17th Biennial Conference of the Association for the Advancement of Animal Breeding and Genetics 2007

Genetic Improvement – Making it Happen

Armidale, New South Wales, Australia 23-26 September 2007

ISBN: 978-1-61738-633-6

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© (2007) by AAABG – Association for the Advancement of Animal Breeding and Genetics All rights reserved.

Printed by Curran Associates, Inc. (2010)

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 The University of Adelaide Roseworthy, SA Australia 5371

www.aaabg.org

Additional copies of this publication are available from:

Curran Associates, Inc. 57 Morehouse Lane Red Hook, NY 12571 USA Phone: 845-758-0400 Fax: 845-758-2634 Email: curran@proceedings.com Web: www.proceedings.com

TABLE OF CONTENTS

Making real genetic progress

Creation of value for the industry from the use of genomics in animal breeding	1
H.A.M. van der Steen	
Genetic trends in Australian beef cattle- Making real progress	8
D.J. Johnston	

Breeding Program Design Initiatives

Breeding Program Design Initiatives	16
T. Gubbins and W. Upton	
Investment in genetic improvement in meat sheep breeding- 2007 and beyond T_{Bull}	22
The information nucleus-a new concept to enhance sheep industry genetic improvement	29
Optimising between and within family selection for harvest weight in prawns with	33
restricted harvest size	55
M. Macbeth	
Genetic improvement and dissemination of Rohu (Labeo rohita, Ham.) in India	37
K. Das Mahapatra, J.N. Saha, N. Sarangi, R.K. Jana, B. Gjerde, N.H. Nguyen, H.L.	
Khaw and R.W. Ponzoni	
Continuous sexed dairy F1 production to alleviate poverty: Combining the economics and	41
the genetics	
S. McClintock, R. Ouma, I. Baltenweck, A.M. Okeyo, A.E. McClintock and	
J.E.O. Rege	

Pigs and Poultry

Calculation of economic values for turkey breeding using a production model	45
B.J. Wood and N. Buddiger	
Optimum test duration for the measurement of growth and feed efficiency in pigs	49
L.R. Giles, I.M. Barchia and P.F. Arthur	
Single nucleotide polymorphisms in suppressor of cytokine signalling-2 gene and	53
association with feed conversion ratio and growth in pigs	
E. Piper, Y. Chen, Y. Zhang, B. Tier, H. Graser, B. Luxford and C. Moran	
Associations between feed intake of growing gilts, lactating sows and other reproductive	57
and performance traits	
K.L. Bunter, B.G. Luxford and S. Hermesch	
Genetic analysis of feed intake in lactating sows	61
S. Hermesch	

cyp21 as a candidate gene for androstenone on boar taint	65
P. Arasta, Y. Chen, Y. Zhang, R. Kerr, H. Graser, B. Luxford and C. Moran	
Gene Expression and Bioinformatics	
Systems genetics approaches for genetic improvement of livestock HN Kadarmideen	69
Theoretical false discovery rate, false discovery rate controlling methods and sample size for microarrays J. Song and P.C. Thomson	77
Integrating whole-genome genetic-association studies with gene expression data to prioritise candidate genes affecting intramuscular fat in beef cattle traits <i>E.K.F. Chan and A. Reverter</i>	81
A systems biology approach for the comprehensive understanding of complex traits: application to beef cattle <i>A. Reverter, E. Chan, W. Barris and B.P. Dalrymple</i>	85
Proof of Profit	
The CEFN in-house nucleus program	93
The value of genetic change in the beef industry A. McDonald	98
Is increased fleece weight associated with reduced reproduction rate? Results from long term multi-trait selection flocks	103
Response to selection method on visual traits in South Australian Merino sheep R.A. Curnow, F.D. Brien, W.S. Pitchford and D.J. Koopman	107
Estimation of genetic change in the GIFT strain by comparing contemporary progeny produced by males born in 1991 or 2003 <i>H L. Khaw, R W. Ponzoni and M LC. Danting</i>	111
Economic weights for disease resistance in Sydney rock oysters A.C. Hansson and K.L. Bunter	115
Gene Mapping 1	
Fine mapping QTL with haplotypes determined from dense single nucleotide polymorphic markers	119
<i>Y. Zhang, B. Tier and R. Hawken</i> QC analyses of SNP array data: experiences from a large population of dairy sires with 23.8 million data points	123

