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Evolution of Nutritional Concepts and Feeding Methods of Breeding Sows: Historic and Perspectives

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PIC

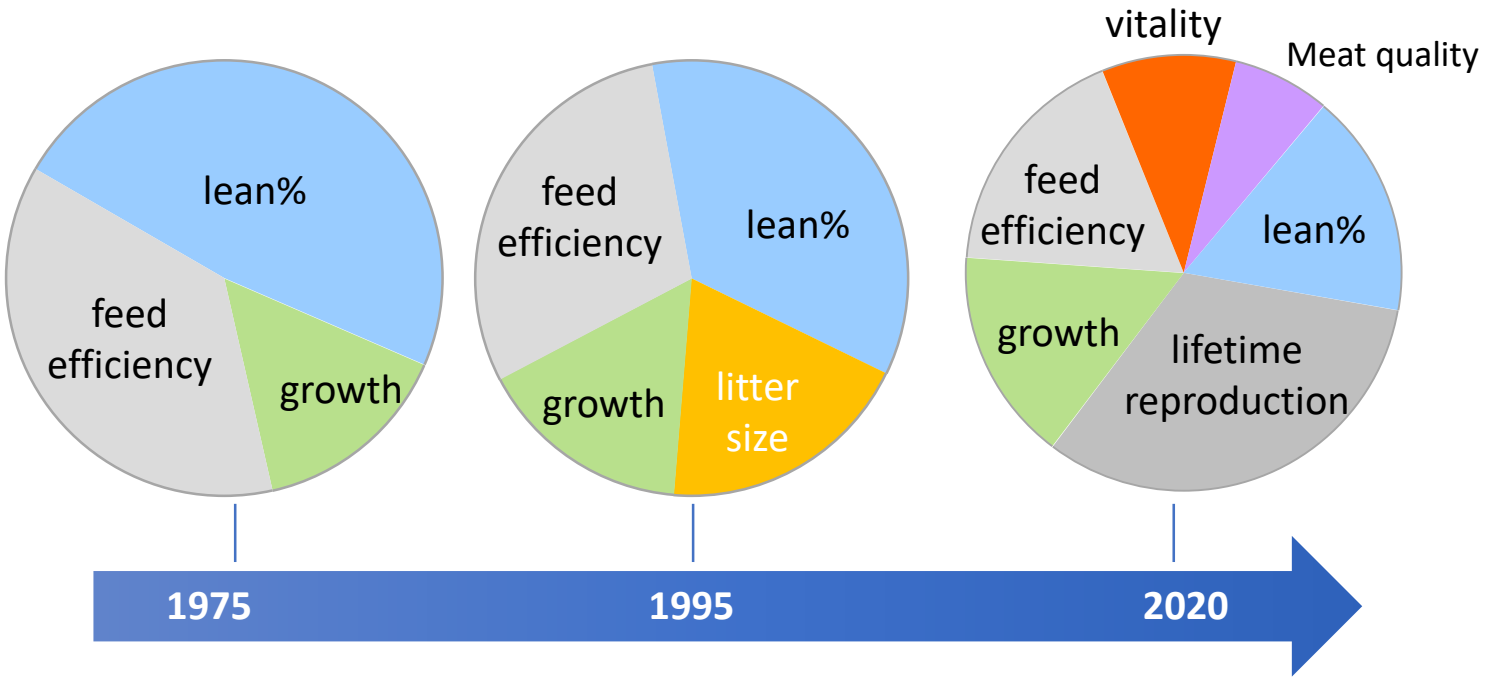
Never Stop Improving
Nutrition

Outline:

- Impact of genetic improvement on sows herd
- Importance of gilt development on future herd
- Assessment of feeding program in accordance with herd body weight
- Feeding gilts and sows:
  - Early gestation
  - Late gestation
  - Peripartum
  - Lactation
  - Wean to estrous interval
- Sow body condition driven sow's farm success
- Farm implementation

Genetic companies select for traits that are relevant

Relevant traits drive producer's economics, are heritable, and measurable



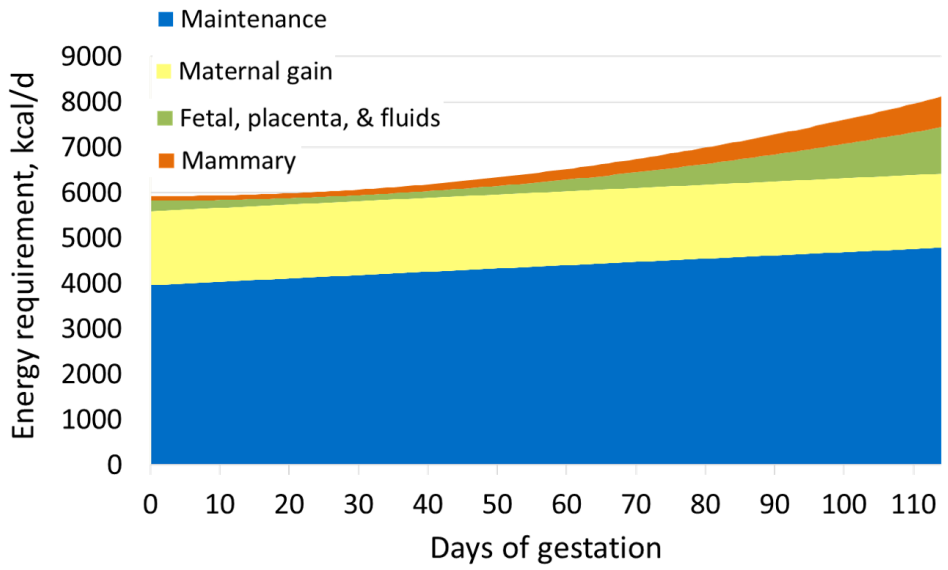
Genetic improvement for bigger litter size:

Selecting for profitability

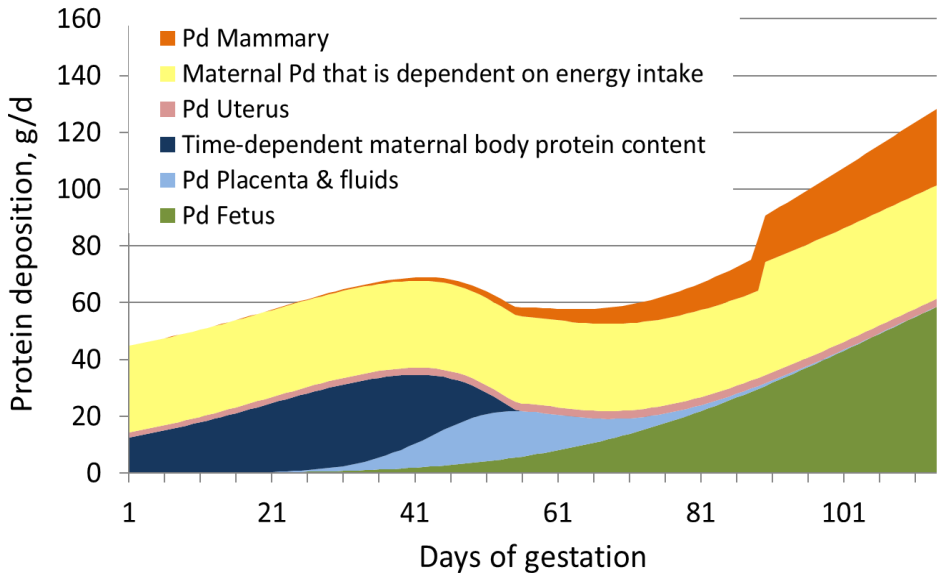
Nutrition and Feeding in Late Gestation

Goals: to meet the nutrient requirements for maintenance and growth of the breeding female and for adequate development of the conceptus, while managing body condition.

Estimated daily ME requirements of gilts in gestation



Estimated total protein deposition of sows in gestation

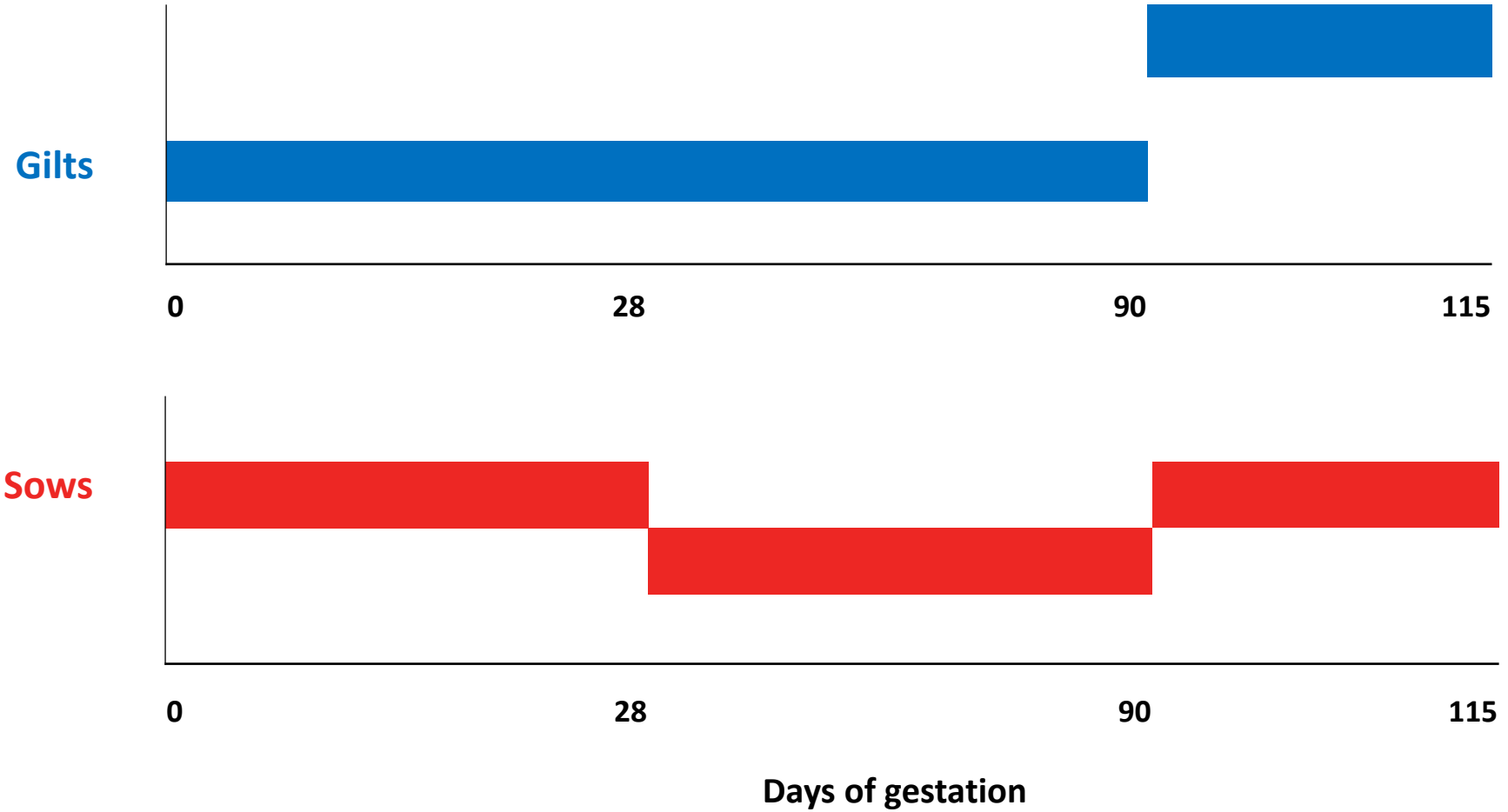


In late gestation, both estimated protein deposition and energy requirement are exponentially increased and directed towards fetal growth and mammary development

Adapted from NRC 2012

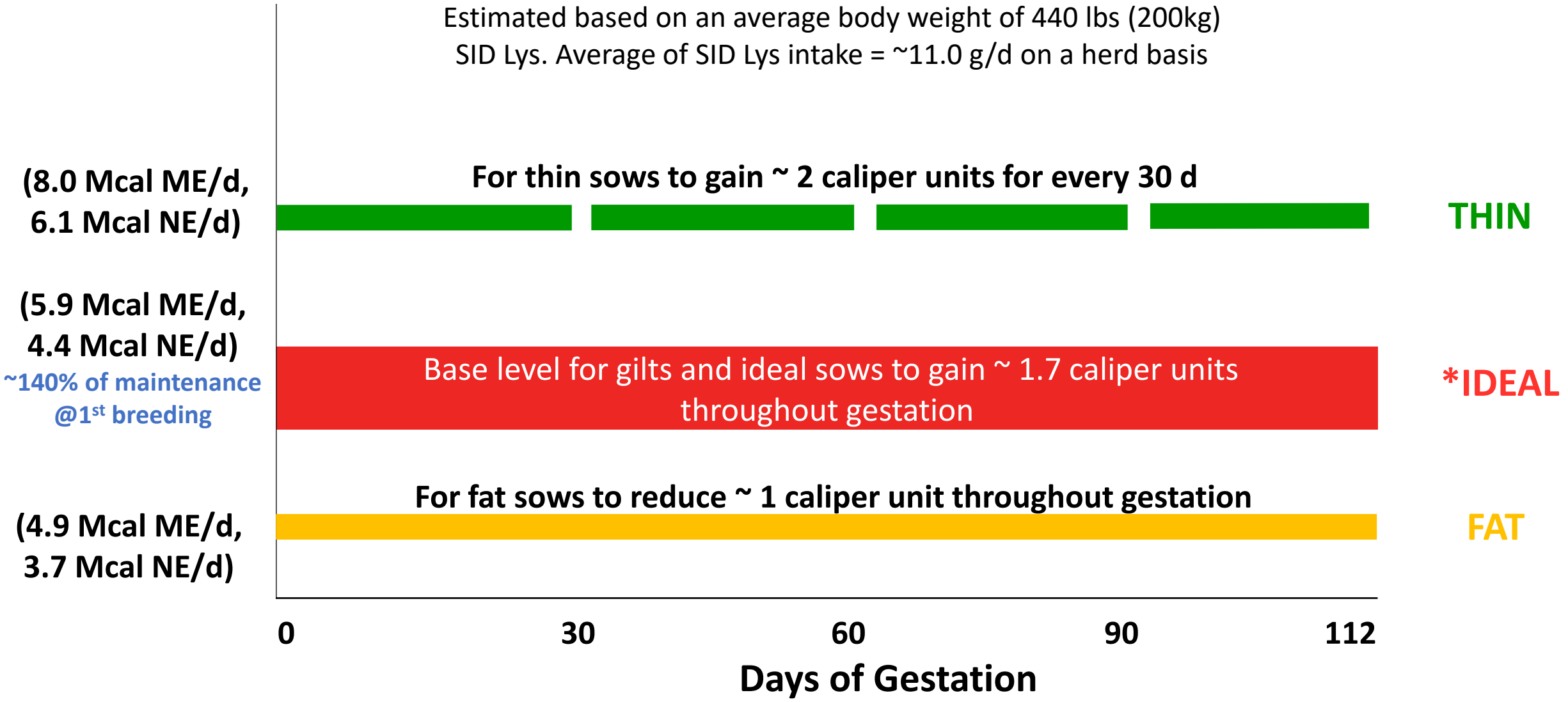
Nutrition and feeding during gestation

Traditional gestation feeding program



Nutrition and feeding during gestation

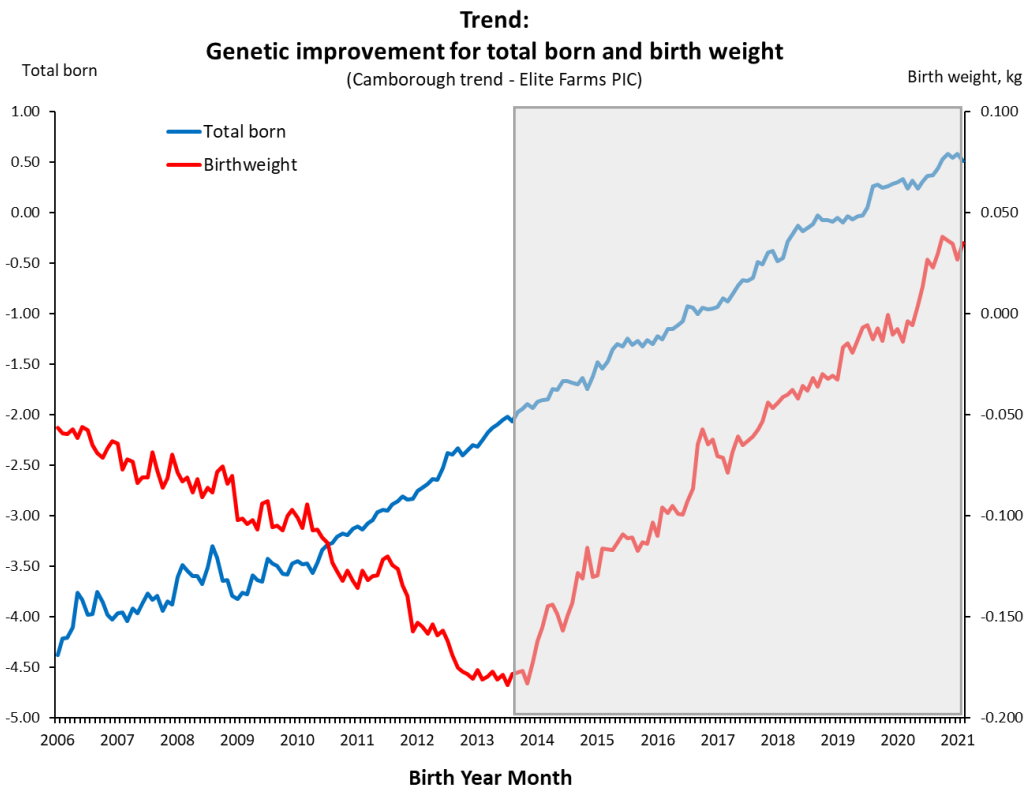
Gilts and Sows

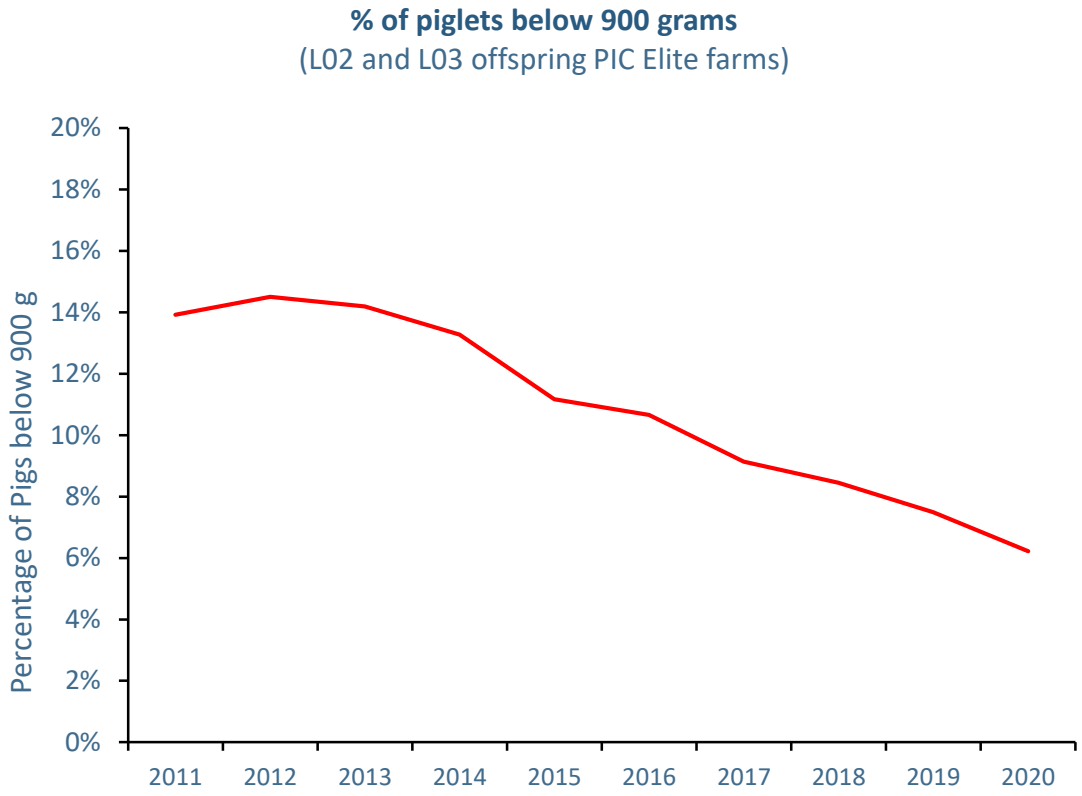


* For each additional 50 lbs (23 kg) of sow body weight, increase the base feeding level by 0.3 lbs/d (150g/d)

Genetic development:

Trent in total born and birth weight

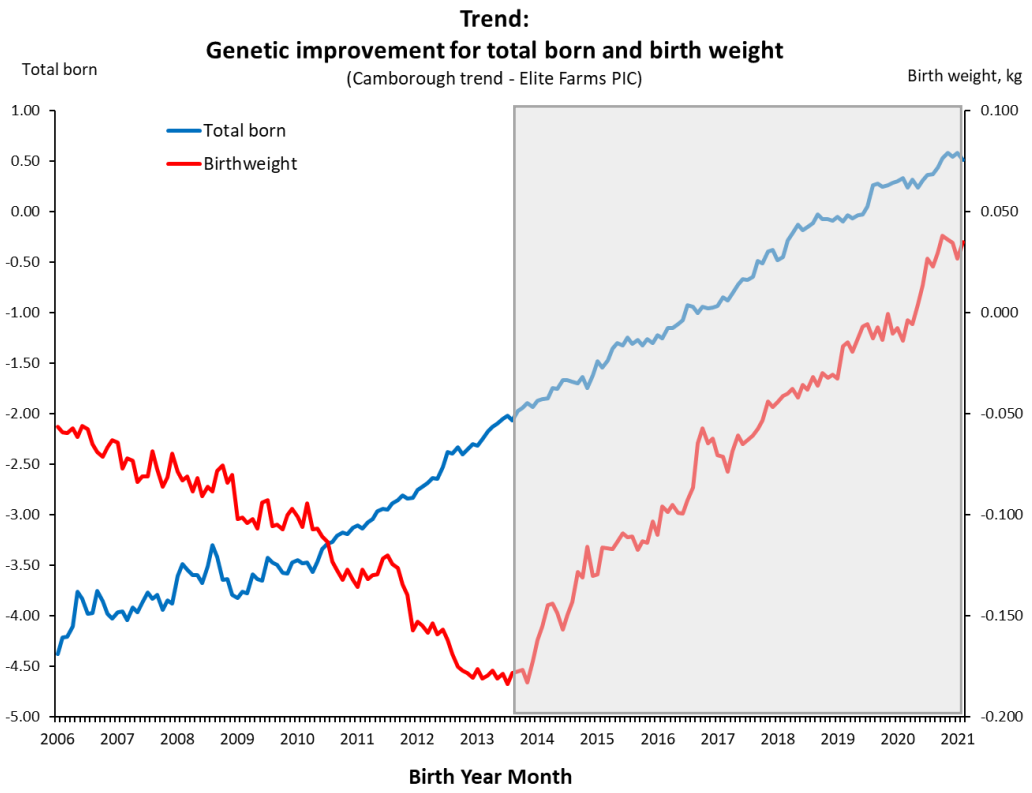


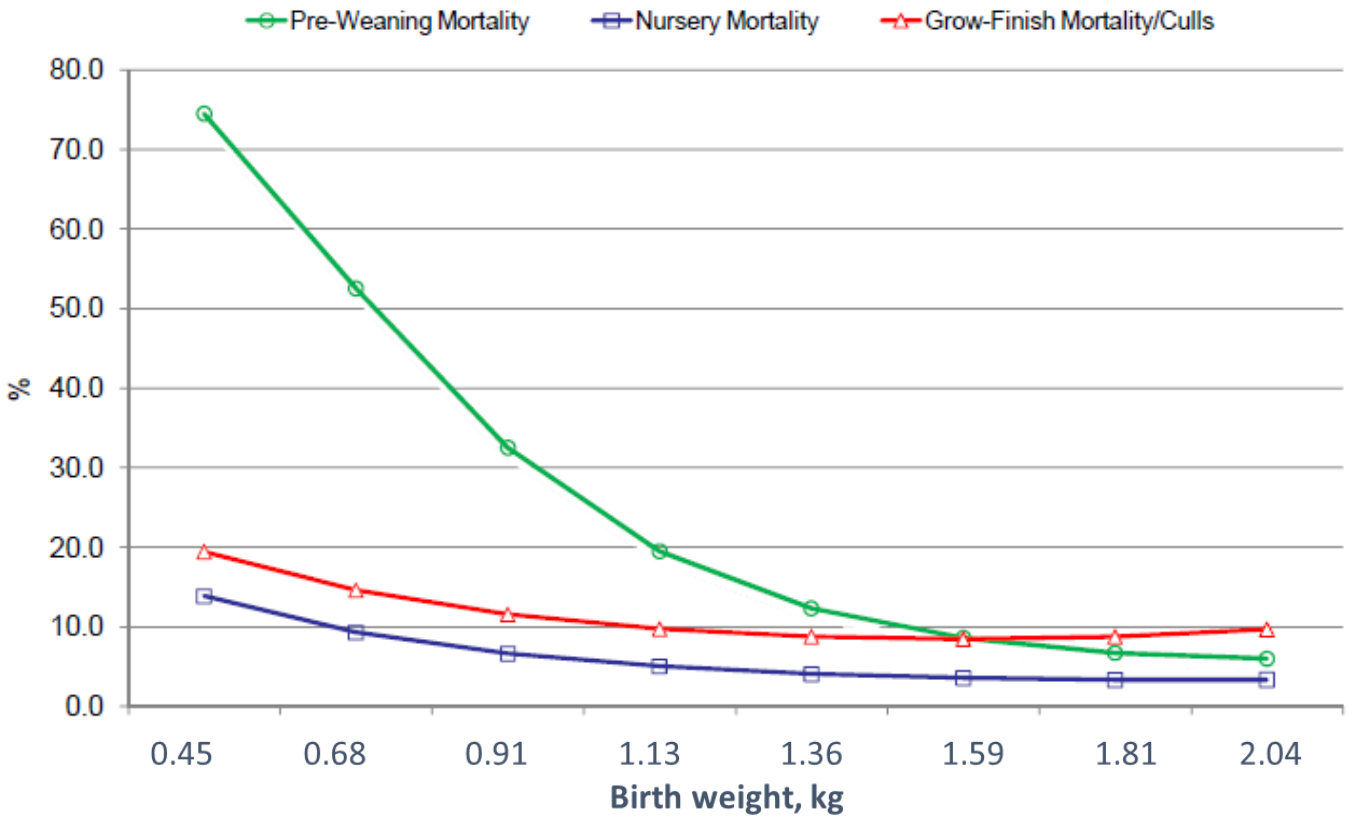


Data from PIC Global Genetic development: Average line 2 and 3 Vertical axis is normalized to zero average for last 2 years

Genetic improvement for:

