

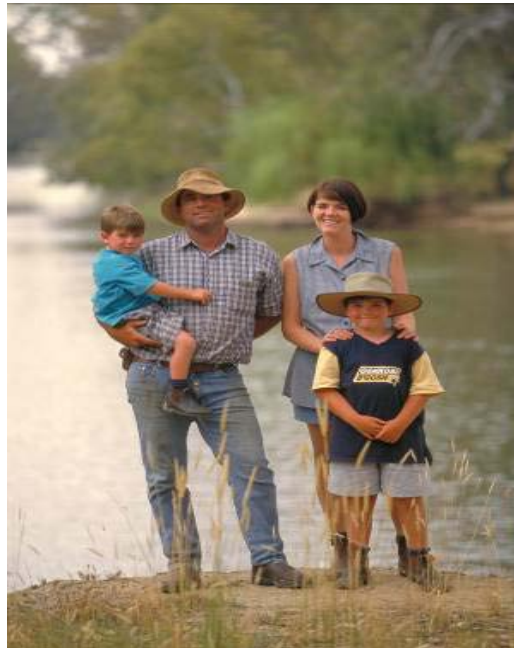
Biotechnology for Genetic Improvement: A Producer Perspective

Terry Longhurst
Manager Strategic Science

About Meat & Livestock Australia

MLA is a:

- producer-owned company with more than 47,500 members
- service company for beef, sheepmeat and goatmeat producers and industry



About MLA

MLA does:

- build demand, productivity and trust for Australia's red meat industry
- deliver marketing and research services with government and industry

About MLA

MLA does not:

- regulate the industry
- lobby Australian Government
- buy or sell meat
- control prices

MLA interests

- Research & Development
 - On-farm
 - Off-farm
 - Industry Systems
- Marketing
 - Domestic
 - International
 - Market analysis

On-farm

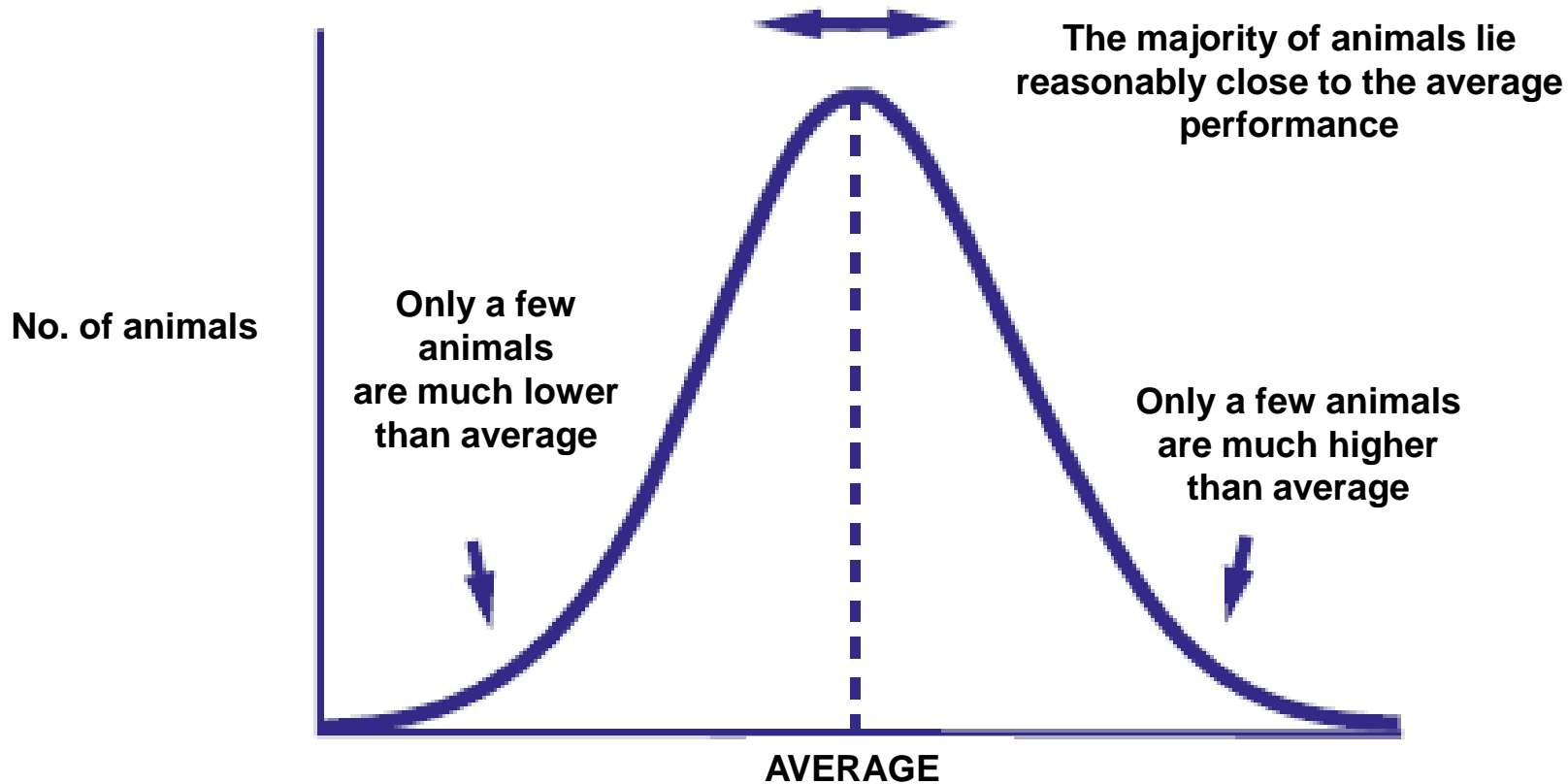
We invest levy income paid by producers and matching Govt \$ in on-farm innovations to improve triple bottom line outcomes for producers

