RESEARCH REPORT
SWINE HEALTH

Title: An Industry Education Program for Understanding the Risk Factors Associated with PRRSv Breaks in Negative or Naïve Breeding Herds – **NPB #06-187**

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Abstract
A variety of methods have been applied for the elimination of PRRS virus from swine production sites. The initial success of these methods has been variable, and the reasons for failure are not well understood. For those sites that are successful with their initial PRRS virus elimination efforts, success in maintaining a PRRS-negative or naïve status for extended periods of time following elimination projects has been inconsistent and unpredictable. In 2006 a five-year PRRS-CAP funded study entitled "Quantifying risk and evaluating the relationship between risk score and PRRS-negative herd survival" (PRRS Site Survival Study) was initiated to test whether survival of PRRS virus negative or naive swine breeding herd sites (where "survival" is defined as remaining negative or naïve) is influenced by:

1) Risk factors as well as a composite of risk factors in the form of risk index scores measured using version 2 of the AASV PRRS Risk Assessment for the Breeding Herd
2) Season of establishing the site as negative or naive
3) Method of establishing the site negative or naïve
4) Region of the U.S. in which site is located

An integral part of the PRRS Site Survival Study is the PRRS Risk Assessment for the Breeding Herd and therefore, the first objective of this project was to promote use of PRRS Risk Assessment for the Breeding Herd and population of the database with risk assessments to enhance the value of benchmarking the risks measured by the tool. Additional objectives included creating benchmarking reports for sites that are undergoing a PRRS virus elimination project as well as those collaborating in the PRRS Site Survival Study, and presenting uses of the PRRS Risk Assessment to those seeking to more rigorously manage the risks associated with PRRS. Each of these objectives have been met: 1) the PRRS Risk Assessment database now includes over 800 sites with 256 sites from the PRRS Site Survival Study, 2) all 42 of the PRRS Site Survival Study collaborating veterinarians received a comprehensive benchmarking summary in the Fall of 2007, 2) the new web-based PRRS Risk Assessment (called PADRAP) was launched in November 2007 and since then 83 veterinarians have been trained, and 3) application of PRRS Risk Assessment program has been presented at three conferences in 2007.

Since its release, the authors are aware of several ways in which swine veterinarians have used the PRRS Risk Assessment to help producers:

1. To evaluate current and develop new biosecurity protocols
2. To demonstrate improvement in biosecurity over time to help justify expenditure of resources on measures to improve biosecurity
3. As an aid in the decision to initiate a project to eliminate PRRSv from a breeding herd site
4. As a tool to identify modifiable risk factors in an effort to increase the likelihood that an elimination project will be successful long-term
5. As an aid in the decision to use a breeding herd site to produce genetic animals and
6. As part of the due diligence process for purchases or contracting agreements

Producers interested in using the PRRS Risk Assessment for the Breeding Herd are encouraged to contact their veterinarian. For more information on the web version of the PRRS Risk Assessment for the Breeding Herd please email aasv@aasv.org or call the AASV office at 515-465-5255.

Introduction

While a variety of methods have been described and applied for the elimination of PRRS virus from pig production sites (Dee and Joo, 1993; Dee et al., 1998, Philips et al., 2000a; Philips et al., 2000b; Torremorell and Baker, 2000; Dee et al., 2001; Gillespie and Carroll, 2003), the initial success of these methods has been quite variable, and the reasons for failure are not well understood. For those sites that are successful with their initial PRRS virus elimination efforts, success in maintaining a PRRS-negative status for extended periods of time following elimination projects has been inconsistent and unpredictable.

While there have been some risk factor studies conducted focused on PRRS-related factors (Baysinger et al., 1997; Hurd et al., 2001; Lager et al., 2002; Firkens and Weigel, 2004) their focus has not been on evaluating factors related to PRRS-negative herd survival – a focus which is essential if individual farm and regional elimination efforts are to meet with initial as well as sustained success. To have the opportunity for long-term sustained success of individual site and regional PRRS elimination efforts, it is imperative to better understand the key factors which influence long-term survival of PRRS negative or naïve breeding herds.

