



Soil Health Management



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Auditor-General

Soil Health Management

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The Hon. Robert Smith MLC
President
Legislative Council
Parliament House
Melbourne

The Hon. Jenny Lindell MP
Speaker
Legislative Assembly
Parliament House
Melbourne

Dear Presiding Officers

Under the provisions of section 16AB of the *Audit Act 1994*, I transmit my performance report on *Soil Health Management*.

Yours faithfully



D D R PEARSON
Auditor-General

5 October 2010

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Audit summary

Healthy soils support plant growth, decomposition and recycling processes, and resist erosion. They are fundamentally linked to the protection of natural assets, where soil health is primarily viewed as a threat, and productive land where soils are viewed as an asset. Continued levels of agricultural productivity depend on good soil health. Loss of agricultural productivity from declining soil health would have substantial economic implications for Victoria.

The audit examined how effectively and efficiently soil health programs have been implemented across private land, focusing on integrated soil health initiatives.

Conclusions

The Departments of Sustainability and Environment (DSE) and Primary Industries (DPI), along with catchment management authorities (CMA), have implemented soil health programs effectively.

However, clearer governance arrangements, greater coordination and better alignment of state and regional priorities would strengthen soil health management.

Currently, soil health responses are neither integrated, nor well coordinated; leading to a patchwork of unaligned and fragmented soil health projects across regions. While the projects have generally met their objectives individually, they have tended to focus on the delivery of outputs rather than achievement of outcomes. Consequently, it is unknown whether soil health programs have actually improved the health of Victoria's soil.

Findings

There is no whole-of-government approach to soil health to guide planning, implementation and investment. No single agency is responsible for coordinating regional, multi-regional and state soil health projects across private land.

Roles and responsibilities lack clarity and transparency across regions due to the range of stakeholders involved, each with different mandates and priorities.

Individual soil health projects by DPI and CMAs have been well managed and delivered as planned across the state. Project objectives have generally been met. However, as a suite of activities there is little evidence that these projects have met the broad objectives set for soil health in regional and state strategies.

The effectiveness of the suite of soil health projects in improving soil health cannot be accurately reported as individual projects and their performance and reporting frameworks are output focused, little soil health monitoring occurs, and existing soil health data varies in quality and is fragmented and inconsistent. This finding reflects the broader findings of VAGO's *Performance Reporting by Departments* performance audit tabled in Parliament in 2010, which highlighted the lack of cost-effective evaluations and outcome-based reporting in general.

Recommendations

Number	Recommendation	Page
1.	<p>The Department of Sustainability and Environment and the Department of Primary Industries should:</p> <ul style="list-style-type: none"> develop an integrated statewide soil health framework to improve coordination of effort and alignment of priorities establish a cross-agency committee to oversee the development of the framework and the coordination and alignment of activities. 	16
2.	<p>The Department of Primary Industries and the Department of Sustainability and Environment should identify and agree on key soil health information and data needs and develop 'fit for purpose' monitoring and research programs to guide investment decisions.</p>	24

Submissions and comments received

In addition to progressive engagement during the course of the audit, in accordance with section 16(3) of the *Audit Act 1994* a copy of this report, or relevant extracts from the report, was provided to the Department of Sustainability and Environment, the Department of Primary Industries, and the Corangamite, North Central and North East Catchment Management Authorities, with a request for submissions or comments.

Agency views have been considered in reaching our audit conclusions and are represented to the extent relevant and warranted in preparing this report. Their full section 16(3) submissions and comments however, are included in Appendix A.

1 Background

1.1 Introduction

Healthy soils support plant growth, decomposition and recycling processes, and resist erosion. They are fundamentally linked to environmental sustainability and productive land.

Historically, soil management has focused on soil issues, such as soil erosion, salinity and soil acidification, in isolation. The more recent focus is on considering these issues in an integrated way. This allows policy makers and land managers to address the diverse issues that arise in soil management in a coordinated way, rather than through a range of separate projects and policies.

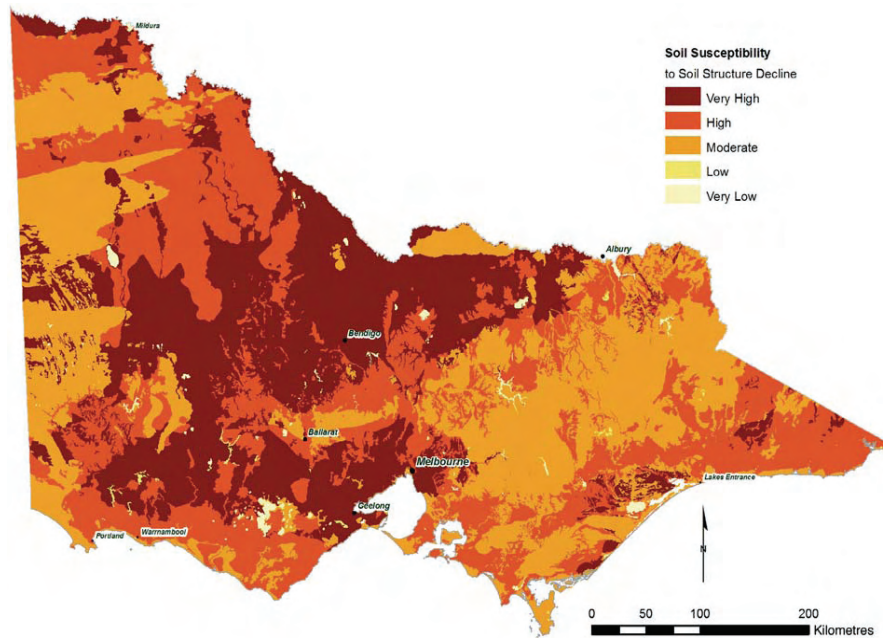
Risks to soil health are predominantly a private land issue. Maintaining levels of agricultural productivity is dependent on good soil health, as is the protection of natural assets from the impacts of soil erosion and degradation. Loss of agricultural productivity from declining soil health would have substantial economic implications for Victoria, which produces around 25 per cent of Australia's agricultural output, contributes \$8.7 billion to the Victorian economy and around 35 per cent of Victoria's export income.

There is no simple measure of soil health, and a lack of monitoring means that the true extent of soil health issues is unknown. However, from the available data, it is estimated that:

- up to 60 per cent of Victoria's soils are prone to erosion and soil structure decline. Previous assessments have identified that around 30 per cent of agricultural land is being severely degraded
- around 240 000 hectares are affected by soil salinity
- around 8.6 million hectares are affected by soil acidification.

