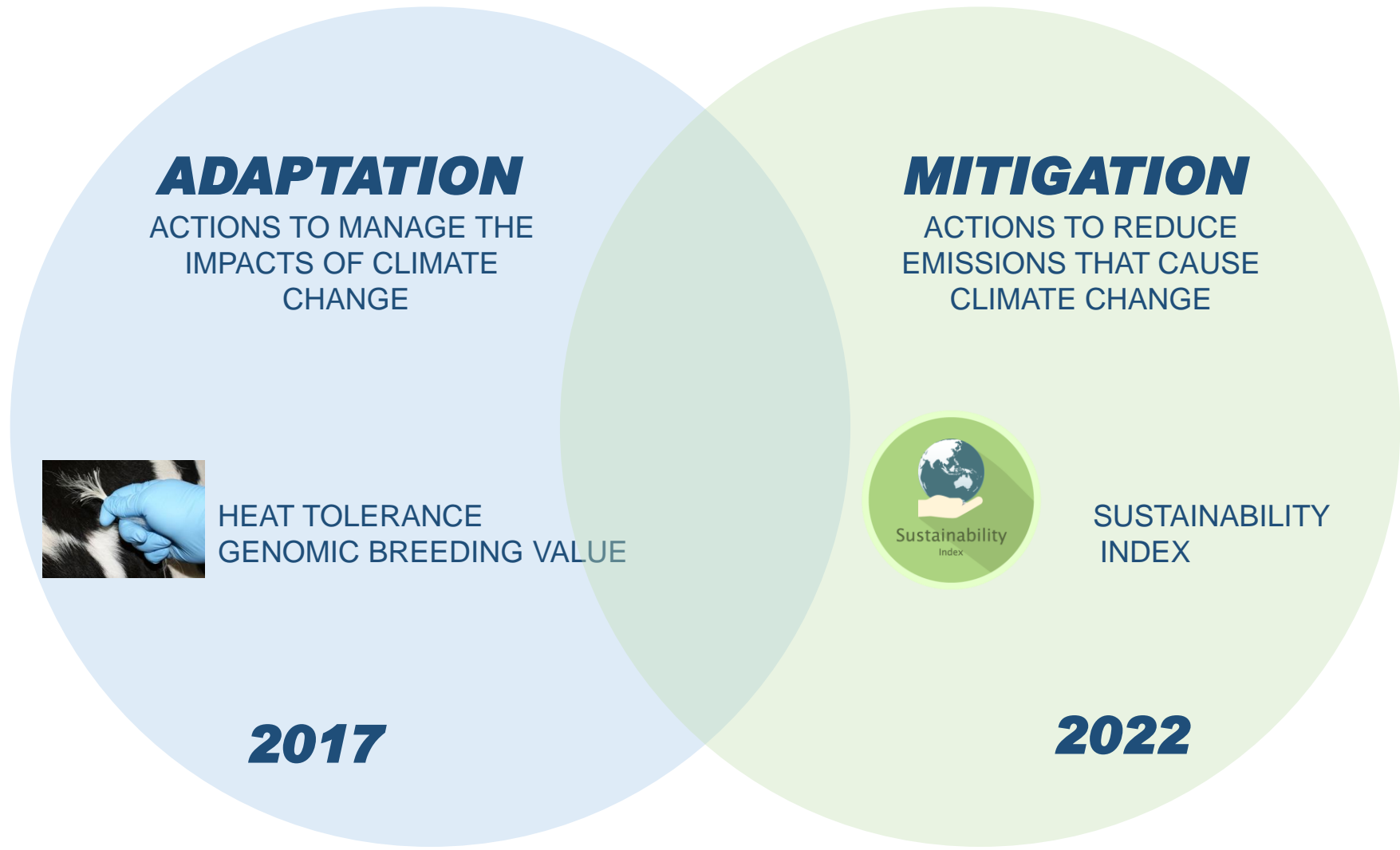




# The Sustainability Index: A new tool to breed for reduced GHG emissions intensity in Australian dairy cattle

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Gert Nieuwhof, Peter Thurn, Matthew Shaffer





# Goals



**30%**

Reduction in emissions intensity at farms by 2030

A light green rectangular box containing a list of four goals for 2030. Each goal is preceded by a circular icon: a landscape with hills, a water tap, a hand holding a flame, and a circular arrow. The text '2030 Goals' is at the top left. The goal 'Reducing GHG emissions intensity' is underlined in red.

