



2016

GLOBAL DOHNE CONFERENCE

JULY 21 -22 | AUSTRALIA

Celebrating
50 years

"A must for all sheep producers"

Genomics and the Nucleus Flock

Julius van der Werf (Univ. of New England, Sheep CRC)



If you want to improve it.....you need to measure it !

2007-2011 CRC Information Nucleus Flock

~ 18,000 lambs weaned
measured for:

- Live weight and scan traits
- Carcase Traits
- Wool Production Traits
- Visual Traits
- Parasites
- Reproduction

Genomic Selection Reference Flock



Genomic Technologies

Development of SNP-chips

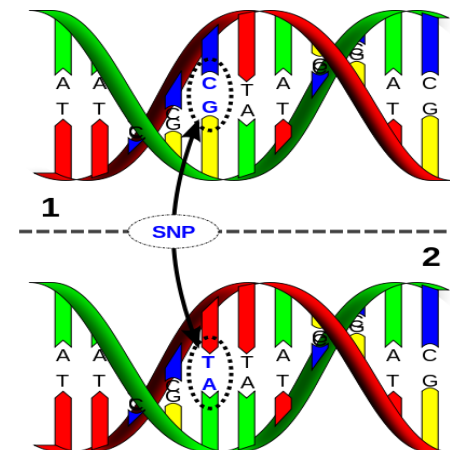
2005	Cattle 10k	\$400
2007	Cattle 50k	\$200
2009	Sheep 50k	\$100
2010	Cattle 800k (HD)	\$200
2012	Sheep 600k (HD)	\$200
2013	Sheep 12k	\$50
2016	Sheep 15k	\$50

50,000 DNA markers

2016 Sheep Full Sequence \$1200 (\$500 million in 2001!)

Expect 2019

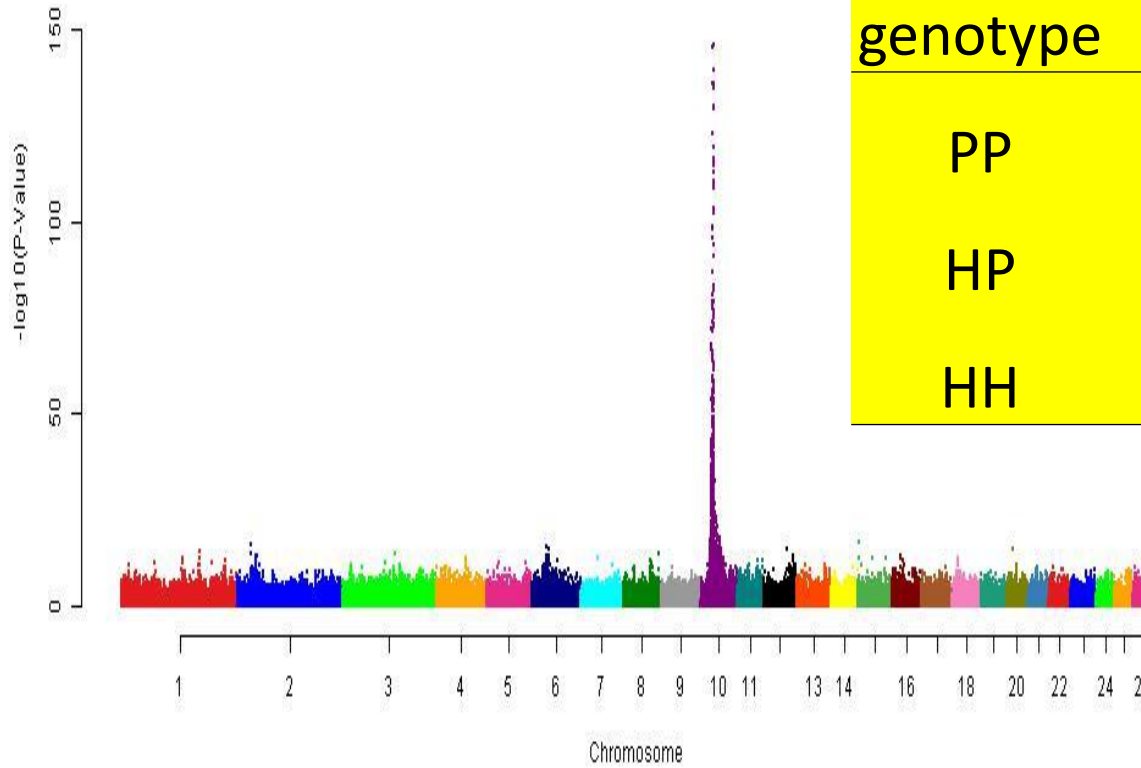
Genomic Test (for EBV)	\$25
Parentage. Horns, Genetic defects etc.	\$15



