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To whom it may concern,

Submission: Climate Change Response (Zero Carbon) Amendment Bill

Abstract.

We recommend the agricultural emissions reduction target is based on farm emissions intensity (kg of CO_2 (equivalent) per unit of product) and on-farm efficiency. This target aligns with the recommendations of the IPCC/ FAO.

The model to measure, report and manage emissions intensity has been developed by the FAO (GLEAM). The model is compliant with IPCC Tier 2 methodology and ISO standards 14040 and 14044 (ISO, 2006).

This strategy also ensures the other global challenges - poverty alleviation and food security - are also addressed.

Agricultural emissions should be viewed as valuable resources that are currently being wasted (methane is energy lost and urea is protein lost (leading to nitrous oxide emissions)). If we can improve the efficiency of ruminant animals, we will produce more milk and meat and less waste (emissions).

We have the technology to reduce emissions intensity and increase ruminant efficiency. This means New Zealand can increase productivity (i.e. production of milk/meat) and achieve a gross reduction in emissions, thus ensuring economic gain while also complying with international standards, meeting market demands for 'low carbon' produce, and meeting our global food security obligations

Submission.

Measuring Methane

The biogenic methane reduction plan in the Climate Change Response (Zero Carbon) Amendment Bill could be difficult to manage but there is an easier option.

Livestock do not emit methane at a constant rate or intensity. The gas comes out both ends and at a variable rate. Current measurement techniques (largely lab or chamber based) have serious limitations, Therefore, biogenic methane per se cannot be accurately measured. If we can't measure it, it is difficult to manage it.

UN FAO Recommendations

The UN FAO states that "Relative to other global greenhouse gas abatement opportunities, reducing enteric methane through productivity gains is the lowest cost option and has a direct economic benefit to farmers". If we focus on the FAO's recommendations, our farmers can immediately implement many of the options presented by the FAO. This strategy also ensures that other global challenges, in particular poverty alleviation and food security, are also addressed. Therefore, farming must become more efficient resulting in an increase in revenue and decrease in carbon emission intensity per unit of product (and a gross reduction in emissions).

We can immediately follow the IPCC/UN FAO guidelines. This is an economically smart, climate smart strategy to adopt.

FAO Modelling Tool (GLEAM)

The UN FAO has developed and provided a modelling tool (GLEAM) to measure and account for all farm emissions for each sector, farming type and geographical area. Country-specific emissions factors are also defined in the National Inventory Reports (this includes data for New Zealand). Baselines have been established and the tool is constantly being improved and updated. Therefore, any changes in farming operations that contribute to the reduction of methane, nitrous oxide and carbon dioxide can be quantified and effectively managed.

GLEAM is freely available and includes an online tool.

Privately Owned Modelling Tool: Overseer

The Government has indicated that it will provide considerable financial support for Overseer to try to overcome the shortcomings of this privately-owned system. Taxpayer support may be problematic due to ownership issues. The current and ongoing ownership and management of Overseer is not clear but here appears to be a serious conflict of interest (Companies Office information shows that Overseer is owned by Overseer Limited, with that company owned up to 99.93% by New Zealand Phosphate Company Limited, with that company in turn owned 50/50 by Ballance and Ravensdown) this also presents a concerning opportunity for data mining. This private ownership and consequent conflict of interest will likely limit the system's recognition of tools and methodologies developed by outside sources (this has been an issue to date). This will drive up the costs and limit the feasibility of bringing new technologies to market. This, in turn, will delay and/or inhibit the farming sector's ability to adopt climate smart solutions and could threaten the ability of the sector to achieve the Climate Bill targets.

The Government is considering providing significant financial assistance to private companies to develop a regulatory tool that will remain in private control. This is a significant investment that will not provide a solution or mitigation of emissions – only another tool to model emissions. Considering this is an important and contentious area of regulation (and other tools exist), this decision should be carefully considered.

Use Existing Tools so that Funding can be Redirected to Develop Solutions

GLEAM is an internationally developed modelling tool that is compliant with IPCC Tier 2 methodology and ISO standards 14040 and 14044. The money allocated in the Budget to repair and develop the Overseer model can instead be directed to support adoption of the FAO recommendations. We recommend the Government uses GLEAM and supports the development and implementation of mitigation tools and strategies that will provide real steps toward achieving the Climate Bill targets.

If we implement the FAO recommended options, our farmers will be economically smart *and* climate smart farming champions. For every tonne of methane a farmer reduces, 86 tonnes of CO2 is offset. For every tonne of nitrous oxide they reduce, 298 tonnes of CO2 is offset.

Existing Technology to Increase Efficiency and Reduce Emissions

Zest Biotech, based in Pukekohe and 100% New Zealand owned, has developed and proven a technology trademarked Biozest. Application of Biozest on pasture increases pasture resilience and productivity. When livestock graze the treated pasture, more pasture is converted to milk and meat and less is wasted as methane and urea. More profit less gas and urea. Biozest helps farmers to reduce greenhouse gases and their environmental footprint through productivity gains, in line with the FAO's recommendations.

1. Carbon Sequestration

Biozest can double pasture productivity, and this has been well established in trials. According to the FAO, under our 'closed cycle' pastoral farming system, pasture sequesters 50% more carbon compared to forestry on a per hectare basis. By doubling pasture productivity, every hectare of Biozest-treated pasture can sequester double the CO^2 of untreated paddocks or three times that of forestry.

