Aduso, A., Ledgard, S., Rys, G., and Ettema, P, 2019. LEAP – a global tool to support New Zealand sustainability. In: Nutrient loss mitigations for compliance in agriculture. (Eds. L. D. Currie and C.L. Christensen). http:flrc.massey.ac.nz/publications.html. Occasional Report No. 32. Fertilizer and Lime Research Centre, Massey University, Palmerston North, New Zealand. 7 pages.

LEAP – A GLOBAL TOOL TO SUPPORT NEW ZEALAND SUSTAINABILITY

Alessandro Aduso[1], Stewart Ledgard[2], Gerald Rys[1], and Peter Ettema[1]

[1]Ministry for Primary Industries - Manatū Ahu Matua
PO Box 2526, Wellington 6110, New Zealand
[2]AgResearch Ruakura Research Centre, Private Bag 3123, Hamilton 3240, New Zealand
Email: alessandro.aduso@mpi.govt.nz

Abstract

The United Nations Food and Agriculture Organization Livestock Environmental Assessment and Performance (LEAP) partnership's objective is to develop comprehensive guidance and methodology for understanding the environmental performance of livestock supply chains, whilst ensuring their economic and social viability. A range of guidelines have been published for different livestock groups and cover a number of resource use and environmental areas including nutrients, water, greenhouse gases, soil carbon and biodiversity.

LEAP guiding principles include: global, inclusive, consensus, transparency, scientific, comprehensive, continuous improvement and adoption. It involves global stakeholders from across the livestock and associated sectors as well as central Government and non-Government Organisations. In New Zealand, this includes scientists, agricultural companies, and the Ministry for Primary Industries. The goal of New Zealand's engagement is to increase NZ's environmental efficiency and provide our primary producers with verifiable information they can use in international markets, as well as ensuring that the guideline methods treat livestock products from NZ grazing systems fairly.

In New Zealand and around the world, farmers, consumers and other livestock stakeholders are increasingly in need of more information about the environmental performance and the sustainability of livestock supply chains. LEAP guidelines have been picked up by, for example, the European Commission's Product Environmental Footprinting work, and dairy companies (such as Danone, Arla and Fonterra), with further uptake by other international organisations likely in the near future. An explanation of LEAP, and its relevance to New Zealand, is provided to raise awareness, and increase New Zealand industry engagement with, and uptake of LEAP principles and guidelines.

The global context driving the need for environmental footprinting

Over recent years, the interest in, and perception of, what constitutes sustainable and nutritious food has changed. This is shaping what kind of product-information consumers are seeking including understanding where their food comes from and how it is produced. In particular, consumers are becoming increasingly conscious of the environmental impact of the food, and other products which they consume. Consequently, governments, food producers, retailers, and sector bodies are seeking ways to evaluate and express the environmental impact of products, set out in terms which are relatively accessible to the consumer (labelling, for example).

There are a number of global drivers influencing the need to better understand the environmental impact of livestock systems. These include:

- Climate change: Globally, agriculture accounts for approximately 14 per cent of global emissions (IPCC 2014). It is estimated that global agriculture emissions need to be reduced by at least 1 gigaton of carbon-dioxide equivalent per year by 2030 to limit warming in 2100 to 2°C above pre-industrial levels (Wollenberg et al. 2016).

- Food insecurity: In 2017, the number of undernourished people is estimated to have reached 821 million. The issue of food insecurity may be further compounded as the global population heads towards 9 billion people by 2050. The FAO projects total world consumption of all agricultural products to increase at 1.1 percent per annum from 2005/2007-2050 (FAO, IFAD, UNICEF, WFP and WHO 2018).

- United Nations Sustainable Development Goals (SDGs) are shaping and driving global awareness of social and environmental issues, government policies, and indicators.

- Circular economies which aim to reduce resource use by maximising the value extracted from their use, for example through the recovery and regeneration of products and materials at the end of each service life. This concept is driving, for example, the design of new European Union rules on fertilisers – a deliverable of the EU Circular Economy Package (European Commission 2018).

- Comparing different food types: there is increasing consumer interest in comparing the environmental impact and nutritional value of livestock-derived foods with other, largely plant-based foods.

