Department of
Infrastructure, Planning and Natural Resources

Contact: Ms C Beckett
Phone: (02) 9895 7315
Fax: (02) 9895 7109
Email:
charmaine.beckett@dipnr.nsw.gov.au

The Secretary
Senate Environment, Communications Information Technology
and the Arts References Committee
Parliament House
CANBERRA ACT 2600

Dear Sir/Madam

Subject: Inquiry into the Extent and Economic Impact of Salinity

I am pleased to provide the New South Wales submission to the Commonwealth Senate Inquiry into the Extent and Economic Impact of Salinity. This is a joint submission from the State's natural resource agencies and Catchment Management Authorities.

The New South Wales Government is very mindful of the salinity issue and its broad economic impact both on both rural and urban communities. The Government committed an additional $52 million over the last four years to ensure that we have the best science and tools to enable land managers to minimise salinity damage and to target the National Action Plan for Salinity and Water Quality funds for the best outcomes.

New South Wales has also undertaken significant structural reform of natural resource management, including the establishment of thirteen Catchment Management Authorities. The reforms allow local and regional management of salinity issues, which our scientific advances indicate is the most effective scale to tackle this issue in the New South Wales context.

Should you have any questions relating to this submission, I have arranged for Ms Charmaine Beckett to assist you. Ms Beckett can be contacted at our Parramatta Office on 02 9895 7315.

Yours sincerely

Peter Sutherland
Deputy Director General
Coastal, Rural and Regional NSW

NSW Government Submission to the Commonwealth Senate Environment, Communications, Information Technology and the Arts References Committee Inquiry into the extent and economic impact of salinity

(a) Whether goals of national programs to address salinity have been attained, including those stated in the National Action Plan for Salinity and Water Quality, National Heritage Trust and National Landcare programs

The agreement between the Commonwealth of Australia and the State of New South Wales Relating to the National Action Plan for Salinity and Water Quality Initiative (NAP) of the Council of Australian Governments, signed on 17 May 2002, recognised that the NSW Salinity Strategy established a framework for managing salinity in New South Wales. It further recognised that the key tools of the NSW Salinity Strategy aligned closely with the six key elements of the NAP, including:

(i) an improved governance framework;
(ii) integrated catchment/regional management plans;
(iii) targets and standards for natural resource management;
(iv) capacity building for communities;
(v) clearly articulated roles for the Commonwealth, State/Territory, Local governments and the community; and
(vi) a public communications program.

The NSW Salinity Strategy's main objectives were to build an understanding of the salinity problem in NSW and to develop the capacity of State Government, local government, Catchment Management Authorities and landholders to manage salinity in the short term and to halt the predicted worsening trends in the medium to long term. The Strategy was implemented between 2000 and 2004 by several NSW Government agencies including Department of Infrastructure Planning and Natural Resources, Department of Primary Industries, Department of Environment and Conservation, and the Department of State and Regional Development in collaboration with universities, Cooperative Research Centres and the CSIRO. Forty-six of the fifty-five actions of the Strategy were completed, with some programs ongoing.

The achievements of the Salinity Strategy have taken place in the context of major natural resource management reforms commenced by the NSW Government in 2003. While many goals and objectives have been achieved, and will be outlined in further detail throughout this submission, the NSW Government recognises that managing salinity is a long-term, whole-of-government process, which requires all forms of Government to work cooperatively with industry and the community. The achievements of NSW Government programs and reforms will be outlined with respect to the six key elements of the NAP.

(i) An improved governance framework
(ii) Integrated catchment/regional management plans
(iii) Targets and standards for natural resource management

NSW Government natural resource management reforms

In 2003 the NSW Government announced major natural resource management reforms in New South Wales with three bills passed by the Parliament putting these reforms in place:

- *Natural Resources Commission Act 2003;*
- *Catchment Management Authorities Act 2003; and*
- *Native Vegetation Act 2003.*

The regional model for natural resource management embodied in the Bills is the culmination of significant natural resource management reforms at both a national and state level. The reforms set the framework for ending broadscale land clearing and rewarding farmers for good land management.

The *Natural Resources Commission Act 2003* created an independent Natural Resources Commission (NRC) to establish standards and targets for natural resource management, and to audit progress towards those targets. The NRC is developing the state-wide standards and targets based on the best scientific, economic and social information available and in consultation with NSW natural resource management agencies, Catchment Management Authorities, the Australian Government and other stakeholders. In addition, the NRC is taking into consideration existing targets, including those established under the Salinity Strategy.

