

Towards integrating soil quality monitoring targets as measures of soil natural capital stocks with the provision of ecosystem services

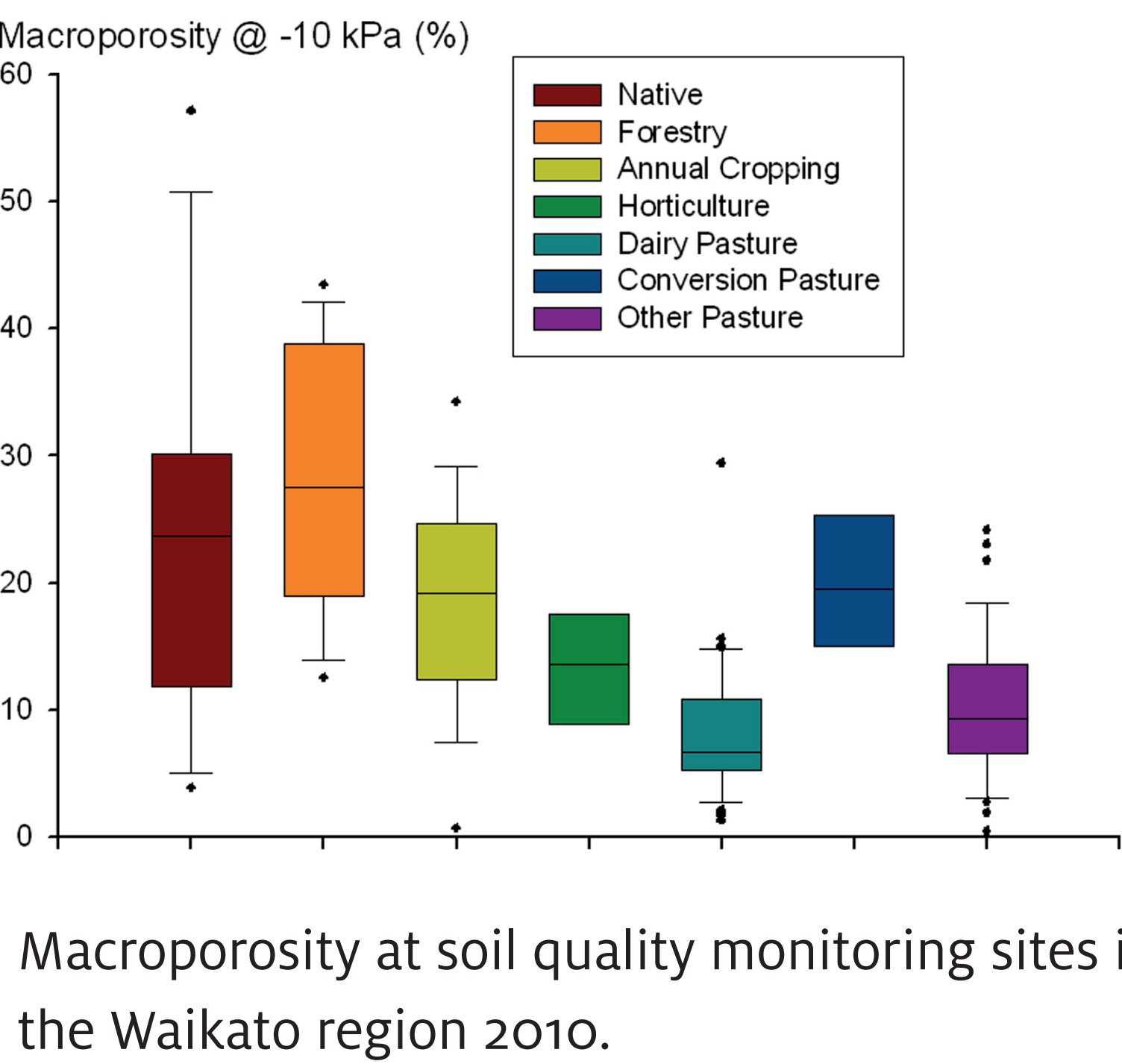
Matthew Taylor¹, Alec Mackay², Reece Hill¹, Estelle Dominati²
¹ Waikato Regional Council, Hamilton, New Zealand. ² AgResearch, Palmerston North, New Zealand.
Email: Matthew.taylor@waikatoregion.govt.nz

