Sustainable Soil and Nutrient Management

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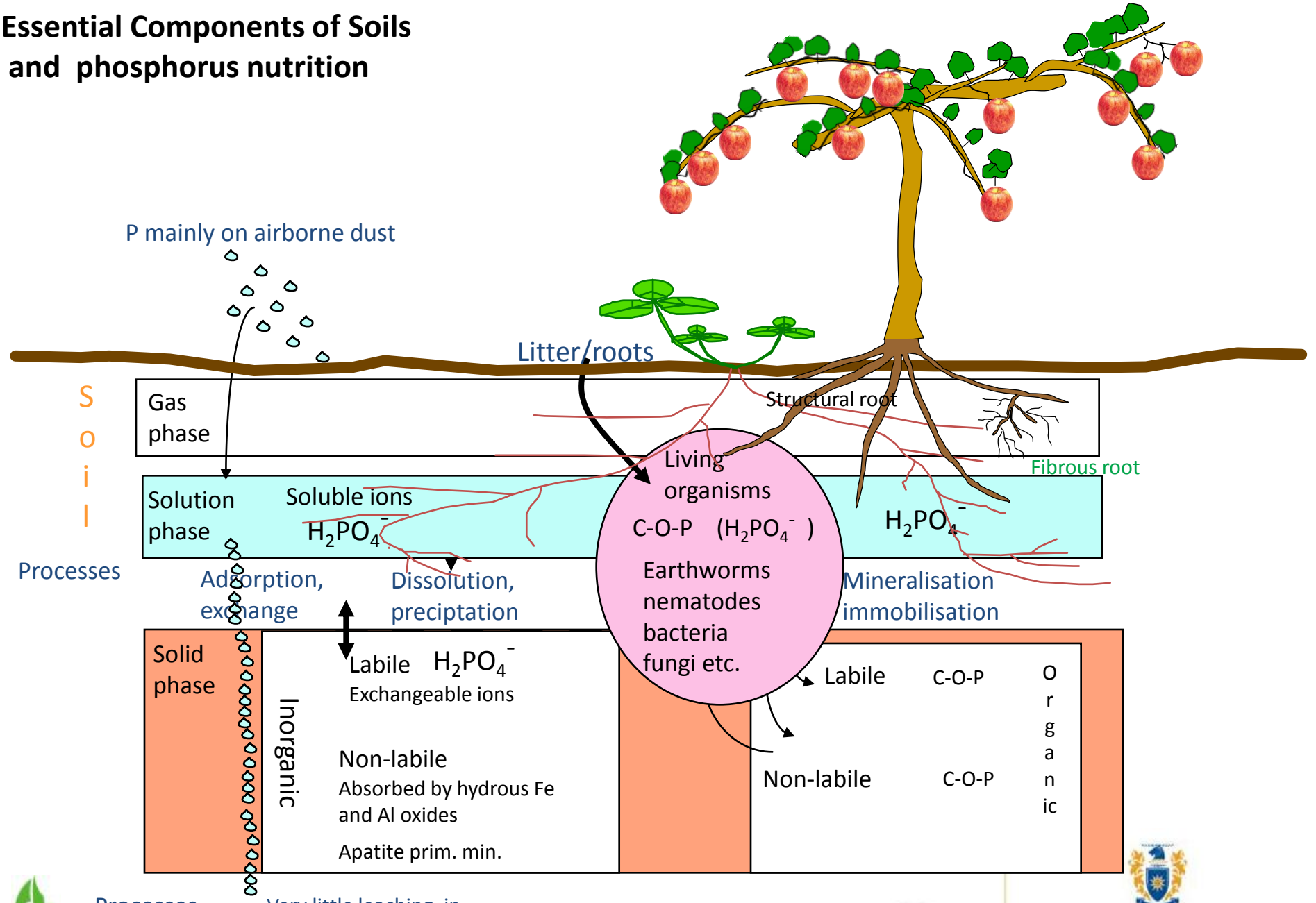
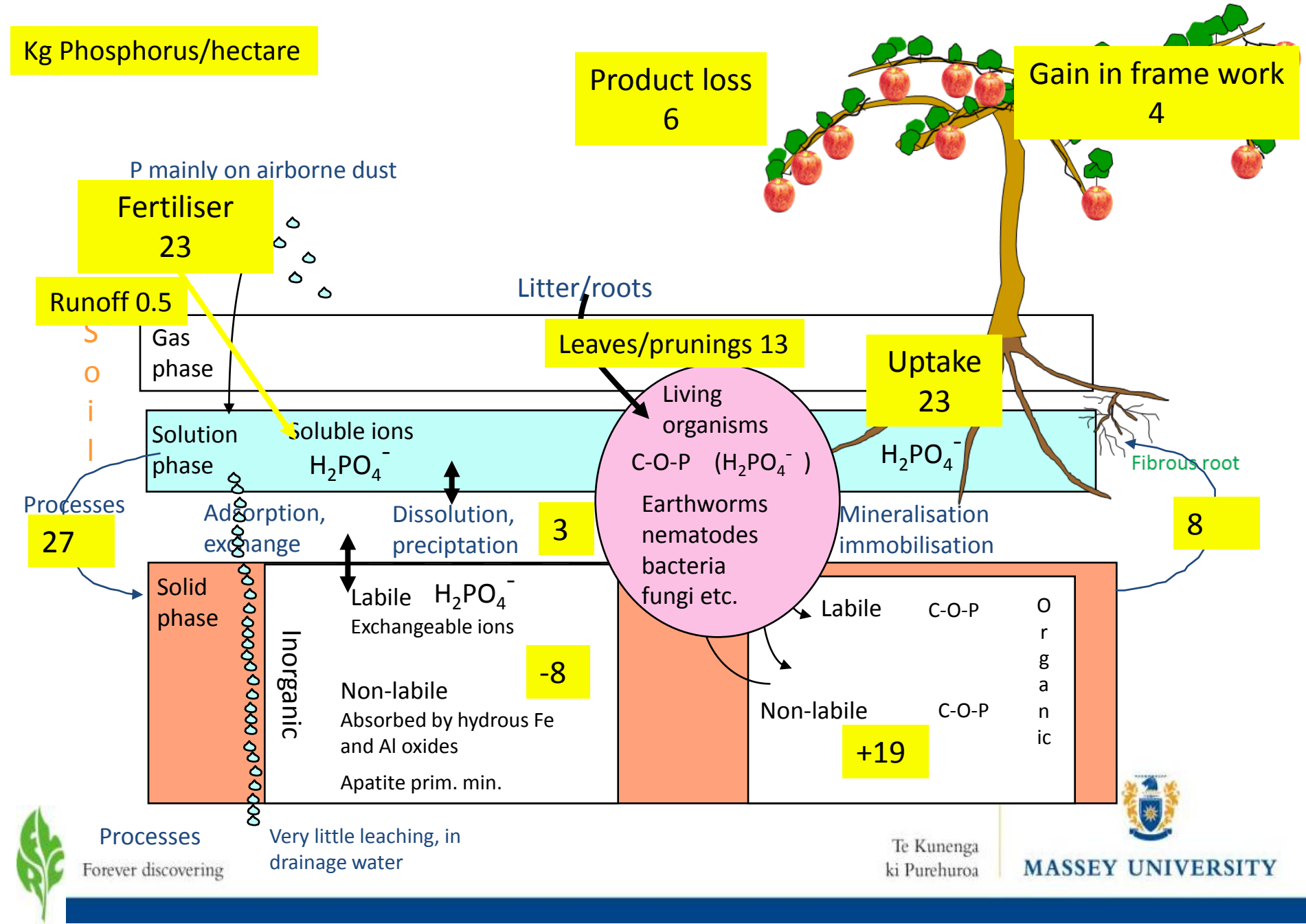
Sustaining the productive capacity of our soils.

Source: Soils in t he New Zealand Landscape - the Living Mantle, 2nd Edition", by Les Molloy

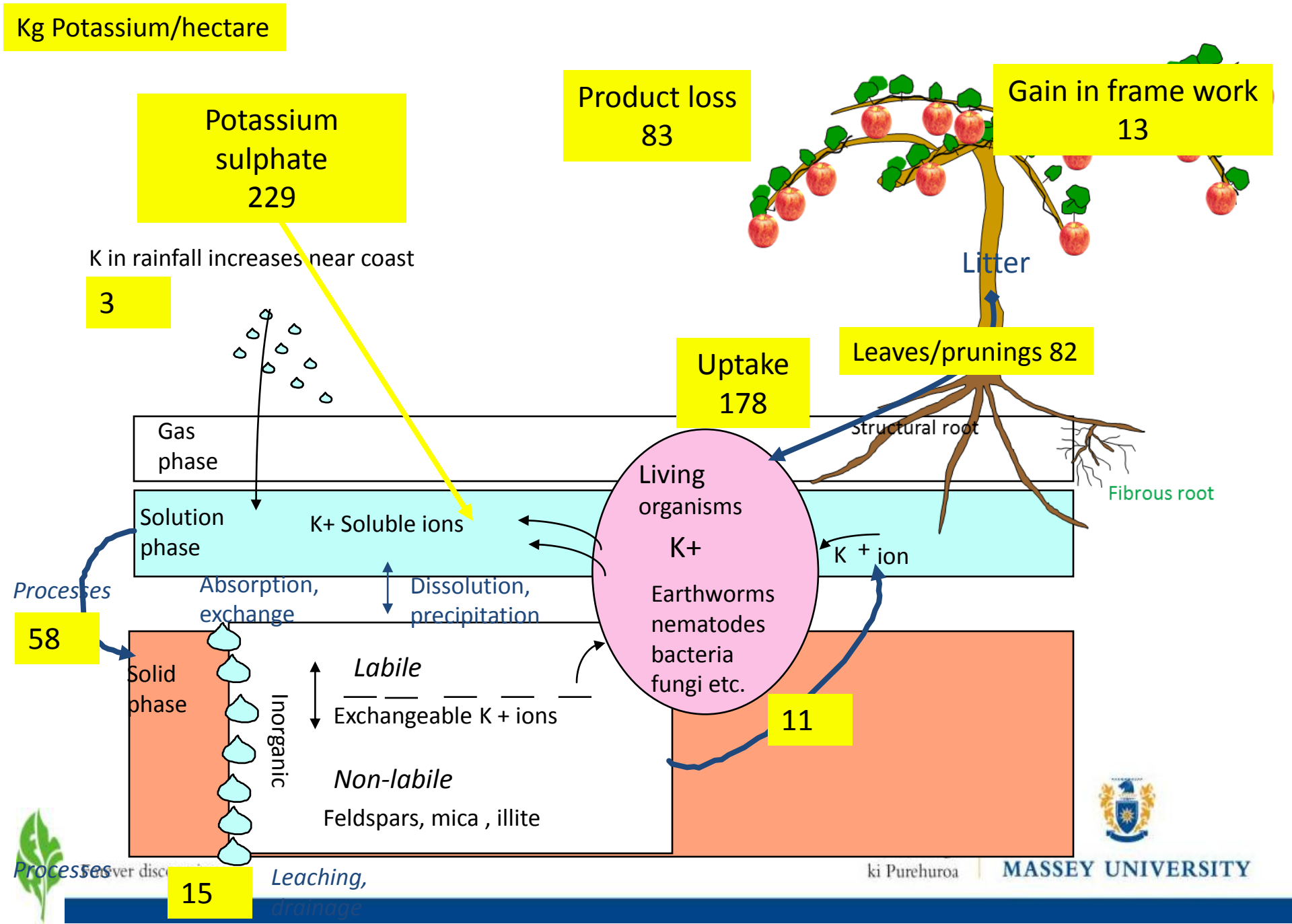
Essential Components of Soils and phosphorus nutrition