The standards and targets are necessary to ensure a coordinated, consistent approach to natural resource management across catchments, to guide investment of finite resources and to provide a basis for assessing the performance of Catchment Management Authorities. The approach to the development of indicators for assessing progress against each recommended state-wide target has been mindful of the State's obligations on these matters under the National Action Plan for Salinity and Water Quality and the Natural Heritage Trust programs. The NRC is also responsible for providing independent advice to the Government on issues including water, native vegetation, salinity, soil, biodiversity and coastal protection.

The *Catchment Management Authorities Act 2003* established 13 locally driven Catchment Management Authorities (CMAs) to play the central role in delivering integrated services and planning at the catchment level to combat natural resource problems. CMAs are required to prepare and implement Catchment Action Plans (CAPs) and associated investment strategies that identify the key natural resource management issues facing their catchments. In many catchments, salinity management is recognised as a priority issue.

It is a requirement of the *Catchment Management Authorities Act 2003* for the CAPs to take into account the state-wide standards and targets set by the NRC. The *Natural Resources Commission Act 2003* provides for the NRC to advise the NSW Government whether the CAPs are consistent with the state-wide standards and targets and to audit the implementation of the CAPs for promotion of the state-wide targets.

NSW Salinity Strategy

Targets set
Salinity targets and monitoring have been key outcomes of the NSW Salinity Strategy. Salinity targets for NSW's inland river systems were approved by the Government in 2002, following consultation with catchment communities. The targets represent agreed levels of salinity that can be tolerated by the community and the environment and that can be achieved affordably. The targets provide a key tool for monitoring the effects of catchment activities and assessing how well strategies to manage salinity are working.

The salinity target setting process has helped catchment communities to understand the issues of the trade-offs that are a necessary part of the management of natural resources for socio-economic, as well as environmental outcomes. It has also helped catchment communities move to target driven investment. Quantifying targets that people are prepared to work to and live with, help to scope the extent, size and cost of the remedial and preventative actions required to manage salinity and other natural resource management issues. The salinity targets are currently being reviewed by the Catchment Management Authorities and the Natural Resource Commission, as there have been significant advances in the technical and scientific knowledge since they were established.

(iv) Capacity building for communities

NSW Salinity Strategy

Salt Action Teams
The NSW Government provided $3.3 million over four years for the establishment of six Urban and Rural Salt Action Teams. The six teams provide specialist client-focused salinity and socio-economic advice in an integrated natural resource management framework. The Salt Action Teams have been crucial in delivering the products, strategies and training programs needed to build the capacity of stakeholders to understand how to manage salinity in the context of the whole landscape. The Urban Salt Action Teams is continuing to provide strategic and technical advice as urban salinity has been identified as a major economic threat.

Understanding salinity
Significant advances have been made in understanding the biophysical processes of salinity operating in NSW. It is now recognised that the causes of salinity in NSW are the result of a complex interplay of variables. Salinity remediation and response time for intervention correlate to a large extent with the groundwater flow systems and climatic variability. The flow systems can be local, intermediate or regional systems. The response times for the regional systems can be 50 years or more. However, the response times for local systems can be as little as two years. Most salinity in eastern NSW is related to local groundwater flow systems that respond to variations in climate. This knowledge at the catchment scale allows Catchment Management Authorities to target salinity work where outcomes are achievable. In some areas, experts are able to accurately site an interception planting so that a salt scald shows improvement within a very short time span.

Land use and salinity outbreak maps for eastern NSW
Catchment scale land use and salinity outbreak maps were completed for the eastern part of NSW from the coast to the start of the western plains. The mapping provides baseline information for the planning of investment and monitoring programs. The project delivered a

series of 119 salinity outbreak maps and a series of 126 land use maps. The mapped data has assisted Catchment Management Authorities in their planning by highlighting the extent of the salinity problem as well as potential downstream threats to agriculture, urban communities, infrastructure (roads and railways) and natural environments.

The maps have been instrumental in the development of the Salinity Hazard Index (SHI), which depicts the relative extent to which natural physical characteristics predispose a landscape to salinisation. Generating the SHI involved developing an analytical method drawing on more than 20 input data themes, including soil salt stores, geology, groundwater salinity and groundwater flow systems. Many of these themes had previously not been assembled for the whole of NSW. The SHI has informed many modelling and decision support tools developed under the Strategy and has supported decision making at the catchment scale.

