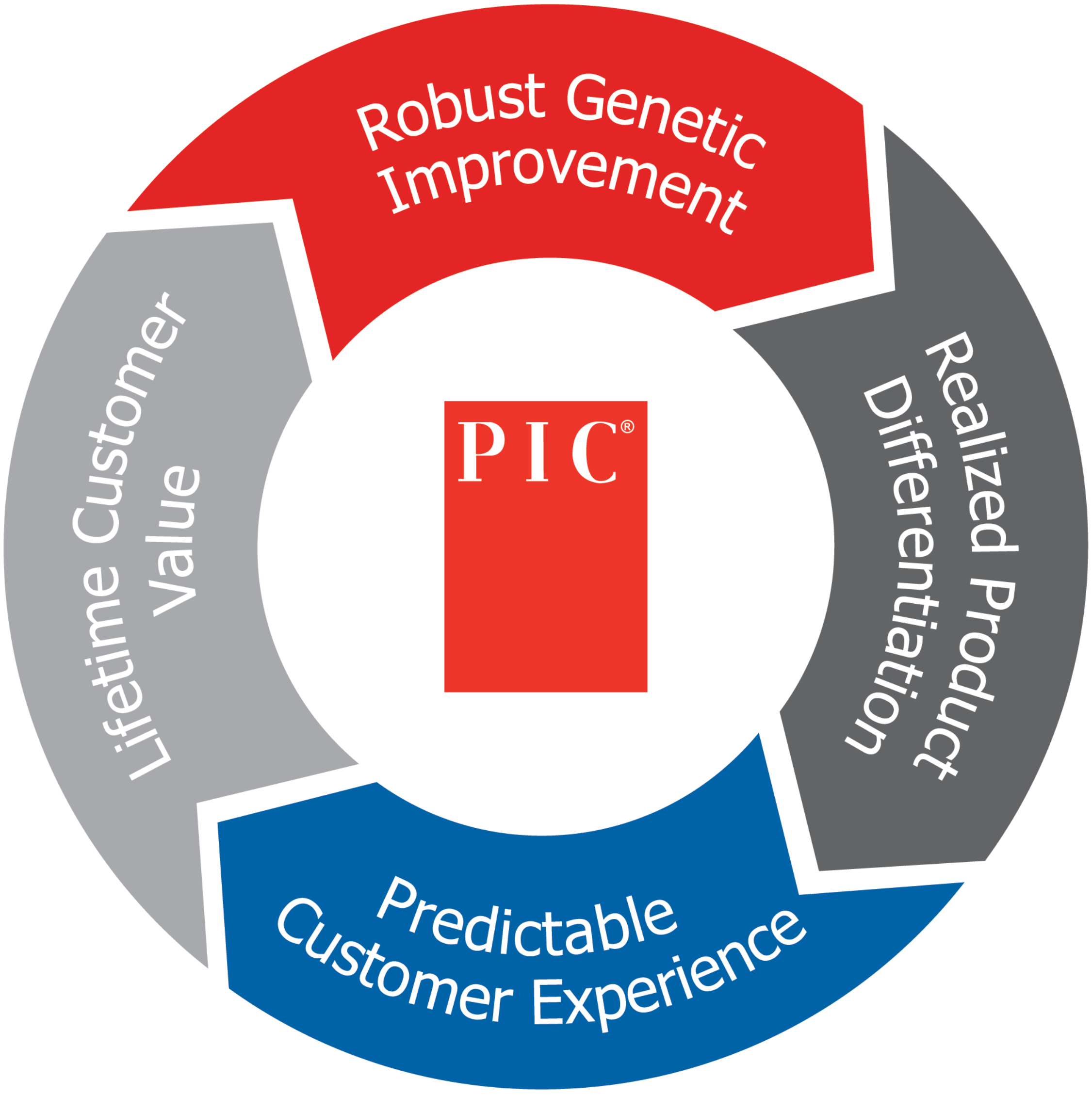
2018 PIC Canada Symposium

NEVER STOP IMPROVING

"Never Stop Improving"



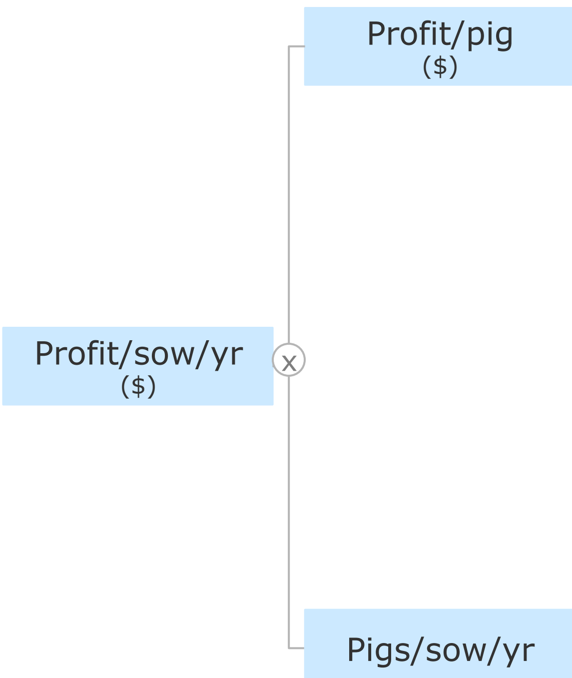
How to deliver
$100 more per sow

The value of a sow

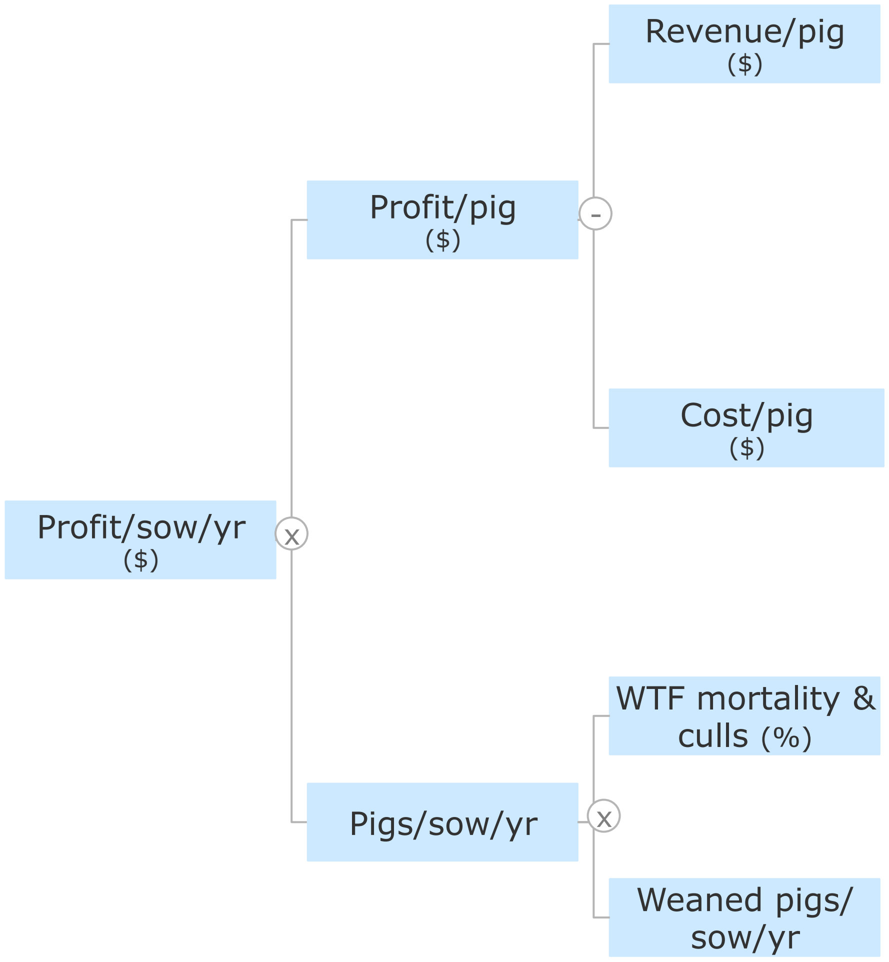
The value of a sow

Profit/sow/yr
($)

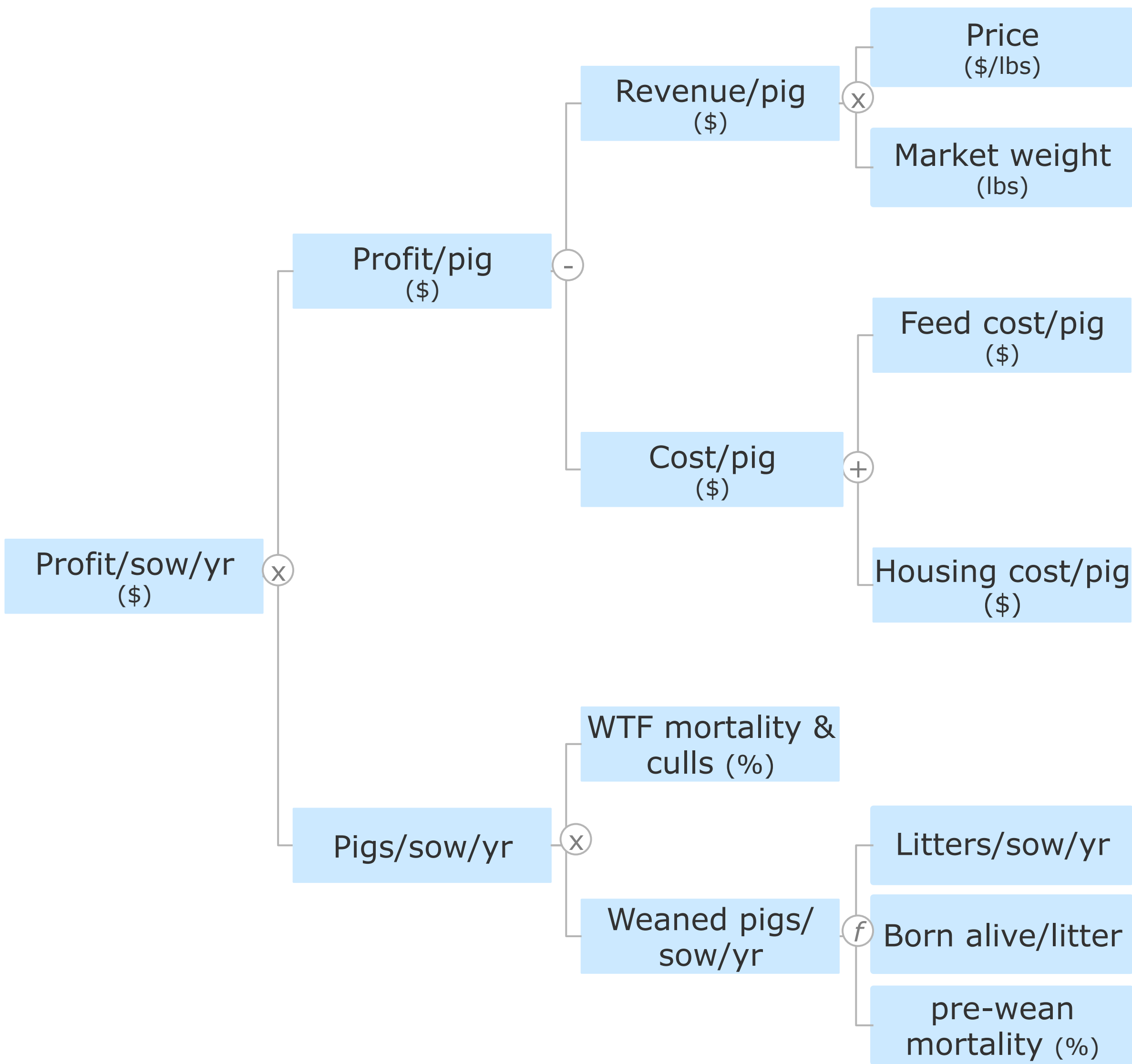
The value of a sow



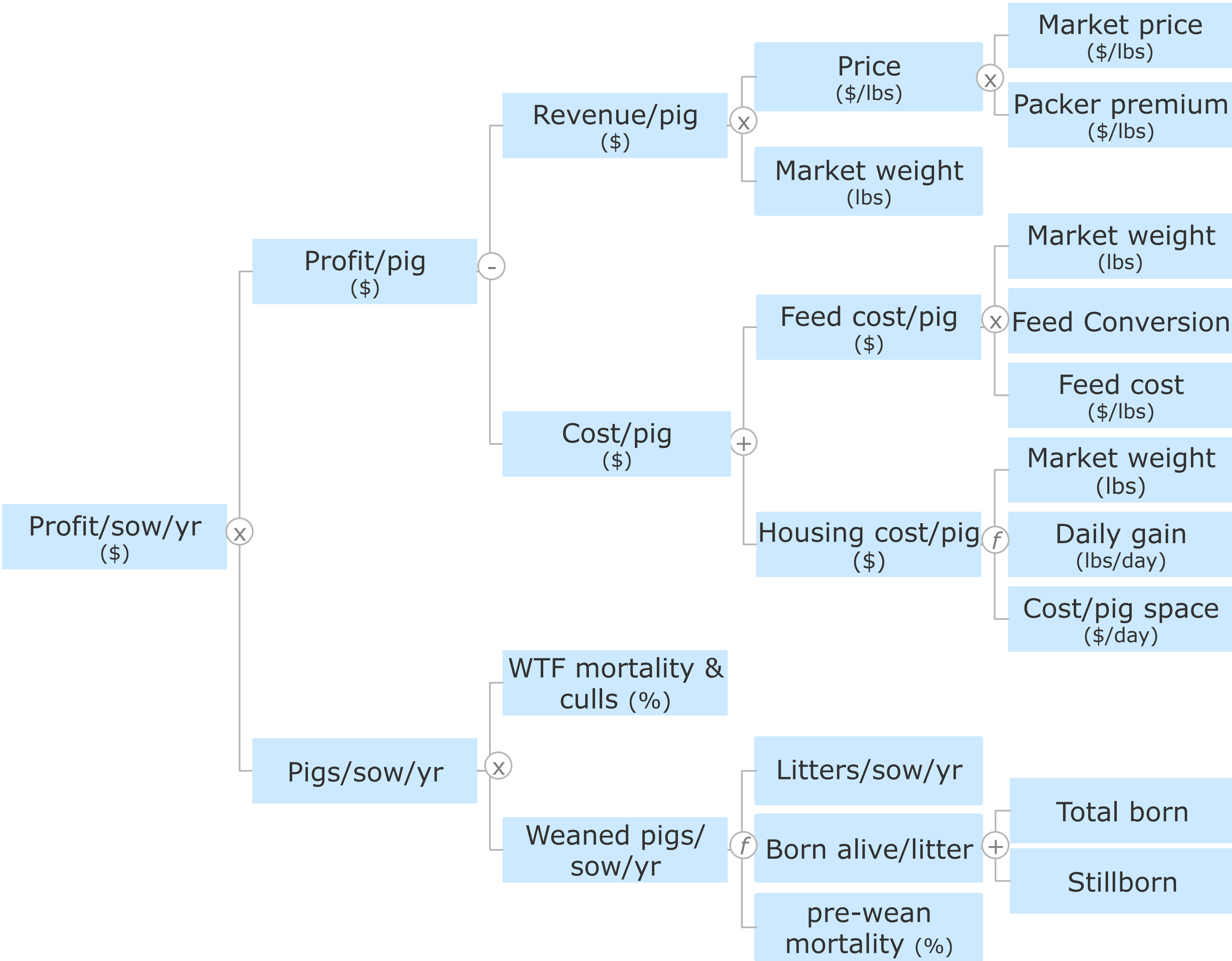
The value of a sow



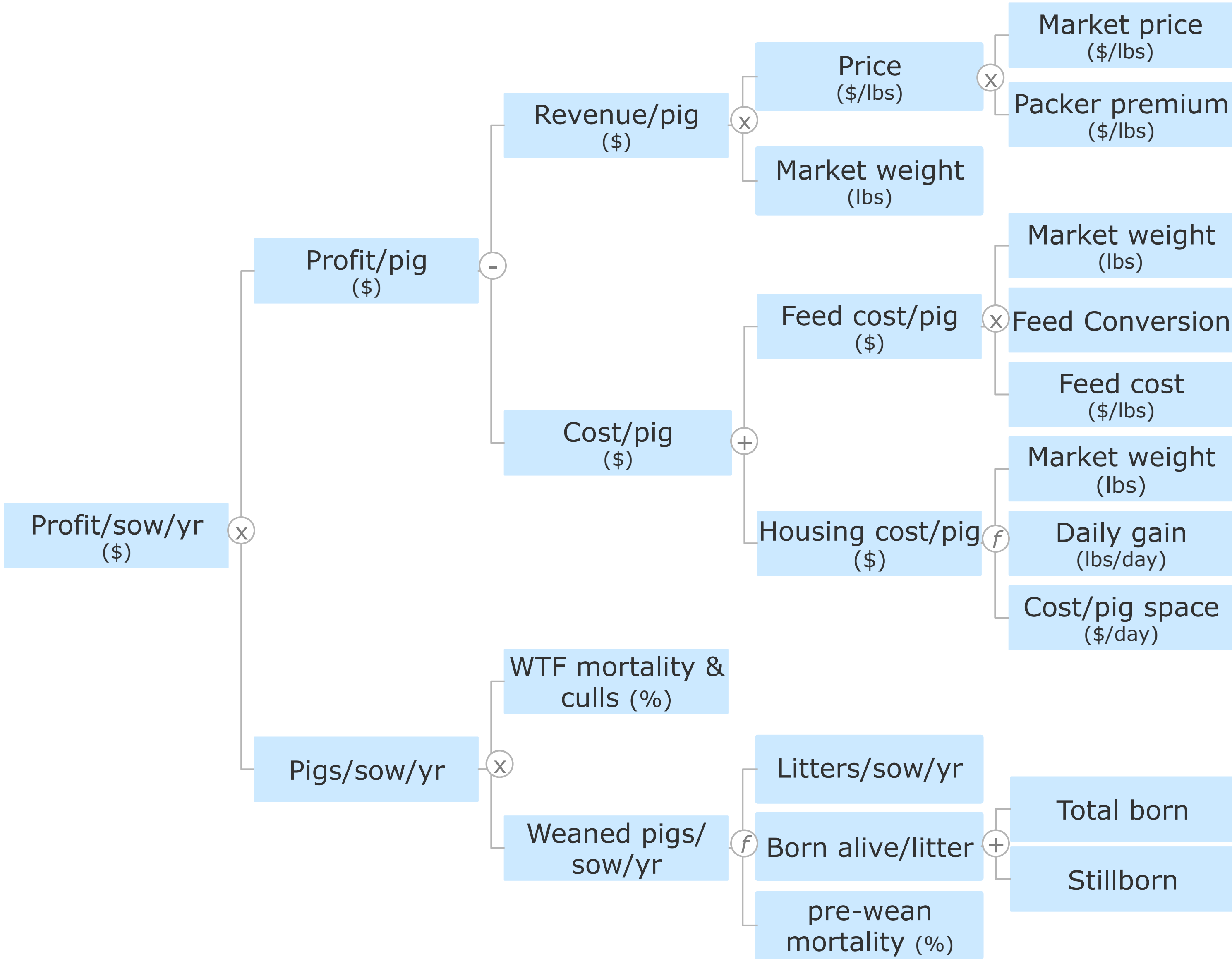
The value of a sow



The value of a sow



The value of a sow



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Profit/sow/yr ($)

Profit/pig ($)

Revenue/pig ($)

Price ($/lbs)

Market price ($/lbs)

Packer premium ($/lbs)

Market weight (lbs)

eed cost/pig ($)

Market weight (lbs)

Feed Conversion

Feed cost ($/lbs)

Hous t/pig

Market weight (lbs)

Daily gain (lbs/day)

Cost/pig space ($/day)

WTF culls (%)

Pigs/sow/yr

Litters/sow/yr

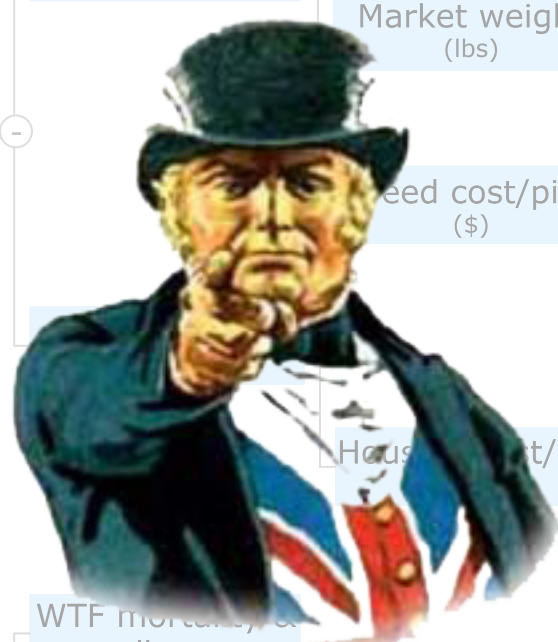
Weaned pigs/ sow/yr

Born alive/litter

pre-wean mortality (%)

Total born

Stillborn



What can you do...

...to deliver $100 more per sow

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We would like to have you walk away with…

PIC

10 WAYS TO GET $100 MORE PER SOW

1. ....

2. ....

3. ....

4. ....

5. ....

6. ....

7. ....

8. ....

9. ....

10. ....

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Agenda

Timing	Session	Speaker
9:30-10:00 a.m.	Check-In and Continental Breakfast	
10:00-10:05 am	Welcome	Mario Lapierre
10:05-10:30 am	What Do Top Producers Do?	Dan Hamilton
10:30-10:55 am	Reducing Cost & Losses in Finishing	Steffen Klenk
10:55-11:05 am	Break	
11:05-11:30 am	How to Get the Most out of Feed & Nutrition	Wayne Cast
11:30-11:55 am	Keeping Your Herds Healthy	Tom Riek
11:55-12:55 pm	Lunch	
12:55-1:20 pm	Cost-Competitiveness through PWM Control	Michel Lariviere
1:20-1:45 pm	Realizing Genetic Potential	Daniel Godbout
1:45-2:00 pm	Break- *Complete Q&A Card*	
2:00-2:20 pm	Never Stop Improving	Todd Wilken
2:20-2:50 pm	Question & Answer Session	Mario Lapierre & Speakers
2:50-3:00 pm	Final Wrap Up & Meeting Adjourned	

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What Do Top Producers Do?

Dan Hamilton

PIC®

What Top Producers Do

Four key parts of presentation:

1. Culture of top companies or producers.
2. Production and cost advantages of Agri Stats
   Top 25% in profit.
3. Benchmarking data from PIC customers.
   - Value of Benchmarking – PIC Navigator.
4. What does the future look like.

What Do Top Producers Do?

CULTURE

CULTURE of Top Companies

- LEADERSHIP:
  - Management sets the culture.
  - Positive, motivating, inclusive, empowering, fun, rewarding, etc.
- TEAM:
  - Many parts – one body – same focus.
  - Different roles - each important and needed.
  - All know company purpose, program & goals.
  - Every team member on board & committed.
  - "Ride for the Brand".

CULTURE of Top Companies

- USE OF DATA:
  - Production records a given but not enough.
  - Must have cost accounting and analysis!
  - Evaluate cost, performance and trends.
  - Benchmark or compare to peers.
  - Identify strengths and <u>key</u> opportunities.
  - Make use of data a regular and critical part of business operations:
    - Have analyst(s) in place.
    - Involve entire team in review and plans.
    - Make part of business culture!

CULTURE of Top Companies

- FOCUS:
  - Make decisions based on what is best for cost and profit!
  - Best performance does not necessarily equal best cost or profit.
  - Measure and evaluate performance and results.
  - Determine top three or so opportunities and goals – all stay focused on those.
  - Professional, fun, rewarding.

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What Do Top Producers Do?

ADVANTAGES TOP 25% PROFIT

Advantages Top 25% Profit

- Agri Stats data – *provided courtesy of Agri Stats*
- 2008 – 2015 calendar years
- 14 key cost and production metrics
- Some confounding included and accepted
- Measure variance of Top 25% in Profit vs. average of population
- Rank deviation to Average – largest deviation indicates largest advantage to Average
- See by year and 8 year average

Advantages Top 25% Profit

Advantages of the Top 25% in Profit*

VARIANCES TO THE OVERALL AVERAGE BY VARIABLE AND ADVANTAGE RANKING

	SALES $/CWT	% CULL WT	FIN WT	FIN AGE	FIN MORT%	FIN ADG	FEED CONV	CAL FC 23-123 kg	FINISH $/TON	COST $/CWT	$/WEAN PIG	LMSY	BORN LIVE	PRE-WN MORT%
2015 Variance	8		12	11		13	14	10					9	
Ranking		2			1				4	5	6	7		3
2014 Variance	8		10	14		12	13	11					9	
Ranking		2			3				6	5	4	7		1
2013 Variance	10		12	9		11		8	13				14	
Ranking		1			2		7			6	4	5		3
2012 Variance			8	13	12	11	10	9					14	
Ranking	7	1							6	4	3	5		2
2011 Variance	8		10	12		9	13	11					14	
Ranking		1			3				6	5	4	7		2
2010 Variance	8		10	12			13	11				9	14	
Ranking		1			2	7			6	5	3			4
2009 Variance			8	9			11	10			13	12	14	
Ranking	3	1			2	6			7	5				4
2008 Variance				8	11		14	9			13	12	10	
Ranking	4	1	7			6			3	5				2
8 Year Average Variance			10	11		9	12	10				8	12	
Ranking	7	1			4				6	5	6			3

What Do Top Producers Do?

PIC BENCHMARKING & DATA

Benchmarking

- **What is Benchmarking?**

At its simplest meaning:

It means to Improve ourselves by looking at others!

- *"Benchmarking is the practice of being humble enough to admit that someone else is better at something and wise enough to try and learn how to match or even surpass them at it."* – American Productivity and Quality Center, 1988

PIC Sow Benchmark

	No. of Sows	No. of Systems	Total Born	PWM %	PSY	Farrow Rate	Sow Death Loss
Avg. → Total	875,399	21	14.6	13.4%	26.6	86.0%	10.5%
Top 10%	80,787	6	15.1	10.4%	31.4	91.5%	7.3%
Top 25%	219,452	12	14.9	11.5%	29.7	89.4%	8.6%
Top 50% → Top 50%	355,855	15	14.7	11.9%	28.8	88.1%	9.3%

- Ranked on PSY

PIC Grow – Finish Benchmark

	Number Close-outs	Percent of Closeouts	Number of Pigs Sold	ADG, lb / d	Feed Conv. Ratio	Mortality Rate, %
Avg. → **Database Total**	**7,277**		**12,920,359**	**1.94**	**2.70**	**2.9**
Top 1%	70	0.96%	93,972	2.15	2.25	1.3
Top 5%	362	4.95%	361,799	2.10	2.34	1.6
Top 10%	726	9.95%	786,195	2.07	2.39	1.8
Top 25%	1,817	24.79%	2,521,081	2.03	2.46	2.0
Top 50% → Top 50%	3,637	49.59%	5,740,967	1.99	2.54	2.3
Remaining 50%	3,640	50.41%	7,179,392	1.88	2.85	3.4

*The values displayed are from reporting systems only and are not representative of expected PIC product performance.
[1]Closeouts were ranked separately for each year and production type based upon opportunity cost deviation from expected PIC 337 performance.
[2]All Others – all other companies reporting with data in the described time period and production type.

Benchmarking – Next Step

- What is the value of improvement?
- What traits should I focus on first?
- What are my next steps?

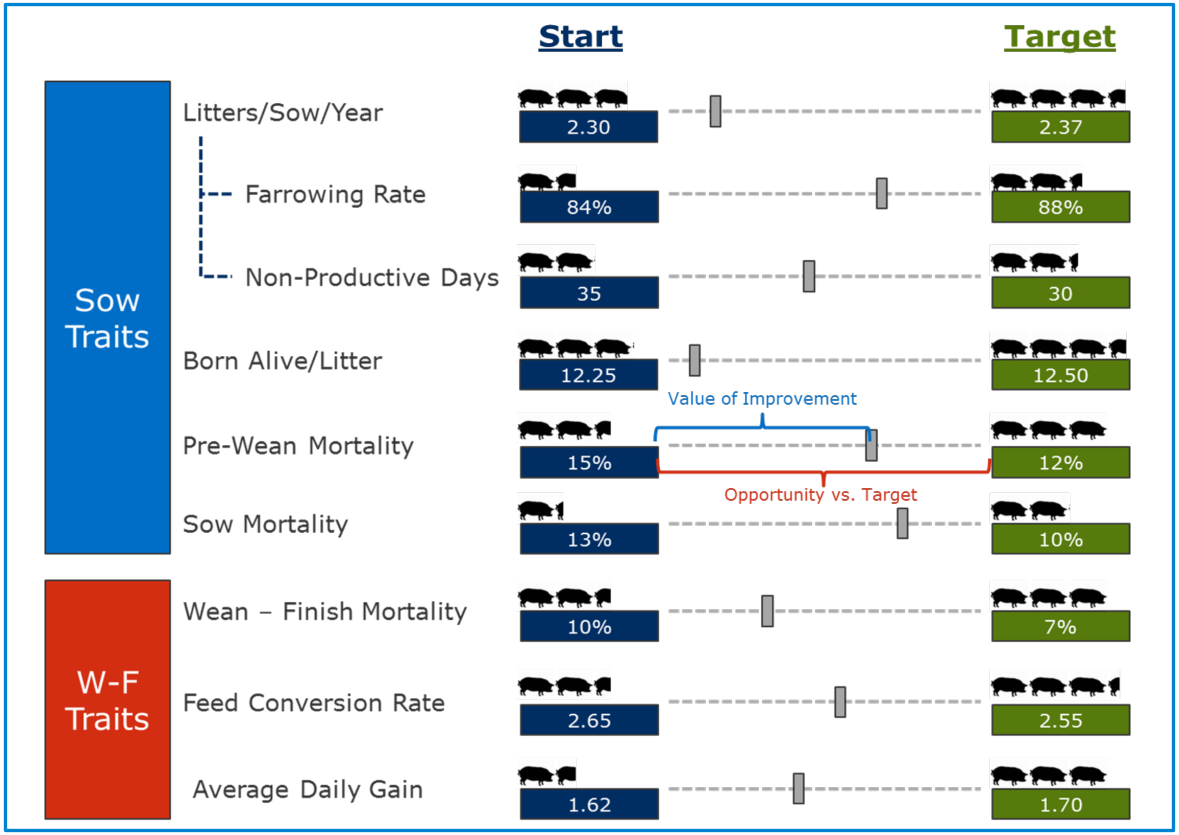
The PIC Navigator Tool

The PIC Navigator calculates profit potential by evaluating the impact of a trait improvement on the number of pigs produced per sow.

Sow Farm

$$\frac{Pigs}{Sow} = LSY * \frac{BA}{L} * (1 - PWM) * (1 - WFM)$$

Finisher



Converting Throughput to Profit

Sow Farm

$$Throughput = \frac{Weaned\ Pigs}{Sow} = LSY * \frac{BA}{L} * (1 - PWM)$$

Revenue / **Cost***

$$Profit = \left[\frac{Weaned\ Pigs}{Sow} * \frac{Value}{Weaned\ Pig}\right] - \left[\frac{Weaned\ Pigs}{Sow} * \frac{Cost}{Weaned\ Pig}\right]$$

* **Note:** cost is calculated on current weaned pig headcount. Increasing sow efficiency decreases cost/pig for the system.

Finisher

$$Throughput = \frac{Market\ Pigs}{Sow} = LSY * \frac{BA}{L} * (1 - PWM) * (1 - WFM)$$

Revenue / **Cost**

$$Profit = \left[\frac{Market\ Pigs}{Sow} * \frac{MktWeight}{100} * MktPrice\right] - \left[\frac{Market\ Pigs}{Sow} * \frac{MktWeight}{100} * \frac{Cost}{Mkt\ Pig}\right]$$

* **Note:** cost is calculated on current market pig headcount + feed cost of additional pigs.

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Bringing It All Together

Source	Trait	Start (Average)	Target (Top 50%)	Improvement	Value of Improvement ($/sow/yr)	Priority
Sow Benchmark	Farrowing Rate	86%	88.1%	2.1%	$17.74	●
	Born Alive/Litter	13.14	13.23	0.09	$5.79	
	Pre-wean Mortality	13.4%	11.9%	1.5%	$14.63	●
	Sow Mortality	10.5%	9.3%	1.2%	$5.81	
Grow-Finish Benchmark	Wean-Finish Mortality	2.9%	2.3%	0.6%	$10.71	
	Feed Conversion Ratio	2.70	2.54	0.16	$136.54	●
	Avg Daily Gain (lb/d)	1.94	1.99	0.05	$27.49	●

Sow Farm Opportunity:

$43.97/sow/yr

$1.67/pig/yr

Finisher Opportunity:

$174.74/sow/yr

$6.82/pig/yr

Total Opportunity:

$218.71/sow/yr

$8.49/pig/yr

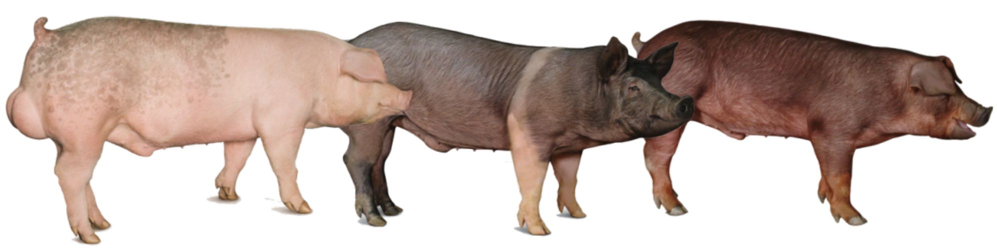
* LSY = 2.32, Market Price = $65/cwt

What Will the Future Look Like?

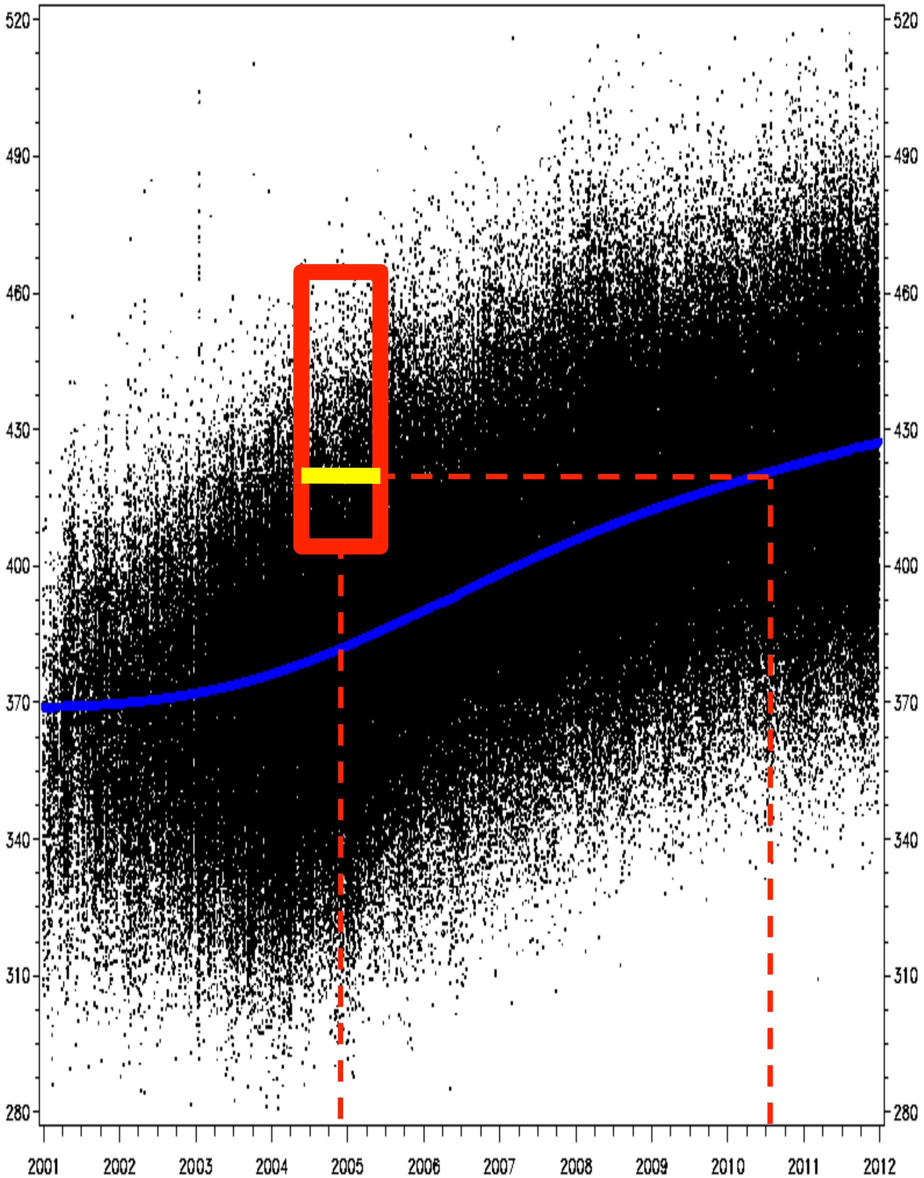
Performance Potential

Product	Test ADG, grams/day Average	Top 10%	Test FCR Average	Top 10%
PIC280	1070	1265	1.99	1.71
PIC327	1061	1238	1.91	1.60
PIC337	1138	1315	1.80	1.52

- Test performance over the last 12 months
- Approximately 10,000 boars



Pushing Biological Limits



- The top-25 % for genetic LTGR potential in 2004 (n=11,673 here)
- LTGR potential ≥ 404 g/d, mean at 419 g/d
- The population mean reaches 419 g/d by early 2010
- Set the diet according to the top-25% requirements of 6 years ago

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Working to Deliver the Future

	Today	Annual Change	2027
Pigs / Sow / Year	32.5	1.1	43.5
Weaned / Litter	13.3	.45	17.8
Kgs Weaned / Sow / Year	184.6	6.80	252.7
Pigs Weaned / Sow / Lifetime	60.0	1.3	73.0
Kgs Sold / Sow / Year	3857	172.6	5584
% Sold	93	.35	96.5
Avg Market Weight (kgs)	129.7	1.32	143
Post-Wean Feed Efficiency	2.20	.03	1.90

Take Home Message

- Top companies and producers build and maintain a culture that empowers people and uses data to focus on cost, improvement and profitability.
- The industry continues to improve performance and efficiency over time.
- PIC Benchmarking and customer data demonstrates PIC's economic advantage and improvements made through the "Robust Genetic Improvement, Technical Service and Health Assurance Programs"

Driving Excellence in Wean to Finish

Opportunities for Enhancing Performance and Operation Cost

Steffen Klenk

Not all weaned pigs have the same condition for growing in our W2F barns!

