

# FUTURE REQUIREMENTS FOR SOIL MANAGEMENT IN NEW ZEALAND

**Mackay A<sup>1</sup>, Collins A<sup>2</sup> and Rys G<sup>3</sup>.**

*AgResearch<sup>1</sup>, Landcare Research<sup>2</sup>, Ministry for Primary Industries<sup>3</sup>*

## **Abstract**

A review commissioned by the Ministry for Primary Industries identifies that the most significant pressures on the soil resource result from:

- Intensification: the addition of more chemicals, irrigation and inadequate vegetation cover;
- Land use change: fragmentation and urban expansion, as well as poor matching of land use to inherent capacity; and
- Legacy: impact of past deforestation and pests and diseases.

These pressures result in a range of proximal (effect on soil stocks including availability and condition) and distal (effect of the loss of soil function on the condition of other resources) impacts. The scale (national, regional or local) and magnitude (high, medium or low) of these impacts varies according to the ability to mitigate or reverse the impact and the relative social acceptability of impacts.

To address these pressures and impacts will require appropriate capability within and outside of the science system. This readiness will also require addressing significant gaps in coverage, scale or utility of nationally-agreed underpinning resource information and ensuring it is easily accessible to a range of users.

The study also reveals:

- Complexity in the governance of soil in New Zealand, reflecting ownership including iwi and the involvement of a diverse range of organizations, sectors and individuals in decision-making;
- That while the primary sector practises a number of soil management approaches to address these pressures, it is difficult to determine their effectiveness; and
- Greater attention is needed within our policy and planning framework to protect soil functional capacity, reduce the fragmentation of land and loss of versatile soils. This includes the development of regulatory and non-regulatory measures to ensure the full range of services provided by soils is sustained into the future.

As a result of this study a National Soil Management Group is to be established and work towards the development of Aotearoa's Living Soil Action Plan. The Action Plan will incorporate the recommendations of this study to unlock and realise the full potential of New Zealand's soils.

## Introduction

Soils are a finite resource and in New Zealand there is evidence of growing pressure on the use and availability of productive soils. Soil is fundamental to New Zealand's economy and well-being, underpinning food, feed, fibre and fuel production. Food production and agriculture is also a significant employer and export earner, employing 350,000 people in the sector (MPI, 2014). While New Zealand currently ranks third out of OECD countries for land per capita, only 5.5% of our land (1.5 million hectares) is classified as 'high-class' (MfE & SNZ, 2015). New Zealand's valuable biological-based economy depends on soils, but at the same time population growth and urban expansion is irreversibly locking up high-class peri-urban soils. Competing land uses and the implications for our soil resource are expected to continue, particularly as a result of green-field housing expansion, an expectation of economic growth from the primary sector, and as the environmental limits that safeguard natural resources, are increasingly reached (Collins et al, 2015b).

The Ministry for Primary Industries (MPI) initiated a project in 2014 to collate the evidence-base to make informed decisions on soil management. This project recognised that much of the necessary evidence is already held by the science, primary and resource sectors but has never been comprehensively collated and analysed to provide a benchmark on the state of New Zealand's soils. The project findings are published in a series of reports titled *Future Requirements for Soil Management in New Zealand* (Collins et al., 2016a, b, c) and aim to inform future policy and good practice principles to protect and realise the full potential of New Zealand's soil resource.

The major findings from each of the three phases are summarised in this paper.

**Phase 1 (Collins et al., 2016a)** sets the direction by identifying the pressures and impacts on New Zealand's soil resource and related environments (such as freshwater) concluding the following:

- The importance of soil to the environment and economy, as well as its non-renewable and finite nature as a natural resource;
- The continuing expectation of economic growth from the primary sector, but the emergent shift towards high value products and recognition of the critical role of Maori in a new paradigm for natural resource management;
- Global recognition on the need for appropriate soil governance and nationally around the need for choices to be made so natural resources such as soil are not degraded;
- Socio-economic factors are the 'driving force' that underpins the long-proud tradition we have in land development and highly productive land-based industries. However these same factors also give rise to the pressures of today and tomorrow, as well as influence the scale and severity of impacts on the soil resource;
- There are four key pressures impacting on the soil resource, including: Intensification, Land use change, Climatic change and Legacy effects. These pressures result in a range of proximal (effect on soil stocks including availability and condition) and distal (effect of the loss of soil functions and services on other resources) impacts;
- The scale (national, regional or local) and magnitude (high, medium or low) of these impacts varies according to the ability to mitigate or reverse the impact and the social acceptability of impacts;
- In agreement with past reviews, the most highly ranking pressures in today's operating landscape are:

- Intensification – particularly irrigation, the addition of more chemicals and inadequate vegetation cover;
- Land use change – especially the rising trend towards fragmentation and urban expansion, as well as poor matching of land use to inherent capacity; and
- Legacy – most notably the impact of past deforestation and pests and diseases;
- A key dependency in ensuring New Zealand’s readiness to address these pressures and impacts will be building appropriate capability within and outside of the science system;
- That readiness will also require addressing significant gaps in coverage, scale or utility of nationally-agreed underpinning resource information and ensuring it is easily accessible to a range of users; and
- That there are opportunities to ensure ongoing readiness including securing stable investment for underpinning resource information, protecting long-term trials and engaging in foresight projects.

