized Midwestern hog producers.

The major conclusions reached from this project were:

- Hoop structures work well for breeding and gestating sows. Innovations included feeding stalls, deep bedding using large, round bales of cornstalks, group-housed sows, and the hoop structure. The hoop structure for sows was one of the first in the United States and attracted considerable attention.
- Pre-wean pig losses in this system were high and need further evaluation.
- Group lactation worked well in the deep-bedded room. Pig growth was good and mortality low.
- The deep-bedded nursery performed very credibly. The pigs grew extremely well without antibiotics.
- The overall system worked well in all seasons except hot, humid weather during farrowing.
- The system, which generates solid manure, was environment-friendly; i.e. low odor, no toxic gases, no liquid manure.
- The system was people-friendly; i.e., pleasant working conditions, high management skills, and low labor requirements.
- The system is generally pig-friendly; i.e., pigs were healthy, did not show signs of stress, grew rapidly, and had high reproductive performance. The sole exception was the high pre-wean mortality rate.

Education and outreach

In addition to being presented to six ISU swine management classes over three years, the demonstration farm was a popular tour site for numerous hog production groups. Two field days drew nearly 2,000 visitors to the Armstrong Farm. Media coverage came from Iowa Pork Today and included a KCCI-TV (Des Moines) and KMTV (Omaha) news feature called “Born Free.”

The outreach component of the project proved to be more extensive than originally planned. At least 4,000 people have seen the demonstration or viewed slides of it. Many more saw the TV coverage, read popular articles, or requested information. More than 300 descriptions of the demonstration and other alternative swine production practices were sent to interested individuals.

For more information, contact Mark Honeyman, Animal Science, Iowa State University, Ames, Iowa 50011; (515) 294-4621; email honeyman@iastate.edu.