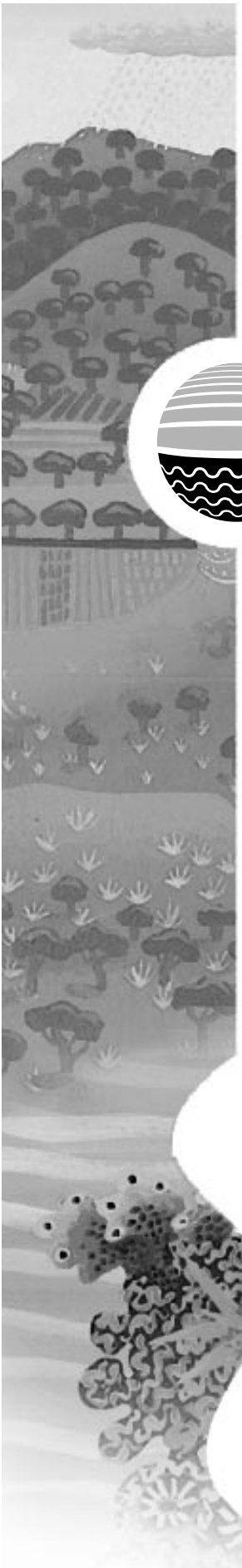

Land & Water
AUSTRALIA
research • development • innovation

Annual Report
2000–2001

Land & Water Resources
Research & Development Corporation

ISSN 1037–6658

We at Land & Water Australia have made a commitment to meet the highest standards in management performance, and to continually improve as an organisation. We believe these are encapsulated in the requirements of AS/NZS ISO 9001:2000.

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Land & Water AUSTRALIA
research · development · innovation

Senator the Honourable Judith Troeth
Parliamentary Secretary to the Minister for Agriculture, Fisheries and Forestry
Parliament House
CANBERRA ACT 2600

Dear Senator Troeth,

Land & Water Resources Research & Development Corporation
Annual Report: 2000-2001

In accordance with Section 28 of the *Primary Industries and Energy Research & Development (PIERD) Act 1989*, and Section 9 of the *Commonwealth Authorities and Companies Act 1997 (CAC Act)*, I have pleasure in presenting to you the Annual Report of the Land & Water Resources Research & Development Corporation for 2000–2001.

To demonstrate that the Corporation is meeting Commonwealth Government reporting requirements, an Index of Compliance is provided.

The past year has seen the Corporation reposition itself in readiness for implementation of the 2001-2006 Strategic Research & Development Plan. Among several highlights during the year, the Corporation marked its tenth anniversary with a celebratory dinner in Goulburn in December, followed by a natural resource management forum at which leading scientists and stakeholders reflected on achievements over the decade and imperatives for the next decade and beyond.

As you are aware, the ten-year event also marked the launch of the new brand name for the Corporation, Land & Water Australia. The new name and new 'look' for the Corporation reflect the Board's determination to enhance communication effort to ensure greater adoption of the outputs of the Corporation's Research & Development programs at policy and on-ground levels. This is emphasised within the new Research & Development Plan as a priority for the life of the plan.

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The past year has also seen considerable work to begin implementing other priorities set out in the new Research & Development Plan, including:

- Negotiation of new Research & Development partnerships with industry through commodity Research & Development Corporations.
- Major steps to improve cross-program integration and to focus more at the landscape/catchment scale. This approach is being applied on a large scale through the Ord-Bonaparte Program in the East Kimberleys, which commenced during the year.
- Strengthening linkages with the National Land and Water Resources Audit and seeking to contribute to the National Action Plan for Salinity and Water Quality.
- Greater Research & Development effort focused on the social, economic and institutional dimensions of natural resource management.

Other highlights during the year included the commencement of new Research & Development programs dealing with river contaminants (focusing on salt and nutrients), riparian lands and native vegetation.

Land & Water Australia continues to enjoy strong support from Government agencies, rural industry bodies, community groups and research organisations. We are building on these collaborative partnerships. In particular, we are looking to enhance relationships with State Governments through the negotiation of Memoranda of Understanding encompassing *inter alia* Research & Development priorities and dissemination of outputs through State-based delivery mechanisms.

We look forward to maintaining this collaborative approach to the sustainable and productive use of Australia's natural resources. Research and Development highlights for 2000–2001 are described within the Annual Report. I commend it to you.

Yours sincerely,

Roberta Brazil
Chair
15 October 2001

Att: Land & Water Resources Research & Development Corporation Annual Report 2000–2001

Certification

I hereby certify that the 2000-2001 Annual Report for the Land and Water Resources Research & Development Corporation, known as Land & Water Australia, has been prepared in accordance with a resolution of the Directors of the Corporation.

The date for the Annual Report is 30 June 2001.

The Directors are responsible under section 9 of the *Commonwealth Authorities and Companies Act 1997* for the preparation and content of the Report of Operations in the Annual Report in accordance with the Finance Ministers Orders.

Signed this nineteenth day of September 2001.

Signed

Roberta Brazil
Chair

19 September 2001

Signed

Andrew Campbell
Executive Director

19 September 2001

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Contents

1 Chair's Report

THE YEAR 2000–2001 was pivotal in the evolution of Land & Water Australia. In December 2000, the Corporation celebrated its tenth anniversary, which it marked with a change of name from the Land & Water Resources Research & Development Corporation, to Land & Water Australia.

The year saw the development and approval of a new Strategic R&D Plan for 2001–2006. This new Strategic Plan sets out an innovative approach to investment in new Research and Development (R&D) and also to management of the tremendous portfolio of R&D that has been established over the last decade.

The new mission statement for the Corporation makes it very clear that Land & Water Australia is still in the business of generating knowledge, but equally we are concerned with informing debate and inspiring innovation and action on the ground. The implication of this is that Land & Water Australia has two key areas of core business:

- We invest in R&D to generate new knowledge that is needed in the pursuit of more sustainable management of Australia's unique natural resources.
- We are also engaged in knowledge management – adding value to R&D outputs so that they become more meaningful, more useful, more accessible and/or more user-friendly.

The Strategic R&D Plan 2001–2006 outlines how these two roles will be delivered over the next five years and sets out a structure for the Land & Water Australia R&D portfolio around five R&D Arenas and four Integrating Themes. This structure is designed to facilitate a more integrated approach. R&D programs are clustered into arenas – sustainable primary industries, rivers, vegetation, future landscapes and cross-cutting activities.

Interwoven across these arenas are four Integrating Themes – perceiving and valuing, learning and understanding, living in and managing, and organisation and governance. These themes are common to all natural resource management issues and they are key drivers of behaviour and on-ground practice. They provide a conceptual hook on which to hang activities and synthesis products that cut across the R&D arenas and the Corporation's ten-year R&D portfolio.

Research and development activities have continued throughout the strategic planning process. Important R&D programs were initiated in riparian lands, native vegetation and river

At the launch of Land & Water Australia's new Strategic R&D Plan for 2001–2006. L to R: Andrew Campbell – Executive Director, Roberta Brazil - Chair, Senator Judith Troeth – Parliamentary Secretary to the Minister for Agriculture, Fisheries and Forestry and the Honourable Tim Fisher MP.

contaminants. A major integrated new program commenced in the East Kimberley region based on the catchment of the Ord River and its associated estuarine and marine ecosystems. We continue to fund complementary and catalytic projects within our General Call.

We have also continued our active participation and support in the R&D programs managed by other corporations, for example the Sustainable Grazing Systems program managed by Meat & Livestock Australia and the Joint Venture Agroforestry R&D Program managed by the Rural Industries R&D Corporation.

Further, we initiated negotiations around several major new partnerships with research bodies representing industries including the wool, grains, meat and livestock, cotton and dairy industries. The Land & Water Australia Board expects these negotiations and scoping studies currently underway to lead to very significant new research, development and extension initiatives that will generate practical tools for landholders to improve their sustainability across a large proportion of the continent.

The Board's decision to enhance communication effort, announced in last year's Annual Report, resulted in a complete overhaul of the Corporation's systems and processes for translating R&D results into subsequent action. The communication team likens this effort to the re-stumping, re-wiring and re-plumbing involved in renovating a house – largely invisible to an outsider but fundamental to the long-term integrity and function of the structure.

Changes have included looking at and improving: the way communication is integrated into the R&D process; the databases we use to manage contracts and programs; the systems we use to develop, manage and disseminate publications and other products; the way we use the World Wide Web and the Internet; the way we engage with different audiences; and the relationships we have with commodity RDCs and organisations that have extension networks. We have also made some more obvious changes such as the new name and 'look' for the Corporation, which I am delighted to say have been very well received.

An exciting new initiative for the Corporation, developed in 2000–2001, was an addition to our range of scholarships and fellowships, called Community Fellowships. These fellowships are designed to assist non-scientists working at a community level, who have experiences in natural resource management that could be of interest to others, to 'tell their story' in ways that share the lessons with a much wider audience.

The fellowships recognise that science does not have a monopoly on knowledge, that practical experience is extraordinarily valuable also, especially if it can be made accessible to a wider audience. It is very heartening that our first six such fellowships were funded by a private philanthropist. These fellowships complement our PhD scholarships and our travelling and visiting fellowships, which collectively represent an important investment in building human capacity in natural resource management.

The National Land and Water Resources Audit, a program of the Natural Heritage Trust (NHT), is working extremely hard towards the culmination of its first phase. Important national products are emerging from all of the Audit's seven themes. The Audit is coordinating the development of the on-line Australian Natural Resources Atlas, which I believe will come to be seen as among the most exciting breakthroughs in natural resource management information in Australia. It 'unlocks', and makes freely available to the public, layers of data that have previously resided within the map drawers and databases of State and Commonwealth agencies.

The Atlas and other Audit products will assist natural resource decision-making by governments, industries, land users and community organisations. The coming year will see the end of this first phase of the Audit, which will be crucial both in publishing and disseminating the results of the first phase and ensuring that ongoing arrangements are established, so that momentum is not lost.

I would again like to record the sincere thanks of the Corporation to the many government agencies, other R&D corporations and funding bodies, catchment and landcare groups, and researchers and their organisations who continue to provide a high level of support and collaboration within our R&D portfolio. The active participation of these many individuals and organisations is crucial to the success of our programs, and to the high level of return being achieved on the investment of public funds into natural resource management R&D.

On behalf of the staff, program coordinators and fellow directors, I would like to record our appreciation of the contribution of my predecessor, Alex Campbell, during his five years as Chairman of the Corporation to 30 June 2001.

Finally I would like to thank the staff of the Corporation who have maintained a high level of performance and professionalism during a very busy year which saw considerable change. They continue to be the Corporation's most valuable asset.

Roberta Brazil
Chair, Land & Water Australia

2 Broad Directions for the Future

AS WE ENTER the first year of a new five-year strategic R&D Plan, Land & Water Australia is consolidating the strategic directions set out in that plan.

A major priority over the next few years is to **enhance partnerships with primary industries**, in particular through the commodity-based R&D corporations. Initially, we have concentrated on the broadacre industries responsible for managing most of the continent. We are developing major partnerships with the meat and livestock, wool and grains industries. We are also working with the dairy and cotton industries to explore opportunities for large-scale collaborative R&D.

Over the next few years, we hope to initiate partnerships with the more intensive industries including horticulture, sugar and grapes. Through these partnerships, we are looking to ensure that Land & Water Australia-funded R&D is directly relevant to industry needs. We hope to see our R&D results

extended through industry-based delivery mechanisms.

The **enhanced emphasis on communication** of R&D outputs was heralded in last year's Annual Report and is underlined in the R&D Plan 2001–2006. This effort is not just about getting information 'out there' in more useful formats. It is also about developing more direct two-way communication with the users of our research. Industry partnerships are one way to do this.

New web-based technologies offer other options that we will be testing through a redesigned web interface for the Corporation. Land & Water Australia is also seeking to develop Memoranda of Understanding with each State and Territory, encompassing inter alia State/Territory input into our R&D priorities, and dissemination of R&D outputs through State/Territory delivery channels.

Partnerships with non-government organisations that have extensive regional networks such as Greening Australia are also being negotiated. Regular Land & Water Australia events such as regular R&D Forums, rotating among our five R&D Arenas, also provide opportunities for face-to-face interaction between researchers and the users of research.

Land & Water Australia has two key areas of core business.

The first is obviously **generation of knowledge**. We invest in R&D to generate new knowledge that is needed in the pursuit of more sustainable management of Australia's unique natural resources.

We are also engaged in **knowledge management** – adding value to R&D outputs so that they become more meaningful, more useful, more accessible or more user-friendly. As an R&D Corporation that has funded more than 1300 projects across Australia over the last decade, we are uniquely placed to tap into this reservoir of information and knowledge to synthesise useful products and services.

We will be significantly enhancing investment in the systems and tools needed to manage the knowledge we have created, as well as funding creation of new knowledge. With our knowledge management activities, no research project will ever be 'finished' or forgotten.

A major priority for the Corporation over the next few years is to fund more integrated R&D projects, and to **achieve greater integration** across projects and programs. The Strategic R&D Plan 2001–2006 sets out a structure for the Land & Water Australia R&D portfolio around five R&D Arenas and four Integrating Themes. This structure is designed to facilitate a more integrated approach.

R&D programs are clustered into arenas – sustainable primary industries, rivers, vegetation, future landscapes and cross-cutting activities. Investment proposals for new R&D are developed at an arena level, Program Coordinators work in arena teams and over time there are likely to be fewer, larger research programs. So the arenas themselves are an integrating mechanism.

The R&D Arena that is set for the largest proportional increase in Land & Water Australia investment over the next five years is the **future landscapes** Arena. This R&D arena exists because of a recognition that, for many of the resource management issues facing Australia, incremental improvement of existing farming systems and land uses is incapable of moving the system towards sustainability.

Marginal improvement might decrease the level of unsustainability, but with inherently inappropriate land uses that will never be enough. In some regions of Australia we need to re-think how we use natural resources if we are to develop land use systems that are in tune with Australian landscapes, Australian climates and Australian biota, all of which are quite unlike those in the countries where our broadacre farming systems originated.

Our future landscapes arena starts from the ecological parameters within which we need to operate, and then considers new land use options, informed by insights into broader shifts in technology, markets, lifestyles, consumer preferences and so on. This is a challenging area, and to some extent we are constrained by lack of research capacity in Australia and lack of a strong design tradition within the natural resources disciplines. Nevertheless, it offers exciting possibilities for quantum shifts in approach to natural resource management issues and is quite properly a priority for new research.

Finally, Land & Water Australia sits at the intersection of two major contemporary priorities in public policy – the environment (specifically natural resource management) and innovation. As a Corporation primarily investing in public good issues for wider public benefit, public policy is at least as important as a user of our R&D as onground management.

We have a major challenge, and it is a very high priority over the next few years, to **improve linkages between research and policy**. For example, through the National Dryland Salinity Program, Land & Water Australia is actively pursuing opportunities to align R&D outputs with the needs of the National Action Plan for Salinity and Water Quality, and is working closely with the National Land and Water Resources Audit.

Research to inform policy, and research to inform public debate, are not necessarily the same as research to solve a problem on the ground. Teasing out how we can improve the focus, management and delivery of R&D to inform public policy is a key direction for Land & Water Australia.

Andrew Campbell

Executive Director
Land & Water Australia

Report of Operations

3 Corporation Overview

Introduction

THE LAND & WATER Resources Research & Development Corporation (the Corporation) was established under the *Primary Industries and Energy Research and Development Act (PIERD Act) 1989*, with the purpose of "the funding and administration of research and development relating to primary industries".

The specific remit of Land & Water Australia relates to the productive and sustainable management of land, water and vegetation resources. The Corporation's basic purpose, then, is to utilise the full national R&D capability to help achieve the goal of sustainable management of the natural resources which underpin the rural primary industries and regional communities. As a Commonwealth Authority, Land & Water Australia has a particular charter to foster and achieve national collaboration to improve the efficiency and effectiveness of this R&D effort.

Land & Water Australia is only one of several organisations involved in this endeavour. Responsibilities for natural resource management, whether for legislation, policy, programs or onground works, are distributed across all levels of government, community-based groups such as catchment committees and Landcare groups, rural industries and individual landholders.

In order to discharge its responsibilities and meet its objectives within this context, the Corporation emphasises the establishment of national research programs, supported jointly by several partner organisations, and aimed at bringing together resource managers and researchers to jointly identify priorities and to ensure that research findings are adopted and implemented.

Mission and role

Our mission is to provide national leadership in generating knowledge, informing debate and inspiring innovation and action in sustainable natural resource management. The Corporation will establish directed, integrated and focused research and development programs where there is clear justification for additional public funding to expand or enhance the contribution of R&D to sustainable management of natural resources.

The Corporation's role is to identify, fund and manage a portfolio of R&D programs to help achieve better and more sustainable use of natural resources and to help maintain the industries reliant on those resources.

Responsibilities

Within an annual government appropriation of about $11.0 M, the Corporation is responsible for R&D which helps support an irrigation industry worth $4.5 billion per year, a dryland cropping industry worth $9 billion per year, grazing industries worth $12 billion per year and natural ecosystems and vegetation of inestimable value to the nation.

The R&D it funds is directly aimed at protecting and enhancing the value of these industries, through ecologically sustainable use and management of natural resources.

These industries, and the activities of Australian society, have triggered environmental problems such as waterlogging and salinisation, soil acidification, erosion, soil structure decline and pollution (by nitrogen, phosphorus and heavy metals) of many of the country's major rivers and waterways.

With the assistance of Land & Water Australia, the Australian Conservation Foundation (ACF) and the National Farmers' Federation (NFF) – Land & Water Australia's representative organisations – cooperated in 2000 to quantify the investment required to conserve rural landscapes and the many productive and environmental values that they sustain.

The cost of degradation to rural landscapes – shown opposite – is conservatively estimated today at $1.4 billion annually.

ACF–NFF cost estimates of land and water degradation

Form of degradation	Estimate ($ M per year)
Salinity	270
Acid soils	300
Sodic soils or structural decline	200
Erosion	80
Irrigation salinity	65
Water quality	450
Total	1365

Highlights of 2000–2001

1. In September 2000, the Board of Land & Water Australia decided to adopt this shorter and more user-friendly brand name for communication purposes. The formal legal name of the Corporation has not changed. However, our R&D outputs and the public face of the Corporation now use the brand Land & Water Australia, with the tag line *research. development. innovation.* Our mission became to *provide national leadership in generating knowledge, informing debate and inspiring innovation and action in sustainable natural resource management.*

2. From the Climate Variability in Agriculture Program (CVAP), a streamflow forecast module has been developed and incorporated as a module into the successful 'Australian RAINMAN' software. The improved capacity to forecast streamflow will have important implications in the water industry, in irrigation management and in developing more effective environmental flow regimes.

   An Agriculture, Advancing Australia survey shows that, a decade after their introduction, 37% of farmers take seasonal climate forecasts into account in their farm management decisions, and that 73% of farmers are aware of seasonal forecasts. For sugar and cotton, more than 50% of farmers surveyed take seasonal climate forecasts into account in farm management decisions.

   Based on CVAP research on communicating probabilities, Bureau of Meteorology probability statements for seasonal outlooks now have an explanation in frequency terms, ie. 'in 6 years out of 10' to better explain 60% probability.

3. Dryland salinity is increasingly recognised as a natural resource management challenge of major proportions in Australia that is not confined to the rural sector. The National Dryland Salinity Program (NDSP) has contributed to a better understanding of the threat to rural and urban infrastructure (roads, railways, bridges, buildings, pipelines and gardens) native vegetation, wetlands and native flora and fauna.

   The NDSP also contributed to the Salinity Theme of the National Land and Water Resources Audit (Audit). This work has refined national, State and regional estimates of the extent and nature of dryland salinity. The Audit's findings were released as the Australian Dryland Salinity Assessment 2000 in March 2001. Information products are also provided in the Australian Natural Resource Atlas <www.nlwra.gov.au/atlas>.

State level strategies for salinity management have emerged in South Australia, New South Wales and Queensland and have been reviewed in Western Australia and Victoria. At the national level, the Federal Government announced creation of a $1.4 billion National Action Plan for Salinity and Water Quality, the key strategies of which are informed by research funded through NDSP.

4. The National Program for Irrigation R&D (NPIRD), the COAG Task Force and AFFA, with the support of the Australian National Committee on Irrigation and Drainage (ANCID), developed a model to benchmark the performance of irrigation water providers. This model has been adopted by the International Committee on Irrigation and Drainage, and is being used to develop an international water provider benchmarking system. The World Bank has expressed further interest in promoting the methodology globally.

5. Partial Rootzone Drying (PRD), developed as a result of NPIRD research, maintains both wet and dry soil within the upper horizons of the rootzone, reducing the amount of water lost by the leaves. Fruit yield is unaffected however, resulting in increased water use efficiency. For grapevines and some tree crops, PRD offers the possibility of saving up to 50% of normal irrigation allocations without affecting yield.

   Partial Rootzone Drying is truly groundbreaking research that has practical application and substantial economic and environmental benefits to individual farmers and to the nation as a whole.

6. In the final year of the North Australia Program (jointly funded with Meat & Livestock Australia), grazing management systems were developed to maintain or improve native pastures and the landscapes within which production occurs. The Program worked with beef producers to integrate ecological sustainability with economic and social aspects of the beef production enterprises, with strong emphasis on delivery of outcomes in formats readily accessible to producers.

7. The Sustainable Grazing Systems (SGS) Program (jointly funded with Meat & Livestock Australia) pioneered an approach to bring researchers, producers and extension agents into a partnership to collectively improve the productivity, profitability and sustainability of grazing systems in Southern Australia's high rainfall zone.

   The SGS goals were far exceeded:

   - 8000 producers made beneficial changes to grazing practices that they anticipate will yield financial and environmental benefits.
   - A random phone survey of producers in Southern Australia during 2001 showed 62% aware of SGS, and 41% 'engaged' with SGS.

8. National Groundwater R&D Program research on fractured rock systems has been especially important in developing new techniques for evaluating water and solute flow in such systems which underlie much of Australia.

Research into groundwater interactions with ecosystems, which will be completed by late 2001, has greatly increased awareness of the issue. Consequently, several States are now developing policy in this area.

9. The National Riparian Lands R&D Program determined that a well-maintained grass buffer strip of six metres width can be very effective in trapping up to 95% of sediment and associated nutrients from upslope intensive agriculture.

   The important effect of tree roots in reinforcing and stabilising streambanks has been quantified for different parts of a river's catchment. Research has shown the relative importance of hill slopes and gullies/channels as sources of sediments under particular catchment and land use conditions. This data has been used to generate sound management principles and decision-support tools.

   Riparian research has shown that nitrogen, rather than phosphorous, is the key nutrient that limits in-stream algal growth in forested streams.

   Of special importance, riparian research has shown that the shading effect of riparian vegetation is critical in preventing the growth of nuisance plants and algae in streams, even in the presence of enhanced nutrient levels. Shade equivalent to approximately 70% of that found under natural conditions is required to prevent the growth of nuisance plants and algae. A level nearer 60% is sufficient at higher latitudes to the South. This has been a common finding across Australia.

   Much of the shading effect of vegetation can be obtained by revegetating just the Northern bank on East-West flowing streams of up to several metres width. This is important information for catchment or rivercare groups with limited funds.

10. The National Rangelands R&D Program pioneered a new approach to rangelands research through the close linkage between R&D and local communities and their planning processes. It identified a number of policy and related issues of institutional structures and responsibilities to help develop methods of land use and management which maintain the condition, productive capacity and environmental values of rangelands. Some of these opportunities for change, based on the program's NSW project, were incorporated in the report of the recent NSW Western Lands Review, currently before the NSW Parliament.

11. A CD-ROM, containing all 14 publications from the Native Vegetation R&D Program, has been produced with the aim of assisting government agencies, community groups and landholders to better manage and conserve native vegetation in rural landscapes. Phase Two of this program commenced in 2001.

12. The Redesigning Agriculture for Australian Landscapes (RAAL) Program, from its field studies in Southern NSW and in Western Australia, provided ongoing and

challenging insights into the role of water and nutrients in agricultural and natural systems. A third site, on the wet tropical coast near Atherton in far North Queensland, has also been established to focus on rain-forest, horticultural and pasture systems. Comparisons between the ability of native and agricultural systems to use water and nitrogen are indicating broad principles necessary to redesign agricultural systems.

13. The Ord-Bonaparte Program (OBP) was established as a partnership between government, industry and the wider community to meet the R&D needs of the Kimberley region of North-Western Australia. The OBP is a world-leading innovation program in both its scope and its integrated approach to natural resource management at a regional scale. The Program is committed to effective community participation and capacity building; it integrates biophysical, social and economic research.

14. The Social and Institutional Research Program (SIRP) focuses on the social, economic, commercial, legal, policy and institutional dimensions of natural resource management. Its first phase of research, aimed at policy makers and advisors, generated 11 information sheets and a synthesis report encompassing key issues in natural resource management..

    During 2000–2001, the Program established collaborative relationships with the Murray-Darling Basin Commission, Meat & Livestock Australia, Bureau of Rural Science, Department of Agriculture, Fisheries and Forestry – Australia, and a number of State natural resource management agencies.

15. The National Land and Water Resources Audit, in an Australian first at a national scale, has determined productive returns on-farm and the level of impact off-farm from inputs such as fertiliser. The Audit has tracked soil erosion and phosphorus run-off from hill slopes and from gully to river reach, including riverbank erosion and dissolved sources of phosphorus through to the estuary and near-shore marine zones.

    The Audit launched the Australian Dryland Salinity Assessment 2000 and the Australian Water Resources Assessment 2000 and e-published the water resources topic in the Australian Natural Resources Atlas at <www.nlwra.gov.au/atlas>. The atlas presents integrated results of Audit assessments and provides an on-line mapping facility. The Australian Natural Resources Data Library also became available on-line.

    In addition, key Audit findings have been adopted in Government policy including providing information on the priority catchments for the National Action Plan for Salinity and Water Quality.

Financial and Investing Activities

The Corporation receives general funding support from the Commonwealth Government of about $11 M each year. Additional funds are sourced from external partnerships within collaborative programs and other activities. Land & Water Australia also derives income from sources such as investments, royalties

and sales of products, information and services.

As detailed in the audited financial accounts, the Corporation has maintained a low surplus of accrued funds of $2.1 M at 30 June 2001 (1999–2000 Amount: $1.7 M). The Corporation maintains only a small prudential reserve to cover contingencies in its R&D portfolio. All surplus funds are invested on deposit in Commonwealth approved banks. During the course of the reporting year, the Corporation ensured that it met its debts and obligations as they fell due.

Financial Summary Data

Table A. 2000–2001 Summary of Actual and Budget Income and Expenditure ($ M)

	Budget[1] $ M	Actual $ M	Actual %	Explanation of Variance
INCOME				
Commonwealth appropriation	11.159	11.314	50	Increased indexation of appropriation
Natural Heritage Trust	7.490	7.194	32	Delay in program activities
Third party contributions[2]	4.169	3.366	15	Delay in program activities & partnerships
Interest and other income	0.580	0.707	3	Below expected interest income offset by additional return of R&D funds
TOTAL INCOME	**23.398**	**22.581**	**100**	
EXPENDITURE				
R&D Funding				
Commissioned R&D programs	11.177	10.981	49	Delay in program activities
National Land and Water Resources Audit	7.491	7.329	33	Delay in contract completion – contractors from Commonwealth, State, Territory agencies, research organisations and private consultants
General call	1.570	0.634	3	Projects transferred to commissioned R&D programs
Sub-total	20.238	18.944	85	
Communication & Adoption	1.705	1.401	6	Delay in implementing communication products and systems
Strategic planning & management	0.120	0.444	2	Additional expenditure on strategic planning process
Review & evaluation	0.120	0.052	1	Delay in implementing evaluation strategy
Administration	1.215	1.321	6	Additional management activities
TOTAL EXPENDITURE ($ M)	**23.398**	**22.162**	**100**	
Deficit ($ M)	**0**	**0.419**		
Opening balance at 1 July 2000	**0.935**	**1.691**		
Closing Balance at 30 June 2001	**0.935**	**2.110**		

NOTES:

(1) As approved by Minister in 2000–2001 Annual Operational Plan (AOP).

(2) Third party contributions are disclosed in accrual terms. In 2000–2001, Land & Water Australia received $2.6 million in cash terms.

Table B. 2000–2001 R&D Funding Allocation and Expenditure – $1000s

ARENA/PROGRAM	Opening Balance	LWA Budget	Third Party Contributions (2)	Interest/ Other Income	Total Budget	Expenditure	Surplus
SUSTAINABLE INDUSTRIES							
Development of sustainable production systems (1)	-95 751	300 000	0	0	204 249	255 556	-51 307
Dryland salinity	777 717	1 151 651	163 906	71 447	2 164 721	1 875 125	289 596
Climate variability	1 233 544	100 000	603 373	85 887	2 021 804	1 250 656	771 148
North Australia	-2 618	500 000	0	0	497 382	500 000	-2 618
Irrigation	466 405	669 500	660 326	23 012	1 819 243	1 237 192	582 051
Sub-total	2 379 297	2 721 151	1 426 605	180 346	6 707 399	5 118 529	1 588 870
RIVERS							
National River Health- R&D	265 690		0	19 933	285 623	232 791	52 811
National River Health – State/territory	24 760	0	0	0	24 760	0	24 760
River Contaminants (prev. Nutrients & eutrophication management)	210 572	280 000	100 000	8 273	598 845	379 424	219 421
Groundwater	130 778	459 000	0	0	589 778	282 260	307 518
National Rivers Consortium	240 869	827 116	404 880	28 217	1 501 082	882 015	619 067
Riparian lands	107 217	645 969	0	2 136	755 322	567 274	188 048
Sub-total	979 886	2 212 085	504 880	58 559	3 755 410	2 343 764	1 411 625
VEGETATION							
Rangelands	233 781		0	0	233 781	167 279	66 502
Native vegetation	107 070	500 515	200 000	35 867	843 452	394 215	449 237
Agroforestry (1)	1 951	515 000	0		516 951	519 343	-2 392
Sustainable management of military lands	-9 647	0	29 192	1 425	20 970	11 711	9 259
Sub-total	333 155	1 015 515	229 192	37 292	1 615 154	1 092 548	522 606
FUTURE LANDSCAPES							
Redesign of agriculture for Aust. Landscapes	316 275	390 000	0	14 003	720 278	281 406	438 872
Sub-total	316 275	390 000	0	14 003	720 278	281 406	438 872
CROSS-CUTTING							
Social & Institutional	113 060	1 332 729	25 000	0	1 470 789	1 275 633	195 156
Ord-Bonaparte	-630	400 000	885 000	4 811	1 289 181	869 823	419 358
General Call	0	610 067	0	23 740	633 807	633 807	0
Audit	747 066	0	7 699 000	183 070	8 629 136	7 328 518	1 300 618
Sub-total	859 496	2 342 796	8 609 000	211 621	12 022 913	10 107 781	1 915 132
TOTAL – R&D FUNDING	4 868 109	8 681 547	10 769 677	501 821	24 821 154	18 944 109	5 877 045

Note 1: Externally managed program

Note 2: Cash contributions provided by third parties

4 Summary of Achievements

Performance Information for Outcomes and Outputs

FOR THE PAST six years, Land & Water Australia has responded fully to Commonwealth Government needs for better accountability in the operations of publicly funded bodies. The Corporation has reported accomplishments each year in relation to a set of performance indicators, with specific, quantified measures, for major aspects of its activities.

Land & Water Australia's corporate objectives, strategies and performance indicators were identified in the 2000–2001 AFFA Portfolio Budget Statement and the Corporation's 2000–2001 Annual Operational Plan. They are summarised in the Table on the following page.

These indicators have been substantially revised in preparing the new R&D Plan for 2001–2006 to make them much more outcome and stakeholder-focused. The new indicators will form the basis of the Annual Operational Plan for 2001–2002 and future years.

Performance information for Land & Water Australia outcomes – effectiveness	
Indicator	**Measure**
Analyses of random stratified samples of Land & Water Australia-funded R&D show that mean benefits exceed costs by a ratio of at least 5:1.	Measurement through quantitative evaluations of random stratified samples of R&D projects.
Impact analyses of completed Land & Water Australia programs or projects shows that results are being implemented and public benefits achieved in meeting ESD principles.	Measurement through ex-post quantitative evaluations of random stratified samples of R&D projects and ex-post program evaluations.
Performance information for Land & Water Australia outputs	
Indicator	**Measure**
Output 1 – Research and development funding.	At least 80% of Land & Water Australia budget is committed to programs and projects that have joint funding and close involvement from industry/resource agency partners. Less than 5% of Land & Water Australia projects fail to meet their objectives without acceptable reasons.
Output 2 – Communication.	Communication strategies developed and being implemented for 80% or more of R&D programs receiving Land & Water Australia funds. At least 10% increase each financial year in the number of people seeking Land & Water Australia newsletters, publications or other information products. Research results from Land & Water Australia projects publicised in appropriate ways within six months of receipt. These communication performance indicators have been revised for the 2001-2002 year to make them more stakeholder focused.
Performance information for Land & Water Australia management	
The Corporation's administration expenses are kept at less than 7% of total expenditure.	Close control and assessment of expenditure on administrative activities.

Investment environment – opportunities and threats

The Corporation identified the following key opportunities and risks in managing its business during 2000–2001.

Opportunities

Government Priorities and Programs

As detailed below, the Corporation continues to align its R&D activities to government policies and programs wherever possible. Land & Water Australia also contributes to government policy related to the management of land, water and vegetation resources, in particular assisting the Commonwealth with information requirements for the National Action Plan for Dryland Salinity & Water Quality (see below). The Corporation also seeks to inform debate in major natural resource issues.

Collaboration with agricultural R&D Corporations

In an effort to bridge the gap between productivity and ecological sustainability, the Corporation has identified strategic partnerships with rural industries. The Corporation has established a new Industries Arena Leader position specifically to enhance linkages between Land & Water Australia and rural industries through the commodity-based R&D Corporations.

The Climate Variability in Agriculture R&D Program, involving financial support from AFFA and the Sugar, Grains, Dairy and Rural Industries R&D Corporations, remains one of the best examples of industry cooperation. Australian Wool Innovation Pty Ltd and Land & Water Australia are working together to implement a comprehensive natural resource management program for wool producers.

Partnerships have also been established with MLA, AWI and GRDC to explore the potential for a large new integrated R&D program focusing on sustainability and productivity issues in the grazing and cropping regions of Australia. The Corporation has continued its support of the Joint Venture Agroforestry R&D Program, in partnership with RIRDC, NHT and FWPRDC.

The Corporation has also secured partnerships within the National Dryland Salinity Program (NDSP), with state resource agencies, GRDC, RIRDC, MDBC and AFFA. The Corporation has pursued further partnerships with the cotton and dairy industries.

Improved marketing strategy for Australia, based on 'clean and green' image

The recent Foot and Mouth outbreak in Europe has underlined the importance of Australia's 'clean and green' image for food production. This image is being used as a major marketing strategy for Australia and has been identified by the Minister as a priority (see below).

Industries may therefore need to assess whether their producers and processors are meeting international standards in order to meet market requirements. It is important for Australian land and water users and managers to be able to demonstrate and verify the environmental soundness of management practices. Many of the Corporation's R&D programs are aimed at improving current recommended practices.

Closer links will be established during 2001–2002 with commodity R&D corporations to expand this work and to examine ways to maximise the potential of environmental management systems.

Threats

Decline in resources provided by collaborative partners

The Corporation is finding it progressively more difficult to secure funding partnerships at a program level within its R&D activities. This is due to a range of research and NRM organisations, all with external earnings targets, trying to lever funds from other organisations to improve their own funding bases. Land & Water Australia continues to foster partnerships where possible in order to engage the key stakeholders at the outset to maximise ownership and adoption of R&D results.

The decline in the resources provided for some State and Territory agencies responsible for agriculture and natural resource management continues to be a major concern. These agencies play an important role in the Corporation's applied research effort, and are essential participants in extension and implementation activities. Their regulatory and policy roles make them essential partners in many collaborative projects.

Declining State resources may have a significant effect on the adoption component of Corporation projects, and hinders agencies' capacity to maintain their long-term commitment to major programs. A corollary of the run-down in extension services at State and Territory levels is that R&D Corporations have to allocate an increasing proportion of their budgets to adoption-focused activities. We have also been looking increasingly to rural industries, local government, non-government organisations and community groups to facilitate the adoption of natural resource management programs and activities by landholders.

Communication/adoption

The biggest threat to the impact of Land & Water Australia-funded R&D is insufficient adoption of research outputs. There are several strategies to minimise this risk. The first is to ensure that research is relevant to real needs, ie. that there is a demand for the products of the research. Secondly, it is important to produce R&D outputs in forms that are useful to end-users. Finally, active communication of research outputs is required to ensure that intended end-users are aware of the work. Involvement of end-users in research program/project design, and in project implementation, can help to achieve each of these strategies.

The Land & Water Australia Board increased its communication investment substantially in 2000–2001, from 5% to 20% of its core budget, through a communication plan focused on increasing the adoption of Land & Water Australia-funded research and development. This one-off 'spike' assisted the development of a number of key system design improvements which help with better targeting and marketing of our research outputs. We have also put more effort into benchmarking communication effort and monitoring the adoption of R&D outputs. This has been undertaken with a primary goal of

moving from 'output' to 'outcome' focused R&D.

Spreading resources too thinly

The natural resource management challenges facing Australia are huge. The Land & Water Australia budget is modest, so the Corporation has to target its investment to where it meets high priority national needs, to where it can make a real practical difference and to where it generates a significant return on investment. These are the key filters used to screen potential investments, of which there are many. The risk of spreading resources across too many issues, such that none are dealt with properly, is a constant threat to the effectiveness of the Corporation.

Dissemination and commercialisation activities

Each program and funded project has in place a detailed dissemination plan to ensure that the outputs of funded R&D are provided to the key beneficiaries or stakeholders, through different media including electronic (www), publication and field/demonstration activities.

We are also aware that while stakeholders are interested in getting their information via a printed medium (notably newsletters and magazines), they are more likely to internalise information and turn it into 'their knowledge' through face-to-face interactions. To this end, Land & Water Australia has established regular Arena forums to provide the opportunity to communicate our research directly to stakeholders, while seeking their input on new R&D directions.

The Corporation also has in place a protocol to effectively manage and mitigate the legal risks associated with communication and commercialisation activities.

CORPORATE OUTCOMES

Description

R&D to improve the long-term productive capacity, sustainable use, management and conservation of Australia's land, water and vegetation resources.

Achievements and outcomes

Refer to general achievements in Chair's Report (pp ix–xii) and also under specific programs in Chapter 5.

Performance information

a. Analysis of random stratified samples of Land & Water Australia–funded R&D shows that mean benefits exceed costs by a ratio of at least 5:1.

The target was achieved. In 1999–2000, the Corporation undertook a synthesis of prior life of project evaluations which showed that the average benefit to cost ratio for 29 randomly selected projects was 17:1, well above the target of 5:1.

No further evaluations were conducted in the 2000–2001 year.

During 2000–2001, Land & Water Australia undertook to review its current evaluation tools and processes to improve our capacity to clearly demonstrate and track the overall impact of our R&D or the impact of specific programs or projects.

The Corporation has approved an evaluation strategy, with a range of

tools, which is currently being implemented.

A first stage of ex-post benefit-cost reviews will be completed during the 2001–2002 year.

b. Impact analysis of completed Land & Water Australia programs or projects shows that results are being implemented and public benefits achieved in meeting Ecologically Sustainable Development (ESD) principles.

Current reviews for CVAP, Audit and Irrigation programs suggest a significant impact of the results of Land & Water Australia R&D investments, and that significant public benefits are being achieved.

A recent stakeholder survey from the Agriculture Advancing Australia concluded that a majority of cotton and sugar cane growers take the seasonal climate forecasts into account in a variety of farming decisions, from irrigation to cash flow management based on yield prospects. The sugar industry is supporting research on applications in marketing and for scheduling shipping. Refer to the CVAP program report at page 31 for further details.

The chart below shows the record of achievement on objectives (a) and (b) for the past four years. Estimates of the projected accomplishment in the current year are also shown.

CORPORATE OUTPUTS

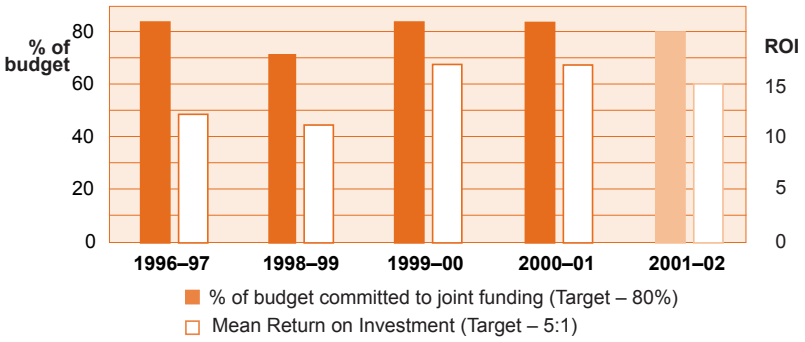
Research & Development Investment and Portfolio Management

Goals and strategies

Land & Water Australia's objective is to develop, fund and manage R&D activities where the Corporation's involvement will significantly enhance the sustainable use, productivity and conservation of Australia's land, water and vegetation resources.