Outline

1. Piglet quality: birth weight and weaning age
2. Wean to Finish (W2F) Considerations
   - ✓ Early Pig Care
   - ✓ Stocking Density
   - ✓ Water Availability
   - ✓ Temperature
   - ✓ Health
   - ✓ Genetic

Key Biological & Management Factors

Birth Weight

- Parity Distribution
- Litter Size
- Gestation Length
- Muscle fibers formed prenatally
- Sex
- Genetic trend
- Sow Nutrition

Farrowing Houses Procedures

- Milking Capacity
- Colostrum SOP
- Temperatures
- Health
- Weaning Age

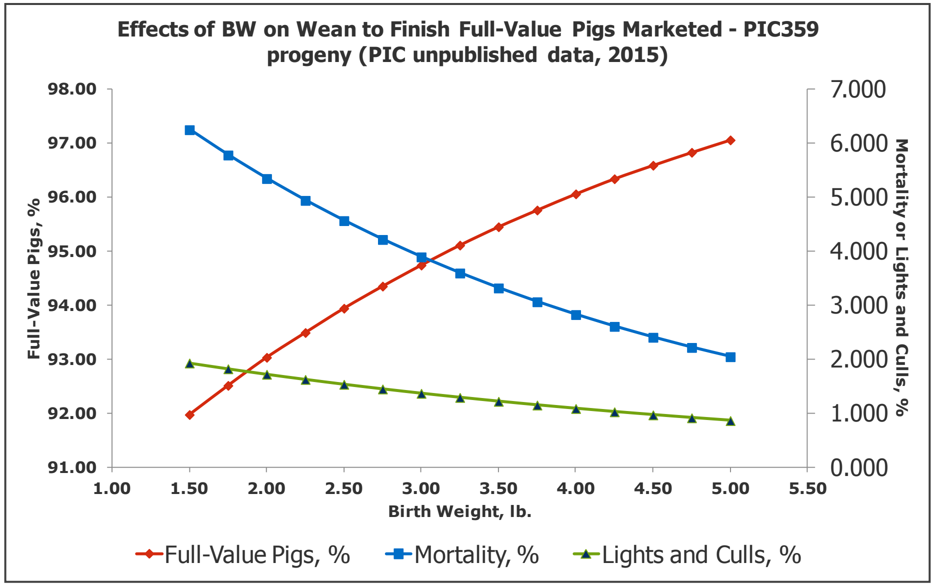
Weaning Weight(consequence)

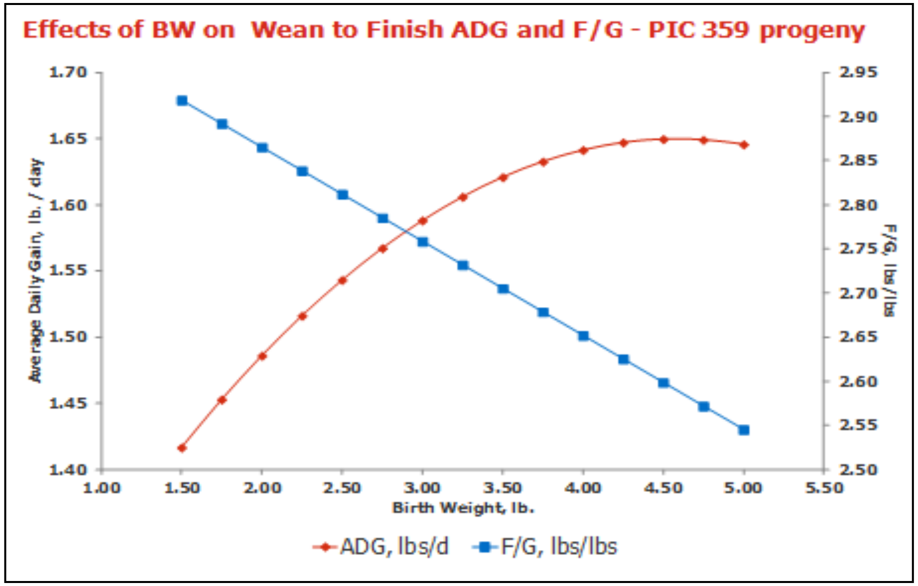
Wean to Finish Keys

- Early Pig Care
- Nutrient Access (feed and water)
- Stocking density
- Ventilation
- Health
- Marketing

Carcass Value & Market Pig Cost

Birth Weight - W2F Results

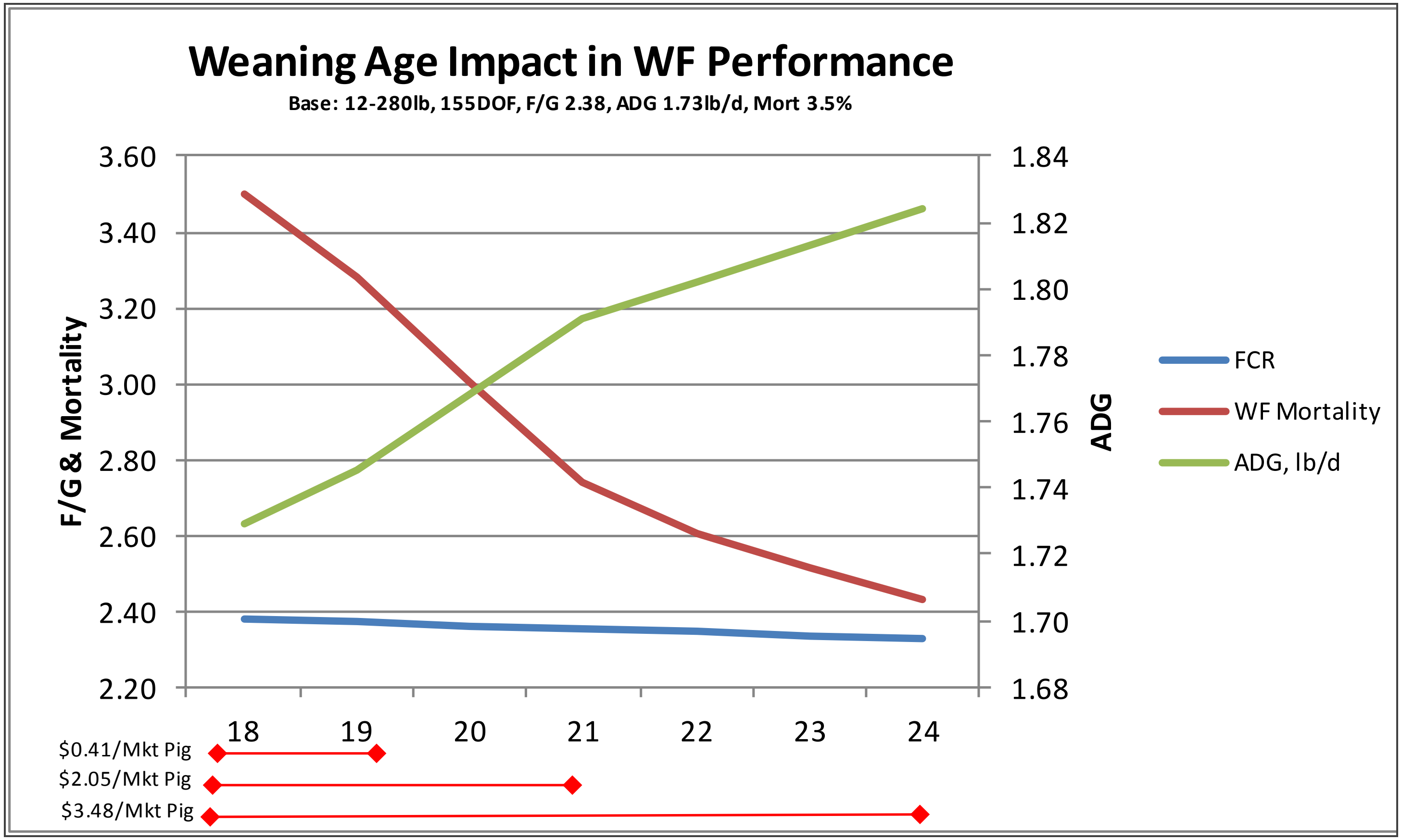




BW<3lb
Good
W2F practices

BW>3lb
Good
Pigs

When We Want… Better WF Pigs

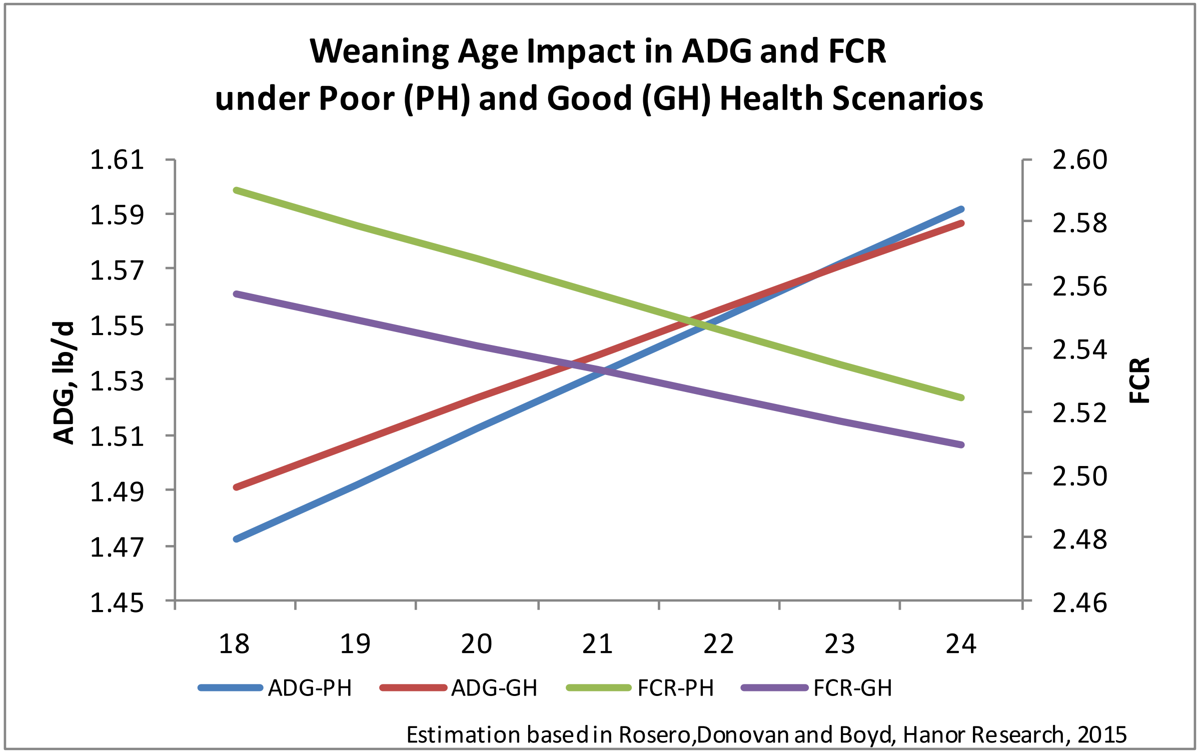


1,000 sows -28PYS, Base 18ds	19	21	24
Opportunity Cost/wk	$221	$1,104	$1,874

Weaning Age Impact in W2F with Health Challenge

Customer Research, 2015. Unpublished

Graph based in prediction linear equations to estimate the effects of increasing weaning age on days to 300 lb of BW, ADG and F/G.



Opportunity Cost/pig for moving weaning age from 18-24 days

Health Status	Days 300lb	Feed Cost	Total
Good	$2.12	$1.58	$3.71
Poor	$2.56	$4.72	$7.28

Good health conditions, no PRRS, no PEDv
Poor health conditions: +PRRS and +PEDv

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Key WF Factors - Slat Level

Early Pig Care Considerations

(AT SLAT LEVEL)

Early Pig Care- Room Temperature

Plastic flooring and solid side

No Comfort Zone

DOF	11lb	14lb
1	84	81
7	82	79

W/Comfort Zone

11lb	14lb
73-74	71-70
72-73	70-69

Slat flooring and solid side

No Comfort Zone

DOF	11lb	14lb
1	86	83
7	84	82

W/Comfort Zone

11lb	14lb
75-76	73-72
73-74	71-70

Note: When comfort zone is removed, the temperature back to normal DRT

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Early Pig Care- Early Feed Intake

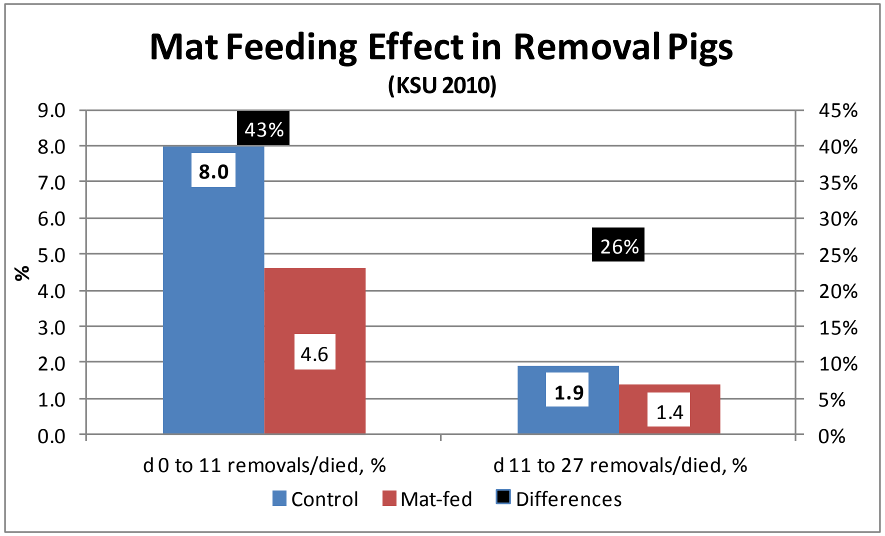
Mat Feed Training

Concept	Detail
Recipe	1lb per 40 pigs per day
Space/pig	0.4 ft^2
Frequency	4-6 times/day @ 3-7 days
Expected Result	Reduction in sorting pigs, Less scours and better nursery performance.
Goal	**Achieve a feed intake of 3-4lb in first week** and identify pigs that are not competing well

Gruel Feeding

Concept	Detail
Recipe	8 oz feed &24 oz H_2O/15 pigs
Space/pig	3 inches of linear feeder space
Frequency	3 times/day@ 2-3ds
Expected Result	Improve feed intake in smaller and poor competitors
Goal	Avoid starve outs, dehydration and recover body condition in poor competitors

Early Pig Care- Mat Feed Training



ADG could be impacted by 5% in the first 27 DOF

Mat Investment
60 pigs of Mat capacity@4'x6'
1,000 pigs/room=17-18 mats
Cost $47.5 /mat @ 3 useful life
Mat Investment= $285/yr

Additional Income for +5% ADG
+0.91lb/pig* x 960pigs sold/room**
x $0.26/lb (2015)

Nursery
x 6turns/yr
Additional Income= $1,363/yr

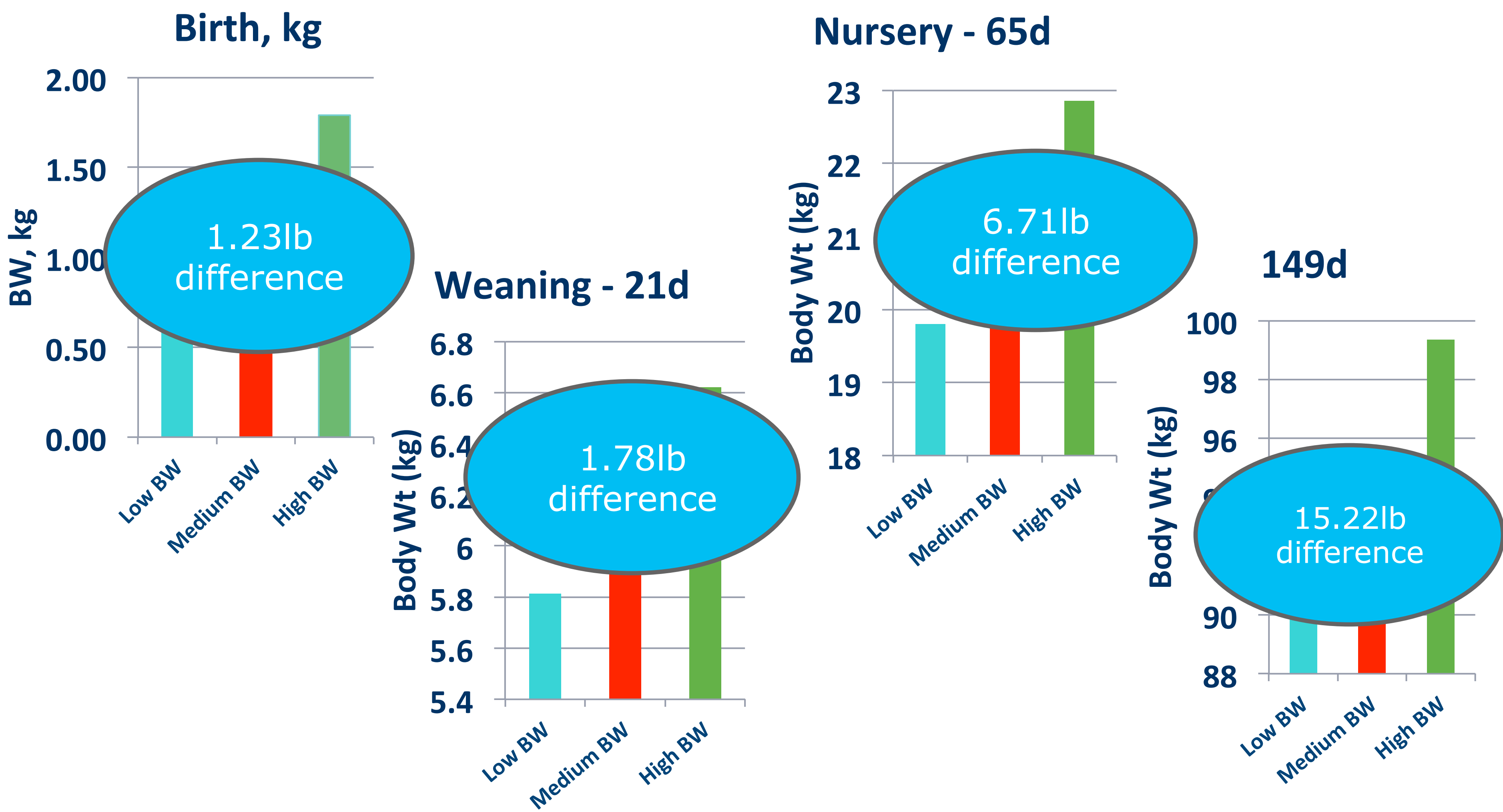
W2F
x 2turns/yr
Additional Income= $454/yr

*Each lb at the end on nursery represents 2.4 market lb. **4% W2F mortality

From Birth Weight to Market

Slide used by Jennifer Patterson, 2013 (Swine Reproduction and Development Program)

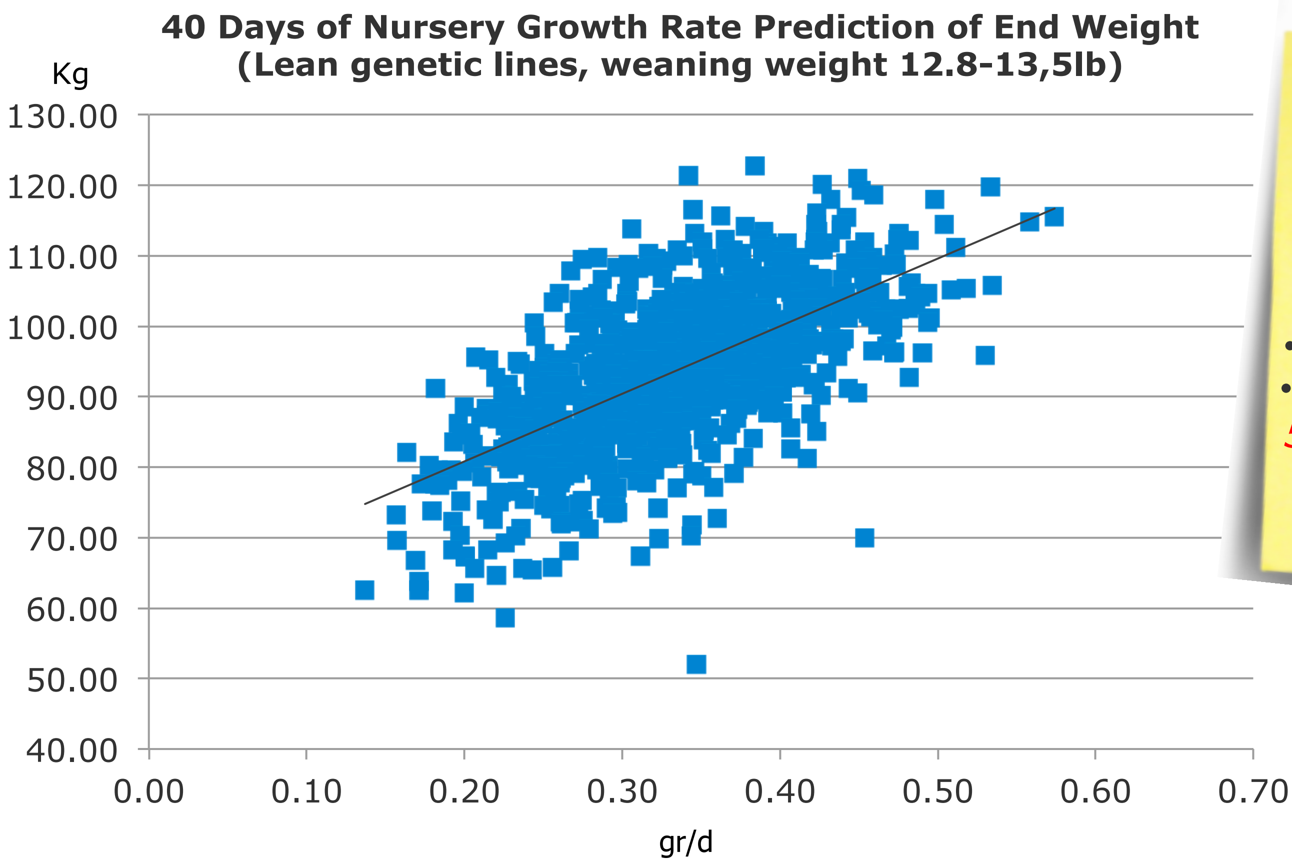
Body Weight till 149 days



Smit, 2013

HW: range 3.96 to 4.84 lbs- LW: range 1.76 to 2.64lbs

ADG of first 40 DOF vs. Market Weight



Example

- *1,000 sows with 26 PSY*
- *24.18 FVP/sow (93%)*
- *24.180 market pigs*

- *1 additional lb/nursery pig*
- *24.180 pigs/yr x 2.4lb :*

58,000 additional lbs/1k sows
X $0.26/lb MOFC
$15,080/yr/1k sows

Nursery: 1 lb at the end of day 40 on feed = 2.4 lb at market

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Stocking Density

"more than just floor space"

(AT SLAT LEVEL)

Stocking Density-
Finishing Pig Example
Market Weight Fixed at 280lb.

Ideal 8sqft/pig	Indicator	Current 7.62sqft/pig	+5% 7.26sqft/pig	+10% 6.91sqft/pig	+15% 6.58sqft/pig
1,125	Pigs/Barn	1,181	1,240	1,302	1,367
56	Pigs/Pen	59	62	65	68
~2.0	Feeder Space in/pig (100in/feeders)	1.69	1.61	1.54	1.46
10	Pigs/Drinker	14.8	15.5	16.3	17.1
15,750	Minimum Vent. Needs CFM/ Market Pig	16,538	17,364	18,233	19.144
100	Max.Vent. Tunnel % of Air Exchange by Pig	95	91	86	82

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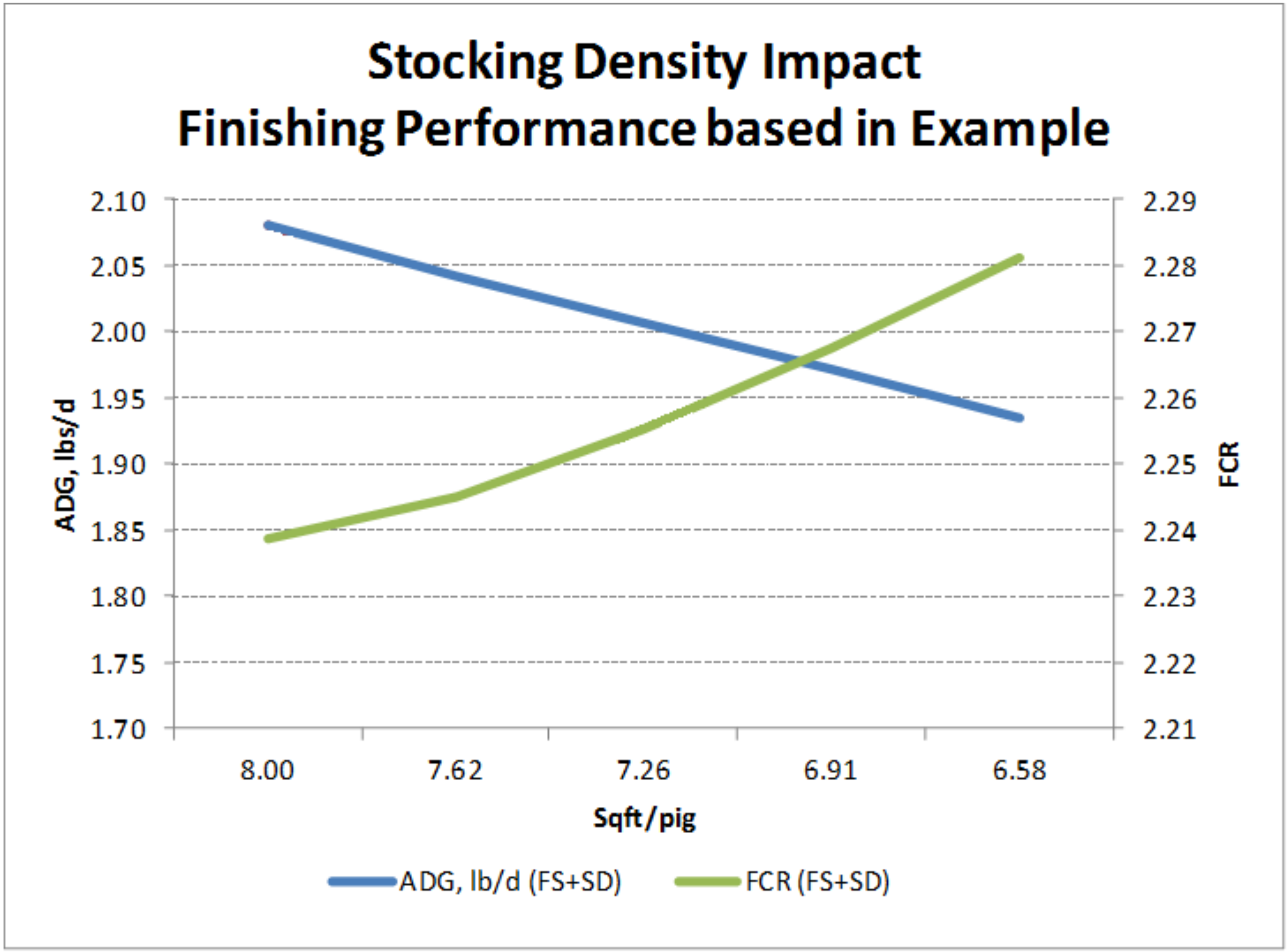
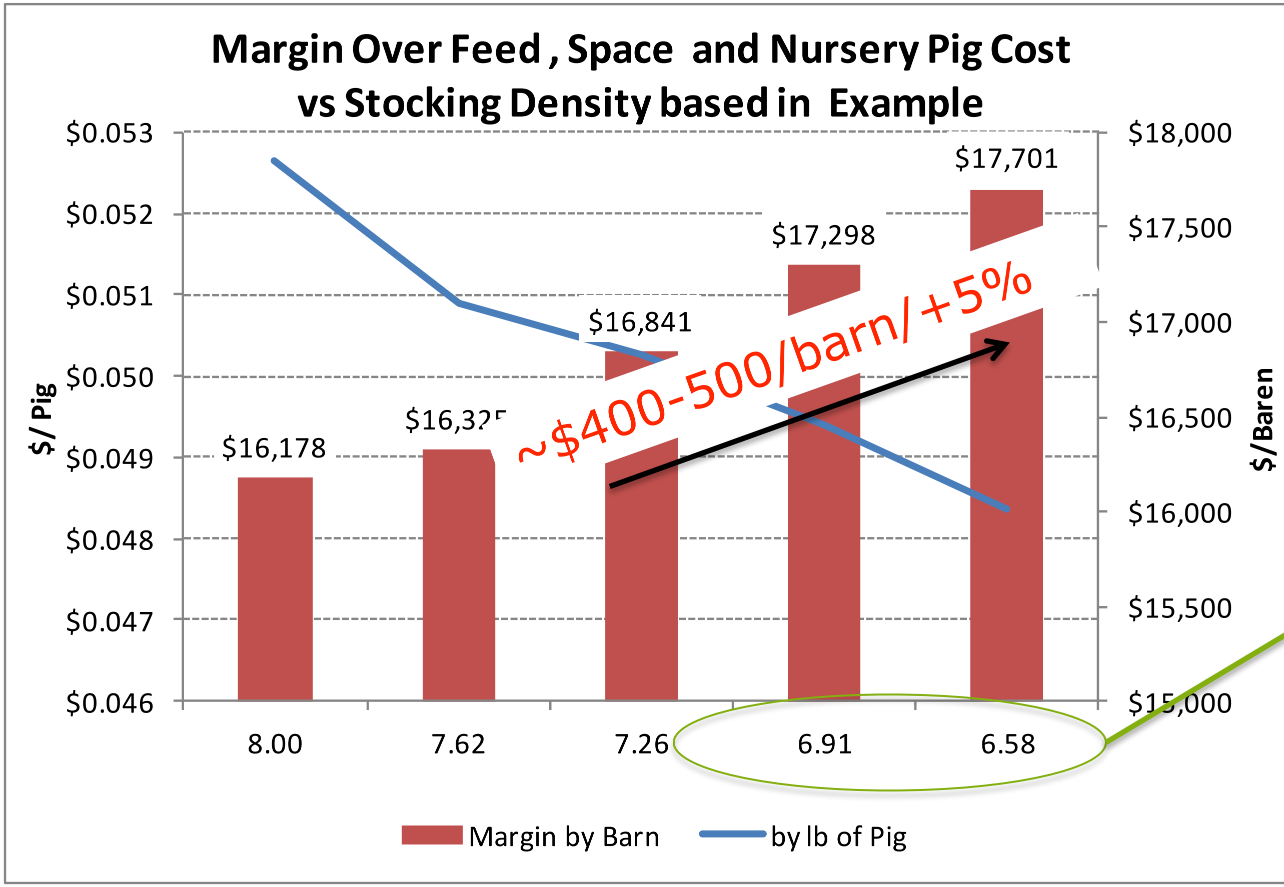
Finishing Indicators Impacts



Example based in slide 6 data. F/G value is including part of mortality effect. Personal estimation in water availability impact

Economics by Barn

Market Weight Fixed at 280lb. Finishing Pigs



Ventilation Capacities

Animal Welfare

Vices losses

Manure Storage

Strong Marketing Strategies are needed

Example based in slide 6 data. Live Price: $0.53/lb, Space cost: $0.12/day/pig, Feed Cost; $0.1/lb, Nursery Pig Cost; $50/pig

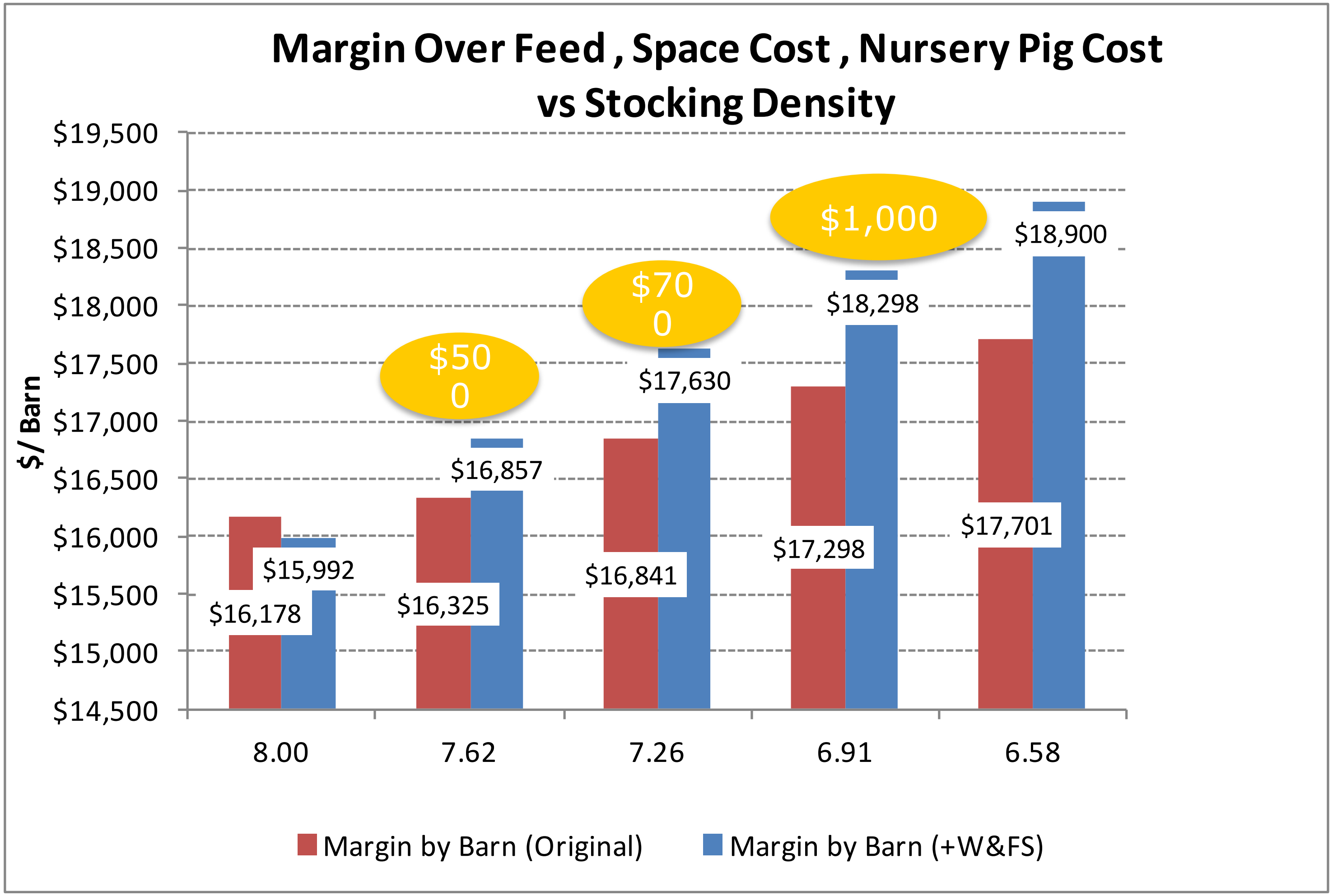
Flexibility by Drinkers & Feeder Space

Market Weight Fixed at 280lb. Finishing Pigs

Ideal 8sqft/pig	Indicator	Current 7.62sqft/pig	+5% 7.26 sqft/pig	+10% 6.91sqft/pig	+15% 6.58sqft/pig
1,125	Pigs/Barn	1,181	1,240	1,302	1,367
56	Pigs/Pen	59	62	65	68
2.0	Feeder Space in./pig (**120in**/feeders)	**2.03** (1.69)	**1.93** (1.61)	**1.84** (1.54)	**1.76** (1.46)
10	Drinkers/Pig	**9.8** (14.8)	**10.3** (15.5)	**10.9** (16.3)	**11.4** (17.1)
15,750	Minimum Vent. Needs CFM/Market Pig	16,538	17,364	18,233	19.144
100	Max.Vent. Tunnel % of Air Exchange	95	91	86	82
135,000	Max.Vent. Needs. No Tunnel. CFM/Barn	141,750	148,838	156,279	164,093

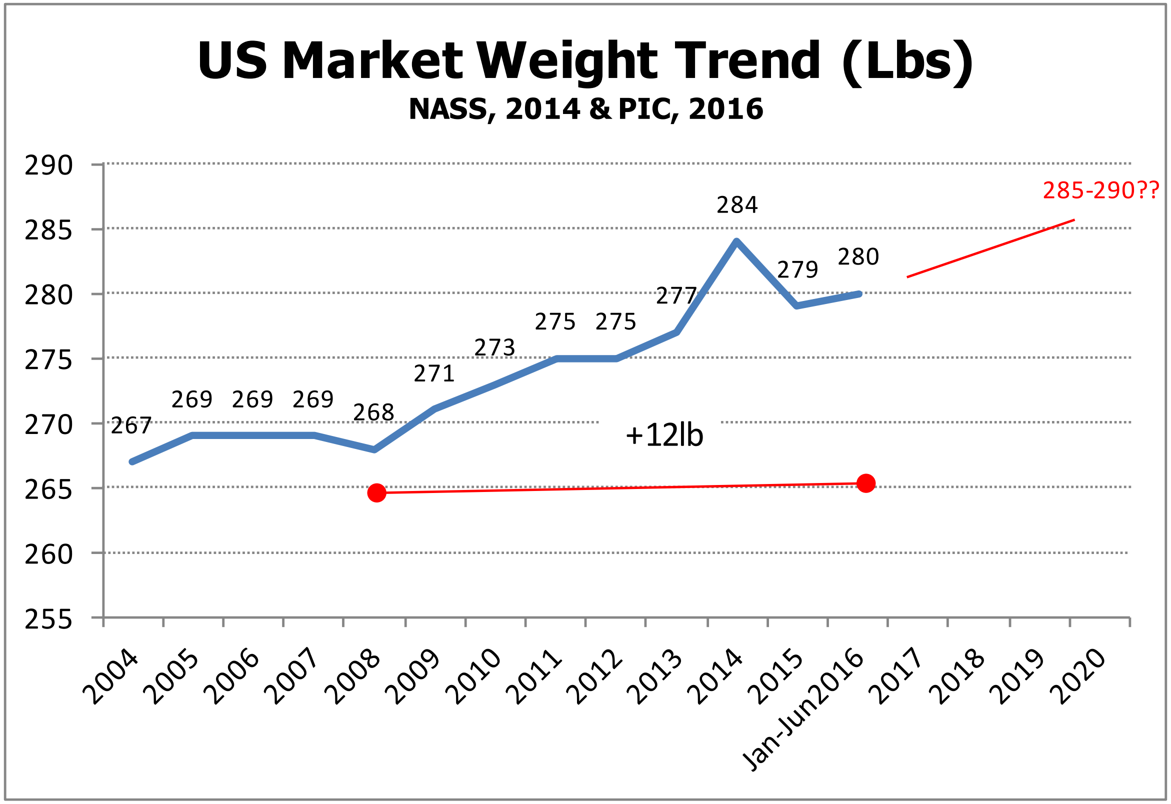
Barn Flexibility and Economic Impacts

Market Weight Fixed at 280lb. Finishing Pigs



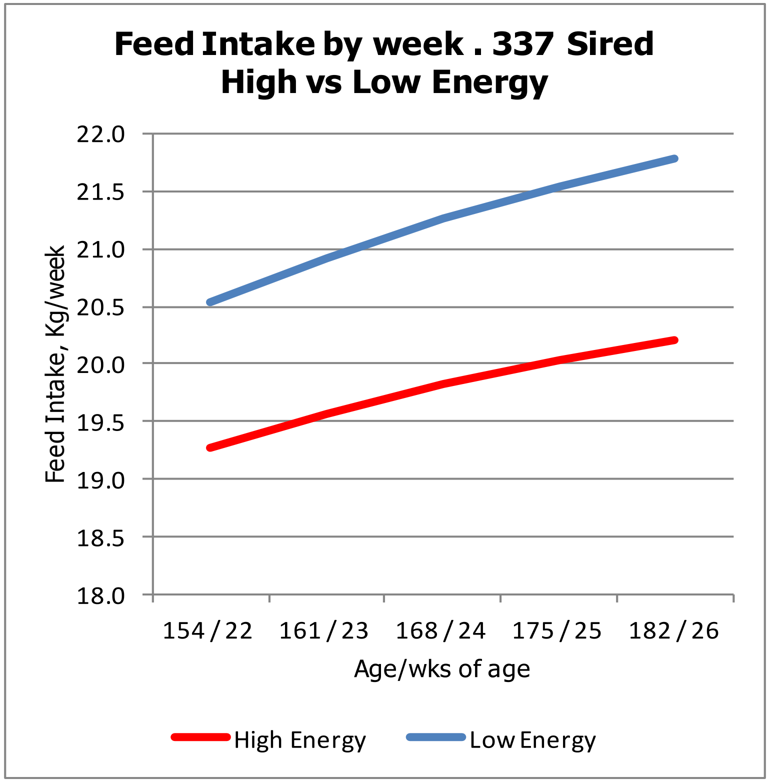
Example based in slide 6 data. Pig Cost isn't included. Price: $0.6/lb, Space cost: $0.12/day/pig, Feed Cost; $0.1/lb

When Market Weight Increases….

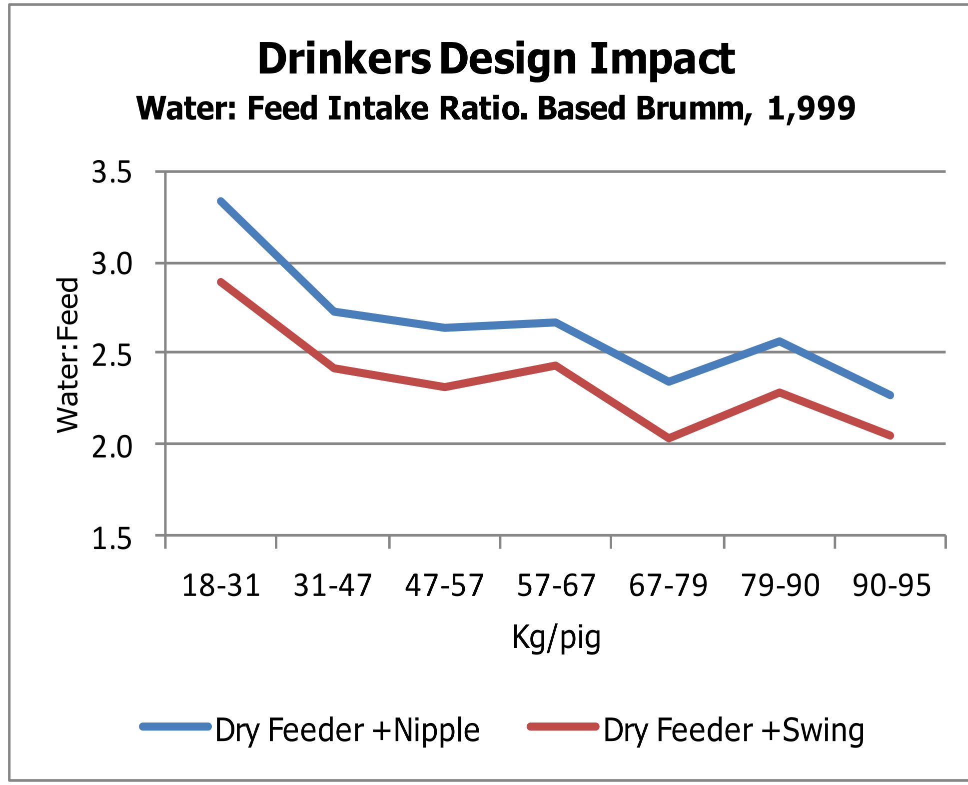


Indicator	270 vs. 280 lb
Stocking Density	+3.0%
Feeder Hole Space/Feeder	+1.3%
Feed & Water Intake (Cumulative)	+6.6%
Heat Production, W/Kg	+1.7%
Transport Space -Market Pig	+7.1%

When Diets or Drinkers Change...



PIC Executive Summary 49-51



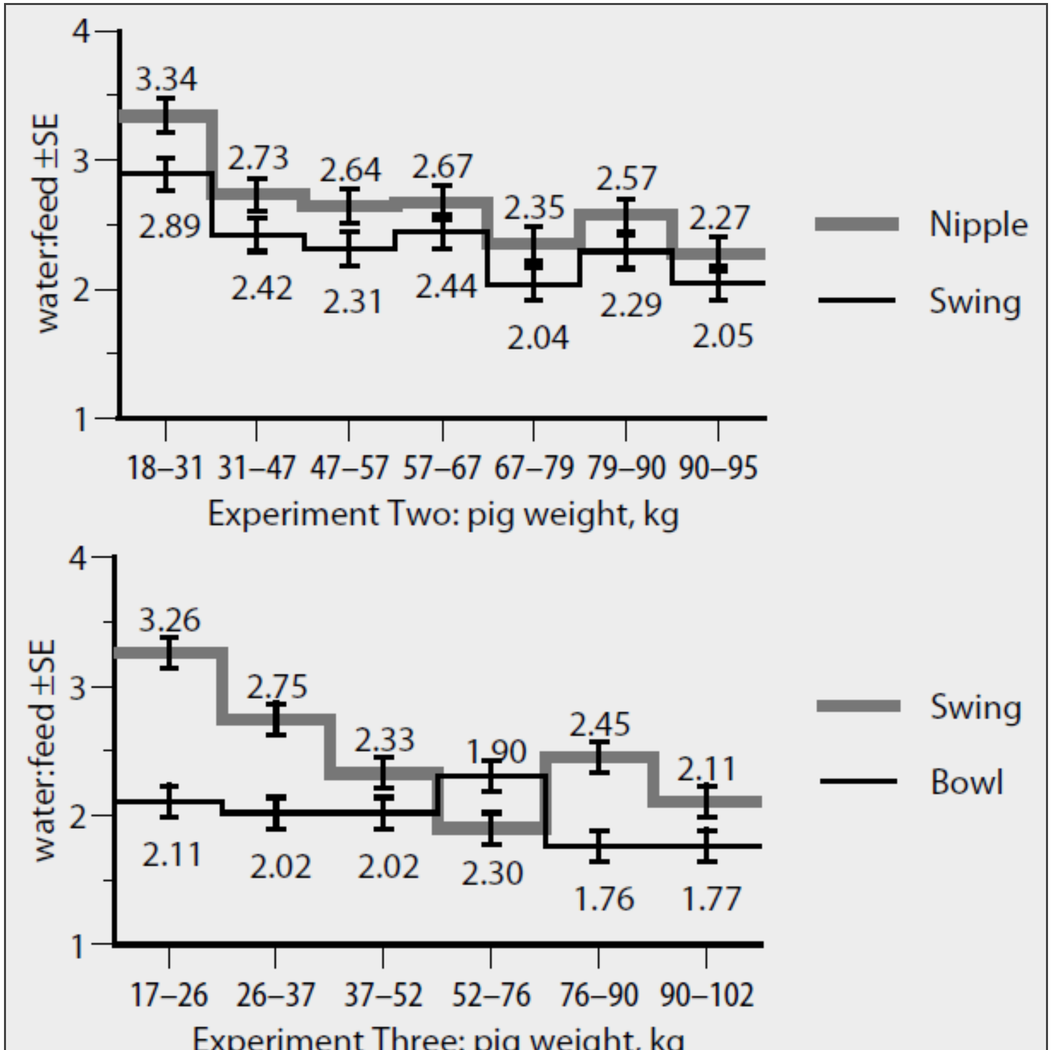
Swine Health and Production. Volume 8, Number2.