- Profit benefits
- Planet benefits
- People benefits

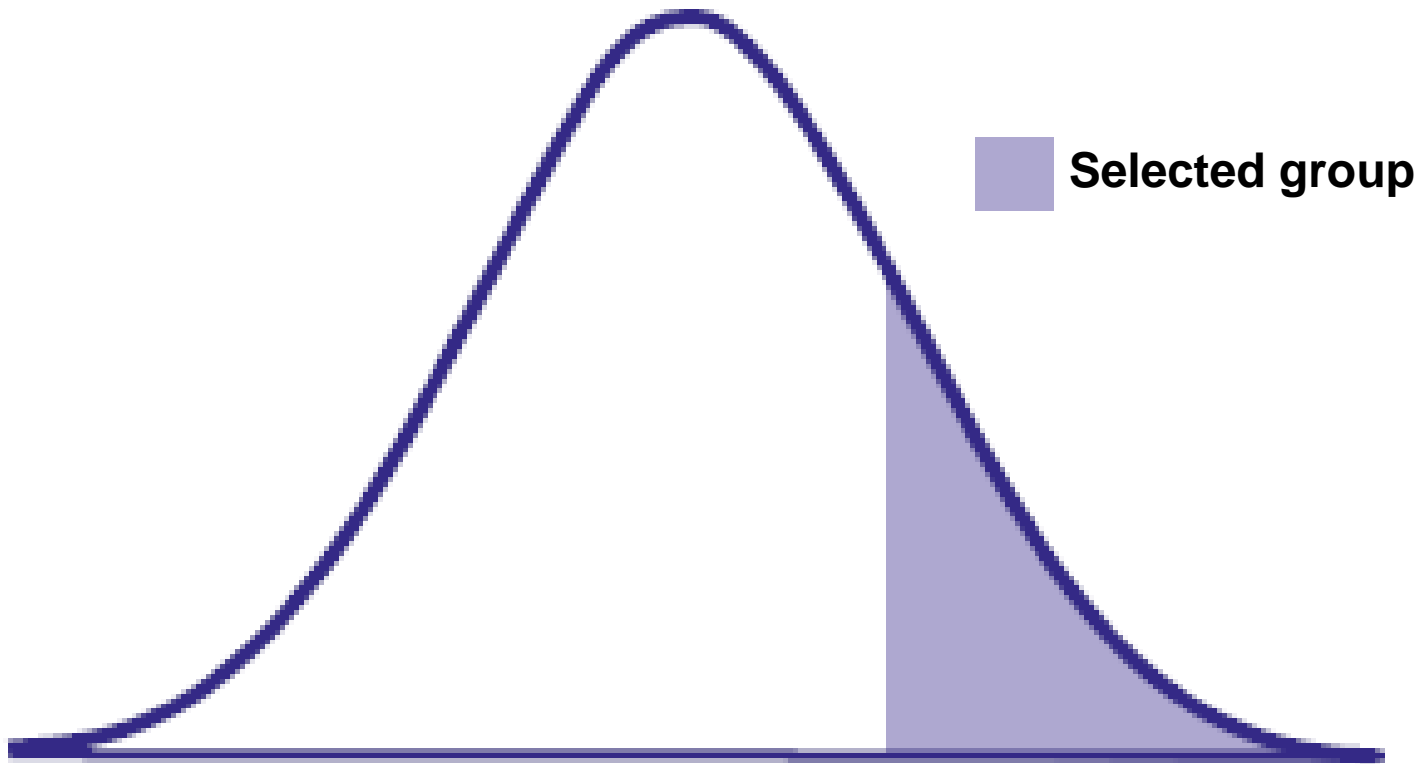
Biotechnology for genetic improvement

- Genetics and Genomics in Beef CRC, Sheep CRC and SheepGenomics
- DNA markers in use by industry