Soil Quality Monitoring Programme

- Started in New Zealand 15 years ago.
- Soil quality monitoring has become an important state of the environment reporting tool for Regional Councils.
 - Assists councils to track the condition of soils resources.
 - Assess the impact of different land management practices.
 - Provides timely warning of emerging issues to allow early intervention and avoid irreversible loss of natural capital stocks.
- A recently developed ecosystems service framework was used to explore the feasibility of linking soil natural capital stocks measured by the current suite of soil quality indicators to the provision of ecosystem services by soils.
- The new approach builds on the time series data sets collected by current suite of soil quality indicators.
 - Adds value to the current effort.
 - Potential to set targets ranges based on the economic and environmental outcomes required.
 - Can be for a range of scales e.g. farm, catchment or region.

Application using the macroporosity indicator

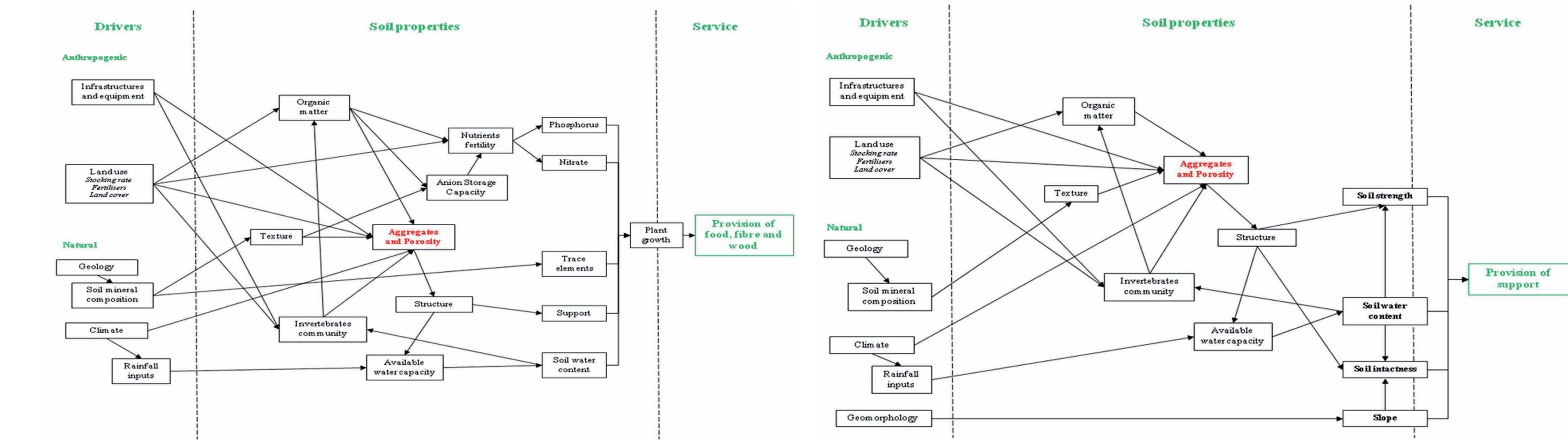
- Used to monitor the physical condition of the soil.
- Provides an estimate of surface compaction.



Integrating with the provision of ecosystem services: Soil service provided by the property of soil porosity

