Salinity Inquiry

Submission No. ...8..........

Submission by

The Cooperative Research Centre for Plant-Based Management of Dryland Salinity

Summary of recommendations

1. That the Commonwealth's NRM programs recognise the distinct and complementary roles of research in two categories: (1) research primarily focused on understanding and quantifying salinity processes and their effects and (2) research aimed at developing technologies and their applications.

2. That the Commonwealth adequately resource both categories of research, particularly category 2, which focuses on technology development, essential for long-term success in salinity management on a large scale, and encourage industry groups such as the Grains Research & Development Corporation, Meat & Livestock Australia and Australian Wool Innovations to take a leading role in supporting category 2 research.

3. That the Commonwealth explicitly remove perceived or actual impediments to funding of R&D by regional NRM planning bodies funded under the NAP by allocating significant levels of NAP funding to R&D priorities at the state level. Although they should be consulted, individual regional bodies should not have the power of veto over how these funds are allocated.

4. That the Commonwealth put in place strategies to encourage strategic partnerships between agribusiness, State agencies and CMAs to enhance face to face extension of the results of research. This CRC has a partnership with Landmark, which may serve as a model.

5. That the Commonwealth use some of its NAP funds to increase its understanding of the socio-economic constraints to the widespread adoption of relevant technology.

6. That the Commonwealth support the continuation of the NDSP as the key national coordination body for salinity R&D. Failing this support the Commonwealth should provide support for the CRC to coordinate the research and extension.

7. That the Commonwealth review the agricultural research funding model with a view to establishing a structure that encourages integration of commodities, sustainability and the provision of ecosystem services.

Terms of Reference

The House of Representatives Standing Committee on Science and Innovation shall inquire into and report on the Commonwealth's role in managing and coordinating the application of the best science in relation to Australia's salinity programs.

In conducting its inquiry, the Committee will give particular consideration to the:

a) use of salinity science base and research data (including the development of new scientific, technical and engineering knowledge) in the management, coordination and implementation of salinity programs;

b) *linkages between those conducting research and those implementing salinity solutions, including the coordination and dissemination of research and data across jurisdictions and agencies, and to all relevant decision makers (including catchment management bodies and land holders); and*

c) *adequacy of technical and scientific support in applying salinity management options.*

This submission commences with a brief background about the CRC for Plant-Based Management of Dryland Salinity, presents a range of information and concerns relating to the Terms of Reference, comments on the questions raised in the background paper and makes seven recommendations for the Inquiry to consider.

Background on the CRC

The CRC for Plant-Based Management of Dryland Salinity is a coordinated scientific response to dryland salinity, involving eleven core-partners across four states, as well as linking closely with various stakeholder organisations and groups. The underpinning principles of the CRC are twofold: firstly that farming systems should use perennial plants such that there is functional mimicry of the natural landscape; and secondly that perennial~based farming systems should be as profitable or more profitable than existing annual plant~based farming systems to encourage adoption of perennials on the scale necessary to impact on salinity. Refer to Appendix A for information on the CRC's objectives, partners and goals.

Much of the research that has previously been supported by the Commonwealth and States has been directed at defining the extent and causes of the problem. This appears to be recognised in the terms of reference of the inquiry which recognise that there are two kinds of research:

> Category 1. Scientific research primarily focused on understanding and quantifying salinity processes and their effects.

> Category 2. Scientific research aimed at developing technologies and applications.

This CRC has established activities in both areas but is primarily concerned with redressing the historical neglect of the second category. In doing so it is focusing on plant-based systems rather than engineering responses. However, this is not to say that engineering responses are inappropriate or irrelevant. This submission focuses on category 2 research.

We strongly endorse the following statements from the information paper:

> "Designing sound public policy to address salinity involves combining scientific and technical knowledge, as well as economic, social and ethical considerations."

> "The effective management of salinity, and research into the application of treatments, necessarily requires that the relevant socio-economic factors be considered."

In addition we would like to emphasise that:

> "Adoption of new technologies on the scale required is likely to limit the application of emerging technologies".

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The CRC includes programs of research on economic and social aspects of dryland salinity, integrated and collaborating closely with the Centre's biophysical R&D. It also is attempting to address the problem of slow and incomplete adoption.

