Breeding your cows for genetic gain

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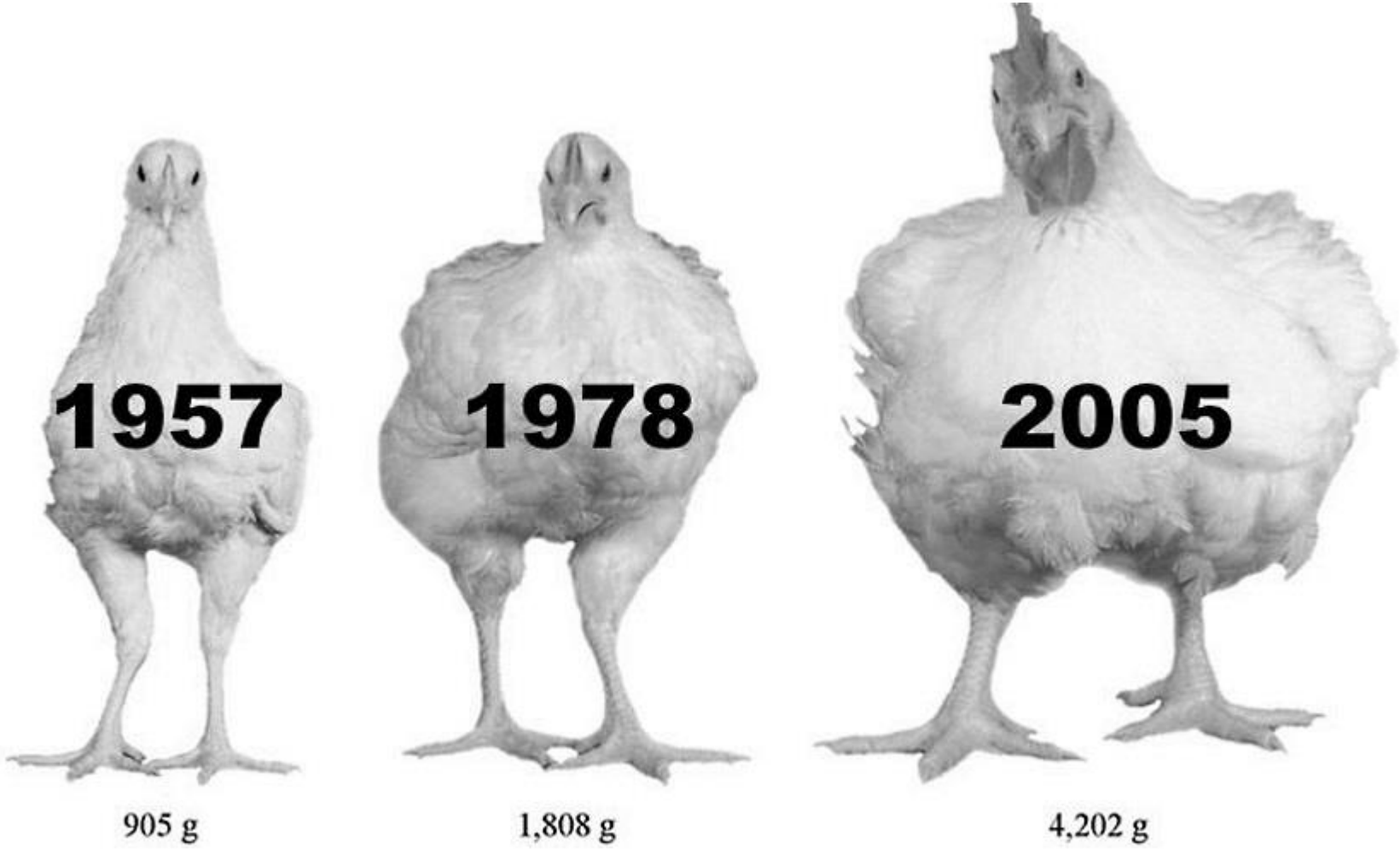
Genetic improvement

Genetic improvement should be the key objective for a stud breeder.

- Occurs when the sire team you select are of higher merit than the cows in your herd and ultimately breed calves that are superior to their parents

• Genetic change vs genetic improvement



Raised on the exact same diet,

for the same length of time,

under the same conditions

Factors: Heritability (h2)

How much of what you see is genetic.

