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# Comparison of Alternative Winter Farrowing Techniques on Four Niman Ranch Cooperating Farms in Southern Minnesota

**A.S. Leaflet R2155**

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### Summary and Implications

Research of winter farrowing techniques on four farms was conducted over two winters (2002 and 2003) for this project. All four farmers sell to Niman Ranch Pork Company of Thornton, IA. Niman Ranch Pork Company is endorsed by the Animal Welfare Institute and uses that fact in their marketing campaign. The Animal Welfare Institute has formed an acceptable protocol for pig husbandry that they endorse and Niman Ranch requires.

The biggest practical requirement of this protocol is that farrowing crates are not allowed. The entire standard can be found at www.awionline.org/farm/standards/pigs.htm. Another challenging standard for Niman Ranch producers is raising pigs without antibiotics. This project was completed to determine if farrowing under these conditions could compete with conventional farrowing's productivity. This project was the creative component for a Master of Agriculture project.

The four farms were located in southeast Minnesota and used older existing buildings that were converted for farrowing. Three farms used dairy barns and one farm used a grower building. During the winters of 2001–2002 and 2002–2003, the four farms averaged 11.0 pigs born live per litter and 8.8 pigs weaned per litter. These values compare favorably with U.S. and Minnesota averages. Temperature in the barns during farrowing was about 49°F compared with an average outdoor temperature of 14°F. The use of bedding and zone heat allowed the piglets to be comfortable at the temperatures below the piglets' lower critical temperature. Energy use per litter varied greatly by farm depending on insulation and ventilation.

### Introduction

This report is an excerpt of the creative component. Swine farmers interested in enrolling in the growing niche markets for alternative-reared pigs must usually farrow during the winter. The niche markets have a shortage of winter-born pigs because it is the most difficult time to meet the standards of no farrowing crates, use of bedding and no antibiotics. The purpose of this study was document alternative winter farrowing on four farms in southern Minnesota. Data were collected for performance (number born alive, number weaned) and energy use.

### Materials and Methods

An examination of each farm's facilities and management techniques follows. Producer A's farm near Austin, Minnesota is an old traditional 40 ft. × 60 ft. barn that had a 2 in. thick coating of urethane sprayed on all walls making a very "tight" barn. Ventilation is accomplished by two 12 in. × 12 in. doors into the second level hay mow. An exhaust fan is also set to come on if the natural ventilation does not keep the temp below 50 degrees. The farm currently uses portable 6 ft. × 7 ft. A-frames that replaced Swedish-style boxes within large rooms. No heated creep areas or supplemental heat were provided. Temperatures and relative humidity were monitored during the winter of 2002–2003 inside and outside the A-frames.

Producer B's farm near Rushford, Minnesota used a 100 year-old 36 ft. × 90 ft. dairy barn with 18 in. thick stone walls. Some areas of the barn have dirt floors. A temporary wall of straw bales was constructed to give a farrowing area of 35 ft. × 45 ft. No additional ventilation was done in this barn because of numerous cracks and holes in the walls. Too much "natural" ventilation is a continual struggle. A propane heater is used, but there are no heated creep areas. Farrowing is done in temporary pens approximately 15 ft. × 18 ft. and usually includes two or three sows per pen. Litters are then mixed with more litters at three weeks of age. A major challenge for the farm is when sows in the same pen farrow simultaneously.

Producer C's farm uses a traditional block-walled barn that uses both supplemental heat and heated lamps in creep areas. Once again the farrowing area is ventilated into the hay mow by access doors. The farrowing pens are 12 ft. × 6 1/2 ft. including a 2 1/2 ft. × 6 1/2 ft. creep area with a 250-watt heat lamp. The bulb is changed to a 125 watt at approximately 15 days post farrowing. An open center aisle runs the length of the barn in between the farrowing pens. The pens have individual swinging doors on the fronts to isolate each sow and litter as needed. The pigs also have access to an outdoor lot if the weather is favorable.

During the summer of 2001, Producer D remodeled their 1989 starter hog house to a winter farrowing hog house. It had been a nursery to grower combination building; hence it was dubbed a "starter" hog house. The starter hog house is 30 ft × 48 ft. It is a conventional one-story hog barn. The hog house has a 7 ft. × 4 in. gutter that is cleaned with a tractor loader. It also has a homemade plywood feeder that runs the length of the building. It was divided into four pens each with a 12 ft. × 12 ft. bedded area next to the gutter. The remodeling included installing a ceiling with 6 in. fiberglass insulation and chimney ventilation. The ceiling insulation improved a roof with 4 in.