 - Parentage testing
 - DNA markers identified with traits
 - Whole Genome Selection
- How are DNA markers being delivered to industry?
 - Now
 - Future

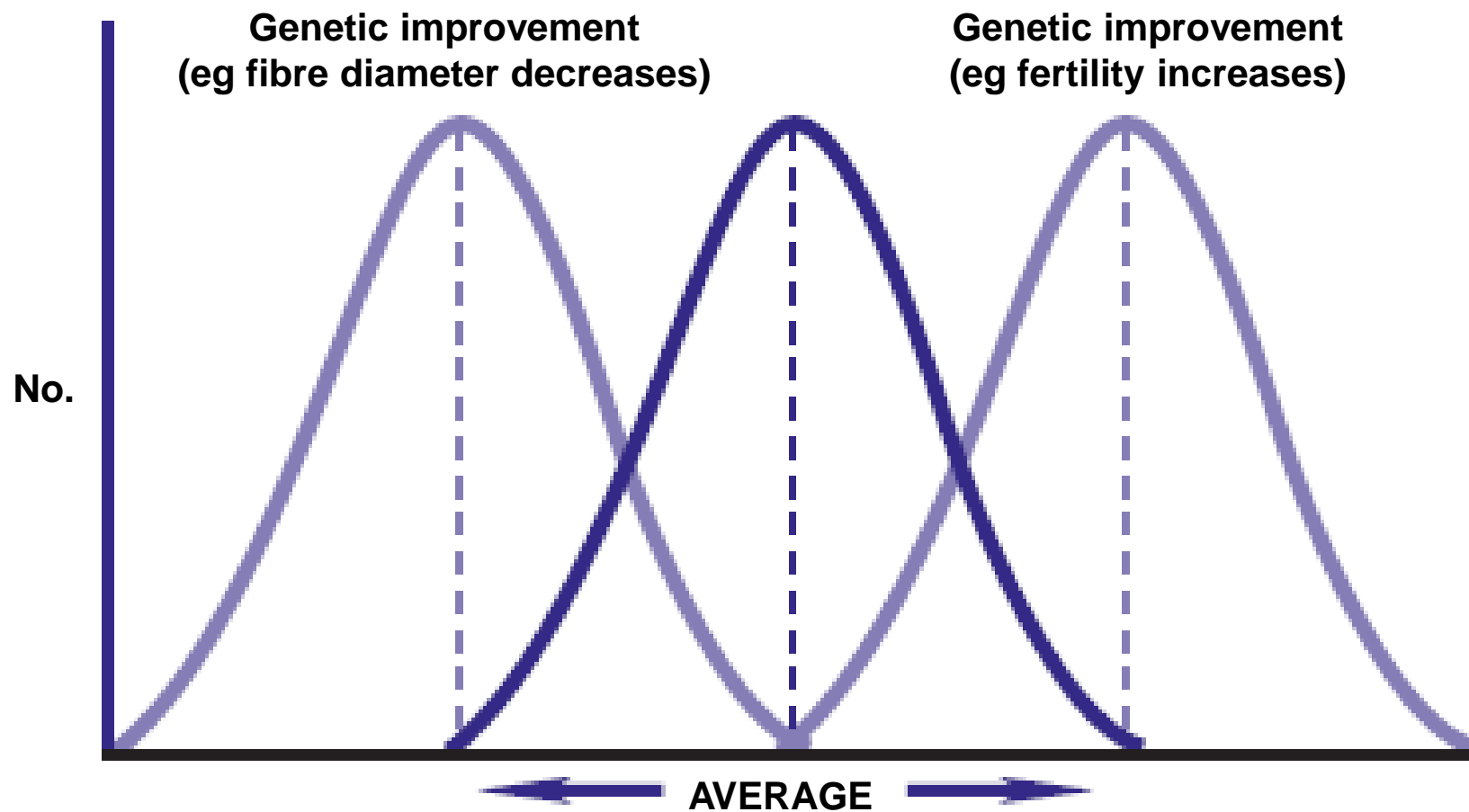
Population normal distribution or 'bell curve'