Or… how much a calf is like its parents

- If its not heritable then you cant select
- Expressed 0 to 100% or 0 to 1

Some of the questions you face

1. *How many heifers should be kept for replacements?*
2. *How many sires should I use? And which sires?*
3. *Should I use a proven older sire or a promising young sire?*
4. *Should I use or buy in new bloodlines?*

PHENOTYPE = GENOTYPE + ENVIRONMENT

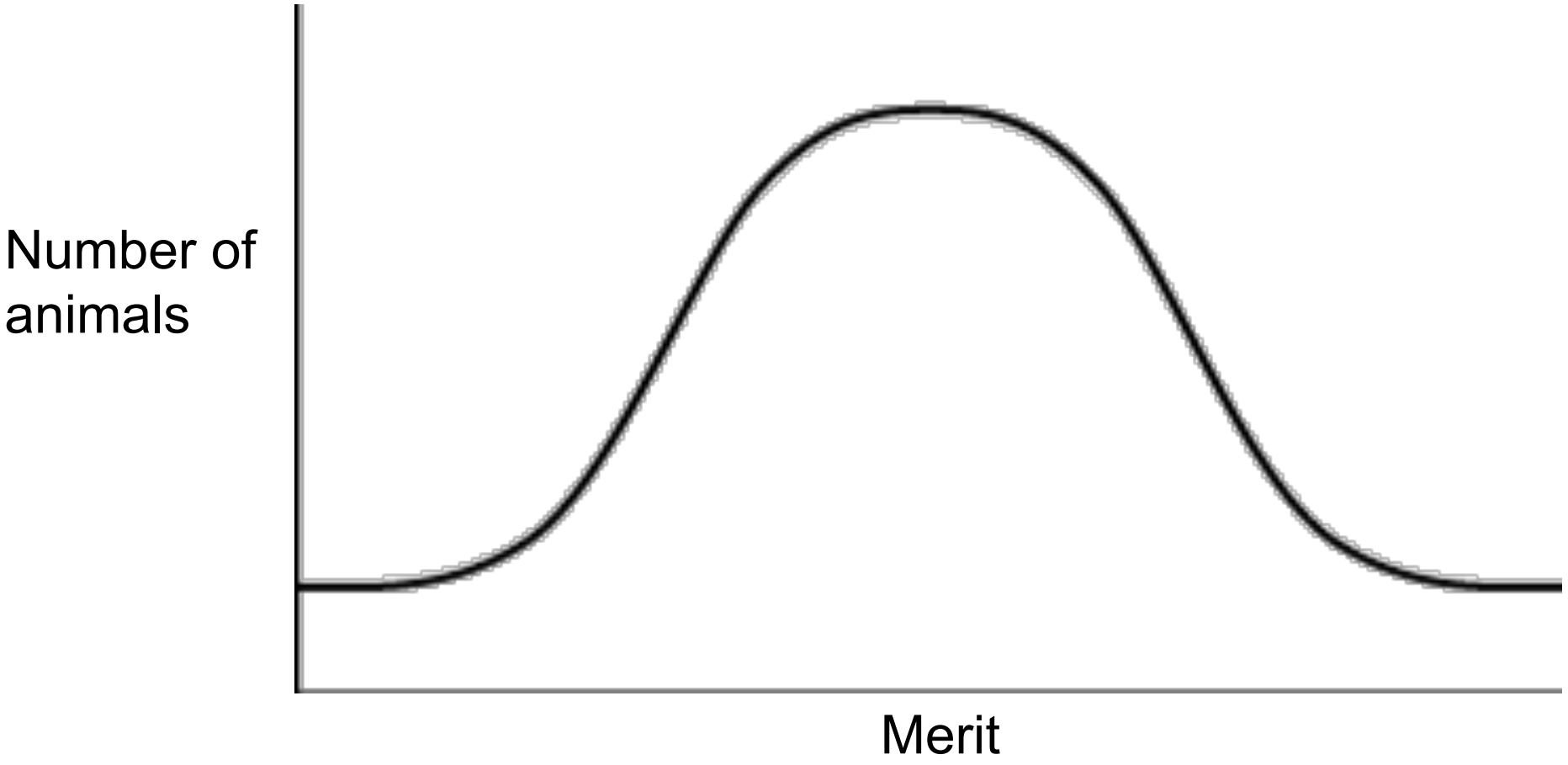
$P = G + E$

Low Heritability

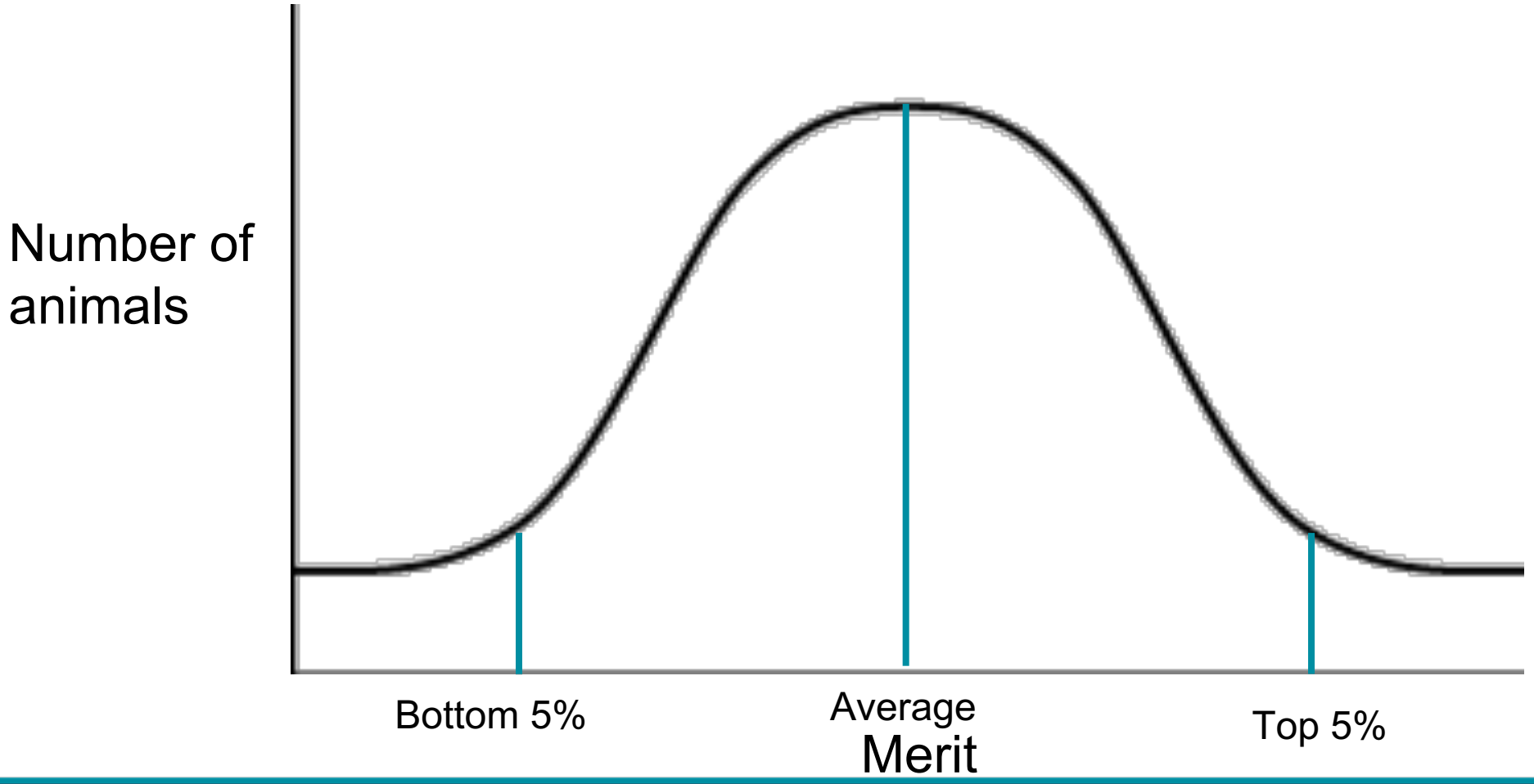
$P = G + E$

High Heritability

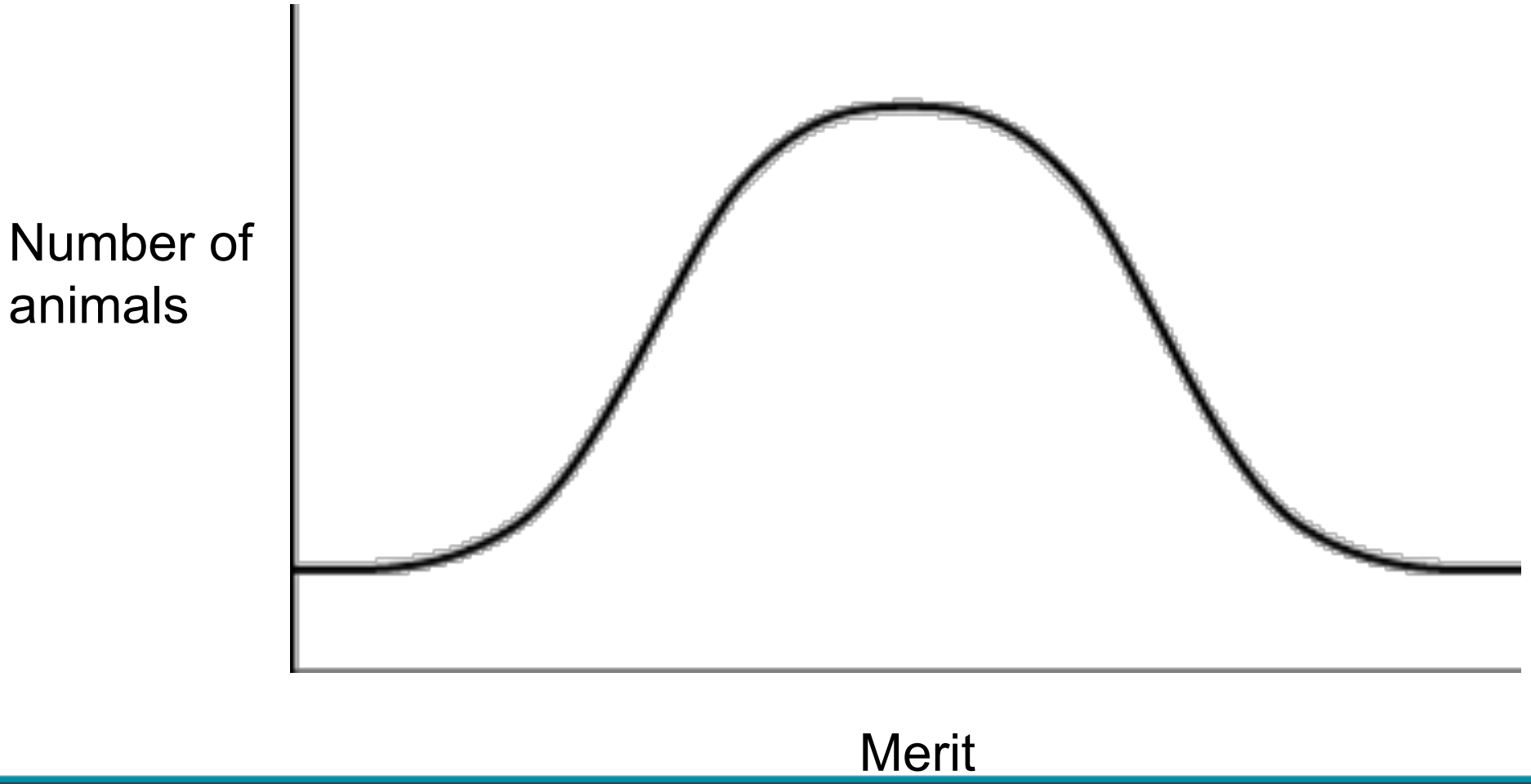
The bell curve



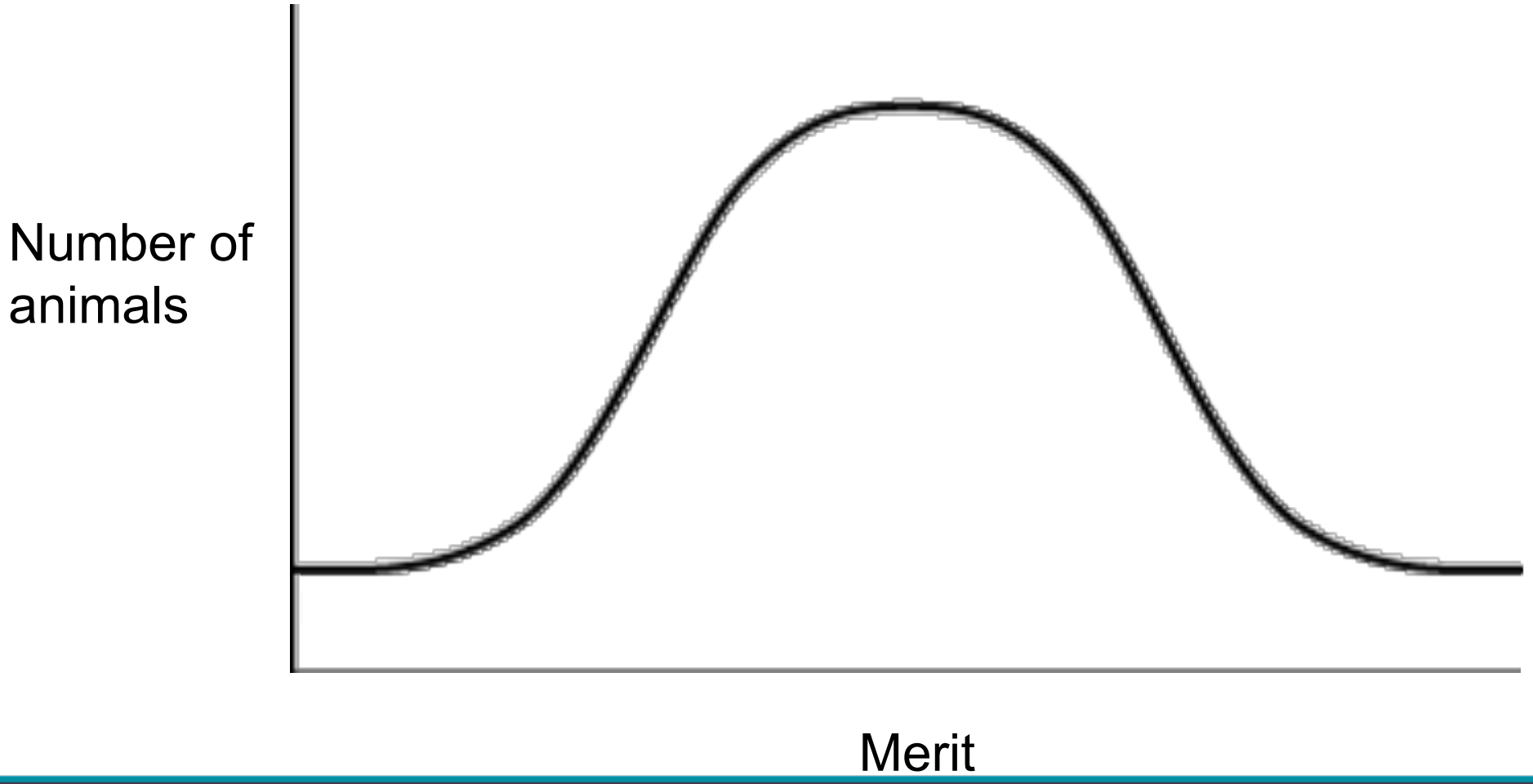
The bell curve



The bell curve



The bell curve

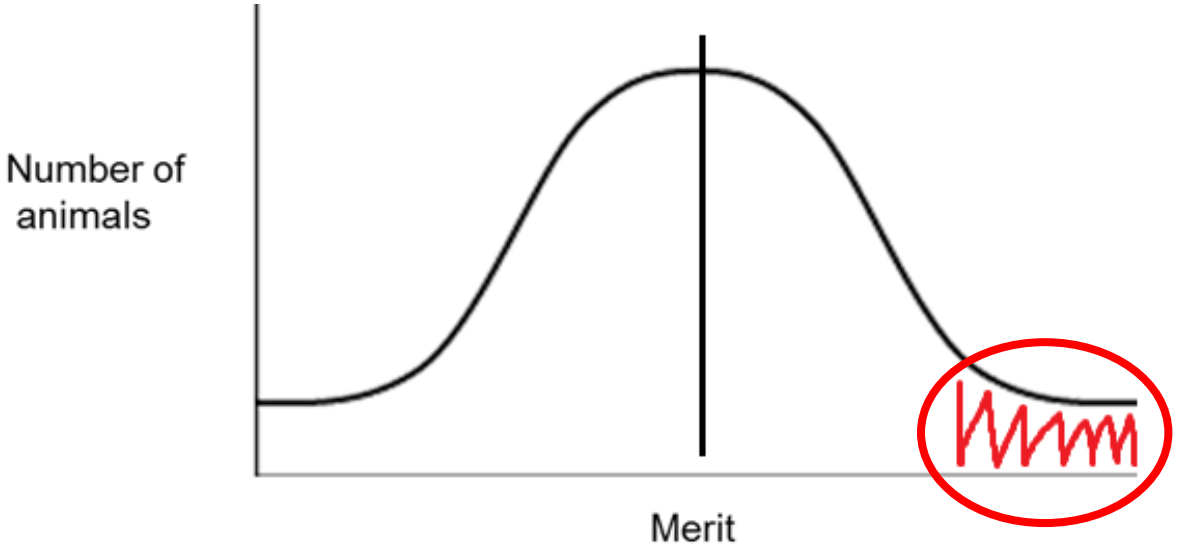


The Breeders Equation