Trent in total born and birth weight/impact in wean-to-finish survivability

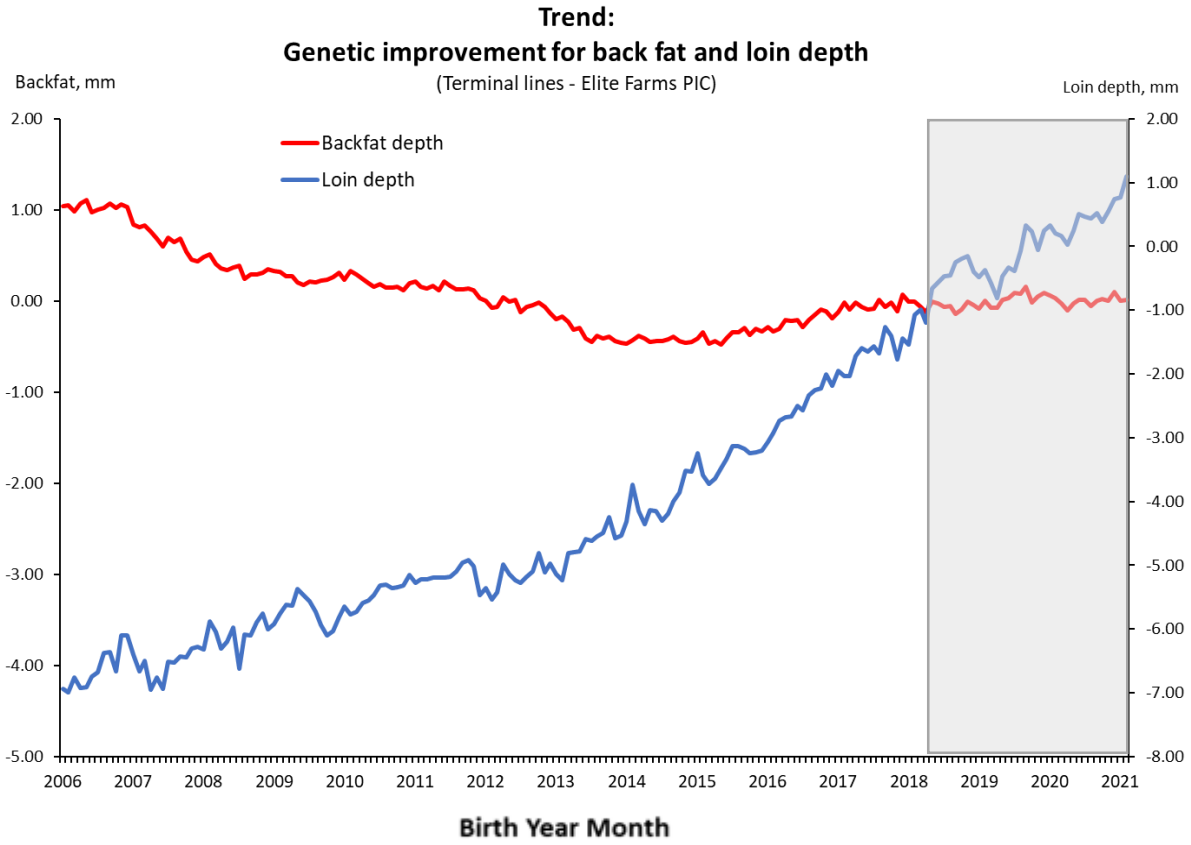




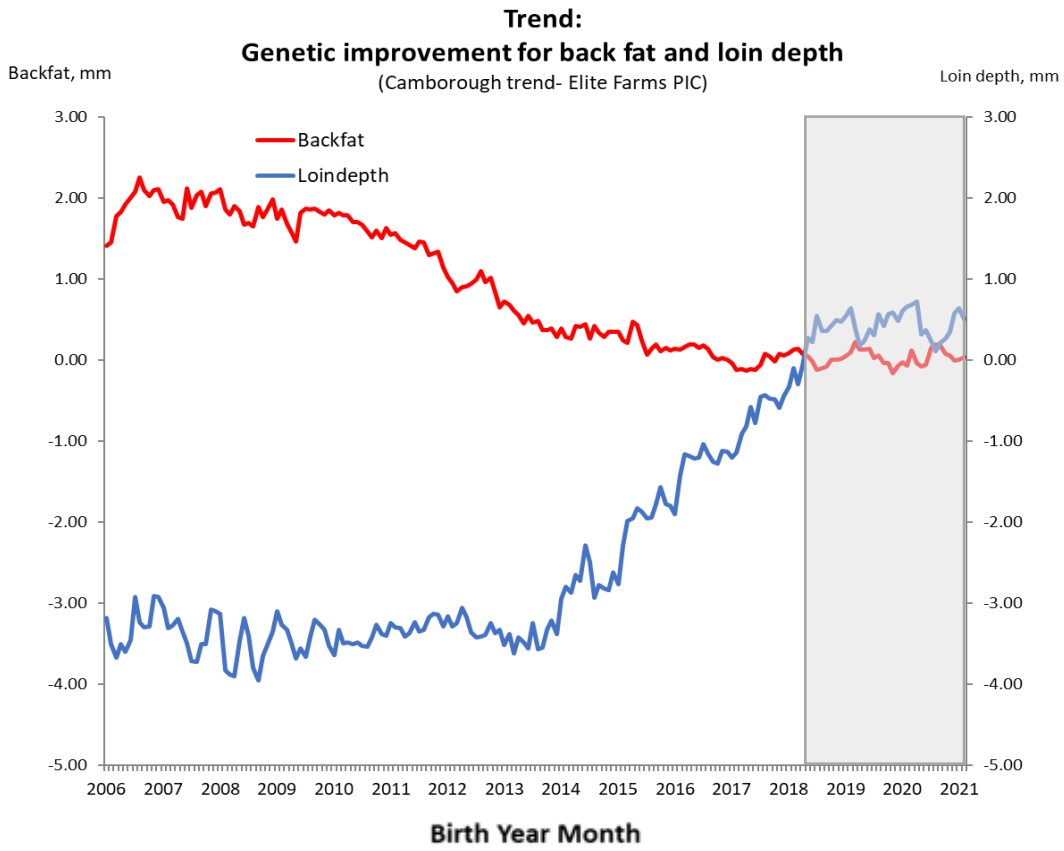
Data from PIC Global Genetic development: Average line 2 and 3 Vertical axis is normalized to zero average for last 2 years

Genetic improvement for:

Trent in back fat and loin depth



Data from PIC Global Genetic development: Average of lines 15, 27 and 65. Vertical axis is normalized to zero average for last 2 years

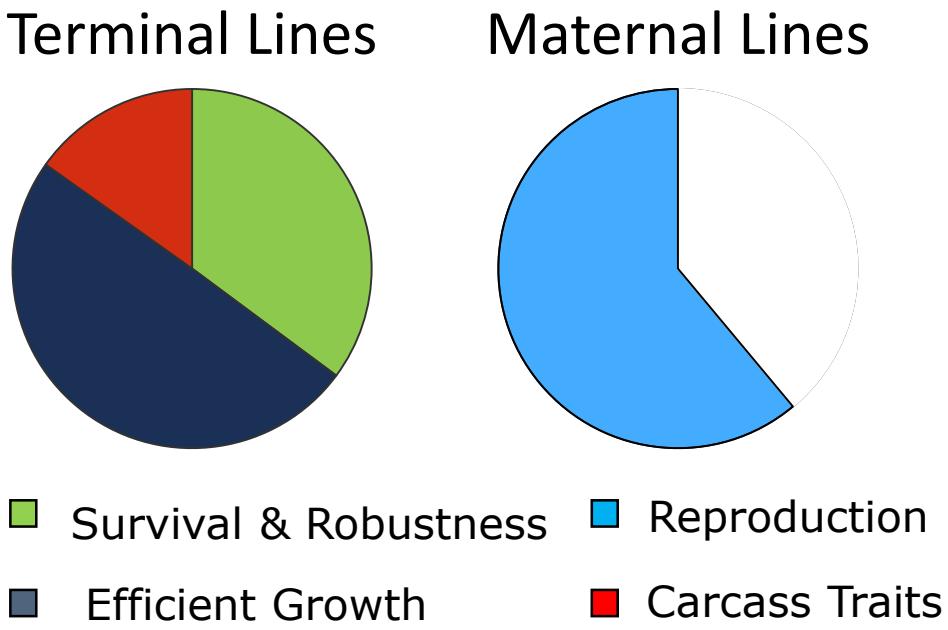


Data from PIC Global Genetic development: Average of lines 2 and 3. WDA = weight per day of age. Vertical axis is normalized to zero average for last 2 years.

Genetic improvement for bigger litter size:

Selecting for profitability

The improvements in reproductive performance increase metabolic demands on the sow during gestation and lactation.



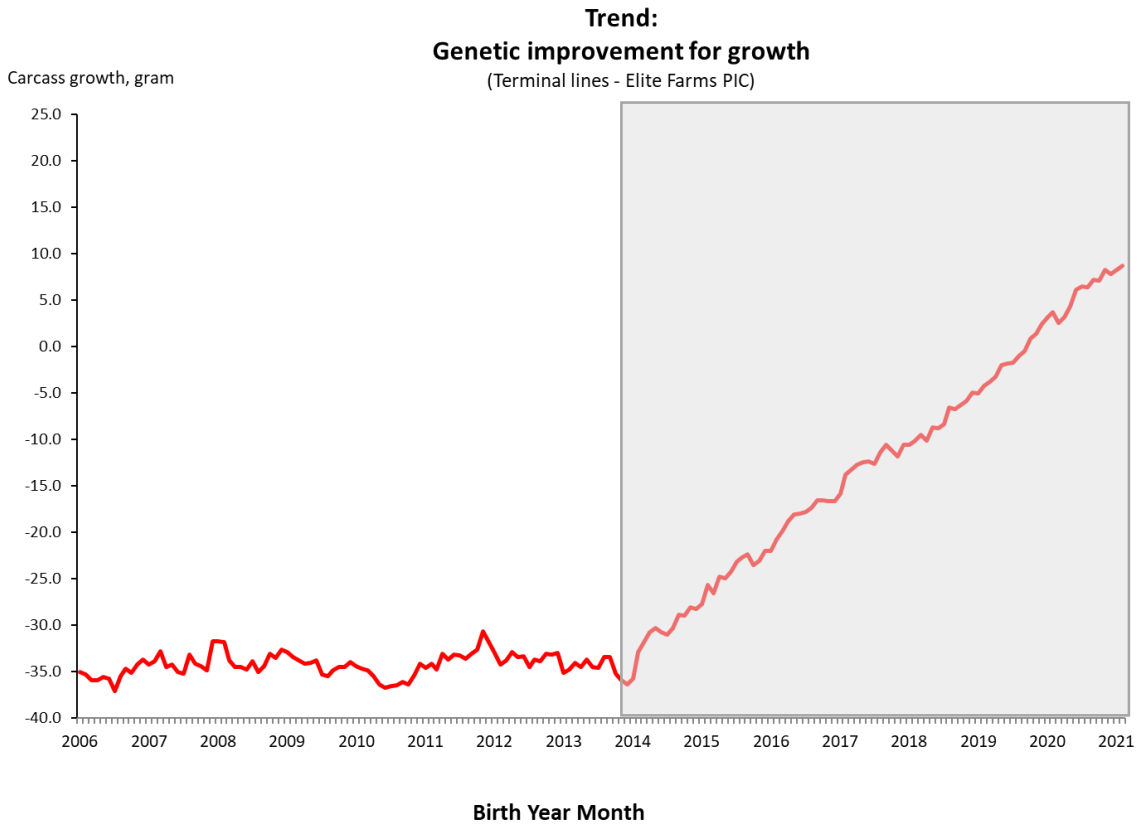
Today's modern genotype females are also faster-growing and have less adipose tissue than their predecessors

Increases in litter size increase total fetal growth in late gestation, farrowing duration, colostrum needs and milk production.

Data from PIC Global Genetic development

Genetic development:

Trent in growth for terminal and maternal lines



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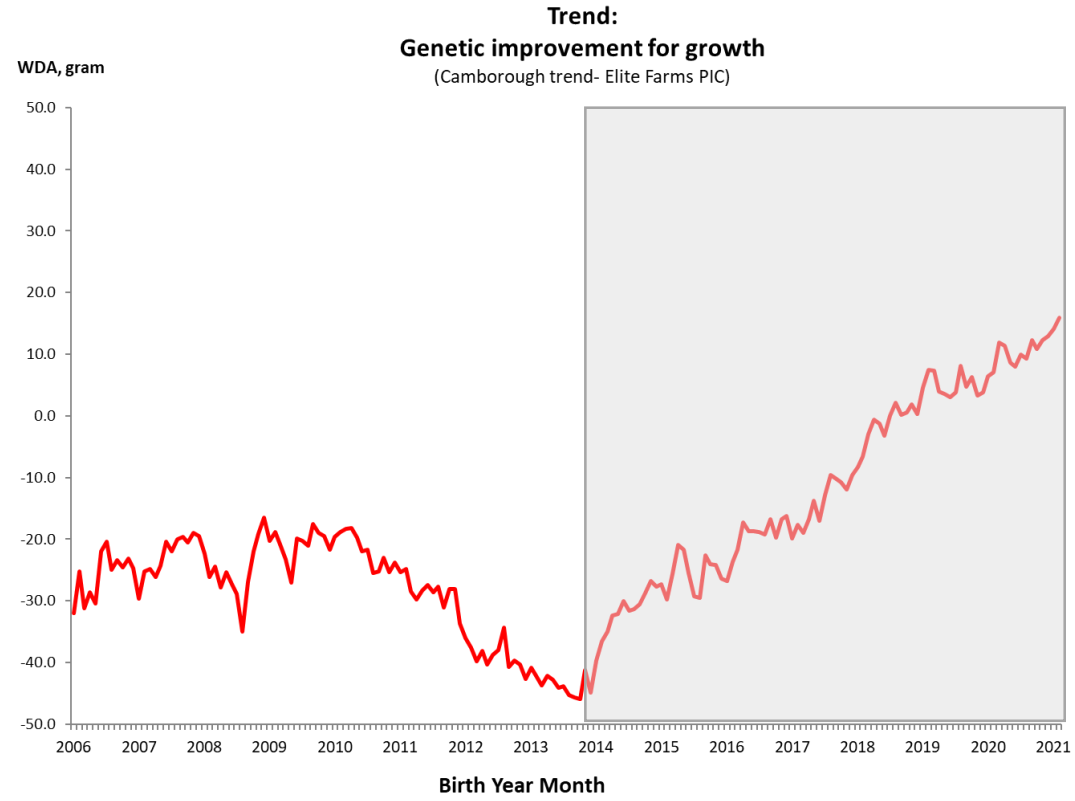
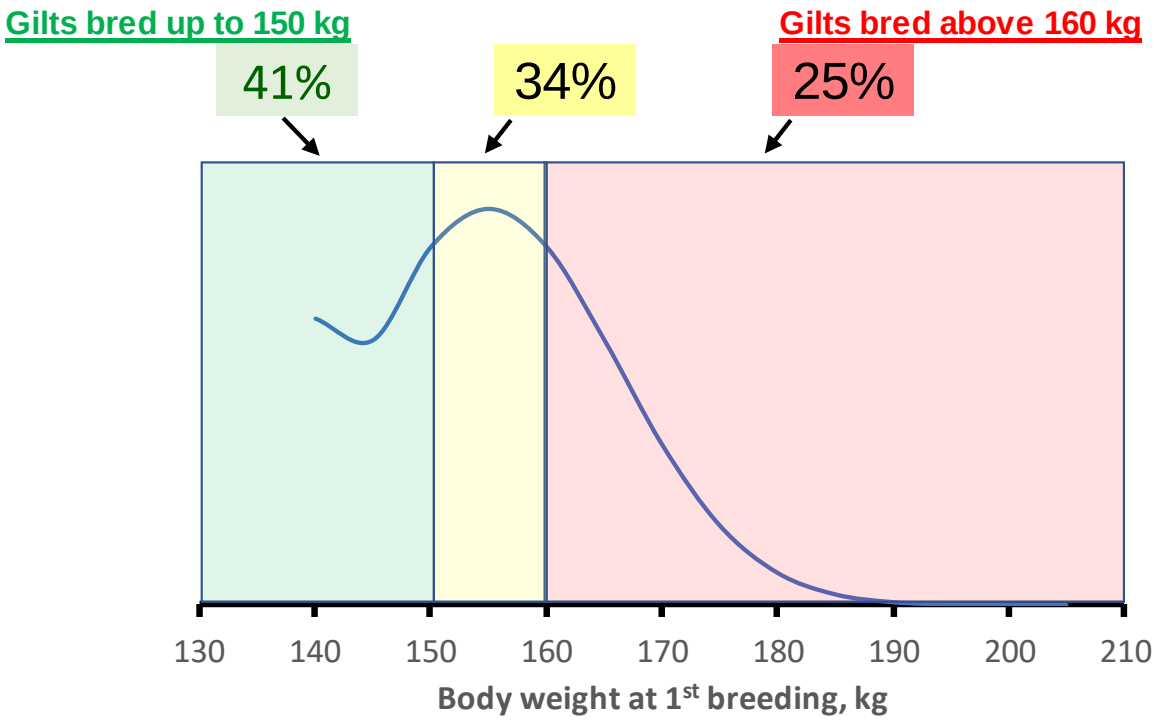


Data from PIC Global Genetic development: Average of lines 2 and 3. WDA = weight per day of age. Vertical axis is normalized to zero average for last 2 years.

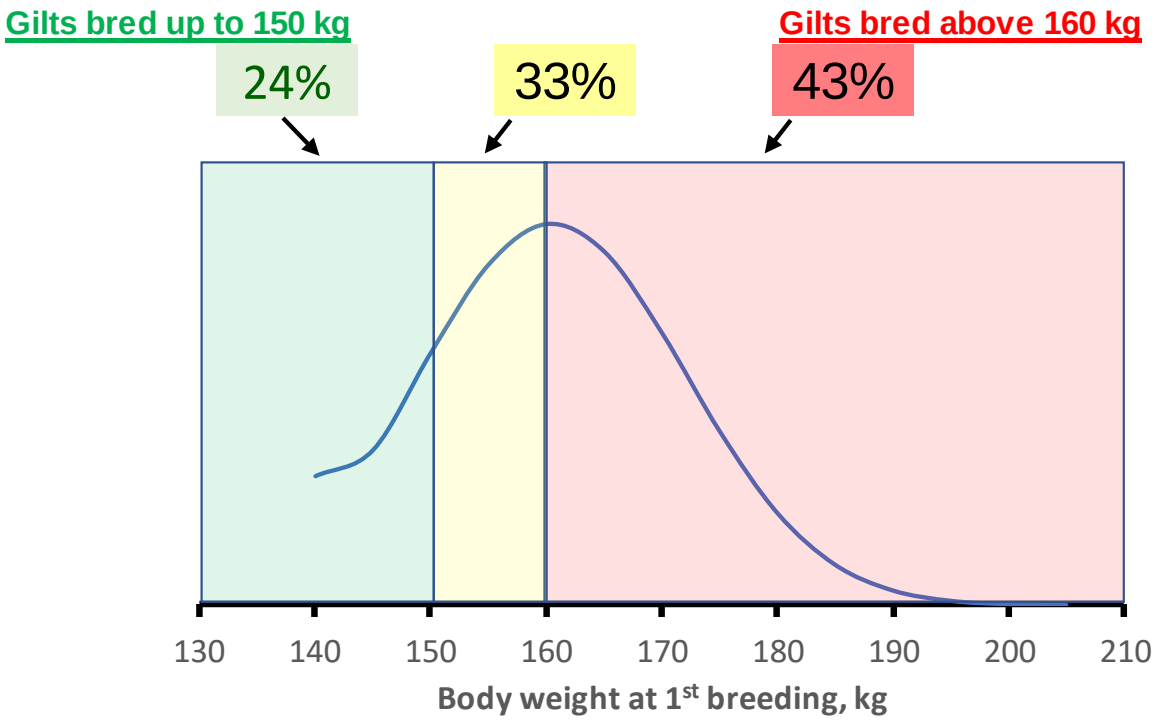
Nutrition and feeding during gestation for gilts

Impact of average body weight at 1st breeding on % of gilts bred above 160 kg

Av. BW = 148kg



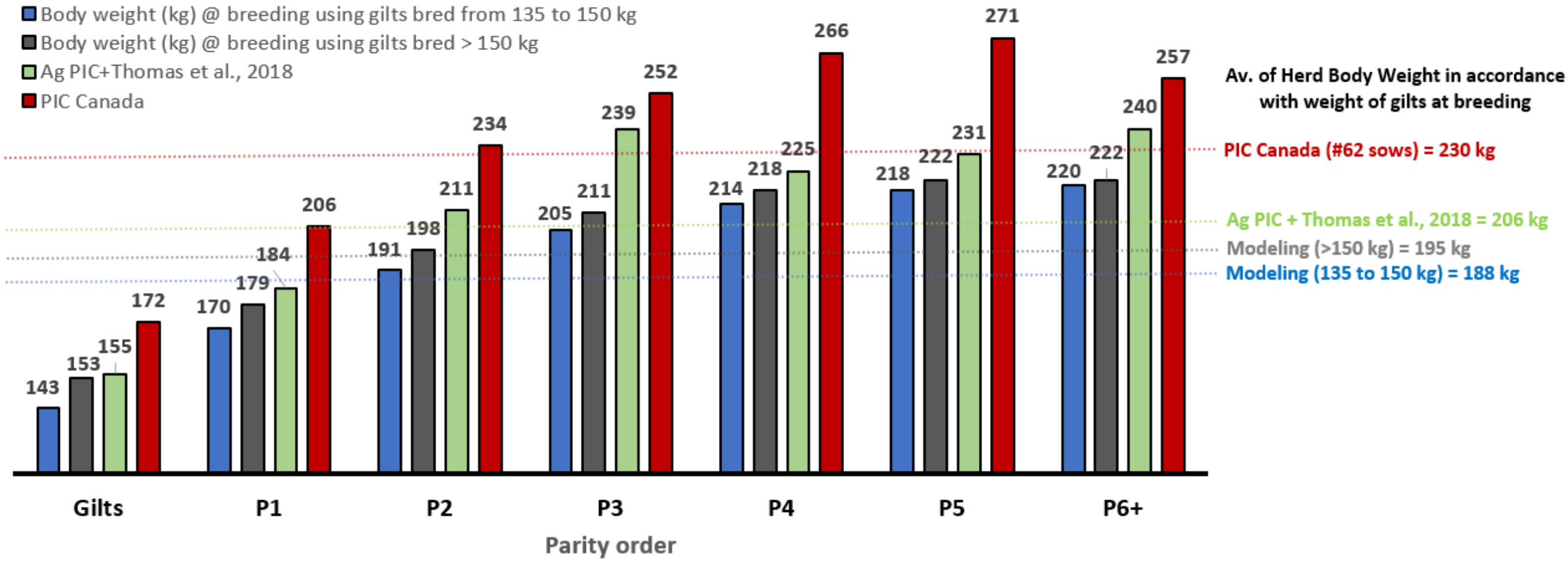
Av. BW = 153kg



Source: PIC unpublished data

Assuming all gilts were bred above 135 kg of body weight and CV =7.5%

Herd body weight at weaning in accordance with gilts body weight at breeding



Source: PIC unpublished data

Feeding Developing Gilts:

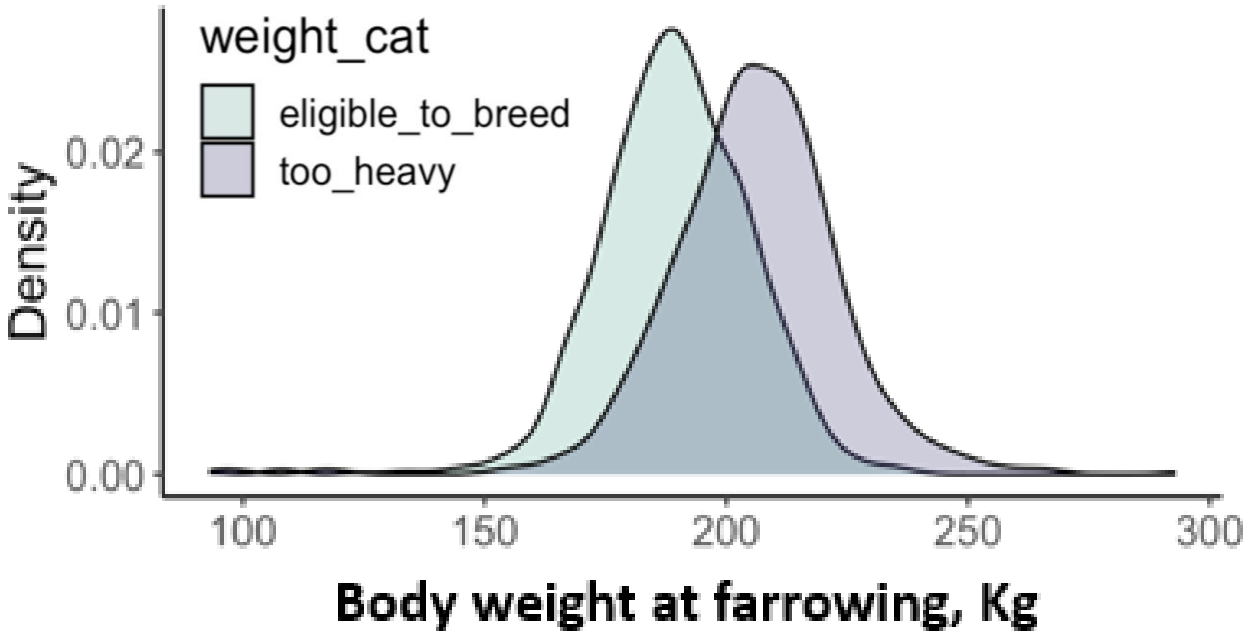
How many diets to build a reasonable phase-feeding?

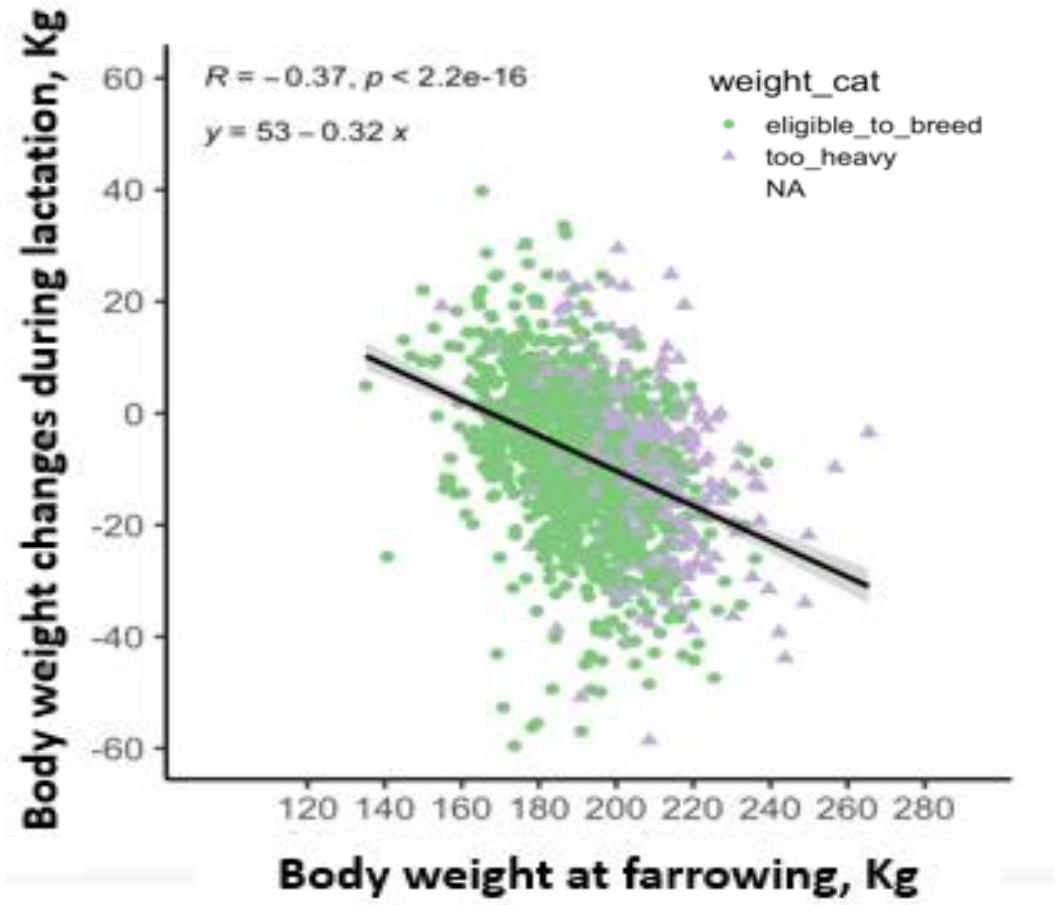
Body weight of developing gilts, kg		
23 to 60	60 to 90	90 to breeding
Use GDU specific diet or either the commercial gilt diet or the lactation diet.	Use GDU specific diets. One or more diets maybe used within this weight range.	Use a GDU specific diet or the gestation diet which is typically used in many farms.