Risks and specific opportunities

The 2001–2006 Strategic R&D Plan emphasises the challenges of dealing with multi-dimensional problems, of integrating across disciplines and issues and delivering R&D outputs in more effective ways. It underlines that Land & Water Australia should be actively managing its 10-year investment in more than 1300 projects, as well as current programs.



These challenges have significant and sometimes complex ramifications for the organisation. A key response to these challenges has been the development of the concept of portfolio management.

Land & Water Australia has five portfolio management tasks: strategic planning, integration, science leadership, knowledge management and evaluation. These activities add value to the core business of the Corporation – investment in knowledge generation, through its research and development arenas and integrating themes.

Achievements and outcomes

This information is provided for individual programs in Chapter 5.

Analysis of Performance

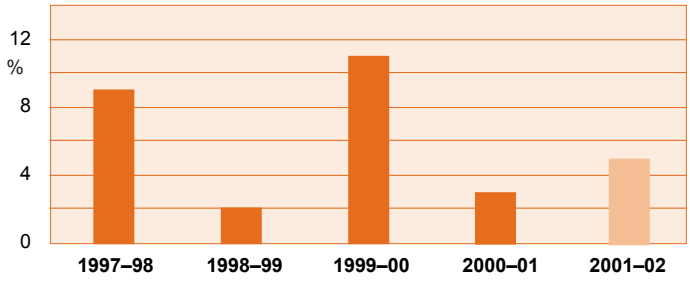
c. At least 80% of the Land & Water Australia budget is committed to programs and projects that have joint funding and close involvement from industry/resource agency partners.

With $18.3 M (83% of Land & Water Australia's expenditure of $22.1 M) directed to jointly-funded projects and programs, this target was achieved during the year. The total value of partnership contributions to Land & Water Australia programs and projects in 2000–2001 was $29.9 M (135% of Land & Water Australia expenditure). This included:

- $10.5 M as cash and an additional $19.4 M as in-kind support by third parties and funded research organisations. This compares with $37.9 M (159% of Land & Water Australia's budgeted expenditure) in 1999–2000. While direct cash investment through partner contributions is increasingly difficult to secure, as all organisations seek to leverage others' funds, the Corporation expects a significant increase in partnerships during 2001–2002 across a range of R&D arenas and programs.
- Close involvement with industry and resource agency partners was achieved within the range of commissioned R&D programs, including:
  - partnerships with Meat & Livestock Australia in the Sustainable Grazing Systems R&D Program, with the Rural Industries R&D Corporation and the Forest and Wood Products R&D Corporation in the Joint Venture Agroforestry Program, and with the Grains R&D Corporation in the Environmental Management Systems Program;
  - participation by the Grains R&D Corporation and the Rural Industries R&D Corporation in the National Dryland Salinity Program; and
  - participation by the Grains, Rural Industries, Sugar and Dairy R&D Corporations in the Climate Variability in Agriculture R&D Program.

d. Less than 5% of Land & Water Australia projects fail to meet their objectives without acceptable reasons.

The target was achieved. During 2000–2001, 11 out of 358 projects (3%) failed to meet contractual R&D objectives at the specified date in the



agreement (1999–2000, 11%). However a further 19 projects, while achieving their R&D objectives, had overdue financial statements.

The R&D objectives were achieved for all projects that had submitted final reports during the period. The Corporation continues to tighten its policy on tardy reporting, including withholding payments and automated follow-ups from an upgraded project management system.

The chart above shows the record of achievement on objective (d) for the past four years. Estimates of projected accomplishments in 2001–2002 are shown.

Future directions

In the so-called 'knowledge economy', where innovation and economic growth are essentially knowledge-driven, considerable energy is being devoted to the emerging field of Knowledge Management in both private and public sector organisations.

This field is highly relevant to the new Strategic R&D Plan of Land & Water Australia as a key element of our portfolio management activities. The Corporation's Portfolio Management aims to deliver:

- analysis of emerging issues and opportunities for Australia to identify the best strategic opportunities for R&D investment;
- knowledge management activities including synthesis, codification, dissemination, debate, review, evaluation, brokering, application and embedding of knowledge in the pursuit of sustainability;
- integration at all levels of the R&D process, from design to management to delivery, where it significantly adds value; and
- effective and ongoing evaluation processes allowing high-level reporting and tracking of progress along the strategic pathway.

Communication

Goals and strategies

Land & Water Australia's goal is to integrate the outcomes from Land & Water Australia-funded R&D and design information and decision support materials that facilitate adoption onground, inform and influence policy making, and consolidate the knowledge base that supports R&D and sustainable natural resource management.

The key principles in framing our communication approach are:

- Effective communication relies on relationship building across all areas of the Corporation and in strategic interactions with other organisations and like-minded people thinking sustainable natural resource management.
- Investment in communication is assessed against adoption rates by users.
- Communication is fundamental to achieving Land & Water Australia's role as the national leader in natural resource research and development.
- Successful communication involves the development of key messages from R&D programs and their integration into future natural resource investments.
- Evaluating our communication effectiveness will help focus our future investment in research and development.
- Communication of Land & Water Australia's key messages is the responsibility of all areas of Land & Water Australia.

These principles may be grouped into six key outcome areas:

- Relationships
- Adoption
- Promotion
- Education
- Evaluation
- Management

Risks and specific opportunities

Relationships

The development of a broadly strategic approach in identifying the range of important organisations and key players has enabled Land & Water Australia to be open to opportunities as NRM issues come to public prominence.

Conferences and other meetings provide an opportunity for Land & Water Australia to discuss central NRM issues with involved key players.

Such liaison also helps to ensure that Land & Water Australia directions and R&D findings are recognised and used in developing policies and programs.

By identifying key organisations and individuals, we have ensured a feedback loop which provides input directly into R&D direction-setting, as well as a more powerful vehicle for communicating relevant research outputs.

Adoption

Land & Water Australia's leveraged model of distribution of R&D information involves working through State/Territory agencies, consultants, other research funders and providers, and community group facilitators and coordinators.

Land & Water Australia recognises that we may not want to deliver our outputs directly to interested individuals and organisations. This may be because there is an established network which has credibility with a particular group; or it may be that resource constraints limit direct communication.

Land & Water Australia's 'gates of adoption' approach ensures that we

target the most appropriate avenue for our communications.

Promotion

Publishing, both printed and electronic, continues to be a key communication strategy for Land & Water Australia.

Increasingly, Land & Water Australia has placed a stronger focus on meeting the changing information needs of its research results end users, including those involved in natural resource management on the ground and at policy levels.

Use of face-to-face meetings, such as increasing sponsorship of conferences, and the establishment of Arena Forums has enabled us to deliver research outputs directly to some of our target audience.

Education

Land & Water Australia's role in education in the past has been relatively small, being mainly contained in our investment in postgraduate scholarships. Land & Water Australia postgraduate scholarships are designed to train the next generation of R&D providers and natural resource managers.

However, we also recognise the need to inform different levels within the education sector.

We have developed joint activities with the Science Festival, the Federation of Science and Technological Societies, as well as developing an education site on our soon-to-be launched redesigned Land & Water Australia WebSite (expected by October 2001).

Evaluation

Land & Water Australia's commissioned research programs are all independently responsible for program and project level communication. There has been considerable variation in the extent to which individual programs plan for communication.

The Communication team continues to provide support to programs, in monitoring communication effectiveness and risk management.

We also recognise the importance in monitoring the Corporation's communication performance. A benchmark survey conducted in 1998 and followed up in 2000 resulted in changes to a number of our approaches (most notably a name change to the more user-friendly Land & Water Australia).

Management

Land & Water Australia has given higher priority to communication activities, with the Board decision to substantially increase communication resources from 2000–2001.

While responsibility for communication implementation rests to some extent with everyone in the Corporation, the Land & Water Australia Communication Team has been created to provide an important resource to all Programs.

The Communication Team's advice covers such areas as media, events management, marketing, communication strategy development and network mapping. As such, there is a requirement for discussion and training to ensure all Corporation personnel are familiar with their responsibilities and contribute towards implementation of the Land & Water Australia communication strategy.

Achievements and outcomes

As the Corporation starts its 11th year of operation, and an increasing number of R&D projects mature to produce an increasing volume of R&D results, the number of communication products – such as publications – on offer to stakeholders also grows. The Land & Water Australia publications produced during 2000–2001 are listed in Appendix 2, pp.151–158.

This same trend in the growing supply and demand for information to improve the management of Australia's land, water and vegetation resources is reflected in the expanding usage of the Land & Water Australia Internet WebSite.

Selected Land & Water Australia publications may be downloaded from the Land & Water Australia WebSite in PDF format. See Appendix 2, p.151.

Researchers and other stakeholders can also link directly to Australia's premier natural resources bibliographic database, *Streamline*. This is available from the Land & Water Australia WebSite <www.infoscan.com.au>.

The WebSite allows access to *Streamline* as well as the *Australian Bibliography on Agriculture* (*ABOA*) and *Australian Rural Research in Progress* (*ARRIP*) databases, which are supported by Land & Water Australia and other agencies.

The performance indicators for Communication listed below were identified in Land & Water Australia's 2000–2001 Operational Plan. These are being changed for the 2001–2002 year to indicators that are more outcome- and stakeholder-focused.

a. Communication strategies developed and being implemented for 80% or more of R&D programs receiving Land & Water Australia funds.

Each of the R&D Programs receiving Land & Water Australia funds has a communication strategy in progress, at a program and/or an R&D project level. These strategies are discussed in each Program's Communication section, under Program Management.

b. At least 10% increase each financial year in the number of requests for Land & Water Australia newsletters, publications or other information products.

Following a rationalisation of the Land & Water Australia mailing list, and with the conclusion of some titles including *Intersect* and *Rivers for the Future*, the number of listings for Land & Water Australia information on the database actually decreased some 50% to 8732, down from 17 031 at 30 June 2000. Land & Water Australia is planning an electronic communication product to incorporate features of *Intersect* and *R&D Management News*.

c. Key research results from Land & Water Australia projects publicised in appropriate ways within six months of receipt.

Free photocopies of all Land & Water Australia final reports (which it should be recognised are compliance reports required for final payment) are available through the AFFA Library by phoning (02) 6272 2143.

All Land & Water Australia publications, including print-on-demand requests, can be accessed through our new free number at Canprint on 1800 776 616.

Australia's premier natural resources database *Streamline*, which is supported by Land & Water Australia, is available at <www.infoscan.com.au> on the Internet. *Streamline* is linked to Land & Water Australia's WebSite at <www.lwa.gov.au>.

There are currently more than 47 729 records on the database (up from 46 259 in 1999–2000), including details of every final report received by the Corporation.

In addition, selected research outputs receive additional communications assistance, eg. publication, fact sheet production, media attention, showcasing through Arena forums, or other relevant avenues.

Analysis of Performance

Land & Water Australia's performance is measured against performance indicators which indicate our outputs in the following areas: WebSite hits; number of publications; increase in requests for publications; and research results publicised in an appropriate way. Revised indicators will be reflected in a broader evaluation framework which is currently being developed.

Future directions

The Land & Water Australia Communication Plan for 2001–2002 continues the mission to establish a new benchmark in Australian science communication through translation of the Corporation's R&D outcomes into value-added and integrated services and products. This feeds into the Corporation's mission to provide national leadership in generating knowledge, informing the debate and inspiring innovation and action in sustainable natural resource management.

Much of the emphasis over the next year will be consolidating the new direction for the Land & Water Australia 2001–2006 R&D Plan. Particular focus will be on:

- Working with Programs to identify the best way to market research outputs to our key stakeholders in a way they can best access.
- Developing better indicators for tracking the influence of Land & Water Australia-funded R&D commencing with a Stakeholder Survey in August 2001.
- Working with the Science Manager to identify potential innovation success stories, and developing a system which allows us to capture our experiences and manage them to the benefit of our stakeholders.
- Working with the National Land and Water Resources Audit to ensure that the Atlas and other Audit outputs feed into our products in a consistent and focused way.
- Working with all other RDCs to address how best the commodity RDCs can meet government and community NRM expectations; and promoting the RDC model as one that delivers the best and most targeted research to its users.

The Land & Water Australia Communication Team is also responsible for internal communication. The development and introduction of a new performance appraisal system was completed successfully. The next goal is

to look at team-building across the three Land & Water Australia teams as well as the Corporation as a whole.

Business Management

Goals and strategies

Land & Water Australia has as its objective to evaluate and improve the efficiency, effectiveness, focus and balance of its portfolio of land, water and vegetation R&D.

Achievements

The Corporation further enhanced its systems approach to R&D investment and contract management. The Corporation achieved international standard accreditation (ISO 9000) in May 1996 and maintained its commitment to continuous improvement and the highest level of client service and accountability.

In addition, the Corporation has implemented a range of improvements to its information technology systems including online payments and enhanced contract management.

The office premises have now been expanded to accommodate the Communication, R&D, Audit and Business Teams. A new office has been established in Kununurra to implement the Ord-Bonaparte program (see p.79).

Land & Water Australia has implemented effective systems and practices to manage the introduction of the Goods and Services Tax.

The Corporation also developed a human resource management policy to cover the performance appraisal system, staff development and change management strategies emerging from the new business & R&D investment structure.

Analysis of performance

a. The Corporation's administration expenses are kept at less than 7% of total expenditure.

The target was not met. Administration expenditure as a percentage of total expenditure during 2000–2001 was 8.8%. This amounted to $1.3 M in administration expenditure, out of a total expenditure of $14.796 M (excluding expenditure under the National Land and Water Resources Audit).

This reflects the lower than expected expenditure in program accounts (around $1.1 M) and increased administrative costs due to the expansion of the Land & Water Australia office and to implement the new R&D Plan.

The Land & Water Australia Board has agreed that the target for administrative expenses should be a rolling average of 7% over a three-year cycle, and is looking to an increase in the revenue base to bring administrative expenses into line with this target.

During 2001–2002, it is anticipated that administration expenditure will be maintained at around 8% of the total budgeted expenditure.

The chart presented on the next page shows the Corporation's performance over the past four years in relation to objective (a). Estimated performance levels for the year 2001–2002 are also shown.

Future directions

The expected outcomes for business management as per the 2001–2002 Annual Operation Plan are to:

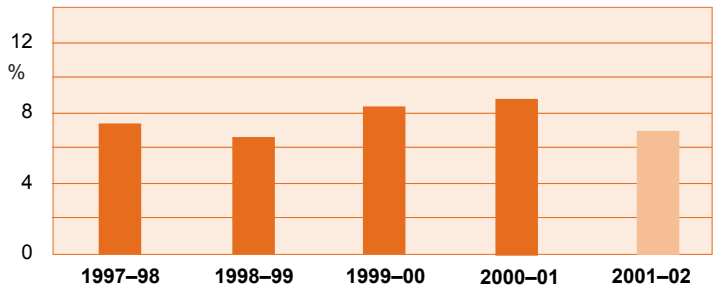
- Meet all statutory obligations and accountability requirements in a comprehensive, timely and transparent manner.
- Manage the business operations of the Corporation in an efficient and effective manner so that funds for R&D are invested well.

The key outputs are:

- Provision of the highest level of accountability of Corporation activities.
- Effective financial, human and project management support to Land & Water Australia programs.
- Enhanced information and quality systems to meet the changing needs of Land & Water Australia and to improve efficiency and effectiveness of Land & Water Australia processes.
- Preparation of a new business structure to implement the new R&D plan.

The Corporation in its own administrative processes will further develop the systems approach to R&D investment. These principles will be applied to assist the Corporation meet the highest standards of administrative efficiency and effectiveness, so matching the requirements that Land & Water Australia seeks from research organisations and others involved in its programs.

In addition, the Corporation will be implementing a range of improvements to its information technology systems to align to the knowledge management framework and to fully capture the benefits of electronic commerce to enable increased productivity gains.



Admininstration expenditure as percentage of total (Target 7%)

5 Program Management

DURING 2000–2001, LAND & WATER Australia developed a new Strategic Research and Development Plan for the period 2001–2006. At the heart of the new R&D Plan is a matrix based around five Research and Development Arenas and four Integrating Themes.

In readiness for implementation of the plan, the Corporation reorganised its R&D portfolio into this new structure during the 2000–2001 year.

The purview of Land & Water Australia under the PIERD Act is very broad. However the Corporation has only limited resources and is one of a number of agencies at State and national levels investing in R&D on natural resource management. We need to focus investment on issues of national importance and priority, where Land & Water Australia is well-placed to make a difference.

The five R&D Arenas that emerged from the strategic planning process were:

Industries Arena – Improving sustainability and addressing contemporary issues in primary industry

Rivers Arena – Managing Australian river landscapes

Vegetation Arena – Managing vegetation in rural landscapes

Futures Arena – Future landscapes and compatible industries

Cross-cutting Arena

In an explicit attempt to take a more integrated approach to both investing in R&D and managing an R&D portfolio, the plan sets out four Integrating Themes, which operate across the R&D Arenas and which describe the relationship between human societies and the world around us, however we categorise it. These are: how we **perceive and value** our environment; how we **learn about and understand** our landscapes; how we **live in and manage** our natural resources; and the **organisation and governance** arrangements that influence natural resource management at a societal level.

R&D activities and outputs are discussed in this Chapter, grouped by program into the new Arenas.

Industries Arena – Improving sustainability and addressing contemporary issues in primary industry

THE INDUSTRIES ARENA addresses the productivity and ecological integrity of the resource base that supports primary industries. This is the core mandate for Land & Water Australia. We work with the primary industries to find ways to ensure that natural resources are used sustainably while supporting profitable farm businesses and viable rural communities. Key research covers dryland salinity, climate variability in agriculture, and irrigation.

In addition, other R&D programs which are concluding are reported under this Arena for the 2000–2001 period. These include the North Australia Program and Sustainable Grazing Systems.

National Dryland Salinity Program

Goal and strategies

The National Dryland Salinity Program (NDSP) is a leading natural resource management initiative jointly sponsored by Australia's leading rural industries, the Commonwealth Government and State Governments. It was initially established in 1993 to improve coordination of the national R&D effort to assist in dealing with this increasingly important challenge.

The first five-year phase was completed in 1997–98. A second phase, built largely on the results and emerging trends from the first, is due for completion in 2003. While biophysical

research continues as a major element, this second phase includes important research into the social, institutional and policy implications of the salinity threat.

Dryland salinity is increasingly recognised as a natural resource management challenge of major proportions in Australia that is not confined to the rural sector. The NDSP has contributed to a better understanding of the threat to rural and urban infrastructure (roads, railways, bridges, buildings, pipelines and gardens), native vegetation, wetlands and native flora and fauna. Streams and rivers are vulnerable to salinity and increasing decline in water quality has serious implications for both regional and urban communities.

Partnership with Audit

In particular, the NDSP has contributed to the Salinity Theme of the National Land and Water Resources Audit. This work has refined national, State and regional estimates of the extent and nature of dryland salinity.

The Audit undertook a dryland salinity risk assessment of Australia in collaboration with State and Territory agencies. This assessment is based on the known incidence of salinity, soil characteristics, topography and groundwater – that is, groundwater within 2 metres of the soil surface or within 2 to 5 metres of surface and with demonstrated rising watertables.

Australia's groundwater flow systems have been defined and mapped by the Audit. This mapping framework broadly identifies the scale and type of management required to mitigate the effects of dryland salinity effectively. The groundwater flow systems also provide a basis for monitoring the success of works and activities.

The Audit's findings were released in March 2001 as the Australian Dryland Salinity Assessment 2000. Information products have also been released on the Australian Natural Resource Atlas <www.nlwra.gov.au/atlas>.

Key Audit Findings on Dryland Salinity

- Approximately 5.7 million hectares are within regions mapped to be at risk or affected by dryland salinity. The estimates are that in 50 years this area may increase to just over 17 million hectares.
- Some 20 000 km of major roads and 1600 km of railways are already at risk – estimated to increase to 52 000 km and 3600 km respectively by 2050.
- Salt is transported by water – up to 20 000 km of streams could be significantly affected by 2050.
- Areas of remnant native vegetation and their ecosystems are at risk – about 630 000 ha. This is estimated to increase to approximately 2 million ha over the next 50 years.
- Towns are not immune – more than 200 towns could be affected by dryland salinity by 2050, with a larger number of villages and small localities also at risk.

The Audit's Australia-wide assessment also specifies management options based on groundwater flow systems. The Australian Dryland Salinity Assessment 2000 therefore provides the context for

trade-offs between production and salinity control options.

The Audit, with its management orientation is also providing a rigorous framework for salinity control. Project work on updated annual costs to Australia is now available, including a much better idea of the costs to local government and householders.

Risks and specific opportunities

The salinity problem in Australia is now known to be of such a scale as to cause loss of hundreds of millions of dollars in both the domestic and international economy. Assessment updating the extent of the threat is well advanced. State level strategies for salinity management have emerged in South Australia, New South Wales and Queensland and have been reviewed in Western Australia and Victoria. At the national level, the Federal Government announced the creation of the $1.4 billion National Action Plan for Dryland Salinity and Water Quality, the key strategies of which are informed by research funded through NDSP.

An R&D program based on partnerships between the levels of government and industry provides the opportunity for collaboration and consistency and the potential for planning for nationally-driven natural resource management policies such as those emanating from implementing the National Action Plan. Results from projects funded by the NDSP can potentially feed into both the State level strategies and National Action Plan policy frameworks. These will include options for productive use of lands affected by salinity and new industry opportunities.

Collaborating organisations

- Land & Water Australia (lead agency)
- MDBC (funding partner)
- GRDC (funding partner)
- RIRDC (funding partner)
- National Land and Water Resources Audit (funding partner)
- AFFA (funded from the National Landcare Program)
- CSIRO (research partner)
- State Governments of New South Wales, Queensland, Victoria, Western Australia, Tasmania and South Australia (management partners)

The Management Board has been successful in the past year in expanding the partnership to include the State of Tasmania and Westpac Banking Corporation.

Achievements and outcomes

The NDSP achieved considerable success from its project results over the past year. These have included:

- The distribution of salinity management material to more than 400 Local Governments across Australia. The related project was the catalyst for the National Local Government Salinity Summit, convened in August 2001.
- The detailed analysis of 17 industry options for the productive use of saline lands and the development of draft business plans for five of these. The results of this work have had an enormous impact on State and national level strategies that now

incorporate substantial strategies based on 'living with salt'.

- The refinement of spatial and temporal data relating to the extent and nature of salinity's impact at national, State and regional scales. This information now underpins management strategies at all three scales.
- The development of a national Groundwater Flow System that enables different management responses to be analysed for their likely effectiveness prior to their implementation.
- The development of national and State level policy options that have been incorporated into the National Action Plan and various State salinity management plans.
- The distribution of a simple 'leakage calculator' to enable grain growers to analyse the likely recharge characteristics of various plant-based management options so that they can appropriately reduce their on-farm and off-site contribution to salinisation.
- The development of a water management module for graziers, now incorporated into the PROGRAZE® extension program. Some 7000 graziers are likely to undertake training in this module in 2001.

Analysis of performance

The second phase of the NDSP was reviewed during the year, and as a result the Program has revised its goal to better reflect its relationship with the many national and State-level salinity strategies that have recently emerged.

The Program's goal is now to support the efforts of its partners in managing dryland salinity through the provision of options based on rigorous science with high utility. It achieves this through investing in R&D against seven themes:

- Audit and monitoring
- Industry solutions
- Policy and institutional options
- Infrastructure management
- Productive use of saline lands
- Environmental protection
- Regional management and responses

The mid-term review of the NDSP has pointed to the Program's tremendous influence on the development of the National Action Plan and State-based salinity management strategies. Recommendations to invest further in the productive use of saline lands have been responded to, and new partnerships in this area will be implemented in 2001.

With new research investments dealing with environmental impacts and regional planning, all seven of the NDSP's themes are now being addressed. During 2000–2001, all remaining Program funds were distributed towards activities that continue through to 2003.

The inclusion of Tasmania as a partner in the NDSP now makes it truly national. The participation of Westpac Banking on the NDSP Board has also given the Program a stronger commercial edge. This has complemented the strong industry participation of the Grains R&D Corporation.

Communication

A revision of the NDSP communication strategy for the remainder of the Program was endorsed by the NDSP Board, as was an additional financial commitment to communication activities.

In response to the mid-term review of the NDSP, a revised Communication Strategy was prepared to provide direction for communication activities over the remaining life of the Program (to June 2003). This strategy has seen a strengthening in the NDSP State Communication Coordinator network, with new appointments made in Western Australia, New South Wales and Queensland.

The revised strategy has also resulted in a boost in the use of the Program's WebSite <www.ndsp.gov.au>. The NDSP WebSite has now become the second most commonly used WebSite in natural resource management in Australia (with more than 100 000 users per month). The page dealing with the MDBC project, *Tools*, has proven to be singularly successful in providing information to people wanting to explore options for recognising and responding to salinity.

The media component of the communication strategy has also proved effective, with the Program constantly presenting research results across appropriate media avenues nationally. The NDSP has remained committed to pursuing positive stories that give hope to those managing salinity. In particular, the reformatting of the NDSP flagship magazine *Salt* has proved most successful with farmers across Australia. During 2000–2001, its distribution to the farming sector doubled to more than 70 000.

The adoption of research results, including the Local Government salinity management kit and handbook, the farming leakage calculator and Audit data have been an encouraging sign that the Program's communication activities are having a high pay-off.

Future directions

The NDSP's future remains secure over its remaining life, with funds underpinned in particular by Land & Water Australia and the Grains R&D Corporation. A prospective partnership with the Australian Wool Innovation Pty Ltd will considerably expand the Program into territory dealing with the productive use of saline lands. Plans are afoot to develop a 'harvest year' in 2003–2004 to extract every potential benefit from the results of NDSP research funded over both its first and second phases.

Uncertainty remains about how the NDSP will relate to the National Action Plan and State-based salinity management strategies in future.

While the Program has contributed significantly to the development of these options, the overall positioning of research within them is not yet clear. A priority for the NDSP over the next year will be to demonstrate the value of research in implementing national, State and regional scale responses to managing salinity.

For further NDSP information, please consult Land & Water Australia at <www.ndsp.gov.au>.

Climate Variability in Agriculture R&D Program (CVAP)

Goals and strategies

The goal of the current phase of the Program – set following a consultative meeting with stakeholders in 1997 – is to work with the Australian agricultural sector to develop and implement profitable and sustainable management strategies using climate information. These are strategies which prepare the agriculture sector to respond to the major opportunities and risks arising from climate variability.

The Program was initially funded as part of the National Drought Policy initiative of the Commonwealth Government. The strategic framework included a farm sector dealing self-reliantly with risk and with a capacity to manage its natural resources sustainably. The current CVAP phase, which will wind up in mid-2002, is part of Agriculture, Advancing Australia, funded through AFFA.

CVAP's implementation strategy includes building on a unique national opportunity to foster more effective collaborative approaches within the agricultural sector, and between agriculture and researchers in meteorology and oceanography.

Tailoring climate forecasts to meet user needs, and incorporating feedback from applications research to climate research, both require close integration in research. The Program has maintained a balance of projects to include those with shorter-term outcomes and some major strategic initiatives, which lay the foundations for improved understanding and prediction in the future.

Four objectives further define the research strategies being implemented in the current phase:

- The first continues with developing improved seasonal forecasts through statistical approaches and climate models.
- The second is developing better-adapted farming systems.
- The remaining two objectives concentrate on communication and marketing aspects, which were given high priority in consultation workshops to plan the current phase.

Currently five R&D corporations complement AFFA's lead role in funding of CVAP. Their involvement in planning and management is a major feature and strength of CVAP. Decision support tools can thus be readily developed in partnership with specific industries as well as more generic tools of value in a wide range of industries and regions.

Risks and specific opportunities

The Program is a relatively new focus for research. Thus, the major challenge is to integrate new knowledge of climate variability into existing and routine approaches to managing climate-related risks. Collaborative projects and generic tools are the two most effective ways for CVAP as a national program to contribute.

Approaches to ensure successful research projects include using referees to establish scientific rigour, using Steering Committees to involve potential users of research and funding projects

which build on successful applications in other regions and industries.

Applications in the water industry will be feasible following the development of a streamflow forecast module in 'Australian RAINMAN'.

The capacity to forecast streamflow will have important implications in irrigation management and in developing more effective environmental flow regimes. Improved communication of the probabilistic nature of seasonal forecasts has been a challenge for the Program and is being addressed by research on farmer decision making.

Opportunities for further research are being pursued through the project review process currently being undertaken (see Future Directions). The new Land & Water Australia Strategic Plan is providing a range of opportunities to better integrate outputs from CVAP. Emphasis on communicating an integrated package of information – eg. for catchment management – will provide more markets for products as they are developed.

Collaborating organisations

- Land & Water Australia (co-lead agency)
- AFFA (major funding partner)
- RIRDC (funding partner)
- GRDC (funding partner)
- SRDC (funding partner)
- DRDC (funding partner)
- NFF (Management Committee)

Achievements and Outcomes

The project review scheduled for November 2001 will provide an overall evaluation of the Program's achievements. Most projects will have completed final reports before the November review. The Program's current phase will thus be completed by June 2002.

The Program goal relates to more effective responses to major opportunities and risk arising from climate variability. The role of seasonal climate forecasts in informing decisions on farm and natural resource management is a key one in the Program.

A survey of Australian farmers for Agriculture, Advancing Australia shows the current level of adoption of seasonal climate forecasts (see Table below). CVAP has made significant contributions to development and delivery of the forecasts, and in applications in agriculture.

The survey appears to reflect several interrelated factors:

Farmer use of seasonal climate forecasts

State/ Territory	% aware	% using
NSW	75	44
VIC	64	29
QLD	82	44
SA	70	29
WA	75	33
TAS	69	36
NT	65	40
All Farms	73	37

Note: From an *Agriculture, Advancing Australia* survey (AFFA, 2000) of 2574 farmers, which included farmer awareness of seasonal climate forecasts, and whether the forecasts were taken into account in farm decisions.

1. Perceptions of the accuracy and applicability of the forecasts.
2. Industry and state agency support for seasonal forecast applications in research and extension agencies.

The survey results are also available on an industry basis. For sugar and cotton, more than 50% of farmers surveyed take seasonal climate forecasts into account in farm management decisions. On a state basis, use in Victoria appears low compared to the known impact of El Niño Southern Oscillation (ENSO) events.

A study was commissioned by CVAP to define opportunities for more effective use of forecasts in South-Eastern Australia. Results of the first stage are presented in the following table.

Forecasting spring rain in the Eastern Australian grain regions

	North	Centre	South
Correlation (r) of spring rain with May to June's			
Total rain	.07	.14	.26
SOI	.27	.38	.42
% chance of spring rain > median (based on June–July SOI phase)			
SOI negative	23	21	19
SOI positive	69	67	71

Note: Based on a CVAP study by Hayman (2001) for six locations in each region. The study was of established historical relationships from Australian RAINMAN between the Southern Oscillation Index and spring (Aug–Oct) rainfall.

The correlations between May–June rain and spring (Aug–Oct) rain show stronger persistence in the South. This confirms that in the South, a wet winter is a little more likely than not to be followed by an above average spring. However, the winter spring correlation is higher with the SOI than with rainfall. There is little difference in the probabilities between North and South. Thus for the region, the chance of above average spring rain is only about one in five when the June–July SOI phase is negative. There were about 20 June–July negative phases over the last century. About 4 of the 20 would have resulted in above-average spring rain.

The study shows that the mid-year ENSO effect does not change enough from North to South to account for the reduced use of forecasts in the South. Other factors to be studied include scope to use forecasts in decisions, and recent experience with the forecasts. There were a couple of occasions in parts of the South during the 1990s when above average rain followed forecasts of a greater chance of below average rain. One possibility being researched by CVAP is that decadal variation could account for this.

The second stage will recommend strategies ranging from applied research on forecast value, to extension emphasising locally-based interpretations and demonstrations of potential applications.

For the Program generally, projects are producing products and general purpose tools that can be applied in a range of industries and regions. Highlights included:

- Increasing interest and range of applications from CVAP projects in the sugar industry and in agribusiness.

- A well-attended conference at Albury to promote and develop climate products with users.
- Launch of the Masters of Climate case studies at Albury, and their use in a wide range of rural media (studies are available on www.cvap.gov.au).
- International recognition of the world-class research being done by Australian researchers (including many involved with CVAP) through the publication of a book *Applications of Seasonal Climate Forecasting in Agricultural and Natural Ecosystems – The Australian Experience* (Kluwer Academic Press).
- Extension of the project on the potential of seasonal climate forecasting to prevent degradation events in grazing lands, by testing the value of a range of new forecasts.
- Two extensions of the SILO project to better promote and market climate and weather data and ensure the services are self-funding.
- Based on CVAP research on communicating probabilities, Bureau of Meteorology probability statements for seasonal outlooks now have an explanation in frequency terms, ie. 'in 6 years out of 10' to better explain 60% probability.
- A new project on the influence of the North-West cloudbands on Eastern Australian rainfall being undertaken by the University of Western Australia.
- CVAP projects informing policy development through projects on exceptional circumstances and taxation impacts on resource sustainability.
- Results from a CVAP project (with GRDC and RIRDC) on using seasonal forecasts in the Northern grains region being applied by farmers in opportunity cropping systems to increase profitability and sustainability.

Analysis of Performance

The management strategy for the current phase of CVAP includes annual milestones. As was also shown last year by the mid-term review, these are being met taking into account unavoidable delays in the Program start-up. A major concluding milestone for the program is completion of the Program review now scheduled for the end of 2001.

At the project level, the majority of projects will be completed by mid 2001 or soon after. Since the current phase began in mid-1997, there have been 42 projects in the Program. Included are some concluding projects from the earlier phase and projects on communication and management activities. Some projects have had extensions to enable them to meet reporting requirements. All projects are on original or revised schedules to achieve their planned outputs as demonstrated by milestone reports which are on at least an annual basis.

Communication

As an indicator of growing recognition of climate variability research, two major features were published in national farm journals during the year. *Farming Ahead* in September 2000 had

a climate feature prepared by Kondinin staff. The *Australian Farm Journal* (April 2001) had a climate special including a review of the achievements of the last decade provided by the Program Coordinator. The special also included case studies from the Master of Climate project. These showcase the experiences of farmers around Australia in building new climate knowledge and products into their farm management.

The Program has maintained a range of effective communication activities in response to the high priority previously identified. As part of the communication plan for the program a newsletter (*CLIMAG*), a WebSite <www.cvap.gov.au>, and project fact sheets were developed in previous years. A survey of *CLIMAG* readers gave highly favourable feedback. The priority audience for communication activities includes researchers and advisers in agriculture and natural resource management.

Future directions

The two challenges for the year ahead are:

- harvesting products from the current phase as it concludes; and
- sowing the needs for a new phase.

The Agriculture, Advancing Australia survey shows that after a decade since their introduction, 37% of farmers are taking forecasts into account in their farm management decisions. There are some regions and industries where opportunities are limited.

Forecast skill at critical decision time is a key constraint. But gains are possible. Experience is showing that better interpreted information at a local level is the important trigger for many farmers. The Program has now provided the generic tools to facilitate this.

The first stage of the Program review has completed a draft report based on preliminary consultation with stakeholders. The review affirms that a broadening of the Program is now the most effective means to achieve wider adoption. In addition to a greater focus on applied research to show value in specific industries and regions, the review gives high priority to application in water resources and natural resource management.

The final stage of the review will be based on a workshop to evaluate the performance of all projects in the current phase. The evaluation will include lessons which need to be addressed in design of further research.

Short-term action to harvest the potential benefits of the current project more effectively will concentrate on potential applications in water resources management.

For further CVAP information, please consult <www.cvap.gov.au>.

National Program for Irrigation Research and Development (NPIRD)

Goals and strategies

NPIRD has operated since 1993. It was established as a partnership between Land & Water Australia, various state agencies and the irrigation industry to address issues related to the sustainability of irrigated agriculture.

Between 1993 and 1996, the Program followed priorities identified in a study

commissioned by the National Irrigation Research Fund. These priorities focused on integrated water management systems, conjunctive water use, environmental impacts and infrastructure refurbishment.

The next NPIRD phase to 1999 was focused solely on water use efficiency, following consultation with stakeholders and clients. The total investment over the first two phases of the Program has been more than $7.78 M, with Phase 2 (1997–2000) investing more than $5.33 M (including $2.16 M in 1999–2000).

The irrigation industry has undergone significant physical, financial and cultural changes since 1996. As a result, the Phase 3 Program Plan addresses a range of new priorities to emerge from the extensive process of stakeholder consultation. A further $4.2 M in partnership funding has been negotiated in NPIRD Phase 3, with the following goals:

- Establish a national generic Water Use Efficiency (WUE) framework for irrigation that can be applied to the wide range of irrigation systems and environments. This will involve clarifying the terms, measurements needed, and methods of interpreting and reporting data.
- Improve understanding of how irrigation activities interrelate with wider catchment processes. The aim is to minimise environmental impacts, raise awareness on unforeseen risks and enhance irrigation and catchment sustainability.
- Gain a better understanding of the benefits, costs and strategic implications of the restructuring of water provision services; separation of water from land rights; water trading; and environmental flow allocations.
- Promote national uptake of participative R&D processes, improve industry networks and enhance the R&D base for irrigation.
- Consolidate national benchmarking of irrigation systems and scope the potential linkages with on-farm performance monitoring.

Risks and specific opportunities

The third phase of NPIRD provided opportunities of running a truly national program for irrigation, improving networking and gaining improved adoption of R&D outputs. The substantial industry consultation and representation focused the R&D effort on real needs and issues. In contrast, a significant risk is too little investment in strategic R&D as identified in the Program review.

A financial risk has been accessing contributions from NSW which have been insufficient throughout Phase 3.

Collaborating organisations

- Land & Water Australia
- NSW Land and Water Conservation
- NSW Irrigators Council
- Queensland Department of Natural Resources
- Goulburn-Murray Water
- Wimmera-Mallee Water
- Southern Rural Water
- Sunraysia Rural Water

- WA Water and Rivers Commission
- WA Agriculture
- Ord Irrigation
- South West Irrigation

Achievements and outcomes

Among NPIRD's diverse R&D portfolio, four research projects in particular achieved notable innovation to improve the overall productivity and sustainability of the irrigation industry:

- Benchmarking for irrigation water providers.
- Soil Water Monitoring Irrigation Insights.
- Improving the Water Use Efficiency of Horticultural Crops.
- Flow measurement from channel to farm.

Benchmarking for irrigation water providers

An essential part of the process of improving the performance of any business or industry is setting benchmarks, ie. comparing performance with their peers, from which any improvement can be measured.

NPIRD, the COAG Task Force and AFFA, with the support of the Australian National Committee on Irrigation and Drainage (ANCID), provided funding for a project in 1997 to develop a mechanism to benchmark the performance of irrigation water providers. This was an essential first step for the adoption of best management practice in the sector.

The report that resulted from this project was released in early 1999. It reported on 33 irrigation systems and incorporated a number of measures in each of the key areas of: system operation, environmental issues, business processes and financial performance.

Two more annual reports have been released since this first one with the process now being managed by ANCID. In the last report, released in early 2001, 47 irrigation systems were reported on. These systems represent about 40% of the water used each year for irrigation in Australia, and 60% of the water supplies to farms through constructed off-stream reticulation systems.

The model has been adopted by the International Committee on Irrigation and Drainage, and is being used to develop an international water provider benchmarking system. The World Bank has expressed further interest in promoting the methodology globally.

Soil Water Monitoring Irrigation Insights

Soil Water Monitoring was chosen as the first title in a series of publications to be produced, called 'Irrigation Insights'. The Irrigation Insights series is NPIRD's primary vehicle to provide information to the irrigation community in Australia. As well as being available in hard copy, titles in the series can be viewed on the program's WebSite at <www.npird.gov.au>.

Soil Water Monitoring is a comprehensive guide to equipment for monitoring soil water and techniques for measuring and monitoring soil water status. Central to the publication is a collection of tables summarising the main product features. Commercial information about suppliers are presented and descriptions of the

advantages and limitations of each device, as are case studies from experience and from the literature.

To date, Soil Water Monitoring has sold more than 400 copies, almost half the number of copies printed. A further indication of its acceptance in the marketplace is the number of hits the electronic version receives through the NPIRD WebSite. Soil Water Monitoring is by far the most popular page on the WebSite and it creates very heavy traffic on some days. For instance on 17 January 2001, it was accessed 28 441 times by users from around the world and 27 000 times the next day. In the week 16–24 January it received at least 7000 hits a day. This popularity continues.