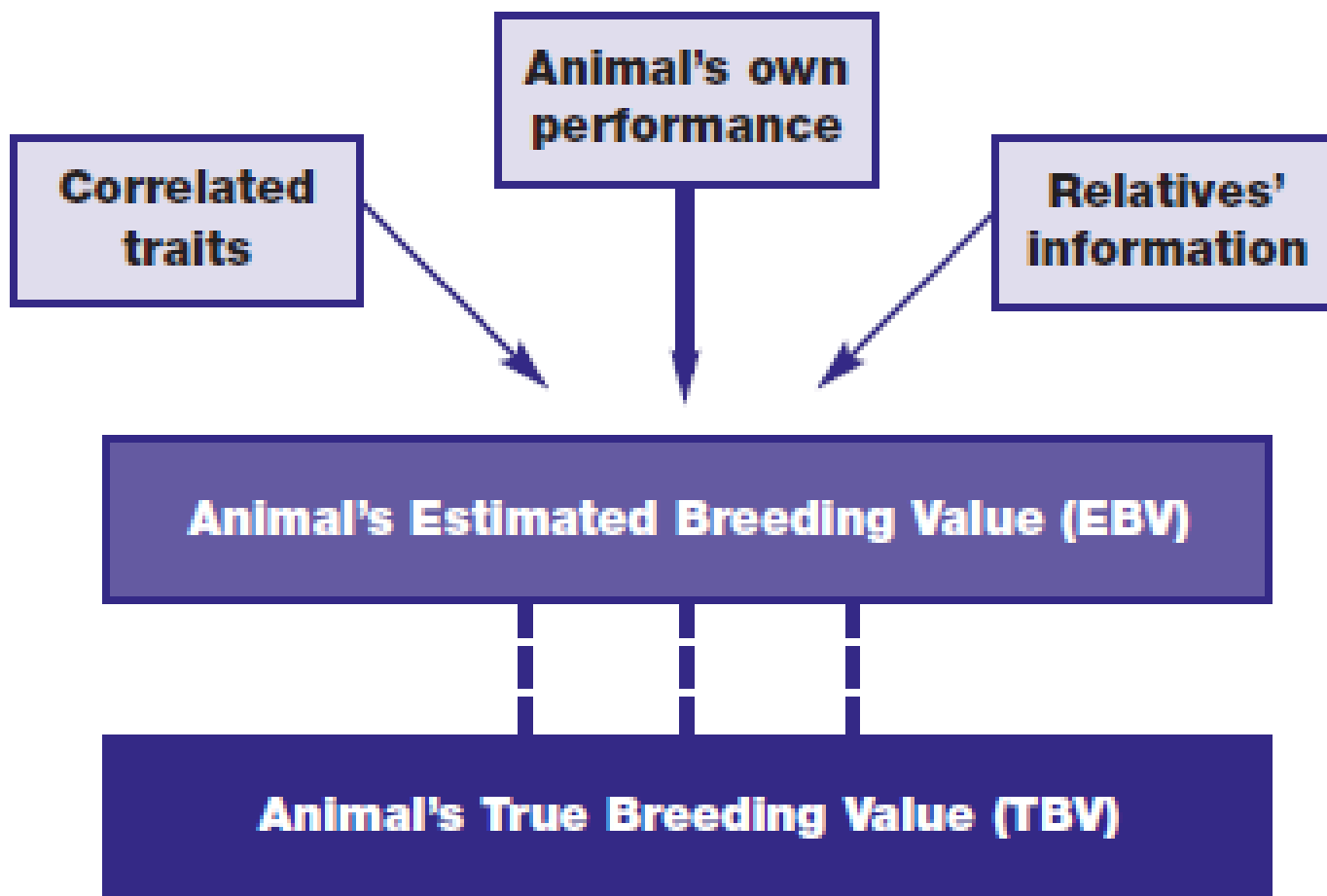
Make selection decisions if the trait is heritable



