NEW ZEALAND

Submission to the Subsidiary Bodies of the UNFCCC, Koronivia Joint Work on Agriculture for workshop 2(e) on improved livestock management systems, including agropastoral production systems

October 2020

1. New Zealand welcomes the opportunity to submit its views on topic 2(e) - *Improved livestock management systems, including agropastoral production systems* - in accordance with the conclusions of the 48th session of the Subsidiary Bodies on the Koronivia Joint Work on Agriculture (KJWA).[1]

2. New Zealand strongly supports the KJWA and looks forward to actively participating in a constructive discussion. New Zealand acknowledges that with the COVID-19 pandemic, this workshop must be postponed but welcomes the idea of conducting the workshop virtually.

Context

3. This submission provides an overview of livestock management systems in New Zealand and how we are addressing livestock's role toward achieving our commitments under the Paris Agreement.

4. Livestock farming is fundamental to global food security.[2] Meat, milk and eggs provide approximately 34 percent of the protein consumed globally, as well as a range of essential micro-nutrients.[3] Livestock, however, are responsible for a large portion of global greenhouse gas emissions. The demand for livestock products is increasing with population growth, higher incomes and urbanisation. Given the importance of livestock systems in maintaining food security and livelihoods globally, it is paramount that any increase in production simultaneously considers the impact on climate change.

5. In New Zealand, pastoral livestock farming is a major contributor to our economy, with over half of our goods exports comprising agricultural commodities. Emissions from agriculture contribute approximately 48 percent of our total emissions profile, with a relatively high proportion coming from ruminant livestock (dairy cattle, non-dairy cattle, sheep and deer).[4]

[1] Report of the Subsidiary Body for Scientific and Technological Advice on the first part of its forty-eighth session, held in Bonn from 30 April to 10 May 2018.
[2] From the FAO definition: Food security exists when all people, at all times, have physical and economic access to sufficient safe and nutritious food that meets their dietary needs and food preferences for an active and healthy life.
[3] FAO publication, *Livestock solutions for climate change*, 2017, p3,
[4] Approximately 91 percent of New Zealand's agriculture emissions are from ruminant livestock. New Zealand's Greenhouse Gas Inventory 1990-2018.

6. Despite an increase in overall agricultural production in New Zealand over the past thirty years, greenhouse gas emissions per unit of meat or milk produced on-farm have dropped by approximately 1 percent on average per year. Many of our farmers have adopted a range of practices to more efficiently utilise resources and increase their outputs. These practices have been geared towards improving farm efficiency so that both on-farm productivity and emissions intensity are improved.

Our international and domestic climate change commitments

7. We have committed in our Nationally Determined Contribution under the Paris Agreement to reduce emissions by 30 percent below 2005 levels by 2030. Given that a large proportion of our emissions are from agriculture, and from livestock specifically, further improving our livestock management systems stands to play an important role in transitioning to a low-emissions economy.

8. In November 2019, the Climate Change Response (Zero Carbon) Amendment Act was passed into law, which provides a framework by which New Zealand can develop and implement clear and stable climate change policies – on a path to a low-emissions, climate-resilient economy, in line with limiting global temperature increase to 1.5 degrees Celsius above pre-industrial levels. It sets new domestic greenhouse gas emissions reduction targets for New Zealand to reduce emissions of biogenic methane to 24-47 percent below 2017 levels by 2050, including to 10 percent below 2017 levels by 2030; and reduce net emissions of all other greenhouse gases to zero by 2050.

9. In late 2019, a Joint Action Plan, He Waka Eke Noa,[5] was formed between the Government, the agri-food and fibre sectors and iwi/Māori to address agricultural emissions. He Waka Eke Noa aims to deliver a world-first scheme for our agriculture sector to measure, manage and price agricultural greenhouse gas emissions by 2025.

10. Fundamental to this decision to address agriculture emissions is the knowledge that farmers will need support and further options to estimate and mitigate their on-farm emissions. Current and future strategies, along with further science and innovation are paramount for farmers to meet increasing social and regulatory requirements in relation to emissions from livestock systems.

