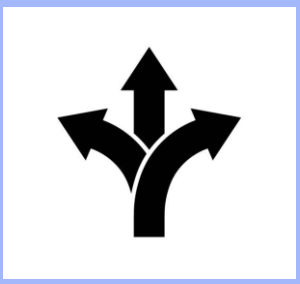
TOWARDS 2050

RESILIENT PASTURES &
THE FUTURE OF AOTEAROA NEW ZEALAND

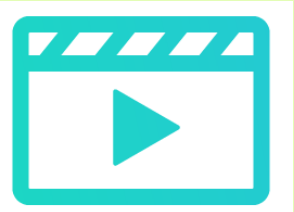
$29.4 BILLION

AT STAKE
35-40% of NZ's annual export earnings

TOWARDS 2050: FEELING THE PRESSURE
Regulatory reform
Land use change
Climate change
Carbon zero



TOWARDS 2050: REALISING THE OPPORTUNITY
Resilient pastures
Thriving communities
Premium agri-food exports
National and regional prosperity



TOWARDS 2050: TACKLING THE CHALLENGE
Lack of readiness
Pan-sector RD&E surge
Public + private investment
Community, science and business collaboration

A Green Paper based on the
2021 Resilient Pastures Symposium
February 2022

Contents

Introduction

New Zealand's unique grass-based farm systems currently face three existential challenges.

- *Perennial pastures are failing in some regions; climate change modelling predicts such failure will become more widespread in the next 30 years.*
- *Land use change is removing pastoral land from animal production.*
- *Simultaneously, we must significantly adapt farm systems to meet pressing community, environmental and consumer expectations.*

Our farmers transform sunlight and grass into highly nutritious human food, at very low financial cost, better than anyone else in the world. Their success is built on world-leading knowledge and systems honed over many decades.

Temperate pastoral agriculture consistently earns 35-40% of our country's export revenue, and covers approximately 40% of our land area. Natural, high quality, free-range food and fibre grown on resilient farms have a bright future. They are sought-after by global consumers who trust and value the New Zealand brand, and have strong potential for increased export value.

Without prompt intervention through rapid adaptation to new production methods, however, changing climate, land use and social-cultural expectations seriously threaten this future.

In May 2021, over 200 leading industry stakeholders met at a specially convened symposium to consider how we can best ensure a strong, vibrant pastoral agricultural sector in 2050.

They concluded that, at present, New Zealand grass-based farming is ill-prepared for the rapid changes ahead, let alone for achieving sustainable growth in future value.

They also noted solving these problems takes decades due to the long-term nature of plant research and breeding. The longer investment in solution development is delayed, the greater the risk that the economic and social benefits New Zealand enjoys from pasture-based livestock industries will be eroded.

This report outlines why, and recommends strategies to support thriving, resilient agricultural land use for the good of all New Zealanders.

Roadblocks and recommendations

Climate change and land use transitions are looming tipping points threatening pastoral agriculture's ability to continue as is, let alone to grow the New Zealand economy.

> Recommendation 1: To enable public and private investment, a clear value proposition for the ability of resilient pastures to meet environmental, economic and social goals is developed at farm, community/regional and national levels, including the consequences of failure to adapt to these rapidly changing settings.

The landscapes and climate of Aotearoa are unique, and adaptations and solutions need to be locally developed.

> Recommendation 2: A regional network of demonstration hubs for a range of new forage options and systems be jointly funded by public/private partnerships, and be overseen by local collectives of farmers, consultants, researchers and rural professionals, merging resilient pasture principles with current community initiatives such as catchment groups to provide connectivity and expertise.

We lack critical information about our pasture resource.

> Recommendation 3: A national inventory of New Zealand's current forage base, performance trends, insect pests, weeds and diseases be undertaken, and this information used to identify key areas of future risk and potential.

Intellectual capability, and the integration of that capability into practice change and regional development activities, has eroded over time and in its current form cannot support major challenges to pasture resilience.

> Recommendation 4: A culture of engagement between farmers and their communities, and sector-supporting organisations (including Crown Research Institutes, universities, plant breeders and other key technology developers) is incentivised to jointly discover new resilient pasture options based on sound science principles. This culture is to include providing direct support for farmers to find optimal system solutions.

