2008-2013 SUMMARY ANALYSIS

of Pork Industry Productivity

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Because there is a lack of publically available information for producers to use when trying to benchmark productivity in various phases of production, the National Pork Board's Animal Science Committee initiated the Industry Productivity Analysis. The committee's objective was to provide data documenting the productivity of U.S. pork production to offer real-word benchmarks.

The information mined from analysis of this data is intended to benefit all producers through improved productivity at the farm level. The data should allow producers to determine areas that may allow for management improvements that may rapidly affect profitability. The analysis should also serve to inform the Checkoff program, academics and other funding agencies about areas of research which are likely to have the greatest impact on productivity.

The following information was prepared from the final report submitted by Dr. Ken Stalder at Iowa State University. This report only a summary, but the full report can be found at *www.pork.org/research*.

Introduction

The U.S. pork industry continues its goal of continuous improvement by many measures, including increased production efficiency over time. However, the effects of season/weather can negatively impact this goal, which makes getting a solid understanding of this impact of critical importance. . In order to quantify the overall productivity improvements made in the industry, and to determine how seasonality impacts the industry as a whole, a national database must be analyzed for production changes between seasons, across years and among different production systems. The results from this study are based on a group of pork production companies representing approximately 35 percent of the U.S. pork industry. Specifically the study set out to quantify the annual production levels and the variation associated with several key performance indicators for the pork industry in all production phases (i.e. sow farm, nursery, wean-to-finish and conventional finisher facilities) from 2008 to 2013. Additionally, seasonal effects associated with the key performance indicators were measured.

The results of this industry analysis indicate that the pork industry has been successful in improving production efficiency, however there are some performance indicators, such as preweaning mortality that may need to be focused on in the upcoming years. Changes have been made to increase the pounds of pork produced in a given time frame while reducing finishing mortality. This, along with increased litter size, has increased the throughput of the swine industry as a whole. The industry improvements over time can be attributed to better genetics, health and management. The results from this analysis can used to determine when management practices need to be improved and/or maintained to ensure the maximum performance level for each porkproduction stage based on where each farm ranks for a given performance indicator. Knowing when production levels decreased will allow producers and researchers to focus efforts on improving production practices during that time to increased production levels, improve production efficiency, and ultimately improve operational profitability.

Porcine epidemic diarrhea virus (PEDV) infected the U.S. swine population for the first time in 2013. By the end of 2013, the industry was just beginning to see the ramification of this disease, particularly in the poorer performing sow herds. Where it is most obvious is in the total born, born alive, number weaned and preweaning mortality figures when compared to previous years. It is likely that the effects of PEDV on better performing sow herds and on downstream production will be evident in next year's report.

Demographics and Production Measures

The farms reporting in this data set may represent a single farm or multiple sites owned by an overarching company. The results presented in this study are based on a group of pork production companies representing approximately 35 percent of the U.S. pork industry. Records were reported monthly for each production stage. All data are presented as means and their associated standard deviation. The top 10 percent%, top 25 percent and bottom 25 percent of farms in each production stage was determined. The farms in each percentile were determined for each production indicator meaning that the farms in each percentile are not necessarily the same for each production indicator. The top and bottom were defined as desirable and undesirable for each trait rather than numerically higher and lower.

Key Production Indicators in this Analysis:

Conventional Finisher	Wean-Finish*	Nursery	Sow Farm
Mortality (%)	Mortality (%)	Mortality (%)	Pigs/Mated Sow/Year
Finishing Weight (lbs)	Finishing Weight (lbs)	Exit Weight (lbs)	Litters/Mated Sow/Year
Days in Finisher	Days in Finisher	Days in Nursery	Total Born
Average Daily Gain (lbs/day)	Average Daily Gain (lbs/day)	Average Daily Gain (lbs/day)	Stillborn and Mummies
Feed Conversion (F:G)	Feed Conversion (F:G)	Feed Conversion (F:G)	Number Born Alive
			Number Weaned
			Pre-weaning Mortality (%)
			Weaning Weight (lbs)
			Weaning Age (d)

*All Wean-Finish data has been removed from this report in the sake of brevity. The full report, which includes the Wean-to-Finish data, can be found at *pork.org/animalscience*.