1 kg of water = 1 Liter

PIC

Water Availability – Water Waste

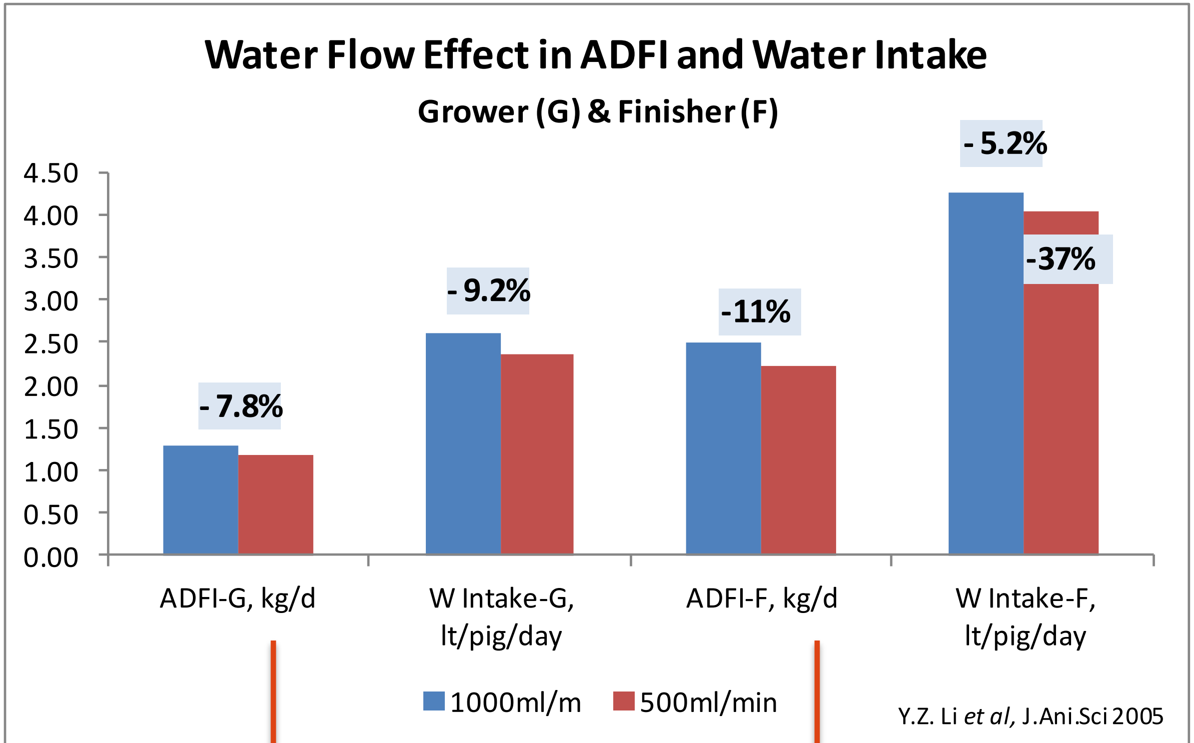
Drinker type impact on water:feed ratio



M.Brumm et al, Swine Health ad Production 1999, Vol. 8 Number 2

Water Availability – Water Flow

PIC Recommends: Growing/Finishing-1,000 ml /min



Period	Opportunity Cost (less market pounds)
Growing -52 DOF	$2.08
Finishing -57 DOF	$1.56

Take Home

1. There are key factors that are impacting pig performance after wean. Important to consider the interactions between them

2. Each decision in those factors has opportunities cost in ADG, F/G, Mortality, Market Variation, Meat Quality, Animal Welfare, Safety and Environmental

3. Facilities investments in Wean to Finish should consider "flexibility" to avoid opportunity costs. Remember:
   a) Market conditions are dynamics
   b) PIC genetic has important upward trends in PSY & ADG

PIC

Break

How to Get the Most Out of Feed and Nutrition

Wayne Cast

“Knowing the right thing to do is not the trick being able to implement it is”

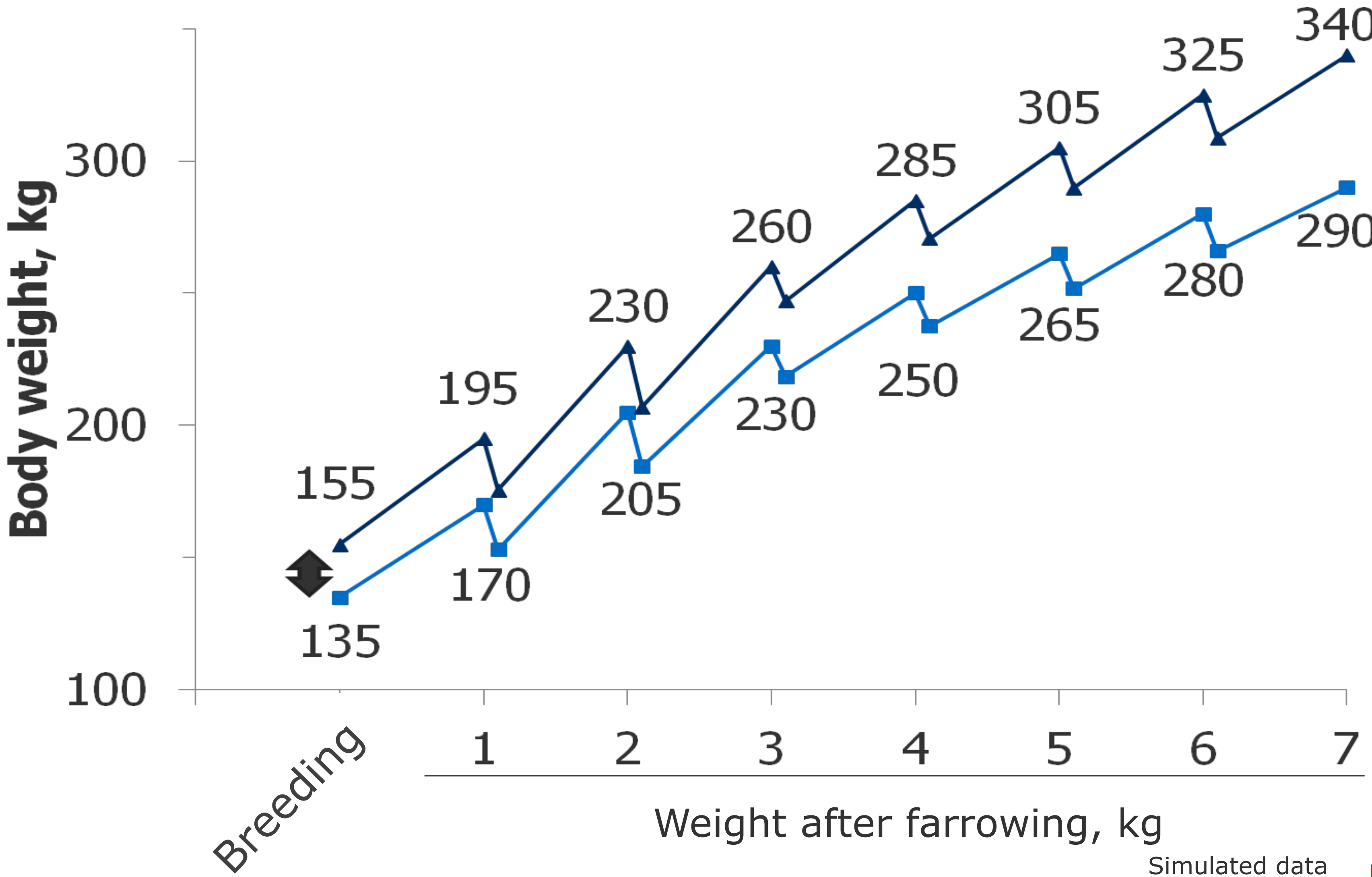
Dean Dau

Non Negotiable Attributes @ First Service

Trait	Goal/Target
Age	200-210 days; 95% of gilts bred at/after 2nd Heat
Maximized Feed Intake Prior First Breeding	Feed *ad libitum* from birth to breeding
Body weight	135 -150 kg (individual basis)
Target	Min 80% of gilts bred within 135-150 kg and max 20% within 150-160 kg
ADG	0.61 to 0.77 kg/d lifetime (birth-to-breeding)
Immunity level	3 weeks from last vaccine or any other health procedure.
Selection	Feet and leg quality

The combined positive effect of these 7 attributes is powerful. Never underestimate the negative effect of the lack of one or more

Bigger Gilts, More Maintenance the Rest of Their Lives

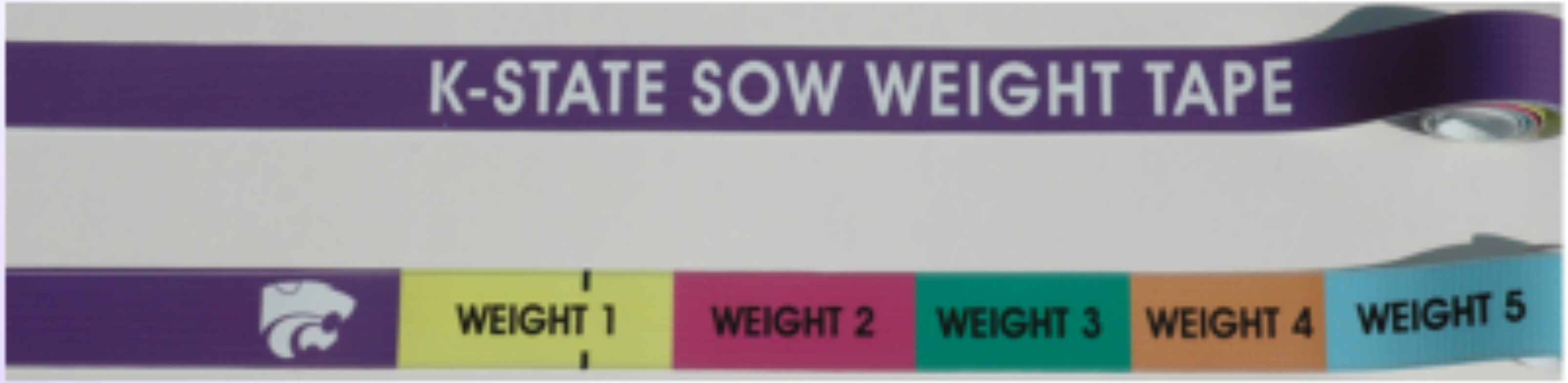


Simulated data

How Much More Does a Fat Herd Cost Compared to an Ideally Conditioned Herd?

- 140 vs. 160-kg gilt BW at breeding
- It takes 0.17 kg of feed/d just for maintenance
- For a 5,000-sow farm, it costs an extra $54,500 per year
- **$10.9/sow/year**

Flank measurement to set feeding levels



$BW^{0.333}$ in kg =

0.0511 x Flank-to-flank, cm + 0.5687

Resources About the Weight Tape

- http://krex.k-state.edu/dspace/bitstream/handle/2097/1885/Comparison%20of%20Heart%20Girth%20or%20Flank%20to%20Flank%20Measurements%20for%20Predicting%20Sow%20Weight-%20Swine%20Day%202004.pdf?sequence=1&isAllowed=y
- https://www.youtube.com/watch?v=iemmCZd9VVI

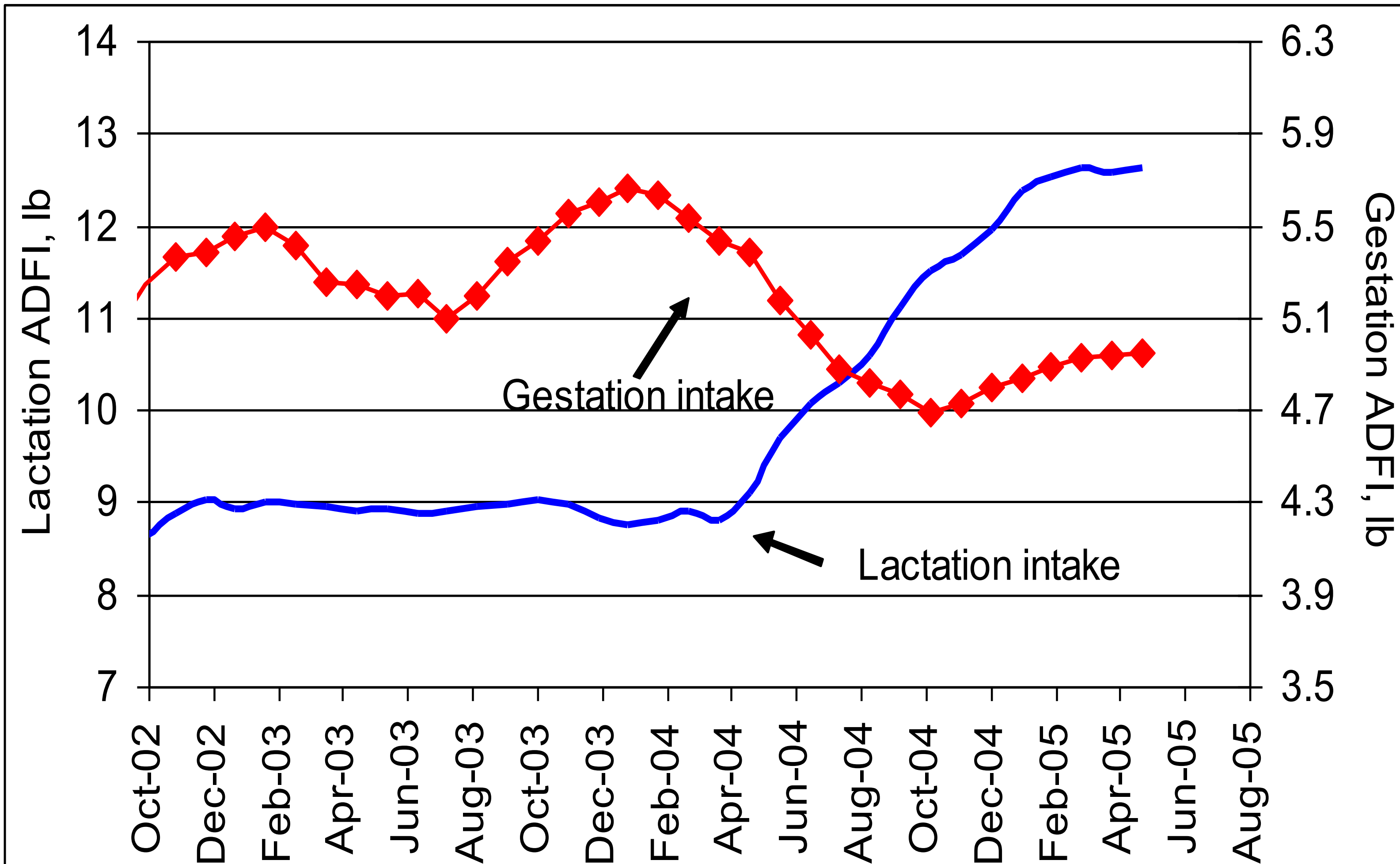
Economics of Age at Mating

- 205 d (PIC) vs. 240 d (others)
- 35 d x 3.6 kg/d x $0.176 = $22.2/ gilt
- $22.2 x 45% replacement rate =

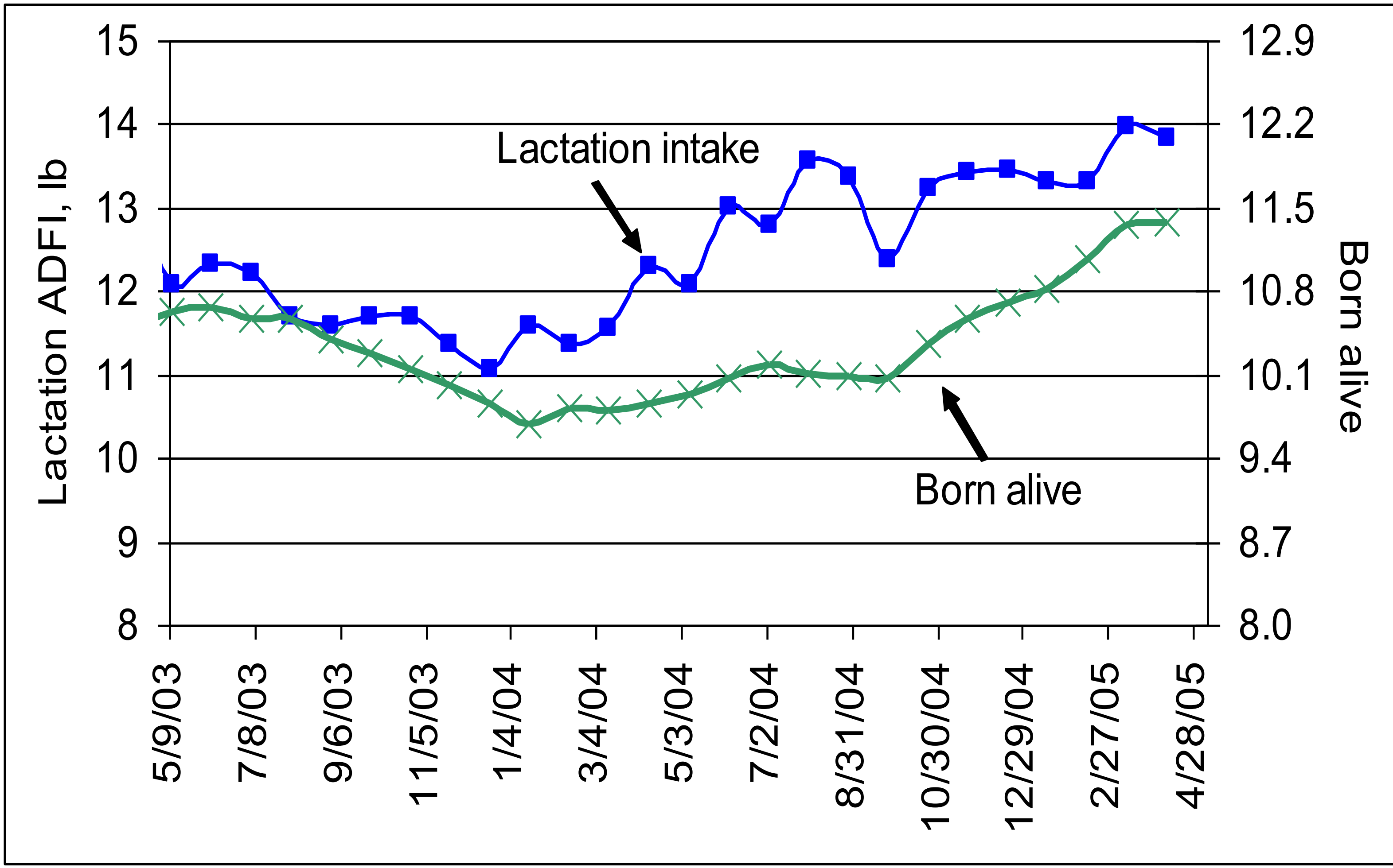
$10.0/sow/year

Tape measure: https://www.youtube.com/watch?v=iemmCZd9VVI

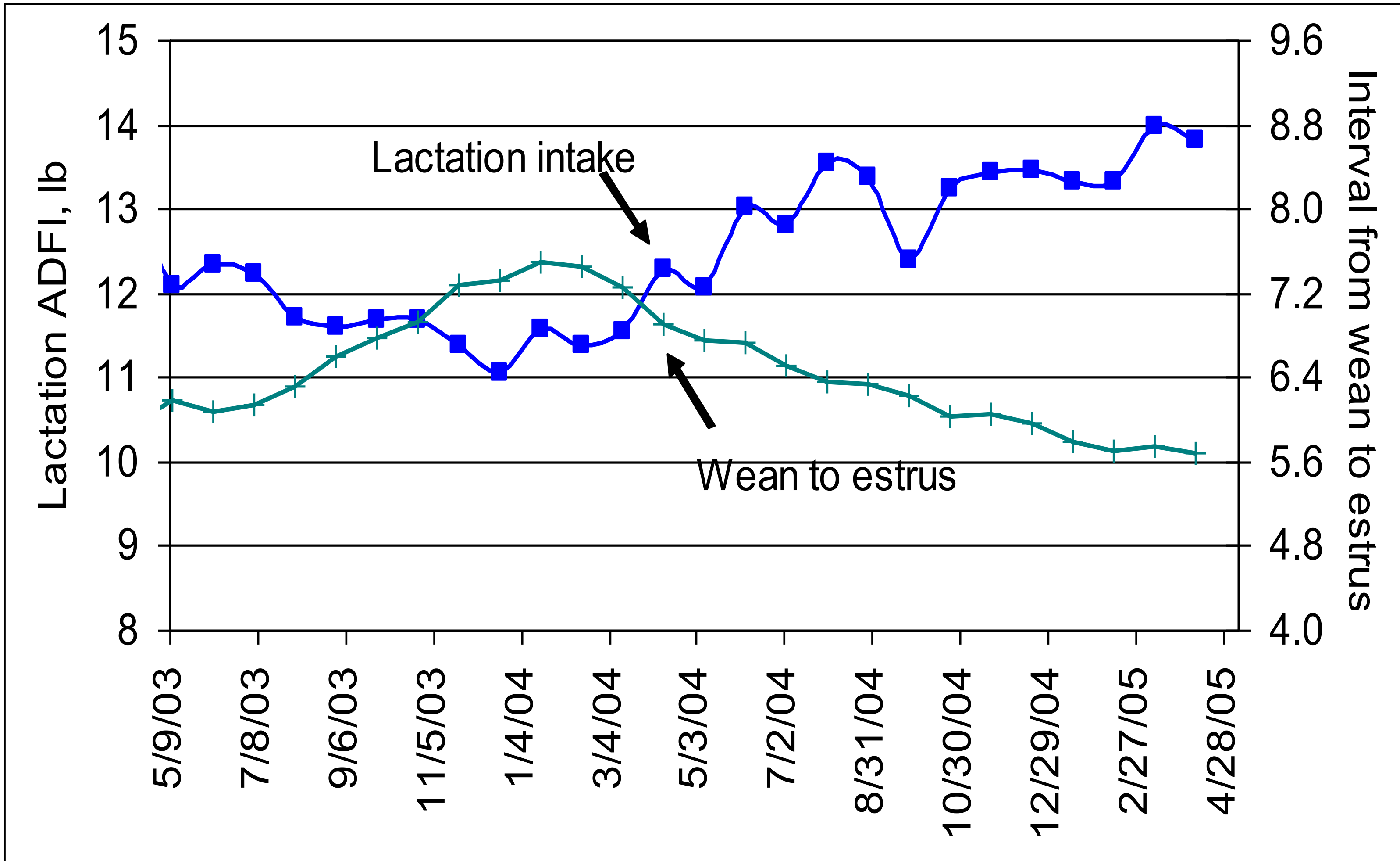
Tracking gestation and lactation feed intake
Six month rolling average



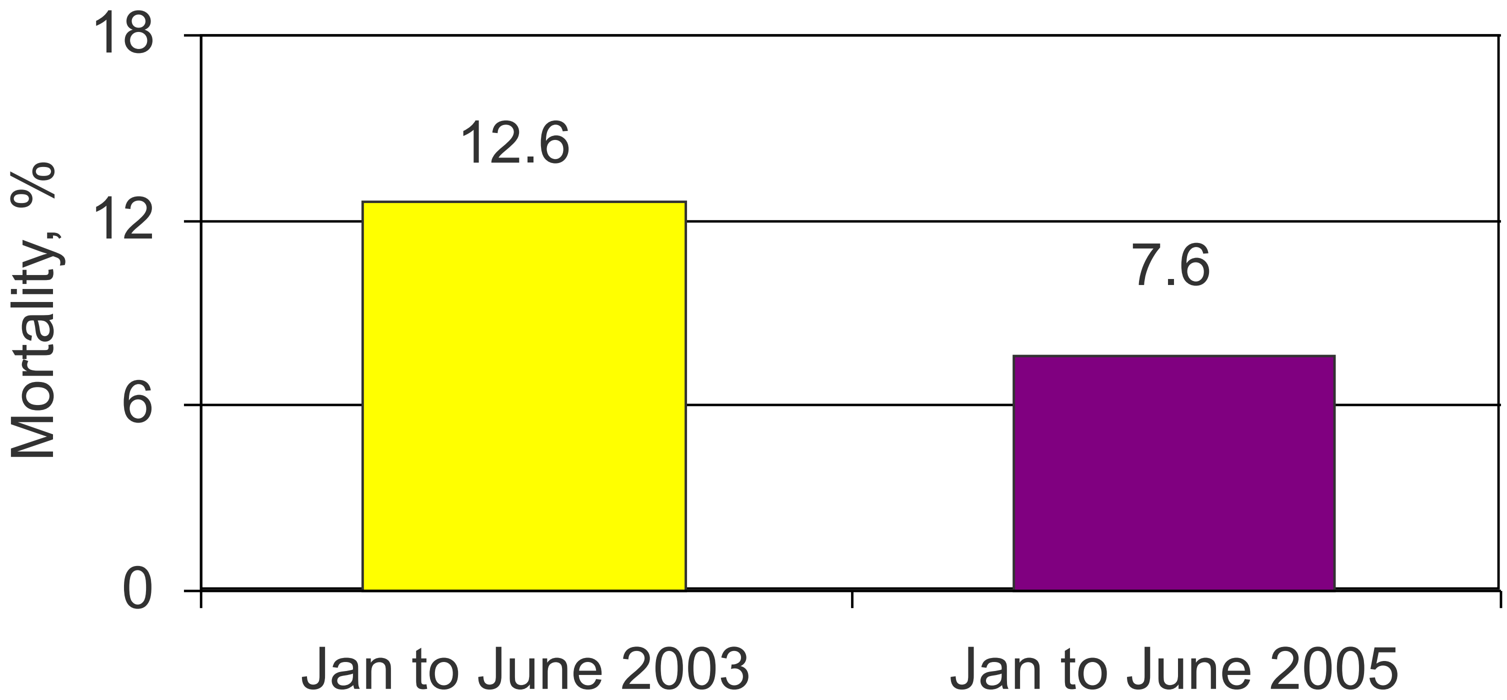
Relationship Between Lactation Feed Intake and Subsequent Born Alive



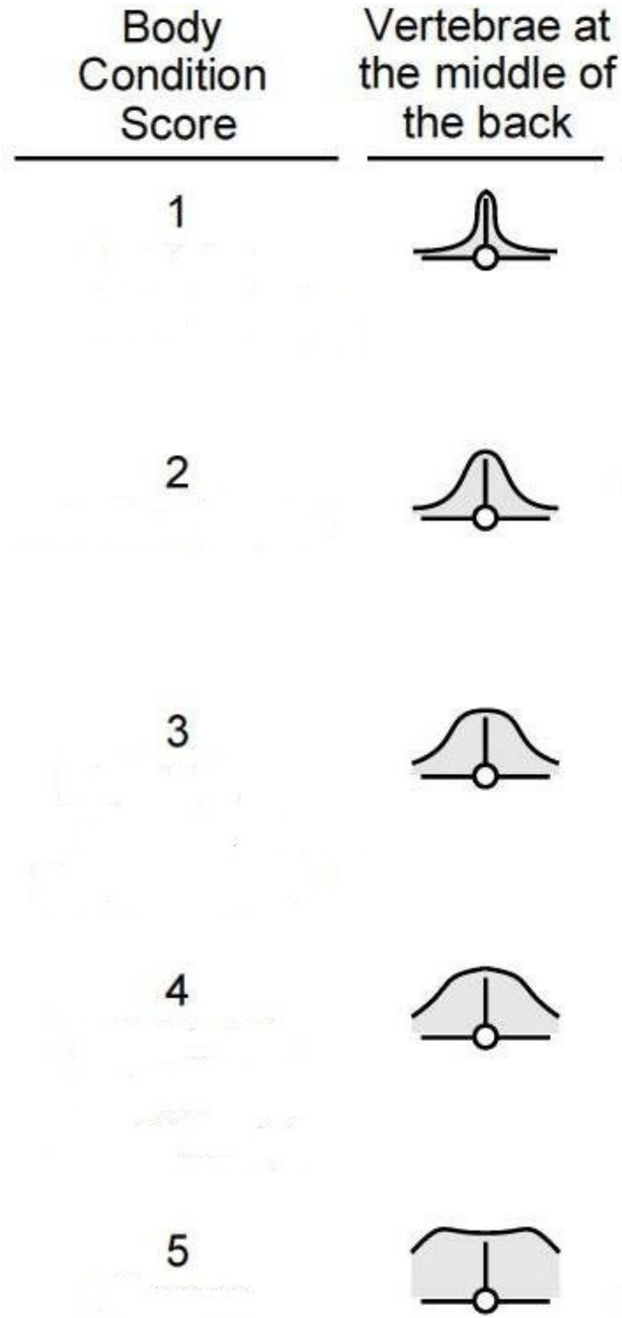
Relationship Between Lactation Feed Intake and Interval From Wean to Estrus



Annual Sow Mortality



The Concept...



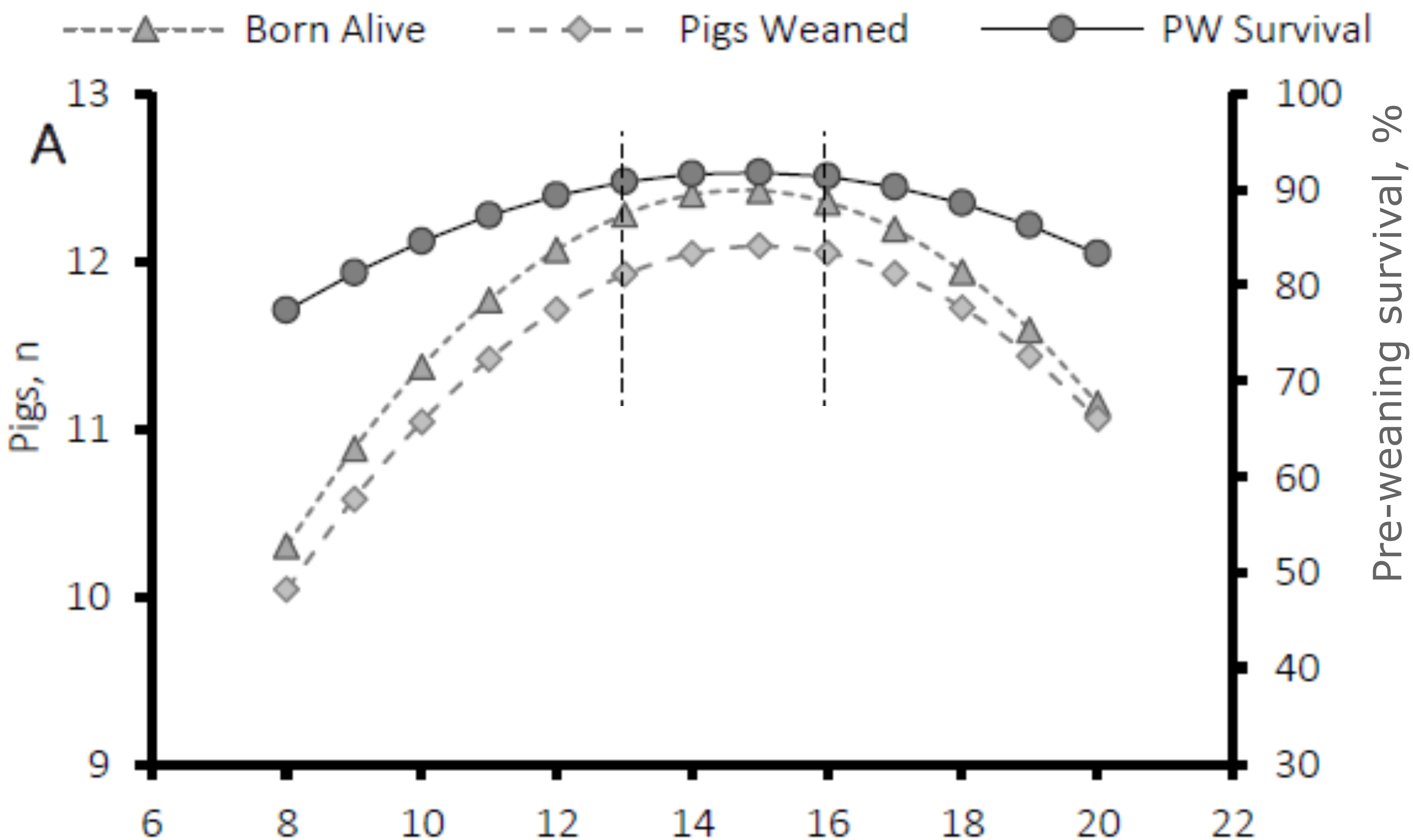
Adapted from Edmonson et al. (1989)

Using the Caliper – Find the Last Rib

https://www.youtube.com/watch?v=YgxQEIzkjbQ

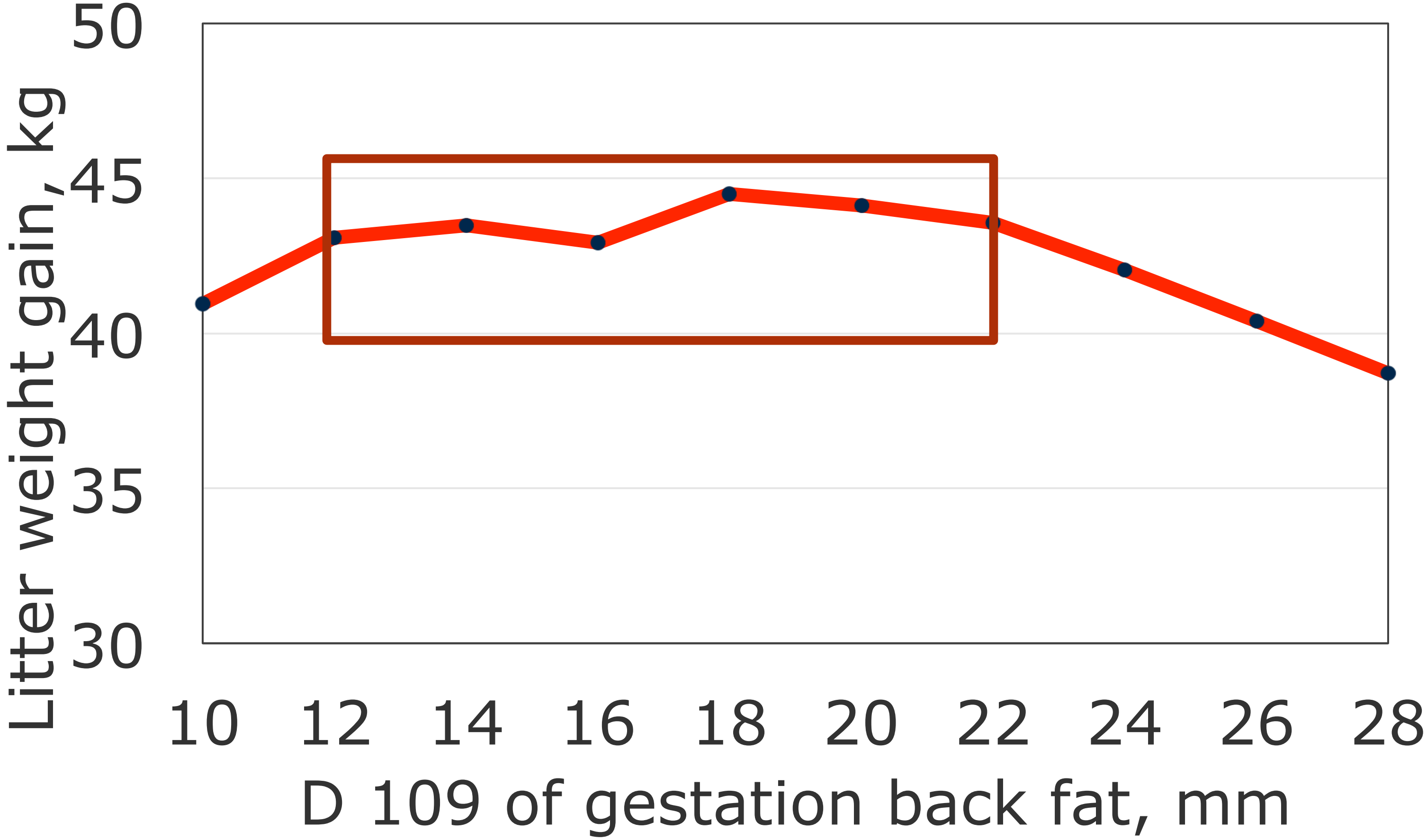
The Sow Caliper - an Objective BCS Tool

The Benefits of an Ideally Conditioned Herd



Bryan and Knauer, 2014; A total of 2460 sows were used.