Prediction of Polled/Horn based on DNA test

Basically a single gene trait

Predicting male phenotypes



genotype	%horn	%poll
PP	0 %	78 %
HP	1 %	54 %
HH	67 %	4 %



Genomic breeding values for complex traits

Very many genes involved

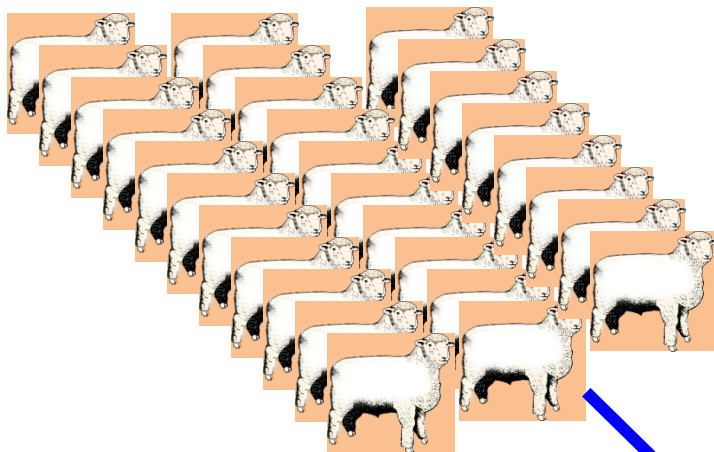
- Pedigree “borrows” information from relatives
- Can also “borrow” information from animals with similar DNA profile

Genomic relatedness

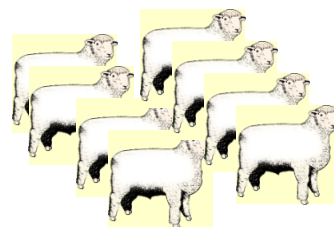
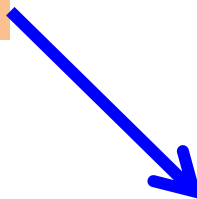
- For young rams, like having some progeny with records!