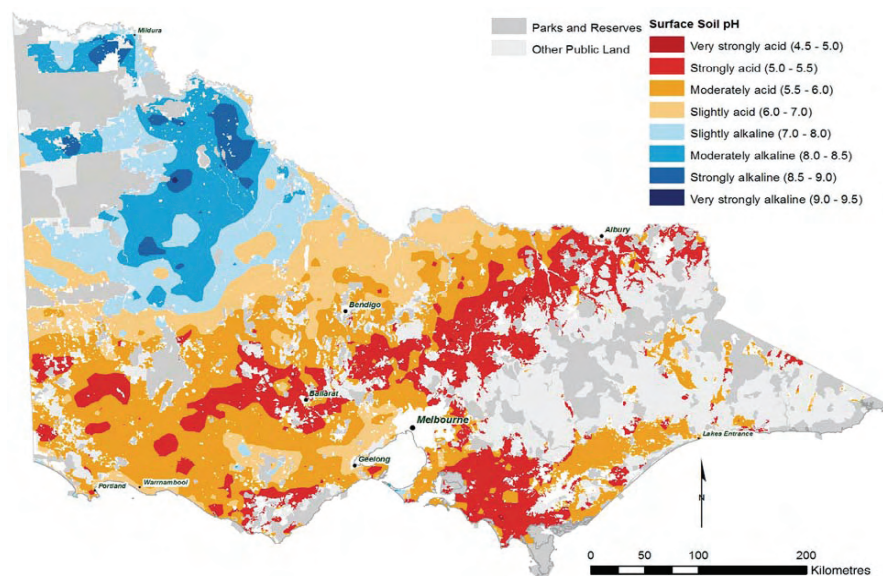
Figures 1A and 1B illustrate the extent of soil erosion susceptibility, and soil acidity and alkalinity across Victoria.

Figure 1A
Soil erosion in Victoria



Source: The Commissioner for Environmental Sustainability's *State of the Environment Report – Victoria 2008*.

Figure 1B
Soil pH ranges across Victoria



Source: The Commissioner for Environmental Sustainability's *State of the Environment Report – Victoria 2008*.

1.2 Roles and responsibilities

In Victoria, soil health is a shared responsibility between the Department of Primary Industries (DPI) and the Department of Sustainability and Environment (DSE), in partnership with catchment management authorities (CMA), the Environment Protection Authority (EPA) and Parks Victoria (PV). DPI and DSE are the principal agencies responsible for the development of soil health policy.

Department of Primary Industries

DPI is responsible for improving landowner's skills, knowledge and practices to improve soil health on private land. Its role in soil health is based on healthy and productive land to support sustainable production of 'agricultural' goods and services.

To achieve this, DPI undertakes research, develops policies and designs and delivers technical and educational programs that enable farm businesses to sustainably maximise the wealth and wellbeing they generate.

Department of Sustainability and Environment

DSE is responsible for promoting and managing the sustainability of the state's natural and built environments, as well as being a major public land manager. Its responsibility to protect and manage the state's natural assets is carried out through 10 CMAs. DSE is directly responsible for soil health in state forests and reserves, while responsibility for crown frontages is delegated to CMAs, and for soil health in national parks, to PV. DSE is responsible for setting standards for soil health across the landscape irrespective of tenure.

To achieve this, DSE develops policies to:

- manage soils for all their values, irrespective of either land tenure or use
- retain soil values for future generations
- sustain values derived from soil, and manage private interests so they do not compromise public interests.

Catchment management authorities

CMAs are the lead natural resource management agencies operating in a regional structure. CMAs work in partnership with DPI, DSE, EPA, PV and local councils, as well as local stakeholders and land managers. CMAs are also associated with the Victorian Catchment Management Council, an overarching body.

State funding for CMAs is delivered through the Victorian Investment Framework (VIF), and is used for natural resource management activities. This includes on-ground soil health works on private and public land and Crown land frontages, and whole-of-farm planning activities on private land.

1.3 Policy and project framework

1.3.1 Soil health policy framework

There is no specific soil or soil health policy in Victoria, rather, it is addressed in a range of strategies. The two key strategies that outlined a policy base for soil between 2001 and 2010 were *Growing Victoria Together 2001* and *Our Environment, Our Future: Environmental Sustainability Action Statement 2006*. Since 2010, soil policy has been guided by the *Securing Our Natural Future: A White Paper for Land and Biodiversity at a Time of Climate Change*, 2009 and the *Future Farming Strategy*, 2008.

Growing Victoria Together

Growing Victoria Together (GVT) outlines the government's vision for Victoria for 2010 and beyond, and is the overarching strategy for the entire state. It highlights the inter-relationship between economic growth and the environment. One of its goals is: 'the condition of our land will improve as the impact of salinity and soil degradation is reduced'. This was updated in the 2006 policy—*Our Environment, Our Future*.

Our Environment, Our Future: Environmental Sustainability Action Statement

This DSE Environmental Sustainability Action Statement (ESAS) outlines a long-term integrated approach to maximise future growth, maintain quality of life and protect the environment by:

- maintaining and restoring our natural assets
- using resources more efficiently
- reducing our everyday environmental impacts.

The ESAS includes commitments to invest more than \$200 million, spread over 150 actions. Action four of ESAS is 'healthy and productive land', which includes funding of \$4 million over four years, 2006–10, for DPI to manage soil health projects. Its main objective is to assist land owners with soil management by providing access to the best available information and management practices to improve environmental services from soil.

Securing Our Natural Future: A White Paper for Land and Biodiversity at a Time of Climate Change

Securing Our Natural Future (the White Paper) is a long-term strategic framework to secure the health of Victoria's land, water and biodiversity over the next 50 years. Chapter 6 of the White Paper, 'Building healthy and resilient ecosystems across the landscape', includes the following actions for soil management:

- develop a statement on soil conservation, soil health and dryland salinity by the end of 2011
- develop an action plan to update modelling tools and farm planning tools to include a more complete range of soil management issues by 2012
- develop and implement a strategy to capture and retain knowledge by 2012.

Future Farming Strategy

The *Future Farming Strategy* (FFS) is a \$205 million DPI initiative over four years, of which \$24 million was included for strengthening land and water management. The specific soil health initiative within the FFS is the development of a soil health policy framework to guide investment and strategic policy.

