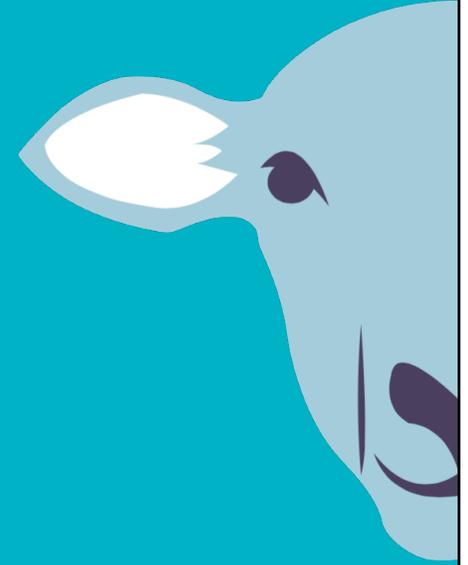


B+LNZ GENETICS
SHEEP BREEDER FORUM

2016



Index development: BCS, EWT penalty and nonlinear NLB

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and Peter Amer, AbacusBio

Background

- Continuing refinements to NZMW index for:
 1. New Body Condition Score (BCS) economic value
 2. Ewe weight (EWT) penalty and impact on rankings
 - Tim Byrne presentation later
 3. Non-linear economic value for Number Lambs Born (NLB) to reduce the importance of this trait in highly-prolific flocks
- Tested index variations for effects on ram rankings and predicted selection response

Current NZMW index

	eBV	Economic weight (cents/unit)	Test
Growth	Weaning weight	136	
	Weaning weight maternal	121	
	Carcass weight	374	
Adult weight	Ewe mature weight	-149	Reduce by 10%
Meat	Fat Yield	0	
	Hind quarter lean yield	501	
	Loin lean yield	752	
	Shoulder lean yield	251	
Wool	Fleece weight 12 mo	113	
	Lamb fleece weight	261	
	Ewe fleece weight	327	
Reproduction	Number lambs born	2231	Change to nonlinear
Survival	Lamb Survival	9246	
	Lamb Survival maternal	8378	
			Add BCS

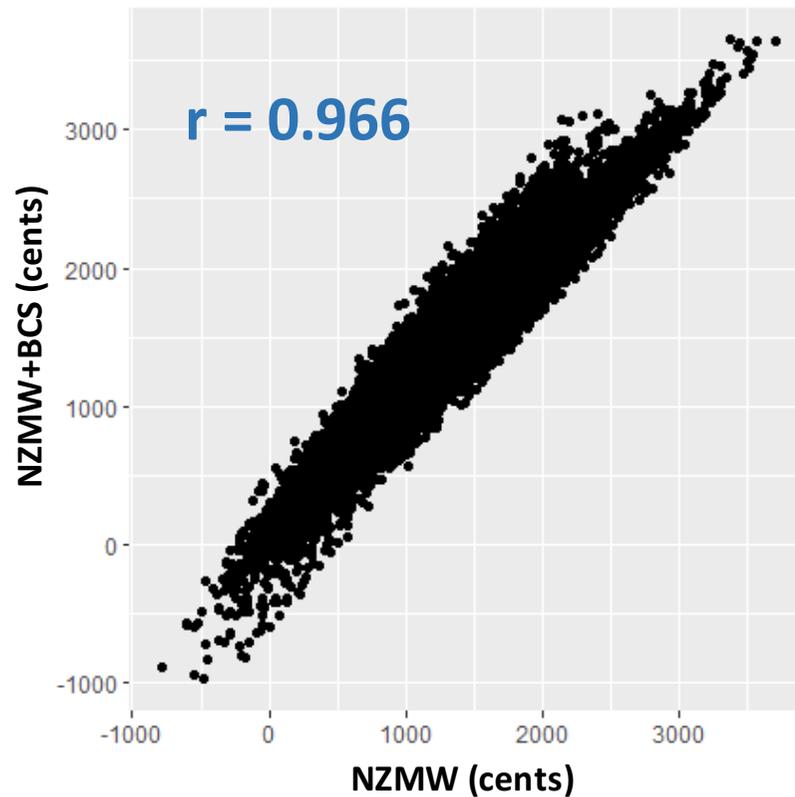
Test Data

- Subsets of rams from SIL database
 - a) **Young Rams** = selection candidates born in 2014, approx. 12 months old at time of evaluation
 - Represents unselected population, no progeny information
 - N = 22,624
 - b) **Proven Rams** = born 2012-2014 with NLB accuracy $\geq 60\%$
 - Represents previously-used selection candidates being considered for re-breeding, some progeny information
 - N = 974