Genomic Prediction: basic idea



1) measure lots (of sheep);
phenotypes and their DNA
→ Reference population



2) A breeder tests
DNA on young rams

Prediction from DNA → genomic breeding values

Genomic breeding values

*Most useful for:
Hard to measure, late in life*

- Number of lambs weaned
- Adult wool traits
- Lean meat yield, meat quality

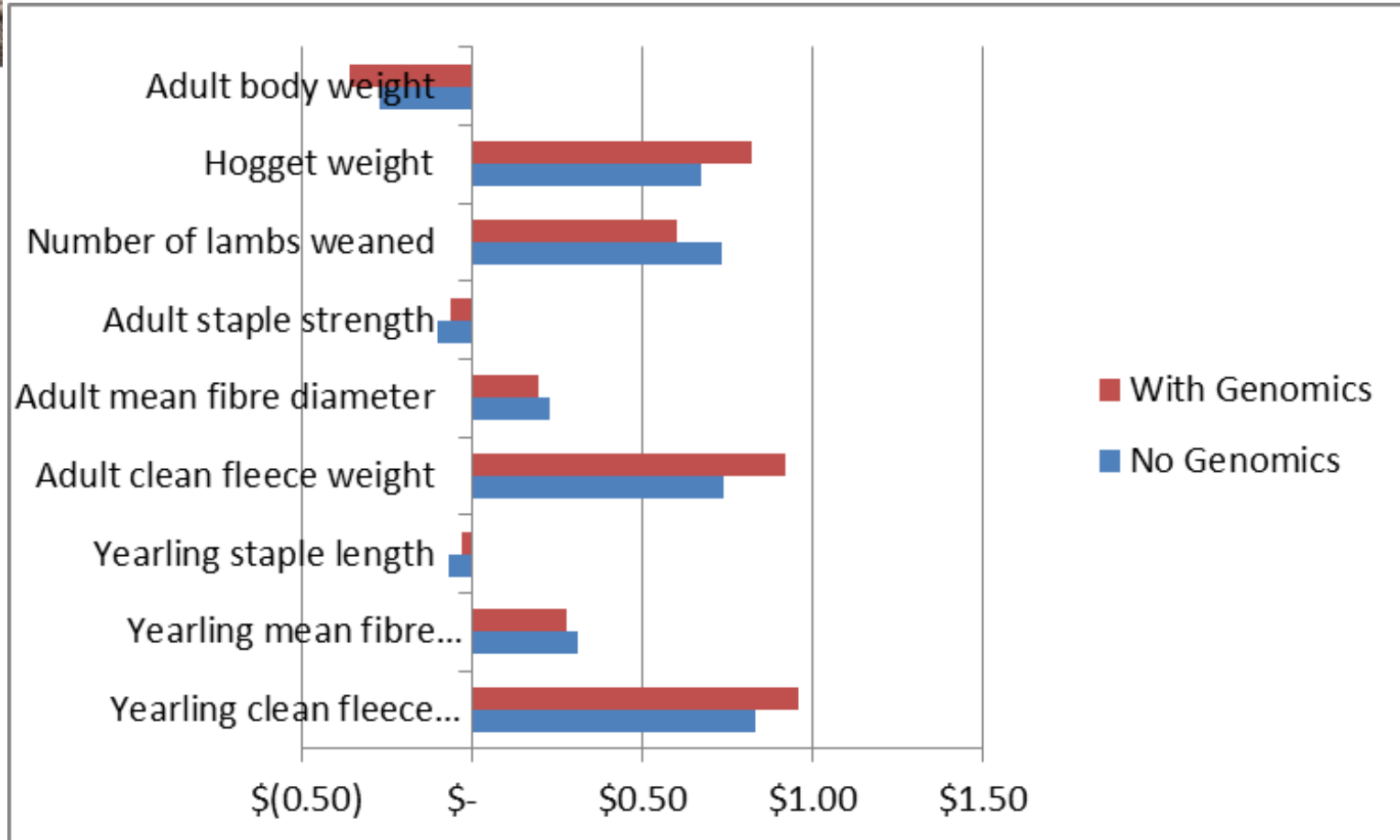
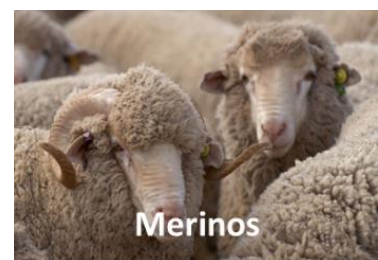


Adding accuracy with genomic testing

	EBV accuracies of young males at 18 months		
Trait	W/o GS	With GS	%difference
Birth Weight	0.32	0.48	48%
Post Weaning Weight	0.67	0.79	17%
Post Weaning Eye Muscle	0.66	0.70	6%
Post Weaning Fat	0.58	0.64	9%
Adult Weight	0.49	0.69	41%
Adult Clean Fleece Weight	0.55	0.69	25%
Number of Lambs Weaned	0.17	0.28	60%
Dual Purpose Index	0.24	0.35	46%