1.3.2 Key soil health programs and projects

Land Health program

DSE's Land Health program is one of the four programs under the VIF that provides approximately \$6 million each year to reduce soil and dryland salinity threats to high-value natural assets, and protects the value of healthy soils. This three-year investment covers a range of activities, but is primarily focused on on-ground works across 13 priority areas aligned with the White Paper.

Healthy Soils project

DPI's Healthy Soils project is a \$4 million project that started in 2006 and is scheduled to end in 2010. The project is funded under the ESAS, and is targeted towards improving landholders' management of their soils. The project also aims to develop a soil health framework to guide work with farmers and landholders, focusing initially on direct industry and community engagement in the grain and dairy sectors. The specific objectives of the project are to:

- improve access to available soil health information
- improve and develop new soil health assessment tools
- enhance soil health extension projects
- develop a coordinated program for soil health.

Whole-of-Farm Planning program, including Farm Plan 21

Whole-of-Farm Planning projects provide decision-support tools to help farmers make informed decisions across the entire farm. It helps them plan and prepare for challenges from climate variability, biosecurity threats, emergency management and variable market conditions, and to manage their natural resource base, including soils. DPI has provided \$700 000 annually from 2010 to 2014 and DSE, through the VIF, has provided \$550 000 in 2009–10 to implement DPI's Farm Plan 21 project. The objective of Farm Plan 21 is for DPI to provide consistent farm planning services across the state.

Regional catchment management strategies

Between 2003 and 2005, CMAs developed five-year regional catchment strategies. These strategies were designed to integrate with, and complement soil health policy. They set regional soil health targets and actions and provide the overarching framework for all soil health activities in the region.

1.4 Audit objective and scope

The audit examined how effectively and efficiently soil health projects have been implemented. Specifically, the audit examined the planning, projects, information systems, data management and reporting, related to the management of soil health. This included the roles and activities of DPI, DSE and three CMAs.

The audit examined integrated soil health initiatives, rather than focusing on individual soil initiatives/projects, such as salinity and soil acidification projects.

The audit was performed in accordance with Australian Auditing and Assurance Standards. The cost of the audit was \$200 000.

2 Responding to soil health issues

At a glance

Background

To maximise the effectiveness of responses to soil health, best practice soil health planning and management requires an integrated approach where effort is coordinated, priorities and objectives are agreed on, and roles and responsibilities are clear and transparent.

Conclusion

Individual soil health programs and projects have been implemented well; however, there is a need to enhance overall soil health management through clearer governance arrangements, greater coordination of effort and better alignment of priorities.

Findings

- There is no whole-of-government approach and response to soil health issues. No single agency or body is responsible for soil health across private land.
- Individual soil health projects by the Department of Primary Industries (DPI) and catchment management authorities (CMA) have been well managed and delivered as planned across the state.
- The planning and implementation of soil health projects on private land between DPI, the Department of Sustainability and Environment and CMAs is uncoordinated and associated roles and responsibilities lack clarity and transparency.
- There is a patchwork of disconnected and unaligned soil health projects across private land. There is little evidence that this suite of activities has met the broad objectives set for soil health in regional and state strategies.

Recommendation

The Department of Sustainability and Environment and the Department of Primary Industries should:

- develop an integrated statewide soil health framework to improve coordination of effort and alignment of priorities
- establish a cross-agency committee to oversee the development of the framework and the coordination and alignment of activities.

2.1 Introduction

Responsibilities for managing soil health on private land differ depending on the 'role' the soil plays, such as an asset for primary productivity, or as a threat to the protection of natural assets, including the soil itself. This means that multiple stakeholders with different policy aims and priorities are involved in responding to soil health issues.

To maximise the effectiveness of responses to soil health, best practice requires an integrated approach, where effort is coordinated, priorities and objectives are agreed and roles and responsibilities are clear and transparent.

2.2 Conclusion

The Department of Primary Industries (DPI) and the regional catchment management authorities (CMA) have implemented individual on-ground soil health projects well. While each project generally met its objectives, clearer governance arrangements, greater coordination of effort and better alignment of state and regional priorities would address regional soil health issues across the state more efficiently and effectively.

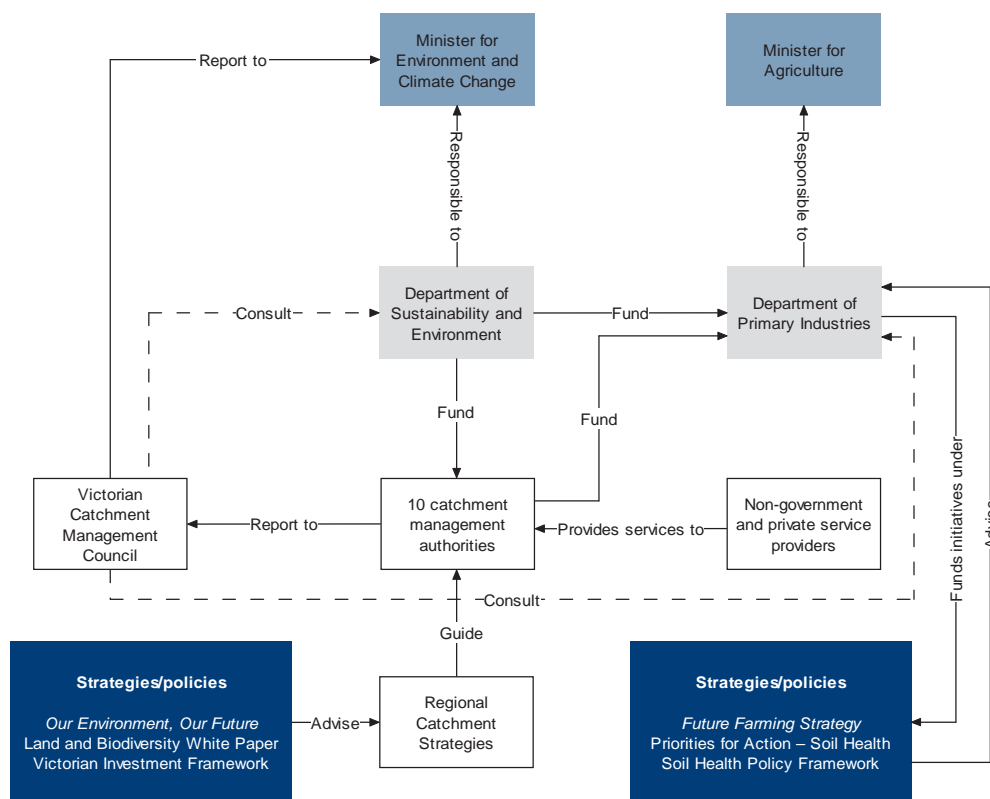
2.3 Soil health governance

Soil health management on private land affects primary productivity and the protection of natural assets on both public and private land. It is important, therefore, that responses to soil health issues on private land reflect this and are integrated and coordinated across regions and agencies.

