Dryland Salinity R&D

Executive Summary

Land & Water Resources
Research & Development Corporation

National Soil Conservation Program

Murray-Darling Basin Commission

December, 1992

Policy Development Planning

Executive Summary

Background

This report presents the findings and recommendations arising from a review of dryland salinity R&D commissioned by a consortium of the three agencies responsible for most of the Commonwealth funding support for dryland salinity Research and Development (R&D) in Australia. The review was initiated by the Land and Water Resources Research and Development Corporation (LWRRDC) as part of its undertaking to develop a Dryland Salinity R&D Program.

This report is presented in five Parts broadly following the Terms of Reference. In addition to the main report, we have prepared four sets of Working Papers.

Part 1 The Control Technologies

This Part of the report briefly reviews the current technologies available to control dryland salinity and indicates why some technologies have been more readily adopted than others. We found that the technologies in themselves have generally been in use for some time but not for the purpose of salinity control. As a result, they are generally relatively simple and well-established but that the key determinants for their successful application for dryland salinity management has not been clearly identified. The key issues seem to be: the method of choosing the best technologies for a specific site; and the extent to which the technologies should be applied to achieve a pre-determined reduction in recharge or other desired effect.

The state agencies are generally not satisfied that they have the answers to these issues. They ranked most technologies as having an inadequate research base with the result that recommendations were tentative and often depend on local empiricism. Overall the states suggested that the reliability of the technologies was only moderate. Perennial pastures and cropping system management changes, both of which have high profitability for adopting farmers, are regarded as the best prospects for salinity control. The major determinants of the rate of adoption of technologies for salinity control are the long-term, relative profitability of the practices, and the farmer's level of concern about dryland salinity. It seems that farmers are only applying control technologies in situations ***where their adoption also leads to improved profitability.***

There are no comprehensive assessments of the rate of adoption of dryland salinity control measures in any state and few direct adoption studies. Our guesstimate, based on the better documented studies in Victoria would be that perhaps 25% of the landholders in areas already

affected to a large degree would have adopted some measures that contribute to salinity control. Not all of those 25% would have adopted the measures ***because*** of their impact on salinity but we have no way of estimating the proportions. The key factors seem to be the perceived "relative advantage" offered by the technology and the landholders' beliefs as to the need for control measures on their own land.

In conclusion, our review suggests that the rate of adoption of control measures is most likely to remain low unless landholders are convinced that they have a problem and that there is a sound technology available that will work in their situation generating greater income than the alternative of doing nothing. The challenge, therefore, seems to be more a case of improving the method of selecting, and subsequently convincingly demonstrating, the most appropriate technology, than a case of developing better technologies.

Part 2 The State Strategies

Each state other than Queensland and Western Australia has developed a strategic plan for dryland salinity management. WA is in the process of finalising its strategic plan and Queensland has incorporated plans for dryland salinity into its strategy for Natural Resource Management. There is a greater divergence amongst the states in how they plan to implement their dryland salinity program. Those differences that have implications for a national approach are identified.

The linkages with other forms of land degradation vary. Victoria, WA and SA tend to deal with dryland salinity as a separate entity or threat whereas others, particularly Queensland and to a lesser extent NSW, tend to deal with it as one of several forms of land degradation. We believe that the Commonwealth government's initiatives as part of the Decade of Landcare will encourage the states to adopt the more general resource management approach.

We recommend that the national R&D program for dryland salinity should encourage the resource management approach wherever possible and seek to integrate R&D in this area with other resource management initiatives associated with the Decade of Landcare.

Those states that have been active in the Murray-Darling Basin initiative (NSW, Victoria and SA) show strong linkages in their strategies. We *recommend that the national strategy should seek to build on existing linkages such as those provided by the MDB initiative and should extend these linkages to include Queensland and Western Australia where possible and appropriate.*

There are differences amongst the states in the extent to which they involve local communities in the development and implementation of dryland salinity management activities and in particular with the setting of R&D priorities. We *recommend that the national R&D program should seek to involve communities and potential beneficiaries in the R&D process but that a significant part of the R&D program should be based on R&D needs assessed on both technical merits and likely future adoption.*

To the extent that the problems are specific to any one state, that state will need to accept responsibility for conducting the necessary R&D. A national program would be of greatest benefit to the states in areas such as: development of techniques and models; research into problems that are common to a number of sites and which collectively account for a significant part of the salinity problem; research into problems that cross state borders; and research into aspects that require human and/or financial resources beyond the capacity of any one state.

