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Towards Integrating Soil Quality Monitoring Targets as Measures of Soil Natural Capital Stocks with the Provision of Ecosystem Services

M.D. Taylor (1), A.D. Mackay (2), E. Dominati (2), and R.B. Hill (1)

(1) Waikato Regional Council, 401 Grey St, PO box 4010, Hamilton East, Hamilton, New Zealand, (2) AgResearch, Grasslands Research Centre, Tennent Drive, Private Bag 11008, Palmerston North 4442, New Zealand.

This paper presents the process used to review soil quality monitoring in New Zealand to better align indicators and indicator target ranges with critical values of change in soil function. Since its inception in New Zealand 15 year ago, soil quality monitoring has become an important state of the environment reporting tool for Regional Councils. This tool assists councils to track the condition of soils resources, assess the impact of different land management practices, and provide timely warning of emerging issues to allow early intervention and avoid irreversible loss of natural capital stocks. Critical to the effectiveness of soil quality monitoring is setting relevant, validated thresholds or target ranges. Provisional Target Ranges were set in 2003 using expert knowledge available and data on production responses. Little information was available at that time for setting targets for soil natural capital stocks other than those for food production. The intention was to revise these provisional ranges as further information became available and extend target ranges to cover the regulating and cultural services provided by soils. 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. Importantly the new approach builds on and utilises the time series data sets collected by current suite of soil quality indicators, adding value to the current effort, and has the potential to set targets ranges based on the economic and environmental outcomes required for a given farm, catchment or region.

It is now timely to develop a further group of environmental indicators for measuring specific soil issues. As with the soil quality indicators, these environmental indicators would be aligned with the provision of ecosystem services. The toolbox envisaged is a set of indicators for specific soil issues with appropriate targets tied to ecosystem services and changes in critical soil function. Such indicators would be used for specific purposes for limited periods, rather than long-term, continuous monitoring. Some examples will be presented.

An important step needed to successfully initiate and complete the review was assigning national oversight. Reigniting scientific interest (which had declined with the cessation of funding in 2003) and documentation of the process were other important steps. We had to extend the recently developed ecosystem service approach to accommodate the catchment scale. This required additional attributes in the framework and recognition that some of the proxies will change with scale as will the techniques to value the services. The framework was originally developed for use at the farm scale. Macroporosity, one of the two indicators used to monitor the physical condition of the soil, was used to illustrate how the ecosystem service framework could be used to link a change in the physical condition of the soil with the provision of services. The sum of the dollar values of selected soil ecosystem services were used to inform the state of soil natural capital stocks. This estimate provides a new insight into the value of the soil quality indicators and existing target ranges. Doing so will enable targets to be more closely aligned and integrated with the provision of a range of ecosystem services, going far beyond food production.