Decision Support Tools and Models

A number of decision support tools and models were developed under the Salinity Strategy to build the capacity of landholders and Catchment Management Authorities to manage salinity more effectively. These included the Catchment Salt Balance Model (CATSALT), the Catchment Scale Multiple Use Atmosphere Soil Water and Solute Transport Model (CLASS) and the Land-use Options Simulator (LUOS).

CATSALT simulates the rainfall-runoff process and the mobilisation and export of salt from catchments. It uses time series climate data as input, together with data on catchment characteristics and produces daily time series of streamflow, salt loads and salinities as primary outputs. CATSALT can analyse the impacts of land use changes in a catchment on streamflow, salt loads and salinities at the catchment outlet. CATSALT has been applied to 150 priority sub-catchments in the Murray-Darling Basin, Hunter and other coastal catchments, including the Lachlan, Macquarie, Murrumbidgee and Murray (Billabong) valleys.

CLASS is an enhanced version of CATSALT. It evaluates impacts of land use changes at sites in a catchment on daily time series of water yields, salt loads and salinities exported from the catchment more reliably than CATSALT, and evaluates interactions with adjoining areas as well. The science supporting the tools developed in CLASS and CATSALT has been peer reviewed and has been published in leading international journals. CLASS supports the natural resources management reforms and will guide the Natural Resources Commission to set standards and targets for water quantity and quality, by linking inland landscapes to streams.

The Land Use Options Simulator (LUOS) is a decision support tool that uses the CATSALT model to predict the changes in average run off yield and salt load exports at the outlet of a catchment due to land use changes at one or more sites within the catchment. Every part of a catchment can be defined in terms of its current relative contribution to catchment water yield and salt export. Changes in land use or management on a property can cause a change in a catchment's mean annual salt and water yields.

Communication of catchment scale implementation of CLASS to the regions and CMAs will be facilitated through decision support tools like LUOS. The property scale tools in the CLASS framework will be available to the CMA and regional staff and give first cut information on planning biophysical aspects of the impact of on-ground works.

Models based on the best available science - recharge validation
Models are a cost-effective way to predict, analyse and assess landscape condition. However, models are only as good as the science and data that underpins them. Over the past four years a major collaborative project has evolved that combines the strengths of a number of government agencies, universities and Cooperative Research Centres. A network of four monitoring sites has been established to assess recharge from cropping, pasture, planted forests and remnant native vegetation. The data collected at these four sites is crucial for the improvement and validation of models for targeting land use change for salinity outcomes. The current experimental period has been dominated by drought. Continuation of monitoring in non-drought conditions will provide information on how the land uses behave under conditions when water and salt movement are at their greatest.

Development of native grasses for salinity management
Farmers now understand the need to manage recharge. There is improved knowledge about how salt tolerant pastures and specialised farming systems can help them do this. The LIGULE ("low input grasses useful in limiting environments") project identified native grasses that make better use of water and nutrients because they grow at a time when most other pasture grasses are dormant or have died off. Vigorous summer active native perennial grasses have the potential to close the nitrogen cycle by keeping legume nitrogen available to livestock, as well as minimising soil erosion and maximising water use to prevent it reaching the water table. These native grasses, which are now commercially available, have the potential to be a great asset for salinity management.

(v) Clearly articulated roles for the Commonwealth, State/Territory, Local governments and the community

NSW Salinity Strategy

The Local Government Salinity Initiative
The Local Government Salinity Initiative (LGSI) is developing the capacity of councils to manage urban salinity. The LGSI is providing training, education and technical support to local government on urban salinity issues so that they can include salinity in planning and development decisions. Workshops have been held throughout the state with over 40,000 copies of the LGSI booklet series sent to councils.

Booklets in the series are:
- Indicators of Urban Salinity 2002
- Broad Scale Resources for Urban Salinity Assessment 2002
- Site Investigations for Urban Salinity 2003
- Roads and Salinity 2003
- Introduction to Urban Salinity 2003
- Building in a Saline Environment 2003
- Waterwise Parks and Gardens 2004
- Salinity Plant Indicators 2004
- Groundwater Basics for Understanding Urban Salinity 2004
- Costs of Urban Salinity 2004
- Land Use Planning and Urban Salinity 2004
- Urban Salinity Processes 2004.

