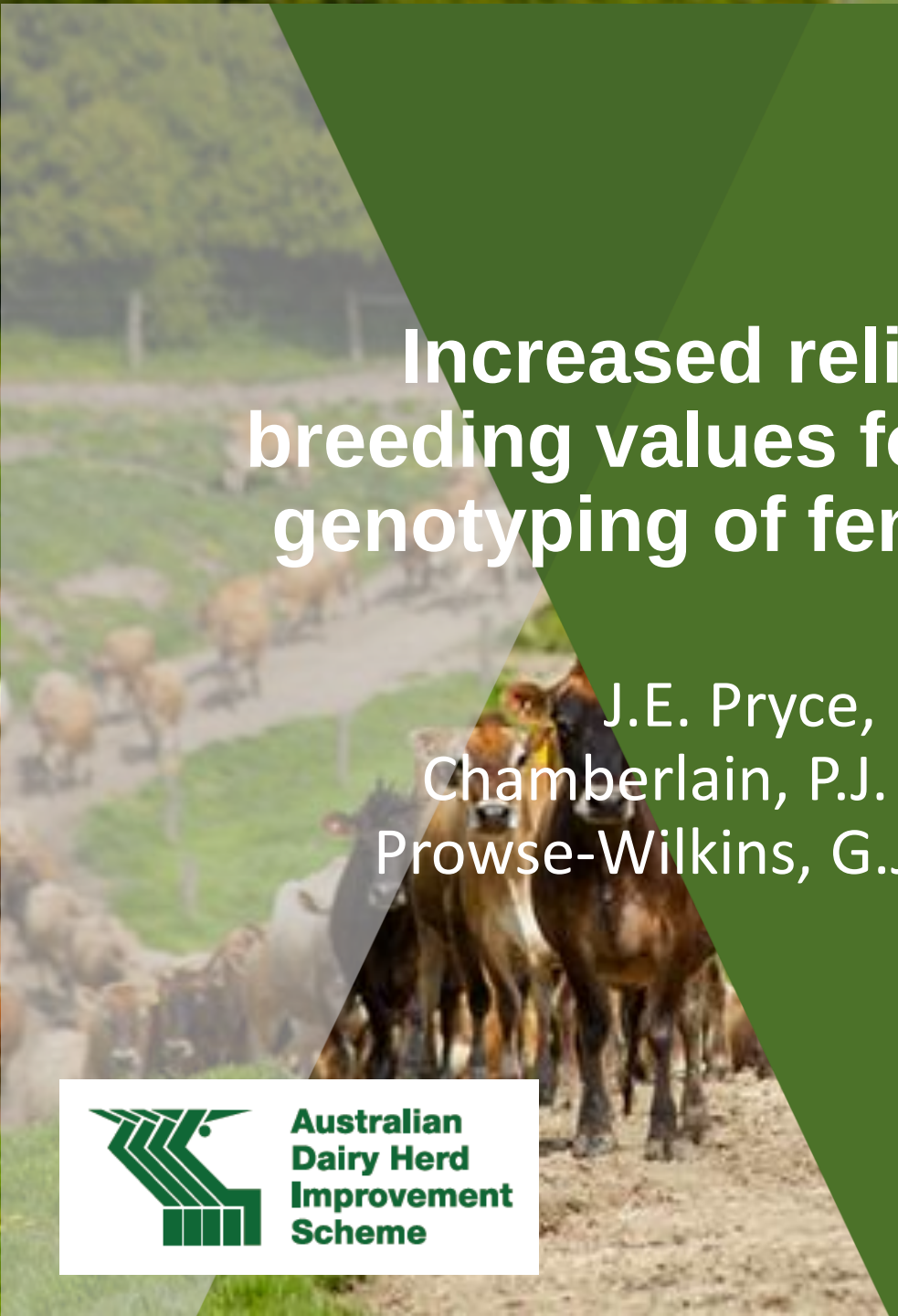


Economic Development, Jobs, Transport and Resources

Increased reliabilities of genomic breeding values following large-scale genotyping of females with excellent phenotypes