Improving the Water Use Efficiency of Horticultural Crops

Partial Rootzone Drying (PRD) is the name of a technique developed as a result of NPIRD research. PRD maintains both wet and dry soil within the upper horizons of the rootzone. It causes biochemical changes in the roots which reduce the amount of water lost by the leaves. Fruit yield is unaffected, however, resulting in increased water use efficiency

PRD has taken knowledge about plant physiology and applied this to the on-farm situation with a particular aim of improving water use efficiency. It is truly groundbreaking research that has practical application and substantial economic and environmental benefits to individual farmers and to the nation as a whole.

For grapevines and some tree crops, PRD offers the possibility of saving up to 50% of normal irrigation allocations without affecting yield. With almost 250 000 ha of irrigated horticultural crops in Australia (ABS, 1993) the potential economic and environmental benefits of PRD are substantial.

PRD research was jointly funded by NPIRD, the Grape and Wine Research and Development Corporation, CSIRO Plant Industry, NSW Agriculture, Department of Natural Resources and Environment Victoria, the SA Research and Development Institute and the University of Adelaide.

Flow measurement from channel to farm

Know the Flow (KTF) is a series of projects. Its beginning was a workshop held at Tatura in 1997. That workshop aimed to identify the major water management issues facing irrigation supply authorities. High on their list was finding a replacement for the Dethridge wheel, the standard method for measuring water flows from channels to farms.

KTF projects are resulting in a multi-faceted view of the topic of flow measurement. Attacking the issue from more than one view, eg. both technically and from a communication perspective, has resulted in a holistic approach in determining irrigation issues and developing actions for the future.

The projects have been highly participative with a high level of consultation and involvement of industry.

Two more KTF projects have recently been approved, one to develop training modules in the installation and use of flow meters and the other to develop a

standard test methodology to verify performance of meters.

KTF has had an impact on the commercial irrigation sector and on terminology. For example, suppliers of flow equipment now understand the industry's requirements and are actively pursuing suitable alternative flow measurement devices. There is acceptance by all irrigation companies that they will try to use the same terminology.

Analysis of performance

NPIRD is more than half way through its third phase and looking at options for a fourth phase. Since the Program was established in 1993, more than $12 M has been invested in more than 90 research projects.

Funds have been set aside for the next program review in 2001–2002. It is noteworthy, however, that NPIRD has featured very strongly in the new Land & Water Australia Innovations Database.

Communication

The Program has acted as a catalyst for more integrated irrigation R&D effort in Australia. A number of Phase 3 NPIRD projects focus on improved communication between regions and institutions. In addition, NPIRD and the MDBC Irrigation Program have reciprocal membership to ensure that maximum benefits are obtained from limited resources.

A significant amount of work has gone into redesigning the Program's communication effort in response to a comprehensive communication audit of NPIRD, and in line with the restructure of Land & Water Australia operations.

The new NPIRD communication package, implemented in 2000–2001, included the following key elements:

- enhancement of the NPIRD WebSite <www.npird.gov.au> functionality;
- continued development of information packages in the NPIRD Irrigation Insights Series;
- revised information recording and distribution strategy;
- a business planning approach to the marketing of reports and project outcomes;
- more structured communication guidelines and assistance for project managers; and
- coordinated communication with other Land & Water Australia programs through agreed service contracts.

NPIRD has an increasingly important role working with the two peak industry bodies, ANCID and the IAA, in the scoping and delivery of National Workshops and conferences on core issues. This relationship works particularly well, since NPIRD brings the research credibility and resources whilst the industry partners bring networks and essential industry backing.

Future directions

All of Phase 3 funds are now allocated to projects. The latter stages of investment will focus on the development of projects based on identified strategic issues:

- National consistency in our approach to measurement and reporting of

crop water balance and evapotranspiration.

- A scoping exercise into the feasibility of a National On-Farm Benchmarking Scheme.
- Development of a framework (jointly with MDBC) for assessing the suitability of new irrigation developments, consolidating a previous investment by NPIRD in this area.
- A consultancy to explore policy, social and economic priorities for irrigation.
- Further development of the ecological risk assessment projects.

NPIRD's future focus will be on the following areas:

- ensuring that contracted projects deliver against agreed outcomes;
- ensuring that the NPIRD communication package is implemented according to the revised strategy and priorities (including a review of communication links with financial partners, with the aim of improving awareness of Program activities and linkages);
- ensuring that NPIRD makes a significant contribution to the new Land & Water Australia strategic plan and corporate structure;
- investigation and agreement on a revised Program and project evaluation methodology;
- review of phase 3; and
- planning for NPIRD Phase 4 (2002–2005).

For further NPIRD information, please consult <www.npird.gov.au>.

North Australia Program of R&D (NAP)

Goals and strategies

The 2000–2001 year was the final year of Meat & Livestock Australia's North Australia Program (NAP), which began in 1986 with a strong R&D emphasis on increasing productivity and profitability. Since then, and with significant financial and policy input from Land & Water Australia, NAP has placed increasing emphasis on sustainable use of pastures and the natural resources that sustain them.

During Phase 3 of NAP (1996–2001) Land & Water Australia has provided co-funding of $0.5 M per year to complement MLA's Program funding of $2.5 M per year.

The Program was established to serve the needs of the North Australian beef industry which occupies the majority of land across Queensland, the Northern Territory and the Kimberley and Pilbara regions of Western Australia. The 12.8 million cattle in the North account for about half of Australia's beef herd, almost half of Australia's national beef production and more than half of all beef exports.

The R&D emphasis within the final phase of the Program has been to develop grazing management systems to maintain or improve native pastures and the landscapes within which production occurs. Increasingly, the Program has working with beef producers to integrate ecological sustainability with economic

and social aspects of the beef production enterprises it serves.

The overall goal of the Improving Resource Management sub-program within the final phase of the NAP has been to improve the development and adoption of ecologically sustainable resource management systems and their profitable use by the Northern Australian beef industry.

In working to achieve this goal, this sub-program has sought to:

- apply and further develop ecological sustainability principles for grazing systems in the major agri-ecological regions across Northern Australia;
- examine the relationships, on a regional or landscape basis, between livestock production and ecological sustainability, which is broadly defined to include maintenance of regional populations of plants and animals, as well as maintaining the condition and productivity of land and water resources;
- support research to develop effective linkages between knowledge and decision-making processes; and
- ensure the integration of sustainable management strategies into profitable whole property management systems.

Throughout the latter stages of NAP, the Resource Management sub-program has been strongly complemented by a sub-program focused on integrating both resource management and cattle production R&D outcomes into a whole property context.

Risks and specific opportunities

Seasonal variability of climatic conditions across Northern Australia, and the impacts of highly unstable commodity prices on the capacity of beef producers to undertake major change in their production systems are two of the greatest threats to R&D within the NAP.

However, each of these is also an ongoing feature of beef production in Northern Australia, and as such offers an opportunity to design R&D projects which address real on-property production situations. Increasingly, throughout the life of the NAP, the R&D focus has moved from research plot work to paddock and whole property and landscape scales, with a stronger involvement of beef producers in the development of research projects.

Changing investment priorities within MLA, as a producer-owned and managed company operating in a market-driven climate, could also see a shift of funds from resource management. However this is considered unlikely, given existing commitments to place greater emphasis on environment and sustainable management issues in a climate of growing expectations of consumer and the wider community.

Collaborating organisations

- MLA (lead agency)
- Land & Water Australia (major funding partner)
- Environment Australia (EA – funding partner)

Since 1996, Land & Water Australia has been a major contributor to the

Improving Resource Management sub-program and EA has also become a financial partner in some specific projects. A collaborative approach by funding agencies with different key interests has enabled the research program to cover a breadth of resource sustainability issues less feasible for the NAP operating alone on behalf of the beef industry.

A Resource Management Panel, comprising representatives from the three funding organisations, together with representatives from Landcare, the World Wide Fund for Nature and individual beef producers, has provided advice to the Program.

Funding within the NAP has also been dependent upon R&D providers each making a significant contribution in either funding or related in-kind activities, such that CSIRO, various State government agencies and universities have also been collaborators within the Program. Collaboration with the North Australian Beef Research Council and the Tropical Savanna CRC has also been strengthened during the latter stages of the Program.

Achievements and outcomes

Specific resource management issues included in the NAP include:

- continuation of projects on the long-term effects of different grazing pressure and management strategies (eg. fire) on pasture composition, tree/grass balance and weed management;
- relationships between grazing, grazing management and maintaining key aspects of ecosystem function, including both water and nutrient movement and the conservation of biodiversity;
- piloting of the application of an accredited Environmental Management System to Northern beef enterprises;
- integration of grazing and resource management practices into efficient and profitable whole property management systems; and
- the integration of resource management issues with other aspects of producer empowerment and skills building through the producer-driven Beef Plan project.

Numerous major research sites, supported by results from a larger number of minor sites, have participated across Northern Australia. NAP funding has also supported other projects in cattle management and nutrition, property management and efficiency, which provide strategies to reduce grazing pressure and provide on-farm resources to devote to resource management issues. Increasingly, over the life of NAP, emphasis has shifted towards integration of sustainable resource management with other aspects of on-property production. Both the producer-led Beef Plan project, and a recently established Grazing Land Management project, are directed to building awareness and skills across the industry in sustaining healthy landscapes with profitable cattle production.

The NAP has facilitated and funded several workshops, coordination meetings and producer demonstration sites and has assisted in creating a

rewarding and dynamic relationship between producers, agribusiness, extension and research workers. As part of an action learning process, producers are being provided with greater opportunities for direct involvement in R&D projects. Several of these have resulted in publications within the NAP Occasional Paper series targeted primarily to the R&D community, while others have resulted in more practical publications targeted primarily to beef producers.

As the final year of the NAP begins, strong emphasis is being placed on delivery of outcomes of funded projects in formats readily accessible to producers.

Analysis of performance

Since the commencement of Phase 3 of NAP in 1996, strong emphasis has been placed both on scientific peer review and on ensuring relevance of the R&D to the beef producers, who are both co-funders and clients of the Program.

Detailed peer reviews, involving project team members and external reviewers (both scientific and producer), have been conducted annually for all projects in the resource management sub-program. Three major peer review workshops were conducted on a regional basis (Rockhampton, Darwin and Townsville) during the latter part of 2000, to assess:

- progress of projects against agreed goals;
- the achievement of the resource management sub-program against its goals and objectives; and
- the effectiveness of projects and the program communication strategies in the field.

Each of these review sessions involved both seminar presentations by the various project teams and site visits during which presentations using a 'field day' format were used to present the projects and their outcomes.

It is likely that the incoming Industry Committee overseeing the Northern Beef Program will also initiate an external evaluation of the whole of NAP.

Communication

The primary focus of the NAP has been in individual R&D projects, each of which is required to develop and implement its own communication strategy. The NAP has also sponsored various workshops on elements of sustainability in Northern beef production, each of which brings together technical expertise from within the R&D community and Northern beef producers.

Sub-program 3 of the NAP, which was directed to Improving Whole Property Management, served as a vehicle to encourage uptake of the outcomes of the resource management R&D conducted within sub-program 2. This has been complemented through sponsorship of occasional field days and other events, and ongoing producer demonstration sites.

The NAP also publishes a regular newsletter, *NAP News*, and a series of Occasional Papers resulting from annual peer review workshops and the outcomes of various R&D projects. The Program is also contributing to MLA's

Tips & Tools series prepared for landowners and managers.

Future directions

Most of the projects in progress during the final year of the Program were completed by June 2001. However, a small number of landscape scale projects and projects placing greater emphasis on producer-led R, D & E having a strong whole property perspective, have been identified for continuation in the new Northern Beef Program, which commenced on 1 July 2001.

Through a major customer-focused needs analysis, and interaction with co-funding bodies and other key stakeholders, Meat & Livestock Australia has developed a five-year Northern Beef Program. This Program will see MLA's investment in resource management R&D in the North more strongly focused on linking solutions-based basic R&D with communications and awareness, producer access to and uptake of R&D outcomes, and capacity building within the R, D and E community in the North. While Land & Water Australia will not be making an initial investment in the new Program, it is likely that collaborative efforts will be made on specific projects.

For further information about the recently completed North Australia Program or its successor Northern Beef Program, please consult Meat & Livestock Australia <www.mla.com.au>.

Sustainable Grazing Systems (SGS)

Goal and strategies

SGS was set up in 1996 to address the issues of declining pasture productivity and sustainability in the grazing systems of the higher rainfall zone of Southern Australia (annual rainfall >550 mm).

SGS formally concluded on 30 June 2001, but rather than begin a new program immediately, some of the investors in SGS have funded a 'Harvest Year' to ensure the full value is derived from the Program's investment.

Instead of the traditional approach where research operates independently to develop and package information for producers, SGS has pioneered an approach to bring researchers, producers and extension agents into a partnership to collectively improve the productivity, profitability and sustainability of grazing systems in the high rainfall zone. There are four interacting elements within SGS:

1. PROGRAZE® to provide training and skills development for producers.
2. A network of 11 regional producer committees to determine local issues and priorities for action, and then to manage local delivery.
3. A National Experiment to develop the principles, tools and indicators that are needed for assessing and improving the profitability and sustainability of grazing systems.
4. The SGS Model – to provide a computer representation of grazing systems for interpretation and analysis of National & Regional Sites, and to provide a 'what if' capability for all sectors of SGS.

The SGS goals were to have:

- 2000 producers adopt changes to their grazing systems that are at

least 10% more profitable and more sustainable; and

- another 5000 producers trialing at least some of the Program's recommendations.

These goals were clearly met – see 'analysis of performance' section.

Risks and specific opportunities

The major risk with SGS was that change would not be fast enough at the farm level, to meet the SGS goal – however, that risk is past, and the goal has been met.

The specific opportunities available to SGS during the Harvest Year include:

1. Continuation of some of the key elements of SGS, including many of the sites in the National Experiment.
2. Rapid development of the tools and products from the combination of proven scientific results and producer experience in SGS.
3. More rapid analysis of research results and delivery of scientific information.
4. Clearly defined issues for demonstration to producers at local sites, through to key questions for new research and development in the new MLA Programs.
5. Substantially improved program(s) to follow SGS because of the pausing, reflecting, testing, and cross-site analyses during the Harvest Year.

Collaborating organisations in the Harvest Year

- MLA (lead agency)
- MDBC (funding partner)
- Land & Water Australia
- NSW Agriculture
- Victoria Department of Natural Resources and Environment
- Agriculture WA
- NSW Land and Water Conservation
- Tasmanian Department of Primary Industries and Fisheries
- South Australian Department of Primary Industries
- Universities of Melbourne and New England
- Producers and producer groups across the high rainfall zone of Southern Australia

Achievements and outcomes

SGS has an excellent record of delivery to stakeholders – key outcomes by the end of June 2001 include:

- Incorporation of key water management and sustainability messages into PROGRAZE®, and its ongoing delivery to around 1000 producers per year.
- Development of a new product – PROGRAZE® Update, with a strong emphasis on water management and sustainability, and its planned delivery to around 2000 producers (PROGRAZE® graduates) over the next two years.
- The establishment of an extended network of 11 committed regional committees throughout Southern Australia who have become champions for development and adoption of more sustainable grazing systems.

- 100 producer-driven regional sites nationally, most of which focus on improving productivity and sustainability through improved use of perennial pastures, grazing management, improving groundcover etc. Unlike many 'research' sites, these have strong credibility with producers.
- Two SGS National Farmwalks (Spring 1999 and Autumn 2001), attracting around 4000 producers each to regional and national sites, each time attracting (hopefully) around 1500 new 'converts' to the SGS information loop.
- Quarterly publication and distribution of *Prograzier* magazine to more than 12 000 livestock producers in Southern Australia. Recent editions include the highly successful 'Water' and 'Nutrients' editions, with 'Pastures' (perennial of course), 'Animals' and 'Biodiversity' to come.
- Distribution of a special series of SGS 'Tips and Tools' to 11 000 producers, focusing almost entirely on establishment and management of perennial pastures in the high rainfall zone.
- Two highly successful SGS National Forums which have focused on the dual challenge of increased productivity and sustainability.
- Three major benchmarking surveys of producer management practice in the high rainfall zone (1994 – 1998 – 2001) to monitor changes in producer adoption of more sustainable management practices.
- Detailed final research reports from the SGS National Experiment, integrated across six national sites and five key themes. These reports will provide new data and information on the interactions between pastures, water, nutrients, animal production, biodiversity, and grazing and pasture management, across a wide range of production systems and environments.
- The SGS Model, a dynamic and powerful predictive model incorporating the above elements that will be validated and tested against the outcomes of the National Experiment.
- A consolidated SGS database, which captures in one database and common format all of the data from the SGS National Experiment.
- An economic analysis tool for use by researchers, that for the first time combines the usual financial assessment of the impact of experimental treatments with an evaluation of the impact on the resource base to facilitate full reporting to producers.
- An SGS Final Report, written in a triple bottom line format, which pulls it all together.

Analysis of performance

The 2001 Producer Survey

In 2001, a random phone survey of 1630 producers was conducted across the SGS region of Southern Australia to determine changes in practices and relate this to involvement in SGS. This survey confirmed the penetration of SGS

into the high-rainfall zone marketplace. Of this population:

- 62% were aware of SGS.
- 41% have 'engaged' with SGS either through a regional activity, a PROGRAZE® course or receive *Prograzier*.
- 26% of the population have 'actively' participated in SGS through PROGRAZE® or a Regional Committee activity.

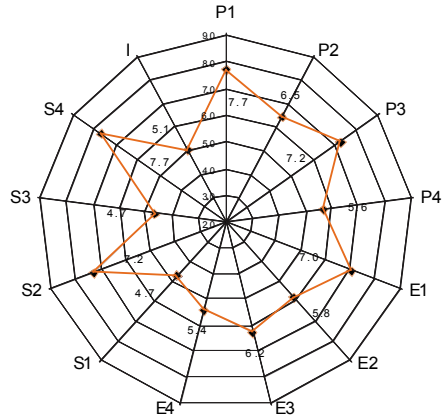
Key messages

- 9839 producers have participated (actively by participation in regional activities and PROGRAZE®, or passively just by receiving *Prograzier*); up to 8000 have made beneficial changes to their grazing practice that they anticipate will yield financial and environmental benefits.
- The number of producers who have stated they have 'trialed' and/or 'adopted' actions clearly indicate that the goal of 5000 trialing, and 2000 adopting has been achieved.
- Producers who have been in SGS have made more changes to activities which underpin their grazing management than non-participants.
- Producers who have participated in SGS are more confident in the financial and sustainable benefits will accrue from changes made to their grazing management than non-participants who have made changes.
- Attribution to SGS is shown by significant positive responses from the producers who have participated in SGS, where they indicated SGS activities had helped them better:
  - manage pastures 83% (7792 farms)
  - manage animals 78% (7324 farms)
  - manage soil, water and nutrients 75% (7041 farms)
  - understand environmental issues 80% (7511 farms)
  - share information 90% (8450 farms)

As well as the random producer survey, the key participants in SGS (researchers, regional committee members and management) were surveyed as part of the preparation of a Triple Bottom Line final report from SGS.

A questionnaire was sent to 253 core participants, who were asked to rate SGS performance on a scale of 1 (poor, or very little) to 10 (to a large extent) on a total of 30 questions. Confidential responses were received from 165 respondents and the results are shown in the Spider web diagram below.

Average scores given to SGS by 160 of the key participants in the Program



The meanings of the designations in the diagram are listed in the following Table.

P1 - Recognition	Extent to which productivity/profitability issues were recognised and incorporated into SGS
P2 - Delivery	Extent to which SGS developed, demonstrated and delivered more productive grazing systems
P3 - Management	Extent to which SGS improved our ability to understand/manage productivity of grazing systems
P4 - Impact	Extent to which SGS reduced costs, increased returns, and increased the efficiency of operations
E1 - Recognition	Extent to which sustainability issues were recognised and incorporated into SGS
E2 - Management	Extent to which SGS improved our ability to understand/manage sustainability of grazing systems
E3 - Delivery	Extent to which SGS developed, demonstrated and delivered more sustainable grazing systems
E4 - Impact	Extent to which SGS improved the on-farm and off-farm environments, and increased knowledge of environmental issues in the high rainfall grazing industries
S1 - Recognition	Extent to which social issues were recognised and incorporated into SGS
S2 - Satisfaction	Degree of satisfaction achieved from involvement in SGS and in the meat industry
S3 - Community Perceptions	To what extent has SGS been able to influence the knowledge and perceptions of the wider community and influence the policy for the grazing industries
S4 - Personal Growth	To what extent has involvement in SGS helped increase your skills and knowledge, your linkages and interactions with peers and other groups
I - Integration	Extent to which SGS has integrated the social, environmental and economic issues and trade-offs

Production (Productivity & Profitability):

The purpose of this section was to assess the extent of any improvements in the productivity/ profitability/ efficiency of producers and those providing supporting services to the meat industry from involvement in SGS.

Environmental

The purpose of this section was to assess the extent of any improvements in the environmental capital (any actual on- and off- farm improvements) from SGS.

Social

The purpose of this section was to assess the extent of any social improvement in the social capital (confidence, competence, well-being) of individual meat producers, those supporting the industry, and the associated rural communities from SGS.

Communication

SGS has a formal communication plan, based on meeting the needs of four key target groups. The target groups, their approximate numbers, and the major communication activities undertaken in 2000–2001 are summarised below for the four target markets.

Target Market 1 – SGS Champions

(500 producers, sponsors, researchers – leading the development, trialing, adaptation and adoption of sustainable grazing systems.)

- SGS National Forum in Albany, May 2001.
- National FarmWalk.

Target Market 2 – Producers with PROGRAZE® like skills

(8500 producers who have completed PROGRAZE®, many of whom are involved with national or regional sites and who are the most active producers in the network.)

- *Prograzier* newsletter.
- *Tips & Tools.*
- Activities at regional sites.

Target Market 3 – Producers desiring PROGRAZE® skills

(1500 producers who are currently completing PROGRAZE®, or who have applied to undertake the course.)

- Support to undertake a PROGRAZE® course.
- *Prograzier.*
- Activities at regional sites.
- National FarmWalk.

Target Market 4 – Producers not aware of SGS

(11 000 producers who do not know about SGS, or do not feel inclined to become involved.)

- Newspaper articles.
- National FarmWalk.

Future directions

The SGS Harvest Year will be instrumental in providing future directions for more profitable and sustainable grazing systems, via the activities of four Harvest Teams. These are mixed teams of producers and researchers working to rapidly draw together and interpret the results and experiences from SGS. The Harvest Teams are:

i. Water and Nutrients in grazing systems

ii. Pasture and Animal management and performance

iii. Biodiversity (including Trees) in grazing systems

iv. Social and Adoption issues relating to profitable and sustainable grazing systems.

These Harvest Teams have the responsibility to develop the tools and products that producers need to make progress against the following five objectives that will collectively deliver the outcome of 'more productive and sustainable grazing systems':

1. Increasing productivity and profitability of grazing systems
2. Increasing the total water use of grazing systems
3. Protecting the farm's natural resources
4. Creating a more diverse grazing landscape
5. Reducing off site impacts of grazing systems.

In addition, the planning for a new program to follow SGS has begun. This new Program (with the working title of Sustainable Grain and Grazing Systems) is currently being planned through a joint venture between MLA, GRDC, AWIL and Land & Water Australia.

For further SGS information, please consult Meat & Livestock Australia <www.mla.com.au>.

Rivers Arena – Managing Australian River Landscapes

WATER RESOURCES ARE of crucial importance to Australia and appropriate water management is a national priority. Land & Water Australia is well placed to contribute sustainable river management practices through our role as managers and key investors in the National Riparian Lands R&D Program, the National Rivers Consortium and the National River Contaminants Program.

In addition, other R&D programs which are concluding are reported under this Arena for the 2000–2001 period. These include the National Wetlands R&D Program (concluded) and the National Groundwater R&D Program.

National Rivers Consortium

Goals and strategies

The National Rivers Consortium's vision is to achieve continuous improvement in the health of Australia's rivers. The Consortium is a strategic collaboration between policy makers, river managers and scientists.

The Consortium is established under a Board of Management comprising Land & Water Australia, the Murray-Darling Basin Commission, CSIRO Land and Water, the WA Water and Rivers Commission and the NSW Department of Land and Water Conservation. The Board will expand as additional partners join the Consortium.

The Consortium has the following priorities:

- protecting rivers with retained natural values;
- restoring degraded rivers;
- training river managers;
- turning research into practical river management solutions; and
- undertaking regional and catchment demonstration projects.

Risks and specific opportunities

The major risk to progress is ensuring effective collaboration with key R&D providers, National and State agencies and catchment authorities, to support this national initiative.

The Consortium needs to secure sufficient resources to undertake an effective program of activities and the benefits of national collaboration have to outweigh the transaction costs if the initiative is to be successful. Making an impact on the continuing degradation of our rivers requires substantial financial resources and a coordinated and focused national effort.

Collaborating organisations

- Land & Water Australia (managing agency)
- CSIRO Land and Water (funding partner)
- MDBC (funding partner)
- WA Water and Rivers Commission (funding partner)
- NSW Department of Land and Water Conservation (funding partner)
- Recfish (member)

- Wetland Care (member)

Achievements and outcomes

Activities and achievements completed include the following.

- Development of a river restoration framework for river restoration planning and rehabilitation.
- Development of methods for identifying and protecting rivers of high ecological value.
- Development of guidelines for protecting Australian waterways.
- Report and design of a program of activities for information exchange and capacity building.
- Tendering of a contract for the development of a program of training and education activities to increase the capacity and skills of river managers.
- Design of a regional or catchment based best practice research/demonstration project in the Torbay catchment of WA.
- Holding a workshop in Alice Springs on the management of inland river systems.

The Consortium is also implementing the new direction proposed in the Land & Water Australia Strategic Plan 2001–2006, with a team-based approach and Rivers Arena being one of the five areas of Land & Water Australia research activity.

Analysis of performance

The Consortium has limited resources but skilled staff to deliver useful and readily applied outputs. There has been a significant increase in support for the Consortium and growing confidence that it can meet the needs of river managers. In particular, catchment and river management authorities are becoming strong supporters of the Consortium.

Communication

Communication for this Program is integrated with the new Land & Water Australia communication plan. A service agreement specifies the respective roles and responsibilities for undertaking communication activities by the Consortium and by Land & Water Australia.

Major communication products include the newsletter *RIPRAP*, the <www.rivers.gov.au> WebSite, management based fact sheets and final report publications.

Future directions

The National Rivers Consortium will better assemble the full range of skills, expertise and capacity of major organisations involved in river restoration and protection in Australia. The Consortium will connect the various types of activities (policy, science, practical management) and speed up progress to achieve community goals for river condition and management.

For further NRC information, please consult <www.rivers.gov.au>.

National Riparian Lands R&D Program

Phase Two of this Program commenced 1 July 2000, following an independent review that found Phase One had met its objectives and was setting a world class

standard in the science and communication activities being undertaken. This review was combined with an extensive consultation process involving landholders, government agencies, research institutions and community-based organisations, to develop a Plan for a second phase.

Strengths of Phase One have been built into this Plan, the Program retaining a practical focus with an investment strategy that funds research according to key riparian management issues. It necessitates a multi-disciplinary approach to ensure findings can be accessed and used by river managers in the 'real world'.

Goals and strategies

The Program's goal is to facilitate communities to implement, monitor and evaluate practices for ecologically sound, effective and economic management of riparian lands.

The Program will achieve this goal by investing in research according to key riparian management issues:

1. Development of conceptual model showing riparian zone interactions.
2. Influence of riparian management on flood hazard at a catchment scale.
3. Stabilising streambanks and trapping of sediments and nutrients.
4. Improving water quality and aquatic ecosystem health.
5. Reintroduction and maintenance of large woody debris.
6. Preventing or reducing pollution due to nitrogen and associated carbon sources.
7. Valuing riparian ecosystem services to improve decision making.
8. Determining appropriate riparian width for different management objectives.
9. Management of domestic stock and feral animals.
10. Development of simple but effective techniques for monitoring and evaluation of riparian management and vegetation condition.
11. Overcoming constraints to implementation of sound riparian management.

These riparian management issues will be investigated using research, demonstration and knowledge exchange approaches. Full details of the work to be undertaken in each of these areas may be found on the WebSite <www.rivers.gov.au> under the 'activities' heading.

Risks and specific opportunities

As consumers place greater demands on commodity-based industries to demonstrate 'clean green' credentials, there is increased opportunity for the Program to work with particular industries to develop Environmental Management Systems. Work with the Sugar Research and Development Corporation over the past year has resulted in a publication entitled *Managing Riparian Lands in the Sugar Industry: A Guide to Principles and Practices*. It was developed with canegrowers to ensure that its contents were relevant and applicable for the sugar industry.

Work has also begun on a large demonstration project with the dairy industry in Gippsland to show how riparian restoration and management can result in benefits for the farmer and local community. Similar projects are planned with the wool and grains industry over the next five years.

In addition to the new market for Program outputs presented by commodity-based industries, community awareness and expectations in sound management of rivers and their adjacent riparian lands is increasing.

There has been a high demand for products designed for both technical audiences (eg. government agency personnel, catchment management and landcare facilitators), and those products aimed more broadly at the community and individual landholders.

The Program will continue to develop innovative products to meet these demands, as well as consolidate its role as a 'national clearing house' for river and riparian information.

Collaborating organisations

- Land & Water Australia (Lead agency)

Program Partners:

- CRC for Catchment Hydrology (co-investor & research provider)
- CSIRO Land and Water (co-investor & research provider)
- Centre for Catchment and In-Stream Research – Griffith University (co-investor & research provider)
- University of Western Australia (co-investor & research provider)
- Charles Sturt University (co-investor & research provider)
- James Cook University (co-investor & research provider)

Project Partners:

- Dairy Research and Development Corporation (co-investor project)
- Gipps Dairy (co-investor project)
- Australian Wool Innovation (co-investor project)
- Agriculture, Fisheries and Forestry – Australia (co-investor project))
- Sugar Research & Development Corporation (co-investor project)

Advisory Committee and potential Project Partners:

- Queensland Department of Natural Resources & Mines
- NSW Department of Land and Water Conservation
- SA Environmental Protection Authority
- SA Department of Water Resources
- Tasmania Department of Primary Industries and Fisheries
- NT Department of Land Planning & Environment
- Victoria Department of Natural Resources & Environment
- WA Water and Rivers Commission
- Environment ACT

Achievements and outcomes

The first phase of this Program was completed at 30 June 2000. The two research components have been highly

successful in identifying and quantifying critical processes that govern interactions between riparian lands and their vegetation and aquatic systems.

For example, it has been shown that a well-maintained grass buffer strip of six metres width can be very effective in trapping up to 95% of sediment and associated nutrients from upslope intensive agriculture.

The important effect of tree roots in reinforcing and stabilising streambanks has been quantified for different parts of a river's catchment. Work has shown the relative importance of hill slopes and gullies/channels as sources of sediments under particular catchment and land use conditions. This data has been collated in the form of sound management principles and decision-support tools. For instance, data is presented as look-up tables showing the influence of tree roots in stabilising banks in relation to distance and depth, or the width of grass buffers needed for particular slopes and land uses.

The ecological research has demonstrated that:

- leaves, twigs, flowers, fruit and bark from streamside vegetation are a critical component of aquatic food chains for streams in natural condition in Australia;
- nitrogen, rather than phosphorous, is the key nutrient that limits in-stream algal growth in forested streams; and
- the shading effect of riparian vegetation is critical in preventing the growth of nuisance plants and algae in streams, even in the presence of enhanced nutrient levels – this has been a common finding right across Australia, with results also showing the influence of latitude and stream orientation.

At lower latitudes in the tropics, shade equivalent to approximately 70% of that found under natural conditions is required to prevent the growth of nuisance plants and algae. A level nearer 60% is sufficient at higher latitudes to the South. Much of the shading effect of vegetation can be obtained by revegetating just the Northern bank on East-West flowing streams of up to several metres width. This is important information for catchment or rivercare groups with limited funds. The information from this ecological research has also been collated in the form of management principles and decision-support tools.

The demonstration/evaluation projects have enabled landholders and community groups to test and evaluate different methods of riparian management and rehabilitation, and this model will be continued in Phase Two. A number of cost:benefit analyses have been completed. This work has led to a large expansion of interest and involvement in riparian management in the catchments concerned. However, information and awareness has been slower to move to adjacent catchments. The results of these projects are at present being collated and will be published as a set of national case studies to provide support and guidance to the many other groups who wish to undertake riparian projects.

Much of the work undertaken in the first phase of the Program has been

published in a detailed set of *Riparian Land Management Technical Guidelines*, that summarise known information from published literature. A set of practical methods is presented for onground riparian management. It provides an essential source document of information not previously available within Australia and demand for this report, as for other Program products, has been high. The Program newsletter *RIPRAP* and other Program outputs have continued with similar high levels of demand.

Working with commodity-based industries to translate the work of the Program in ways that make it relevant and accessible by particular industry groups, is proving to be a strength of the Program and is likely to be expanded further over the coming years.

Analysis of performance

With the first phase of the Program complete, an independent review has identified the significant progress made in process understanding and development of sound principles for riparian management. It has clearly been very influential in raising the profile and capability for riparian land management within Australia.

The close working relationships established by Program research teams and State agency personnel, as well as with many community groups, has helped to ensure a high level of interest in, and uptake of, Program findings and outputs. The challenges now are:

- to help further extend the level of awareness amongst the Australian community of the importance of riparian lands and the need for improved management;
- to ensure that Program findings are used to maximum effect to support onground management, including that supported under the Natural Heritage Trust; and
- to work with industry to raise awareness about the need to better manage river and riparian systems and develop Environmental Management Systems that ensure this occurs.

Communication

An innovative and dynamic communication approach developed by the Program has led to increased demand for its products and interest in its activities. A River Landscapes Poster, promoting the message of working together to restore Australia's river and riparian environments, has been widely sought. Similarly, the poster's companion brochure outlining the work of the Program and how its research activities and products can assist groups and individuals to better manage these special environments has been in demand.

Establishment of the Rivers WebSite <www.rivers.gov.au>, combined with the release of the Riparian Land Management Technical Guidelines and the Rehabilitation Manual for Australian Streams, has been an important part of Program communication. Printed copies of these materials have also been made widely available as a ready-reference source. An interactive CD-ROM has translated the Rehabilitation Manual for Australian Streams into a dynamic and innovative product that uses case

studies, animation and virtual reality to explore the complexities of river rehabilitation. Presenting information in this way has proved to be very successful, with the CD-ROMs freely available and demand for copies high.

Other products arising from the Program, including its newsletter, *RIPRAP*, as well as further technical reports and decision-support tools, have achieved a high level of penetration amongst potential user audiences.

Future directions

Contracts have now been signed with three consortia to undertake research and demonstration activities for Phase Two. Negotiations are now underway with State, Territory and Catchment Management organisations for some of this work to be undertaken in their jurisdictions.

For further information about the National Riparian Lands R&D Program please consult <www.rivers.gov.au> or contact the Program Coordinator, Dr Siwan Lovett.

National River Contaminants Program

Goals and strategies

The National River Contaminants Program is funded under a partnership with the Murray-Darling Basin Commission. It tackles declining water quality in Australia's river systems. Contaminants affect the health and ecological value of riverine systems (including wetlands and floodplains, and also threaten consumptive and commercial uses of water resources.

Further, river contaminants are a major threat to receiving waters (estuarine, coastal, wetland and reservoirs). Some ecosystems under serious threat are of enormous national value, including the Great Barrier Reef, Gippsland Lakes, Macquarie Marshes and Swan-Canning estuary. Salinity, nutrients and sediments are the highest priority river contaminants for the program.

The Program builds upon the highly successful National Eutrophication Management Program that explored the cause and management of algal blooms.

Risks and specific opportunities

The river contaminants program covers a broad range of potential river contaminants such as salinity, nutrients and algae, soil erosion, and pesticides. The Program will invest strategically, taking a holistic, long-term, ecosystem-focused approach. More basic knowledge is required about the ecological effects of salinity in ecosystems where salinity is the dominant cause of stress, with links to the National Dryland Salinity Program. For nutrients and sediments, investment will focus on turning existing knowledge into management tools and policy changes. Partnerships and effective collaboration with key R&D providers, National and State agencies and Catchment Authorities will be pursued to achieve critical funding mass for large-scale ecosystem studies.

Collaborating organisations

- Land & Water Australia (managing agency)
- MDBC (funding partner)

Achievements and outcomes

- Program Plan finalised and Funding Agreement negotiated.
- Advanced contract negotiations completed for a salt sensitivity database.
- Other projects to initiate the program will be scoped and contracted in the 2001–2002 financial year.

Communication

Communication for this Program is integrated with the new Land & Water Australia communication plan. Major communication products include the newsletter *RIPRAP*, the <www.rivers.gov.au> WebSite, management-based fact sheets and final report publications.

Future directions

The Program covers a broad range of potential river contaminants issues such as salinity, nutrients and algae, soil erosion, and pesticides. A major challenge is to strategically invest the Program funds while meeting the following identified objectives:

- A holistic, long-term, ecosystem-focused approach should be adopted.
- More basic knowledge and supporting R&D is required about the ecological effects of salinity in ecosystems where salinity is the dominant cause of stress, with links to the National Dryland Salinity Program.
- For nutrients and sediments, investment priorities should be focused on turning existing knowledge into management tools and policy changes.
- Partnerships and effective collaboration with key R&D providers, National and State agencies and Catchment Authorities need to be pursued to achieve critical funding mass for large scale ecosystem studies.

For further information, please consult <www.lwa.gov.au>.

National Groundwater R&D Program

Goals and strategies

The mission of this Program is to provide management and policy information and tools to assist in the sustainable use of groundwater resources and the protection of groundwater quality.

The Program strategy has involved a national review of R&D needs followed by prioritisation by a management committee comprising experts from the key State managing agencies. Other strategies include undertaking collaborative R&D with partners, commissioning R&D in priority areas of supply failure, incorporating appropriate communication/transfer pathways in each project and maintaining a watching brief on groundwater policy and management developments.

Risks and specific opportunities

The principal risk with groundwater is always 'out of sight – out of mind'. The Program needs therefore to continually raise the awareness of groundwater issues in the minds of managers and policy makers.

Opportunities are increasingly arising to incorporate groundwater as part of the whole water cycle from allocation to management to protection. Better tools, information and awareness are needed to achieve this. Raising the understanding and management capability for groundwater managers in rural areas is a key challenge.

Collaborating organisations

- Land & Water Australia (lead agency)
- NSW Department of Land and Water Conservation
- Western Australian Water and Rivers Commission
- Queensland Department of Natural Resources & Mines
- National Groundwater Management Committee under the Standing Committee on Agriculture and Resource Management (SCARM)

Achievements and outcomes

The Program was reviewed by independent consultants in late 1999. The review was complimentary in describing the Program's performance

"...Land & Water Australia has raised the profile of groundwater R&D with the inception of the National Groundwater R&D Program. All researchers and management agencies believe that Land & Water Australia has the national focus and the organisational structure to continue to enhance applied research in the groundwater area."

2000–2001 was the final year of the Program. Work on fractured rock systems at Clare and Wagga Wagga has now been completed. The Clare project has been especially important in developing new techniques for evaluating water and solute flow in such systems. These studies, combined with the study underway on the Atherton Tablelands, have given new insights as to the management of fractured rock aquifers which underlie much of Australia.

Due to the interest in this work, it was decided to commission a manual which will bring together what we know about groundwater in fractured rock. This manual will be completed by late 2002.

Work in progress on three studies into groundwater interactions with ecosystems will be completed by late 2001. This work, initiated by Land & Water Australia, has greatly increased awareness of the issue. Consequently, several States are now developing policy in this area.

Analysis of performance

The external review of the Program has shown that its performance has been good in terms of innovation and leading edge R&D that is increasingly influencing groundwater management.

Communication

Due to the relatively small size of this Program, a formal program-level communication strategy has not been developed and communication activities are undertaken on a project by project basis. This has proven highly effective, with good outcomes attained from briefing tours, promotion of reports and use of the national groundwater school and conferences.

Future directions

The five-year Program is now almost complete. The future of groundwater research in Land & Water Australia is under consideration by the Board.

For further Program information, please consult <www.lwa.gov.au>.

National Wetlands R&D Program

The National Wetlands R&D Program began in late 1996 and concluded this financial year.

Goals and strategies

The Program goal was to support the conservation, rehabilitation, restoration and long-term sustainable development of wetlands by government and private sectors in Australia through targeted R&D. The strategy is based on the outcomes of a national R&D priorities review and involves funding projects against seven key areas: water regime; contamination; grazing and cropping practices; invasive pests; health monitoring; valuing wetlands; and information/technology transfer.

Risks and specific opportunities

The risks to the continued sustainability of Australian wetlands are varied and the Program aimed at minimising some of these risks by providing for more effective management.

Several specific opportunities exist within the area of wetland management which are likely to contribute to an increased effectiveness of the Program. These include:

- greater awareness by the private and public sector of the values of wetlands and the nature of threats likely to impact on them;
- greater awareness and understanding of wetland management techniques; and
- increased community group interest in on-ground management of specific wetland sites.

