

NZ GRASSLAND ASSOCIATION

Fuelled by Science, Tempered by Experience

GRASSLAND NEWS

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President's Welcome

Dr Warren King

Happy New Year!

With 2020 now behind us it is time to look forward with optimism to 2021. And there is a lot happening. While NZGA held no face-to-face meetings last year, there are two significant events this year: the Resilient Pastures Symposium (11/12 May) and the NZGA Annual Conference in Invercargill (9-11 November).

The Resilient Pastures Symposium will be held at the Don Rowlands Centre (below) at Lake Karapiro near Cambridge



and planning is well advanced. With many of the papers now through the refereeing process it is clear that the programme will deliver thoughtful reviews, new data and future-focused insights too. The aim is for the RPS to help set a pathway forward based on solutions to pasture's current and future challenges.

This year's conference in Invercargill will be special for many reasons. Firstly, it's Invercargill of course! We will also be welcoming once again our friends from the NZ Agronomy Society, who add significantly to the breadth of the programme.

In addition – for the first time – we will be joined by the NZ Society of Animal Production. Having been to NZSAP conferences in the past, it is clear that their focus is complementary to that of NZGA. The programme will certainly have a lot to offer. Perhaps most of all, this will be a conference with people (COVID permitting) and I can't wait!

Invitation to Resilient Pastures Symposium 2021

Save these dates in your calendar!

Preparations are underway for the Resilient Pastures Symposium in **Hamilton, 11th and 12th May 2021**. This Symposium aims to follow up on issues raised in 2011 at the Pasture Persistence Symposium, also held in Hamilton, to set a pathway forward based on understanding pasture's challenges.

The 2021 symposium will gather New Zealand's leading farmers and pastoral experts, both commercial and scientific, together to review progress and determine future challenges. Dr Dave Chapman, RPS organising committee chair, introduces this in more depth [here](#).

Registrations will open in early March so keep an eye out for that on the [Events page of the NZGA website](#).



NZGA for over 80 years

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Why do we not terrace more hill slopes for agricultural production in Aotearoa/New Zealand?

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Introduction

New Zealand society has set agriculture the goal of reducing its environmental impact. In addition, the New Zealand Government is urging diversification within catchments and increased resilience for farms and rural communities. A technique from the past, still used in some parts of the world, could be of assistance – terracing.

The practice of terracing hill slopes for agricultural production probably had two separate regional origins – dryland terracing in the Near East, and wet field terracing in south-east Asia. Dryland terracing began five to ten thousand years ago and the technology migrated west into Europe, south into North Africa, and east into the southern Pacific (Spencer & Hale 1961) where it was widely practiced



The rice terraces of Longji, in Guangxi, China - an ancient farming technique that conserves water and slows erosion. [Link to image](#)
Source [here](#)

throughout Polynesia (Leach 1984). Ten terrace forms have been recognised but the key functions common to virtually all of them were maximising productive use of available water and retention of silt. The modern practice of contour ploughing on moderately sloping land effectively forms mini terraces with the same functionality. The contemporary agricultural landscape of New Zealand hill country is distinctive for the almost complete absence of man-made terraces.

Terracing land for food production in pre-European Aotearoa/New Zealand

Terracing hill slopes for food production was practiced by Māori in pre-European New Zealand (Bulmer 1989). In his book 'Maori Agriculture', Best (1925) has reports from 1830-1840 describing hillsides terraced for production of kumara and taro at several North Island sites and the Pelorus district in the South Island. Leach (1984) and Davidson (1984) both mention terraced Māori gardens, but the extent of terracing is not made clear. Some terraces

were reported to have stone facings (Davis & Ladefoged 2013) or were faced with logs held in place with large wooden pegs.

A photograph of a clearly terraced hill slope at South Head, Porirua Harbour is shown in Ongley (1931). The origin of these terraces was originally contentious – they may have been formed by wave action, and subsequent uplift rather than being man-made. However, the presence of sand and gravel transported from the beach points to their use for crop production. Macnab (1969) suggests that the use of terracing in the Wellington district enabled improved yields of the tropical origin root crops that were close to their low temperature limits in this region.

Although it is certain that Māori did terrace hill slopes for food production, the over-all extent of terracing is unclear, and sometimes the supposed function of recorded terraces is not given e.g. Middleton (2003). The practice seems to have stopped around the time of European colonisation. Macnab (1969) suggests that the introduction of more cold tolerant European crops e.g. potatoes and wheat, may have decreased the need for the terracing that was required historically to grow more warm-adapted plants.

