

MateSel Publications

Overview

This page contains publications that are related to the development of MateSel. There is a long history, starting with a desire to integrate different issues in animal breeding into a single decision framework. Publication reference numbers use the following codes: **R**efereed journal, **C**onference (**I**nvited, **S**ponsored).

Core methods

The first publication opened the door to simultaneous mate selection. The second added grouping in an efficient manner, which does not rely on penalising illegal solutions, as done in TGRM.

C52 Kinghorn, B.P. and Shepherd, R.K. 1999. Mate selection for the tactical implementation of breeding programs. *Assoc. Advmt. Anim. Breed. Genet.* 13:130-133.
<http://www.aaabg.org/livestocklibrary/1999/AB99025.pdf>

R62 Kinghorn, B.P. 2011. An algorithm for efficient constrained mate selection. *Genetics Selection Evolution.* 43:4. <http://www.gsejournal.org/content/43/1/4>

Feature development (see also key implementations)

CIS24 Kinghorn, B.P., Van Eenennaam, A.L., MacNeil, M.D. 2015. Targeting Multiple End-Uses in Beef Cattle Breeding Programs. *Proceedings of the 2015 Applied Reproductive Strategies in Beef Cattle conference*, August 17-18, 2015, Davis, CA. <https://beefrepro.org/wp-content/uploads/2020/09/17Kinghorn-VanEeen-pg250-257.pdf>

C120 Kinghorn, B.P., 2017. Committed matings under mate selection. *Proc. Assoc. Advmt. Anim. Breed. Genet.* 22: 277-280 <http://agbu.une.edu.au/AAABG%202017/63Kinghorn22277.pdf>

C123 Kinghorn, B.P., 2018. Accommodating recent contributions under optimal contribution selection. *Proceedings of the World Congress on Genetics Applied to Livestock Production*, 11: 217
<http://www.wcgalp.org/system/files/proceedings/2018/accommodating-recent-contributions-under-optimal-contribution-selection.pdf>

C125 Kinghorn, B.P. and Van Eenennaam, A.L. 2019. Fine control of bull allocation to help avoid dystocia. *Proc. Assoc. Advmt. Anim. Breed. Genet.* 23: 226-229
<http://www.aaabg.org/aaabghome/AAABG23papers/55Kinghorn23226.pdf>

Genotypic information

C60 Li, Y.; Van der Werf, J.H.J.; Kinghorn, B.P. 2001. Optimization of selection for two identified quantitative trait loci. *Assoc. Advmt. Anim. Breed. Genet.* 14: 265-268.
<http://www.aaabg.org/livestocklibrary/2001/ab01061.pdf>

R79 Upperman, L.R., Brian P. Kinghorn, Michael D. MacNeil, Alison L. Van Eenennaam, 2019 Management of lethal recessive alleles in beef cattle through the use of mate selection software. *Genetics Selection Evolution*, 51(1):36 <https://gsejournal.biomedcentral.com/articles/10.1186/s12711-019-0477-3>