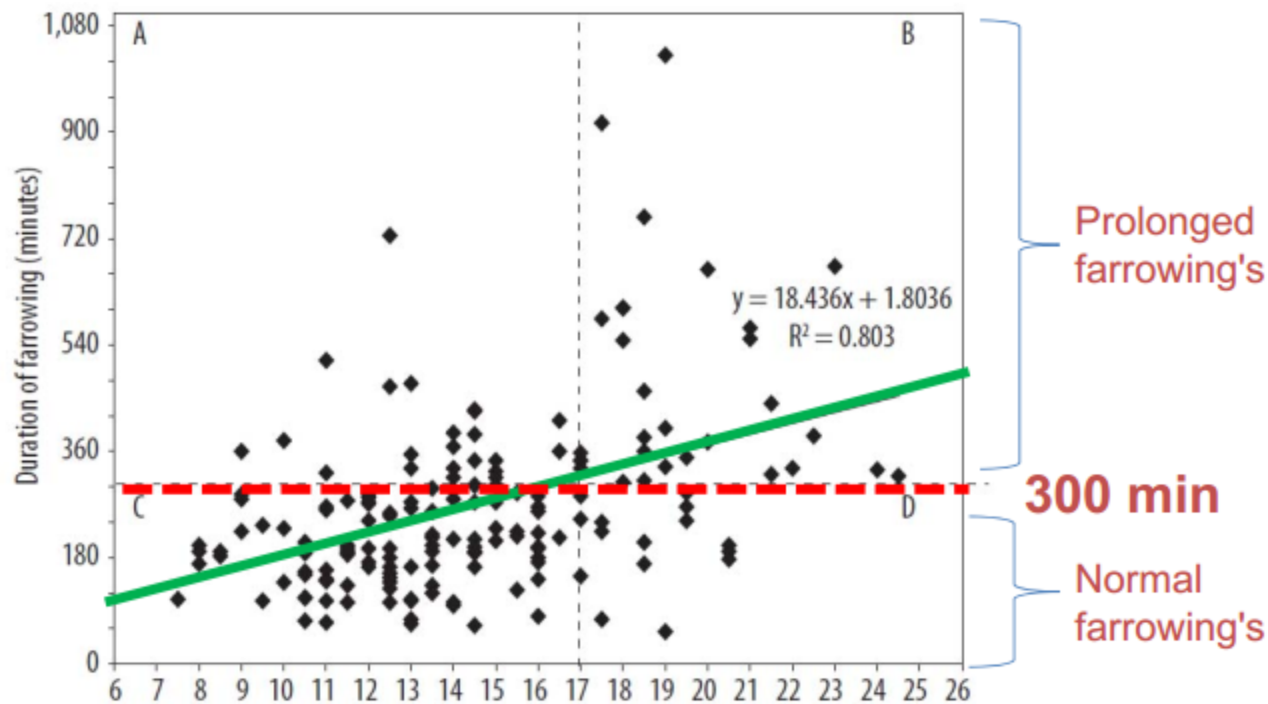
Feeding During Most of Gestation: Influence of Back Fat Level at Farrowing



Kim et al., 2015

Farrowing length influenced by backfat

OPTIMIZING SOW BODY CONDITION REDUCES THE DURATION OF FARROWING

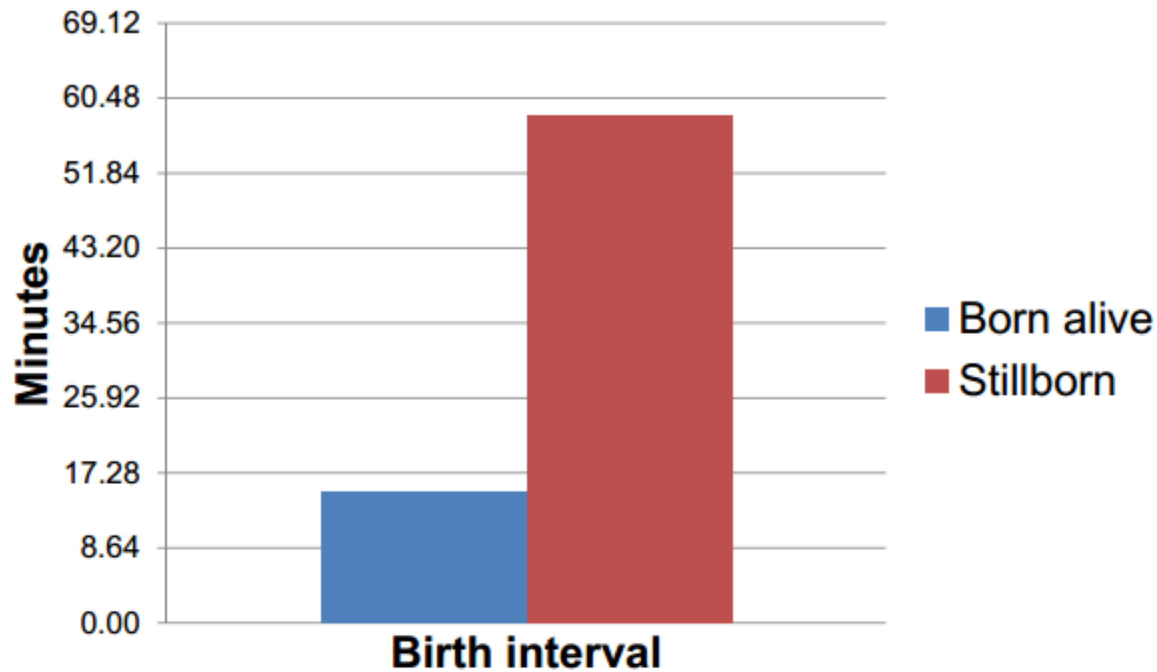


(Oliviero et al. 2010)

Presented by van Wesel, 2018

Farrowing length and birth interval influence Livability

FARROWING DURATION - MAJOR CAUSE OF STILL BORN PIGLETS



(Van den Bosch et al., unpublished)

Presented by van Wesel, 2018

Descriptive Summary of Bump-Feeding Experiments for Gilts

Exp.[1]	Parity	Start, d of gestation	Litters per trt, n	Total born, n	Control, Mcal ME/d	Control, g SID Lys/d	Bump feeding, Mcal ME/d	Bump feeding, g SID Lys/d	Increased by bump feeding: Female BW gain, kg/kg of extra feed[2]	Increased by bump feeding: Piglet birth weight, g
Shelton et al. 2009	G	90	21	14.3	6.8	11.9	9.8	17.1	5.7	86
Gonçalves et al. 2015	G	90	371	14.2	5.9	10.7	8.9	10.7	5.6	24
Gonçalves et al. 2015	G	90	371	14.2	5.9	20	8.9	20	9.1	28
Soto et al. 2011	G	100	24	12.5	7	9.8	12.9	18.2	NR	126
Greiner et al. 2016b	G	100	65	13.4	5.9	9.0	8.8	14.0	0	-120
Mallmann et al., 2016	G	90	55	14.6	5.9	11.7	7.2	14.3	6.8	17
Mallmann et al., 2017	G	90	243	14.3	5.9	10.8	7.5	13.8	7.6	26
Mallmann et al., 2017	G	90	242	14.4	5.9	10.8	9.1	13.8	9.2	-1
Mallmann et al., 2017	G	90	246	14.4	5.9	10.8	10.7	13.8	8.2	-11
Avg[3]	---	---	---	**14.2**	**5.9**	**12.8**	**9.0**	**14.6**	**7.3**	**12.6**
SD	---	---	---	0.7	0.5	3.2	1.7	2.8	3.0	68

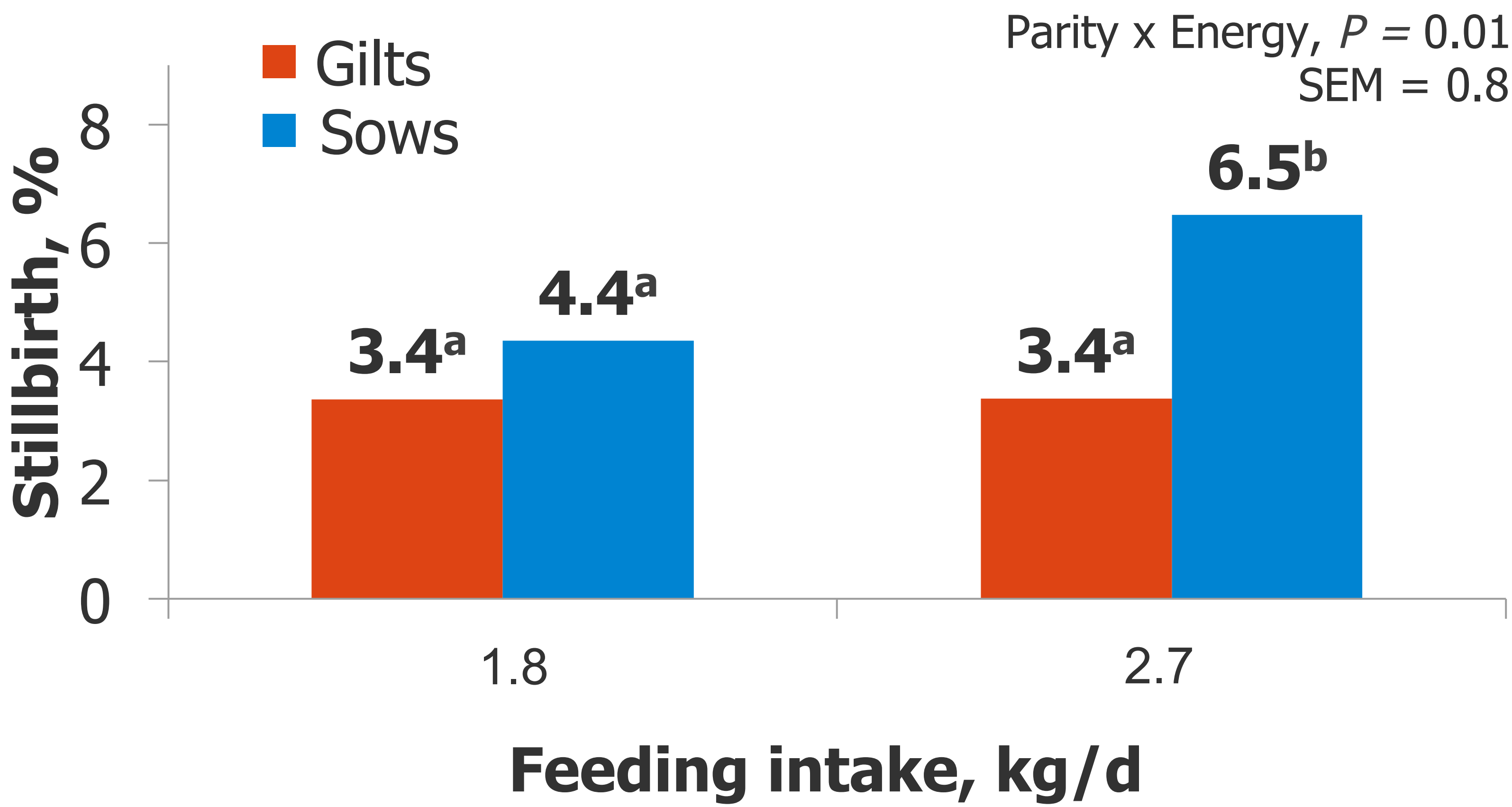
[1]Experiments as identified in the references. [2]Based on a corn-soy bean meal based diet, is the amount in kg of BW gain for kg of extra feed above the basal level. [3]Weighed based on the number of sows in each study. NR = Non-recorded in the study. *Not statistically significant (*P*>0.05).

Descriptive Summary of Bump-Feeding Experiments for Sows

					Control,		Bump feeding,		Increased by bump feeding	
Exp.[1]	Parity	Start, d of gestation	Litters per trt, n	Total born, n	Mcal ME/d	Control, g SID Lys/d	Bump feeding, Mcal ME/d	g SID Lys/d	Female BW gain, kg/kg of extra feed[2]	Piglet birth weight, g
Shelton et al. 2009	S	90	32	12.4	7.9	11.9	11.4	19.9	5.4	-109
Gonçalves et al. 2015	S	90	181	15.1	5.9	10.7	8.9	10.7	9	47
Gonçalves et al. 2015	S	90	181	15.3	5.9	20.0	8.9	20.0	10.8	19
Soto et al. 2011	S	100	51	12.9	7.9	11.2	13.9	19.5	NR	-69
Greiner et al. 2016a	S	95	128	14.7	5.9	9.0	8.8	14.0	7.1	-40
Mallmann et al., 2016	S	90	221	15.4	5.9	11.7	7.2	14.3	9.0	-4
Avg[3]	---	---	---	**14.9**	**6.1**	**12.9**	**8.8**	**15.3**	**8.4**	**-1.3**
SD			77	1.3	1.0	3.9	2.4	3.9	2.1	58

[1]Experiments as identified in the references. [2]Based on a corn-soy bean meal based diet, is the amount in kg of BW gain for kg of extra feed above the basal level. [3]Weighed based on the number of sows in each study. NR = Non-recorded in the study. *Not statistically significant (P>0.05).

Bump Feeding Can Increase 2.1% Stillborns in Sows, But Not in Gilts



Treatments from d 90 to d 112 of gestation; adapted from Gonçalves et al., 2016

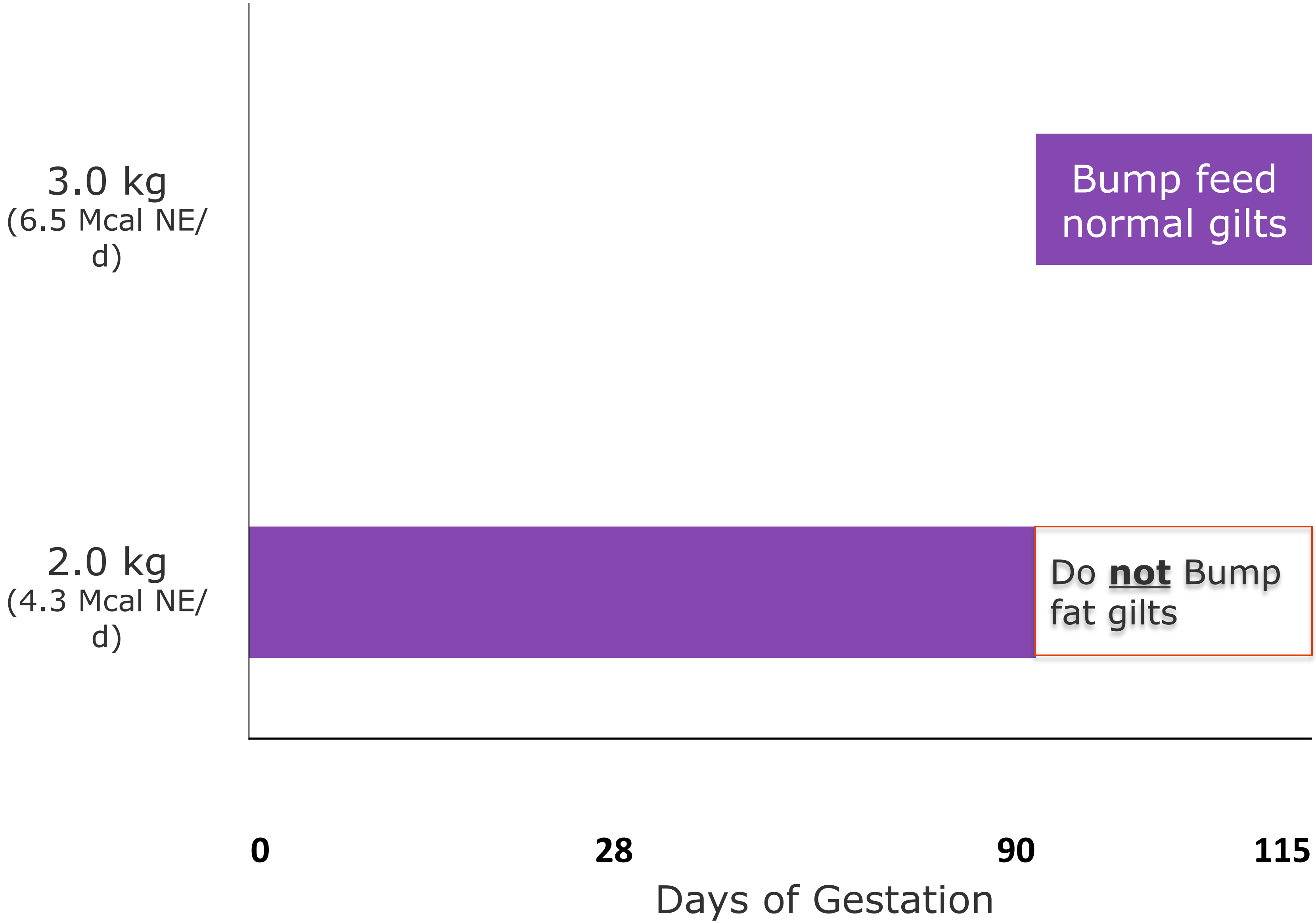
Gestation Feeding

- Calibrate feeders: Weigh actual feed amount dropped on a monthly basis and align feed boxes accordingly.

In this case, both feed boxes are set to drop 2.3 kg, however:

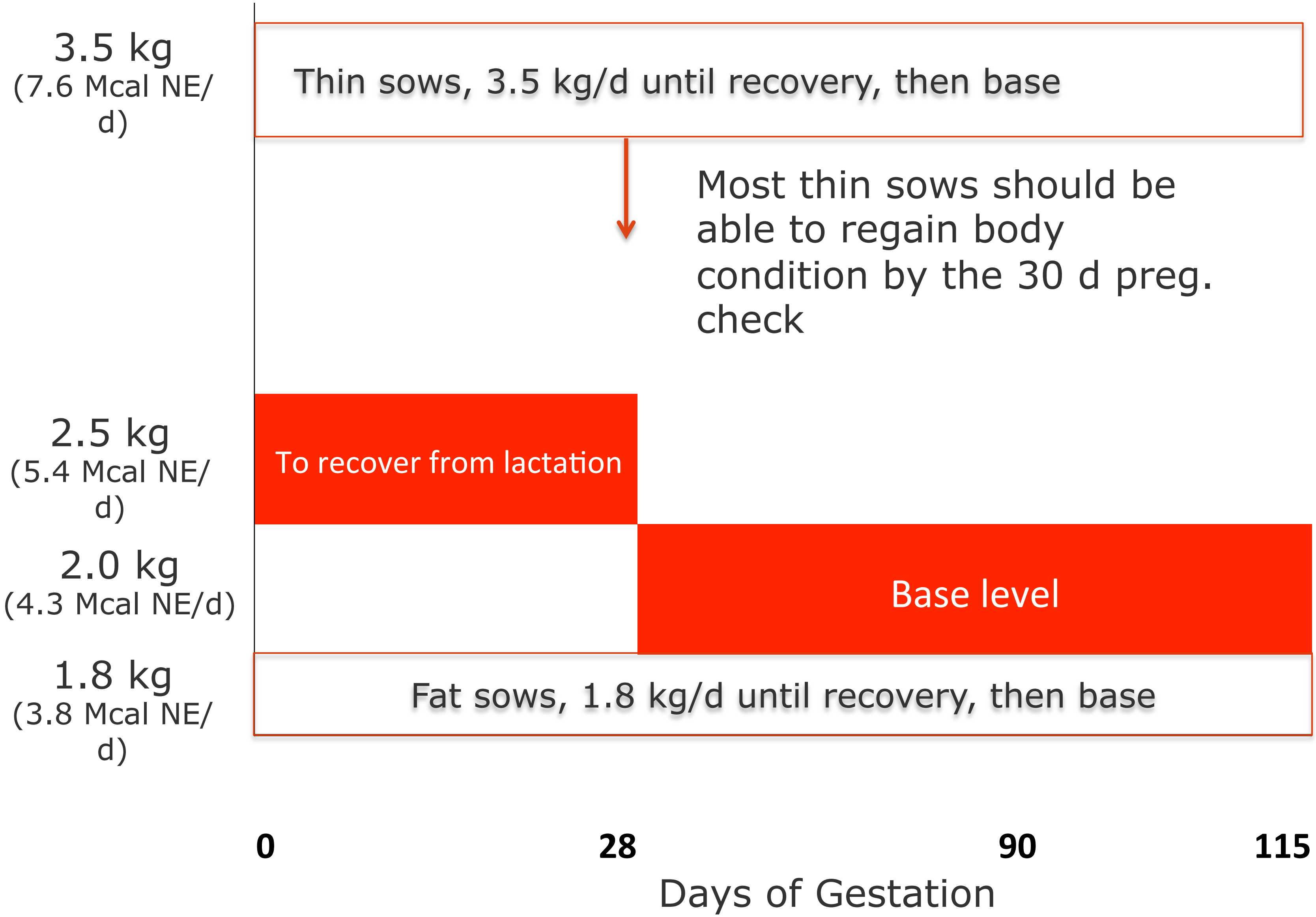
Feed Box 1 is dropping 2.2 kg
Feed Box 2 is dropping 1.7 kg

Example: Gilts



Assuming wheat-barley based diet with 0.54% SID Lys.

Example: Sows



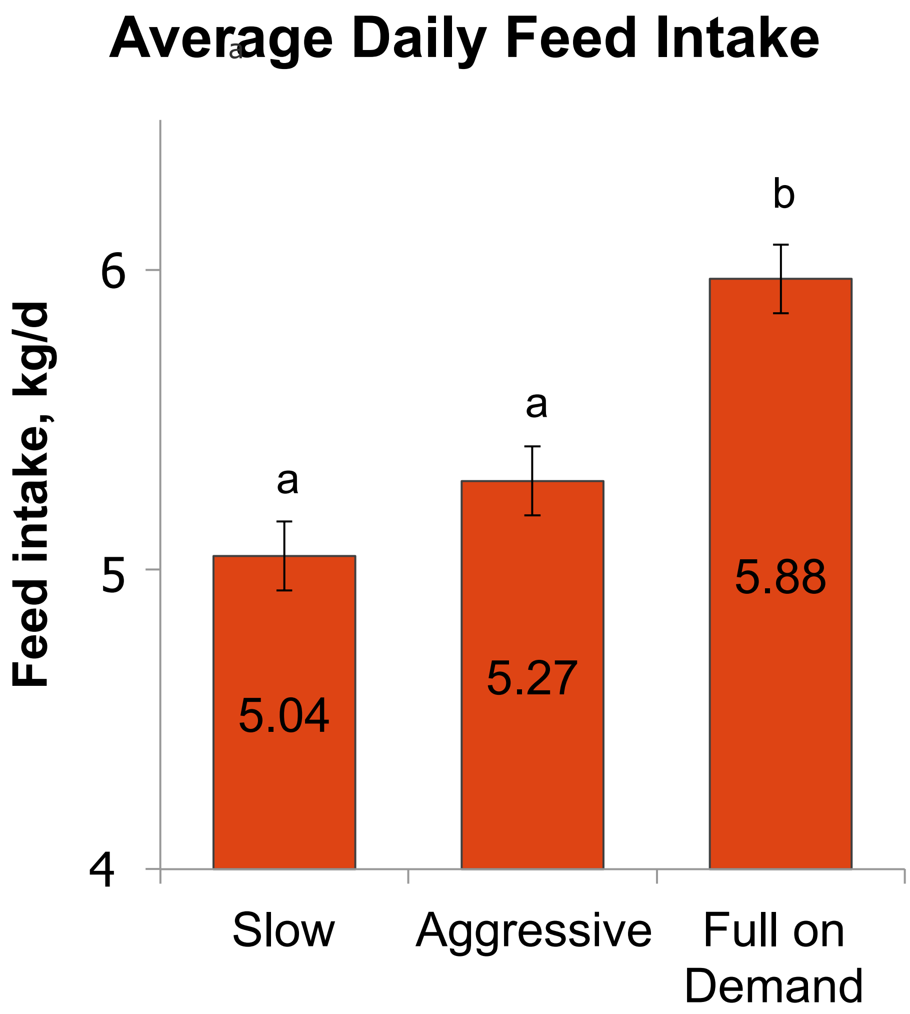
Assuming wheat-barley based diet with 0.54% SID Lys.

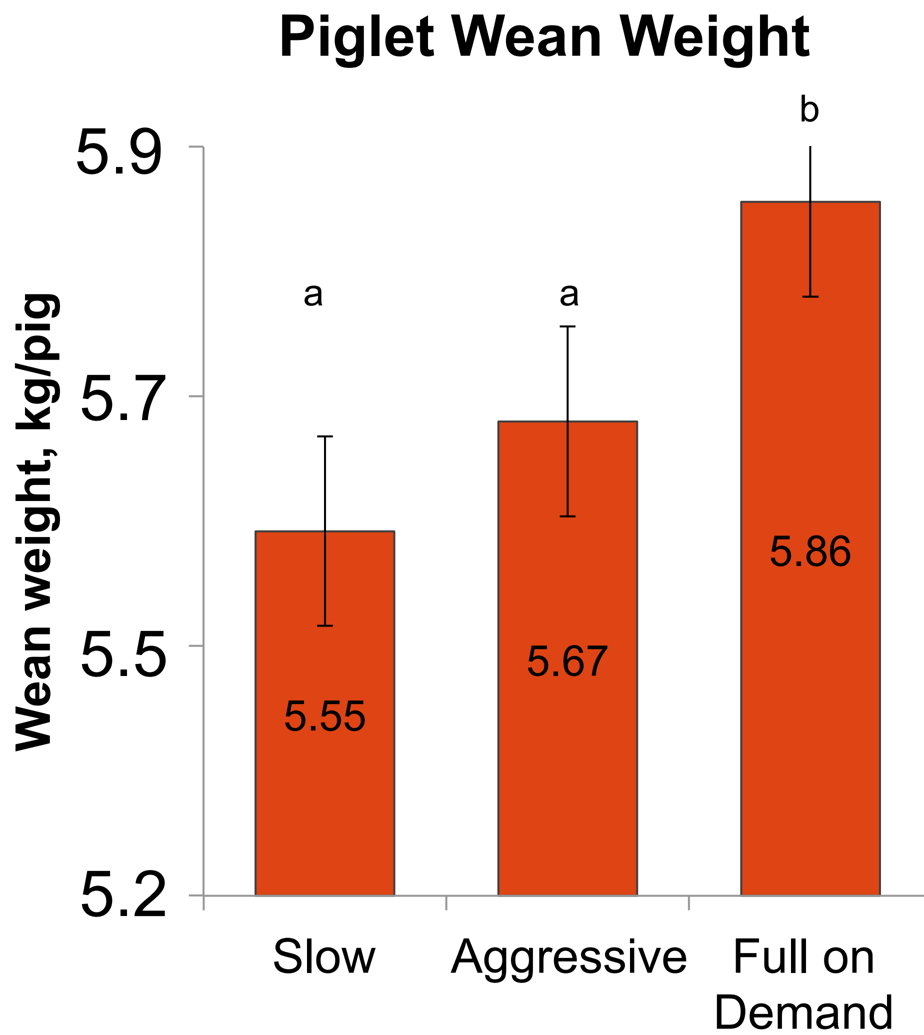
Economics of Gestating Sow Feeding

- Bump feed gilts, but not sows
- 0.9 kg of feed savings per day from 90 to 112 d with 2.4 farrowings/sow/year x 80% sows in the herd =

$6.7/sow/year

Feed Intake and Weaning Weight





Wean to Estrous

- Ad lib feeding
  - Full feed thin sows.
  - Feed ~3.6 kg/d to all others.
  - We might see some waste on some days.
  - Self-feeder may reduce waste.

In Case You Dozed Off

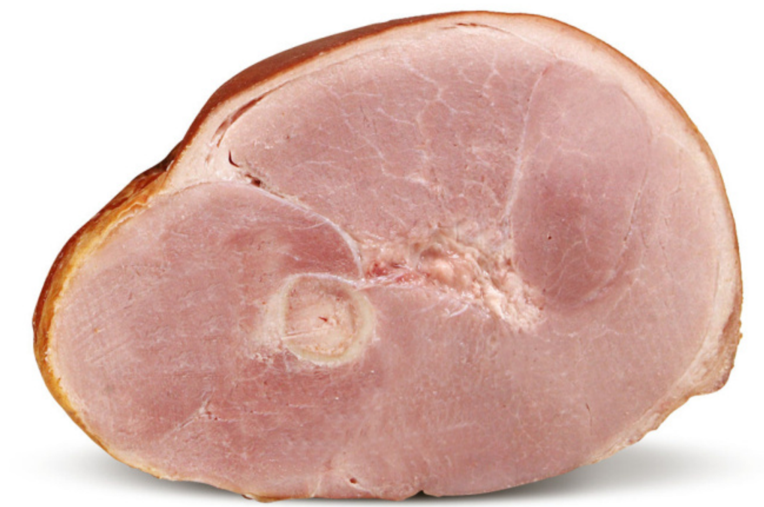
• Wean to Breed	Feed a lot
• Gestation	Feed a little
• Lactation	Really feed a lot

Great Truths

1. Sows can be fed in a variety of manners while still achieving excellent productivity… There is more than one way to skin a cat.
2. Research should be used to challenge our current methods… We reserve the right to get smarter.

Amino Acid Requirements

- Lysine is the first limiting AA
  - The amount of Lysine to make 1 kg of body weight gain is virtually the same over the years

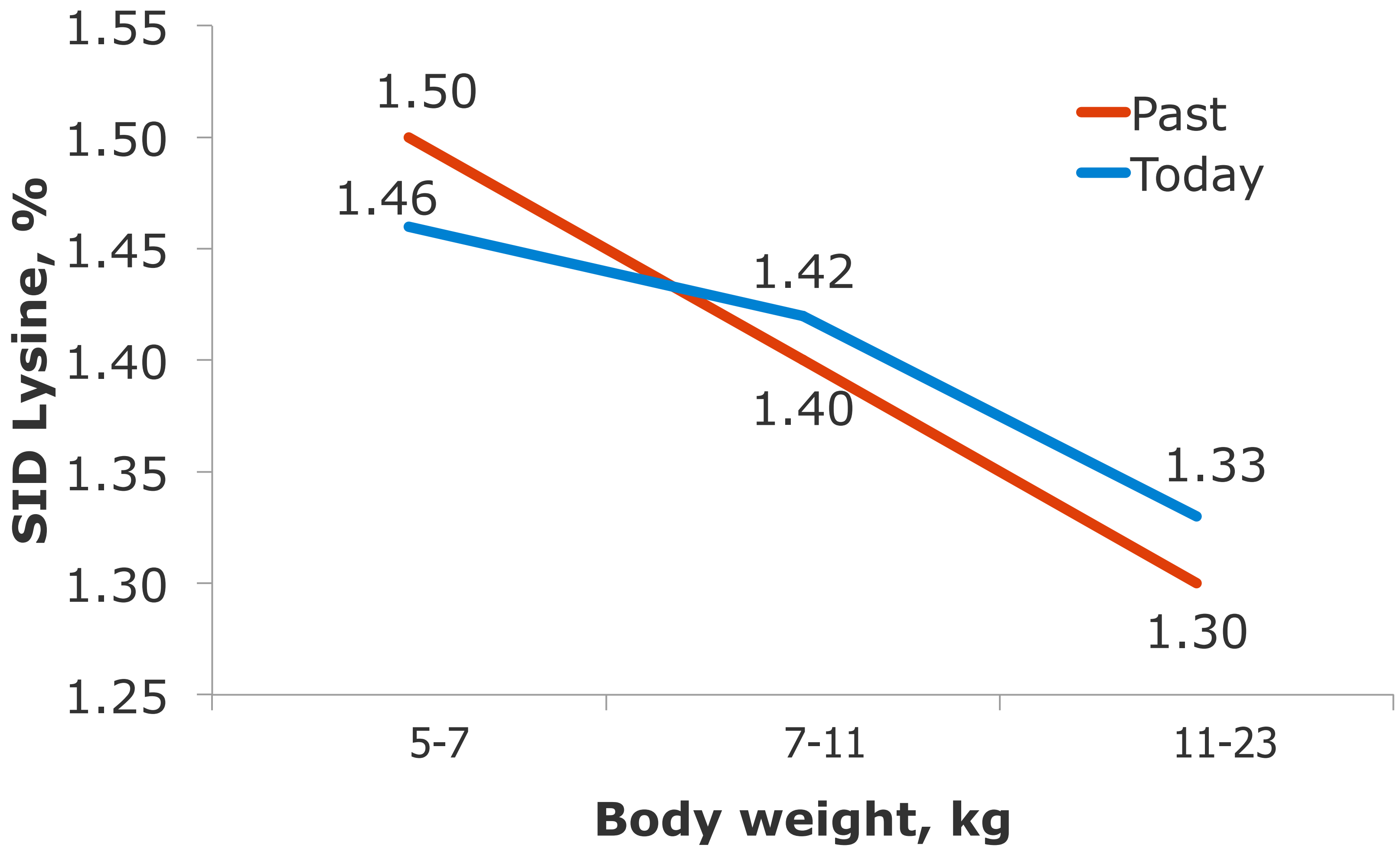


Improved growth rate

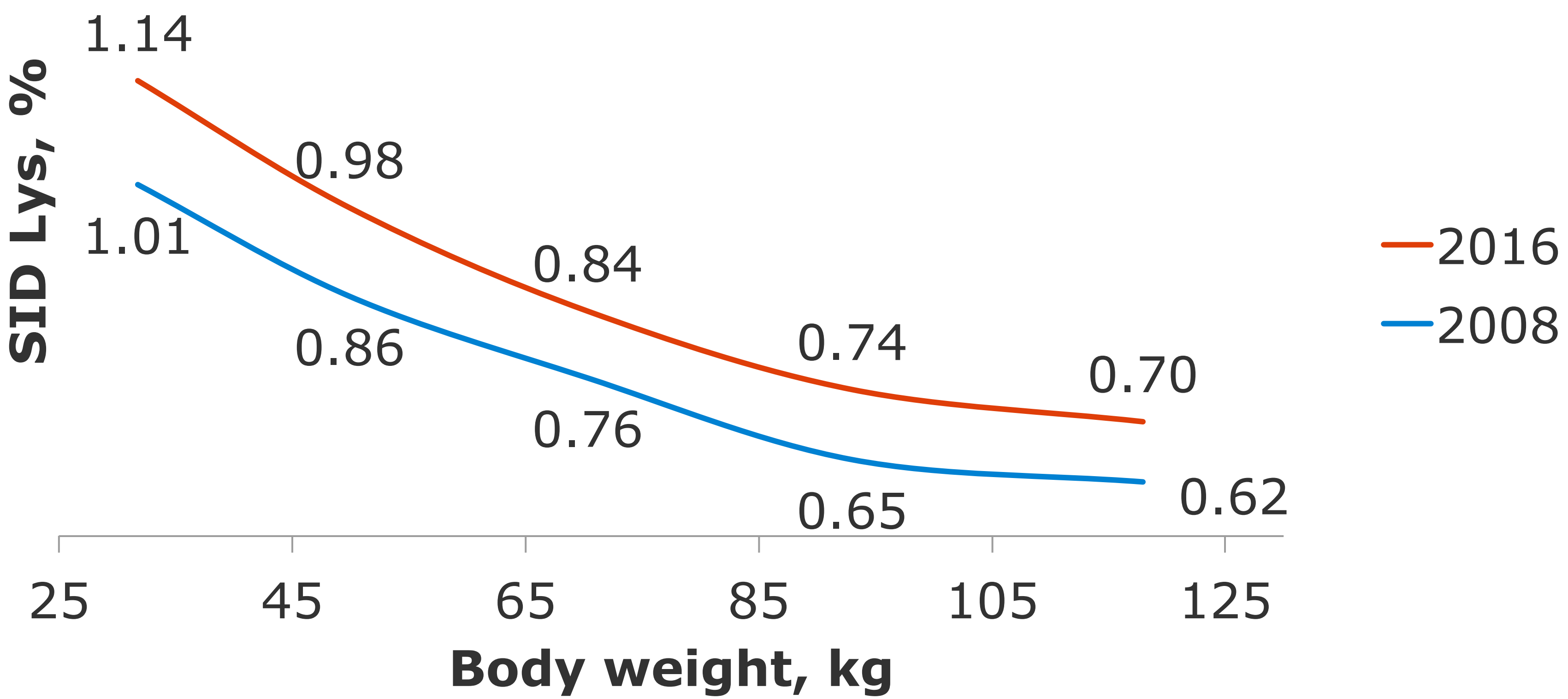
Improved feed efficiency

Over time there is a need to concentrate the diets

Times are Changing…



SID Lysine Requirement
2.4 Mcal NE/kg



A total of 27 commercial experiments were used in the meta-analysis with a total of 45,102 pigs.
Average of barrows and gilts, average of ADG and F/G.
Assuming a corn-soybean meal diet with phytase

More Than Biological Requirement…

PIC Lysine requirement for PIC pigs

Energy level, NRC ME kcal/kg	3300	3300	3300	3300	3300	3300
Weight In, kg	23	40	60	80	105	105
Weight Out, kg	40	60	80	105	123	123
Lys:Cal ME						
Barrows	3.48	2.99	2.57	2.25	2.09	2.09
Gilts	3.67	3.10	2.65	2.35	2.26	2.26
Boars	4.36	3.79	3.30	2.91	2.69	2.69
Lys % (ME equation)						
Barrows	1.15	0.99	0.85	0.74	0.69	0.69
Gilts	1.21	1.02	0.88	0.78	0.74	0.74
Boars	1.44	1.25	1.09	0.96	0.89	0.89

Instructions | Lbs - ME | Lbs - NE | Metric - ME | Metric - NE

…maximizing profit!

http://na.pic.com/resources.aspx

PIC

Alberta: Worth $2.5/Pig Going to New PIC Levels if Short in Space

PIC

Economic model for optimum lysine for PIC pigs

Input ***(please fill beige cells)***

Gender	Barrows and gilts
Live pig price, $/kg	$1.50
Feeder pig cost, $/pig	$50.00
Facility cost, $/pig/day	$0.16
Other costs, $/pig	$14.00

			Biological requirement		Current diets	
BW, kg		Energy, kcal NE/kg	SID Lys, %	$/ton	SID Lys, %	$/ton
23	40	2,300	1.11	$322	1.01	$305
40	60	2,300	0.95	$293	0.85	$281
60	80	2,300	0.81	$276	0.71	$265
80	100	2,300	0.72	$261	0.62	$250
100	130	2,300	0.67	$253	0.57	$243

Output

	Biological requirement	Current diets
% of maximum ADG	100.0%	96.2%
% of maximum feed efficiency	98.7%	95.5%
Net profit difference, $/pig		
Fixed time (space short)	+ 2.50	– 2.50
Fixed weight (space long)	+ 0.07	– 0.07

CAD: $1.5/kg live, Wheat $225/MT, Barley $223/MT, Peas $265/MT, Corn DDGS $295/MT
L-Lysine-HCl $2.10/kg

Saskatchewan: Worth $2.2/Pig Going to New PIC Levels if Short in Space

PIC

Economic model for optimum lysine for PIC pigs

Input ***(please fill beige cells)***

Gender	Barrows and gilts
Live pig price, $/kg	$1.50
Feeder pig cost, $/pig	$50.00
Facility cost, $/pig/day	$0.16
Other costs, $/pig	$14.00

BW, kg		Energy, kcal NE/kg	Biological requirement SID Lys, %	Biological requirement $/ton	Current diets SID Lys, %	Current diets $/ton
23	40	2,400	1.16	$338	1.06	$317
40	60	2,400	0.99	$293	0.89	$276
60	80	2,400	0.85	$269	0.75	$257
80	100	2,400	0.76	$253	0.66	$243
100	130	2,400	0.70	$244	0.60	$234

Output

	Biological requirement	Current diets
% of maximum ADG	100.0%	96.2%
% of maximum feed efficiency	98.7%	95.5%
Net profit difference, $/pig		
Fixed time (space short)	+ 2.23	– 2.23
Fixed weight (space long)	– 0.32	+ 0.32

CAD: $1.5/kg live, Wheat $214/MT, Peas $255/MT, Corn DDGS $280/MT
L-Lysine-HCl $2.05/kg

Manitoba: Worth $1.7/Pig Going to New PIC Levels if Short in Space

PIC

Economic model for optimum lysine for PIC pigs

Input ***(please fill beige cells)***

Gender	Barrows and gilts
Live pig price, $/kg	$1.50
Feeder pig cost, $/pig	$50.00
Facility cost, $/pig/day	$0.16
Other costs, $/pig	$14.00

BW, kg		Energy, kcal NE/kg	Biological requirement SID Lys, %	Biological requirement $/ton	Current diets SID Lys, %	Current diets $/ton
23	40	2,500	1.20	$335	1.10	$315
40	60	2,500	1.03	$300	0.93	$280
60	80	2,500	0.88	$274	0.78	$257
80	100	2,500	0.79	$256	0.69	$247
100	130	2,500	0.73	$244	0.63	$229

Output

	Biological requirement	Current diets
% of maximum ADG	100.0%	96.2%
% of maximum feed efficiency	98.7%	95.5%
Net profit difference, $/pig		
Fixed time (space short)	+ 1.68	– 1.68
Fixed weight (space long)	– 1.01	+ 1.01

CAD: $1.5/kg live, Corn $185/MT, Corn DDGS $240/MT
L-Lysine-HCl $2.15/kg

Optimizing Dietary Net Energy Level for Maximum Profitability in Growing-Finishing Pigs

- PIC/K-State
- http://na.pic.com/resources.aspx

K·STATE Research and Extension

Economic model for optimum energy level V1.0

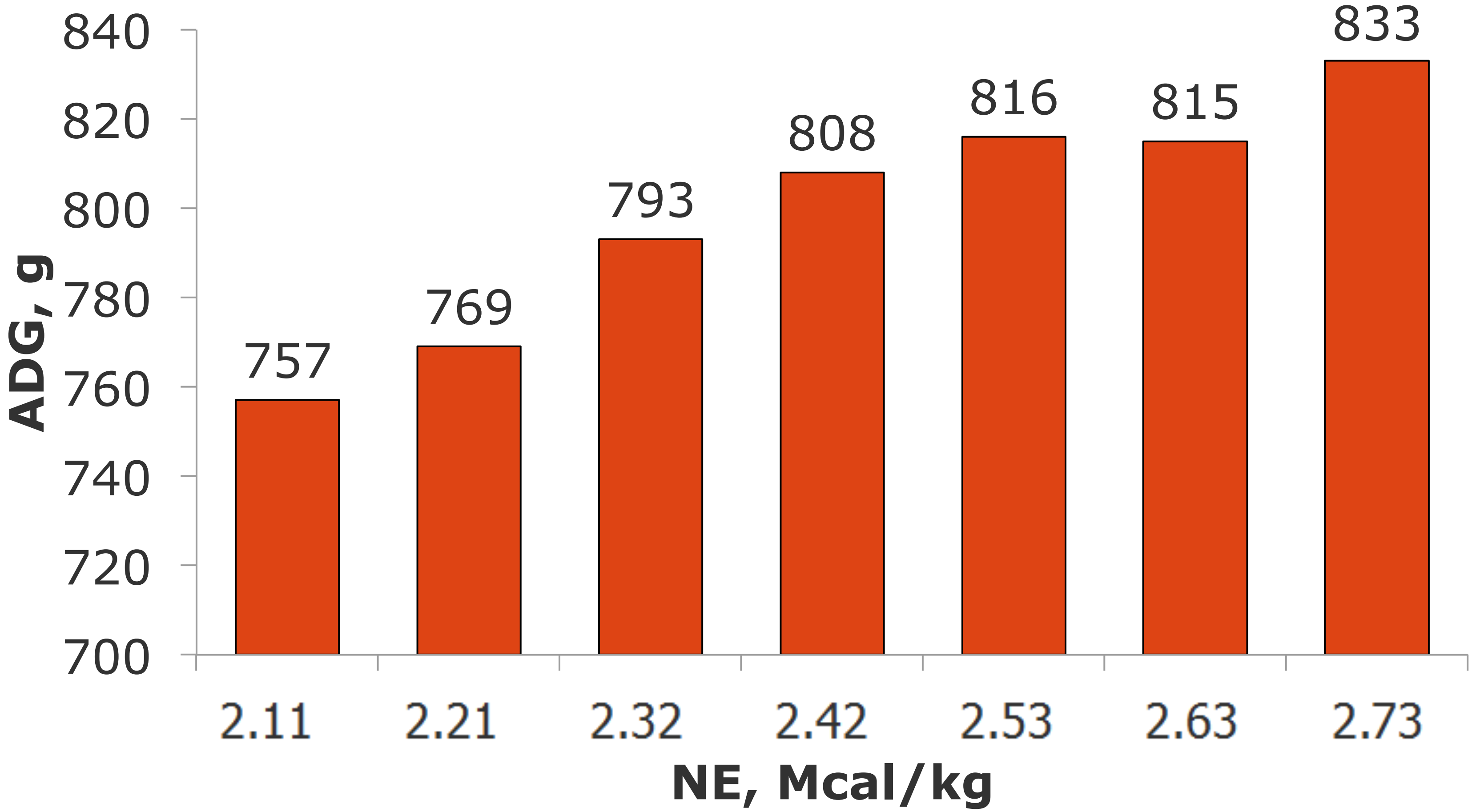
PIC

Purpose: This spreadsheet was created to allow the user to calculate the dietary net energy level for maximum profitability in growing-finishing pigs

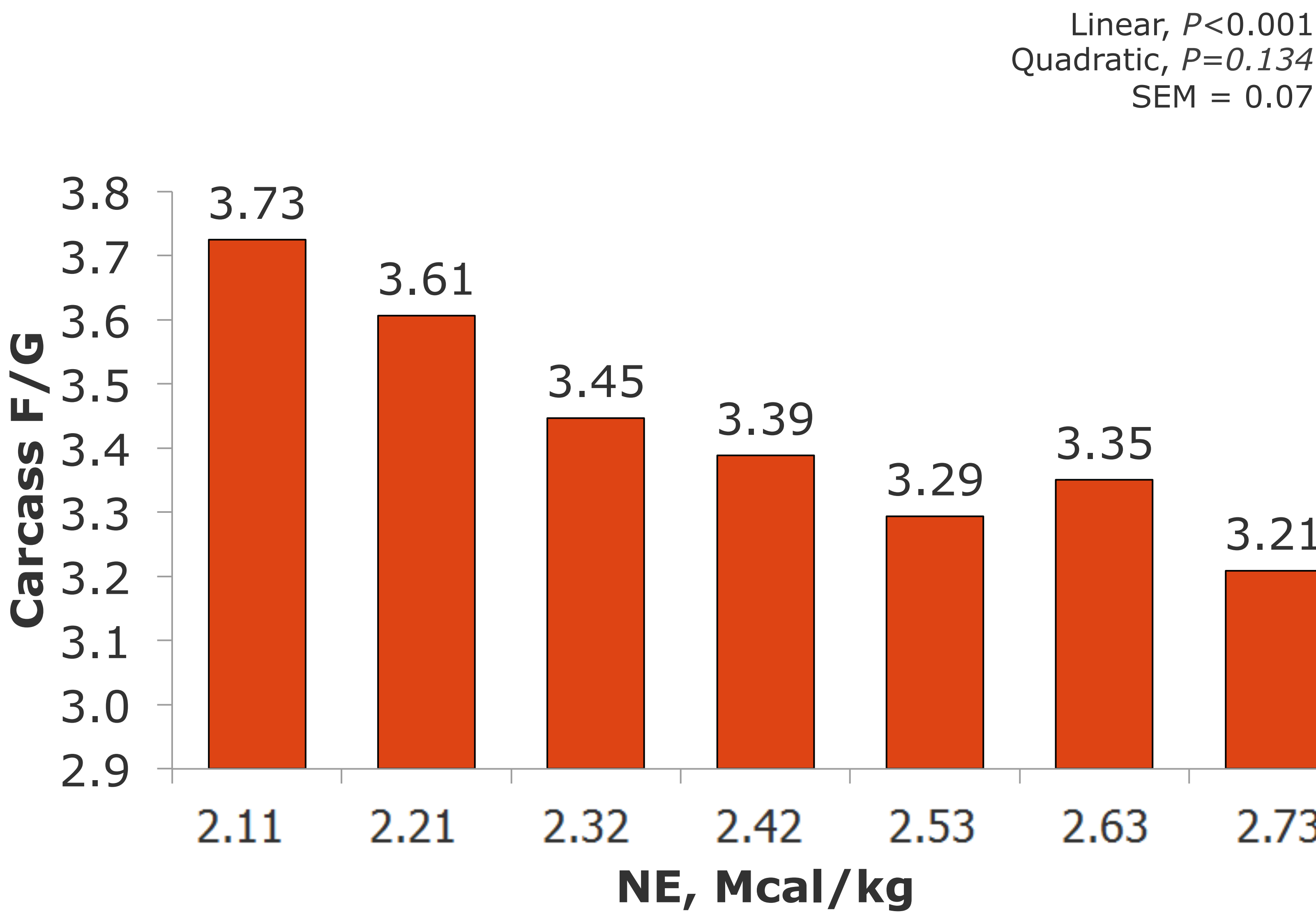
Description: This tool is divided in three sections: (1) inputs (i.e. economics inputs and dietary information) (2) calculations (ADG, F/G predictions and economic outputs) and (3) outputs (summary of calculations). In section 2 the user will be able to enter their own inputs, and in section 3 the user will able to see the dietary level of energy that optimizes profitability based on the inputs provided in section 1.