Collaborating organisations

- Environment Australia (lead agency)
- Land & Water Australia (funding partner)

Achievements and outcomes

Eleven projects have been funded and completed under the program. They are listed in the Table on the next page

A Program review has been undertaken by Resource Policy and Management Pty Ltd, as part of the mid-term review of the Natural Heritage Trust, and a report presented to the Program Management Committee.

The report concluded that:

> "Program activities have efficiently and effectively responded to the Program's mission statement. Research funded under the Program is of the highest quality and has responded to the Program's objectives. The development aspect of many projects needs further institutional support to maximise the potential for research findings to influence and provide benefit to on-ground wetlands management practices across Australia."

Analysis of performance

All funded projects have been completed.

1. Integrating wetlands R&D and onground wetland management – scoping study	S. Chamala and G.S. Baxter
2. Changing water regimes and wetland habitats in the Lowbidgee Floodplain	Dr Richard Kingsford: NSW National Parks & Wildlife Service
3. The effect of flow on nutrients on wetland habitats	Dr Martin Thoms: CRC for Freshwater Ecology, University of Canberra
4. How do water regime and grazing alter the reproductive capacity of aquatic plants	Dr Margaret Brock: Botany Department, The University of New England
5. Implications of nutrient enrichment for management of primary productivity in wetlands	Dr P C Bailey: Department of Ecology and Evolutionary Biology, Monash University and Dr P Boon: Department of Biological and Food Sciences, Victoria University of Technology
6. Modelling ecological responses to water regimes in arid zone wetlands	Dr Jim Puckridge: River Murray Laboratory, Dept of Zoology, University of Adelaide
7. Monitoring Wetlands Health: Are National River Health Program protocols applicable?	Dr Jenny Davis: Murdoch University
8. The availability of wetland habitat for waterbirds in arid Australia	Professor Alistair Robertson: School of Science and Technology, Charles Sturt University
9. The Private and Social Values of Wetlands	Professor Jeff Bennett: School of Economics and Management (ADFA) The University of NSW
10. Weed management and the biodiversity and ecological function of tropical wetlands	Michael Douglas & Stuart Bunn: Northern Territory University
11. Identifying and Monitoring Change in Wetland Inundation Patterns, Kakadu NT	Associate Professor Anthony Milne: School of Geography and Centre for Remote Sensing and GIS, University of New South Wales

Communication

Fact sheets, CD-ROMs, newsletters and web-based information for wetland managers and the community have been prepared and made available for specific projects over the life of the Program.

Future directions

Further developmental activities in support of extension of project outcomes and outputs have been recommended to be undertaken at the national level in consultation with State and Territory representatives as well as other stakeholders, including Project Investigators. This will require consideration of how project outputs can be institutionalised within Commonwealth, State and other systems, and influence policy and practice across Australia.

Vegetation Arena – Managing vegetation in rural landscapes

DEPLETION, DEGRADATION and fragmentation of Australia's native vegetation cover is the most important single cause of dryland salinity, the single biggest driver of biodiversity loss, and among the largest single contributors to net greenhouse gas emissions.

The Land & Water Australia-managed Native Vegetation R&D Program, and the Joint Venture Agroforestry Program, managed by RIRDC, form key elements of this Arena.

In addition, the completed National Rangelands R&D Programs is reported under this Arena for the 2000–2001 period.

Management of Native Vegetation

Goals and strategies

The Native Vegetation R&D Program aims to assist government agencies, community groups and landholders to better manage and conserve native vegetation in rural landscapes, through the application of knowledge and improved understanding gained from R&D. The overall aim of the Program is to provide practical assistance for on-ground management of native vegetation and also to assist the development of improved policies and programs to help achieve this aim.

The first phase of this research Program commenced in 1994 and was a joint initiative of Land & Water Australia and Environment Australia.

More than 30 ecological, socio-economic and planning projects were funded in this phase, looking into the way that native species are lost, practical measures to reverse this loss, and how to support the development of policies and Programs to help manage remnant vegetation. *Managing the Bush*, which provides a synthesis of the first phase, was published in 2000.

The Program commenced its second five-year phase of research in July 2000, and is currently developing research projects in three key areas.

1. **Methods to assess native vegetation status, viability, and thresholds for significant change**

   The Program will fund research to develop and test practical methods that vegetation managers can use to:

   - assess the condition of native vegetation;
   - make predictions about long-term viability of vegetation; and
   - understand thresholds in landscape change where the condition and viability of vegetation is significantly affected.

2. **Incorporating native vegetation management into agricultural production systems**

   Early research in the first phase of the Program demonstrated that few landholders had incorporated management of native vegetation, fauna and natural systems into their property plan, cropping or grazing strategies or

farm management activities – particularly in an integrated manner.

The research identified a number of barriers to better management and included innovative projects to help overcome these barriers. The second phase of the Program will pull together the results of this work into a 'toolbox' of approaches for people who manage native vegetation and fund some case studies to further develop and test these methods and to demonstrate their effectiveness.

3. Testing different landscape design principles and methods

The role of native vegetation in agricultural landscapes has received greater attention recently from both a production and conservation perspective. People are developing methods to identify the most appropriate size and spatial configuration of native vegetation and areas to be revegetated.

The 'focal species' approach and 'no net loss/net gain' are examples. However, most of the rules of thumb applied in these situations are based on theory, not measured outcomes, and would benefit considerably from more rigorous testing.

These projects will be developed within a research framework that encourages participation of the end-users of the research and the development of practical tools and guidelines. Effective communication of research results will also be an essential element of the Program, utilising networks such as those nurtured by Greening Australia.

Risks and specific opportunities

Provision of sound information on the benefits of sustaining native vegetation in rural landscapes, and strong links between research, policy development and practice help to overcome the risks associated with the Program, or at least to minimise their impacts.

The highest level of risk is associated with factors largely beyond the control of the Program, such as a renewed emphasis on commodity prices and potential changes in the policy environment, overseas markets or the taxation regime.

Climate change impacts are another external factor that represents both a direct and indirect risk to native vegetation. In comparison, the technical risks associated with R&D on native vegetation conservation and management are relatively small.

By continuing the Program into a second phase, a specific opportunity has arisen to build on the work undertaken in the Program and to maintain the national focus it provides.

Collaborating organisations

- Land & Water Australia
- CSIRO Sustainable Ecosystems
- CSIRO Plant Industry
- Tasmania Department of Primary Industries, Water and Environment
- Victorian Department of Natural Resources and Environment
- Queensland Department of Natural Resources & Mines
- SA Department of Environment and Heritage
- NSW Department of Land and Water Conservation

- WA Department of Conservation and Land Management
- Greening Australia

Achievements and outcomes

The second phase will build on the successes of first phase of the Program and continue to feed its outputs into other processes, for example the development of best practice guidelines by rural industries and farmer groups.

Analysis of performance

A mid-term review of the second phase of the Program is planned in 2002. This will examine the likely contribution of completed and current projects to improved management of native vegetation, the value of the program in terms of actual and potential benefits and the program's administrative and communication performance.

Communication

Phase 1:

While the first phase of the Program finished in mid-2000, the benefits from its projects will continue to grow.

Since the last Annual Report, the following publications associated with the first phase have become available, and a CD-ROM containing all 14 publications has been produced by Land & Water Australia.

RR 6/00. Patches of bush in a sea of pines: Summary of studies from the Tumut fragmentation experiment.

This report examines the contribution that native vegetation makes to biodiversity conservation in pine plantations.

RR 5/00. Looking to the farm business.

This report provides a framework for managing native pastures in South-Eastern Australia.

In addition, a synthesis of the work on incentives for managing native vegetation; and a publication on the value systems of stakeholders associated with vegetation management are planned.

Where possible, existing communication/distribution networks such as Greening Australia and industry networks will be utilised to distribute Program and project products.

Phase 2:

Detailed communication plans will be developed for each project. At the Program level, a poster and a native vegetation WebSite are under development, integrated into the Land & Water Australia WebSite at <www.lwa.gov.au>. A publication on landscape design based on the outcomes from a number of workshops is also planned.

In March 2001, the National Trust of WA held a conference 'Taking Care of the Bush: Nature Conservation on Private Land'. The Program Coordinator gave an invited spoken presentation at this meeting on the challenges faced in developing sustainable landscapes and making production and biodiversity compatible. Papers from the National Forum are available on <www.ntwa.com.au>.

The Native Vegetation R&D Program and the Joint Venture Agroforestry Program are the two main programs in Land & Water Australia's Vegetation Arena. On 30–31 May 2001, the Vegetation Arena held a forum in

Tanunda to highlight recently completed and current projects in the Arena, explore linkages with other initiatives and discuss future R&D directions.

Some of the common themes in the forum were regional scale planning that involves setting targets to meet multiple objectives, the need to better integrate conservation and production systems and demonstrating the economic benefits of retaining and managing vegetation. Effective communication and adoption is a critical component of any research and development program, and participants gave some useful feedback about how the current efforts could be built on. Papers from the forum are available on the WebSite at <www.lwa.gov.au>.

Future directions

Partnerships are being explored between native vegetation research and the MDBC, GRDC and other commodity groups such as the wool industry. Communication of results at both the project and Program level is a major focus in the second phase.

The first Coordination meeting for the second phase of the Program will be held in September 2001 to review progress on recently started and ongoing projects. A number of external participants, including other Land & Water Australia Program Coordinators, have been invited to the meeting to broaden the discussion.

These meetings are very productive and serve to enhance networking and communication among both researchers in the Program and a range of other participants. They also provide feedback on activities proposed at the Program level, as well as recommendations for communication activities and potential linkages between projects, other initiatives and with funding bodies.

For further Program information, please consult <www.lwa.gov.au>.

Joint Venture Agroforestry R&D Program (JVAP)

The Joint Venture Agroforestry Program (JVAP) is managed by the Rural Industries R&D Corporation (RIRDC) and is covered in more detail in RIRDC's Annual Report. Land & Water Australia is a partner in JVAP.

Goals and strategies

JVAP's vision is for a dynamic Australian agroforestry sector that is:

- economically viable through its contribution to the sustainable production of agricultural and forest products;
- managed to sustain land, water and biodiversity resources; and
- designed to enhance landscapes valued by landholders and communities at the regional and national levels.

JVAP has the goal of integrating sustainable and productive agroforestry within Australian farming systems. To achieve this goal, the following objectives and strategies are being pursued. These have been structured to recognise the multiple benefits of farm forestry and the higher level of risk that farmers face in adopting farm forestry compared to many other agricultural enterprises.

1. **Targeted strategies for implementation of farm forestry**

   This objective seeks to underpin the removal of a range of economic, institutional and social impediments to the adoption of farm forestry.

2. **More sustainable management of natural resources**

   Strategies under this objective seek to provide and disseminate the biophysical and economic information needed to optimise the investment in trees to improve Australia's environmental amenity and natural resource base, including soil, water and biodiversity. Since some 60% of Australia's land is managed by private landholders, the integration of trees into commercial farming systems will be crucial to achieving the level of tree planting needed to address these issues.

3. **Optimised productivity of crops and pastures.**

   This objective recognises that the integration of agroforestry with farming systems can provide benefits such as shelter and increased yields of crops and pasture.

4. **Optimised direct returns from tree products.**

   Production of commercial timber, oils and other products has the potential to provide for diversification of farm income. Uptake, however, requires improved information on commercially viable species, management systems, harvesting and processing. If the multiple objectives of farm forestry are to be achieved, then its geographical range needs to be extended. The development of agroforestry in medium to low rainfall areas is a key strategy.

5. **Cost effective multi-purpose agroforestry systems to meet commercial and environmental objectives.**

   This objective aims to bring together the research outcomes from the Program's other objectives to provide a better understanding of multi-purpose agroforestry systems and to develop design guidelines and decision making tools that will assist farmers to balance commercial and environmental outcomes.

6. **Effective communication.**

   Effective communication is crucial to the success of the strategies in this Program. Each of the above objectives will be managed to ensure that the research outcomes are accessible to forest growers and their advisors.

Risks and specific opportunities

Agroforestry systems are increasingly being applied to areas previously considered to be marginal for traditional forestry activities, most notably medium to low rainfall areas. To optimise the potential viability of agroforestry in these areas, a key priority for JVAP is the development of commercial species and provenances for agroforestry systems in medium to low rainfall areas.

As part of the R&D activities to assess low rainfall species, JVAP provides support for trials to assess a range of species for hardwood and softwood production and other products, such as oil mallee. Many of the trials presently being established may also include basic species, provenance or family collections from the wild.

Collaborating organisations

- RIRDC (lead agency)
- Land & Water Australia (funding partner)
- FWPRDC (funding partner)
- MDBC (funding partner)
- NHT
- AGO
- GRDC

Achievements and outcomes

- Held the highly successful JVAP Stakeholder Consultation and Information Exchange Meeting in November 2000.
- Communicated the JVAP Design Guideline Series to stakeholders in a Plenary Session of the Australian Forest Growers Conference, 2000.
- Supported a workshop and published the Proceedings and Discussion Paper from the Plantations, Farm Forestry and Water Workshop.
- Received the 2000 Allan Strom Eureka Award for the Master TreeGrowers Program for excellence in Environmental Education.
- Published a final report describing the results of a scoping study investigating the potential for integrated mallee processing for carbon products, eucalyptus oil and electricity – a pilot plant based on this system is currently being established in Narrogin (WA) with government and private investment.
- Released a Risk Management Strategy to address potential genetic pollution from eucalypt and eucalypt hybrids in farm forestry systems.
- Supported the Bioenergy Australia Conference 2000.
- Published more than 10 final research reports.
- Updated and reprinted a JVAP information brochure.
- Distributed 10 000 copies of *Biomass Energy and Products* brochure.

Analysis of performance

The level of the adoption by industry of the results of research, organised and supported by JVAP is indicated by:

- Some $12 000 in sales of the total 51 publications.
- Some 1200 subscribers to the *Shaping the Future with Farm Forestry* newsletter.
- Increasing number of viable commercial options that underpin an expansion of agroforestry.
- Availability of farm and catchment design information that provides clearer guidance on the placement of trees in the landscape to manage groundwater.
- Availability of information to farmers which allows them to quantify and predict the impact of trees on their farming systems.
- Availability of systematic information on financially viable species and provenances for agroforestry systems and products.
- Availability and uptake of design options and decision making tools.

- Wide availability of JVAP products and use by agroforestry advisors and forest growers.

Communication

Effective communication is a key strategy in the Program. In line with the RIRDC communication strategy, most project final reports are published and/or made available on the World Wide Web. In addition, where the results are considered to be of wide enough interest, 8–12 page short reports are written by science communicators to promulgate the key findings.

JVAP continued to produce the *Shaping the Future with Farm Forestry* newsletter, which has a circulation of approximately 1200. Moreover, a number of articles were published in popular media such as *Australian Farm Journal*.

JVAP published 16 new full reports, three new short reports and two research updates in 2000–2001.

Full reports

- *Blue Gum Timberbelt Design Farming for Alley Farming* R00/154 *(2000, 100 pp.)*
- *Effect of Salt on Wood & Fibre Formation in Eucalypts* R00/169 *(2000, 55 pp.)*
- *Extension and advisory strategies for Agroforestry* R00/184 *(2001, 116 pp.)*
- *Forecasting Growth of Key Agroforestry Species* R00/068 *(2000 59 pp.)*
- *Growing Neem Trees in Australia* R01/061 *(2001, 14 pp.)*
- *Harvesting Trees on Farms* R00/046 *(2000, 57 pp.)*
- *Native Regrowth – A Farmers Guide to Maintaining Biodiversity* R00/012 *(2000, 24 pp.)*
- *Plantations, Farm Forestry & Water – Proceedings of Workshop* R01/020 *(2001, 62 pp.)*
- *Sustainable Hardwood Production in Shallow Watertable Areas* R00/163 *(2000, 105 pp.)*
- *Sustaining the Productivity of Tree Crops on Agricultural Land* R01/009 *(2001, 69 pp.)*
- *Socio-Economic Research to Support Successful Farm Forestry* R01/013 *(2001, 89 pp.)*
- *Socio-Economic Impacts of Farm Forestry* R01/045 *(2001, 74 pp.)*
- *The Carbon Farmer Model* R01/059 *(2001, 18 pp.)*
- *The Carbon Farmer Model User Manual* R01/060 *(2001, 70 pp.)*
- *The Carbon Farmer Model CD* C01/002 (to be sold with manual – not individually)
- *Wattle Seed Production in Low Rainfall Areas* R01/008 *(2001, 34 pp.)*

Short reports

- *Designing Blue Gum Alley Farms* S01/099
- *Sustaining Productive Tree Crops in South Western Australia* S01/093
- *Farm Forestry in Australian Rural Communities* S01/103

Research Updates

The new Research Update series was developed. More than 3000 copies were distributed to stakeholders.

- No 1. *Trees, Water and Salt Research: an Australian guide to using trees for healthy catchments and productive farms* (R00/170)
- No 2. *Emerging products and services from trees in lower rainfall areas* (R00/171

Future directions

Key future developments anticipated include the following:

- Continue to support nationally coordinated R&D into the use of agroforestry and farm forestry systems for bioenergy production and also to manage Bioenergy Australia.
- Continue to support R&D into medium to low rainfall agroforestry systems.
- Support and facilitate R&D to investigate the impact of farm forestry on catchment yield and water quality.
- Facilitate projects to investigate commercialisation of environmental services from agroforestry systems with an emphasis on medium to low rainfall areas.
- Continue refinement of guidelines to optimise the biodiversity values of agroforestry systems.
- Publish a series of case studies detailing examples of the biodiversity values of farm forestry systems.
- Increase production of improved genetic material for medium to low rainfall areas of Australia.
- Publish the results of a review of the R&D priorities for agroforestry and farm forestry systems in Northern Australia.
- Release a silvicultural decision support system, including the Farm Forestry Site Selection Manual, to facilitate farm forestry capacity building at a regional level by predicting wood product yield based on a few simple site descriptors and the plantation silviculture applied.
- Release guidelines for the silvicultural management of blackwood.
- Publish a report investigating the production of high-value farm wood production in the semi arid zone.
- Publish the outcomes of a study investigating the potential of plantation-grown trees to produce high value solid wood products in the medium to low rainfall zone.
- Complete a study assessing the cost benefits of small log processing for laminated three-ply flooring.
- Release a whole-farm and regional agroforestry decision making system.
- Continue to publish the quarterly ANU Forestry Market Report.

For further JVAP information, please consult <www.rirdc.gov.au>.

Maintenance of Condition, Productive Capacity and Environmental Values of Rangelands

Goals and strategies

The aim of the National Rangelands R&D Program was to help develop methods of land use and management which maintain the condition, productive capacity and environmental values of rangelands. The Program was completed in 2000–2001.

In the scoping studies prior to developing this Program, the Corporation identified that the scale and diversity of Australia's rangelands meant that examination of productive use and sustainability could only be done effectively at a regional scale. There was also a pressing need to link R&D with regional resource management planning processes. The key components of this Program were designed to meet these two requirements.

The Program supported three core regional land use planning projects: one based in the North-East Goldfields of WA, another in the Mulga Lands of Western NSW, and a third based in the Central Highlands region of Queensland. In each case, local communities and agencies were involved in a regional-scale process to examine resource allocation and management practice.

The Corporation supported research teams to work closely with the regional communities to prepare maps of natural resources and to develop and evaluate alternative resources use patterns. The projects also developed and tested mechanisms to help communities negotiate resources use patterns that were likely to optimise economic and ecological outcomes for the region.

Risks and specific opportunities

The three regional planning projects were all high-risk ventures, in that if the outputs are to be translated into tangible outcomes, strong political and policy support, as well as funding, will be required.

At the same time, there is the potential that externally-driven changes in policies and programs will overtake the R&D, which is of necessity a slower process. Each project has attempted to deal with this risk through developing links (primarily via its community structures) into policy and political frameworks, and by 'institutionalising' project outputs as far as possible.

Collaborating organisations

- Land & Water Australia (co-lead agency)
- CSIRO (co-lead agency)
- Commonwealth Department of Transport and Regional Services (funding partner for WA project)
- State agencies (co-lead agencies)
- Agriculture WA
- NSW Land and Water Conservation
- Queensland Department of Natural Resources

Achievements and outcomes

In the WA project, the sector-based 'rules' for use of particular landscape elements were collated to produce a set of maps of potential resource use in the region. A regional community executive was established, and will use these maps

to further negotiate and implement opportunities for improved resource use in the region.

During the course of the project, there was continued change in lease tenure, with many now held by mining interests and fewer being managed primarily for grazing. This has also influenced the uptake of project outputs.

The NSW project identified a number of policy and related issues of institutional structures and responsibilities that reflect the views of different stakeholder groups involved in the project. Some of these issues and opportunities for change were incorporated in the report of the recent NSW Western Lands Review, currently before the NSW Parliament.

In the Queensland project, emphasis was placed on developing local structures to improve decision-making and management practice related to natural resources. Opportunities to 'institutionalise' community involvement and negotiation on important decisions related to sustainable natural resource management were identified and acted upon. These have related initially to the State's impact assessment process, and through significant community involvement in responding to the Fitzroy River draft Water Allocation and Management Plan.

Each of the three projects involved close participation from stakeholder groups, both within each region and more widely (eg. State and Commonwealth agencies). Each developed specific products for use in its region, and these are being taken up by agencies and community organisations. The final reports of each project, which summarise the issues addressed and methods used, are publicly available through Land & Water Australia and the AFFA Library.

The NSW and Queensland projects have established WebSites to help make project outputs widely available. Each project prepared a number of written reports that are particularly valuable for agencies and groups interested in improving natural resource management in other rangelands regions. These too are publicly available.

Analysis of performance

All three of the Program's core regional resource-use planning projects were completed in 2000–2001. As they have taken different approaches to the original aim of linking research with regional planning processes, the opportunity was taken to conduct an independent review across the three studies.

The aim of this review was partly to identify whether the projects and the Program as a whole met their objectives. More particularly, the review also identified critical success and failure factors in the development of a knowledge-based process to guide planning for the use and management of natural resources at a regional scale. The review was also completed during the year, and an edited version of its report will be made available from Land & Water Australia.

This Program pioneered a new approach to rangelands research through the close linkage between R&D and local communities and their planning processes. The reports and papers from the three projects, and the review report,

all provide valuable pointers to critical issues that must be accommodated in regional resource-use planning projects if they are to successfully meet both local and national needs and priorities.

In view of the increasing emphasis being given by the Commonwealth and State/Territory governments to regional resource-use planning for sustainable use of natural resources, this Program investment by Land & Water Australia was most timely.

Communication

As noted above, a range of communication products has been prepared by individual projects and at the Program level. All are publicly available, and together provide valuable insights into critical success and failure factors for regional planning.

Future directions

This Program was completed in 2000–2001. Land & Water Australia will consider whether there are opportunities for further investments in rangelands R&D that will help to meet the objectives and outputs laid out in its R&D Plan.

For further Program information, please consult <www.lwa.gov.au>.

Futures Arena – Future landscapes and compatible industries

THERE ARE SIGNIFICANT areas where conventional agricultural systems of land use and management are inherently unsustainable. The primary research program in this Arena is Redesigning Agriculture for Australian Landscapes.

To ensure that the Future Landscapes Arena informs the Sustainable Industries Arena and vice versa, the two Arenas will be managed within Land & Water Australia by the same team of people.

Redesigning Agriculture for Australian Landscapes R&D Program (RAAL)

Goals and strategies

The mission of this Program is:

To design novel agricultural systems which ensure economic production and ecosystem and landscape function, by matching these systems to the unique biophysical characteristics of the Australian environment.

The Program arose from increasing evidence that most current agricultural production systems in Australia are not likely to be ecologically sustainable in the long-term. In particular, current crop and pasture plants, and production systems, are not able to make full use of available rainfall and soil moisture; consequently, they leak water and also nutrients.

This contrasts to the native systems that have been displaced which were able to use a much greater proportion of available rainfall. This additional water leaking from agricultural systems is largely responsible for moving salt and nutrients around the landscape, giving rise to dryland salinity, soil acidification and nutrient exports to lakes and rivers. There is a clear need to develop new agricultural systems that match the

unique characteristics of the Australian landscape. These new systems must focus on addressing the underlying cause of the major forms of degradation, and seek to 'mimic' the functions of the Australian landscape.

As a first, but significant, step to design new agricultural systems for Australia, Phase 1 of RAAL ran from 1997–2000. RAAL has made substantial progress in understanding water and nutrient leakage in agricultural and native systems at two locations (Wagga Wagga in NSW and Moora in WA). A third site has recently been established in the wet tropics of far North Queensland. Phase 1 identified broad principles necessary to redesign agricultural systems.

Phase 2 of the RAAL Program commenced in 2000 and is using the outputs of Phase 1 to explore the design concepts, criteria and broad options to redesign agricultural systems against a range of sustainability criteria, including protection of biodiversity.

Four objectives have been developed for RAAL:

1. Understand, by comparison, the key biophysical processes affecting leakage of water and nutrients in cropping, grazing and natural systems.
2. Benchmark criteria for redesigning agricultural systems in Australian landscapes.
3. Develop a toolbox of redesign options to modify current, or develop new, agricultural systems for Australian landscapes.
4. Facilitate implementation of redesign options in priority Australian landscapes by exploring the socioeconomic, institutional, policy, marketing and technological requirements and implications of each option.

Risks and specific opportunities

This Program carries an element of risk due to the inherent complexity involved in designing new agricultural systems that mimic natural systems, and the aspirational nature of the potential opportunities to be achieved by the Program.

An ongoing risk is to influence the much larger effort in agricultural research with the outcomes of the Program, specifically those addressing sustainability issues. The science behind these outcomes is strong, and is beginning to influence the agricultural community.

In addition, the Program is seeking the active participation of people from other research and rural industry organisations.

Collaborating organisations

- Land & Water Australia (co-lead agency)
- CSIRO (co-lead agency)

Achievements and outcomes

In 2000–2001, work at two major field studies near Wagga Wagga in Southern NSW and at Moora and Kalannie in Western Australia provided ongoing and challenging insights into the role of water and nutrients in agricultural and natural systems.

A third site, on the wet tropical coast near Atherton in far North Queensland,

has also been established to focus on rainforest, horticultural and pasture systems. At each site, work is comparing the ability of native and agricultural systems to use water and nitrogen.

The field studies are identifying the key functionalities involved in each system, and comparisons are indicating broad principles necessary to redesign agricultural systems. In addition to the field data collection, the Program includes a modelling project that enables the field data (as well as data from other work) to be modelled for particular agricultural environments.

Based on Agricultural Production Simulation (APSIM), the model is exploring the broad redesign principles for a range of landscapes using long-time series of climatic data. It is assessing the extent to which agronomic modification can improve the sustainability of existing crop and pasture systems.

The modelling project was completed in June 2001 and has demonstrated the capability of tools such as APSIM to contribute to the redesign process at both a conceptual and farm scale.

As part of the second phase of the Program, three new projects were initiated. The outputs of the Phase 1 of the Program have been collated for publication. The Program has explored 'Concepts of Landscape Redesign' in a project designed to explore new ways of thinking about Australia's landscapes, and how we might actively 'redesign' those landscapes to achieve a range of economic, environmental and social outcomes.

The Program has also undertaken a 'Review of Farmer-Initiated Innovative Farming Systems' to identify the innovations occurring at the farm scale across the country. A fourth project explored links between the Program and other redesign initiatives.

These projects have all highlighted the challenges involved in designing new farming systems, and the further challenges involved in integrating these farming systems in the landscapes within which the farming systems operate.

New ways of thinking are emerging about the future of Australia's landscapes and a small but healthy degree of farmer innovation has been identified. In addition, a significant increase in the number of initiatives exploring farming system and landscape redesign issues has occurred over the life of the Program.

These findings, combined with the lessons from the RAAL experimental sites, have strengthened the case for additional R&D into new farming systems. They have also provided insights and pathways into broader landscape issues. The latter, with its wide-ranging focus on people, politics, culture and more, as well as the more traditional biophysical, social and economic aspects, is now seen as critical in the future management of Australia's natural resources.

The new Land & Water Australia Future Landscapes Arena will focus on these broader issues over the next five years. In addition, the RAAL Program is exploring options for ongoing R&D into new farming systems.

Analysis of performance

Results from the Program's R&D continue to provide insights into the redesign of agricultural systems. Field studies and modelling activities have addressed project objectives and are delivering outputs, many of which are being picked up in other R&D and related activities.

The understanding of the challenges involved in designing novel farming systems which address the causes of issues like dryland salinity is increasing, though this remains a daunting challenge.

New work undertaken in the last 12 months has extended understanding relating to the Program's mission by exploring broader landscape issues, and innovations at the farm scale. A range of complementary activities continues to be undertaken by CSIRO Land and Water and CSIRO Sustainable Ecosystems.

Communication

Communication of the Program has focused on highlighting the mission and objectives through active discussions regarding the various projects in the Program's R&D portfolio. These discussions have been at the project planning, implementation and review stages, and have involved a wide range of organisations.

The Concepts of Landscape Redesign project involved widespread consultation, including technical and policy analysts in Canberra, as well as four regional communities across Australia – Liverpool Plains NSW, Pomona QLD, Onkaparinga SA and Collie WA. The Review of Farmer Innovations Project advertised and consulted nationally to identify innovative farming systems, and then travelled through five States undertaking case studies of various systems.

These projects have provided a significant opportunity to seek community and stakeholder input into the RAAL Program. Other communication activities, via presentations, electronic newsletters and media have continued to shine a light on the need for new farming systems.

Future directions

The Program will be finalised in June 2002. An interim review is about to commence to evaluate the Program's leadership, influence, relevance, return on investment and accountability.

Experimental work continues at the Wagga Wagga site, focusing on additional data collection at the agricultural and native systems. The work in the wet tropics will provide fascinating insights into the water and nutrient use of rainforests, which will assist with managing issues of runoff and agricultural sustainability in a sensitive region.

The Program is currently considering other options for the final 12 months of investments to maximise the potential of the work undertaken to date. Lessons from this work will enhance the Program's ability to deliver its mission in the long term, and also will assist in the new Future Landscapes Arena within Land & Water Australia.

For further RAAL information, please consult <www.lwa.gov.au>.

Cross-cutting Arena

LAND & WATER AUSTRALIA has another suite of investments that do not lend themselves to easy characterisation with particular resource management issues.

The first of these is the Social and Institutional Research Program which, in groundbreaking research, studies the social, economic, commercial, legal, institutional and policy environments required to be conducive to making good natural resource management decisions at the right time.

The second is the Ord-Bonaparte Program (OBP) in the East Kimberley region of Western Australia. The OBP is a major new natural resource management R&D program, seeking to underpin ecologically sustainable development in an integrated manner at a regional scale.

This Arena also provides resources for R&D and communication activities specifically generated by the National Land and Water Resources Audit.

In the 2001–2002 Annual Report, Land & Water Australia will report on its Integrating Themes, as these are developed during the implementation of the 2001–2006 R&D Strategic Plan.

Social and Institutional Research Program (SIRP)

Goals and strategies

Land & Water Australia established this Program in September 1999. Its focus is innovation in the social, economic, commercial, legal, policy and institutional dimensions of natural resource management (NRM).

NRM is about people's management of land, water and vegetative resources. SIRP seeks continuous improvement in natural resource management through enhanced knowledge of:

- how people value and perceive natural resources;
- how they learn about and understand natural resource management;
- how people live in and manage natural resources; and
- the processes and governance that influences natural resource management.

SIRP strategies continued during the year include the following.

- Consolidation of Australian and international knowledge on the social and institutional drivers and impediments to improved NRM.
- Assisting the understanding of social and institutional factors that determine NRM behaviour across all levels.
- Support for analyses of the social and institutional drivers and impediments to improved NRM at all levels.
- Assessment of alternative institutional arrangements in NRM (eg. regulation, market mechanisms, self-regulation, community-based programs, joint ventures and partnership arrangements).
- Development of policy and program options in NRM for government,

industry and community organisations.

- Support for analyses of NRM law and the improvement of NRM regulation.
- Funding for, and leadership in, R&D on options for improved community participation in NRM.
- Provision of the ways and means for information from different disciplines to be integrated and made available in useable form for NRM decision-makers.
- Development of recognition of SIRP to generate increased awareness, understanding and participation.
- Development of relationships with key people, groups and organisations that will contribute to SIRP's goal and strategies.
- Communication of knowledge of NRM social and institutional factors to research funders, providers and users.
- Communication, specifically to government, industry and community policy groups, on options for social and institutional innovation.
- Development of improved research methodologies, techniques and skills in the social sciences and humanities relating to NRM research.
- Promotion of, and support for, NRM research activities that integrate the information and approaches of the various disciplines.
- Promotion and support of research activities which meet the needs of users of R&D results and which involve them in the design, conduct and review of projects.
- Facilitated coordination of social and institutional research across all the Land & Water Australia-managed R&D Programs.

Risks and specific opportunities

Although there is developing knowledge in natural resource management there remains a significant gap in understanding the social, economic, commercial, legal, policy and institutional factors that drive or impede improvements in NRM.

This is the gap in understanding which Land & Water Australia has identified as often being the most potent constraint to more sustainable use of Australia's natural resources. The Corporation implemented SIRP to provide a new focus and major effort to overcome these concerns. This involves:

- building critical mass in community awareness of the key issues and support or ownership of solutions;
- undertaking R&D and analysis which offers integrated and commercially and socially feasible solutions;
- developing NRM practices that take account of environmental, economic, commercial, cultural, aesthetic, health and heritage values;
- developing social and institutional arrangements and processes for scientific and technological advancement, which are more complementary to the processes of natural systems;
- reforming old institutional frameworks and building new ones

which provide the right operational climate and incentives for action to be commercially driven;

- communicating information in useable forms and which outline the practical steps for natural resource managers to take; and
- establishing commercial and community-based arrangements for follow-up advice and support.

Collaborating organisations

Australia's financial and human resources for social science and humanities research in NRM is limited and building critical mass in R&D skills and capacity requires a highly collaborative approach amongst organisations which have similar goals.

During 2000–2001, the Program established collaborative relationships with the Murray-Darling Basin Commission; Meat & Livestock Australia, the Social Sciences Centre, Bureau of Rural Science, Agriculture, Fisheries and Forestry, Australia, and a number of State natural resource management agencies.

SIRP will continue major efforts to add value to social and institutional research in natural resource management by building on the expertise and existing knowledge of other organisations and pursuing new directions.

Achievements and outcomes

A large number of projects were completed during the year:

- understanding the social and institutional dimensions of NRM;
- a typology of community participation in NRM;
- requirements for effective policy relationships in NRM;
- evaluation of NRM policies and programs;
- a methodology for the analysis of NRM law and regulation;
- reviews of current NRM decision support and assessment techniques;
- guidelines for integrating disciplines in NRM R&D;
- guidelines for participation of R&D users in research;
- analysis of farm decision making and resource use under new corporate structures and contractual arrangements;
- integration of research and development in catchment management;
- use of citizens' juries for community participation in natural resource management; and
- analysis of Australian experiences with processes and institutional arrangements for resource and environmental management.

Six new projects were commissioned:

- Lessons for Australia of international sustainable development institutions.
- Drivers and constraints to adoption by producers of sustainable NRM practices.
- Transferability of successful NRM institutions.

- Options for reform of Australian natural resource property rights, land tenure and land management institutions.
- Producer initiated and managed R&D.
- Gap and opportunity analysis of the Land & Water Australia R&D portfolio against strategic theme outcomes.

General Call projects incorporated into SIRP included:

- Reflections on integration of social science into seven NRM organisations 1980–2000.
- Burnout in the Australian Landcare Movement.

Other projects in operation in 2000–2001 that will continue in 2001–2002 include:

- Social and institutional implications of landscape and land use change.
- Decision points for land and water futures.
- An Insight Model for exploring land and water policy alternatives.
- Assessment of ecosystem goods and services in the Goulburn-Broken catchment.
- Governance of natural resources across regional landscapes.
- Creation of a common property resource management institution.
- Integrating cross-jurisdictional planning for sustainable regions.
- Integrating water policy reforms and rural adjustment.
- The effectiveness of integration of water and land use planning.
- Coordination of stakeholders and interdisciplinary teams in natural resource science.
- Producer initiated and managed R&D.

Several of these projects will be completed in the coming year.

Analysis of performance

SIRP has established a strong social and institutional knowledge base comprising:

- understanding of knowledge requirements, providers of research and users of research;
- institutional analysis of Australian experience in natural resource management that identifies lessons and implications;
- analysis of policy implementation processes and instruments such as governance systems, models of community participation and market instruments;
- social, economic and legal decision making tools;
- integrated catchment management processes, planning, evaluation and models; and
- research methodologies.

During the coming year, further assessments will be made of the impact of completed projects and awareness of SIRP amongst government, industry and community audiences.

Communication

Emphasis will be given to the integration of the outputs of SIRP projects and their communication to policy and advisory groups in the coming year. A series of short briefing documents outlining the results of the research is being prepared for distribution to target audiences. This will be followed up with demand driven seminars and briefings on the outputs of SIRP research.

All new projects are required to integrate communication into their activities and to provide advice on a communication strategy for their outputs. Significant funding is provided each year to ensure that these are communicated effectively to users.

Future directions

Major challenges for SIRP in 2001–2002 will be:

- Seeing the whole picture for sustainable Australian landscapes and influencing R&D accordingly.
- Progressing new generation knowledge building, extension and application at regional and policy scales.
- Engaging with the policy, legislative and management agendas of government and the wider community including non-government organisations.
- Informing an evolving policy milieu in natural resource management.
- Broadening its R&D projects, communication and knowledge management activities to cover all the Integrating Themes and the integration outcomes of Land & Water Australia.
- Developing partnerships and attracting additional funding to enhance Land & Water Australia's capacity and influence.

Major emphasis will be given to integrating and communicating the outputs of SIRP's significant R&D portfolio and engaging legislators, policy makers and natural resource managers in the contribution that its resource outputs can make.

The SIRP Program Plan provides significant funding to integrate and communicate the results of research projects that were completed in 1999–2000 and 2000–2001 or are completing in 2001–2002. These activities will seek to synthesise results from previous and current research and attempt to add value to individual research results particularly from a whole systems perspective.

For further SIRP information, please consult <www.lwa.gov.au>.

The Ord-Bonaparte Program

The Ord-Bonaparte Program (OBP) is a partnership between government, industry and the wider community to meet the R&D needs of the Kimberley region of North-Western Australia. The Program has been developed following a Scoping Study conducted in 1999 by CSIRO for Land & Water Australia and the Fisheries Research and Development Corporation.

The Scoping Study examined the issues critical to the sustainable development of tropical Australia. The study identified the Ord-Bonaparte Region as

the best place to look at how development can proceed in Northern Australia without repeating the mistakes that have proved so costly in the Murray-Darling Basin and elsewhere in Southern Australia.

The OBP is a world-leading innovation program in both its scope and its integrated approach to natural resource management at a regional scale. The study region takes in the whole of the Ord and Keep Rivers catchments extending out into the Joseph Bonaparte Gulf. The Program is committed to effective community participation and capacity building and integrates biophysical, social and economic research.

Goals and strategies

The OBP aims to build on existing activities and, in partnership with regional stakeholders, to develop effective tools, methods, processes and strategies to underpin policy, planning and management for the sustainable use of natural resources at catchment and regional levels. OBP outcomes will apply at catchment and regional levels in the region and across Northern Australia.

A five-year R&D Plan for the OBP was developed in 2000 with the participation of a wide range of agencies and stakeholders. The R&D Plan sets out strategies to approach the issues identified in the 1999 Scoping Study and outlines the activities and associated resources required to deliver them.

Sub-programs under the OBP and strategies proposed within each under the R&D Plan are:

1. Regional Resource Futures

- Develop tools to make data acquired in the OBP accessible to stakeholders.
- Develop methods and tools for integrated regional analysis of natural resource use.
- Develop an enhanced capacity to evaluate alternative regional resource use futures.
- Conduct a systematic and rigorous evaluation of the impacts of outputs and outcomes of the Ord-Bonaparte Program.

2. Rangeland Systems

- Characterise Ord-Bonaparte rangeland systems and processes and assess at a range of scales, rangeland resource status and trends.
- Develop a capacity to predict impact of pastoral management activities on rangeland resources at paddock, catchment and landscape scales.
- Develop a capacity to evaluate the economic, ecological and social impacts of tourism on rangelands.
- Develop methods for improved integration of technical, social and economic considerations within natural resource planning and management in the Ord-Bonaparte rangelands.
- Develop multiple land use options for rangelands that integrate ecological, biodiversity, economic, social and cultural values.

3. Water Resource Planning and Management

- Build on existing knowledge, develop an improved physical, chemical and biological understanding (inventory and process) of the surface and groundwater resources of the Ord catchment, with a focus on the lower Ord.
- Develop an improved understanding of social, cultural and economic values relating to freshwater resource use in the Ord catchment.
- Develop an understanding of the physical, chemical and biological dynamics of Lake Argyle.
- Quantify the impacts of modifications of the Ord catchment on in-stream, coastal and marine environments.
- Develop methods and processes for improved integration of social, cultural and economic considerations within water resource planning and management.