1. Purpose

This paper reveals key issues and opportunities facing approximately 50,000 people on +13 million hectares of farmland underpinning New Zealand's pasture-based exports. It reflects the analysis of 240 pan-pastoral industry stakeholders at the Resilient Pastures Symposium (RPS) at Karapiro in May 2021[1].

The Symposium[2] was convened by the New Zealand Grassland Association (NZGA) in response to disturbing trends in a) the productivity of our unique pasture base; b) land use change, and c) the 'knowledge economy' that supports sustainable food production in Aotearoa New Zealand.

a) Both farmer observation, and recent evidence from industry and research, show pasture performance is stagnant or declining. On-farm impacts of climate change and new environmental regulations will further challenge key metrics such as pasture eaten per hectare.

b) Market forces are driving significant land use change away from pastoral agriculture. Chief among these is the rising price of carbon and the move toward 'carbon farming' which is out-competing traditional hill farming enterprises in terms of financial returns.

c) Significant capability in pasture research, extension, and on-farm management execution has been lost in recent decades as funding models and priorities have changed. We no longer have enough expertise to quickly and effectively tackle the challenges ahead.

    → *This in turn has eroded farmer engagement with, and trust in, key science organisations and forage plant breeding companies. Farmers feel their needs and expectations are poorly recognised and often misread. This is especially so in northern regions where climate change is impacting significantly now.*

This paper seeks to prioritise pastures among those making decisions about where best to allocate scarce resources. It also seeks to guard against risky, unfounded assumptions that our existing farming support systems, knowledge and tools are adequate for meeting future challenges, or that the right solutions can be readily adopted from other parts of the globe.

[1] Agricultural service providers (35%); researchers (32%); farmers (15%); consultants (10%); sector governance (5%) and others.

[2] See Appendix A.

2. Context

High value animal products from pasture-based farm systems have consistently provided 35-40% of New Zealand's total goods and services export earnings of $80-85 billion[3].

Pastoral agriculture also generates around 4% of New Zealand's GDP[4]. The importance of this contribution has been cast in stark relief as the Covid-19 pandemic slashed earnings for other key export sectors such as tourism and international education.

While other parts of the economy faltered during the pandemic, export prices and demand for our natural, pasture-based primary products have remained strong, sustained by global recognition of New Zealand's unique production systems.

One in three New Zealanders lives regionally, where people cannot always access the same services and job opportunities as those who live in major urban centres. Critically, use of the New Zealand landscape by grazing ruminants provides more than just a source of income to farmers. **Every $100M of GDP generated from pastoral agriculture supports 700–800 jobs across 15 sectors of the New Zealand economy[5]**. Two-thirds of these jobs are retained in the regions, supporting the social and physical infrastructure of rural communities.

Culturally, our pastoral rural landscape anchors the identity of all New Zealanders.

Our livestock farms have been shaped by climatic, topographical, soil and market factors unlike any in the world. Over the past 150 years, we have developed unique temperate pasture systems, based predominantly on ryegrass[6], typically grown with white clover.

Long proven productive and resilient, these systems are, on closer analysis, ecologically vulnerable.

Failure of such pastures to survive beyond two or three years in northern dairy regions is now irrefutable, raising alarm about continued performance loss in a changing climate, and the environmental cost of more frequent pasture renewal. Hill country pastures are also suffering loss of production[7].

As the climate changes, those vulnerabilities are likely to be magnified by associated changes in insect biology[8].

[3] MPI June 2021
[4] Source required for % GDP
[5] Doole et al. 2021
[6] NZPBRA Proprietary Seed Sales Statistics 2020
[7] Gobilik 2017
[8] Mansfield 2021

New Zealand's maritime, humid climate is unique and does not 'map across' to any substantive analogue regions of the globe from which pasture solutions could be readily adapted[9].

All these points highlight one conclusion: **solutions to the challenges facing our pastures and pasture-based farm systems must be largely developed in New Zealand.**

Our farms are entering a period of rapid, deep change. Evolving consumer and public expectations have been given voice in National Policy Statements for Fresh Water Management and Indigenous Biodiversity as well as accounting for greenhouse gases through He Waka Eke Noa.