2. Methane and Nitrous Oxide Reduction

- Biozest-treated pasture contains (18%) higher simple sugars enabling more efficient ruminant digestion. Therefore, less energy is wasted as methane and heat.
- Biozest reduces urea excretion (by 20% -40%). This has a major benefit for the environment (with regard to land and water pollution). The type of nitrogen that is excreted is less liable to leaching. Reduced urea means nitrous oxide emissions are also reduced.
- Biozest-treated paddocks are grazed more evenly resulting in less post-grazing residual pasture decomposition. This reduces both methane and CO2 emissions.

These are claims based on controlled, on-farm and full life cycle trial data.

If the UN FAO options published in February this year are adopted by farmers, they may achieve a reduction in methane intensity of up to 37% and provide economic growth and food security to meet the demands of global population growth without having to increase herd size.

In the appendix we list the FAO options and describe how Biozest will help farmers achieve the benefit of each of the options.

In on-farm, controlled trials with Biozest, pasture productivity was doubled and milk and meat productivity was increased by over 30%. We are confident the UN FAO's benchmark up to 37%

increase in productivity (without increase in herd numbers) can be achieved. The result will be economically smart, climate-smart pastoral farming, more profit less gas. It will also affirm our pasture-fed milk and meat brands and play a major role in achieving global food security.

Farmers will make a large contribution towards management of our climate change obligations and economic growth.

As revealed in the recent Review of the New Zealand Agricultural Greenhouse Gas Research Centre, the current science funding model is stifling innovative companies. To facilitate adoption of the technology, we recommend the Government supports companies such as Zest Biotech that are striving (without current access to funding) to develop solutions that will give farmers the tools they need to achieve emissions reductions as mandated by the Climate Change Bill. The Government may wish to explore options such as Public-Private Partnerships, which are often employed when the scale and difficulty of the problem necessitates collaboration beyond the restricted scope/abilities/time constraints of government research bodies.

Appendix

Mitigation measures often simultaneously reduce environmental impacts and increase productivity, thereby contributing to food security and economic development.

Possible interventions to reduce emissions are thus, to a large extent, based on technologies and practices that improve production efficiency at animal and herd levels (see Pg14).

FAO Options for Reducing GHG Emissions http://www.fao.org/3/CA2929EN/ca2929en.pdf	**Biozest Results.** https://www.zestbiotech.co.nz/biozest-trials
GHG emissions represent inefficiencies in dairy systems. The loss of methane and nitrous oxide into the atmosphere means that energy and nitrogen inputs which could be directed towards production is lost. (pg. 31)	Biozest treated pasture contains higher soluble sugars and phenylpropanoids. This increases pasture quality and resilience. As a result, productivity is also improved. This reduces the need for supplementary feed cultivation and importation and improves carbon sequestration. When livestock graze Biozest treated pasture milk and meat production can be increased by 30%. Urea excretion is reduced by up to 48%. This shows that we are no longer wasting our valuable inputs (energy and nitrogen) and efficiency is increased resulting in less waste (urea and GHG emissions) and more milk/meat.
1. Feed and feeding management	
Increase feed efficiency by optimizing the energy and protein content in feed.	Biozest increases the functional quality of pasture. Biozest treatment enables the pasture itself to synthesise more simple sugars and bioactive molecules (phenylpropanoids) that can improve carbohydrate and protein digestion efficiencies.

Use more locally produced feed and source low-emissions feeds such as by-products. **Feed is the largest single cost** to dairy producers and its efficient use will improve net income and reduce potentially negative impacts on the environment (pg.31).	Trials show pasture productivity may be doubled resulting in more feed produced on farm and less imported supplementary feed. Biozest improves feed conversion efficiency- more milk& meat (profit) less gas & urea. Grazing Biozest treated pasture reduced livestock urea excretion by 30% (median). Biozest treated pasture is more palatable, livestock eat the pasture right down and evenly, leaving minimum residuals to rot and emit CO_2 and methane.
Carbon Sequestration Permanent pastures and meadows cover about 3.3 billion ha, one quarter of the Earth's land area and 68% of the global agricultural area. Grasslands (3.3 billion hectares) are estimated to contain globally 343 billion tonnes of carbon, nearly 50% more than is stored in forests worldwide (http://www.fao.org/3/a-i8098e.pdf, pg. 5) Store more carbon in the soil by means of better grassland management.	Biozest treatment can double pasture productivity and ,therefore, sequester double the carbon (this affirms our grass fed milk & meat brand). The nutritional value of milk and meat also increases in pasture fed systems. Biozest improves pasture cover, density and resilience. Trials confirm Biozest treatment resulted in denser pasture cover and double the pasture baleage yield; cultivation of supplementary feed was not necessary. Biozest treatment improves grass tiller and clover production (thicker pasture) The larger clump of grass results in increased root mass plus the increased clover nodulation are together expected to increase soil sequestration of carbon.
2. Animal health and husbandry	
Reducing the prevalence of diseases and parasites would generally reduce emissions intensity as healthier animals are more productive, and thus produce lower emissions per unit of output. Mastitis infections cause approximately 3 to 4 percent decrease in milk yield (pg. 32)	Both trial data and observations show body condition, health and livestock productivity increases.
3. Other Emissions Sources	
Land use changes (LUC) induced by the production of feed (excluding grassland and grazing) (pg15) Fodder and feed production including application of mineral fertilizer (pg. 15)	Biozest treatment increases pasture productivity eliminating importation or cultivation of supplementary feed. The importation of carbon liabilities avoided. An additional loss of carbon due to cultivation is avoided. This affirms our grass-fed brand.