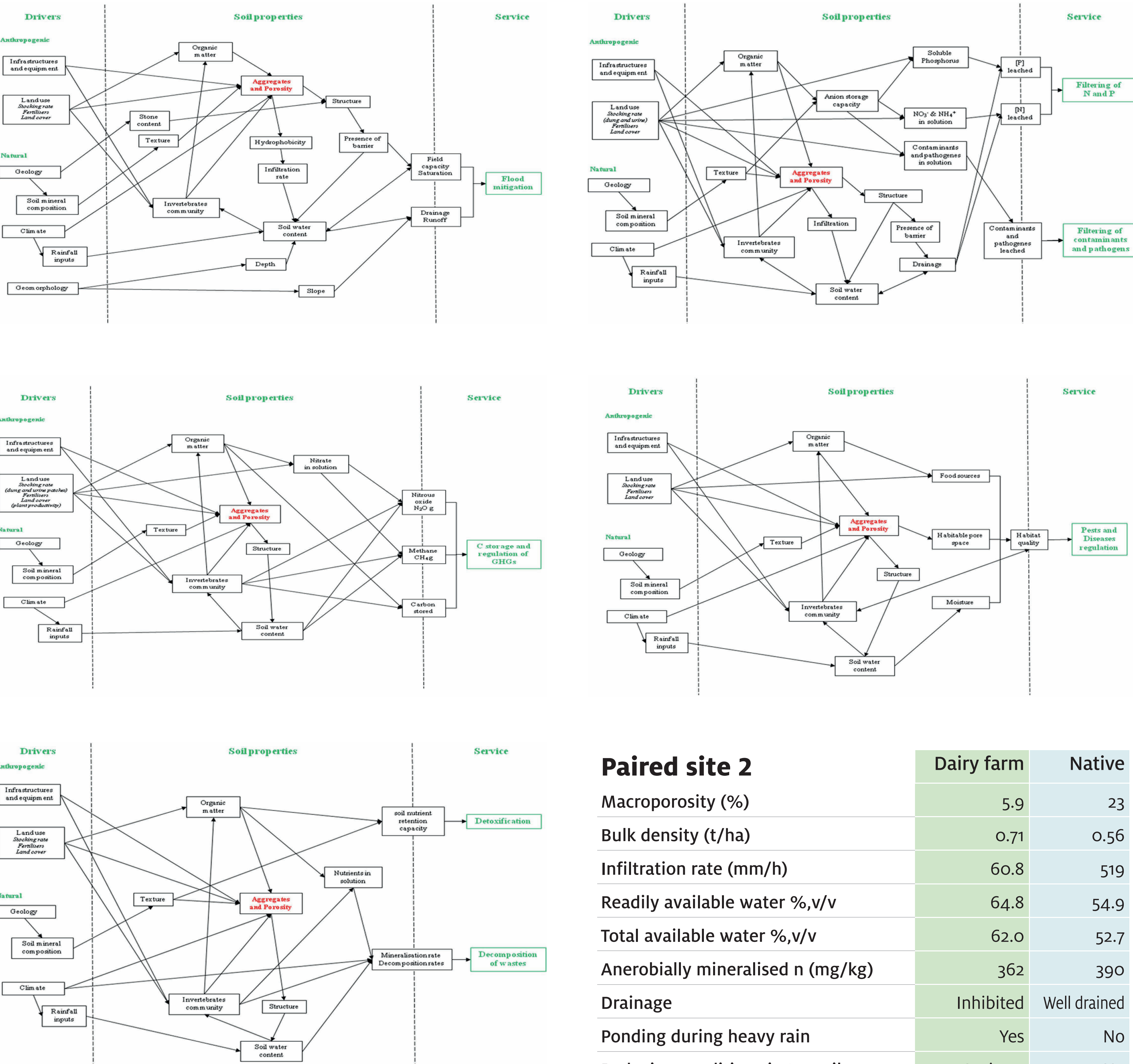
Provisioning services

- Provision of food (quantity and quality).
- Provision of physical support to human infrastructures and farms animals.
- Provision of raw materials.



Regulating services

- Filtering of nutrients (N and P) and contaminants.
- Flood mitigation.
- Recycling of wastes and detoxification.
- Carbon storage and regulation of N₂O and CH₄ emissions.
- Biological control of pests and diseases.



Paired site 1	Dairy farm	Forestry
Macroporosity (%)	4.5	24.9
Bulk density (t/ha)	0.80	0.88
Infiltration rate (mm/h)	42	600
Readily available water %v/v	13.3	11.2
Total available water %v/v	32.4	24.2
Anerobially mineralised n (mg/kg)	107	110
Drainage	Inhibited	Well drained
Ponding during heavy rain	Yes	No
Reducing conditions in topsoil	At times	No
Habitable pore space	Few	Many
Structural support	Firm	Soft
Dries out in summer	Often	Sometimes
Hydrophobicity observed	Yes	Yes
Water storage	Moderate	Moderate

Paired site 2	Dairy farm	Native
Macroporosity (%)	5.9	23
Bulk density (t/ha)	0.71	0.56
Infiltration rate (mm/h)	60.8	519
Readily available water %v/v	64.8	54.9
Total available water %v/v	62.0	52.7
Anerobially mineralised n (mg/kg)	362	390
Drainage	Inhibited	Well drained
Ponding during heavy rain	Yes	No
Reducing conditions in topsoil	At times	No
Habitable pore space	Few	Many
Structural support	Firm	Soft
Dries out in summer	Often	Rarely
Hydrophobicity observed	Yes	Rare
Water storage	Moderate	High