J.E. Pryce, P. Douglas, C.M. Reich, A.J. Chamberlain, P.J. Bowman, B.A. Mason, C.P. Prowse-Wilkins, G.J. Nieuwhof, T. Hancock, D. Abernethy and B.J. Hayes

Australian Dairy Herd Improvement Scheme

AGRICULTURE VICTORIA

New directions in breeding

Welfare

- **Fertility**
- Mastitis
- Lameness
- Metabolic disease
- **Heat tolerance**

Environment

- **Feed saved**
- Methane
- **Heat tolerance**

Australian Dairy Herd Improvement Scheme

AGRICULTURE VICTORIA

Issues

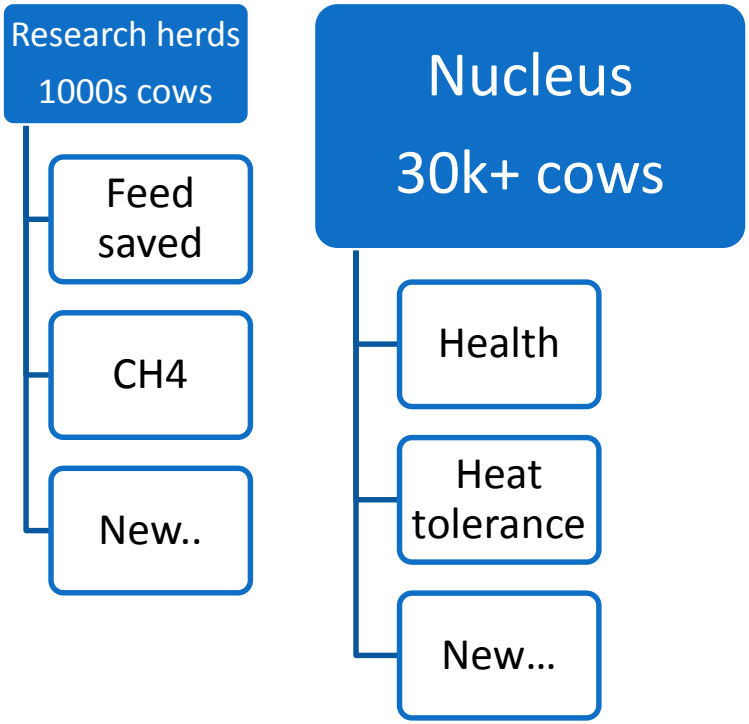
- Sources of phenotype data
  - Are the traits available in commercial herds?
  - Data completeness/bias?
- Cost of phenotypes
- Calculating breeding values
  - Heritability
  - Genomic or pedigree relationships?
  - Genomics: female or male reference populations
- Evaluating and monitoring
  - Is genetic improvement being made for these traits?

Australian Dairy Herd Improvement Scheme

AGRICULTURE VICTORIA

Ginfo Project

- To build a nucleus reference population of genotyped females with high quality phenotypes as a rich resource of data



