Developing a 5 tonne sow: Biologically possible or commercially probable?

G.A. Walling & E.F. Knol

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Defining the 5 tonne sow

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5,000kg of pig carcases per sow

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Current Levels Of Output From Elite Sows

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Current Elite Sows

- Assumptions
  - Always hold to first service
  - No failed pregnacies
  - Never have prolonged weaning-service intervals
  - Culled immediately at final weaning
  - All pigs sold at full weight

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Elite Sow: Cycle Length

- Gestation 114 days
- Lactation 23 days
- Weaning-Service 5 days
- Total 142 days

- Litters/sow/year = 365/142 = 2.57

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Elite Sow: Piglet Output

- Total Born per litter 18.2
- Live born per litter 16.1
- Weaned per litter 13.5
  - Pre-weaning mortality 16%
- Finished per litter 12.8
  - Post-weaning mortality 5.2%
- Kilos sold per litter 1,216kg
  - Carcase weight 95kg

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Current Elite Sow Output
2.57 x 1216kg = 3,125kg

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Towards the 5 tonne sow

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Achieving the 5 tonne sow

1. Increase Litter Size

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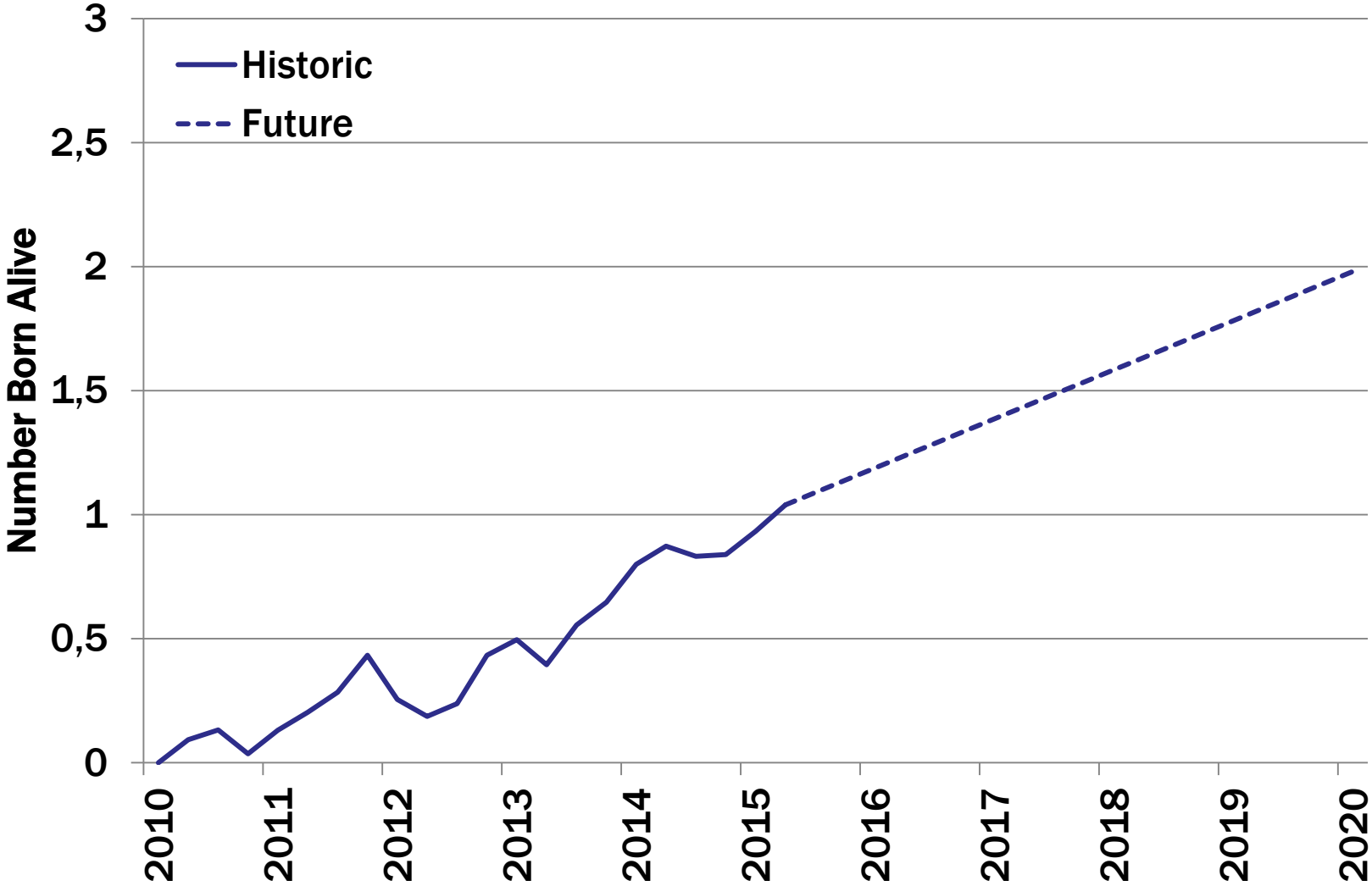
Genetic Trends: Numbers Born Alive



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Genomics Benefits Litter Size Traits

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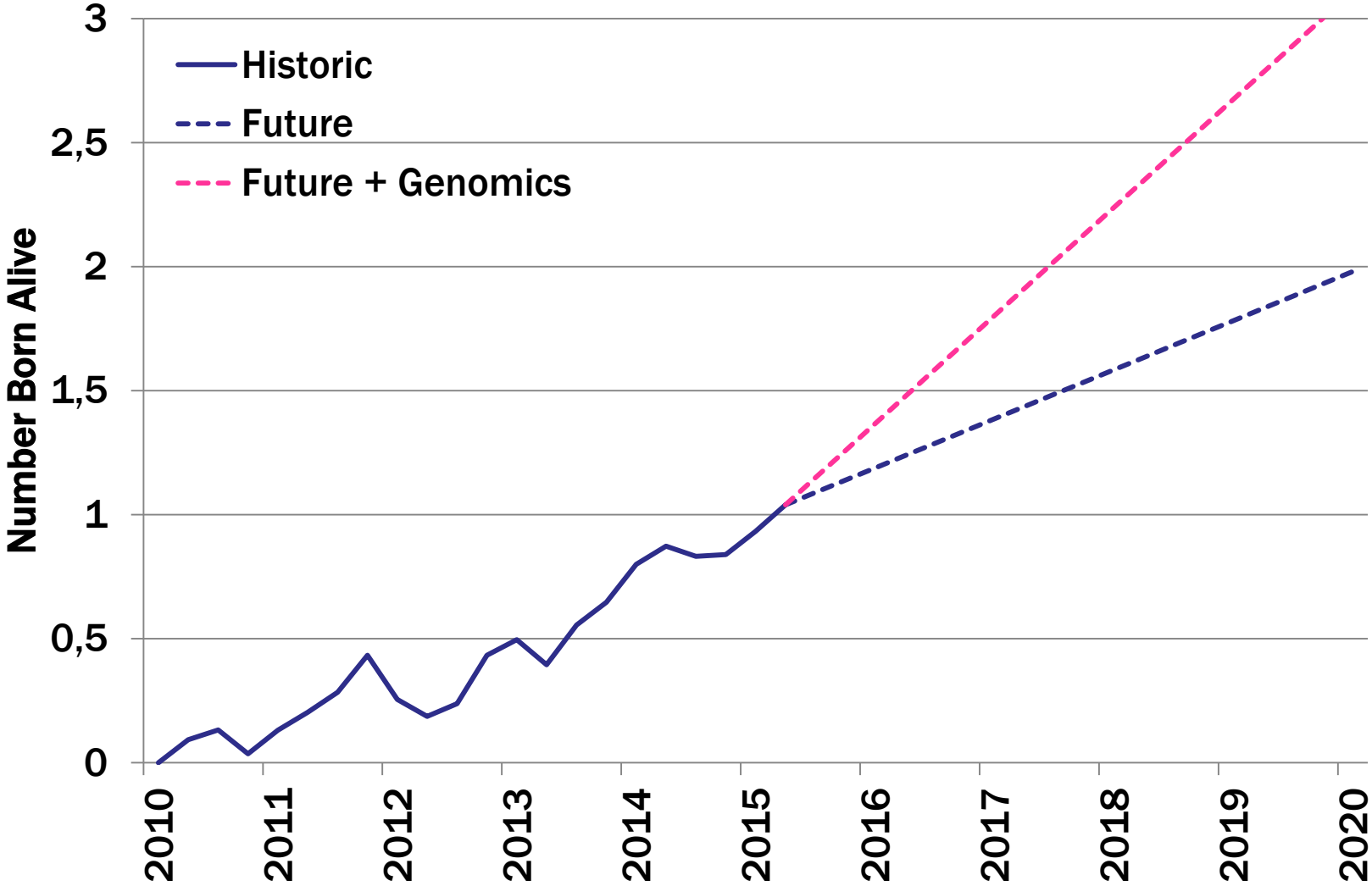
Genetic Trends: Numbers Born Alive



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Impact of Genetic Progress for Litter Size

- Total Born per litter 18.2
- Live born per litter 16.1 + 2
- Weaned per litter 13.5 + 1.7
  - Pre-weaning mortality 16%
- Finished per litter 12.8 + 1.6
  - Post-weaning mortality 5.2%
- Kilos sold per litter 1,216 + 152kg
  - Carcase weight 95kg

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Elite Sow Output

2.57 x 1368kg = 3,516kg (+12.5%)