In 2006 a five-year PRRS-CAP funded study entitled "Quantifying risk and evaluating the relationship between risk score and PRRS-negative herd survival" (PRRS Site Survival Study) was initiated to test whether survival of PRRS virus negative or naive swine breeding herd sites (where "survival" is defined as remaining negative or naïve) is influenced by :

1) Risk factors as well as a composite of risk factors in the form of risk index scores measured using version 2 of the AASV PRRS Risk Assessment for the Breeding Herd
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The objectives of this study leverage the work done for the PRRS Site Survival Study by promoting the AASV PRRS Risk Assessment for the Breeding Herd and creating educational and outreach opportunities to help veterinarians and producers benefit from risk assessment and what is learned from the PRRS-CA funded study when complete.

Objectives

1. Promote use of AASV PRRS Risk Assessment for the Breeding Herd and population of the database with risk assessments to enhance the value of benchmarking the risks measured by the tool.
2. Develop and create benchmarking reports for sites that are undergoing a PRRS virus elimination project based on information collected with the PRRS Risk Assessment and lessons learned from the

PRRS Site Survival Study for swine veterinarians and producers actively engaged in PRRS virus elimination projects including those collaborating on the PRRS Site Survival Study.

3. Develop and deliver presentations regarding use of the PRRS Risk Assessment for the Breeding Herd by veterinarians and producers currently conducting or considering PRRS virus elimination projects or seeking to more rigorously manage the risks associated with PRRS.

Materials & Methods

Objective 1:

For sites enrolled in the PRRS Site Survival Study (n=256), risk assessments have been completed when initially enrolled in either 2006 or 2007. These assessments have been and will continue to be added to the database of risk assessments.

The study directors have learned through experience that projects like this and the PRRS Site Survival Study are necessary to rapidly generate assessment data and essential experience with risk assessment. A critical mass of assessment data was necessary to do meaningful benchmarking of risks.

Eighty-three veterinarians have been trained in twelve 4.5 hour sessions using the web-based risk assessment (PADRAP) since the 1st training session in November 2007.

Objective 2:

Objective 2 included development of an individual benchmarking report for sites that were undergoing a PRRS virus elimination project. The report has served both as information for collaborators on the PRRS Site Survival Study as well as a template for others that wish to use the PRRS Risk Assessment to increase the likelihood of a successful elimination project. The benchmarking report included:

- Reports benchmarking aggregated risks measured using the PRRS Risk Assessment for the Breeding Herd for the site(s) of interest relative to other sites in the database. These reports have provided the opportunity to analyze meaningful relationships between the measured risks and the likelihood a site remains PRRS negative or naïve.
- Summaries of individual risk factors for the site and for all sites in the database. These reports have been used to identify opportunities to implement biosecurity practices that may reduce the risk of a site becoming PRRS positive.

Objective 3:

Three presentations promoting the PRRS Risk Assessment for the Breeding Herd and summarizing the lessons learned from the PRRS Site Survival Study have been prepared and given. The presentations focused on using the PRRS Risk Assessment to evaluate risks for a PRRS virus elimination project and on benchmarking of individual risk factors for "best biosecurity practices."

Results

Objective 1:

Promotion of the PRRS Risk Assessment Tool for the Breeding Herd has been accomplished by hiring veterinary students for summer internships to complete annual risk assessment and collect quarterly diagnostic data for the PRRS Site Survival Study site. Quantifying risk and evaluating the relationship between risk score and PRRS-negative herd survival." Other promotion activities that were not specifically outlined in the proposal include conducting risk assessment training sessions for swine veterinarians and veterinary students hired for summer internships.

<u>Veterinary Internships</u>

In 2007, four veterinary students (three from Iowa State University and one from the University of Minnesota) were employed from May 14, 2007 to August 10, 2007. This coming summer, four veterinary students (three from Iowa State University and one from University of Tennessee) and one pre-veterinary student will be employed for 12 weeks. The veterinary students will continue to collect annual PRRS risk assessments and quarterly diagnostic data for monitoring purposes from the sites enrolled in the PRRS Site Survival Study. The completed risk assessments will continue to be added to the database of risk assessments.