Part 3 The Project Review

The consortium is currently responsible for a portfolio of 126 salinity R&D projects implemented through at least 22 agencies. The focus of effort has been balanced evenly between recharge and discharge area management with both accounting for around 37% of the projects. The study of groundwater processes accounts for a further 24% leaving 2% for socio-economic studies.

The efforts to identify where problems were occurring or to develop techniques to assist in this process accounted for 13% of the projects. Efforts to identify management practices dominate the project portfolio, accounting for 51% of all projects. Monitoring and demonstration activities account for 13% of the effort overall but these activities represent 50% of the efforts devoted to the

study of groundwater processes. In fact overall, monitoring accounts for at least 10% of effort. Education and extension efforts (other than demonstrations) account for 10% of the projects. The balance of the effort comprises about 11% for process and modelling studies and 2% for socio-economic studies.

Our conclusions on the total portfolio are summarised below.

1. Lack of Strategic Focus

There is no sense of a program-approach and, with a few exceptions, the projects were designed and implemented as free-standing activities. Despite this, with a few exceptions, the resulting portfolio does not seem grossly unbalanced. .

2. Strong Emphasis on Development of Management Solutions

This seems to indicate that sponsors felt that sufficient was known about the underlying principles and processes to develop practical solutions. In the light of the fundamental questions still being asked in most locations, this judgement seems unjustified.

3. Relatively little Emphasis on Processes or Mapping

This is the corollary of the emphasis on management and reinforces the idea that sponsors and R&D agencies felt that enough was already known.

4. Neglect of Socio-economic Aspects

The portfolio has provided little support to efforts to study the sociology of dryland salinity or to use economic tools to help define approaches to cost-effective management of dryland salinity. Given the now widely recognised need for community involvement in successful solutions and the complexity of the social issues involved in salinity, it is surprising that so little has been done in this area.

5. Lack of Monitoring and Evaluation

There has been disturbingly little hard-nosed evaluation of the activities that have been supported by either the funding agencies or the implementing agencies.

Findings from the Project Review

We did not attempt to assess each project in terms of its technical merit or efficiency. Rather, we concentrated on the effectiveness of the projects and attempted to identify those features that enhanced effectiveness and indicated where we felt there was scope for improvement. We defined effectiveness as "doing the right things" in the pursuit of the goal of "managing" dryland salinity so as to minimise its net cost to society. We suggest that the following areas are crucial to improving effectiveness and we have used these as criteria to help assess the sampled projects.

Clearly defined goals

We found that many of the projects lacked clear goals. Well-established and/or well-staffed agencies are more likely to have made the necessary prior investigations than agencies without those attributes. Affiliation or collaboration with other agencies doing similar work seems to lead to more clearly defined goals. For some projects, it was unclear what the goal was.

We recommend that the consortium give more attention to the goals that are set for the projects they support.

Well designed projects.

Few of the projects have been well designed. The most common failing was that the projects were too ambitious.

We recommend that the consortium should encourage more widespread use of formal project planning tools by requiring the projects it supports to provide a Logical Framework Matrix.

Closely monitored projects

The more effective projects tended to be those where the implementing agency had strong internal monitoring procedures in place. For a number of projects supported by the consortium, we found it difficult to see how effective monitoring was possible.

We recommend that the consortium should assess the capacity of the implementing agency to monitor its projects adequately. It should use the results of this assessment as one criterion to choose the best-qualified research contractor.

Collaborative projects

There are some indications that projects involving collaboration among several agencies may have been more effective than those implemented by a single agency. Conversely, there were situations where collaboration led to inefficiencies.

We recommend that the consortium should encourage inter-agency collaboration, more specialisation of function, and should provide the additional management inputs which can be made cost-effective by the development of the program approach.

Linkages with users

Those projects where users' needs and resources had been carefully assessed had the potential to be the more effective than those where there had been no such assessment. However, the extent to which a project should respond directly to users depends on the stage of research being considered.

Part 4 Gaps and Opportunities

Part 4 identifies the gaps in current knowledge of dryland salinity and its control as a basis for suggesting priorities for future R&D or other measures.

The states were asked to indicate the knowledge gaps that were limiting adoption. All states other than Victoria nominated the need for better information on the likely outcomes from alternative control technologies including information on costs and benefits. This is the specific information that landholders demand before they adopt new technologies. The fact that the states feel they need this information is an implicit admission that they are not ready for large scale extension efforts.