Genetic improvement is 'shifting the bell curve'



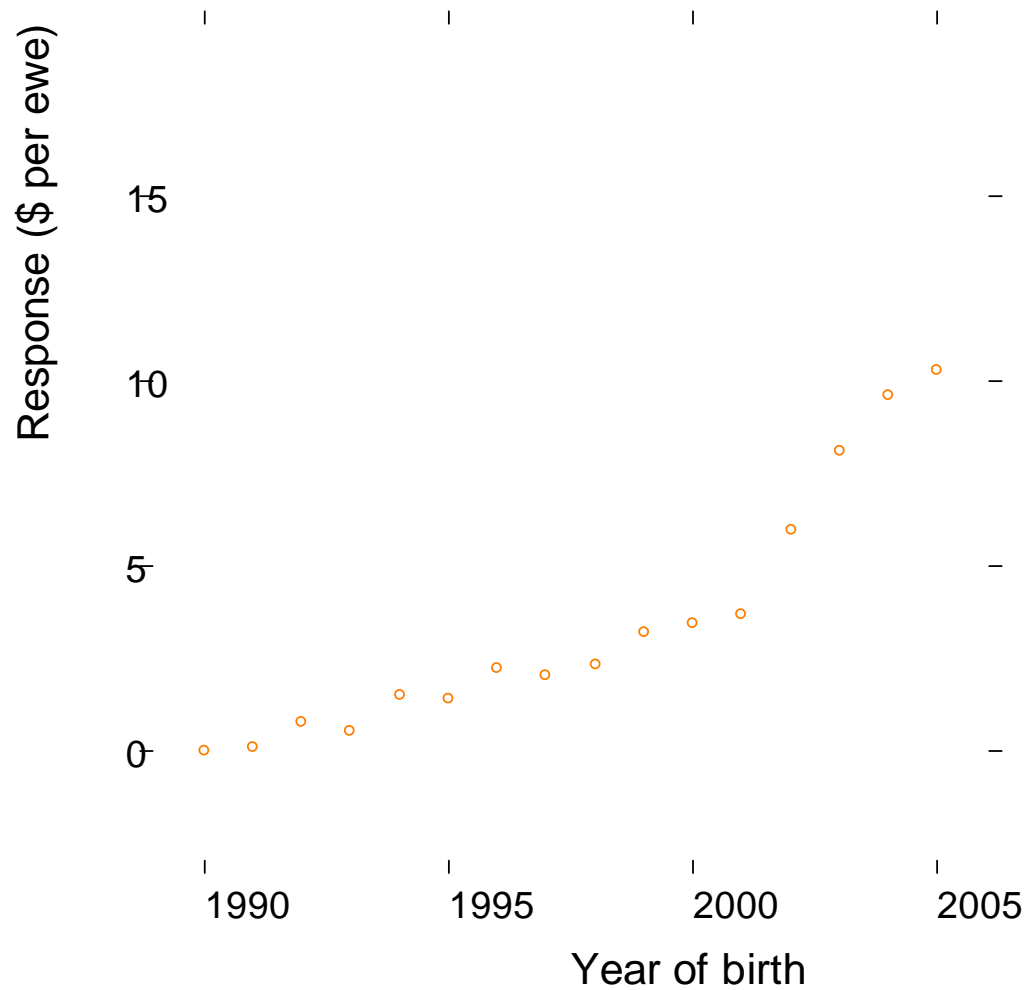
Information contributing to EBV and TBV



