AUSTRALIAN INSTITUTE OF AGRICULTURAL SCIENCE AND TECHNOLOGY

Bringing The Elements Together

"The Genetic Future- More than just GMOs"

30th September 2009
Hotel Grand Chancellor, Launceston

SYMPOSIUM PROGRAM

Chair: Neville Mendham

4:00pm to 4:30pm:	Registration
4:30pm to 4:35pm:	Welcome by AIAST Tasmanian Division President (Brian Stewart)
4:35pm to 5:00pm:	Future Directions- More than just GMOs (Dr Tony Fist, Tasmanian Alkaloids)
5:00pm to 5:20pm:	Use of gene marker technology for livestock improvement (Dr Aduli Malau-Aduli, University of Tasmania)
5:20pm to 5:40pm:	Improving barley stress tolerance through molecular marker assisted selection (Dr Meixue Zhou, Tasmanian Institute of Agricultural Research)
5:40pm to 6:00pm:	Heritage genes (Mr Steve Martin, The Lost Seed)
6:00pm to 6:25pm:	Speaker Panel Discussion and Questions
6:25pm to 6:30 pm:	Close by AIAST Tasmanian Zone President (Brian Stewart)

For those staying for dinner it is 7:00pm for 7:30pm

Not a member of the AIAST? Why not consider joining. Visit www.aiast.com.au, or talk to an AIAST Tasmanian Division committee member at this symposium.

Speaker Profiles & Presentation Summaries

Dr Tony Fist graduated from the University of Tasmania in 1980 with a B. Agric Sci. (Hons), and completed a PhD in plant nutrition from the University of Queensland in 1987. He is Manager of Agricultural R&D at Tasmanian Alkaloids Pty Ltd, a position he has held for 17 years. Tony has conducted a wide range of research projects at Tasmanian Alkaloids. His work on breeding, cultivation and harvesting of the poppy crop has added considerable value to the operations of farmers in Tasmania. In the mid 1990s his team developed the "Norman" poppy which was the first commercial poppy that produced thebaine as its main alkaloid, rather than morphine. This placed Tasmanian Alkaloids and Tasmania at the forefront in the manufacture of thebaine and its derivatives such as buprenorphine, oxycodone and naltrexone which are used for pain relief and treatment of addiction. Tony is a Fellow of the Australian Institute of Agricultural Science and Technology, and recipient of the Johnson Medal for Research and Development, which is the highest recognition of research scientists in Johnson & Johnson. He was awarded a University of Tasmania Foundation Graduate Award in 2001.

Presentation Summary: Tony will discuss the means of plant improvement using non-GM technology. Much of this information will be equally relevant to livestock improvement. Tony will discuss the poor relative of GM, conventional plant breeding, and some of the techniques available to make plant breeding more efficient and effective. Tony's presentation will describe mutagenesis and other plant improvement tools such as tissue culture and polyploidy.

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Dr Aduli Malau-Aduli is a Senior Lecturer in Animal Production and Genetics at the School of Agricultural Science (SAS), University of Tasmania (UTAS), Hobart. He earned his PhD degree in Animal Genetics and Breeding from The University of Adelaide. He has nearly 20 years of research and teaching experience in Universities and National Research Institutes in Australia, Japan and Nigeria where he has supervised 19 Honours, masters and PhD research students. He currently serves as an elected member of the UTAS Academic Senate and Honours Degree Coordinator at SAS. His research interests with sheep, beef and dairy cattle include genetics-nutrition interactions and DNA marker associations with meat, milk and wool quality. He has been a Consultant Reviewer of Milestone and Final Reports for Dairy Australia, Australian Greenhouse Office Canberra, International Livestock Research Institute Kenya and regularly reviews scientific journal articles for *Livestock Science* (The Netherlands), *Journal of Animal Science* (USA) and *Animal* (UK). He is an Editor (Breeding and Genetics Section) for *Animal* published by the Cambridge University Press; Editor, *Animal Science and Genetics* E-Book Series Published by Bentham Science Publishers, Associate Editor, *Journal of Cell and Animal Biology* published by Academic Journals Inc., Advisory Board Member, *Journal of Applied Agricultural Research* published by the Agricultural Research Council of Nigeria. He has published 96 scientific papers in local and international peer-reviewed journals, abstracts, conference proceedings and invited seminars. Dr Malau-Aduli was a recipient of the prestigious AUGU/Heddle Award of the University of Adelaide, Excellent Journal Paper Award from the Japanese Society of Animal Science, ADCOS Award of the Australian Agency for International Development, Postdoctoral Research Fellowship Award of the Japanese Society for the Promotion of Science, Alan Roberts Award for Animal Genetics from the British Society of Animal Science, Junior Scientist Award of the Australian Association of Animal Breeding and Genetics and Life Membership Award of the Nigerian Society for Animal Production. He is a member of the Association for the Advancement of Animal Breeding and Genetics (Australia & New Zealand), Japanese Society of Animal Breeding and Genetics, American Society of Animal Science, American Dairy Science Association, Australian Society of Animal Production, Japanese Society of Animal Science and Nigerian Society of Animal Production. He has won research grants and scholarships from the Australian Wool Education Trust, Commonwealth Scientific and Industrial Research Organisation's Food Futures National Research Flagship, Dairy Australia, University of Tasmania Internal Research Grants, Tasmania Feedlot Pty, Australian Alpaca Association and the UTAS Central Conference Support Scheme.