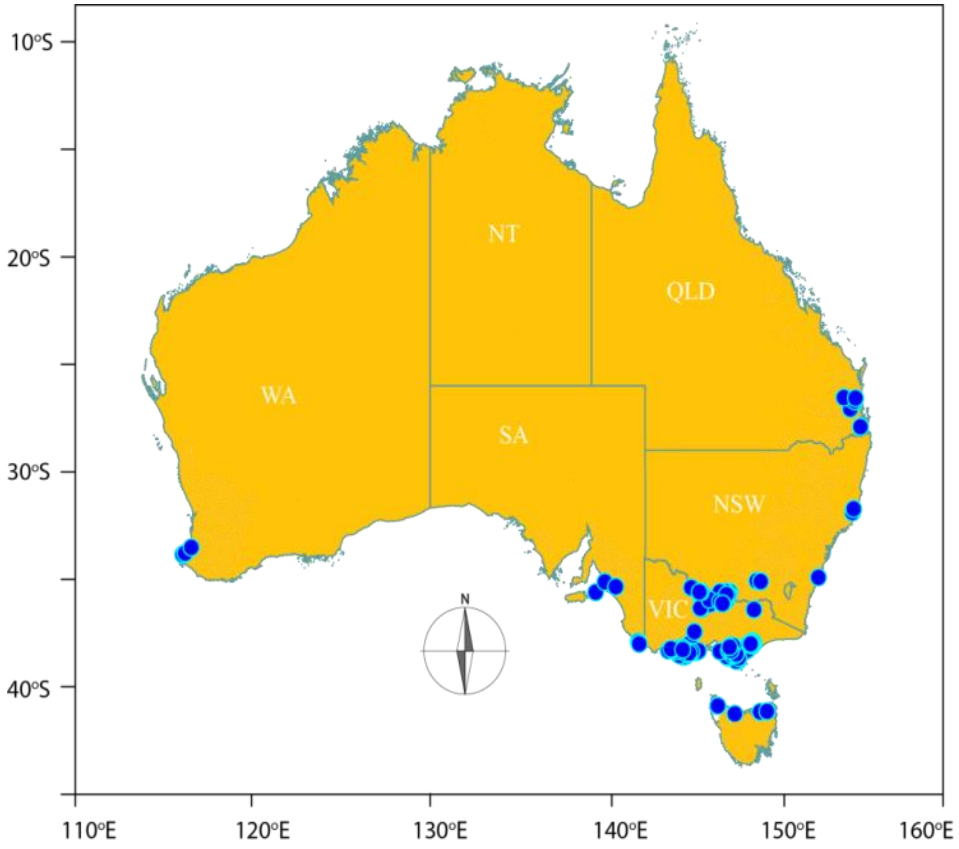
Herds Summary

- The selection of Ginfo herds primarily focused on their data quality.

- Key herd data status:
  - Standard herd test data resources
    - e.g. Milk Volume, Protein and Fat Test, SCC,
    - Calving Interval.
    - Additional data references for mating data and pregnancy testing.
  - Scoring System
    - the maximum score was 25 and having complete fertility phenotypes can make up 10 of these points.
  - All first lactation heifers were required to participate in type evaluation

Geographical location of Ginfo farms

- In total
  - 103 herds
  - 32,386 daughters of 2,917 bulls



Australian Dairy Herd Improvement Scheme

AGRICULTURE VICTORIA

Genotyping by sequencing (GBS)

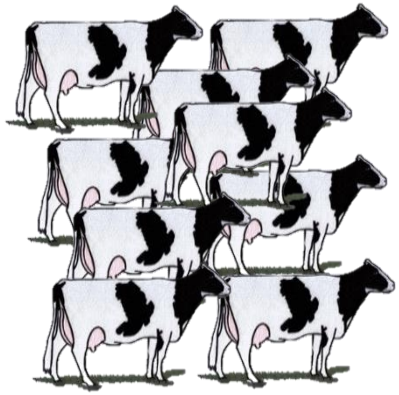
- Part of the Ginfo project is the evaluation of Genotype by Sequencing (GBS) as a more efficient and potentially cost effective genotyping.
- With the incorporation of this new genotyping system, challenges become apparent.
- Sequencing is more sensitive to variability due to issues such as sample contamination or hair colour.

Number of Records - Summary

	Records	Cows	Recs/Cow
Calving Ease	53054	22069	2.40
Conformation	9537	9537	1
Health	97781	13725	7.12
Milk production (lactation)	103204	30344	3.40
Fertility	287333	29671	9.68
Workability	14816	14816	1.00