2.3.1 Roles and responsibilities

Responsibility for managing soil health rests primarily with 12 agencies—the Department of Sustainability and Environment (DSE), DPI, and 10 regional CMAs. There is a lack of coordination between these agencies, highlighting their different priorities and objectives. Figure 2A shows the current governance arrangements for responding to soil health, including the strategies, policies and projects applicable to each agency.

**Figure 2A
Governance arrangements**



Source: Victorian Auditor-General's Office.

No single agency or body is responsible for the coordination of soil health projects across private land.

DPI is responsible for the planning and coordination of soil health projects on private land to sustain and improve primary productivity and maintain soil health. It does this primarily through developing the skills and knowledge of landholders to effect land management changes. In this context, DPI regards soil as an asset that needs to be managed to achieve sustainable and productive farming.

DSE is responsible for setting statewide priorities to protect natural assets from soil impacts on both public and private land. As such, DSE primarily regards soil health as a threat to their protection efforts. DSE carries out this responsibility through the CMAs. Historically, DSE's response to soil health threats is to fund targeted, on-ground and other activities to protect natural assets from soil erosion, acidity and dryland salinity.

The issues and the areas DSE prioritised form only a subset of regional soil health priorities developed by the CMAs, and there is limited alignment in terms of the weighting and ranking of priorities. This lack of alignment is mainly due to the changing priorities of DSE from the 2003 Regional Catchment Investment Program to the new integrated approach outlined under the Victorian Investment Framework (VIF), released in 2009, to protect natural resources from catchment activities.

Roles and responsibilities between DPI and CMAs for soil health on private land are not transparent, and the level of involvement in planning, coordination and management of soil health projects amongst these agencies is inconsistent. While DSE carries out its responsibility to CMAs for the protection of natural assets due to soil management practices on private land, CMAs are often not involved with the planning or implementation of DSE-funded soil health projects on private land.

DPI may act as a planner, administrator or service provider for soil health projects on private land, but this varies between CMAs, projects and funding frameworks. This limits DPI's ability to coordinate soil health projects across regions. For example, in the Corangamite region, DPI is responsible for planning and implementing the soil health carbon project, for which CMAs are funded, while in the North Central and North East regions the CMAs are planning and implementing the project independently of DPI, using alternative service providers. In line with *Securing Our Natural Future: A White Paper for Land and Biodiversity at a Time of Climate Change*, the VIF has established soil health investment priorities at the state level. Regional catchment management strategies (RCS) and approaches are yet to reflect this.

CMAs are responsible for soil health at a regional level, including developing a vision for soil health for the whole region. They have been limited in achieving this vision because regional and state priorities are currently not aligned.

2.3.2 Impact on soil health management priorities and practice

Due to the range of soil health issues and stakeholders involved in its management, roles and responsibilities are complex, and lack clarity and consistency. When combined with differing priorities and poor coordination, this has led to a patchwork of often disconnected soil health projects.

DSE and DPI have different respective focuses of protecting natural assets and increasing primary productivity, which has influenced what projects each department funds. This has limited integration opportunities within projects to deliver on both protecting natural resource assets and increasing primary productivity.

2.3.3 Impact on coordination of activities

In addition to different priorities, the differing roles and responsibilities of the agencies involved in soil health management hinder coordination and lead to inconsistent approaches across the regions. A range of issues relating to roles and responsibilities are evident, including:

- DSE, DPI and CMAs have overlapping roles. Each agency is responsible for planning around soil health, although there is little collaboration.
- DSE and DPI are responsible for policy development. However, there is also little collaboration despite the complementary nature of their roles.
- DSE and DPI approve and fund regional and multi-regional projects on private land, however little effort is made to collaborate and coordinate effort to address regional issues.

One example of inconsistency in coordination is in the Corangamite region where the CMA contracts DPI to develop and implement its soil health strategy and any related programs and projects. This allows one agency to coordinate all soil health projects across a region.

In the North East and North Central regions, the planning and implementation of soil health projects varies from project to project. Activities in the North East Mega Murray Flagship Area are identified and planned by community groups, administered by the CMA and implemented by DPI. Whole-of-farm planning services administered across the North Central region are planned and implemented by a range of service providers that depend on funding sources. As a consequence, whole-of-farm planning services across the region are inconsistent in both process and content.

2.3.4 Impact of state funding arrangements

The VIF prioritises funding for CMAs to conduct activities, including on-ground works in areas that align with state priorities to reduce the threat of dryland salinity and soil degradation to high-value assets. The distribution of funding across regions varies in accordance with state priorities.

For example, under the VIF funding, North East CMA and North Central CMA are limited to implementing on-ground soil health works to protect natural assets on around 45 per cent and less than 5 per cent of their land respectively, although the RCS highlight a range of targets and actions outside of these areas.

DPI also funds soil health projects on private land to meet its priorities for soil health, although CMAs have no involvement in their planning.

The CMAs must get funds from other sources opportunistically to address regional soil health priorities not identified at the state level. This leads to the ad hoc and inconsistent implementation of regional catchment strategies and soil health strategies.

2.4 Soil health programs

Agencies respond to soil health issues mainly through on-ground works and Whole-of-Farm Planning programs. These projects need clearly defined objectives and require a clear implementation plan that details how and when the project will be introduced. They also require monitoring and reporting to provide information on whether they have been implemented as planned.

Given the range of stakeholders and varying priorities and approaches to soil health issues across private land, it is important that projects are coordinated and managed in an integrated way.

Individual DPI and CMA soil health projects have been well managed and delivered as planned across the state. Individual project objectives have generally been met at the local level. However, there is little evidence that this suite of activities is well coordinated, or that they have met the broad objectives set for soil health in regional and state strategies.

2.4.1 Statewide soil health projects

There are two multi-regional and statewide projects for managing soil health. Both the Healthy Soils project and the Whole-of-Farm Planning program address soil health on private land.

Healthy Soils project

The Healthy Soils project was the key landscape-scale soil health project that DPI administered under the Environmental Sustainability Action Statement (ESAS) Healthy Soils Initiative. This \$4 million four-year initiative, between 2006 and 2010, was targeted at improving landholders' soil management and developing a soil health framework to guide work with farmers and landholders. Its focus was on direct industry and community engagement in the grains sector.