2030 Goals

- Improving land management
- Increasing water use efficiency
- Reducing GHG emissions intensity
- Reducing waste

# Australian selection indexes

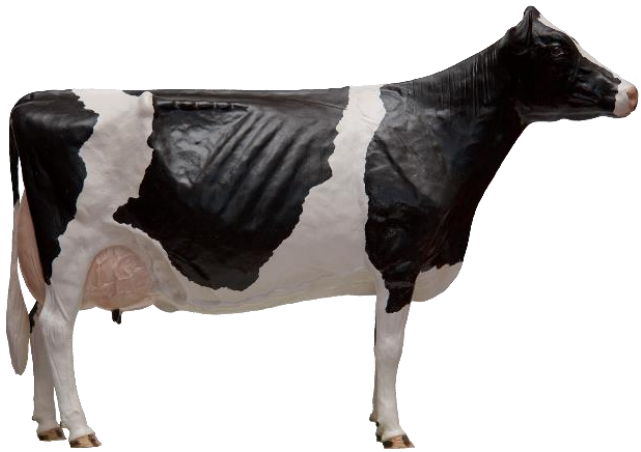


- BPI – Balanced Performance Index

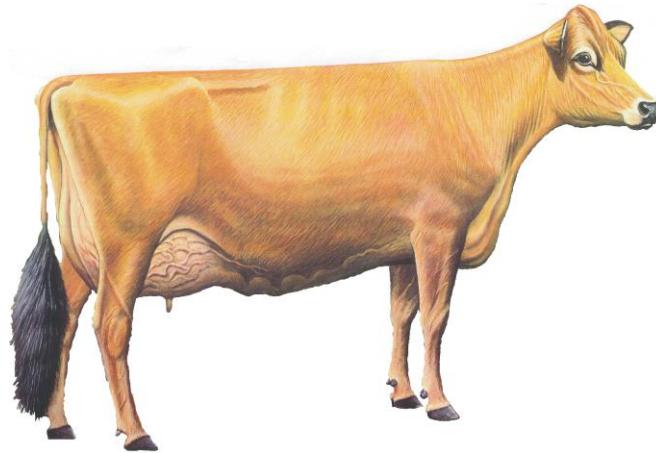


- HWI – Health Weighted Index

