agresearch NEWS release

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## Science discovery already returning millions to New Zealand sheep farming

An enormous international effort to map the sheep genome, which has been published today [6 June 2014], has already had very valuable spin-offs for New Zealand agriculture.

The paper, which has been published in the prestigious journal *Science*, represents eight years' work by researchers in eight countries, 26 institutions with 73 authors.

AgResearch Principal Scientist John McEwan is one of the paper's authors. He says New Zealand scientists have been using the information from the project for the last six to seven years as it has been generated.

"It has allowed us to do a whole lot of things that were previously impossible. The international effort produced a very high quality assembly of the sheep genome. Associated work has identified more than 30 million DNA variants, and because of the assembly, we know the order of all those variants as well," he says.

"It has enabled us to create low, medium and now high density ovine SNP chips. As a result, we have implemented genomic selection in sheep, and New Zealand has been world-leading in this regard. It has also meant that the pace of discovery of gene variants affecting production and disease traits has advanced much more rapidly internationally."

The information was used to create the 50K SNP chip which is being used to develop genetic selection in the majority of the New Zealand dual purpose sheep for 22 traits as part of the Beef + Lamb New Zealand and AgResearch-funded Ovita project. These include facial eczema, parasite resistance, number of lambs born, meat yield and adult ewe liveweight. Commercial implementation uses lower density chips developed from 50K results.

"This technology has proven useful for hard-to-measure traits which are recorded late in life," says Mr McEwan. "We have also used this information to develop parentage assays that are now widely used in the industry and around the world."

Use of the low and medium density (5K and 50K) SNP chips has been estimated to generate $200 million for the NZ industry over the next 15 years.

The sequencing for the early work was done at the University of Otago and Baylor College of Medicine in Texas while more recent sequencing has been done at BGI in China, Baylor and the Roslin Institute in Edinburgh.

Beef + Lamb New Zealand Chief Executive Dr Scott Champion says the work was underpinned by the huge commitment New Zealand sheep farmers have made to genomic research through their earlier investments in Ovita.

“The outcomes being celebrated here are a taste of what’s to come through the new entity Beef + Lamb New Zealand Genetics.”

FarmIQ CEO Collier Isaacs says the new genome information has been absolutely critical for the high density SNP chip that was completed a year ago.

“It’s primarily being used by FarmIQ to track eating quality traits in New Zealand sheep. If this work is successful, we expect it will be used in the industry within 12 months. The amount of information which the high density SNP chip can provide is really impressive. If you use the analogy of the 50K SNP chip giving genetic information down to the city you came from in New Zealand, this will provide the house. It’s about 12 times more dense.”

“AgResearch is increasingly moving into using newer technologies such as genotyping by sequencing and having an annotated genome such as this one for sheep makes the implementation of that technology much simpler,” says AgResearch Research Director Professor Warren McNabb.

The paper in *Science* is “The Sheep Genome Illuminates Biology of the Rumen and Lipid Metabolism” and it describes the assembly and properties of the sheep genome and concentrates on what makes it unique with two examples. The first is a gene family that is important in the structural integrity of the rumen, a unique organ which allows the digestion of cellulose and other plant material in ruminants. The second is how the tissues and pathways involved in fatty acid metabolism have also changed.

The research institutes involved are: Australia (CSIRO; University of New England; University of Sydney), China (BGI-Shenzhen; Inner Mongolia Agricultural University; Institute of ATCG, Nei Mongol Bio-Information; Kunming Institute of Zoology; Lanzhou Institute of Husbandry and Pharmaceutical Science; Macau University of Science and Technology; North West A&F University; Sichuan Agricultural University), Denmark (University of Copenhagen), France (INRA), New Zealand (AgResearch; University of Otago), Saudi Arabia (King Abdulaziz University), UK (Biosciences KTN; Edinburgh Genomics; European Molecular Biology Laboratory, European Bioinformatics Institute; The Roslin Institute; Wellcome Trust Sanger Institute; University of Edinburgh), USA (Baylor College of Medicine; USDA-ARS Animal Disease Research Unit; Utah State University; Washington State University).

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