The scope and pace of change demands simultaneous solutions on multiple fronts: production; profit; freshwater quality; nutrients; greenhouse gas emissions; animal care, and consumer trends being among the headline issues. Importantly, solutions to any one of these challenges cannot result in poorer outcomes for others.

While disturbing, the situation we now face is surmountable. We take heart from the fact that **high value edible animal protein products from pasture-fed cattle and sheep are a unique New Zealand asset**, with embedded 'nature positive' attributes and production efficiencies that are not easily emulated. We are world leaders in pastoral farming, with an invaluable competitive advantage in top-quality, grass-fed food and fibre. The Primary Sector Council took an optimistic view of the future:

> *"Our primary sectors can lead across the three pillars of New Zealand's economic recovery to achieve … ambitious targets:*
>
> ***Productivity**: add $44 billion in export earnings over the next decade via a focus on creating value and building off the strong position of our core sectors."*
>
> Primary Sector Council (PSC). 2019. *Fit for a Better World. Accelerating our Economic Potential*.

In the absence of emerging new industries each capable of contributing $10 billion per annum to New Zealand, this vision to grow total primary sector exports value in the next 10 years implies our pasture-based farm contribution needs to increase in total value substantially by 2030.

The collective, emphatic opinion of pan-pastoral industry stakeholders behind this paper is that we cannot achieve that as things stand.

[9]Garcia 2021

3. The Value Proposition

The Primary Sector Council vision for primary sector leadership of New Zealand's economic recovery highlights the 'strong position of our core sectors' as a vital building block for the future. This begs several questions.

- Just how strong is the physical and human resource base currently supporting pasture performance in New Zealand?
- Can it withstand the disruptions ahead?
- What would be the consequences of failure to adapt to a more resilient state?

At present:

- Climate change preparedness and adaptation is seriously under-developed.
- We urgently need an action plan for pasture innovations to reduce livestock methane emissions.
- More work is required on reducing nutrient and sediment losses from pasture land.
- We must resolve poor physical/biological resilience of pastures under current and future stressors, especially in the upper North Island.
- Causes of static and/or declining rates of pasture harvest on top farms in most dairy regions need to be rectified.

Meantime, direct RD&E investment (estimated at approximately $70 million per annum from public, industry-good and private/commercial businesses) equates to just $6.40/hectare, or 0.23% of the average export value generated from each hectare of pasture[10].

Much public investment in particular is short-term and reactive, targeting environmental improvement, at the expense of longer-term industry development and adaptation.

Pasture receives about 10% of total private and public sector investment in all primary industry sectors while underpinning 60+% of their combined export earnings. This level of investment will not support the 'strong position' that the Primary Sector Committee argues is needed to build future value.

Investment in pasture-related RD&E has fallen steadily in recent decades, especially from public sources. Implications of this are developed further in Sections 4 and 5. New approaches to attracting and managing investment are required.

Interest from public, industry-good and private investors in pasture-related innovation and development will only accrue if there are clear and compelling environmental, economic, and social benefits in investing.

[10] Chapman 2021

We recognise that climate change and land use transitions are looming tipping points threatening pastoral agriculture's ability to continue as is, let alone to grow the New Zealand economy.

> ***Recommendation 1: To enable public and private investment, a clear value proposition for the ability of resilient pastures to meet environmental, economic and social goals is developed at farm, community/regional and national levels, including the consequences of failure to adapt to these rapidly changing settings.***

4. Innovation

Knowledge gaps

We lack understanding of our current pasture resource. Without better information in this area, we cannot develop the most effective strategies to adapt to immediate and future challenges.

Developing pasture technologies for the future takes 12-15 years from inception to delivery,and requires significant up-front investment with limited commercial return for several years. If New Zealand pastoral agriculture is to adapt to what lies ahead, and fulfil its future value potential, we must review and update our existing pasture breeding objectives, technologies and funding models to ensure they are fit for purpose[11]. The possible benefit of gene editing in particular merits revisiting in this context.