Recommendation 1: That the Commonwealth's NRM programs recognise the distinct and complementary roles of research in two categories: (1) research primarily focused on understanding and quantifying salinity processes and their effects and (2) research aimed at developing technologies and their applications.

Responses to issues in the TOR

The priorities of the CRC are based on careful assessment of bio-physical and socio-economic research into dryland salinity over the past decade. This assessment leads us to the view that there has been an imbalance in Commonwealth investment in salinity science, and an inadequate overall level of investment by the Commonwealth in salinity science.

Research imbalance

Existing salinity-related science funded by core Commonwealth agencies and programs falls almost entirely into the first of the categories identified by the Inquiry (scientific research primarily focused on understanding and quantifying salinity processes and their effects). Clearly there is an important need for research in this category to inform the selection of priorities for funding of on-ground works under the National Action Plan for Salinity and Water Quality (NAP).

However, research findings in hydrology, plant science and resource economics have increasingly highlighted the crucial role of science in your second category (scientific research aimed at developing technologies and applications). There are several broad types of technologies that are relevant to this category.

a) perennial plant-based systems for recharge areas (trees, shrubs, pastures, crops),
b) salt-tolerant plants for making productive use of salt-affected land (various species and production systems),
c) engineering systems for managing water tables (eg drains, pumps), and
d) technologies for making productive use of salinised water resources (eg aquaculture, salt harvesting, desalination).

These areas correspond broadly to the three different responses that are relevant to salinity: repair (eg engineering), contain (eg perennials) and adapt (eg salt-tolerant plants and technologies for using saline resources).

This CRC is heavily involved in research under points (a) and (b). The crucial importance of research in these two areas is highlighted by the following brief outline of recent research results from different disciplines.

• The extent of land-use change (adoption of perennial plants) that would be needed to contain dryland salinity is much greater than previously believed (eg George *et al.* 1999; Hatton and Nulsen 1999; Hatton and Salama 1999; Stauffacher *et al.* 2000; NLWRA 2001).

• Social research shows that farmers require new farming systems to be profitable if they are to be adopted on a large scale (Pannell 2001a).

- Economic research shows that there are very few perennial systems currently available that are profitable, and that the existing options are only profitable on a small-to-modest scale that varies region-by-region (Kingwell et al. 2003). *This explains why farmers are not adopting plant-based systems on the required scale for effective salinity containment.*

- Because of that lack of adoption and because of momentum in existing groundwater changes, there will inevitably be a worsening of salinity before it is contained (George et al. 1999; State Salinity Council 2000).

- *Plant research is showing that there are many promising opportunities for plant-based systems that may be profitable in either recharge or discharge areas* (eg Wildy *et al.* 2000; Cocks 2001). In other words, the paucity of current profitable options reflects an absence of past research in this area, rather than fundamental barriers to success.

Taken together, these research findings indicate that the strategy of the NAP will not succeed in achieving salinity management on a substantial scale unless it is strongly supported by R&D that succeeds in developing profitable new technologies for salinity management. Given the scale and costs involved, NAP funding alone is sufficient to achieve salinity containment in only a small minority of threatened locations.

Recommendation 2: That the Commonwealth adequately resource both categories of research, particularly category 2, which focuses on technology development, essential for long-term success in salinity management on a large scale, and encourage industry groups such as the Grains Research & Development Corporation, Meat & Livestock Australia and Australian Wool Innovations to take a leading role in supporting category 2 research.

Research shortfall

It is fortunate indeed for salinity management that this CRC was funded by the CRC program. It is notable that R&D of this type has received minimal funding from the Commonwealth's Natural Resource Management (NRM) programs (eg the Natural Heritage Trust, NHT) and so far none at all from the NAP. This reflects poorly on the capacity of certain Commonwealth agencies to assess the real needs for salinity management. Ideally the NAP would have supported R&D in both categories to a much greater extent. Instead, R&D funding in category 1 research has been directed to a subset of the relevant issues and not conducted in a way that is most helpfully supportive of regional planning, while NAP funding for R&D in category 2 is at minimal levels.

From our experience in discussions with relevant state agencies and catchment management bodies, it appears that for R&D to be funded through the NAP, it needs to be prioritised for funding by the regional NRM planning groups (eg Catchment Management Authorities -- CMAs). However, while a number of CMAs are keen to encourage location of CRC research projects within their regions, our experience has been that they are unwilling to fund it to any significant extent.[1] Furthermore, except possibly in South Australia, there appears to be almost no co-ordination between CMAs in terms of research investment priorities. Strategic research which addresses the needs of multiple CMAs has almost no chance of being funded.

