

23rd Association for the Advancement of Animal Breeding and Genetics Conference 2019

Armidale, Australia
27 October – 1 November 2019

ISBN: 978-1-7138-0335-5

Printed from e-media with permission by:

Curran Associates, Inc.
57 Morehouse Lane
Red Hook, NY 12571



Some format issues inherent in the e-media version may also appear in this print version.

Copyright© (2019) by AAABG – Association for the Advancement of Animal Breeding and Genetics
All rights reserved.

Printed with permission by Curran Associates, Inc. (2020)

For permission requests, please contact AAABG – Association for the Advancement of Animal Breeding and Genetics at the address below.

AAABG – Association for the Advancement of Animal Breeding and Genetics
University of New England
Armidale NSW 2351
Australia

Phone: 61 2 677 320 55

Fax: 61 2 677 332 66

AGBU@une.edu.au

Additional copies of this publication are available from:

Curran Associates, Inc.
57 Morehouse Lane
Red Hook, NY 12571 USA
Phone: 845-758-0400
Fax: 845-758-2633
Email: curran@proceedings.com
Web: www.proceedings.com

TABLE OF CONTENTS

Plenary 1

Investments in breeding technologies and organization to meet global needs	1
<i>J.A.M. van Arendonk, M.C.A.M Bink, K. Peeters, B. Visser, N. Duijvesteijn and P. van As</i>	
Improved rate of targeted gene knock-in of in-vitro fertilized bovine embryos	7
<i>J.R. Owen, S.L. Hennig, E.E. Paulson, J.L. Lin, P.J. Ross and A.L. Van Eenennaam</i>	
Integration of functional genomics and phenomics into genomic prediction raises its accuracy in sheep and dairy cattle	11
<i>H.D. Daetwyler, R. Xiang, Z. Yuan, S. Bolormaa, C.J. Vander Jagt, B.J. Hayes, J.H.J van der Werf, J.E. Pryce, A.J. Chamberlain, I.M. MacLeod and M.E. Goddard</i>	

Computational and Statistical 1

More genotypes than markers: the SS-T-BLUP model in action. An application study in multi-trait Australian Angus BREEDPLAN genetic evaluation	15
<i>V. Boerner and D.J. Johnston</i>	
Simple example to demonstrate the effect of allele frequencies on the genomic relationship matrix values	19
<i>M.H. Ferdosi, N.K. Connors, V. Boerner and D.J. Johnston</i>	
Deep learning for genotype quality control	23
<i>D.P. Garrick</i>	
'Meta-founders' to model base populations in genomic evaluation for multi-breed sheep data	27
<i>Karin Meyer and A.A. Swan</i>	
Using random Forest to identify SNPs that decrease accuracy of genomic prediction – behaviour of SNPs with negative VIM values	31
<i>Y. Li, F.S.S. Raidan, M. Naval Sanchez, A.W. George and A. Reverter</i>	

Breeding Objectives

Importance of heat stress adaptation for New Zealand dairy cattle	35
<i>S. Harburg, P.R. Amer, J. Duckles, G.M. Jenkins and J. Sise</i>	
Genotype by environment interaction for heat tolerance in Australian Holstein dairy cattle	39
<i>E.K. Cheruiyot, M. Haile-Mariam, T.T.T. Nguyen, B.G. Cocks and J.E. Pryce</i>	
Novel selection criteria will be required for reduction of New Zealand's national greenhouse gas emissions inventory through dairy genetics	43
<i>X. Zhang, G.M. Jenkins, J.A. Sise, B. Santos, C. Quinton and P.R. Amer</i>	
Experiences with non-linear economic values in selection index design	47
<i>C.D. Quinton, P.R. Amer, T.J. Byrne, J.A. Archer, B. Santos and F. Hely</i>	
Current progress on developing a selection index for Australian meat goats	51
<i>M.N. Aldridge, W.S. Pitchford and D.J. Brown</i>	