of fiberglass insulation and an open ridge. The chimneys are 2 ft. × 2 ft. with a sliding plywood baffle. Sidewalls are insulated with 6 in. fiberglass. Ventilation doors on two walls use 1 1/2 in. styrofoam insulation. Waterers and feed troughs were modified to accommodate pigs from 10 lb. to 500 lb. sows. The feed trough was 10 in. deep with a 3 1/2 in. lip with solid dividers each 15 in. Small pigs would climb into the trough with their front legs but would not be able to be trapped with the solid dividers. The waterers were trough style also with lower heights for the small piglets. The building has a 110,000 BTU L.B. White heater. Producer D built pen dividers from home-sawed oak boards that allowed them to make three farrowing pens in each 12 ft. × 12 ft. section, giving them a total of 12 pens in the building. The 48 sq. ft. pens were constructed as trapezoids allowing the sows more room to turn around and making an obvious choice for the creep area. The creep area is heated with a 250-watt bulb for at least 15 days and then switched to a 125-watt bulb. The pens were made to be dissembled. A 2 ft. × 2 1/2 ft. piece of plywood was used as a door that would be dropped in to keep the sow in or out of her farrowing pen.

No major diseases were reported on any of the four farms during this project, although none of the four farms were PRRS negative. They all utilized customized vaccination programs that included E. coli, erysipelis, pneumonia complex, pseudorabies, lept-parvo, and ileitis.

## Results and Discussion

Results from the four farms compare favorably with area and industry averages (Table 1). Although many of the differences can be traced to management, the variation in genetics should not be ignored. Only Farms C and D used identical genetics.

Temperature and relative humidity data was collected at Farms A, B, C, and D during the winter of 2002-03. The monitors took readings every half hour. The monitor failed at Farm B. In the winter of 2001-02 the temperature and relative humidity data was collected at Farm B. Comparisons for the entire winter would be misleading, because each farm allowed the barns to be empty without supplemental heat at various times during the winter between farrowings. Observations for this study will concentrate on temperatures during the week of farrowing at each farm (Table 2).

The four farmers are utilizing environmental temperatures that are much lower than the lower critical temperatures for piglets and the recommended temperatures in conventional farrowing barns. The cool temperature is partially offset by bedding and supplemental zone heat.

As you can see from the table, Farm A recorded a 4-degree temperature increase at the top of the A-frame as compared with the main barn. The A-frame had a 1 in. gap the full length of the A-frame at the peak. This may help to explain the fact that the relative humidity did not have a consistent differential between the A-frame and the main barn. The barn on Farm A was able to achieve an average of 24 degrees above outside temperature without any supplemental heat.

Farm B was able to achieve an average temperature rise of 23 degrees above outside conditions. Their goal was to just keep the temperatures above freezing.

Farm C had the most consistent temperature and the lowest humidity. It should be noted that during the monitoring period the barn was only at 50% of capacity.

Farm D had the most variation on temperature and humidity. Their barn had the highest stocking density. It also may have had some outlier readings taken by the monitors during cleaning which occurred every third day.

Farms C and D tried to keep their barns warm enough to avoid chilling of newborn pigs. This also encourages the little pigs to utilize the heated creep areas. It appears that 50 degrees in a bedded environment is near the pigs' critical temperature for farrowing. Both farmers tried to attend farrowings and would move newborns to the heated creep areas until dried off. Farm D now turns the thermostat 10 degrees higher during periods when he can't attend the farrowings.

Farms B and D were able to keep energy cost records. Farm B used solely LP and Farm D used both LP and electricity for heat lamps. Farm C's LP tank was not used solely on the hog barn so no energy costs could be accurately computed. The following tables summarize the energy use.

Farm A used no supplemental heat, therefore had no energy cost. Farm D had the smallest and best insulated barn as shown by the reasonable energy cost and the higher temperatures that could be maintained. As with most productivity measures, pigs per litter have the greatest effect on efficiency. The supplemental heat cost per litter could easily pay for itself with one more pig per litter saved (Table 1).

Overall, the numbers of the four farmers do compare favorably with industry averages. Although Farm A had the lowest production numbers, they had the lowest energy cost and operated in the coldest temperatures, with the tightest barn. Farms C and D both utilized heated creep areas. These creep areas are utilized much differently by the pigs compared with a creep area next to a sow's udder in a farrowing crate. Both farms reported that the newborn pigs needed to be 24 hours old before they would utilize the creep areas on their own. Piglet crushing after the first day was minimal. Farms C and D farrowed in the warmest temperatures. Warmer temperatures and heated creep areas helped production efficiencies.

Farms A and B had the highest death losses in the first three weeks with the majority in the first week. All four farms reported how critical it is to keep sows and litters isolated from other sows and litters.

Farm D had the most death loss in the group lactation situation. His group size was as many as 18 sows and litters in a group. The farm has documented a 60% decrease in mortality since this project began during the group lactation. The changes in the group lactation area made included vaccinating for illeitis and constructing a heated creep area with 850 watts of electricity at an energy cost of approximately $0.25 per pig.