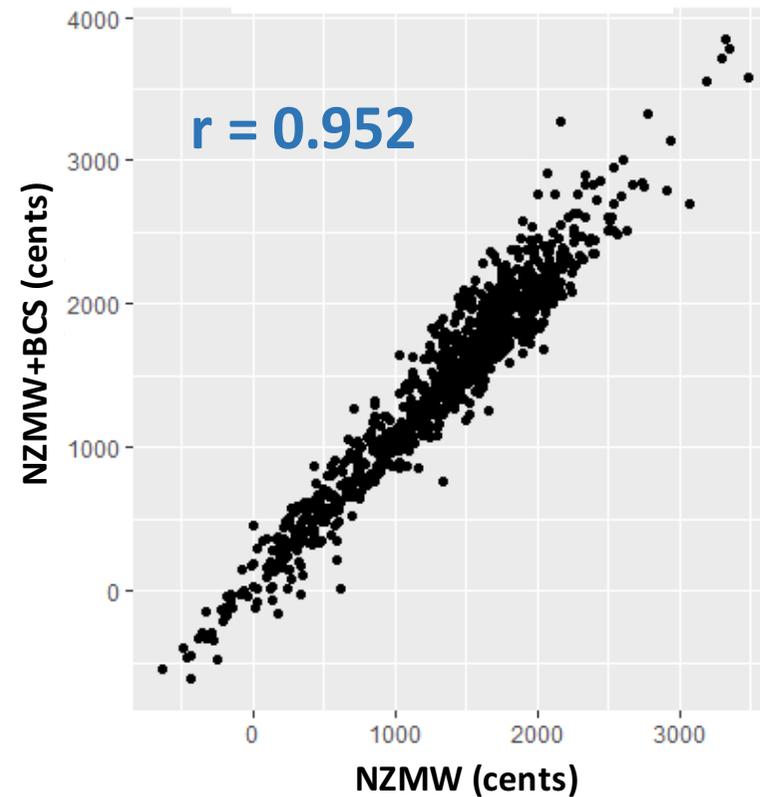
Adding BCS to index

$$+(1697 \times \text{BCS eBV})$$

YOUNG RAMS



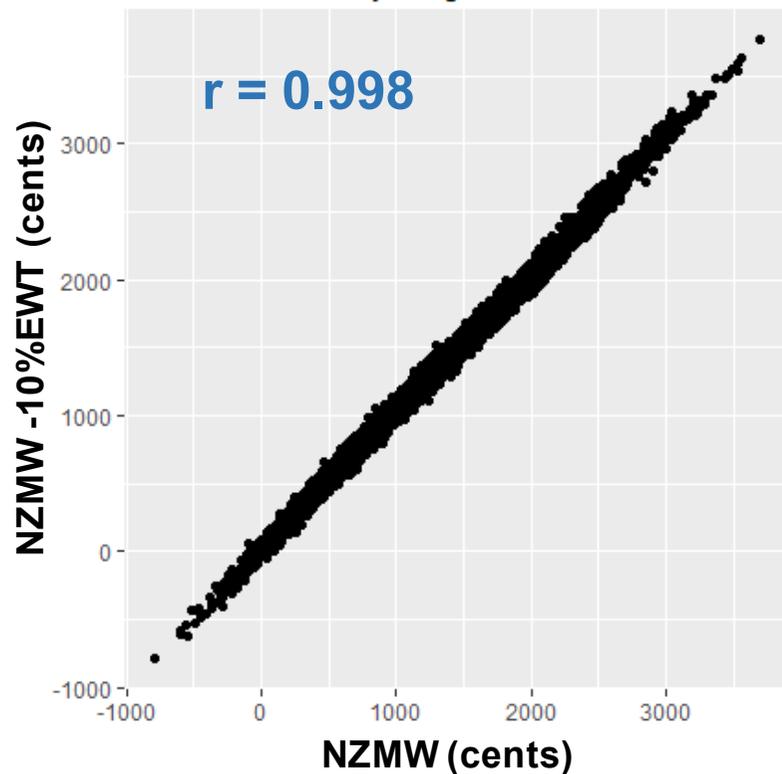
PROVEN RAMS



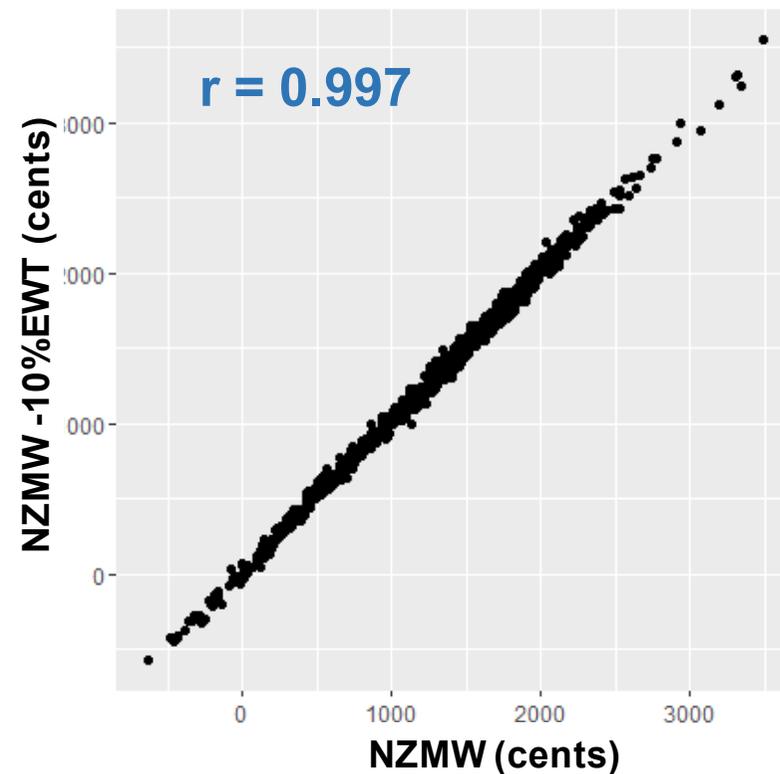
Reduce EWT penalty by 10%

- Change economic value to -134 cents/kg

YOUNG RAMS



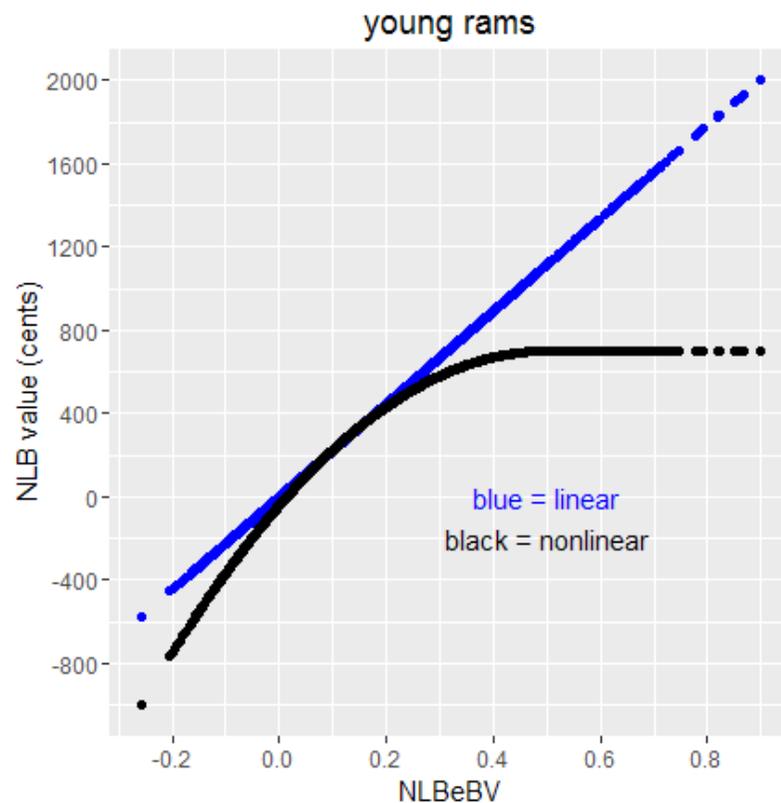
PROVEN RAMS



Number Lambs Born