Industry consultation survey for the American Angus \$value indexes review	55
<i>B. Santos, J.A. Archer, D. Martin-Collado, C.D. Quinton, J. Crowley, P.R. Amer and S. Miller</i>	
Gene Editing and Novel Genes	
Comparison of gene editing versus conventional breeding to introgress the <i>polled</i> allele into the tropically adapted Australian beef cattle population	59
<i>M.L. Mueller, J.B. Cole, N.K. Connors, D.J. Johnston, I.A.S. Randhawa and A.L. Van Eenennaam</i>	
Pre- and post-puberty co-expression gene networks from RNA-sequencing of Brahman heifers	63
<i>L.T. Nguyen, A. Reverter, A. Cánovas, L.R. Porto-Neto, B. Venus, A. Islas-Trejo, S.A. Lehnert, J.F. Medrano, Milton G. Thomas, S.S. Moore and M.R.S. Fortes</i>	
Genetically engineered and Genome edited large animal models for neuronal ceroid lipofuscinoses – a review	67
<i>I. Tammen, C.G. Grupen, C.L. Pollard, N. Morey and F. Delerue</i>	
Genomic prediction in a numerically small sheep breed population using imputed sequence variants	71
<i>N. Moghaddar, D.J. Brown, A.A. Swan, I.M. MacLeod and J.H.J van der Werf</i>	
Beef 1	
Genetic diversity in Australian Angus beef cattle	75
<i>S.A. Clark, T. Granleese and P.F. Parnell</i>	
Validation of Single step genomic best linear unbiased prediction in beef cattle	79
<i>M.G. Jeyaruban, P.M. Gurman, D.J. Johnston, A.A. Swan, R.G. Banks and C.J. Girard</i>	
Feasibility of using imaging carcass traits in genetic evaluation for Australian Wagyu beef cattle	83
<i>Y. Zhang and R.G. Banks</i>	
GBLUP analysis predicted fertility phenotypes of crossbred bulls using data from Brahman and tropical composite	87
<i>L.R. Porto Neto, M.R.S. Fortes and A. Reverter</i>	
Genetics of heifer age at puberty in Australian Hereford cattle	91
<i>M.L. Wolcott, R.G. Banks, M. Tweedie and G. Alder</i>	
How does maternal weaning weight (milk) affect body condition score at weaning in Angus cattle	95
<i>T. Granleese and S.A. Clark</i>	
Sheep	
Contributions from genetic groups and outcrossing to components of reproduction in maternal sheep breeds	99
<i>K.L. Bunter, A.A. Swan and D.J. Brown</i>	
Graphical modelling of the relationship between body reserves and yearling reproduction in maternal sheep	103
<i>S.F. Walkom, K.L. Bunter, A.A. Swan and S.A Clark</i>	