Terracing created by stock treading on hill slopes

The relationship between increasing slope angle and decreasing pasture production is well established for New Zealand hill country (Lambert et al. 1983; Douglas et al. 2016). Over time, stock treading across hill slopes creates 'paths' or 'tracks' that are in effect mini terraces with higher fertility and moister soils than the adjacent slopes. The improved edaphic conditions on the tracks leads to dominance by ryegrass and white clover (Levy 1970; Rumball & Esler 1968).

Potential advantages and difficulties of terracing hill country pastoral farms

Terracing hill country would provide several environmental benefits compared with traditional sheep/beef systems. Because terraces reduce surface runoff and retain silt, they could make a useful contribution to improving surface water quality with far-reaching downstream benefits from less siltation. Despite this, terracing was not considered within mitigation options in a review by Dodd et al. (2016) of contaminant losses to water from hill country farms.

Terracing for horticultural cropping could also allow a reduction in the number of ruminants being farmed on hill country, with consequent reductions in methane emissions, and faecal coliform bacteria in waterways. Cropping would also allow targeted ground-based application of fertiliser and lime rather than aerial application across the landscape. This would reduce the risk of direct entry of nutrients into waterways.

There is limited contemporary New Zealand experience of terracing for crop production. Exceptions include the Akarua 25 Steps Vineyard in Central Otago with grapevines on a steep terraced hill slope (See <https://akarua.com> for an image) and the Esk Valley Terraces Vineyard in Hawkes Bay. However, New Zealand has considerable capability and experience in geotechnical engineering and landscape modification from roading projects in hilly areas. It should be possible to terrace a hill slope and replace the topsoil while controlling silt loss. The set-up costs will be substantial, but there is potential to replace low-value hill pastures with higher value horticultural systems. The payback period is unlimited, with some European terraces dating back two millennia.

Integrating alternative land uses into hill country sheep/beef operations will be challenging. However, if the poorest, least productive hill slopes are terraced it might not reduce the farm's pastoral productivity significantly. In fact, it could increase the overall farm's profitability with higher-value options – achieving the diversification being urged by government. The different growing conditions on north and south aspects would allow for crop diversity, adding resilience to farm incomes. More diverse and intensive use of hill country through terracing would contribute to more resilient local communities. This would be especially true if local processing of crops into higher value products was carried out by local cooperatives.

So, why do we not terrace more hill slopes for agricultural production in Aotearoa/New Zealand? One possibly important factor was European colonisation dominated by settlers from the United Kingdom where terracing was not part of the agrarian culture. Faced with an abundance of land – whether acquired by fair means or foul, there was no economic or cultural incentives to terrace hill slopes and diversify production. For Maori the introduction of more cold tolerant European crops would have decreased the need for terracing as a technology to avoid cold air ponding in valley bottoms. This was historically necessary for growing warm-adapted species originally sourced from more northern sites in the Pacific. Evaluating the potential of terracing in our hill country could be done in three stages

as indicated below.

Modelling of growing conditions on different aspects of hill land in different regions, to identify what crops might be grown.

A geotechnical analysis of soil conditions at a range of sites to identify areas where lowest cost, stable terracing might be done.

Establishment of some pilot scale terraced sites and monitoring them for productive performance and environmental impacts.

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Call for papers for Invercargill 2021 - 83rd NZGA Conference

Invercargill: 9th-11th November 2021

Theme *"Grazing the Deep South"*

Key conference themes

- * Wintering systems
- * Farm systems for the future
- * Water quality management systems
- * Forages for a future climate

We are seeking papers relevant to NZ's grassland industry for inclusion in the Journal of New Zealand Grasslands. These will be published as Vol 83 of JNZG.

Topics to include, but not restricted to:

1. Hot topics, cool solutions - the latest grassland science
2. Future farming, farm systems and innovation
3. Grazing management
4. Soils, fertility and environmental management

5. Dairy and alternate dairy options
6. Environmental impacts and mitigations (Inc. climate change)
7. Biodiversity, forestry on farm and alternative land uses
8. Pests, weeds and diseases
9. Plant breeding and genomics (inc. cultivar performance)

Please submit your summary on the official form, which is available at the Journal of New Zealand Grasslands homepage [here](#). Abstracts are to be submitted by **Friday Feb 19 2021** to: jnzgeditor@outlook.com

Authors will be notified in late March whether or not their paper offer has been accepted. The deadline for submission of full manuscripts is **Monday 17 May 2021**.

