RESEARCH REPORT
SWINE HEALTH

Title: Development of new risk assessments and enhancements to the web application for the Production Animal Disease Risk Assessment Program - **NPB# 07-236**

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Date Submitted: September 30, 2010

Industry Summary:
The American Association of Swine Veterinarian's (AASV) Production Animal Disease Risk Assessment Program (PADRAP) is an epidemiologically-based initiative to help producers and veterinarians manage disease risks faced by North American swine industry. It offers a set of risk assessment questionnaires, databases and reports for measuring and benchmarking disease risks. With funding from the National Pork Board there are now two risk assessments available within PADRAP: Porcine Reproductive and Respiratory Syndrome (PRRS) Risk Assessment for the Breeding Herd and PRRS Risk Assessment for Growing Pig Herd. PADRAP is designed to easily accommodate risk assessments for other swine disease, other stages of production and even other species. The purpose of this project was to complete the development of PADRAP online and to develop two new risk assessment surveys to be offered through the program, Breeding Herd (version 3.0) and Grow-finish Herd (version 1.0). The new risk assessment surveys were developed from literature, biosecurity and other risk assessments by teams of veterinarians and researchers who are experts in their respective fields. More information about PADRAP may be obtained at www.padrap.org.

Keywords: PADRAP, PRRS virus, biosecurity, swine breeding herd, swine grow-finish herd, risk assessment

Scientific Abstract
The pork industry is an increasingly high risk industry; disease is a major source of that risk. Pork producers know firsthand that it is difficult to control diseases that are endemic to the U.S. like Porcine Reproductive and Respiratory Syndrome (PRRS) virus. Emerging diseases such as porcine circovirus type 2, foreign animal diseases like foot and mouth disease, and diseases with human health implications like H1N1 create havoc in the swine industry. Waiting until an incident or problem occurs and then scrambling to contain it is not a strategy that will lead to the long-term survival and global competitiveness of the swine industry. Producers need to be able to minimize the risk of introduction and transmission of the pathogens that cause these diseases. The best way to keep disease and pathogens out of a herd is by managing biosecurity.

The American Association of Swine Veterinarian's (AASV) Production Animal Risk Assessment Program (PADRAP) is a standardized method of capturing and quantifying information about biosecurity practices that are essential for learning how to keep herds negative, in addition, to preventing positive herds from repeatedly breaking. Keeping the virus out of herds and minimizing/eliminating lateral transmission between growing pig/breeding herd sites is the major remaining barrier to eradication of PRRS.

The web-based application, PADRAP Online, allows trained veterinarians to complete and submit assessments for breeding herd sites and immediately view and print risk benchmarking reports for the sites. The purpose of this project was to complete the development of PADRAP Online and to develop the next version (version 3.0) of the Breeding Herd survey and a survey (version 1.0) for Grow-finish Herds.

The deliverables for this project included additional functionality in PADRAP Online and two new risk assessment surveys. Additional functionality was added: 1) options to reduce the time required to complete the surveys, 2) provide veterinarians a method to complete the survey without internet access, 3) ability to create JPEGs of the key reports and incorporate into PowerPoint presentations, and 4) ability to print in full color. Development of the next version (version 3.0) of the Breeding Herd survey required a thorough evaluation of all the questions, responses, and risk scores in the current version. In addition, literature, review of biosecurity, and feedback from veterinarians were all components of information made available to a development team who was assembled to conduct the evaluation. They were charged with adding, deleting, or changing the questions, responses and risk scores. The Delphi survey approach was used with this group to narrow the list of questions to be included in the final survey. The Grow-finish Herd Risk Assessment, version 1.0, was constructed with a similar approach used to develop the Breeding Herd survey, version 3.0. Information was accumulated and summarized from multiple sources to provide a basis for the evaluation. A development team was assembled to conduct the evaluation and utilized the Delphi survey approach to decipher which question should be included in the final survey and to assign risk scores to the possible responses for each question.

With the recent interest in eradication of PRRS, PADRAP is also gaining recognition for its use in the regional elimination and control projects. The activities and deliverables funded by this project substantially increased the value of the program for use in these area projects as well as the more traditional uses. For more information about PADRAP, go to www.padrap.org.