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[1] To some extent this depends on the stage of development of the CMAs concerned (see later discussion).

The NAP has created community expectations that program funds will be spent exclusively on on-ground-works, and CMAs are not willing or able to violate these expectations. Even if they were, the NRM regions are not the right scale to determine most funding priorities for salinity science. Particularly in category 2, priorities need to be determined and the research conducted at a state scale, if not a national scale.

We are aware that attempts have been made to allocate some NAP funds at a state level to fund state-level priorities for R&D, but these attempts have been strongly resisted by the administrators of the NAP. We believe that in South Australia some NAP funding may be allocated to R&D at the state scale, but the amounts involved are inadequate to meet the needs in category 1, let alone address category 2.

Recommendation 3: That the Commonwealth explicitly remove perceived or actual impediments to funding of R&D by regional NRM planning bodies funded under the NAP by allocating significant levels of NAP funding to R&D priorities at the state level. Although they should be consulted, individual regional bodies should not have the power of veto over how these funds are allocated.

Coordination at the national level

How is the relevant scientific knowledge being utilized in the development, management and implementation of salinity programs?

In respect to category 1 research some CMAs that are well funded and have good management structures have formed effective partnerships with CSIRO, the State agencies and or private consulting firms. However, this has been done on a case by case basis and neglects those CMAs that are less well advanced in their planning. There are also problems with competition both between agencies (CSIRO and state agencies) and between public and private organisations, resulting from an overall decline in the publicly funded research base and increased competition between some scientific groups. It would be useful for a 'clearing house' to be established for the exchange of this kind of knowledge. Furthermore a partnership of state agencies, CSIRO and universities, as exemplified by the CRC, would have a significant impact in encouraging and fostering collaboration rather than competition.

When we consider category 2 research (management and solutions to salinity) there are two obstacles to widespread adoption:

- Firstly, the scale of landscape change is such that most land managers need to change their management practices. This requires an adoption capacity that is certainly beyond the CMAs themselves and, due to funding difficulties in the States, is also beyond the State agencies.

- Secondly, as mentioned earlier, the research itself is inadequate and the management solutions have, in most cases yet to be developed.

Recommendation 4: That the Commonwealth put in place strategies to encourage strategic partnerships between agribusiness, State agencies and CMAs to enhance face to face extension of the results of research. This CRC has a partnership with Landmark, which may serve as a model.

The nature and effectiveness of the linkages between scientists and technologists conducting research into salinity, and those implementing salinity interventions on the ground.

At present these linkages are ineffective for category 2 research. Up to 95% of the land managers who are responsible for change are farmers, and the complexities of the changes required and the need for them to be profitable highlight three points:

- The required land management changes are not currently available for most situations;

- Even where they are there is a reluctance by farmers to change in the absence of convincing evidence that they are profitable and/or compatible with current management skills/capacity and there is an inability of existing extension structures to provide that evidence at the scale needed;

- There is commonly a lack of understanding by researchers, technologists and bureaucrats of the social and economic constraints faced by rural communities.

Recommendation 5: That the Commonwealth use some of its NAP funds to increase its understanding of the socio-economic constraints to the widespread adoption of relevant technology.

How current research into salinity and information on options to address the problem are being distributed across jurisdictions, agencies, and to all relevant decision makers.

This CRC has taken on a coordinating role within its sphere of influence (seven state agencies, three universities, parts of CSIRO, primarily research focusing on plant-based management). However we note that the National Dryland Salinity Program (NDSP) has played the main science coordination role at the national level. NDSP appears likely to cease operation at the end of this financial year, leaving an important gap. The relevant Commonwealth agencies have poor track records in this area and apparently lack a depth of understanding of the salinity problem, so we would not like to see any of them attempt to take on this coordinating role. Rather, we would support Commonwealth funding for the retention and revitalisation of the NDSP in which the CRC takes a lead role.

As raised above, there is the issue of competition between some research providing agencies, given the declining amount of public research funding. The CRC provides an important vehicle to minimise competition and encourage collaboration between organisations.

Recommendation 6: That the Commonwealth support the continuation of the NDSP as the key national coordination body for salinity R&D. Failing this support the Commonwealth should provide support for the CRC to coordinate the research and extension.