K.R. Zenger, M.S. Khatkar, B.Tier, M.Hobbs, J.A.L. Cavanagh, J. Solkner, R.J. Hawken, W. Barris and H.W. Raadsma

Building an integrated QTL map for all major production traits in sheep based on multiple	127
QTL mapping populations	
H.W. Raadsma, K. Fullard, K.R. Zenger, J.A.L. Cavanagh, P.C. Thomson, M. Lam,	
D. Piedrafita, E. Margawati, S. Widjayanti, E. Estiningsih and F.W. Nicholas	
Biochemical and DNA polymorphisms and their associations with osteochondral diseases	131
and production traits in pigs	
H.N. Kadarmideen	
Genetic variation at the myostatin locus	135
B.A. O'Rourke, B.J. Hayes, P.L. Greenwood, P.F. Arthur and M.E. Goddard	
Polymorphisms in the bovine leptin gene associated with serum leptin, feed efficiency,	138
growth and carcass traits: model comparisons	
F.N. Mujibi, D.J. Nkrumah and S.S. Moore	
Statistical Methods	
Covariance structures for quantitative genetic analyses	142
K. Meyer	
Transformations and response to selection	150

J.W. James A note on bias in reduced rank estimates of covariance matrices K. Meyer and M. Kirkpatrick

Adoption

Overcoming barriers to adoption of genetic technologies in the beef industry	158
W.H. Upton, D.C. Nicol and R.E. Freer	
Effective value chain partnerships are essential for rapid adoption of beef genetics	167
technology	
P.F. Parnell	
Breedleader - advanced breeding and genetics short course for beef seedstock producers	175
D.C. Nicol and W.H. Upton	
Challenges and opportunites for genetic improvement in the Merino industry	179
T.M. Fischer and R.G. Banks	
Genetic improvement in the SA selection demonstration flock and at Seamour stud – a	183
producer's view	
W.B. Richardson	

Sheep 1

Genetic evaluation for the Australian sheep industry	187
D.J. Brown, A.E. Huisman, A.A. Swan, H-U. Graser, R.R. Woolaston, A.J. Ball,	
K.D. Atkins and R.G. Banks	

Implications of selection for meat and wool traits on maternal performance in Merinos	195
M.B. Ferguson, N.R. Adams and I.R.D. Robertson	
Feed intake and its genetic relationship with growth traits in Merino sheep	199
E. Safari, N.M. Fogarty, S.I. Mortimer, J.C. Greeff, S. Hatcher, G.J. Lee, and A.R.	
Gilmour	
Heritability estimates of individual fatty acids in Merino meat	203
J.C. Greeff, M. Harvey, P. Young, S. Kitessa and M. Dowling	
Selection of flock rams for eye muscle depth will improve the boning room profitability of	207
their progeny	
B.M. McLeod, A.K. White, W.J. O'Halloran and S.G. Nielsen	
Genomics 1	
Using pig bacterial artificial chromosomes to validate the construction of the virtual sheep	211
genome	
A. Ratnakumar and B.P. Dalrymple	
Extent of linkage disequilibrium and haplotype blocks in bovine genome using high	215
density SNP markers	
M.S. Khatkar, K.R. Zenger, J.A.L. Cavanagh, R.J. Hawken, M. Hobbs, W. Barris,	
P.C. Thomson, F.W. Nicholas, B. Tier and H.W. Raadsma	
The AgResearch/University of Adelaide QTL study of carcass composition and meat	219
quality traits in beef cattle	
C.A Morris, N.G. Cullen, W.S. Pitchford, C.D.K. Bottema and T. Wilson	
Design of a whole genome scan experiment for a multi-breed beef cattle population with a	223
complex pedigree	

M.J. Kelly, B.J. Hayes and S.P. Miller Genome based genetic evaluation and genome wide selection using supervised dimension 227 reduction based on partial least squares

G. Moser, R.E. Crump, B. Tier, J. Solkner, K.R. Zenger, M.S. Khatkar, J.A.L.
Cavanagh and H.W. Raadsma
Genome wide selection in dairy cattle based on high-density genome-wide SNP analysis: 231
from discovery to application.