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Introduction

Production Animal Disease Risk Assessment Program (PADRAP) was initiated in 2006. Iowa State University College of Veterinary Medicine, Food Supply Veterinary Medicine provides program coordination to develop, manage and promote disease risk assessment tools and databases of completed risk assessments held by the American Association of Swine Veterinarians (AASV).

PADRAP is an epidemiologically-based initiative to help producers and veterinarians manage disease risks faced by the North American swine industry. If offers a set of risk assessment surveys and reports for measuring and benchmarking disease risks.

Some of the ways PADRAP has been applied include:

- As a tool to evaluate current biosecurity protocols and/or to develop new biosecurity protocols to avoid risk
- To demonstrate improvement in biosecurity over time to help justify expenditures or resources on measures to improve biosecurity
- As an aid in the decision to initiate a project to eliminate PRRS virus from a site
- As an aid in the decision to use a breeding herd site to produce genetic animals
- As part of the due diligence process for purchases or contracting agreements
- As a tool for regional elimination or control projects

Objectives

The purpose of this project was to complete the development of PADRAP Online and to develop two new risk assessment surveys to be offered through the program. PADRAP Online now enables trained veterinarians to complete and submit assessment surveys for sites and immediately view and print benchmarking reports.

1. Complete web application (PADRAP Online) for the American Association of Swine Veterinarians (AASV) Production Animal Disease Risk Assessment Program (PADRAP).

2. Develop the next version (version 3.0) of the PRRS Risk Assessment for the Breeding Herd using the knowledge acquired from use of the current version as well as that from recent experimental research that has advanced our understanding of the disease.

3. Develop a PRRS Risk Assessment for the Grow-finish Herd (version 1.0).

Materials and Methods

Objective 1

The web-based application allows trained veterinarians to submit completed assessments for breeding herd sites and immediately view and print risk benchmarking reports for the sites. Additional functionality was added: 1) options to reduce the time required to complete surveys, 2) provide veterinarians a method to complete the survey without internet access, 3) ability to create JPEGs of the key reports and incorporate into PowerPoint presentations, and 4) ability to print in full color.

Objective 2

Development of the next version of the PRRS Risk Assessment for the Breeding Herd, version 3.0, required evaluation of all of the questions, responses and risk scores in the current version. Information was accumulated and summarized from multiple sources to provide a basis for the evaluation. A development team was assembled to conduct the evaluation. The team consisted of 7 researchers and veterinarians with expertise in PRRS virus transmission and ecology. They were charged with adding, deleting or changing the questions, responses and risk scores in the current version after careful consideration of all the information made available to them. A Delphi survey approach was used with this group to narrow the list of questions to be included in the final survey and to assign risk scores to the possible responses to each question. The Delphi approach is a multistage method designed to elicit group consensus based on expert opinion.

Objective 3

Development of the PRRS Risk Assessment for the Grow-finish herd, version 1.0, was developed with a similar approach used to develop the PRRS Risk Assessment for the Breeding Herd, version 3.0. Information was accumulated and summarized from multiple sources to provide a basis for the evaluation. A development team

was assembled to conduct the evaluation. The team consisted of 5 researchers and veterinarians with expertise in PRRS virus transmission and ecology. They were charged with developing the initial list of questions, responses and risk scores after careful consideration of all the information made available to them. A Delphi survey approach was used with this group to narrow the list of questions to be included in the final survey and to assign risk scores to the possible responses to each question. The Delphi approach is a multistage approach designed to elicit group consensus based on expert opinion.

Results

Objective 1

Web application for PADRAP Online (http://www.padrap.org) was completed by adding four additional functionality items.

1. Reduce time required to complete surveys

There are two features that were incorporated into PADRAP that reduce the time required to complete the surveys: duplicate survey (Figure 1) and take multiple survey option (Figure 2).

Duplicate Survey Opinion

The duplicate feature is used frequently if a production system (i.e. company) is completing risk assessments on an annual basis. For example, the production system had completed a risk assessment in 2007 and would like to complete a risk assessment for that same site in 2008, the veterinarian could duplicate the surveys from 2007 and then update the survey questions that had changed from 2007 to 2008. It is also used to facilitate "what-if" analysis. A completed survey may be duplicated and the response to one or more questions changed to reflect that what-if being evaluated. The original and duplicated surveys may be compared to determine the resulting impact of the changes on the reported risk scores.