Genetic trend



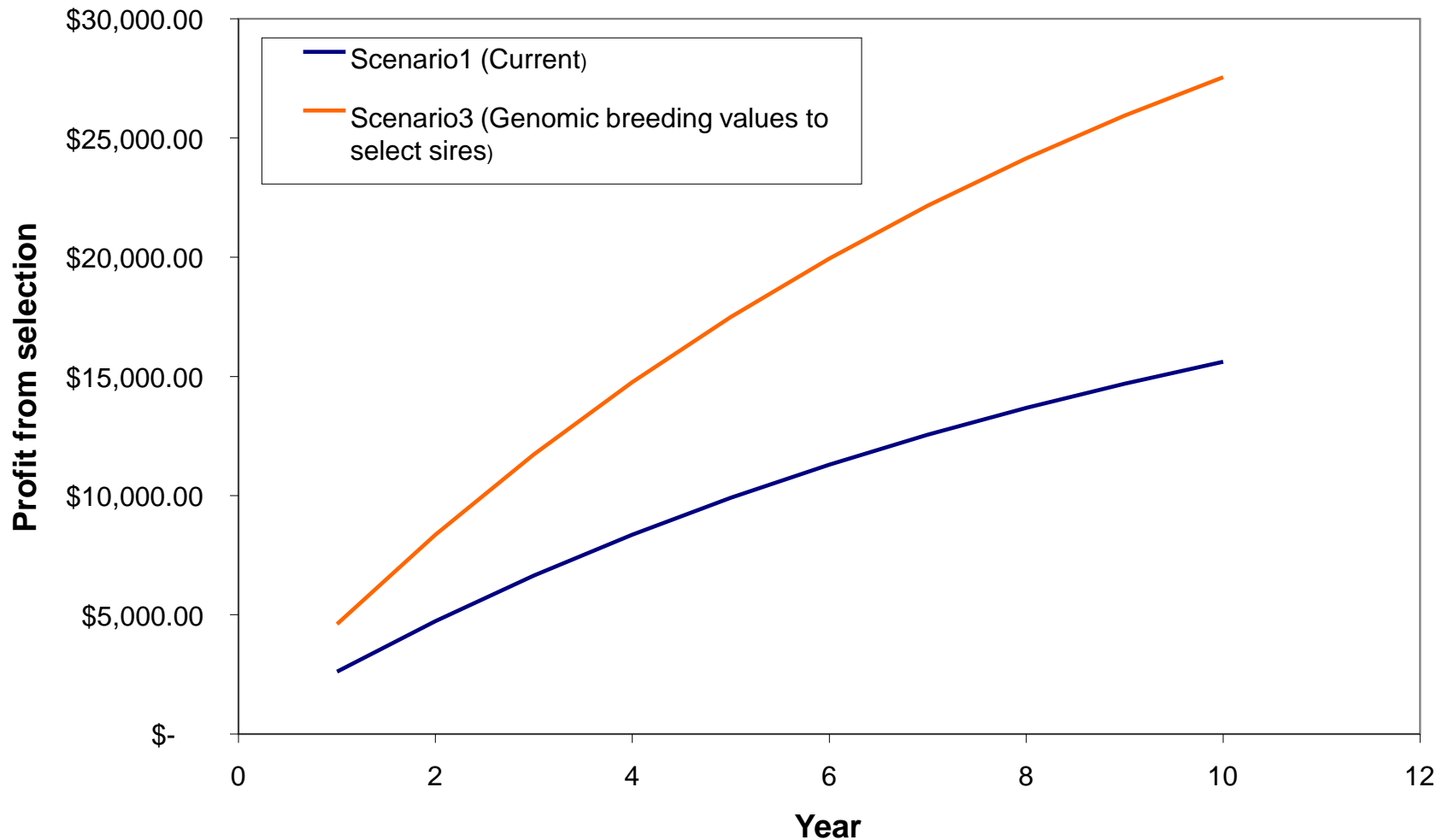
Response in \$ per ewe per year



Why use SNP chip info?