Phosphorus transformations – maintaining P supply , replacing losses Gala apple block

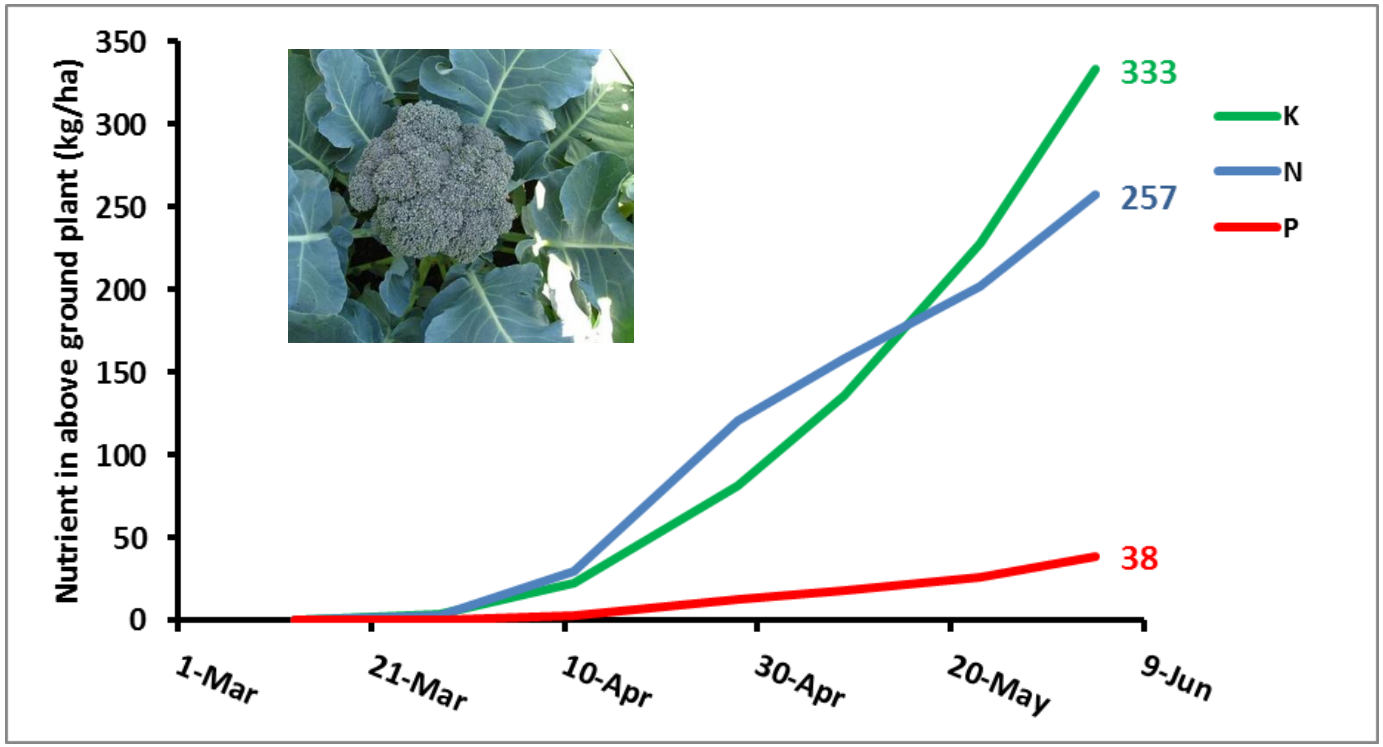


Potassium (K) uptake and removals from a Gala apple block



Field crops – take up and export large amounts of potassium and phosphate .

Nutrient uptake by Broccoli



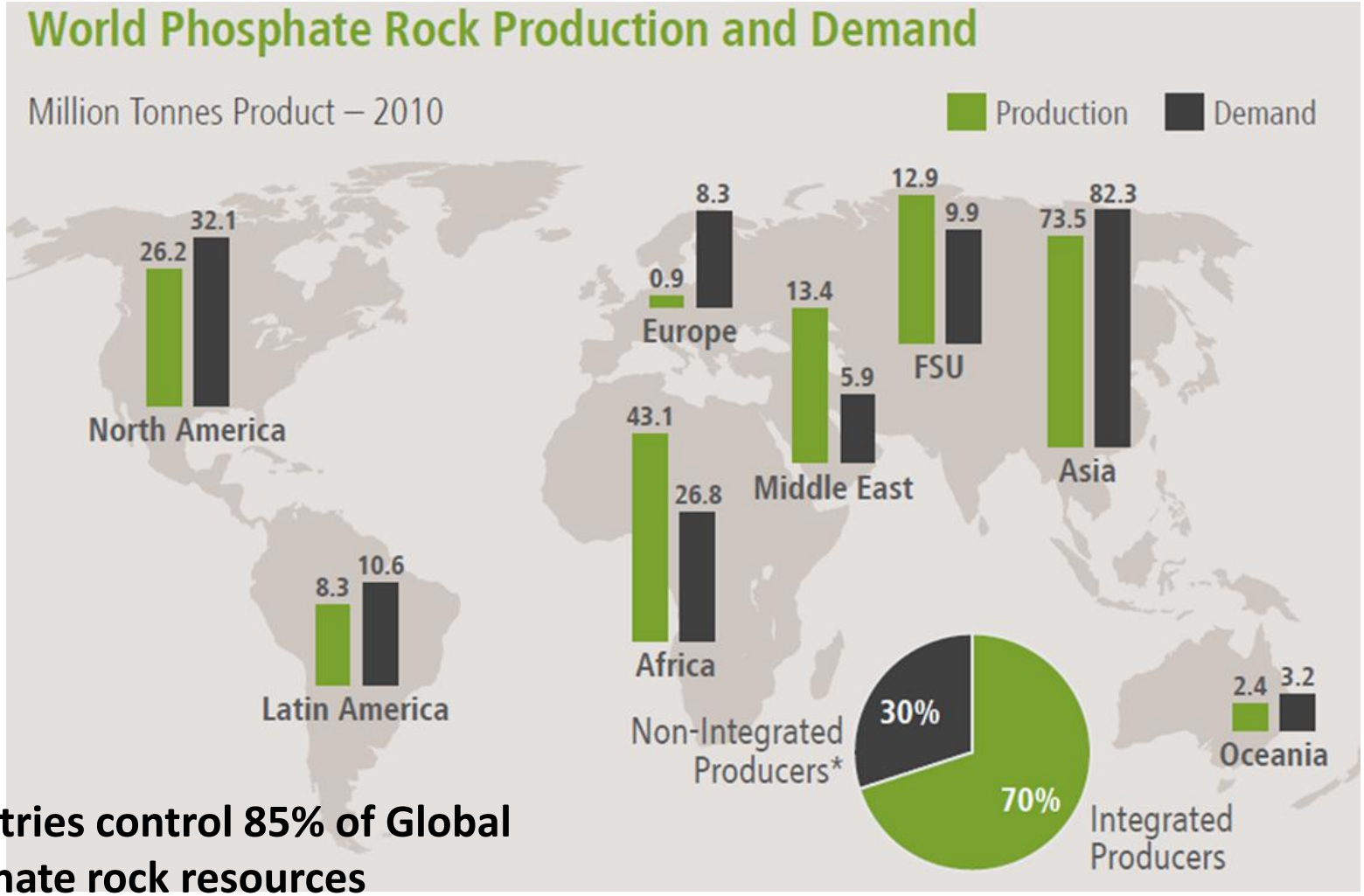
(BASF trials Levin)

Summary :

NZ primary industries depend upon significant inputs of :

Non- renewable Phosphate and Potassium

Where will our replacement P come from ?