- Minimum feeding specifications for replacement gilts over **60 kg BW**
  - Vitamin and mineral premix for reproduction
  - Higher Calcium and Phosphorus levels

Nutrition and feeding during gilt development

Targets at first breeding: 4 key elements



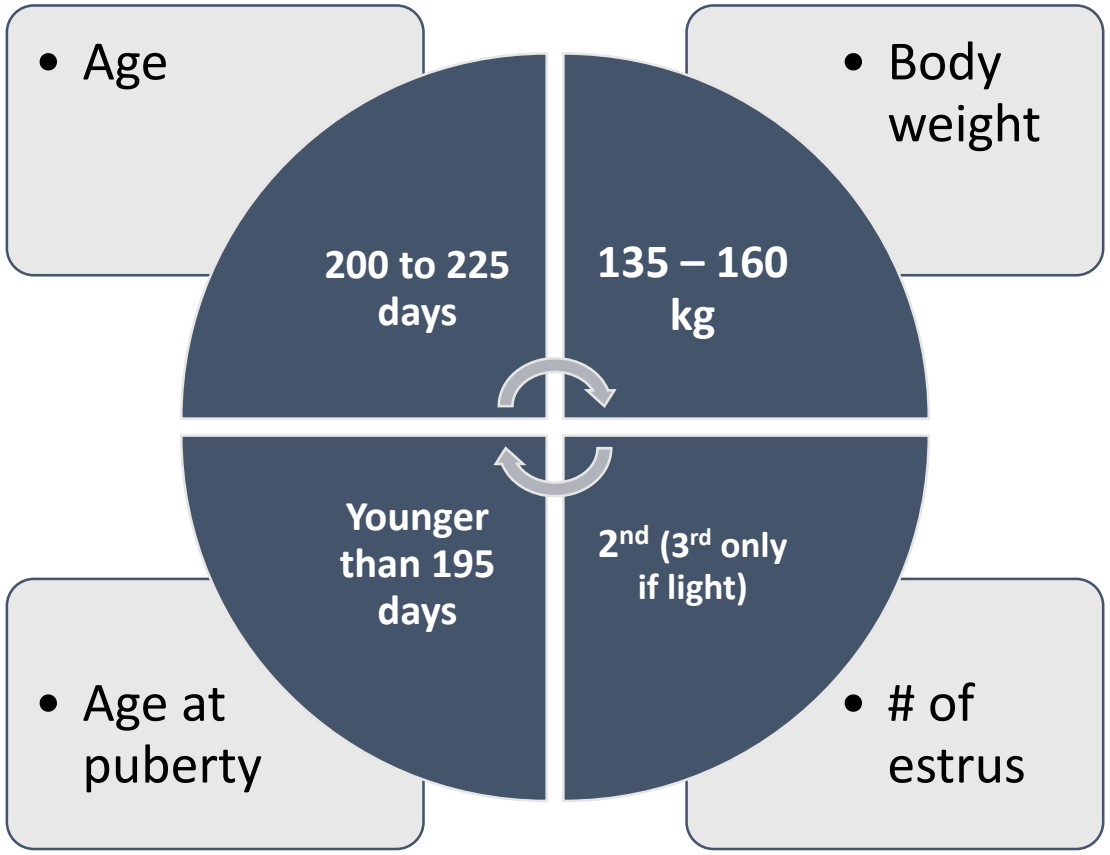


Fonte: Agroceres – PIC Unpublished data

Data from 1460 gilts collected in sows farm in the South of Brazil

Nutrition and feeding during gilt development

Targets at first breeding: 4 key elements

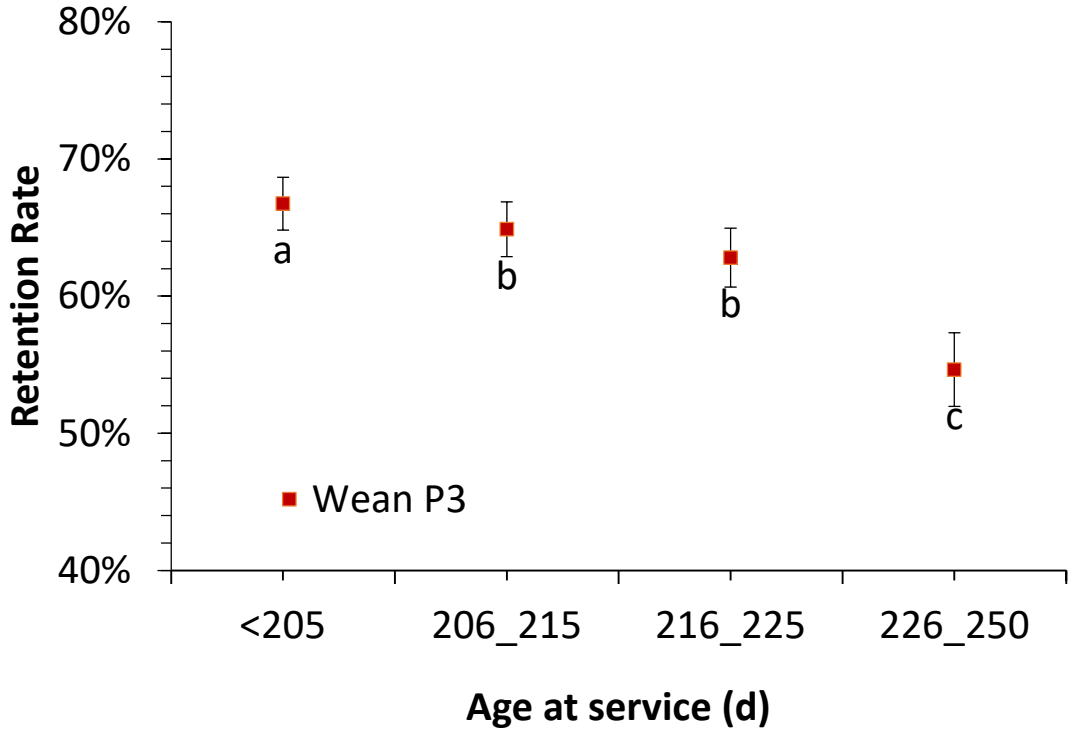


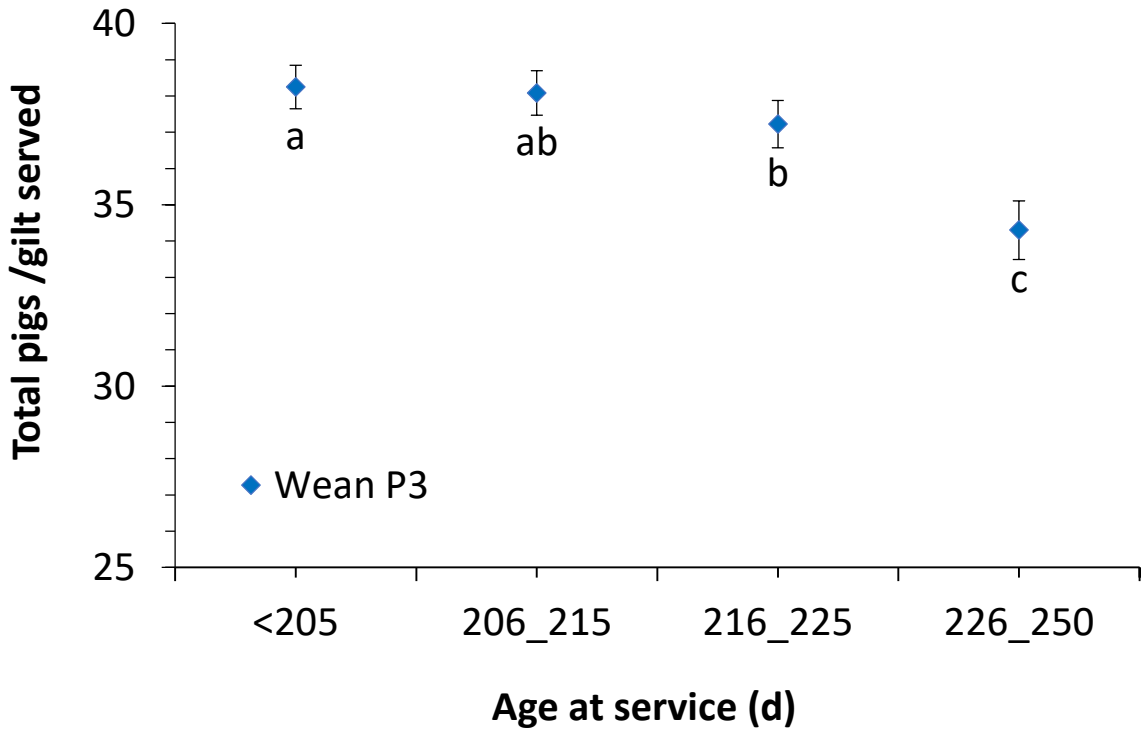
Patterson et al, 2020

Data from 77K+ Camborough herd, overall 16+ TB, 33+PSY evaluated up to 3rd parity
In collaboration with PIC, Keken in Mexico and University of Alberta, Canada

Gilt Breeding Eligibility:

Four key components for gilt eligibility – age at 1st service



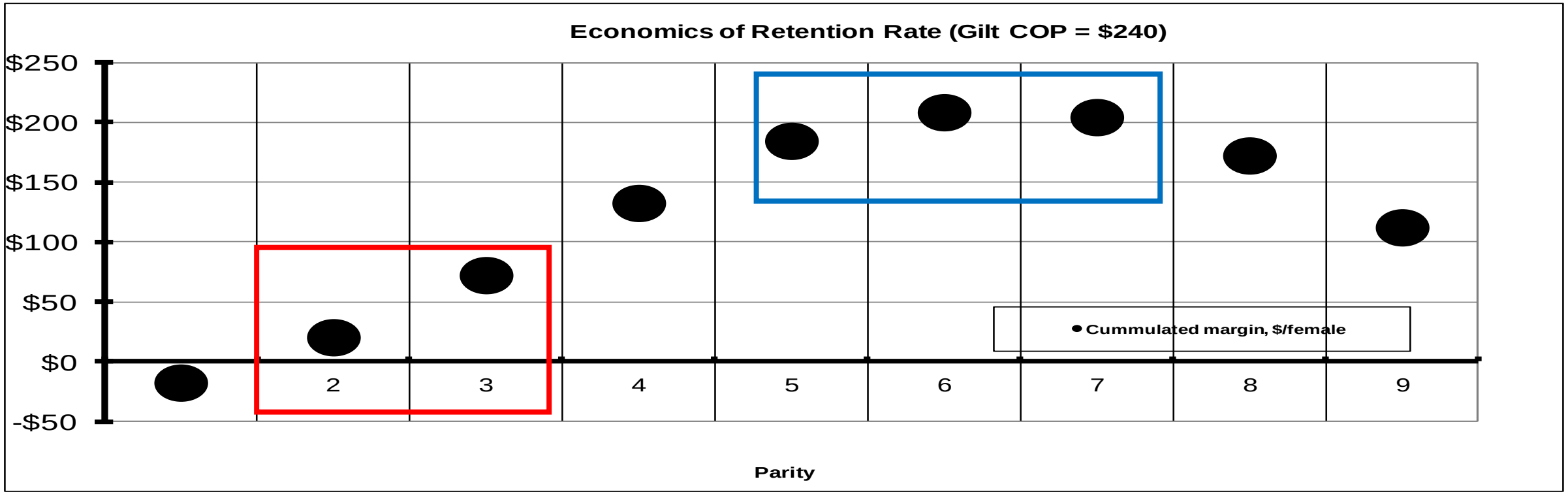


Gilts > 225 days of age at service have a decreased retention to 3rd parity farrowing

Patterson et al, 2020

Why it is important to look at retention rate?

Economics of retention rate

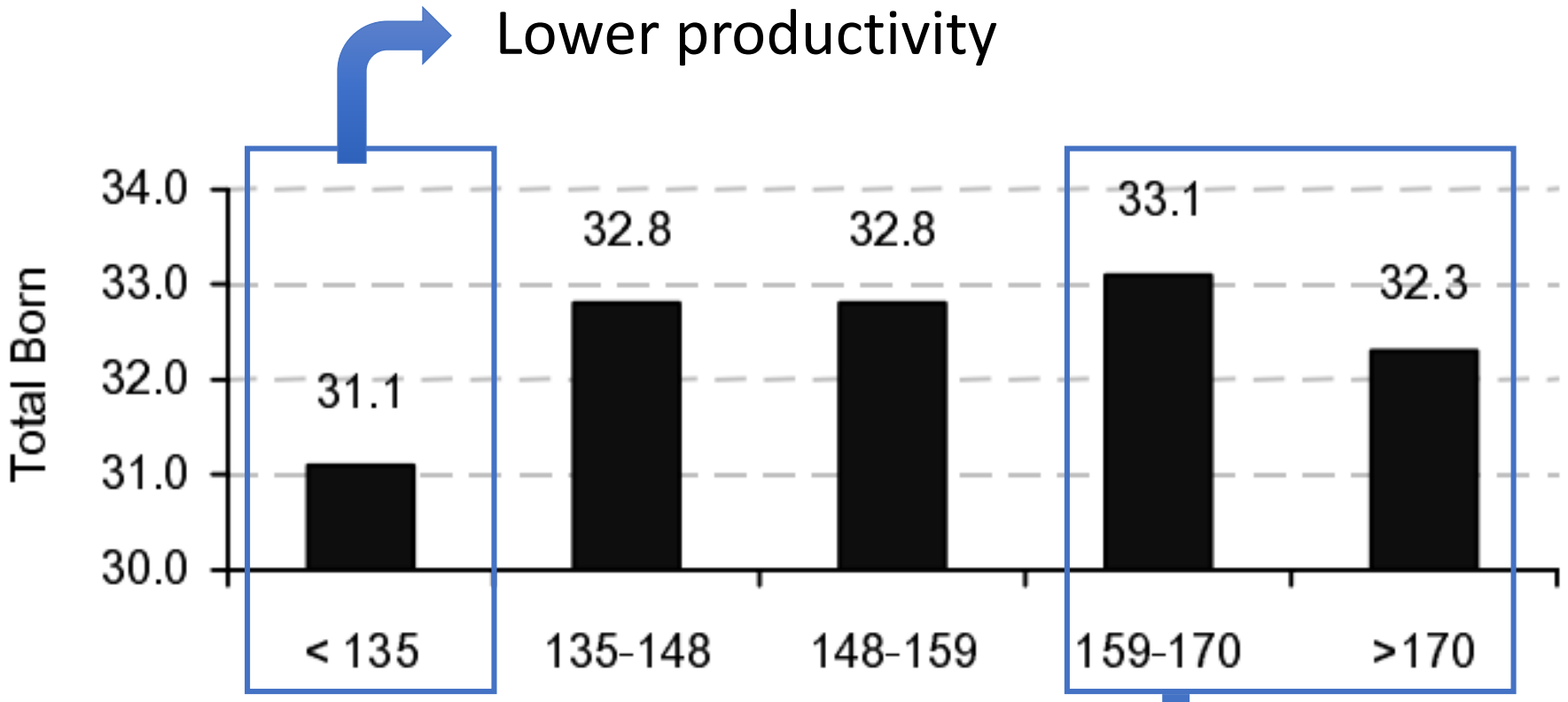


Gilt break even. Almost never at P1. Sometimes after P2 and P3. It varies by performance, input costs and piglet value

Female maximized profitability. Usually not earlier than P5, thus we recommend P5 as average age at removal

Nutrition and feeding during gilt development

Impact of individual weight of gilts at 1st service on total born through 3 parities

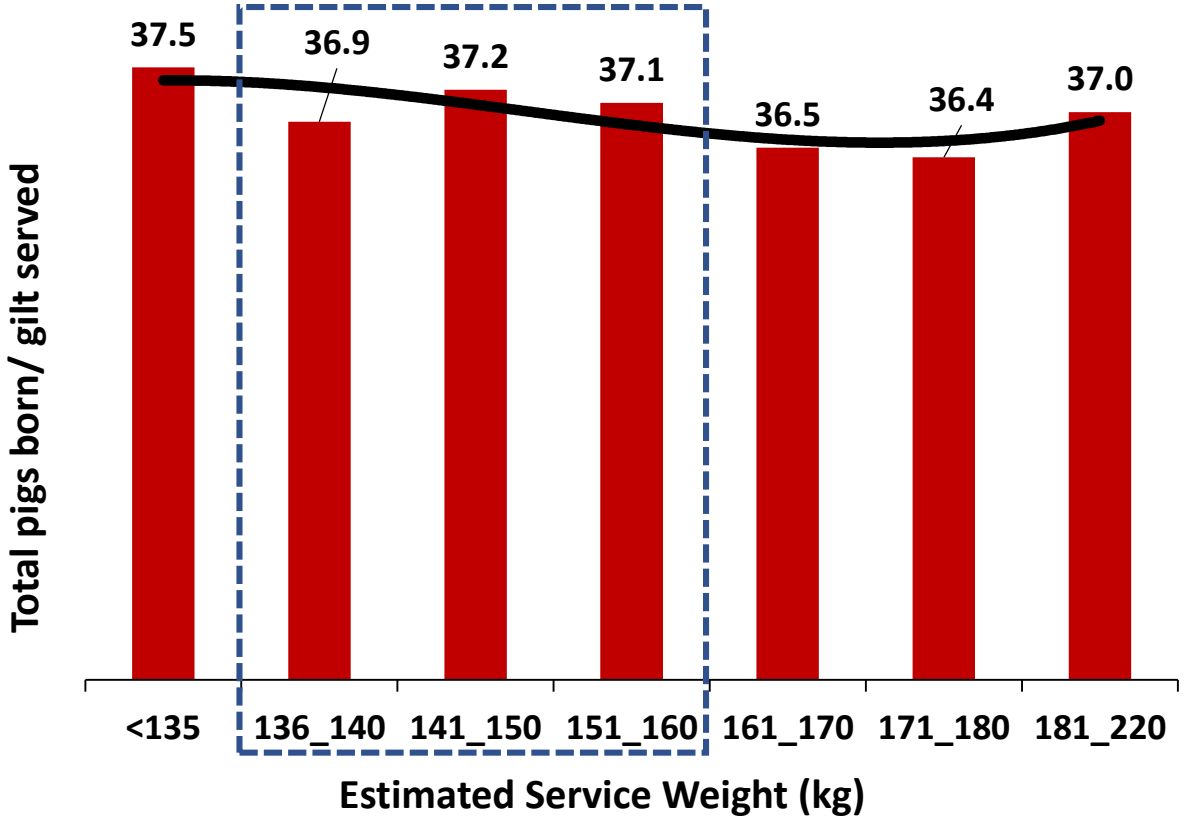


Williams, Patterson, and Foxcroft (2005)

Gilt Breeding Eligibility:

Four key components for gilt eligibility – weight at first service

Camborough



Delaying first breeding to achieve heavier weights only add cost as gilts bred heavier tend to have lower retention and ultimately tend to produce less pigs in their lifetime.

Patterson et al, 2020

Factors that influence colostrum yield and quality

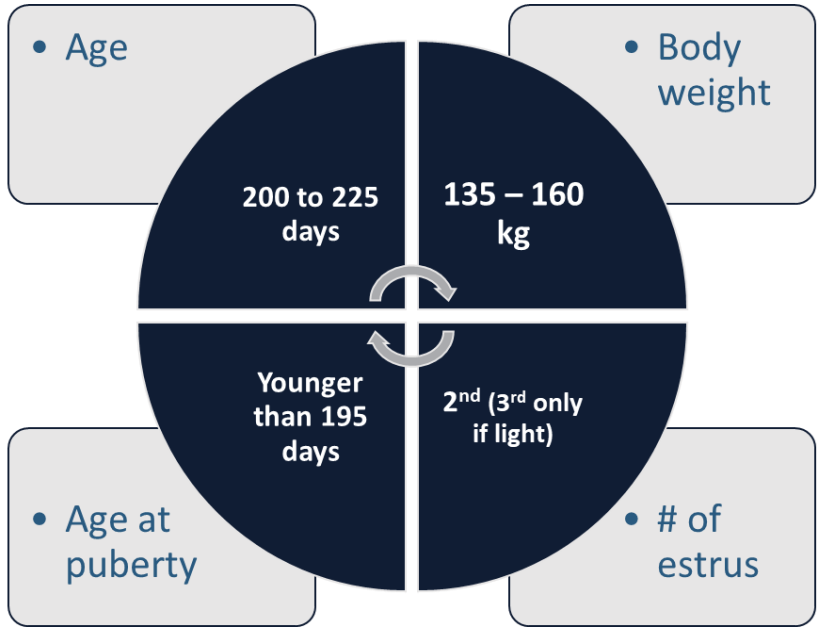
Mammary development – as influenced by pre-pubertal feeding

- Feed restriction (compared to *ad libitum* feeding) from d 90 of age until puberty drastically reduced mammary parenchymal tissue mass and *ad libitum* feeding stimulates mammary development[1,2]

[1] Farmer et al, 2004, [2] Sørensen et al., 2006

- Our recommendation in PIC is to provide gilts with *ad libitum* access to feed from birth to breeding whilst considering the 4 key elements and targets

Average Daily Gain from birth to 1st breeding		
Age, days	225	200
Weight, kg	135	160
ADG, g	600	800



[3] Patterson et al. 2020

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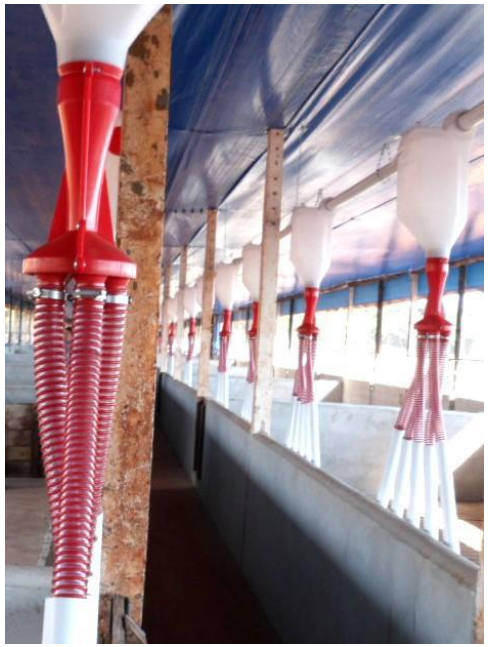
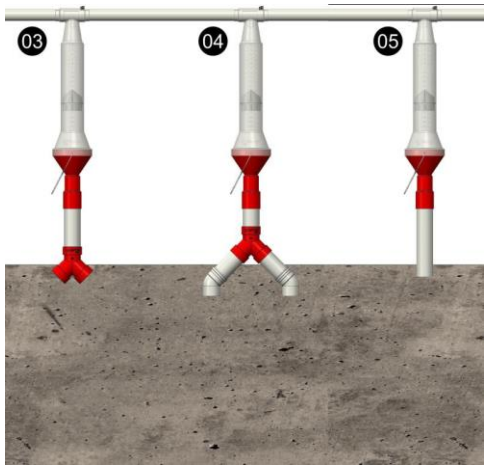
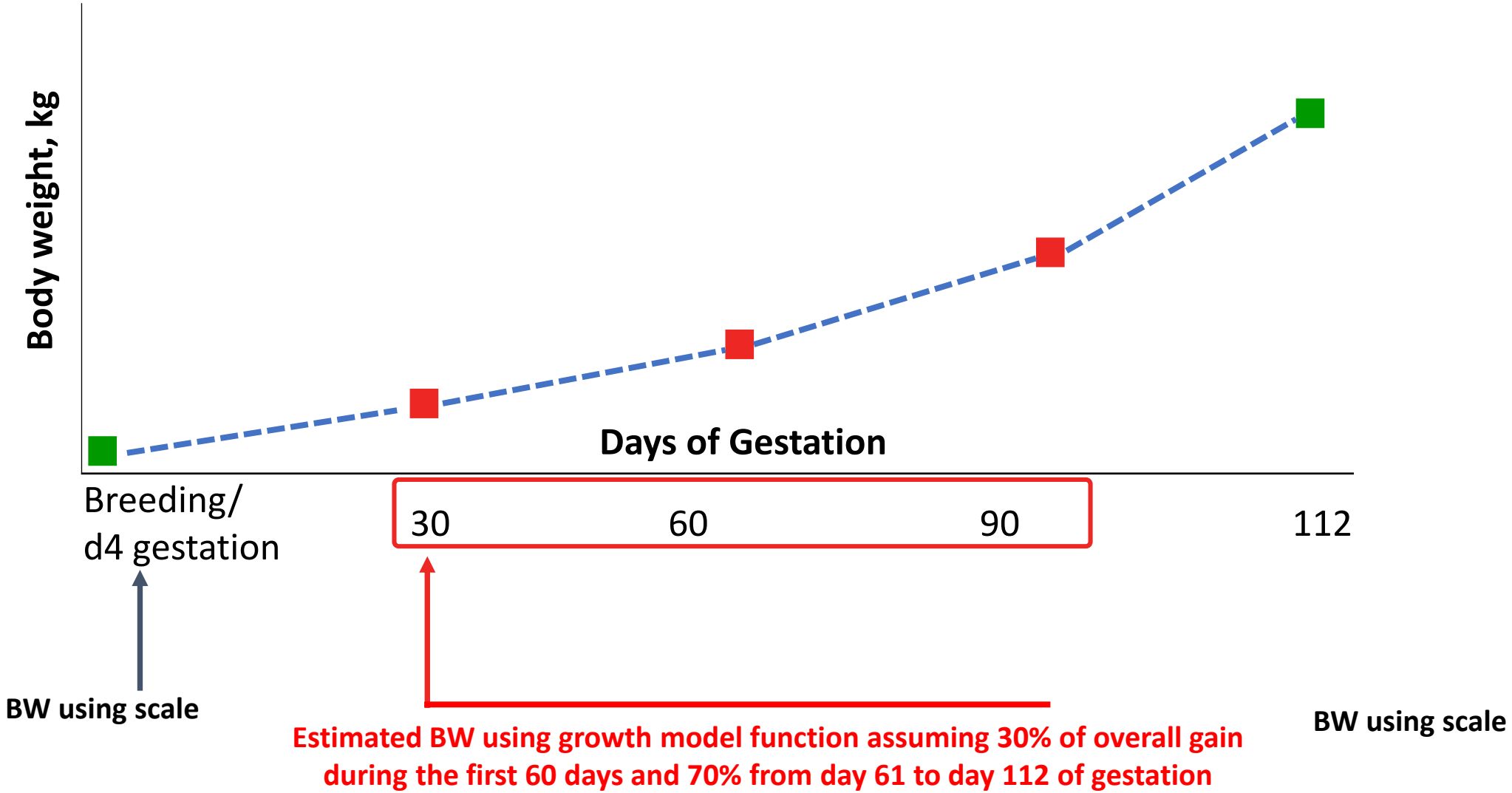