Take Multiple Survey Option

Due to common practices within a production system (i.e. boar stud or transportation practices), the veterinarian could create a "template" by answering all the questions for the particular section, duplicate the template, and then use the "Take Multiple Survey" to complete up to five surveys at the same time.

2. Method to complete surveys without internet access

As with any web-based program, it is important to recognize that not every site will have internet. PADRAP now has a feature that allows veterinarians to print off a PDF of the survey prior to going to the site (Figure 3). When returning to the office, the veterinarian, or their office staff, would enter the responses into PADRAP from the PDF.

3. Ability to create JPEGs

Ability to create JPEGs of risk quadrants and risk profile reports was added. This has been particularly useful as many veterinarians are incorporating these reports into their PowerPoint presentations to the producer. An example of the risk profile report is shown in Figure 4.

4. Ability to print in color

The fourth feature is the ability to not only display the benchmarking reports in color, but to print in full color (i.e. Adobe PDF or color printer). The Individual Risk Report is a key report that many veterinarians use to access which factors are most risky for the particular site (Figure 5). The color graphics are instrumental in the presentation of the report.

Objective 2

The Breeding Herd Risk Assessment version 3.0 was developed using the knowledge acquired from the 2.0 version as well as that from recent experimental research to advance our understanding of the disease. This information was accumulated and summarized from multiple sources to provide a basis for the evaluation.

- A systematic search of literature on PRRS virus transmission. A veterinary intern collected all pertinent articles and summarized the articles. The funding for this veterinary intern was not part of this proposal, but was beneficial in completion of objective 2.
- Review of biosecurity and other swine disease risk assessments (i.e. PCVAD). Questions that may or should be considered part of the version 3 Breeding Herd Risk Assessment were summarized.
- Since 2005, feedback was gathered from veterinarians that have used the PRRS Risk Assessment for the Breeding Herd and were summarized.
- The most significant information came from the database of version 2 risk assessments. The current version of the PRRS Risk Assessment for the Breeding Herd was developed in 2004. Since that time, the database of assessments, using this version, has grown to over 2486 assessments representing nearly 1333 North American breeding herd sites. The data stored in the database for each of the assessments includes the current PRRS status of the breeding herd site, demographic information, such as the location of the site, details about 155 risk factors and outcomes, such as the number of historical clinical PRRS virus breaks. Contingency tables were completed to determine association between each risk factor in the version 2 Breeding Herd survey and number of clinical PRRS breaks in the last three years.

The development team used all the information provided in cooperation with the Delphi survey approach to compile the questions that were used to populate the final survey.

The development team included:

Dr. Montse Torremorell, University of Minnesota
Dr. Rodger Main, Iowa State University
Dr. Jim Lowe, Carthage Veterinary Services
Dr. John Waddell, Sutton Veterinary Center
Dr. Paul Yeske, Swine Veterinary Center
Dr. Dale Polson, Boehringer-Ingelheim Vetmedica, Inc.
Dr. Derald Holtkamp, Iowa State University

Objective 3

The Grow-finish Herd Risk Assessment version 1.0 was developed using the information from multiple sources to provide a basis for the evaluation. The data was accumulated and compiled from three resources as preliminary information for the development team.

1) A systematic search of literature on PRRS virus transmission. A veterinary intern collected all pertinent articles and summarized the articles. The funding for this veterinary intern not part of this proposal, but was important for completion of objective 3.
2) A grow-finish prototype was developed and all questions were summarized for the development team.
3) Review of biosecurity and other swine disease risk assessments (i.e. PCVAD). Questions that may or should be considered part of the grow-finish, version 1.0, risk assessment were summarized.

The development team used all the information provided in cooperation with the Delphi survey approach to compile the questions that were used to populate the final survey.

The development team included:

Dr. Paul Yeske, Swine Veterinary Center
Dr. Jim Lowe, Carthage Veterinary Services
Dr. Dale Polson, Boehringer-Ingelheim Vetmedica, Inc.
Dr. John Waddell, Sutton Veterinary Center
Dr. Derald Holtkamp, Iowa State University

Discussion/Conclusion

With the recent interest in area PRRS control and elimination projects, use of PADRAP has increased substantially. The activities and deliverables funded by this project considerably increased the value of the program for use in these area projects as well as the more traditional uses. The deliverables for all three objectives may be viewed by accessing the program online at www.padrap.org. A username and password is required. Veterinarians are given usernames and passwords upon completion of a 4 hour training course. Please contact Dr. Derald Holtkamp for information about accessing the program.