7 countries control 85% of Global phosphate rock resources

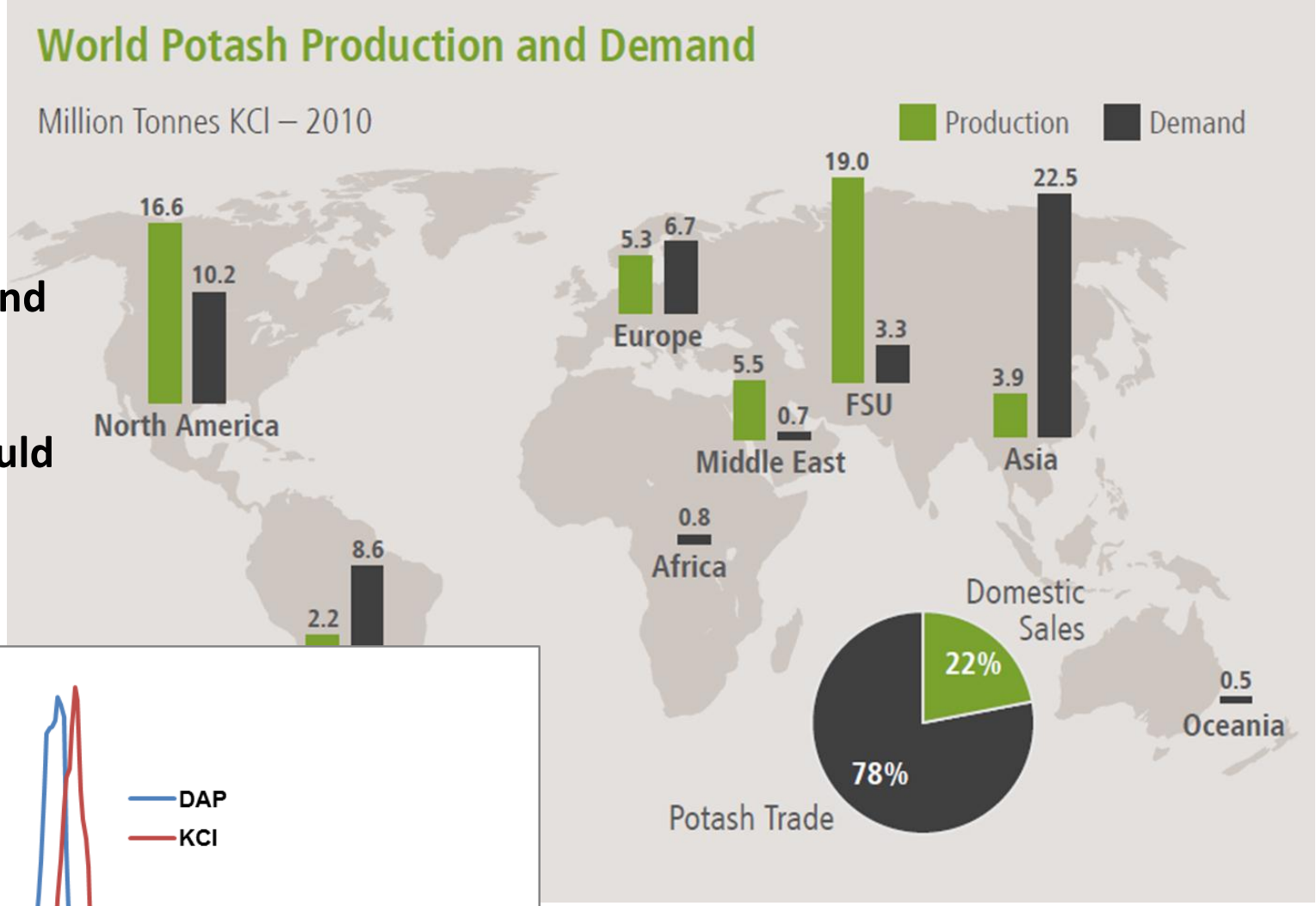
With whom should we trade ?

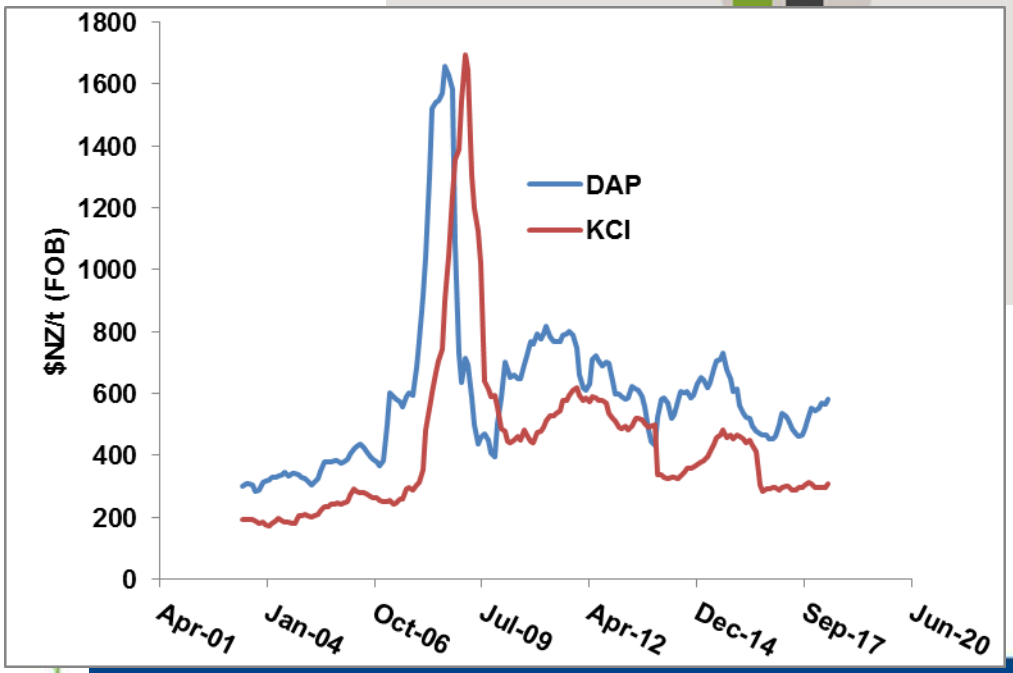
Small Oceania fish in a large pond ?

Where will our replacement K come from ?

Minute Oceania fish in a large pond ?

With whom should we trade ?





6 countries control 85% of Global potassium chloride resources

Te Kunenga ki Purehuroa

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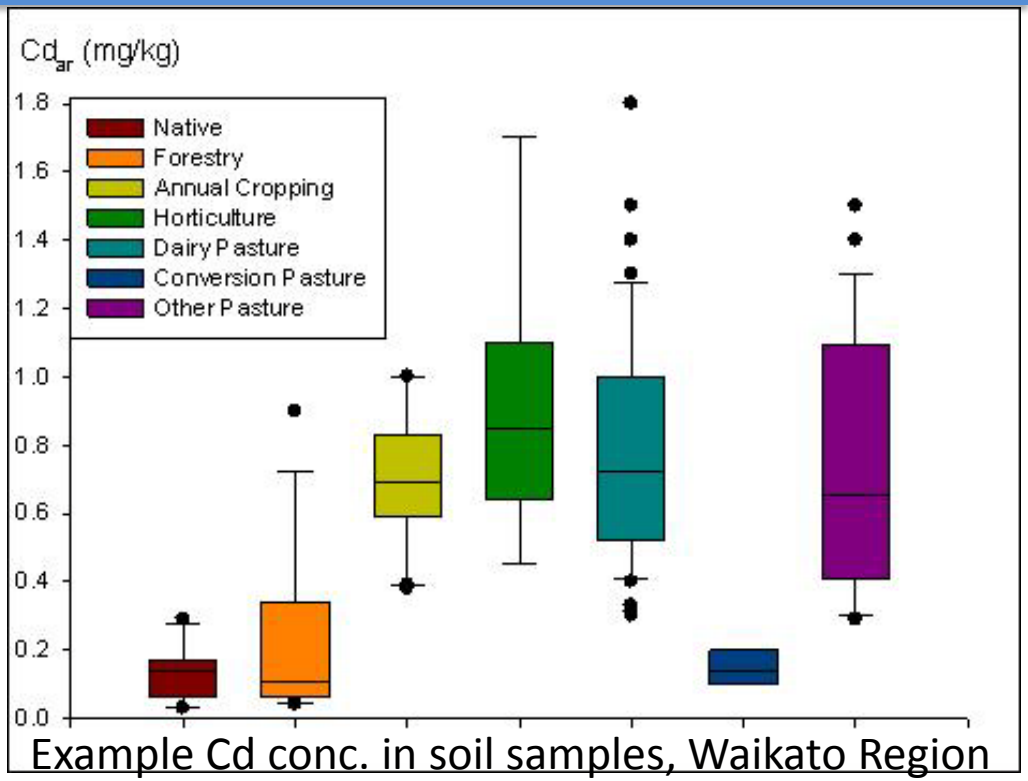
Managing risks from contaminants - Cadmium derived from P fertiliser

NZ Cadmium Management Strategy

Tiered Fertiliser Management System (TFMS)

- **5 yearly screening of farmed soils**
- **Categorise soils into different Tiers**
- **Managed by Fertiliser companies**



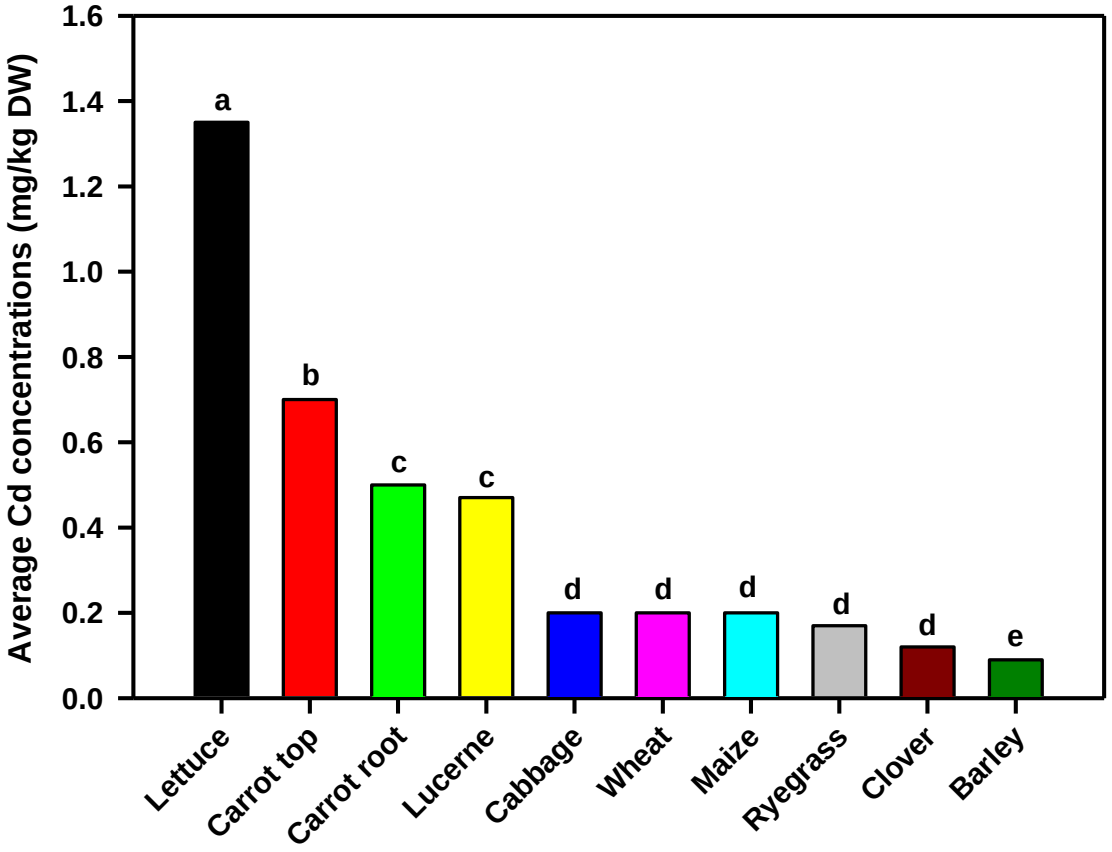
Example Cd conc. in soil samples, Waikato Region

Source M. Taylor et al FLRC Workshop 2011.