H.W. Raadsma, K.R. Zenger, M.S. Khatkar, R. Crump, G. Moser, J. Solkner, J.A.L. Cavanagh, R.J. Hawken, M.Hobbs, W. Barris, F.W.Nicholas and B.Tier

Sustainable Breeding Programs

Sustainable livestock genetic improvement	235
P. Bijma, H.A. Mulder and E.D. Ellen	
Physiological consequences of selection for increased performance	240
W.M. Rauw	

Sheep 2

Sire by environment interaction in sheep may re-rank sires for some traits	248
<i>M.J. Carrick and J.H.J. van der werf</i> Liveweight and wool production estimated breeding values are not affected by post weaning growth path	252
J. E. Hocking Edwards and T. M. Starbuck Adjustment of faecal worm egg count for faecal moisture content will not affect rate of genetic gain when selecting for worm resistance in Merino sheep I.C. Greeff, D. Palmer and I. I.F. Karlsson	256
The impact of phenotypic selection for clean fleece weight on reproduction S.Hatcher and K.D. Atkins	260
Selecting sheep for nematode resistance and correlated responses in dags in a winter rainfall environment	264
L.J.E. Karlsson and J.C. Greeff Variance components for lambing ease and gestation length in sheep D.J. Brown	268
Software Tools	
Solving complex problems with evolutionary computation C. Gondro and B.P. Kinghorn	272
Performance of REML algorithms in multivariate analyses fitting reduced rank and factor- analytic models	280
SNPaway: a SNP pruner for association studies based on a bootstrap forward regression approach	284
A. Reverter, W. Barris, E. Chan, R. Hawken, W. Barendse and B. Dalrymple QTL-MLE: a maximum likelihood QTL mapping program for flexible modelling using the R computing environment	288
P.C. Thomson, S.C. Brown and H.W. Raadsma Optimising the allocation of beef cattle to market endpoints B.J. Walmsley, C. Gondro, J.H.J. van der Werf and B.P. Kinghorn	292
Genetic Evaluation and Marker Assisted Selection	

Predicting genomic breeding values within and between populations	296
B.J. Hayes, A.P.W. De Roos and M.E. Goddard	
Genome wide selection in dairy cattle: use of genetic algorithms in the estimation of	304
molecular breeding values	
R.E. Crump, B. Tier, G. Moser, J. Solkner, R.J. Kerr, A.F. Woolaston, K.R. Zenger,	
MC KI I I I I C I I I I I W D I	

M.S. Khatkar, J.A.L. Cavanagh, and H.W. Raadsma

Genome wide selection: issues and implications	308
B. Tier, R. Crump, G. Moser, J. Solkner, P. Thomson, A. Woolaston and	
H. Raadsma	
Designing experiments that estimate genetic marker, major gene and treatment effects	312
D.L. Robinson, L.M. Cafe, J.M. Thompson and P.L. Greenwood	
Investigation of the power and design of using SNP chips for genome-wide association	316
studies in farm animals: an example	
B. Auvray and K.G. Dodds	