The shortage of hydrogeological data for specific sites is nominated as a major gap by both Victoria and WA, the states with the longest history of dryland salinity R&D. This suggests that their experience has convinced them that effective solutions must be based on better hydrogeological data. NSW and Victoria both report knowledge gaps in the definition of areas at risk and in identifying suitable agronomic treatments.

Queensland and SA both suggest that there are knowledge gaps relating to the quantification of landscape features and SA also suggests there is a need to develop a better understanding of water use and the role of deep drainage.

WA was the only state to suggest that there was a knowledge gap relating to social and economic issues.

A further indication of the priorities in relation to R&D was given by the response of selected individuals to a questionnaire asking them to rank the available control technologies according to their need for further R&D. The five priorities most commonly identified were:

1. Identification & mapping of recharge areas;
2. Management of cultivated land to maximise water use and minimise deep drainage;

3. Establishment of perennial pastures on non-arable areas;
4. Establishment & maintenance of high water use vegetation in preferential recharge areas with poor land capability; and
5. Identification of Land Management Units & specification of preferred management systems on the basis of recharge capacity.

Taken overall, the responses indicate the following priority:

1. Agronomic measures in recharge areas
2. Planning activities in recharge areas
3. Planning activities in discharge areas
4. Agronomic measures in discharge areas
5. Engineering measures in recharge areas
6. Engineering measures in discharge areas.

Based on our analysis, we suggest that the knowledge gaps are as indicated below (not in priority order).

Extent and rate of expansion of dryland salinity problem

We suggest that one of the greatest knowledge gaps is in hard data on the extent and rate of change of the dryland salinity problem at national, state, regional and catchment levels, and its contribution to off-site costs and production losses. This knowledge gap is hindering the development of strategic plans and focussed programs at the national and state level. It also makes the priority of individual projects difficult to judge.

1. Recharge Area Management

Determination of Recharge Areas

There is an urgent need to improve methods of identifying recharge areas. Although remote sensing seems to offer the best prospects there is no consensus concerning the best approach to use of remote sensing and there is a proliferation of alternatives being considered.

We recommend that funding of remote sensing projects be suspended pending the outcome of a technical review of available techniques and their utility for dryland salinity research.

Estimation of Recharge Volume

Catchment planning requires reliable estimates of the change in recharge that can be expected with clearing and the reduction in recharge resulting from changes to land management. It is important that the most cost-effective method be identified.

Agronomic control options.

The use of agronomic measures to reduce deep drainage in recharge areas has been the major focus of attention by state agencies. Whilst there are still a number of knowledge gaps, many of these appear to be highly site specific and hence their strategic importance may be low. *We recommend that support from the consortium for further work in this area be conditional upon the applicant indicating the scope for extrapolation of the findings.* We regard work on pasture management to optimise both water use and productivity as of strategic importance and, although not reviewed, agroforestry is also likely to be of strategic importance. Another strategic area may be the use of plant breeding/genetic engineering approaches to produce salt tolerant and acid tolerant pastures.

2. *Groundwater Processes*

A major knowledge gap acknowledged by most researchers is the lack of information on hydrogeology and groundwater processes for specific catchments and specific geological conditions. The inadequacy is the definition of the minimum data set of groundwater and other information needed for extrapolation of results from a "test" catchment to other catchments. *We recommend that activities be initiated to define the "minimum data set" required to allow extrapolation from one catchment to another.*

Groundwater management strategies involving the interception of good quality groundwater before evaporative salt concentration occurs in discharge areas, appear to offer exciting options for dryland salinity control. *We recommend that both of these ideas warrant further investigation.*

3. *Discharge Area Management*

The areas at risk can be identified using predictive simulation models, geomorphic features, remote sensing and by using a combination of geological, geomorphic and soil mapping techniques. *We recommend that activities be supported to establish the preferred techniques for any given situation and to provide guidelines for the reliable use of the techniques.*

We support the need for an increased effort in the area of saltland agronomy.

We recommend that enhanced funding (both state and Commonwealth) be allocated to assess the off-site effects of dryland salinity. This is necessary because of community concern about water quality, and the fact that many existing catchment research studies do not have facilities to measure salt export to streams.

4. *Integrated Catchment Approaches*

The knowledge gaps restricting application of integrated catchment management would best be overcome by using models to analyse the impact of landuse management changes on the catchment. The management changes best suited to a catchment can be determined using qualitative conceptual catchment models or quantitative predictive models.