Genetic parameters for growth traits in Hampshire sheep in Mexico	107
<i>L. De la Cruz, S.F. Walkom, H.G. Torres and A.A. Swan</i>	
The inheritance of flight distance as a maternal behaviour score of the dam and its impact on lamb survival	111
<i>J.C. Greeff, A.C. Schlink, D. Blache and G.B. Martin</i>	
Genetic evaluation and relationship across ages for dag score in maternal sheep	115
<i>A.J. McMillan, S.F. Walkom and D.J. Brown</i>	
Growth, carcass and meat quality traits of dorrner and South African mutton Merino lambs	119
<i>A. Muller, T.S. Brand, J.J.E. Cloete and S.W.P. Cloete</i>	
Dairy	
Breeding values of the 1000-Bull-Genome cattle estimated by dairy pleiotropic variants	123
<i>R. Xiang and M.E. Goddard</i>	
Genetic parameters of first lactation milk yield under low, medium and high production systems in Kenya, using test-day random regression model	127
<i>P.K. Wahinya, T.M. Magothe, A.A. Swan and M.G. Jeyaruban</i>	
Genetic correlation between milk urea and efficiency of crude protein utilization estimated from a random regression model	131
<i>H.B.P.C. Ariyaratne, M. Correa-Luna, H.T. Blair, D.J. Garrick and N. Lopez-Villalobos</i>	
Genetic parameters for milk yield, milk electrical conductivity and milk flow rate in first-lactation jersey cows in Sri Lanka	135
<i>A.M. Samaraweera, V. Boerner, S. Disnaka, J.H.J. van der Werf and S. Hermesch</i>	
Effects of selection for fertility on milk production traits	139
<i>E.M. Strucken, G.A. Brockmann and Y.C.S.M. Laurenson</i>	
Age at culling and reasons of culling in Australian dairy cows	143
<i>Z.W. Workie, J.P. Gibson and J.H.J. van der Werf</i>	
Pigs and Poultry	
Late gestation health status is correlated with lactation outcomes for sows	147
<i>L. Vargovic, K.L. Bunter, S. Hermesch, J. Harper and R. Sokolinski</i>	
Post-farrowing health status of sows and piglets is correlated with lactation outcomes of sows	151
<i>L. Vargovic, K.L. Bunter, S. Hermesch, R. Sokolinski and J. Harper</i>	
Genotype by temperature grouping interaction for farrowing rate at first insemination	155
<i>A.M.G Bunz, K.L. Bunter, R. Morrison, B.G. Luxford and S. Hermesch</i>	
Genetic parameter estimates for pre- and post-weaning piglet mortality	159
<i>J. Harper, K. L. Bunter and S. Hermesch</i>	
Genetic associations between early and late growth with sexual maturity in Thai native chickens	163

- S. Tongsir, M.G. Jeyaruban, J.H.J. van der Werf, L. Li, S. Hermes and T. Chormai*
Genetic analyses of sow longevity traits, age at first farrowing and first-litter characteristics 167
N. Kerssen, B.J. Ducro and S. Hermes

Native Breeds and Challenging Environments

Integrating gender considerations into livestock genetic improvement programs in low to middle income countries 171

K. Marshall, N. de Haan and A. Galiè

Perceptions of women and men smallholder pig keepers in Uganda on pig keeping objectives, and breed and trait preferences 175

B.M. Babigumira, E. Ouma, J. Sölkner and K. Marshall

Genetic structure and differentiation among African *Bos taurus* cattle breeds 179

N.Z. Gebrehiwot, E.M. Strucken, H. Aliloo, K. Marshall and J.P. Gibson

Analysis of growth of two major breeds of domestic camel in Pakistan: implications for breed improvement 183

S. Sabahat, M.S. Khatkar, A. Nadeem and P.C. Thomson

Genetic characterization of Indian indigenous cattle breeds 187

E.M. Strucken, M. Swaminathan, S. Joshi and J.P. Gibson

Morphometric differentiation of selected indigenous cattle breeds in Nigeria 191

A.D. Oladepo, A.E. Salako, A.A. Adeoye and O.A. Adeniyi

Plenary 2

Developing genomic strategies for the livestock industries: all implementations are challenging 195

D.A.L. Lourenco, S. Tsuruta, Y. Masuda and I. Misztal

The accuracy obtained from reference populations for genomic selection 206

J.H.J. van der Werf, S.A. Clark, S.H. Lee and N. Moghaddar

Increase of power and efficiency to fine-map genetic defects using genotype probabilities through segregation analyses 210

N. Duijvesteijn, S.A. Clark, B.P. Kinghorn and J.H.J. van der Werf

Breeding Program Design

Progeny of Anderson rams selected for resistance to internal parasites in Australia are comparable in other traits to that from Talitas rams selected in Uruguay 214

A. Sánchez, F. De Brum, E. van Lier, A. Burton, J. Paperán, W. Bell and R. Ponzoni

Investigating novel traits in single trait selection for their potential in selection indexes for feed efficiency of crossbred pigs 218