# Has the BPI contributed to the reduction in emissions intensity? (2015 – 2022)



**-1.3%**



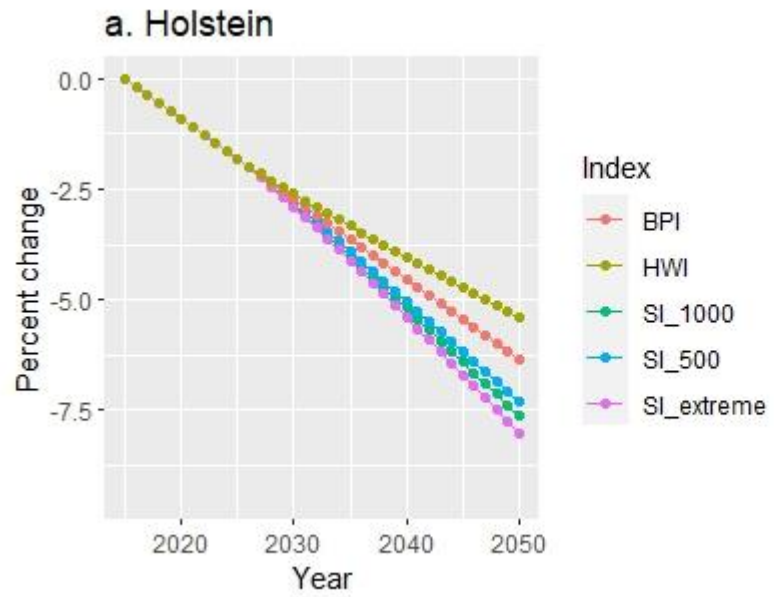
**-1.4%**



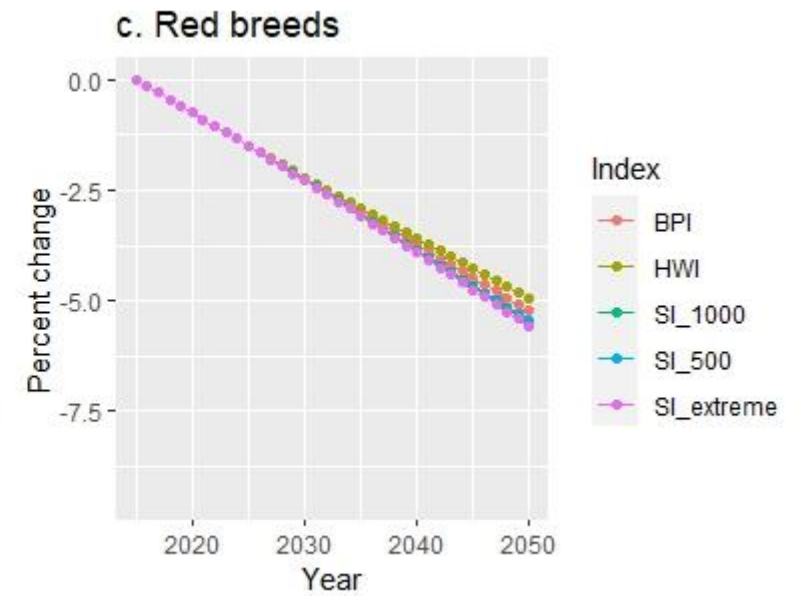
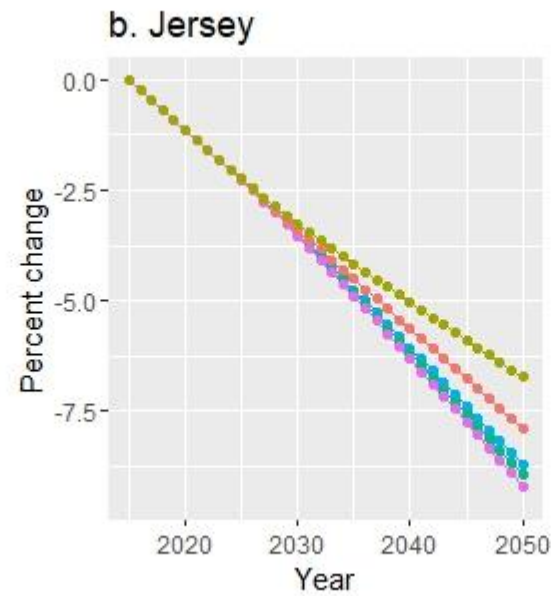
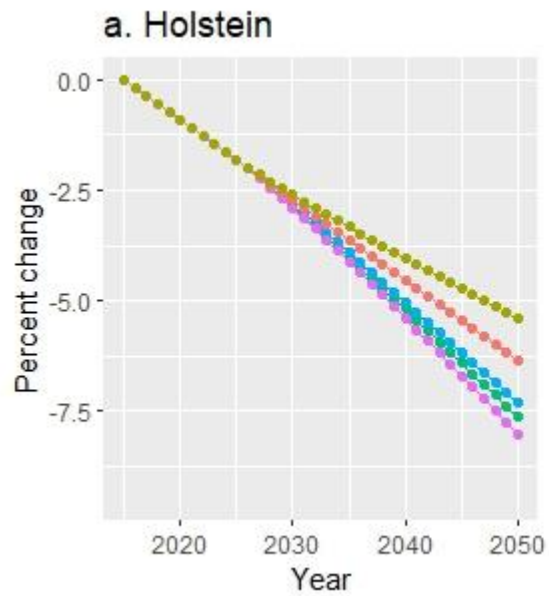
**-0.8%**