Nutrition and feeding during gestation

PIC Feeding Program for Gilts and Sows

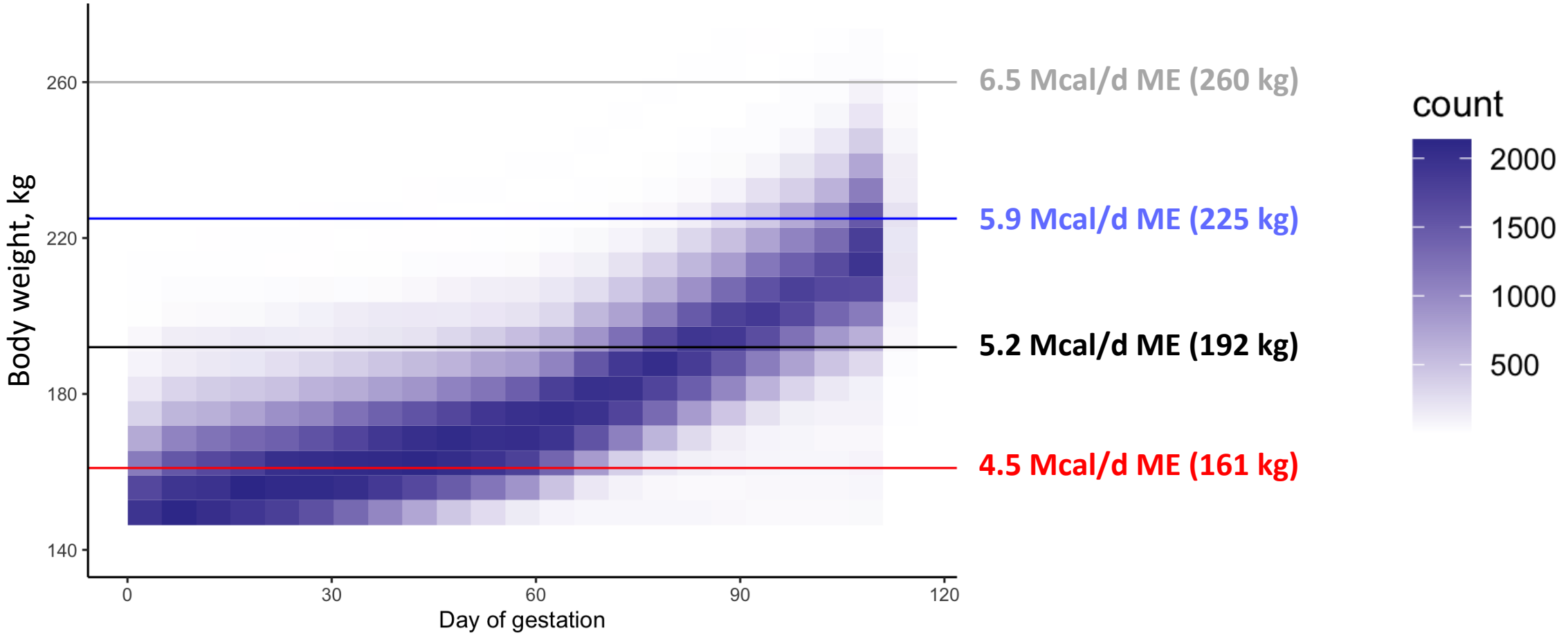


Source: Thomas et al., 2018 and Agroceres PIC, unpublished data

Data from 2475 gilts collected in a sow farm in the South of Brazil and in a sow farm in the USA Midwest

Nutrition and feeding during gestation for gilts

Gilt weight at 100% of the energy requirement for maintenance based on different feeding levels – 100% of gilts



Source: Thomas et al., 2018 and Agroceres PIC, unpublished data

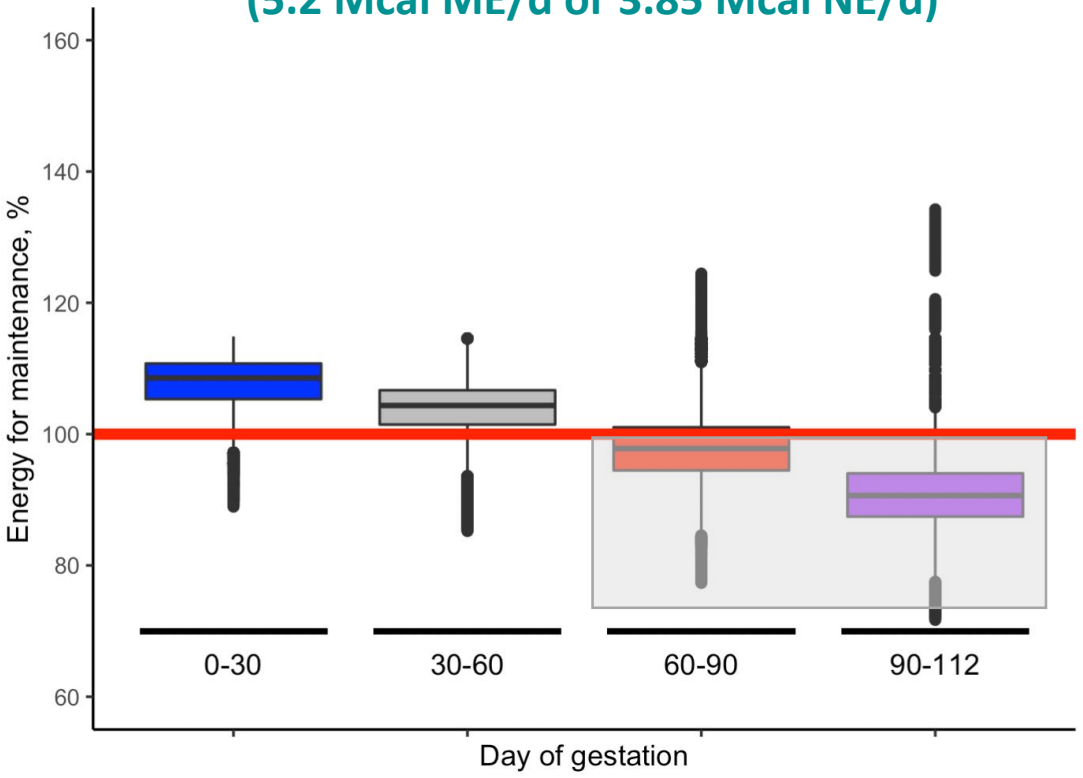
Data from 2475 gilts collected in a sow farm in the South of Brazil and in a sow farm in the USA Midwest

Nutrition and feeding during gestation for gilts

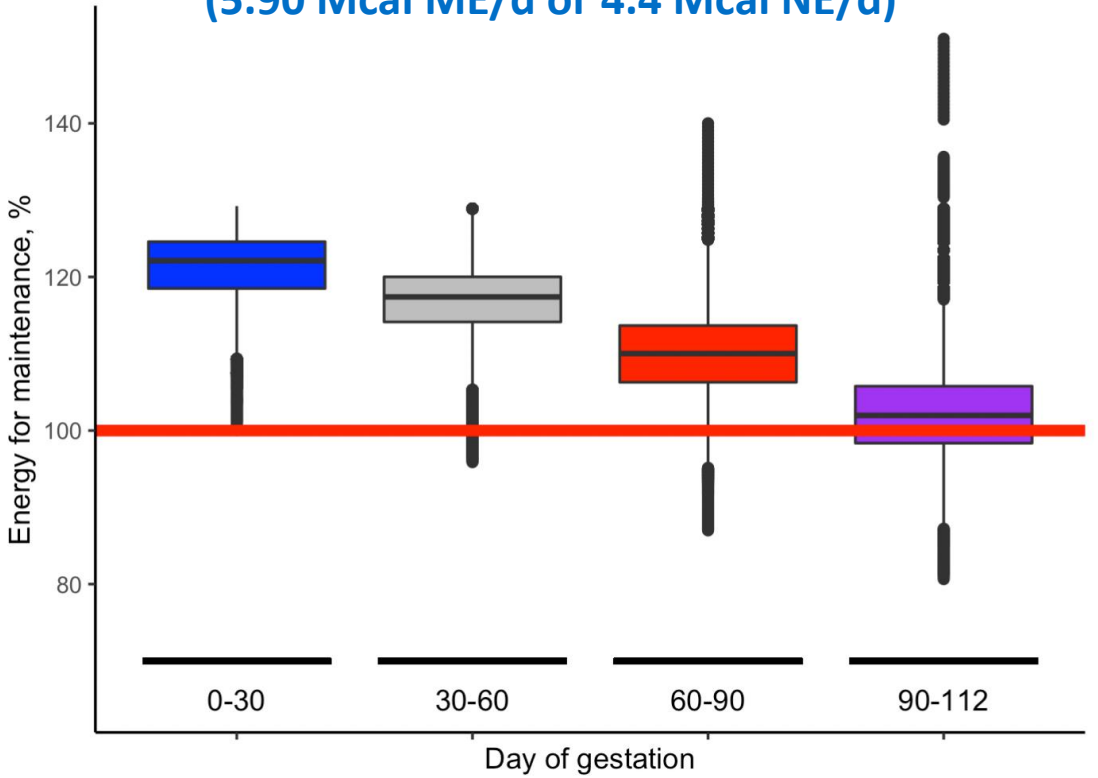
Proportion of the females fed under/above energy requirement for maintenance at different gestation feeding levels – 692 heavy gilts (>160kg)

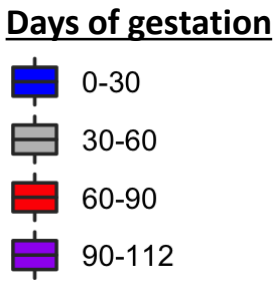
It assumes a minimum of 11.0 grams of Standardized Ileal Digestible Lysine intake per day on a herd basis

Feeding below PIC recommendation of (5.2 Mcal ME/d or 3.85 Mcal NE/d)



Feeding at PIC recommendation of (5.90 Mcal ME/d or 4.4 Mcal NE/d)





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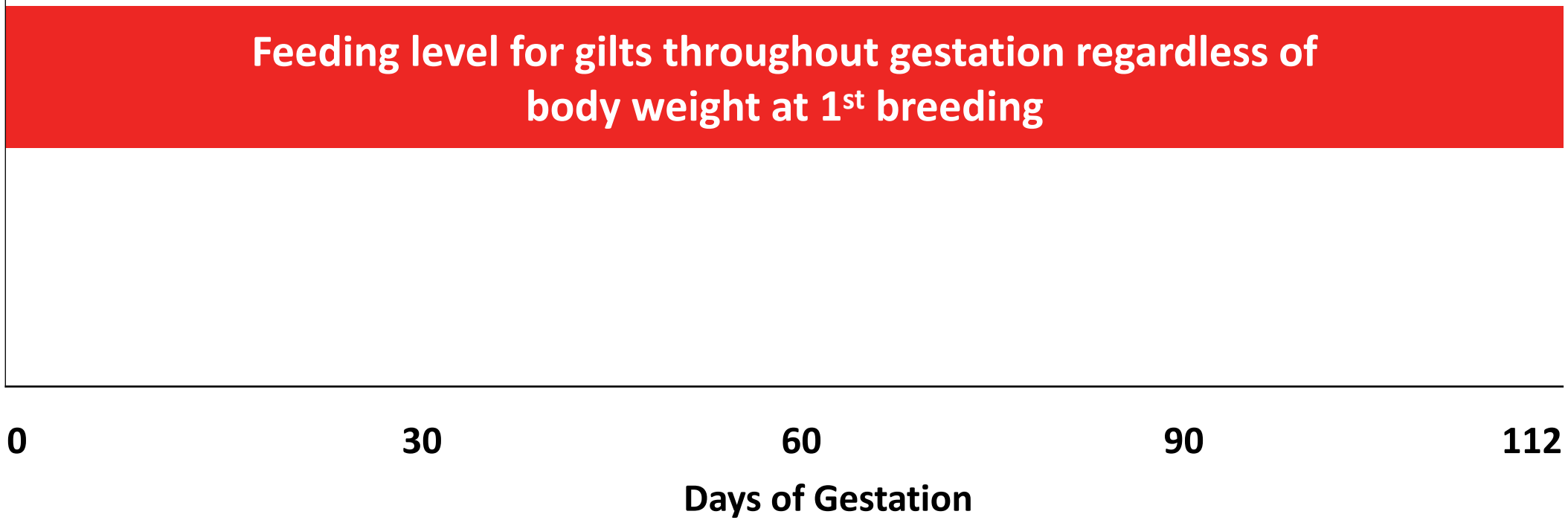
Nutrition and feeding during gestation

GILTS

It assumes a minimum of 11.0 grams of Standardized Ileal Digestible Lysine intake per day on a herd basis

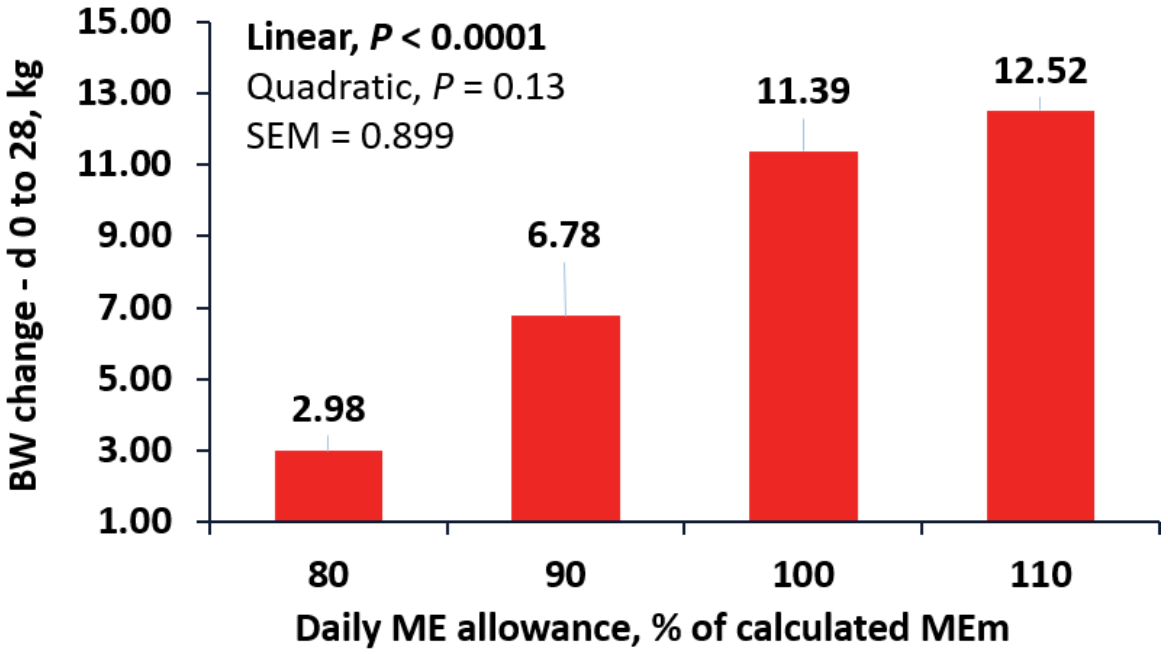
5.9 Mcal ME/d
4.4 Mcal NE/d

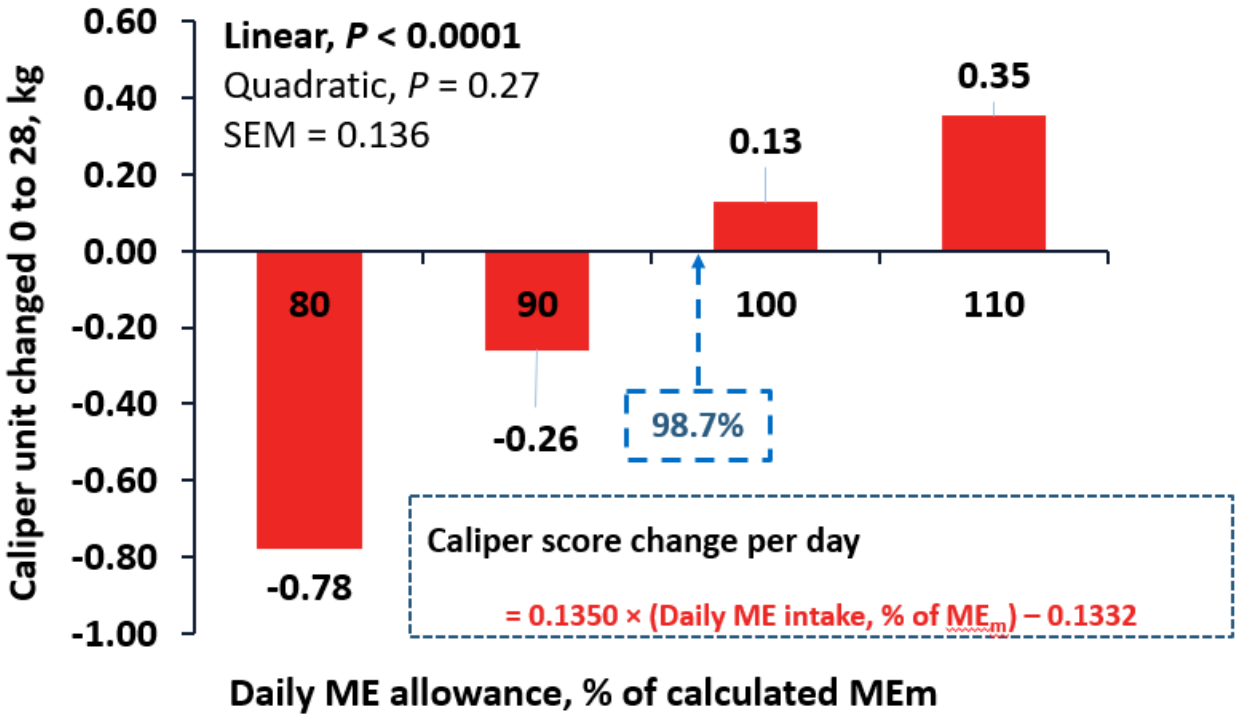


*This energy concentration would achieve ~140% of maintenance @1st breeding for gilts averaging 325 lbs (147 kg)

Impact of feeding levels during mid-gestation on body weight and condition changes

Evaluation of the NRC (2012) model in estimating standard maintenance ME requirement of PIC sows during mid-gestation





Only weight gain doesn't necessary imply improvement in body condition

Feeding 98.7% daily ME allowance is predicted to result in no change in caliper score

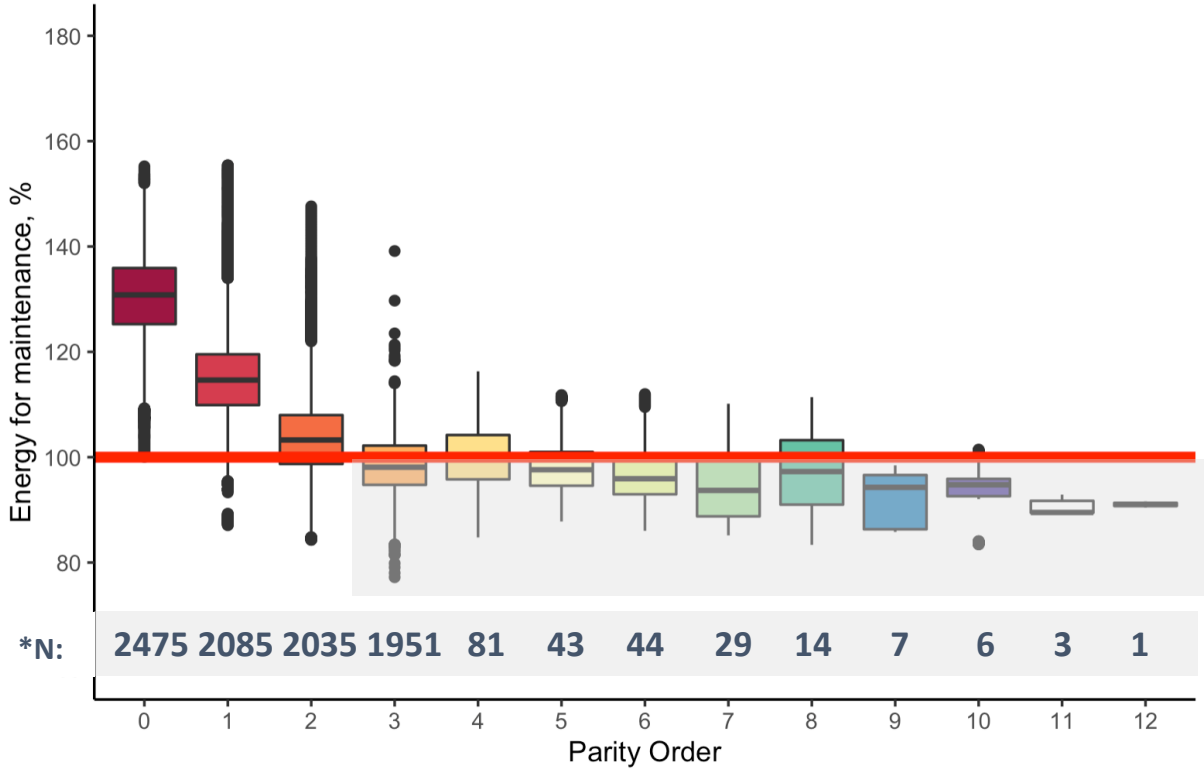
Knauer et al., 2020

Nutrition and feeding during gestation

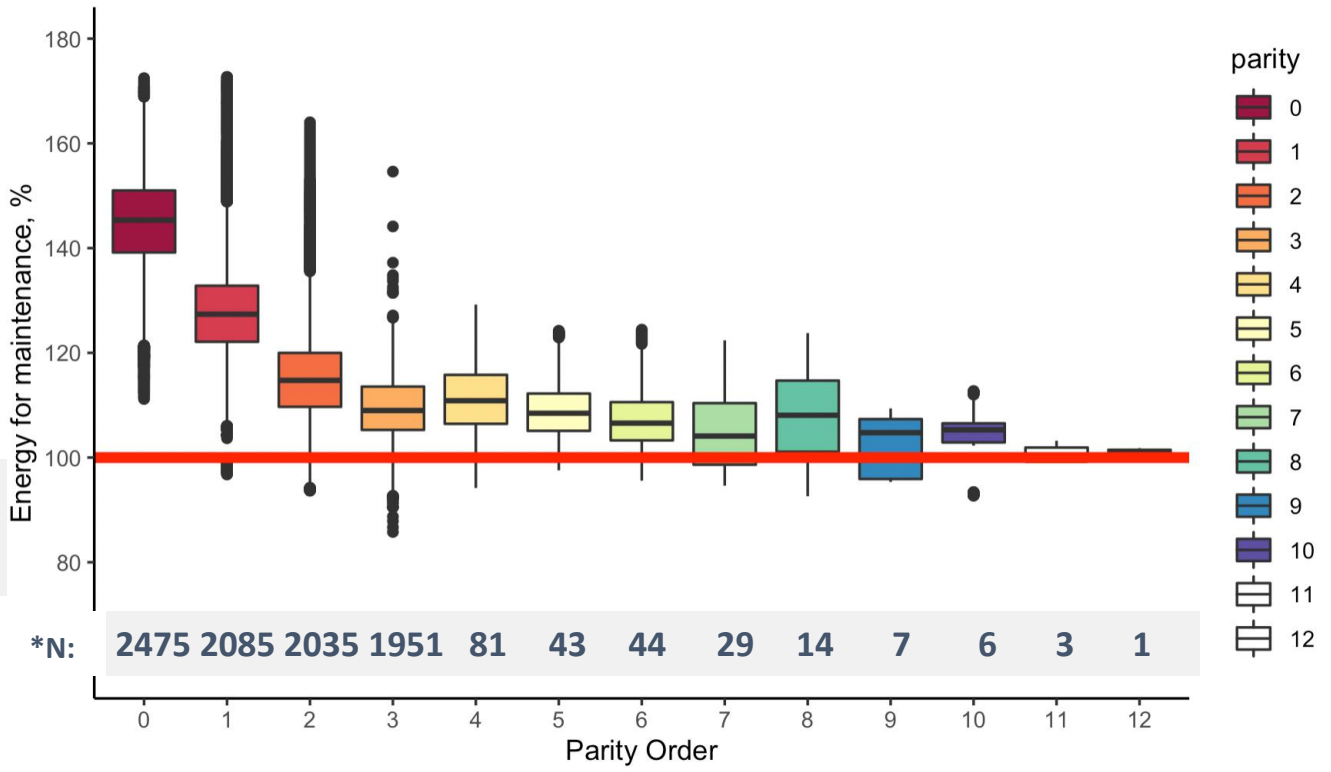
Proportion of females fed under/above the energy requirement for maintenance at different gestation feeding levels according to parity category

It assumes a minimum of 11.0 grams of Standardized Ileal Digestible Lysine intake per day on a herd basis

Feeding at PIC recommendation of (5.90 Mcal ME/d or 4.4 Mcal NE/d) during EARLY gestation



Feeding above PIC recommendation of (6.46 Mcal ME/d or 4.82 Mcal NE/d) during EARLY gestation