Tests of performance and key implementations

- R76 Cowling, W.A., L. Li, K.H.M. Siddique, M. Henryon, P. Berg, R.G. Banks and B.P. Kinghorn, 2017. Evolving gene banks: improving diverse populations of crop and exotic germplasm with optimal contribution selection. *Journal of Experimental Botany* 68, 1927–1939. <https://academic.oup.com/jxb/article/68/8/1927/2457456>
- R77 Cowling, W.A., Li Li, Kadambot H. M. Siddique, Robert G. Banks, **Brian P. Kinghorn**, 2018. Modeling crop breeding for global food security during climate change. *Food Energy Secur.* <https://onlinelibrary.wiley.com/doi/full/10.1002/fes3.157>
- C122 Suontama, M., B.P. Kinghorn, W.A. Cowling and H.S. Dungey, 2018. Tactical desired gains for control of red needle cast in radiata pine under optimal contributions selection. *Proceedings of the 11th World Congress on Genetics Applied to Livestock Production*. 11: 375
<http://www.wcgalp.org/system/files/proceedings/2018/tactical-desired-gains-control-red-needle-cast-radiata-pine-under-optimal-contributions-selection.pdf>
- R81 Clare Mukankusi, Wallace A. Cowling, Kadambot K.M. Siddique, Li Li, Brian Kinghorn, Jean Claude Rubyogo (2020) Diversity Breeding Program on Common Bean (*Phaseolus vulgaris* L.) Targeting Rapid Cooking and Iron and Zinc Biofortification. (Multidisciplinary Digital Publishing Institute) *Proceedings* 2019, 36, 194; doi:10.3390/proceedings2019036194 <https://www.mdpi.com/2504-3900/36/1/194>
- C126 Kinghorn, B.P. Kinghorn A.J. 2021. Management of inbreeding and coancestry to target short-term and long-term genetic gains. *Proc. Assoc. Advmt. Anim. Breed. Genet.* 24: 191-194
<https://www.youtube.com/watch?v=NcfFpQ1c3L8>
- R82 Saradadevi, R., Mukankusi, C., Li, L., Amongi, W., Mbiu, J. P., Raatz, B., Ariza, D., Beebe, S., Varshney, R. K., Huttner, E., Kinghorn, B., Banks, R., Rubyogo, J. C., Siddique, K. H. M., & Cowling, W. A., 2021. Multivariate genomic analysis and optimal contributions selection predicts high genetic gains in cooking time, iron, zinc, and grain yield in common beans in East Africa. *Plant Genome*. 2021;e20156. <https://doi.org/10.1002/tpg2.20156>
- R83 Cowling, W.A.; Castro-Urrea, F.A.; Stefanova, K.T.; Li, L.; Banks, R.G.; Saradadevi, R.; Sass, O.; **Kinghorn, B.P.**; Siddique, K.H.M. Optimal contribution selection improves the rate of genetic gain in grain yield and yield stability in spring canola in Australia and Canada. *Plants* 2023, 12, 383. <https://doi.org/10.3390/plants12020383>
- Castro-Urrea, F.A.; Urricariet, M.P.; Stefanova, K.T.; Li, L.; Moss, W.M.; Guzzomi, A.L.; Sass, O.; Siddique, K.H.M.; Cowling, W.A. Accuracy of Selection in Early Generations of Field Pea Breeding Increases by Exploiting the Information Contained in Correlated Traits. *Plants* 2023, 12, 1141. <https://doi.org/10.3390/plants12051141>
- Kinghorn, B.P. Kinghorn A.J. 2023. Management of diversity and inbreeding when importing new stock into an inbred population. *J. Heredity*. <https://doi.org/10.1093/jhered/esad027>

From MateSel users (Research and/or making design and breeding decisions)

- M001 Trevor D. Walker, Cooperative Tree Improvement Program. 2021 Coastal 5th-Cycle Candidate Selection Analysis. January 15, 2021
https://matesel.com/content/documentation/ncsu_tree_improvement_program_2021_candidate_selection_analysis.pdf
- M002 Varshney, R.K., Roorkiwal, M., Sun, S. et al. A chickpea genetic variation map based on the sequencing of 3,366 genomes. *Nature* (2021). <https://doi.org/10.1038/s41586-021-04066-1>

- M003 Walkom, S.F., K.A. Donoghue, P.F. Arthur, S.A. Clark and B.J. Walmsley. 2021. Using Matesel to aid sire allocation in genomic reference populations – southern multi-breed an example. *Proc. Assoc. Advmt. Anim. Breed. Genet.* 24: 419-422
- M004 Martin, S.J. and T. Granleese, 2021. MerinoLink/UNE DNA Stimulation Project: Doubling the rate of genetic gain – Where are we after 4 years? *Proc. Assoc. Advmt. Anim. Breed. Genet.* 24: 476-479

Early history

These publications aimed to integrate different issues (initially selection, crossing and costs) into a single decision framework.

