Zest Biotech
Economically Smart, Climate-Smart Solutions

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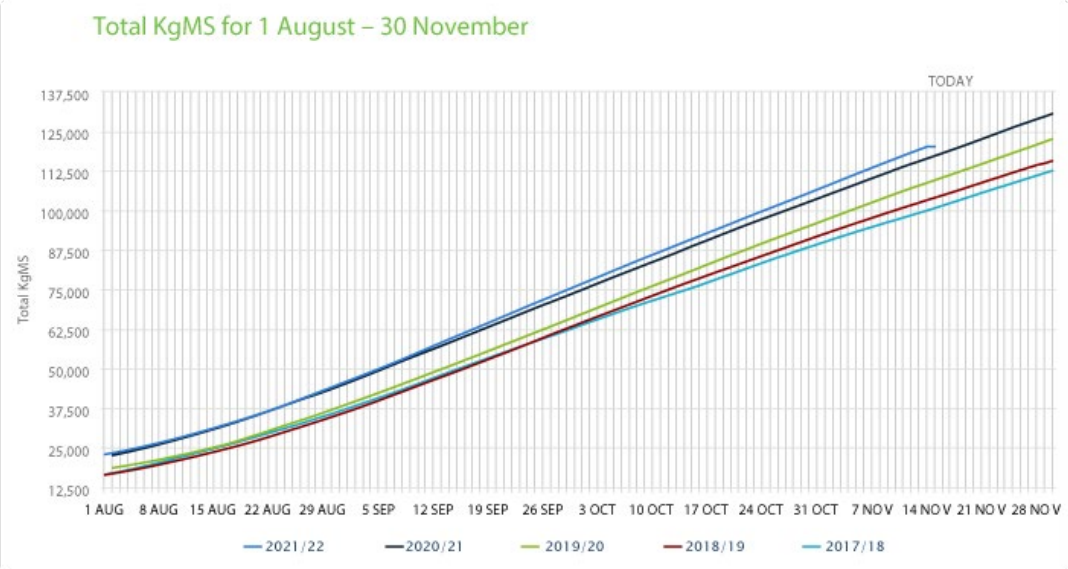
Case Study: Waikato Dairy Farm

Milk Production

Introduction

Zest Biotech tracked the milk production data from a Waikato farm which started using Biozest across the whole farm on 20 August 2021. The data in this report was extracted directly from the dairy company reports.

Milk solids



Current production has been compared to the previous 4 seasons.

The graph shows that milk solids production was following a similar trend to the previous season but, once the stock began grazing on Biozest treated pasture, production began to pull ahead (from early September).

Production is 3757kg higher than the next highest season (2020/21).

2 applications of Biozest have been applied at a cost of $5979.62 (plus application costs).

The increase in milk solids production translates to **increased earnings of $31,600**. Biozest has paid for itself approximately 5 times over.

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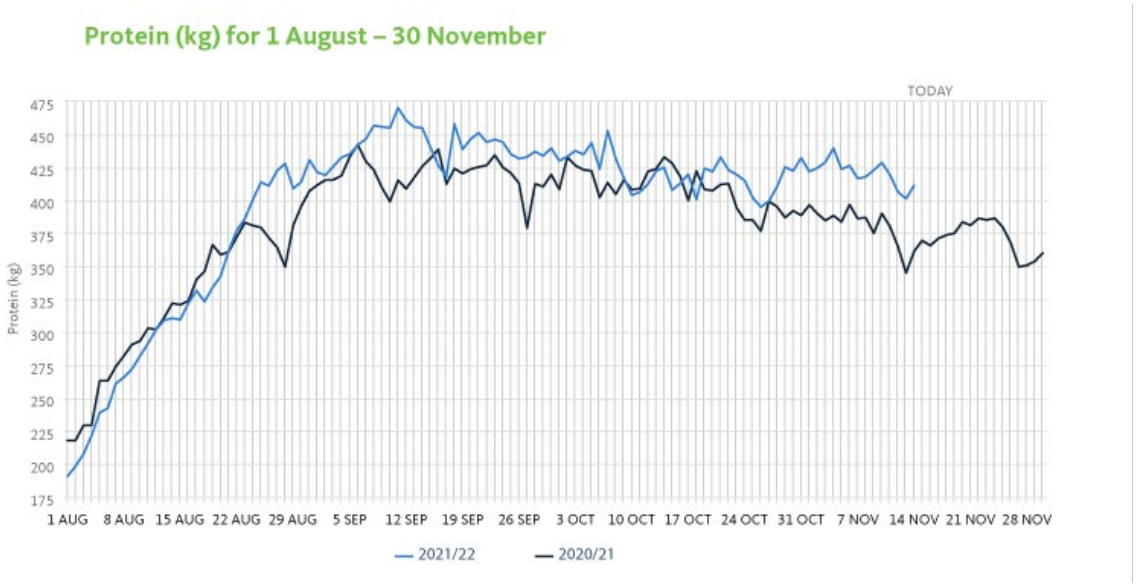
PROTEIN PRODUCTION



Biozest was applied on 20 August. This graph shows that **protein production immediately increased** and continued to trend above last season's results.