The editor reserves the right to return manuscripts that do not follow NZGA Guidelines.

Ray Brougham Trophy Winner 2020 - Dr Gerald Rys (MPI)

In a normal year the NZ Grassland Trust would announce the winner of the Ray Brougham Trophy at the conference dinner. However, 2020 was not a normal year and the Trust therefore chose to make the announcement during the [online conference](#) in Nov 2020 that the winner of the **Ray Brougham Trophy for 2020 is Dr Gerald Rys**.

Gerald has been Principal Science Advisor at MPI since 2012. Most recently he has been providing science and evidence into policy in resource areas of contaminants, climate change, water, forage, land use, nutrients, soils, precision agriculture, and extension and adoption. He has also been providing advice on policies for national science particularly MBIE including National Statement of Science Investment, new contestable funds, CRI core funding, funding for databases and collections, National Science Challenges particularly Our Land and Water, Regional Research Initiative, and proposal evaluator Endeavour Fund MBIE.

Prior to being Principal Science Advisor he was Senior Scientist, Natural Resources Group at MAF for 12 years. Before that he worked for Ministry of Research, Science and Technology in a variety of roles for 10 years, having come from MAF Technology where he was scientist for 15 years. This background in agricultural research has resulted in Gerald

being a strong advocate for value derived from pastoral agricultural research.

Gerald is the author or co-author of over 170 scientific, technical and conference publications, 11 major departmental reports, commissioned and direct supervision of over 250 significant external contracted science reports.

Gerald has made an impressive contribution throughout his career to New Zealand science and agriculture in his roles as a research scientist, advisor in R&D funding agencies, and more recently in providing policy advice. He is considered to be the bastion of sense, science and agriculture by colleagues at MPI, where his contribution has been recognised with the 2018 Director-General's Science Prize acknowledging an exceptional science career. Gerald has received (2016) the NZSS LI Grange Medal in recognition of outstanding service to Soil Science, but his PhD was in nitrogen fixation in white clover, which makes his work key to grassland.

Please join with the Trust to congratulate Dr Gerald Rys as a worthy recipient of the Ray Brougham Trophy for 2020.

Note: the award presentation to Dr Rys by Dr John Caradus is in the 1st webinar of the [online NZGA conference](#) (at 1:05:00).

Invitation to Register for the Australian Grassland Association Virtual Symposium

JOIN US on Wednesday evenings (7-9 pm AEDT) in March 2021 - "Resilience in the face of change—pastures for the future."

Due to COVID-19 we have adapted our usual program and will instead be running a series of 4 evenings over March where you will be able to watch the presentations and par-

ticipate in an extensive question-answer session with the presenters. A single registration gains access to all 4 evenings plus after the evenings have concluded you will be able to watch any of the sessions again via the members portal on our website (access is complimentary with registration). [REGISTER Here](#)

NZGA Virtual Conference 2020—the 82nd annual conference

As a reminder to those who missed the conference in November or want to revisit some of the great presentations the programme and links are here. There is great content that is worth revisiting.

[Webinar 1](#)

Succeeding in challenging times - Bringing a global context to the future for New Zealand agriculture (Mike Petersen)

Breeding for lowered methane emissions from grazing livestock (Dr Suzanne Rowe, AgResearch)

New-generative agriculture - based on science, informed by research, and honed by farmers (Dr Jacqueline Rowarth)

Impact of winter fodder beet or kale allocation on body condition score gain and early lactation performance of dairy cows (Roshean Woods, DairyNZ)

Nitrogen leaching losses from fodder beet and kale crops grazed by dairy cows in southern Southland (Chris Smith, AgResearch)

Real time on farm N loss measurement (Samuel Dennis,

Grounded)

NZGT Ray Brougham Award - presented to Dr Gerard Rys, MPI by John Caradus (NZGT Chair)

[Webinar 2](#)

Keynote Address: Thoughts from a Newbie (Dr Sue Bidrose, AgResearch CEO)

Cutting through complexity (Dr Anna Campbell, AbacusBio)

Sheep milking - the lessons of research and on farm practice (Thomas MacDonald, Spring Sheep)

Forage Value Index (FVI) and economic weightings for sheep and beef (Cameron Ludemann)

A circular bioeconomy for NZ farm systems (Dr Vicki Burggraaf, AgResearch)

Genomic assessment of white clover and perennial ryegrass genetic resources (Marty Faville, AgResearch)

NZGA Presidents Address

Dr Warren King (NZGA) - Agricultural Transformation