The large basin hydro-geological models differ from the predictive models both in function and purpose. Since they serve a useful but separate purpose, they should be treated separately when it comes to considering funding support. *We recommend that funding for these basin models should be contingent on the anticipated ability of the models to answer strategic planning questions.*

5. *Economic Assessment, Social Impact Assessment and Policy Review*

This area of research has been neglected in all states and by the consortium. Of the 126 projects in the dryland salinity area funded by LWRRDC, MDBC and NSCP, only three have a socio-economic focus. This neglect seems all the more remarkable when it is noted that all available evidence shows that the major determinant of success in managing dryland salinity will be landholder response (adoption) and the major determinant of that is the "relative advantage" as perceived by the landholder which largely comes down to relative profitability. (It is accepted that there are other NSCP projects that are outside the consortium portfolio that do in fact address the socio-economic issues of land degradation in general.)

In *economic research*, the major knowledge gaps seem to be: lack of an accepted methodology for determining the optimal level of salinity control: failure to integrate financial costs and benefits with environmental costs and benefits; and generally inadequate basic data on the costs and benefits of alternative approaches.

We recommend that these gaps be addressed by the consortium and that a workshop be conducted to review existing approaches and to select one model for general use in the assessment of optimal dryland salinity management measures.

Social Impact Research is another area that has been neglected although there has been some good work carried out in Victoria. *We recommend the consortium should give funding priority to socio-economic studies which will provide practical guidance for managers of salinity control programs.* There has been little work carried out in the field of *Policy Review* for dryland salinity management. In practice, however, before policy research can be properly targeted, the large gaps in technical knowledge, economic assessment and understanding of optimal extension procedures must be redressed. *We recommend that reviews of government policies influencing dryland salinity should await a clearer definition of the preferred control strategies based on technical and socio-economic research. We recommend that the consortium should support policy research to develop appropriate government policies to deal with situations where there are clear market failures.*

Part 5 Conclusions and Further Recommendations

The Policy Environment

The strategy for a national dryland salinity R&D program must be consistent with the policy environment and the broader issues concerning resource management and the Commonwealth's role. The management of land and water resources in Australia is the responsibility of the states, and the Commonwealth government only becomes involved where it is in the "national interest" to do so. It is the existence of this national interest potential that provides the basis for Commonwealth intervention.

Since the release of the Decade of Landcare Plan (DOLP) in 1991, the Commonwealth has used this Plan as a vehicle to further influence the policy environment in which land and water resource management decisions are made at the state and landholder levels. DOLP stresses the need to take an integrated approach to resource management and to foster the collaboration of all levels of government, community groups and individuals in the management of resources. It also signals some changes in the Commonwealth-state relationship by shifting the emphasis for Commonwealth support from individual projects to statewide programs. As a mechanism for implementing this approach, the Commonwealth is requiring the states to develop "Partnership Agreements" to serve as the basis for future support for all activities other than R&D which has been incorporated into LWRRDC.

We believe that the implications of this emerging arrangement for dryland salinity management are as follows:

1. Each state will need to develop an overall strategic plan for management of its resources.

We recommend that the national dryland salinity R&D program should build on the state plans.

2. It is likely that most states will address dryland salinity as a sub-set of other resource degradation issues rather than as an issue in itself.
3. Although it will not be strictly necessary under the Partnership Agreement, it would be preferable that dryland salinity R&D be treated as a sub-set of an overall R&D program for resource management rather than in isolation.
4. Most states will need to strengthen their existing mechanisms for planning and managing resource management programs to comply with the accountability requirements implicit in the Commonwealth's Partnership Agreements. If this flows on to R&D it is likely to reduce intra-state inefficiencies and duplication of efforts in all areas of R&D.

We recommend that the national R&D program should support the state initiatives along these lines if they are already in place or make provision for supporting them if they are not yet in place.

Setting Research Priorities

Three issues need to be considered in order to set research priorities for a national R&D program, as indicated below.

1. The relative importance of dryland salinity

The issue here is how much of the total R&D funding for land degradation management should be devoted to dryland salinity. This is beyond the Terms of Reference for this consultancy but clearly needs to be resolved.

We recommend that an early priority for the consortium will be to allocate shares of R&D funding to each of the major forms of resource degradation that fall within the members' collective responsibilities. We suggest a number of criteria in the report.

2. The priorities set within State programs

Priorities for dryland salinity research are set in different ways in different states.

We recommend that the national program should support those state priorities that will lead to a more effective use of the total national resources devoted to dryland salinity control.