Sheep 3

Genetic change in South African Merino resource flocks	320
S.W.P. Cloete, J.J. Olivier and W.J. Olivier	
Genetic change in some South African Merino studs participating in the MERINOPLAN	324
J.J. Olivier and S.W.P. Cloete	
Breeding Merino wool for colour stability is achievable	328
M.E. Dowling , A.C. Schlink and J.C. Greeff	
Genetic parameters for subjectively assessed and objectively measured wool and live	332
weight traits in South African Merinos	
P.A. Matebesi, S.W.P. Cloete and J.B. van Wyk	
Genetic parameters for subjectively scored traits in yearling and adult fine wool Merinos	336
D.L. Robinson, S.I. Mortimer, A.A. Swan, and I.W. Purvis	
Preliminary results on genetic variation in yarn strength and handle characteristics of	340
Merino wool	
M.E. Dowling, C. MacDonald, A.C. Schlink and J.C. Greeff	

Beef

The effect of age slicing interval on the variance components and data effectiveness for	344
birth and 200day weights in Angus cattle	
D.J. Johnston, D.J. Brown and H-U. Graser	
Genetic variation in adaptive traits of cattle in north Australia	348
N.J. Corbet, K.C. Prayaga, D.J. Johnston and H.M. Burrow	
Impact of addition of new herds on genetic parameter estimates in the Australian Brahman	352
population	
K.A. Donoghue, D.J. Johnston and HU. Graser	
Genetics of meat quality traits in two tropically adapted genotypes of beef cattle 1. Genetic	356
parameters and correlations	
M.L. Wolcott, D.J. Johnston, S.A. Barwick and J.M. Thompson	
Genetics of meat quality traits in two tropically adapted genotypes of beef cattle 2.	360
Influence of tenderstretching	

C.L. Iker, M.L. Wolcott, D.J. Johnston and J.M. Thompson

Accounting for selective slaughter over time when estimating breeding values for carcase traits - a simulation study <i>C.D. Worsnop, D.J. Johnston and HU. Graser</i>	364
Gene Mapping 2	
Combining information across traits using a factor analytic model increases the power of QTL detection	368
<i>W.S. Pitchford, A. Esmailizadeh Koshkoih and A.R. Gilmour</i> Fine-mapping of quantitative trait loci using combined linkage disequilibrium and linkage with general pedigrees	376
S.H. Lee and J.H.J. van der Werf Cross validation of QTL from linkage analysis and linkage disequilibrium analysis D.L. Hulett, B. Hayes, A.J. Chamberlain, L. Krishnan, H. McPartlan, R.M. Herd	384
and M. Goddard Significance thresholds in two-stage QTL mapping experiments J.M. Henshall, A. Bell and S. Dominik	387
Genetic Evaluation	
Development of a genetic evaluation system for structural soundness traits in Angus cattle <i>M.G. Jevaruban, D.J. Johnston and H.–U. Graser</i>	391
A simple bootstrapping proceedure to validate the MERINOSELECT model for weaning weight	395
A.A. Swan and D.J. Brown What genetic group structure to fit? A Bayesian approach applied to yearling worm egg count in Merino sheep	399
A.E. Huisman and D.J. Brown Determining pedigree by association in Merino flocks	403

 Determining pedigree by association in Merino flocks
 403

 J.S. Richards and K.D. Atkins
 403

 Scope for estimation of variances due to sex-linked, maternal and dominance effects in
 407

 mixed model analyses
 K. Meyer

R. meye

Sheep QTL

SheepGenomics and the International Sheep Genomics Consortium	411
H. Oddy, B. Dalrymple, J. McEwan, J. Kijas, B. Hayes, J. van der Werf, D.	
Emery, P. Hynd, T. Longhurst, T. Fischer, D. Ferguson, R. Forage, N. Cockett	
and F. Nicholas	
Use of gene markers in the NZ Sheep Industry	418
K.G. Dodds	

Expression of reproductive and production traits in commercial Merino ewes having 0, 1	426
or 2 copies of the FecB mutation	
S.W. Walkden-Brown, D. Wolfenden, R.J. Charles and J.F. Maddox	
Reproductive performance of Indian crossbred Deccani ewes carrying the FecB mutation	430
C. Nimbkar, P.M. Ghalsasi, B.V. Nimbkar, S.W. Walkden-Brown, J.F. Maddox,	
V.S. Gupta, V.C. Pardeshi, P.P. Ghalsasi and J.H.J. van der Werf	