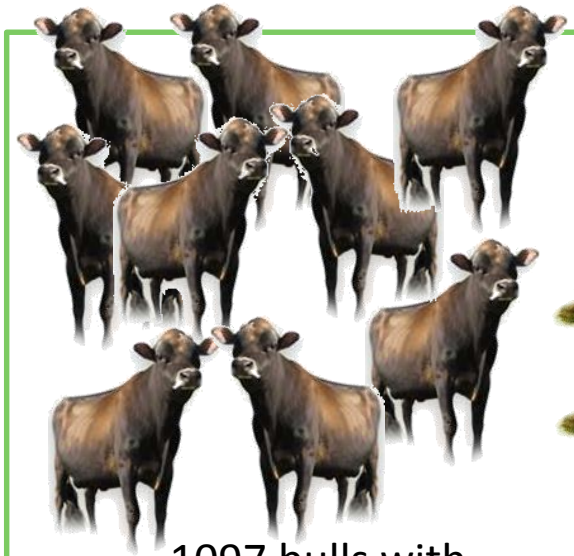
April 2016

4172 bulls with
Australian daughters

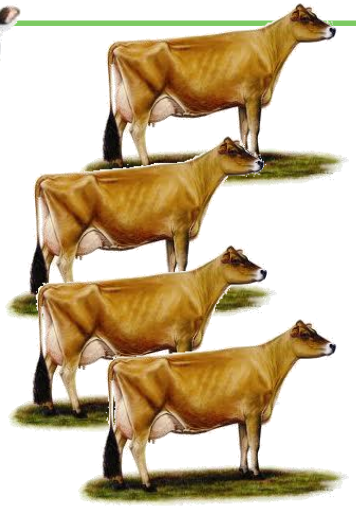


10254 cows
deliberately selected

10,000 cow



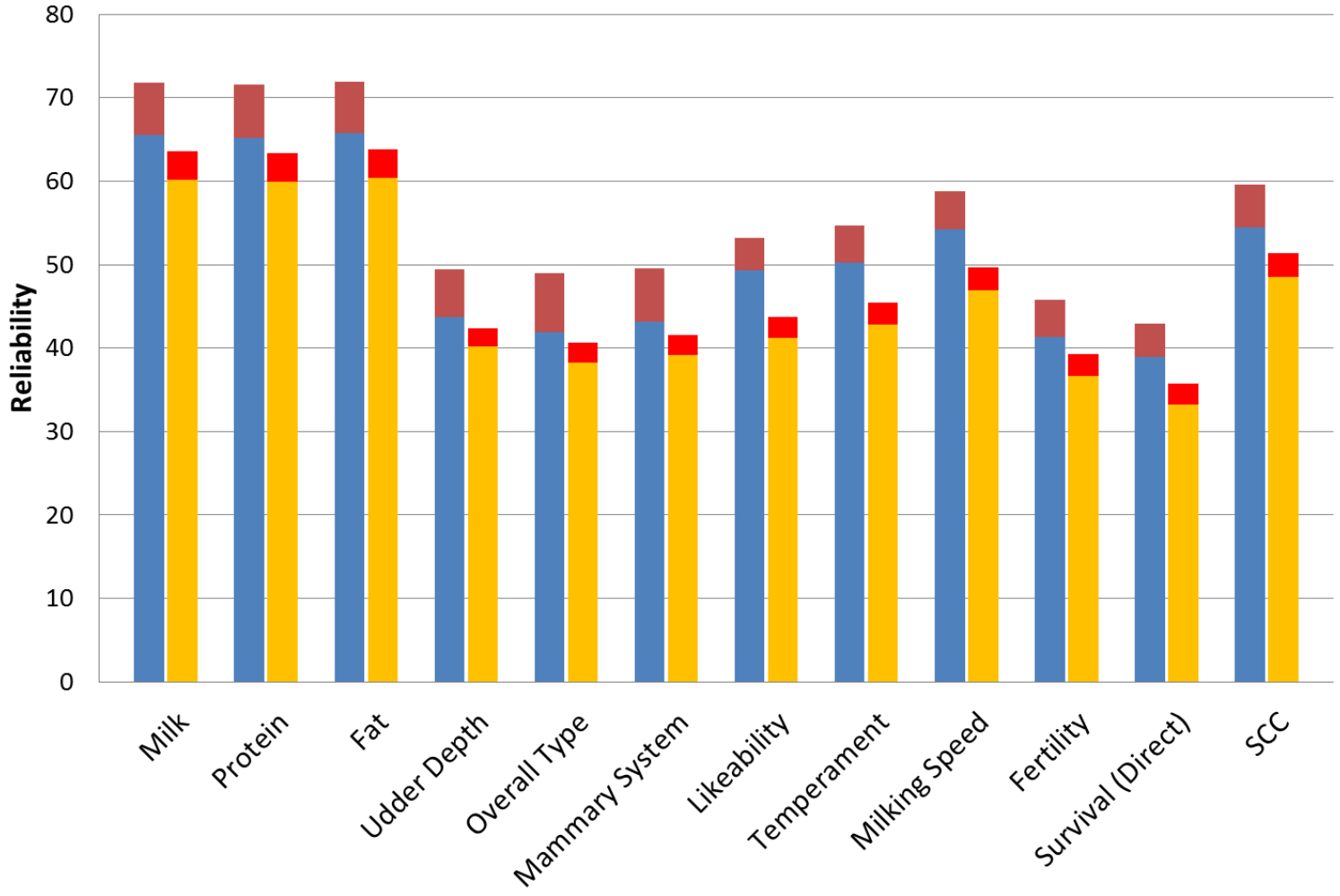
1097 bulls with
Australian daughters



JERNOMICS

4232 cows
deliberately selected

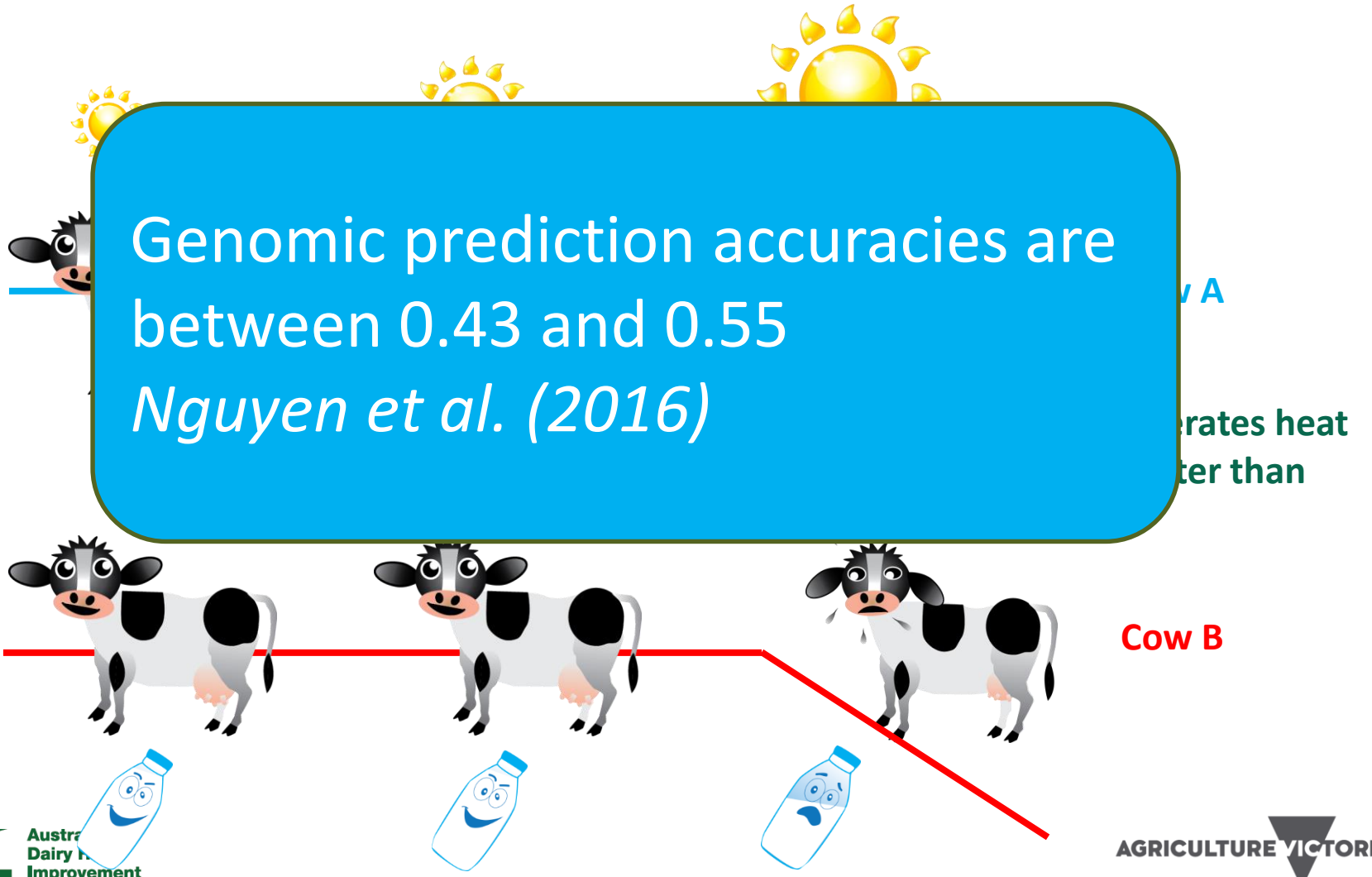