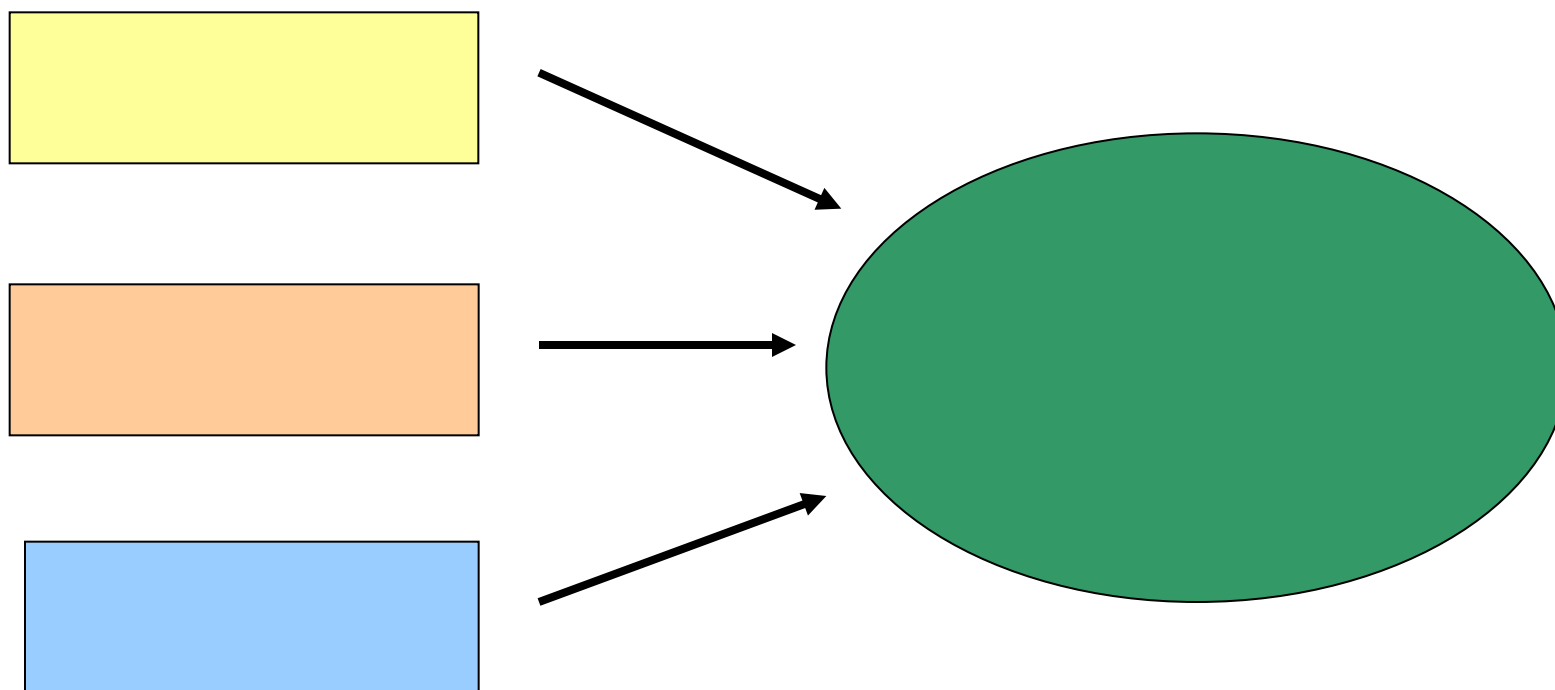
- Value of using information from SNP chip
 - Hard to measure traits - sheep
 - For Terminals**
 - Carcase traits
 - Eating quality
 - Merinos / Maternals**
 - Adult traits
 - Reproduction
 - Hard to measure traits – cattle
 - Feed efficiency – pasture and feedlot**
 - Methane production**
 - **Shorter selection timeframes**
 - Make selection decisions at younger ages with more confidence**

Benefit to industry



What is the aim for genomics?

Seamless integration!



Estimated Breeding Value (EBV)

Can be calculated from:

- Trait + Pedigree
- Trait + Pedigree + DNA marker information
- DNA marker information
 - DNA markers need to be validated in relevant population
 - Accuracy increases with more data from more animals

Genetic Improvement Models

- Selection based on looks
- BreedPlan and Breed Societies and Sheep Genetics Australia
 - Current delivery model which can include genomic data
 - Increase in effectiveness as databases grow
- Whole Genome Selection may redesign genetic improvement sector
 - WGS data will need calibration
 - No pedigree info required as WGS give relationship
 - Small studs may struggle for relevance?
 - Commercial sector can make more decisions?

Industry use of DNA markers

- First DNA markers in cattle have had a mixed success
 - Tenderness is proven
 - Marbling and Feed efficiency?
- Complex traits have 1000's of markers
 - Whole Genome Selection
- Parentage testing
 - Being improved with SNPs

Industry expectations for the future



- More data will become available
- Combine with more trait measurements
- Major cost will be trait measurement

Which traits?

