Genetics to meet pastoral farming requirements in the 2020's – a dairy perspective

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- About CRV Ambreed
- Some issues facing pastoral farming and CRV Ambreed initiatives



CRV Ambreed

- A herd improvement company
- Established in NZ over 40 years ago
- Now owned by a co-op of Dutch & Belgian dairy farmers
- HQ in Arnhem, The Netherlands
- Business units in: NZ, Britain, Czech Republic, Germany, Brazil, USA, S Africa



CRV Ambreed Products and Services

- Genetics
- Progeny test 120 bulls each year
- Sell 1.1M straws locally, 0.4M exported
- Information products
- Based on herd testing and recording services



1: Accelerating the rate of genetic gain – an old issue with new technology

- Widespread use of AI in dairy industry
- Means that elite bulls can be v heavily used and have a big impact genetically (up to 200,000 dtrs)
- So it is economically and genetically sensible to accurately test bulls to identify the genetically elite animals
- Historically this has been done through progeny testing
- Expensive
- Time consuming (generation interval)
- But high accuracy of individual bull selection (0.87 0.99)



Genomic selection

- Involves reading the DNA of an animal and comparing it to a "library" of DNA (the reference or training population)
- This reference population contains the relationships between genetic markers and phenotypes
- To do genomics well, need
 - DNA for many reference animals, and
 - very good phenotypes for the traits of interest
- Allows EBV (genomic BV) to be calculated at a very young age



CRV Ambreed and genomics

- Involved for almost 10 years (with CRV HQ, Aus DFCRC)
- Accuracy for Protein BV has increased from .59 (parent average) to .68 (PA plus genomics)
- So a long way to go to get to .87
- 3000 bulls, 25k cows in reference population
- Aim 100k cows
- (Eurogenomics .8)
- NZ dairy cow population very heterogeneous huge amount of cross-breeding over decades



Current use at CRV Ambreed

- As a tool to select our 120 young bulls each year for our progeny test program
- Then some of these are marketed as young sires recommended that a team is used
- In time we will only sell "young genomically selected bulls"



Low-hanging fruit when genotype females

- Parent or sire verify
- Traits controlled by single genes (eg polled, some health/fitness traits)
- But as we build up reliability we will move towards "genomic herd management"
- select which young heifers to rear



2: Deterioration of water quality – a new issue and an old technology

- Over the last few years deterioration of waterways has become a very important issue in NZ
- Nitrogen leached from the cow urine patch is the primary source
- CRV Ambreed is marketing genetics expected to reduce the amount of urinary N and hence reduce N leaching



Milk urea and Milk urea nitrogen (MUN)

- Measured MUN in 650k milk samples (individual cows)
- Genetic analyses
- Heritability .2
- Range in BV MUN for bulls
- We now know we can reduce MUN through genetic selection



Relationship MUN – Urinary N – influence of diet



- Many published studies
- amount N excreted in urine (g/day) has straight-line relationship with MUN (concentration)
- 15g/day per 1 unit MUN
- Av NZ cow has MUN 14 and, using the relationship, excretes 210g N per day in urine

What does this mean

- We know that there is a strong MUN-UN relationship when cows are fed differently
- We know from our work over last 5 years that we can reduce MUN genetically
- Do animals GENETICALLY different for MUN excrete different amounts of UN when they are fed the same diet



What happens to dietary N?

Dairy cow eats about 170kg N per year

- Milk protein (25-30 kg N)
- Muscle gain (v little N used in mature animal)
- Urine (70 kg N)
- Dung
- N gases



Modelling reduction in N leached

IF the MUN – UN relationship holds up

- the offspring of our 2017 "LowN Sires" will excrete 3.5kg less per year as urine, and there will be a 8-10% reduction in N leached

- Over 8 years it is possible to reduce N leached by 13-15% and
- CRV Ambreed is promoting a reduction in N leaching of "20% in 20 years"



In addition our work

- Has found that low MUN genetics tends to have high %Protein in milk
- Evidence that indeed animals partition dietary N differently
- So low MUN animals may
- put less N into urine (meaning less leached)
- and be more efficient in using dietary N for production

Future work

- Partnership bid to MBIE
- Prove the MUN UN pathway holds for genetically different cattle

RFFF

- Include MUN in compliance models, breeding indexes
- Demonstrate in farmlet systems

Wider implications for sheep and beef farmers

- Lactating dairy cows aren't the only ruminants that pee on the paddock
- Young dairy stock
- Beef sourced from dairy
- Beef breeds