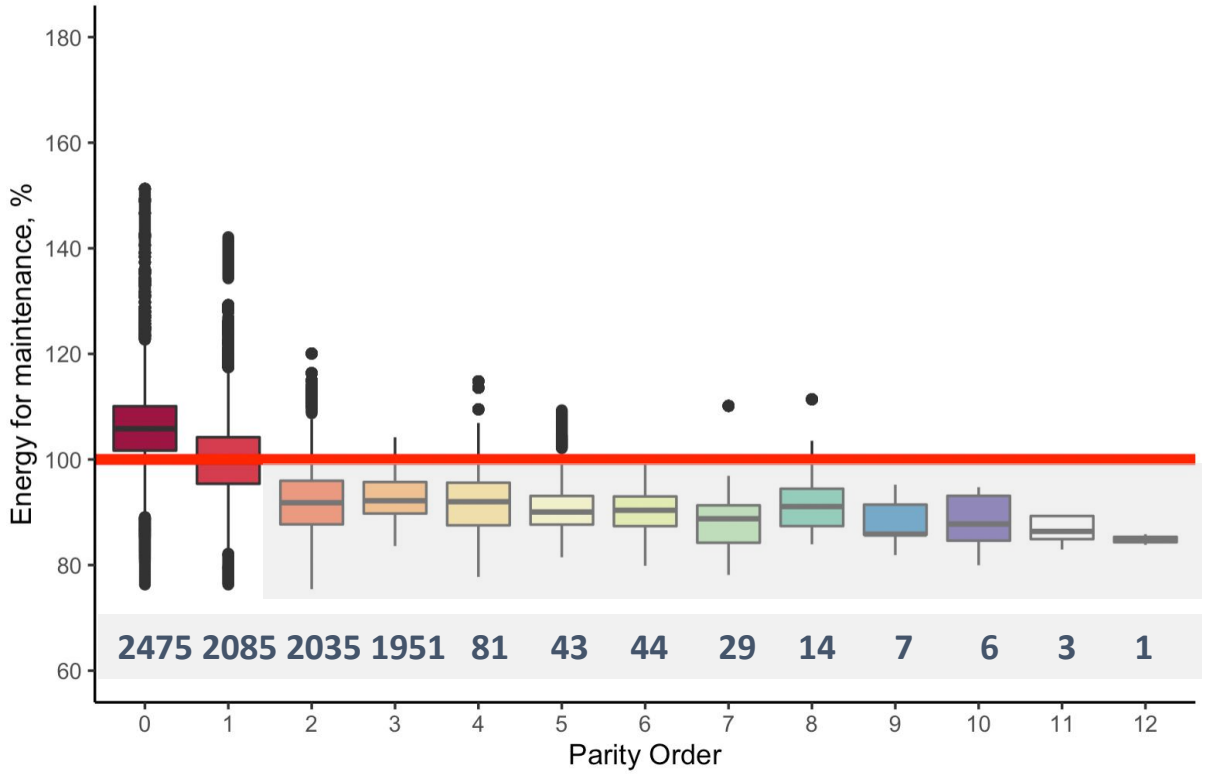
Sow body weight data (Thomas et al., 2018 and Agroceres PIC, unpublished)
*Number of females

Nutrition and feeding during gestation

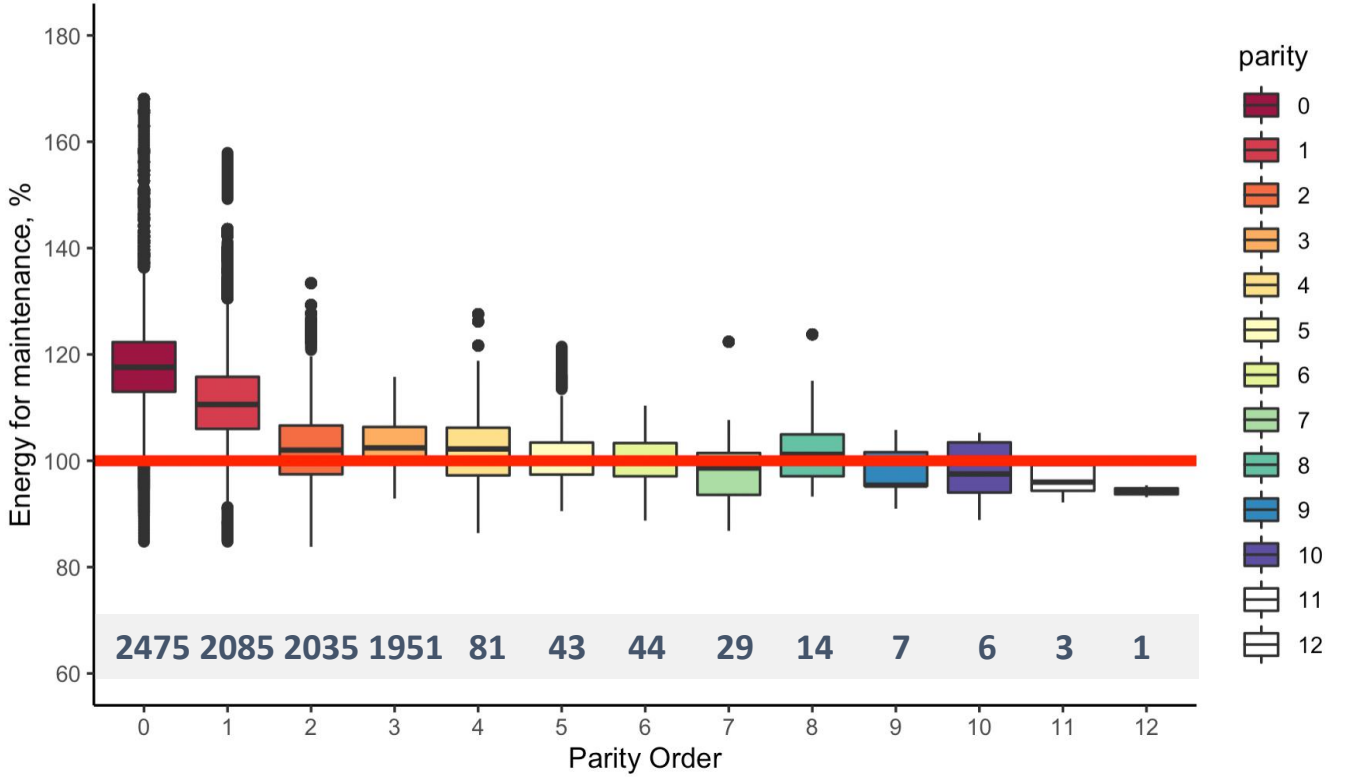
Proportion of females fed under/above the energy requirement for maintenance at different gestation feeding levels according to parity category

It assumes a minimum of 11.0 grams of Standardized Ileal Digestible Lysine intake per day on a herd basis

Feeding at PIC recommendation of (5.90 Mcal ME/d or 4.4 Mcal NE/d) during LATE gestation



Feeding above PIC recommendation of (6.46 Mcal ME/d or 4.82 Mcal NE/d) during LATE gestation



Sow body weight data (Thomas et al., 2018 and Agroceres PIC, unpublished)

Nutrition and feeding during gestation

SOWS

It assumes a minimum of 11.0 grams of Standardized Ileal Digestible Lysine intake per day on a herd basis

THIN

- Sows in thin condition at **any stage of gestation**: 8.0 Mcal ME/d or 6.1 Mcal NE/d.
- Feeding this level for **30 d** results in an estimated gain of ~2 caliper units.
- **Re-assess body condition** to determine if sows have recovered to ideal condition.

***IDEAL**
5.9 Mcal ME/d
4.4 Mcal NE/d

Base level for ideal sows to gain ~ 1.7 caliper units throughout gestation

FAT

- Sows in fat condition from **d 0-30 and d 90-112**: 5.9 Mcal ME/d or 4.4 Mcal NE/d.
- Sows in fat condition from **d 30-90**: 4.9 Mcal ME/d or 3.7 Mcal NE/d.
- It is very difficult to adjust the body condition of a fat sow during gestation.

*Estimated based on an average body weight of **440 lbs (200 kg)**.

*For sows in ideal or fat condition **from third gestation on (parity 2+)**, during early (before preg. check) and late gestation (~d90), increase the **base feeding level** by **0.3 lbs/d (0.15 kg/d)** to avoid feed below the energy required for maintenance

Nutrition and feeding during gestation

Early Gestation

Descriptive summary of different early gestation feeding levels on embryo survivability and hormone secretion of gilts and sows

REFERENCE	SAMPLE SIZE	STAGE	GESTATION DAYS	WEIGHT AT BREEDING, kg	ME_m, Mcal/d	DIETARY ME, Mcal/kg	FEEDING LEVEL, kg/d		% OF ME_m		RESPONSE CRITERIA		
							CON.	TRT.	CON.	TRT.	EMBRYO SURVIVABILITY	PLASMA PROGESTERONE	TOTAL BORN
Jindal et al., 1996	48	Gilt	1 – 15	116	3.52	2.71	1.9	2.6	146%	200%	-22%	-57%	-
De et al., 2008	36	Gilt	1 – 35	-	-	2.91	-	-	120%	200%	-20%	-14%	-
Athorn et al., 2013	18 or 19	Gilt	0 – 10	126	3.76	2.89	1.5	2.8	115%	215%	19%	26%	-
Langendijk et al., 2015	21	Gilt	10 – 11	103	3.22	2.87	0.0	2.5	0%	223%	-	-8%	24%
Virolainen et al., 2005	12	Sow	1 – 35	252	6.32	2.83	2.0	4.0	89%	179%	-35%	-25%	-
Hoving, 2012	37	Sow	3 – 35	170	4.71	3.11	2.5	3.3	165%	215%	2%	ns	
Mallmann et al, 2020	244	Sow	6 – 30	197	5.26	3.15	1.8	2.5	108%	150%	-	-	0%
Mallmann et al, 2020	239	Sow	6 – 30	197	5.26	3.15	1.8	3.2	108%	192%	-	-	-8%
Weighted Average	**-**		**-**	**185**	**5.00**	**3.08**	**1.8**	**2.9**	**111%**	**180%**	**-12%**	**-24%**	**-2%**

PIC Base Level (Gilt/Sow)	**150/200**	**4.18/5.32**	**3.23**	**1.8**	**141%/111%**
PIC Thin Level (Sow)	**190**	**5.12**	**3.23**	**2.5**	**157%**

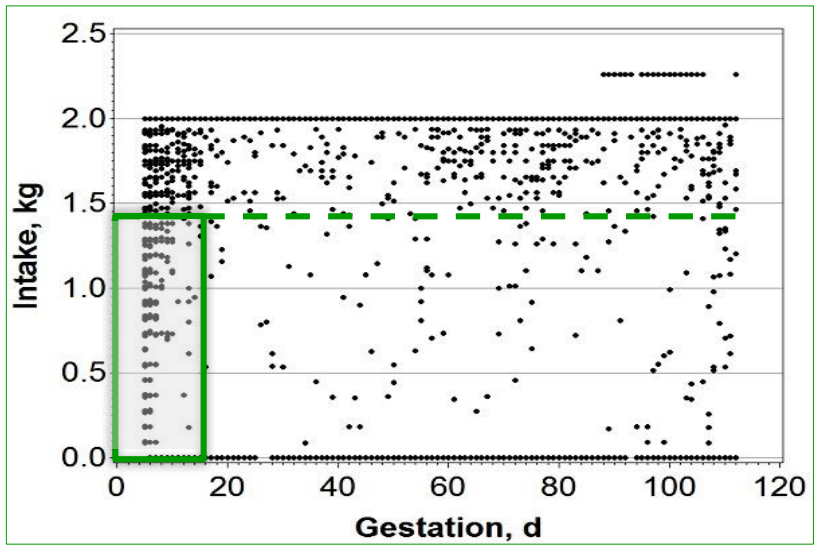
Nutrition and feeding during gestation

Early Gestation

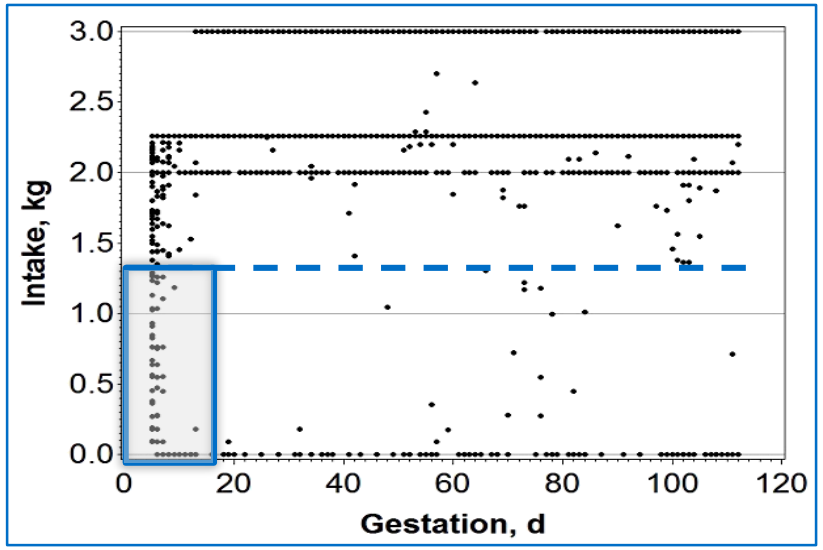
Group-housed **gilts** and **sows** fed via electronic feeding system struggle to consume their full feed allowance during early gestation.

Parity 1 and 2+ sows begin to consume their allowance much faster than gilts.

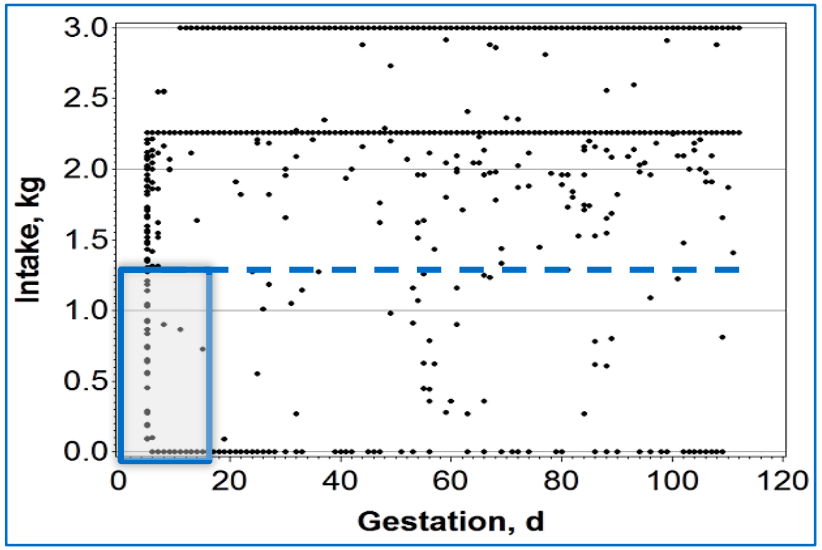
Intake records: *n* = 74,114 (PIC 1050, PIC®)



Gilts



Parity 1 sows



Parity 2+ sows

Average gilt and sow weight = 165 kg

ME for maintenance= 4.60 Mcal of ME/day which is equivalent to 1.43 kg/d

Thomas et al., 2016

Nutrition and feeding during gestation

Late Gestation

Descriptive summary of bump feeding experiment in PIC sows

REFERENCE	START, DAY OF GESTATION	LITTERS PER TREATMENT	TOTAL BORN	CONTROL,		INCREASED FEED INTAKE,		CHANGES DUET TO EXTRA FEED	
				Mcal ME/d	g SID Lys/d	Mcal ME/d	g SID Lys/d	BW GAIN per kg OF EXTRA DAILY FEED, kg	PIGLET BIRTH CHANGE, g
Shelton et al. 2009	90	32	12.4	**7.9**	**11.9**	11.4	19.9	4.9	-109
Soto et al. 2011	100	51	12.9	**7.9**	**11.2**	13.9	19.5	NR	-69
Gonçalves et al. 2015	90	181	15.1	**5.9**	**10.7**	8.9	10.7	9.0	47
Gonçalves et al. 2015	90	181	15.3	**5.9**	**20.0**	8.9	20.0	10.8	19
Greiner et al. 2016	95	128	14.7	**5.9**	**9.0**	8.8	14.0	7.1	-40
Mallmann et al., 2018	90	221	15.4	**5.9**	**11.7**	7.2	14.3	9.0	-4
Average	---	---	**14.3**	**6.6**	**12.4**	**9.9 (50%)**	**16.4 (32%)**	**8.9**	**-1.3**
Standard deviation	---	---	**1.3**	**1.0**	**3.9**	**2.4**	**3.9**	**1.6**	**44.2**

Nutrition and feeding during gestation

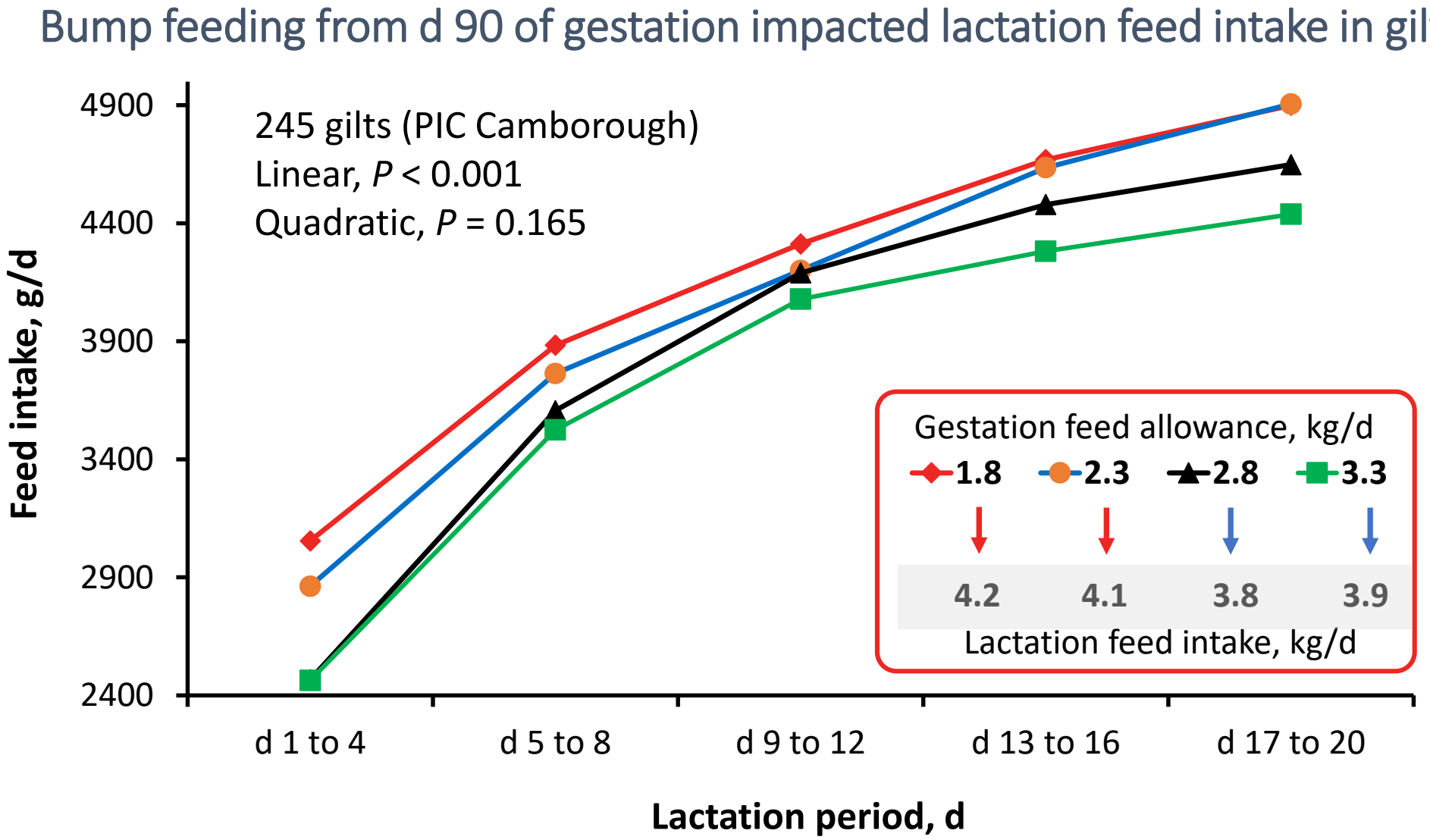
Late Gestation

Descriptive summary of bump feeding experiment in PIC **gilts**

REFERENCE	START DAY OF GESTATION	LITTERS PER TREATMENT	TOTAL BORN	CONTROL		INCREASED FEED INTAKE		CHANGES DUET TO EXTRA FEED	
				Mcal ME/d	g SID Lys/d	Mcal ME/d	g SID Lys/d	BW GAIN per kg OF EXTRA DAILY FEED, kg	PIGLET BIRTH CHANGE, g
Shelton et al. 2009	90	21	14.3	**6.8**	**11.9**	**9.8**	**17.1**	6.6	86
Soto et al. 2011	100	24	12.5	**7.0**	**9.8**	**12.9**	**18.2**	NR	126
Gonçalves et al. 2015	90	371	14.2	**5.9**	**10.7**	**8.9**	**10.7**	5.6	24
Gonçalves et al. 2015	90	371	14.2	**5.9**	**20.0**	**8.9**	**20.0**	9.1	28
Greiner et al. 2016	100	65	13.4	**5.9**	**9.0**	**8.8**	**14.0**	NR	-120
Ampaire 2017	90	17	13.4	**7.2**	**12.3**	**8.6**	**14.5**	24	-10
Mallmann et al., 2018	90	50	14.4	**5.9**	**11.7**	**7.2**	**14.3**	6.5	6
Mallmann et al., 2019	90	243	14.1	**5.9**	**11.5**	**7.6**	**14.7**	6.4	26
Mallmann et al., 2019	90	242	14.3	**5.9**	**11.5**	**9.2**	**17.9**	8.8	-1
Mallmann et al., 2019	90	246	14.3	**5.9**	**11.5**	**10.9**	**21.1**	7.9	-11
Average	---	---	**13.9**	**6.2**	**12.0**	**9.3 (49%)**	**16.3 (36%)**	**7.7**	**12.0**
Standard deviation	---	---	**0.6**	**0.5**	**3.0**	**1.6**	**3.2**	**2.4**	**36.1**

Nutrition and feeding during late gestation

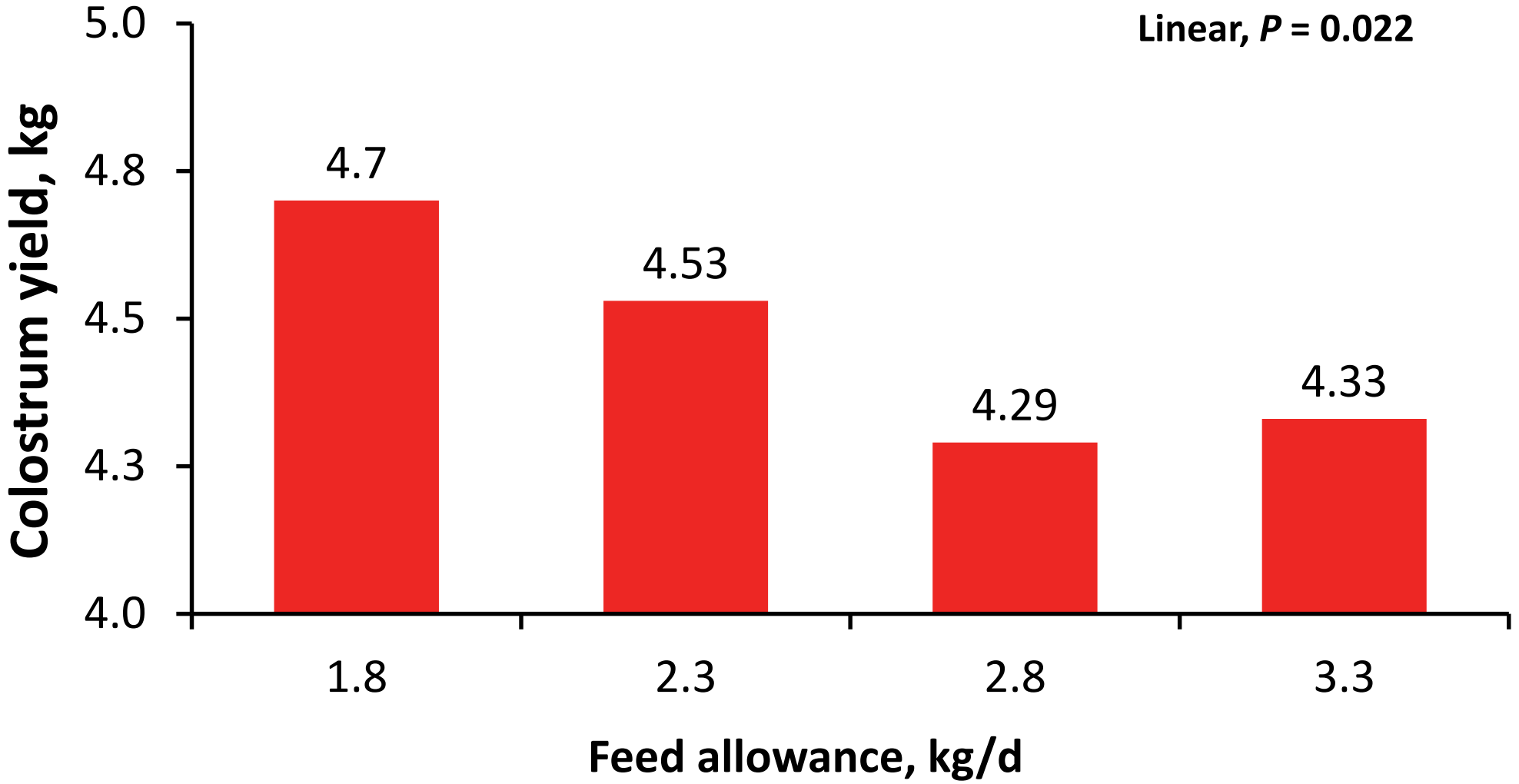
Bump feeding from d 90 of gestation negatively impacted lactation feed intake in gilts



Mallmann et al., 2019

Nutrition and Feeding in Late Gestation

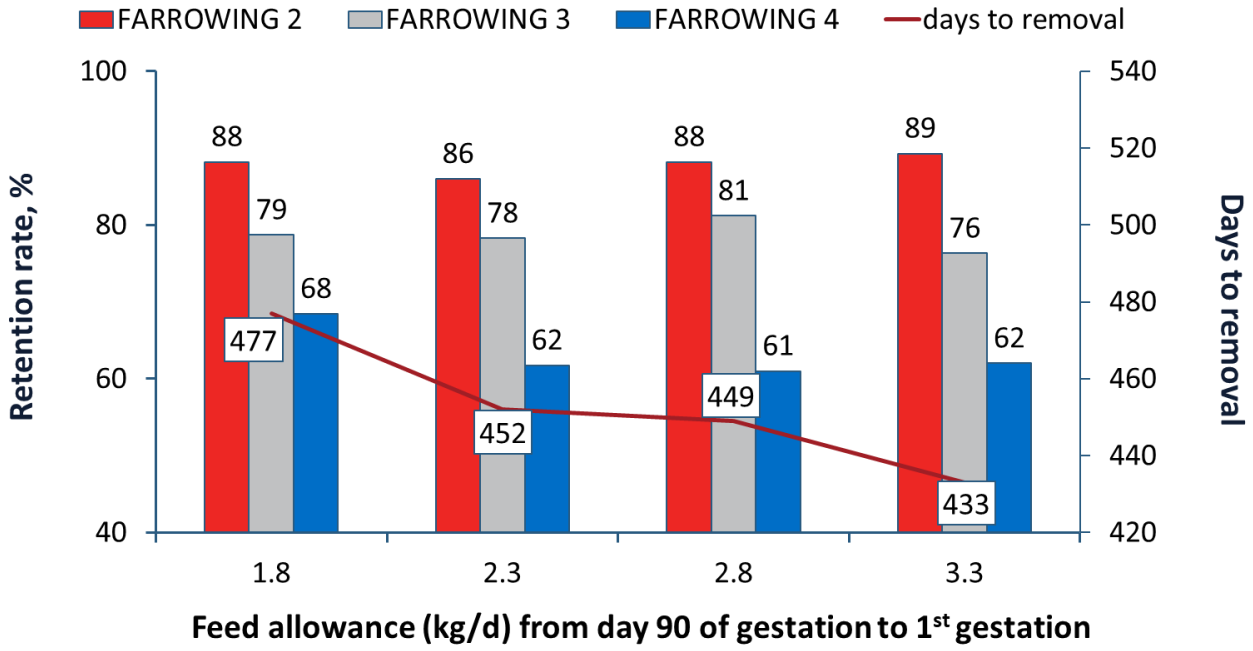
Bump feeding from d 90 of gestation negatively impacted colostrum yield of PIC gilts



