

**BEFORE THE COMMISSIONERS  
At PALMERSTON NORTH**

**UNDER:** the resource management Act 1991

**IN THE MATTER OF:** an application for a **Notice of Requirement** by **New Zealand Transport Agency** to the Palmerston North City Council, Manawatu District Council and Tararua District Council for **E AHU A TŪRANGA MANAWATŪ TARARUA HIGHWAY.**

Further information requested by the Commissioners following AgResearch hearing 3<sup>rd</sup> April 2019.

Dated 5<sup>th</sup> April 2019

The Commissioners requested the following information from AgResearch after the hearings on the 3<sup>rd</sup> April 2019.

- List of field assessments and measurements from the long-term system trial.
- Documented evidence of current and planned research
- Status of other research Stations.

#### **List of field assessments and measurements from the long-term system trial**

These are listed in Table 1 (Attached spreadsheet) in chronology order in two groups, those measuring the performance of the systems (farmlets) and those exploring specific components of the systems or using the systems to conduct evaluations and for modelling.

1. Systems (farmlet) measures include animal performance, pasture growth, pasture composition (including woody species), nutrient content, soil fertility, soil carbon, phosphorus, nitrogen and sulphur measured to depth, heavy metals (Cadmium, Fluorine, Mercury, Uranium) biology, soil physical and nutrient losses.

Core measures are animal performance each year and comprehensive assessment of soil fertility, biology, physical, soil C, P, N and S and heavy metals to depth every 10 years.

2. Component measures cover pasture ecology, N fixation, N mineralisation, Nitrous oxide, nutrient losses, Cd, soil C, plant roots, through to evaluations (e.g. germplasm, hyperspectral technologies, fertilisers) and modelling.

#### **Documented evidence of current and planned research**

There are a number of current or planned future (3-10 years) lines of inquiry. The list below are all good examples of the continual demand and value of research using the long-term system trial. These projects are all developed in close consultation with our stakeholders.

- 1. Measurement of natural capital stocks and services.** Currently exploring, as part of a MBIE Regenerative Hill Country Partnership Programme lead by Beef & Lamb NZ, the use of the long-term farm system trial to expand existing measures of resources. This could include soil biology, soil carbon, physical health, diversity and function, pasture species diversity and water quality to provide a more complete picture of the condition of the natural capital stocks and flow of services as farm systems evolve. Remote sensing and digital technologies for collecting/creating spatially discrete data layers are an integral part of this work through a new digital technology platform within AgResearch and in collaboration with partners. The base line data collected over the last 44 years provides the platform for this work and a living laboratory in which to work with producers and industry in advancing sustainable practices.
- 2. Influence of agricultural practices on pedogenesis (Existing MBIE programme)**  
This study is utilising the LFNF and HFHF farmlets and a bush reserve to establish if there is any evidence to show that over human lifespans anthropogenic processes can have a range of effects on nutrient retention, soil structure and C sequestration. A field study over 12 months using in situ mesocosm lysimeters has just been finished, with future work programmed.
- 3. Soil Carbon stocks.** Understand the influence of P fertiliser and sheep stocking rate on soil C stocks and to model soil C stock change in hill pastures is a current project. As part of the stage of that research another sampling of the soils across all four farmlets is planned (2020/21) and component work on quantifying litter decomposition rates under contrasting systems (2021/22)
- 4. Impact of future climates on pastures and animal production.** Measure pasture growth and composition and soil moisture profiles across the farmlets 2019-2022

to build a better understanding of the influence of changing climate on the performance of systems with contrasting P fertility and sheep stocking rate histories.

5. **Measuring and modelling contaminants:** A complete set of soil samples to depth from across the farmlets were collected in 2014 to quantify the amounts, and distribution of a suite of nine-contaminants (including Cadmium & Fluorine). These samples have been analysed and are with the statisticians. There is also a project with Waikato University investigating Cd isotope fractionation with the view to investigating presence and movement of natural background, historic and recent cadmium, with Ballantrae a key site due to its long-term consistent management. Discussions on the use of the livestock on the long-term study to track Cd and other contaminant accumulation rates in animals will continue to be advanced.
  
6. **In addition, there are three other potential research projects that continue to receive attention in discussion with stakeholders.** All of these would have the potential to change the management of one or multiple farmlets into the future.
  - These are the greater use of forages (beyond grasses) in hill land and opportunity, but also risk to the environment.
  - The use of lime to address the issue of slow acidification.
  - The third is a shift to the greater use of N fertiliser and a reduction in the use of P, because of a combination of factors ranging from the difficulty of sourcing phosphate rocks with high P contents and low levels of contaminants, exposure to the Middle East for phosphate rock and lastly pressure domestically to reduce effects on receiving environments

#### **Status of other research Stations.**

**Te Kuiti** was not owned by MAF but for a period of time was made available for research by a private land owner.

**Kaikohe** originally owned by DSIR, was established initially to explore development option for podzols (very challenging soil order that was dug for gum) and forage and livestock systems for the sub-tropical climate found in Northland. Its role in providing a national network for forage development was transferred to Kerikeri. It was sold and integrated into the neighbouring High school farm.

**Whatawhata** was sold as part of the Tainui treaty settlement and initially leased back, but with the decline in research investment the lease was not renewed. Some water quality measurements continue in two contrasting catchments at Whatawhata.

**Winchmore (mid Canterbury)** – has a long-term fertiliser trial, under irrigation on the Canterbury plains. The long-term fertiliser site is protected through a registered lease to protect the site, for science, irrespective of tenure of the wider property.

A similar strategy has been in place for the long-term fertiliser and sheep grazing study at Ballantrae with a clear understanding of the importance of protecting the integrity of the long-term system trial into the future management of the Ballantrae Research Station.

Alec Mackay  
5<sup>th</sup> April 2019