4. Coastal, Estuarine and Marine Resources

- Develop an improved understanding of social, institutional, cultural and economic values and drivers of estuarine, coastal and marine resource use in the Joseph Bonaparte Gulf.
- Develop indicators of estuarine, coastal and marine ecosystem health.
- Assess physical, chemical and biological impacts of current and projected land and water management practices (including fisheries and aquaculture) on estuarine, coastal and marine resources.
- Develop improved planning tools for sustainable development with estuarine, coastal and marine resource – use scenarios reflecting stakeholders' expectations and values.

5. Aboriginal Management and Planning for Country.

- Determine Aboriginal aspirations for the present and future use and management of natural resources in the Ord-Bonaparte region.
- Interpret the interface between indigenous and non-indigenous knowledge/perceptions of ecological sustainability.
- On an appropriate spatial basis (eg. social groupings, catchments), record and conserve traditional resource management knowledge of species and ecological processes.
- Develop an understanding of the role, significance and value of Aboriginal subsistence economies and the impacts on them of non-Aboriginal management practices.
- Using community-based participatory planning techniques, enhance the capacity of Aboriginal people to participate in regional and catchment scale planning and management activities.
- Restore, maintain and protect 'country' of economic and cultural significance to Aboriginal people.

Risks and specific opportunities

To date there has been a comparatively small investment of R&D in the Kimberley region. Baseline knowledge is generally poor, and although some high-quality, project specific R&D is occurring (eg. studies for the Ord Stage II development, water allocation planning and investigations conducted by the Tropical Savannas CRC), research in the region generally lacks a whole-of-system perspective (ie. catchment to sea).

An opportunity exists to deliver benefits by value-adding to existing R&D activities in the region and providing additional resources to address major gaps in data and knowledge. The region represents a unique range of ecosystems and land use interactions, and is a possible model for evaluating impacts of future development elsewhere in Northern Australia.

Potential outputs and outcomes from the OBP include:

- A substantial increase in fundamental and baseline biophysical and socioeconomic knowledge to support improved resource management strategies.
- Research and technological innovation with new tools, techniques and methods for research, and improved natural resource planning approaches at a regional scale.
- Innovative mechanisms/processes to ensure R&D delivery to stakeholders and clients, based on a collaborative approach.
- Innovative and flexible approaches to decision support to underpin sustainable natural resource policy, planning and management.
- Synthesis and integration, within a systems framework, of biophysical and socio-economic research to underpin improved development and analysis of policy, planning and management.
- A significant contribution to underpin the ecologically sustainable development of multiple resource uses in region, which if successful, could be readily transported to other rapidly developing regions in Northern Australia and overseas.

Major risks to the successful implementation of the Program include:

- inability to attract sufficient resources to fulfil the intent of the R&D plan and a consequent failure to meet the expectations of stakeholders;
- lack of comprehensive support from key regional and local stakeholders; and
- inability to align the desired outputs from the OBP among different interest groups, particularly the varying priorities of local stakeholders, major funding partners and researchers.

OBP success is dependent on delivering outcomes of relevance to the local and regional community within a timeframe aligned with their expectations and gaining the support of government and government agencies, industry and other existing or potential partners.

Collaborating Organisations

The OBP is a joint venture partnership between Commonwealth, State and local agencies and organisations. Signatories to the OBP Collaborative Research Agreement are:

- Agriculture WA
- WA Department of Conservation and Land Management
- WA Waters and Rivers Commission (WRC)
- Kimberley Land Council
- Shire of Wyndham and East Kimberley
- CSIRO
- Land & Water Australia
- Agriculture Forestry and Fisheries – Australia (AFFA)
- Australian Institute of Marine Science
- Centre for Resource and Environmental Studies at the ANU
- Cooperative Research Centre for Tropical Savannas at NTU.

In addition to the signatories to the formal agreement, many other organisations are involved in the OBP. There is a high level of collaboration between the Program and the regional community.

The Program is managed by a Governing Board comprising an independent Chair; representatives of the five major funding partners (Land & Water Australia, CSIRO, Agriculture WA, WRC and AFFA); the Program's CEO; and five local community representatives that represent the broad spectrum of local stakeholders within the study region. Key community organisations collaborating in the development and implementation of the OBP include the Halls Creek East Kimberley Land Conservation District Committee and Ord Land and Water.

Achievements and outcomes

Through a lengthy consultation phase overseen by an interim Program Management Group, the Collaborative Research Agreement was finalised in December 2000 and a series of scoping projects developed for each of the sub-program areas. The Governing Board for the Program was established in early 2001.

The Chief Executive Officer, responsible for the day-to-day management of the Program, was appointed in February 2001 and is based in Kununurra. The scoping projects were implemented in the first half of 2001, and have led to the development of proposals for future research, to be considered by the Governing Board at its meeting in August 2001.

Analysis of performance

A specific project to evaluate the performance of the OBP has already been initiated and will continue for the life of the program. The evaluation process is a partnership between the evaluation team and key stakeholders, including the regional community, and will be underpinned by the following principles:

- The evaluation objectives will be agreed between the major stakeholders and all study team parties.
- The criteria for showing the Program objectives have been met will be decided in partnership with the stakeholders.

- The evaluation will systematically address the Underpinning Principles listed in the OBP R&D Plan (see pp. 6–10, *OBP Plan 2000–2005*).
- The evaluation methodology will be chosen in partnership with the stakeholders and based on the recommendations and options provided by the evaluation team.
- The OBP Board will provide regular external review of the evaluation strategy and process.
- The evaluation will influence the OBP planning and integration on an ongoing basis to maximise the likelihood of success in key indicator areas.

Regular feedback from the evaluation project will assist the Board and the CEO in ensuring an adaptive approach to program management. A mid-term Program review is scheduled for June 2003.

Communication

Communication will be critical to the effectiveness of OBP in delivering its outcomes. As a collaborative initiative between the Program partners and the regional community, it is essential that the Program achieve effective communication, both internally and with its external stakeholders in the East Kimberley community.

The adequate resourcing of the Program is dependent on building effective partnerships with contributing agencies and organisation. This in turn is dependent on building support for the OBP with all levels of government, key stakeholders and the general community.

A communication strategy for the OBP is currently under development with the assistance of the Land & Water Australia Communication team, which provides communication support to the OBP through a Service Agreement. Key objectives identified in the draft OBP communication strategy include:

- Building commitment to a vision of sustainable natural resource management for the East Kimberley region where advancing knowledge generated through R&D is adopted at all scales leading to continuous improvement in management practices.
- Building awareness of and support for the Program with stakeholders at all levels of government and in the community.
- Enhancing opportunities for the commitment by potential or existing partners of the resources required by the Program to meet its objectives.
- Promoting the participation of stakeholders by ensuring the accessibility of the Governing Board, the Program CEO, the Operations Committee and research providers, and participation of stakeholders at all levels in the Program and in the individual projects.
- Building openness in relationships and respect for different backgrounds and points of view which will encourage constructive debate and innovative solutions.
- Developing useable and understandable integrated information packages and decision support

systems for stakeholders and to make this information readily accessible.

Target audiences include:

- Governments at all levels (including the Commonwealth, State and Local Governments, statutory authorities, inter-governmental groups) which are funders of R&D and natural resource management programs, policy makers, legislators and providers of incentives and information services.
- Potential and existing program partners which may provide additional resources to assist the program in meeting its objectives.
- Industry associations and groups which represent individual enterprises to government and other bodies, and are policy makers, providers of information services, and organisers and facilitators of group activities such as quality assurance and training.
- Community groups that represent the interests of individuals committed to issues and causes and are policy makers, providers of information and advice services, and organisers and facilitators of group activities.
- Key individuals and the broader East Kimberley and Australian communities.
- Research institutions and researchers within and beyond natural resource management disciplines (and their professional associations) which develop research methodologies, conduct research projects and provide research and information services.

To date, during the process of research project development, much of the communication effort has been focused on direct interaction with key stakeholders, including Government Ministers and members, senior agency staff in Commonwealth, State and Local government, regional and local organisations and key stakeholders within the community.

Media coverage has included an article in the local press on the collaborative workshop process for the development of projects in the water and marine, coastal and estuarine sub-programs, and radio and newspaper interviews by the Program CEO.

An official launch for the program was held 6 September 2001 in Kununurra, with the Hon Dr Judy Edwards, West Australian Minister for the Environment and Heritage; Water Resources, officiating.

Future directions

The Program will pursue the strategies outlined in the OBP R&D Plan over five years, within the constraints of available funding. Implementation of individual research components over the life of the OBP will be in accordance with priorities determined by the Governing Board through a process of collaboration between researchers and stakeholders. Projects will continue to evolve and scope remains to take on board stakeholders' views, to adjust projects in the light of new knowledge or to augment existing proposals, particularly if the OBP attracts additional resources from new or existing partners.

Other R&D initiatives – General Call

Goal and strategies

THE MAJORITY OF Land & Water Australia's R&D investment is through commissioned research programs. Although the commissioning process has the potential to provide substantial benefit in achieving desired outcomes, the Corporation accepts that it is also a process that locks longer-term investment into tightly defined priorities.

To ensure that the Corporation can respond to emerging issues, and to provide an opportunity for researchers to propose new or untried approaches to understanding and managing land, water or vegetation resources, an annual General Call is also used.

In 2000–2001, Land & Water Australia called for projects commencing 1 July 2002. The key research priorities for this General Call included:

- future sustainable landscapes;
- implications for the emerging life sciences for natural resource management; and
- untested and innovative approaches to improve in any NRM topic within Land & Water Australia's charter.

Risks and specific opportunities

While the General Call elicits projects that may otherwise be overlooked in a process dominated by programs, one-off focused projects resulting from the General Call are at risk of being isolated from a broader context that would help facilitate adoption of results.

For this reason, Land & Water Australia expects all projects, including General Call projects, to have a substantial consultation and communication component and preferably have third party support from agencies with interest in the project outcomes.

Collaborating organisations

Most General Call projects include third party support from a wide range of agencies and groups. Some, especially those testing novel concepts, are funded solely by Land & Water Australia.

Achievements and outcomes

Projects selected from the 2000–2001 General Call are shown in the Table opposite.

Analysis of performance

More time and effort has been expended to ensure a high-quality process for administering the General Call process and building improved relationships with the R&D community. In addition, more attention is now being given to identifying exciting new issues for the R&D community to direct its attention to. This is resulting in an enhanced and more valuable contribution to Land & Water Australia's R&D portfolio.

Communication

All projects selected under the General Call have a communication component to ensure the best chance of having the research results adopted.

Title	Principal Investigator	Arena/Theme
Transition to a biofuel economy in Australia	Barney Foran CSIRO	Vegetation
Vegetation restoration and landscape design for enhanced biodiversity conservation	David Lindenmayer ANU	Vegetation
Community exploration of changing landscape values	Ian Bishop Melbourne University	SIRP
Assessing and managing burnout in Landcare members, leaders and coordinators	Allan Curtis Charles Sturt University	SIRP
Alternative ecological states: a potential paradigm for managing salinised ecosystems	Jenny Davis Murdoch University	River Contaminants
Where's Wally? – Reflections on integration of social science in NRM organisations 1980–2000	Alice Roughley	SIRP
Incorporating biodiversity monitoring into rangeland condition assessment	Alaric Fisher	Vegetation
Agrochemical environmental risk management tool for landowners and extension bodies	Bruce Simpson Queensland Department Natural Resources	Sustainable Industries
Genetically-modified crops: environmental effects on soil biological processes	Gupta Vadakattu CSIRO	Sustainable Industries
Mapping regional metabolism – an essential decision support tool for NRM	Janis Birkeland Canberra University	SIRP
Environmental fate of endocrine disrupting chemicals under Australian conditions	Rai Kookana CSIRO	River Contaminants
Building regional Australia's capacity to initiate markets for ecosystem services	Carl Binning	SIRP

Future directions

The General Call this year focuses on Future Rural Landscapes, a key arena in Land & Water Australia's new strategic plan. Currently, there is little investment in this emerging arena other than the Redesigning Agriculture for Australian Landscapes Program. Hence this call will enhance the Corporation's activity and give the R&D community its first chance to contribute its ideas, albeit radical, to designing a sustainable future.

For further information, please consult <www.lwa.gov.au>.

National Land and Water Resources Audit

Goals and strategies

THE NATIONAL LAND and Water Resources Audit is a program of the Natural Heritage Trust. The Audit is being managed within the Land & Water Australia structure under a contract with the Department of Agriculture, Fisheries and Forestry – Australia.

The Audit was established in 1997 to provide Australia-wide assessments of land, water and vegetation resources to facilitate improved decision making on land and water management by:

- providing a clear understanding of the status of, and changes in, the nation's land (including vegetation) and water resources and implications for their sustainable use;
- providing an interpretation of the costs and benefits (economic, environmental and social) of land and water resource change and any remedial actions;
- developing a national information system of compatible and readily accessible land and water data;
- producing national land and water (surface & groundwater) assessments as integrated components of the Audit;
- ensuring integration with, and collaboration between, other relevant initiatives; and
- providing a framework for monitoring Australia's land and water resources in an ongoing and structured way.

In accordance with section 89 of the *PIERD Act*, Land & Water Australia established the Audit Advisory Council as a formal committee of the Corporation.

The Audit is co-located within the Land & Water Australia office. Co-location promotes interaction between the Audit and the programs of the Corporation. Through a business arrangement, Land & Water Australia provides administrative support to the Audit Management Unit.

Risks and specific opportunities

A key characteristic of the Audit is the integrated nature of its activities across the biophysical, social and economic attributes defining natural resource management and the partnership/capacity building arrangements being undertaken with agencies of Commonwealth, State and Territory Governments. This brings with it both risks and opportunities.

Any integrated program of activities requires close and careful design of projects in terms of timing and data dependencies and inter-dependencies. Outputs of many Audit projects are inputs into other projects, which has resulted in a complex set of interrelationships. Working with agencies Australia-wide also brings with it issues of project management – to meet milestones and deliver outputs within tight timeframes.

Details of risk management and the project management system put in place to minimise risk was detailed in the previous Annual Report. Some of the key opportunities that the Audit has capitalised on include:

- Partnerships with the agricultural sector – eg. the dairy industry through Australian Dairy Farmers Federation to develop a Natural Resources Management Strategy for the dairy industry; and the fertiliser industry to assess the efficiency of fertiliser use, collate soil testing information and determine the threats from soil acidity.
- Integrated cause and effect assessments building links across disciplines and projects eg. across land use and Australia's key natural resources, our rivers and estuaries. For the first time at a national scale, determining productive returns on-farm and the level of impact off-farm from inputs such as fertiliser – tracking soil erosion and phosphorus run-off from hill slopes and from gully to river reach, including riverbank erosion and dissolved sources of phosphorus through to the estuary and nearshore marine zones.
- Building Australia-wide initiatives based on common purpose eg. the Cooperative Research Centre for Coastal Zone, Estuary and Waterway Management and the Fisheries Research and Development Corporation sponsored the Audit's estuary inventory and management initiative.
- Fostering policy development that enables improved natural resource management eg. the across Commonwealth and the Australian and New Zealand Land Information Council initiatives to foster data access and information sharing.

Collaborating organisations

By working across a range of natural resources issues, the Audit has developed an unprecedented number of partnerships. These partners include Commonwealth, State and Territory agencies; CSIRO; key natural resource management CRCs – Freshwater Ecology, Catchment Hydrology, Coastal Zone, Estuary and Waterway Management, and Tropical Savannas; universities; the community through Landcare and Catchment Management Committees; and industry, eg. the horticulture and dairy industries in association with their R&D corporations.

These partnerships bring a breadth of competencies and skills to the Audit's activities and ensure that Audit outcomes are practical and relevant.

Collaboration between the Audit and other organisations has been achieved on several levels:

- Ongoing consultation through the Audit's Advisory Council, Theme Working Groups and Natural Resources Standing Committees to ensure links with policy and management;
- Memoranda of Understanding, building a formal component to many partnerships, particularly to ensure that the legacy of the Audit is put in place;
- Partnerships that bring joint resources to bear for key problems

facing Australia's natural resources, doubling Audit dollar investment overall; and

- Project-based and issues-based interaction encompassing data, intellectual inputs and capacity building for natural resource managers across Australia.

Achievements and outcomes

Themes

- Launched the Australian Water Resources Assessment 2000 and e-published the water resources topic in the Australian Natural Resources Atlas.
- NDSP – in cooperation with the Audit, completed the Australian Dryland Salinity Assessment 2000 and e-published the Land-Dryland Salinity information products topic in the Australian Natural Resources Atlas.
- Completed Water Availability, Dryland Salinity and Rangelands work plans, including release of the discussion paper on Rangelands Monitoring.
- Negotiated Theme sponsorship arrangements for Water Resources Information, Land use mapping, National Vegetation Information System and Australian Soil Resources Information System.
- Completed the Australia-wide land use mapping project and regional land use mapping projects in Gippsland (Victoria) and Fitzroy (Queensland).
- Completed development of the Australian Soil Resources Information System project.
- Ensured adoption of key Audit findings in Government policy including providing information on the priority catchments for the National Action Plan for Salinity and Water Quality.

Data management

- Organised Australian Natural Resources Atlas on line <www.nlwra.gov.au/atlas>, presenting integrated results of Audit assessments and providing an on-line mapping facility.
- Established the Australian Natural Resources Data Library on-line.
- Worked with the Commonwealth Inter-Departmental Committee and the Australian New Zealand Land Information Council to develop and advocate protocols for increased data access and information sharing.

Program reporting and evaluation

- Disseminated Audit's Annual Report 1999–2000.
- Contributed to Land & Water Australia Annual Report 1999–2000 and Natural Heritage Trust Annual Report 1999–2000.
- Initiated Phase II of Audit program evaluation.
- Continued meetings and workshops of Audit Advisory Council, and theme and data working groups to build and maintain partnerships across Australia.

Administration

- Participated in risk management and accountability audits as part of Land & Water Australia's improved administration practices.

Analysis of performance

- Key performance indicators for each Audit objective were defined in the Strategic Plan.
- Operational level targets for 2000–2001 were listed within the Annual Operational Plan. The Audit has met the majority of its targets for 2000–2001, the significant exception being due to delays from putting in place data systems and sponsorship arrangements to follow on from the Audit's activities. Further details are given in the National Land and Water Resources Audit's Annual Report 2000–2001.
- Program Evaluation – phase II of the Audit Program Evaluation is underway. An initial report suggesting further improvements to the Audit process is complete, with recommendations being implemented. The final Program Evaluation report will be produced by December 2001.

Communication

- Launched the Australian Dryland Salinity Assessment 2000 and the Australian Water Resources Assessment 2000.
- Initiated National Science Briefing Series with CSIRO National Awareness to promote the Audit and Atlas to Federal and State Parliaments.
- Initiated promotion of Audit and Audit products to all Commonwealth, State and Territory politicians including House of Representatives Standing Committee on Environment, similar Committees in State Governments and individual briefings of Ministers and Members of Parliament.
- Made numerous presentations to the agriculture and landcare sectors – eg. Australian Landcare Council, Australian fertiliser industry, Meat & Livestock Australia, Australian Dairy Farmers Federation, State Catchment Committees and Pastures Protection Boards, National Farmers' Federation Environment Sub-Committee.
- Made a series of presentations at Conferences – eg. National Dryland Salinity Program, Australian Water and Wastewater Association, Productive Use of Saline Lands, Australian River Symposium, Australian AgriBusiness Association.
- Participated in the Envirolinx Electronic Conference across 14 Australian sites – featuring estuary management.
- Published *Dryland Salinity in Australia* and *Water Resources in Australia* summarising water and dryland salinity findings.
- Published new *Fast Facts* brochures on dryland salinity; water use and availability; water quality; rangelands monitoring; vegetation and the Atlas.

Future directions

2001–2002 is a key year for the Audit. The remaining Theme Reports will be

completed prior to December 2001 and work will continue on the delivery of regional information sets to assist in natural resources planning and management.

During the coming year Audit activity will focus on:

- **Project management** – completing contracts for all Audit projects.
- **Relevance and reporting** – work with key Commonwealth and State agencies, community and industry to ensure Audit outputs meet the decision making needs of Australia's natural resource managers.
- **Partnerships** – build further links with government, community and industry, particularly with a focus on implementation of Audit findings.
- **Data and information management** – concentrate on data access, data sharing, national sponsorship and data display through the Australian Natural Resources Atlas in close cooperation with ANZLIC, data custodians and information users across Australia.
- **Biodiversity assessment** – the only new area of Audit assessment, building on Audit findings from other themes.
- **Implementation** – encourage and facilitate a receptive environment for the application of Audit findings.

Further information on Audit activities is available in the National Land and Water Resources Audit Annual Report 2000–2001 or by viewing the Audit WebSite at <www.nlwra.gov.au>.

6 Governance and Organisation

Corporate Governance

Corporate governance principles

THE LAND & WATER Australia Board is committed to the highest standards of corporate governance, in accordance with required statutes and principles. The Board provides effective oversight and leadership of the affairs of the Corporation and ensures an independence from management.

The Board relies upon a range of measures to ensure that the Corporation is operating according to the accountability provisions of the *Commonwealth Authorities and Corporations Act 1997 (CAC Act)*, including: compliance checklists and internal and external audits; a due-diligence checklist and code of conduct for Directors; effective processes for the disclosure and management of conflicts (or perceptions of conflicts) of interest; a risk identification and management framework; and effective systems for monitoring performance and ensuring that the

Corporation can meet its debts and other obligations as they fall due.

The Annual Report includes a comprehensive summary of corporate governance matters, including a description of how strategic directions, policies and processes have been applied during the year. The Board continually reviews policies and processes concerning all major areas of Board operations.

A number of Board committees (including Communication, Finance and Audit), and other committees of the Board as deemed necessary from time to time, act on the Board's behalf. Appropriate R&D program management committees are also established to oversee program design and management, ensuring that desired program outputs are being met and that partnership and Government funds are wisely spent.

Corporate status

Land & Water Australia is a statutory body, one of 14 R&D corporations and one Council within the Agriculture, Fisheries and Forestry portfolio. It was created as the Land & Water Resources Research & Development Corporation on 3 July 1990 under the Primary Industries & Energy Research & Development (PIERD) Act 1989, which provides a foundation for its accountability to Parliament and to natural resource users and managers across Australia.

The *CAC Act* was enacted on 1 January 1998 and placed additional responsibilities on the Corporation and its Directors and officers.

Parliamentary accountability & ministerial powers.

The Corporation is accountable to Senator the Hon. Judith Troeth, Parliamentary Secretary to the Minister for Agriculture, Fisheries and Forestry, who is empowered by the *PIERD Act* to:

- approve the Corporation's R&D Plans, Annual Operational Plans and variations to both of these plans, assessed against the objects set out in the Act;
- select and appoint the Chairperson and Government Director to the Board, and appoint the Presiding Member and other members to the Land & Water Resources R&D Corporation Selection Committee for Board positions;
- approve the nominees for membership on the Board; and
- transfer contracts, agreements and assets held in the name of the Commonwealth to the Corporation.

Under the *CAC Act*, the Minister must table the Corporation's Annual Reports in Parliament.

The Minister is responsible for the Corporation's enabling legislation and is in turn answerable to Parliament. The Minister also has other discretionary powers (provided through section 143 of the Act) to give written directions to the Corporation as to the performance of its functions and the exercise of its powers.

The Minister has directed the Corporation to include in its Annual Reports details of energy use by the Land & Water Australia office, and of the Corporation's commitment to the

Government's ESD initiative.
(See pages 108–109).

The Corporation is also obliged to ensure compliance with any policies of the Commonwealth Government of which it is notified by the Minister under the *CAC Act* (s.28).

Representative organisations

In addition to its accountability to the Minister, Land & Water Australia is accountable to two representative organisations, which represent the interests of key natural resource users and managers.

Details of both planned and actual payments of consultation costs, consistent with the powers available to the Minister under Section 16(1)(b) of the *CAC Act 1997*, are given later in this chapter.

The representative organisations in 2000–2001 were:

Australian Conservation Foundation
Mr Don Henry
Executive Director
340 Gore STREET
FITZROY VIC 3065.

National Farmers' Federation
Ms Anna Cronin
Executive Director
PO Box E10
Kingston ACT 2604.

Stakeholders

Land & Water Australia sees its stakeholders as:

- the two representative organisations, as listed above;
- funding bodies, including the Commonwealth Government and other agencies that provide collaborative support within commissioned R&D programs;
- landholders, committee groups, State agencies and local government who are involved in the use, management, regulation or conservation of Australia's land, water and vegetation resources;
- consultants, advisors, research organisations and researchers who provide advice and direction and new knowledge on the improved management of Australia's land, water and vegetation resources; and
- the general community, as owners and beneficiaries of natural resources and as tax payers who fund the Corporation.

Further details on collaborating organisations within commissioned R&D programs are discussed in the status reports on the individual R&D programs.

Enabling legislation

Functions (Section 11, PIERD Act)

The functions of the Corporation are: to investigate and evaluate the requirements for R&D relevant to issues affecting the management of land, water and related vegetation resources; to coordinate and fund R&D activities; to monitor, evaluate and report to Parliament, the Minister and representative organisations on R&D coordinated and funded by the Corporation; and to facilitate the dissemination, adoption and commercialisation of the results of R&D.

The Corporation is able to enter into agreements and administration, employ

staff, borrow money, form companies and participate in joint ventures, take out patents and determine its own internal structures and processes.

The Corporation may employ staff under its own terms and conditions and it may set up committees to advise the Board.

The Corporation may complement the expertise of its staff through the engagement of consultants as it deems appropriate. A full listing of researchers and consultants used by Land & Water Australia during 2000–2001 is included as Appendix 4 to this Annual Report.

The Corporation has in place a risk assessment and management policy. This policy is consistent with the Commonwealth Government's best practice for fraud control.

The Board, in the development of its R&D Plans, is required to consult with its representative organisations. Consultation by the Board on matters affecting Corporation operations extends to researchers, research administrators, resource users and resource management agencies.

Powers (Section 12, PIERD Act)

The powers of the Corporation enable it to enter into agreements for carrying out R&D activities, make applications for and deal with patents vested in the Corporation, charge for work or services rendered by the Corporation, accept gifts, grants and bequests, and act as a trustee of money or property vested in the Corporation, acquire, hold and dispose of real and personal property and join in the formation of companies and enter into joint venture agreements (s.14).

Objects (Section 3, PIERD Act)

The objects of the *PIERD Act* are to fund and administer R&D, with a view to:

- increasing the economic, environmental or social benefits to members of primary industries and to the community in general by improving the production, processing, storage, transport or marketing of the products of primary industries;
- achieving the sustainable use and sustainable management of natural resources;
- making more effective use of the resources and skills of the community in general and the scientific community in particular; and
- improving accountability for expenditure on R&D activities in relation to primary industries.

The chart on the next page details the linkages between Land & Water Australia objectives, and the strategies described in the R&D Plan and these four objects of the *PIERD Act*.

Revision of the R&D Plan and Annual Operational Plan

There has been no revision of the R&D Plan during the reporting period to 30 June 2001. The Corporation consulted with interested natural resource management agencies and individuals to revise the Land & Water Australia R&D Plan for 2001–2006. The Annual Operational Plan was amended in December 2000 to align more closely to the AFFA Portfolio Budget Statement.

PIERD ACT Object	Link to Land & Water Australia Mission and Objectives
A. Increasing the economic, environmental or social benefits to members of primary industries and to the community in general by improving the production, processing, storage, transport or marketing of the products of primary industries	Land & Water Australia has a planned output or arena to enhance the capacity for Australia's primary industries to manage natural resources sustainably. Land & Water Australia will work with the primary industries (particularly through sister R&D corporations) to find ways to ensure that natural resources are used sustainably while supporting profitable farming systems.
B. Achieving the sustainable use and sustainable management of natural resources	This object constitutes Land & Water Australia core business and there is a direct link with the Land & Water Australia mission and objectives of our R&D Plan.
C. Making more effective use of the resources and skills of the community in general and the scientific community in particular	To ensure that we meet the Relevance and Influence corporate objectives, we encourage the involvement of all key groups in the design, development and implementation of R&D programs and projects. The communication strategy has an objective to equip present and future land managers, policy makers, educators and others with the knowledge and tools to expand their capabilities in achieving sustainable natural resource management. Through funding postgraduate scholarships and travelling and community fellowships in identified areas of deficiency, the Corporation will enhance R&D capacity and make more effective use of the skills of the community.
D. Improving accountability for expenditure on R&D activities in relation to primary industries.	The Land & Water Australia key accountability objective states "To meet all statutory obligations and accountability requirements in a comprehensive, timely and transparent manner". This objective provides a clear link to accountability for expenditure, and hence to achieving Object D of the Act.

Section 28 (1) (v) – (viii) PIERD Act matters

The Corporation: has not commercially exploited a patent or granted a license under a patented invention; holds no interests in a company; has not undertaken any activities in relation to the formation of a company; and has had no significant acquisitions or disposals of real property during the 12 months to 30 June 2001.

Corporate objectives

Goal

The Corporation's goal is to direct and manage a limited amount of public funds to develop practical ways of preventing and reversing resource degradation. It is achieving this by identifying the major forms of resource degradation at the national level, helping determine the crucial barriers to sustainable use and management of

those resources, and finding ways to harness the expertise and capabilities of the research community to overcome those barriers.

Broad objective

The *PIERD Act* requires the Corporation to fund R&D relating to primary industries, to increase the economic, environmental or social benefits to Australian primary industries and the community, achieve the sustainable use and management of Australia's natural resources, make more effective use of existing research skills in the scientific community and improve the accountability of expenditure upon R&D activities.

Specific objectives

R&D Objective: To develop, fund and manage R&D activities, where the Corporation's involvement in leadership, design, funding and management will significantly enhance the sustainable use, productivity and conservation of Australia's land, water and vegetation resources.

Communication Objective: To initiate, fund and manage activities in association with the Corporation's R&D portfolio that raise awareness of, exchange information about, and promote adoption of improved sustainable use, management and conservation of land, water and vegetation resources.

Management Objective: To evaluate and improve the efficiency, effectiveness and focus of a balanced portfolio of land, water and vegetation R&D; and to manage the knowledge generated to enhance its contribution to more sustainable management of natural resources.

R&D activities

The Corporation has a broad charter and, during 2000–2001, it tackled a wide range of natural resource issues. To manage these issues effectively, the Corporation developed a management and reporting structure for its activities that allows resource users, the wider community and researchers to interact with the Corporation and assess its aims and performance. The structure also provides a framework for thorough assessment of issues and identification of objectives and priorities, enables efficient internal management of the research funding process, and supports development and effective external management of focused, integrated programs of R&D.

As well as large, integrated programs of research, referred to by Land & Water Australia as 'commissioned programs' and described in detail in the relevant sections of Chapter 6 – Program Management, the Corporation supports a number of individual R&D projects.

Details on Land & Water Australia research projects

Details of all present Land & Water Australia-funded projects are entered onto the publicly-available online database, *Australian Rural Research in Progress (ARRIP)*. *ARRIP* includes details such as project title, principal investigator, objectives, contact numbers and amounts of funding provided.

These details (except for project objectives and funding) are at Appendix 4.

In addition, the listing publication is available at <www.infoscan.com.au>, which also hosts the *Streamline*, *ARRIP* and *ABOA* databases. *Streamline* is

Australia's natural resources bibliographic database, and is supported by Land & Water Australia and the Water Services Association of Australia. *ABOA* is the *Australian Bibliography of Agriculture* database.

Abstracts of all final reports received by Land & Water Australia are entered onto *Streamline*. *Streamline* can also be accessed on CD-ROM. For further information on *Streamline*, contact Infoscan Pty Ltd, tel: (02) 6236 6267; fax: (02) 6236 6440, email: <infoscan@acslink.aone.net.au>.

Land & Water Australia Board of Directors

Board structure (Section 16 and 131, PIERD Act)

The Corporation was established with nine Directors, whose task it is to develop policy, review research programs, evaluate the Corporation's performance and, where required, create committees and working groups to work on specific Corporation activities such as finance, communication and commissioned programs.

The Board comprises a Chairman and a Government Director selected and appointed by the Minister, six non-executive Directors nominated by the Land & Water Australia Selection Committee and appointed by the Minister and an Executive Director appointed by the Land & Water Australia Board. The Annual Report for the Selection Committee is attached.

Board members are selected to reflect a balance of expertise in appropriate areas. They are not appointed as representatives of the organisations or sectors with which they are associated.

Board members can be contacted through the office of Land & Water Australia, GPO Box 2182, Canberra ACT 2601 or email <public@lwa.gov.au>.

Terms of appointment

The Chairman and Directors (except for the Government Director and Executive Director) are appointed for a term not exceeding three years, but are eligible for re-appointment. The Government Director holds office at the Minister's pleasure and the Executive Director holds office at the Board's pleasure. The present Executive Director has been appointed for a three-year period to 31 January 2003.

The current Board is appointed to 30 June 2002. The term of appointment of the Chairman, Alex Campbell, concluded at 30 June 2001. The new Chair, from 1 July 2001, is Ms Roberta Brazil.

Directors

Outgoing Chairman – Alex Campbell* (term 1 July 1999 to 30 June 2001)

Alex Campbell has farming interests which include sheep, cattle and farm forestry. He is a member of the National Land and Water Resources Audit Advisory Committee and both the WA and Federal Greenhouse Committees. He is Chair of the WA Salinity Council and is also a former General President of the WA Farmers' Federation and Board member of Landcare Australia Limited and Greening Australia.

Incoming Chair – Ms Roberta Brazil* (term 1 July 2001 to 30 June 2004) B.A., LL. M. (UQ), Grad. Dip. L.P. (QUT)

Roberta (Bobbie) Brazil is a former lawyer and a partner with her husband in large-scale mixed farming and pastoral

businesses on Queensland's Darling Downs and in the Northern Territory. Bobbie brings to the Board an excellent understanding of catchment management and extensive experience on a range of natural resource management and other bodies. She has played an active role in local landcare and catchment management groups and she currently chairs the Condamine Catchment Management Association and represents that Catchment on the Community Advisory Council of the Murray-Darling Basin Commission.

Bobbie remains the Queensland community representative on the Australian Landcare Council and a director of the Cotton Research and Development Corporation.

Deputy Chairman – Warwick Watkins
(term 1 July 1999 to 30 June 2002)
(AMP:ISMP (Harv.); Nat.Res. (UNE); Dip.Sci.Agr. (UNE); HDA (Hons)

Warwick Watkins is currently Deputy Chair of the Land & Water Australia Board, appointed in 1996 and is Chair of the Board's Finance Committee. He is Director General of the NSW Department of Information Technology and Management, which also encompasses the role of Surveyor General.

He is a foundation Director of Landcare Australia Ltd and has been a Vice-President of the World Association of Soil and Water Conservation. In 1984, he was seconded to the (then) Federal Department of Primary Industries and Energy to join the initial task force which established what is now the National Landcare Program.

Executive Director – Andrew Campbell**
(term 31 Jan. 2000 to 31 Jan. 2003)

MSc (Wageningen), B. ForSc (Hons) (Melb), Dip.For (Creswick).

Andrew Campbell has been Executive Director of the Corporation since March 2000. He was previously a senior executive of Environment Australia from 1996, responsible for the Bushcare program funded through the Natural Heritage Trust. Andrew has been involved at the cutting edge of natural resource management in Australia for 20 years.

He was instrumental in the development of Landcare, as Australia's first National Landcare Facilitator from 1989–92.

Andrew's family has been farming in Western Victoria since the 1860s and he has been managing the family farm with the help of a neighbour since 1987.

He is a member of the CSIRO Land and Water Sector Advisory Committee, the Board of the Rural Extension Centre of the University of Queensland at Gatton, the Board of the Ord-Bonaparte Program, the Board of the Joint Venture Agroforestry Program, and the Strategic Research Committee of Meat & Livestock Australia.

Government Director – Charles Willcocks*
B. Rural Science (Hons) (UNE), Diploma of Economic Development (University of Glasgow)

Charles Willcocks is the General Manager, Landcare and Regional Capacity Branch, Natural Resource Management Division, Department of Agriculture, Fisheries and Forestry – Australia.

Other Directors

Jason Alexandra (term 1 July 1999 to 30 June 2002)

Jason Alexandra has more than 20 years experience in natural resource management. He has commercial experience in agriculture, horticulture, forestry and consulting. As a policy analyst and researcher he has authored numerous publications on NRM, environmental management, agroforestry and water. He has been a member of both the Murray-Darling Basin Ministerial Council's Advisory Committee and the National Board of Greening Australia.

Leith Boully (term 1 July 1999 to 30 June 2002)
B. Rural Science (UNE); Postgraduate Diploma of Business Studies (UNE); CPAg

Leith Boully has been a wool, beef cattle and cotton producer on the Lower Balonne floodplain near Dirranbandi in Queensland for 15 years. She has worked with community organisations on natural resource management issues since 1988.

Since 1999, as Chairman of the Murray-Darling Basin Ministerial Council's Advisory Committee (CAC), Leith has fostered the building of strong relationships between the CAC, agencies and governments. She is also a Board member, Australian Broadcasting Corporation; Chairman, CSIRO Biodiversity Sector Advisory Committee; and member of the Australian Landcare Council.

Stuart Bunn (term 1 July 1999 to 30 June 2002)
BSc Hons and PhD, both in Zoology at the University of Western Australia

Professor Bunn is Director of the Centre for Catchment and In-Stream Research in the Faculty of Environmental Sciences at Griffith University in Brisbane. His major research interests are in the ecology of river and wetland systems with a focus on aspects of ecosystem function. He now leads the Restoration Ecology Program within the Cooperative Research Centre for Freshwater Ecology and is a Project Leader within the Restoration Program of the CRC for Catchment Hydrology.

Professor Bunn is currently Deputy Chair of the Scientific Expert Panel for the South-East Queensland Regional Water Quality Strategy and previously served on several other State Government advisory committees on water related issues. He is a member of the Scientific Committee for Water Research for the International Council of Science.

Sheila Donaldson (term 1 July 1999 to 30 June 2002)
B. Rural Science (Hons) (UNE); CPAg

Since 1993, Sheila Donaldson has been consulting in natural resource management, especially in catchment planning for salinity management. She has developed integrated catchment proposals for whole valleys and catchment groups in the Namoi, Gwydir and Macquarie valleys in NSW, developed through community participation and ownership. She also has skills and experience in group facilitation and strategic planning.

Sheila has a background in mixed farming in Northern NSW. She has represented the rural community on natural resource management issues including the North West Catchment Management Committee (NSW), the Murray-Darling Basin Ministerial Council's Advisory Council and Australian Landcare Council.

She is currently Chair of the Tamworth Development Corporation, and a member of the Advisory Committee for the CRC for Sustainable Cotton.

Mike Logan (term 1 July 1999 to 30 June 2002)

Mike Logan is a cotton, cereal and beef producer from Narrabri, NSW. He has a Bachelor of Business degree from Kuringai CAE, is a Fellow of the Australian Institute of Company Directors and is an accredited ISO14000 auditor.

He has been instrumental in introducing an Environmental Best Management Practice program into the cotton industry and is probably the first commercial farmer in Australia and perhaps the world to achieve ISO14001 accreditation of the Environmental Management System for his farm.

* Appointment by the Parliamentary Secretary to the Minister, not part of the Selection Committee process.

** Appointed by the Corporation.

Committees

From its establishment, the Corporation set up committees to deal with the matters affecting the Board. In 2000–2001, the committees were:

- **Audit Committee**, comprising three Directors and the Corporation's Business Manager, which was established to monitor the financial systems, operations and accounts of the Corporation.
- **Finance Committee**, comprising two Directors, the Business Manager and the Executive Director, which was established to consider financial matters affecting the Corporation and to make appropriate recommendations to the Board.
- **Communication Committee**, comprising three Directors, the Executive Director and the Communication Manager, which was established to develop a communication strategy for the Corporation and to ensure its longer-term implementation.

In addition, the Corporation has established other committees as required to assist in the management of specific R&D programs.

Directors' committee membership and attendance at meetings

		Committees		
Directors	Board Meetings	Audit	Finance	Commu-nication
Number of Meetings Held	**4**	**5**	**4**	**3**
Alex Campbell	4	N/A	N/A	N/A
Charles Willcocks	4	5	N/A	N/A
Jason Alexandra[1]	4	5	N/A	N/A
Leith Boully[2]	4	2	N/A	3
Warwick Watkins[3]	3	N/A	4	N/A
Andrew Campbell	4	N/A	4	3
Sheila Donaldson	4	5	N/A	3
Mike Logan	4	N/A	4	N/A
Stuart Bunn	4	N/A	N/A	2

1. Chair of Audit Committee
2. Chair of Communication Committee
3. Chair of Finance Committee

N/A Directors are not members of the specified Committee.