Carcass ADG

Linear, *P*<0.001
Quadratic, *P=0.174*
SEM = 9.5

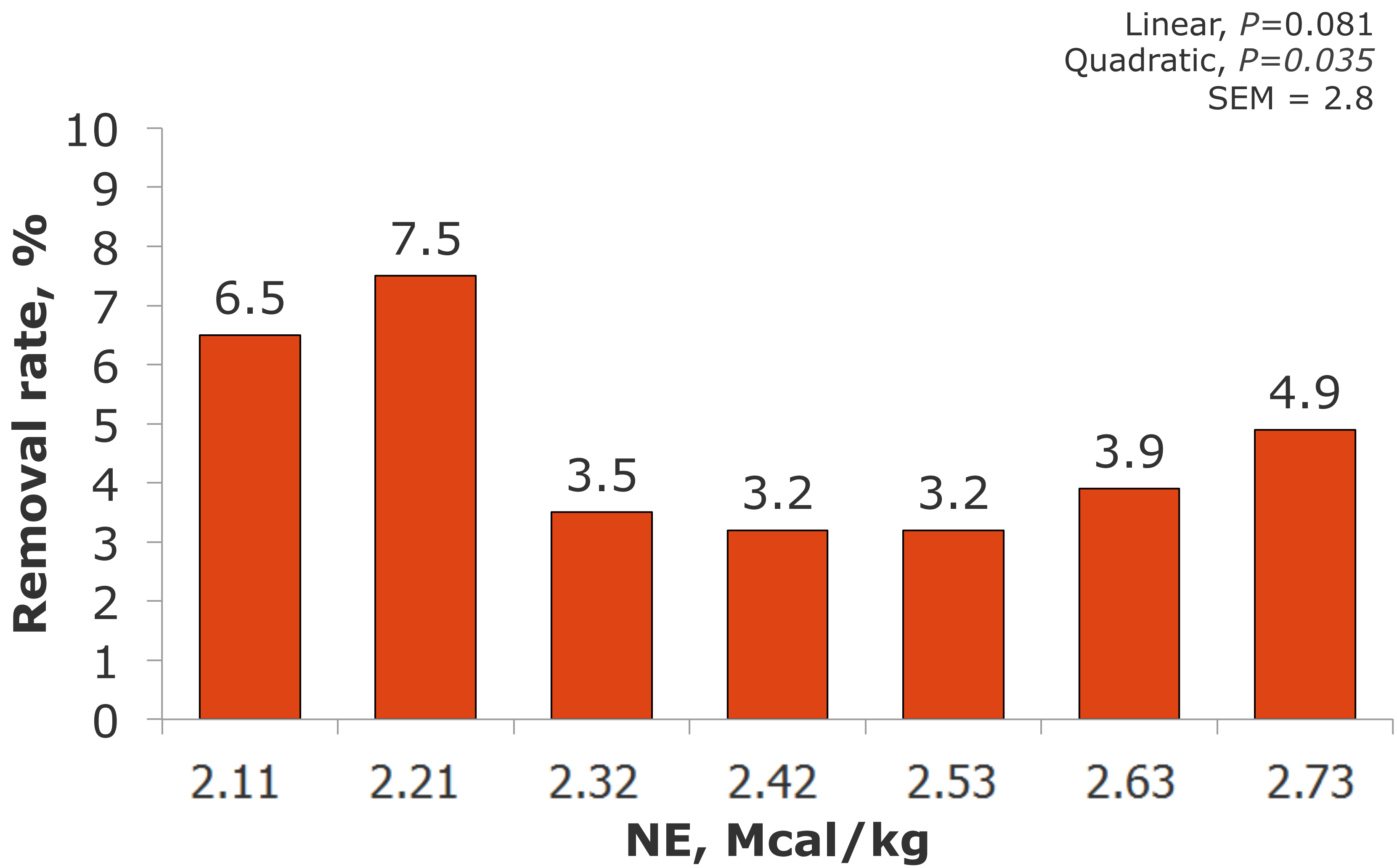


Carcass F/G

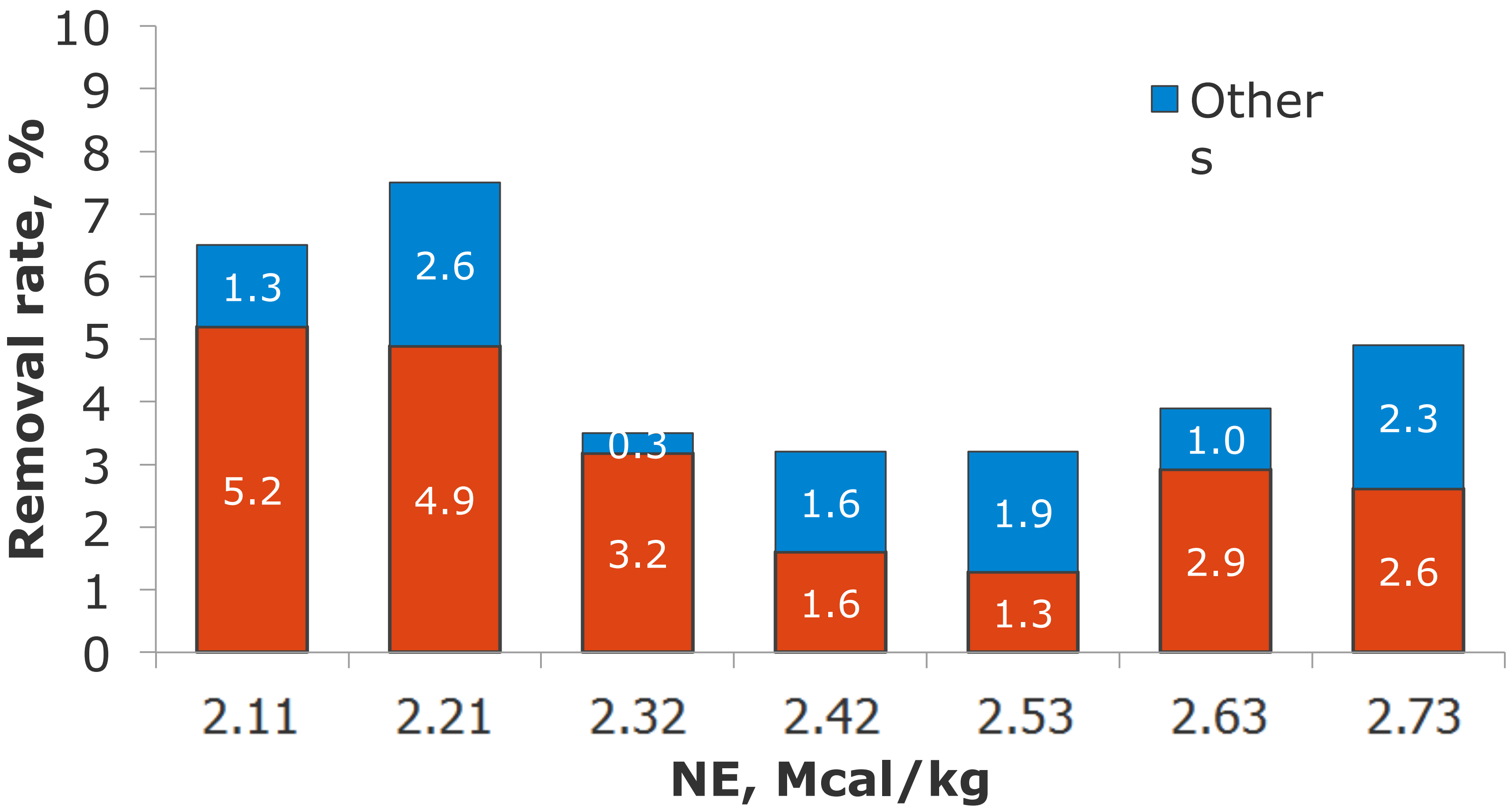


Linear, *P*<0.001
Quadratic, *P=0.134*
SEM = 0.07
Carcass F/G
3.8
3.7
3.6
3.5
3.4
3.3
3.2
3.1
3.0
2.9
3.73
3.61
3.45
3.39
3.29
3.35
3.21
2.11
2.21
2.32
2.42
2.53
2.63
2.73
NE, Mcal/kg

Removal Rate



Vices Were More Prevalent in Low Energy Diets



Could not analyze statistically because there is no data of reason per pen, only per treatment.

Take Home Message

- Wean to breed feed a lot
- Gestation feed little,
- Lactation really feed a lot

- The pig has changed and diet needs to be more dense (i.e., AA, Phos).

Keeping Your Herds Healthy

Tom Riek

Weaned Pig Cost Average vs. Top 25%

- Difference of $7.11 per pig
- PWM difference of 17.5% (3.4 points)
- Difference of 2.42 P/S/Y

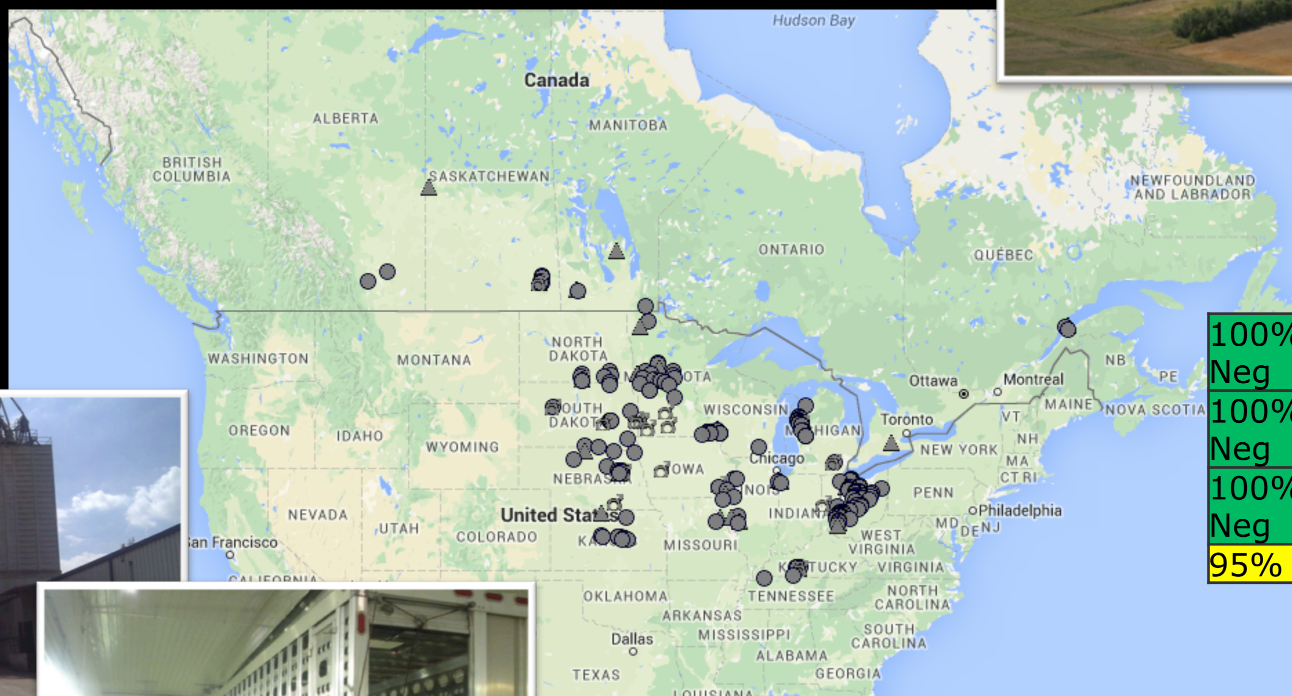
- Average – 10,537,000 weaned pigs
- Top 25% - 2,021,000

Team

- ✓ **HAV:**
  Andrea Pitkin
  Bob Thompson
  Jer Geiger
  Tom Riek
  Deanne Hemker
  Jess Waddell
  Jean Paul Cano
- ✓ **HO:**
  Vicki Law
  Beth Spiekermeier
- ✓ 40+ **HTVs**

PIC multiplication system in NA

20 boar studs = **8.4k** boars
38 breeding herds = **100K** sows
173 grow-finish sites
40+ shipments / week



100% PRRS Neg
100% SEC Neg
100% *App* Neg
95% *Mhp* Neg

51 feed mills
43 truck washes
23 owners + 40 HTVs
12 diagnostic Labs

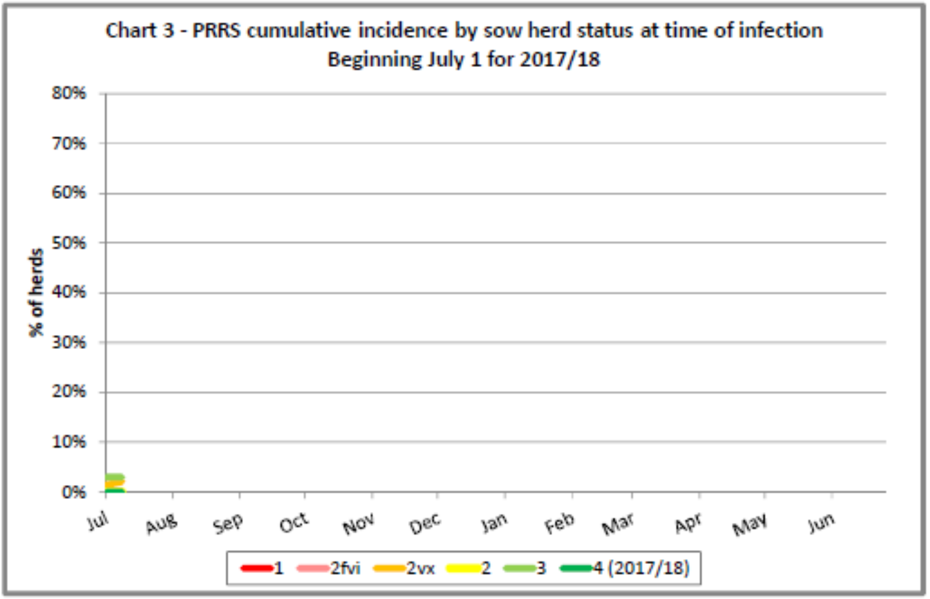
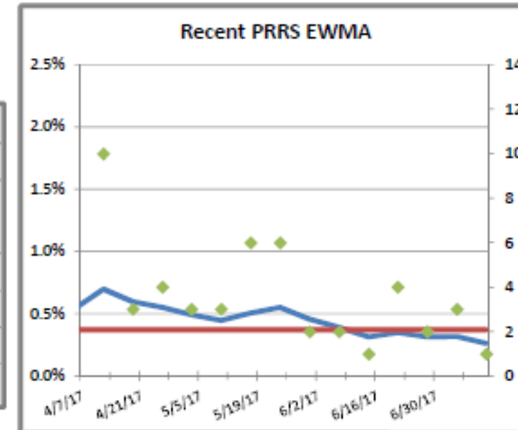


Chart 3 - PRRS cumulative incidence by sow herd status at time of infection Beginning July 1 for 2017/18

Number of sows
2,354,069
Number of farms
905

Classification Scheme	
1	Positive Unstable
2fvi	Positive Stable, Ongoing field virus exposure
2vx	Positive Stable, Live virus vaccinated
2	Positive Stable
3	Provisionally Negative
4	ELISA Negative



Recent PRRS EWMA

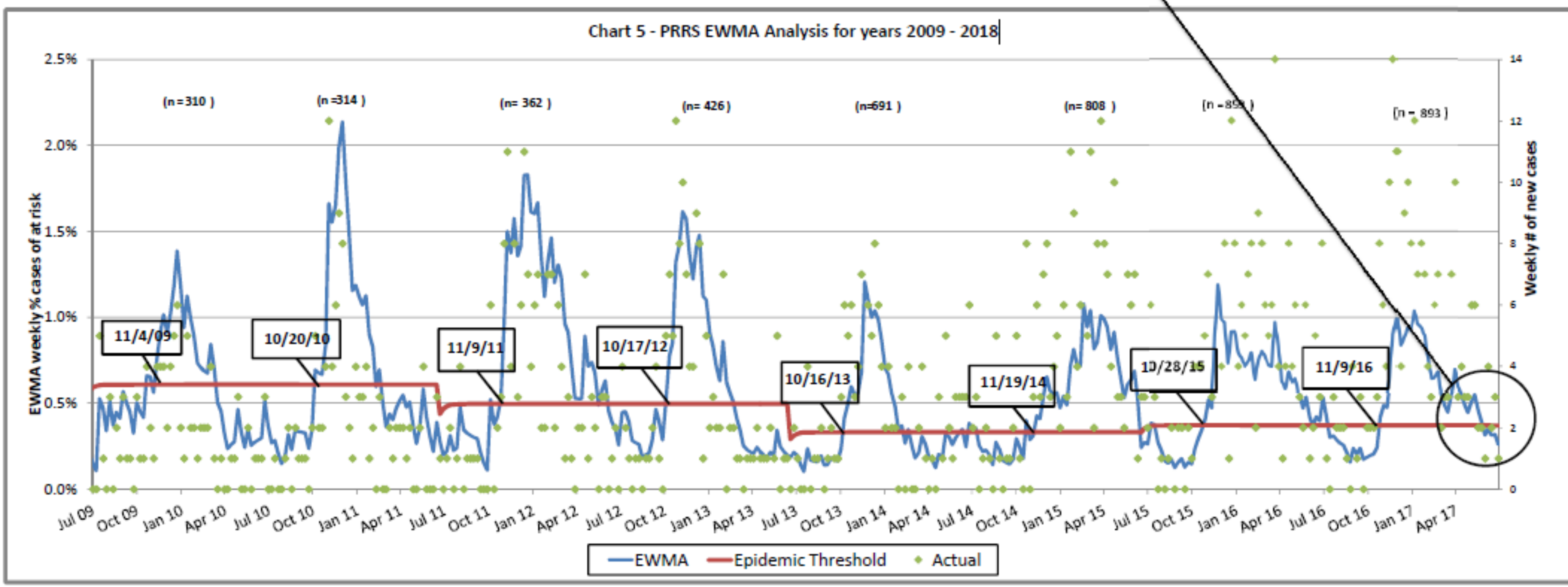
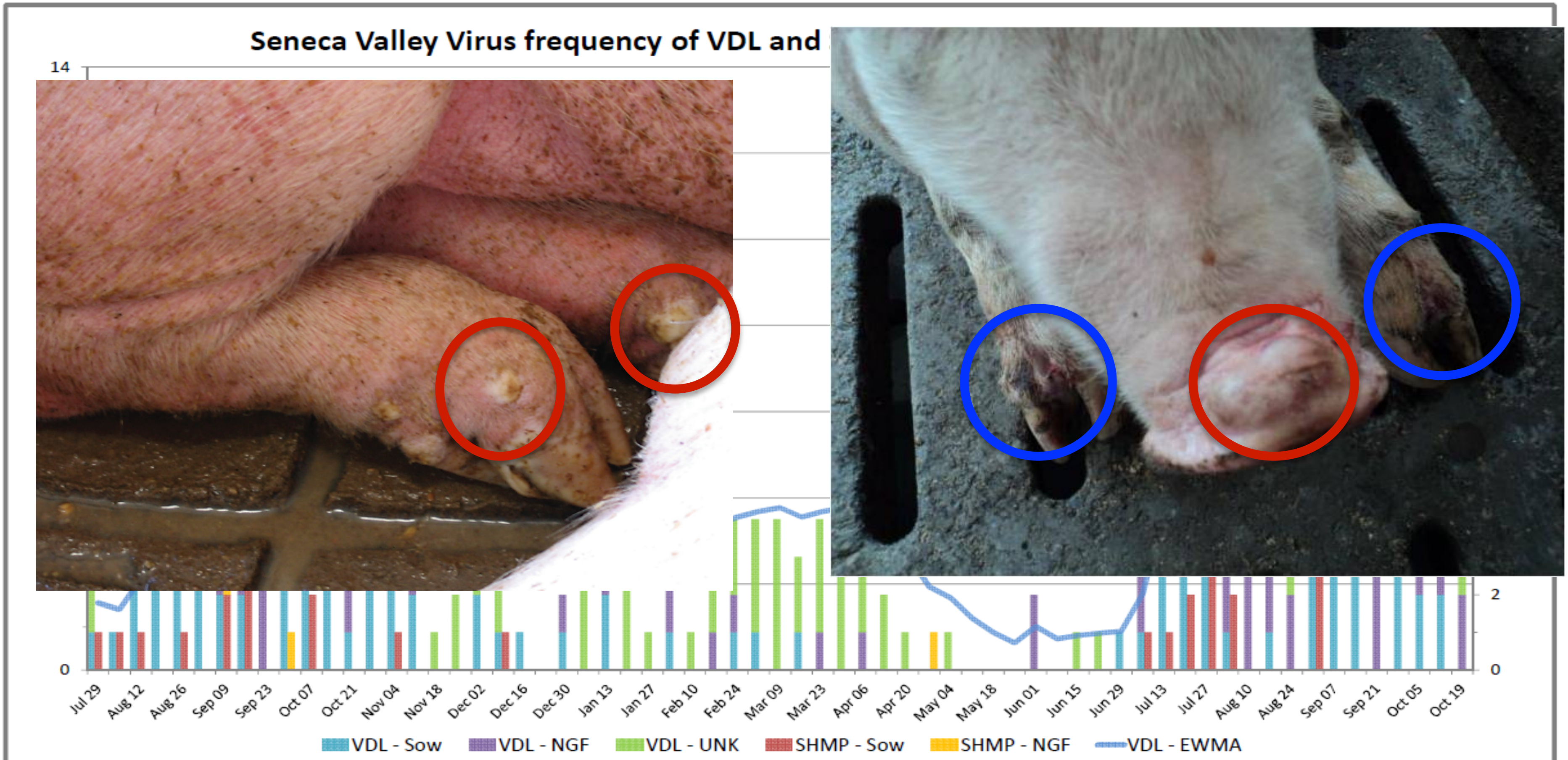


Chart 5 - PRRS EWMA Analysis for years 2009 - 2018

SVV/SVA Accessions by Week



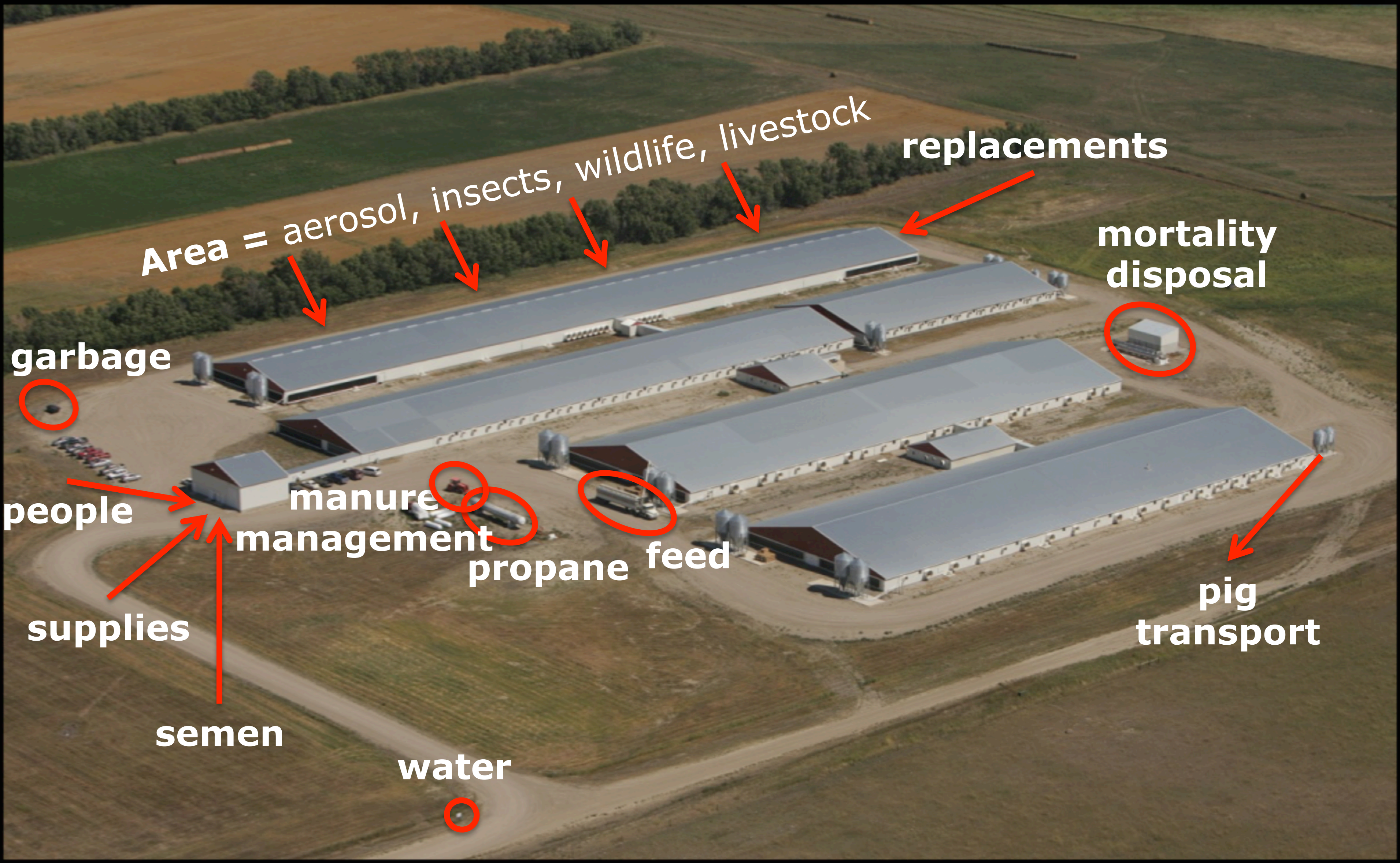
SHMP 10/21/16

SVV/SVA Cases

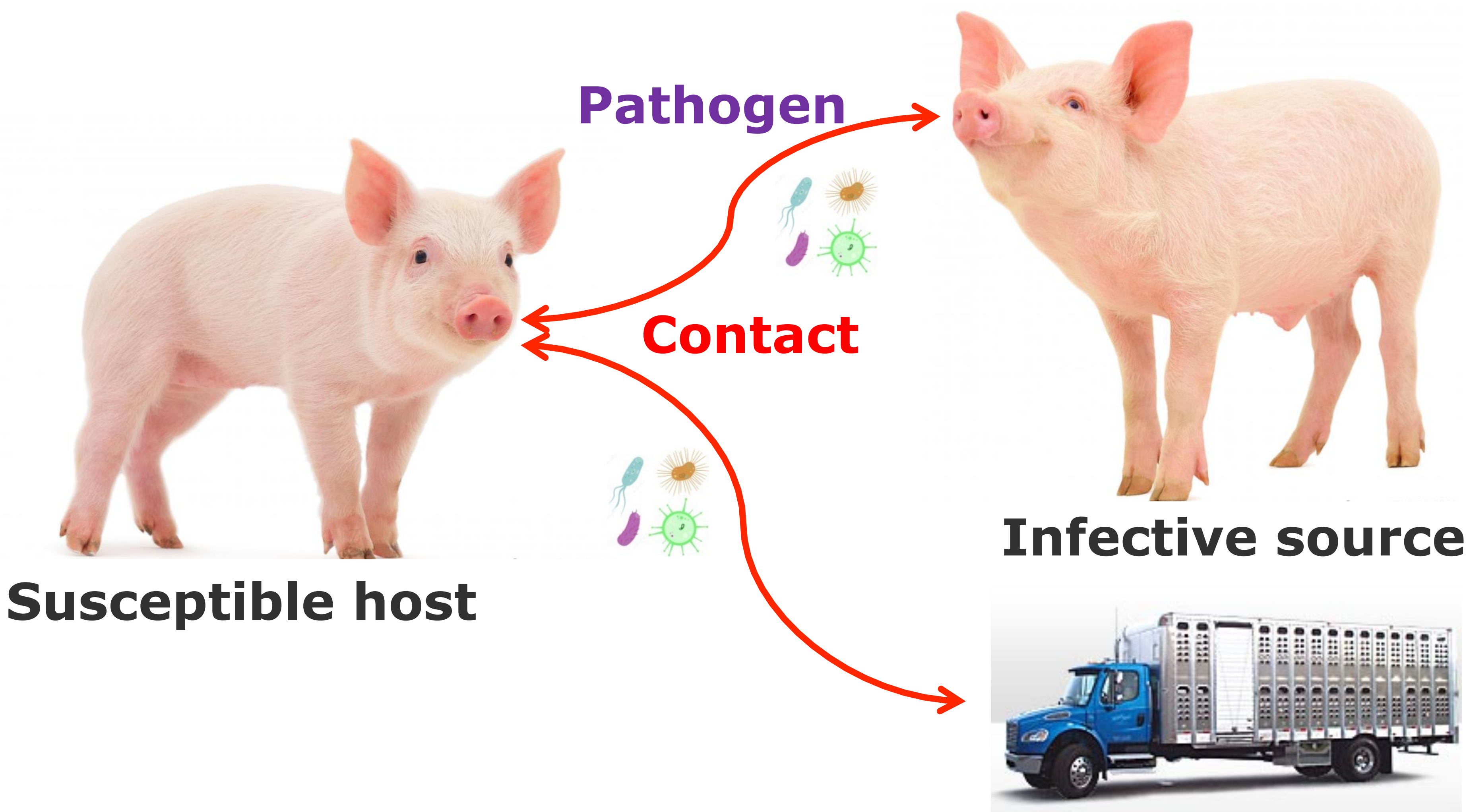
- Sudden onset 30%–70% mortality in neonatal pigs for about 1 week
- No skin lesions on piglets
- No reproductive effects
- Disinfectants
  - Clorox (1:20 dilution of 5.25% sodium hypochlorite) 10 – 15 minutes
  - Synergize (1:256) 60 minutes
  - Accelerated Hydrogen Peroxide (Prevail) 1:20 for 10 minutes in wet films
  - Virkon (1%)
  - Phenolic derivatives not effective

Source: *University of Minnesota and Iowa State University rapid response teams*

PIC


Area = aerosol, insects, wildlife, livestock
replacements
mortality disposal
garbage
people
manure management
propane
feed
supplies
semen
water
pig transport

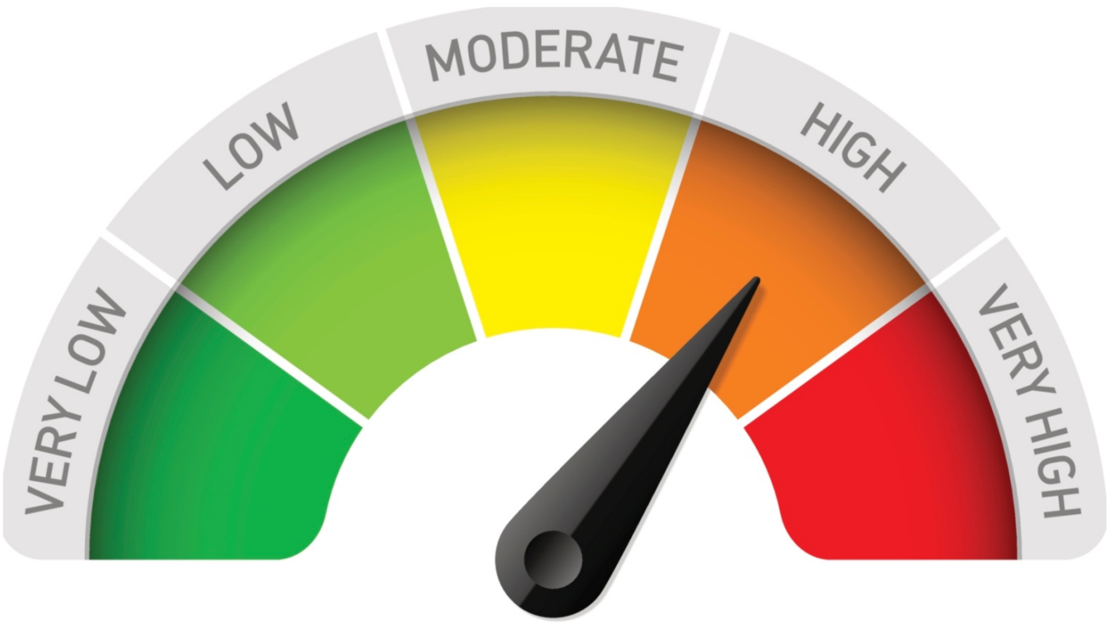
Foundation of Biosecurity is Based on the Knowledge of Transmission



Biosecurity Program Components

1. Risk assessment
2. Policy and guidelines
3. Education
4. Infrastructure

Risk Assessment

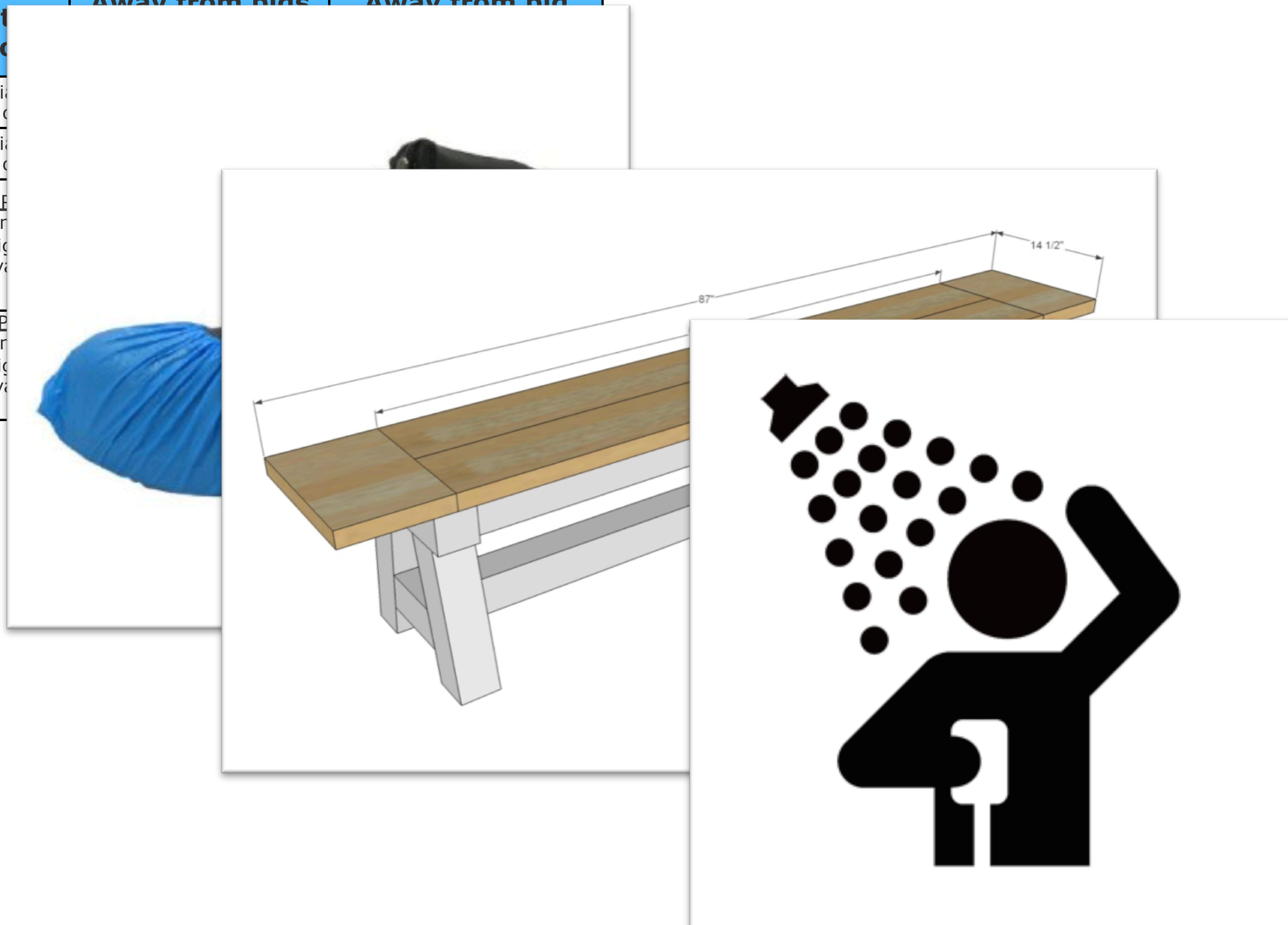


- ✓ **Semi-quantify**
- ✓ **Audit**
- ✓ **Prioritize**
- ✓ **Educate**

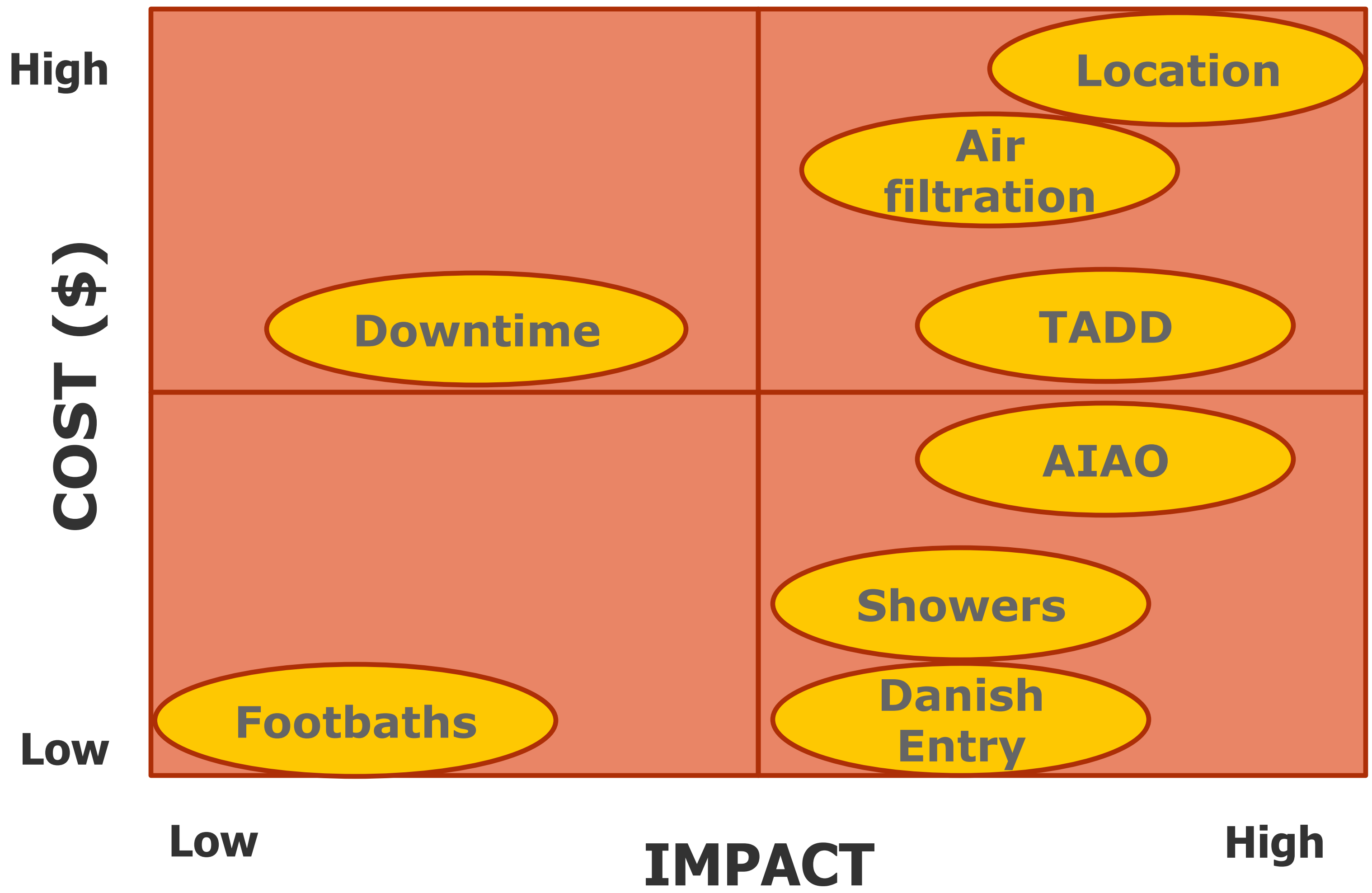
Policy and Guidelines

Downtime

Herd to be entered	Internat al visit	Away from pigs	Away from pig
Genetic Nucleus	By speci permission c		
AI Stud	By speci permission c		
Production Nucleus/ Daughter Nucleus/ Boar Multiplier	Two nights P to arrival ir and 1-5 nig POST arriv NA**		
Gilt Multiplier	Two nights P to arrival ir and 1-5 nig POST arriv NA**		



Cost-Impact Matrix (Examples)