M.N. Aldridge, R. Bergsma and M.P.L. Calus

Genomic relationships to control inbreeding in optimum-contribution selection realise more genetic gain than pedigree relationships when inbreeding control is relaxed around quantitative trait loci	222
<i>M. Henryon, P. Berg, H. Liu, G. Su, T. Ostersen and A.C. Sørensen</i>	
Fine control of bull allocation to help avoid dystocia	226
<i>B.P. Kinghorn and A. L. Van Eenennaam</i>	
Wether trials and their role in Merino bloodline evaluation	230
<i>K.L. Egerton-Warburton, K.D. Atkins, L.M. Stephen and S.I. Mortimer</i>	
Genotype by environment interaction in Australian maternal and terminal sheep	234
<i>L. Li, A.A. Swan, D.J. Brown and J.H.J. van der Werf</i>	
Computational and Statistical 2	
Simulating genotypic merit with high-order epistatic interactions	238
<i>A.B. Kinghorn and B.P. Kinghorn</i>	
Impact of an approximate inverse of the genomic relationship matrix for single-step evaluation of Australian meat sheep	242
<i>Karin Meyer and A.A. Swan</i>	
An evaluation of ‘deflation’ to improve convergence rates for single-step genomic evaluation with the hybrid model	246
<i>Karin Meyer and A.A. Swan</i>	
Alternative implementations of preconditioned conjugate gradient algorithms for solving mixed model equations	250
<i>D.J. Garrick, B.L. Golden and D.P. Garrick</i>	
Adjusting the genomic relationship matrix for breed differences in single step genomic blup analyses	254
<i>P.M. Gurman, K.L. Bunter, V. Boerner, A.A. Swan and D.J. Brown</i>	
Detection of Causal Variants	
Genetic control of fertility traits across species: variance in tropical beef heifers’ age at puberty explained by genes controlling age at menarche in women	258
<i>R. Costilla, C. Warburton and B.J. Hayes</i>	
Signatures of selection in admixed dairy cattle of Kenya	262
<i>H. Aliloo, R. Mrode, A.M. Okeyo and J.P. Gibson</i>	
Genome-wide association study of carcass and eating quality traits in Australian Angus beef cattle	266
<i>W.M.S.P. Weerasinghe, B.J. Crook, S.A. Clark, N. Moghaddar and A.I. Byrne</i>	
Molecular investigation of several emerging inherited diseases in cattle and sheep	270

<i>S.A. Woolley, E.R. Tsimnadis, R.L. Tulloch, P. Hughes, B. Hopkins, S.E. Hayes, M.R. Shariflou, A. Bauer, I.M. Häfliger, V. Jagannathan, C. Drögemüller, T. Leeb, M.S. Khatkar, C.E. Willet, B.A. O'Rourke and I. Tammen</i>	
The population genomic signature of environmental selection in chickens from Malawi, South Africa and Zimbabwe	274
<i>K. Hadebe, E.F. Dzomba and F.C. Muchadeyi</i>	
Genomic Selection 1	
Assessment of genomic prediction accuracy for meat quality traits in Hanwoo cattle	278
<i>M. Bedhane, J.H.J. van der Werf, M. Al Kalaldehy, D. Lim, B. Park, M. N. Park, R. S. Hee and S.A. Clark</i>	
Genomic predictions for fertility traits in tropical beef cattle from a multi-breed, crossbred and composite reference population	282
<i>B.J. Hayes, G. Fordyce and S. Landmark</i>	
Selection of reference candidates for whole genome sequencing in an Australian Wagyu population	286
<i>R.A. McEwin, M.L. Hebart, H. Oakey, R.G. Tearle, J. Grose, G.I. Popplewell and W.S. Pitchford</i>	
The accuracy of genotype imputation in selected South African sheep breeds from Australian reference panels	290
<i>C.L. Nel, K. Gore, A.A. Swan, S.W.P. Cloete, J.H.J. van der Werf and K. Dzama</i>	
Application of genomic selection to Vietnamese household dairy herds	294
<i>N.N. Bang, B.J. Hayes, I.A.S. Randhawa, R.E. Lyons, J. B. Gaughan, N.V. Chanh, N.X. Trach, N.D. Khang and D.M. McNeill</i>	
Genomic tools for use in the New Zealand deer industry	298
<i>K.G. Dodds, S-A. N. Newman, S.M. Clarke, R. Brauning, A.S. Hess, T.P. Bilton, J.F. Ward, A.J. Chappell, J.C. McEwan, T.C. Van Stijn, M. Bates and S.J. Rowe</i>	
Efficiency and Product Quality	
GWAS for methane yield, residual feed intake and liveweight in New Zealand sheep	302
<i>M.K. Hess, P.L. Johnson, K. Knowler, S.M. Hickey, A.S. Hess, J.C. McEwan and S.J. Rowe</i>	
Selection for divergent methane yield in New Zealand sheep – a ten-year perspective	306
<i>S.J. Rowe, S.M. Hickey, A. Jonker, M.K. Hess, P. Janssen, T. Johnson, B. Bryson, K. Knowler, C. Pinares-Patino, W. Bain, S. Elmes, E. Young, J. Wing, E. Waller, N. Pickering and J.C. McEwan</i>	
Visual marbling score as a predictor of intramuscular fat for the genetic improvement of eating quality in lamb	310
<i>S.Z.Y. Guy, P. McGilchrist and D.J. Brown</i>	
The genetic relationships between intramuscular fat measured in four different lamb muscles	314
<i>S.Z.Y. Guy, S.F. Walkom, F. Anderson, G.E. Gardner, P. McGilchrist and D.J. Brown</i>	
Genetic parameters for primal cut weights in pigs	318
<i>N.R. Sarker, B.J. Walmsley and S. Hermes</i>	