Results

Overall Productivity

The highlights of the improvements in overall productivity are listed below. Changes in production practices have been made to increase the pounds of pork produced in a given time frame while reducing finishing mortality. This, along with increased litter size, has increased the throughput of the pork industry as a whole. The industry improvements over time can be attributed to better genetics, health and management. The results from this analysis can used to determine which management practices need to be improved and/or maintained to ensure the optimum performance for each swine production stage, based on where each farm ranks for a given performance indicator. The data in the tables are presented as an average and their associated standard deviation. Key production indicators that have large variation may represent areas where the most progress can be made.

- Finishing mortality has decreased by about 1% for both types of finisher facilities (grow-finish and wean-to-finish) from 2008 to 2013.
- Finishing weights have increased over time for both conventional finisher and wean-to-finish facilities; however, days in finisher has decreased for conventional finishers and increased for wean-to-finish facilities.
- Wean-to-finish facilities had higher mortality compared to conventional finishers.
- Average daily gain increased for conventional finishers and remained relatively unchanged for wean-to-finish facilities.
- Feed conversion has slightly improved for the conventional finisher, but has remained consistent in wean-to-finish facilities from 2008 through 2013.
- Nursery mortality has decreased by 2% from 2008 to 2013.
- Average daily gain and feed conversion of pigs during the nursery phase have shown minimal change from 2008 to 2013, but have continued to make improvement across time.
- Pigs/mated sow/year has increased by almost 1 pig from 2008 to 2013 which was actually a decrease in the rate of improvement of almost 2 pigs from 2007 to 2012.
- The top 10% of farms in pigs/mated sow/year average 29.5 pigs.
- Litters/mated sow/year changed little suggesting that most of the increase in pigs/mated sow/year has been a result of increasing litter size.
- Total number of pigs born per litter has increased by over a pig from 2008 to 2013, while the stillborn and mummies have decreased over the same time period, resulting in all of the increase in total born being realized in the number born alive.
- Number weaned increased by 0.5 pigs from 2008 to 2013.
- Percent pre-weaning mortality increased from 2008 to 2013.
- Weaning age has increased by 2.2 days and weaning weight has increased by 1 lb. from 2008 to 2013.

Conventional Finisher Productivity

	2008	2009	2010	2011	2012	2013
Percent Mortality	6.29 (±4.60)	5.12 (±3.44)	4.70 (±3.05)	4.48 (±2.49)	5.03 (±3.30)	5.04 (±3.07)
Finishing Weight (lbs)	261.2 (±16.1)	265.0 (±14.9)	268.7 (±13.4)	271.5 (±12.8)	269.2 (±14.1)	272.1 (±17.2)
Days in Finisher	125.7 (±11.0)	124.3 (±11.4)	124.6 (±10.3)	122.7 (±9.7)	121.5 (±10.8)	122.8 (±13.0)
Avg. Daily Gain (lbs)	1.69 (±0.16)	1.75 (±0.15)	1.76 (±0.14)	1.81 (±0.14)	1.81 (±0.15)	1.81 (±0.16)
Feed Conversion[b]	2.82 (0.32)	2.76 (±0.27)	2.77 (±0.25)	2.71 (±0.24)	2.68 (±0.23)	2.66 (±0.23)

Nursery Productivity

	2008	2009	2010	2011	2012	2013
Percent Mortality	5.82 (±5.71)	4.68 (±4.41)	4.12 (±3.62)	4.32 (±4.32)	3.80 (±3.01)	3.87 (±3.38)
Exit Weight	49.0 (±9.2)	49.4 (±8.4)	50.7 (±9.1)	50.3 (±9.3)	50.7 (±8.4)	50.9 (±8.7)
Days in Nursery	47.4 (±6.8)	46.2 (±5.4)	46.2 (±5.5)	46.0 (±6.1)	46.0 (±5.1)	45.4 (±5.7)
Average Daily Gain (lbs)	0.78 (±0.14)	0.80 (±0.13)	0.82 (±0.14)	0.81 (±0.14)	0.82 (±0.13)	0.83 (±0.13)
Feed Conversion[b]	1.54 (±0.30)	1.53 (±0.29)	1.52 (±0.28)	1.53 (±0.25)	1.48 (±0.19)	1.48 (±0.18)