Reliabilities



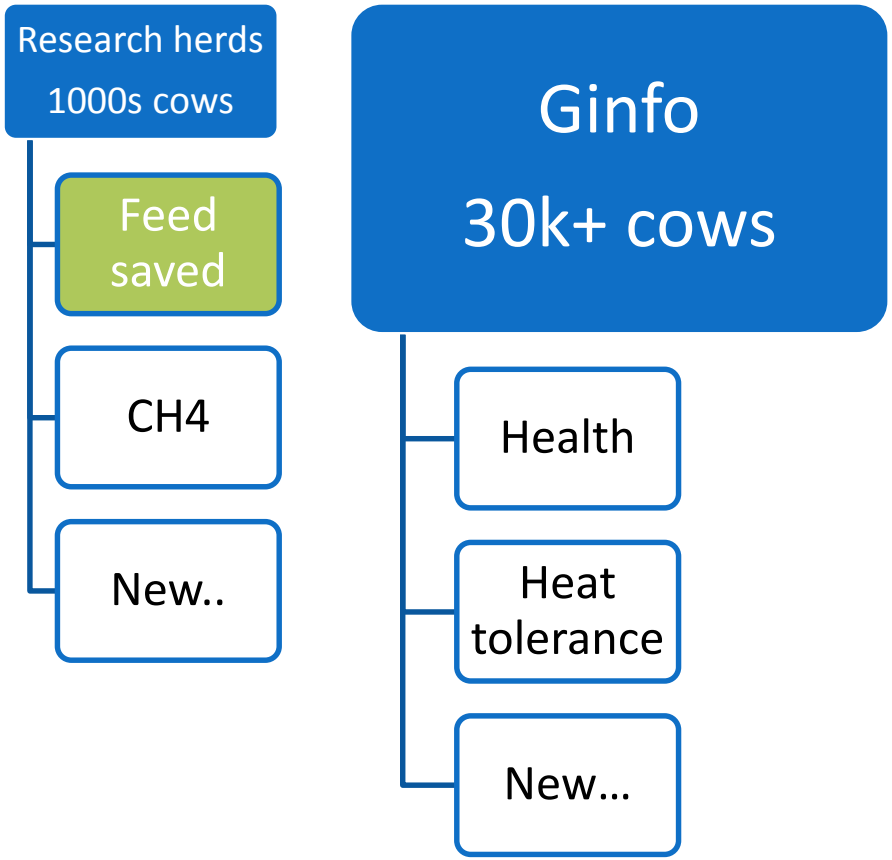
Australian Dairy Herd Improvement Scheme

AGRICULTURE VICTORIA

Heat tolerance trait



Reference populations in Australia



Feed saved breeding values

Residual feed intake only available for genotyped Holsteins

Holsteins that are not genotyped and other breeds have feed saved calculated using

Feed saved ABV

Residual feed intake DGV

Maintenance from Bodyweight ABV

Australian Dairy Herd Improvement Scheme

Dairy Herd Improvement Scheme

AGRICULTURE VICTORIA

Australian Government
Department of Agriculture and Water Resources

Rural Research and Development for Profit
Keeping Australian farmers at the cutting edge

