Exciting space for cattle

By Anne Boswell

Genetic companies have been working together to produce genetics that will help farmers to meet targets in the Zero Carbon Act.

New Zealand farmers may be able to purchase genetics to breed low-methane-emitting cattle by 2025, thanks to a collaboration between dairy genetics giants LIC and CRV.

Following the success of a pilot trial in May 2020, the companies have developed a programme that will isolate and select genetics for breeding low-emitting dairy cattle – crucial to meeting the targets set out by the Zero Carbon Act.

"The Zero Carbon Act – which aims to see methane emissions reduced by 10% by 2030 and up to 40% by 2050 – will require a multi-factorial approach, and breeding is just one of those," LIC senior scientist Dr Lorna McNaughton says.

"Although we are at the beginning of the journey to breed for methane, genetic selection is a permanent and cumulative solution with an expected 0.5-1% gain each year.

"Over a 20-year period we will be able to make a reasonable breeding contribution."

NZ's pasture-based system has made it difficult to measure methane emissions because determining the exact amount of feed each animal is eating is difficult to achieve with grazing milking cows.

The team decided to take another approach and measure the methane emissions of the high-use LIC and CRV bulls set to sire around 90% of NZ's dairy cows.

"As high-use bulls sire 10-30,000 daughters in a single season, the genetics can be quickly disseminated," she says.

The pilot trial saw penned yearling bulls measured for methane emissions via the GreenFeed system, with animals placing their heads inside a hood to feed for at least one methane release cycle.

Methane and carbon dioxide was measured each time, with a target of taking 100 measurements per bull over 28 days.

LIC research assistant Gemma Worth and LIC senior scientist Lorna McNaughton at the pilot trial seeking to identify the possible link between the methane cows produce and their genetics.

"The grams of methane per kg dry matter was consistent with the national inventory of around 21.6g methane per kg DM, with the data encouraging enough to go to a full trial," she says.

This year, the team will measure all 300 bulls in the progeny testing programme used in dairy herds. Next year, the methane emissions of the extremely high and low-emitting bulls' progeny will be tested in Portable Accumulation Chambers, or PACs.

In 2024, the progeny will be lactating and more testing will establish whether the daughters of the high and low bulls are high or low-methane themselves.

In 2025, farmers should be able to purchase semen to breed low-methane animals.

AgResearch senior scientist Suzanne Rowe has spent over a decade measuring and ranking sheep in NZ-based on their methane emissions, and believes it is now time to turn their sights to achieving similar results in the dairy industry.

Having developed two research flocks with high and low-methane selection

> "We have been selecting on methane solely, but the progeny have been healthier, more profitable sheep overall."
>
> Suzanne Rowe

lines, they are now breeding the third generation of low-emitting sheep and results have been encouraging.

"We have been selecting on methane solely, but the progeny have been healthier, more profitable sheep overall," Rowe says.

The low-methane animals are producing an average of 11% less methane per kilogram of feed eaten, as well as producing more lean growth and more wool.

It was also discovered that the gut microbiome had changed in low-methane animals, which was not only found to be a predictor of key traits such as feed efficiency, but also has potential

to provide an alternative measurement method to monitor large numbers of animals in a high throughput way.

"Rumen Microbial Profiles is the most informative phenotype to date," she says.

She says the next step is to transfer technology developed for sheep to help overcome the challenges involved with measuring methane and genetic variation in large numbers of animals.

"We've seen the cattle industry measure bulls via the GreenFeed devices, but I would urge us to take other samples such as rumen profiles, blood and genomic profiles, so we can screen a wider population of cattle," she says.

"In the meantime, short-term measures include developing PAC chambers for calves, which have been successful for sheep."

McNaughton says the genes selected for propagation would not be chosen on methane status alone.

"It will be a balance between methane production and other traits that are important to dairy farmers," she says.

"We will not want to go down the single trait selection path as you could end up selecting for bulls with low-methane production, but undesirable other traits."

Dr Suzanne Rowe with a Portable Accumulation Chamber, which tests methane emissions of the extremely high and low-emitting bulls' progeny.

Rowe says the economic impact of the programme on the industry is entirely dependent on the price set for carbon, the Global Warming Potential (GWP) and how the Government chooses to account for methane emissions.

"However, the physical impact based on current studies could be a cumulative reduction in farmed livestock of around 1% per year," she says.

"It is an exciting space for the cattle industry." ■