**Phase 2 (Collins et al., 2016b)** identifies the extent to which current practice, and our policy and planning framework, addresses these pressures and opportunities, as well as looking overseas for examples of how others have addressed priority pressures and impacts, highlighting:

- The complexity in the governance of soil in New Zealand, reflecting the close links we all have with our land and its ownership and at the same time the involvement of a diverse range of organizations, sectors and individuals in decision-making;
- That many of the priority pressures identified in Phase 1 (*poor matching of land use to inherent capabilities; inadequate vegetation cover; irrigation; addition of chemicals*) are identified as issues and addressed to some degree within primary sector practice. It is however, difficult to ascertain uptake or effectiveness.
- Some priority pressures are accommodated within the current policy and planning framework through a range of regulatory and non-regulatory approaches, but policy looking specifically at sustaining soils functional capacity has yet to emerge;
- Attention is needed to ensure:
  - Pressures associated with poor matching of land use to inherent capability and fragmentation of land and loss of elite soils are better dealt with, particularly given the finite nature of the soil resource;
  - Pressures associated with emergent land uses (e.g. brought about by access to irrigation water and/or new technologies) are understood and incorporated within policy;
  - An optimal mix of regulation and non-regulatory measures are developed to ensure the full range of services provided by soils is sustained into the future; and
  - The full potential of New Zealand’s soil is unlocked and realised.
- That as a small, biologically-based country New Zealand has the ability and agility to develop the partnerships and integrated measures to realize enduring economic, ecological and social value from its soils for the benefit of the nation.

**Phase 3 (Collins et al., 2016c)** promotes a guiding vision for New Zealand soils and recommends the following future requirements for soil management:

1. Establish a National Soil Management Group to develop national soil strategy; provide leadership; inform and advise policy and practice; provide a national perspective on research; promote and monitor a capability growth strategy; and ultimately act as an advocate for soils.
2. Develop a National Soil (and land) Management Strategy to set direction on the use, policies, capabilities and research on soil.
3. Profile the importance of land and soil to the New Zealand economy and society by quantifying the actual and total potentially realisable economic value of our soils.
4. Undertake a foresight exercise to explore risks to future economy and environment by examining how soils are and might be used into the future.
5. Undertake a national prioritisation of soil research to support the national science challenges, sectors and government agencies and guide investment in R&D.
6. Agree a national suite of underpinning soil and land resource information required to inform policy and decision-making on soil management, agreeing development priorities and stable funding.
7. Create an inventory of the current and projected skills and capability in central and regional government and industry, including current and projected graduate numbers, and identify a strategy for priming the capability system, including improving competencies for extension and adoption.
8. Develop an evaluation and monitoring framework to determine the effectiveness of soil management practices, non-regulatory approaches, and policies in achieving soil management goals.
9. Investigate the form of an integrated regulatory and/or non-regulatory framework that explicitly recognises and protects soil functions from current and future pressures and gains highest value from them.

This is our opportunity to unlock and realise the full potential of New Zealand's soil – and this is the call to action.

## References

- Collins A, Mackay A, Basher L, Schipper L, Carrick S, Manderson A, Cavanagh J, Clothier B, Weeks E, Newton P, 2014, *Future Requirements for Soil Management in New Zealand. Phase 1: Looking Back*
- Collins A, Mackay A, Thomas S, Garrett L, Weeks E, Johnstone P, Laurenson S, Dyck B, Payn T, Gentile R, 2015a, *Future Requirements for Soil Management in New Zealand. Phase 2: Looking Out*
- Collins A, Mackay A, Hill R, Thomas S, Dyck B, Payn T, Stokes S, Gentile R, 2015b, *Future Requirements for Soil Management in New Zealand. Phase 3: Looking Forward*
- Ministry for the Environment and Statistics New Zealand, 2015, *New Zealand's Environmental Reporting Series: Environment Aotearoa 2015*
- Ministry for the Environment, 2010, *Māori Values Supplement: A supplement for the Making Good Decisions Workbook*
- Ministry of Business, Innovation and Employment, 2013, *The Business Growth Agenda*
- Ministry for Primary Industries, 2014, *Future Capability Needs for the Primary Industries in New Zealand.*