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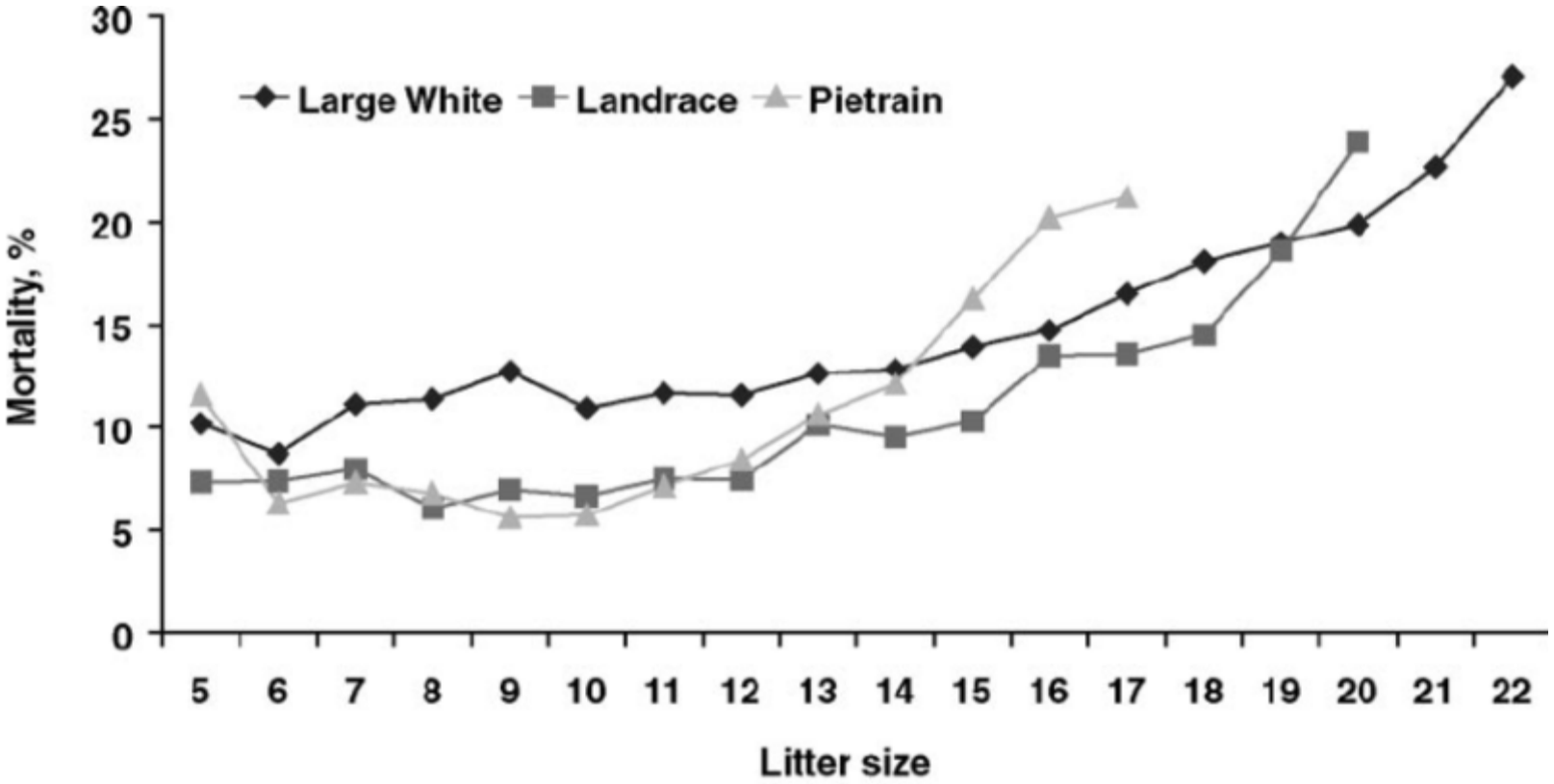
Mortality Increases In Larger Litters



From Ibanez *et al.* (2008) Journal of Animal Science 87(1):80-7

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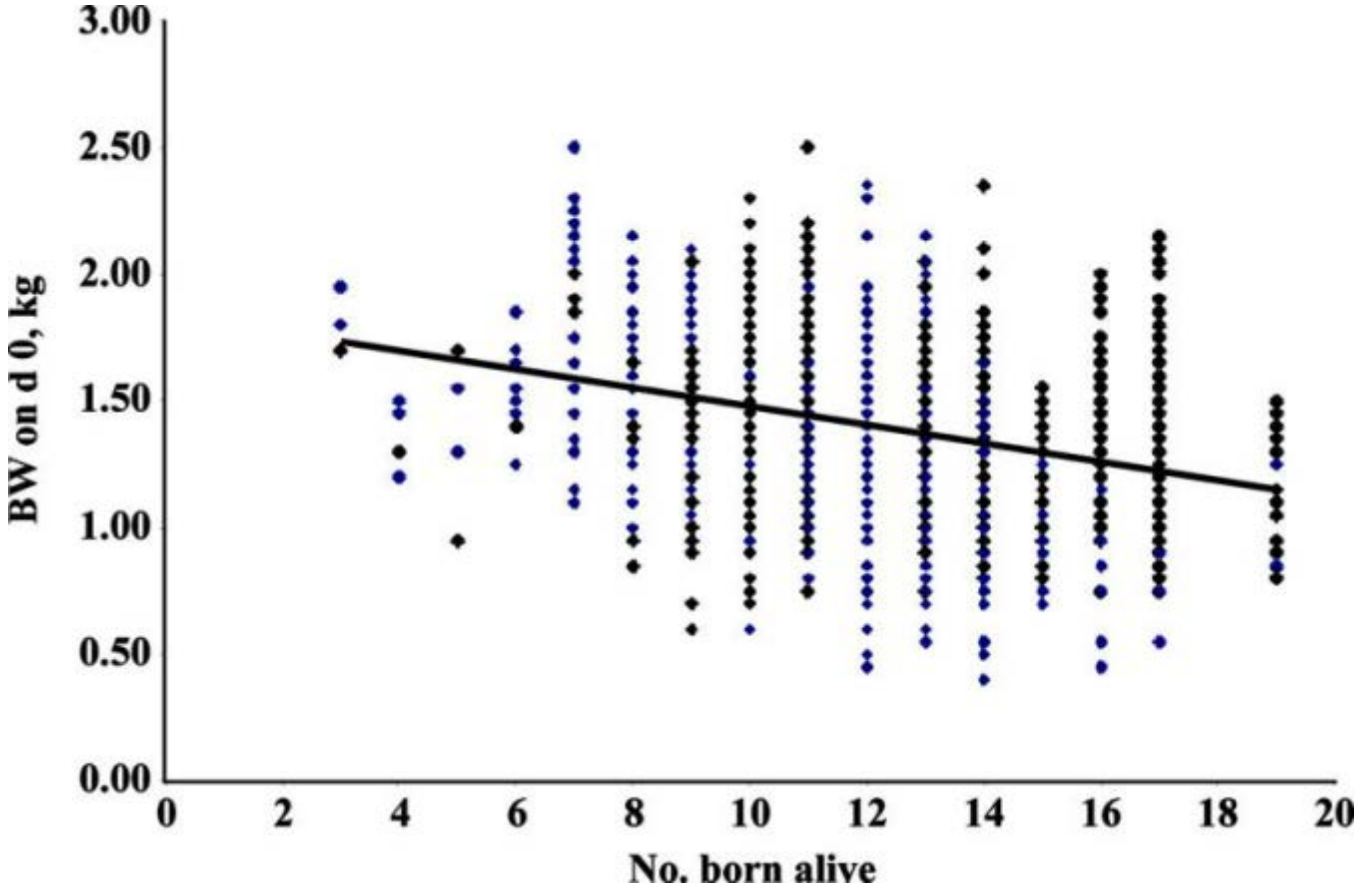
Larger Litters Produce Lighter Piglets



From Beaulieu *et al.* (2014) Journal of Animal Science 88(8):2767-2778

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Lighter Piglets Have Increased Mortality.....