The New Zealand context - why it matters

New Zealand's pasture-based agriculture sector is particularly sensitive to ebbs and flows in consumer-driven global markets. New Zealand's economy is reliant on revenue from agricultural exports, in particular dairy, sheep-meat, beef, and wool. Over 90 per cent of New Zealand's agricultural produce is exported (see **Figure 1**), which is valued at $42.6 billion of New Zealand's export revenue for the year ending June 2018 (Ministry for Primary Industries 2018). Additionally, the sector is unsubsidised, meaning that on-farm returns correlate closely to international supply and demand.

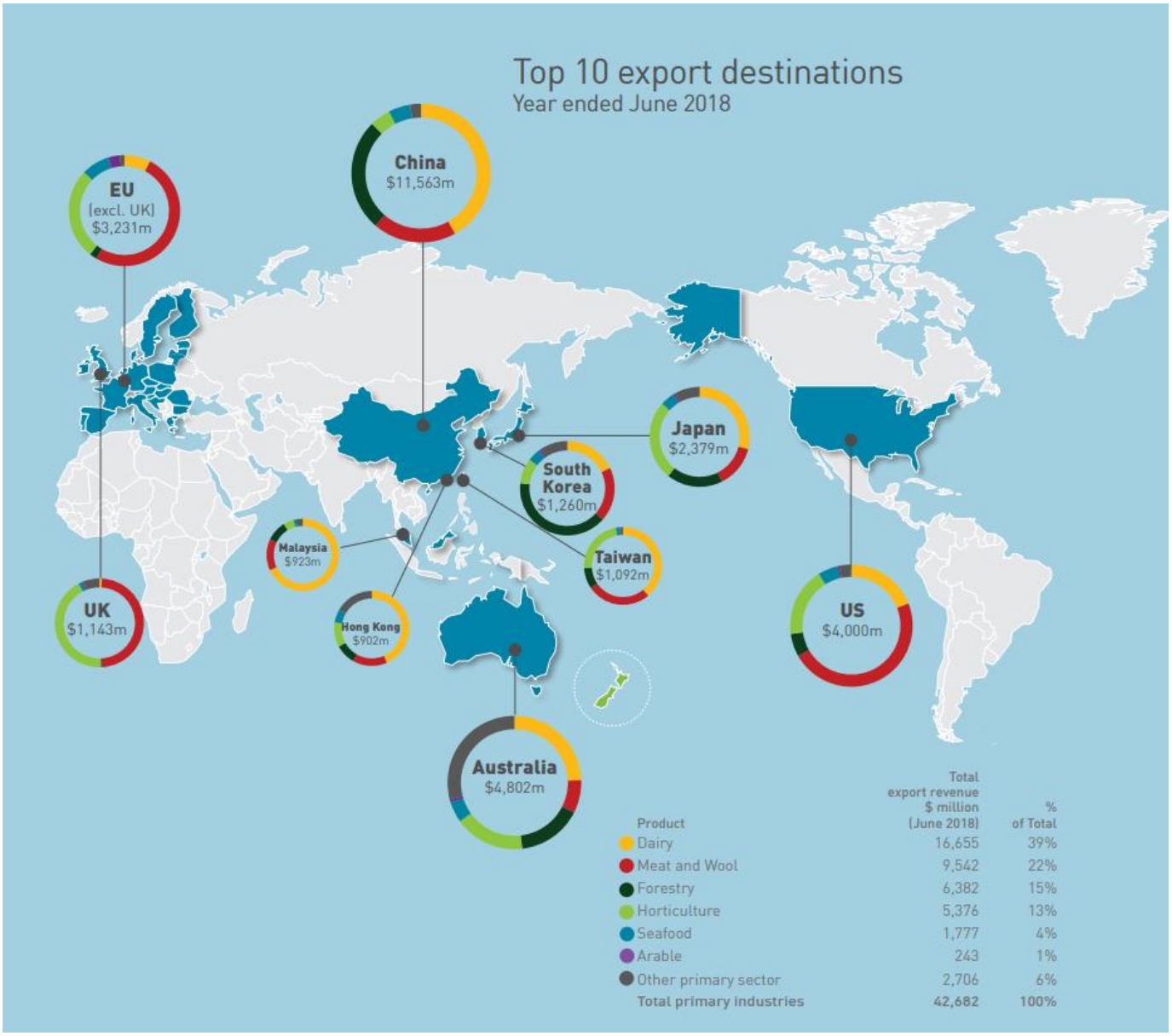

Figure 1. Top 10 New Zealand export destinations (Ministry for Primary Industries 2018).