Sow Farm Productivity

	2008	2009	2010	2011	2012	2013
Pigs/Mated Sow/Year	22.8 (±2.9)	23.2 (±3.0)	23.5 (±2.7)	24.1 (±3.1)	23.9 (±2.9)	23.7 (±4.3)
Litters/Mated Sow/Year	2.35 (±0.23)	2.34 (±0.21)	2.33 (±0.20)	2.33 (±0.22)	2.31 (±0.22)	2.30 (±0.26)
Total Born	12.5 (±0.9)	12.8 (±0.9)	13.0 (±1.0)	13.4 (±1.1)	13.4 (±1.0)	13.6 (±1.1)
Stillborn and Mummies	1.23 (±0.49)	1.20 (±0.46)	1.22 (±0.48)	1.24 (±0.49)	1.17 (±0.46)	1.14 (±0.42)
Number Born Alive	11.3 (±0.8)	11.6 (±0.9)	11.8 (±0.9)	12.1 (±1.0)	12.3 (±0.9)	12.4 (±1.0)
Number Weaned	9.7 (±0.7)	9.9 (±0.8)	10.0 (±0.7)	10.2 (±0.7)	10.3 (±0.7)	10.2 (±1.3)
Pre-weaning Mortality %	14.2 (±5.5)	14.5 (±5.6)	14.6 (±5.8)	15.5 (±5.9)	15.5 (±5.7)	17.3 (±10.9)
Weaning Weight (lbs)	12.4 (±1.3)	12.8 (±1.5)	13.0 (±1.4)	13.1 (±1.4)	13.2 (±1.6)	13.4 (±1.7)
Weaning Age (d)	19.7 (±1.8)	20.5 (±2.0)	20.8 (±2.1)	20.9 (±2.5)	21.5 (±2.8)	21.9 (±2.9)

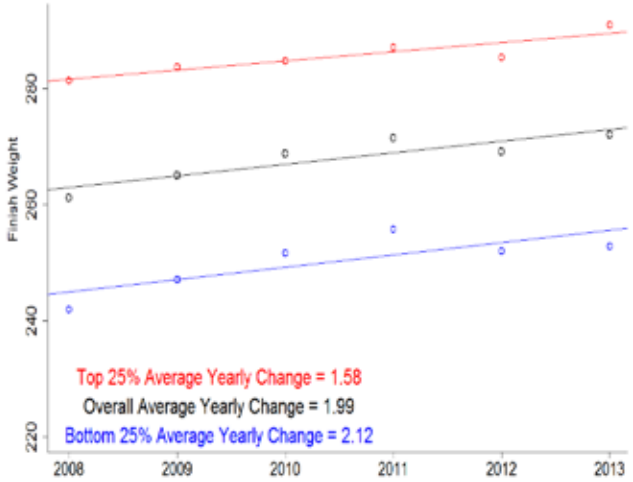
Benchmarking Productivity

The visual representation of the graphs clearly depicts the rate of change for a given indicator over time for the top 10 percent, top 25 percent and bottom 25 percent; red, black and blue respectively. These graphs show that there are some indicators that are changing at the similar rates for all three groups, while other indicators are changing at different rates. For example, litter size averages have increased at almost the same rates for top 10 percent, top 25 percent, overall, and bottom 25 percent groups. This suggests that a litter size limit has yet to be reached. On the other hand, the variation between the three groups in percent finisher mortality has substantially decreased over time. This could be the result of increased importance or focus placed on reducing mortality by owners, barn managers and barn workers as well as new vaccination developments. Moreover, most of the improvement in finishing mortality has come from producers with the highest mortality (bottom 25 percent). This trend also holds true for mortality in nursery facilities. Feed efficiency in the nursery has remained relatively unchanged for all three groups during this time, and thus it may represent an opportunity for improvement for producers in the bottom 25 percent.