Guiding principles and practices

Successful pasture innovation entails complexity and a multi-tiered approach, capable of accommodating regional and national imperatives alike, with equal emphasis on both practical application and new thinking.

Our guiding principles for innovation are:

- Accelerate – act fast to build momentum.
- Anticipate – audit existing forage, weeds and pests; model likely climate outcomes, and identify variations/exceptions in regional responses.
- Collaborate - agree on measures needed, combine resources, share successes.

Practices would include:

- Co-development with all parts and partners of all pastoral sectors.
- Commitment to long-term collaboration and ownership of future models.
- Co-investment in processes to develop and deliver regional and cultural solutions.
- Integration of regenerative/organic/cultural/Mātauranga processes.

Themes emerging at the Symposium that are related to these practices are developed further in Section 5.

[11] See Appendix B

We recognise that the landscapes and climate of Aotearoa are unique, and that adaptations and solutions need to be locally developed.

> ***Recommendation 2: A regional network of demonstration hubs for a range of new forage options and systems be jointly funded by public/private partnerships, and be overseen by local collectives of farmers, consultants, researchers and rural professionals, merging resilient pasture principles with current community initiatives such as catchment groups to provide connectivity and expertise.***

We recognise that we lack critical information about our pasture resource.

> ***Recommendation 3: A national inventory of New Zealand's current forage base, performance trends, insect pests, weeds and diseases be undertaken, and this information is used to identify key areas of future risk and potential.***

5. Capability

Human capability dedicated to pastures and pasture-based systems limits our ability to meet the challenge of Te Taiao and the Primary Sector Council.

Engagement

The ability of our farms to evolve and adapt, retaining the critical function of providing for local and national wellbeing, must be at the heart of any future strategy. Our rural communities have demonstrated their resilience many times in the past, but regulatory, land use and climate change now challenge the pasture base on which their ability to grow and prosper depends.

History has shown that, to achieve positive change:

- Practical policy development and implementation must be a shared responsibility with active engagement from all key stakeholders.
- Co-design must be led by rural communities and iwi as they are at greatest risk of loss of autonomy and livelihood.
- Highly engaged local groups, supported by science, engender the greatest gains.
- Reconnection of researchers with local communities will enhance the rate of change and adaptation.

Skill gaps

'Fit for a Better World' acknowledges growth in the value of New Zealand primary industries will demand significantly more people, with improved training, support and diversity.

As noted in Section 4, the three essential components of advice and extension to farmers (science and research, education, and technical advice) are disconnected and function independently. Links between research and training back to policy and funding are broken. Finally, trust in science, both at policy level and by end users, has waned.

Government policy and many industry programmes reinforce the key role of rural professionals in improving farm systems at all levels (climate change, greenhouse gas emissions, freshwater quality, biodiversity, health and safety, mental health, animal care, improved productivity and profitability). But in the absence of rural professionals with greater understanding of whole farm systems, environmental best practice and regulatory change, this approach can be only partially effective.

We must grow this capability for the future so these skills are embedded in our agricultural sector well before 2050.

Community successes

Initiatives such as Regenerative Agriculture and community catchment groups have potential to change the culture toward community-led discovery combining local and national expertise. Catchment groups are a good example of local groups using their knowledge and networks to develop local solutions (a Mātauranga approach) to protect our waterways. Regional expertise in project governance and securing professional input to address local issues is growing as a result.

This thinking also provides a trusted framework where new knowledge is developed and delivered through local networks, allowing adaptive responses to change and helping ensure future community resilience.

Some of the critical challenges to pasture resilience can be met through these types of initiatives. The lead being taken by MPI in implementing a much more strategic and better coordinated approach to investment is an excellent step in the right direction.

From a pasture resilience perspective, two things must happen to capitalise on these new ways of working, in addition to the points raised in Section 4:

1. Pastures are recognised as a key part of the solution to many of the pressing issues being addressed in regional/local projects. As noted in the final paragraph of Section 1, 'Purpose', a view frequently and strongly expressed at the RPS was that this point has been lost over the past two decades.
2. Science sector organisations incentivise their staff to contribute their much-needed skills and knowledge to regional and community projects. The direct impact of applied science on regional and national prosperity should be highly valued, not downgraded within science sector assessment criteria.