Compliance testing for potential contaminants - Soil Cadmium 2017

Tier	mg Cd/kg soil	Restrictions
1	< 0.6	none
2	0.6 < 1	low Cd, P fertilisers, to maintain soil Cd below acceptable threshold for 100 y
3	1 < 1.4	v. Low Cd P fertilisers, to maintain soil Cd below acceptable threshold for 100 y
4	1.4 < 1.8	No application of Cd allowed Cd free fertiliser

Managing risks from contaminants - Cadmium derived from P fertiliser

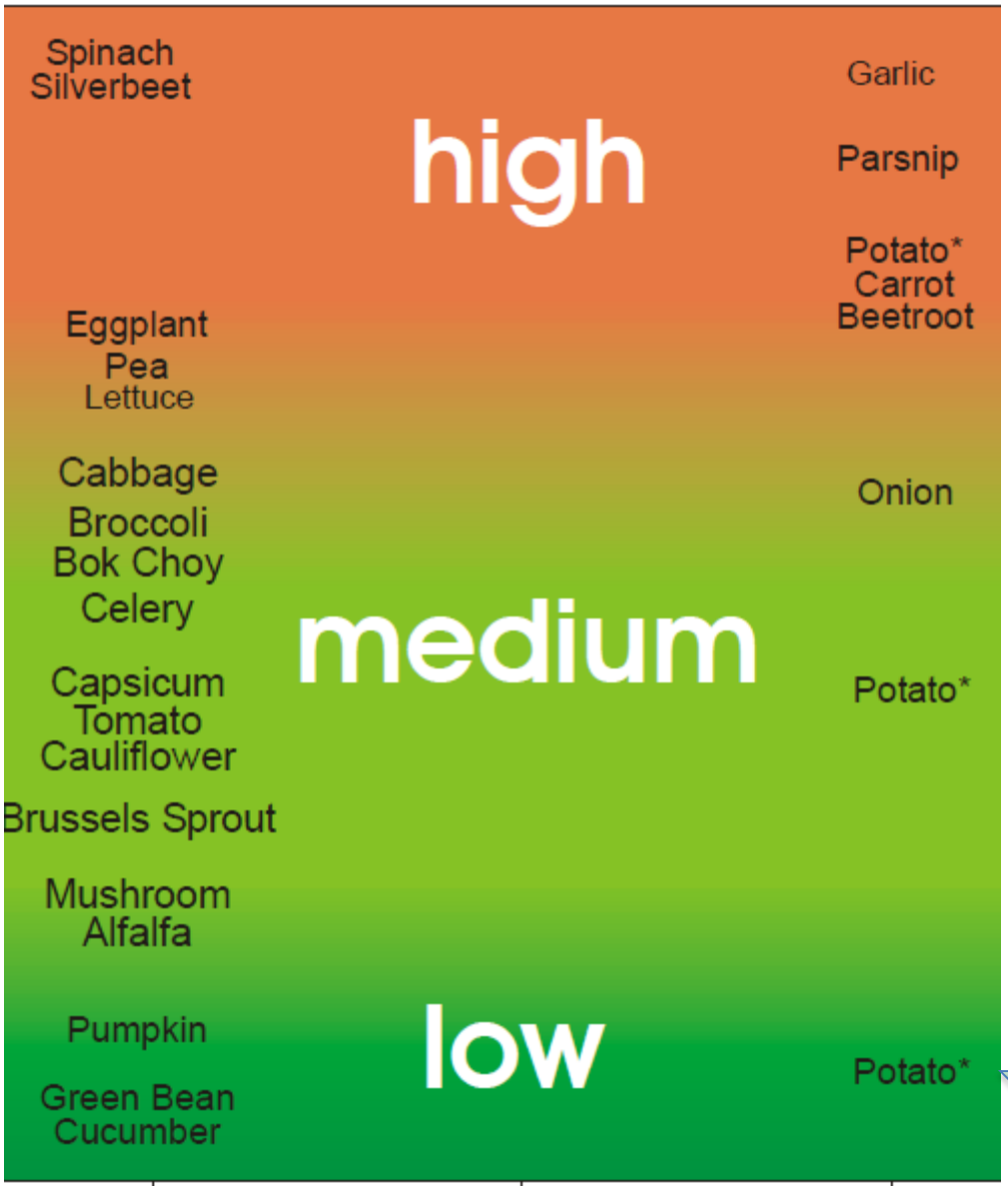


Mean CD concentration for different plant species. Values accompanied by the same letter are not significantly different (P >0.05) according to LSR analysis *(After Gray et al., 1999).*

Plant availability of Cd

Description	Factor affecting Cd uptake
Soil factors	Amount of Cd present in soils
	pH (increase pH = decrease Cd uptake)
	CEC (increase sorption = decrease Cd uptake); adsorption onto oxides, organic matter
	Competition with micronutrients, especially Zn
	Salinity (CdCl complexes) promotes Cd uptake
Crop factors	Species and cultivars; weeds > grass > clover
	Plant tissues; leaves > grain, fruit, roots
	Leaf age; old > young

Reduce Cd accumulation in plants



www.cadmium-management.org.au/publications.html

Crop management

- **use cultivars with low Cd concentration (eg. Wheat and potato)**

Soil/land management:

- **Liming**
- **Maintaining high soil organic matter**
- **Alleviating Zn deficiency**
- **One off deeper cultivation**

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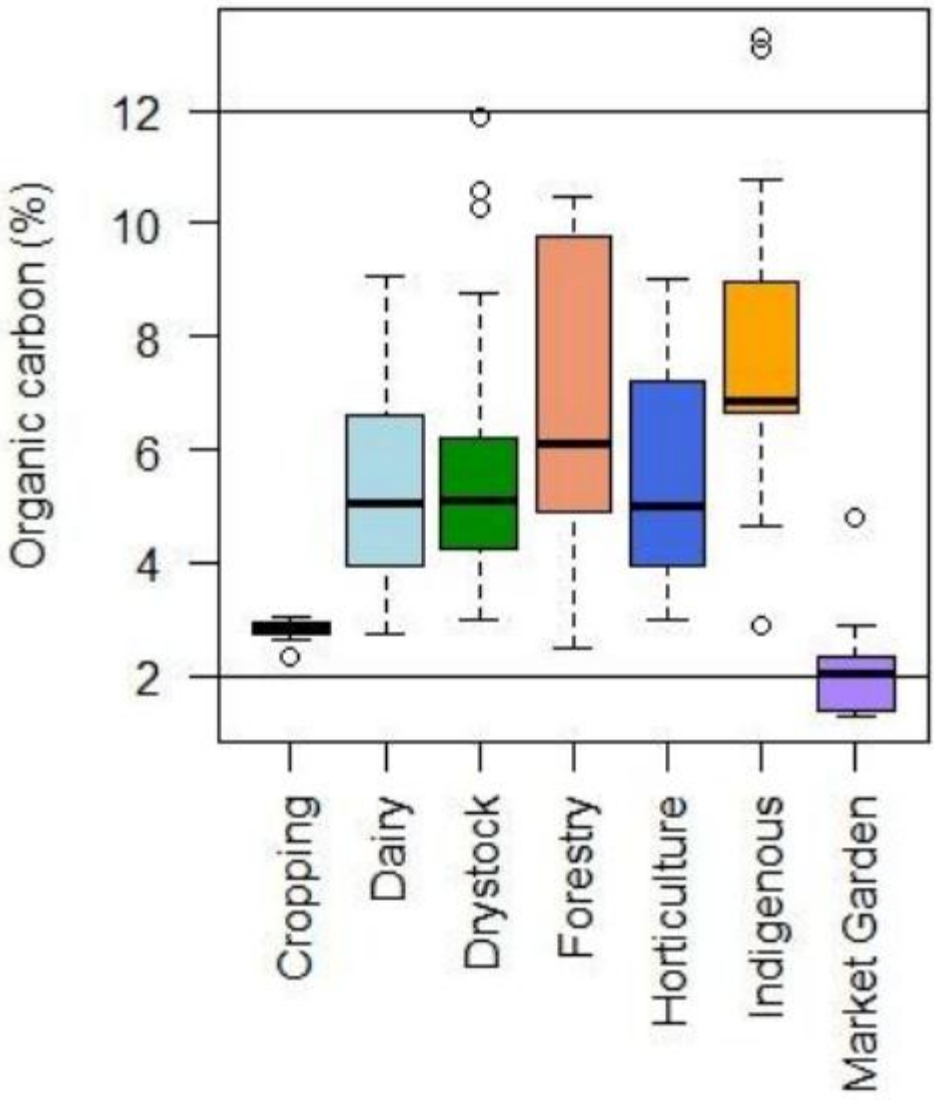
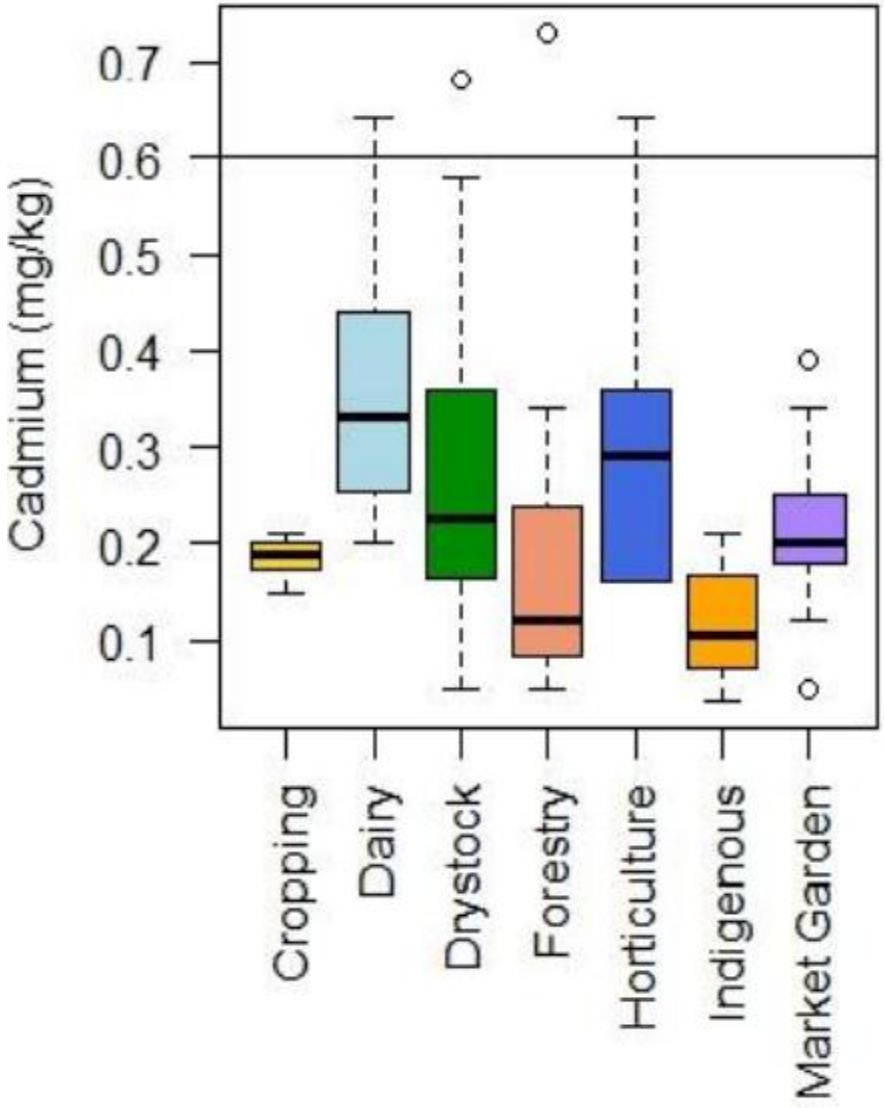
Are we managing risks from cadmium ?