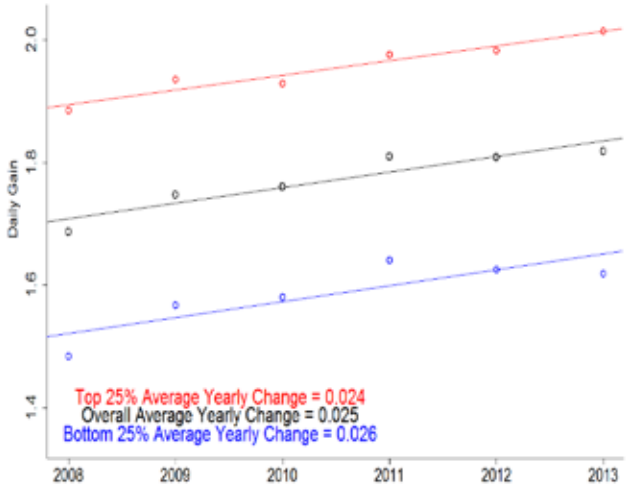
The rates of change for total born, number born alive, pigs weaned and preweaning mortality are almost identical for the three groups. There is a marked difference between the top 25 percent and the bottom 25 percent in weaning weight. This is most likely driven by weaning age as weaning age is the primary factor that influences weaning weight and a similar pattern exists between the two measures.

This information can also be used to predict future productivity for any given trait. For example, pigs per mated female per year typically increase by about 0.33 pigs per year. Given this information, producers can predict the number of pigs they are likely to produce five years from now. They may then use that information as they make decisions about, among other things, building design, animal flow, commodity purchase and health programs.

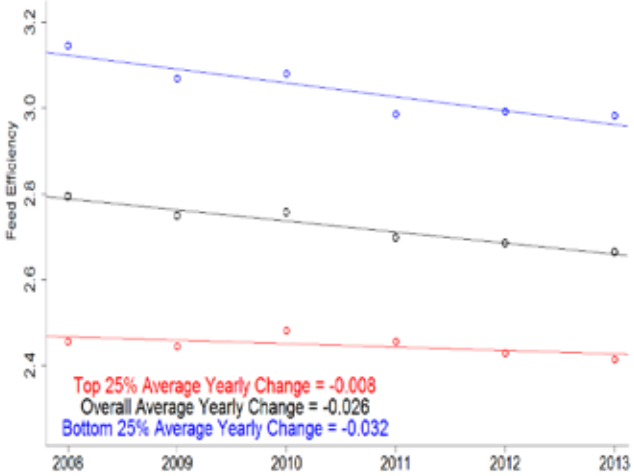
Conventional Finisher - Avg. Finish Weight



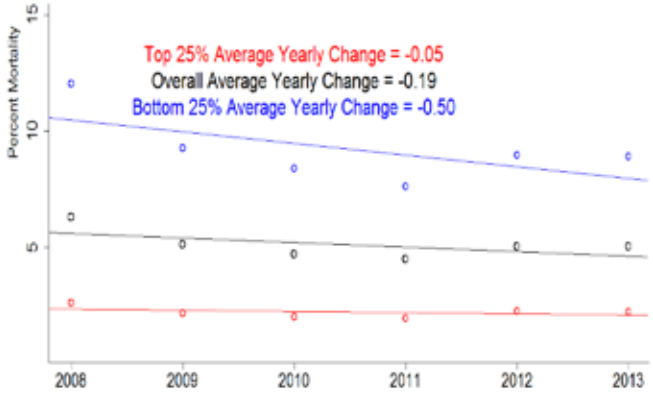
Conventional Finisher - Avg. Daily Gain



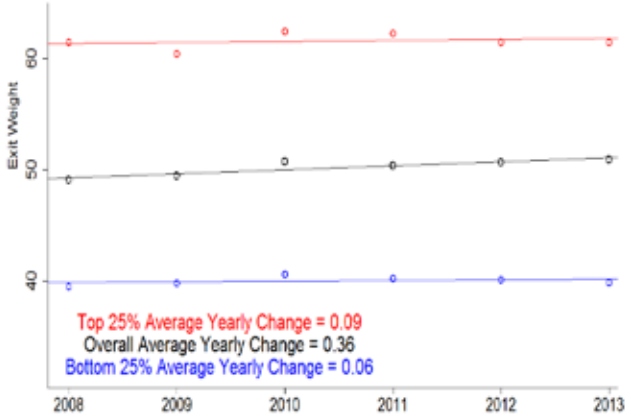
Conventional Finisher - Avg. Feed Efficiency