Domestic and international research

11. New Zealand is investing in research to improve productivity and reduce emissions from our agriculture sector. We have a strong domestic research programme, overseen by the New Zealand Agricultural Greenhouse Gas Research Centre. This Centre works with existing organisations to bring cost-effective, simple solutions to New Zealand farms while also contributing to the international science community.

[5] Te Reo Māori translation for "We are all in this together".

12. We are a founding member of the Global Research Alliance on Agricultural Greenhouse Gases (GRA). In particular, the Livestock Research Group of the GRA, of which New Zealand is co-Chair, is focussed on developing joint research collaborations across its member countries to reduce the emissions intensity of livestock production systems, increase the quantity of carbon stored in soils supporting these systems, and improve countries abilities to measure, monitor and report their agricultural greenhouse gas emissions nationally and internationally.

13. Domestically, the Pastoral Greenhouse Gas Research Consortium, established in 2003 by agricultural sector partners, funds research into mitigation technologies and management practices for ruminants and provides information to improve on-farm inventories. New Zealand also established the Biological Emissions Reference Group in 2016 to build a portfolio of evidence covering the opportunities to reduce methane and nitrous oxide emissions from New Zealand agriculture, and the costs and benefits of these opportunities and barriers to their use. A report was published in 2018 summarising the group's findings.

14. A key consideration in the science, research and development of mitigation practices and technologies is that consideration of the overall farm system is taken into account to ensure that proposed interventions in one area do not create perverse outcomes in another.

Available mitigation strategies

15. Animal selection and genetics can contribute to greater energy and nutrient efficiency. It is estimated globally that genetic improvement can result in 0.5-1 percent efficiency increase per animal per year.[6] New Zealand has a ruminant breeding programme which has demonstrated that low and high methane-emission sheep, born in 2017, are predicted to differ on average by more than 11 percent since selection started in 2008. A case study on this programme is provided in Annex 1.

16. Feed and nutrition strategies can directly affect an animal's productivity and health status, and can strongly influence absolute or per unit of product greenhouse gas emissions. Dietary changes, for example, introducing low-protein grain supplements, cereal silages, fodder-beet winter feed, herb-containing ryegrass pastures, and by improving herd fertility and lowering herd replacement rates can contribute to greater milk production per cow per lactation, less nitrogen leaching, and lower greenhouse gas emission intensities.[7]

17. Improvements to manure management contribute to the reduction of greenhouse gas emissions and offer benefits for reducing nutrient losses and other environmental impacts of livestock production, such as air and water pollution. The diet is known to strongly influence manure composition and, depending on existing limitations or surplus of nitrogen, the feed supply can reduce manure emissions

[6] New Zealand Agricultural Greenhouse Gas Research Centre and Pastoral Greenhouse Gas Research Consortium, *Reducing New Zealand's Agricultural Greenhouse Gases: What are we doing?* 2016, p8.
[7] Van der Weerden et al., *The Effects of System Changes in Grazed Dairy Farmlet Trials on Greenhouse Gas Emissions*, 2018, p16.

and/or improve animal productivity. Due to the high prevalence of pastoral farming in New Zealand, most manure is directly deposited onto pasture, with little going into manure management systems. This results in decomposition under aerobic conditions and less methane being produced. However, nitrous oxide emissions can be greater under our pastoral farming system, depending on soil conditions and manure management practices.

18. In general, when adopting a whole farm system approach, increasing soil carbon stocks could be used to offset other greenhouse gases produced by livestock farming. As well as the sequestration ability of soil, high soil carbon content also offers soil health and water management benefits. However, in New Zealand, our soils are already relatively high in carbon, therefore it would be challenging to increase our soil carbon stock, if we were to use this to offset biological emissions. It is also challenging to measure and monitor at scale due to high spatial and temporal variability. Protocols have been developed to measure changes in soil carbon through time, at the farm and national level, using a statistically designed framework.