$$\text{Response} = \frac{\textbf{Intensity} \times \textbf{Accuracy} \times \textbf{Differential}}{\textbf{Generation Interval}}$$

Selection intensity

How good the parents are. So… select the best parents



Response = $\frac{\textbf{Intensity} \times \text{Accuracy} \times \text{Variation}}{\text{Generation Interval}}$

Selection accuracy

Difference between estimated and true genetic merit

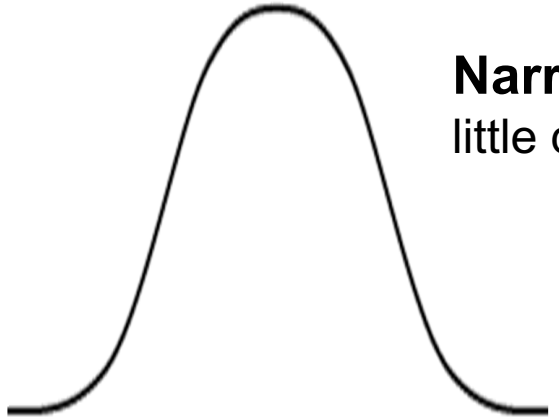
- the Better the info contributing to the EBV the better the accuracy
- Can still have gain with low accuracy
- Trade offs. Should I use a proven bull or a promising young sire?

$$\text{Response} = \frac{\text{Intensity} \times \textbf{Accuracy} \times \text{Variation}}{\text{Generation Interval}}$$

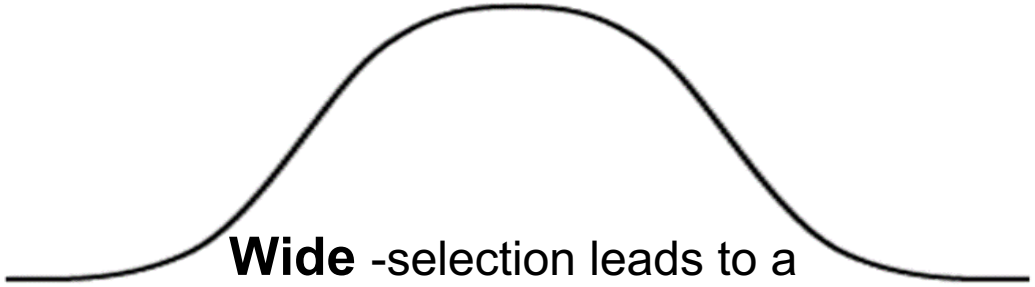
Variation

Extreme ends of the scale are inbreeding depression and Hybrid Vigour

- Use more sires. Product consistency trade off



Narrow -selection leads to little difference in the mean



Wide -selection leads to a larger difference in the mean

$$\text{Response} = \frac{\text{Intensity} \times \text{Accuracy} \times \textbf{Variation}}{\text{Generation Interval}}$$

Generation interval

Average age of your herd

Yearling bulls to yearling heifers?