Urban salinity is now incorporated in the Standard Provisions for Local Environmental Plans, as part of the reform of the planning process in NSW. Builders are now required to comply with a NSW variation to the Building Code of Australian to use high impact membranes on concrete slab constructions. The membranes help stop punctures during construction, protecting buildings from rising saline water damage.

The Urban and Coastal Salt Action teams helped Western Sydney Regional Organisation of Councils (WSROC) to develop a Salinity Code of Practice. This has lead to WSROC appointing a salinity officer to work with its constituent councils. The Coastal Salt Action Team supported development of the Western Sydney Salinity Potential Map (2003) which has raised the profile of salinity amongst local government in western Sydney and has given local councils a management tool to help in planning decisions.

(vi) Public communications program

NSW Salinity Strategy

Salt Action Teams facilitating knowledge transfer
The Salt Action Teams have led public communication of the impacts of salinity and the ways in which it can be managed. One of the most far-reaching outcomes of the Strategy has been the development of an understanding about holistic landscape management. Managing salinity requires a 3-demensional approach with knowledge of geology, hydrology, topography, soils, agronomy, economics, surface and groundwater management and the impact of climate variability as well as an expert knowledge of the salinity risk of land use systems. The Salt Action Teams have delivered educational programs to communities in both urban and regional areas, providing information on better landuse management practices.

The southern Salt Action Team, in consultation with salinity economists and hydrology research staff, has developed an accredited salinity management training program. The program includes competencies and learning outcomes suitable for delivery to landholders and frontline staff. The training has delivered:

- ten workshops training over 150 private agronomists and consultants in the impacts of salinity and the plant based solutions available for its management;
- the Glovebox Guide to Salinity Management for NSW Murray and Murrumbidgee catchments – a training resource providing salinity information on location and causes, identification and investigation and management;
- salinity factsheets for private agronomists to use with their clients; and
- significant and new networks and linkages with private agronomists.

As a result of the training, land managers, Cooperative Research Centre scientists, State Government extension officers and private agronomists are now exchanging practical experience, research and development results, and educational information. Landholders have received comprehensive information from private advisors to allow them to manage natural resources better and reduce the onset of salinity.

(b) the role that regional catchment management authorities are required to play in management of salinity-affected areas, and the legislative and financial support available to assist them in achieving national goals

The *Catchment Management Authorities Act 2003* established 13 locally drive Catchment Management Authorities (CMAs) which have responsibility for planning and implementing natural resource management in their respective regions. Overseen by community-based Boards, the Authorities have started preparing Catchment Action Plans (CAPs) and associated investment strategies to guide on-ground actions that will improve the environmental, economic and social sustainability of their catchments. The CAPs are due to be finalised by December 2005.

The CMAs are supported by a direct investment of over $436 million, which includes money from the National Action Plan for Salinity and Water Quality and the Natural Heritage Trust. The investment will enable the Authorities to implement the on-ground actions identified in their CAPs and to fund incentives programs for on-farm projects, for instance to manage native vegetation.

In developing their CAPs, the CMAs are integrating and building on the Catchment Blueprints previously endorsed by the Government, regional vegetation management plans and other natural resource management plans. The Authorities are using the knowledge and tools generated by the Salinity Strategy to support the development of a number of aspects of their Action Plans.

CMAs are the primary State Government body responsible for delivering the natural resource management reforms on the ground, including managing salinity-affected areas and assisting landholders to develop environmentally sustainable land management practices. An important role of CMAs is facilitating the development of Property Vegetation Plans (PVPs). A PVP is a voluntary but legally binding agreement between the landholder and the local CMA identifying what can be done with native vegetation on a property. The role of CMAs in this process includes: allocating funds to support development of PVPs and for PVP-based incentive programs; certifying or facilitating certification of PVPs; and monitoring performance against Catchment Action Plans and certified PVPs. The impact on salinity of any native vegetation clearing will be assessed by CMAs and landholders when developing individual PVPs.

Results from many actions undertaken as part of the NSW Salinity Strategy will continue to inform Catchment Management Authorities when planning and implementing the Catchment Action Plans and Property Vegetation Plans. Scientific and technical knowledge gained as a result of research projects, decision support tools and modelling programs, and partnerships created through community based programs will all assist CMAs in their future management of salinity-affected areas.