Risk assessment training sessions

The new web-based PRRS Risk Assessment (called PADRAP) was unveiled in Nov of 2007. The on-line version offers improved access, ease of use and the ability to view benchmarking reports immediately after submitting an assessment. Veterinarians who have been previously trained on the Excel spreadsheet version are being offered training sessions on how to use the web-based risk assessment. Training sessions have been offered via GoToMeeting.com, an on-line Web conferencing tool.

In total, 148 individuals have been PRRS Risk Assessment trained. Of the 148, eighty-three have been trained using the web-based risk assessment (PADRAP) since the first training session in November 2007.

- January – April 2008; seven training sessions (GoToMeeting.com)
- March 8, 2008; San Diego, CA (AASV)
- February 21, 2008 ; Calgary, Alberta
- February 22, 2008 ; Winnipeg, Manitoba
- January 8, 2008; Wyoming
- November 10, 2007; Ames, Iowa (ISU Swine Disease Conference)
- June 7, 2007; Des Moines, Iowa (WPX)
- April 25 & 26, 2007; Stratford, Ontario (OPIC) – 2 sessions
- March 3, 2007; Orlando, Florida (AASV) – 2 sessions
- November 8, 2006; Ames, Iowa (ISU Swine Disease Conference)
- September 23, 2006; St. Paul, Minnesota (Leman)
- June 7, 2006; Des Moines, Iowa (WPX)
- 2 others prior to handover to AASV Risk Benchmarking Reports on submitted

Objective 2:

Benchmarking reports have been developed for sites that are undergoing a PRRS virus elimination project based on information collected in the PRRS Risk Assessment survey and lessons learned from the PRRS Site Survival Study for swine veterinarians and producers actively engaged in PRRS virus elimination projects including those collaborating on the PRRS Site Survival Study.

Prior to the launch of the on-line PRRS Risk Assessment program (PADRAP), the risk profile report was routinely provided in PDF format, along with four other risk benchmarking reports, to veterinarians who have submitted risk assessments to the database. Since the launch of PADRAP, veterinarians have the ability to view benchmarking reports immediately after submitting an assessment.

Additionally, the collaborating veterinarians of the PRRS Site Survival Study received a summary packet via email that included: 1) risk quadrant report comparing their sites enrolled versus all sites enrolled in the study in 2006 and 2007 (see example in Figure 1); 2) risk quadrant report comparing all sites with 2007 surveys versus all sites in the database (as of Nov. 07, n=781); and 3) individual site benchmarking reports (risk quadrant, risk profile, percentile, individual risk, and Pareto reports; see examples in Figures 2 through 4. Forty-two collaborating veterinarians have enrolled sites from 50 different commercial production, genetic and management companies.

Figure 1. Examples of Risk Quadrant Report

Average Internal and External Risk Index scores for sites from an individual company (displayed as "Benchmarked") were compared to all sites enrolled in Site Survival Study (displayed as "Benchmarked Against"). An additional comparison was made between 2006 and 2007 for same "Benchmarked" sites (n=5).