Presentation Summary: Early animal breeders practised selective breeding by identifying what they considered worthwhile characteristics and sought a means of increasing the frequency of such desirable qualities in future generations. This has resulted in the present day specialised breeds of livestock like the Belgian Blue well known for its lean meat, the Holstein-Friesian noted for its milk-production, Superfine Merino for good quality wool and the Japanese Wagyu renowned for its highly marbled beef. For many farm animals, conventional breeding has

already achieved high producing animals, but it seems increases in productivity by this means have peaked and are at the sedentary plateau phase. World population on the other hand is on the increase and so is the demand for animal products. Selective breeding cannot keep up with the pace of population growth because it is a painfully slow process and can take many years (especially in cattle with long gestation periods and generation intervals) to establish the desired phenotypic changes. However, the advent of DNA marker technology and its application to animal breeding programs now provides a fast-tracking of selective breeding and livestock improvement.

A genetic marker for a trait is a DNA segment which is associated with, and hence segregates in a predictable pattern, as the trait. Genetic markers facilitate the "tagging" of individual genes or small chromosome segments containing genes, which influence the trait of interest. Availability of large numbers of such markers has enhanced the detection of major genes influencing quantitative traits. The method involves screening the genome for genes with a large effect on traits of economic importance through a procedure known as linkage analysis. The process of selection for a particular trait using genetic markers is called marker assisted selection (MAS). MAS can accelerate the rate of genetic progress by increasing accuracy-of selection and by reducing the generation interval. About 50% additional genetic gain can be obtained if the marker explains 20% of the additive genetic variance and the economic trait has a heritability of 0.2. This paper discusses the use of gene marker technology for the improvement of economic traits in beef cattle, sheep and pigs covering aspects of the Ryanodine receptor (Halothane) gene in pigs, Myostatin (double muscling) gene in cattle, Callipyge gene in sheep, TG5 (marbling) gene in cattle and the use of DNA profiling for parentage testing, carcass traceability, worm parasite resistance testing in sheep and the identification of the Inverdale gene for prolificacy in sheep. The paper will conclude with our current collaborative research in SNP Markers for healthy omega-3 fatty acids in crossbred prime lambs at the University of Tasmania.

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Dr Meixue Zhou has been involved in barley research for more than 25 years which include more than 10 years experience in China. In the last 10 years, he has published more than 50 papers in peer-reviewed journals. Meixue's major interests include 1) development of barley varieties for high rainfall areas of Australia, 2) development of barley germplasm with stress tolerance (waterlogging, salinity and acid soils), 3) cereal quality improvement, 4) physiological mechanism for waterlogging and salinity tolerance, 5) identifying molecular markers for waterlogging, acid soil and salinity tolerance in barley.

Presentation Summary: Abiotic stresses (waterlogging, salinity, acid soils, frost and drought) have become major limiting factor in barley production. The most economic way to reduce the damage caused by waterlogging is to introduce tolerance genes into the current varieties. To achieve this target, both sources of tolerance and a reliable trait evaluation method are crucial. The understanding of the genetic behaviour of waterlogging tolerance is also needed to make the selection more efficient. Since tolerance to most of the stresses such as waterlogging tolerance was controlled by multiple genes and it is difficult to select for the tolerance because of low heritability, variability among stress treatments, and the difficulty of screening a large number of lines in the field or under controlled conditions. Marker assisted selection could be very effective since molecular markers give unambiguous, single site genetic differences that can easily be scored and mapped in most segregating populations. However, the success of MAS depends on the development of reliable markers (accurate QTL location). Accurate phenotyping is imperative to the success of the QTL 'genetic dissection' approach. This talk will present some evidence on genetic resources, development of molecular markers and the effectiveness of marker assisted selection.

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Mr Steve Martin of The Lost Seed, a Tasmanian company who supplies heritage and heirloom seeds, will describe the importance of preserving and generating heritage genetic material. The Lost Seed's mission is "Bringing back the foods our forefathers enjoyed". More information at www.thelostseed.com.au.