Figure 1. Example of Duplicate Survey Option

Figure 2. Example of the "Take Multiple Survey" Option

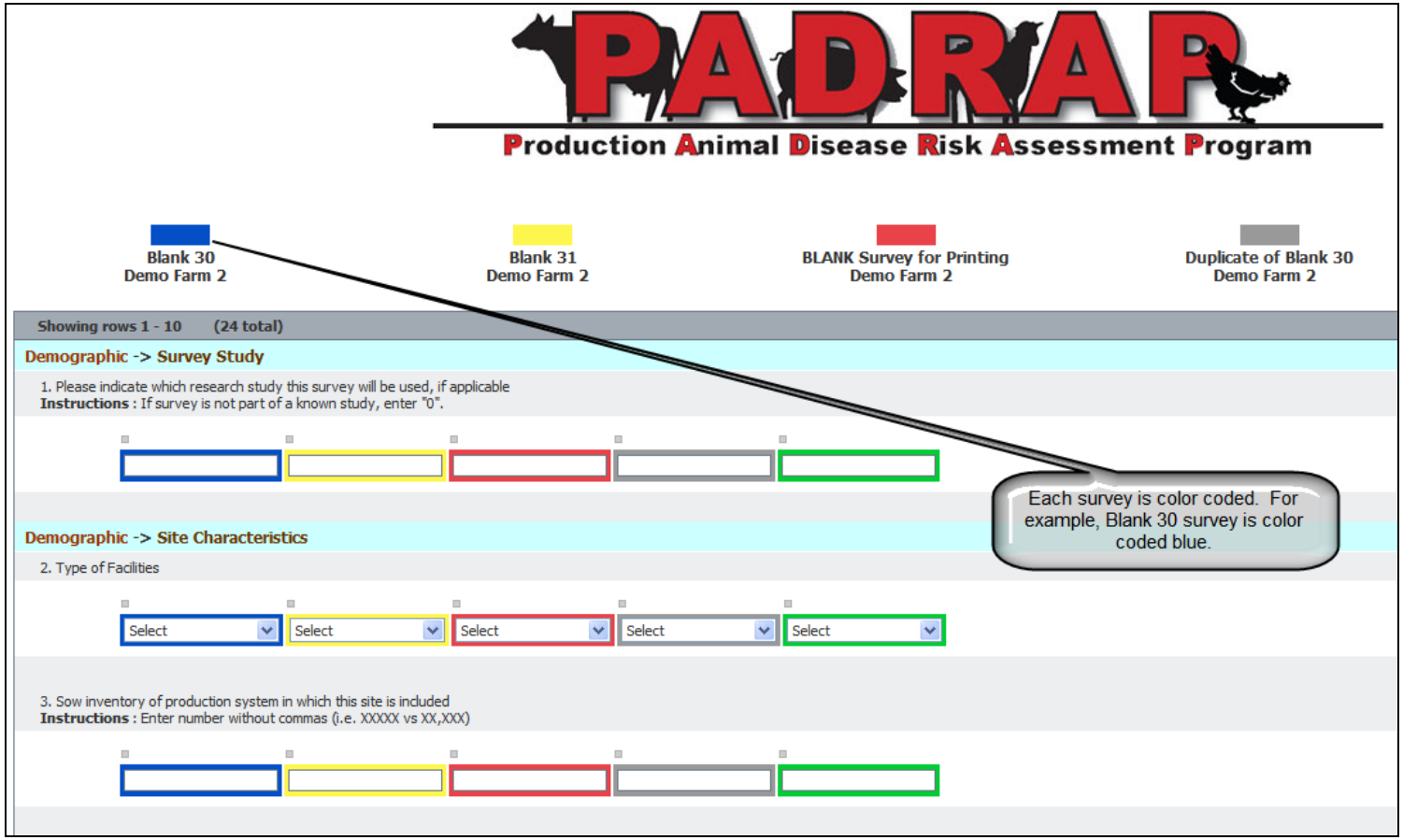

Figure 3. Example of Survey PDF

Survey Title: Blank 30
Prod System Name: Demo Company 2
Site Name: Demo Farm 2
Date Started: 2008-07-18

Demographic

Demographic -> Survey Study

1. Please indicate which research study this survey will be used, if applicable

[Instructions:If survey is not part of a known study, enter "0".]