The adequacy of scientific and technical support for those on the ground implementing salinity management options.

For category 1 research the need is to strengthen those catchment groups currently unable to access the strong research programs in CSIRO and the State agencies. These groups are likely to need expertise themselves if they are to know the right questions to ask.

For category 2 research many of the catchment groups understand that productivity and sustainability need to be linked. However the inability of researchers and technologists to forge these links is deeply embedded in our Australian research ethic. There are at least two reasons why this problem exists:

a) The dominance of the commodity based funding model of research investment (eg Grains Research and Development Corporation, Meat and Livestock Australia, Wool Innovations, Cotton R & D Corporation etc) has led to an emphasis on productivity. Attempts are being made to recognise that farming systems in, for example, the wheat belt include several commodities, but the funders struggle to put together research projects that encompass this reality. With the new requirement for sustainability the commodity model will struggle even more.

b) Many specialist discipline-based scientists have trouble understanding the complexity of agricultural systems. The interaction of the economic, social, environmental, political and cultural contexts of agricultural systems is complex and unless scientists work in multi-disciplined teams, many pieces of technology are unlikely to deliver useful results. At heart this too may be a problem of the commodity model in funding agricultural research.

A recent paper by Ridley (2003) has in part discussed some of these issues.

Recommendation 7: That the Commonwealth review the agricultural research funding model with a view to establishing a structure that encourages integration of commodities, sustainability and the provision of ecosystem services.

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Appendix A: The Cooperative Research Centre for Plant-Based Management of Dryland Salinity

Vision

The CRC will have an enduring impact on the future of Australian agriculture and its capacity to maintain the nation's natural resources, with an initial focus on dryland salinity, the largest and most intractable environmental problem in Australia.

Mission

Through an improved understanding of the way natural and agricultural ecosystems work, the CRC will provide new plant-based land use systems that lessen the economic, environmental and social impacts of dryland salinity and thereby help to sustain rural communities.

Goals

1. Direct and influence plant-based research delivering agricultural production and processing systems that cope with, arrest and reverse dryland salinity, improve water quality and sustain rural communities

2. Create awareness, will and capacity to adopt plant-based solutions to dryland salinity for the economic, environmental and social benefit of Australia

3. Provide an expanding pool of graduate researchers capable of solving the complex natural resource management issues facing Australia

4. Achieve effective collaboration among CRC researchers that transcends geography, agency, discipline and sector, interacts purposefully with industry and the community, and takes a lead in the effort to optimise the use of Australia's intellectual and research resources

Objectives

1. **Leadership:** Provide leadership to all levels of government and the community aimed at developing and implementing strategies to manage dryland salinity.

2. **Communication:** Increase the awareness of the need for change in dryland management

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practices and strengthen the will and capacity of rural communities to implement new land management systems.

3. **Scientific capacity:** Understand the scientific basis for, and, through education, increase the scientific capability to ensure effective development of plant-based solutions focused on coping with, arresting and/or reversing the impacts of dryland salinity.

4. **Plant breeding:** Select and breed woody and herbaceous perennial and salt tolerant plants for new farming systems and industries, which increase water use and enhance profitability.

5. **Plant systems:** Develop, evaluate and promote land use systems that a) are profitable, b) reduce recharge to ground water, c) tolerate waterlogging and salinity in discharge areas and d) reduce adverse off-site effects.

6. **Animal systems:** Develop and demonstrate profitable and practical animal production systems using a) salt and waterlogging tolerant plants in discharge areas and b) new and existing perennial plants in recharge areas.

7. **Economic and hydrological performance:** Evaluate economic and hydrological performance of actual and potential CRC outputs and develop policy options recognizing the socio-economic opportunities and constraints that lead to the adoption of new land use systems.

8. **Biodiversity:** Develop and promote effective land uses for salinity management that protect and enhance biodiversity values in the agricultural landscapes of southern Australia

Partners

NSW Agriculture
Charles Sturt University
Department of Primary Industries, Victoria
Department of Sustainability & Environment, Victoria
Department of Primary Industries & Resources, SA
Department of Water, Land & Biodiversity Conservation, SA
The University of Adelaide
Department of Agriculture, WA
Department of Conservation & Land Management, WA
The University of WA
CSIRO