

Soil Quality in New Zealand: Policy and the Science Response

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ABSTRACT

Soil depletion and degradation have been increasingly recognized as important environmental issues in many parts of the world. Over the last decade a number of political and legislative measures have been introduced to encourage and enforce sustainable soil management in New Zealand. Application of the new legislation has highlighted gaps in our knowledge of soil quality and a lack of scientific methods to assess and monitor soil quality. This paper describes the legislative measures and outlines the scientific response to the needs of regulatory agencies responsible for maintaining environmental quality. The research recommended a set of indicators to assess soil quality. Each soil quality attribute has an associated "target range" defining the acceptable value for the attribute. The paper also discusses the communication of results to end-users, including the development of a computerized assessment tool. The legislative measures and scientific response have fostered a closer relationship between the policy and science communities, leading to more well-focused research, but greater collaboration is still required.

farmers to be more efficient, including a lack of farm subsidies, a small domestic market, and the large distance from overseas markets, have all encouraged agricultural intensification, which has increased the risk of soil degradation. New Zealand is now facing a variety of environmental issues, such as hill country erosion, soil compaction, organic matter decline, and soil and water contamination.

Recognizing the strength of the environmentally damaging pressures, the New Zealand government has implemented a number of legislative measures to encourage sustainable use of land resources. In this paper, we describe the new legislative framework employed in New Zealand to promote and enforce sustainable management of natural and physical resources, and the policy-science relationship that has developed as a result of implementing this legislation. We also summarize research developments arising from the refocused science.

ENVIRONMENTAL POLICY AND LEGISLATION

The mid-1980s saw radical economic reforms in New Zealand as the newly elected government moved rapidly to establish a market economy (Bühns and Bartlett, 1993). Prior to this, farm production was encouraged through a range of financial incentives, and soil and water conservation and water quality measures were subsidized. The removal of subsidies had a drastic effect on farm incomes as farmers were exposed to market fluctuations and international competition. Further regulatory reform followed in 1991 with the Resource Management Act (RMA), which brought environmental policy into the forefront of land use activities.

The RMA (New Zealand Government, 1991) was implemented on top of major reforms to government institutions in which policy, provider, and funding functions for government services were separated into independent institutions. For example, the powerful Ministry of Works, which previously controlled city and regional planning and soil conservation at a national level, was disestablished. The RMA defines new responsibilities for "natural and physical resources" in a framework for implementation and policy development at national, regional, and local levels, each with its own funding stream. A new agency, the Ministry for the Environment, has national functions; Regional authorities have regional functions; and City and District coun-

Abbreviations: CRI, Crown Research Institute; MDS, minimum data set; RMA, Resource Management Act.

THE NEW ZEALAND landscape is of predominantly hilly to steep topography with a wide diversity of soils (Molloy, 1998). There is generally sufficient moisture available from either surface or ground water resources, or rainfall, to sustain primary production on much of this land. Agricultural and forestry products exported in 1997 accounted for NZ\$13.7 billion, or 67% of the value of New Zealand's merchandise exports (New Zealand Ministry of Agriculture and Forestry, 1998). Therefore, productive land is one of the vital natural resources of New Zealand. It is important that this valuable resource is maintained in good condition to sustain the national economy, and to support New Zealand's "clean and green" image, which is important in international marketing.

The environmentally damaging pressures on soils experienced in many countries are less extensive in New Zealand because of its small population, relatively short history of human settlement, few environmentally damaging heavy industries, and a legume-based pastoral system. However, many years of land use under agricultural production have had their cost (New Zealand Ministry for the Environment, 1997a). Economic pressures on

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