Because of New Zealand's export-led economy, and the changing global context and market demands, it is important that New Zealand producers are able to continue to inform consumers about the environmental integrity of their products. As the LEAP guidelines are internationally accepted, they are a key tool to support this, and the focus on continual improvement. More broadly, this will enhance international understanding of New Zealand's competitive advantage as efficient producers of livestock products. As such, New Zealand's objectives for engaging in LEAP are:

1. International rules to verify environmental footprinting standards are fair and transparent;
2. Rules are applied fairly and without discrimination internationally; and
3. New Zealand primary producers participate in environmental assessment measurement to enhance environmental performance.

What is LEAP?

LEAP is a multi-stakeholder initiative that was formed in 2012 by the FAO in response to farmers, consumers, and other relevant stakeholders increasingly seeking more information about the environmental performance and sustainability of livestock supply chains. Prior to this, a broad range of environmental assessment methods had been developed, however a lack of consistency across these methods was a bottleneck to effective action.

LEAP seeks to address this bottleneck by establishing globally-agreed science-based, comparable, and standardised livestock environmental performance indicators – seeking to progress the focus of the dialogue from methodological assessment issues to actual practical environmental improvement measures on the ground. Life Cycle Assessment (LCA) is the fundamental concept underpinning LEAP's work. It is an approach to the development of guidance to measure environmental performance which ensures that all inputs and outputs across the life-cycle stages are taken into account. Life-cycle thinking also avoids burden shifting – where impacts could be shifted to other parts of the product life-cycle in order to minimise or maximise the impact somewhere else. This enables the calculation of total resource use and environmental emissions of a product from 'cradle-to-grave' using International Standards Organisation (ISO) standards such as ISO14040 and ISO14044.

Key to LEAP's success is the collaborative partnership approach it has taken in developing its accounting methods and metrics. LEAP guidelines, and other products, have been developed jointly by government, and non-government bodies (including industry, standard-setting bodies, academia, and non-governmental organisations).[1] The LEAP Steering Committee, which provides overall leadership, consists of three stakeholder groups: Governments, Private Sector, and Civil Society and Non-Governmental Organisations. The Chair rotates annually between the groups, and decisions are made by consensus. The Technical Advisory Groups (TAGs), which sit under the Steering Committee, provide multi-stakeholder expertise to develop the guidelines and other products.[2]

There is a suite of existing published LEAP guidelines and products which include:

- Guidelines for assessment: Nutrient flows and associated environmental impacts in livestock supply chains
- Guidelines for assessment: Measuring and modelling soil carbon stocks and stock changes in livestock production systems

[1] The LEAP secretariat is hosted by the United Nations Food and Agriculture Organization. Country members include: Argentina, Australia, Brazil, Canada, China, Costa Rica, the European Commission, France, Hungary, India, Ireland, Italy, Kenya, New Zealand, Nigeria, Switzerland, the Netherlands, Uruguay, and the United States of America. Sector-body members include the International Feed Industry Federation (IFIF), International Meat Secretariat (IMS), International Dairy Federation (IDF), International Poultry Council (IPC), International Egg Commission (IEC), International Wool and Textiles Organization (IWTO), International Federation for Animal Health (IFAH), and the International Council of Tanners (ICT). Non-governmental and civil-society organizations include the World Wildlife Fund (WWF), World Vision International, World Alliance of Mobile Indigenous Peoples (WAMIP), International Planning Committee for Food Sovereignty (IPC), and the International Union for Conservation of Nature (IUCN). Advisory and networking members include the International Standards Organization (ISO), Technische Universität Berlin, Global Research Alliance (GRA), European Joint Research Centre, United Nations Environment, World Organisation for Animal Health (OIE), and the World Bank.