- R2 Kinghorn, B.P. 1980. A model for the optimisation of genetic improvement by the introduction of novel breeds into a native population. *J. Anim. Breed. Genet.* 97, 95-100
<https://onlinelibrary.wiley.com/doi/abs/10.1111/j.1439-0388.1980.tb00915.x>
- R4 Kinghorn, B.P. 1982. Genetic effects in crossbreeding. II Multibreed selection indices. *J. Anim. Breed. Genet.* 99, 315-320 <https://onlinelibrary.wiley.com/doi/abs/10.1111/j.1439-0388.1982.tb00390.x>
- R9 Kinghorn, B.P. 1983. Genetic effects in crossbreeding. IV A simulation study on global selection of sires for an open population. *J. Anim. Breed. Genet.* 100, 223-237
<https://onlinelibrary.wiley.com/doi/abs/10.1111/j.1439-0388.1983.tb00728.x>
- CIS2 Kinghorn, B.P. 1984. A single approach to genetic improvement which exploits both selection and crossbreeding effects. *Proc. 2nd World Congress on Sheep and Beef Cattle Breeding.* pp 473-482.
- CIS4 Kinghorn, B.P. 1986. Mating plans for selection across breeds. *Proc. 3rd World Congress on Genetics Applied to Livestock Production.* Nebraska, July 1986. Vol XII, 233-244.
<http://www.wcgalp.org/system/files/proceedings/1986/mating-plans-selection-across-breeds.pdf> [GENUP module MATE is based on this method.]
- R14 Kinghorn, B.P. 1987. On computing strategies for mate allocation. *J. Anim. Breed. Genet.* 104, 12-22.
<https://onlinelibrary.wiley.com/doi/abs/10.1111/j.1439-0388.1987.tb00104.x>
- CIS1 Kinghorn, B.P. 1982. Multibreed selection indices for dairy cattle. *European Association of Animal Production.* (Leningrad) 33, 8pp <https://rdcu.be/cm9FM>
- CIS6 Kinghorn, B.P. 1989. Exploiting the total genetic resource in beef cattle. *Proceedings of Beef Breeding Workshop, South Australian Department of Agriculture, 23-26 October 1989.* Paper 11. [This led to the name Total Genetic Resource Management in 1998, with thanks to Robert Banks for “Management” rather than “Exploitation”].

Others, for the record

- R27 Klieve, H.M., Kinghorn, B.P. and Barwick, S.A. 1994. The joint regulation of genetic gain and inbreeding under mate selection. *J. Anim. Breed. Genet.* 111:81-88.
- R37 Kinghorn, B.P. 1998. Mate selection by groups. *J. Dairy Science.* 81:55-63.
- R42 Piyasatian, N. and Kinghorn, B.P. 2003. Balancing genetic diversity, genetic merit and population viability in conservation programs. *Journal of Animal Breeding and Genetics.* 120: 137-149.
<https://onlinelibrary.wiley.com/doi/abs/10.1046/j.1439-0388.2003.00383.x>