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Demographic -> Site Characteristics

2. Type of Facilities

Outdoor production --> DropDown
Partial confinement --> DropDown
Total confinement --> DropDown

3. Sow inventory of production system in which this site is included

[Instructions:Enter number without commas (i.e. XXXXX vs XX,XXX)]

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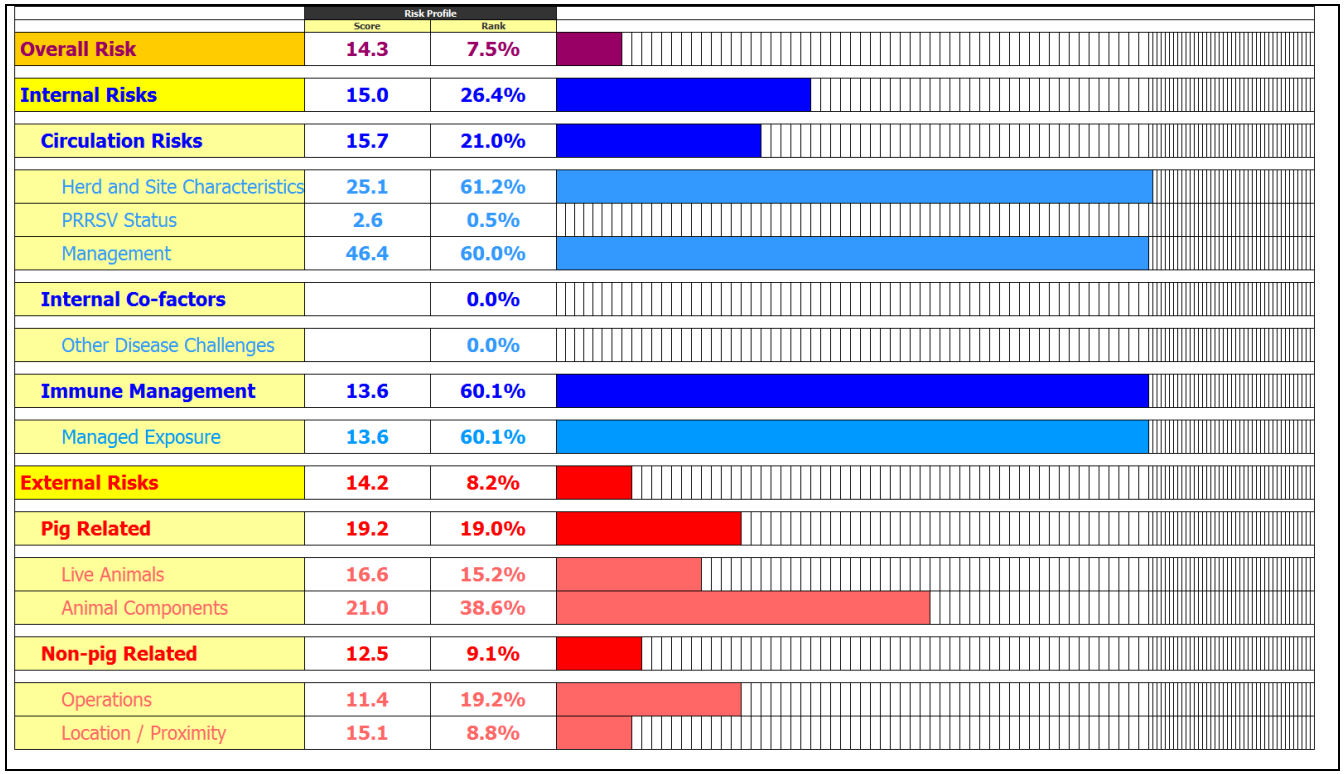
4. Site Production Type