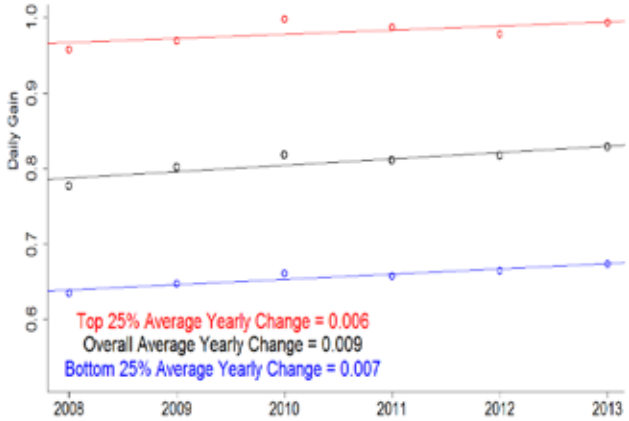
Conventional Finisher - Avg. Percent Mortality



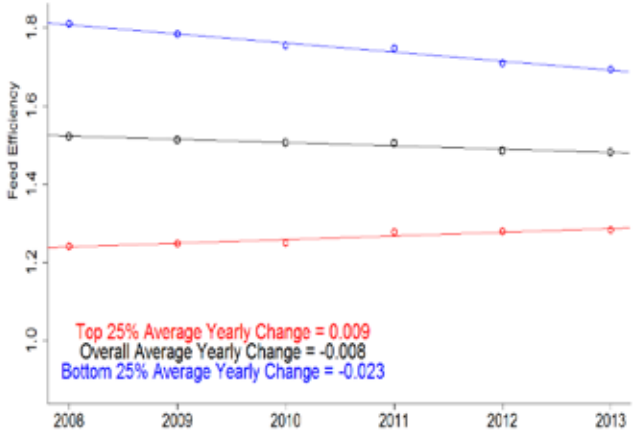
Nursery - Avg. Exit Weight



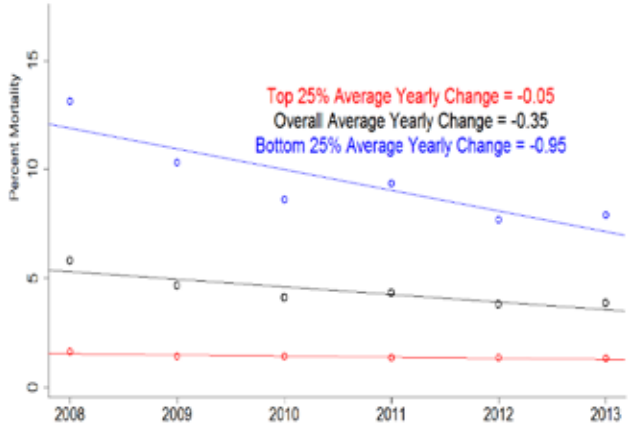
Nursery - Avg. Daily Gain



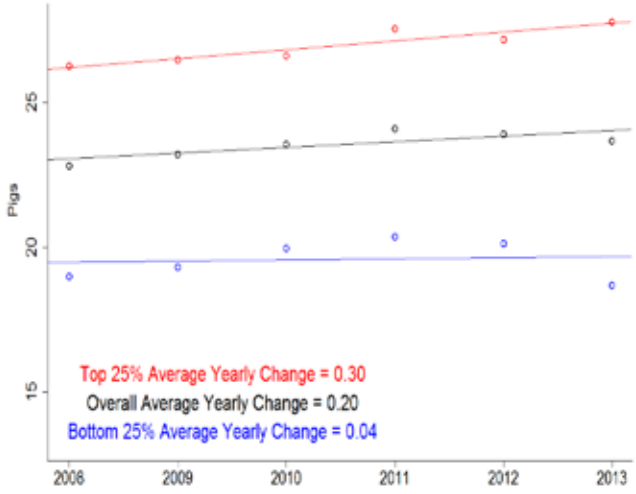
Nursery - Avg. Feed Efficiency



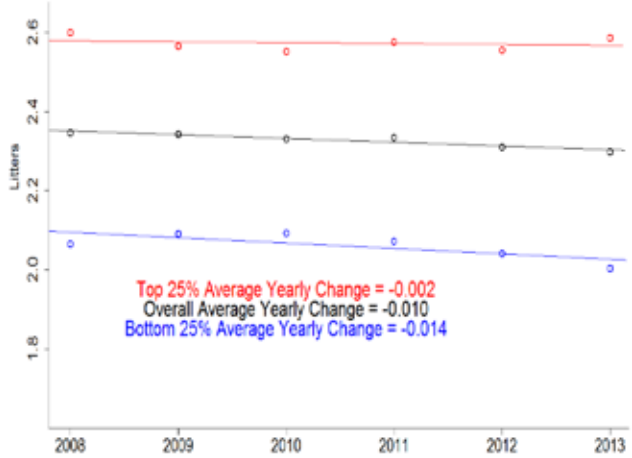
Nursery - Avg. Percent Mortality



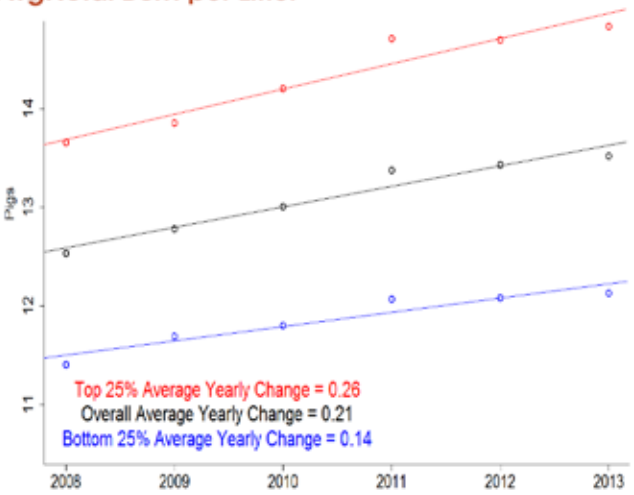
Avg. Pigs/Mated Sow/Year



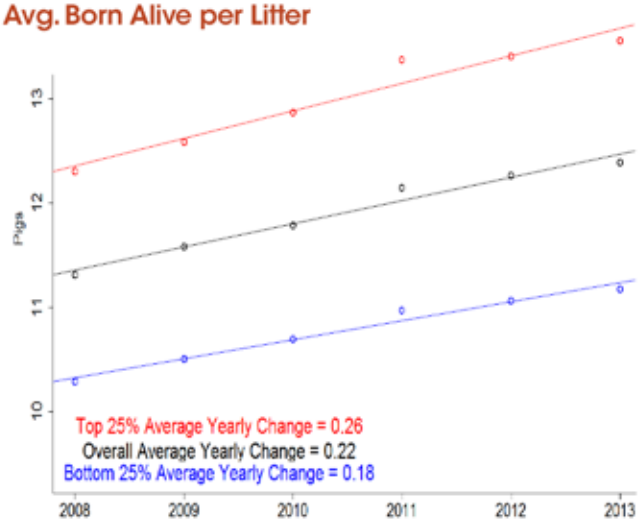
Avg. Litters/Mated Sow/Year



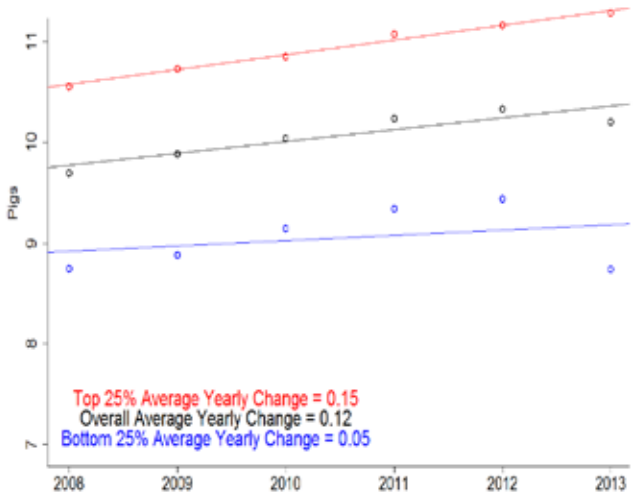
Avg. Total Born per Litter



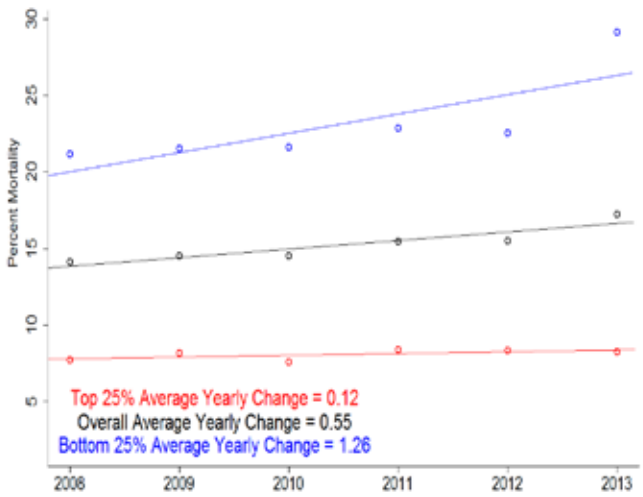
Avg. Born Alive per Litter



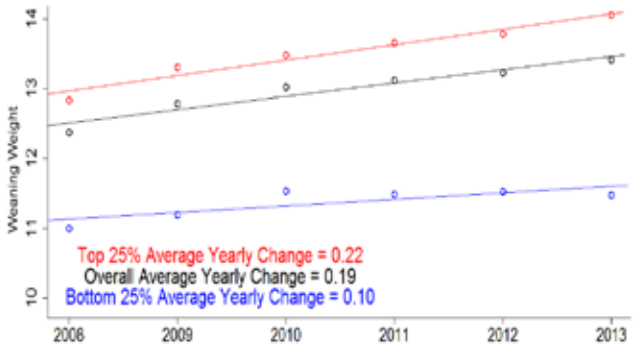
Avg. Pigs Weaned per Litter



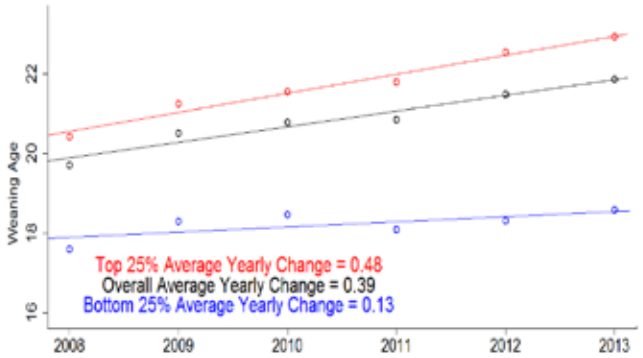
Avg. Pre-Weaning Mortality



Avg. Weaning Weight



Avg. Weaning Age



Changes in Productivity due to Season

The tables showing the changes in key productivity indicators for different seasons depict monthly effects relative to January production levels. The results of the analysis clearly show reduced productivity in all phases of production due to elevated summer temperatures. The highlights of this analysis are as follows.

- Market weight was lowest in August for both finisher types and highest in December for conventional and wean-to-finish facilities.
- Mortality in conventional finishers was best for pigs marketed in August and poorest for pigs marketed in February while it in wean-to-finish facilities it was highest for pigs marketed in July.
- There was less variation between months for conventional finishers compared to the variation between months for wean-to-finish facilities.
- Nursery mortality was best for pigs exiting the facility in September and poorest for pigs exiting in March.
- Body weight was greatest for pigs exiting the nursery in December and lowest in June.
- Feed conversion was poorest for pigs exiting the nursery in February and best for pigs exiting in June and July.
- Number born alive was greatest among litters weaned in August and September and lowest among litters weaned in December.
- Pre-weaning mortality was greatest among litters weaned in August and lowest in litters weaned in May.
- Weaning weight was greatest among litters weaned in May and lowest in litters weaned in August.