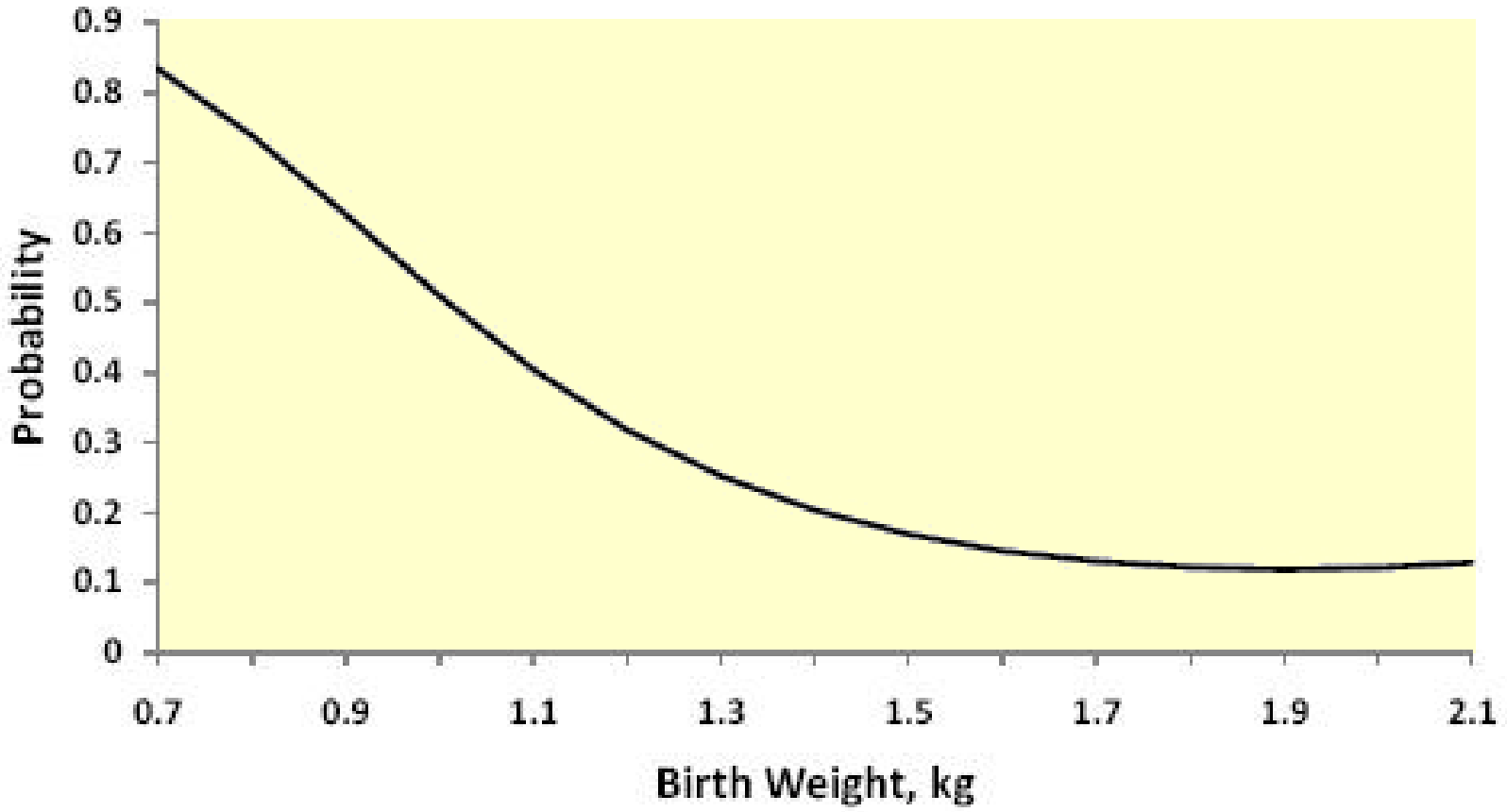

Image taken from http://www.thepigsite.com/articles/2767/piglet-birth-weight-affects-future-growth-composition-and-mortality

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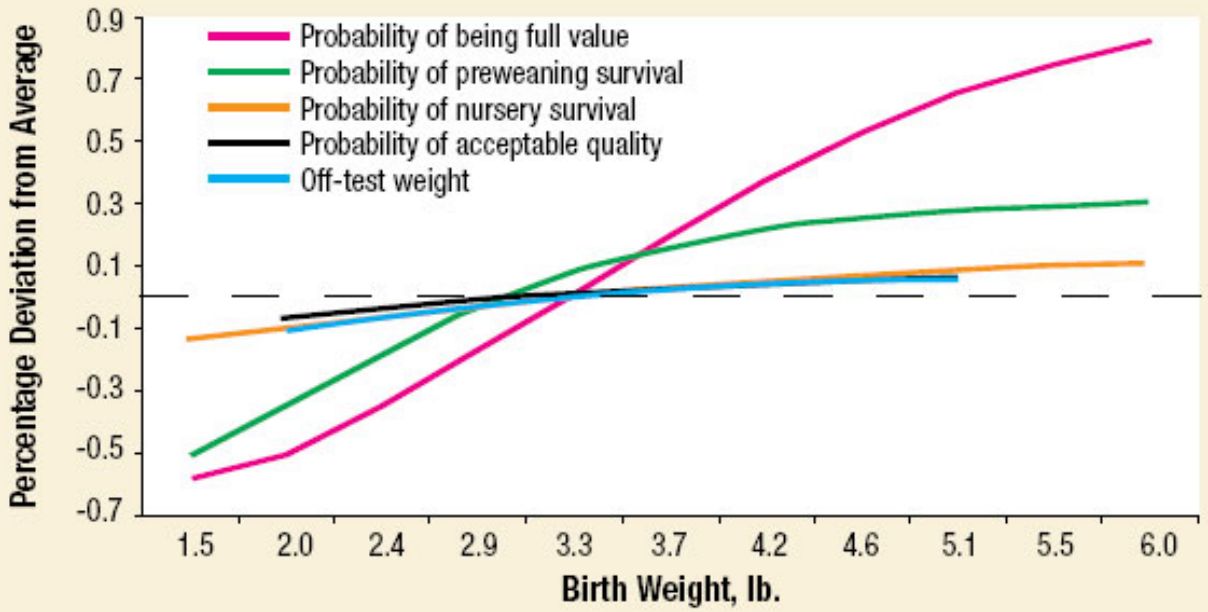
… and are less likely to make full value

Figure 1. Impact of Birth Weight on Survival, Growth, Quality and Likelihood of a Pig Being Full Value (Data are expressed as percent deviations from the average)



Research by Justin S. Fix and M. Todd See, North Carolina State University, Raleigh; Graph taken from nationalhogfarmer.com

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Difficult to maintain with higher litter size

- Total Born per litter 18.2
- Live born per litter 16.1 + 2
- Weaned per litter 13.5 + 1.7
  - Pre-weaning mortality 16%
- Finished per litter 12.8 + 1.6
  - Post-weaning mortality 5.2%
- Kilos sold per litter 1,216 + 152kg
  - Carcase weight 95kg

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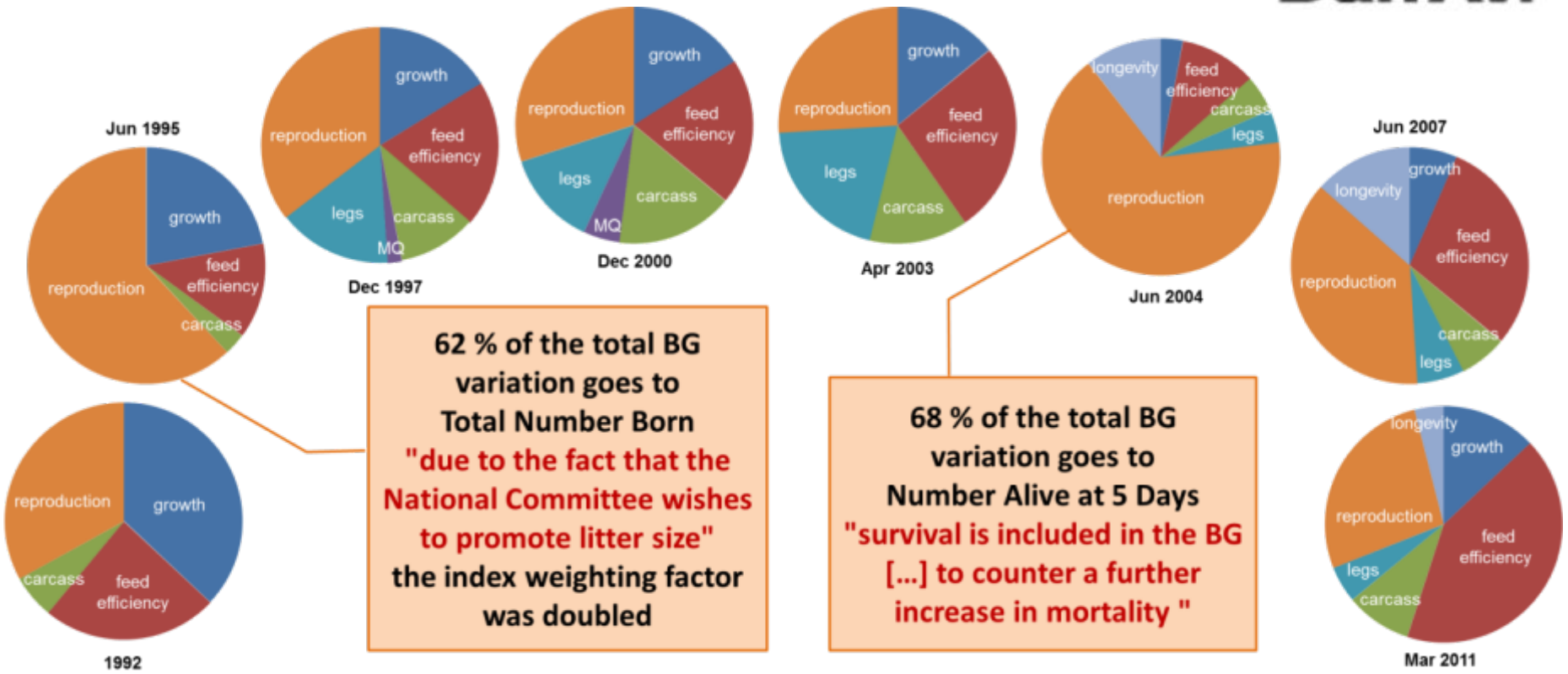
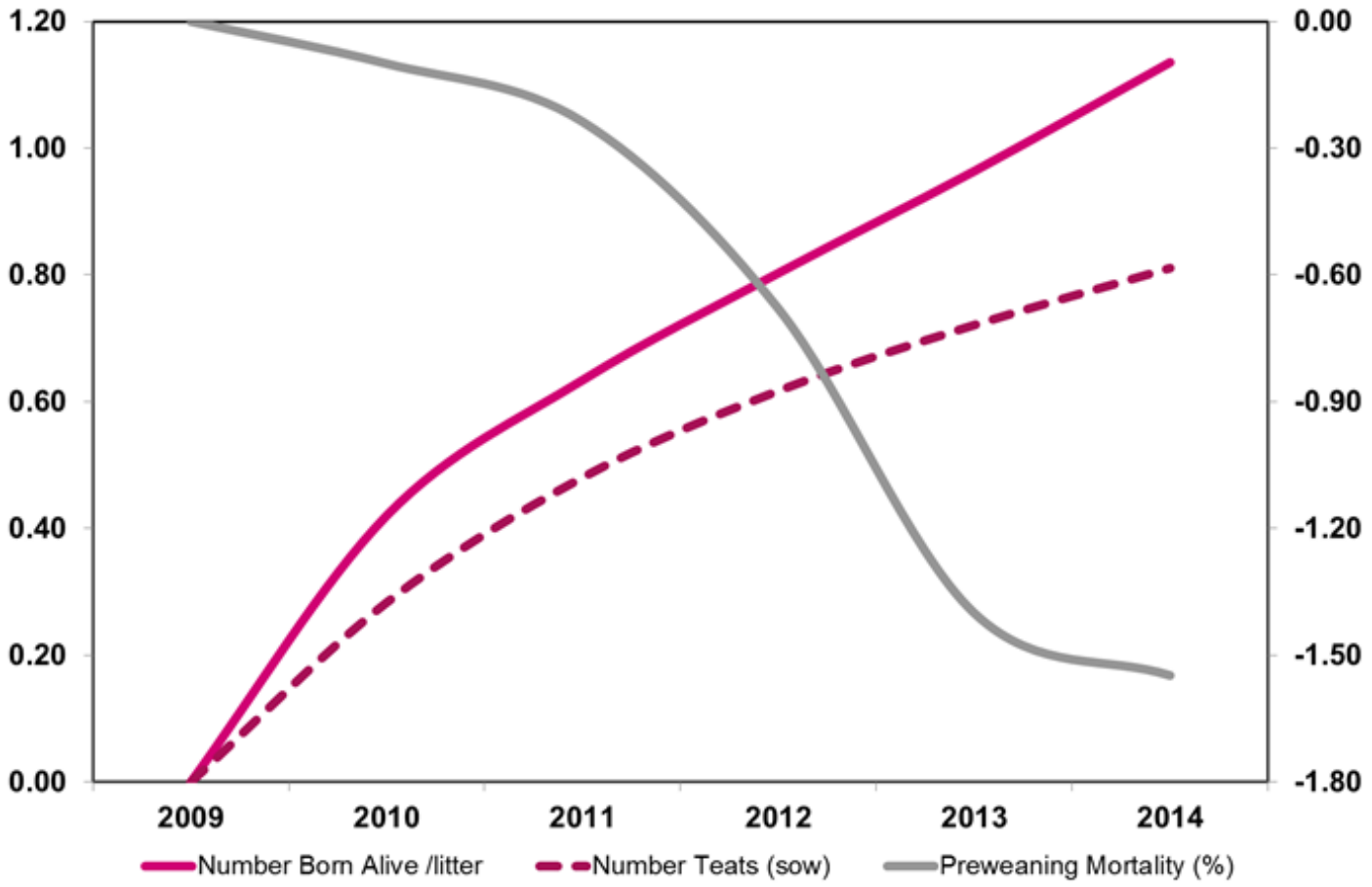
Solution: More balanced selection