2006 **2007**

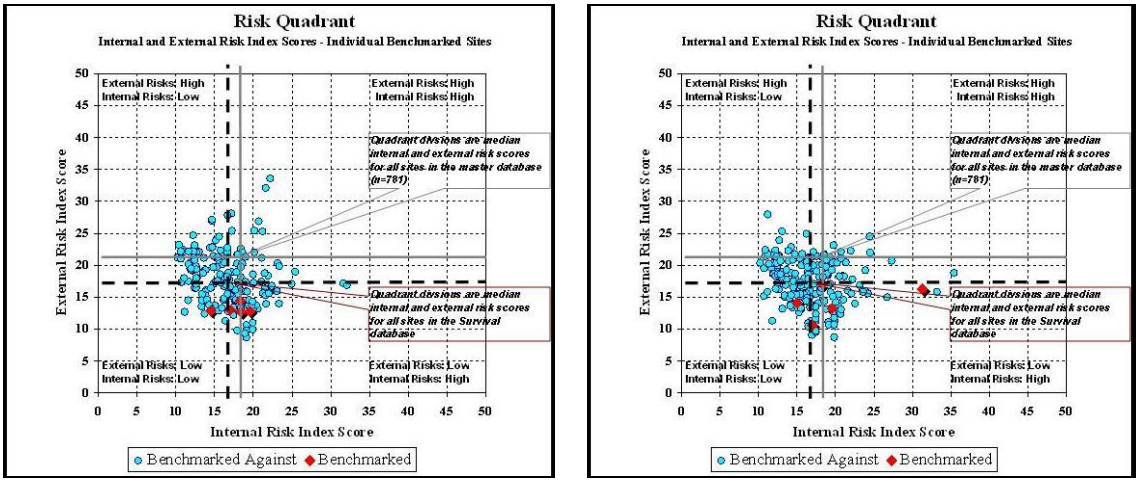


Figure 2. Example of Risk Profile Report *(individual site benchmarking report)*

For an individual site, an aggregated risk score for each category is displayed as well as the percentile