Report of the Selection Committee

The Land & Water Resources Research & Development Corporation Selection Committee was formerly abolished in July 1999, pursuant to section 129 of the *Primary Industries and Energy Research and Development Act 1989*. The Selection Committee was abolished after it had completed the task of nominating to the Minister, persons for appointment as new Directors of the Corporation for a three-year term, from 1999–2002.

The Selection Committee was not formally recalled during financial year 2000–2001; therefore no Annual Report was submitted to the Minister.

It is currently anticipated that the Selection Committee will be established during 2001–2002.

Dr John C Radcliffe

Presiding Member
Land and Water Resources Research and Development Corporation
Selection Committee

27 July 2001

Freedom of Information

As a Commonwealth statutory authority, the Corporation is subject to the Freedom of Information Act 1982.

Categories of documents

Documents relating to research and development activities funded by the Corporation are held at the office in Canberra. They include:

Category	Nature	Access Code
Annual Operational Plan	Files	D
Annual Report	Files	D
	Publications	C
Applications and Agreements	Files and forms	D
Financial and project administration	Files and electronic data	D
	Publications	C
Information relating to the commercialisation of R&D	Files	D
R&D Plan	Files	D
	Publications	C
R&D reports & Occasional Papers	Files	D
	Publications	C
Staff administration & personnel	Files	D

Access C: Documents customarily made available.

Access D: Documents not customarily made available due to privacy or commercial-in-confidence reasons.

FOI statistics

FOI Requests received	Nil
Internal review received	Nil
Administrative Appeals Tribunal appeals	Nil

Facilities & procedures for Freedom of Information (FOI) access

Members of the public can access and examine documents at the Corporation's office in Canberra by contacting the Business Manager on (02) 6257 3379. Office hours are Monday to Friday between 8.30 am and 5.00 pm. Access to the documents incurs a fee as prescribed under the Freedom of Information Act.

This statement is correct to 30 June 2001

Compliance with Ministerial Directions

Notification

Neither the Responsible Minister nor other Ministers have notified the Corporation of a Ministerial direction either:

(i) during the financial year; or

(ii) since the end of the financial year.

Compliance with General Policies of Government

The Corporation has fully complied with general policies of the Government, including:

a. Government priorities for rural research

The Government has indicated its ongoing financial commitment to R&D and recognition that the system of rural research and development corporations plays a critical role in taking science into the paddock. In December 1999, the Minister wrote to all RDCs outlining the Government's priorities for rural research to increase the competitiveness of Australia's rural industries. The Corporation's response against each of the seven priority areas is set forth below.

Sustainable natural resource management (NRM)

The Corporation's core business relates to protecting and enhancing the natural resource base that underpins rural Australia. Work ranges from developing a better understanding of the key processes that drive Australian ecosystems, to the effective uptake of improved management through industry best practice guidelines. Land & Water Australia works with the other R&D corporations to ensure a coordinated R&D effort for NRM across each of the commodity industries.

Whole-of-industry approach

The Corporation ensures a whole-of-industry approach in all its collaborative activities with RDCs, such as incorporating ecological sustainability into the PROGRAZE® farming systems package. The National Dryland Salinity Program has collaborative support with State resource management agencies, GRDC, RIRDC, MDBC and AFFA. This Program will develop a framework for appropriate resource allocation by governments and resource managers in managing dryland salinity. A whole-of-industry approach is required in managing this important national issue.

Biotechnology

The Corporation has worked with other R&D corporations, to review the potential impact of biotechnology on the natural resource base.

Increase in trade and market access

Land & Water Australia R&D programs, in association with programs of the other RDCs, are helping landholders to diversify and produce new and improved high-value products (for example agroforestry products and productive use of saline lands) which satisfy the needs of both environmental sustainability and the domestic and export markets.

Land & Water Australia is also supporting the development of increased processing and value adding, through work into the management and re-use of wastes from rural industries. Work on farming systems incorporates opportunities for new rural industries based on agroforestry and higher-value crops that are more suitable to the Australian environment.

Clean and green

The emergence of 'clean and green' marketing, and the threat of non-tariff trade barriers being imposed on Australia's exports, make Land & Water Australia's research vital in winning and maintaining overseas markets and in increasing farm productivity. Work funded by the Corporation is developing improved methods of resource management that are taken up by rural industries. It also provides a quantitative base for Australian industries to demonstrate their credentials in sound environmental management.

Rural industries are direct partners in many Land & Water Australia programs, thereby promoting a whole-of-industry approach that brings productivity and sustainability together. Land & Water Australia was also instrumental in developing a management system for pesticide use in the cotton industry by collaborating with a range of parties who have direct links to the cotton industry.

Food safety for consumers

Land & Water Australia has minimal direct R&D responsibility for food safety. However, the Corporation cooperates with the commodity-based R&D corporations, which have this direct food safety responsibility, to ensure food is sustainably produced through effective management of natural resources.

Improving our human resources

Land & Water Australia is looking to expand the successful capacity-building program based on postgraduate scholarships, travelling fellowships and visiting fellowships. The Corporation has established a new category of community fellowships, funded by a private philanthropist, to assist community members who have been involved in interesting or unusual activities in natural resource management, to take 'time out' over several months to write up their experience to draw out the lessons for a wider audience.

Postgraduate scholarships continue to be directed to areas where research capacity requires expansion. The Corporation assists researchers within its programs to upgrade their skills by providing joint support, with research organisations, for attendance at training workshops and courses. Land & Water Australia also provides a number of annual visiting and travelling fellowships to boost Australia's research capacity in areas of identified need. The Social and Institutional Research Program contributes to understanding the uptake and adoption of sustainable management practices.

b. Payments made to Representative Organisations

The Corporation expended $500 ($20 000 in 1999–2000) during the reporting period for payments related to consultation with Land & Water Australia's Representative Organisations.

c. Energy Efficiency statement

The Corporation supports the enhanced Energy Management Program announced by the Commonwealth Government in October 1990 and the energy management guidelines announced in the Prime Minister's Environment Statement in December 1992. The guidelines call for improved energy efficiency in relation to vehicles, equipment and building design. The Corporation leases offices as part of a large office complex and does not own large, energy-consuming equipment or commercial vehicles.

d. Management of Frequent Flyer Points

The Corporation's finance policy states that frequent flyer points accumulated by staff and directors on Land & Water Australia business must only be redeemed for the benefit of the Corporation. At the end of each year, staff and directors are asked to identify FFP earned on Corporation business during the preceding year, and how they have used or will use these points.

e. Fraud control policy of the Commonwealth

The Corporation has in place a Fraud Control Plan that is in accordance with the Fraud Control Policy of the Commonwealth and the Corporation's risk management program.

f. Industrial Democracy and Equal Employment Opportunity

The Corporation's terms and conditions of employment promote a work environment free from discrimination in employment matters, ensuring application of the principles of merit and equity. The Corporation also promotes the principles of industrial democracy and a participative work place.

g. Legislation/regulations impacting on business

Land & Water Australia is required to comply with the Government's requirements for regulatory best practice arrangements when proposing new regulation or amending existing regulation which impacts on business. Land & Water Australia has not been involved in any regulatory proposals during the reporting period.

Compliance with Other Legislative Requirements

PIERD Act 1989, CAC Act 1997 and Auditor-General Act 1997

The Corporation has demonstrated compliance with the above legislation through the completion of a Compliance Index. The Corporation's legal advisers and Audit Committee have reviewed this checklist.

The Corporation has comprehensive insurance cover with the Commonwealth Insurer, COMCOVER, for its Directors and Officers. In accordance with the contract of insurance with COMCOVER, the Corporation is prohibited from disclosing details of insurance, as required under Division 3 Section 16 of the CAC Orders for the Report of Operations.

Reviews

There were no judicial decisions or decisions of administrative tribunals during the reporting period that have had or may have a significant impact on the Corporation's operations.

There were no reports from a Parliamentary Committee or the Commonwealth Ombudsman regarding the operations of the Corporation.

Significant Events

The Corporation did not notify the Minister of any significant events during 2000–2001.

Administrative Decisions (Judicial Review) Act 1977

There were no administrative appeals during the reporting period.

Archives Act

The Corporation has complied with the requirements of the Archives Act.

Environment Protection and Biodiversity Conservation Act 1999

Sustainable use and management of natural resources is the cornerstone of the Corporation's mission and the purpose of its policies and programs. As such, the Corporation has a major role in achieving the aims of the 1992 National Strategy for Ecologically Sustainable Development.

Land & Water Australia requires that 'sustainability' (both economic and ecological) of the natural resource base is the over-riding objective when researchers and others are designing R&D projects and programs.

Project contracts have specific clauses requiring providers to minimise

environmental impacts. A significant number of projects across the R&D portfolio actively progress the intent of the Environment Protection and Biodiversity Conservation Act by enhancing understanding of Australia's unique biodiversity, developing measures to limit or reverse threatening processes, and informing management of biodiversity and its habitat.

Goods and Services Tax

The Corporation has effectively met the compliance and operational requirements of the Goods and Services Tax on its introduction from 1 July 2000.

Occupational Health and Safety (Commonwealth Employment) Act 1991

The Corporation has complied with the requirements in this legislation. The Corporation has in place an occupational health and safety policy as part of the terms and conditions of employment.

During the year, a detailed workplace assessment was undertaken to ensure that each staff member has an effective work environment.

There were no accidents and injuries during the year that resulted in significant leave by staff.

Political Broadcasting and Political Disclosures Act 1991(Section 20

The Corporation expended about $90 000 during the reporting period towards direct mail organisations (excluding postage costs).

Organisation structure

Location of office

The Land & Water Australia office is at the second floor, UNISYS Building, 91 Northbourne Avenue, Turner ACT 2612. Postal address: GPO Box 2182, Canberra ACT 2601. Contact numbers:
Tel: (02) 6257 3379
Fax: (02) 6257 3420
E-Mail: <public@lwa.gov.au>
WebSite: <www.lwa.gov.au>

Structure

Land & Water Australia's organisation structure is shown in the chart presented on the next page.

Service charter

The Corporation has developed a service charter in line with the quality management system and as a basis for promoting greater stakeholder focus. The Corporation achieved ISO 9002 Quality Assurance Accreditation in 1996. The quality policy manual details the following service charter principles:

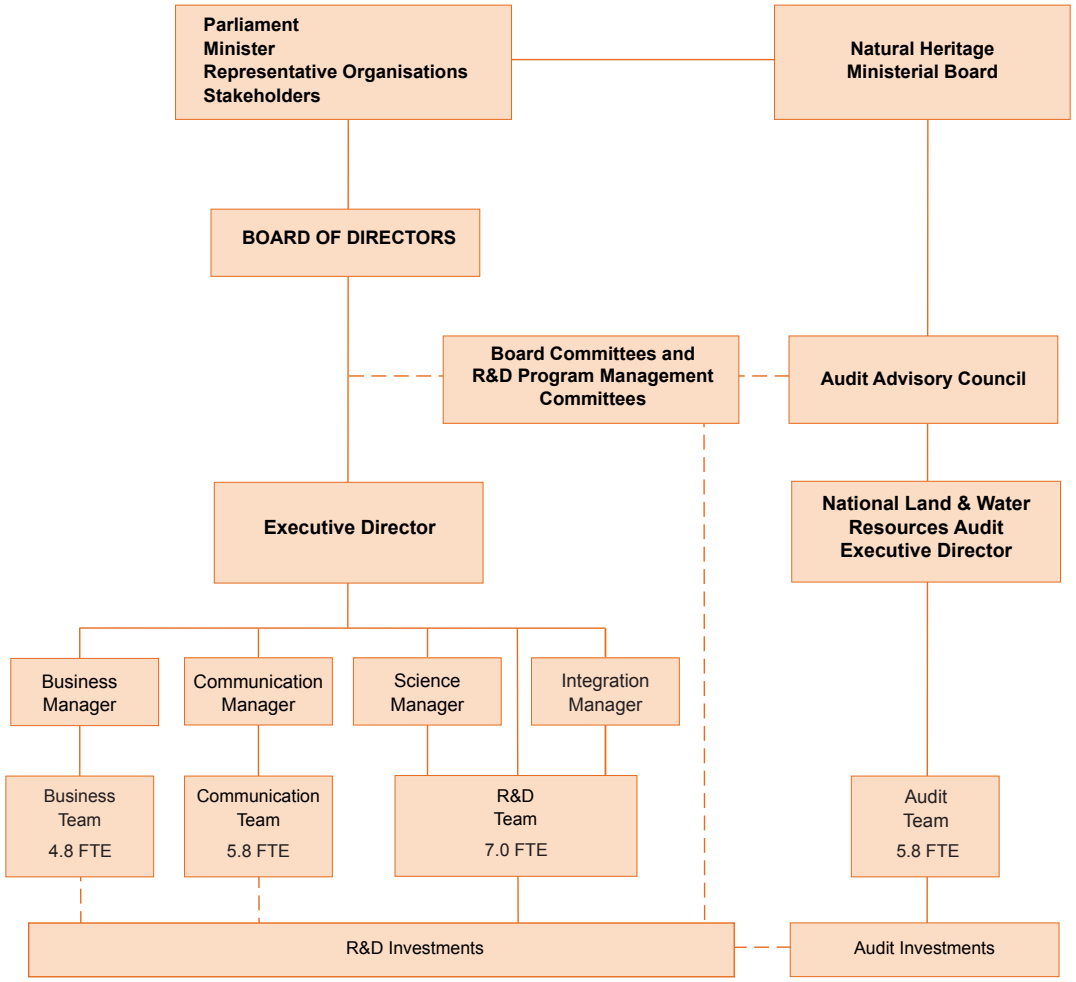
a. the Corporation shall verify that the requirements of stakeholders are identified and satisfied in a competent and professional manner;

b. Land & Water Australia products and processes shall be reviewed and aligned to reflect the needs of its stakeholders – this is achieved through close consultation and feedback with key stakeholders; and

c. any variances to stakeholder requirements shall be dealt with in a timely manner, in accordance with the quality system.

During the year, the Corporation demonstrated effective conformance to these principles through ongoing ISO

Land & Water Australia Organisational Structure (as at 30 June 2001)



NOTES:
FTE = Full Time Equivalent staff
The R&D team also utilises 14 Part-time Program Coordinators
Publicist (Audit team) works one day per week for Land & Water Australia

accreditation and positive feedback from a stakeholder survey.

Executive and operating staff

Corporation staff carry out the day-to-day work involved in establishing R&D programs and in calling for, assessing, developing, implementing, supporting and reviewing funding applications. Staff are employed on terms and conditions determined by the Corporation. During 2000–2001, 18 full-time staff and four part-time officers were employed. An additional seven full-time staff were employed as part of the Audit Management Unit.

Most executive and staff positions within Land & Water Australia have been restructured, effective from July 2001. This restructuring is reflected in the following list of positions and responsible officers.

Executive staff (effective 2000–2001)

Executive Director	Andrew Campbell
Science Manager	Nick Schofield
Communication Manager	Christine Ellis
Business Manager	Sandy Lolicato
Integration Manager	Catherine Mobbs
Manager, National Dryland Salinity Program	Richard Price
CEO, Ord-Bonaparte Program	Brian Prince
Communication Officer	Glenn Conroy
Communication Officer	Warren Mortlock
Knowledge Broker (part-time)	Dianne Flett
Communication Officer (part-time)	Fleur Flanery
Publicist (1 day/week with Land & Water Australia, 4 days with the National Land and Water Resources Audit)	Drusilla Patkin
Publication Officer (Acting, part-time)	Roberta Dowd
Systems Controller	Kerri Morson
Business Services Officer	Jenny Nitschke
Financial Controller (part-time)	Rebecca Barnes
Finance Officer	Betsy Vucetic
Executive Officer R&D	Melanie King
Program Officer	Penny Cook
	Bobbie Heath (resigned)
Program Officer	Gill Whiting
Program Officer	Catherine Viljoen
Program Officer	Christine Louis
Program Officer and Executive Assistant	Joanne Barbaro

National Land and Water Resources Audit

Executive Director	Colin Creighton
Technical Director	Warwick McDonald
Technical Manager – Data	Stewart Noble
Technical Manager – Ecology	Jim Tait
Information Specialist	Maria Cofinas
Project Manager	Rochelle Lawson
Business Manager	Sylvia Graham

Program Coordinators (external, part-time consultants)

Climate Variability in Agriculture R&D Program	Barry White
National Dryland Salinity Program	Nicholas Newland (consultancy concluded – responsibility assumed by NDSP Manager)
National Rivers Consortium	Phil Price Brendan Edgar
Riparian Lands	Siwan Lovett
National Program for Irrigation R&D	Brett Tucker (consultancy concluded – new consultants Murray and Liz Chapman appointed)
Sustainable Grazing Systems R&D Program	Warren Mason
North Australian Program of R&D	Judy Lambert
Native Vegetation R&D Program	Jann Williams
Joint Venture Agroforestry R&D Program	Ros Prinsley
Arena Leader Primary Industries and Future Landscapes	Peter Day
Redesigning Agriculture for Australian Landscapes R&D Program	David Clarke
Social and Institutional Research Program	Ken Moore
National Groundwater R&D Program	Graham Allison
Integrating Themes Coordinator	Su Wild River (resigned)
River Contaminants Coordinator	Jacky Croke (resigned) Brendan Edgar
National Eutrophication Management Program	Richard Davis (consultancy concluded)
National River Health R&D Program	Peter Davies (consultancy concluded)
National Wetlands R&D Program	Bill Williams (consultancy concluded)
R&D for Environmental Management of Military Lands Program	John McIvor (consultancy concluded)

Financial Report

7 Financial Statements

INDEPENDENT AUDIT REPORT

To the Minister for Agriculture, Fisheries and Forestry

Scope

I have audited the financial statements of Land and Water Resources Research and Development Corporation for the year ended 30 June 2001. The financial statements comprise:

- Statement by Directors;
- Statement of Financial Performance;
- Statement of Financial Position;
- Statement of Cash Flows;
- Schedule of Commitments;
- Schedule of Contingencies, and
- Notes to and forming part of the Financial Statements.

The Directors of the Corporation are responsible for the preparation and presentation of the financial statements and the information they contain. I have conducted an independent audit of the financial statements in order to express an opinion on them to you.

The audit has been conducted in accordance with Australian National Audit Office Auditing Standards, which incorporate the Australian Auditing Standards, to provide reasonable assurance as to whether the financial statements are free of material misstatement. Audit procedures included examination, on a test basis, of evidence supporting the amounts and other disclosures in the financial statements, and the evaluation of accounting policies and significant accounting estimates. These procedures have been undertaken to form an opinion as to whether, in all material respects, the financial statements are presented fairly in accordance with Australian Accounting Standards, other mandatory professional reporting requirements and statutory requirements in Australia so as to present a view of the entity which is consistent with my understanding of its financial position, the results of its operations and its cash flows.

The audit opinion expressed in this report has been formed on the above basis.

GPO Box 707 CANBERRA ACT 2601
Centenary House 19 National Circuit
BARTON ACT
Phone (02) 6203 7300 Fax (02) 6203 7777

Audit Opinion

In my opinion,

(a) the financial statements have been prepared in accordance with Schedule 1 of the Commonwealth Authorities and Companies (Financial Statements 2000-2001) Orders; and

(b) the financial statements give a true and fair view, in accordance with applicable Accounting Standards, other mandatory professional reporting requirements and Schedule 1 of the Commonwealth Authorities and Companies (Financial Statements 2000-2001) Orders, of the financial position of Land and Water Resources Research and Development Corporation as at 30 June 2001 and the results of its operations and its cash flows for the year then ended.

Australian National Audit Office

Darren Box
Executive Director

Delegate of the Auditor-General

Canberra
20 September 2001

Land & Water AUSTRALIA
research · development · innovation

STATEMENT BY DIRECTORS

In our opinion, the attached financial statements give a true and fair view of the matters required by Schedule 1 of the Commonwealth Authorities and Companies (Financial Statements 2000-01) Orders for the year ended 30 June 2001.

Signed

Roberta Brazil
Chair
4 September 2001

Signed

Andrew Campbell
Executive Director
4 September 2001

Land & Water Resources Research & Development Corporation • Level 2 91 Northbourne Ave Turner ACT 2612
GPO Box 2182 Canberra ACT 2601 • Tel +61 2 6257 3379 • Fax +61 2 6257 3420 • ABN: 25 602 743 013
Website: www.lwa.gov.au

LAND & WATER RESOURCES RESEARCH & DEVELOPMENT CORPORATION
STATEMENT OF FINANCIAL PERFORMANCE

For the year ended 30 June 2001

	Notes	2001 $	2000 $
Revenues from ordinary activities			
Revenue from Government	5A	**11,314,000**	11,049,000
Third party contributions utilised	4	**10,560,145**	12,198,570
Interest	5B	**200,539**	349,641
Proceeds from disposal of assets	5C	**4,700**	-
Other	5D	**501,119**	523,470
Total revenues from ordinary activities		**22,580,503**	24,120,681
Expenses from ordinary activities			
Employees	6A	**2,975,306**	2,111,434
Suppliers	6B	**3,073,734**	1,200,292
Research & Development expenses	7	**15,845,427**	20,394,156
Depreciation and amortisation	6C	**245,089**	177,750
Write-down of assets	6D	**6,542**	-
Disposal of assets	5C	**15,783**	-
Total expenses from ordinary activities		**22,161,882**	23,883,632
Net operating surplus (deficit) from ordinary activities		**418,621**	237,049
Net surplus (deficit)		**418,621**	237,049
Net deficit attributable to the Commonwealth		**418,621**	237,049
Total changes in equity other than those resulting from transactions with owners as owners		**418,621**	237,049

The above statement should be read in conjunction with the accompanying notes.

LAND & WATER RESOURCES RESEARCH & DEVELOPMENT CORPORATION
STATEMENT OF FINANCIAL POSITION

as at 30 June 2001

	Notes	2001 $	2000 $
ASSETS			
Financial assets			
Cash	9A	**3,527,097**	3,550,879
Receivables	9B	**1,276,239**	682,020
Investments – other	9C	**561,618**	1,027,923
Total financial assets		**5,364,954**	5,260,822
Non-financial assets			
Property, plant and equipment	10A,B	**424,399**	315,304
Intangible assets	10C,B	**238,451**	120,103
Total non-financial assets		**662,850**	435,407
Total assets		**6,027,804**	5,696,229
LIABILITIES			
Interest bearing liabilities			
Other	11A	**–**	926,077
Total interest bearing liabilities		**–**	926,077
Provisions			
Employees	12A	**449,851**	373,050
Total provisions		**449,851**	373,050
Payables			
Suppliers	13A	**393,133**	252,024
Research & Development expenses	13B	**3,075,278**	2,454,158
Total payables		**3,468,411**	2,706,182
Total liabilities		**3,918,263**	4,005,309
EQUITY			
Accumulated surplus (deficit)		**2,109,541**	1,690,920
Total equity		**2,109,541**	1,690,920
Current liabilities		**3,742,748**	3,936,521
Non-current liabilities		**175,515**	68,788
Current assets		**5,364,954**	5,260,822
Non-current assets		**662,850**	435,407

The above statement should be read in conjunction with the accompanying notes.

LAND & WATER RESOURCES RESEARCH & DEVELOPMENT CORPORATION
STATEMENT OF CASH FLOWS

for the year ended 30 June 2001

	Notes	2001 $	2000 $
OPERATING ACTIVITIES			
Cash received			
Appropriations		**11,314,000**	11,049,000
Interest		**200,539**	361,934
Third party contributions		**10,325,379**	12,987,381
GST recovered from taxation authority		**725,695**	-
Other		**826,661**	251,328
Total cash received		**23,392,274**	24,649,643
Cash used			
Research & Development expenses		**(15,224,308)**	(22,737,013)
Employees		**(2,898,503)**	(2,034,239)
Suppliers		**(4,343,305)**	(1,258,391)
Total cash used		**(22,466,110)**	(26,029,643)
Net cash from operating activities	15	**926,158**	(1,380,000)
INVESTING ACTIVITIES			
Cash received			
Proceeds from sales of property, plant and equipment		**4,700**	-
Bills of exchange and promissory notes		**466,305**	-
Total cash received		**471,005**	-
Cash used			
Purchase of property, plant and equipment		**(494,866)**	(233,303)
Bills of exchange and promissory notes			(27,923)
Total cash used		**(494,866)**	(261,226)
Net cash from investing activities		**(23,861)**	(261,226)
Net increase in cash held		**902,297**	(1,641,226)
Cash at the beginning of the reporting period		**2,624,802**	4,266,028
Cash at the end of the reporting period		**3,527,097**	2,624,802

The above statement should be read in conjunction with the accompanying notes.

LAND & WATER RESOURCES RESEARCH & DEVELOPMENT CORPORATION
SCHEDULE OF COMMITMENTS

as at 30 June 2001

	2001 $	2000 $
BY TYPE		
OTHER COMMITMENTS		
Operating leases[1]	**1,035,927**	1,328,288
Other commitments[2]	**19,257,457**	20,149,227
Total other commitments	**20,293,384**	21,477,515
COMMITMENTS RECEIVABLE	**(1,844,853)**	(1,952,501)
Net commitments	**18,448,531**	19,525,014
BY MATURITY		
All net commitments		
One year or less	**12,010,986**	14,285,095
From one to five years	**6,437,545**	3,252,088
Over five years	**-**	1,987,831
Net commitments	**18,448,531**	19,525,014
Operating lease commitments		
One year or less	**237,098**	253,460
From one to five years	**704,654**	954,075
Over five years	**-**	-
Net operating lease commitments	**941,752**	1,207,535

NB. Commitments are GST inclusive where relevant.

1. Operating Lease is exclusively in relation to office accommodation for a fixed rental lease to March 2005.
2. As at 30 June 2001 Other commitments comprise future commitments to research organisations and for jointly-funded projects and programs managed by other funding agencies. Payment is dependent upon progress in each funded research project, annual ministerial approval of the Annual Operational Plan and adequate annual appropriation of funds for the Corporation and funding partners.

The above statement should be read in conjunction with the accompanying notes.

LAND & WATER RESOURCES RESEARCH & DEVELOPMENT CORPORATION
SCHEDULE OF CONTINGENCIES

as at 30 June 2001

	2001	2000
	$	$
CONTINGENT LOSSES		
Total contingent losses	**0**	0
Net contingencies	**0**	0

The above statement should be read in conjunction with the accompanying notes.

LAND & WATER RESOURCES RESEARCH & DEVELOPMENT CORPORATION
NOTES TO AND FORMING PART OF THE FINANCIAL STATEMENTS

For the year ended 30 June 2001

Note 1: Summary of Significant Accounting Policies

1.1 Basis of accounting

The Land and Water Resources Research and Development Corporation (the 'Corporation'), trading as Land & Water Australia, is required by Section 20 of the Commonwealth Authorities and Companies Act 1997 to provide proper accounts and records of the transactions and affairs of the Corporation in accordance with accounting principles, generally applied in commercial practice.

The financial statements are required by clause 1(b) of Schedule 1 to the *Commonwealth Authorities and Companies Act 1997* and are a general purpose financial report.

The statements have been prepared in accordance with:

- Schedule 1 to Orders by the Finance Minister for the preparation of Financial Statements in relation to financial years ending on or after 30 June 2001;
- Australian Accounting Standards and Accounting Interpretations issued by Australian Accounting Standards Boards;
- other authoritative pronouncements of the Boards; and
- Consensus Views of the Urgent Issues Group.

The statements have been prepared having regard to:

- Statements of Accounting Concepts;
- the Explanatory Notes to Schedule 1 issued by the Department of Finance and Administration; and
- Guidance Notes issued by that Department.

The Corporation and Statements of Financial Performance and Financial Position have been prepared on an accrual basis and are in accordance with historical cost convention. Except where stated, no allowance is made for the effect of changing prices on the results or the financial position.

Assets and liabilities are recognised in the Corporation and Statements of Financial Position when and only when it is probable that future economic benefits will flow and the amounts of the assets or liabilities can be reliably measured.

Revenues and expenses are recognised in the Corporation and Statements of Financial Performance when and only when the flow or consumption or loss of economic benefits has occurred and can be reliably measured.

1.2 Changes in Accounting Policy

The accounting policies used in the preparation of these financial statements are consistent with those used in 1999–2000.

1.3 Reporting by Outcomes

A comparison of Budget and Actual figures by outcome specified in the Appropriation Acts relevant to the Corporation is presented in Note 2. Any intra-government costs included in the figure 'net cost to Budget outcomes' are eliminated in calculating the actual budget outcome for the Government overall.

1.4 Revenue

The revenues described in this Note are revenues relating to the core operating activities of the Corporation.

Interest revenue is recognised on a proportional basis taking into account the interest rates applicable to the financial assets.

Revenue from disposal of non-current assets is recognised when control of asset has passed to the buyer.

Revenue from the rendering of a service is recognised by reference to the stage of completion of contracts or other agreements to provide services to other bodies. The stage of completion is determined according to the proportion that costs incurred to date bear to the estimated total costs of the transaction.

The Corporation receives revenue from third parties for the management of collaborative programs and projects.

Revenues from Government – Output Appropriations

From 1 July 2000, the Commonwealth Budget has been prepared under an accruals framework. Under this framework, Parliament appropriates moneys to the Corporation as revenue appropriations. Revenues from government are revenues of the core operating activities of the Corporation. Appropriations for outputs are recognised as revenue to the extent they have been received into the Corporation's Bank account or are entitled to be received by the Corporation at year end.

Resources Received free of charge

There were no resources received free of charge during 2000–01 (1999–00, nil).

1.5 Employee Entitlements

(a) Leave

The liability for employee entitlements includes provision for annual leave and long service leave. No provision has been made for sick leave as all sick leave is non-vesting and the average sick leave taken in future years by employees of the Corporation is estimated to be less than an annual entitlement for sick leave.

The liability for annual leave reflects the value of total annual leave entitlements of all employees at 30 June 2001 and is recognised at its nominal amount.

The non-current portion of the liability for long service leave is recognised and measured at the present value of the estimated future cash flows to be made in respect of all employees at

30 June 2001. In determining the present value of the liability, the Corporation has taken into account attrition rates and pay increases through promotion and inflation.

(b) Separation and redundancy

Provision is made for separation and redundancy payments in circumstances where the Corporation has formally identified positions as excess to requirements and a reliable estimate of the amount of the payments can be determined.

No separation or redundancy payments were made during 2000–2001.

(c) Superannuation

Employees either contribute to the Commonwealth Superannuation and Public Sector Superannuation Schemes, or to another selected scheme in accordance with the Superannuation Guarantee levy. Employer contributions amounting to $246,568 (1999–2000: $190,984) for the Corporation in relation to these schemes have been expensed in these financial statements.

No liability for superannuation benefits is recognised as at 30 June as the employer contributions fully extinguish the accruing liability which is assumed by the Commonwealth.

Employer Superannuation Productivity Benefit contributions for the Corporation totalled $32,226 (1999–2000: $24,210).

1.6 Leases

Operating lease payments are expensed on a basis which is representative of the pattern of benefits derived from the leased assets. The net present value of future net outlays in respect of surplus space under non-cancellable lease agreements is expensed in the period in which the space becomes surplus.

1.7 Research & Development expenses

Research & Development expenses are expensed as incurred. At 30 June 2001, there was no property income due from funded research and development projects other than those re-applied within some projects.

The Corporation has debited all items of expenditure against each individual R&D program account where a program management committee has been formed. These items include funding for research and development projects, scoping reviews, communications and other *ad hoc* management expenses related directly to the research *(see Note 7)*.

The Corporation recognises research and development liabilities as follows.

Most research and development agreements require the grantee to perform services or provide facilities, or to meet eligibility criteria. In these cases, liabilities are recognised only to the extent that the services required have been performed or the eligibility criteria have been satisfied by the grantee. (Where Research & Development monies are paid in advance of performance or eligibility, a prepayment is recognised.)

In cases where grant agreements are made without conditions to be monitored, liabilities are recognised on signing of the agreement.

1.8 Cash

Cash means notes and coins held and any deposits held at call with a bank or financial institution.

1.9 Financial Instruments

Accounting policies in relation to financial instruments are stated at Note 21.

1.10 Acquisition of Assets

Assets are recorded at cost on acquisition. The cost of acquisition includes the fair value of assets transferred in exchange and liabilities undertaken.

1.11 Property (Land, Buildings and Infrastructure), Plant and Equipment

Asset Recognition Threshold

Purchases of property, plant and equipment are recognised initially at cost in the Statement of Financial Position, except for purchases costing less than $1,000, which are expensed in the year of acquisition (other than where they form part of a group of similar items which are significant in total). Assets purchased from project funds and greater than the threshold of $5,000 may revert to the Corporation at the end of the project period. At 30 June 2001, no reversions took place. All sundry equipment transferred from the Commonwealth has been written off.

Revaluations

The Corporation did not undertake a revaluation of assets during 2000–2001. The carrying amounts of assets have been assessed to approximate the deprival value and the class of assets are not significant to the Corporation.

Recoverable amount test

The carrying amount of each item of property plant and equipment assets is reviewed to determine whether it is in excess of the asset's recoverable amount. If an excess exists as at the reporting date, the asset is written down to its recoverable amount immediately. In assessing recoverable amounts, the relevant cash flows, including the expected cash inflows from future appropriations by the Parliament, have been discounted to their present value.

The application of the recoverable amount test to the non-current assets of the Corporation is a change of accounting policy required by the Finance Minister's Orders in 1999–2000. No write-down to recoverable amount has been made in 2000–2001 as a result of this change in policy.

Depreciation and Amortisation

Depreciable property, plant and equipment are written off to their estimated residual values over their estimated useful lives to the Corporation using, in all cases, the straight-line method of depreciation. Leasehold improvements are amortised on a straight-line basis over the lesser of the estimated useful life of the improvements or the unexpired period of the lease, this being four years.

Depreciation and amortisation rates (useful lives) and methods are reviewed at each balance date and necessary adjustments are recognised in the current, or current and future reporting periods, as appropriate.

Depreciation and amortisation rates applying to each class of depreciable asset are based on the following useful lives:

	2000–2001	1999–2000
Leasehold improvements	**Lease term**	Lease term
Plant and equipment	**3–8 years**	3–8 years

The aggregate amount of depreciation allocated for each class of asset during the reporting period is disclosed in Note 10.

1.12 Intangibles

The carrying amount of each non-current intangible asset is reviewed to determine whether it is in excess of the asset's recoverable amount. If an excess exists as at the reporting date, the asset is written down to its recoverable amount immediately. In assessing recoverable amounts, the relevant cash flows, including the expected cash inflows from future appropriations by the Parliament, have been discounted to their present value.

The application of the recoverable amount test to the intangible assets of the Corporation is a change of accounting policy required by the Finance Minister's Orders in 1999–2000. No write-down to recoverable amount has been made in 2000–2001 as a result of this change in policy.

Intangible assets comprise externally acquired and internally developed software.

Intangible assets are amortised on a straight-line basis over its anticipated useful life after it is commissioned into use.

Useful lives are:

	2000–2001	1999–2000
Externally acquired software	**3 to 4 years**	3 to 4 years

1.13 Taxation

The Corporation is liable to payroll tax, fringe benefits tax, stamp duty and goods and services tax. The Corporation is exempt from the payment of income tax under clause 46(1) of the *Primary Industries and Energy Research and Development Act 1989 (PIERD Act)*.

1.14 Insurance

The Corporation has insured risks through the Government's insurable risk managed fund, called 'Comcover'. Workers compensation is insured through Comcare Australia.

1.15 Comparative figures

Comparative figures have been adjusted to conform to changes in presentation in these financial statements where required.

Note 2. Reporting by segments and outcomes

Reporting by segments

The Corporation operates across primary industries and segments in the water and wastewater industries. The principal activities of the Corporation are the co-ordination and funding of research and development for the sustainable use of land, water and vegetation resources. The Corporation operates predominately in one geographic area, this being Australia.

The Corporation is structured to meet one outcome:

To provide national leadership in utilising research and development to improve the long-term productive capacity, sustainable use, management and conservation of Australia's land, water and vegetation resources.

Reporting by Outcomes for 2000–2001

	Outcome	
	Budget	Actual
Net cost of entity outputs	23,398,000	22,580,503
Net cost to Budget Outcome	23,398,000	22,580,503
Outcome specific assets *	5,141,000	6,027,804
Assets that are not outcome specific	–	–

* All assets are regarded as outcome specific. Variance as a result of the change in R&D expenditure as at 30 June 2001 ie impact on the cash balance and the impact of GST.

Note 3. Economic Dependency

The Corporation is dependent on appropriations from the Government for its continued existence and ability to carry out its normal activities.

Note 4. Third party contributions

Third party contributions were received for the following programs and projects in which the Corporation was a participant and managed the activity on behalf of other funding agencies:

ACTIVITY	**Utilised 2001 $**	Utilised 2000 $	**Not yet utilised 2001 $**	Not yet utilised 2000 $
National Dryland salinity R&D	414,323	585,130	49,453	299,870
Climate variability in agriculture	914,090	1,287,199	500,849	812,566
Sustainable mgmt of military lands	29,192	146,488	0	0
Social & Institutional R&D	25,000	0	0	0
Ord-Bonaparte program	885,000	0	0	0
National river health program (NRHP)	0	68,739	0	0
NRHP – State/Territory monitoring Sub-program	17,698	24,319	0	17,698
National eutrophication management	123,586	313,999	52,489	76,075
Irrigation R&D	555,489	414,107	213,487	108,650
National Rivers Consortium	303,723	155,879	203,460	102,303
Riparian lands	0	40,000	0	0
National rangelands R&D	0	25,000	0	0
National remnant vegetation R&D	97,628	0	102,372	0
National Land and Water Resources Audit	7,194,416	9,020,788	1,090,915	587,052
Joint research and development projects	0	116,922	0	0
Total	**10,560,145**	12,198,570	**2,213,026**	2,004,214

Of the third party contributions received, $10,560,145 has been recognised as income at balance date (1999–2000, $12,198,570). The amount not yet utilised as at year ended 30 June 2001 has been included as a creditor (see Note 13B).

Note 5. Operating Revenues

	2001 $	2000 $
Note 5A. Revenues from Government		
Appropriations for outputs	**11,314,000**	11,049,000
Total	**11,314,000**	11,049,000
Note 5B. Interest		
Deposits	**200,539**	349,641
Total	**200,539**	349,641
Note 5C. Proceeds and expenses from sale of assets		
Non-financial assets – Infrastructure, plant and equipment:		
Revenue (proceeds from sale)	**4,700**	–
Expense from sale	**(15,783)**	–
Total	**(11,083)**	–
Note 5D. Other revenues		
Return of R&D funds	**275,834**	383,100
Publication sales	**11,808**	20,916
Other sundry items	**213,477**	119,454
Total	**501,119**	523,470

Note 6. Operating Expenses – goods and services

	2001 $	2000 $
Note 6A. Employee expenses		
Remuneration (for services provided)	**2,965,268**	2,039,445
Other employee expenses	**10,038**	71,989
Total	**2,975,306**	2,111,434
Note 6B. Suppliers expenses		
Supply of goods and services	**2,828,866**	1,015,692
Operating lease rentals	**244,868**	184,600
Total	**3,073,734**	1,200,292

The variance in supply of goods and services is attributed to:

- 1999–2000 comparative figure not including R&D non-project, supplier related expenditure of around $1.1M; and
- increase in non-project communication activity.

