



→ Dairy cows on average secrete in milk 25 - 35% of the nitrogen they consume

→ Approximately 60 to 80 percent of the nitrogen in urine is in the form of urea.

→ Nitrogen leaching is the downward movement of nitrate through the soil.



## 🔑 CASE STUDY BREEDING FOR ENVIRONMENTAL TRAITS GENETICS

The National Breeding Objective (NBO) in New Zealand is to breed dairy cows that are able to efficiently convert feed into profit. Breeding Worth (BW) is the index that is used to rank cows and bulls according to their ability to meet this objective. However conventional genetic progress for traits in the NZ dairy industry's Breeding Worth (BW) index contribute to only very modest environmental gains at best.

AbacusBio worked with DairyNZ to exploit variation in other key traits that affect the amount of Nitrogen (N) excreted/leached by dairy cattle, utilising genetics to contribute to environmental gain

AbacusBio were Involved in setting out what a new breeding goal might look like, defining a set of breeding objective traits that could facilitate efficient genetic progress towards this goal. We then estimated the potential relationships between animal measures that might allow us to predict animal genetic merit for these breeding objective traits.

A new objective was to breed dairy cows that were able to efficiently convert feed into profit while also improving the amount of N leached beyond the root zone and into water ways. The need to favour multiple factors to continue to breed profitable cows was paramount.

The nitrogen cycle further explains this objective, described as "A series of processes that convert nitrogen gas to organic substances and back to nitrogen in nature" Nitrogen is a crucial element for pasture growth. Nitrogen is introduced into the soil via precipitation or fertiliser, in which plants fix. Livestock feed on pasture, in turn consuming nitrogen which is then excreted as urine.

Nitrogen is applied to patches of soil which can become concentrated, resulting in leaching from the soil. It can then enter the ground water, and other aquatic environments such as streams, ponds and lakes. At high concentrations, nitrogen is lost to the atmosphere as nitrous oxide - a potent greenhouse gas that is 300x more effective than CO<sub>2</sub> at trapping heat in the atmosphere

AbacusBio aims to continue to find new traits that could be added to the national breeding objective, aiming to contribute to genetic gain in a broader breeding goal that includes environmental outcomes.