(c) what action has been taken as a result of recommendations made by the House of Representatives' Science and Innovation Committee's inquiry 'Science overcoming salinity: Coordinating and extending the science to address the nation's salinity problem' and how those recommendations may be furthered to assist land-holders, regional managers and affected communities to address and reduce the problems presented by salinity

Many actions of the NSW Salinity Strategy have been developed which support the recommendations made by the House of Representatives' Science and Innovation Committee's inquiry 'Science overcoming salinity: Coordinating and extending the science to address the nation's salinity problem'. The actions are related to the recommendations as follows:

Recommendation 1

Catchment Management Authorities (CMAs) are ensuring that validated salinity research findings are being incorporated in regional Catchment Action Plans (CAPs). A number of innovative pilot projects were undertaken as part of the NSW Salinity Strategy to provide incentives for land managers to change their practices to deliver environmental services and ensure sustainable land use. The NSW Government allocated $21 million over four years to develop and implement market-based schemes to manage salinity. CMAs are using the results of these pilot projects to improve CAP implementation.

Liverpool Plains Project
The Liverpool Plains Pilot Project trialled market mechanisms and schemes for strategic investment in natural resource management in the agriculturally productive Liverpool Plains catchment. The project facilitated land use and management change for salinity, water quality and biodiversity outcomes, and resulted in greater community understanding of the processes causing salinity and of the actions required for its abatement.

The Liverpool Plains project found that a 'bush tender' scheme allowed much better targeting of investment than the traditional grant programs, but that farmers usually required greater than 50:50 cost sharing as an incentive to participate. The project also trailed an Environmental Benefits Index (EBI) to rank proposals which farmers supported as it was an open and transparent process.

TARGET project
The TARGET Project was undertaken in the Lachlan, Macquarie and Castlereagh catchments and involved surveying farmers to identify the social and economic barriers to, and triggers for, adopting significant land use and water management changes. Results of the surveys, along with the biophysical data, were used to develop and trial new and innovative investment strategies. These included tender-based approaches, variable cost sharing ratios based on environmental values, and investments in longer-term results over a five year period. Incentive funding was provided to undertake on-ground works in strategic locations. The type of work funded included perennial and native pastures, conservation farming machinery conversions, intercropping, saline agro-forestry, farm forestry, riparian vegetation conservation and remnant vegetation conservation.

A major finding of this project is that the take-up of incentives is not dependent on the level of incentive offered. Take-up was linked to the level of understanding of why the work

needed to be done, how it fitted into the plans and aspirations for the farm business, the financial position of the farmer and the family and social structures. The project also found that the social and technical knowledge of the negotiator, or CMA officer, was a crucial factor in achieving positive response to incentive take-up.

Heartlands project
The Heartlands Project brought together community, State and Australian Government and CSIRO resources to develop and trial new, large-scale systems of land use that deliver multiple benefits to the environment, the economy and the community. The project piloted a two-year component of the Heartlands Initiative, a longer-term program of action and investigation in the NSW-Victoria border region of the Murray-Darling Basin. In NSW the project was implemented in upper Billabong Creek in the Murray Catchment and in Kyeamba Valley in the Murrumbidgee Catchment.

The project, which combined research and on-ground works, focussed on the development of innovative farm forestry designs and native vegetation management schemes that provide a number of environmental benefits, including salinity and erosion control and enhanced biodiversity and water quality. The social and economic responses to these land use systems were examined, as were the social and economic impediments to changing land use and management practices.

The Heartlands project found that participatory research, where farmers and researchers worked together to implement a project, improved the on ground outcomes. This had the two-way benefit of making sure research undertaken was relevant to farmers and that farmers understood how to adopt practices in their own situations. The project also broke down some of the traditional suspicion that exists between researchers and farmers.

CMAs are in a position to drive these partnerships when implementing the CAPs. They can also use knowledge derived from the pilot projects about barriers farmers face in adopting changed land use practices to develop incentive programs.

Recommendation 2

The NSW Government committed $250,000 to undertake an audit of the Hunter, and North and South Coast catchments. The Hunter audit assessed the impact of dryland salinity on stream salinity and river salt loads, and predicted future stream salinity based on groundwater level trends. The audit did not address land salinisation.