19. There is further potential for mitigating emissions in our livestock sector. Modelling has found that if there were widespread adoption of currently available mitigation options, we could see a reduction of up to 10 percent in absolute biological emissions from pasture-based livestock.[8]

20. The ability of farmers to implement livestock mitigation options varies widely and outcomes are dependent on factors such as how mitigation options are implemented, the skill level required to implement these options, the fit with existing farm systems, commodity prices and emissions prices. The uptake of future mitigation options is also dependent on farmers' capability, willingness to take risks, access to skilled labour, availability of relevant information, skilled advisors, finance and the influence of markets into which New Zealand is selling its agricultural products.

Future mitigation strategies

21. Some of the mitigation options with the largest potential impacts on livestock emissions in New Zealand are under still development. Two such options are aimed at directly targeting methanogens through vaccines and inhibitors.

22. Research is also underway on integrated farm systems to identify profitable, practical and low greenhouse gas emission ruminant farming systems. The data and analysis from this programme will be used for development of extension material and processes that enable sheep and beef farmers to understand which mitigation options are most effective for their particular situation.[9]

23. New Zealand anticipates that with increasing competitive trade pressures and environmental constraints, the emissions intensity of our livestock systems will require further reduction. However, in

[8] *Report of the Biological Emissions Reference Group*, 2018, p5.
[9] New Zealand Agriculture Greenhouse Gas Research Centre, *Highlights 2019*, 2019, p7.

the absence of new technologies, the overall potential to reduce on-farm biological emissions and in particular from grazed livestock systems, is limited. Ongoing interaction between farmers, government and research programmes focussing on productivity and on greenhouse gas emissions monitoring will continue to be critical in achieving further efficiency gains and reductions in emissions intensity on-farm.

24. Challenges may lie in future regulatory settings and market responses, domestically and internationally, in relation to some of the mitigation technologies that are currently being investigated. For example, ensuring market acceptability of novel mitigation technologies is paramount to fully securing their potential, along with gaining approval through domestic regulatory bodies and international bodies.

Conclusion

25. New Zealand hopes the workshop can help to identify some ways in which the UNFCCC can support information exchange on improved livestock management systems in the context of climate change and food security. In particular, we suggest the following questions are incorporated into the workshop discussion:

- What strategies are Parties adopting to include the livestock sector in their Paris Agreement commitments?
- How are Parties encouraging or supporting farmers to adopt available mitigation strategies?
- How are Parties balancing productivity and profitability with emissions efficiency?
- How can Parties ensure context-specific approaches are adopted for addressing livestock emissions?
- How can Parties facilitate the broad international acceptance on novel mitigation technologies?

Annex 1

Case study: Using breeding to select for low methane animals

With methane contributing approximately 42 percent to New Zealand's gross emissions, our scientists have been using genetics to breed sheep that produce less methane per kg of feed eaten from their pasture-based diets. The breeding research programme has been underway since 2008.

The breeding programme has demonstrated that after three generations, low and high methane-emission sheep, born in 2017, are predicted to differ on average by more than 11 percent less methane per kilogramme of feed eaten. Lambs born in 2019 differ by approximately 16 percent.

Breeding for low methane has yielded changes such as smaller rumens, changes in feeding and consumption patterns and increases in lean muscle tissue with a higher content of branched chain fatty acids. Advantages of the low methane animals are faster lamb growth, more lean meat, less fat, better parasite resistance and better wool growth. No detrimental associations with production or health traits have been found to date.

On-farm selection is obtained by placing animals in Portable Accumulation Chambers (PAC). These are now being used by selected ram breeders in a pilot programme to get this genetic trait into the national commercial sheep flock.

The programme is also now investigating differences in milk, blood plasma and rumen fluid microbial composition between the high and low lines, to determine if theses might provide proxies to select animals which can then be applied to cattle.

The project recognises many other countries are facing similar challenges to New Zealand and is collaborating directly with countries and through the Global Research Alliance on Agricultural Greenhouse Gases (GRA).

In a programme called GrassToGas, New Zealand scientists from AgResearch have exported PACs to Ireland and Norway to enable them to measure methane emissions and establish breeding values. UK scientists are also involved in this project to work on identifying individual animal, feed and environmental attributes associated with feed and water intake efficiency for pasture-based sheep production systems. Other countries involved in GrassToGas include France, Turkey and Uruguay.