Slide kindly shared by Pieter Knap, PIC

Breeding Companies Including Piglet Survival Traits in Indices



Number born alive per litter and number of teats (left axis)
Pre-weaning mortality % (right axis)

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More traits in index can reduce genetic progress for other existing traits

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Achieving the 5 tonne sow

1. Increase Litter Size
2. **Reduce Cycle Length**

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Elite Sow: Cycle Length

- Gestation 114 days
- Lactation 23 days
- Weaning-Service 5 days
- Total 142 days

Variation between sows and litters

- Litters/sow/year = 365/142 = 2.57

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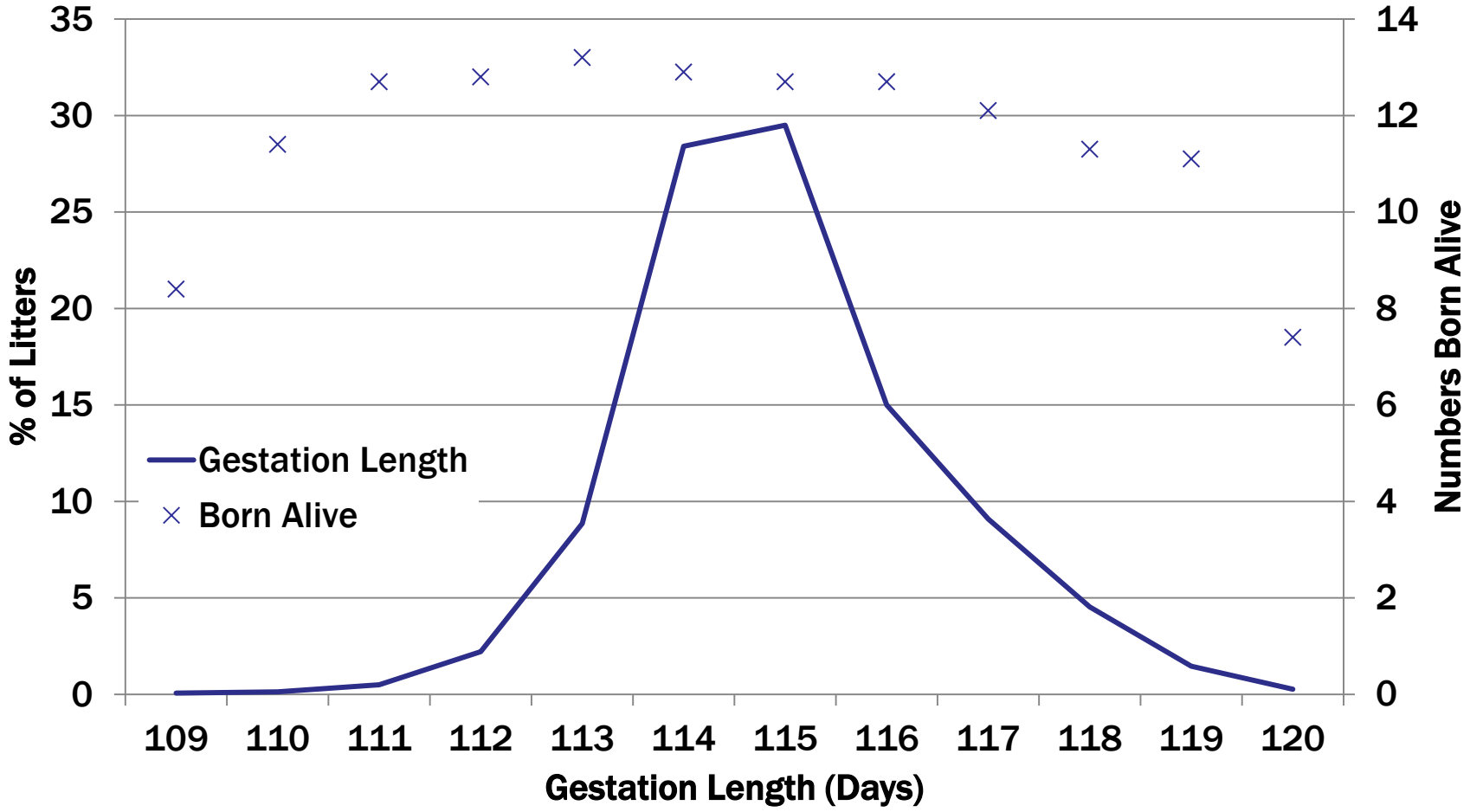
Typical Distribution of Gestation Length



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Elite Sow: Cycle Length

- Gestation 114 days
- Lactation 23 days
- Weaning-Service 5 days
- Total 142 days

Variation between sows and litters

Legal minimum is 21 days not 23

Possible to reduce by ~1 day

- Litters/sow/year = 365/142 = 2.57

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Elite Sow: Cycle Length

- Gestation 114 days -2 days
- Lactation 23 days -2 days
- Weaning-Service 5 days -1 day
- Total 142 days -5 days

- Litters/sow/year = 365/137 = 2.66

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Elite Sow Output

2.66 x 1368kg = 3,639kg (+3.5%)