**kg CO<sub>2</sub>-e/ kg prot-e**

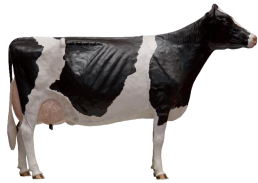
# Do we need another index?



# Do we need another index?

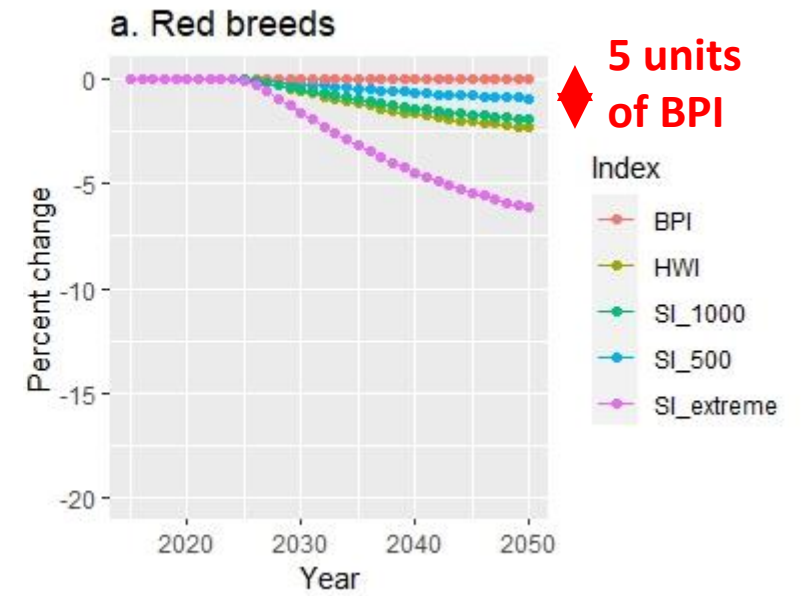
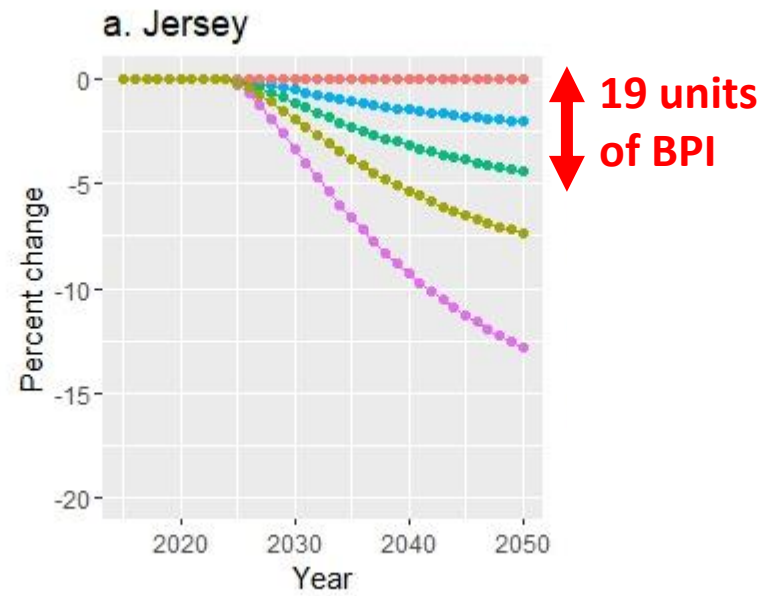
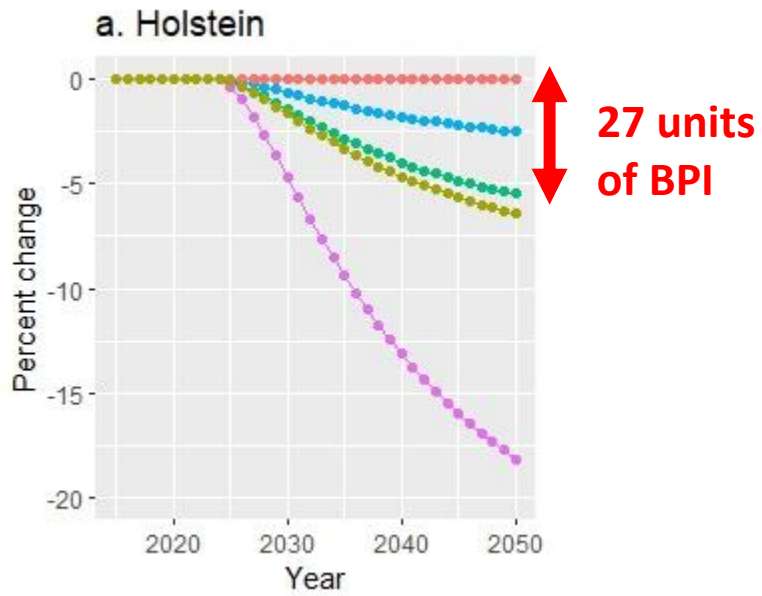
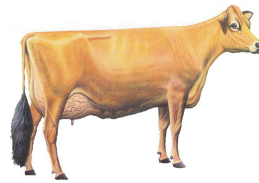