Data from the soil quality survey of Wellington regional council





Drewry, et al. FLRC, 2017

Are we managing risks from cadmium ?

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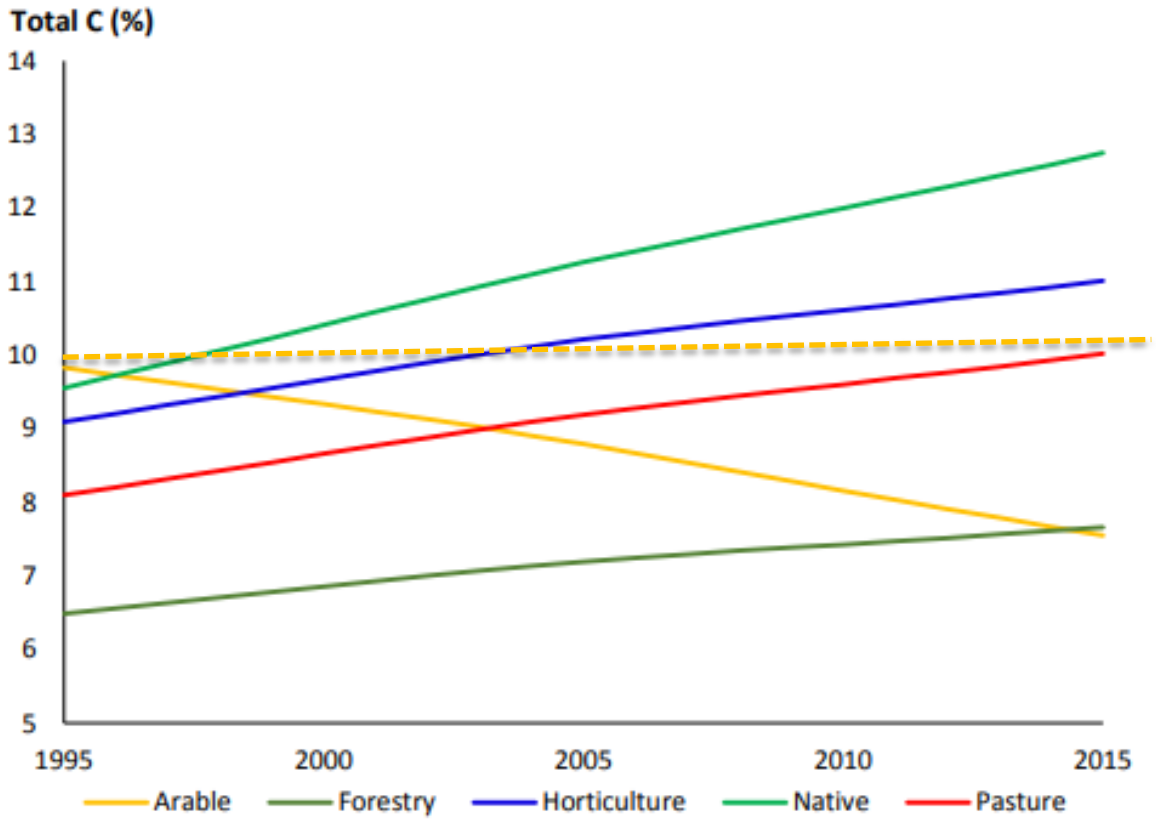

Figure 29: Change in mixed modelling average total C 1995-2015 by land use.

Decline in soil organic matter will increase Cd bioavailability if soil pH also declines.

M.Taylor, 2013

Sustaining productive capacity

will require.

- Education on soils and landuse
- Farm mapping: soils and landuse

With particular emphasis on .

- Physical management
- Water supply
- Securing essential Nutrients
- Avoiding Soil contamination
- Managing environmental risk

