AI Forum submission
to
Ministry for the Environment and Ministry for Primary Industries
on the
Pricing Agricultural Emissions consultation document

18 November 2022

Background

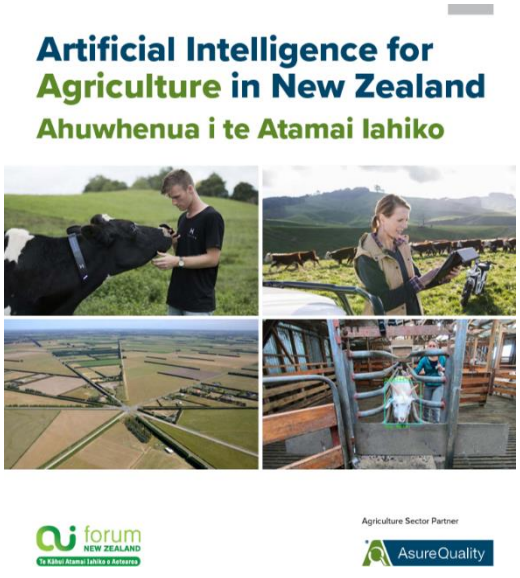
The Artificial Intelligence Forum of New Zealand (AI Forum) is a purpose-driven, not-for-profit, non-governmental organisation (NGO) that brings together New Zealand's community of artificial intelligence technology innovators, end users, investor groups, regulators, researchers, educators, entrepreneurs and interested public to work together to find ways to use AI to help enable a prosperous, inclusive and thriving future for our nation.

AI is transforming industries around the world by augmenting human labour, automating processes, and providing intelligent analytics. AI is a catch-all term for a range of automation technologies that most often use "machine learning" to make predictions using data. We include a range of computational techniques that can be applied to problems in agriculture including robotic process automation, computer vision, natural language processing, reinforcement learning and generalised deep learning.

AI in agriculture is in its early days globally but we are already seeing many applications of AI working hard across our agricultural landscape, e.g. utilising the networks of sensors and machines on farms to help productivity, or find new chemicals to kill weeds. AI combined with machine vision is being used to map and measure carbon sequestration, harvest lettuce, identify animals and measure their behaviour, health or predict impending illness. AI is also enabling autonomous drones for precision herbicide and fertiliser applications.

Our submission focuses on relevant question areas mainly regarding the technical design of a farm-level agricultural emissions pricing system, including the data and evidence requirements for emissions reporting.

It draws on knowledge from across our members and our 2019 report on Artificial Intelligence for Agriculture in New Zealand. In this report we describe how New Zealand's focus on farming anchors our provenance story, but that there is a tendency to look at food "from farm to fork" as opposed to using data and technology to look back down the supply chain from the consumer and drive thinking from that direction. Application of AI in our supply chains to manage risk, provide transparency to consumers and maximise outputs through effective utilisation of inputs have the greatest potential to provide value-adding opportunities for New Zealand.



Executive Summary

We note and support the accompanying submission to this consultation from AgriTech NZ Ltd and its earlier submission to the He Waka Eke Noa Partnership in May 2022. This was a summary of technology and adoption considerations when designing a levy-based system for emissions reduction. This submission is founded on a belief that Government can embrace a digital-first approach with an informed and pragmatic focus on adoption.

In addition to AgriTech's submission, we make the following recommendations (further detail is included in the body of the submission):

1. We recommend a more temporally accurate and data-driven approach than using receipts for synthetic nitrogen fertiliser use. This can be achieved through the analysis and reporting of application data from spreader application technology. This will provide a better and more accurate incentive to minimise use.

2. We recommend a price for biogenic methane be set every year – not every three years – to allow the scheme to be sensitive to participant impact across the sector and to technology availability.

3. We recommend that NZ Tech representatives (including AI Forum, AgriTech and IoT Alliance) should be engaged on advisory panels to ensure emissions reduction technology research and development is well designed, standards-based, ethically sound, scalable and appropriate to meet sector needs over the long term.

4. We recommend concessions be considered for participants altering their farming systems to accommodate and trial new emissions reduction technology.

5. We recommend that sequestration that contributes towards targets should be included in the scheme. The Government's decision to not include sequestration does not seem equitable based on its rationale. Using satellite imagery and aerial photography in conjunction with AI we believe it is technically possible to affordably map and monitor vegetation categories annually including scattered forest, shelterbelts, woodlots and indigenous vegetation greater than 0.25 ha in area.