- In practice there is optimum NLB, above which there is no economic benefit of additional lambs
- Current linear economic value gives same weighting for NLB to all animals, regardless of current prolificacy
 - Over-prolific genetics are over-valued
 - Some animals have high index ranks due to extreme NLB eBV

Nonlinear NLB value function



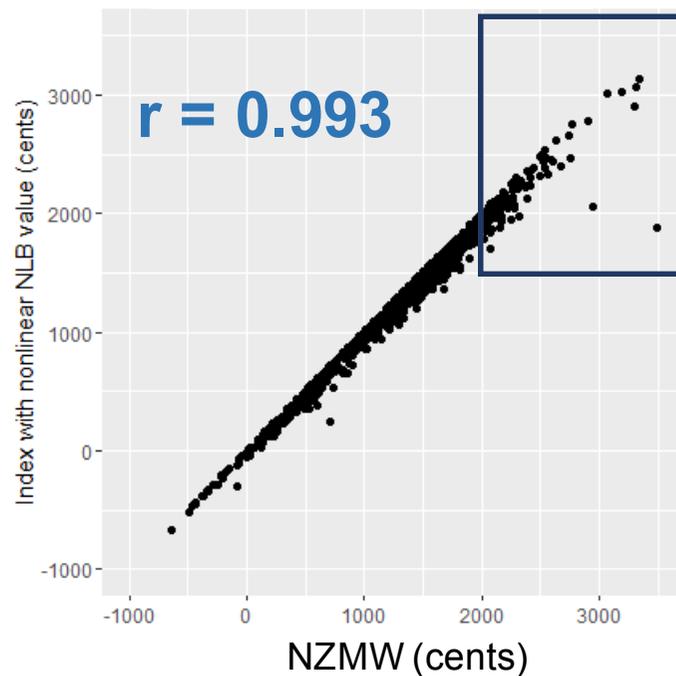
