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

New directions in breeding

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

- Feed saved
- Methane
- Heat tolerance
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?
Ginfo Project

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

- Research herds
  - 1000s cows
    - Feed saved
    - CH4
    - New...

- Nucleus
  - 30k+ cows
    - Health
    - Heat tolerance
    - New...
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
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

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April 2016

4172 bulls with Australian daughters
10254 cows deliberately selected

10,000 cow

1097 bulls with Australian daughters
4232 cows deliberately selected

Ginfo 18,106
Heat tolerance trait

Genomic prediction accuracies are between 0.43 and 0.55

*Nguyen et al. (2016)*
Reference populations in Australia

Research herds
- 1000s cows
  - Feed
    - saved
  - CH4
  - New..

Ginfo
- 30k+ cows
  - Health
  - Heat tolerance
  - New...
Residual feed intake only available for genotyped Holsteins

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

Feed saved breeding values

Residual feed intake

DGV

Maintenance from

Bodyweight

ABV

ABV

Australian Dairy Herd Improvement Scheme

Dairy Herd Improvement Scheme
MIR for Profit

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

DataGene
Solutions for Herd Development

Dairy Australia
Your Levy at Work

Australian Dairy Farmers

DairyBio

VICTORIA
State Government
Economic Development, Jobs, Transport and Resources

Australian Dairy Herd Improvement Scheme

AGRICULTURE VICTORIA