The project aimed to:

- **Improve access to available soil health information**—more than 200 soil health pages were developed and upgraded on Victorian Resources Online, making it the most comprehensive soil health site nationally.
- **Deliver new and improved soil health assessment tools**—a toolkit for healthy soils was developed and a soil health management plan piloted on two farms.
- **Enhance soil health extension programs**—activities delivered included training workshops, seminars, field days and demonstration sites to more than 2 000 participants in five catchment regions.
- **Deliver a coordinated Victorian program for soil health**—a framework for soil health to sustain and improve primary productivity on private land was published.

The project met all these objectives, except the delivery of a coordinated soil health program. This objective was not fully met because the level of funding requested was not obtained, and the funding it did get was prioritised to key regions where partnerships with industry groups and linkages with other projects improved delivery efficiency.

The project was effectively tracked and monitored through DPI's internal project tracking system, which reflected the responsibilities, coordination arrangements, implementation risks, key milestones and deliverables, and associated time frames detailed in the project implementation plan.

Whole-of-Farm Planning program

The other main landscape-scale program to improve soil health is a Whole-of-Farm Planning program made up of a range of projects, including whole-of-farm plans EMap and EFarmer. CMAs and DPI administer the projects depending on the funding source. Several stakeholders, including DPI, industry groups and training providers, deliver them.

The main project is Farm Plan 21, which DSE, through the VIF, and DPI jointly fund. DPI has committed \$700 000 annually for four years from 2010–14 and DSE has provided \$565 000 to pilot this project across the Wimmera and North Central CMA regions in 2009–10.

Farm Plan 21, implemented by DPI, aims to help farmers make informed decisions across their farms, through the implementation of whole-of-farm plans, which include soils as a key component. It also aims to standardise and bring consistency to DPI farm planning services across the state.

Projects delivered under this program have met, or are on target to meet, their intended outputs, such as the number of plans or the development of tools. Projects have been effectively tracked through quarterly and annual reporting, either under DPI's internal project tracking system, or the catchment activity management system that DSE administers.

While the projects completed have delivered the required outputs, the delivery of whole-of-farm planning services is inconsistent and ad hoc at the regional level. Projects are funded either through the VIF or DPI; however, the decisions about where whole-of-farm planning services are delivered are not based on consistent criteria across regions.

There is limited coordination between DSE, DPI and CMAs in the prioritising and targeting of areas for whole-of-farm planning services, as implementation is opportunistic rather than strategically planned. A range of service providers deliver whole-of-farm planning services, but there is no formal relationship between these service providers or documented guidance to increase the likelihood that content and delivery of whole-of-farm planning services is consistent.

DPI is piloting Farm Plan 21 in the North Central and Wimmera regions to standardise and improve the delivery of DPI farm planning services and develop standardised training and guidance documents. However, in areas where Farm Plan 21 is not being piloted, farm groups often use alternative providers of whole-of-farm planning services directly, adding to the inconsistent approach to service delivery.

2.4.2 Regional soil health projects

CMAs are responsible for the planning and coordinating a range of regional soil health projects funded under the VIF. The two types of regional projects funded are on-ground works, and improving land management practices through extension activities and whole-of-farm planning. These projects have the objective of maintaining and improving soil health, as measured by the:

- hectares and number of sites treated for erosion
- kilometres of waterway stabilised, including dams, rivers and wetlands
- hectares managed for soil improvement.

Regional soil health targets and actions are specified in RCS. These strategies are designed to identify natural resource management priorities and form the basis for investment in programs in the region. RCS are supported by underlying strategies and action plans for particular resource management issues, such as salinity, nutrients, biodiversity and soils. This audit examined regional soil health projects in three CMAs—Corangamite, North East and North Central. The process for setting and delivering regional soil health priorities was examined.

The setting of regional soil health targets in RCS is 'aspirational' to the extent that funding is not allocated for each target, but rather the strategies reflect the identified regional priorities and issues.

Each of the three CMAs developed RCS, and the process for setting soil health targets was in line with guidelines, outlining soil health targets and actions. CMAs varied in their approach to addressing soil health targets, with only one CMA developing an overarching coordinated soil health strategy for the region to specifically identify and address soil health issues in an integrated way.

All soil health projects that the three CMAs implemented under the VIF have objectives consistent with the VIF, and have either met, or are on track to meet, these output-based objectives. The projects are effectively tracked and monitored through DSE's Catchment Activity Management System.

Corangamite Catchment Management Authority

Corangamite CMA adopted a comprehensive and integrated approach to soil health planning and management, compared with the other two CMAs. Its RCS has two soil health targets to address salinity and soil deterioration threats to the 'land use' asset. These targets are referred to and expanded further in the Corangamite Soil Health Strategy and the Soils and Salinity Program.

The strategy and program provide a framework for decision-making and regional investment in soil health, and incorporate all current programs and projects related to soil health that are state or Commonwealth funded. Corangamite has contracted DPI to develop and implement all its soil and salinity programs.

Corangamite CMA does not have the funding or flexibility to implement all regional soil health priorities and actions that the RCS identifies. This is due to different investment priorities between the region and the state, with state funding typically restricted to on-ground works in DSE prioritised areas, with a focus on land management impacts on rare and threatened vegetation. As a consequence, its approach does not consider all the priorities for the region. Rather, it focuses more on the priorities of the dominant funder, which may not accord with the priorities for the region. This means priority regional soil health issues may only get partially addressed.

North East Catchment Management Authority

The North East CMA's RCS sets two soil health targets and actions around soil health—improved land management practices to increase primary productivity, and protecting land assets from threats of soil salinity, acidity and erosion. A draft soil health action plan was developed in 2001, but this was not approved. The 2004 RCS drew on the draft soil health action plan to identify soil health issues.

The key on-ground soil health project is the Salinity, Sediment, Nutrients and the Murray project, where \$45 000 has been allocated to specialist soil conservation extension and \$110 000 for on-ground works incentives. This project is not identified in the RCS. Extension and on-ground works are targeted to areas across the region, identified as contributing a lot of salt, sediment and nutrient loads to the Murray River. Therefore, soil health projects funded under the VIF are limited to approximately 45 per cent of the region.

The activities for this project are identified by community groups and facilitated by the CMA. DPI provides the services for these activities through an annual service agreement.