6. We recommend that carbon mapping and monitoring at a farm level should be done annually in line with the other reporting. This would give farmers the end-to-end picture and support for decisions on managing farm profitability, emissions, sequestration, net profile and adaptation. Annualised mapping and documentation of stock exclusion barriers, riparian planting, indigenous bush and pest control is feasible using AI techniques described in this submission.

7. We recommend a higher level of support to transition a low-emissions economy should be considered for the sheep and beef sector to manage the immediate impact of emissions pricing. This could be through transitional support arrangements, while systems and mitigations are developed to reduce their emissions.

Response to Consultation Questions

Question 4: Do you support the proposed approach for reporting of emissions? Why, and what improvements should be considered?

We support farm level pricing including the amendment to set a threshold for farms based on livestock numbers. The emissions calculation method must remain transparent with all participants aware at all times of the price signals and technology options. This programme should help stimulate an acceleration of the farm digitisation process, which is already underway, including enabling farm data interoperability as part of the system's reporting obligations. AI technology should be front and centre of the technology investment plan as it holds great promise for agriculture.

We recommend a more temporally accurate and data-driven approach than using receipts for nitrogen fertiliser use. Instead, the use of application data from spreader technology will provide a better and more accurate incentive to minimise use, while also taking into account slope on each farm.

Question 5: Do you support the proposed approach to setting levy prices? Why, and what improvements should be considered?

We recommend a price for biogenic methane be set every year, not every three years. This will avoid any unintended consequences and impacts on sub-sector groups.

This will also allow the scheme to react more quickly to change in participant behaviour, impact and technology availability. We also recommend this price be set initially at a rate slightly lower than modelled to gauge and calibrate the impact on farms most vulnerable to the impact.

Question 6: Do you support the proposed approach to revenue recycling? Why, and what improvements should be considered?

We support the revenue recycling concept including the incentive payments, research funds and sequestration rewards. A robust research and development investment programme including eligibility guidelines, rules around publication of results and IP should be put in place. This should be designed to facilitate integrated technology development and iterative design thinking across participants.

We recommend that NZ Tech representatives (including AI Forum, AgriTech and IoT Alliance) should be engaged on the advisory panel to ensure new technology research and development is well designed and appropriate to meet the long-term needs of the sector. Specialists in sensors, AI, robotics and process automation should be consulted with. The process could include contestable grants with a managed submission process based on technology gaps and anticipated returns.

Question 7: Do you support the proposed approach for incentive payments to encourage additional emissions reductions? Why, and what improvements should be considered?

Incentive payments are a useful way to drive behaviours. Many of the mitigation technologies will be developmental and require changes to the farming system that may be disruptive. Participants wanting to take up these shouldn't be disadvantaged.

We recommend concessions be considered for participants altering their farming system to accommodate and trial new emissions reduction technology.

On farm trials for mitigation technologies should also be encouraged which will accelerate the market readiness for solutions funded out of the programme.

AI technology can be deployed using computer vision and satellite imagery to monitor and map changes in land use on an annual basis. Annual land use maps will enable accurate reporting and ensure incentive payments are correct. These maps will also facilitate technology solutions for further emissions reductions such as pasture, water use, fertiliser, planting and more.

Question 8: Do you support the proposed approach for recognising carbon sequestration from riparian plantings and management of indigenous vegetation, both in the short and long term? Why, and what improvements should be considered?

We support the Partnerships' proposal that farmers and growers should be recognised for their on-farm sequestration as a core component of any agricultural emissions-pricing system. We agree that only sequestration that contributes towards targets should be included. A migration towards ETS in 2025 is logical and may allow other sectors beyond forestry and pastoral farming to be incorporated, e.g. local authorities. We understand the complexity of changing legislation and regulations in regard to the timing of this.

We recommend that sequestration that contributes towards targets should be included in the scheme. The Government response to not include sequestration does not seem reasonable based on its rationale. Using satellite imagery and aerial photography in conjunction with AI it is possible to affordably map and monitor vegetation categories annually including scattered forest, shelterbelts, woodlots and indigenous vegetation greater than 0.25 ha in area.

From an AI perspective mapping of woody vegetation is not particularly complex with examples including Net Carbon Zero By Nature and Carboncrop.nz. By analysis of historic imagery this can also be done in such a way as to guarantee additionality. The alignment with biodiversity incentives is to be applauded and will further promote holistic on-farm thinking. We agree that land owners should be provided with recognition for increases in carbon in indigenous vegetation linked to specific management interventions. AI technology again can play a key role in land use monitoring, fence line detection and riparian system monitoring. For example, a Riparian survival project is currently being led by AI Forum members PDP and Lynker Analytics, supported by the Ministry for the Environment, to monitor riparian systems.