Investigating relationship between traits associated with eating quality and market end point	322
<i>S.J. Lee, M.L. Hebart and W.S. Pitchford</i>	
Health, Welfare and Immunity	
The heritability of congenital entropion in dual-purpose New Zealand sheep	326
<i>K.M. McRae, S.M. Clarke, K.G. Dodds, S.J. Rowe, S-A. Newman, H.J. Baird and J.C. McEwan</i>	
Correcting sampling bias in microsatellite marker testing for polledness	330
<i>N.K. Connors, R.G. Banks and D.J. Johnston</i>	
Genetic analysis of tail-biting victims in pigs	334
<i>S. Hermes and S.Z.Y. Guy</i>	
Genomic prediction of metabolic profiles in dairy cows	338
<i>T.D.W. Luke, T.T.T. Nguyen, S. Rochfort, W.J. Wales, C. Richardson, M. Abdelsayed and J.E. Pryce</i>	
Poll testing efficiency, accuracy and trends in Australian cattle	342
<i>I.A.S. Randhawa, M.R. McGowan, L.R. Porto-Neto, B.J. Hayes, K.M. Schutt and R.E. Lyons</i>	
Determining the gene expression profiles of 17 candidate genes for host resistance to ticks in South African beef cattle	346
<i>B. Dube, K.J. Marima, C.M. Marufu, F. Muchadeyi, N.O. Mapholi, N.N. Jonsson, K. Dzama and C.L. Nel</i>	
Beef 2	
Production and polledness: genetic correlations between target traits in beef cattle	350
<i>I.A.S. Randhawa, L.R. Porto-Neto, M.R. McGowan, B.J. Hayes, K.M. Schutt and R.E. Lyons</i>	
Genetic correlations between days to calving and other male and female reproduction traits in Brahman cattle	354
<i>D.J. Johnston and K. Moore</i>	
Genome-wide association studies for BODY weight and average daily feed intake during the feedlot test period	358
<i>J.A. Torres-Vázquez, J.H.J. van der Werf and S.A. Clark</i>	
Coefficient of variation as a measure of general resilience for yearling weight in nellore cattle	362
<i>D.C.B. Scalez, A. Reverter, B.O. Fragomeni, L.R. Porto-Neto, L.H.S. Iung, L.G. Albuquerque and R. Carvalheiro</i>	
Increases in accuracy of female reproduction genetic evaluations for beef breeds in northern Australia	366
<i>K.L. Moore, C.J. Girard, T.P. Grant and D.J. Johnston</i>	
Genomic Selection 2	
Sharing multibreed cow data with New Zealand to improve prediction for Australian crossbreed cows for milk yield traits	370
<i>M. Haile-Mariam, I.M. MacLeod, M. Khansefid, C. Schrooten, E. O'Connor, G. de Jong, H.D. Daetwyler and J. E. Pryce</i>	