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Achieving the 5 tonne sow

1. Increase Litter Size
2. Reduce Cycle Length
3. **Reduce Mortality**

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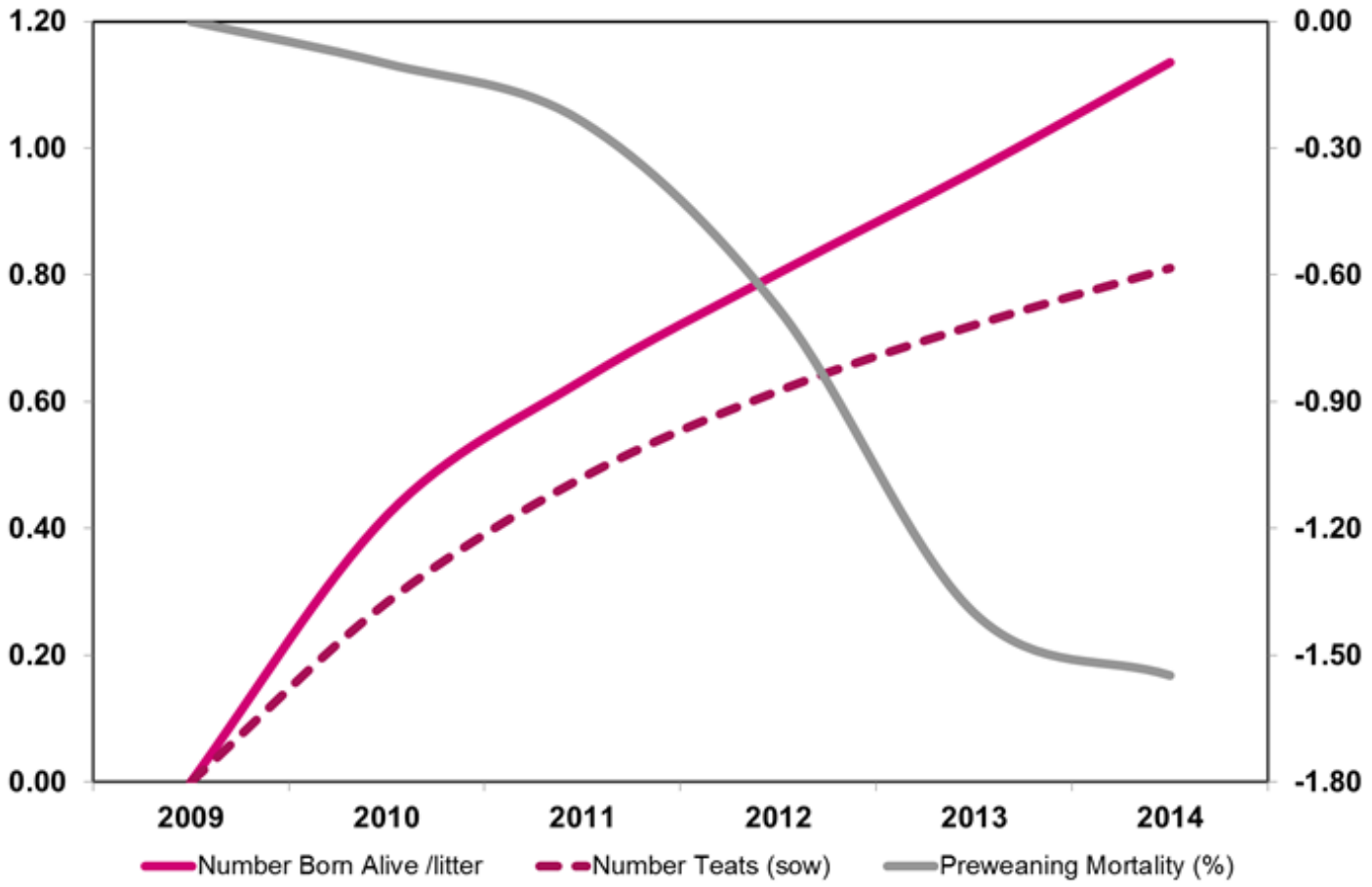
Possible to Genetically Reduce Mortality



Number born alive per litter and number of teats (left axis)
Pre-weaning mortality % (right axis)

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Impact of Genetic Progress for Litter Size

- Total Born per litter 18.2
- Live born per litter 16.1 + 2
- Weaned per litter 13.5 + 1.7 + 0.3
  - Pre-weaning mortality 16% - 1.5%
- Finished per litter 12.8 + 1.6 + 0.4
  - Post-weaning mortality 5.2% - 0.5%
- Kilos sold per litter 1,216 + 152kg + 38kg
  - Carcase weight 95kg

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Elite Sow Output

2.66 x 1406kg = 3,740kg (+2.8%)

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Still nowhere near a 5 tonne sow

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Shortcut To The 5 Tonne Sow

Becoming Italian and Increasing Weight

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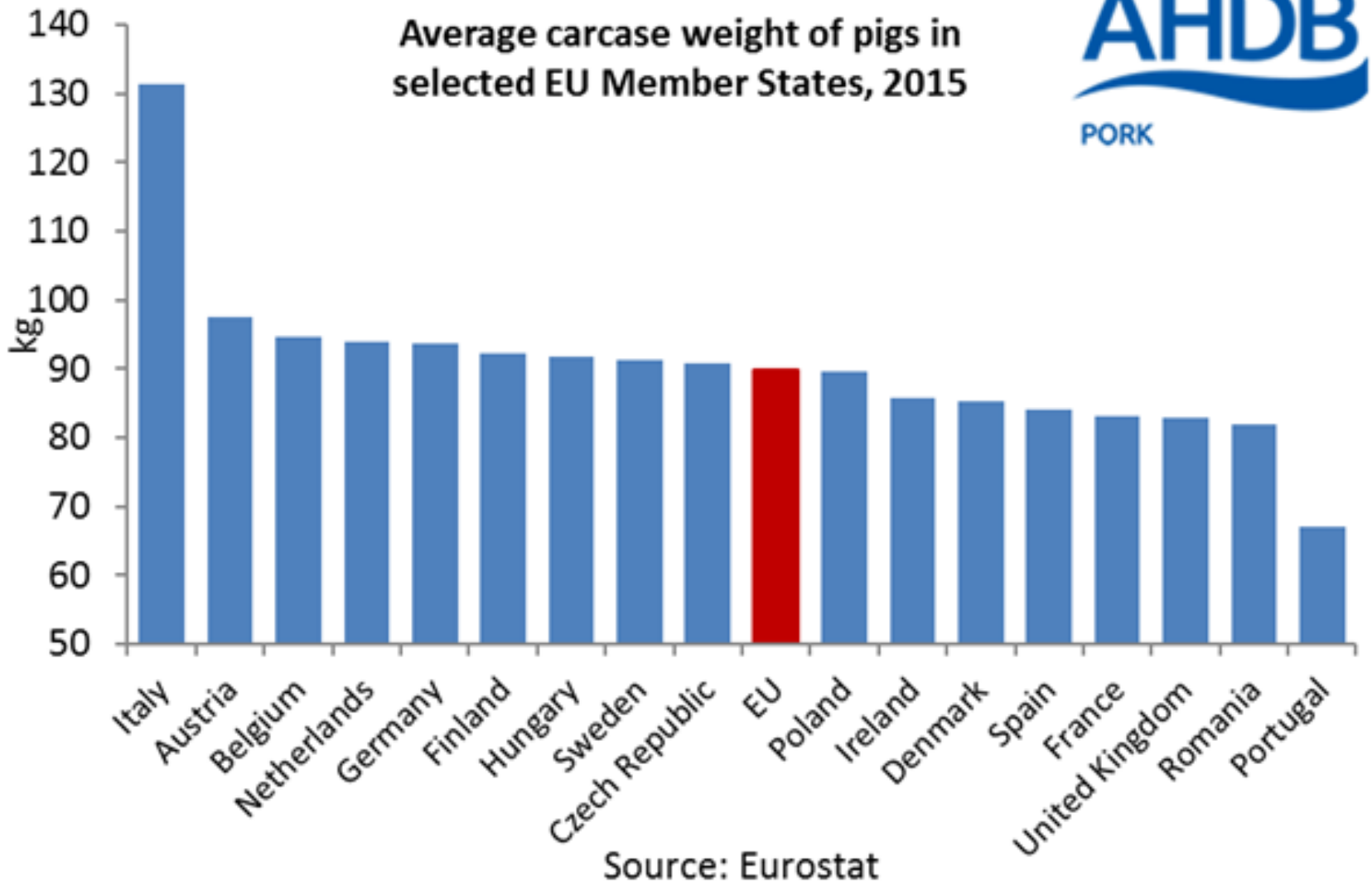

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Impact of Genetic Progress for Litter Size

- Total Born per litter 18.2
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- Weaned per litter 13.5 + 1.7 + 0.3
  - Pre-weaning mortality 16% - 1.5%
- Finished per litter 12.8 + 1.6 + 0.4
  - Post-weaning mortality 5.2% - 0.5%
- Kilos sold per litter 1,216 + 152kg + 38kg + 539kg
  - Carcase weight 131.4kg

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Elite Sow Output

2.66 x 1945kg = 5,174kg (+38.3%)

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Issues With This Approach

- Consumer/Retail Demand
  - Pack & Portion size

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finest
Thick Cut
PORK CHOPS


essential
Waitrose
british pork
outdoor bred with care by farmers
who share our values
pork chops


TESCO
Pork Chops

Issues With This Approach

- Consumer/Retail Demand
  - Pack & Portion size
- **Shape of the Growth Curve**

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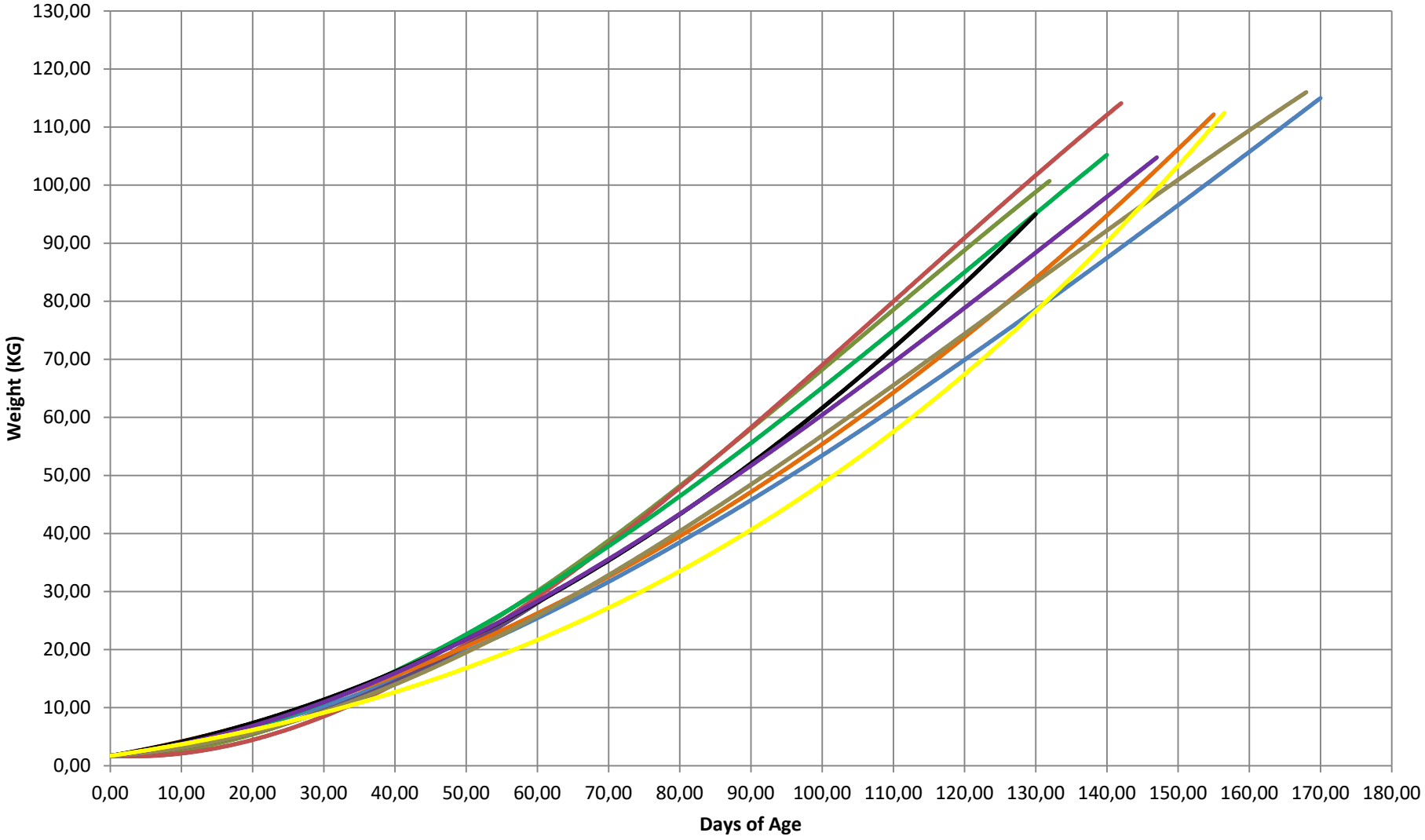
Customer Growth Curves