Intensity x Accuracy x Variation

Generation Interval

Antagonisms

- Intensity and variation (the best parents are often related)

- Accuracy and generation interval (young bulls-not enough info)
  - Genomics

Balance the breeders equation

If the relative factors of genetic change can be achieved in balance then there is no end to the potential improvement within a programme

van der Werf et al. 2011

Ramping up gain: Tools and Methods

Get a breeding objective

- This gives you the goal

- Record what's important to that objective

- If you are selecting on many traits you wont go as fast
  - Index selection is a good idea for balance

Ramping up gain: Tools and Methods

Spread the good genes

- ET *(Intensity)*
- A.I *(Intensity)*

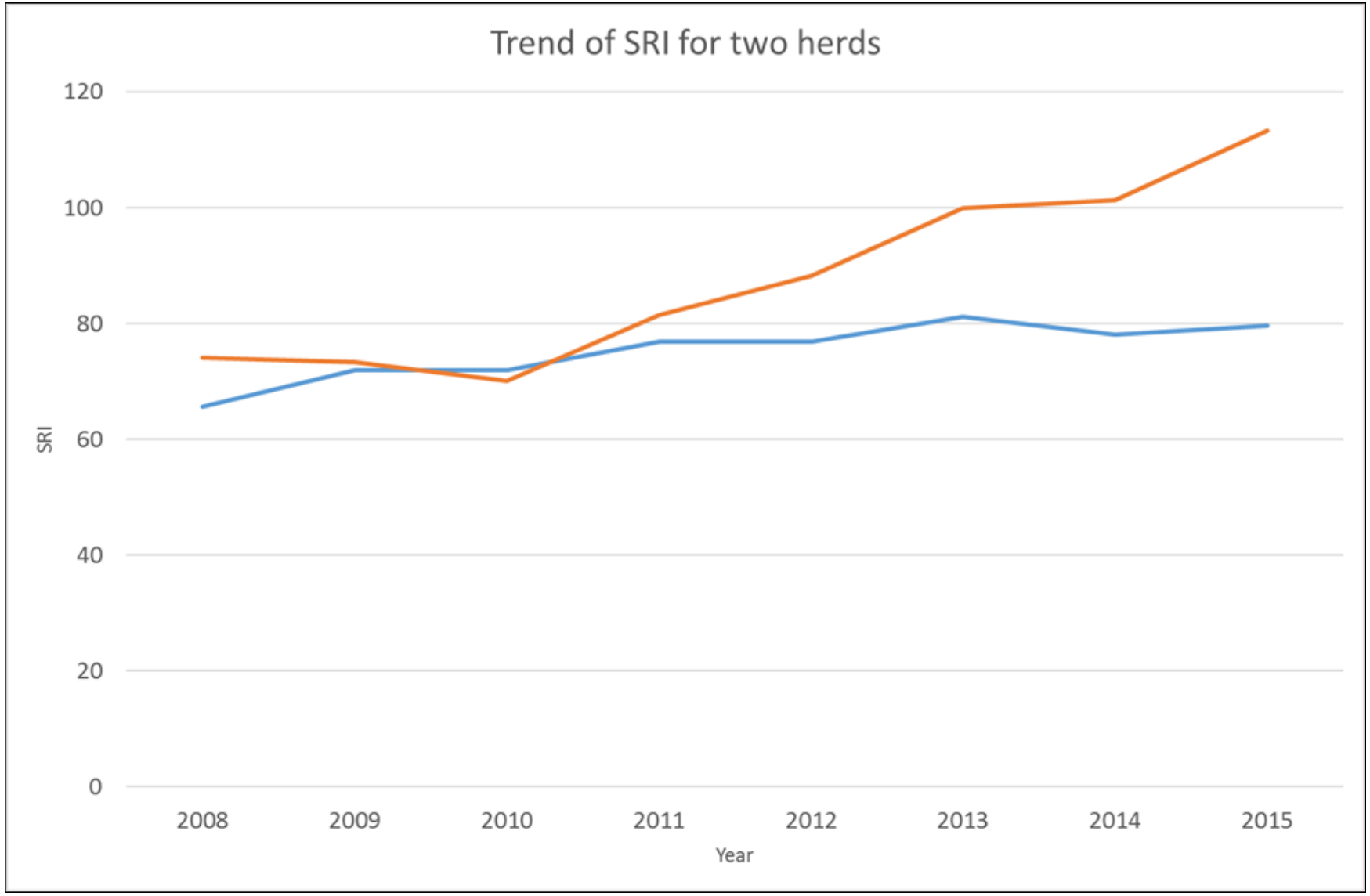
* Trade off is price

Ramping up gain: Tools and Methods

Make sure your EBVs are solid *(Accuracy)*

- DNA parentage
- Use your EID tags- electronic capture
- Get a herd recording software
- Improve you herd star rating
- Genomics- if this is available to you

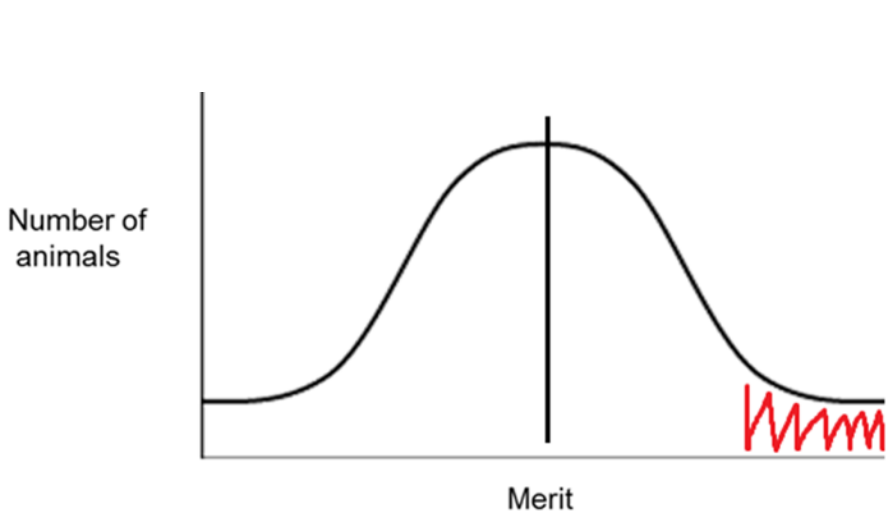