[2] New Zealand has provided scientific expertise and chairs to multiple TAGs: Small ruminants, Large ruminants, Water, Nutrients, and Soil Carbon.

- Guidelines for assessment: Greenhouse gas emissions and fossil energy use from small ruminant supply chains
- Guidelines for assessment: Environmental performance of animal feeds supply chains
- Guidelines for assessment: Environmental performance of pig supply chains
- Guidelines for assessment: Greenhouse gas emissions and fossil energy use from poultry supply chains
- Guidelines for assessment: Environmental performance of large ruminant supply chains
- Methodological notes: Developing sound tools for transition to sustainable food and agriculture
- Application to livestock production at global scale: A review of indicators and methods to assess biodiversity
- Principles for the assessment of livestock impacts on biodiversity

Focus on guidelines for assessment: Nutrient flows and associated environmental impacts in livestock supply chains

The published LEAP Nutrient Guidelines introduce a harmonized international approach assessing the nutrient flows and impact assessment for eutrophication and acidification across various livestock supply chains.

The development of the Nutrient Guidelines was led by a Technical Advisory Group led jointly by New Zealand scientist Dr Stewart Ledgard (AgResearch), and Dr Adrian Leip (European Union Joint Research Centre, Italy). The make-up of this group was agreed across all LEAP partners. New Zealand participation ensured the guidelines have country relevance beyond Europe, including that both nitrogen and phosphorus were considered for eutrophication. The guidelines are to:

- quantify nutrient flows in livestock supply chains;
- quantify the environmental impact of eutrophication and acidification; and
- include other relevant indicators (e.g. nutrient use efficiency; nutrient footprint) to understand the nutrient use and associated environmental impacts in livestock supply chains.

A few case studies are provided as Appendices to the guidelines, including one for *Lamb production in New Zealand to consumption in the United Kingdom* showing an example of nitrogen use efficiency, nitrogen flows and its use in estimating life cycle eutrophication potential (see **Figure 2)**. Other case studies to illustrate inventory data and results from a range of livestock systems include:

- Beef and sheep extensive grazing system in Uruguay;
- Egg production, in combination with pigs and cereal production in Sweden; and
- Fully grazing dairy cattle supply chain in Rwanda.

These guidelines, as well as the others, are to be updated and improved as more stakeholders become involved in LEAP, and as new methodological frameworks and data become available.

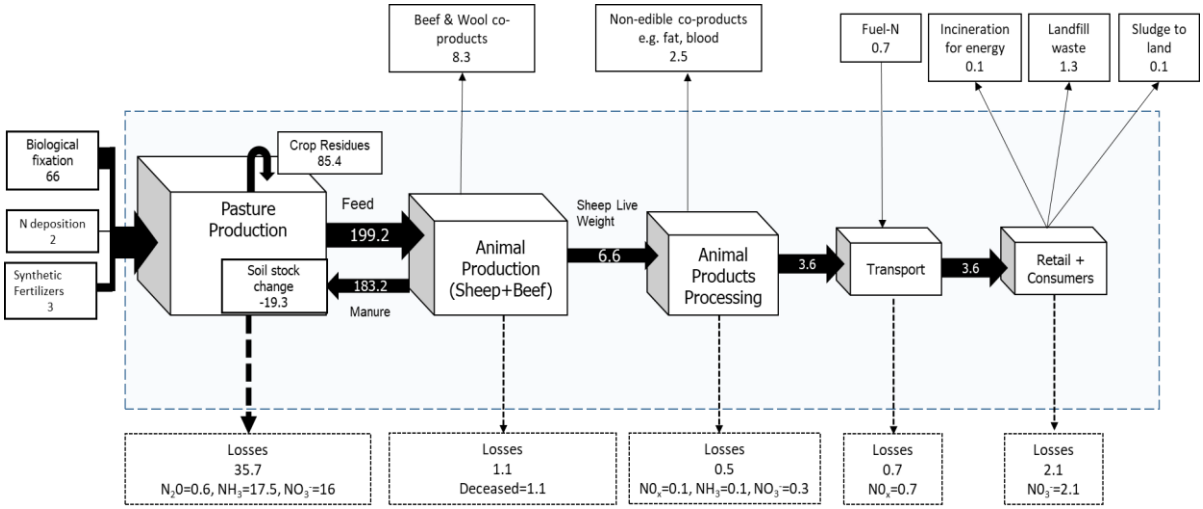

Figure 2. Illustration contained in the LEAP *Lamb Production in New Zealand to consumption in the United Kingdom* case study (FAO, 2018).