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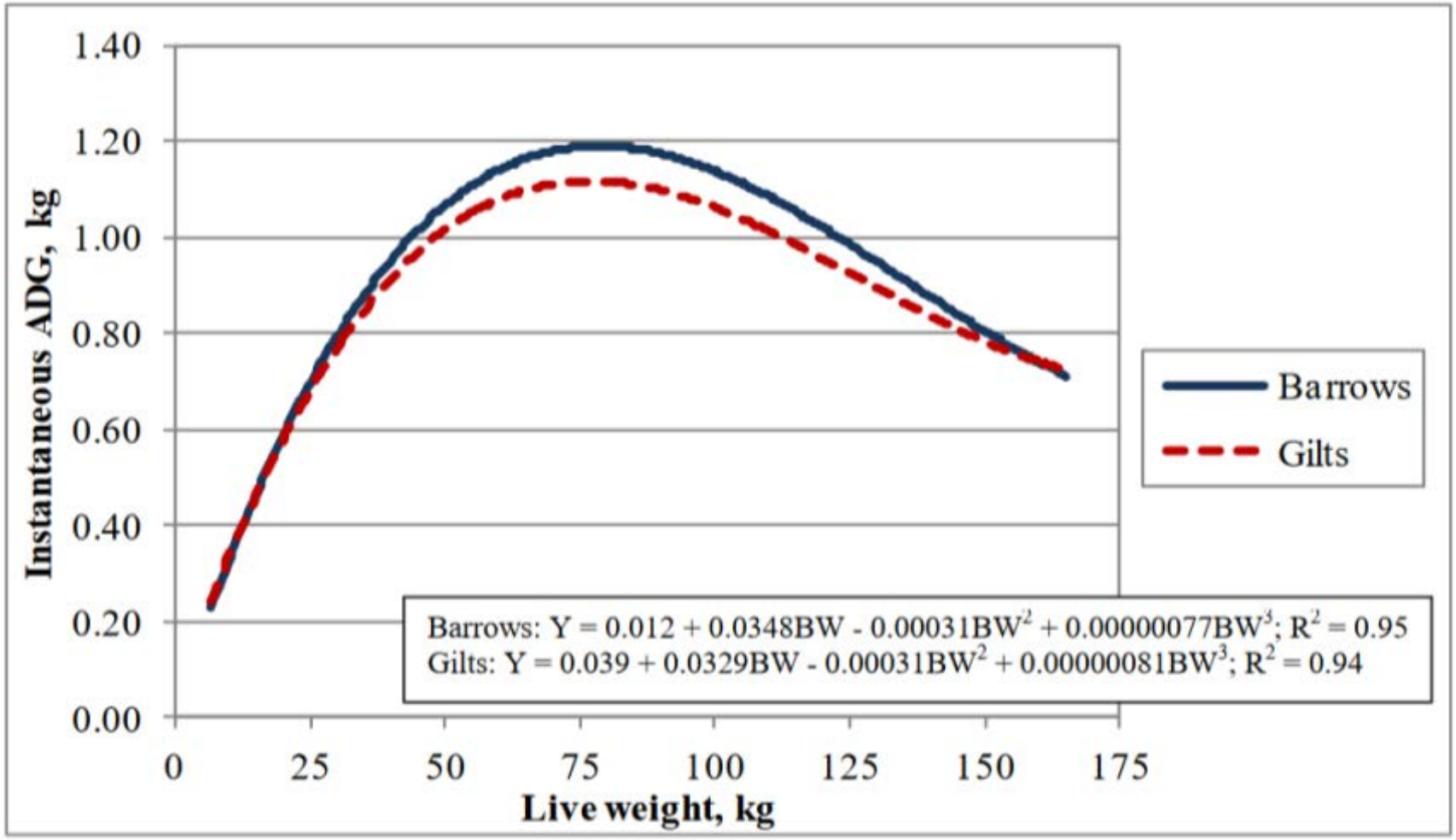

Taken from PhD Thesis of Shull (2013), University of Illinois

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Issues With This Approach

- Consumer/Retail Demand
  - Pack & Portion size
- Shape of the Growth Curve
- **Boar Taint**

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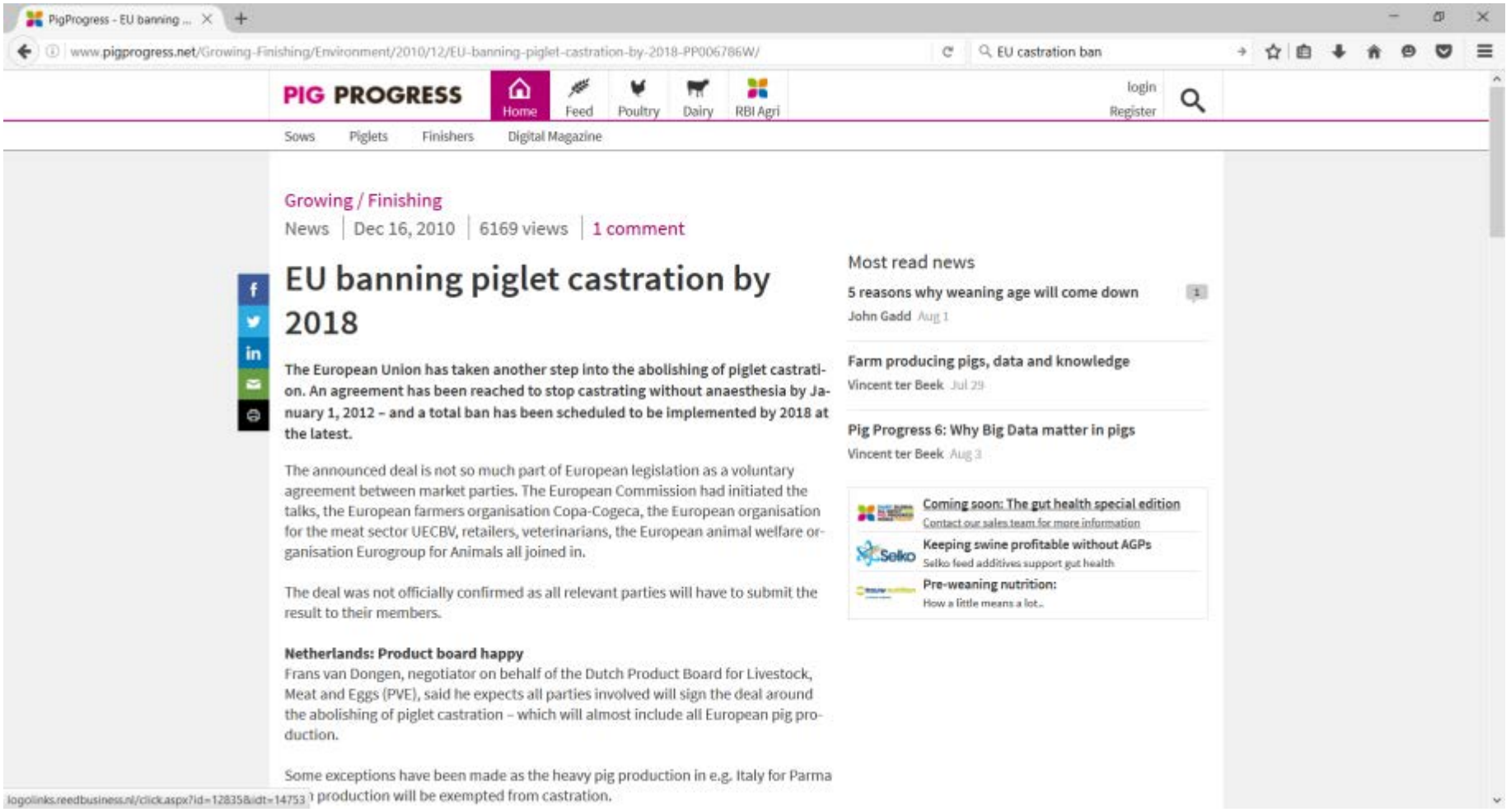