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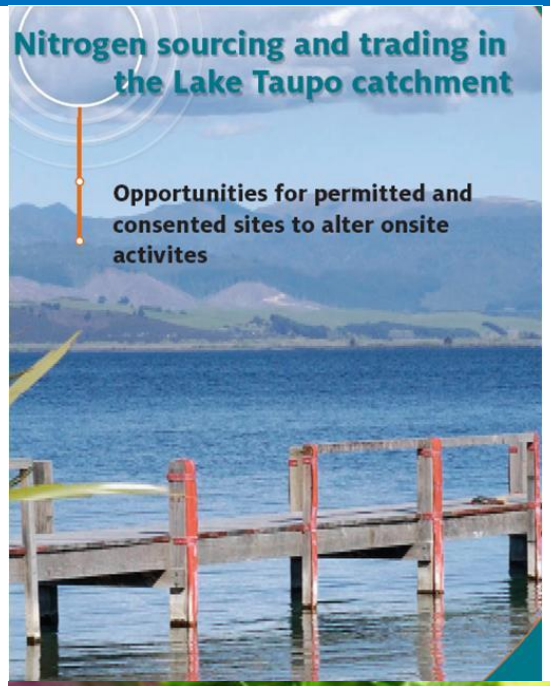
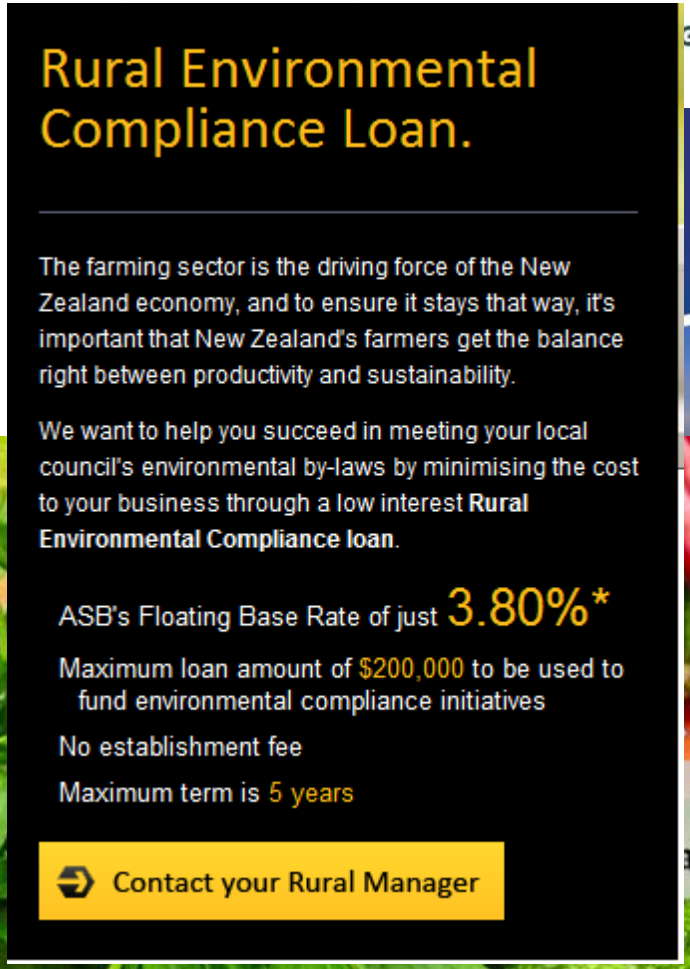
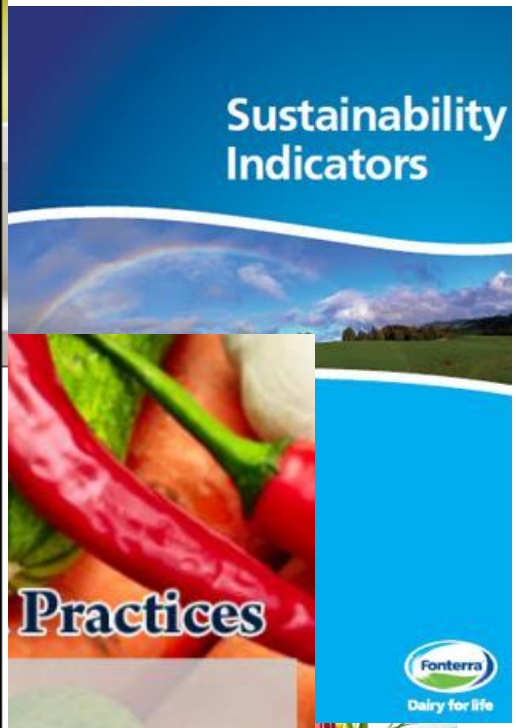
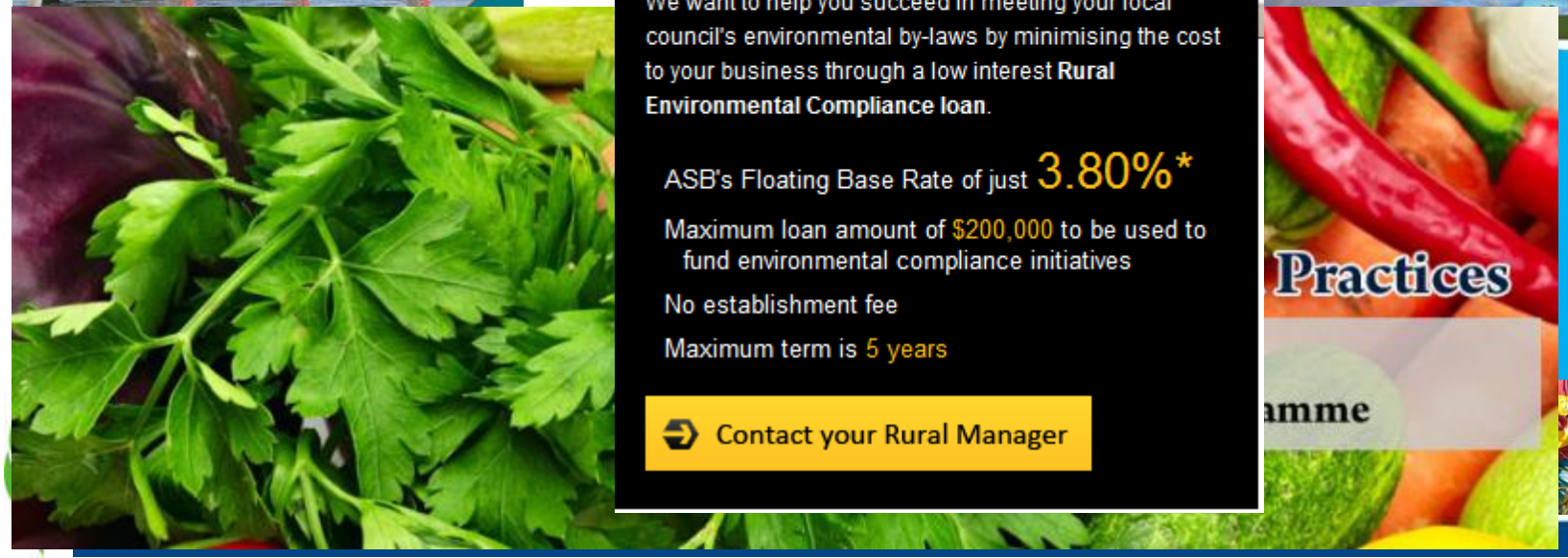
Nutrient Management Plans – Cost effective nutrient use, minimising nutrient loss to the environment and primary product quality assurance



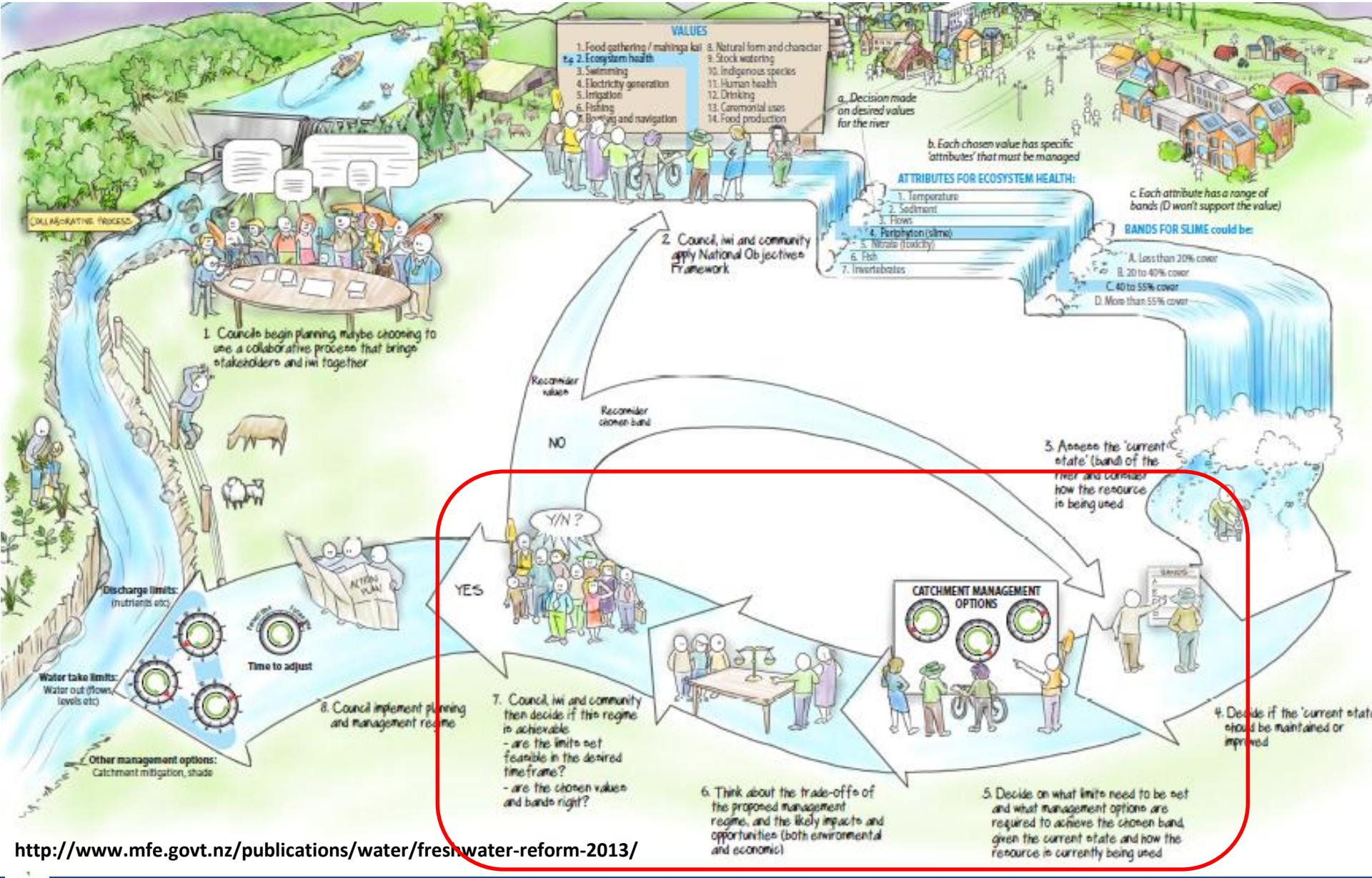






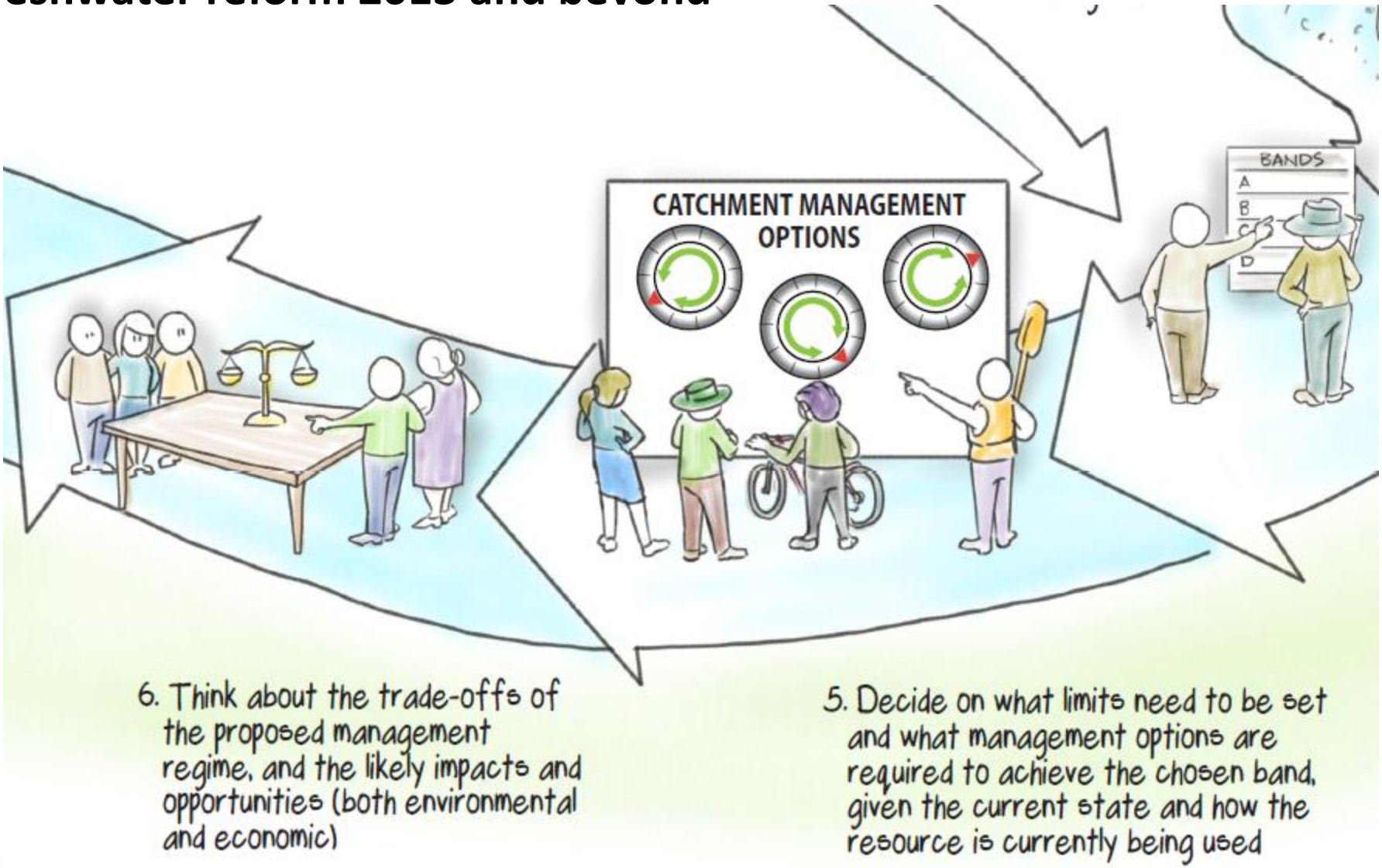
Nutrient Management for the Farm, Catchment and Community