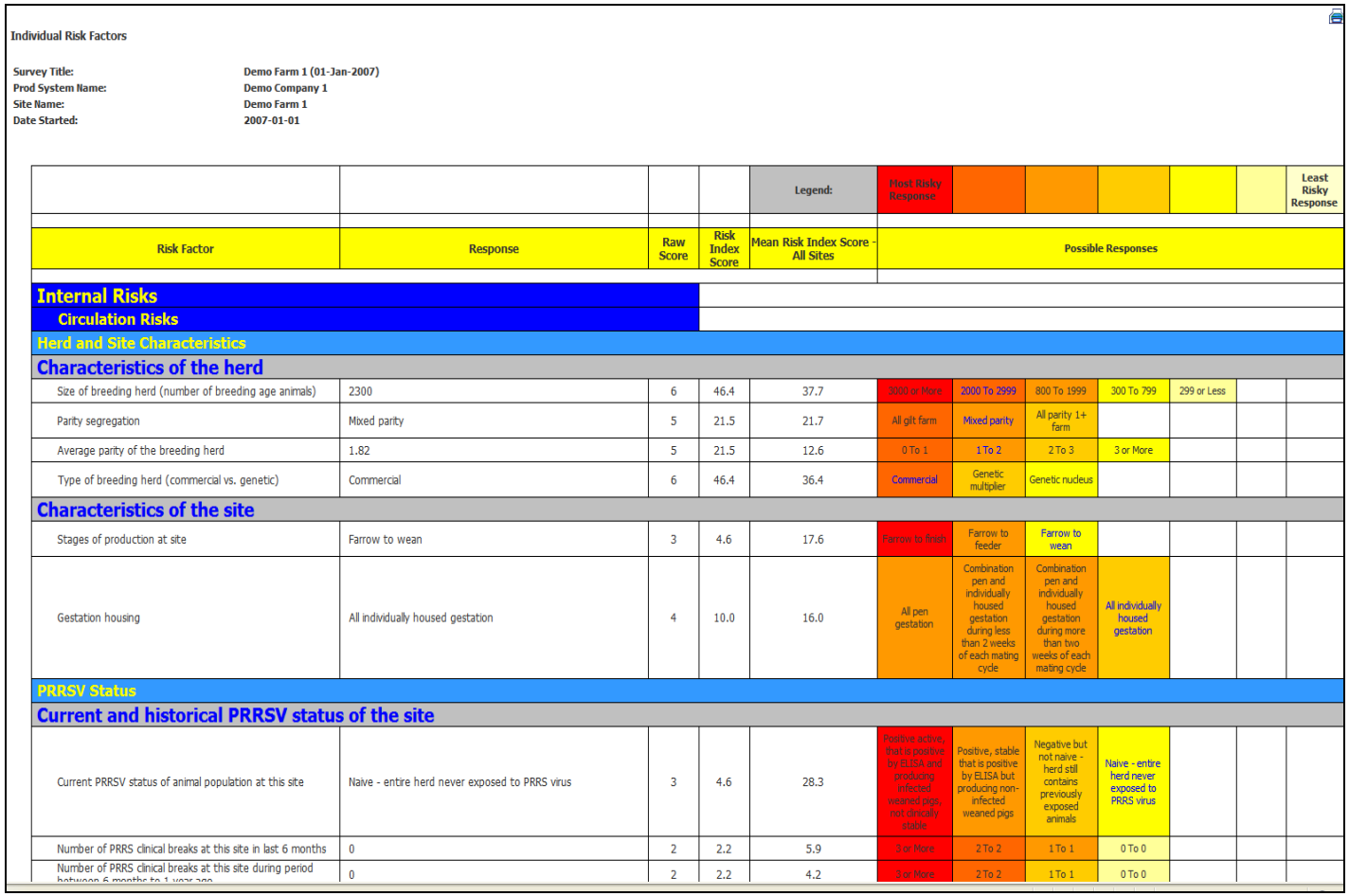
Figure 4. Example of Risk Profile Report



	Risk Profile Score	Rank
Overall Risk	14.3	7.5%
Internal Risks	15.0	26.4%
Circulation Risks	15.7	21.0%
Herd and Site Characteristics	25.1	61.2%
PRRSV Status	2.6	0.5%
Management	46.4	60.0%
Internal Co-factors		0.0%
Other Disease Challenges		0.0%
Immune Management	13.6	60.1%
Managed Exposure	13.6	60.1%
External Risks	14.2	8.2%
Pig Related	19.2	19.0%
Live Animals	16.6	15.2%
Animal Components	21.0	38.6%
Non-pig Related	12.5	9.1%
Operations	11.4	19.2%
Location / Proximity	15.1	8.8%

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 5. Example of Individual Risk Report



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			

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.