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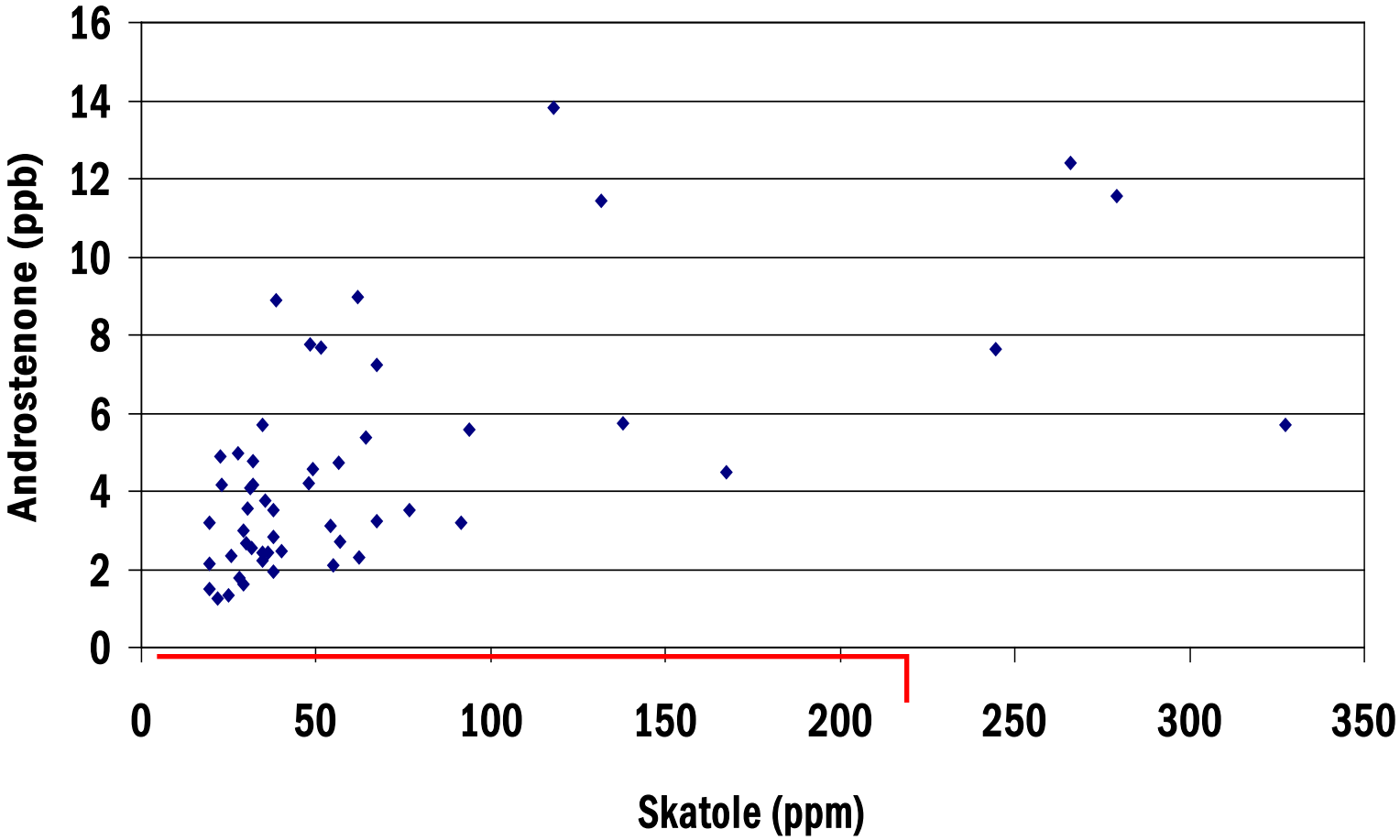
Duroc Sireline: 100% Taint



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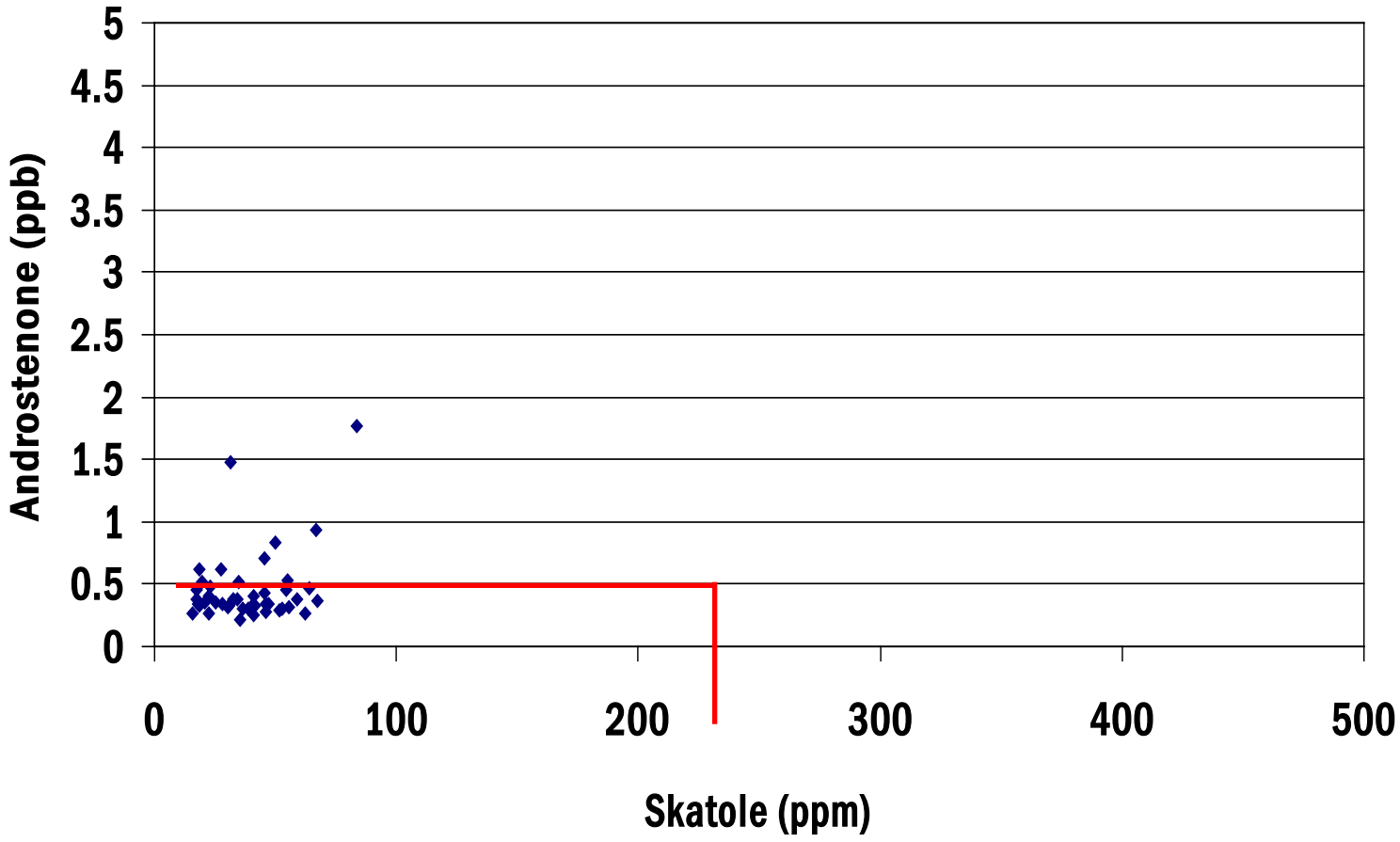
Low Taint Sireline: 4.5% Taint



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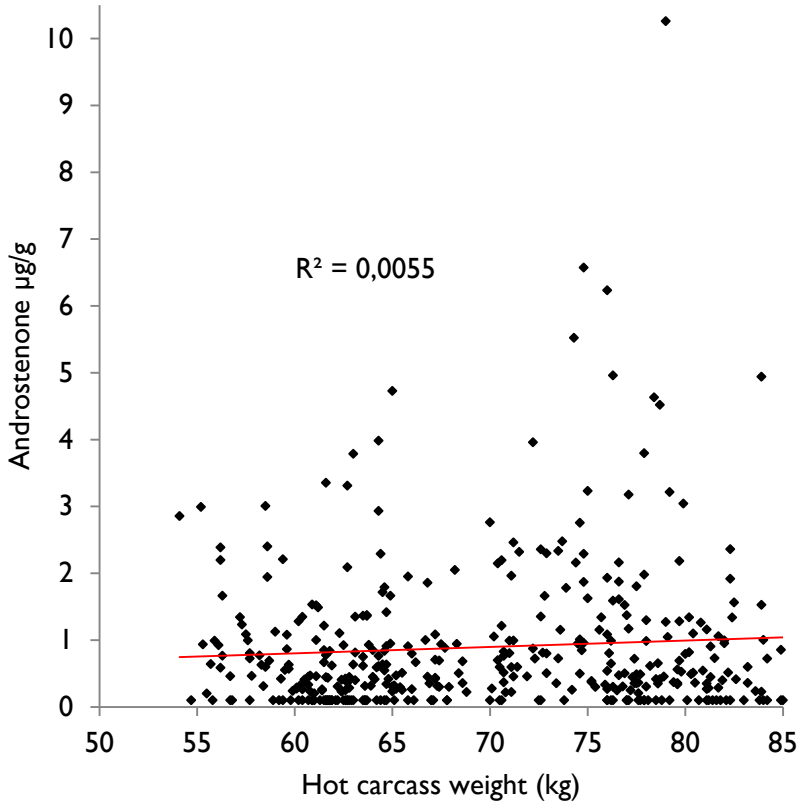
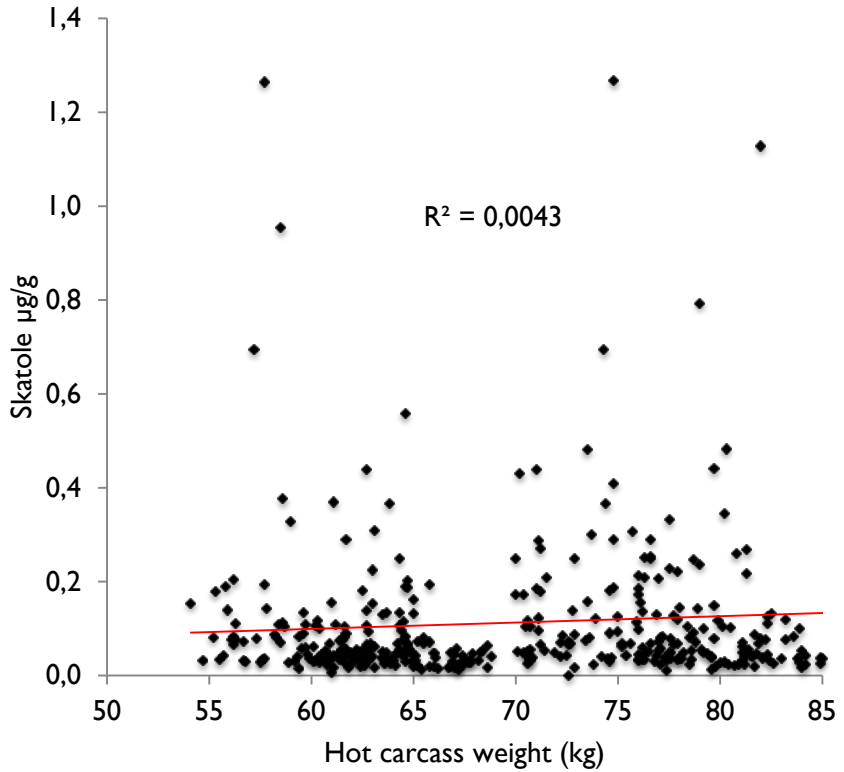
Poor correlation between boar taint risk and carcase weight