# Do we sacrifice anything?





# Do we sacrifice anything?



# Features of the Sustainability Index

- Desired gains index.
- Adjusts the BPI to account for carbon output.
- For farmers who want to “fast track” genetic gain for carbon emissions reduction.
- Focus is Emissions Intensity (kg CO<sub>2</sub>-e / kg protein-e).



# Index Weights



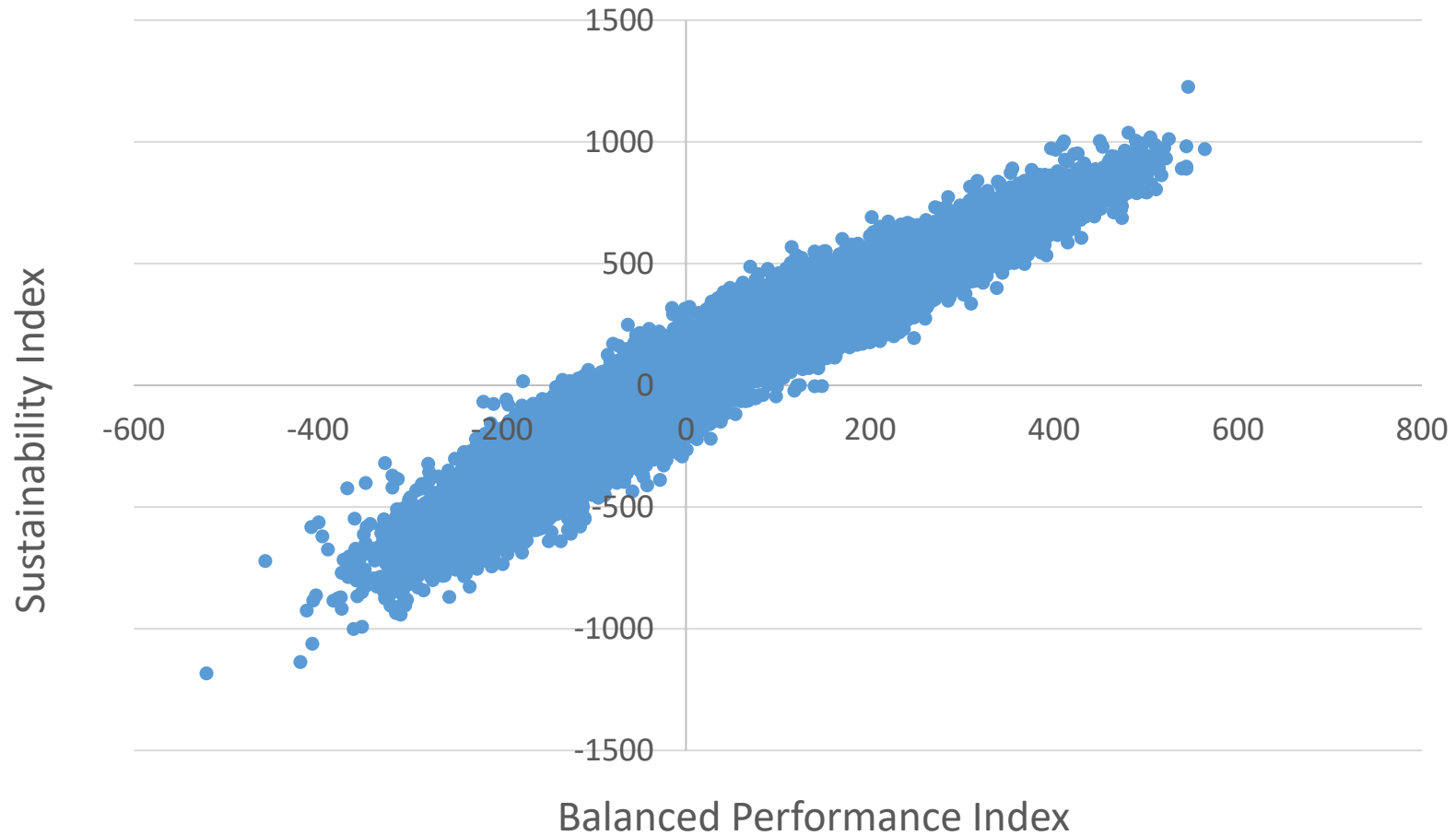
Trait	Holstein		Jersey		Red Breeds	
	BPI	SI	BPI	SI	BPI	SI
PROT	6.76	17.49	6.76	17.49	6.76	17.49
FAT	2.08	2.82	2.08	2.82	2.08	2.82
MILK	-0.11	-0.11	-0.11	-0.11	-0.11	-0.11
SURV	7.2	20.21	7.2	20.21	7.2	20.21
FERT	6.94	6.94	6.94	6.94	6.94	6.94
SCC	0.69	0.69	0.69	0.69	0.69	0.69
MASTITIS	6.75	8.7	6.75	8.7	6.75	8.7
M SPEED	5.02	5.02	5.02	5.02	5.02	5.02
TEMP	3.6	3.6	3.6	3.6	3.6	3.6
MAMM	2.76	2.76	2.76	2.76	2.76	2.76
UDDEP	0.82	0.82	0.82	0.82	0.82	0.82
O TYPE	1.36	1.36	1.36	1.36	1.36	1.36
PIN SET	0.78	0.78	0.78	0.78	0.78	0.78
F SAVED	0.1927	0.7227	0	0.53	0.1927	0.7227