The North East CMA also received Commonwealth funding for the Sustainable Farming Practices—Soil Carbon project which has provided opportunities to deliver soil health activities in the region broader than soil carbon objectives. The Soil Carbon project provides an opportunity to address a range of broader soil health issues around salinity and acidity, identified in the RCS. This is an example of how CMAs opportunistically use a range of funding sources to address soil health issues. While necessary, this illustrates the ad hoc approach to the implementation of soil health planning where CMAs need to rely on identifying funding opportunities as they become available to meet their regional objectives for soil health.

North Central Catchment Management Authority

North Central CMA's RCS sets out three targets for soil health as an asset for primary productivity and improved land management practices to protect natural resources from threats of soil salinity. These three targets are referred to and further developed in the *Dryland Regional Management Plan* and the *Loddon-Campaspe Irrigation Region Land and Water Management Plan*.

The North Central CMA can only implement on-ground soil health projects to protect natural assets from salinity to less than 5 per cent of its region due to state priorities under the VIF. No state funding was received for on-ground soil health projects to protect natural assets in the dryland areas.

The CMA administers on-ground soil health activities funded under the VIF, with services provided by DPI. Projects to improve land management practices, mainly through whole-of-farm planning are delivered by a range of service providers. Other soil health initiatives in the region include targeted extension activities undertaken as a part of DPI's Healthy Soils project and Commonwealth funding under Caring for Our Country for the Soil Carbon project. This project has been planned and is being implemented independently of DPI, although it focuses on land health as an asset to improve farm productivity.

Recommendation

1. The Department of Sustainability and Environment and the Department of Primary Industries should:
 - develop an integrated statewide soil health framework to improve coordination of effort and alignment of priorities
 - establish a cross-agency committee to oversee the development of the framework and the coordination and alignment of activities.
-

3 Improving soil health

At a glance

Background

Demonstrating that soil health has improved is challenging. It requires agreement on soil health indicators and monitoring programs to assess soil health status and trends over time. It also requires baseline and up-to-date information and data that is accessible to soil health planners and managers before the implementation of soil health projects.

Conclusion

While agencies can assess how effectively they have met project outputs and objectives, they cannot assess whether they have achieved the outcome of sustained or improved soil health.

Findings

- Soil health project performance monitoring and reporting frameworks, at both the state and regional levels, are generally sound and detail requirements to evaluate project outputs, budgets and timeliness.
- The evaluation of soil health projects is process driven and their effect on soil health outcomes is not measured in any meaningful way.
- Comprehensive reporting of soil health trends and conditions is limited, as data on soils is fragmented at a regional and statewide level.
- There is no agreement on the range of soil health indicators required to monitor soil health.
- The lack of soil health monitoring undertaken at any level across the state compounds the inadequacies of current soil health data.

Recommendation

The Department of Primary Industries and the Department of Sustainability and Environment should identify and agree on key soil health information and data needs and develop 'fit for purpose' monitoring and research programs to guide investment decisions.

3.1 Introduction

A range of soil health projects have been, and continue to be, delivered. While they have differing objectives, whether they are designed to improve primary productivity or protect natural assets, they are ultimately aimed at improving soil health.

Demonstrating that soil health has improved is challenging. It requires agreement on soil health indicators and monitoring programs to assess soil health status and trends over time. It also requires baseline and up-to-date information and data that is accessible to soil health planners and managers to assess soil health before and after the implementation of projects.

3.2 Conclusion

Catchment management authorities (CMA) and the Department of Primary Industries (DPI) have established effective performance monitoring arrangements to assess how well projects have been implemented, and to what extent they have delivered their outputs and met their objectives.

However, the extent to which soil health has improved cannot be reliably determined because there is no agreement on soil health indicators, monitoring programs and responsibilities required to measure soil health outcomes on private land. It is not possible to conclude, therefore, to what extent soil health has been maintained or improved through soil health projects delivered to date.

3.3 Effectiveness of soil health programs and projects

Project monitoring provides information about how well a project is being implemented and whether outputs and objectives are being achieved. Importantly, monitoring should also tell those investing in the projects whether intended outcomes have been achieved.

It is not possible to report on the extent to which soil health projects have improved the soil health outcomes government wanted due to:

- lack of consistent and integrated performance monitoring and reporting frameworks
- output-focused projects
- lack of soil health monitoring programs
- inadequate data.

3.3.1 Performance monitoring

Consistency of approach

Soil health project performance monitoring and reporting frameworks, at both the state and regional levels, are sound and detailed in terms of what is required to evaluate project outputs, budgets and timeliness. 'Investor' focus is on the achievement of outputs rather than outcomes. Consequently, projects had a heavy emphasis on the delivery of outputs, and were not supported by monitoring programs or project time frames to measure soil health properties that link project outputs to soil health outcomes. For example:

- For the Farm Plan 21 project, improvement in land management practices, and therefore soil health, was measured through the number of whole-of-farm plans implemented, and in some cases an evaluation of improved landholder knowledge and skills.
- For the regional soil health projects, while having the objective of improved soil health, effectiveness was assessed by measuring:
 - hectares and number of sites treated for erosion
 - kilometres of waterway stabilised, including dams, rivers and wetlands
 - hectares managed for soil improvement
 - the number of whole-farm-plans delivered.
- For the Healthy Soils project, evaluation was taken to a further level, which included interviewing farmers about changes in land practices they had or intended to implement as a result of skills and knowledge transferred through the project.

This finding reflects the broader findings of VAGO's *Performance Reporting by Departments* performance audit tabled in Parliament in 2010, which highlighted the lack of cost-effective evaluations and outcome-based reporting in general.

A range of project performance monitoring frameworks are in place to measure the effectiveness of soil health projects due to the many stakeholders involved in soil health management. Apart from the regional and multi-regional soil health monitoring and reporting processes required by the Department of Sustainability and Environment (DSE) under the Victorian Investment Framework (VIF), there is no integration of, or consistency between, soil health monitoring and reporting frameworks between stakeholders.

Under the VIF, DSE and the CMAs track and report on the progress of projects through the project information retrieval system and the AXAPTA project planning and management/closure data information system. Project progress and outputs are reported through the catchment action management system. This results in the consistent recording, tracking and reporting of proposals submitted to CMAs and DSE and the tracking and reporting of each approved project.

CMAs use other systems to monitor and report on projects not funded under the VIF, which are not standardised across regions.

DPI uses its internal project tracking and management system to monitor and report on the performance of its Healthy Soils project and Whole-of-Farm Planning program, including the Farm Plan 21 project. For both these projects, performance monitoring and reporting occurs under two different DSE frameworks, the Expenditure Review Committee Framework and the VIF, as they are funded under these programs. Consequently, Farm Plan 21 projects are monitored and reported under different project monitoring and performance frameworks, depending on the funding source.