Australian Dairy Herd Improvement Scheme

NHIA

Dairy Australia
Your Levy at Work

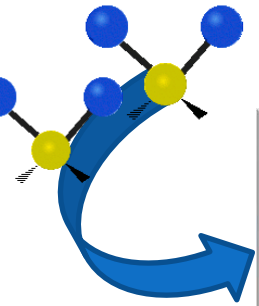
VICTORIA State Government

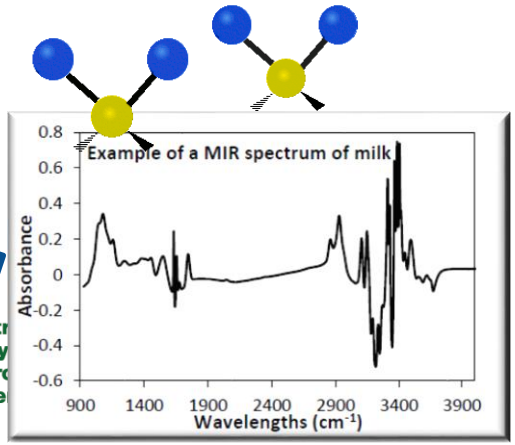
DairyBio

MIR for Profit

Predictions of:

- Fat%
- Protein%
- SCC
- Ketosis?
- Acidosis?
- Energy balance?
- Protein utilisation?
- Methane?
- Pregnancy?
- Heat?
- ?



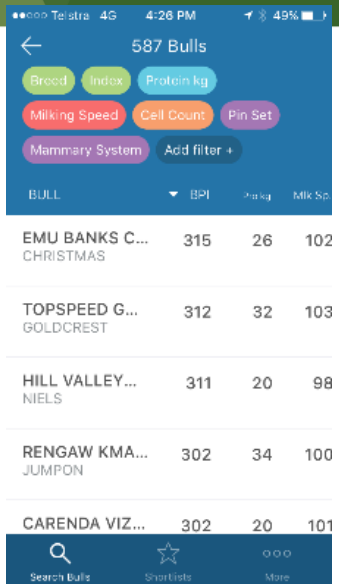


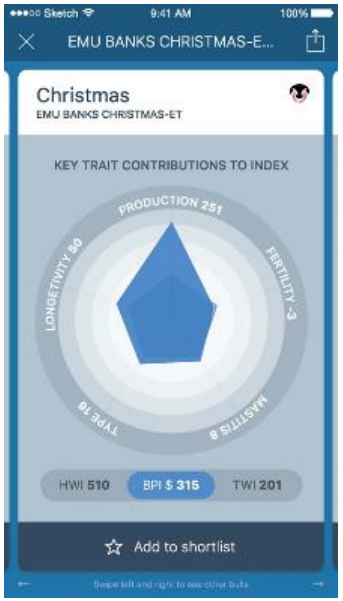
Australian Dairy Herd Improvement Scheme

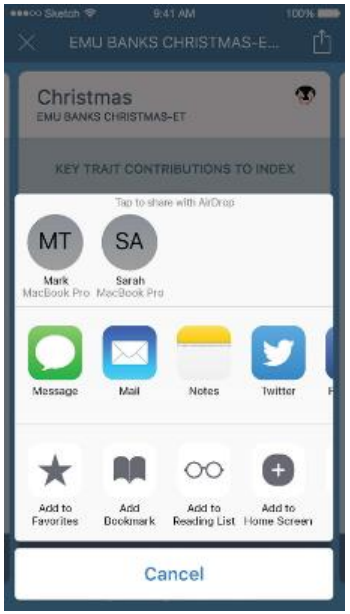
eagasc Agriculture and Food Development Authority
RIC
Université de Liège
ULg
cra-w

Good Bulls App

- Sort & re-sort on any filter
- Remove or adjust filters one at a time
- Click on any bull to see detailed ABV information
- Export individual bull cards and shortlists
- Share information with your farm team







Australian Dairy Herd Improvement Scheme

AGRICULTURE VICTORIA

Conclusions

- End of progeny-testing makes the move to female reference populations inevitable in the future?
- The future of GINFO
  - 60,000 milking animals in 200 herds to reflect the genetics, location and farm systems in the broader Australian dairy population.
  - Ginfo is anticipated to become a primary source for the Australian industry's ongoing evaluation
  - we will explore the collection of emerging and new phenotypes of farmer interest particularly for animal health traits.
- New research will provide guidance on inclusion of such traits in future national selection index (BPI)

Industry Partners

Australian
Dairy Herd
Improvement
Scheme

AGRICULTURE VICTORIA