*Management tips*

-Sow must have dry, clean place to farrow.
-Sow must be isolated from other sows during farrowing.
-Attend farrowings if possible and dry pigs off in a heated creep or by some other method.
-Warm any chilled pigs.
-If unable to attend farrowings turn the temperature above 60°F if possible, with supplemental heat.
-Keep litters separate from other litters for the first week.
-Ear notch pigs and keep records so that "lost" pigs can be matched back with correct sow.
-Use plenty of straw to reduce the pigs' critical temperature.
-Keep temperatures at a range where pigs want to sleep in creep areas.
-Select from large litters when choosing replacement gilts.
-Vaccinate, vaccinate, vaccinate, especially in an antibiotic-free production system.
-Remember personal safety when dealing with sows in pens.
-Always have an escape route planned for the unexpected.
-Lock the sows out of their farrowing pens when processing pigs, preferably while they are eating.
-Feed and water the sows outside of their farrowing pens to keep their pens drier and cleaner.
-Use heated creeps to save pigs even during group lactations and it will be economically rewarding.
-Use solid dividers in sow feeders so little pigs will not get caught.

**Table 1. Farrowing results.**

| | # Born alive | | # at commingling | | # at weaning | |
|---|---|---|---|---|---|---|
| **Year** | 01-02 | 02-03 | 01-02 | 02-03 | 01-02 | 02-03 |
| Producer A | 8.7 | 10.7 | 8.0 | 8.0 | 7.8 | 7.8 |
| Producer B | 12.8 | 10.0 | 9.3 | 8.3 | 9.0 | 7.6 |
| Producer C | 12.4 | 11.0 | 10.1 | 9.9 | 9.7 | 9.5 |
| Producer D | 12.1 | 10.1 | 11.4 | 9.6 | 10.2 | 8.7 |
| Minnesota farm management summary | 10.1 | 10.1 | N/A | N/A | 8.7 | 8.7 |
| USDA- 2000 NAHMS | 10.0 | | 8.9 | | 8.6 | |

**Table 2. Analysis of temperature.**

| Dates of 1st week of farrowing | Farm | Avg outdoor temp (°F) | Temperature (°F) | | | Humidity (%) | | |
|---|---|---|---|---|---|---|---|---|
| | | | Avg | Max | Min | Avg | Max | Min |
| 1-14 to 1-20-03 | Farm A in A-frame | 6[1] | 34.5 | 39.5 | 25.9 | 75.3 | 94.8 | 60.1 |
| 1-14 to 1-20-03 | Farm A in barn | 6[1] | 30.4 | 34.9 | 23.3 | 78.9 | 88.2 | 65.8 |
| 12-28-01 to 1-3-02 | Farm B | 13[2] | 36.9 | 42.5 | 30.9 | 61.7 | 73.4 | 50.4 |
| 12-1 to 12-7-02 | Farm C | 25[1] | 52.0 | 53.7 | 49.7 | 51.5 | 63.8 | 42.2 |
| 12-1 to 12-7-02 | Farm D | 23[3] | 46.7 | 56.6 | 37.2 | 64.1 | 74.9 | 51.0 |
| 1-10 to 1-16-03 | Farm D | 7[3] | 45.6 | 64.2 | 32.5 | 56.6 | 74.4 | 25.7 |
| 2-17 to 2-23-03 | Farm D | 21[3] | 52.5 | 67.6 | 30.1 | 61.0 | 92.8 | 32.8 |

[1]http://www.crh.noaa.gov/arx/climo/data, Austin location.
[2]http://www.crh.noaa.gov/arx/climo/data, Winona location.
[3]http://www.crh.noaa.gov/arx/climo/data, Rochester location.

**Table 3. Energy cost comparison – LP.**

| | Gallons LP/litter | | Gallons LP/pig | | Cost/litter | | Cost/pig | |
|---|---|---|---|---|---|---|---|---|
| Year | 01-02 | 02-03 | 01-02 | 02-03 | 01-02 | 02-03 | 01-02 | 02-03 |
| Farm B | 18.5 | 24.5 | 2.6 | 3.2 | 16.61 | 25.00 | 2.37 | 3.29 |
| Farm D | 3.68 | 3.57 | .35 | .47 | 4.34 | 3.57 | 0.42 | 0.56 |

**Table 4. Energy cost comparison – electricity.**

| | Electricity/litter Kwh/litter | | Electricity/pig Kwh/pig | | Cost/litter | | Cost/pig | |
|---|---|---|---|---|---|---|---|---|
| Year | 01-02 | 02-03 | 01-02 | 02-03 | 01-02 | 02-03 | 01-02 | 02-03 |
| Farm D | 160.0 | 175.8 | 15.3 | 19.1 | 11.20 | 12.31 | 1.07 | 1.34 |

**Table 5. Energy cost comparison – total.**

| | Cost per litter | | Cost per pig | |
|---|---|---|---|---|
| Year | 01-02 | 02-03 | 01-02 | 02-03 |
| Farm B | 16.61 | 25.00 | 2.37 | 3.29 |
| Farm D | 15.54 | 15.88 | 1.49 | 1.90 |
| Farm A | 0.0 | 0.0 | 0.0 | 0.0 |