The Research Alliance for Farrowing Project

Background

The swine industry is in change. Consumers are showing interest in pork that "tells a story" of sustainable farming in concert with the environment and quality of life ideals. A growing number of farmers who raise pigs on diversified farms are seizing on these emerging markets as a way to remain in farming while enhancing their quality of life and the environmental sustainability of the farm. However, producers who are raising pigs in alternative systems are among the first to cite the difficulties. Responding to these concerns, PFI submitted a project proposal to the USDA SARE (Sustainable Agriculture Research and Education) Program that we called *The Research Alliance for Farrowing, the Weak Link in Alternative Swine Systems*.

Alternative swine production systems generally seek to create a "high health" environment. Environmental stressors are avoided, and animals are permitted social behaviors, promoting their resistance to disease. These alternative production systems integrate well with the farm and environment, often utilizing crop residue as bedding, producing a manure in which nutrients are stabilized or composted, and often consuming a minimum of energy.

Rather than creating a biotic vacuum through isolation and antibiotics, these systems are often very open to the outside and have tended to rely instead on a favorable balance of organisms in a low-stress production environment. This approach is often successful when environmental stress is low, as for instance when sows farrow on pasture in good weather. Many producers, however, report that success can turn to disaster when farrowing moves into winter. This may not be surprising, since alternative production facilities do not control the environment as tightly as conventional ones. What is more, alternative systems may not employ antibiotics, which compensate for suboptimal conditions.

The Research Alliance for Farrowing, the Weak Link in Alternative Swine Systems, was designed to address herd health problems identified by farmers using alternative production systems. Field veterinarians, ISU veterinary scientists, and swine producers using alternative systems were brought together through workshops, field days, on-farm research, and a three-year collaborative effort to produce a herd health guidebook for alternative swine systems. Intensive case studies of seven cooperator swine systems provided insights into the functioning and health issues of alternative systems. The case studies also helped lead project participants to the principles and strategies set out in the guidebook, *Managing for Herd Health in Alternative Swine Systems*.

RAF Project Summary

The USDA SARE-supported Research Alliance for Farrowing (RAF) project addressed information and communication deficiencies around young pigs in alternative production systems. Intensive case studies provided better understanding of the health threats in different kinds of alternative production systems. Eleven workshops and four field days were held. A herd health toolbox, *Managing for Herd Health in Alternative Swine Systems*, consolidates current knowledge of best health practices for alternative systems and through case examples shows effective vet-producer relationships and successful health management strategies in alternative swine production systems (www.practicalfarmers.org/resources/niche-pork-resources.html). The full RAF project report (minus tables) is available online at www.sare.org/projects.

Surveys

At the beginning and at the end of the project, surveys were sent to veterinarians and to swine farmers using alternative systems. The surveys helped us assess how familiar veterinarians were with alternative swine systems and provided a picture of what producers considered their biggest challenges.

The vets proved to be generally knowledgeable about practices used and motivations behind alternative swine production systems. They estimated the most significant problems for young pigs in these systems to be crushing, scours, and pneumonia, in descending order. In the pre-project survey, veterinarians did not consider alternative approaches to swine production to be highly viable. On a scale from 0 (completely unviable) to 5 (highly viable), they rated the viability of alternative farrowing systems at the equivalent of 2.2.

In the post-project survey, we again asked veterinarians their opinion of the viability of alternative farrowing systems. Four years and three months after being asked the same question, vets responded with an average rating of 3.9 on the scale of 0-5, a marked change from their earlier 2.2 opinion on viability. The Research Alliance for Farrowing project has worked to increase veterinarians' familiarity with alternative swine systems, and this project deserves at least a small part of the credit for the change in veterinarians' attitudes.

End-of-project surveys were sent to 269 swine farmers with sustainable agriculture connections of some sort, and 51 surveys were returned, a 19% response rate. We asked farmers to respond to the top causes of pre-weaning death that farmers had identified in the pre-project survey. Their responses are summarized in Figure 10. By far the highest rated cause of preweaning death was crushing (4.1 out of 5). The 10 organic farmers responding to the survey gave crushing essentially the same rating (4.0).

Figure 10. Swine farmers were asked to rate the top causes of pig loss before weaning.

The end-of-project survey also presented farmers with the top-listed causes of post-weaning death provided by farmers in the pre-project survey. Their responses are summarized in Figure 11. Respiratory problems were ranked highest. The parallel herd health study funded by the National Research Initiative found that respiratory problems from *Mycoplasma hyopneumoniae* were more frequent in alternative swine systems than in conventional ones, while respiratory issues due to swine influenza virus and PRRS (porcine reproductive and respiratory syndrome) were less frequent in alternative systems.

Producers were asked the same question about viability that was put to veterinarians. Not surprisingly, these farmers rated the viability of alternative farrowing systems at 4.4 on a scale of 0 to 5.