The North and South Coast audit involved collation and review of available salinity data and analysis of surface and groundwater data. Based on the limited data available, salinity issues of significance in coastal NSW relate to urban and infrastructure development, intensive land use and significant land use change in salinity hazard landscapes. The audit also focussed on stream salinity, but unlike the Hunter, there was insufficient groundwater data for coastal river basins to be able to make salinity trend predictions. Salinity is identified as a problem in the Hunter coal mining areas of the Manning and Karuah basins and the southern tableland areas around Braidwood and Goulburn.

The Coastal Audit did not cover the western Sydney area where salinity is a recognised hazard with the potential to affect large areas of new development in the future. The Salinity

Potential of Western Sydney is a separate study that has been undertaken as part of a Natural Heritage Trust project.

Recommendation 6

Salinity causes considerable damage to homes and infrastructure in many urban areas of NSW. The Local Government Salinity Initiative is developing the capacity of councils to manage urban salinity. The Initiative is providing training, education and technical support to local government on urban salinity issues so that they can include salinity in planning and development decisions. Local governments in the Dubbo area are adopting a strong proactive response to salinity in partnership with the Catchment Management Authority, community and relevant government agencies.

Best practice for salinity in building codes
The Urban Salt Action Team developed the booklet *Building in a Saline Environment* which has proven to be a highly useful tool for local councils and building industry groups. Urban salinity is now incorporated in the Standard Provisions for Local Environmental Plans in NSW. Builders are required to comply with a NSW variation to the Building Code of Australia to use high impact membranes on concrete slab constructions, which help stop punctures during construction, thereby protecting buildings form rising saline water damage.

Recommendation 9

Research into the impact of various farming practices
Two research sites, each approximately 700 hectares, have been established at Duri (south of Tamworth) and Sloane's Creek (east of Wellington) to investigate sustainable land and water management practices. The biophysical and economic effects of deep-rooted perennial pastures, long-season annual crops and multiple cropping systems on water use, deep drainage and salt movement have been evaluated at the research sites.

Some of the findings of the project include:

- perennial pastures are not equally effective, in that pastures which are more effective at using water in the summer and autumn months are likely to be able to create a dry soil buffer which will reduce the incidence of deep drainage during the winter months;
- run-off from rainfall in the upper parts of the catchment will only occur in a small part of the lower catchment in all but the most intense rainfall events and is likely to be generated by mobilisation of groundwater in semi-saturated soils near the surface; and
- the amount and concentration of salt exported from a saline outbreak will vary according to rainfall pattern and intensity.

Catchment Management Authorities support this work, as it provides them with quality information on hydrological processes and enables them to make more informed decisions resulting in better investment of on-ground works.

Model farms
To complement the research sites, six satellite site model farms were established to provide information which addresses salinity over a large area of central and northern NSW. The farms are located at Pine Ridge (near Tamworth), Breeza, Carcoar, Boorowa, Condobolin and Young. This has been a collaborative project involving Sydney University, the Grains Research and Development Corporation, Meat and Livestock Australia, Land and Water Australia, the Cooperative Research Centre for Plant-Based Management of Dryland Salinity and Duri, Boorowa and Cundumbul Landcare groups.

The results of the research have provided farmers with important information about the best farming systems for minimising and adapting to salinity in the landscape. Some of these findings include:

- native perennial pastures appear to have been effective in eliminating deep drainage near Tamworth, although observations need to be extended in order to measure native pasture effectiveness in wetter years and components of the water balance need to be more precisely partitioned; and
- stands of saltbush alone are not likely to prevent deep drainage, such that when managed with a perennial pasture, the combined system may provide a productive grazing system which is effective in reducing recharge.

Communication of the results of both the research sites and the model farms has been a priority. In addition to journal papers, newsletter articles, conference proceedings and newspaper articles being published, field days, bus tours and Landcare group meetings have taken place. Salinity education courses have been provided for agency staff, private agribusiness staff and Catchment Management Authority staff. Salt Action Teams have been integral to communication activities under these projects.

The baseline data collected from both the research sites and the model farms is useful for most soil-related natural resource management issues, including acidification, erosion, sodicity, soil structure, native vegetation, river health, whole farm and catchment economics, and biodiversity.