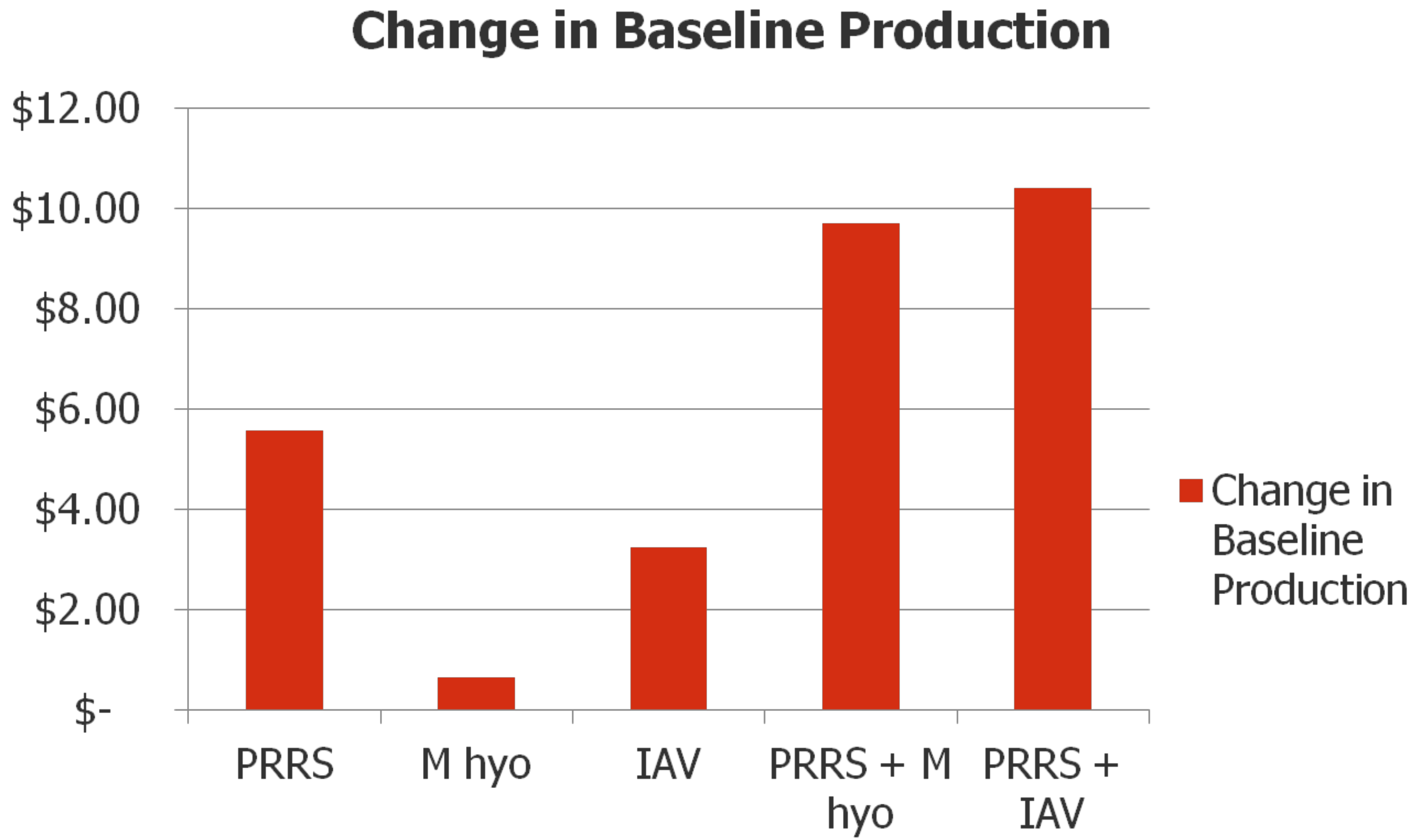


Economic Impact of Disease

	PSY/Yr Impact	Assumptions	WTM Impact	Assumptions
PEDV	$2.08/pig	3 wks. 100% 6 wks. 10% 28 P/S/ Y $30/pig	$0.85/pig	Mortality $0.78 Treatment Cost $0.07
PRRSV	$7.07 - 10.57/pig	26 weeks TTS 28/P/S/Y	$5.57 – 13.52/pig	Haden, 2013 Neumann, 2005

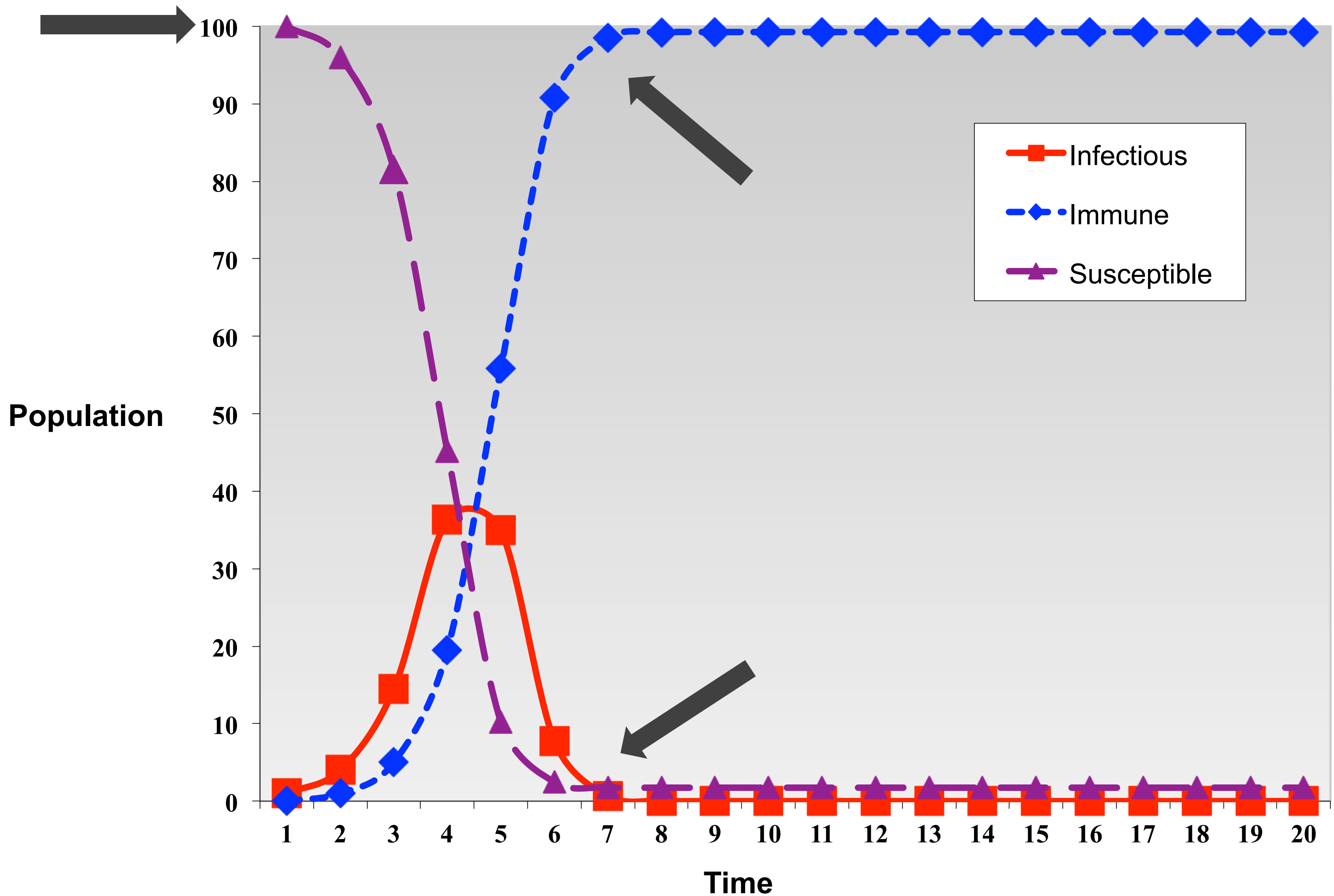
PRRS can cost **$475,000-$710,000** to a 2,400 sow herd

Economic Impact PRRS in Combination



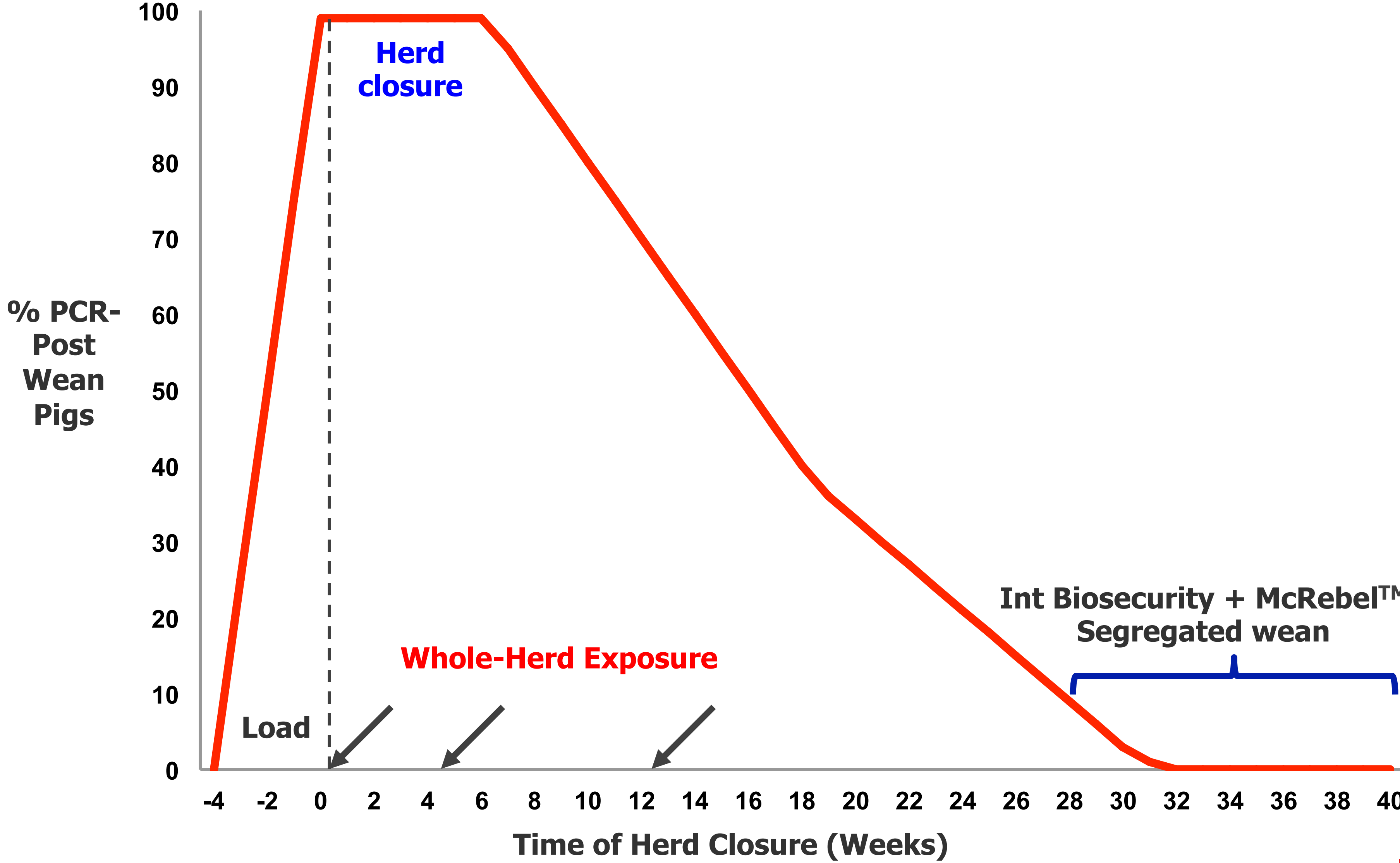
Haden, 2012

Herd Closure Principle



Reed-Frost Model from Ecology of Infectious Diseases, Dr Randall Singer, U of MN

PRRSV in a Breeding Herd During Load- Close-Expose



Sow Herd Vaccinations

- The goal is to minimize the number of vaccinations given prior to farrowing
- Excessive vaccinations can lead to late term abortions
- Feed back 5, 4 and 3 weeks prior to farrowing is important for Rota virus, Clostridium and E. coli control
- Appropriate **gilt acclimatization** will help reduce the need for vaccines and antimicrobials

Sow Vaccine Cost

BA/Litter 12.4; PWM 14.7% Weaned pigs 10.6

Vaccine	Cost	Doses	Cost/Dose	Cost/Weaned Pig
Farrowsure Gold	$48.93	50	$0.98	$0.095
Flusure XP/ Farrowsure Gold	$99.81	50	$2.00	$0.19 *
Litterguard LTC	$51.60	50	$1.03	$0.10 *
Iron	$22.88	100	$0.23	$0.24 *
Marquis	$281	1000	$0.28	$0.30 *
Excede			$0.09	$0.095 *

Cost per weaned pig $0.93 *

Weaned Pig Medicine Cost

Drug	Cost/lb.	Weight	Cost/Weaned Pig
Excede	$0.03	3 lb.	$0.10
Baytril	$0.02	3 lb.	$0.06
Draxxin	$0.06	3 lb.	$0.18
Excede	$0.03	5 lb.	$0.15
Excede	$0.03	13 lb.	$0.38
Draxxin	$0.06	13 lb.	$0.74

Day 1 Excede – navel infection
Day 5 Excede – castration infection
Wean Draxxin -

Added $1.00/weaned pig

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Health Cost-Benefit

- Weaned pig cost of $7.11
- PWM 17.5%
- P/S/Y 2.42
- WTM $4.00/pig

Understanding the cost of disease, transmission routes, and the cost of biosecurity will guide the effective implementation of interventions

Lunch

Cost Competitiveness through PWM Control

Michel Lariviere

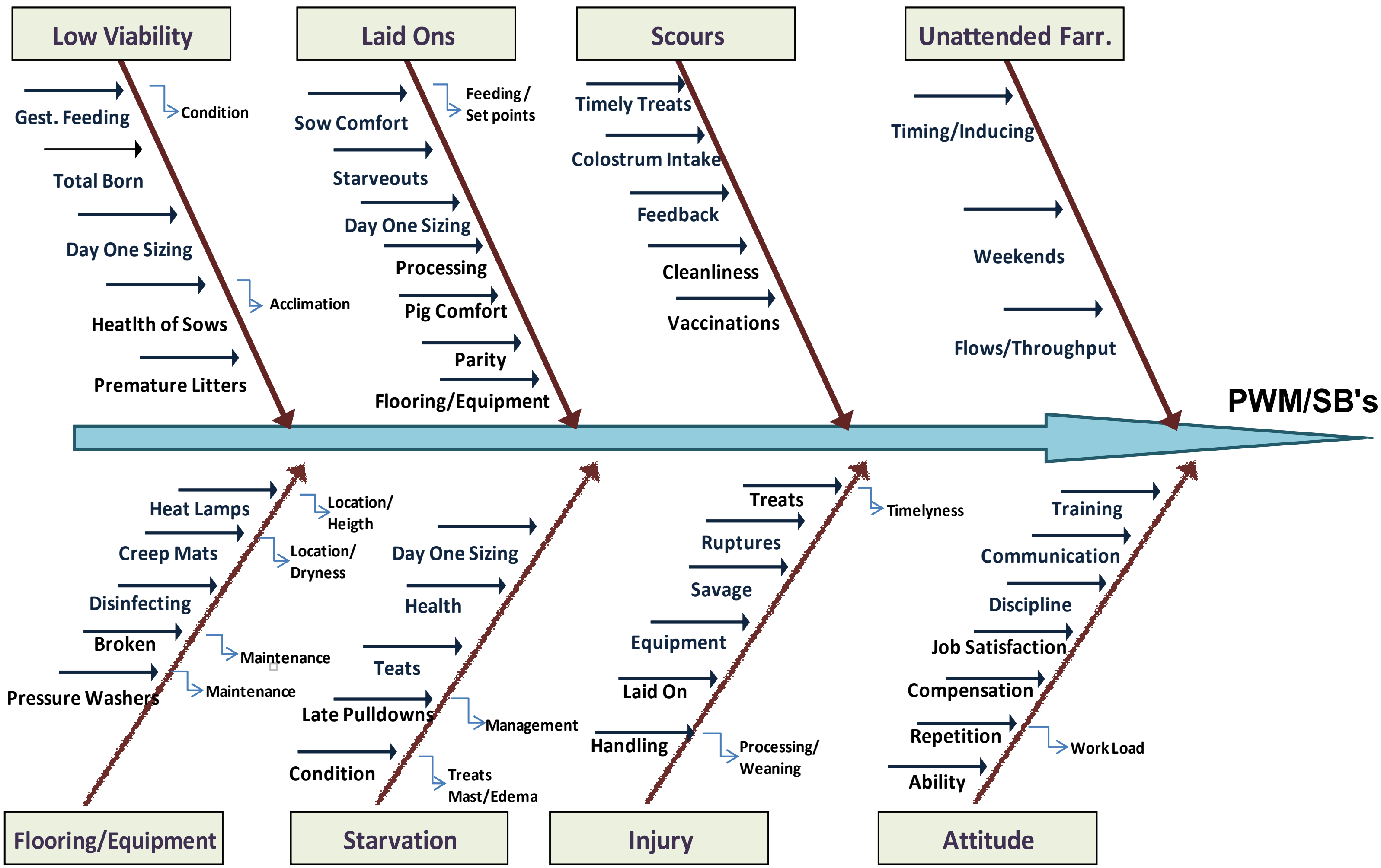
NEVER STOP IMPROVING

Goal

We want to provide you with a simple strategy to get your pre-weaning mortality down.

Saving Those BA

Farrowing Losses Are Complex Issue



Courtesy of Mr. Joe Higgings (2010)

Let’s Start With The Facts

Indicator	PigChamp 2015		A Top 25 U.S. Pork Powerhouse	TLC
	Average	Better 10%		
BA	12.4	13.5	13.6	14.9
PWM	14%	9.5%	11%	7%
Weaned	10.7	12.2	12.1	13.9

- PWM is an old, elusive and seemingly unbeatable foe.
- Some producers/systems seemingly have found the way to be under 10%. How is that possible?
- What you wouldn’t do to reduce it by…3 points?

PWM Impact

- Public perception & staff morale.
- “Solid”/quantifiable outcome - Cost of production.

Indicator	Worst in Class Cost Variation	Avg	Best in Class Cost Variation
BA	11.2 ($3.3) W	12.3	13.4 $2.7 B
LSY	1.94 ($5.5) W	2.27	2.51 $3.4 B
PWM	39% ($10.4) W	22%	8.5% $5.0 B

Courtesy of Gregg Bilbrey – Agri-Stats® - Jan to Dec 2014.

Key Point(s)

PWM can account for up to $15/WP variation.
PWM dollar value > LSY > BA = 3 > 2 > 1

Know Your Enemy

- We surveyed 50 sow farms, 160K sows in total across different geographies.
- PWM average was 11%, with ranges form 5% to 20%.
- Questions were clustered

Labor	Facilities	Flow
FTE, total	Year of construction	Batch system
Sows per FTE ratio	Facility age	# of sows
FTE Farrowing House	Farrowing crates	Breeding group variation
Hr/week FTE FH	Size of farrowing crates	Replacement Rate
Hours per week in Farrowing	Heat lamp/Mat complex	Average end parity
Hours per farrowing	Lactation self feeders	Weaning events/week
Turnover/yr		Farrowing/week
		Total pigs weaned/week

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Know Your Enemy

- **Multi-factorial issue -** There is not a single factor to blame.
- **Stable labor** - Consistent execution of plans and commitment.
- **Active monitoring** – Minimizing hypoxic piglets at birth.
- **Chilling prevention** - Avoiding energy losses and lethargy.
- **Quick access to colostrum** – The sooner the better.

Active Monitoring

- **First 2 hours of the day** -
  - Check overnight farrowings.
  - Dry piglets found wet in your first walk.
  - Check heat sources and ensure they work well.
  - Utilize this opportunity to help with colostrum intake. Mark empty belly pigs (hungry pigs) and/or born between 907-1.360 grams (2-3lbs.) with no sign of eating for udder training.
- **Timing** –
  - Every 20 minutes.
  - Have everything you need: plastic gloves, lube, watch, pen, markers.
  - If no piglets are born, be prepared to sleeve.

Active Monitoring

- **Manpower** –
  - To do a good job, one person per every 15-20 active farrowings.
  - One person has to stay in farrowing rooms while everybody else is on break.
  - Plan in advance for days known by having more farrowings.
  - On weekends, prioritize the urgent chores.

Chilling Prevention

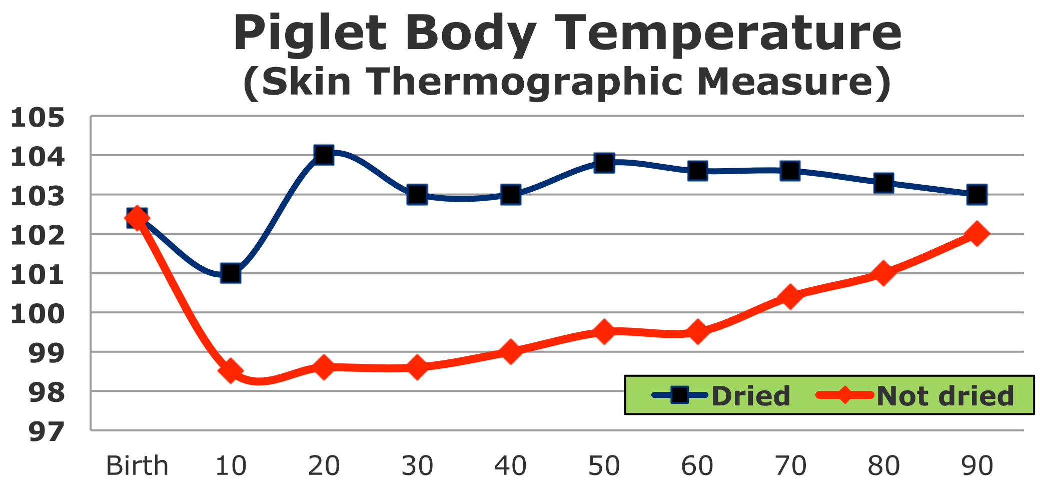
- **Body temperature** – No matter what, it drops by 4-8ºF - (2.5ºC) - within 30 minutes after birth.
- **Mitigate effect of body temperature drop -**

Area of intervention	Action items
Room	(23º C) - 74ºF at farrowing Avoid air drafts
Creep Area	(32-35ºC) - 90–95ºF in 100% of creep areas Monitor piglet behavior
Piglets	Target drying >90 % of piglets born when staff are in the farm

Early Pig Care

Drying Piglets is One of the Control Strategies

- Drying off will help piglets stay warm and consequently will help to get PWM down.
  - It takes only 20 sec per pig.
  - Use linen towels or paper towels.
  - Dry all piglets off during the day, but also all wet piglets born overnight, found in early morning.



Morales, Manso, Aparicio y Pineiro (2010) IPVS Procedings

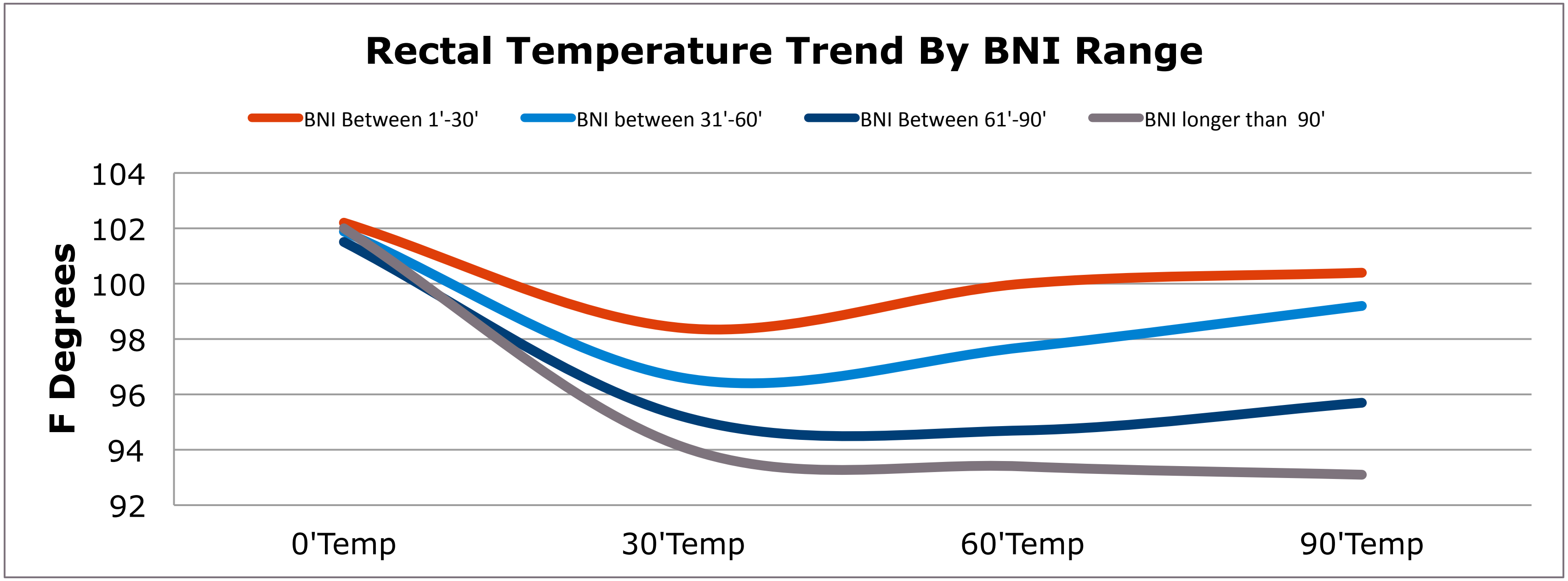
Udder Training

Targeted population: 2-3 lb. pig

- Mark them.
- Choose the proper teat.
- Execute udder training within 30 minutes after farrowing.
- The goal is to have piglets drinking milk on its own after intervention.
- Repeat 60 minutes after birth.

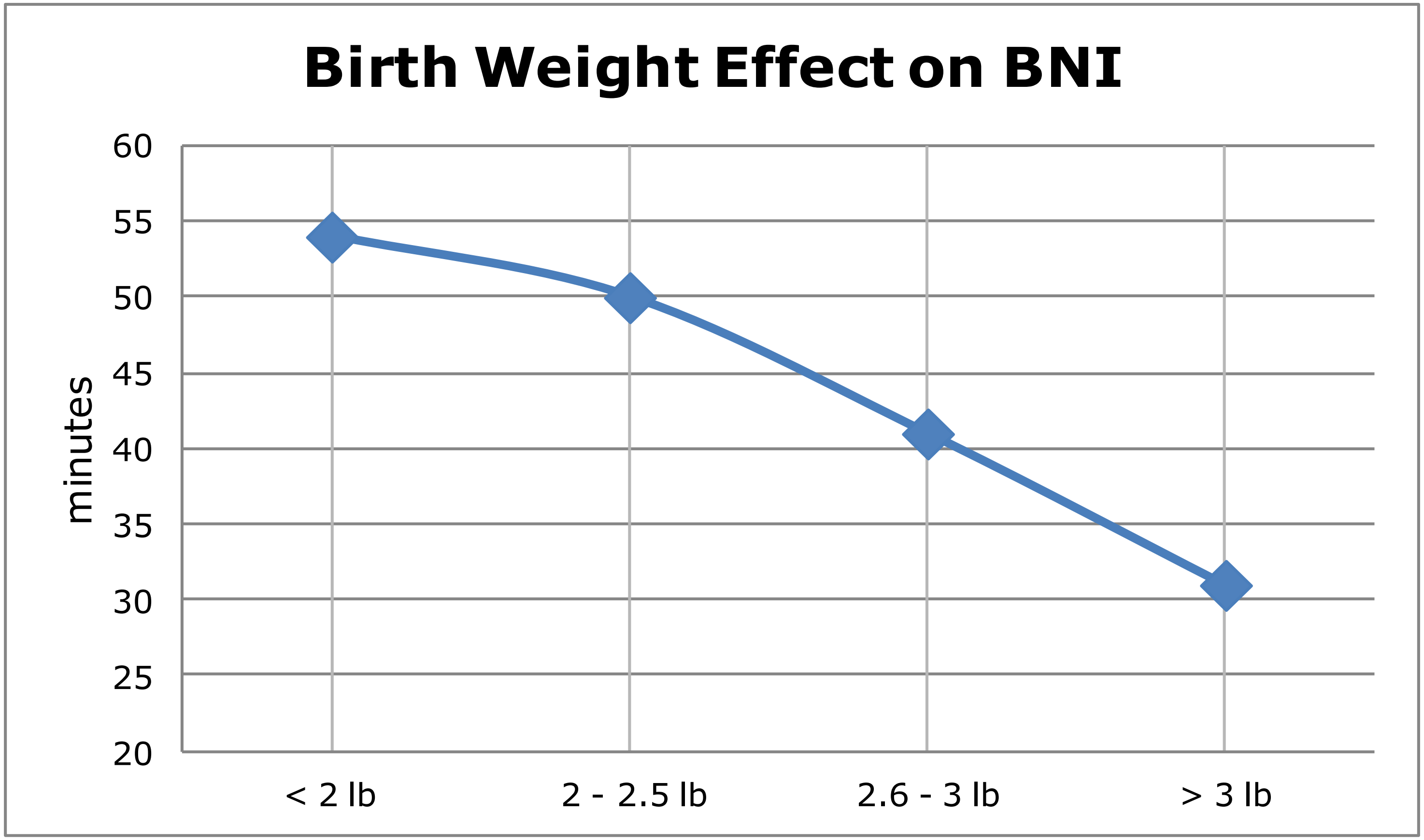
Quick Access to Colostrum

- Longer birth-to-nurse interval (BNI) make body temperature fall deeper and piglets take longer to recover, if they recover.



Source: PIC GTSR. Unpublished data, preliminary result. Unassisted farrowings.

Birth-to-Nursing Interval (BNI)



Source: Preliminary data – Global Applied Reproduction team. 2015

Key Point(s)

Time to identify a teat and get colostrum increases as birth weight is lighter.

Targeting The Right Piglets

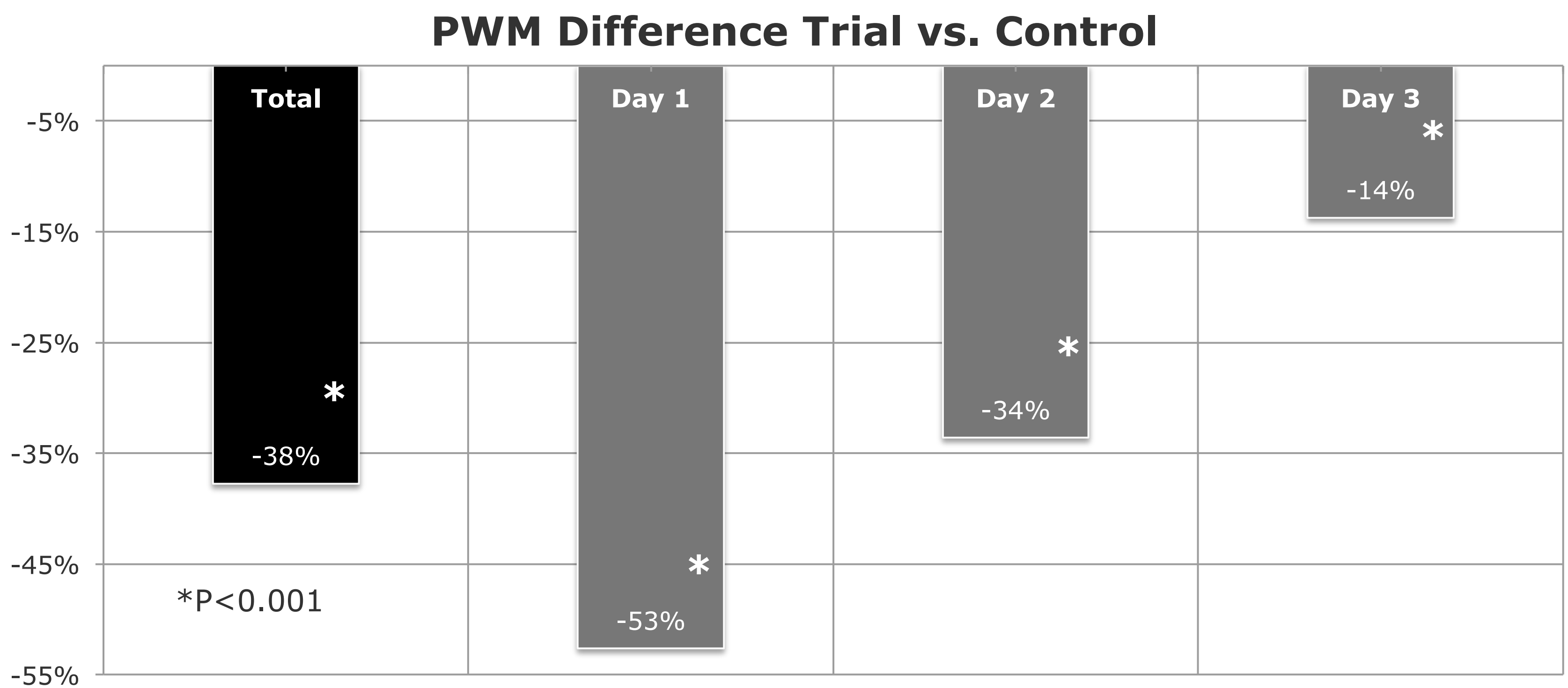
- We had 1,000 piglets born according to the farm protocols (not help) vs. 1,000 pigs that **were born from monitored farrowings and were dried off and udder trained.**

- Not every group of pigs responded the same way to management strategies.

  - Pigs < 2 lbs and > 3 lbs: No differences in PWM.

  - Pigs 907-1.360 grams (2 to 3 lbs): Big difference.

907-1,360 Grams (2 to 3 lb.) Piglets at Birth



PIC Females: Control : 1,022 pigs,: Trial : 1,044 pigs, dried and udder trained at birth, 30 min and 60 min after birth.

- Management strategies helped reduce PWM by a 1/3 in pigs born weighing 907-1.360 grams (2-3 lbs.)

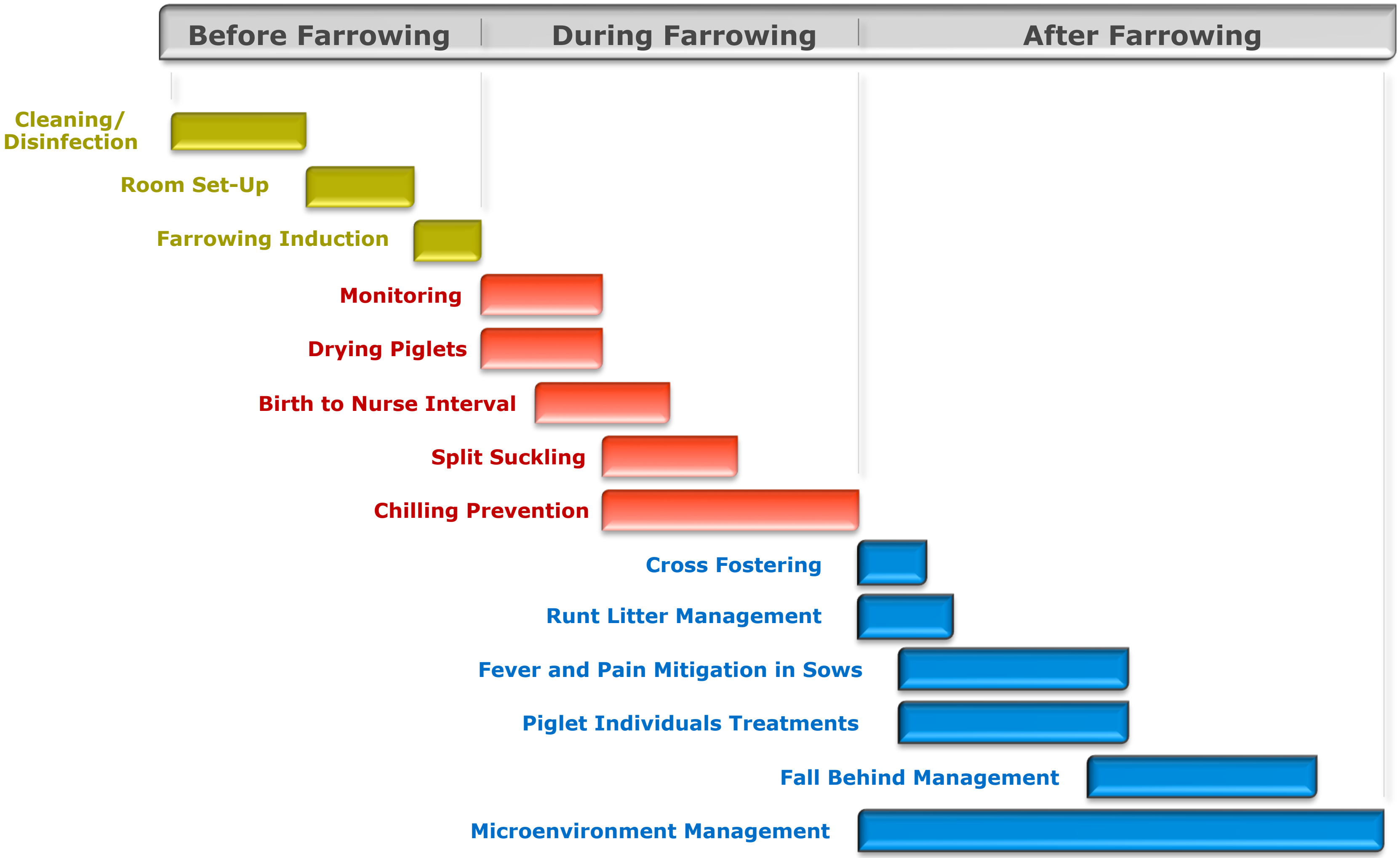
Seize the Opportunity

- **3% potential** - 40% of BA pigs weighed 2 to 3 lb. Strategies discussed earlier proven to drop PWM by 30%+.
- **100% profit** – Additionally saved pigs are margin.
- **Simplest execution** - Consider that even before more complex strategies (split-suckling, cross fostering).

2500	**Sows**
87500	Pigs born alive (14 BA)
35000	Pigs born alive 2.1 – 3.0 lbs per year (40%)
2625	Extra pigs weaned per year (-3% PWM)
1.0	More pigs weaned per sow per year
30$	Price per piglets
75K $	Opportunity

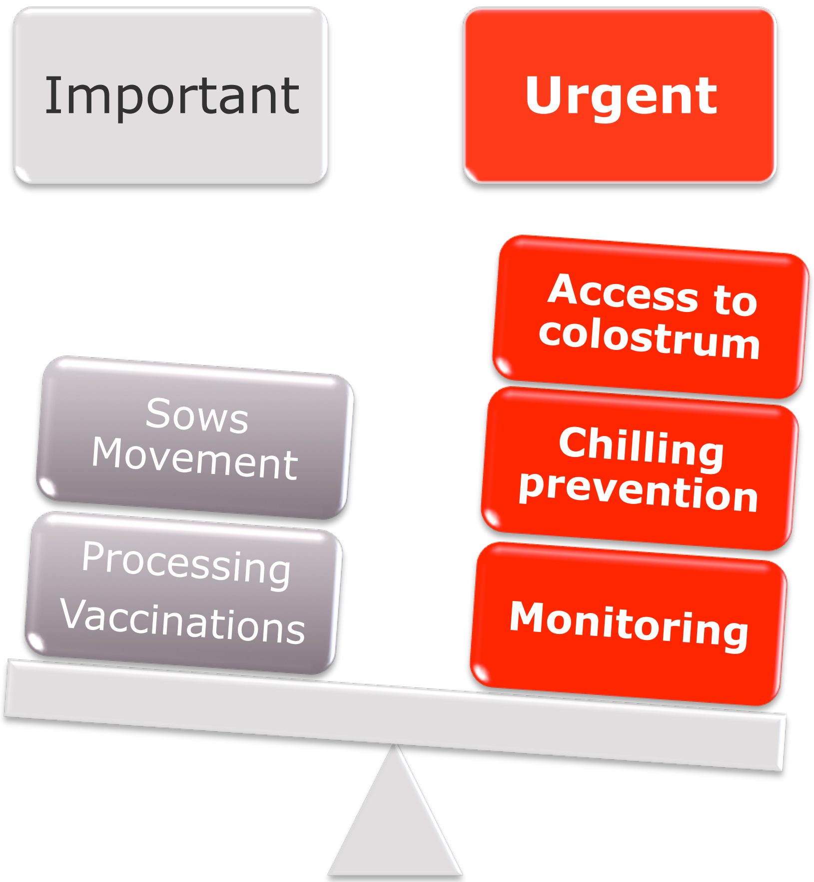
PIC

Do Not Forget The Big Picture



Labor Force Allocation

- Postponing urgent chores equates dead pigs.
- Farm manager is a key piece on setting this right.
- PWM control strategies won't go down without the farms full commitment of all the parts.



Take Away Message

- **Capitalize -** Opportunity is $30/sow/year on PWM.
- **Focus -** The 907–1.360 gram (2-3 lb. pigs) at birth are the subpopulation where we have to fight against PWM.
- **Simplicity & Priorities –** Without giving up the basics, do a good job on monitoring, chilling prevention, and colostrum intake training.
  - Consider other strategies only after you have excelled at the three key points mentioned.
- **Farm Manager -** Key to allocate the staff on urgent chores.