Gold standard vs bronze recording



Ramping up gain: Tools and Methods

Choose good bulls *(Intensity)*

- They determine 80% of the genes in your herd
- Use more sires



Ramping up gain: Tools and Methods

Heifer selection

- Mate as many as you can and mate them young
- Be objective about their place in the herd
- Genomics

Cow selection (Culling)

- Less effective as sire but must chip away
- Represents 20% of the potential gain in your herd

Ramping up gain: Tools and Methods

Optimised mating software *(Variation + Balance)*

- Paint by numbers mating for genetic gain

- No inbreeding

- Best parent to parent combo in each mating

MateSel

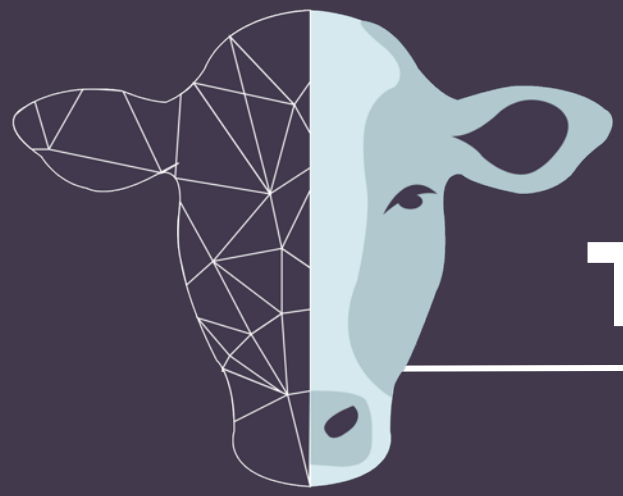
Summary

- Get a breeding objective
- Balance the Breeders Equation
- Use the tools and methods - key being performance recording

$$\frac{\textbf{Intensity} \times \textbf{Accuracy} \times \textbf{Variation}}{\textbf{Generation Interval}}$$

‘There is no end to the improvement of anything biological, it may slow down but it will go on’

Gavin Faloon, 2014



Thank you.

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