Case Studies

Seven representative farms were selected for intensive case studies; two farms at that time were organic and five were marketing pigs through other sustainable agriculture-related labels. The project worked with these producers to document their practices, the physical conditions in the systems, infection rates, farrowing statistics, and production economics.

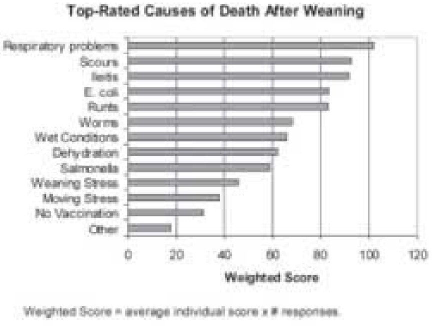

Figure 11. Farmers were asked to rate the top causes of death after weaning.

Farrowing Statistics. Table 17, (click to view) summarizes farrowing statistics on a per-litter basis for the five cooperator farms with the most complete records, breaking out several farrowing environments. (Number of pigs weaned equals number born alive minus total mortality from all sources.) Several sources of death loss are shown; crushing, starving, unknown cause, and "other causes" add up to the total mortality. The number of pigs weaned per litter varied less from farm to farm than numbers reported born, perhaps because the quality of the records affected both the numbers reported born and the number of reported mortalities.

Statistical standard errors are provided for some of the summary statistics to suggest the range of farrowing outcomes that occurred. While the overall death loss ("mortality") per liter averaged 1.3 pigs, the standard error was 2.2 pigs per litter, suggesting perhaps 15 percent of litters experience a death rate of 3.5 pigs (one standard error from the mean) or more.

The farrowing results for different environments incorporate uncontrolled effects for season and farm differences, but the pasture environment is uniformly at or near the top in numbers of pigs weaned per litter. This is consistent with the isolation and with the relative lack of stress afforded in the seasons in which pasture farrowing is practiced.

In the cold months, most producers go to lengths to avoid chilling young pigs. A ½-mph breeze lowers the effective environmental temperature of a 45-lb pig by 7 °F., and for smaller pigs by even more.

Midwestern summers, in contrast, place temperature stress on the large animals of the breeding herd. The temperatures in Figure 12 partly represents the difficulty of placing dataloggers in sow-safe locations, but the corn crib that was put to use as a farrowing structure clearly experienced much lower peak daytime temperatures (below 90 °F.) than did the datalogger beneath the roof of a metal farrowing hut (115 °F. and higher).

Disease and Internal Parasites. Table 18 evaluates internal parasites based on ova (egg) prevalence in fecal samples. Some cooperating farms showed relatively high levels of certain parasites, other farms showed relatively high rates of other parasites. Considering the sum of all parasite ova in a sample, there were significant differences among farms (data not shown). Factors tending to be associated with low levels of parasites included relatively low density of animals, rotation of facilities and fields, and separation of pigs by age.

Table 18. Internal Parasite Evaluations Overall, Seven Farms †.

Parasite Genus	Avg. Rating ‡	Std. Deviation
Overall Trichuris	0.51	
Overall Coccidia	1.00	
Overall Ascaris	0.64	
Overall Strongyloides	0.05	
Overall Strongyl Type	0.24	
Overall Total Parasites	2.44	2.26

† One summer and one winter sampling for most farms, approximately 20 fecal samples per date.
‡ McMaster flotation method. Nominal evaluations transformed as: 0 = None, 1 = Rare, 2 = Few, 3 = Moderate, 4 = Large #, 5 = High #.

In Table 18, the ova numbers for individual parasite genera are summed for a "total parasite" figure. While the individual parasite genera are in low numbers, the total in one system was into the moderate range (data not shown). Again, standard deviations revealed wide variation, in this case even within herds. While the overall total parasite level 2.44 falls between Few and Moderate, the standard deviation of 2.26 suggests that some fecal samples from these farms contained numbers of parasite eggs that would be categorized as Moderate or Large.

Table 19, which shows results of slaughter checks, confirms the presence of gastrointestinal worms. Only one or two lots of 6-12 finished hogs each were sampled per farm, but the results are suggestive. Liver scars from parasites were common and were at high levels in hogs from three of the six farms. Signs of what would be considered typical levels of chronic *Mycoplasma* pneumonia were evident. Dermatitis was an issue with slaughter checks from only one farm, and not an organic operation at that.