Assessing the value of whole genome sequence data in selecting for age at puberty in tropically adapted beef heifers	374
<i>C. Warburton and B.J. Hayes</i>	
Increasing the accuracy of genomic prediction in crossbred dairy cattle	378
<i>M. Khansefid, M.E. Goddard, M. Haile-Mariam, C. Schrooten, G. de Jong, E. O'Connor, J.E. Pryce, H.D. Daetwyler and I.M. MacLeod</i>	
Genotype panel requirements for inclusion into BREEDPLAN single step evaluations	382
<i>N.K. Connors and M.H. Ferdosi</i>	
Finding the optimal reference population for genomic prediction of Australian red dairy cattle	386
<i>I. van den Berg, I.M. MacLeod and J.E. Pryce</i>	
Novel Phenotypes and Other Industries	
Applying next generation phenotyping strategies for genetic gain in dairy cattle	390
<i>J.E. Pryce, T.T.T. Nguyen, P.N. Ho, T.D.W. Luke, S. Rochfort, W.J. Wales, P. Moate, L.C. Marett, G. Nieuwhof, M. Abdelsayed, M. Axford, M. Shaffer and M. Haile-Mariam</i>	
The genetic analysis of adult bird performance together with slaughter traits in ostriches	394
<i>S.W.P. Cloete, A. Engelbrecht, A.R. Gilmour, M.F. Schou, Z. Brand and C.K. Cornwallis</i>	
Trait development for <i>Apis mellifera</i> in commercial beekeeping in New Zealand	398
<i>G.E.L. Petersen, P.F. Fennessy and P.K. Dearden</i>	
A method for developing a breeding objective trait from multiple components using the example of immune competence in Australian Angus cattle	402
<i>S. Dominik, L. Porto-Neto, C.J. Duff, A.I. Byrne, B. Hine, A. Ingham, I.G. Colditz and A. Reverter</i>	
Selective breeding for improved survival to juvenile pearl oyster mortality syndrome in silver lipped pearl oyster, <i>Pinctada maxima</i>	406
<i>C. Massault, K. Zenger, J.M. Strugnell, J. Knauer, G. Firman, R. Barnard and D.R. Jerry</i>	
Plenary 3	
Sequencing strategy, imputation and genomic prediction in a large pig sequencing study	410
<i>R. Ros-Freixedes, A. Whalen A. Somavilla, S. Gonen, M. Battagin, M. Johnsson, G. Gorjanc, C.Y. Chen, W.O. Herring, A.J. Mileham and J.M. Hickey</i>	
Genomic prediction and candidate gene discovery for dairy cattle temperament using sequence data and functional biology	416
<i>I.M. MacLeod, P.J. Bowman, A.J. Chamberlain, C.J. Vander Jagt, H.D. Daetwyler, B.J. Hayes and M.E. Goddard</i>	
Gene network analysis for marbling development using gene expression (RNA-seq) in Hanwoo	420
<i>S. de las Heras-Saldana, D. Lim, S.H. Lee and J.H.J. van der Werf</i>	