Pathway to Freshwater reform 2013 and beyond



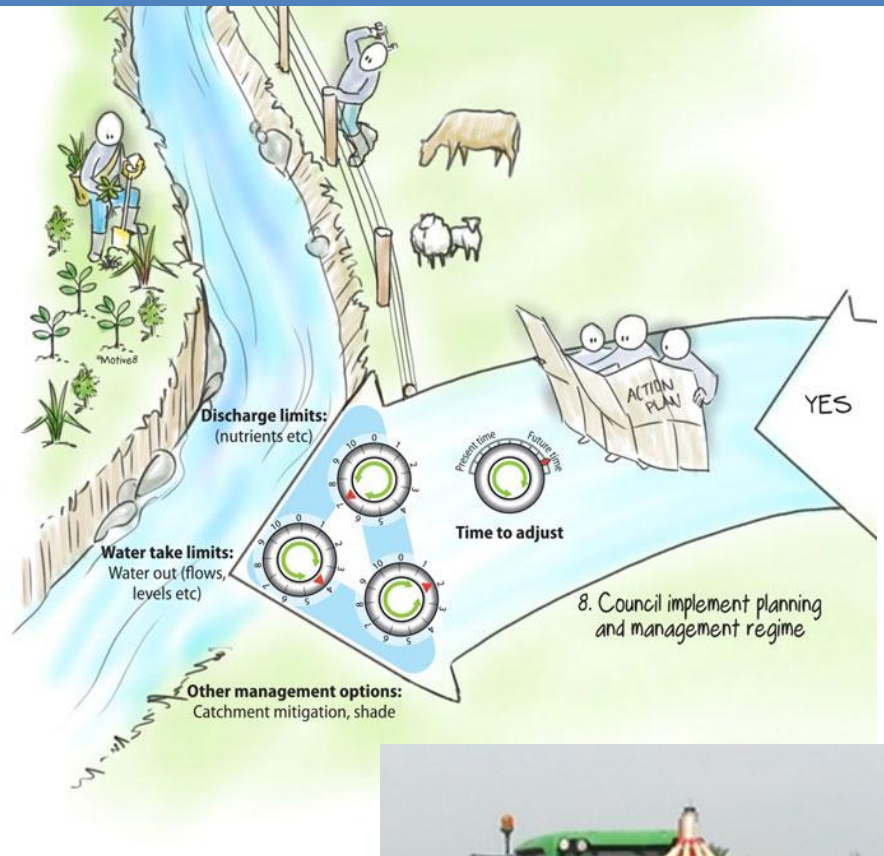
http://www.mfe.govt.nz/publications/water/freshwater-reform-2013/

Freshwater reform 2013 and bevond



Nutrient Management for the Farm, Catchment and Community

Professional development and decision support

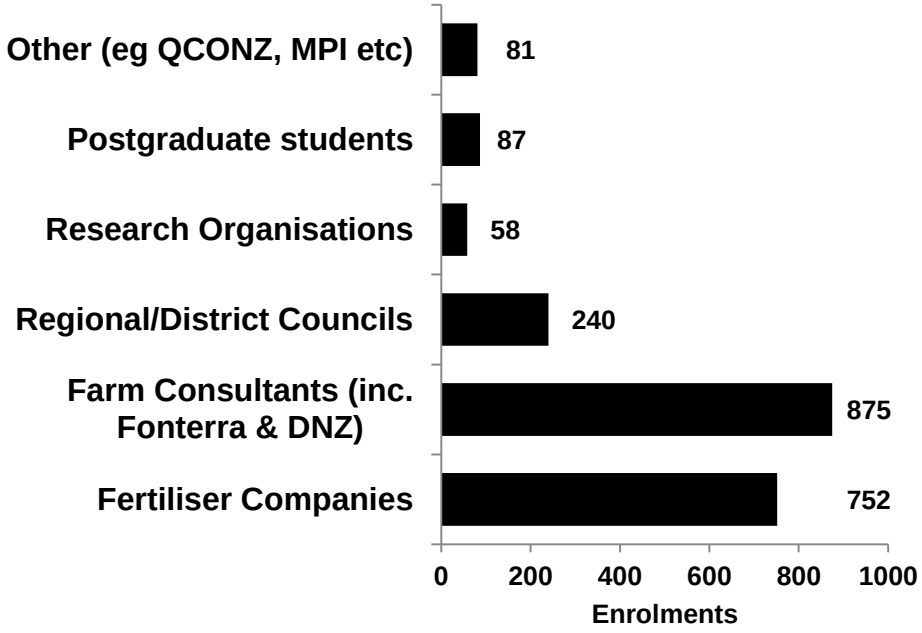


SUSTAINABLE NUTRIENT MANAGEMENT

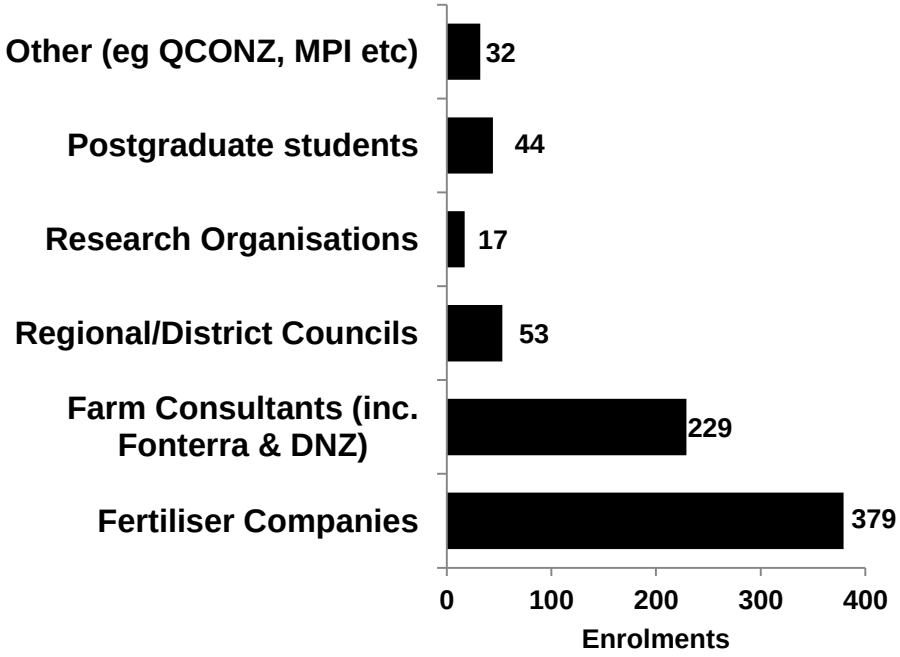
Who is capable of Nutrient Management Planning ?

Trained in Sustainable Nutrient Management plus Industry Experience

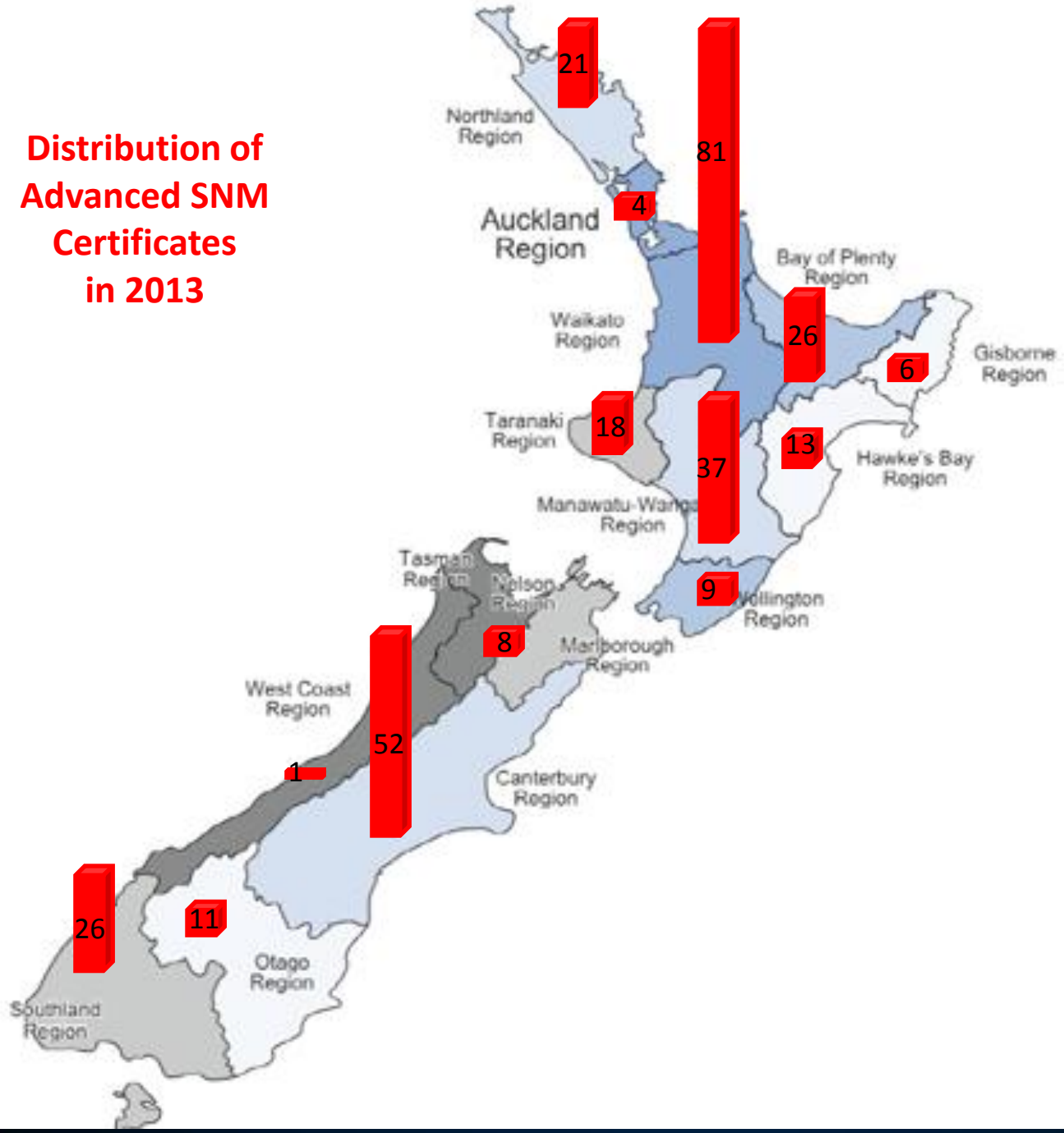
Intermediate SNM course
2093 enrolments since 2002