(D'Souza et al., 2011)

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Issues With This Approach

- Consumer/Retail Demand
  - Pack & Portion size
- Shape of the Growth Curve
- Boar Taint
- **Farm Capacity**

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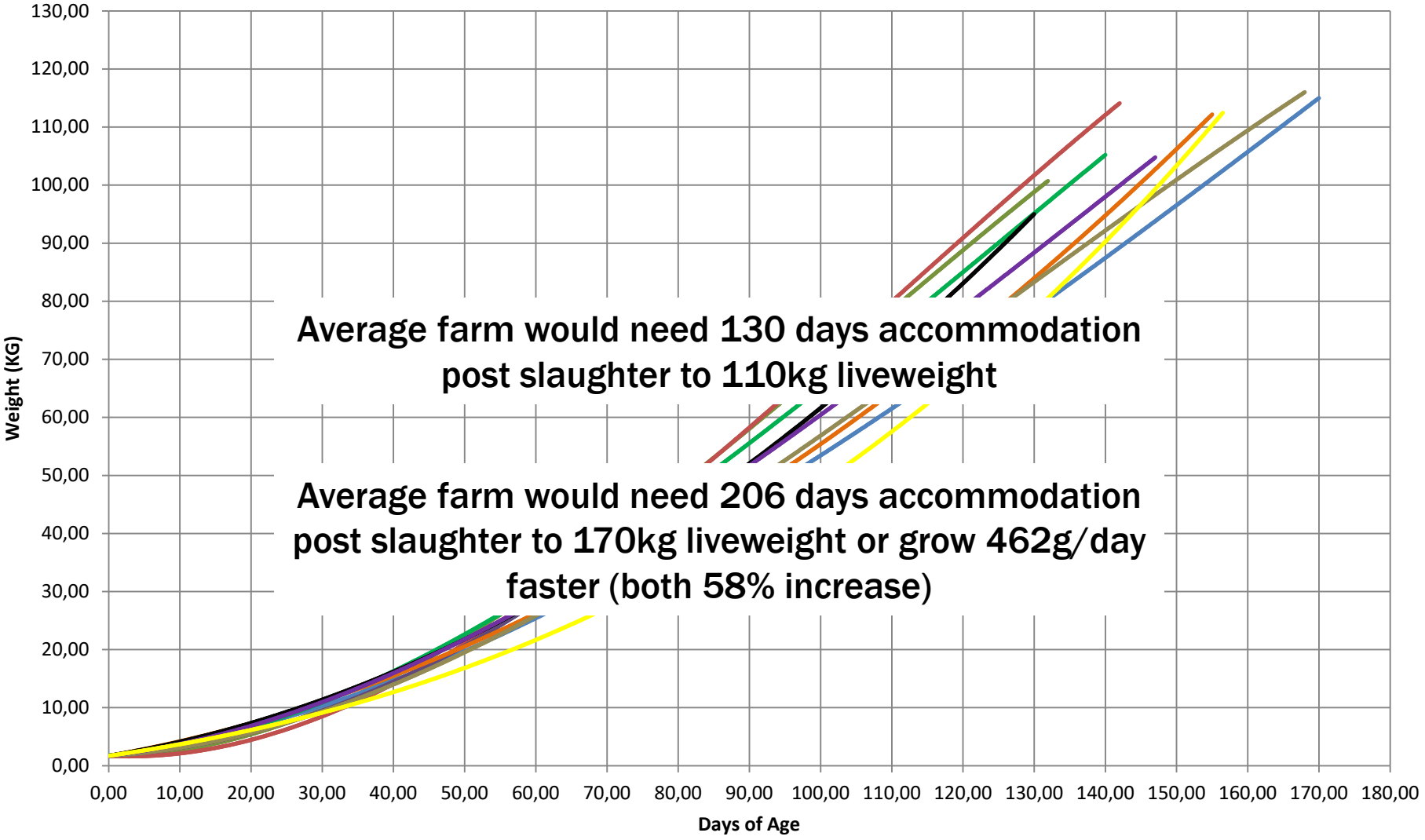
Customer Growth Curves



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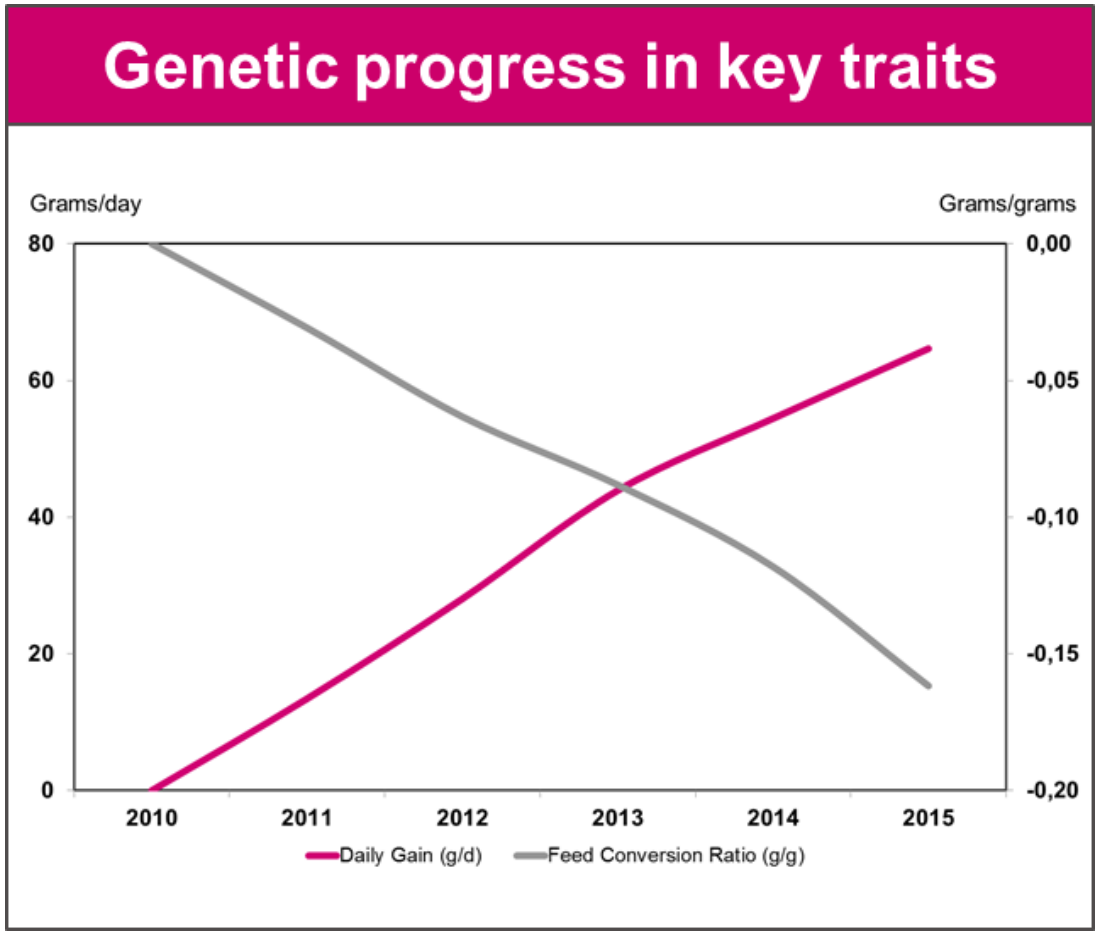
462g/day = 39 years genetic progress!



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5 Tonne Sow: Possible?

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Elite Sow Output

2.66 x 1945kg = 5,174kg (+38.3%)

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5 Tonne Sow: Probable?

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You can never put too much pork in your mouth as far as I'm concerned

Lewis Black

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