Realizing Genetic Potential

Daniel Godbout

NEVER STOP IMPROVING

As We Make Genetic Improvement…

- New boars in stud have the potential to produce market-hogs that…
  - Make it to market sooner on less feed per pound of gain
  - Have better livability from wean to market
  - Have higher packer-value than an older boar in stud

- New gilts entering the sow herd have the potential to…
  - Wean more high-quality piglets per litter
  - Have fewer non-productive days
  - Contribute more total-value per pig weaned

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As Genetic Improvement Accelerates…

- The value of new boars and gilts, compared to the herd average, gets bigger

	5 Year Avg.	3 Year Avg.	1 Year Avg.
Index	**12.9**	15.8	**19.4**
Pigs weaned/sow/year	0.9	0.9	1.1
Kg weaned/sow/year	5.4	5.9	7.9
Pigs marketed/sow/year	0.9	0.9	1.1
Kg marketed/sow/year	25.9	36.8	57.5
PROFIT PER PIG, $ / pig	**2.58**	3.16	**3.88**

@ 25 PSY, the potential is in the pipeline for **$97 per sow** from the genetic contribution…

PIC

And It Still Comes Back to Execution of the Basics

- As production evolves (facilities, technology, the animals…):
  - More broadly measure current and emerging traits that impact commercial profitability today and into the future
- As the area of genomics advances:
  - More effectively use that data to make accurate selection decisions

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Real World Data Capture
Reproductive Efficiency

- Diverse sources
  - Global Database
- Volume
  - 90,000 farrowing records added each month
- Emerging traits
  - Pen gestation
  - Piglet birth weight
  - Pre-wean livability
  - Lactation efficiency
  - Productive life

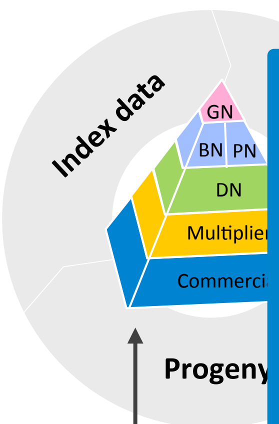
Real World Data Capture
Growth Performance

- Environmental variation
  - Genetic production
  - Commercial environment
- Volume
  - Testing of over 170,000 pigs in commercial flows annually
- Emerging traits
  - Heavy weight efficiency
  - Robustness
    - Lactate / stress
    - Birth weights
  - Carcass value
    - Primal and quality

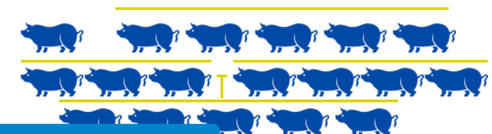
Capturing Economic Value
Real-World Production Efficiency

Global Database

Global Breeding Pyramid



Pureline Performance



Information

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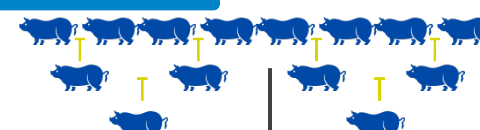
portant traits

e information



Selection & Mating

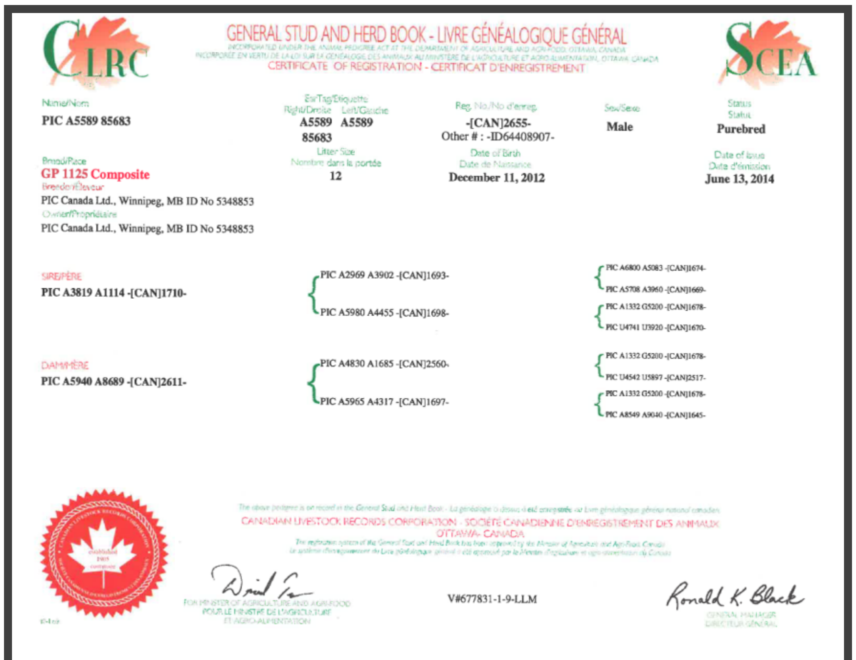
Mate Selection

Interesting details…

1. 35 M pigs in database
2. 4.3 M tissue samples
3. 710 K active sows and gilts
4. 510 K pigs tested in last 12 months
5. 370 M EBV's every week

Turning Data into Effective Decisions
Full Utilization of Genomic Science

- Data that reflects real-world performance
  + ***more effective utilization of data***
  = better selection to drive forward profit potential



GENERAL STUD AND HERD BOOK - LIVRE GÉNÉALOGIQUE GÉNÉRAL

CERTIFICATE OF REGISTRATION - CERTIFICAT D'ENREGISTREMENT

Name/Nom: PIC A5589 85683

Ear Tag/Étiquette Right/Droite Left/Gauche: A5589 85683 A5589

Reg. No./No d'enreg.: -[CAN]2655- Other # : -ID64408907-

Sex/Sexe: Male

Status/Statut: Purebred

Breed/Race: GP 1125 Composite

Litter Size / Nombre dans la portée: 12

Date of Birth / Date de Naissance: December 11, 2012

Date of Issue / Date d'émission: June 13, 2014

Breeder/Éleveur: PIC Canada Ltd., Winnipeg, MB ID No 5348853

Owner/Propriétaire: PIC Canada Ltd., Winnipeg, MB ID No 5348853

SIRE/PÈRE: PIC A3819 A1114 -[CAN]1710-

- PIC A2969 A3902 -[CAN]1693-
  - PIC A6800 A5083 -[CAN]1674-
  - PIC A5708 A3960 -[CAN]1669-
- PIC A5980 A4455 -[CAN]1698-
  - PIC A1332 G5200 -[CAN]1678-
  - PIC U4741 U3920 -[CAN]1670-

DAM/MÈRE: PIC A5940 A8689 -[CAN]2611-

- PIC A4830 A1685 -[CAN]2560-
  - PIC A1332 G5200 -[CAN]1678-
  - PIC U4542 U5897 -[CAN]2517-
- PIC A5965 A4317 -[CAN]1697-
  - PIC A1332 G5200 -[CAN]1678-
  - PIC A8549 A9040 -[CAN]1645-

CANADIAN LIVESTOCK RECORDS CORPORATION - SOCIÉTÉ CANADIENNE D'ENREGISTREMENT DES ANIMAUX

OTTAWA- CANADA

FOR MINISTER OF AGRICULTURE AND AGRI-FOOD / POUR LE MINISTRE DE L'AGRICULTURE ET AGRO-ALIMENTATION

V#677831-1-9-LLM

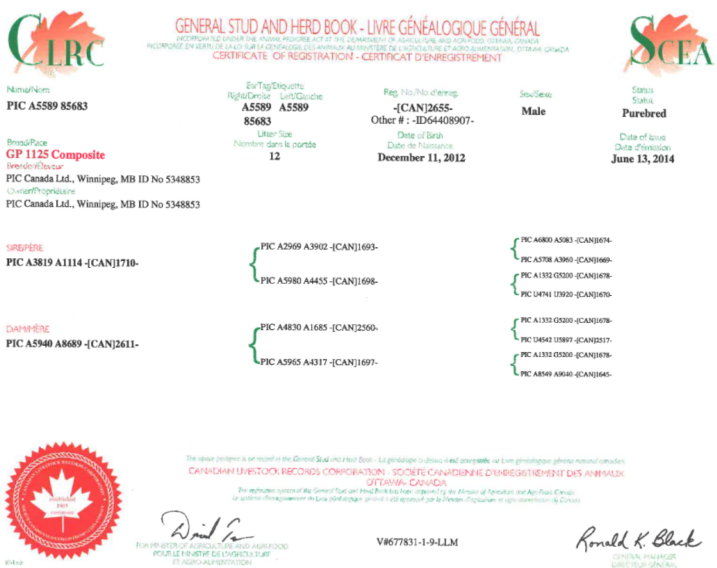
Ronald K. Black

GENERAL MANAGER / DIRECTEUR GÉNÉRAL

vs.

Turning Data into Effective Decisions

Full Utilization of Genomic Science



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Right/Droite: A5589 85683 Left/Gauche: A5589

Reg. No./No d'enreg.
-[CAN]2655-
Other # : -ID64408907-

Sex/Sexe
Male

Status
Statut
Purebred

Breed/Race
GP 1125 Composite

Litter Size
Nombre dans la portée
12

Date of Birth
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  - PIC A5708 A3960 -[CAN]1669-
- PIC A5980 A4455 -[CAN]1698-
  - PIC A1332 G5200 -[CAN]1678-
  - PIC U4741 U3920 -[CAN]1670-

DAM/MÈRE
PIC A5940 A8689 -[CAN]2611-
- PIC A4830 A1685 -[CAN]2560-
  - PIC A1332 G5200 -[CAN]1678-
  - PIC U4542 U5897 -[CAN]2517-
- PIC A5965 A4317 -[CAN]1697-
  - PIC A1332 G5200 -[CAN]1678-
  - PIC A8549 A9040 -[CAN]1645-

CANADIAN LIVESTOCK RECORDS CORPORATION - SOCIÉTÉ CANADIENNE D'ENREGISTREMENT DES ANIMAUX
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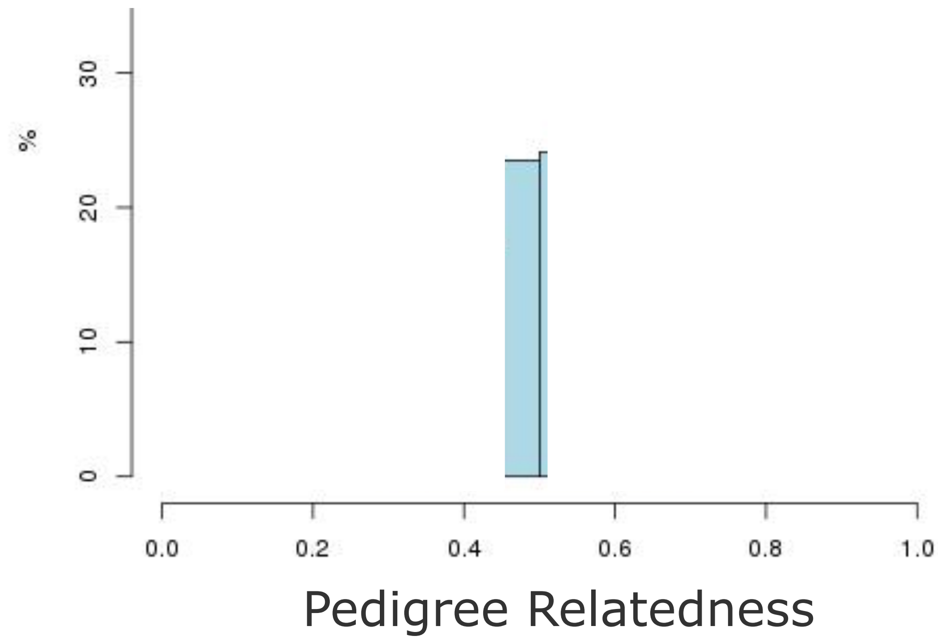
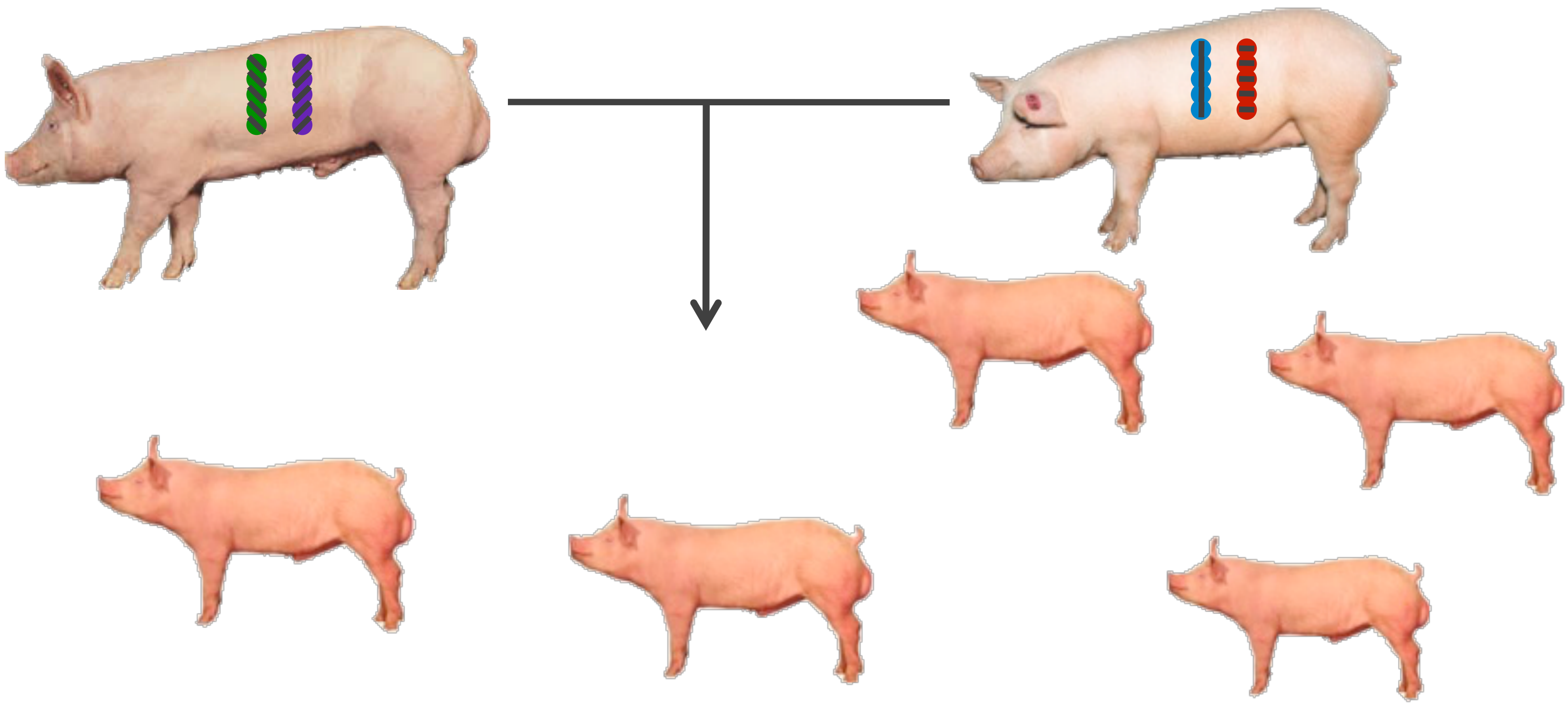
GENERAL MANAGER
DIRECTEUR GÉNÉRAL



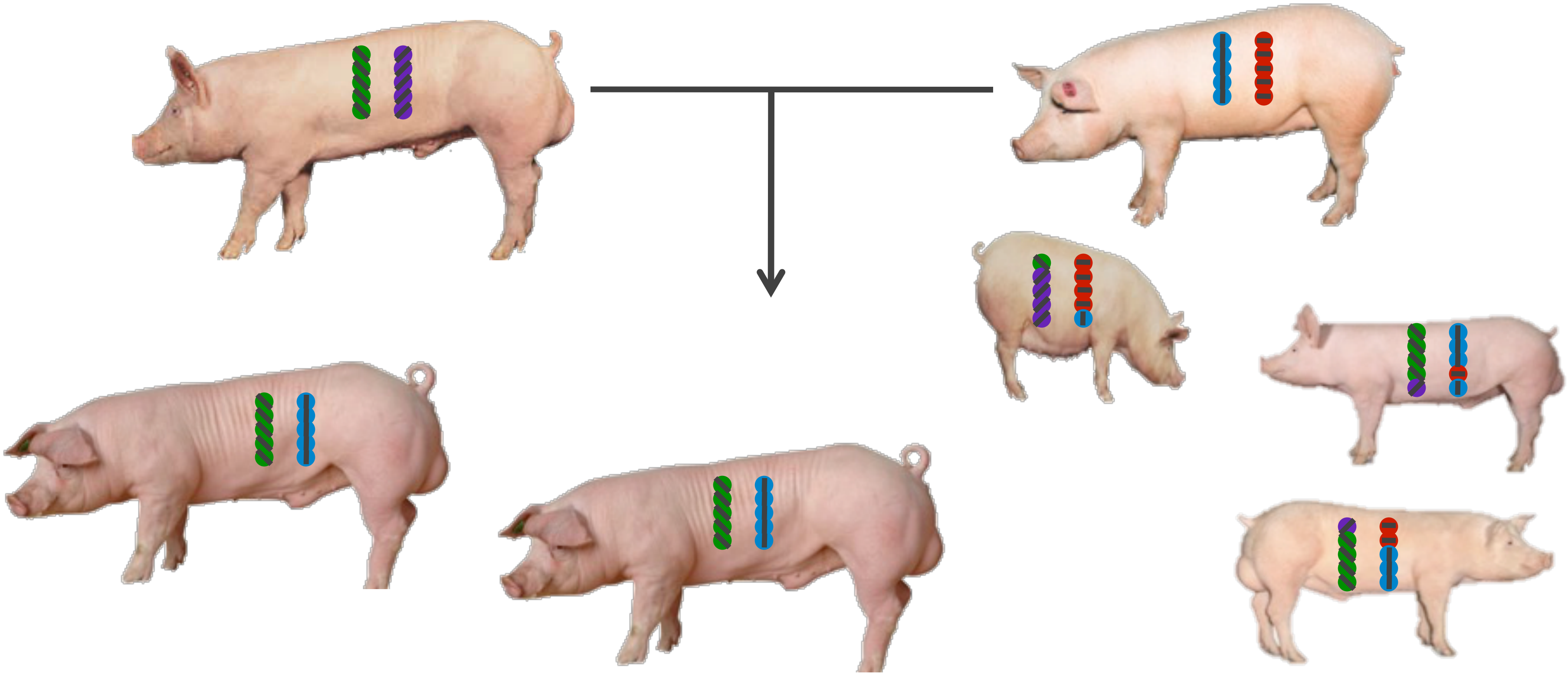
Turning Data into Effective Decisions
Full Utilization of Genomic Science

Genetic markers used to determine genetic profile



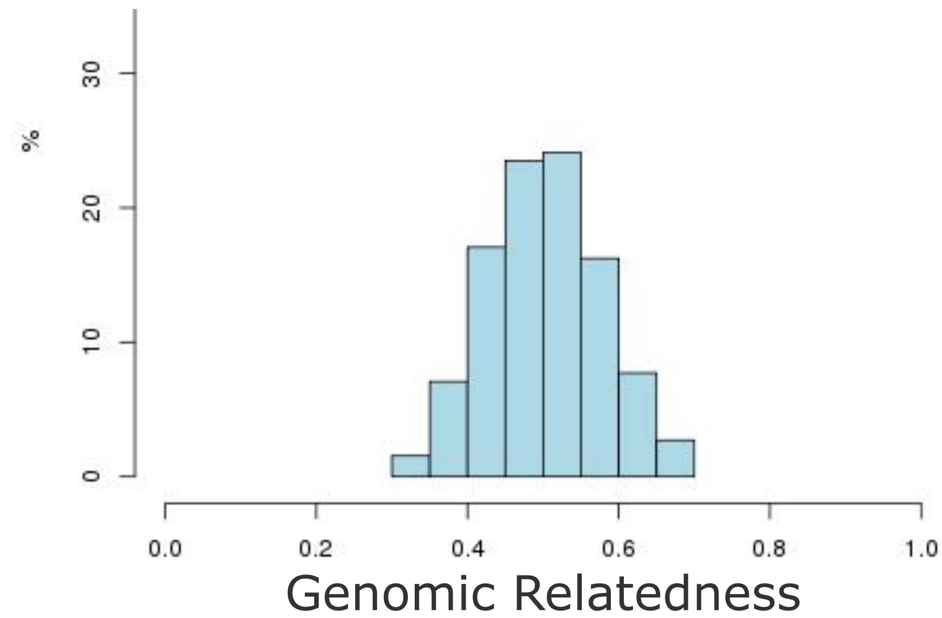
Turning Data into Effective Decisions
Full Utilization of Genomic Science

Genotypes determine what proportion the genome animals share



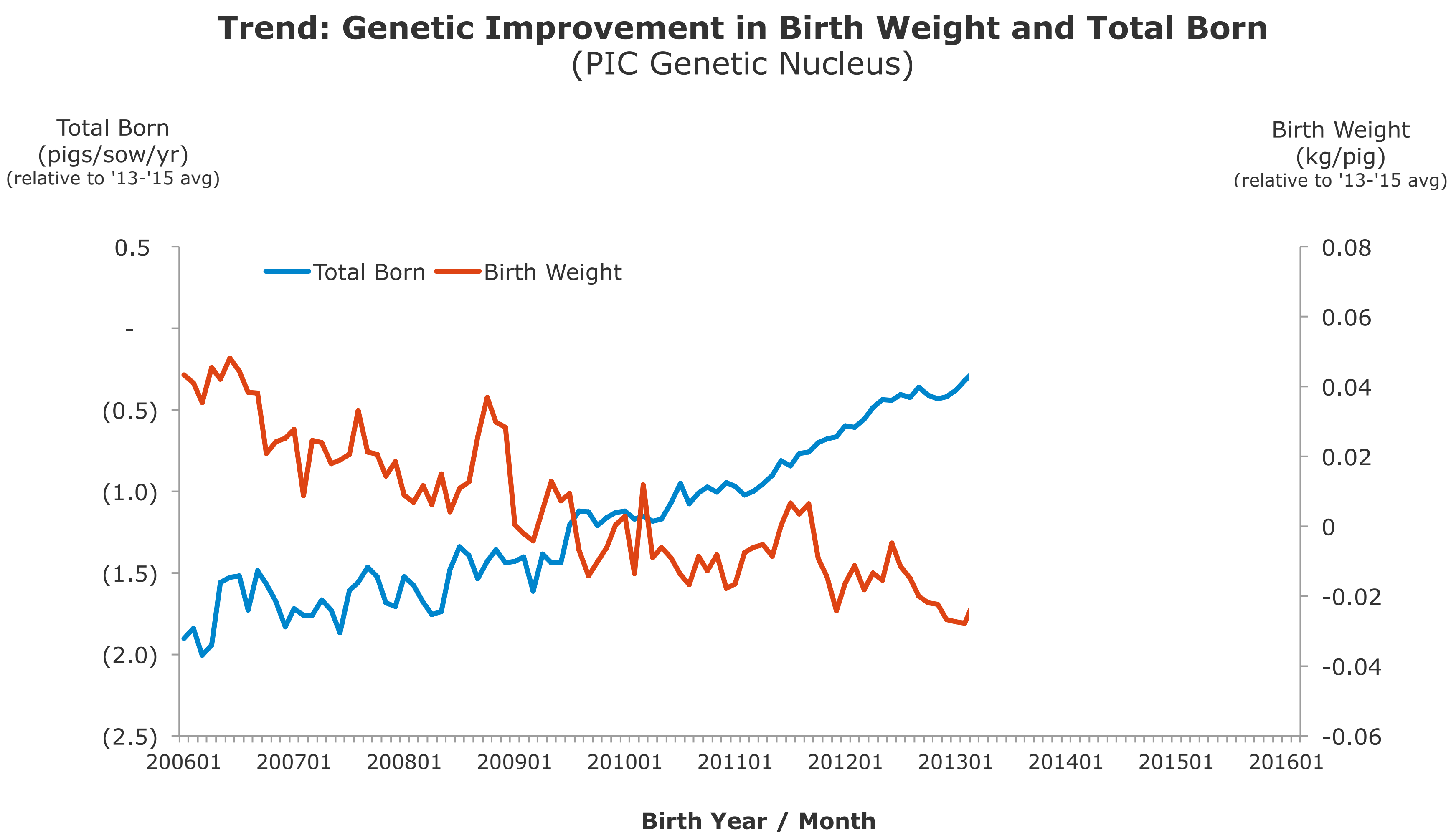
Turning Data into Effective Decisions
Full Utilization of Genomic Science

- Scope, scale, experience…
  - Today, ~**100,000 animals/year**
  - Deep genomic pedigrees
  - **Every nucleus male** is genotyped
  - **Every animal** around the world is positively impacted
  - **Every trait** we select for on **every animal** is impacted

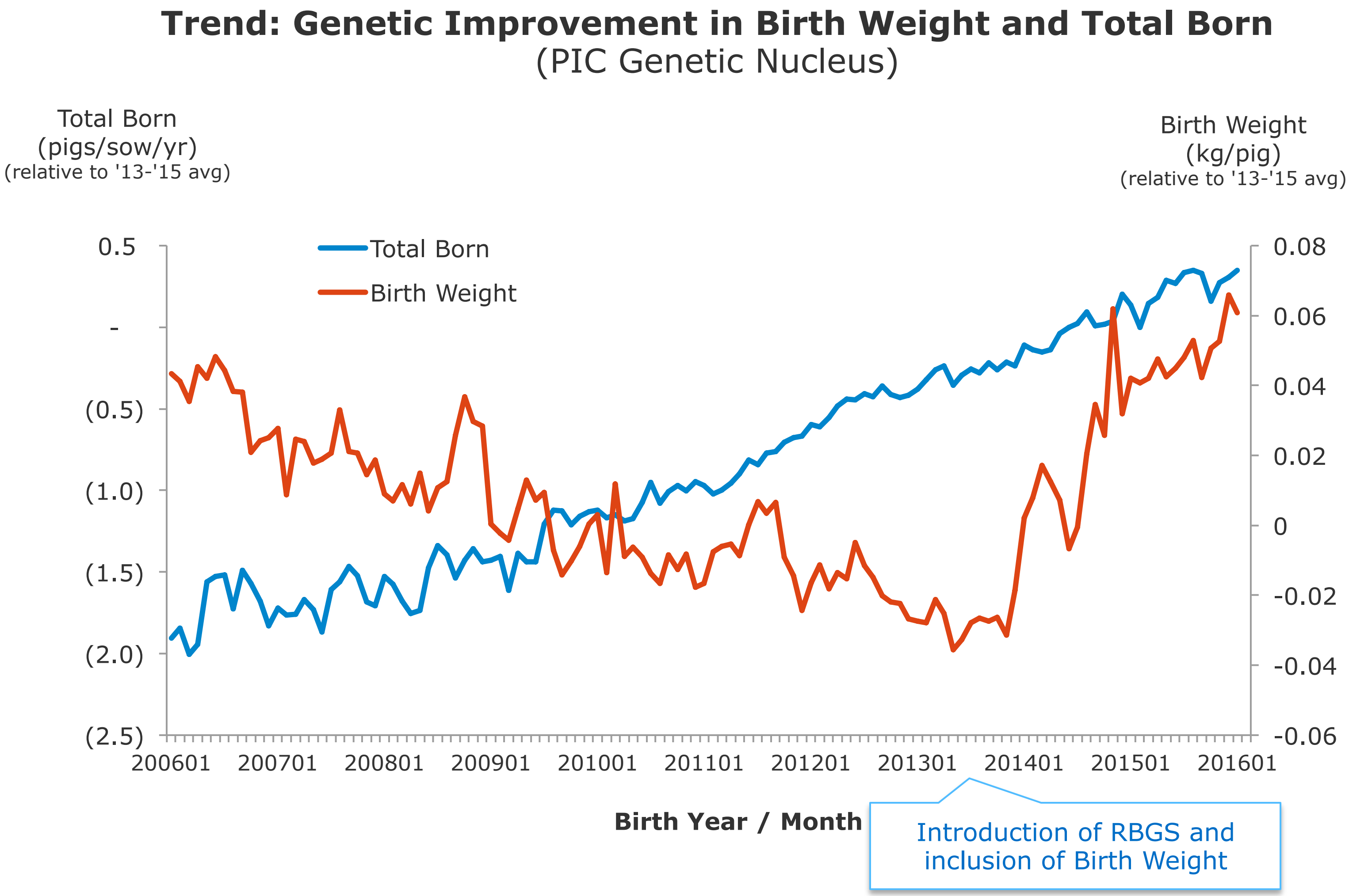


PIC

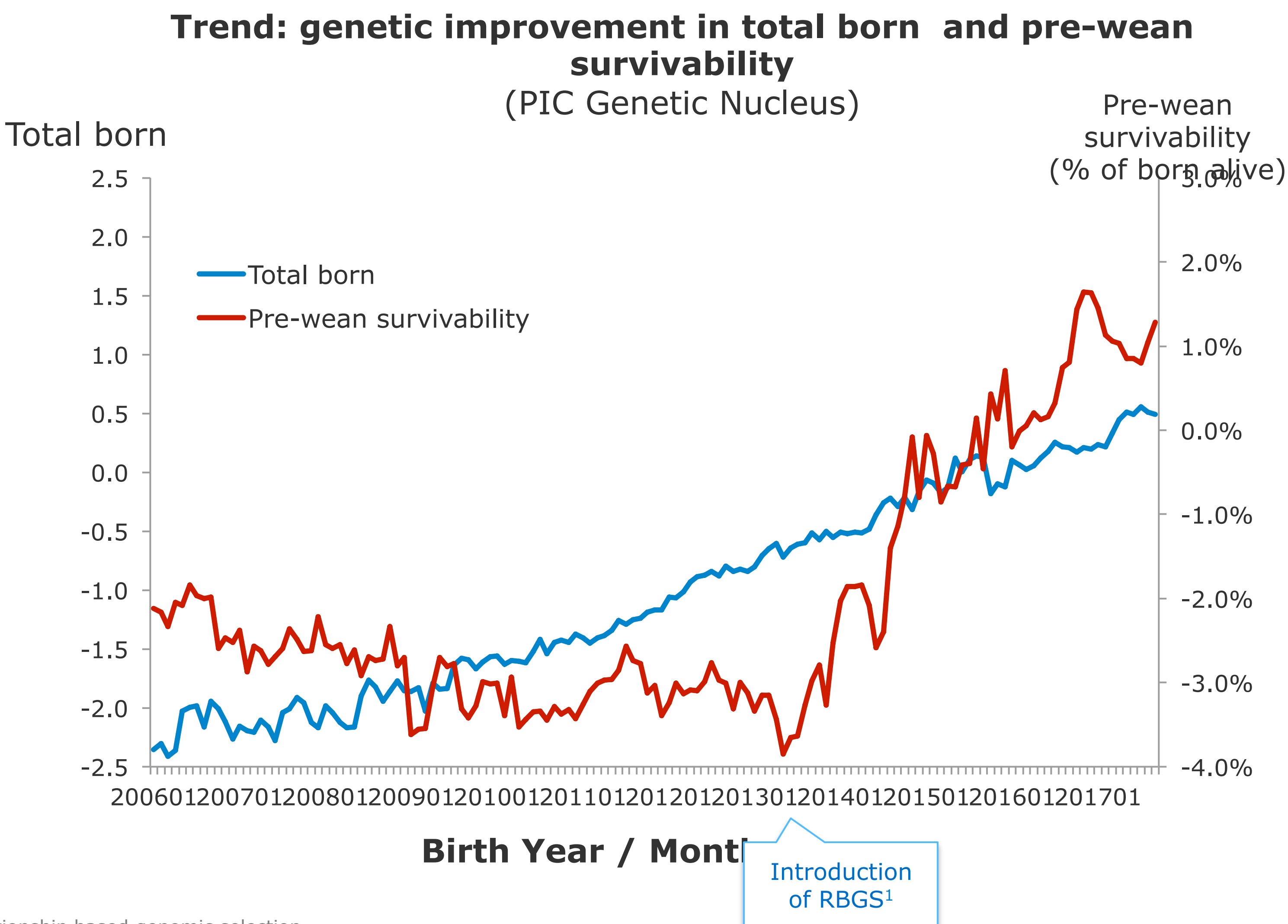
PIC Improves Total Born & Birth Weight



PIC Improves Total Born & Birth Weight

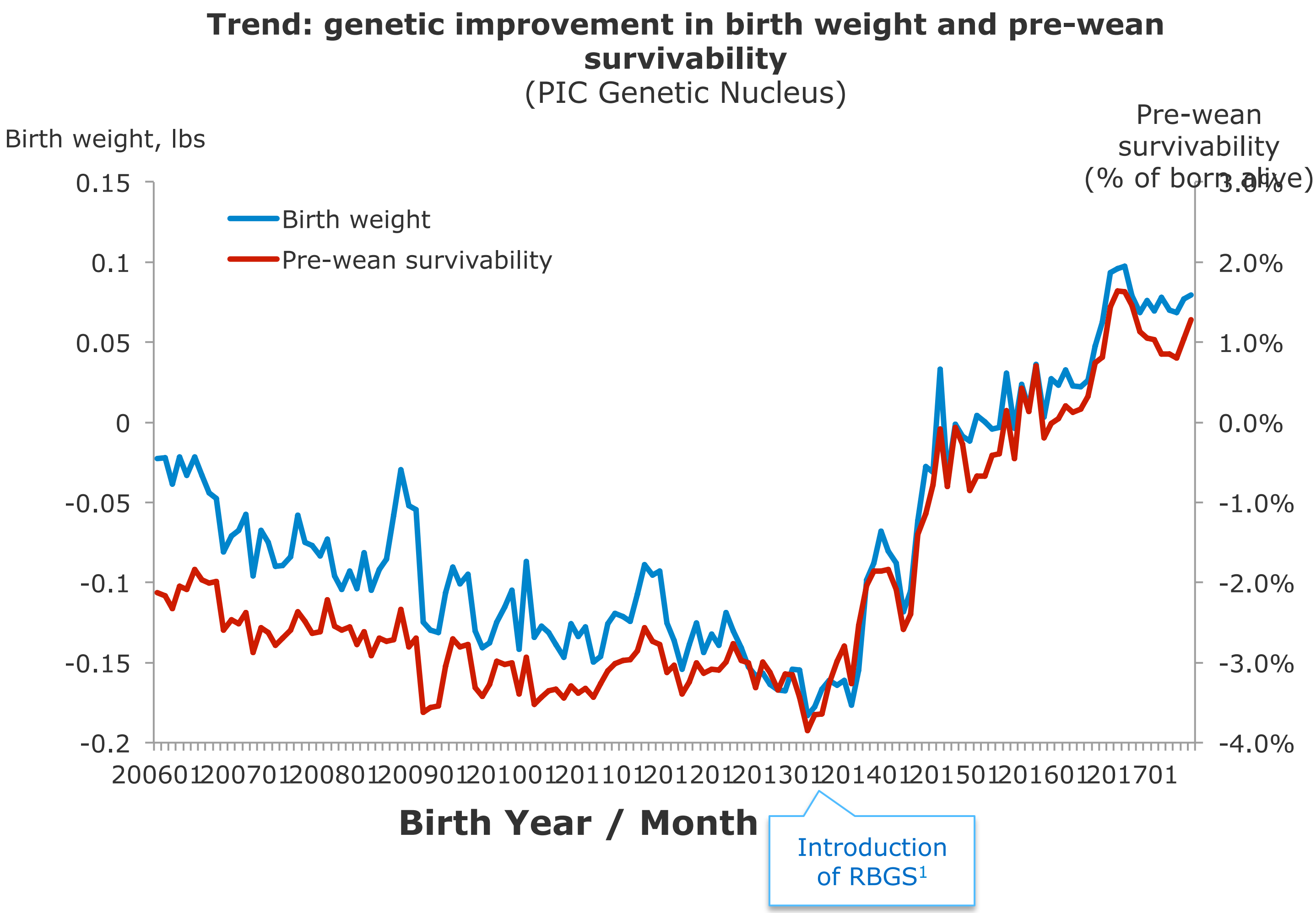


PIC Improves Total Born & Pre-Wean Survivability



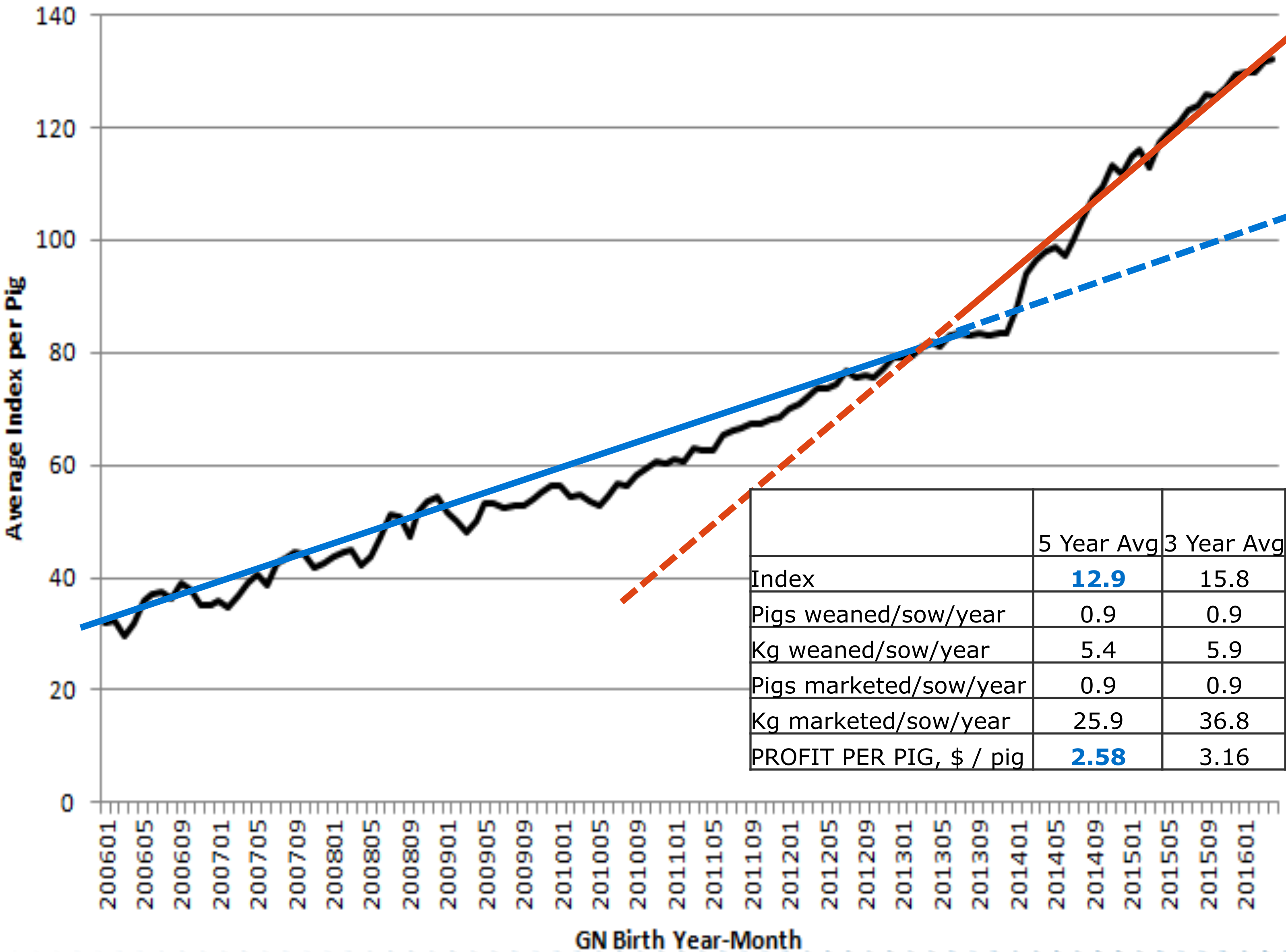
1. Relationship based genomic selection
Source: PIC L02, L03 pure lines (Camborough)

PIC Improves Birth Weight & Pre-Wean Survivability



1. Relationship based genomic selection
Source: PIC L02, L03 pure lines (Camborough)

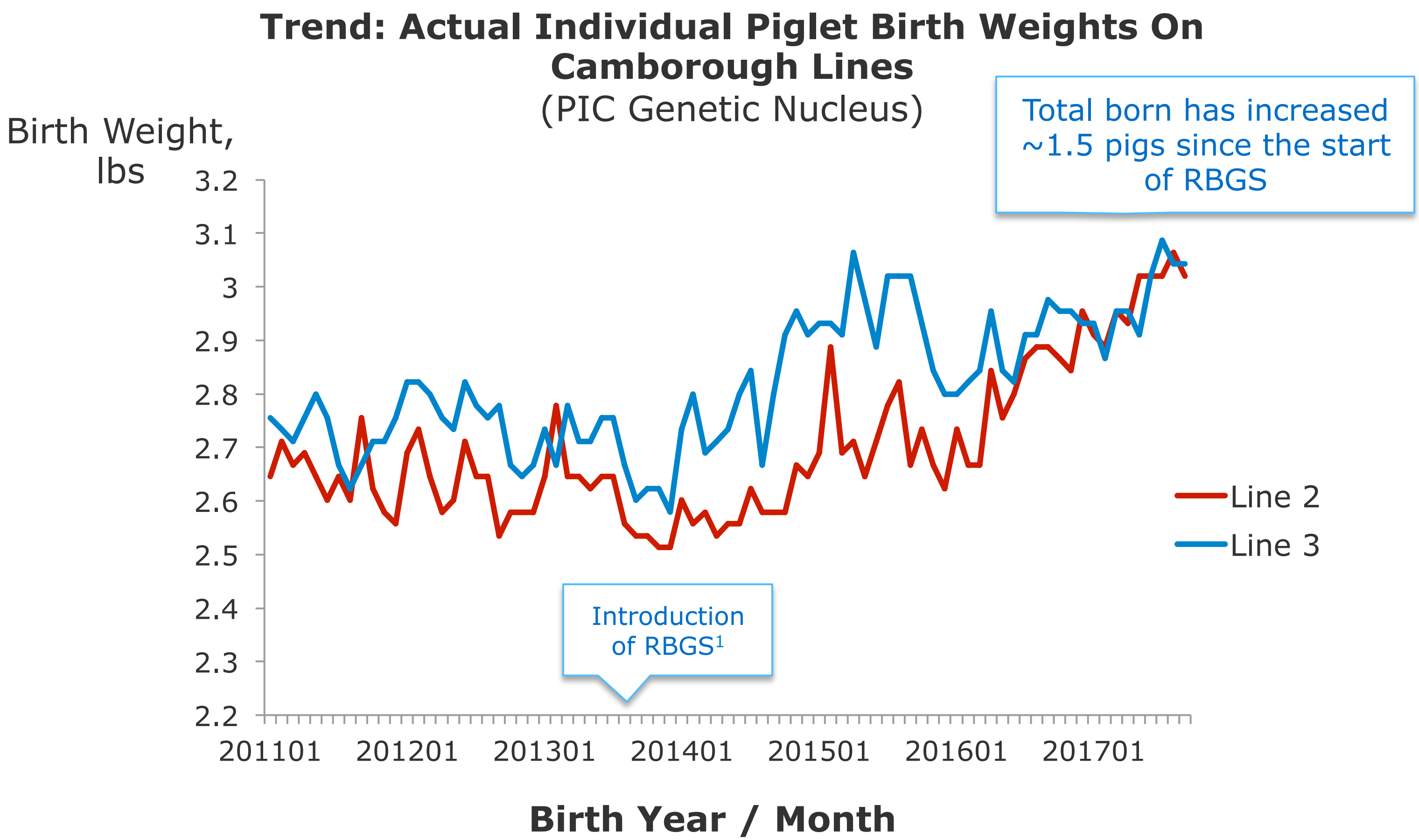
Accelerating Progress



	5 Year Avg	3 Year Avg	1 Year Avg
Index	**12.9**	15.8	**19.4**
Pigs weaned/sow/year	0.9	0.9	1.1
Kg weaned/sow/year	5.4	5.9	7.9
Pigs marketed/sow/year	0.9	0.9	1.1
Kg marketed/sow/year	25.9	36.8	57.5
PROFIT PER PIG, $ / pig	**2.58**	3.16	**3.88**

PIC

Driving Genetic Progress And, It Works



PIC

The Potential is in the Pipeline

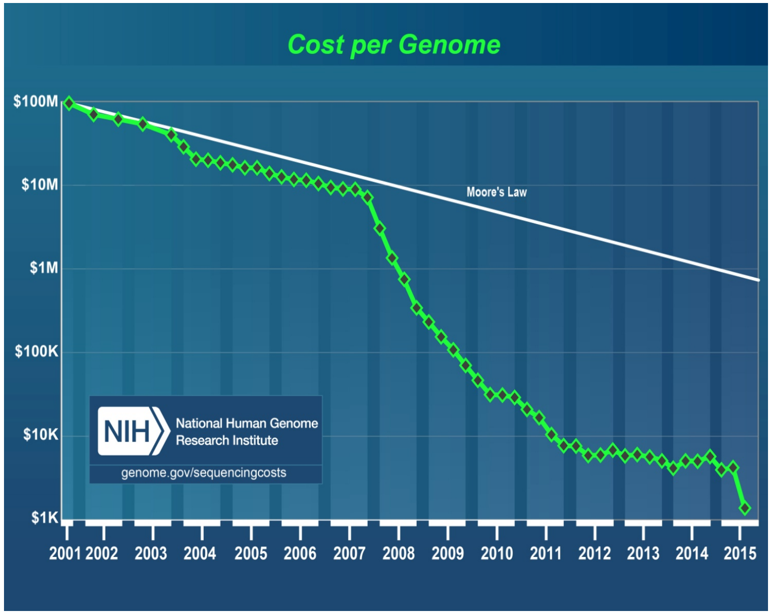
- To exploit the genetic potential on your farm:
  - A **genetic services** team is working with all gilt multipliers and boar studs to maximize how faster the genetic potential reaches the market pig
  - A **technical services** team is working within and across production systems to understand and advise on best-management
  - A **nutrition services** team is focused on feeding strategies to get the most value

- And the R&D team that won't stop pushing…

What's Next?