Table 19. Slaughter Checks for Disease and Parasite History †

Farm	Dermatitis score 0-3	Liver score 0-2 (white spots)	Mycoplasma Pneumonia % lung involved (0-100%)	Atrophic Rhinitis Score 0-5
Farm 1	0.0	0.6	2.6	0.0
Farm 3	0.0	0.4	14.4	0.1
Farm 4	0.9	1.7	1.7	0.4
Farm 5	0.7	0.6	9.7	0.0
Farm 6	0.7	1.9	16.1	0.7
Farm 7	1.2	1.8	6.4	0.3
Overall	0.6	1.2	8.5	0.3

† 6-12 animals per farm per date. 1-2 dates per farm. Slaughter checks performed by Fred Sick, D.V.M., at SiouxPreme Pack, Sioux Center, Iowa.

Salmonella. Manure, bedding, feed, and water samples from the seven cooperator farms were also submitted to the laboratory of Dr. Scott Hurd, Associate Professor of Epidemiology and Risk Analysis at the ISU College of Veterinary Medicine. Hurd's lab evaluated the samples for the presence of *Salmonella* subtypes. *Salmonella* is a pernicious threat in the food system, and it has been an open question whether the pathogen is any more or less present in alternative swine systems than in conventional ones. Two of six farms yielded some samples positive for *Salmonella*. No other cooperator farms provided samples positive for *Salmonella* during the 2005 RAF sampling. The overall incidence of positive samples was 4% (Table 20).

In May-August 2002, prior to this project, Farm #3 and two other farms provided a number of positive bedding and manure samples (Table 20). During that earlier sampling, there was some indication that actively composting bedding was unlikely to test positive, whereas *Salmonella* was detected in fresh, uncomposted corn cob bedding. However, *Salmonella* was detected at one time or another in pastures, hoophouses, Cargill units, and most other environments on the farm in 2002. The incidence of *Salmonella* increased over the summer of 2002 for all three farms tested. However Farm #3, which provided numerous positive samples in 2002, was completely negative for *Salmonella* in the 2005 sampling for the RAF project.

Table 20. Salmonella-positive samples – six RAF farms and two additional farms.

Farm	Environmental Samples	Fecal Samples	Total Samples	Total # Samples
Overall 2005	6%	3%	4%	252
Overall 2002 †	20%	22%	22%	555

† 2002 samples were not part of the RAF project.

There is much to be learned about the factors that influence the appearance and disappearance of *Salmonella* in a swine system. Based on this project there is no indication that the *Salmonella* pathogen is any more or less present in alternative swine systems than in conventional ones.

Economics. Although the focus of the Research Alliance for Farrowing was herd health, the intensive case studies included assessments of the economic functioning of cooperator farms. ISU Extension Swine Field Specialist David Stender worked with cooperators in the intensive case studies to develop economic profiles that would help explain the functioning of these systems. These records bear both on herd health and on the overall production strategies pursued on these farms.

During the RAF project, the producers on one cooperator farm developed a long-standing relationship with a veterinarian and successfully resolved a chronic herd health situation. Death loss experienced after weaning went from 25.1% in 2002 to a remarkable 1.3% in 2006. Largely because of the improvement in health, feed efficiency went from 436 lbs grain per hundredweight of gain in 2002 to 385 lbs of grain in 2004.

Another cooperator farm was a very small-scale operation. This producer successfully cut feed costs $9.44/cwt from 2002 to 2005, not by fixing a disease problem but primarily by switching from a high-priced feed to a plain, NRC-level base premix. However the low volume of production by this producer kept the swine operation from being a major profit center. This was partly by the producer's choice, since he had off-farm employment. However, this illustrates that the scale of an operation does set the range for possible profits. As ISU Extension swine specialist Stender writes, "Niche producers need to realize that cost structure is one of the most important issues in being cost competitive. You can't cut the sow herd in half without being able to cut foundational non-feed cost in half as well - regardless of the herd health status."

During the period of this study another cooperator erected a gestation barn. As a result, total annual non-feed production costs rose from $39,000 to $60,000 between 2002 and 2006, an increase of 53%. Between 2004 and 2006, this producer culled the sow herd from 113 animals to 80, but with more intensive management the number of litters per sow rose from 1.6 to 2.0 per year. The farm sold 21% more pounds of pork in 2006 than in 2002. Non-feed costs rose because of the gestation barn, but feed costs fell, so total costs per hundredweight were essentially the same in 2006 as in 2002. The producer feels strongly that the investment in the gestation barn was a good one because it helped him to sell more pork and manage more efficiently. These objectives could probably be reached without investing in a gestation barn, but the structure does increase this producer's control over feeding and breeding.

Alternative swine systems are as different one from another as are farmers. They are products of the farm, the manager, the entire farm family, and the agricultural economy. Real improvements in profitability result from management changes that favor herd health and management changes that optimize the available facilities. But perfection is an elusive goal. When the situation allows, investments of management, and sometimes capital, can pay real dividends. Many times the situation does not allow that. Nevertheless, a producer with records and a little coaching is in position to make the right moves when opportunity does knock.