rank against the database. The bar chart represents the relative risk to other sites, where a bigger bar implies a higher risk and smaller bar implies a lower risk.

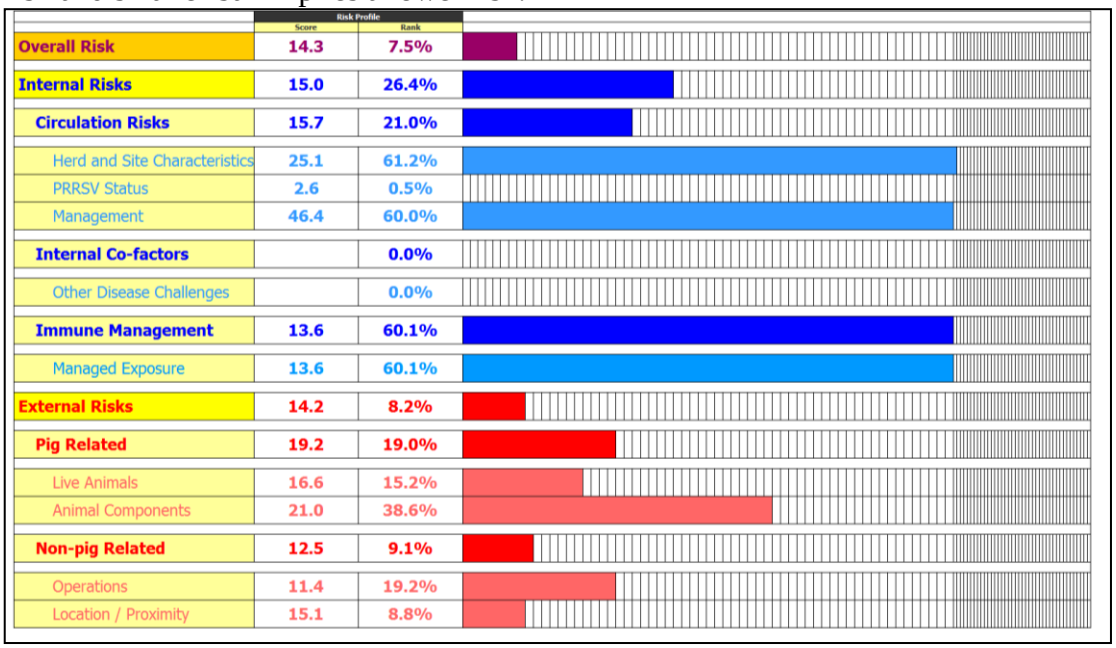
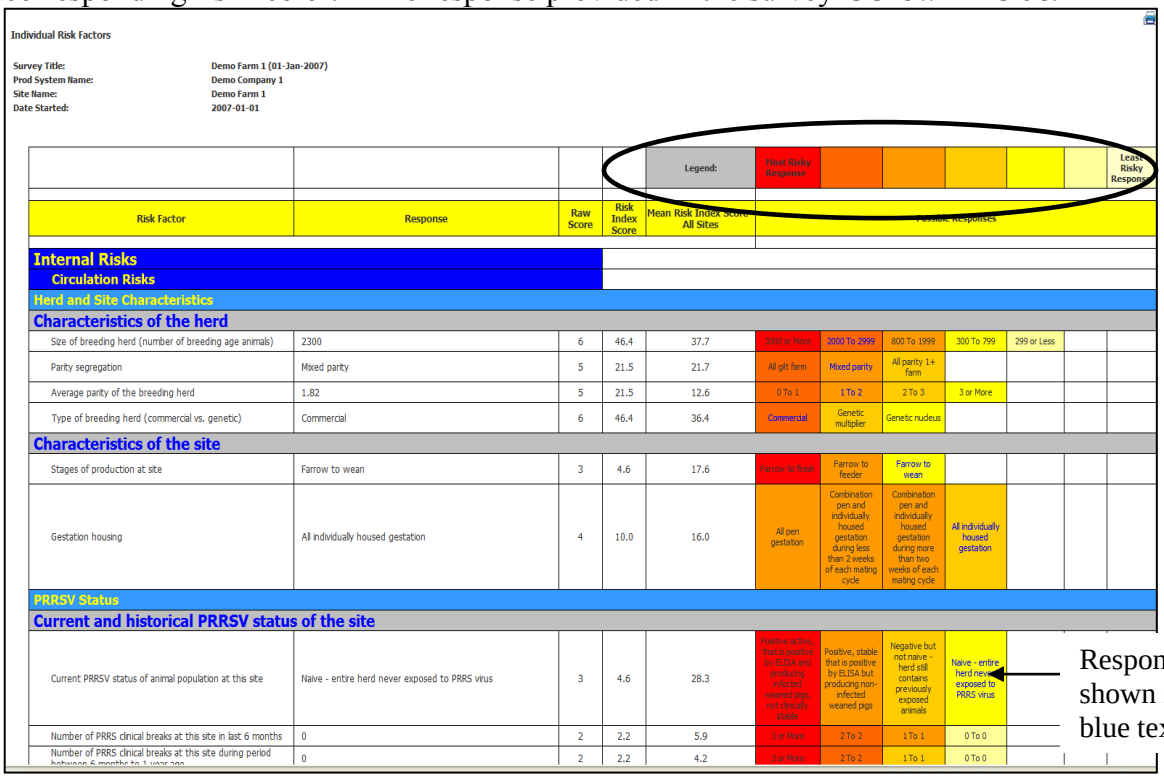