optimum NLB = 1.85 lambs

- Increasing value for NLB eBV up to optimum
- Above optimum, all NLB have same value
 - Over-valued rams on linear index brought back to practical value
- Encourages improvements in lower prolificacy flocks, while keeping more prolific flocks from badly overshooting optimum

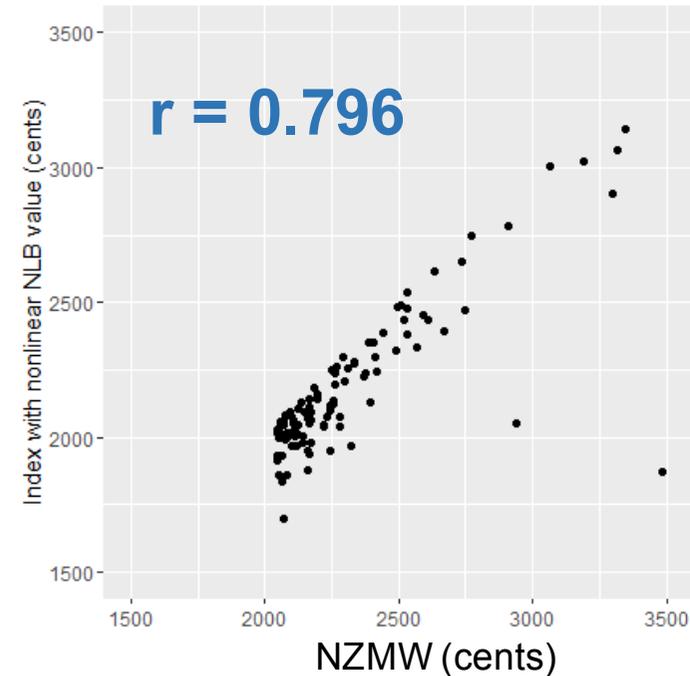
Change in ranking of extreme high NLB animals