Posters

- Exploring the regulatory potential of long non-coding RNA in bovine feed efficiency through coexpression in liver and muscle 424
P.A. Alexandre, A. Reverter, L.R. Porto-Neto, R.B. Berezin, J.B.S. Ferraz and H. Fukumasu
- Genetic improvement of pasture intake and efficiency in beef cattle: are we there yet? 428
P.F. Arthur, R.M. Herd, P.L. Greenwood, K.A. Donoghue and T. Bird-Gardiner
- The effect of including stature in sire selection on the live weight, milk yield, fertility and feed efficiency of Holstein cows 432
C.J.C. Muller, S.W.P. Cloete and M. Burger
- Genetic parameters of milk lactation curve traits of Thai dairy cattle 436
S. Pangmao, P.C. Thomson and M.S. Khatkar
- Genetic variation and estimating breeding values for smallholder crossbred dairy cattle in India 440
M. Alkalaldehy, Y. Gaundare, M. Swaminathan, S. Joshi, H. Aliloo, E.M. Strucken, V. Ducrocq and J.P. Gibson
- Mitochondrial gene expression is associated with organ and tissue metabolism in dairy cattle 444
J. Dorji, I.M. MacLeod, C.J. Vander Jagt, A.J. Chamberlain and H.D. Daetwyler
- Accuracy of genomic predictions for milk production traits in Philippine dairy buffaloes 448
J.R.V. Herrera, E.B. Flores, N. Duijvesteijn, N. Moghaddar and J.H.J. van der Werf
- Medium density beadchip genotype data reveals genomic structure of South African Merino-based breeds 452
E.F. Dzomba and F.C. Muchadeyi
- Evaluation of body morphology and shape of black tiger prawn (*Penaeus monodon*) by morphometric analysis 456
M.M. Hasan, N.M. Wade, C. Bajema, P.T. Thomson, D.R. Jerry, H.W. Raadsma and M.S. Khatkar
- Genotype x environment interaction in shrimp breeding: a review and perspectives 460
M.M. Hasan, P.C. Thomson, H.W. Raadsma and M.S. Khatkar
- Bioeconomic modelling of Australian black tiger prawn *Penaeus monodon* under intensive pond culture 464
M.C. Marin-Riffo, H.W. Raadsma, D.R. Jerry, G.J. Coman and M.S. Khatkar
- Economic weighing of traits in a preliminary selection index for ostriches in South Africa 468
A. Engelbrecht, S.W.P. Cloete and P.R. Amer
- Discovery of signatures of selection in beef and dairy cattle using ultra high-density SNP genotypes 472
I.A.S. Randhawa, M.S. Khatkar, P.C. Thomson, R.D. Schnabel, J.F. Taylor and H.W. Raadsma
- Comparing the carbon dioxide and methane emissions of Holstein and Jersey cows in a kikuyu pasture-based system 476
N.M. Bangani, K. Dzama, C.J.C. Muller, F.V. Nherera-Chokuda and C.W. Cruywagen

Investigation into the effects of number of SNPs and number of reference individuals on imputation accuracy	480
<i>M.H. Ferdosi and N.K. Connors</i>	
Factors affecting development of horns and scurs in domestic ruminants	484
<i>I.A.S. Randhawa, R.E. Lyons, B.J. Hayes, L.R. Porto-Neto and M.R. McGowan</i>	
John Vercoe Memorial Lecture	
Levels of performance recording in the Australian beef industry	488
<i>B.W. Gudex and C.A. Millen</i>	
Breeders Days Beef 1	
The Angus Sire Benchmarking Program – a major contributor to future genetic improvement in the Australian beef industry	N/A
<i>P.F. Parnell, C.J. Duff, A.I. Byrne and N.M. Butcher</i>	
Should Angus breeders live-animal ultrasound scan for intramuscular fat in the genomics era?	496
<i>C.J. Duff, J.H.J. van der Werf, P.F. Parnell and S.A. Clark</i>	
Bull discovery powered by genomics – a practical case study	500
<i>M.J. Reynolds, A.I. Byrne, C.J. Duff and P.F. Parnell</i>	
Benefits of genomic information in the Angus industry – the Rennylea experience	504
<i>S. Dominik, L.R. Porto-Neto, A. Reverter and L. Corrigan</i>	
A survey approach to explore industry priorities for novel traits in Australian Angus	508
<i>A.M. Bell, A.I. Byrne, C.J. Duff and S. Dominik</i>	
Breeders Days Sheep 1	
Design and purpose of the Merino Lifetime Productivity Project	512
<i>A.M.M. Ramsay, A.A. Swan and B.C. Swain</i>	
Merino Lifetime Productivity - economic value of meat and wool from wethers at yearling and adult age	516
<i>B.E. Clarke, J.M. Young, S. Hancock and A.N. Thompson</i>	
Accounting for ewe source effects in genetic evaluation of Merino fleece traits	520
<i>K.L. Egerton-Warburton, S.I. Mortimer and A.A. Swan</i>	
Indicator traits recorded early in life will be useful selection criteria for breech flystrike resistance in weaner Merino sheep	524
<i>J.L. Smith, S. Dominik, S. Lehnert, A. Reverter and I.W. Purvis</i>	
Breeding for reduced breech flystrike as part of multi-trait selection	528
<i>F.D. Brien, S.F. Walkom, A.A. Swan and D.J. Brown</i>	
Breeders Days Beef 2	
Demonstrating BREEDPLAN estimated breeding values in New Zealand commercial beef herds	532