Dairy and Limits to Production

Experiences from breeding for economic efficiency in dairy cattle in New Zealand	434
B. Harris, J.E. Pryce, and W.A. Montgomerie	
An alternative measure of fertility for genetic evaluation of dairy cattle	445
M. Haile-Mariam and M.E. Goddard	
Comparative effects of ASI and APR sire breeding values on the lactation profile of	449
pasture-based Holstein-Friesian cows	
S.A. Adediran, D.J. Donaghy, M. Freeman and A.E.O. Malau-Aduli	
Limits to selection for production efficiency in New Zealand dairy cattle	453
J.E. Pryce, B.L. Harris and W.A. Montgomerie	

Development and use of genomic technologies

Current directions in cattle genomics research (John Vercoe Memorial Lecture)	461
C.P. Van Tassell, T.S. Sostegard, G. Liu and L.K. Matukmalli	
Application of genomic information in a dairy cattle breeding scheme	471
R.J. Spelman, M. Keehan, V. Obolonkin and W. Coppieters	

Breeding Objectives

Incorporating genotype information into selection indexes for beef cattle and sheep	479
P.R. Amer	
Developments in breeding objectives for the Australian sheep industry	483
A.A. Swan, J.H.J. van der Werf and K.D. Atkins	
Selection indexes for crossbred ewe reproduction and productivity	491
R.A. Afolayan, A.R. Gilmour and N.M. Fogarty	
Functional traits - can we find practical measures to quantify them and how important are	495
they?	

S.J. Eady and H. Garreau

Genomics 2

Ovine genomics: lab to paddock J. McEwan 499

Contents	
----------	--

Putting the bovine genome to work W. Barris, R. Hawken, S. McWilijam and B.P. Dalrymple	500
Genome-wide association studies in human populations: results and applications to predict genetic risk of disease <i>P. Visscher</i>	508
Where to from here?	
Where to from here? The technical landscape ahead	509
Where to from here? The landscape ahead in practice G.B. Nicoll	515
Posters	
Evaluating Australian bulls on indexes of other countries and International bulls on Australian indexes	521
An update on inbreeding in the Australian thoroughbred horse population	525
Sheep breeding and selection – targeting the audience <i>LF Court G Hallam L Kubeil and G Kaine</i>	529
Genetic parameters for ostrich slaughter and skin traits	533
Expression profiling of genes involved in muscular activity and inactivity in hind legs of rats	537
M. Ghaderi-Zefrehei, H.N. Kadarmideen and M. Flueck Wool shedding as a trait for genetic improvement using marker assisted selection? P.L. Johnson, D. O'Connell, K.G. Dodds, R.M.W. Sumner, J.C. McEwan and A.J. Pearson	541
The effect of linkage and flock size on the accuracy of estimated genetic group effects <i>M. Khusro, D.I. Brown, HU. Graser and B. Tier</i>	545
Use of dense DNA markers to measure chromosome segment homozygosity in dairy cattle I.M. MacLeod, B.J. Hayes, A.J. Chamberlain, K.W. Savin, H. McPartlan, M. Haile- Mariam, P. Bowman and M.E. Goddard	549
Genetic variation in rectal temperature and its association with heat tolerance in Australian dairy cattle	553
Describing variation in rump p8 fat depth of crossbred cattle from birth to slaughter H.R. Mirzaei, M.P.B. Deland and W.S. Pitchford	557
Does phenotypic selection for fleece weight reduce lamb survival? G. Refshauge, S. Hatcher, G.N. Hinch, D.L. Hopkins and S. Nieslen	561

High resolution mapping of quantitative trait loci on ovine chromosome 3 and 20 affecting565protein yield and lactation persistency*M.Singh, M.Lam, D.McGill, P.Thomson, J.A. Cavanagh, K.R. Zenger andH.W.Raadsma*

Author index

569