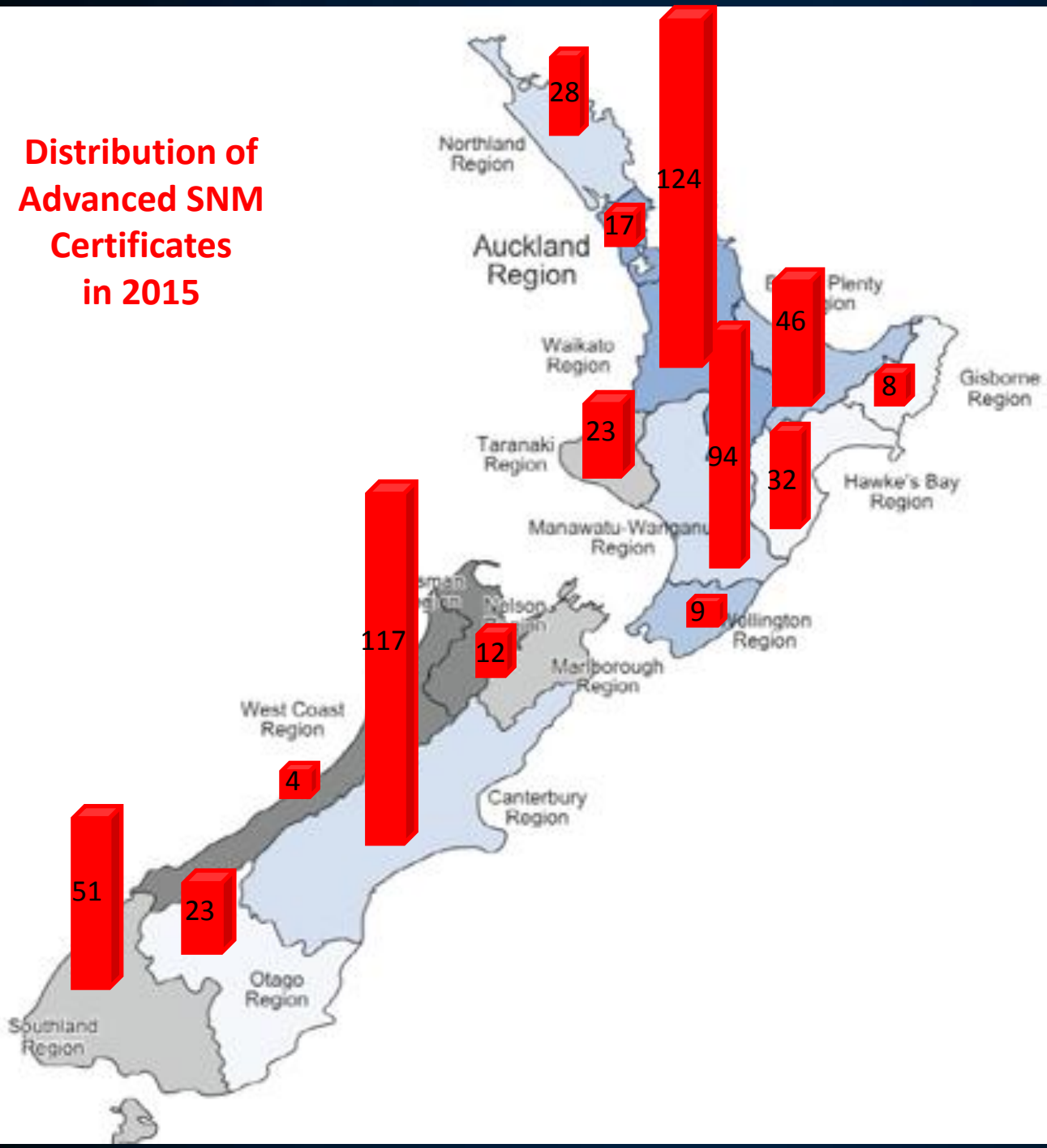
Advanced SNM course
856 enrolments since 2002



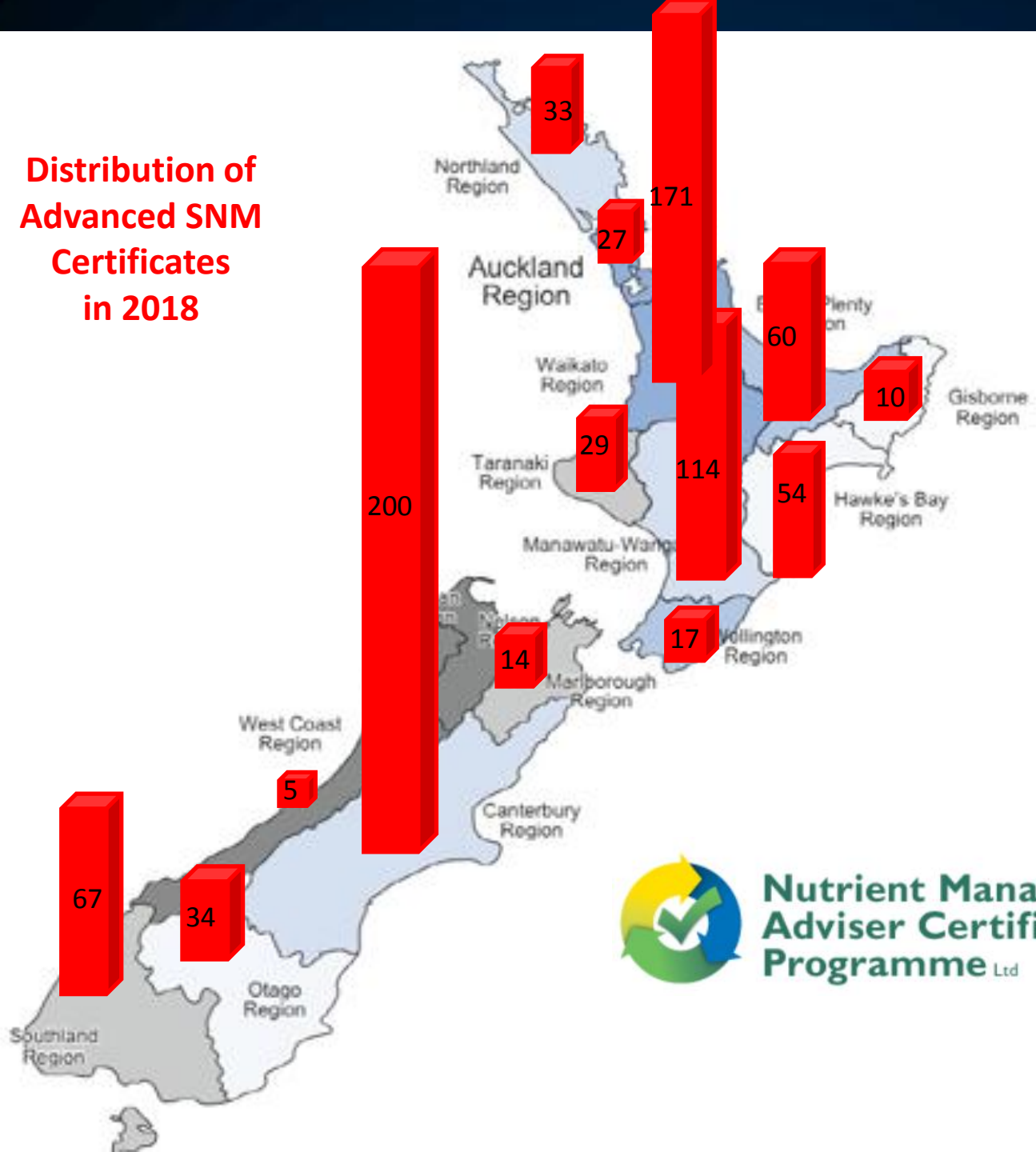
Distribution of Advanced SNM Certificates in 2013



Distribution of Advanced SNM Certificates in 2015



Distribution of Advanced SNM Certificates in 2018



Nutrient Management Adviser Certification Programme Ltd

What will the nutrient management plan include ?

- Farm/Block description – farm property map
- Soil and Land Use Capability Map at paddock scale
- Soil, plant test information
- Crop management plan, irrigation plan
- Nutrient budget, fertiliser recommendations
- Compliance Checklist
- Mitigation Plan – if required to reduce loss of nutrients, sediment and reduce contaminant accumulation.
- Communicate implementation to – staff and contractors.
- Describe a monitoring programme to re-evaluate plan periodically