Accelerating Genetic Gain
What's Next?

- Multi-million dollar investment and collaboration between the Roslin Institute and Genus
- In the project scope/ pipeline, we will sequence over 14,000 animals… animals backed by millions of pedigreed relatives, nucleus phenotypes, and GN crossbred data
- Impute to sequence on hundreds of thousands of animals in our already existing genotype database



Genome Editing

GE is the process of precise editing genome

Nucleotides can be

- added
- deleted
- replaced

The Next Frontier...

This Gene-Editing Tool Could Destroy Zika Virus

CRISPR may help us edit dangerous female mosquitoes out of the population, preventing the spread of Zika

Share this Tweet this

By Joshua A. Krisch on Feb 17, 2016 at 3:45 PM

Aedes aegypti mosquito perches on a leaf in Costa Rica (REUTERS)

DAILY NEWS 5 November 2015

Gene editing saves girl dying from leukaemia in world first

Ad

Layla is doing well so far

Sharon Lees/GOSH

For the first time ever, a person's life has been saved by gene editing.

One-year-old Layla was dying from leukaemia after all conventional treatments failed. "We didn't want to give up on our daughter, though, so we asked the doctors to try anything," her mother Lisa said in a statement released by Great Ormond Street Hospital in London, where Layla (pictured above) was treated.

Delivering Unique Value

CORRESPONDENCE

Gene-edited pigs are protected from porcine reproductive and respiratory syndrome virus

To the Editor:
Porcine reproductive and respiratory syndrome (PRRS) is the most economically important disease of swine in North America, Europe and Asia, costing producers in North America more than $600 million annually[1]. The disease syndrome was first recognized in the United States in 1987 and described in 1989 (ref. 2). The causative agent, porcine reproductive and respiratory syndrome virus (PRRSV), was subsequently isolated and characterized in Europe in 1991 (ref. 3). Vaccines have been unable to control the disease. It has been suggested that disease syndrome and porcine circovirus–associated disease, and can establish a lifelong subclinical infection[6]. In 2006, a more severe form of the disease, called highly pathogenic PRRS, decimated pig populations throughout China[7]. Although genetic selection for natural resistance is an option, success to date has been limited, possibly due to the genetic diversity of the virus[8].

It had been proposed that PRRSV infects alveolar macrophages using the surface protein SIGLEC1 (CD169) as the primary viral receptor[4]. In this proposed model, after binding to CD169 and being taken homologous recombination and somatic cell nuclear transfer) were infected with PRRSV and compared with infected wild-type pigs, no difference in virus replication was found[9]. To test the role of CD163 in infection, we previously created 45 live-born piglets with insertions ranging from 1 bp to 2 kb, deletions from 11 bp to 1.7 kb, as well as a partial domain swap in *CD163* using CRISPR-Cas9 technology[5].

One founder male and one founder female, both of whom had mutations in exon 7 of *CD163*, were bred to produce offspring (**Supplementary Methods**). The founder

PIC

PRRS Resistance
High Level Overview

- Pigs were created with minor nucleotide edits within their existing DNA
- No new or foreign DNA was inserted into the pigs

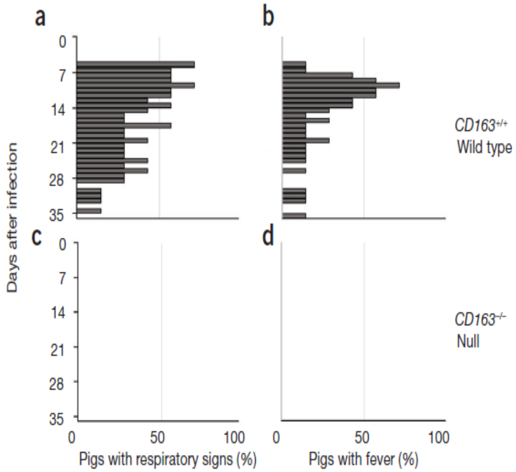


Figure 1 Clinical signs during acute PRRSV infection. (**a**–**d**) Results shown are compiled daily assessments for the presence of respiratory signs and fever for *CD163*$^{+/+}$ (n = 7) and *CD163*$^{-/-}$ (n = 3) pigs. The percentage of pigs with respiratory signs (**a**,**c**). The percentage of pigs with a fever (**b**,**d**). Fever was considered positive if it was ≥104 °F (normal body temperature, 101.6–103.6 °F). Respiratory scores ranged from 0: normal, to 1: mild dyspnea and/or tachypnea when stressed (when handled), 2: mild dyspnea and/or tachypnea when at rest, 3: moderate dyspnea and/or tachypnea when stressed (when handled), 4: moderate dyspnea and/or tachypnea when at rest, 5: severe dyspnea and/or tachypnea when stressed (when handled), 6: severe dyspnea and/or tachypnea when at rest. The percentage of piglets that had a fever or any sign of respiratory stress (a score of ≥1) at the various days of the challenge are shown. Note that the CD163$^{-/-}$ piglets displayed no signs of either respiratory stress or fever.

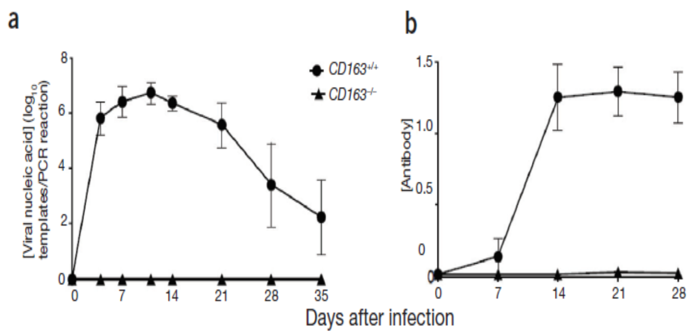
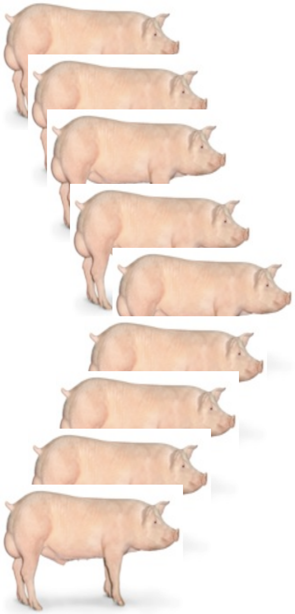


Figure 3 PRRSV-specific nucleic acid and antibody. (**a**,**b**) Mean and s.d. of PRRSV nucleic concentrations (**a**) and antibody (**b**) in serum from *CD163*$^{+/+}$ (n = 7) and *CD163*$^{-/-}$ (n = 3) pigs (one replication) are shown. Sample to positive ratio = the median fluorescent intensity (MFI) of the sample divided by the MFI of the positive control.

Disseminating Genetic Gain
What's Next?

Surrogate Sires



Realizing the Future

- We don’t have the perfect pig but that simple possibility excites and drives us
- Genetic improvement is accelerating at a faster pace than ever before
- Breakthrough technologies will further accelerate this pace of change
- Continued investment in service and support creates the greatest focus on opportunities and probability of success

Break

PIC North America

"Never Stop Improving"

55 Years of Commitment to Building a Better Pig

The White Hart Pub
Nettlebed, England

PIC North America

- Continued Solid Business Growth Globally
- Continued Investment in the Future
  - Technology – RBG's, Gene Editing, Sequencing
  - Supply – GP, Parent, SLN
  - Technical Service/Support - People
- Strategies to Support Customer Performance
  - Updated Nutrition Specifications
  - Benchmarking: Sow and G-F performance
  - Health Stabilization Strategies
  - Leveraging Elite Sires: CBV plus and max
- Relentless Focus on Whole Herd Economics and Customer Profitability

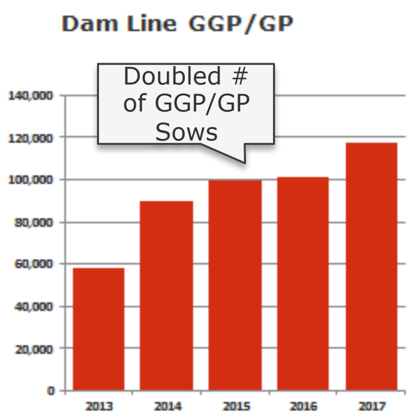
Key Areas of Focus

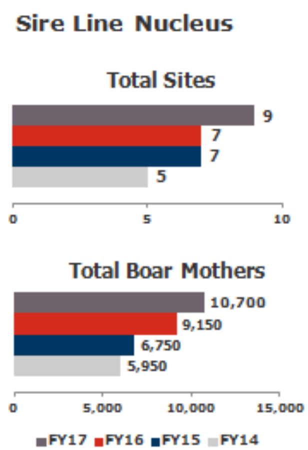
Technical Innovation

Shared Value Growth

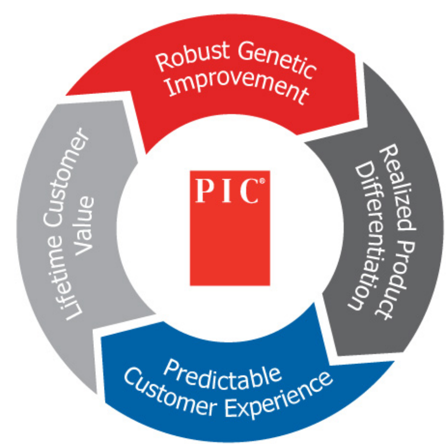
	5 Year Avg	3 Year Avg	1 Year Avg
Index	13.2	16.0	19.5
Pigs weaned/sow/year	0.8	0.9	1.1
Pounds weaned/sow/year	11.9	13.1	17.7
Pigs marketed/sow/year	0.8	0.9	1.0
Total Pounds marketed/sow/year	286.2	319.1	410.7
PROFIT PER PIG, $ / pig	2.63	3.20	3.89

Supply Chain Growth





Operational Excellence



1. Dam line growth not representative of net new GGP/GP Sows

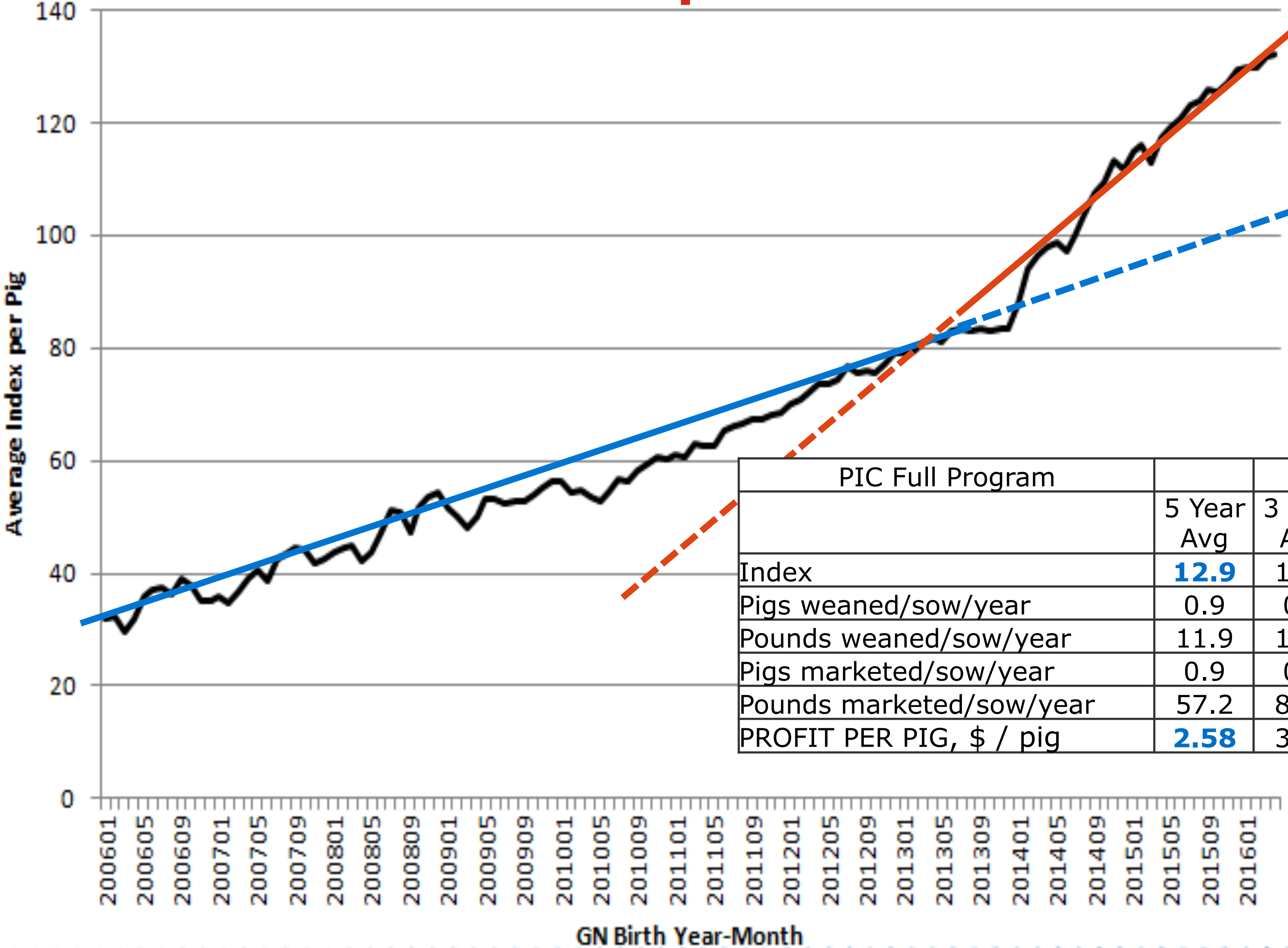
PIC

It's About Maximizing Genetic Gain

$$\Delta G = \frac{\text{Variation} \times \text{Selection Intensity} \times \text{Accuracy}}{\text{Generation Interval}}$$

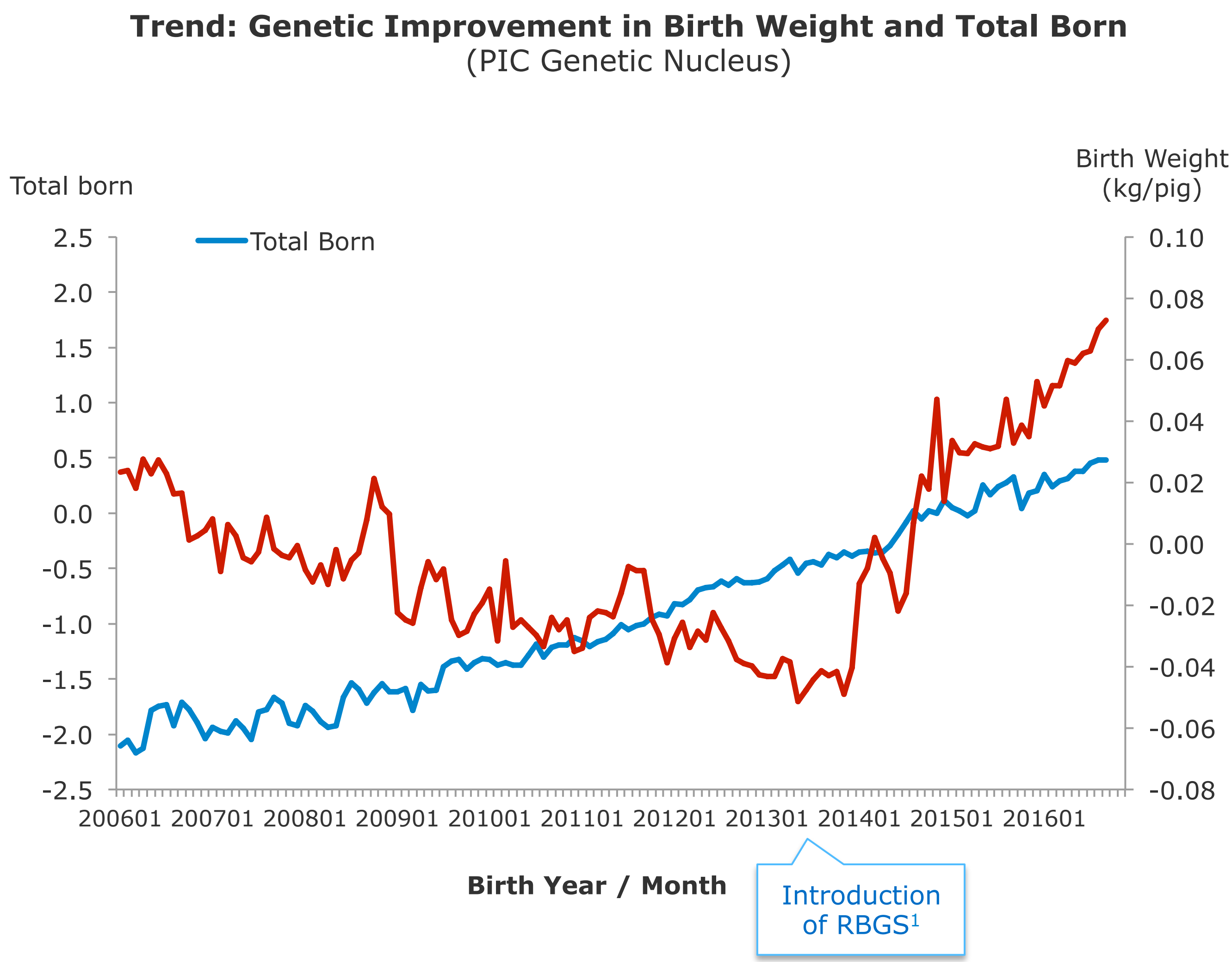
- A Diverse Set of Genes
- Large Populations
- Relationship Based Genomics
- GNX – Real World Data
- Relevant Trait Selection

Accelerating Progress
Relationship Based Genomics



PIC Full Program			
	5 Year Avg	3 Year Avg	1 Year Avg
Index	**12.9**	15.8	**19.4**
Pigs weaned/sow/year	0.9	0.9	1.1
Pounds weaned/sow/year	11.9	12.9	17.4
Pigs marketed/sow/year	0.9	0.9	1.1
Pounds marketed/sow/year	57.2	81.1	126.7
PROFIT PER PIG, $ / pig	**2.58**	3.16	**3.88**

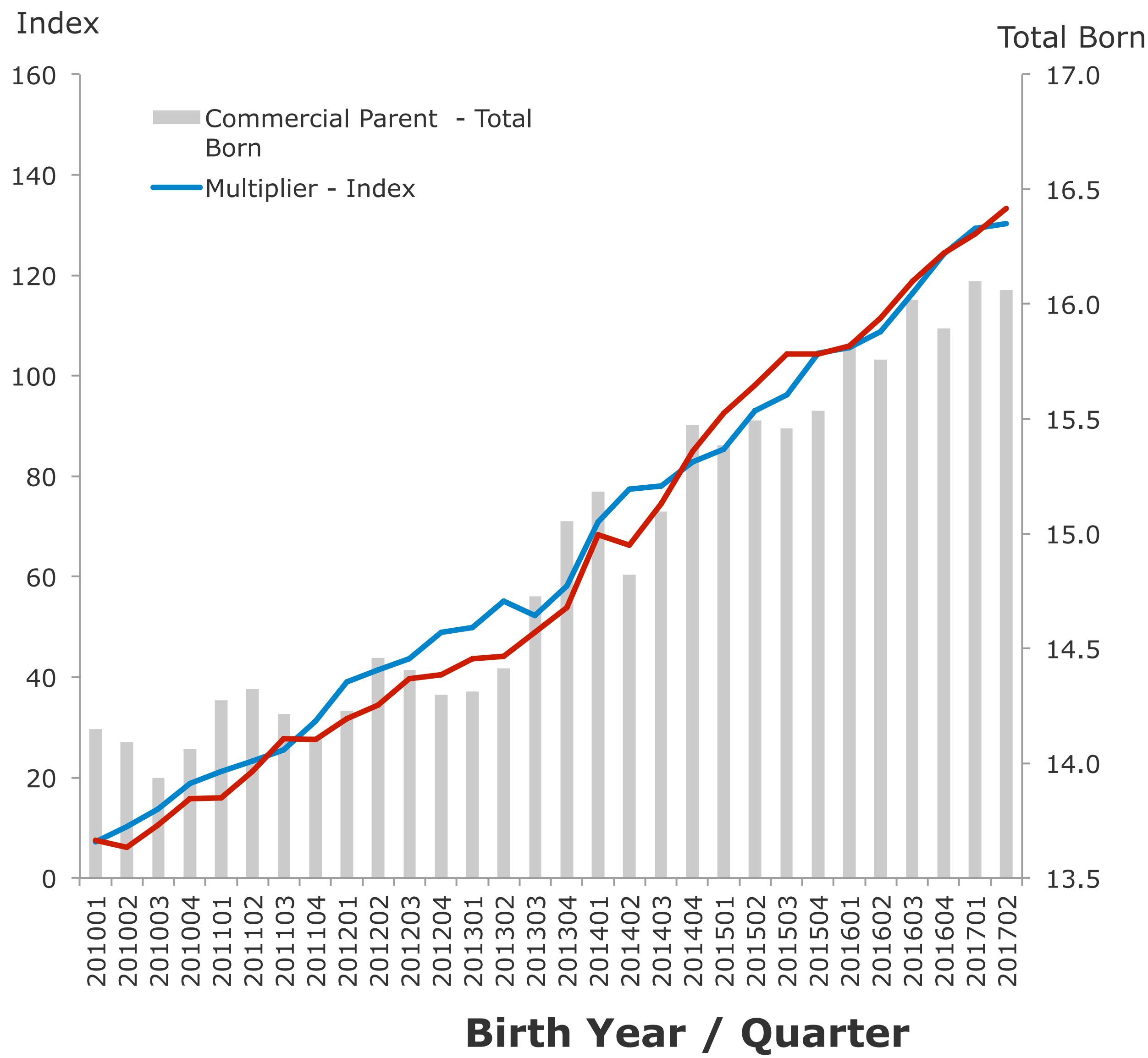
Accelerating Progress
Improving Total Born and Birth Weight



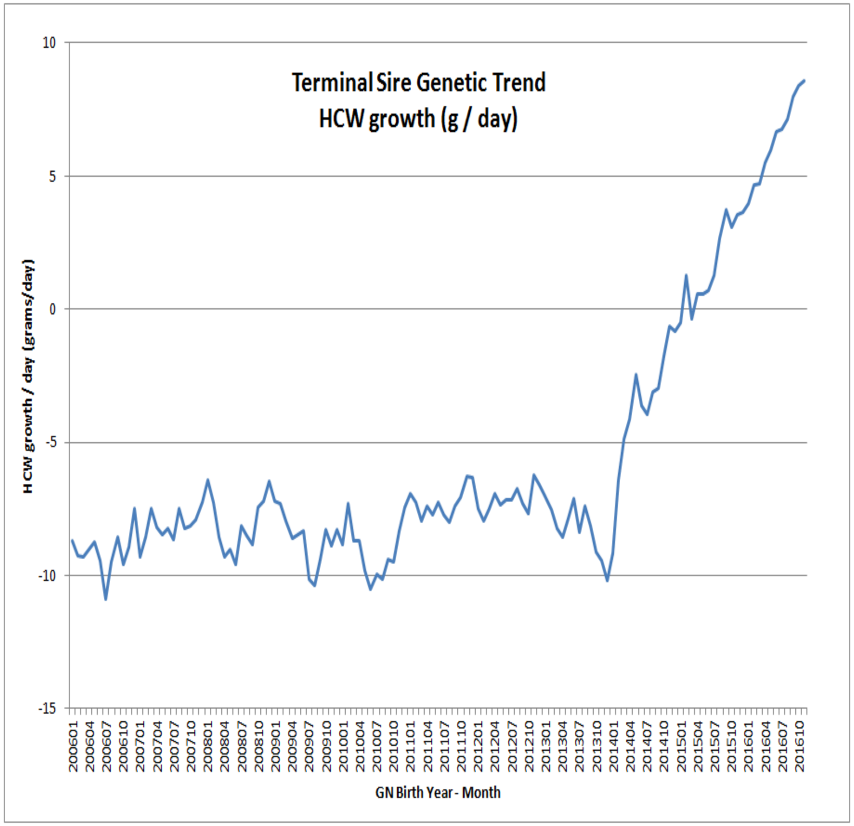
1. Relationship based genomic selection

Source: PIC L02, L03 pure lines (Camborough)

Realizing Genetic Improvement

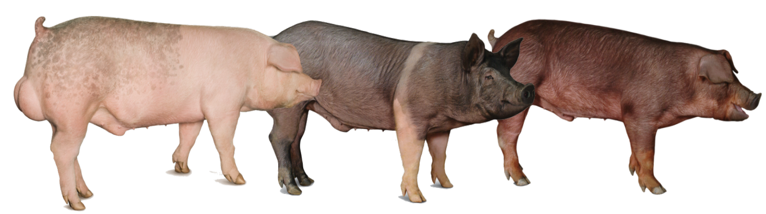


Performance Potential

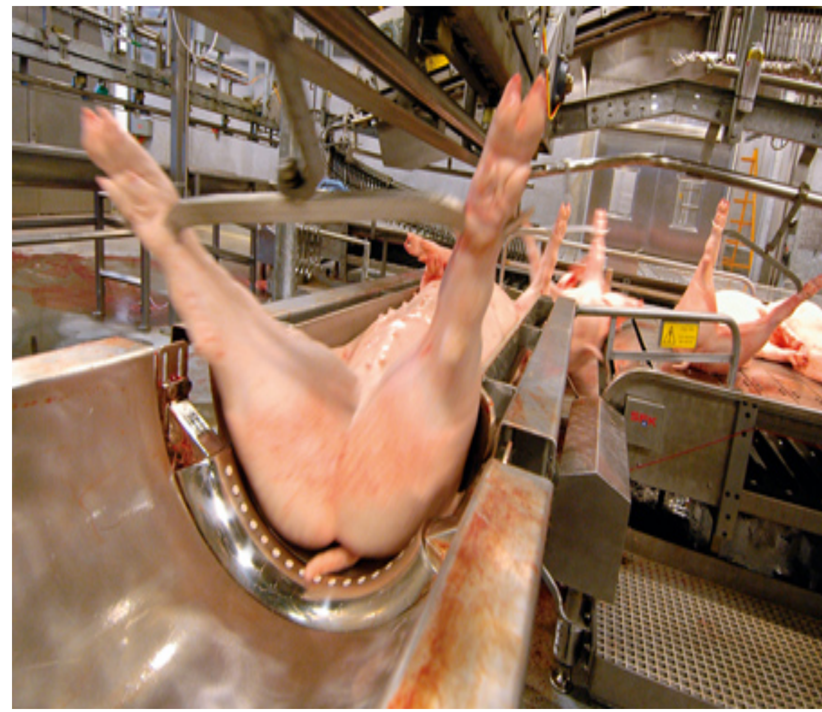


	Test ADG, lbs/day		Lifetime WDA, lbs/ day		Test FCR	
Product	**Average**	**Top 10%**	**Average**	**Top 10%**	**Average**	**Top 10%**
PIC280	2.35	2.77	1.74	2.02	1.99	1.71
PIC327	2.33	2.73	1.74	2.02	1.91	1.60
PIC337	2.51	2.90	1.83	2.11	1.80	1.52

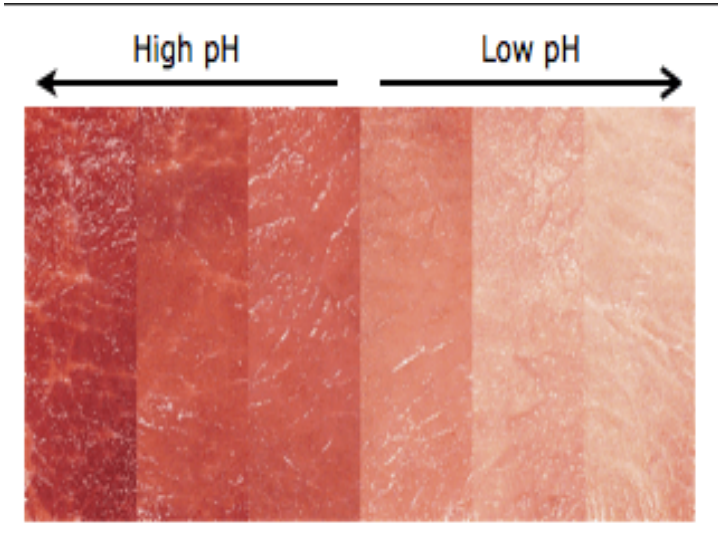
- Test performance over the last 12 months
- Approximately 10,000 intact males

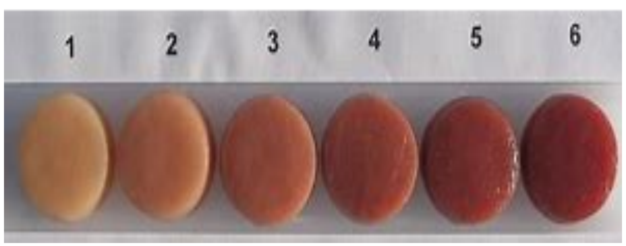


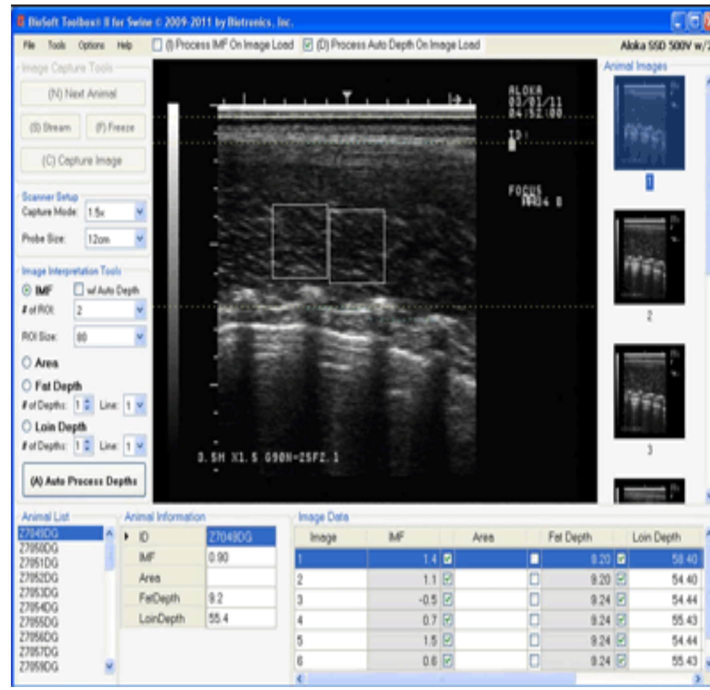
Delivering Maximum Product Value
Differentiated Lean Value



Delivering Maximum Product Value
Fresh and Processed

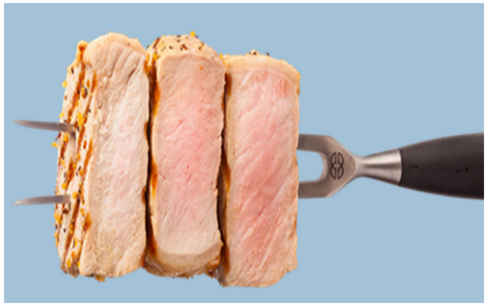


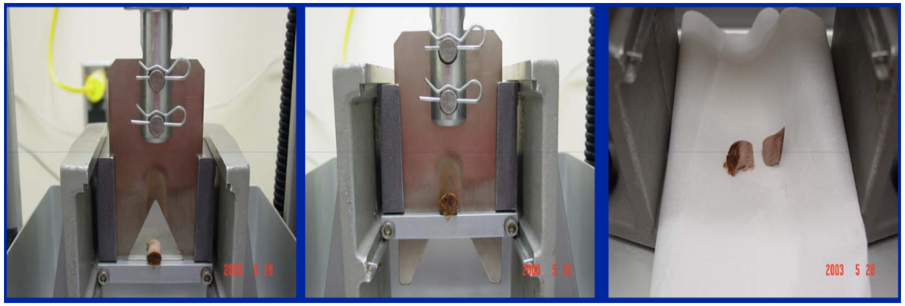




PIC

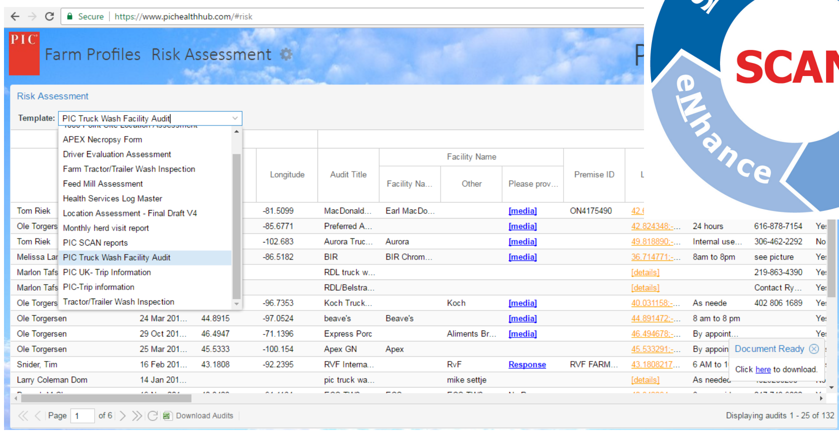
Delivering Maximum Product Value
Eating Satisfaction





- First in swine improvement
  - Significant investment
  - Built on the GNX program
  - Objective tenderness evaluation
    - Cooked chop
    - Cores
    - Shear Force

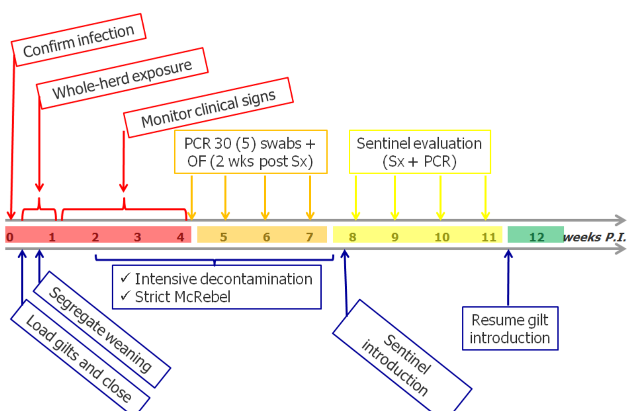
Protecting Customer Health
PIC Health Assurance Program

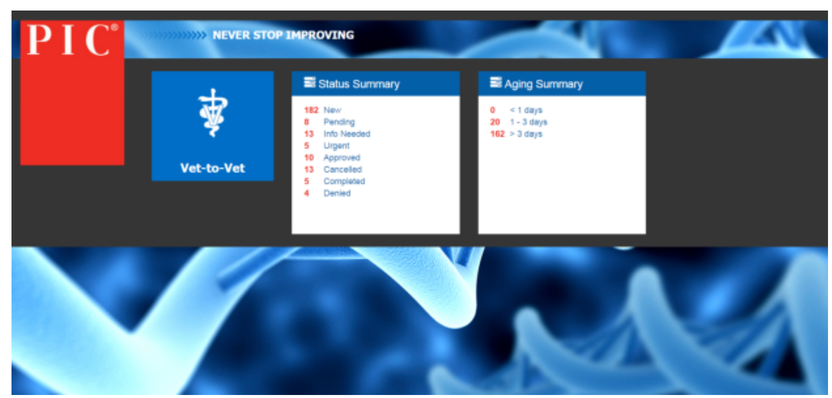


LabLINK HIMS™

Risk Mitigation

Surveillance





Containment & Elimination

Communication

PIC

Helping Customers Realize Value
Technical Service and Support

- Resources and manuals
  - Sow and gilt
  - Wean-to-finish
  - Nutrition
  - Boar studs
- Focused customer interaction
  - On-farm visits
  - Off-farm visits – webinars, etc
  - Boot camps / Road shows
  - Industry events

What's Next?
Gene Editing
Path to PRRS Resistance

Genetic breakthrough creates PRRS-resistant pigs

Could save swine industry millions of dollars each year

Source: University of Missouri *Dec 8, 2015*

EMAIL | SHARE | Tweet | G+1 | Recommend 3.7K | *COMMENTS* 0

More About: Porcine Epidemic Diarrhea Virus (PEDV), Porcine Reproductive & Respiratory Syndrome (PRRS)

RELATED MEDIA

Strategies to more effective PRRS management during the winter season

PRRS virus changes like a flowing river

Standards of filter testing for PRRS virus

(From Left) Kristin Whitworth, research scientist in MU's Division of Animal Sciences; Randall Prather, distinguished professor of animal sciences; and Kevin Wells, assistant professor of animal sciences unlock the genetic key to PRRS resistance.
Nic Benner/University of Missouri

Researchers from the University of Missouri, Kansas State University and Genus plc have combined efforts to breed pigs that are resistant to porcine reproductive and respiratory syndrome virus.

CORRESPONDENCE

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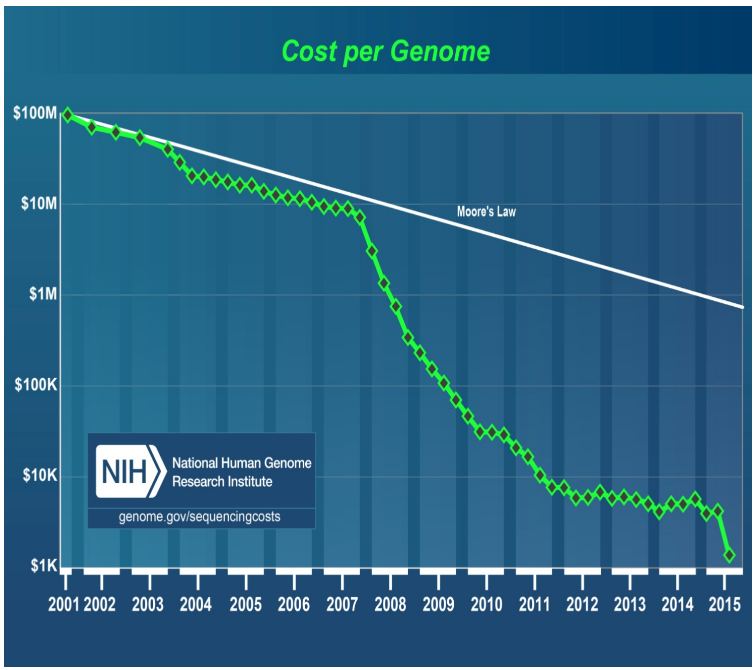
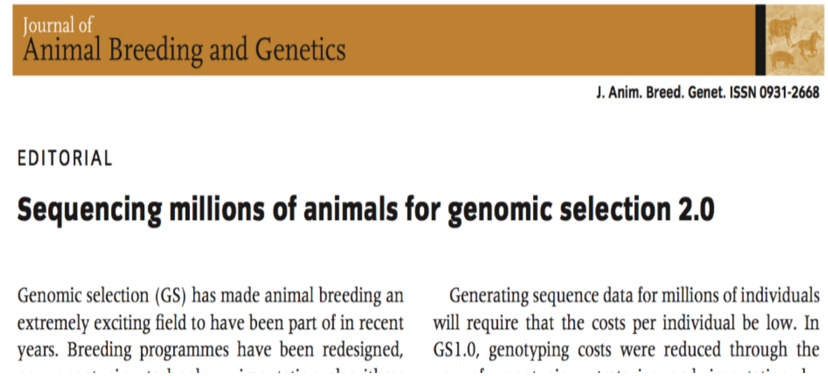
One founder male and one founder female, both of whom had mutations in exon 7 of *CD163*, were bred to produce offspring (**Supplementary Methods**). The founder

And, why it should go faster...

Genome Sequencing

Genome Sequencing





Journal of Animal Breeding and Genetics

J. Anim. Breed. Genet. ISSN 0931-2668

EDITORIAL

Sequencing millions of animals for genomic selection 2.0

Genomic selection (GS) has made animal breeding an extremely exciting field to have been part of in recent years. Breeding programmes have been redesigned,

Generating sequence data for millions of individuals will require that the costs per individual be low. In GS1.0, genotyping costs were reduced through the

What’s Next?

Conduct trials to validate safety & efficacy

Collaborate with FDA on regulatory framework

Understand and address societal concerns

Look ahead: continue innovation to advance animal

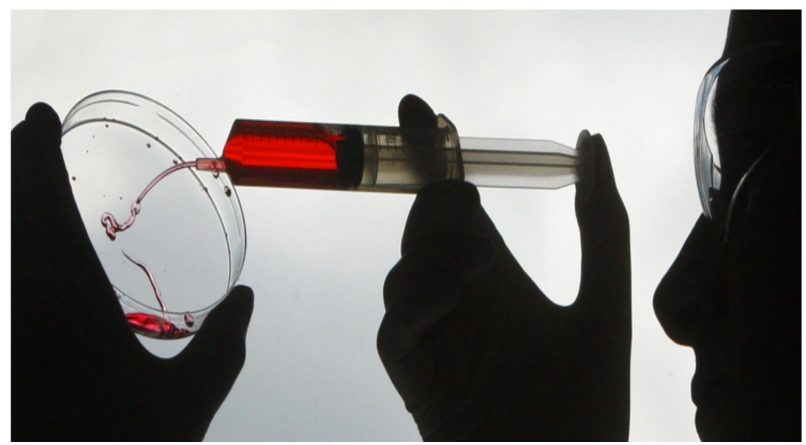
Latest Lifestyle Tech & Gadgets

News › Latest › Science | UK World Showbiz On This Day News extra Weather BT Life Quiz

Members of the public ‘cautiously optimistic’ about gene editing

The survey found broad public support for controversial GM technology.

PA Last updated: 07 March 2018 - 02.50pm



Question & Answer Session

"Never Stop Improving"