- R48 Li, Yongjun, Van der Werf, J.H.J. and Kinghorn, B.P. 2006 Optimisation of a crossing system using mate selection. *Genetics, Selection, Evolution*. 38:147-165.
- R60 Carneiro, R., S.A. Queiroz and B.P. Kinghorn, 2010. Optimum contribution selection using differential evolution. *Revista Brasileira de Zootecnia*. 39:1429-1436. http://www.scielo.br/scielo.php?pid=S1516-35982010000700005&script=sci_arttext
- R67 Kinghorn, B.P. 2012 The use of genomics in the management of livestock. *Animal Production Science*. 52:78-91. <http://www.publish.csiro.au/?paper=AN11092> [This gives the best description of Total Resource Management – sort of Matesel for the production system.]
- R72 Clark, S.A., B.P. Kinghorn, J.M. Hickey, J.H.J. van der Werf. 2013. The effect of genomic information on optimal selection in livestock breeding programs. *Genet. Sel. Evol.* 45:44
- B8 Kinghorn, B.P. 1993. Mate selection for the design of breeding programs. In: *Design of Livestock Breeding Programs*. H-U. Graser editor. AGBU, University of New England. ISBN 0 86389 066 1. Pages 165-170.
- B13 Kinghorn, B.P. 1999. Total Resource Management: Tactical optimisation of vertically integrated animal production systems. In: *The application of artificial intelligence, optimisation and Bayesian methods in agriculture*. Eds. Abbass, H. A. and Towsey, M. Queensland University of Technology. ISBN 1 86435 463 1. Pages 95 - 100.
- B14 Vagg, R.D., Meszaros, S.A. and Kinghorn, B.P. 1999. Delivering the power of artificial intelligence to the practitioner: a client/server solution to a complex optimisation problem. In: *The application of artificial intelligence, optimisation and Bayesian methods in agriculture*. Eds. Abbass, H. A. and Towsey, M. Queensland University of Technology. ISBN 1 86435 463 1. Pages 153 - 162.
- B25 Kinghorn, B.P. 2000. The tactical approach to implementing breeding programs. Chapter 22 in “*Animal Breeding – Use of New Technologies*”, Kinghorn, B.P., Van der Werf, J.H.J. and Ryan, M. (eds.). The Post Graduate Foundation in Veterinarian Science of the University of Sydney. ISBN 0 646 38713 8. Pages 291-308.
- B31 Kinghorn, B.P. 2005. Mating Systems. In *Encyclopedia of Animal Science*. Edited by W. G. Pond and A.W. Bell. CRC Press 2005. Pages 615-621.
- B33 Kinghorn B. P., R. Banks, C. Gondro, V. D. Kremer, S. A. Meszaros, S. Newman, R. K. Shepherd, R. D. Vagg and J. H. J. van der Werf (2008). Strategies to exploit genetic variation while maintaining diversity. In: *Adaptation and fitness in animal populations*. J. H. J. van der Werf, R. Frankham, H. -U. Graser and C. Gondro. Berlin, Springer. Pages 191-200.
- B34 Kinghorn, B.P. 2010. Mating Systems. In *Encyclopedia of Animal Science, 2nd Edition*. Edited by W. G. Pond and A.W. Bell. Taylor and Francis. Pages 744-747. <http://www.informaworld.com/10.1081/E-EAS2-120045691>
- CIS9 Kinghorn, B.P. and Shepherd, R.K. 1994. A tactical approach to breeding for information-rich designs. 5th World Congress on Genetics Applied to Livestock Production. Guelph, 7 - 12 August 1994. 18: 255-261.
- CIS13 Kinghorn, B.P. 1998. Managing genetic change under operational and cost constraints. 36th National Congress of the South African Association of Animal Science. University of Stellenbosch 5-8 April. pp 9-16.
- CIS15 Kinghorn, B.P. 1999. The tactical approach to design and implementation of beef breeding programs. World Gelbvieh Conference, 26-30 March 1999, Sydney. Pages 35-41.
- CIS17 Kinghorn, B.P. 2000. Tactical implementation of beef cattle breeding programs. 3rd National Symposium on Animal Breeding. Belo Horizonte, Brazil. 5-8 June 2000. 8 pages.