Seasonal Effect Estimates for Conventional Finisher

	Year	Feb.	Mar.	Apr.	May	Jun.	Jul.	Aug.	Sep.	Oct.	Nov.	Dec.
PM[a]	-0.10*	0.16	0.04	0.07	-0.03	-0.20*	-0.21*	-0.34*	-0.26*	-0.12	-0.27*	-0.11
FW	1.93*	-1.04*	-0.74*	-0.77*	-1.07*	-3.63*	-7.74*	-9.93*	-7.70*	-3.02*	1.52*	2.35*
ADG	0.016*	-0.009*	-0.008*	-0.009*	-0.015*	-0.031*	-0.066*	-0.084*	-0.063*	-0.027*	0.012*	0.021*
FCR	-0.031*	0.002	-0.004	-0.024*	-0.042*	-0.045*	-0.045*	-0.057*	-0.094*	-0.105*	-0.095*	-0.058*

Seasonal Effect Estimates for Nursery

	Year	Feb.	Mar.	Apr.	May	Jun.	Jul.	Aug.	Sep.	Oct.	Nov.	Dec.
PM[a]	-0.10*	0.15	0.31*	-0.02	0.01	-0.74*	-1.18*	-1.08*	-1.19*	-1.03*	-0.69*	-0.29*
EW	0.07*	-0.19	-0.33*	-0.59*	-0.60*	-0.72*	-0.63*	-0.52*	-0.36*	0.06	0.07	0.10
ADG	0.001*	-0.003	-0.008*	-0.011*	-0.013*	-0.017*	-0.015*	-0.012*	-0.008*	0.003	0.004	0.005
FCR	-0.007*	0.015*	0.007	0.002	0.006	-0.017*	-0.017*	-0.009	-0.003	-0.004	-0.003	-0.003

Seasonal Effect Estimates for Sow Farms

	Year	Feb.	Mar.	Apr.	May	Jun.	Jul.	Aug.	Sep.	Oct.	Nov.	Dec.
PSY[a]	0.34*	0.82*	1.07*	0.92*	1.03*	1.40*	1.52*	1.34*	1.30*	0.87*	0.13*	-0.37*
LSY	0.00	0.06*	0.07*	0.04*	0.03*	0.07*	0.09*	0.08*	0.07*	0.04*	-0.02*	-0.05*
TB	0.23*	0.15*	0.16*	0.19*	0.19*	0.25*	0.27*	0.27*	0.25*	0.17*	0.06*	0.04*
SBM	0.004*	0.034*	0.012	-0.008	-0.017	-0.005	-0.001	-0.007	-0.025*	-0.034*	-0.049*	-0.020*
NBA	0.22*	0.11*	0.15*	0.20*	0.21*	0.25*	0.27*	0.28*	0.28*	0.20*	0.11*	0.06*
PM	0.31*	0.15	-0.15	-0.45*	-0.93*	-0.69*	-0.28*	0.21	0.05	-0.37*	-0.37*	0.04
WW	0.06*	0.01	0.05*	0.09*	0.13*	0.12*	0.03	-0.12*	-0.07*	0.06*	0.06*	0.11*

Summary

The results of this industry productivity analysis indicate that the swine industry has been successful in improving production efficiency across all swine production phases; however there are some production indicators, such as pre-weaning mortality, that may require additional focus in the upcoming years. Changes have been made to increase the pounds of pork produced in a given time frame while reducing finishing mortality. This along with increased litter size has increased the throughput of the swine industry as a whole. The industry improvements over time can be attributed to better genetics, health, management, etc.

The results from this analysis can used to determine when management practices need to be improved and/or maintained to ensure the optimal level of performance for each swine production stage. Knowing when production levels decreased will allow producers and researchers to focus efforts on improving production practices during that time to maintain production levels and improve overall operation production and financial efficiency.

Porcine epidemic diarrhea has hit the U.S. swine population. In 2013, the industry is just beginning to see the ramification of this disease; particularly in the poorer performing sow herds. Where it is most obvious is in the total born, born alive, number weaned and pre-weaning mortality figures when compared to previous years. It is likely that the effects of PED on better performing sow herds and on downstream production will be evident in next year's report.