Note 6C. Depreciation and amortisation		
Depreciation of property, plant and equipment	**104,331**	108,408
Amortisation of lease–hold improvements	**64,345**	61,420
Amortisation of computer software	**76,413**	7,922
Total	**245,089**	177,750
Note 6D. Write-down of assets		
Non-financial assets:		
■ Plant & Equipment – write-off	**6,542**	–
Total	**6,542**	–

Note 7. Operating Expense – Research & Development expenses

	2001 $	2000 $
Research & Development expenses to commercial entities	**4,496,520**	6,003,887
Total	**15,845,427**	20,394,156

Note 8. Total operating expenses

Total operating expenses are classified by functional type as follows:

Administration	**1,321,335**	1,288,572
Research & Development expenses		
Commissioned R&D programs	**10,981,787**	11,026,439
General Call	**633,808**	1,422,045
National Land and Water Resources Audit	**7,328,518**	9,132,901
Communications	**1,400,854**	408,019
Strategic Planning and Management	**443,539**	69,198
Review and Evaluation	**52,041**	536,458
Total	**22,161,882**	23,883,632

Note 9. Financial Assets

	2001 $	2000 $
Note 9A. Cash		
Cash at bank and on hand	**2,309,758**	1,118
Deposits at call	**1,217,339**	3,549,761
	3,527,097	3,550,879
Balance of cash as at 30 June shown in the Statement of Cash Flows	**3,527,097**	3,550,879
Note 9B. Receivables		
Goods and services	**880,215**	645,449
Less: Provision for doubtful debts	**–**	–
	880,215	645,449
Other debtors	**8,070**	36,571
GST Receivable	**387,954**	–
Total receivables	**1,276,239**	682,020
Receivables (gross) which are overdue are aged as follows:		
Not Overdue	**778,319**	36,571
Overdue by:		
■ less than 30 days	**486,060**	253,699
■ 30 to 60 days	**1,740**	1,750
■ 60 to 90 days	**0**	346,087
■ more than 90 days	**10,120**	43,913
	1,276,239	682,020
Total receivables (gross)	**1,276,239**	682,020
Note 9C. Investments		
Term deposit	**561,618**	1,027,923
Total	**561,618**	1,027,923

Note 10. Non-financial assets

	2001 $	2000 $
Note 10A. Property, plant and equipment		
Office equipment – at cost	**521,137**	416,674
Accumulated depreciation	**(255,542)**	(180,596)
	265,595	236,078
Furniture and fittings – at cost	**85,885**	51,238
Accumulated depreciation	**(47,163)**	(40,887)
	38,722	10,351
Leasehold improvements – at cost	**294,686**	179,135
Accumulated depreciation	**(174,605)**	(110,260)
	120,081	68,875
Total Plant and Equipment	**424,399**	315,304

Note 10B. Analysis of Property, Plant, Equipment and Intangibles

Movement summary 2000–01 for all assets irrespective of valuation basis

Item	Office equipment $	Furniture & fittings $	Lease improve-ments $	Computer software $	TOTAL $
Gross value as at 1 July 2000	416,674	51,238	179,135	137,351	784,398
Assets transferred in/(out)	(61,642)	–	–	61,642	–
Additions – Purchase of assets	211,539	34,647	115,551	133,129	494,866
Write-offs	(12,198)	–	–	–	(12,198)
Disposals	(33,236)	–	–		(33,236)
Gross value as at 30 June 2001	521,137	85,885	294,686	332,122	1,233,830
Accumulated depreciation/amortisation charge as at 1 July 2000	180,596	40,887	110,260	17,248	348,991
Assets transferred in/(out)	(3,897)	–	–	3,897	–
Disposals	(17,453)	–	–	–	(17,453)
Depreciation/amortisation charge for the year	101,952	6,276	64,345	72,516	245,089
Write-offs	(5,656)	–	–	–	(5,656)
Accumulated depreciation/amortisation charge as at 30 June 2001	255,542	47,163	174,605	93,661	570,971
Net book value as at 30 June 2001	**265,595**	**38,722**	**120,081**	**238,451**	**662,849**
Net book value as at 1 July 2000	**236,078**	**10,351**	**68,875**	**120,103**	**435,407**

	2001 $	2000 $
Note 10C. Intangibles		
Computer software:		
Externally acquired – at cost	46,106	39,063
Accumulated Amortisation	(31,927)	(17,248)
	14,179	21,815
Internally developed – at cost	286,016	98,288
Accumulated Amortisation	(61,744)	–
	224,272	98,288
Total	238,451	120,103

Note 11. Interest Bearing Liabilities

11A. Overdraft		
Cash at bank	–	926,077

Note 12. Provisions

Note 12A. Employees		
Salaries and wages	139,065	168,719
Superannuation	19,099	–
Leave	291,687	204,331
Total	449,851	373,050

Note 13. Payables

Note 13A. Suppliers		
Trade creditors	329,810	252,024
GST payable	63,323	–
Total	393,133	252,024

Note 13B. Research & Development expenses		
Non-profit institutions	612,252	254,944
Contributions not yet utilised (see Note 4)	2,213,026	2,004,214
Contributions in advance	250,000	195,000
Total	3,075,278	2,454,158

Note 14. Equity – Accumulated results

	2001 $	2000 $
Balance at 1 July 2000	**1,690,920**	1,453,871
Surplus/ (Deficit)	**418,621**	237,049
Balance at 30 June 2001	**2,109,541**	1,690,920

Note 15. Cash Flow Reconciliation

Reconciliation of operating surplus to net cash provided by operating activities

Operating surplus/(deficit)	**418,621**	237,049
Depreciation and amortisation of property, plant & equipment	**168,676**	177,750
Amortisation of intangibles	**76,413**	–
Property, plant & equipment written off	**6,542**	–
(Profit)/loss on disposal of property, plant & equipment	**11,092**	–
Changes in assets and liabilities		
(Increase)/decrease in receivables	**(530,896)**	(29,850)
Increase/(decrease) in employee provisions	**76,803**	77,195
Increase/(decrease) in trade creditors	**77,787**	135,215
Increase/(decrease) in Research & Development expenses payable	**621,120**	(1,977,359)
Net cash from operating activities	**926,158**	(1,380,000)

Note 16. Subsequent events

Since balance date, the Corporation is not aware of any events that have occurred which will effect the amounts disclosed in the Financial Statements.

Note 17. Director Remuneration

The part-time Directors of the Corporation received remuneration and allowances as determined by the Remuneration Tribunal. In accordance with the *PIERD Act*, the part-time Directors are appointed by a Selection Committee. The Executive Director was the only full-time Director of the Corporation.

	2001 **$**	2000 $
Aggregate amount of superannuation payments in connection with the retirement of directors	**–**	21,334
Other remuneration received or due and receivable by directors of the Corporation	**369,592**	264,930
Total remuneration received or due and receivable by directors of the Corporation	**369,592**	286,264

The number of directors of the Corporation included in these figures are shown below in the relevant remuneration bands:	**Number**	
■ Nil – $ 10,000	**1**	1
■ $ 10,001 – $ 20,000	**–**	6
■ $ 20,001 – $ 30,000	**6**	–
■ $ 30,001 – $ 40,000	**1**	1
■ $130,001 – $140,000	**–**	1
■ $160,001 – $170,000	**1**	–
	9	9

Note 18. Related Party Disclosures

The Directors of the Corporation during the year were:

Mr J Alexandra – (Reappointed 1 July 1999)
Mrs L Boully – (Reappointed 1 July 1999)
Prof. S Bunn – (Appointed 1 July 1999)
Mr AD Campbell – (Chairperson – appointment ceased at 30 June 2001)
Mr CA Campbell – (Executive Director – appointed February 2000)
Mrs S Donaldson – (Appointed 1 July 1999)
Mr M Logan – (Appointed 1 July 1999)
Mr W Watkins – (Reappointed 1 July 1999)
Mr C Willcocks – (Government Director – appointed March 1998)

The aggregate remuneration of Directors is disclosed in Note 17.

Loans with Directors and Director-related entities

There were no loans made to Directors or Director-related entities.

Other Transactions with Directors or Director related entities

Research & Development expenses were made to the following director-related entities. The directors involved took no part in the relevant decisions of the Board.

Mrs L Boully	Chairman, CSIRO Biodiversity Sector Advisory Committee.
Prof. S Bunn	Director, Centre for Catchment and In-Stream Research, Griffith University.
Mr CA Campbell	Director, Rural Extension Centre, University of Queensland.
	Member, CSIRO Land and Water Sector Advisory Committee.
Mrs S Donaldson	Member, Advisory Committee, Centre for Resource and Environmental Studies, Australian National University.
Mr C Willcocks	General Manager, Landcare and Regional Capacity, Natural Resource Management, Agriculture, Fisheries and Forestry Australia;
	Member, Advisory Committee, Centre for Resource and Environmental Studies, Australian National University.

The sector advisory committee performs a strategic and advisory role and is removed from direct research operations in particular contractual arrangements with external funding bodies including Land & Water Australia. The Corporation provided research funding to the above agencies. These transactions occurred within the normal terms and conditions of research and development expenses.

	2001 $	2000 $
Research & Development expenses made to director related entities	**3,694,556**	5,453,224

These Research & Development expenses for the 2000–01 year were provided to director related entities as follows:

Entity	2001 $
Australian National University	266,267
CSIRO Land and Water and Biodiversity Sectors	3,253,511
Griffith University	123,892
University of Queensland	50,886
Total	**3,694,556**

The Corporation has also received contributions from director related entities to jointly-funded projects with the Natural Heritage Trust, Agriculture, Fisheries and Forestry Australia. These transactions occurred within the normal terms and conditions of research and development agreements.

Note 19. Remuneration of Officers

	2001	2000
The aggregate amount of total Remuneration of Officers shown is:	**1,165,493**	457,000

The number of officers who received or were due to receive total remuneration of $100,000 or more:

	2001	2000
Between $100,001 – $110,000	**2**	1
Between $110,001 – $120,000	**1**	1
Between $120,001 – $130,000	**2**	2
Between $130,001 – $140,000	**1**	–
Between $170,001 – $180,000	**–**	1
Between $190,001 – $200,000	**1***	–
Between $240,001 – $250,000	**1***	–
	8	5

The officer remuneration includes all officers concerned with or taking part in the management of the Corporation during 2000–01 except the Executive Director. Details in relation to the Executive Director have been incorporated in *Note 17.1 – Remuneration of Directors*. The total remuneration paid to officers in the 1999–2000 year has been amended to incorporate accrued bonuses that were not reflected in the 2000 Financial Statements. In addition, the 1999–2000 amount did not include accrued leave.

* At the direction of the National Land & Water Resources Audit Advisory Council, the officers of the Audit received a retention allowance in recognition of the requirement for specialist expertise to be retained at least until 30 June 2001. These payments referred to a three-year period; however, the entire payment is reflected in this year's financial statements.

Note 20. Remuneration of Auditors

	2001	2000
Remuneration to the Auditor-General for auditing the financial statements for the reporting period	**14,500**	12,000

No other services were provided by the Auditor-General during the reporting period.

Note 21. Financial instruments

(a) Terms, conditions and accounting policies

Financial Instrument	Notes	Accounting Policies and Methods (including recognition criteria and measurement basis)	Nature of underlying instrument (including significant terms & conditions affecting the amount, timing and certainty of cash flows)
Financial assets		Financial assets are recognised when control over future economic benefits is established and the amount of the benefit can be reliably measured	
Cash at bank	9A	The balance is recognised at the nominal amount. Interest is credited to revenue as it accrues. A negative balance arises when unpresented cheques exceed the current bank balance and this is disclosed as an overdraft.	Temporarily surplus funds, mainly from monthly drawdowns of appropriation, are placed in a cheque account with the Commonwealth Bank. Interest is earned on the daily balance at the prevailing daily rate for money on call and is paid at month end. CBA Bank Rating: AAA
Cash on hand	9A	Petty cash held on premises	
Deposits at call	9A	Deposits are recognised at their nominal amounts. Interest is credited to revenue as it accrues	Temporarily surplus funds, mainly from monthly drawdowns of appropriation, are placed on deposit at call with the Commonwealth Bank and Bankers Trust. Interest is earned on the daily balance at the prevailing daily rate for money on call and is paid at month end. CBA Bank Rating: AAA. Bankers Trust Bank Rating: AAA
Receivables for goods & services	9B	These receivables are recognised at the nominal amounts due less any provision for bad and doubtful debts. Provisions are made when collection of the debt is judged to be less rather than more likely.	Credit terms are net 7–14 days (1999–2000: 14 days)
Term deposit	9C	The Term deposit is recognised at cost. Interest is recognised as it is earned.	Term deposits are with Trust Bank and Adelaide Bank, maturing in 2000–2001, and they earn an effective rate of interest of 5.55% and 6.40% respectively. Interest is payable on maturity. Trust Bank Rating: A2; Adelaide Bank Rating A2
Financial liabilities		Financial liabilities are recognised when a present obligation to another party is entered into and the amount of the liability can be reliably measured.	
Contributions not yet utilised and in advance	13B	The Corporation brings income to account in the same period as expenditure is incurred; therefore any contributions not utilised are recorded as a liability.	There are agreements with third party contributors that contributions will be spent on R&D projects and other activities relating to specified programs. The Corporation is the administrator of the funds.
Trade creditors	13A	Creditors and accruals are recognised at their nominal amounts, being the amounts at which the liabilities will be settled. Liabilities are recognised to the extent that the goods or services have been received (and irrespective of having been invoiced).	Settlement is usually made net 14 days.
Research & Development expenses: non-profit institutions	13B	The Corporation recognises a liability on the signing of grant agreements. The amount of the liability is for the total of all payments under the agreement, which are no longer at the Corporation's discretion. The part of the liability recognised in the Balance Sheet comprises payments, which are more rather than less likely to be made.	Grant payments are made in installments according to the grantee meeting agreed milestones and subject to funds being appropriated annually by the Parliament. The Corporation does not necessarily appropriate the benefits of the research to itself and any benefit it receives will only coincidentally approximate in value the grant made.

Note 21. Financial instruments (cont.)

(b) Interest rate risk

Financial Instrument	Notes	Floating Interest Rate		Fixed Interest Rate	
				1 year or less	
		00–01 $	99–00 $	00–01 $	99–00 $
Financial Assets (Recognised)					
Cash at bank	9A	**2,309,262**	–	**–**	–
Cash on hand	9A	**–**	–	**–**	–
Deposits at call	9A	**1,217,339**	3,549,761		–
Receivables for Goods and Services	9B	**–**	–	**–**	–
Term deposit	9C	**–**	–	**561,618**	1,027,923
Total Financial Assets (Recognised)		**3,526,601**	3,549,761	**561,617**	1,027,923
Total assets					
Financial Liabilities (Recognised)					
Bank overdraft	11A	**–**	926,077	**–**	–
Contributions not yet utilised and in advance	13B	**–**	–	**–**	–
Trade creditors	13A	**–**	–	**–**	–
R&D expenses: non-profit institutions	13B	**–**	–	**–**	–
Total Financial Liabilities (Recognised)		**–**	926,077	**–**	–
Total Liabilities					

Fixed Interest Rate		Non-Interest bearing		Total		Weighted Average	
1 to 2 years						Effective Interest Rate	
00-01 $	99-00 $	00-01 $	99-00 $	00-01 $	99-00 $	00-01 $	99-00 $
–	–	–	–	2,309,262	–	1.05	–
–	–	496	1,118	496	1,118		
–	–			1,217,339	3,549,761	4.53	5.7
–	–	1,276,239	682,020	1,276,239	682,020		
–	–	–	–	561,618	1,027,923	6.4	6.0
–	–	1,276,735	683,138	5,364,954	5,260,822		
				6,027,804	5,696,229		
–	–	–	–	–	926,077		
–	–	2,463,026	2,199,215	2,463,026	2,199,215		
–	–	393,133	252,024	393,133	252,024		
–	–	612,252	254,944	612,252	254,944		
		3,468,411	2,706,183	3,468,411	3,632,260		
				3,918,265	4,005,309		

Note 21. Financial instruments (cont.)

(c) Net Fair Values of Financial Assets and Liabilities

Financial assets

The net fair value of cash on hand, deposits on call, receivables for goods and services and term deposit approximate their carrying amounts.

Financial liabilities

The net fair values of cash at bank, contributions not yet utilised and in advance, trade creditors and Research & Development expenses are approximated by their carrying amounts.

(d) Credit Risk Exposures

The Corporation's maximum exposures to credit risk at reporting date in relation to each class of recognised financial asset is the carrying amount of those assets as indicated in the Statement of Financial Position.

The Corporation has no significant exposures to any concentration of credit risk.

Appendices

Appendix 1
Glossary of Terms

AAA	Agriculture, Advancing Australia
ABOA	Australian Bibliography of Agriculture
AFFA	Department of Agriculture, Fisheries and Forestry – Australia
ANAO	Australian National Audit Office
ANCID	Australian National Committee on Irrigation and Drainage
ANU	Australian National University
ANZLIC	Australia New Zealand Land Information Council
AOP	Annual Operational Plan
APEN	Australasia Pacific Extension Network
APSIM	Agricultural Production Systems Simulation
ARRIP	Australian Rural Research in Progress
Audit	National Land and Water Resources Audit
AUSRIVAS	Australian River Assessment Scheme
CAC Act	*Commonwealth Authorities and Companies Act 1997*
COAG	Council of Australian Governments
CRC	Cooperative Research Centre
CRCFE	CRC for Freshwater Ecology
CSIRO	Commonwealth Scientific and Industrial Research Organisation
CVAP	Climate Variability in Agriculture R&D Program
DRDC	Dairy Research & Development Corporation
DSS	Decision Support System
EA	Environment Australia

EDYS	Ecological Dynamics Simulation
EFDSS	Environmental Flows Decision Support System
EFMI	Environmental Flows Management Initiative
ESD	Ecologically Sustainable Development
FFP	Frequent Flyer Points
FNARH	First National Assessment of River Health
FOI	Freedom of Information
FWPRDC	Forest and Wood Products R&D Corporation
GIS	geographic information systems
GRDC	Grains R&D Corporation
GST	Goods and Services Tax
IAA	Irrigation Association of Australia
ISO	International Standards Organisation
JVAP	Joint Venture Agroforestry R&D Program
MDBC	Murray-Darling Basin Commission
MLA	Meat & Livestock Australia
MRHI	Monitoring River Health Initiative
NDSP	National Dryland Salinity Program
NEMP	National Eutrophication Management Program
NFF	National Farmers' Federation
NHT	Natural Heritage Trust
NPIRD	National Program for Irrigation R&D
NRC	National Rivers Consortium
NRCP	National River Contaminants Program
NRHP	National River Health Program
NRM	natural resource management
NVIS	National Vegetation Information System
OGIT	Office of Government Information Technology
PIERD Act	*Primary Industries and Energy Research & Development Act 1989*
R&D	Research & Development
RAAL	Redesigning Agriculture for Australian Landscapes R&D Program
RDC	R&D corporations
RIRDC	Rural Industries R&D Corporation
RMIT	Royal Melbourne Institute of Technology
SCARM	Standing Committee on Agriculture and Resource Management
SGS	Sustainable Grazing Systems
SIRP	Social and Institutional Research Program
SRDC	Sugar Research and Development Corporation
WUE	water use efficiency
www	World Wide Web

Appendix 2

Land & Water Australia Communication Products

THE FOLLOWING LIST identifies communication products produced between 1 July 2000 and 30 June 2001. Land & Water Australia saleable products are available from the Canprint on freecall 1-800-776-616 or email <lwa@canprint.com.au>.

As well as the standard product code, title, author/editor and book number, all listings show WebSite locations from which .PDF files may be downloaded and the prices. The WebSite addresses must be prefixed (in the usual way) with www.

Occasional Papers Series (ISSN 1320–0992)

Product Code	*Publication Title*	*Authors/Editors*	*Book Number*	*PDF at www.+ [WebSite]*	*Price*
PR 000236	Information Package on Soil Water Monitoring (Irrigation Insights 1)	*P. Charlesworth*	*ISBN 0 642 76036 5*	*lwa.gov.au npird.gov.au*	*$55*
PR 990219	*Case Studies in Increasing the Adoption of Sustainable Resource Management Practices*	*Art Shulman and Richard Price*	*ISBN 0 642 26750 2*	*lwa.gov.au*	*$27.50*
PR 000251	Opportunities to breed/select/ bioengineer plant species to control deep drainage and nutrient leakage	*David Clarke and R. Downes*	*ISBN 0 642 76047 0*	*lwa.gov.au*	*$22*
PR 000212	Estimating the water requirements for plants of floodplain wetlands – A guide	*J. Roberts, B. Young and F. Marston*	*ISBN 0 642 76024 1*		*$22*

PR 000186	Identifying and protecting rivers of high ecological value	*Helen Dunn*	*ISBN 0 642 76018 7*	*lwa.gov.au*	*$11*
PR 010257	Nitrogen Workshop 2000	*Barry Hart and M. Grace*	*ISBN 0 642 76052 7*	*lwa.gov.au*	*Free*
PR 010187	River Restoration Framework	*J.D. Koehn, G.J. Brierly, B.L. Cant and A.M. Lucas*	*ISBN 0 642 76056 X*	*lwa.gov.au*	*Free*
PR 010196	Principles and Tools for Protecting Australian Rivers	*N. Phillips, J. Bennett and D. Moulton*	*ISBN 0 642 760586*	*lwa.gov.au*	*Free*

Other Land & Water Australia Publications

Product Code	*Publication Title*	*Authors/Editors*	*Book Number*	*PDF at www.+ [WebSite]*	*Price*
PR 000003	Annual Report 1999–2000	*Land & Water Australia*	*ISSN 1037-6658*	*lwa.gov.au*	*Free*
PR 010328	*Riparian Land Management Technical Guideline – Update No. 1* 'Designing filter strips to trap sediment and attached nutrient'	*Ian Prosser and L. Karssies and CSIRO*	*ISBN 1445-3924*		*Free*
PF 000025	Are there seeds in your wetland? Assessing wetland vegetation	*Margaret Brock and Sally Berridge*	*ISBN 0 642 266921*	*lwa.gov.au*	*Free*
PF 000026	Are there seeds in your wetland? Revegetating wetlands.	*Margaret Brock and Sally Berridge*	*ISBN 0 642 76041 1*	*lwa.gov.au*	*Free*
PF 000027	Does your wetland flood and dry? Water regime and wetlands plants.	*Margaret Brock and Sally Berridge*	*ISBN 0 642 76042 X*	*lwa.gov.au*	*Free*
PR 000329	Landholder perceptions of remnant vegetation on private land in the box-ironbark region of Northern Victoria	*S.D. Hamilton, P.D. Dettmann and A.L. Curtis*	*ISBN 0 642 54008 X*	*lwa.gov.au*	*Free*
PR 000333	Economics of Remnant vegetation	*Michael Lockwood*	*ISBN 0 642 76038 1*	*lwa.gov.au*	*Free*
PR 000336	The value of native vegetation	*John Cary*	*ISBN 0 642 76039 X*	*lwa.gov.au*	*Free*
PR 000341	Looking to the farm business.	*J. Crosthwaite and B. Malcolm*	*ISBN 0 642 76046 2*	*lwa.gov.au*	*Free*
PR 000342	Islands of bush in a sea of pines: Summary of studies from the Tumut fragmentation experiment.	*D. Lindenmayer*	*ISBN 0 642 76049 7*	*lwa.gov.au*	*Free*
PR 000339	Managing the Bush	*Jann Williams*	*ISBN 0 642 76040 3*	*lwa.gov.au*	*Free*
PR 010012	Landscape Conservation and the Non-Government Sector	*Carl Binning and P. Feilman*	*ISBN 0 642 54717 3*		*Free*

Newsletters

Product Code	*Publication Title*	*Issue Numbers*	*Book Number*	*PDF at www.+ [WebSite]*	*Price*
PN 000097 – Issue 4; *PN 010098 – Issue 5*	CLIMAG	*4–5*	*ISSN1441-7987*	*lwa.gov.au* *cvap.gov.au*	*Free*
PN 000143 – Issue 18; *PN 000144 – Issue 19;* *PN 000145 – Issue 20*	Focus	*18–20*	*ISSN1321-4381*	*lwa.gov.au* *ndsp.gov.au*	*Free*
PN 000124 – Issue 3; *PN 000125 – Issue 4*	SALT – *magazine of the National Dryland Salinity Program*	*3–4*	*N/A*	*lwa.gov.au* *ndsp.gov.au*	*Free*
PN 00015 – Issue 17; *PN 00016 – Issue 18* *PN 00017 – Issue 19*	RIPRAP	*17–19*	*ISSN 1324-6941*	*lwa.gov.au* *rivers.gov.au*	*Free*
PN 000168	WaterWheel	*14–15*	*ISSN1324-4604*	*lwa.gov.au* *npird.gov.au*	*Free*
PN000101	Rivers for the Future *(Publication discontinued)*	*12*	*ISSN 1325-1953*		*Free*

Miscellaneous Publications

Publication Title	*Issue Numbers*	*Book Number*	*PDF at www.+ [WebSite]*	*Price*
Innovate Australia *(published by joint R&D Corporations – enquiries to GRDC for copies)*	*6–8*	*ISSN 1442-6277*	*lwa.gov.au* *innovateaustralia.com/*	*Free*
Australian Landcare *(published by Rural Press – with sponsorship by Land & Water Australia and others)*	*September and December 200; March and June 2001*	*ISSN 1440-4397*		*Free*
Sustainable use of Rangelands in the 21st century *(on the road to a better future for the Western Division of NSW)*	*CSIRO Sustainable Ecosystems, NSW Department of Land and Water Conservation and Land & Water Australia*	*N/A*	*lwa.gov.au* *cse.csiro.au/nsw_rangelands*	*Free*

Electronic Communication Products

Product Code	*Title*	*Authors*	*Product Type*	*Price*
EC 010029	A Process for Rehabilitating Australian Streams	*Ian Rutherfurd, K. Jerie and N. Marsh*	*CD-ROM*	*Free*
EC 010030	Native Vegetation Research Reports	*Land & Water Australia and Bushcare*	*CD-ROM*	*Free*
EV 000369	Assessing the health of our rivers	*NRHP*	*Video*	*Free*

Previously published Land & Water Australia publications

PDF files are now available only at <www.lwa.gov.au>

PR 980234	Regional Resource Use Planning in the Rangelands	*Alan Dale and Jenny Bellamy*	*ISBN 0 642 26719 7*	*$11*
PR 990194	Social, Economic, Legal, Policy and Institutional R&D for Natural Resources Management: Issues and Directions for the Land & Water Resources Research & Development Corporation	*Catherine Mobbs and Steve Dovers*	*ISBN 0 642 26742 1*	*$11*
PR 940206	National Program for Irrigation R&D: Technology Transfer and Adoption in Irrigation	*Jeremy Cape, S. Chamala and G. Syme*	*ISBN 0 642 20586 8*	*Free*
PR 950207	RIVERCARE: Guidelines for Ecologically Sustainable Management of Rivers and Riparian Vegetation	*A.W. Raine and J. Gardiner*	*ISBN 0 642 20608 2*	*Free*
PR 990308	Cost of algal blooms	*Atech Group Pty Ltd*	*ISBN 0 642 76014 4*	*$5.50*
PK 010021	Sustainable Stream Management in North-East Queensland (booklet)	*R. Kapitzke*	*N/A*	*Free*
PR 980314	The Cotton Model	*Cox Inall Communication*	*ISBN 0 642 26732 4*	*Free*
PR 960038	Review of Research and Development Opportunities for Using Seasonal Climate Forecasts in the Australian Water Industry	*A.B. Long and T. McMahon*	*ISBN 0 642 20625 2*	*Free*
PR 980193	Microbial Indicators of River Health – 1997 Workshop.	*Duncan Veal (Editor)*	*ISBN 0 642 26714 6*	*$11*
PR 980287	Report of the National Program for Irrigation R&D Benchmarking Project	*Barraclough & Co. Pty Ltd*	*ISBN 0 642 26730 8*	*$11*
PR 930213	Remnant Vegetation in the Rural Landscape: A Consultancy Report	*Judy Lambert*	*ISBN 0 642 16772 9*	*Free*
PR 970192	National Wetlands Research & Development Program Scoping Review	*Stuart Bunn*	*ISBN 0 642 20647 3*	*$8.80*
PR 960208	Biological Impact of Cotton Pesticides	*K.H. Bowmer, P.G. Fairweather, G.M. Napier and A.C. Scott*	*ISBN 0 642 20617 1*	*Free*
PR 980297	Audit & Strategy on Irrigation Education & Skills Development in Australia	*W. Meyer and A. Taylor.*	*ISBN 0 642 26736 7*	*Free*
PR 980295	Assessing the causes, impacts, costs and management of dryland salinity	*Lin Martin and Jenni Metcalf*	*ISBN 0 642 26734 0*	*$11*
PR 980299	Dryland Salinity R&D Foresighting Analysis	*D Alexander, B. Williams and R. Trewin*	*ISBN 0 642 26738 3*	*Free*
PR 940189	National Whole Catchment Management: a review & analysis of processes	*G Syme, J Butterworth, B Nancarrow*	*ISBN 0 642 20584 1*	*$11*

PR 940252	Quantification & Prediction of Recharge with Changed Land Use: Report of a workshop	*Adrian Webb and Richard Price*	*ISBN 0 642 20594 9*	*Free*
PR 940258	Remote Sensing Methods for Identification of Salinity: Report of a Workshop	*Adrian Webb and Richard Price*	*ISBN 0 642 20595 7*	*Free*
PX 990002	Acid Soil Action Manual – Invest for your soil now & future	*Carole Hollier – editor*	*ISBN 0 7311 4309 4*	*Free*
PR 980274	Themes and experimental protocols for sustainable grazing systems	*G.M. Lodge – editor*	*ISBN 0 642 26726 X*	*Free*
PR 980319	Water and Nitrogen Balance in Natural and Agricultural Systems in the Wet Tropics of North Queensland: A Review	*K.L. Bristow, P.J. Thorburn, C.A. Sweeney and H.P. Bohl*	*ISBN 0642267472*	*Free*
PR 970079	Guidelines for the Selection of Evaluation Techniques to Assess R&D Programs	*AACM International Pty Limited*	*ISBN 0 642 20650 3*	*Free*
PR 970086	Evaluation of the Impact of Research Projects Related to Australia's Natural Resources (1995–96 Group; Phase 1)	*ACIL Economics & Policy Pty Limited*	*ISBN 0 642 26693 X*	*Free*
PR 990081	Evaluation of the Impact of Research Projects Relating to Australia's Natural Resources (1998 Series)	*Atech Group Pty Ltd*	*ISBN 0 642 26753 7*	*Free*
PR 990083	Evaluation of the Impact of Research Projects Relating to Australia's Natural Resources (Second Update, 1993)	*Steve Harrison, Clem Tisdell, J.G. Tisdell and M.J. McGregor*	*ISBN 0 642 26754 5*	*Free*
PR 970084	Evaluation of the Impact of Research Projects Relating to Australia's Natural Resources (1993 Group; Phase 2)	*Steve Harrison & Clem Tisdell*	*ISBN 0 642 20652 X*	*Free*
PR 990085	Evaluation of the Impact of Research Projects Relating to Australia's Natural Resources (1995–96 Group; Phase 2)	*ACIL Consulting*	*ISBN 0 642 26772 3*	*Free*
PR 980080	Ex-Ante Evaluation of Selected Research Projects 1997	*Peter Sloane*	*ISBN 0 642 26737 5*	*$22*
PR 970082	Ex-Post Evaluation of Selected Research Projects	*Sloane Cook & King Pty Ltd*	*ISBN 0 642 20651 1*	*Free*
PR 990302	Greenhouse, carbon trading and land management	*Hassall & Associates*	*ISBN 0 642 26776 6*	*Free*
PR 980261	Implementation Pathways for Best Management Practice.	*James Doak*	*ISBN 0 642 26723 5*	*$5.50*
PR 000078	Investment in Natural Resources R&D: A Synthesis of Life of Project Evaluations	*Peter Chudleigh*	*ISBN 0 642 76016 0*	*Free*
PR 990304	Issues in Natural Resources Management – datasheets	*Land & Water Australia*	*ISBN 0 642 26778 2*	*Free*
PR 940276	Natural Resource Communication Workbook	*Jenni Metcalfe and Diana Wolfe*	*ISBN 0 642 20599 X*	*Free*
PR 010017	National Program for Irrigation R&D: Discussion Paper for a Proposed Research Strategy	*C. Forster, J. Cantor, D. Mittelheuser and E. Parr*	*ISBN 0 642 19296 0*	*Free*

PR 980287	Report of the National Program for Irrigation R&D Benchmarking Project	*Barraclough & Co. P/L*	*ISBN 0 642 26730 8*	*$11*
PR 980301	Minimising the impact of pesticides on the riverine environment: key findings from research with the cotton industry – 1998 conference	*N. Schofield and V. Edge (eds)*	*ISBN 0 642 26741 3*	*$11*
PR 980278	Quality Assurance in Pesticide Sampling and Analysis	*Ivan Kennedy et al*	*ISBN 0 642 26727 8*	*$11*
PR 980249	Foresighting Sustainable Irrigation and River Health	*Ron Johnston and Peter Chudleigh*	*ISBN 0 642 26721 9*	*Free*
PR 980303	Comparative evaluation of environmental flow assessment techniques: R&D requirements	*A.H. Arthington et al.*	*ISBN 0 642 26743 X*	*Free*
PR 940268	Nutrient Loadings & Algal Blooms in Australian Waters – a discussion paper	*G.P. Harris*	*ISBN 0 642 20597 3*	*Free*
PR 010257	Nitrogen Workshop 2000: Sources, transformations, effects and management of nitrogen in freshwater ecosystems	*Barry Hart and Mike Grace*	*ISBN 0642 76052 7*	*Free*
PR 980305	Comparative evaluation of environmental flow assessment techniques: Best Practice framework	*A.H. Arthington, S.O. Brizga, M.J. Kennard*	*ISBN 0 642 26744 8*	*Free*
PR 980307	Comparative evaluation of environmental flow assessment techniques:review of holistic methodologies	*A.H. Arthington*	*ISBN 0 642 26745 6*	*Free*
PR 980309	Comparative evaluation of environmental flow assessment techniques: review of methods	*A.H.Arthington and J.M. Zalucki (eds)*	*ISBN 0 642 26746 4*	*Free*
PR 950215	Improved Management of Exotic Aquatic Fauna: R&D for Australian Rivers	*Arthington, A. and Bluhdorn, D*	*ISBN 0 642 20609 0*	*Free*
PR 980202	Interpreting the Outputs from AUSRIVAS	*L.A. Barmuta, B.C. Chessman & B.T. Hart*	*ISBN 0 642 26715 4*	*$11*
PR 000324 & PR 000325	A Rehabilitation Manual for Australian Streams Vol 1 and Vol 2	*Ian Rutherfurd, Kathryn Jerie & Nicholas Marsh*	*N/A*	*$27.50 set of two*
PR 980281	Research and development needs for river restoration in Australia	*Ian Rutherfurd et al*	*ISBN 0 642 26728 6*	*$11*
PR 990300	A Phytoplankton Methods Manual for Australian Freshwaters	*Roger Croome, Gertraud Hotzel*	*ISBN 0 642 26771 5*	*Free*
PR 990211	Contamination of Australian Groundwater Systems with Nitrate	*P. Bolger & M. Stevens*	*ISBN 0 642 26749 9*	*$11*
PR 980270	Dependence of Ecosystems on Groundwater and its Significance to Australia	*Tom Hatton & Richard Evans*	*ISBN 0 642 26725 1*	*$11*
PR 990243	Limiting Nutrient Workshop 1997	*Alistar Robertson*	*ISBN 0 642 26755 3*	*Free*
PR 980284	Phosphorus in the Landscape: Diffuse Sources to Surface Waters	*Dr David Weaver, Dr Nicholas Austin, Professor Malcolm McCulloch and others*	*ISBN 0 642 26740 5*	*Free*

PR 000220	The National Eutrophication Management Program – A Review	*Agtrans Research and R. Groome*	*ISBN 0 642 76026 8*	*Free*
PR 990327	Wetland Research – Restoring the Balance	*Econnect*	*N/A*	*Free*
PF 990069	*Guidelines (1–7) for the Management of Riparian Lands Fact Sheet:* 1. Managing Riparian Lands	*Land & Water Australia*	*N/A*	*Free*
PF 990070	2. Riparian Management for Streambank Stability	*Land & Water Australia*	*N/A*	*Free*
PF 990071	3. Riparian Management for Water Quality	*Land & Water Australia*	*N/A*	*Free*
PF 990072	4. River Ecosystems	*Land & Water Australia*	*N/A*	*Free*
PF 990073	5. Land-Based Ecosystems	*Land & Water Australia*	*N/A*	*Free*
PF 990074	6. Managing Stock in Riparian Land	*Land & Water Australia*	*N/A*	*Free*
PF 990075	7. Snag Management	*Land & Water Australia*	*N/A*	*Free*
PR 970034	DroughtPlan – developing, with graziers, profitable and sustainable strategies to manage for rainfall variability	*S. Smith*	*ISBN 0 642 26696 4*	*$11*
PR 960033	Improved Management of Climate Risk	*Peter Ridge and Peter Wylie*	*ISBN 0 642 20622 8*	*Free*
PR 960041	Managing with Climate Variability Conference: 'Of droughts and flooding rains'	*Land & Water Australia*	*ISBN 0 642 20615 5*	*$11*
PR 960038	Review of Research and Development Opportunities for Using Seasonal Climate Forecasts in the Australian Water Industry	*Alexis B. Long and Tom A. McMahon*	*ISBN 0 642 20625 2*	*Free*
PR 000076	SHEF (Self-Help Evaluation Framework for Integrated Catchment Management)	*CSIRO*	*ISBN 0 642 26735 9*	*$11*
PR 980293	Sustainability in a Commercial Context: Potential for Innovative Market-Based Approaches	*Fiona Scott, Geoff Kaine, Randy Stringer and Kym Anderson*	*ISBN 0 642 26733 2*	*Free*
PR 990332	Beyond roads, rates & rubbish	*Carl Binning, Mike Young and Emily Cripps*	*N/A*	*Free*
PR 990338	Conservation hindered	*C Binning and M Young.*	*ISBN 0 642 54006 3*	*Free*
PR 990340	Talking to the Taxman about Nature Conservation	*Carl Binning and Mike Young*	*N/A*	*Free*
PR 990203	Exploring the Future Requirements for Managing Australia's Natural Resources: Remnant Vegetation	*Peter Chudleigh and Ron Johnston*	*ISBN 0 642 26748 0*	*$5.50*
PR 980331	More than just the odd tree: report on incentives and barriers to rural woodland conservation, using grassy White Box as a model	*Jane Elix and Judy Lambert*	*ISBN 0 642 54001 2*	*Free*

PR 970330	Motivating People – Using Management Agreements to Conserve Remnant Vegetation	*Carl Binning and Mike Young.*	*ISBN 0 642 54000 4*	*Free*
PR 960337	Native vegetation on farms survey 1996: a survey of farmers' attitudes to native vegetation and landcare in the wheatbelt of Western Australia	*Suzanne Jenkins*	*ISBN 0 642 54003 9*	*Free*
PR 990335	Opportunity denied	*Emily Cripps, Carl Binning & Mike Young*	*N/A*	*Free*
PR 980334	Remnant native vegetation – perceptions and policies: a review of legislation and incentive programs	*Denys Slee and Associates*	*ISBN 0 642 54002 0*	*Free*
PR 950239	Socio-economic Aspects of Maintaining Native Vegetation on Agricultural Land	*Phil Price (Ed).*	*ISBN 0 642 20612*	*Free*
PR 960259	Proceedings of a workshop on land management research for the Army's Townsville Field Training Area (TFTA)	*Land & Water Australia*	*ISBN 0 642 20635 X*	*Free*

Appendix 3

National Land & Water Resources Audit Publications 2000–2001

ALL AUDIT REPORTS or their executive summaries are available through the Audit WebSite at <www.nlwra.gov.au>, by emailing <info@nlwra.gov.au> or contacting the Audit office in Canberra.

Project Reports completed in 2000–2001 are available through the Atlas WebSite <www.nlwra.gov.au/atlas>.

August 2000	Annual Report of the National Land and Water Resources Audit 1999–2000	
November 2000	Australian collaborative rangelands information system, operation manual v.1.0	ISBN 0 642 371105
November 2000	Rangelands, Tracking Changes. Australian Rangelands Information System	ISBN 0 642 371067
December 2000	Fast Facts 21 Dryland salinity in Australia	ISBN 0 642 371091
January 2001	Horticulture productivity & sustainability *(joint publication with Horticultural Research and Development Corporation)*	ISBN 0 7341 0173 2
January 2001	Australian dryland salinity assessment 2000	ISBN 0 642 371067
February 2001	Australian water resources assessment 2000	ISBN 0 642 371032
March 2001	Fast Facts 22 Water use and availability in Australia – key findings.	ISBN 0 642 371121

March 2001	Fast Facts 23 Water quality in Australia – key findings.	ISBN 0 642 37113X
March 2001	Water resources in Australia – A summary of the National Land and Water Resources Audit Australian Water Resources Assessment 2000	
March 2001	Dryland salinity in Australia – A summary of the National Land and Water Resources Audit Australian Dryland Salinity Assessment 2000	
May 2001	Fast Facts 24. Assessing Australia's native vegetation.	ISBN 0 642 371156

Appendix 4

Land & Water Australia R&D Projects 2000–2001

The following is an abbreviated listing of current Land & Water Australia R&D projects (ie. those with investments during 2000–2001). They are grouped by Arena and Program title. Contact details for the projects and researchers are available from Land & Water Australia at <public@lwa.gov.au>, facsimile (02) 6257 3420 or telephone (02) 6257 3379.