- CIS18 Kinghorn, B.P.; Meszaros S.A.; Vagg, R.D. 2002: Dynamic tactical decision systems for animal breeding. Proceedings of the 7th World Congress on Genetics Applied to Livestock Production. 33: 179-186. [CD-ROM communication n° 23-07. ISBN 2-7380-1052-0]
- CIS20 Newman, S., V. D. Kremer and B.P. Kinghorn 2009 Mate Selection Strategies - Balancing Genetic Gain and Diversity in Livestock Improvement Programs. 58th Annual National Breeders Roundtable. St Louis Missouri, 7-8 May 2009.
- CI9 Shepherd, R.K. and Kinghorn, B.P. 1998. A tactical approach to the design of crossbreeding programs. 6th World Congress on Genetics Applied to Livestock Production. Armidale, 11-16 January, 1998. 25: 431-438
- CI14 Kinghorn, B.P. 2011. Automated mate selection analyses. *Assoc. Advmt. Anim. Breed. Genet.* 19:15-22.
- C44 Grundy, B., Kinghorn, B.P., Villanueva, B., and Woolliams J.A. 1998. A breeding programme for in-situ genetic conservation of livestock. In: The potential role of rare livestock breeds in the UK farming systems. Appleby Castle, Appleby, Cumbria, 1 – 2 December 1997. British Society of Animal Science, Meeting and Workshop Publication No. 41.
- C48 Hayes, B.J., Shepherd R.K., Newman S. and Kinghorn B.P. 1998. A tactical approach to improving long term response in across breed mating plans. 6th World Congress on Genetics Applied to Livestock Production. Armidale, 11-16 January, 1998. 25:439-442.
- C51 Kinghorn, B.P., Shepherd, R.K. and Woolliams, J.L. 1999. An index of EBV, parental coancestry and progeny inbreeding to help maximise genetic gains. *Assoc. Advmt. Anim. Breed. Genet.* 13:412-415.
- C53 Shepherd, R.K. and Kinghorn, B.P. 1999. Algorithms for mate selection. *Assoc. Advmt. Anim. Breed. Genet.* 13:126-129.
- C54 Chaiwong, N. and Kinghorn, B.P. 1999. Use of genetic markers to aid conservation decisions for groups of rare domestic breeds. *Assoc. Advmt. Anim. Breed. Genet.* 13:365-368.
- C55 Banks, R.G., Ball, A.J. and Kinghorn, B.P. 1999. Total Genetic Resource Management - application in the breeding industries. *Assoc. Advmt. Anim. Breed. Genet.* 13:134-137.
- C64 Shepherd, R.K. and Kinghorn, B.P. 2001. Designing algorithms for mate selection when major genes or QTL are important. *Assoc. Advmt. Anim. Breed. Genet.* 14: 377-380.
- C66 Kinghorn, B.P.; Meszaros, S.A. and Vagg, R.D. 2001. Progeny Explorer - desired gains in progeny based on EBVs of current candidates. *Assoc. Advmt. Anim. Breed. Genet.* 14: 449-452.
- C67 Upton, W.H.; Meszaros, S.A.; Barwick, S.A. and Kinghorn, B.P. 2001. Mate allocation in beef cattle herds. *Assoc. Advmt. Anim. Breed. Genet.* 14: 457-460. <http://www.aaabg.org/livestocklibrary/2001/ab01109.pdf>
- C74 Y. Li, J. H. J. van der Werf and Kinghorn, B.P. 2002. Mate selection in parental lines to exploit known dominant QTL in crosses. Proceedings of the 7th World Congress on Genetics Applied to Livestock Production. 33:191-194. [CD-ROM communication n° 23-09. ISBN 2-7380-1052-0]
- C96 Newman, S., Kremer, V. and Kinghorn, B. 2006. Managing Selection and Diversity in a Breeding Program. Proceedings of the US National Swine Improvement Federation, Nashville, 7-8 Dec. 2006. <http://www.nsf.com/Conferences/2006/contents.html>
- C99 Kremer, V. D., S. Newman, B.P. Kinghorn, P. W. Knap, E. R. Wilson. 2009. Strategic versus tactical management of pig genetics. European Association of Animal Production, Barcelona August 2009. Page 131.
- C101 Roberto Carneiro, Brian Kinghorn, Sandra Aidar de Queiroz 2009. Seleção de Acasalamentos Considerando Diferentes Funções Objetivo. 46^a Reuniao Annual da Sociedade Brasileira de Zootecnia, Maringa, PR-UEM, 14-17 de julho de 2009.

- C108 Carvalho, R., B.P. Kinghorn and S.A. Queiroz. 2010. Mate Selection accounting for connectedness. Proceedings of the 9th World Congress on Genetics Applied to Livestock Production. Paper 0275.
- C109 Kremer, V.D., S. Newman, E.R. Wilson and B.P. Kinghorn. 2010. Mate Selection for sustained genetic improvement in small populations. Proceedings of the 9th World Congress on Genetics Applied to Livestock Production. Paper 0536.
- C113 Newman, S., Kinghorn, B.P. and Kremer, V. 2010. Mate Selection in Pigs: A Genetic Match.com. Pig genetics workshop notes. 2010, University of New England, Armidale, NSW. Pages 9-15 http://agbu.une.edu.au/pig_genetics/pdf/2010/P02-Scott-Newman-Mate%20selection.pdf
- C119 Van Eenennaam, A. L. and Kinghorn, B.P. 2014. Use of mate selection software to manage lethal recessive conditions in livestock populations. Proceedings, 10th World Congress of Genetics Applied to Livestock Production. Paper 408, https://asas.org/docs/default-source/wcgalp-posters/408_paper_9819_manuscript_1027_0.pdf?sfvrsn=2
- C121 Upperman, L, Brian Kinghorn, Michael MacNeil, Alison Van Eenennaam, 2018. Management of lethal recessive alleles while optimizing genetic gain in beef cattle. Proceedings of the World Congress on Genetics Applied to Livestock Production, 11: 701 <http://www.wcgalp.org/system/files/proceedings/2018/management-lethal-recessive-alleles-while-optimizing-genetic-gain-beef-cattle.pdf>