Potential benefits of genomic selection

Wool Objective: about 20% more gain

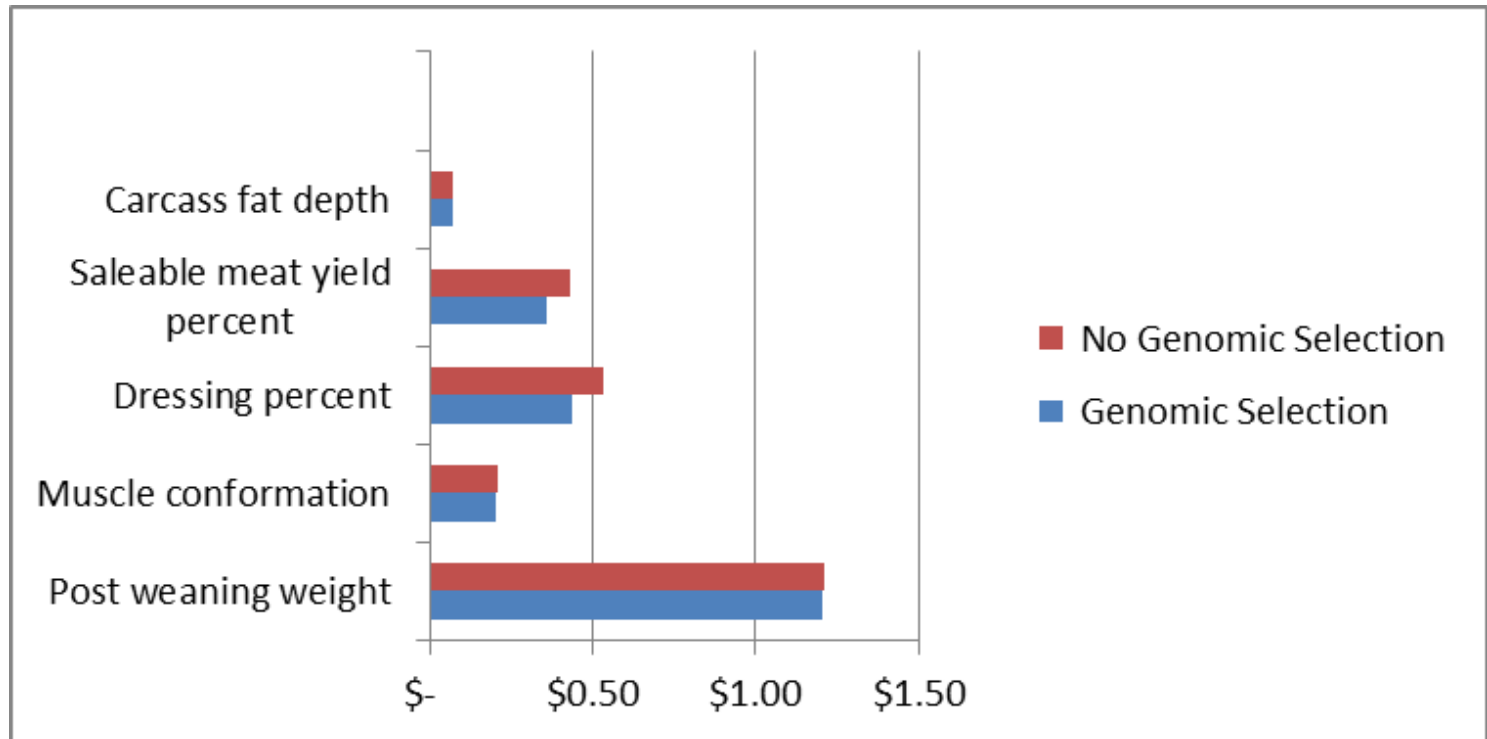


Potential benefits of genomic selection



Meat Objective: About 5% more gain, ...
.....much more with eating quality!

IMF
SF5



Cost - Benefit



- Breeder has 450 ewes, sells 100 rams, 10,000 comm progeny

<u>Per Year</u>	<u>No Genomics</u>	<u>Genomics</u>	Top 20% rams @ \$50
Cost	2,000	3,000	
Benefit Genetic Gain	20,000	22,000	
	\$2 /head	\$2.20 /head	

After 10 years

Cost	20 k	30 k
Benefit Genetic Gain	1100 k	1210 k

- Genetic gain is cumulative and multiplies!

Do people use DNA testing?

Only major breeds:

Merino
Poll Dorset
White Suffolk
Border Leicester

Year	50k	700k	LD	Parentage/Poll
2012	1,519	0	0	10,073
2013	3,313	920	5,386	20,011
2014	1,144	1,430	4,123	13,909
2015	240	151	4,183	27,956
Total	6,408	2,502	14,309	81,543



research

industry

If you want to improve it.....you need to measure it !

2012-2020 MLA Resource Flock

~ 2,000 weaned lambs per year (various breeds)
measured for

- Live weight and scan traits
- Carcase Traits
- Parasites

Genomic Selection Reference Flock



Implementation for Dohnes

- Need a reference population (800 rams/ 2000 ewes)
- In sheep CRC have done ~600 Dohne/Merino crossbred
- Need to genotype more well recorded Dohnes
 - pref. for hard to measure traits
 - Adult traits, Reproduction
 - AWI lifetime project

If you want to improve it,
.....you need to measure it
...at least somewhere.....

Even with genomics