One implication of this recommendation is that there should not be any attempt to simply assist the more backward states **unless this can be shown to be in the national interest.**

3. The need for a strategic focus

It is important to recognise that the research priorities for a national program such as might be supported by the consortium will differ from those of the states. The differences should reflect the fact that the consortium should pursue a strategy that is based on bringing about the most effective use of all funds directed to dryland salinity management.

We recommend that the Commonwealth should focus its support on strategic areas and should avoid supporting activities that have no strategic importance beyond the project site.

We recommend that the Commonwealth should exert a strategic influence on overall dryland salinity research activities using whatever means seem appropriate.

Developing the Strategy

The six key features of the strategy we propose are introduced below.

A Focus on Effectiveness

We envisage that the national program would be formulated with the intention of making best use of the range of resources that were likely to be available for dryland salinity management, regardless of the source. This means that the national program would not be an all-encompassing "omnibus" program but rather a strategically focussed support program.

A Program Approach

The strategy is based on a program approach to R&D in contrast to the past practice of supporting R&D on a project-by-project basis.

A Long-term Commitment

We have suggested that the program should be established as a long-term program consistent with the nature of the problems and the type of R&D that is required.

A Collaborative Operational and Funding Base

Our strategy envisages the establishment of new mechanisms to facilitate collaboration amongst commonwealth agencies and R&D corporations.

Centralised Program Management

The strategy envisages that the national program will be managed by LWRRDC via a National Coordinator and that mechanisms will exist for advisory inputs from other members of the consortium, particularly at a strategic level.

Consistency with LWRRDC Current Plan

The strategy for the national R&D program would respond to both Objective One and Objective Three of LWRRDC's 1992 - 1997 R&D Plan and would support the emerging *modus operandi* of the Corporation.

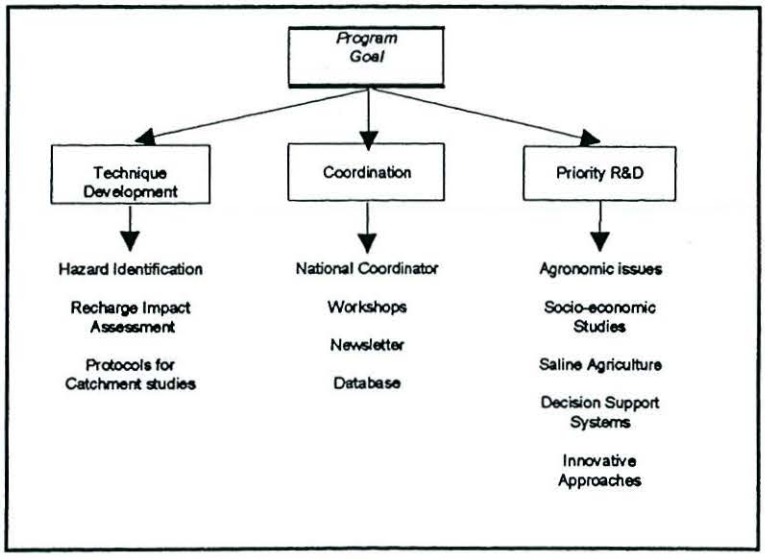
The Collaborative Program Goal

We recommend that the program goal should be to improve the effectiveness of dryland salinity R&D through better coordination and joint development, and use of more reliable and cost-effective techniques.

This goal is necessarily broad because it attempts to embrace several concepts: the concept of greater coordination of efforts; the concept of using better techniques; and the concept of focussing on those priority areas that are best suited to a national approach.

Program Objectives and Outputs

We propose that the national program should have three major objectives or purposes. The overall structure of the proposed program is indicated below.



Program Purposes

1. Coordination

To establish and maintain an active and effective network of dryland salinity specialists including researchers, extension workers, implementing agencies, landholders and community groups.

2. Technique Improvement

To improve the reliability and cost-effectiveness of techniques to identify areas at risk and to select the most appropriate management approaches.

3. Priority R&D Support

To support R&D in under-researched priority areas

A range of program outputs have been specified for each of these program objectives.

Balance of Effort

In developing our recommendations, we have taken the view that the consortium should provide support in areas that can be seen to be in the national interest. We suggest that this will require a change in the balance of funding from that which applied in the past.