Figure 3. Example of Individual Risk Report *(individual site benchmarking report)*
Each response within the survey is assigned a level of risk (risk index score). The risk level corresponds to a "Doppler-Radar" color scheme with red being the most risky response and off-white being the least risky response (legend is circled). All the possible responses for a given question are listed on the right side with the corresponding risk "color." The response provided in the survey is shown in blue.



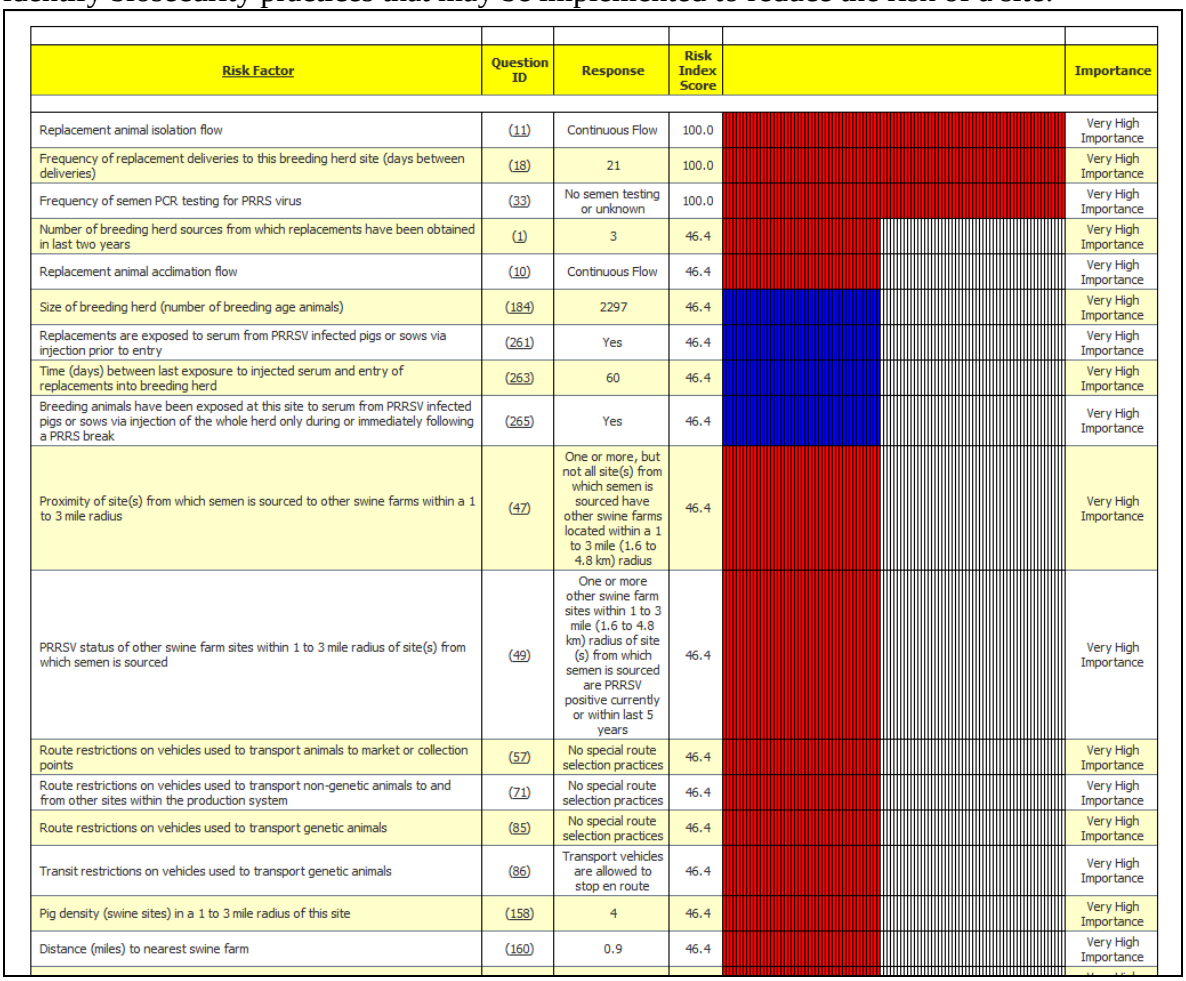
Individual Risk Factors

Survey Title: Demo Farm 1 (01-Jan-2007)
Prod System Name: Demo Company 1
Site Name: Demo Farm 1
Date Started: 2007-01-01

				Legend:	Most Risky Response						Least Risky Response
Risk Factor	Response	Raw Score	Risk Index Score	Mean Risk Index Score All Sites	Possible Responses						
Internal Risks											
Circulation Risks											
Herd and Site Characteristics											
Characteristics of the herd											
Size of breeding herd (number of breeding age animals)	2300	6	46.4	37.7	3000 or More	2000 To 2999	800 To 1999	300 To 799	299 or Less		
Parity segregation	Mixed parity	5	21.5	21.7	All gilt farm	Mixed parity	All parity 1+ farm				
Average parity of the breeding herd	1.82	5	21.5	12.6	0 To 1	1 To 2	2 To 3	3 or More			
Type of breeding herd (commercial vs. genetic)	Commercial	6	46.4	36.4	Commercial	Genetic multiplier	Genetic nucleus				
Characteristics of the site											
Stages of production at site	Farrow to wean	3	4.6	17.6	Farrow to finish	Farrow to feeder	Farrow to wean				
Gestation housing	All individually housed gestation	4	10.0	16.0	All pen gestation	Combination pen and individually housed gestation during less than 2 weeks of each mating cycle	Combination pen and individually housed gestation during more than two weeks of each mating cycle	All individually housed gestation			
PRRSV Status											
Current and historical PRRSV status of the site											
Current PRRSV status of animal population at this site	Naive - entire herd never exposed to PRRS virus	3	4.6	28.3	Positive active, that is positive by ELISA and producing infected weaned pigs, not clinically stable	Positive, stable that is positive by ELISA but producing non-infected weaned pigs	Negative but not naive - herd still contains previously exposed animals	Naive - entire herd never exposed to PRRS virus			
Number of PRRS clinical breaks at this site in last 6 months	0	2	2.2	5.9	3 or More	2 To 2	1 To 1	0 To 0			
Number of PRRS clinical breaks at this site during period between 6 months to 1 year ago	0	2	2.2	4.2	3 or More	2 To 2	1 To 1	0 To 0			