Road testing in New Zealand

The first phase of LEAP called LEAP1 – largely focused on the harmonisation of accounting rules for the quantification of greenhouse gas emissions from livestock supply chains. The second phase – 'LEAP2' – expanded the focus beyond greenhouse gases to develop tools to monitor the performance of nutrient cycles, water use, soil carbon, feed additives and biodiversity.

Preliminary work on road testing[3] was conducted by LEAP Partners, however this has been limited to specific cases.[4] The current phase of LEAP – 'LEAP3' – seeks to consolidate current guidance through dissemination, and the development of a road testing framework and mechanisms, for interested parties to provide feedback on guidelines to the LEAP partnership.

The development of guidelines for measurement, reporting and verification of the environmental performance of livestock sector involves several technical decisions and assumptions that need to be tested in different situations. This testing can ensure that the right balance is achieved between scientific rigor and ease of use, while being cognizant of a range of capabilities of both experienced and new users.

It is important that the road-testing is conducted in a broad range of different countries and production systems to ensure that LEAP guidelines are applicable in different contexts.

For the reasons outlined in this paper, it is important that New Zealand industry engages in the road testing of the guidelines, so that New Zealand's unique farming systems and broader livestock supply chains are considered and incorporated into further iterations of LEAP guidelines. As uptake of these guidelines increases, it is important that industry begins testing livestock supply chains, to enable continual improvement in the environmental performance of

[3] Road testing involves the practical application of the guidelines – with the aim of identifying gaps and other shortcomings, while identifying environmental impact hotspots which require attention.
[4] For example, partners have tested LEAP guidelines on feed and large-ruminant supply chains in different contexts such as agro-pastoral and confined dairy systems and have identified specific methodological issues related to the complexity of allocation rules or data quality evaluation.

New Zealand's livestock sectors, and future-proof New Zealand exports by being better able to inform consumers about the environmental integrity of our products.

References

European Commission. (2018). *Circular Economy: Agreement on Commission proposal to boost the use of organic and waste-based fertilisers.* December 2018. Retrieved from http://europa.eu/rapid/press-release_IP-18-6161_en.htm.

FAO. (2018). *Nutrient flows and associated environmental impacts in livestock supply chains. Guidelines for assessment.* Retrieved from http://www.fao.org/partnerships/leap/en/.

FAO. (2012). *World Agriculture Towards 2030/2050, The 2012 Revision.* June 2012. Retrieved from http://www.fao.org/3/a-ap106e.pdf.

FAO, IFAD, UNICEF, WFP and WHO. 2018. *The State of Food Security and Nutrition in the World 2018. Building climate resilience for food security and nutrition. Rome, FAO.* Retrieved from http://www.fao.org/state-of-food-security-nutrition/en/.

IPCC. (2014). *Climate Change 2014: Synthesis Report. Contribution of Working Groups I, II and III to the Fifth Assessment Report of the Intergovernmental Panel on Climate Change [Core Writing Team, R.K. Pachauri and L.A. Meyer (eds.)]*. IPCC, Geneva, Switzerland. Retrieved from https://www.ipcc.ch/report/ar5/syr/.

Ministry for Primary Industries. (2018). *Situation and Outlook for Primary Industries, December 2018.* Retrieved from https://www.mpi.govt.nz/news-and-resources/open-data-and-forecasting/situation-and-outlook-for-primary-industries-data/.

Wollenberg E, et al. (2016). Reducing emissions from agriculture to meet the 2°C target. Global Change Biology. 22(12):3859-3864. Retrieved from https://hdl.handle.net/10568/73438.