Mallmann et al., 2019

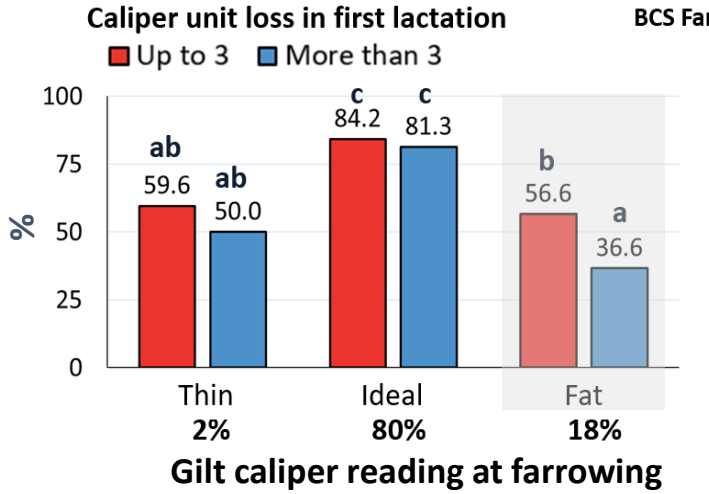
Nutrition and Feeding in Late Gestation

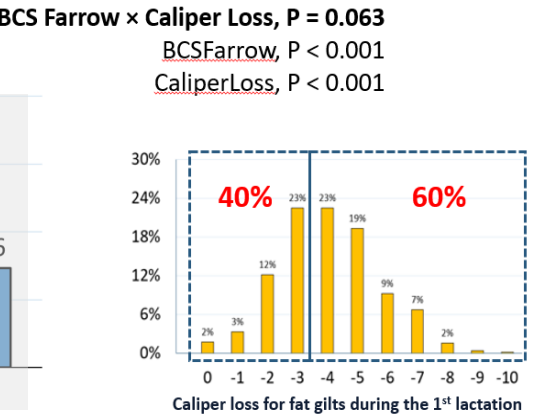
Long term impact of bump feeding during 1st gestation



Mallmann et al., 2019, Unpublished data

Retention up to 3rd parity



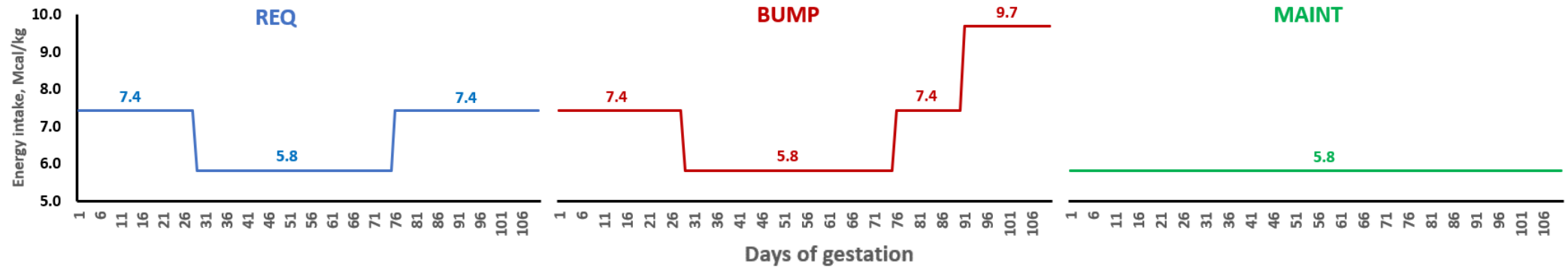


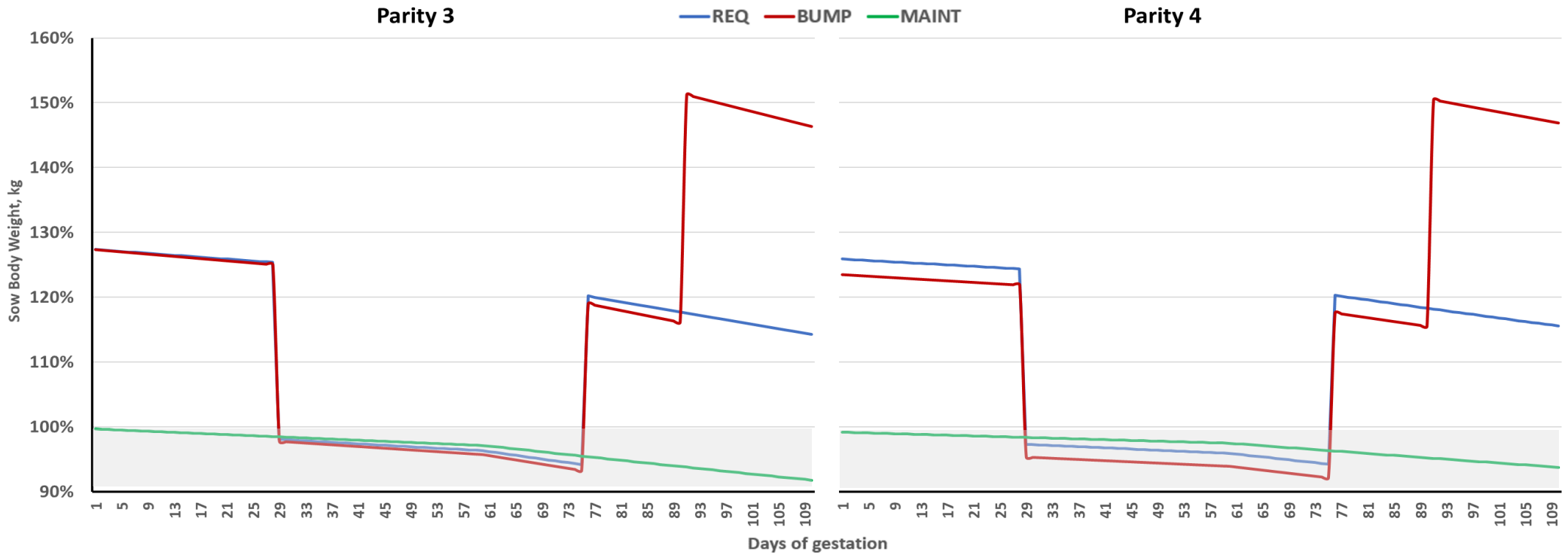
Huerta et al., 2021

Data from 4500 sows measured from parity 1 to 6
In collaboration with Technical Services of UVESA Spain

Nutrition and feeding during gestation

Plane of nutrition during gestation affects reproductive performance and retention rate of hyperprolific sows under commercial conditions

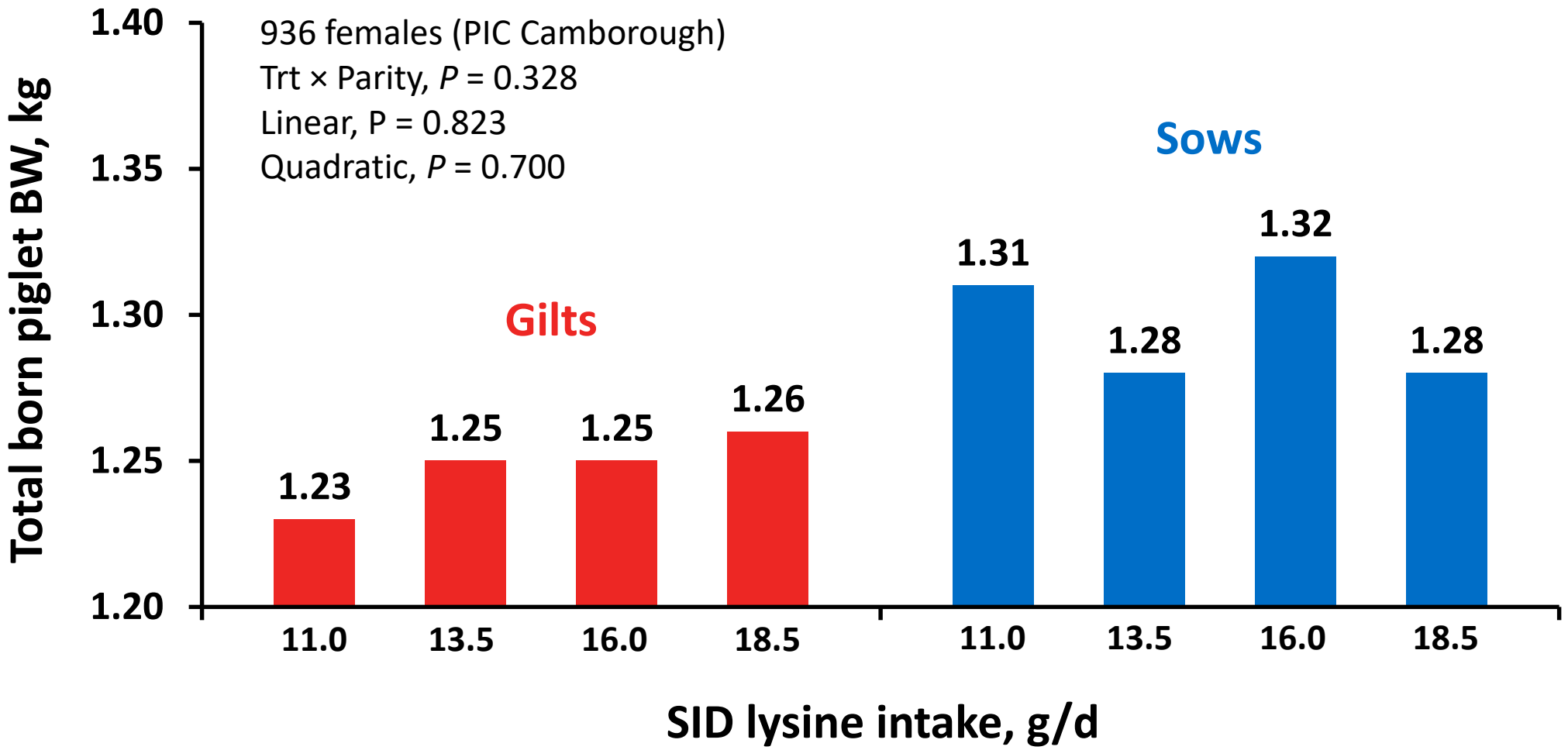




Adapted from Ferreira et al., 2021

Nutrition and Feeding in Late Gestation

Total born piglet birth weight was not affected by increasing SID Lys intake per day



Thomas et al., 2018

Nutrition and Feeding in the Peripartum Period

Goals: to meet the requirements for fetal and mammary tissue growth and colostrum production, prepare the sow for the upcoming lactation demand and supply nutrients during parturition for maximum piglet survival at birth

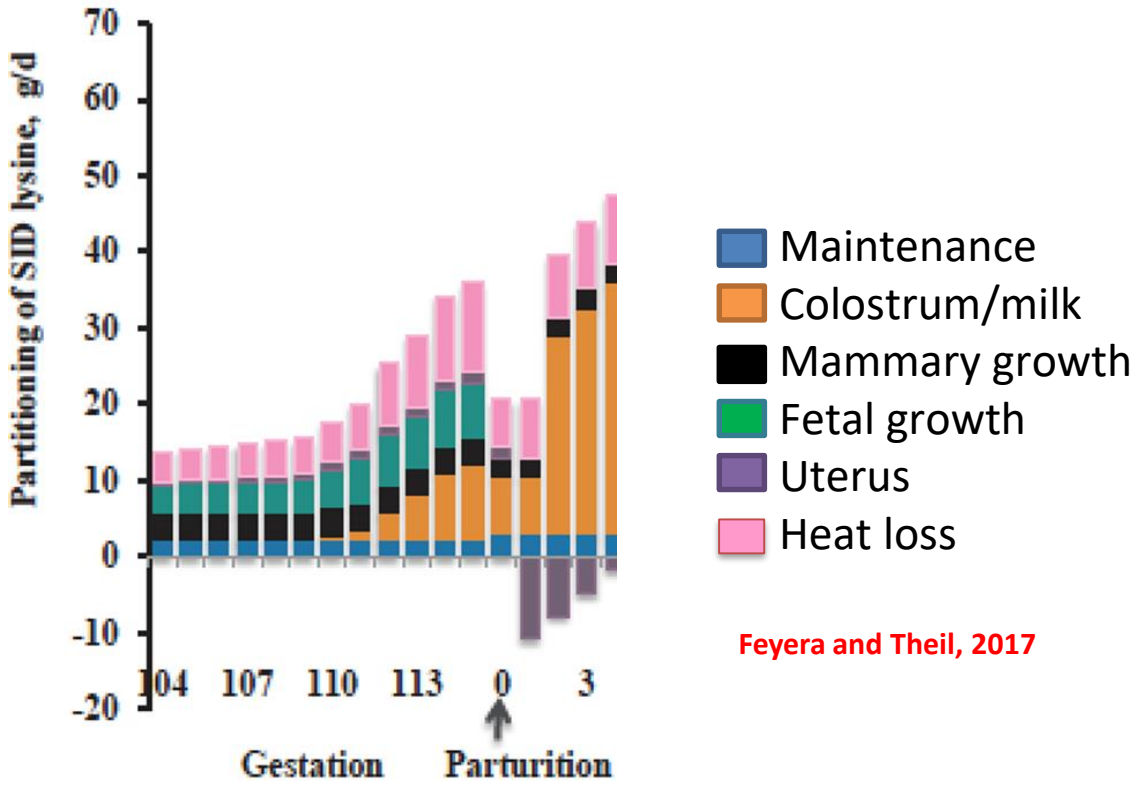
The peripartum period is loosely defined as the last 10 d of gestation to the first 10 d of lactation

Last 12 days prior to farrowing:

- ME requirement increases- 61%
- SID Lys req. increases - 149%

Requirements to support:

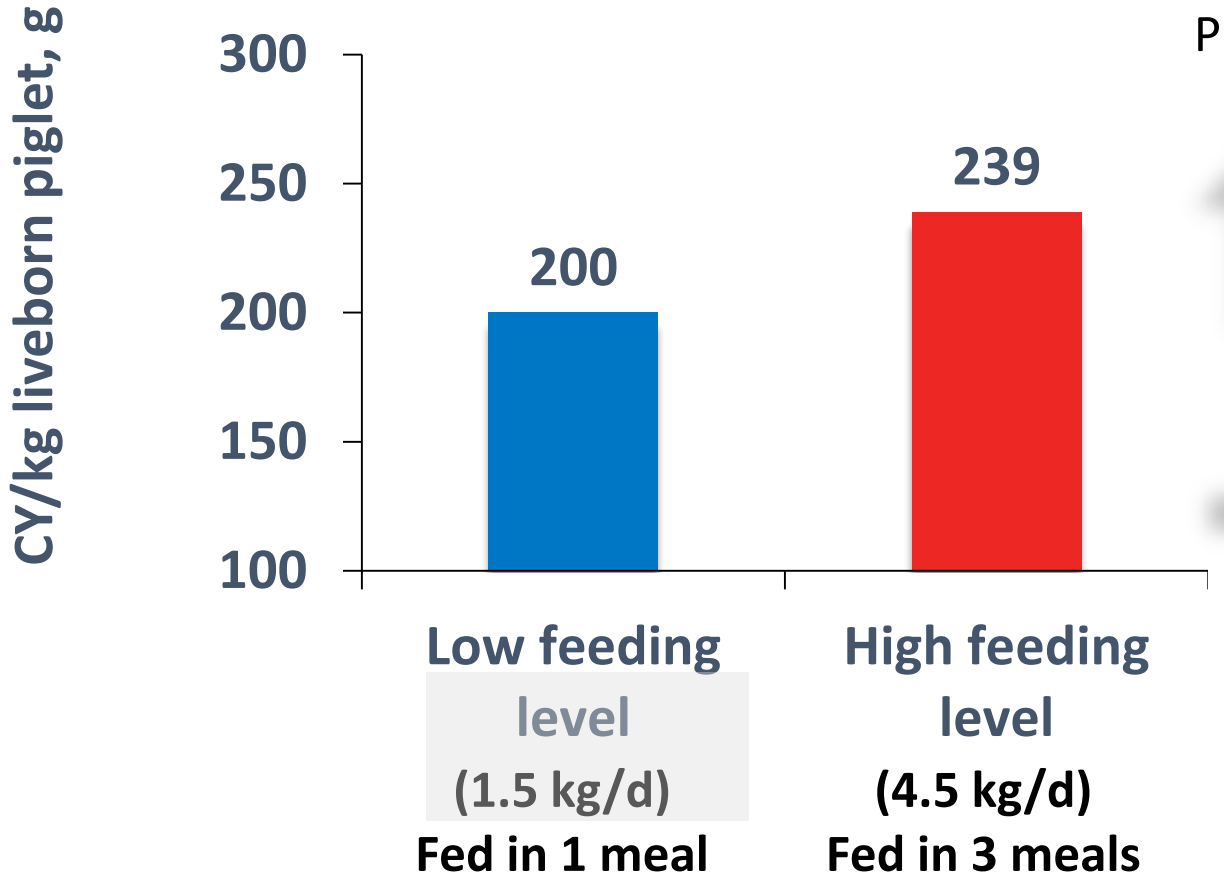
- Fetal growth
- Mammary growth
- **Colostrum production**
- Maintenance
- Uterine components



Feyera and Theil, 2017

Nutrition and Feeding in the Peripartum Period

Feeding level on peripartum influenced colostrum yield and composition (d 108 of gestation until d 3 of lactation)



n = 50 sows (PIC Camborough)

P < 0.05

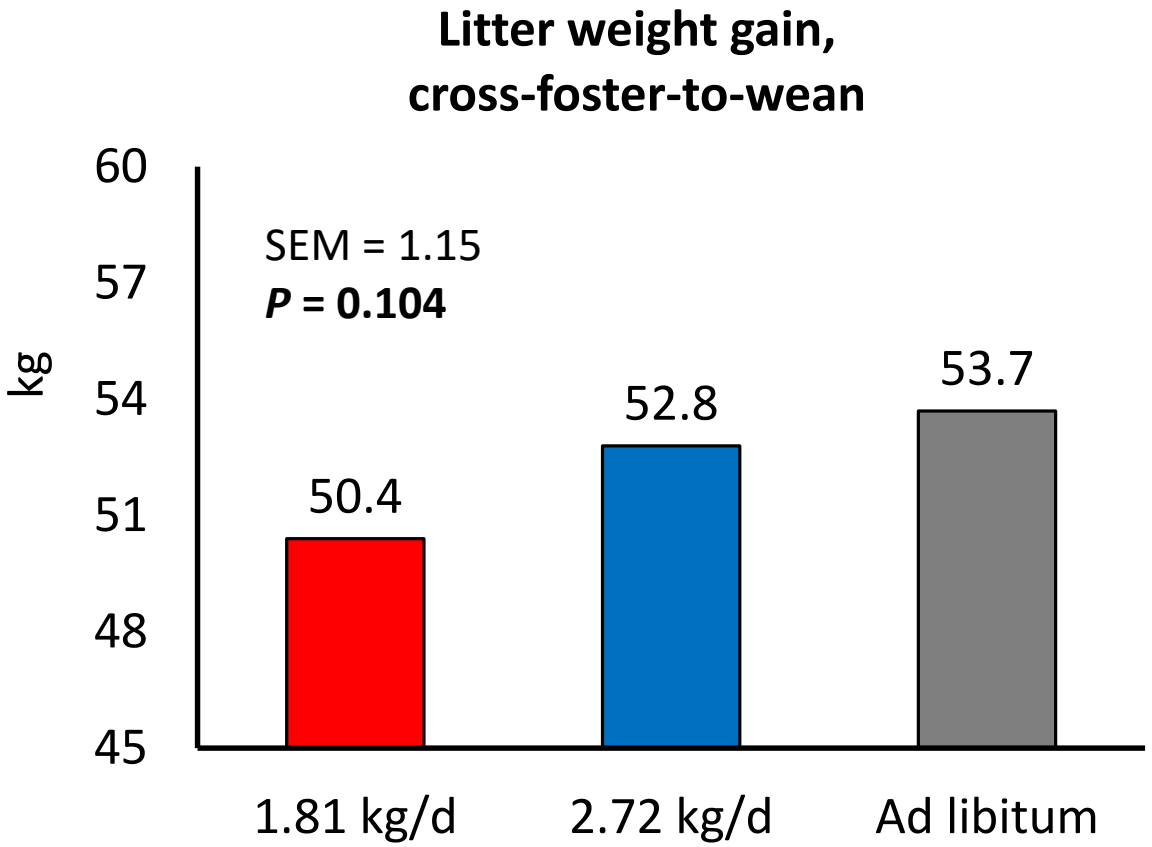
Concentration of lactose and n-3 PUFA

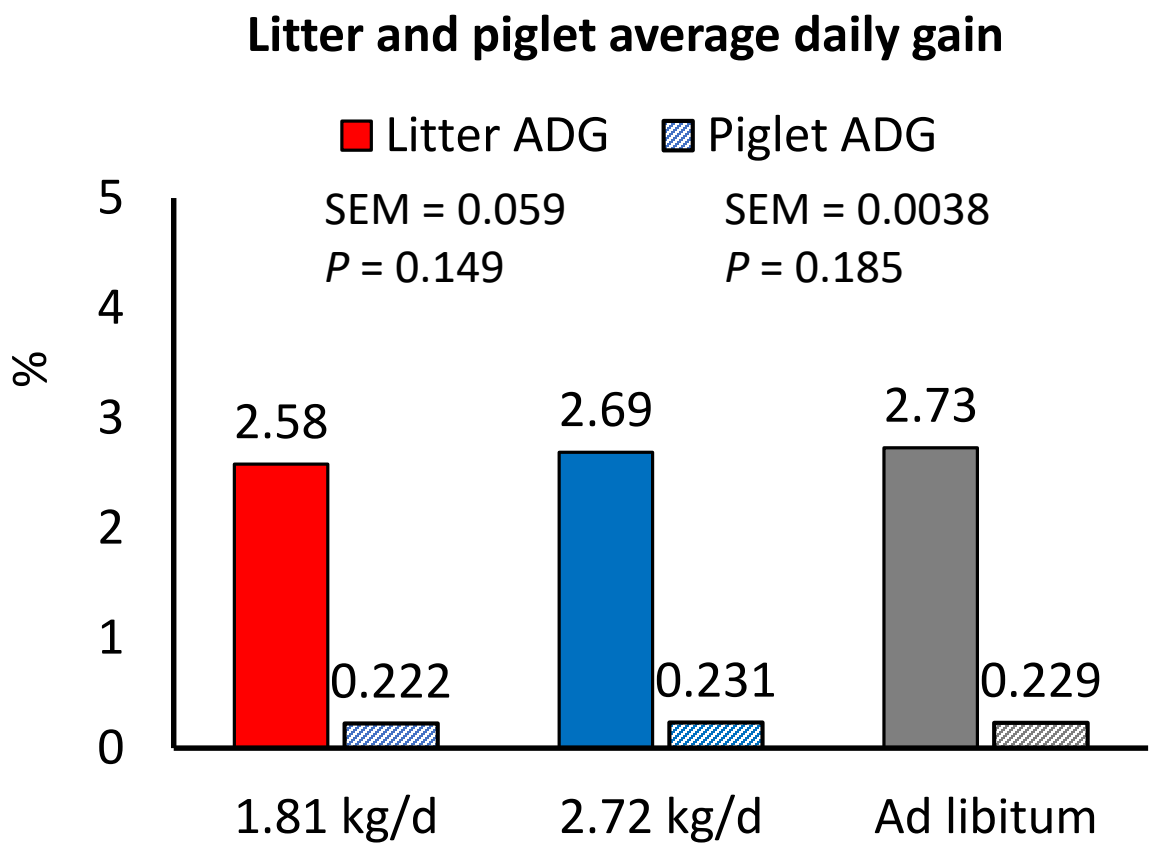
400 g/litter weight gain first 24 h life

Decaluwé et al., 2014

Nutrition and Feeding in the Peripartum Period

Effects of increasing the feeding amount prior to farrowing (d 112 of gestation, fed twice a day) on litter gain





Harper et al., 2021

Nutrition and Feeding in the Peripartum Period

Impact of fat type and inclusion

- Sows fed increasing levels of soybean oil (0, 250, 500 and 1000g) from d 111 of gestation until farrowing:
  - ✓No evidence for differences in colostrum yield or pre weaning mortality

ITEM (400 sows)	Soybean oil supplementation, g				SEM	Probability, P=	
	0	250	500	1000		Linear	Quadratic
Colostrum yield, g	3189	3246	2961	3165	123.5	0.636	0.333
Pre weaning survivability, %	92.0	90.7	91.0	90.5	0.95	0.282	0.552

Santos et al., 2021

- Sows fed with types of fat (3% animal fat, 8% coconut oil, 8% sunflower oil, 8% fish oil, or 4% fish oil+4% octanoic acid) from d 108 of gestation until farrowing:
  - ✓ No evidence for differences in piglet colostrum intake or sow colostrum yield

Theil et al., 2014

Nutrition and feeding during peripartum

Summary

- Continue feeding the same feed amount as sows were previously fed in gestation **(Harper et al, 2021)**
    - Most farms feed lactation diet prior to farrowing during this period.

- Increase the frequency of feeding after sows are loaded in the farrowing crates:
    - Some evidence suggests reduced stillbirth rate when farrowing assistance is limited **(Miller and Kellner, 2020)**

      Example: giving the sow half her feed first thing in the morning and half her feed before you leave.
    - One study has shown improved pre-weaning livability **(Gourley et al., 2020)**

- If self-feeders are used, special attention is needed to identify non-eaters, mainly gilts.

- Fiber may reduce stillborns but more research is needed **(Valadares et al., 2021)**

Nutrition and feeding during lactation

Goals: to maximize feed intake to sustain milk production while avoiding excessive mobilization of body weight reserves

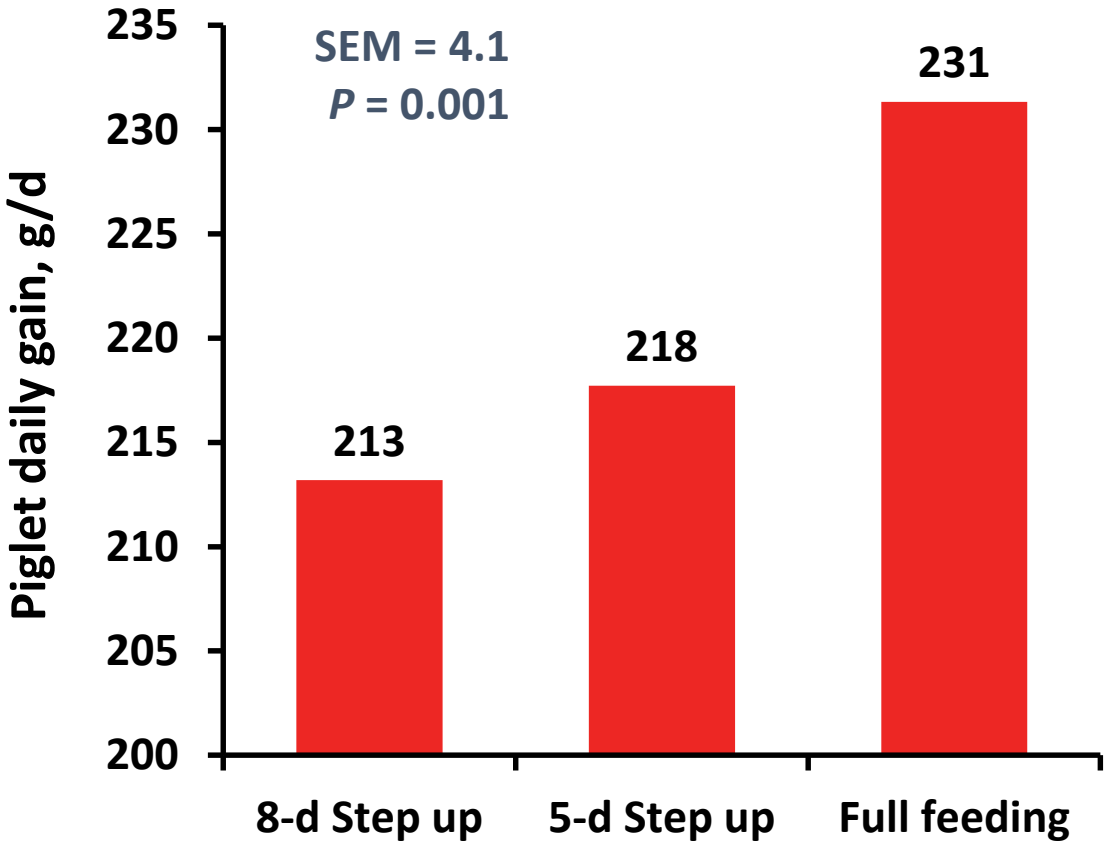
- Energy intake is typically lower than lactation requirements, resulting in sows with a negative energy balance during most of lactation.