Intellectual capability, and the integration of that capability into practice change and regional development activities, has eroded over time and in its current form cannot support major challenges to pasture resilience.

> ***Recommendation 4: A culture of engagement between farmers and their communities, and sector-supporting organisations (including Crown Research Institutes, universities, plant breeders and other key technology developers) is incentivised to jointly discover new resilient pasture options based on sound science principles. This culture is to include providing direct support for farmers to find optimal system solutions.***

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APPENDIX A

The Resilient Pastures Symposium

The Resilient Pastures Symposium was organised by the NZ Grassland Association and held in Waikato in May 2021.

It was modelled on two previous and influential events, the 2011 Pasture Persistence Symposium and the 2016 Hill Country Symposium. Both contributed to important new initiatives for NZ's pasture-based farm sector, including the DairyNZ Forage Value Index; the Red Meat Profit Partnership; and formation of the Primary Sector Council.

The 2021 Symposium sought to shine a spotlight on past successes and future challenges associated with management of pastures that cover approximately 13 million hectares of NZ's land surface.

It featured several review papers delivered nationally and internationally recognised experts covering the current knowledge base regarding climate change, environmental impacts, Mātauranga Māori approaches to building resilience, soils, plants, pests, grazing management, systems design and Regenerative Agriculture.

The programme also included:

- Analysis of the Australian experience of climate change in that country's grazing industries, as a means of foreshadowing potential impacts in New Zealand.
- Invited papers delivered by farmers with a particular focus on Northland as the frontier region for climate change in New Zealand; and the people aspect of non-resilient pastures.
- Several papers reporting new technical information, much of which was prompted by the 2011 Pasture Persistence Symposium
- A 'virtual bar' session with five leading farmers sharing their perspectives on what resilient pastures meant for them.
- Structured workshops designed to elicit priorities and actions required for future success.

These workshops featured direct challenges from farmers back to science, support organisations and funders to act on their messages regarding the pace of climate change; their sense of being disconnected from and often misunderstood by research and technology organisations, and the ramifications of under-resourcing pasture RD&E in the current climate emergency.

That feedback provided much of the raw material for this paper. Further content can be found in *Grassland Research and Practice Series 17: Resilient Pastures Symposium*.

APPENDIX B

The Pastoral Industries Forage Strategy

In 2017, DairyNZ, Beef & Lamb New Zealand, the Fertiliser Association of New Zealand and the Foundation for Arable Research, AgResearch, the New Zealand Plant Breeding and Research Association jointly published a Pastoral Industries Forage Strategy discussion paper.

This 20-year vision of the strategy was to grow the sustainability and profitability of individual farmers and the long-term prosperity of New Zealand by increasing the value of forage grown on New Zealand farms. At the core of this are sustainable and profitable forage-based grazed farm systems.

Developed in response to a lack of a framework for investing in the industry, the unified plan sought to chart a way in which stakeholders could formally work together for the benefit of the whole industry. It contained a wide-ranging overview of the importance of pasture-based farm systems to New Zealand; a comprehensive case for a united forage strategy; future challenges facing the forage sector, and detailed recommendations.

The plan was split into four themes:

Working Together, in the recognition that multiple agencies are competing against each other for Government funding in the sector, resulting in lost opportunities and market failures

Forage Improvement, where broadening the scope of species development beyond the current small number of key temperate species, extending pasture renewal beyond cultivatable land, and, improving environmental outcomes were identified as key prioroties

On-Farm Innovation, where the critical importance of converting forage innovations into workable solutions for farmers was noted as an important area for industry investment

Ready and Responsible, which recognised the impacts that rapidly changing market and environmental settings will have on future forage use and development.

In 2021, these high-level themes recurred repeatedly during the Resilient Pastures Symposium and remain very relevant. Farmers attending the Symposium clearly expressed frustration that progress on them has been minimal.

The discussion paper can be found online at Beef & Lamb New Zealand beeflambnz.com/your-levies-at-work/national-forage-strategy.

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