Recommendation 10

Cooperative Research Centre for Plant-Based Solutions to Dryland Salinity
The Cooperative Research Centre (CRC) was established in July 2001 and is a national organisation conducting research, education and communication activities in plant-based solutions to managing dryland salinity. The NSW Department of Primary Industries has fulfilled the role of core partner for the NSW Government in the CRC.

The CRC has established itself as the major provider of high quality research into salinity processes and plant-based solutions for the management of salinity. Some of the key achievements of the CRC include:

- establishment of a core research site at Tarcutta, to investigate the adaptation of vegetation to water and soil constraints;
- the linking of the hydrology research sites and model farms, discussed above, to modelling frameworks and the integration of woody and herbaceous perennials in Wellington;

- establishment of a new project in the Wagga Wagga area with co-funding from Meat and Livestock Australia to increase pasture production and profitability and reduce recharge; and
- development of a training program titled *Agro-forestry for NRM*, linked to salinity management training.

The CRC is presently funded to 2007. The Department of Primary Industries has commitments up to 2007 as a core partner of the CRC.

Recommendation 11

The NSW Government has supported a number of projects and business enterprises as part of the Salinity Strategy which have sought to manage the salt present in the land productively. There has been a concerted effort over the past four years to encourage private capital to fund commercial operations in regional areas affected by salinity. The Government has helped develop the potential of salt-based industries through business development, information programs and research.

SunSalt
The NSW Government provided assistance to SunSalt, an Australian Salt producing company, to develop a salt harvesting and processing plant in Mourquong in Southern NSW. This is a new business which generates employment and investment by using saline water that has been stored in evaporative ponds near the Murray River. The project involved $1.2 million in investment and 12 full-time equivalent jobs. Two large scale crystallisers have been constructed as well as a brine supply channel. The facility is now capable of producing 30-50 000 tonnes of sodium chloride.

Old Man Saltbush
Old Man Saltbush is a plant which has been used as a means of controlling salinity in parts of the Central West of NSW since 1992. A project to encourage the production and marketing of lamb raised on Old Man Saltbush is currently being supported by the NSW Government.

Inland Centre for Saline Aquaculture Research and Development
The NSW Government provided financial assistance to a joint research project with NSW Fisheries and Murray Irrigation Ltd which resulted in the development of the Inland Centre for Saline Aquaculture Research and Development, based at Wakool, in the southern edge of the Murray Darling Basin. The Centre was opened in May 2002 and is being used to evaluate the potential for using saline groundwater in aquaculture. Research at the Centre has included survival and growth trials of silver perch (a salt-tolerant, native freshwater fish), mulloway (an estuarine fish), black tiger prawns (a marine prawn tolerant of a wide range of salt concentrations) and rainbow trout.

Recommendation 13

Water quality monitoring network established
To enable accurate assessment of progress against salinity targets, the NSW Government allocated $4.8 million over four years for the development of monitoring methods. A fully operational and standardised gauging station network is now in place. The gauging stations collect water quality data, including salinity EC (concentration), from end-of-valley and within-valley sites on a daily basis. This data is posted on the Department of Infrastructure,

Planning and Natural Resources website and is available to the public. The data has wide application including water management and planning, river health programs, the Murray Darling Basin Commission Cap, flood management, water access management and climate variation studies. Clients include councils, the Murray Darling Basin Commission, the mining industry and power authorities.

Recommendation 17

NRM options website

The NRM Options database is a whole-of-government register of the most economically viable land use options suitable for particular climates and landscape conditions. It allows for easy information transfer of the best applied science to Catchment Management Authorities and land managers, improving their access to specialist expertise and corporate knowledge relating to salinity, farming systems and biodiversity management options. The NRM Options will allow researchers to register knowledge and case studies in a quality-controlled environment. The database can be accessed at www.nrmoptions.nsw.gov.au.

NRM Options is used in the Land-use Options Simulator and the Property Vegetation Plan process. Major outcomes from the use of NRM Options include:

- the specialised scientific expertise within NSW Government agencies will be highly accessible to CMAs, reducing reliance upon personal networks;
- the CMAs will have a quality assured and up-to-date source of information negating the need to employ specialists and therefore freeing funds for on ground activities;
- it is a mechanism for NSW natural resource management agencies to integrate their services;
- it builds on previous work to provide a one-stop-shop for investment options; and
- it provides a knowledge benchmark that identifies knowledge gaps requiring research.