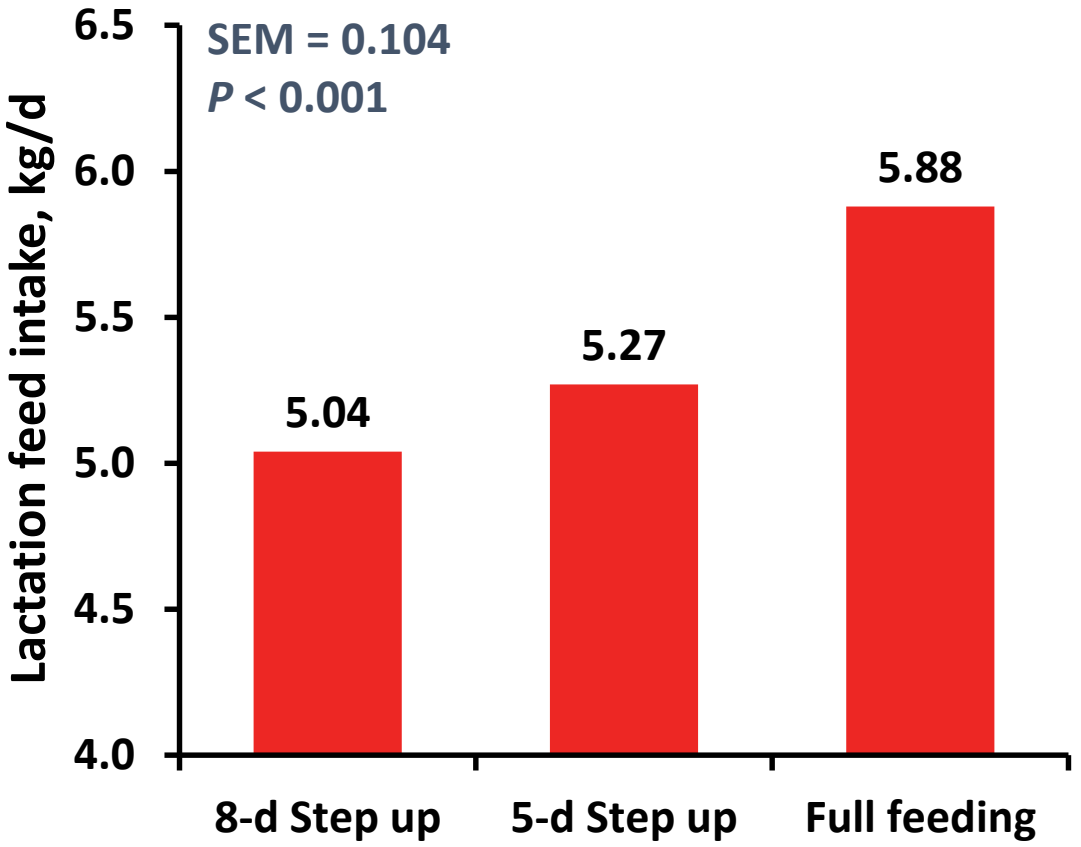
- Thus, it is important to stimulate sows to achieve an optimal level of energy consumption with minimal mobilization of body reserves.

NRC, 2012 adapted from Tokach et al., 2019

Nutrition and feeding during lactation

Ad libitum feed gilts and sows in lactation from the moment they farrow

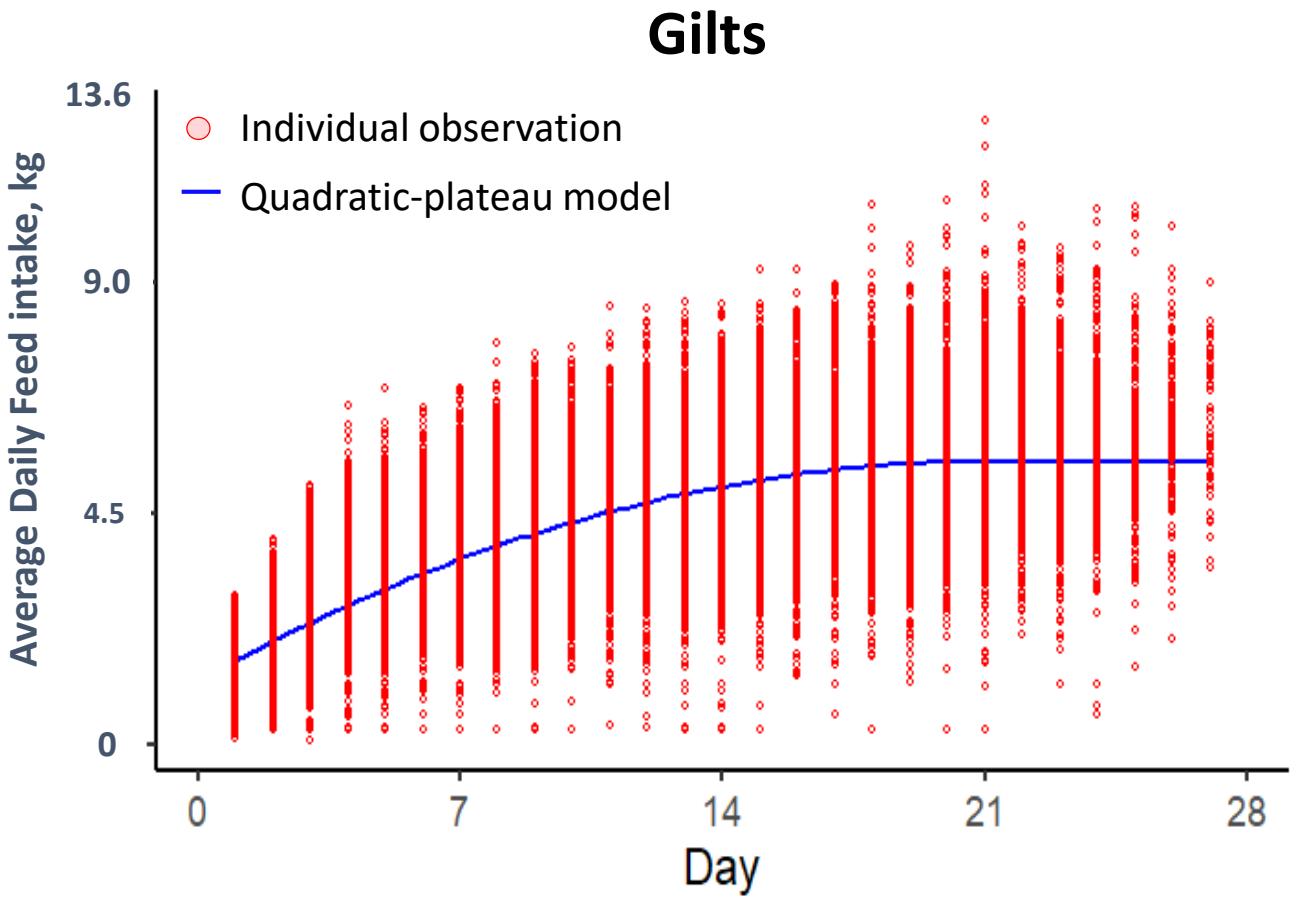


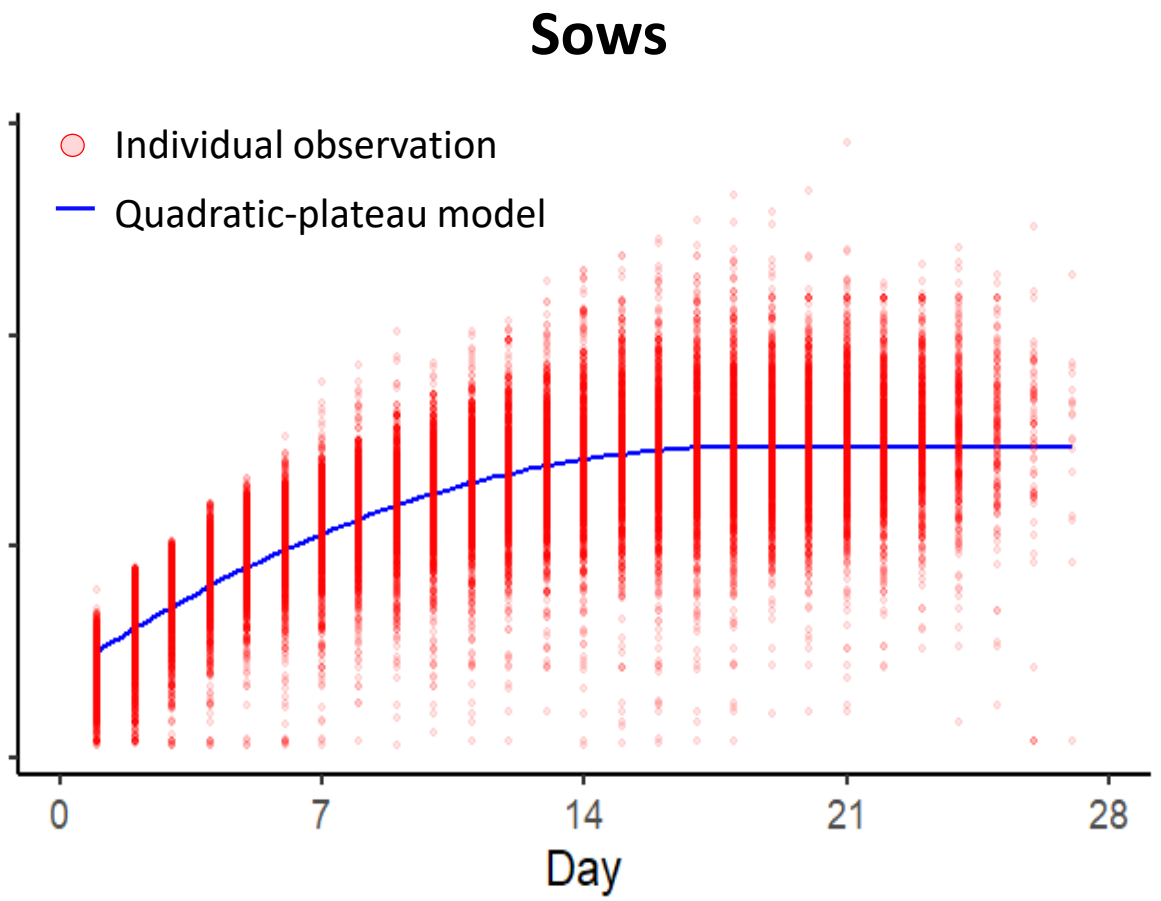


PIC/United Animal Health, internal research

Nutrition and feeding during lactation

Lactation feeding curves for gilts and sows



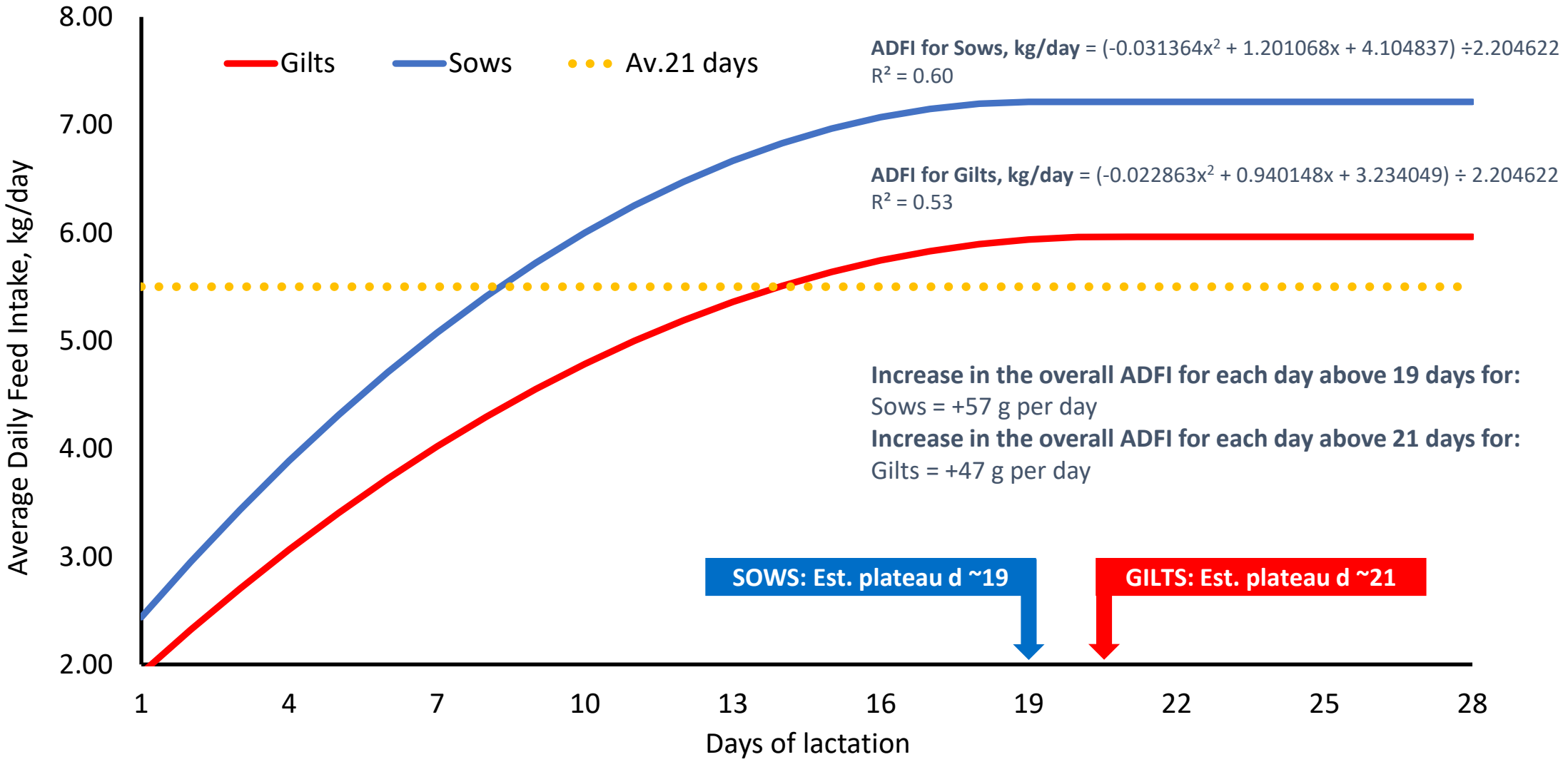


Jerez et al., 2021

Data is based on daily lactation feed intake recorded from 405 Camborough sows over a 10 months period for a total of 9,002 observations and from 1665 L3 sows over a 3 year period for a total of 37,402 observations.

Nutrition and feeding during lactation

Estimated lactation feeding curves for gilts and sows



Jerez et al., 2021

Data is based on daily lactation feed intake recorded from 405 Camborough sows over a 10 months period for a total of 9,002 observations and from 1665 L3 sows over a 3 year period for a total of 37,402 observations.

Nutrition and feeding during lactation

Nutrient specifications

Recommended daily intake of SID lysine under different production scenarios

ITEM	UNIT	GILTS	SOWS	HERD
Net weight body loss	%	<10	<10	<10
Fat loss, Max	mm	0-2	0-2	0-2
Expected caliper loss	units			2.3
Litter growth	kg/d	2.5	2.72	2.67
Daily net energy (NE) intake	Mcal/d	12.5	15.5	14.9
Daily metabolizable energy (ME) intake	Mcal/d	16.9	20.9	20.1
Average feed intake	kg/d	5.00	6.20	6.00

ITEM	UNIT	GILTS	SOWS	HERD
Daily Standardized Ileal Digestible Lysine Intake				
Using a single lactation diet	g/d	50.0	62.0	59.5
Parity segregation or startups	g/d	59.0	56.5	

In all gilt situations such as parity segregation or startups, consider feeding 59.0 g of SID Lys per day for maximum lactation performance.

Nutrition and feeding during wean-to-estrus interval

Goal of nutrition in WEI: Subsequent reproduction

Summary of experiments of the effects of feeding levels during wean-to-estrus interval on sow and piglet performance

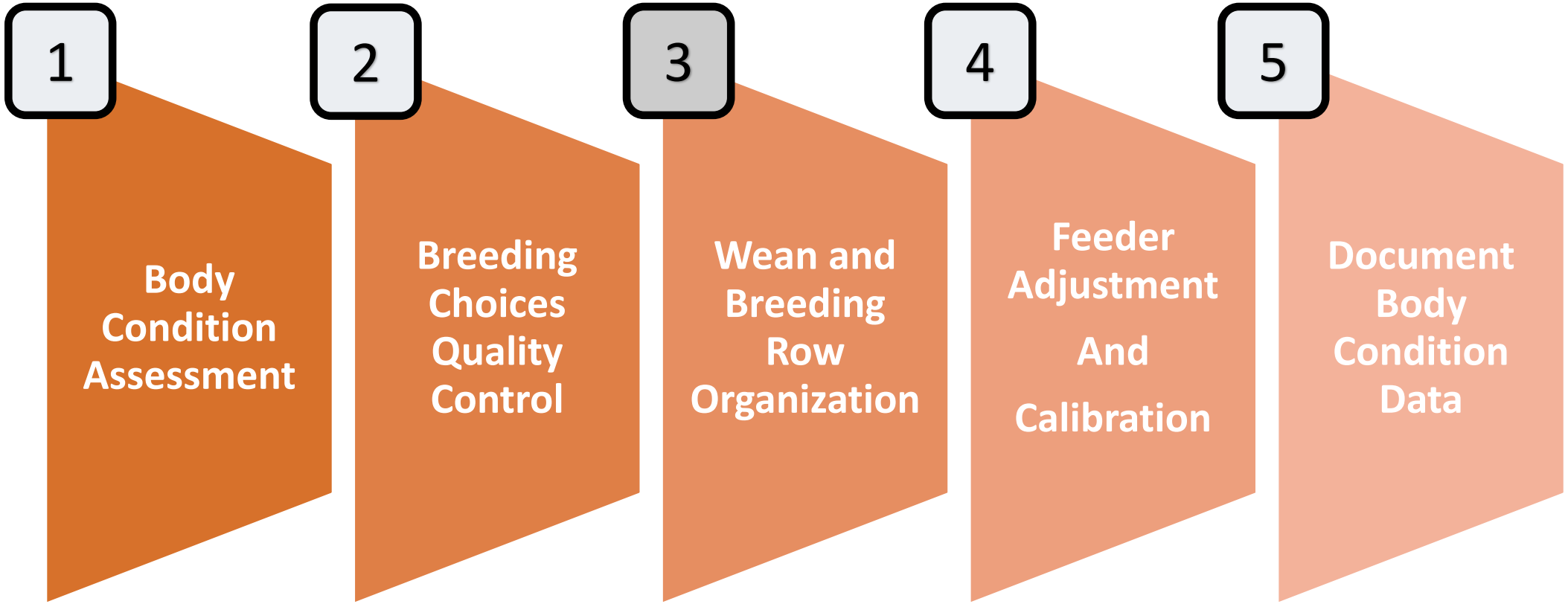
Reference	N	Dietary ME, Mcal/kg	Feeding Levels, lbs/d		ME intake, Mcal/d		Magnitudes of change comparing to CON.				
			CON.	TRT.	CON.	TRT.	WEI, d	FR, %	TB, n	BA, n	BA index, n
Graham et al., 2015	425	3.20	6.0	12.1	8.6	17.6	-0.1	-3.1	-0.4	-0.2	-57
Almeida et al., 2017	543	3.40	6.0	8.2	8.6	11.8	---	5.0	0.4	0.3	118
Almeida et al., 2018	542	3.35	5.7	7.5	8.3	10.9	0.0	0.1	0.2	0.0	-0.7
Gianluppi et al., 2019 – P1	254	3.35	6.0	9.5	8.6	13.8	0.7	-5.9	-0.2	-0.1	-92
Gianluppi et al., 2019 – P2+	806	3.35	6.0	9.5	8.6	13.8	0.1	-0.8	0.3	0.2	0
Lu et al., 2021	386	2.97	6.6	9.9	9.6	14.4	0.0	-1.7	0.3	0.3	-10
Weighted average			**2.7**	**4.2**	**8.7**	**13.5**	**0.1**	**-0.5**	**0.2**	**0.1**	**4.1**

WEI: Wean-to-estrus interval; **FR:** Farrowing rate; **TB:** Total born; **BA:** Born alive;
BA index: Born alive index = FR × BA × 100

Lu et al., 2021

Keys to a Successful Feeding Program Implementation

Remember …… It is the execution of all FIVE STEPS



Body condition management

Correlation between body condition and reproductive performance

- Sows at breeding (n = 1571)
- Sows at farrowing (n = 887)

= (P <0.05)

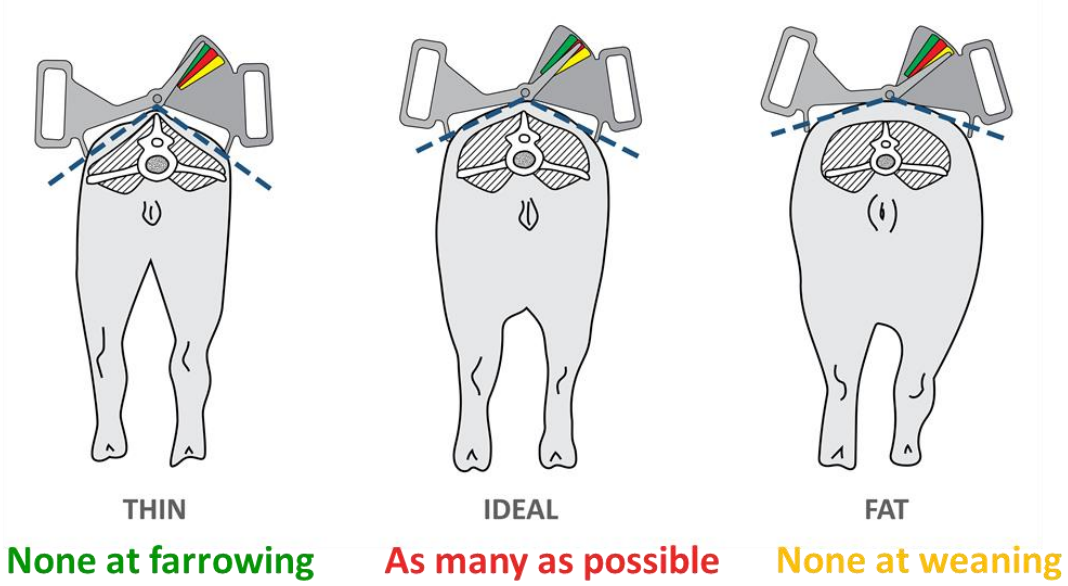
Knauer and Bryan, 2015

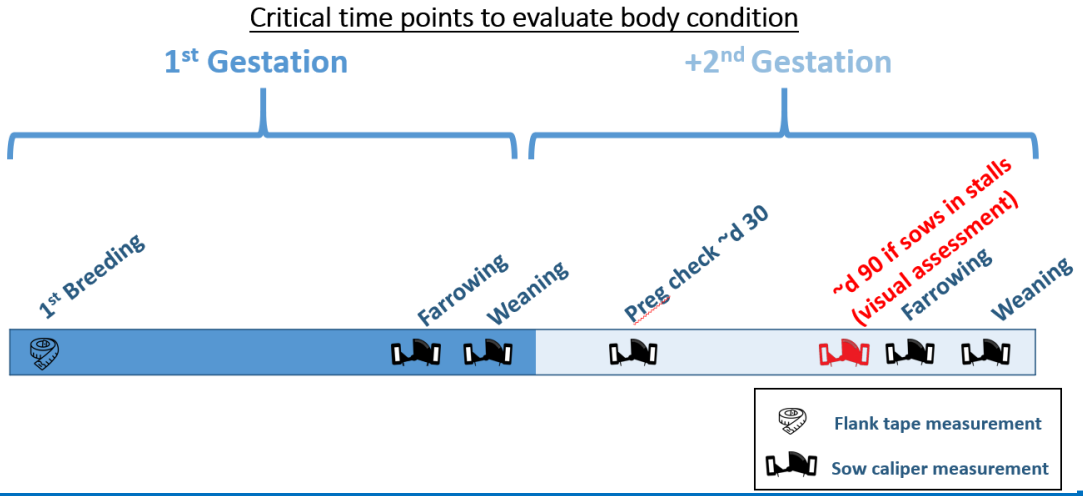
Body condition management

The sow caliper development

The sow caliper developed by Knauer and Baitinger (2015) quantifies the angularity of the top-line of the sow based on the proposal that as an animal's back looses fat and muscle it becomes more angular (Edmonson et al.,1989).

Over-conditioned sows are costly on a feed perspective, on having poorer lactation performance and compromised subsequent reproductive performance.