- Index values and ranking for high NLB rams change more than average rams

PROVEN RAMS



TOP 100 PROVEN RAMS



Combined new developments

- Rank correlations with current NZMW index

Index change	Young rams N = 22624	Proven rams N=974	Top 100 Proven rams
+ BCS	0.966	0.952	0.730
EWT 10%	0.998	0.997	0.955
Nonlinear NLB	0.995	0.993	0.796
BCS + EWT 10 % + nl NLB	0.952	0.937	0.605

- Proven rams have more accurate EBVs with more spread, therefore affected more than young rams
- Changes ranking in elite rams

Predicted Selection Responses

- Growth & Meat traits: Responses in trait units, after 2-3 years of selection (100 index cents)

Trait	Current	+ BCS	EWT 10%	Nonlinear NLB	BCS + EWT 10% + nl NLB
WWT eBV	0.163	0.166	0.171	0.164	0.174
CW eBV	0.083	0.087	0.089	0.084	0.093
EWT eBV	0.004	0.035	0.033	0.008	0.068
BCS eBV	0.000	0.004	0.000	0.000	0.004
FATY eBV	0.005	0.001	0.005	0.004	0.001
LEAN eBV	0.042	0.051	0.047	0.044	0.057

- Combined adding BCS and reducing EWT penalty shifts emphasis toward growth traits, increases lean yield
- Little effect on fat yield

Predicted Selection Responses

- Reproduction traits: Responses in trait units, after 2-3 years of selection (100 index cents)

Trait	Current	+ BCS	EWT 10%	Nonlinear NLB	BCS + EWT 10% + nl NLB
NLB eBV	0.0113	0.0104	0.0113	0.0103	0.0092

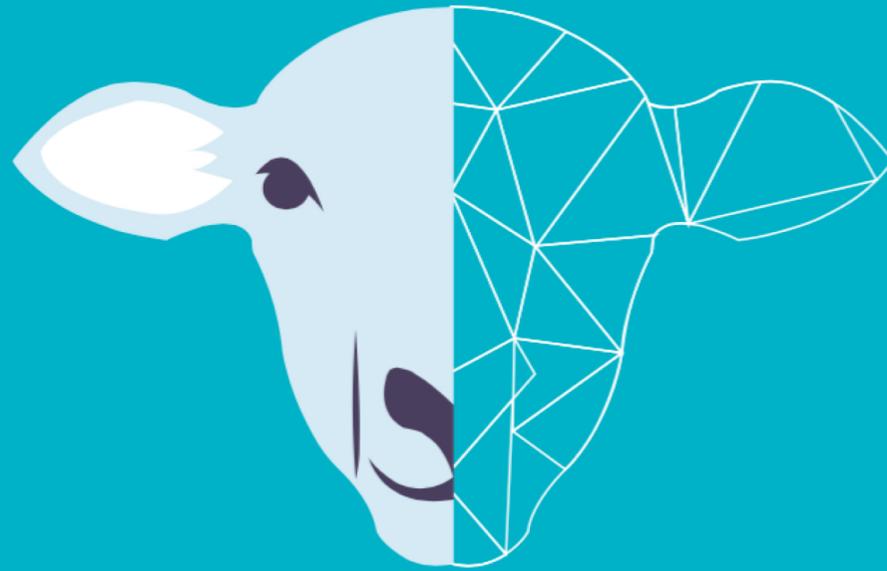
- Rams with high NLB eBV are not ranked as highly on nonlinear indexes
 - Top 30 rams on linear indexes have mean NLB eBV = 0.35
 - Top 30 rams on nonlinear indexes have mean NLB eBV = 0.29
- Therefore nonlinear index is not selecting for extremely high NLB

Summary

- Adding BCS favours meat yield, growth rate, and bigger ewes
- Reducing ewe weight penalty increases emphasis on growth rate, but still controls increase in ewe size
- Non-linear NLB is critical
 - Animals with low NLB eBV still have low reproduction value
 - Animals with high total index values are more likely to be balanced across all traits and not driven only by extreme NLB

Recommendations

- All 3 changes be incorporated into new trial standard indexes
 - Available alongside current standard indexes
 - Change over in one year subject to feedback
- All 3 changes available as options individually or together for specific indexes



THANK YOU