We recommend that carbon mapping and monitoring at a farm level should be done annually in line with the other reporting, giving farmers the end-to-end picture and decision support to manage farm profitability, emissions, sequestration, net profile and adaptation. Annualised mapping and documentation of stock exclusion, riparian planting, indigenous bush and pest control is feasible using AI techniques described in this submission.

Question 10: Do you think the proposed system for pricing agricultural emissions is equitable, both within the agriculture sector and across other sectors, and across New Zealand generally? Why, and what changes to the system would be required to make it equitable?

No. Some parts of the sector, e.g. dairy, will weather the levy impacts better than others, e.g. sheep/beef. While technology is being developed a stock-based levy weighting could be considered that would provide proportional dispensation for sheep/beef in the initial years until technology comes on stream. We want to drive emissions reduction, not economic hardship or migration away from primary production by more at-risk participants. Climate change adaption is also a major threat with higher soil moisture deficits, unpredictable rainfall events, and more frequent and intense agricultural droughts forecast.

We recommend a higher level of support for transition to a low-emissions economy should be considered for the sheep and beef sector to manage the immediate impact of emissions pricing. This could be through transitional support arrangements as systems and mitigations are developed to reduce their emissions.

Question 11: In principle, do you think the agricultural sector should pay for any shortfall in its emissions reductions? If so, do you think using levy revenue would be an appropriate mechanism for this?

Yes, this is acceptable.

Question 12: What impacts or implications do you foresee as a result of each of the Government's proposals in the short and the long term?

Farmers will be required to comply with multiple environmental regulations, such as land use, water quality and emissions management by 2025, all while trying to remain profitable and adapt to threats posed by climate change. Digital farm data and management systems will become essential to good management, reporting and decision making. Digital Farm Environment Plans have been discussed for some time and are the focus of several ongoing projects including research through the Ministry for Primary Industries' (MPI) Sustainable Food and Fibre Futures fund (SFF Futures).

Digitisation of the natural resources and farm infrastructure are all integral to monitoring sequestration, land cover, land use and mitigation of emissions. This will then enable AI-based technology to be used for decision making and mitigation.

For example, AI guided by good digital farm data can optimise pesticides use and limit their application to only the areas that need treatment to reduce costs while increasing yields. This is one of the most common uses of AI and machine learning in agriculture today. In conjunction with intelligent sensors combined with visual data streams from drones, agricultural AI applications can detect infected areas within paddocks or areas of poor pasture production. Using supervised machine learning algorithms, they can then define the optimal mix of pesticides to reduce pest incursion or optimise dry matter production**.**

Finding irrigation leaks, optimizing irrigation systems and measuring the effectiveness of frequent irrigation in improving yield rates are all areas where AI contributes to improving farming efficiencies. Water will become the scarcest resource in some areas. Being efficient in using it can mean the difference between a farm or agricultural operation staying profitable or not. Linear programming is often used to calculate the optimal amount of water a given field or crop will need to reach an acceptable yield level. Supervised machine learning algorithms are ideal for ensuring fields and winter crops get enough water to optimize yields without wasting any in the process.

Monitoring livestock's health, including vital signs, daily activity levels and food intake, ensures their health is one of the fastest-growing aspects of AI and machine learning in agriculture. Understanding how every type of livestock reacts to diet and conditions is invaluable in understanding how they can best be treated for the long-term. Using AI and machine learning to understand what keeps dairy cows contented and producing more milk is essential. For many farms which rely on cows and livestock, this area opens up entirely new insights into how farms can be more profitable while also understanding the net emissions profile.

Conclusion

Thank you for the opportunity to provide feedback on the consultation document. We are happy to engage further to discuss our submission and provide any further assistance.

If you have any further queries, please do not hesitate to contact us.

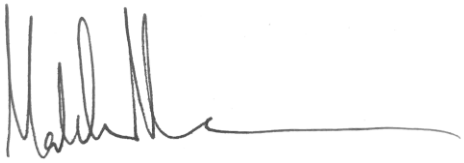
Yours sincerely,

Matt Lythe

Executive Council – Environment Spokesperson

AI Forum New Zealand

E| matt.lythe@lynker-analytics.com **P|** +64 21 445 215



Madeline Newman

Executive Director

AI Forum New Zealand

E| madeline.newman@aiforum.org.nz **P|** +64 21 274 9778