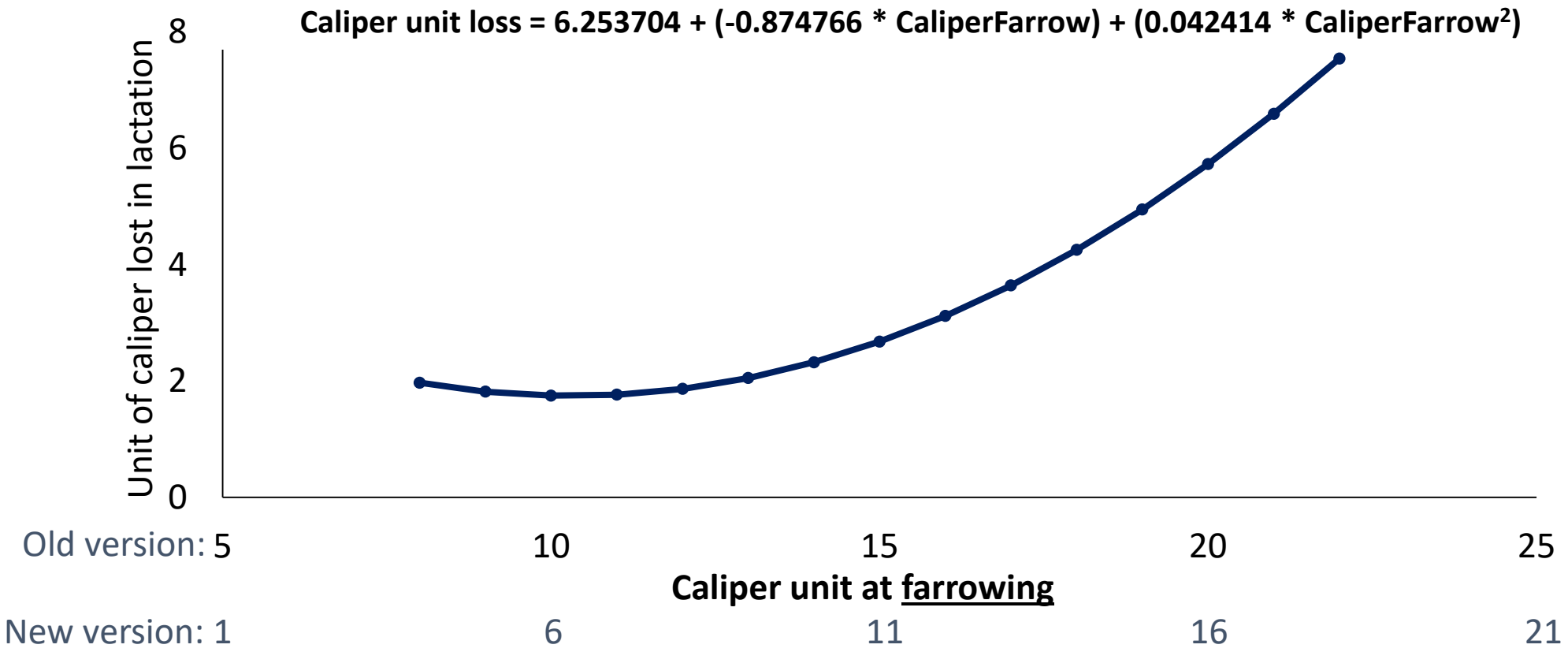


It replaces the subjective Visual Body Condition Scoring

Adapted from Huerta et al, 2021

Body condition management

Project: Investigate association between caliper measurements and reproductive performance: caliper unit loss during lactation



- The difference in caliper measurements was calculated as follows:
  Caliper change = post-weaning caliper – pre-farrow caliper
  Indicative of potential changes in sow body condition

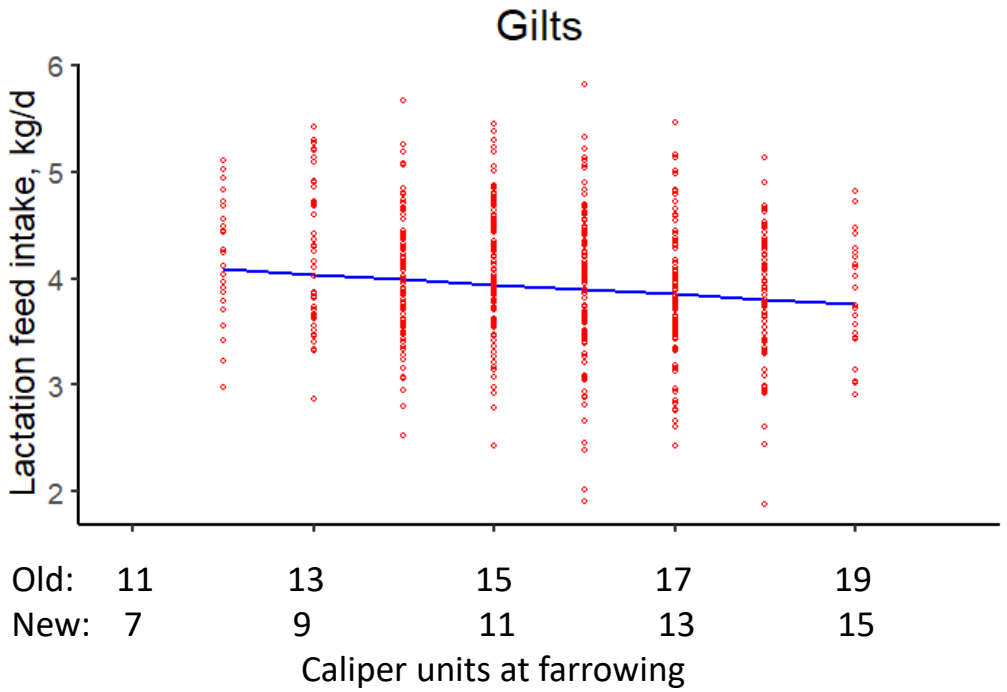
Huerta et al, 2021
Data from 4500 sows measured from parity 1 to 6
In collaboration with Technical Services of UVESA Spain

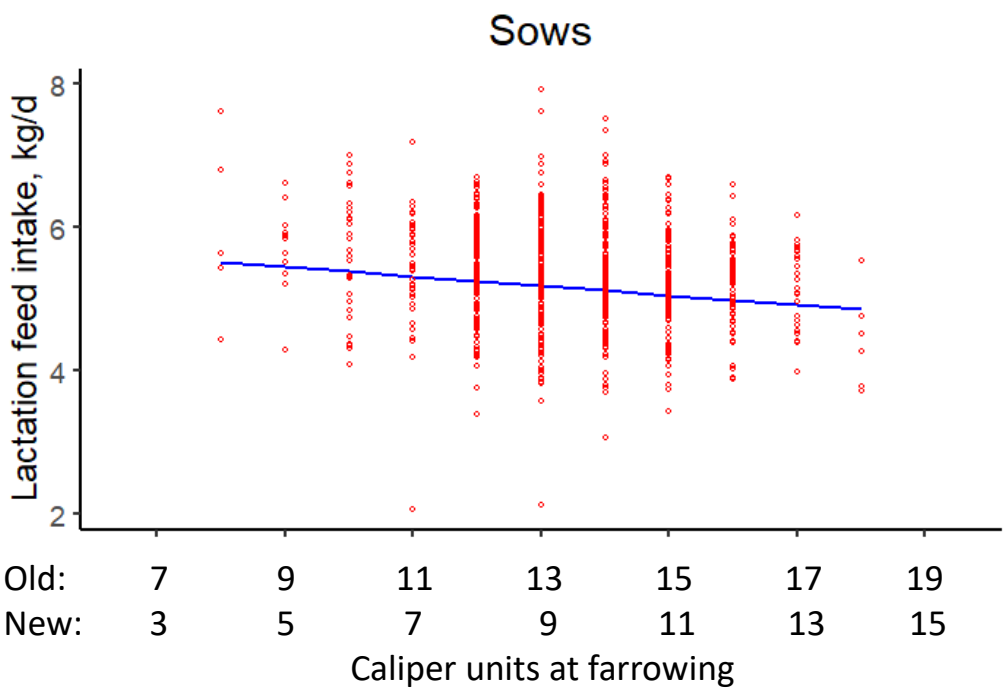
Body condition management

Project: Investigate association between caliper measurements and reproductive performance: lactation intake

ADFI Gilts, kg/d= 2.33756 + (-0.04692 × caliper farrow) + (0.05475 × Lactation length) + (0.09676 × Number weaned)

ADFI Sows, kg/d= 3.17474 + (-0.06631 × caliper farrow) + (0.09073 × Lactation length) + (0.06950 × Number weaned)





Predicted line assumes a fixed lactation length of 21 days and fixed number of weaned pigs of 12 pigs.

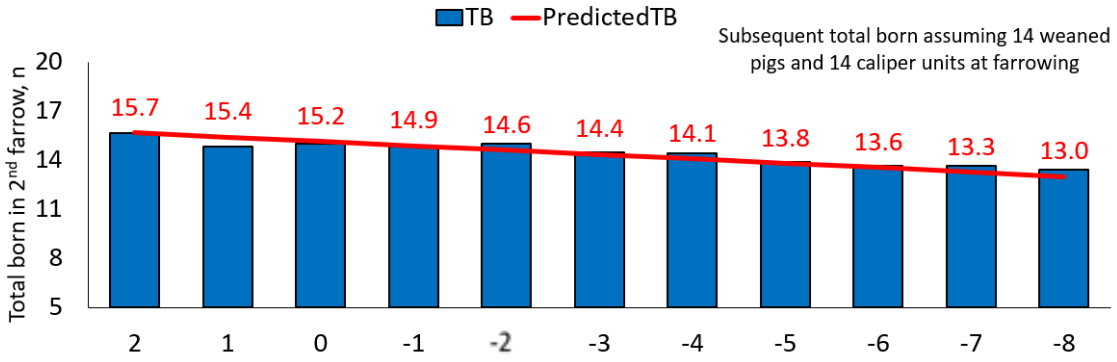
Huerta et al, 2021

Data from Gestal system on 1665 gilts and sows in collaboration with Technical Services of UVESA Spain

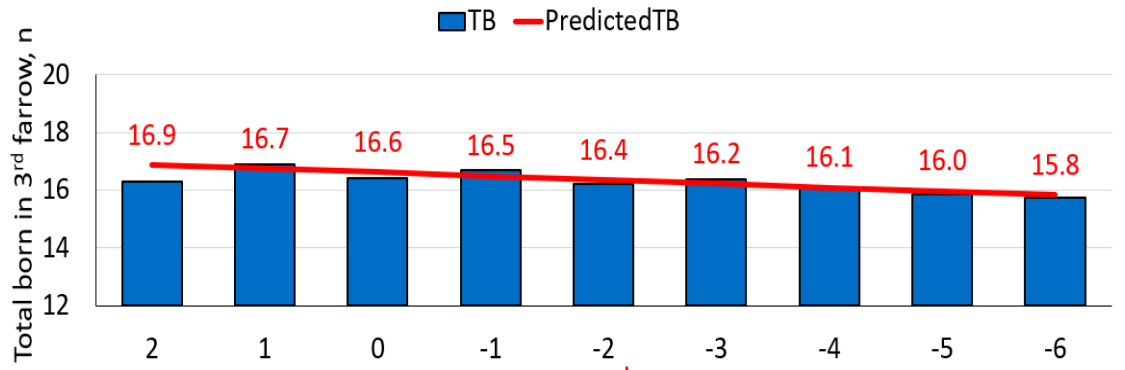
Body condition management

Project: Investigate association between caliper measurements and reproductive performance: caliper at farrowing – caliper at weaning

For every unit of caliper lost during 1st lactation, subsequent TB was reduced by 0.27

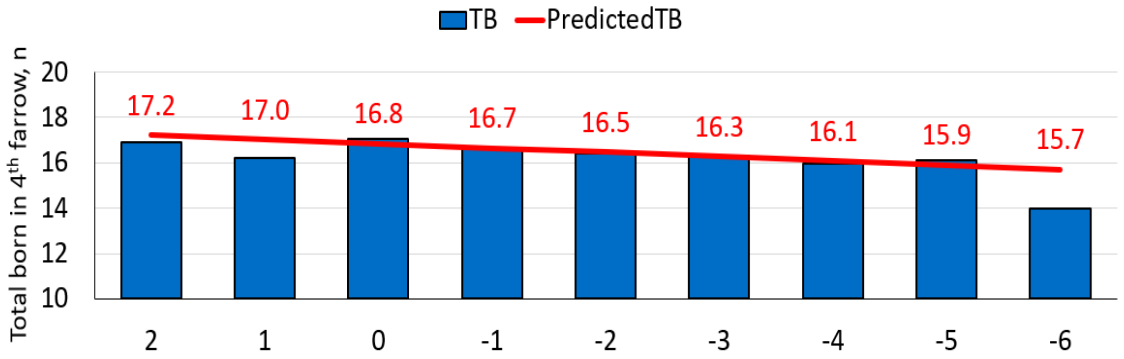


For every unit of caliper lost during 2nd lactation, subsequent TB was reduced by 0.12

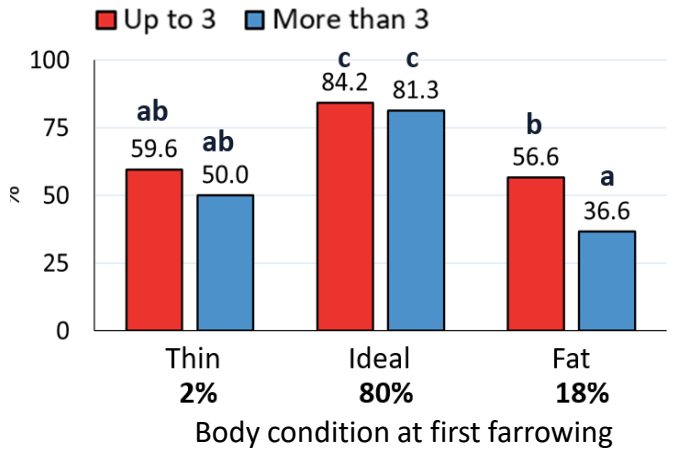


Retention up to 3rd parity

For every unit of caliper lost during 3rd lactation, subsequent TB was reduced by 0.19



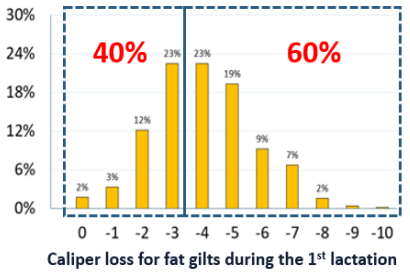
Caliper unit loss in first lactation



BCS Farrow × Caliper Loss, P = 0.063

BCSFarrow, P < 0.001

CaliperLoss, P < 0.001



Huerta et al., 2021

TB, n = 14.51888 + (-0.26649 × CaliperChange1stLactation) + (0.12564 × Caliper1stFarrow) + (-0.0929 × WeanedPigs1stLactation)

Data from 4500 sows measured from parity 1 to 6. In collaboration with Technical Services of UVESA Spain

PIC Sow Feeding Implementation Tool

Body condition management and feeding program recommendations for PIC gilts and sows housed in pens in USA using a gestanchions diet with 3100 Kcal/kg of Metabolizable Energy. Pens are assembled post-implantation and using the stanchions system.

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ROUTINES AT EACH TIME POINT OF BODY CONDITION ASSESSMENT

WEANING OR BREEDING	PREG CHECK	~DAY 90	FARROWING

1. Locate the last rib of sow

2. Obtain caliper reading

3. Marking sows according to body condition

4. Adjust feed box[a] or feeding cuve

5. Document the body condition data[b]

KEY CHECKUPS OF BODY CONDITION MANAGEMENT

WEANING

- Place all P1 and thin sows together in the weaning area
- Don't skip a meal to minimize the risk of reproduction shut-down
- Ensure feed is fresh and minimize wastage

BREEDING

- Make sure sows are grouped based on body condition when moving to the breeding/gestation area
- Sows on the 4th parity and beyond should receive at least 1.9 kg/day during the first 30 days of gestation

PREG CHECK

- Investigate management details of the sow with body condition deviated from the ideal caliper reading since the last body condition assessment
- Make sure sows are grouped based on body condition, when moving to the pens after preg check
- Identify and check the low competitive females in each pen daily when dropping feed

~DAY 90

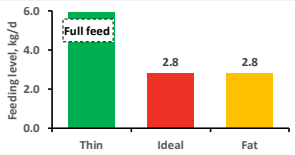
- Make sure that the feed box for thin sows are adjusted according to the PIC GILTS AND SOWS FEEDING PROGRAM to provide more feed
- If body condition within a pen is variable and deviated from the ideal category since the last body condition assessment, re-evaluate the body condition management and the feeding program

FARROWING

- Evaluate feeding program and body condition management by analyzing the progressing of caliper readings before farrowing.
- PIC recommends to maximize the percentage of ideal reading sows at farrowing.

PIC GILTS AND SOWS FEEDING PROGRAM[c]

Sows: Wean-To-Service interval

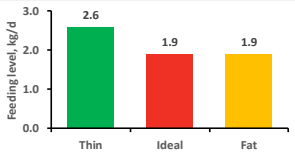


Gilts: Measure body weight at first breeding

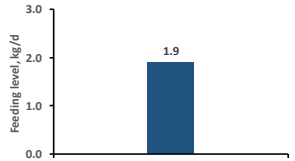
Ideal range for first breeding: 135 - 160 kg

> 90% of gilts should be bred within 135-160 kg
Do not breed any gilt lighter than 135 kg

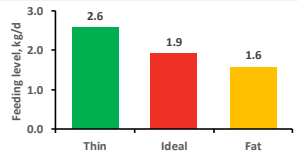
Sows: Breeding to preg check



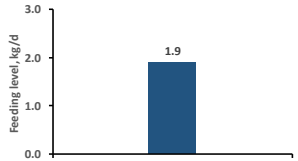
Gilts: Breeding to farrowing[d]
No caliper on gilts[e]



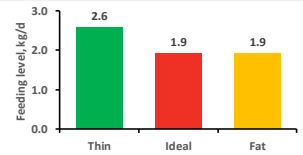
Sows: After preg check to day 90



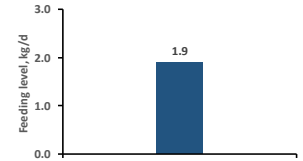
Gilts: Breeding to farrowing[d]
No caliper on gilts[e]



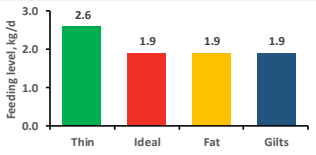
Sows: Day 90 to pre-farrowing



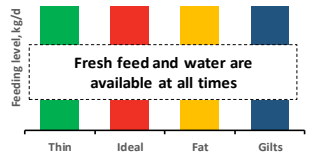
Gilts: Breeding to farrowing[d]
No caliper on gilts[e]



Pre-farrowing - Continue the same feeding level as previously in gestation[f]



After farrowing - Full feed



PIC Sow Body Condition Tracking System

COLÉGIO BRASILEIRO DE NUTRIÇÃO ANIMAL

SOW BODY CONDITION TRACKING - BY BREEDING BATCH (COMPLETE CYCLE ONLY)

Never Stop Improving Your Success.

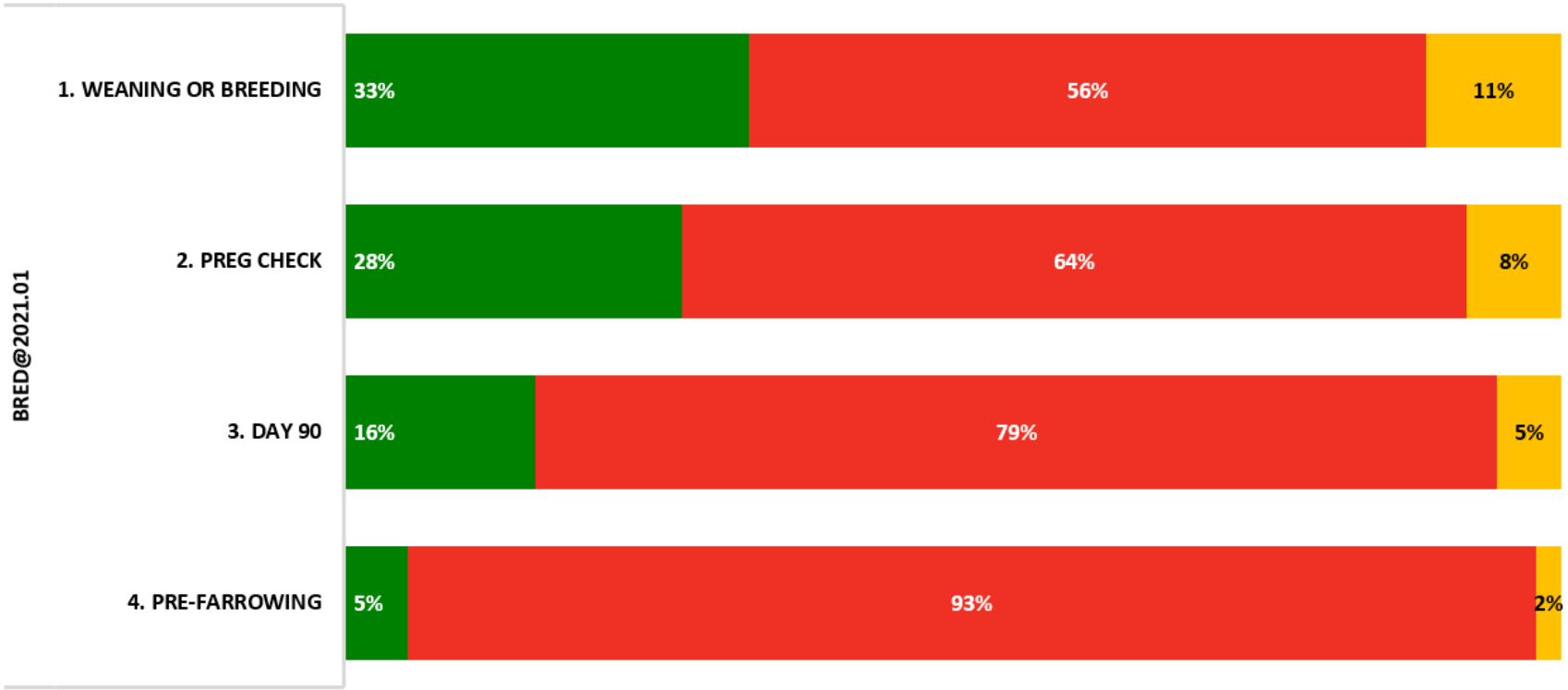
ADJUST CHART SIZE | REFRESH

% OF THIN SOWS | % OF IDEAL SOWS | % OF FAT SOWS

0% 25% 50% 75% 100%

SHOW SELECTED BREEDING BATCH

BRED@2021.01	BRED@2021.02
BRED@2021.03	BRED@2021.04
BRED@2021.05	BRED@2021.06
BRED@2021.07	BRED@2021.08

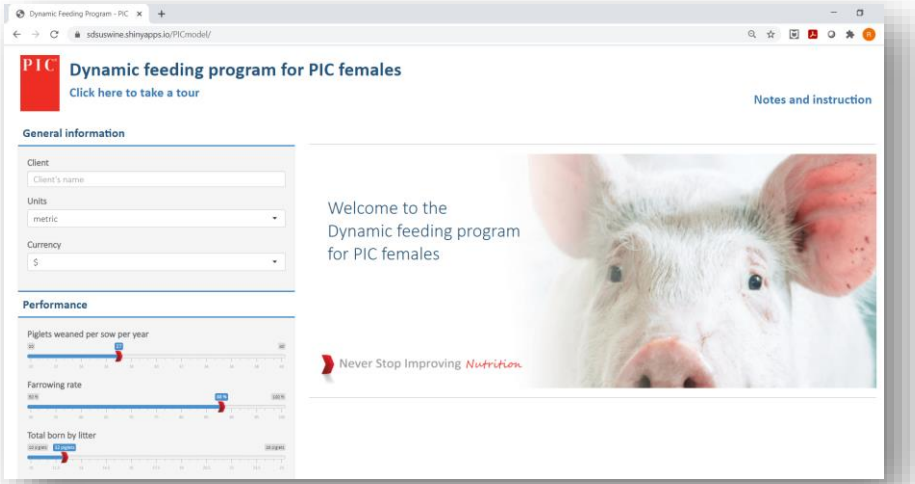


Dynamic feeding program for PIC females

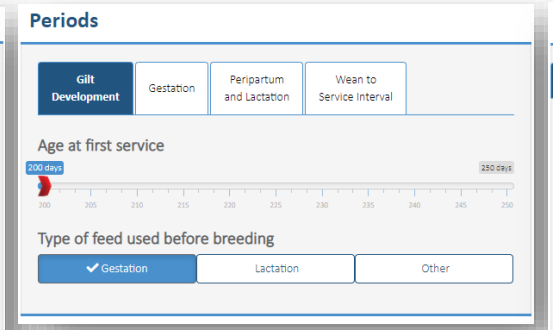
A web application for PIC feeding recommendations and nutrient specifications with profitability and productivity indicators

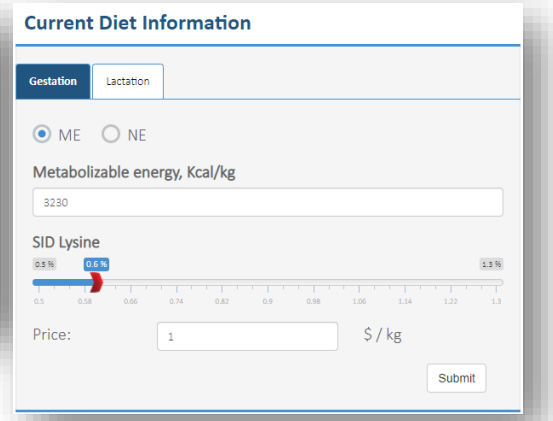
COLÉGIO BRASILEIRO DE NUTRIÇÃO ANIMAL

At a glance

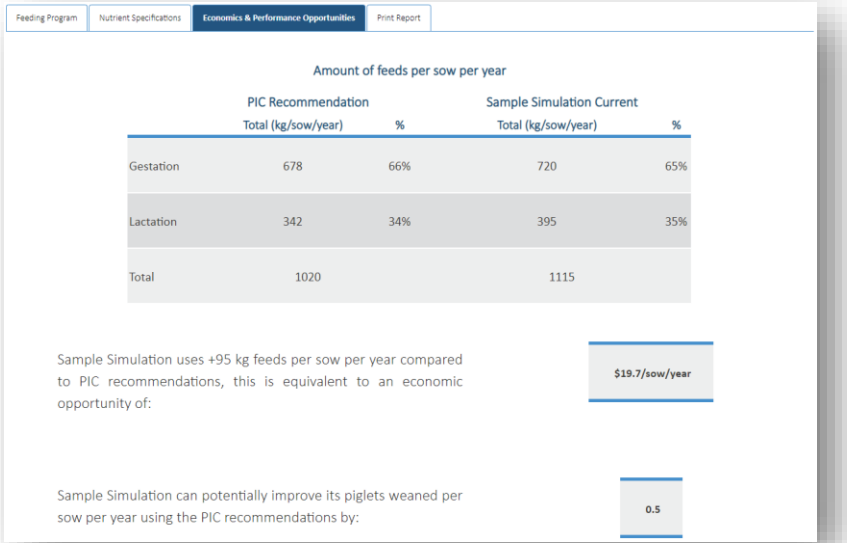


Easy inputs





Data outputs



Link to access:
https://sdsuswine.shinyapps.io/PICmodel/

Jerez et al., 2021

Take Home Messages

- Genetic improvement drives the changes in nutrient requirements and feeding management of hyperprolific sows
- Feeding during gilt development is based on 4 key elements: age at breeding, age at puberty, weight at breeding and number of estrus
- Sow body condition serves as a basis for feeding during gestation and can predict subsequent reproductive performance
- Current knowledge suggest to feed sows during peripartum at an amount similar to late gestation
- Sows should be fed *ad libitum* at the entire lactation period
- *Ad libitum* feeding is provided only to thin sows during wean to service interval. *Ad libitum* feeding for ideally conditioned and fat sows showed no benefits to subsequent performance
- A web tool has been developed by PIC to provide a dynamic feeding program for PIC females

Evolução dos Conceitos Nutricionais e de Métodos de Alimentação de Porcas Reprodutoras: Histórico e Perspectivas

Muito obrigado! Perguntas?

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Nutrition