DSE is working on a new performance and reporting framework under the VIF that recognises a hierarchy of cause and effect relationships, from activities, to outputs, to intermediate outcomes and finally to the achievement of overall soil health outcomes. It will be based on the principles of the monitoring, evaluation, reporting and improvement framework.

3.3.2 Achievement of outcomes

DPI project evaluations are extensive and show positive results for individual awareness and knowledge, skills in soil testing, community involvement and outputs or activities delivered. DPI's Healthy Soils project also reports on changes in land practices as a result of improved farmer skills and knowledge. However, no soil health or other project reporting frameworks focused on the direct assessment or achievement of soil health outcomes as a result of the project outputs.

The Victorian *Catchment Condition Report 2007* and the *State of the Environment Report—Victoria 2008* highlighted the issues with, and the limited amount of, soil health outcome assessment and reporting. The reports concluded that there was little evidence provided that soil health programs are adequately achieving the anticipated state outcomes and that there is insufficient data on the condition of soils across Victoria to be able to report comprehensively at a statewide level.

Short project time frames

Short time frames of one to four years for the soil health projects only allow the setting of intermediate objectives and measurement of outputs to judge their effectiveness. This is because the time lag between outputs and changes to soil health as a result of these is generally longer than four years. The objectives and their measurement are not a measure of improved soil health, but an intermediate step to achieving this. Projects are not supported by longer-term soil health monitoring programs or long-term funding frameworks to measure the effectiveness of projects over a longer time frame.

The current approach to evaluating soil health projects is process driven. There is a lack of causal evidence gathered or known between soil health objectives, project outputs and the desired outcome of sustained or improved soil health. As such, it is unclear how effective these projects have been in sustaining or improving soil health.

A DPI pilot, set up as part of the Healthy Soils project, measures the effects on soil health from different cropping practices demonstrates this. Paired sites, including a test site and control site for each practice, were monitored. No useful data was collected after two years when funding stopped because there was not enough time to see a significant or noticeable impact from changes in cropping practices. No recurrent funding was available to continue the monitoring of these sites.

To improve this situation, short-term projects, between one and four years, should be supported by the measurement of soil health outcomes by long-term 'fit for purpose' monitoring strategies and programs or land use impact models based on validated assumptions.

Measuring condition

Agencies are constrained in measuring improved soil health outcomes or setting outcomes for soil health projects. Critical knowledge gaps exist between the connection of land management practices to soil health properties, and how these properties at a farm-scale impact on soil health outcomes at a landscape scale. In addition, it is not clearly known how a change in soil properties is linked to improved soil health condition. These factors have contributed to the difficulty in getting agreement on soil health indicators between DSE and DPI as part of the land health index, in association with the difficulties associated with different priorities and mandates of the agencies.

Establishing causal links between on-ground actions and improved soil health is difficult because soil health is complex, variable and not adequately understood. This, in turn, means that the ability to develop monitoring programs that can indicate improved soil health using several scales is limited.

3.4 Soil health data

Analysing soil data is an important part of assessing whether soil health has improved. If good data is available it enables project investors and evaluators to assess the health of soils against baseline data to identify improvements, trends and to prioritise soil health issues.

Inadequate soil data across Victoria limits the ability of agencies to report comprehensively on soil health at a regional or statewide level. No short- or long-term trends can be determined for overall soil health.

3.4.1 Availability of soil health data and information

Assessment of soil health projects and investments to improve soil health is limited by the fragmented and inconsistent soil data. Victorian soil data has been collected, collated and published for many decades. However, it is of varying quality and there are issues around its consistency, including:

- how the data was collected
- who collected the data and for what purpose
- who owns and manages the data
- where and how data is stored
- how complete the data is
- who can access the data.

Soil data is fragmented and old in many cases, covers local areas only, uses inconsistent terminology and methods of measurement and is not held in one integrated system. A range of soil health data is also difficult to collect, as it requires extensive, costly and complex soil testing.

There is no systematic history of soil data collection in Victoria. Historical restructuring of agencies and short-term, changing priorities for natural resource management have led to fragmented and inconsistent data acquisition and management.

DPI reviewed its soil data in 2006, but there has been no statewide review of soil data. No formal business arrangements existed within DPI for the management of soil data until the DataTrack project, and other integrated internal DPI projects, began in 2006. The two-year project was targeted at the improved management and use of agricultural and ecosystem data within DPI, and resulted in the development of the Victorian Soils Information System (VSIS).

VSIS is the main information system used to store and manage soil data in Victoria. It was not designed to determine soil health status or trends at a regional or state level. VSIS is only accessible by DPI and DSE staff. DPI is upgrading the system to address these issues.

A five-year \$5.8 million DPI project—Understanding Farming Systems—which began in 2010, will further improve the quality and accessibility of soil data. The objectives of the project are to:

- provide quality controlled soil data and information systems for use in measuring and modelling the impact of farming systems on soil health
- achieve a better understanding of farming systems and soil health through quantitative and qualitative analysis of available data
- develop supporting systems and guidelines to enable users to access and use soil information systems in their decision-making.

The Victorian Resources Online Soil Health webpage is the principal means for communicating Victorian soil health information. The webpage was one of DPI's primary objectives, which it realised through its Healthy Soils project. It is the most comprehensive Australian soil health site. The website is targeted at private landholders to give them the information they need to assess the health of their soils.

While comprehensive compared to other sites, the webpage is still limited because it lacks up-to-date information in a number of key areas, including:

- the impact of land management practices on soil health
- processes contributing to and affecting soil health
- the evaluation of individual soil properties role in overall soil health.

National information is also lacking, which further limits the ability of stakeholders to link soil health project outputs to soil health outcomes.

3.4.2 Soil health monitoring

No single organisation, department or agency has the mandate or capacity to coordinate soil health monitoring and data collection across the state. The significant number of agencies involved in soil health management, and lack of clarity around their roles and responsibilities and lack of coordination creates difficulties for soil health monitoring, data collection and management. For example, CMAs do not think it is appropriate to make soil health monitoring at a regional scale a priority at the expense of practical, industry-focused soil management projects, particularly given that there are no monitoring or funding initiatives for monitoring at a state level. In addition, DSE believes that DPI is the lead agency for soil health monitoring on private land. However, DPI's soil health monitoring, when completed, targets primary productivity objectives, not an assessment of soil health condition and trends at a regional or state level.

