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# ***FARMING FROM THE GROUND UP***

*THE USE OF LAND RESOURCE INFORMATION  
AS A BASIS FOR PLANNING FARM-  
SUSTAINABILITY IN NEW ZEALAND*

**VOLUME ONE**

A thesis presented in partial fulfilment of  
the requirements for Doctor of Philosophy (Soil Science)  
at Massey University, Palmerston North, New Zealand.

Andrew K. Manderson

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**Massey University**  
COLLEGE OF SCIENCES

INSTITUTE OF  
NATURAL RESOURCES  
Te Kura Mātauranga o ngā  
Taonga ā Papatuanuku  
Soil & Earth Sciences  
Private Bag 11 222  
Palmerston North  
New Zealand  
T 64 6 356 9099  
F 64 6 350 5632  
[www.massey.ac.nz](http://www.massey.ac.nz)

5 February 2004

**CANDIDATE'S DECLARATION**

This is to certify that the research carried out for my Doctoral thesis entitled "*Farming from the ground up: The use of land resource information as a basis for planning farm-sustainability in New Zealand*", in the Institute of Natural Resources, Massey University, Turitea Campus, New Zealand, is my own work, and that the thesis material has not been used in part or in whole for any other qualification.

**Candidate's Name:** Andrew Manderson

**Signature:**

*A. Manderson*

**Date:**

*05/02/04*

5 February 2004

**SUPERVISOR'S DECLARATION**

This is to CERTIFY that the research carried out for the Doctoral thesis entitled "*Farming from the ground up: The use of land resource information as a basis for planning farm-sustainability in New Zealand*", was done by *Andrew Manderson* in the *Institute of Natural Resources*, at Massey University, Turitea Campus, New Zealand. The thesis material has not been used in part or in whole for any other qualification, and I confirm that the candidate has pursued the course of study in accordance with the requirements of the Massey University regulations.

**Supervisor's Name:** Alan S. Palmer

**Signature:**

A Palmer

**Date:**

5/2/04



5 February 2004

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**Candidate's Name:** Andrew Manderson

**Supervisor's Name:** Alan S. Palmer

**Signature:**

**Signature:**

**Date:**

05/02/04

**Date:**

5/2/04

---

# ABSTRACT

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Land resource (LR) information describes the character and capability of natural and physical resources as they vary across the landscape, while land evaluation is the decision-making process of assessing the fitness of land for a given purpose or use. This thesis argues and examines LR information and land evaluation as a fundamental prerequisite for the design and management of sustainable farming systems in New Zealand (NZ).

Sustainability may be defined as *the ability of one or many systems to sustain one or many systems over a period of time*, while conceptual applications can be clarified by stating the ‘what’, ‘why’, ‘who’, and ‘for how long’ of sustainability, and the hierarchical tier at which a given interpretation is applied.

Farm sustainability is achieved when all objectives, obligations, and requirements associated with a farm system are fulfilled in a reconciliatory way. Maintaining farm sustainability is dependent on the ability of management to adjust to change, particularly as it relates to refining or redesigning land use in a way that generates a profit without compromising land integrity and environmental quality. Ongoing soil, water and biodiversity problems linked with agriculture demonstrates that the reconciliation of farm sustainability is a difficult proposition. This difficulty will increase as the farming environment becomes more complex, dynamic, and demanding.

New Zealand’s 16 regional authorities are responsible for ensuring the sustainable use and management of farmland. An examination of policy instruments confirms that the autonomy afforded under the Resource Management Act (RMA, 1991) has resulted in major differences in how each authority endeavours to fulfil these responsibilities. A non-regulatory emphasis prevails, and substantial assistance is currently available to most farmers interested in progressing the sustainable land management (SLM) dimension of farm sustainability. This situation may change within the next 10-15 years if the non-regulatory emphasis fails to adequately progress SLM.

Generating and using LR information through land evaluation represents a methodical and effective means of communicating, demonstrating, and planning farm sustainability. Farm-scale land evaluation provides a framework for identifying and systematically evaluating alternative land-use options in terms of potential economic performance and possible environmental impacts.