The increase in protein is evidence that when cows graze on Biozest treated pasture, they can more efficiently convert pasture protein to milk protein. This **increase in efficiency also means less pasture protein is wasted as urea and methane.**

CONCLUSION

Biozest increases milk solids production: this translates to a significant increase in returns.

Biozest increases protein production: this means cows efficiently convert feed to milk protein and produce less waste (urea nitrates and methane), which means less nitrate pollution to land and water, and less GHG emissions.

Biozest significantly increases farmer returns while also reducing environmental impact.

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Relationship between Increased Milk Solids/Milk Protein and Environmental Impact.

Biozest boosts phenylpropanoids and soluble carbohydrates in pasture which results in healthier, highly palatable, more resilient, and more productive pasture.

Biozest treated pasture increases the efficiency of ruminant digestion so that more pasture protein is converted to milk or meat instead of being wasted as urea in dung and urine (lost protein) or contributing to the formation of methane gas (lost energy).

Pasture protein is either utilised by dairy cows and converted to milk protein or, if it cannot be effectively converted, it is wasted and exits the animal as urine urea (nitrates) and methane gas.

Scientific Summary:

On average, ruminants convert 24.7% of feed nitrogen (N) into milk or meat (Hristov and Jouany 2005). Seventy five per cent (75%) of feed N is wasted as urine or dung urea (Hristov and Jouany 2005). In addition, cattle typically lose 6% of their ingested energy as eructated CH_4 (Johnson and Johnson 1995). Therefore, ruminant metabolic inefficiency significantly impacts farm productivity and the emission of CH_4 and nitrous oxide (N_2O), both of which are greenhouse gases (GHG).

N_2O and CH_4 have 298 and 34 times, respectively (with the inclusion of climate–carbon feedbacks) the global warming potential of carbon dioxide over 100 years (IPCC 2014). Therefore, a small reduction in urea excretion and CH_4 eructation can significantly decrease farm GHG liabilities.

A small increase in the percentage of feed protein converted to milk or meat can deliver a substantial increase in farm productivity. For example, a feed protein conversion increase of 2.5% (from 25% to 27.5%) can deliver a 10% increase in farm productivity. In addition, increasing the conversion efficiency of pasture protein into milk or meat results in less waste as urea and CH_4, thus increasing productivity while reducing environmental impacts and GHG emissions.

Biozest™ is a molecular pattern recognition receptor (MPR) signalling agricultural compound. The application of Biozest™ on crops and pasture increases the availability of soluble carbohydrates and induces and sustains the production of phenylpropanoids. This pasture response improves the feed conversion efficiency of ruminants that consume the treated pasture, leading to increased milk/meat production and reduced urea excretion and emissions of N_2O and CH_4.

In all animals (including ruminants), the intestinal digestive system catabolises protein to amino acids. In the ruminant digestive system, the protein is digested further. Amino acids from digested protein are deaminated to NH_3, carbonyl and hydride. Bacteria in the rumen can only use NH_3 to synthesise protein. The rumen bacteria are, however, unable to utilise NH_3 at the rate it is produced. Therefore, the liver removes the excess and converts it to urea and, via the kidneys, discharges it in the urine. The residual carbonyls and hydride moieties undergo methylotrophic and hydrogenotrophic methanogenesis and are released as CH_4. Therefore, there is a direct relationship between urea production and CH_4 emission in ruminant digestion (Carmona-Flores et al. 2020). Because of the reduction in urea excretion as measured in trials, we deduce that deamination has been reduced. Therefore, CH_4 production would also have been reduced in livestock consuming Biozest™ treated pasture.

The productivity improvement is due to the efficient conversion of pasture protein to milk and meat. The higher content of phenylpropanoids in Biozest™ treated pasture forms conjugates with protein (Lee 2014) and therefore is indigestible in the rumen and, instead, undergoes intestinal digestion to amino acids which the livestock convert directly to milk and meat protein.

Higher soluble sugar content in pasture favours the production of more propionic acid relative to acetic acid, resulting in less CH_4 production. We have not directly measured the CH_4 reduction, but the data shows soluble sugars are higher in Biozest™ treated pasture. Therefore, we deduce that Biozest™ treatment of pasture has an added benefit in reducing CH_4 production during carbohydrate digestion in the ruminant.

New Zealand pasture contains more N than ruminants can utilise. Yet, to achieve the required feed budgets, farmers often apply N fertilisers. While N fertilisers increase pasture growth, excess N negatively impacts animal and environmental welfare (Pacheco and Waghorn 2008). **Unlike N, Biozest™ can sustainably double pasture productivity, livestock, productivity and reduce urea, CH_4 and N_2O environmental liabilities.**