National Land and Water Resources Audit

No.	Code	Project	Researcher	Organisation
1	ABA10	Estimating the cost (production losses) of degradation to Australian agriculture – a survey approach.	Mr Colin Mues	ABARE
2	AGT8	Monitoring and Evaluation of the National Land and Water Resource Audit	Dr Peter Chudleigh	Agtrans Research
3	AMH2	National Reporting Framework – Rangelands	Mr Alec Holm	Alexander Holm and Associates
4	ANU20	Derivation of nested catchments and sub-catchments for the Australian continent	Dr Michael Hutchinson	Australian National University
5	BRR10	Catchment water balance and land use impacts Consultancy	Jane Coram	Bureau of Rural Sciences
6	BRR16	Integrated Social and Economic Database System for Sustainable Management: Social Atlas	Associate Professor John Cary	Bureau of Rural Sciences

No.	Code	Project	Researcher	Organisation
7	BRR17	Provision of Data Management Services to the NLWRA	Dr Steve Blake	Bureau of Rural Sciences
8	BRR18	Compilation of a database of socio-economic indicators for the Rangelands	Dr Gerald Haberkorn	Bureau of Rural Sciences
9	BRR5	Land use mapping for continent using AVHRR data Consultancy	Mr Simon Veitch	Bureau of Rural Sciences
10	BRR9	Australian Soil Resource Information System Consultancy	Dr Colin Chartres	Bureau of Rural Sciences
11	CCM6	Subregional Biodiversity Synopsis Reporting and Conservation Strategy Options Case Studies	Mr Norm McKenzie	Department of Conservation & Land Management, WA
12	CIE5	Indicators within a decision framework	Dr Jenny Gordon	Centre for International Economics
13	CLW12	Water-borne soil erosion and sediment transport 2. Regional nutrient and water balance	Dr Chris Moran	CSIRO Land and Water
14	CLW14	Valuing the Resource base and costs of degradation	Mr M. Young	CSIRO Land and Water
15	CLW15	Estuarine Health Assessment	Ms Lynne Turner	CSIRO Land and Water
16	CLW18	Assessment of River Condition	Dr Graham Harris	CSIRO Land and Water
17	CLW26	An initial assessment of catchment condition ILZ	Dr J. Walker	CSIRO Land and Water
18	CLW34	Monitoring the condition and trend of land resources in Australia	Dr Neil McKenzie	CSIRO Land and Water
19	CYC1	Production of Digital Video CD-ROMs for Dryland Salinity and Native Vegetation	Mr Rohan Fisher	Cycad Media
20	DAT6	Extent and Impacts of Dryland Salinity Consultancy	Mr Colin Bastick	Department of Primary Industry, Water & Environment
21	DAV29	Implementation of the surface and groundwater management – availability, allocation, use, and efficiency of use theme work plan	Ms Rae Moran	Department of Natural Resources & Environment(Victoria)
22	DAV30	Land-use mapping: East and West Gippsland Catchment Management Authority areas.	Mr Victor Sposito	Department of Natural Resources & Environment(Victoria)
23	DAV32	Structural Adjustment in Agriculture and the Capacity to Implement Catchment Plans	Mr Neil Barr	Department of Natural Resources & Environment(Victoria)
24	DAV38	Subregional Biodiversity Synopsis Reporting and Conservation Strategy Options Case Studies	Mr David Parkes	Department of Natural Resources & Environment(Victoria)
25	DAW27	Land-use and Vegetation Mapping: Western Australia Consultancy	Mr Greg Beeston	Agriculture Western Australia
26	DAW28	Rangelands Monitoring Theme Coordinator	Dr Ian Watson	Agriculture Western Australia
27	DEP10	Subregional Biodiversity Synopsis Reporting and Conservation Strategy Options Case Studies	Mr Tony Robinson	Department of Environment and Heritage

No.	Code	Project	Researcher	Organisation
28	DET3	Indices of change in ecosystem function at the national scale using AVHRR NDVI data	Dr Shane Cridland	Environment Australia
29	DET4	Incidence of extreme climatic events	Dr Shane Cridland	Environment Australia
30	DET5	Develop core attributes and database for National Vegetation Information System	Elizabeth McDonald	Environment Australia
31	DRD4	National Dairy Land & Water Audit: Sustaining our Natural Resources	Mr Peter R. Day	Dairy R&D Corporation
32	EAR3	Provision of communication services to Audit (Electronic information products, display and presentation material, subprogram coordination)	Dr Dave Johnson	EarthWare Systems
33	EAR5	Web Reporting System	Dr Dave Johnson	EarthWare Systems
34	GBS1	Development of a data management operational plan Consultancy	Mr Ian Musto	Geographic Business Systems
35	GMO1	Landscape Health Assessment	Mr Gethin Morgan	Gethin Morgan
36	M4K1	Australian Collaborative Rangelands Information System Coordinator	Maria Kraatz	M4K Environmental Consulting
37	NDW25	Assessing the status, conditions and trends of native vegetation communities to support vegetation management in low-rainfall cropping lands	Mr Geoff Holden	Department of Land & Water Conservation
38	NTU2	Trend analysis for regional land condition assessment	Mr Rod Applegate	Northern Territory University
39	NTU4	Developing an analytical framework for monitoring biodiversity in Australia's rangelands	Mr John Childs	Northern Territory University
40	PSA1	Scoping an Australia-wide Assessment of Landscape Management	Dr Paul Sattler	Paul Sattler
41	PSA2	Developing Information Products to Identify Priority Vegetation Management Areas in Queensland	Dr Paul Sattler	Paul Sattler
42	PSA3	Audit Biodiversity Assessment Theme Coordination	Dr Paul Sattler	Paul Sattler
43	PWN1	Subregional Biodiversity Synopsis Reporting and Conservation Strategy Options Case Studies	Dr John Woinarski	RTM Parks and Wildlife Commission NT
44	QNR17	Land Use Mapping: Fitzroy Catchment	Dr Don Yule	Queensland Department of Natural Resources & Mines
45	QNR20	Change in Land Tenure/Land Use	Dr Wayne Hall	Queensland Department of Natural Resources & Mines
46	RAD1	Audit Draft Final Report	Dr John Radcliffe	Dr John C Radcliffe
47	RAS1	Reporting for Theme 5 – Agricultural Productivity and Sustainability	Dr Doug Reuter	Reuter & Associates
48	REA1	Dryland Salinity – Socio-Economic Case Studies Consultancy	Mr Mike Read	Read Sturgess & Associates

No.	Code	Project	Researcher	Organisation
49	RJC1	Coordination – Agricultural Productivity and Sustainability	Dr Bob Crouch	Bob Crouch Consulting
50	RPM1	Plain English summaries of regional information for Rangelands Monitoring Website	Mr Roland Breckwoldt	Resource Policy and Management Consultants
51	RPM3	Indigenous Information Needs in Australia's Rangelands	Mr Roland Breckwoldt	Resource Policy and Management Consultants
52	SKL1	Development of the Australian Natural Resources Atlas and Data Library – version 2.0	Mr Noel Ward	Sinclair Knight Merz (LANDINFO)
53	SKP6	Coordinator – Water Availability	Mr Peter Erlanger	Sinclair Knight Merz
54	SKT1	Benchmarking current rural industry practices, productivity, environmental impact and assessing the capacity to implement change	Mr Bob Walker	Sinclair Knight Merz Pty Ltd, Toowoomba
55	THA2	Provision of communication services to Audit (print products)	Ms Robin Jean	Themeda
56	TPI1	Subregional Biodiversity Synopsis Reporting and Conservation Strategy Options Case Studies	Mr David Peters	Tasmania Department of Primary Industry, Water and Environment
57	WEB4	Audit Dryland Salinity Project Coordinator Consultancy	Mr Adrian Webb	WEBBNET Land Resource Services Pty Ltd
58	WRC8	Implementation of the surface and groundwater management – availability, allocation, use, and efficiency of use theme work plan	Mr Roy Stone	Water and Rivers Commission

General Call

59	CLW10	Mid-infrared spectroscopy for rapid prediction of soil physical properties	Mr R Merry	CSIRO Land and Water
60	CLW30	Pesticide impact rating index: Validation and adoption	Dr Rai Kookana	CSIRO Land and Water
61	CLW31	Soil Biota: its function in sustainable soil management	Dr Steve Rogers	CSIRO Land and Water
62	ESA1	Ecological Management and Restoration Journal	Dr Jann Williams	Ecological Society of Australia
63	UNE36	Meeting the need for function-based assessments of soil biological health	Dr Keith J Hutchinson	University of New England
64	UNE37	National audit of changes in farmers' environmental attitudes since 1991	Mr Ian Reeve	University of New England

Postgraduates

65	ANU14	Innovation by resource management institutions: Australia, New Zealand, North America	Mr John Dore	Australian National University
66	ANU31	Improving deliberative forms of public participation for decision making on sustainability	Ms Carolyn Hendriks	Australian National University
67	ANU32	Learning from US Volunteer Monitoring Practices and Protocols	Dr Anna Carr	Australian National University
68	ANU33	Wheat/Sheep Landscapes: perceiving the past, present and future	Mr George Main	Australian National University

No.	Code	Project	Researcher	Organisation
69	GBR2	The role of knowledge and communities in catchment management adjacent to the Great Barrier Reef	Ms Michelle Devlin	Great Barrier Reef Marine Park Authority
70	MQU7	Plant functional types: grazing, fire and global warming in rangelands	Mr Peter Vesk	Macquarie University
71	UAD13	Triglochin procerum: an indigenous macrophyte for waste water purification	Ms Michelle Bald	University of Adelaide
72	UFL1	Salt storage in the River Murray floodplain	Ms Rebecca Whyatt	Flinders University
73	UMU12	Understanding the recruitment biology of vegetation communities on saline soils	Ms Michelle Carey	Murdoch University
74	UWO5	Integrating carbon emissions trading with major Australian land management initiatives	Mr David Jones	University of Wollongong

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Climate Variability in Agriculture Program

75	AGE1	Program management for the Climate Variability Research and Development Program	Dr Barry White	AGEC Consulting
76	AGE2	CVAP Communication Coordination	Dr Barry White	AGEC Consulting
77	BOM4	Improved climate prediction during El Nino events	Dr William Wright	Bureau of Meteorology
78	BOM6	SILO tailored to user's location and preferences for presentation	Dr Scott Power	Bureau of Meteorology
79	BRR7	Framework for analysing climate variability for policy	Dr Greg Laughlin	Bureau of Rural Sciences
80	CIC5	Promotion of Masters of the Climate case studies	Mr Tim Powell	Cox Inall Communications
81	COR5	Extended seasonal climate predictions using a dynamic climate model	Dr Gary Meyers	CSIRO Division of Marine Research
82	CPA2	Climate Variability in Agriculture R&D Program – Communication Package	Mr Thomas Parkes	Capital Public Affairs Consultants
83	CTC16	From oceans to farms: integrated management of climate variability	Dr Andrew Ash	CSIRO Sustainable Ecosystems.
84	CTC18	Better management of climate variability within the agribusiness service sector	Dr Peter S Carberry	CSIRO Sustainable Ecosystems.
85	CWE23	Do government policy instruments support sustainable grazing on-farm?	Dr Mark Stafford-Smith	CSIRO Sustainable Ecosystems
86	HAS5	Climate Variability in Agriculture R&D Program (CVAP) Review	Dr David McClintock	Hassall and Associates Pty Ltd
87	HRM1	Improved management of climate variability on Australian grain farms	Mr Peter Wylie	Horizon Rural Management
88	QNR24	SILO II: Extension, marketing and industry focused product development	Mr Alan Beswick	Queensland Department of Natural Resources & Mines
89	QNR3	The Australian On-Line Agrometeorological Information Service (WeatherWise)	Mr Alan Beswick	Queensland Department of Natural Resources & Mines

No.	Code	Project	Researcher	Organisation
90	QNR9	Australian Grassland and Rangeland Assessment by Spatial Simulation – 'Aussie GRASS'	Dr Wayne Hall	Queensland Department of Natural Resources & Mines
91	QPI42	International workshop on farm management decisions with climatic risk	Mr Rod Saal	QLD Dept of Primary Industries
92	QPI43	CLIMARC – Computerising the Australian climate archives	Mr Nick Clarkson	QLD Dept of Primary Industries
93	QPI44	Can decadal variability (DCV) impact on cropping systems management	Dr Holger Meinke	QLD Dept of Primary Industries
94	URS3	Defining researching opportunities for improved applications of seasonal forecasting in South-Eastern Australia with particular reference to the Southern NSW and Victorian grain regions	Dr Martin Andrew	URS Australia Pty Ltd
95	UWA21	Innovative workshops to improve understanding of price and climate variability	Dr Ross Kingwell	University of Western Australia
96	UWA23	The influence of North-West cloud bands on Eastern Australian rainfall	A/Prof Charitha Pattiaratchi	University of Western Australia
97	VCE14	Strategies to cope with climatic variability in the perennial pasture zone of South-Eastern Australia	Mr Stephen G Clark	Department of Natural Resources & Environment
98	VIR5	Improving the communication of climate information to dairy farmers	Mr Greg Hayes	VCG Australia Pty Ltd
National Dryland Salinity R&D Program				
99	CAG4	Compendium of Dryland Salinity R&D	Mr Noel Beynon	Capital Ag
100	CDS16	Evaluation of the different measurement and modelling techniques for comparing the deep drainage under current and alternative farming systems	Dr John Williams	CSIRO Land and Water .
101	CLW27	Biogeochemical and physical processes in saline soils and potential reversibility	Dr Rob Fitzpatrick	CSIRO Land and Water
102	CLW28	Generation and delivery of salt and water to streams	Dr Hamish Cresswell	CSIRO Land and Water
103	CLW29	Predicting the combined environmental impact of catchment management regimes on dryland salinity	Dr Lu Zhang	CSIRO Land and Water
104	COD1	Organiser of the 7th National PURSL Conference 20–23 March 2001.	Ms Penny Archer	Conference Design Pty Ltd
105	CUR1	Provision of communication coordination services to NDSP	Mr Kim Mitchell	Currie Communications
106	DAW32	National Dryland Salinity Program – State Communication Coordinator – Western Australia	Ms Georgina Wilson	Agriculture Western Australia
107	DEP8	Program Coordinator –National Dryland Salinity Program	Mr Nicholas Newland	Department of Environment and Heritage
108	EAR4	Webmaster for the NDSP website	Dr Dave Johnson	EarthWare Systems
109	GRD5	One million hectares for the future	Dr W Porter	Grains R&D Corporation
110	GRD6	Farming systems with lower recharge for WA	Dr W Porter	Grains R&D Corporation

No.	Code	Project	Researcher	Organisation
111	GRI3	Linking Agricultural Environmental Management Systems with Ecological Processes and Objectives at Landscape and Regional Scales	Mr Neil Urwin	Griffin nrm Pty Ltd
112	IID1	Mid-term Review of the National Dryland Salinity Program	Mr John Leake	Institute for International Development
113	LPM2	Investment of programs and institutional arrangements for effective natural resource management	Mr Jim McDonald	Liverpool Plains Management Committee
114	MDA1	Sponsorship of the National Local Government Salinity Summit held 17–19 July 2001.	Mr Leon Broster	Murray Darling Association
115	MDB7	Determining the costs of dryland salinity – Phase II	Mr Richard Ivey	Murray-Darling Basin Commission
116	MRC6	Improving water management through *PROGRAZE*®	Dr Warren Mason	Meat & Livestock Australia
117	MUN1	National Dryland Salinity Program State Communication Coordinator – South Australia	Dr Bruce Munday	Clear Connections
118	NDW30	National Dryland Salinity Program – State Communication Coordination – New South Wales	Ms Lisa Gray	Department of Land & Water Conservation
119	PPK1	Assessment of options for the productive use of saline lands	Stephanie Bolt	PPK Environment & Infrastructure Pty Ltd
120	RPD1	Local government capacity to manage dryland salinity	Mr Trevor Budge	Research Planning Design Group
121	RUR1	Production of SALT 3 magazine	Ms Donna Clarke	Rural Press Limited Company
123	SPC1	National Dryland Salinity Program State Communication Coordinator – Victoria	Ms Jo Curkpatrick	SPAN Communication
124	SPC2	Review of the use of focus catchments in Phase I of the National Dryland Salinity Program	Ms Jo Curkpatrick	SPAN Communication
125	UMU16	Risk and restoration potential for remnant vegetation in salinising landscapes	Prof. Richard J Hobbs	Murdoch University
126	UWA24	The establishment of a Cooperative Research Centre for Plant-based Management of Dryland Salinity	Professor Phil Cocks	University of Western Australia
127	VCE17	Assessment of a system to predict the loss of aquatic biodiversity from changes in salinity	Mr Phil Papas	Department of Natural Resources & Environment
128	VIR6	Enhancing institutional support for the management of dryland salinity	Mr Greg Hayes	VCG Australia Pty Ltd

National Program for Irrigation R&D

129	AQC1	Gaining acceptance of WUE framework, terms and definitions	Mr Jim Purcell	Aquatech Consulting
130	CDH2	Improving the water use efficiency of horticultural crops	Dr Brian Loveys	CSIRO Plant Industry – Horticulture Unit
131	CID1	Benchmarking irrigation service providers	Mr John Mapson	Australian National Committee on Irrigation & Drainage
132	CID2	National Irrigation and Drainage Science and Engineering Conference	Mr John Mapson	Australian National Committee on Irrigation & Drainage

No.	Code	Project	Researcher	Organisation
133	CLW20	Best management practices for sub-surface drainage design and management	Dr Evan Christen	CSIRO Land and Water
134	CLW21	Rigorously determined water balance benchmarks for irrigated crops and pastures	Dr Elizabeth Humphreys	CSIRO Land and Water
135	CLW25	Development of a national electronic communications strategy and research skills database	Mr Jeremy Cape	CSIRO Land and Water
136	CLW32	Sustainable Management of the Burdekin Delta Groundwater Systems	Dr Keith L Bristow	CSIRO Land and Water
137	CTC10	Guidelines for efficient and sustainable trickle irrigation systems	Dr Keith L Bristow	CSIRO Sustainable Ecosystems.
138	CTC26	Improved irrigation scheduling for crops underlain by shallow, fresh watertables	Dr Peter Thorburn	CSIRO Sustainable Ecosystems.
139	CWN13	Determination of optimal irrigation intensity for irrigation areas	Mr John Madden	CSIRO Land and Water – Griffith
140	DAN11	Improving water use efficiency by reducing groundwater recharge under summer pastures	Mr Hayden Kingston	NSW Agriculture
141	DAN14	Determining 'Whole-of-System' water use efficiencies for NSW River Valleys	Dr Nick Austin	NSW Agriculture
142	DAV23	Alternative irrigation technologies in field cropping to increase water use efficiency	Mr Mike Schulz	Department of Natural Resources & Environment(Victoria)
143	DAV34	Visiting Fellow – Polyacrylamides in Irrigated Agriculture	Dr Bob Sojka	Department of Natural Resources & Environment(Victoria)
144	DAV37	A Review of Genetic Algorithm Technology for Irrigation Water Ordering Systems	Dr QJ Wang	Department of Natural Resources & Environment(Victoria)
145	GMW1	Construction and refurbishment of earthen irrigation channel banks	Mr Ian Moorhouse	Goulburn-Murray Water
146	GMW10	Assessment of ecological risk associated with irrigation systems in the Goulburn Broken catchment. Phase I – identification of risks and development of conceptual models.	Mr Pat Feehan	Goulburn-Murray Water
147	GMW3	Benchmarking the distribution efficiency of an irrigation supply system	Mr Kevin J Preece	Goulburn-Murray Water
148	GMW6	Nutrient removal from rural drainage systems using wetlands	Mr Ross Plunkett	Goulburn-Murray Water
149	GRU25	Enhancement of the water market reform process: A socioeconomic analysis of guidelines and procedures for trading in mature water markets	Dr John Tisdell	Griffith University
150	MCS1	NPIRD Program Coordinator	Mr Tim Cummins	Capital Consulting Partners P/L
151	MDB9	Development of guidelines for quantification and monitoring of seepage from earthen channels	Mr P. Jackson	Murray-Darling Basin Commission
152	NRE1	Irrigation Program Communications Coordinator – Naturally Resourceful	Ms Anne Currey	Naturally Resourceful Pty Limited

No.	Code	Project	Researcher	Organisation
153	NRE2	Develop a website to disseminate information about flow management	Ms Alison Carmichael	Naturally Resourceful Pty Limited
154	QNR26	An evaluation of short term weather forecasting and risk management to improve irrigation scheduling	Mr Ian Gordon	Queensland Department of Natural Resources & Mines
155	QPI26	Nutrient control in irrigation drainage systems using artificial wetlands	Mr George Lukacs	QLD Dept of Primary Industries
156	RMG2	Managing Water Allocation Risk – an Irrigator Toolkit Stage 1	Mr Charles Thompson	Rendell McGuckian Agric. & Mng Consultants
157	SOU1	Developing the concept of satellite links in on-farm irrigation R&D for improved R&D integration across Australia	Mr Geoff Calder	South West Irrigation
158	UCQ2	Assessment of ecological risk associated with irrigation systems in the Fitzroy Basin: Phase I – identification of risks and development of conceptual models.	Dr Leo Duivenvoorden	Central Queensland University
159	UME58	Improving the efficiency and flexibility of contour irrigation design	Dr Hector Malano	University of Melbourne
160	UNE39	Improving water quality from subsurface drainage systems in irrigated agriculture	Dr Evan Christen	University of New England
161	UNS26	Water quality sustainability in groundwater abstraction for irrigation	Ms Wendy Timms	University of New South Wales
162	WRC10	Assessment of ecological risk associated with irrigation systems in the Ord catchment. Phase I – identification of risks and development of conceptual models.	Mr Andrew McCrea	Water and Rivers Commission
163	WTR1	Irrigation Program website maintenance – Wolftracks	Ms Debra Ferguson	Wolf Tracks
North Australia Program of R&D				
164	MRC5	North Australia Program: Phase 3	Mr P. Loneragan	Meat & Livestock Australia
Sustainable Grazing Systems				
165	MRC4	Sustainable grazing systems key program	Dr Ben Russell	Meat & Livestock Australia

Rivers Arena – Managing Australian river landscapes

National Groundwater R&D Program

166	ALL1	Allison Partners Pty Limited – Groundwater Program Coordinator	Dr Graham Allison	Allison Partners Pty Limited
167	CLW19	Development of community education and training programs in groundwater management	Dr Chris Barber	CSIRO Land and Water
168	CLW7	Biogeochemical processes induced by groundwater-surface water interactions	Dr Andrew Herczeg	CSIRO Land and Water
169	CLW8	Guidelines for managing groundwater for vegetation health in saline areas	Dr Jim Cox	CSIRO Land and Water
170	JCU14	Riparian and in-stream vegetation requirements of baseflows from basalt aquifers	Mr George Lukacs	James Cook University

No.	Code	Project	Researcher	Organisation
171	MAE1	Groundwater recharge and flow velocities in fractured rock aquifers	Mr Andrew Love	Department of Primary Industries & Resources SA
172	QNR13	Investigation, assessment and management of groundwater supplies – Atherton Tableland Basalts	Mr Bruce R Pearce	Queensland Department of Natural Resources & Mines
173	UNE42	Causes of eucalypt tree decline in the Namoi Valley	Assoc Prof Nick Reid	University of New England
National Riparian Lands Program				
174	GRU26	Flow-related responses of floodplain vegetation in arid, inland catchments	Assoc Prof Stuart Bunn	Griffith University
175	MQU9	Experimental reintroduction of large woody debris into rivers – geomorphic and habitat implications	Mr Andrew Brooks	Macquarie University
176	NHT1	Production of a CD-ROM on River Restoration and Management	Mr Malcolm Cowan	Noble House Tasmania Pty Limited
177	PPM2	River Ramblers	Ms Hilary Huggan	Pacific Projects Management Pty Limited
178	SIW1	Riparian Lands R&D Program Coordinator	Dr Siwan Lovett	Lovett Clarke Consulting Pty Ltd
179	SRC7	Sugar industry riparian management guidelines	Dr Siwan Lovett	Sugar R&D Corporation
180	UME64	Riparian Land Management: Concepts, Floods and Erosion	Dr Ian Rutherfurd	University of Melbourne
181	WRC4	The Importance of Large Wood Debris in Sandy River Systems	Mr Bill Till	Water and Rivers Commission
National Rivers Consortium				
182	CLO3	Inland Rivers Workshop – Alice Springs	Ms Jane Carter	Conference Logistics
183	CLW35	Analysis of water quality data sets for information on relationships between land uses and water quality	Dr Myriam Bormans	CSIRO Land and Water
184	DAN13	Hydrologic effects of floodgate management on coastal floodplain agriculture	Mr Peter Slavich	NSW Agriculture
185	EDG1	NRC Program Consultant	Mr Brendan Edgar	Edgar & Partners
186	JES1	Improving the legislative basis for river restoration and management in Australia	Mr John Erik Linder Scanlon	John Erik Linder Scanlon
187	MCG3	NRC Program Coordination	Dr Phil Price	Mackellar Consulting Group
188	MMA2	Improving the legislative basis for river restoration and management in Australia	Ms Mary Maher	Mary Maher & Associates
189	MQU6	River styles as a tool for water resources management	Dr Gary Brierley	Macquarie University
190	MWA1	Inland Rivers Workshop – Alice Springs	Mr Michael Williams	Michael Williams & Associates Pty Limited
191	QEH2	Incorporation of protection principles and tools into the River Restoration Framework	Mr John Bennett	QLD Department of Environment
192	QEH3	Environmental planning and evaluation guidelines for rivers and floodplains	Mr John Bennett	QLD Department of Environment

No.	Code	Project	Researcher	Organisation
193	QIM2	Prevalence/characterisation of highly pathogenic waterborne giardia in Australian wildlife	Dr Ann McDonnell	Queensland Institute of Medical Research
194	UME63	Preparation of an Australian handbook of stream roughness coefficients	Dr Anthony Ladson	University of Melbourne
195	UNS25	National framework for the management of Australian estuaries	Dr Wayne Erskine	University of New South Wales
196	UOC16	Habitat heterogeniety and carbon dynamics in semi-arid floodplain river systems	Heather McGinness	University of Canberra
197	UOC17	Knowledge seeking workshop	Professor Peter Cullen	University of Canberra
198	UWA22	Arid zone fish ecology: the importance of floodplain connections	Dr Peter M Davies	University of Western Australia
199	UWO3	Process variability in river systems, South-East Australia: implications for river rehabilitation	Mr Timothy Cohen	University of Wollongong
200	VCE16	Development and testing of the National River Restoration Framework	Mr John Koehn	Department of Natural Resources & Environment
201	WRC11	Torbay System – whole of catchment waterways restoration and management	Ms Naomi Arrowsmith	Water and Rivers Commission

National River Contaminants Program (incorporating NEMP projects)

202	ANU9	Sources and delivery of suspended sediment and phosphorus to four Australian Rivers: Part B. Nd and Sr isotopes and trace elements	Dr Candace Martin	Australian National University
203	BEY1	National Eutrophication Management Program (NEMP) Communications Coordinator	Ms Vivienne McWaters	Beyond the Edge Pty Limited
204	CEM7	Management strategies for control of cyanobacterial blooms in the Fitzroy River barrage	Dr Myriam Bormans	CSIRO Land and Water.
205	CLW16	A quantitative basis for setting flows to control algal blooms in the Fitzroy Basin	Dr Myriam Bormans	CSIRO Land and Water
206	CLW2	Whole-lake biomanipulation for the reduction of nuisance micro-algae	Dr Vlad Matveev	CSIRO Land and Water
207	CWA18	NEMP Program Coordinator – Richard Davis	Dr Richard Davis	CSIRO Land and Water – Canberra
208	CWA21	Sources and delivery of suspended sediment and phosphorus to Australian Rivers: Part A. Radionuclides and Geomorphology	Dr Peter Wallbrink	CSIRO Land and Water – Canberra
209	MDR17	Algal availability of phosphorus discharged from different catchment sources	Dr Rod Oliver	Murray Darling Freshwater Research Centre
210	QNR5	Eutrophication related coordination in the Fitzroy catchment	Mr Peter G Thompson	Queensland Department of Natural Resources & Mines
211	UMO38	National Rivers Contaminants Program Implementation Plan	Prof Barry Hart	Monash University
212	UWA17	Nutrient cycling by Ruppia megacarpa and epiphytes in Wilson Inlet	A/Prof Di Walker	University of Western Australia

No.	Code	Project	Researcher	Organisation
213	WRC2	Eutrophication related coordination in the Wilson Inlet catchment	Mr Malcolm Robb	Water and Rivers Commission
214	CWC1	National River Contaminants Program – Program Coordinator	Dr Jacky Croke	Croke Wallensky Consulting

National River Health Program

215	BIO1	Communication Consultant – Water Resources	Mr Russell Moran	Biota
216	MQL2	Measurement of river health using rapid microbial biodiversity assessment	Dr Duncan Veal	Macquarie Research Limited
217	NDW26	SIGNAL scoring system for river bioassessment by community groups	Dr Bruce Chessman	Department of Land & Water Conservation
218	UMO27	Impact of flow manipulation on the biota of a lowland river	Dr Paul Humphries	Monash University
219	UOC8	In-stream processes and environmental flow requirements for the Barwon-Darling River	Dr Fran Sheldon	University of Canberra
220	UQL11	Bacterial diversity in tropical and sub-tropical lowland, regulated rivers	Dr Lindsay Sly	University of Queensland

Other Arena Projects

222	AGS5	Denitrophication of sediments	Dr David Fredericks	Aust. Geological Survey Organisation
222	CDF9	Wagga Wagga Effluent Plantation Project – Determining Long-Term Sustainability	Mr Brian Myers	CSIRO Forestry and Forest Products
223	CWW28	Equity and other social implications in the allocation of groundwater for sustainable management	Ms Blair Nancarrow	CSIRO Land and Water – Perth

Vegetation Arena – Managing vegetation in rural landscapes

Joint Venture Agroforestry Program

224	RDC1	RIRDC/Land & Water Australia joint agroforestry program	Dr Roslyn Prinsley	Rural Industries R&D Corporation

National Rangelands R&D Program

225	CAG3	Rangelands R&D Program: Review of Regional Resource Planning Projects	Mr Noel Beynon	Capital Ag
226	CTC13	Regional resource use planning in rangelands: a Central Queensland pilot study	Dr Allan Dale	CSIRO Sustainable Ecosystems.
227	CWE11	Patterns of sustainable use of rangelands for the 21st century	Dr Nick Abel	CSIRO Sustainable Ecosystems
228	DAW21	Effective planning procedures for ecologically sustainable land use in the rangelands	Mr Greg Brennan	Agriculture Western Australia
229	UMU15	Planning for Sustainable Land Use at the Property Level in the Australian Rangelands	Mr Donald Marshall	Murdoch University

Native Vegetation R&D Program

230	ANU6	The role of corridors and retained vegetation in biodiversity conservation	Assoc-Prof David Lindenmayer	Australian National University
231	CTC27	Improved vegetation planning for rural landscapes	Dr Sue McIntyre	CSIRO Sustainable Ecosystems.

No.	Code	Project	Researcher	Organisation
232	CTC9	Applying management principles in variegated landscapes: identifying production:conservation tradeoffs	Mr Neil MacLeod	CSIRO Sustainable Ecosystems.
233	RMI8	Native Vegetation R&D Program Coordinator	Dr Jann Williams	Royal Melbourne Institute of Technology
234	UNE26	Building conservation strategies from stakeholders' intrinsic and social values	Mr Geoff Kaine	University of New England
235	UNE41	Stakeholder values, institutional change and formulating vegetation management policies	Ms Jean Sandall	University of New England
236	UTA4	Guidelines for the maintenance and improvement of remnant bush in Tasmania	Prof Jamie Kirkpatrick	University of Tasmania
237	VCA2	Socioeconomic and ecological benchmarks for the evaluation of remnant vegetation	Mr Chris Williams	Victorian College of Agriculture and Horticulture

Futures Arena – Future landscapes and compatible industries

Redesigning Agriculture for Australian Landscapes R&D Program

238	CDS21	Water and nitrogen balances in the Australian wet tropics: a search for sustainable design principles	Dr Keith L Bristow	CSIRO Land and Water
239	CLW36	Conceptual framework for landscape redesign	Dr Stefan Hajkowicz	CSIRO Land and Water
240	CPI8	Modelling the processes which result in soil acidification in Australian landscapes	Dr R. Simpson	CSIRO Division of Plant Industry
241	CPI9	Linkage of Grazplan Pasture/Animal Models to APSIM Crop/Soil Models and the SWIM Water Balance	Dr Andrew Moore	CSIRO Division of Plant Industry
242	CRS1	Review of farmer initiated innovative farming systems	Mr Ian Perkins	LPM Creative Rural Solutions
243	CTC11	A modelling framework to assess performance of natural and managed systems	Dr Brian Keating	CSIRO Sustainable Ecosystems.
244	ECO6	RAAL Phase I – Output Statement	Ms Jenni Metcalfe	ECONNECT
245	GRI2	Future Landscapes Scoping Study	Dr Kate Duggan	Griffin nrm Pty Ltd
246	LMS1	Documenting the concepts of the 'ecosystems farm management' approach	Mr David Chambers	Land Management Society Inc
247	SPV1	RAAL Program Coordinator David Clarke – EFECT PTY LTD	Mr David Clarke	EFECT Pty Ltd
248	URS1	Linkages between RAAL and other Redesign Initiatives	Mr Bruce Howard	URS Australia Pty Ltd

Cross-cutting Arena

Ord-Bonaparte Program

249	CDM8	OBP Project 1.1: The Ord Bonaparte Resource Information System: A Community Resource for Regional Development	Dr Kerry Taylor	CSIRO Division Mathematical & Information Sciences
250	CLW37	OBP Project 3.4/4.2: Needs Analysis for project on Maintaining Healthy Waterways in the Lower Ord, Keep and Estuaries	Dr Christian Roth	CSIRO Land and Water

No.	Code	Project	Researcher	Organisation
251	CLW38	OBP Project 3.3A – Needs Analysis for Best Utilisation of Water Resources for the Ord Irrigation Area	Dr Christian Roth	CSIRO Land and Water
252	CSE2	OBP Project 1.2: Regional Resource Futures for the East Kimberley (Component A – Framework)	Dr Romy Greiner	CSIRO Sustainable Ecosystems
253	CSE3	OBP Project 1.2: Regional Resource Futures for the East Kimberley (Component C – Tools)	Dr Romy Greiner	CSIRO Sustainable Ecosystems
254	CSE6	OBP Project 1.3: OBP Program Evaluation	Mrs Jennifer Bellamy	CSIRO Sustainable Ecosystems
255	DAW34	OBP Project 2.1: Characterisation and Assessment of Rangeland Resources	Dr Paul Novelly	Agriculture Western Australia

Social and Institutional Research Program

256	ANU17	Processes and institutions for resource and environmental management: Australian experiences	Dr Steve Dovers	Australian National University
257	ANU18	Environmental science: from independent experts to post-modern process managers	Lorrae Van Kerkhoff	Australian National University
258	ANU22	Social and institutional implications of landscape and land use change	Assoc-Prof David Lindenmayer	Australian National University
259	ANU24	Implications for Australian natural resource management of international experiences in institutional change and reform arising from Sustainable Development.	Dr Steve Dovers	Australian National University
260	BLA1	SIRP Reports Communication	Ms Jesse Blackadder	Blackadder Communication
261	BOR1	National Coordination of the Social and Institutional Research Program	Mr Kenneth J Moore	Boorara Management and Consulting
262	BRR19	Review and analysis of the drivers of and constraints to producer adoption of sustainable practices derived from research	Associate Professor John Cary	Bureau of Rural Sciences
263	CSE4	Integrating cross-jurisdictional planning and assessment for sustainable regions	Ms Tiffany Morrison	CSIRO Sustainable Ecosystems
264	CWA20	Development of an Integrated Catchment Management Software (ICMS) package	Dr Bill Young	CSIRO Land and Water – Canberra
265	CWE17	Decision points for land and water futures	Mr Barney Foran	CSIRO Sustainable Ecosystems
266	CWE27	Assessing ecosystem goods and services	Dr Steven Cork	CSIRO Sustainable Ecosystems
267	GRU21	Farm decision-making and resource use: new structures and changing responsibilities	Dr David F Burch	Griffith University
268	MMA3	Analysis of Transferability of Successful Organisational and Program Models Across Natural Resource Jurisdictions and Regions	Ms Mary Maher	Mary Maher & Associates
269	RPM2	Evaluation of producer initiated and managed R&D (SGS.013)	Dr Jennifer Andrew	Resource Policy and Management Consultants

No.	Code	Project	Researcher	Organisation
270	RSA1	Design, implementation and maintenance of the Land & Water Resources Research & Development Corporation's Social and Institutional Research Program website	Maurice Height	Rubicon Software Support
271	SWR1	Integrating Themes Coordinator	Ms Su Wild River	Su Wild River
272	SYN2	Gap analysis of the Land & Water Resources Research & Development Corporation's R&D portfolio against strategic theme outcomes	Mr Tony Gleeson	Synapse Agric & Resource Consulting
273	TPF2	Options for reform in Australian natural resource property rights, land tenure and land management institutions and arrangements	Mr Paul Martin	The Profit Foundation
274	UME29	Integration of research and development in catchment management	Prof Tom A. McMahon	University of Melbourne
275	UNE35	Ecological and social functions influencing governance of natural resources	Dr David Brunckhorst	University of New England
276	UNE40	Creating a contemporary common property resource management institution	Dr David Brunckhorst	University of New England
277	UWO4	The effectiveness of the integration of water and land use planning	Ms Carla Mooney	University of Wollongong

Other Arena Projects

278	ADF5	Private sector natural resource management	Stuart Whitten	Australian Defence Force Academy
279	CDS17	A toolkit for hydraulic properties of Australian soils	Dr Hamish Cresswell	CSIRO Land and Water
280	CEN4	Introducing earthworms to reduce soil acidity and increase pasture production	Dr G Baker	CSIRO Division of Entomology
281	CLW22	Improved understanding of drainage water quality towards sustainable agricultural production systems	Professor Jan W Hopmans	CSIRO Land and Water
282	CSU21	Integrating nature conservation and production agriculture: lessons for Australia based on an international tour	Dr David Goldney	Charles Sturt University
283	CWE26	The nature and value of Australia's ecosystem services	Dr Gretchen Daily	CSIRO Sustainable Ecosystems
284	DAV14	Productivity, socio-economic and natural resource impact of changing catchment enterprises	Mr Oliver Gyles	Department of Natural Resources & Environment(Victoria)
285	DAV22	Development of bacterial inoculants for enhanced root development of temperate perennial pasture grasses	Dr Pauline Mele	Department of Natural Resources & Environment(Victoria)
286	DUV4	Land retirement as a conservation policy	Mr Phillip Hone	Deakin University
287	UME32	Landcare – The Next Generation: a model for sustainable agriculture in Australia	Mr Don Thomson	University of Melbourne
288	UME62	Adaptive policy, institutions and management: USA experiences	Dr Sarah Ewing	University of Melbourne

No.	Code	Project	Researcher	Organisation
R&D for Environment Management of Military Lands Program (concluded)				
289	CTC23	Military Decision Support: Manual and Training	Dr Andrew Ash	CSIRO Sustainable Ecosystems
Land & Water Australia Communication				
290	CHA1	A Business name for the Land & Water Resources Research & Development Corporation and a review of all image components	Marilyn Chalkley	Chalkley Consulting
291	GIW1	New Web site	Mr Mark Henderson	Grey Interactive Worldwide
292	INF6	*Streamline* Database 1998–2001	Ms Pam Handyside	Infoscan Pty Ltd
293	INF7	Development of a Web-based Innovations Database Prototype	Ms Brenda Gerrie	Infoscan Pty Ltd
294	LIA1	Review of *Streamline* database	Ms Sherrey Quinn	Libraries Alive
295	PFF1	Oral History Series: Essential Elements – Australian Stories	Mr Gregg Borschmann	People's Forest Foundation
296	SOF1	Design/development/maintenance/evaluation of the Land & Water Australia WWW home page	Mr Chris Deal	Softlaw Corporation Pty Ltd
Land & Water Australia Management				
297	CQS8	Further development and enhancement of the quality management system	Mr Murray Feddersen	CQS Australia
298	CSC1	Assessment and optimisation of the Land & Water Resources Research & Development Corporation's Information Technology and Information Management Processes.	Mr Andrew Ford	CSC Australia Pty Ltd
299	CWA28	Estimation of the scale of management solutions required in natural resource management: continental scale	Dr Neil McKenzie	CSIRO Land and Water – Canberra
300	MAG1	Development and Implementation of a Commercialisation Strategy for Land & Water Australia	Mr Merv Johnston	Magma Pty Limited
301	MCG1	Program Coordinator (Various Land & Water Australia Programs)	Dr Phil Price	Mackellar Consulting Group
302	URS2	Evaluation and monitoring strategy for Land & Water Australia	Dr Martin Andrew	URS Australia Pty Ltd
303	CQS3	Internal quality auditing	Mr Murray Feddersen	CQS Australia
304	DEX2	Supply of IT support to Land & Water Australia and Audit for 1998–99 to 2000–01.	Mr Rowan Lane	Dextra Systems
305	DEX4	Development of a new Project Management System for Land & Water Australia	Mr Rowan Lane	Dextra Systems

Appendix 5
Compliance Index

Pages

PIERD Act 1989

CAC Act 1997

CAC Orders for the Report of Operations

Other reporting requirements

Index

For a number of entries, the index lists sequences of pages. This indicates either general discussion of a topic or that keywords or phrases occur at least once on most pages within the range – not necessarily all.