# Index Weight Summary

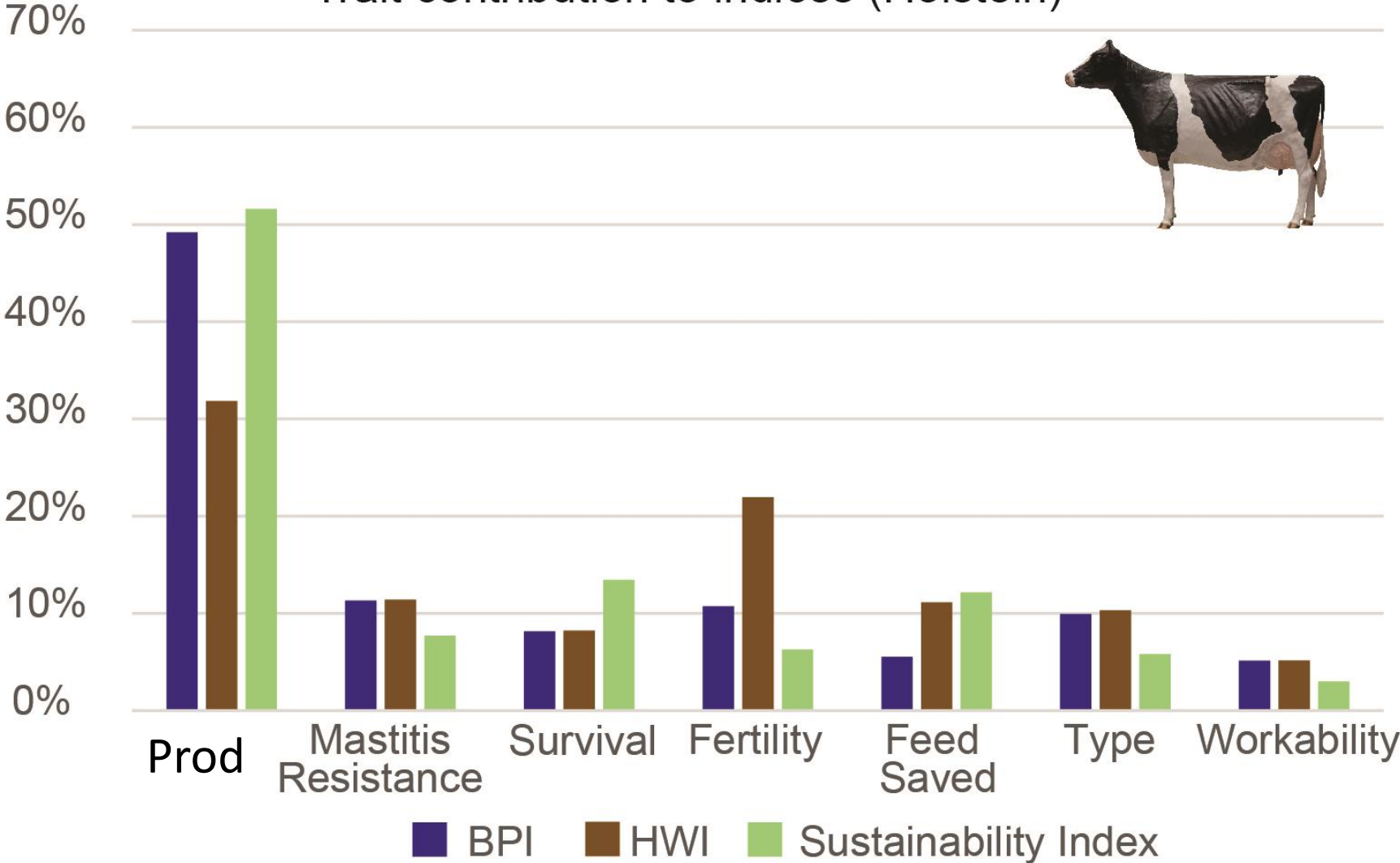
- 2.5 times the weighting on Protein compared to the BPI
- 2.8 times the weighting on Survival compared to the BPI
- 3.7 times the weighting on Feed Efficiency compared to the BPI



$$\text{corr}(\text{BPI}, \text{SI}) = 0.96$$



# Trait contribution to indices (Holstein)



# Response to selection - Holsteins



## Faster gain than BPI for:

- Reduction in emissions intensity
- Production



## Slower gain than BPI for:

- Mastitis
- Cell count
- Fertility



# Take home messages...

- Sustainability Index fast track the reduction in methane emissions intensity
- We have already made progress with BPI
- High correlation between BPI and the Sustainability Index
- This is a cost-effective way to have a breeding tool for reduced GHG emissions given the current lack of methane data.

# Acknowledgements



Breed societies  
Genomic service providers  
Bull companies