- Don't focus on easy to measure traits
 - If it can be measured cheaply use the current model

- Focus on hard to measure traits
 - Feed efficiency
 - Methane output
 - Reproduction efficiency

Information Nucleus herd and flock

- Leading industry sires used in a centralized progeny test
 - Eg 100 sires with 30 progeny per sire pa
- Industry focused trait measurement with data immediately available for industry databases
 - Will deliver improvement through current delivery model
- IN will be used for calibration of DNA marker based equations in Australian industry populations

DNA markers in management decisions

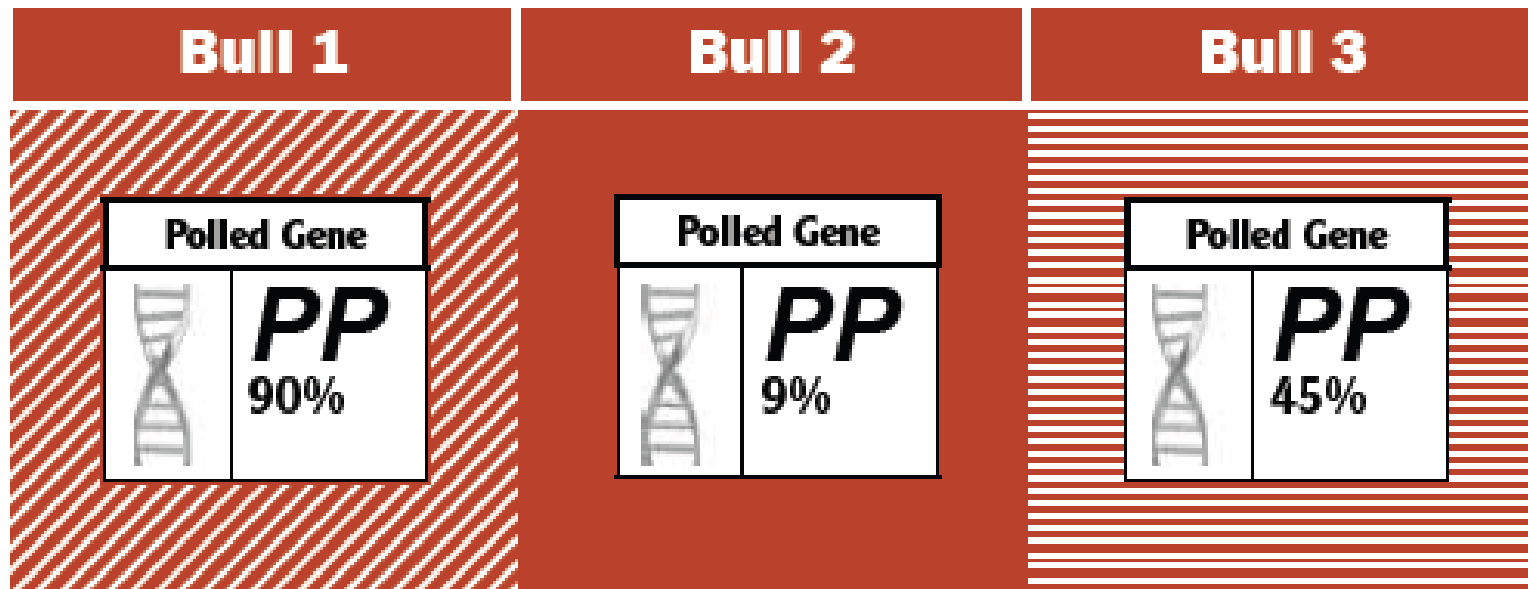
- Which animals to cull?
 - Carrying parasites?
 - Susceptible to parasites
 - Selection of replacement cow/ewe

- Which animals will meet market specifications?
 - Pasture
 - Feedlots

Poll gene marker test - what is the industry issue?



The solution is to breed polled cattle



THE UNIVERSITY
OF QUEENSLAND
AUSTRALIA

What is the commercialisation pathway?

- The test is not 100% accurate, with variation between breeds
- Animal Genetics Laboratory, The University of Queensland is offering the test as for industry validation
- Other DNA technology service providers have been granted commercialisation rights