Difficulties also arise because of the lack of agreed priorities, measurement methods, monitoring arrangements, quality and control processes, data exchange agreements, and arrangements for the continuity of data collection and data uploading.

There are no programs that support substantial short-term or long-term monitoring of soil health. There are no policy initiatives or priorities within strategies or funding frameworks to develop or support soil health monitoring programs. The current VIF is unsuited to long-term soil health monitoring programs because of its short time frames for funding projects.

While direct monitoring of soil condition may be difficult due to the above reasons, DSE, DPI and CMAs have used land impact models as a surrogate for monitoring programs. The Land Use Impact Model was used to support the development of Corangamite CMA Soil Health Strategy. However, it has limitations in determining soil health condition as it is designed as a predictive tool. To use it to accurately predict the impact of soil health projects on soil health, the assumptions on which the model is based need to be validated on-ground as a priority.

Recommendation

2. The Department of Primary Industries and the Department of Sustainability and Environment should identify and agree on key soil health information and data needs and develop 'fit for purpose' monitoring and research programs to guide investment decisions.
-

Appendix A.

Audit Act 1994 section 16— submissions and comments

Introduction

In accordance with section 16(3) of the *Audit Act 1994* a copy of this report was provided to the Department of Sustainability and Environment, the Department of Primary Industries, and the Corangamite, North Central and North East Catchment Management Authorities with a request for submissions or comments.

The submissions and comments provided are not subject to audit nor the evidentiary standards required to reach an audit conclusion. Responsibility for the accuracy, fairness and balance of those comments rests solely with the agency head.

Submissions and comments received

RESPONSE provided by the Secretary, Department of Sustainability and Environment



Department of Sustainability and Environment

Ref: SEC007073
File: CS/33/3045

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Mr D D R Pearson
Auditor - General
Auditor General Victoria
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MELBOURNE VIC 3000

Dear Mr Pearson

PROPOSED AUDIT REPORT - SOIL HEALTH MANAGEMENT

Thank you for your letter dated 1 September 2010 and enclosing a copy of the "Soil Health Management" report. I apologise for the delay in responding.

The Department of Sustainability and Environment (DSE) accepts the recommendations in the report, and will work towards developing strengthened policies and procedures for implementing soil health programs in Victoria. DSE's specific responses to the recommendations appear below.

Recommendation 1: DSE and the Department of Primary Industries (DPI) should:

Develop an integrated statewide soil health framework to improve coordination of effort and alignment of priorities.

DSE is developing a soil health strategy that will articulate priorities for maintaining and improving soil health across public and private land in Victoria. This strategy is intended to articulate DSE's role and guide future investment in soil health. This strategy will also articulate high risk and high value areas for soil health planning that take into account regional as well as priorities outlined in *Securing Our Natural Future: A white paper for land and biodiversity at a time of climate change*. It will be developed in close collaboration with the Catchment Management Authorities (CMAs) to ensure greater coordination and alignment of priorities.

The DSE soil health strategy will also clarify DSE's role and interest in soil management and its relationship with DPI, Parks Victoria and the CMAs. DSE is committed to working closely with DPI to ensure the greatest possible degree of alignment around soil health management in Victoria.

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RESPONSE provided by the Secretary, Department of Sustainability and Environment – continued

In addition, DSE will develop new Victorian Investment Framework priorities for 2011/12 based upon the DSE soil health strategy. These priorities will better reflect both regional and state objectives and will be produced in collaboration with CMAs.

Establish a cross-agency committee to oversee the development of the framework and coordination and alignment of activities.

DSE also welcomes the establishment of a cross-agency committee to ensure greater alignment and coordination across departments and agencies. However, it will be important to ensure that any new, integrated arrangements enable continued investment in public outcomes specific to portfolio responsibilities while maintaining cross-agency alignment of activities.

Recommendation 2: DPI and the DSE identify and agree on key soil health information and data needs and develop “fit for purpose” monitoring and research programs to guide investment decisions.

DSE is pleased to work with DPI to develop a combined approach to identifying and collecting soil health data and information. In particular, the DSE soil health strategy will articulate a clear rationale for monitoring and reporting on soil health outcomes as they relate to natural resource management needs.

Nevertheless, it will remain a challenge to monitor and report on soil health outcomes that often have lag times of 20 to 100 years. There may continue to be a role for output monitoring in the regions as a proxy for outcome monitoring within this context. Alternatively, determining and reporting on soil health investment may benefit from the use of predictive modelling. DSE is currently investigating these possibilities and will continue to work on researching soil health in conjunction with DPI.

Thank you for raising this matter with me.

Yours sincerely



Greg Wilson
Secretary

RESPONSE provided by the Secretary, Department of Primary Industries



Department of Primary Industries

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Mr D D R Pearson
Auditor-General
Victorian Auditor-General's Office
Level 24, 35 Collins Street
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Our Ref:

Dear Mr Pearson,

AUDIT ACT 1994, S16(3) - PROPOSED AUDIT REPORT SOIL HEALTH MANAGEMENT

Thank you for providing the Department of Primary Industries (DPI) with a copy of the Audit Report on Soil Health Management. DPI welcomes the opportunity to provide comment into the Audit Report on Soil Health Management and is supportive of the Audit's recommendations.

The Audit Report and its recommendations are an incentive for DPI to further advance this important initiative on soil health and to move towards an integrated management of soil health priorities across the state. Through the soil health projects, DPI has laid the necessary groundwork to ensure that we are in a position to give due regard for the recommendations contained in the Audit Report and to provide a more coordinated response to long term planning and monitoring of soil health, and to oversee the development of a statewide soil health framework.

The findings of the Audit Report present an opportunity to improve the coordination amongst the significant number of agencies involved in soil health management and to develop a systematic approach for soil health monitoring, data collection management, and evaluation. As stated in your report the current Victorian Investment Framework is unsuited to long-term soil health monitoring programs because of its short timeframes for funding projects. To maximise effectiveness of responses to soil health, we recognise that there needs to be an integrated approach where effort is coordinated, priorities and objectives are agreed and roles and responsibilities are clear and transparent.

The Audit Report found that despite the large number of agencies with different priorities involved in the delivery of soil health, DPI's delivery of individual soil health projects were well managed, and effectively delivered as planned across the state.

DPI supports the Audit Report's recommendations which build on the work that we have already undertaken with farmers and land-holders to improve soil health.

We look forward to working closely with your office and other partner agencies to deliver integrated initiatives on soil health that supports agricultural productivity and protects natural assets.

Yours sincerely,

Richard Bolt
Secretary

15/9/2010

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