Response shown in blue text

Figure 4. Example of Pareto Report *(individual site benchmarking report)*
In the Pareto report, each response is ranked from most risky to least risky with the most risky responses displayed at the top. External risks are indicated in red and internal risks in blue. This report has been used to identify biosecurity practices that may be implemented to reduce the risk of a site.



Risk Factor	Question ID	Response	Risk Index Score	Importance
Replacement animal isolation flow	(11)	Continuous Flow	100.0	Very High Importance
Frequency of replacement deliveries to this breeding herd site (days between deliveries)	(18)	21	100.0	Very High Importance
Frequency of semen PCR testing for PRRS virus	(33)	No semen testing or unknown	100.0	Very High Importance
Number of breeding herd sources from which replacements have been obtained in last two years	(1)	3	46.4	Very High Importance
Replacement animal acclimation flow	(10)	Continuous Flow	46.4	Very High Importance
Size of breeding herd (number of breeding age animals)	(184)	2297	46.4	Very High Importance
Replacements are exposed to serum from PRRSV infected pigs or sows via injection prior to entry	(261)	Yes	46.4	Very High Importance
Time (days) between last exposure to injected serum and entry of replacements into breeding herd	(263)	60	46.4	Very High Importance
Breeding animals have been exposed at this site to serum from PRRSV infected pigs or sows via injection of the whole herd only during or immediately following a PRRS break	(265)	Yes	46.4	Very High Importance
Proximity of site(s) from which semen is sourced to other swine farms within a 1 to 3 mile radius	(47)	One or more, but not all site(s) from which semen is sourced have other swine farms located within a 1 to 3 mile (1.6 to 4.8 km) radius	46.4	Very High Importance
PRRSV status of other swine farm sites within 1 to 3 mile radius of site(s) from which semen is sourced	(49)	One or more other swine farm sites within 1 to 3 mile (1.6 to 4.8 km) radius of site (s) from which semen is sourced are PRRSV positive currently or within last 5 years	46.4	Very High Importance
Route restrictions on vehicles used to transport animals to market or collection points	(57)	No special route selection practices	46.4	Very High Importance
Route restrictions on vehicles used to transport non-genetic animals to and from other sites within the production system	(71)	No special route selection practices	46.4	Very High Importance
Route restrictions on vehicles used to transport genetic animals	(85)	No special route selection practices	46.4	Very High Importance
Transit restrictions on vehicles used to transport genetic animals	(86)	Transport vehicles are allowed to stop en route	46.4	Very High Importance
Pig density (swine sites) in a 1 to 3 mile radius of this site	(158)	4	46.4	Very High Importance
Distance (miles) to nearest swine farm	(160)	0.9	46.4	Very High Importance

Objective 3:
Three presentations regarding use of the PRRS Risk Assessment by veterinarians and producers have been developed and delivered.

The following presentations have been given:
Iowa Pork Congress: "Risk Assessment of Disease in Swine Production – Potential Application to PCVAD" on January 24, 2007, Des Moines, Iowa.

2007 George Young Swine Conference: "PRRS Risk Assessment Tool" on August 16, 2007, South Sioux City, Nebraska.

Allen D. Leman Conference: Update of the AASV PRRS Risk Assessment Tool" on September 17, 2007, St. Paul, Minnesota.