<i>M. Tweedie, J.A. Archer and L. Proctor</i>	
Two years in: lessons from the introduction of Hereford single-step BREEDPLAN	536
<i>C.A. Millen and B.J. Crook</i>	
Pedigromics: a network-inspired approach to visualise and analyse pedigree structures	540
<i>A. Reverter, S. Dominik, J.B.S. Ferraz, L. Corrigan and L.R. Porto-Neto</i>	
Genetics of female fertility in Wagyu cattle using field data	544
<i>K. Reid, G. Moser and M. Kelly</i>	
Popplewell composites: adding value to our customers' tropical beef supply chains through genomic evaluation and selection	548
<i>G.I. Popplewell, R.G. Tearle, R.A. McEwin, M.L. Facy and W.S. Pitchford</i>	
Breeders Days Sheep 2	
Merinolink/UNE DNA stimulation project: Doubling the rate of genetic gain - where are we at in year 2?	552
<i>S.J. Martin and T.Granleese</i>	
Australia you have footrot, time to start breeding against it!	556
<i>S.F. Walkom, K.L. Bunter, H. Raadsma, D.J. Brown and M.B. Ferguson</i>	
Evolution of genetic evaluation for ewe reproductive performance	560
<i>K.L. Bunter, A.A. Swan, P.M. Gurman, V. Boerner, A.J. McMillan and D.J. Brown</i>	
Breeders Days Adoption	
The influence feed cost has on changing beef cattle greenhouse gas emissions	564
<i>B.J. Walmsley, A.L. Henzell and S.A. Barwick</i>	
Costs of and returns from performance recording in beef and sheep studs	568
<i>R.G. Banks, Yue Zhang, Y. Zhang and J. Shovelton</i>	
Impact of key messages on accuracy of sheep breeding programs	572
<i>L.M. Stephen and D.J. Brown</i>	
Farmer app adoption is influenced by age, use of advisors and farmer networks	576
<i>P.J. Schulz, J. Prior, L. Kahn and G. Hinch</i>	
AngusSELECT™	580
<i>M.J. Reynolds, A.I. Byrne, C.J. Duff and P.F. Parnell</i>	
Breeders Days Value Chain	
Enhanced data capture in Australian red meat supply chains for the genetic improvement of eating quality and carcass yield	584
<i>S.Z.Y. Guy and D.J. Brown</i>	
Phenotypic variation in retail beef yield in Angus cattle	588
<i>K.A. Donoghue, L.M. Cafe, B.J. Walmsley and C.J. Duff</i>	

DeSireBull, a decision support tool to simplify genetic information for effective use by 592
commercial beef producers

L.A. Penrose, M. Suarez and B.J. Walmsley

The livestock phenotype revolution: enabling a step-change in farm management and 596
scientific discovery

C.E.F. Clark, S.C. Garcia, K. Marshall, J.E. Pryce, P.L. Greenwood and S. Lomax