Data and Information demands for mapping soil health, ecosystem services, soil change...

Richard MacEwan,
Language now emphasising (ecosystem) services rather than soil health
Soil assets as ‘natural capital’

SOIL ASSETS - SOIL AS ‘NATURAL CAPITAL’

SOIL TYPES ⇒ SOIL QUALITY

SOIL CONDITION = SOIL HEALTH

LAND CAPABILITY

LAND USE

LAND MANAGEMENT

ECOSYSTEM SERVICES

ECOSYSTEM DISSERVICES

Threats from soil & BENEFITS

Threats to soil

STORE WATER

RESIST EROSION

CYCLE AND STORE MATTER

PROVIDE PHYSICAL SUPPORT

SUSTAIN LIFE & SOCIETY

HEALTHY SOILS

DEPARTMENT OF PRIMARY INDUSTRIES

future farming systems research
Data and information needs for mapping ecosystem service from soil

Key soil parameters

Other factors / drivers
  • (e.g. seasonal rainfall, land management)

Indicators (integrating or surrogates)

Data source (quality, scale, age, format)

Feasibility assessment

Method
Relative production (MODIS pixels (2001-2009))

Private land relative productivity
(based on average 2001 to 2009 EVI data)
How well have cereals performed over 9 years?

Data values stretched within Mallee Region reveal high and low performing areas – note alignment with land parcels.
What does this analysis tell us?

Land cover history (rotations)
Crop performance (EVI – biomass)
Differences in performance
  • At the same point in space but in different seasons
  • At different points in space in comparable seasons

What does it mean?

Soil differences (soil type or soil condition)?
Management history?
Spatial variation in seasonal conditions (effective rainfall)
Land Cover
Pasture, Cereals, Oilseed, Legumes etc.,

Weighting for shoot contribution to ground cover

Weighting for root contribution to soil OM

Combinations
Land cover weighting x EVI

Classification into 5 class system

Classifications – map outputs (single or multiple years)
Land ranked for soil surface protection (erosion)
Land ranked for potential below ground inputs to soil carbon

Time Series EVI
‘greenness’ surrogate for biomass
Threat of wind erosion
Threat of wind erosion
The value and future of this work

Provide statewide and regional indicators of relative primary production (photosynthesis -> biomass)

Refine the broad landscape units known as Victorian Primary Production Landscapes

Identify focus areas for investigation of farming systems and agricultural practices – what is successful, what is not, and why?

When compared with soil and landscape maps it has the potential to:

• Distinguish high value soil assets from poorer ones
• Indicate areas where soil may be in a degraded state or poor health
• Assist in stratification of agricultural land and select sites for monitoring soil condition
• Map the threat of soil erosion
• Provide a correlative input for modelling SOC sequestration
Other data analysis and research required

- Ground data to quantify biomass in relation to EVI
- Seasonal analysis of BOM data vs Land Cover & EVI
- Data for shoot:root ratios for major crops and pastures
- Deeper history for land cover and land use (pre MODIS and pre Landsat)
- Analysis of land cover history to classify farming system history
- Field survey of soil type and soil condition at selected sites
- Design for long term monitoring of farming systems, productivity and soil condition
- Response design – actions to take with the farming community: management practices in focus areas for focus issues.
Some key questions

What do we know about the state’s soil?
- Inventory, maps, properties

What processes do we need to understand?
- Ecosystem services (hydrological, production…… etc.)

Do we know if things are working well?
- Indicators, monitoring, baseline data

What is changing?
- Land use, practices, climate, demographics

What are the likely impacts?

What do we need to do?
- Planning, community support, science, scale