Farmers’ apparent predisposition for informal decision-making means that most rely on their ‘knowledge of the land’ and informal methods of land-evaluation when making decisions concerning land-use and management. While informal methods are important, it is generally accepted that traditional approaches to farm management need to become more formal, strategic, knowledge intensive, and information rich, to better accommodate the modern challenges of sustainable agriculture.

A key constraint to the use of more-formal approaches to land evaluation is the availability of appropriate LR information. A critical evaluation of NZ’s map collections and databases concludes that reliable and relevant LR information for farm management purposes cannot be obtained from existing sources. Most sources are unsuitable because of limited geographical coverage and inappropriate scales. Farmers interested in using LR information for farm management purposes can only do so if they collect new information.

A survey of NZ organisations and consultants who specialise in the collection and provision of LR information indicates that a wide variety of commercial survey services and resources are available. A complete exercise resulting in professional soil and paddock maps could cost up to \$7000. The high cost of contracted LR-information collection can be reduced substantially through either having a regional authority ‘farm plan’ prepared, or through assisted soil survey programmes.

A detailed review of historical literature shows that regional authorities and their antecedent catchment boards have long recognised the value of farm-scale LR information and land evaluation for promoting wise and sustainable land use. This recognition is expressed as an evolving 'farm plan' model of land inventory survey, land capability classification, and integrative land-use planning for individual properties. A total of 4730 farm plans representing 50% of NZ's total farmland were prepared before NZ's reform of resource management in 1989. Most have a limited value as a contemporary source of LR information, but the traditional farm plan model is still generally suitable for modern-day land evaluation applications (albeit with refinements for modern issues).

Autonomy afforded under the RMA (1991) resulted in some regional authorities discontinuing the practice of farm planning, while others experimented with new or refined models to better accommodate the demands of sustainable resource management. An interview survey during 2001-2002 identified that approximately 1200-1450 *new* farm plans had been prepared between 1991 and 2001, and that farmers from eight of NZ's sixteen regions (or unitary districts) have access to some form of farm planning service.

A critical evaluation of contemporary farm plan examples shows that the independent development of farm planning during the 1990s has resulted in a diversity of at least 23 different farm plan models. Only five models involve the combined collection of farm-particular LR information, land evaluation, and integrative land-use planning. Farmers interested in obtaining new LR information through a contemporary farm plan can only do so if they reside in the Wellington, Manawatu-Wanganui, Hawkes Bay, or Taranaki Regions.

An alternative low-cost option for collecting, interpreting and using LR information to promote farm sustainability is through the fledgling Soils Underpinning Business Success programme (SUBS). A survey-based evaluation indicates that SUBS farmers attribute substantial land-use and management change to the programme, and are in strong agreement that participation has been beneficial to their abilities as farm managers and the sustainability of their farming operations. Further application of SUBS carries the potential for widespread improvement in farm sustainability, provided future applications are refined in terms of delivery, supporting material, and quality standards. Some headway has already been made, including the development of training and extension resources reported in this thesis.

NZ's presently underdeveloped state of LR information and use creates a large number of opportunities that carry an under-recognised potential for advancing both economic development and sustainable resource management. One option calls for a revised national survey involving the collection of a defined core of LR information at scales relevant to the level at which the majority of land-use decisions are made (*i.e.* farm scales), to be integrated with an active partnership programme to stimulate actual uptake and application from decision-makers themselves. Another borrows from an historical success, to suggest an intensive investment of science and technology into select farms as a means to focus and maximise capabilities towards the identification of solutions regarding persistent environmental problems. The ultimate aim being a new generation of farm plan that exploits our current understanding of biophysical processes and advances in spatial technologies.

The greatest single opportunity is for a national review to clarify the contemporary status and future direction of LR information and land evaluation in NZ. Resolving key review questions could underpin the establishment of a proposed national strategy, with an overriding purpose tightly focused on stimulating sustainable development and management from the proverbial 'ground up'.

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