Much of the work that has been funded by the consortium is not in fact R&D but investigations, monitoring and demonstrations. We suggest that investigations, monitoring and demonstration generally do not meet the national interest test and are therefore inappropriate uses of Commonwealth R&D funding. *We recommend that where the consortium (presumably mainly NSCP) does decide that it is in the national interest to support such activities, it will make strenuous efforts to ensure that the technology being promoted is based on sound research.*

We suggest that some state agencies have started their extension efforts without the benefit of sufficient quantitative research backing particularly in the critical areas of water and salt balances. Because of this lack of quantitative process data, it has not been possible to provide quantitative answers to questions such as "where and how many trees to plant?" or even "are trees a technically and economically viable solution"

This question of balance between research and extension (regardless of the source of funds) requires careful analysis and good judgement. Our assessment is that with the exception of groundwater monitoring, which has often been taken to excess, there has been too little research, and extension activities have often been initiated before the recommendations were shown to be justified.

In summary, *we recommend that the consortium should only fund investigations or monitoring activities that can be shown to be in the national interest and it should only fund demonstrations or extension activities that are clearly supported by sound research findings and are in the national interest.*

Management Arrangements

We suggest that a choice needs to be made between two options for structures that could be used to establish and manage a collaborative national dryland salinity R&D Program. The first would be a single purpose structure that deals only with dryland salinity R&D. The consortium that was formed for this consultancy could serve as the basis for such a structure. The second would be a multi-purpose structure that has the capacity to deal with all forms of resource management R&D. *We recommend a multi-purpose structure be established to deal with all forms of joint R&D in support of the maintenance of production resources.*

We suggest that the multi-purpose structure should be responsible for a Joint Resource Maintenance (JRM) R&D Program that would have the overall goal of maintaining the production resources needed for longterm sustainability of the industries (wool, meat, grains, dairy etc) using

the resources. This JRM goal would be pursued through a number of sub-programs each of which would deal with specific resource management problems such as dryland salinity, acidification etc.

We suggest that the JRM Program should be a collaborative effort involving all the commodity-based R&D corporations, the commonwealth agencies such as NSCP and MDBC, and a representative of the state agencies. These representatives should form a JRM Program Advisory Group. LWRRDC should provide a secretariat for the JRM and provide the overall management for the program. LWRRDC should appoint a part-time Coordinator for each sub-program along with a Sub-Program Review Group responsible for monitoring and evaluating the implementation of the sub-program.

We recommend that LWRRDC should be responsible for the overall management of the dryland salinity R&D program but should be accountable to a Program Review Group formed with representatives of MDBC. NSCP and collaborating R&D corporations, in addition to at least two independent, technically qualified advisers.

The national R&D program for dryland salinity should be developed on the basis of the recommendations presented above and suggestions are provided for a procedure to further develop the program. Recommendations are also provided for the program and project management practices.

Funding Responsibilities

The allocation of responsibilities for R&D&E amongst different agencies and R&D corporations has created uncertainties and potential funding gaps including some in the area of dryland salinity R&D. Since all such R&D in the area of resource management is clearly a joint responsibility, and since the R&D resources required are well in excess of those available to LWRRDC, means must be found to fund the R&D on a collaborative basis.

The consortium members are currently investing more than $4.7 million per year in dryland salinity R&D and the states are investing an unknown amount likely to be in the order of $6 - 8 million. Although no guidelines have been provided to the team for future Commonwealth funding, we assume that it will be around $5 million per year. At present there are different arrangements operating for funding under each Commonwealth Government supported agency.

The largest share of funds is provided by MDBC with some $3.5 million invested annually. NSCP is the second largest investor with around $0.9 million a year spent mainly through its Major Support Program (about $508,000 in 1992/93). Nearly all the balance of its support is directed through the Landcare program apart from about $20,000 to Education and Training.

LWRRDC inherited projects with an annual cost of about $800,000 per year. Its projects cover a wide range of topics and it is difficult to discern any particular strategic focus. They have concentrated on the recharge areas and have included: the identification of areas at risk; studies of process; one economic assessment; and a range of agronomic studies. The projects now in the LWRRDC portfolio have mainly been initiated prior to the establishment of LWRRDC and hence the selection process reflects those of its predecessors (NSCP and AWRAC).

We suggest that it is of critical importance that the production-oriented commodity R&D corporations should contribute to R&D in dryland salinity management and other resource management issues. We have recommended the establishment of a Joint Resource Maintenance (JRM) Program as the vehicle for this collaboration and we are confident that such a program would be welcomed by the Commonwealth as a move in the right direction. It would be in line with the thrust of the Ecologically Sustainable Development recommendations and with the widely recognised need to take a more integrated approach to resource management. We venture the opinion that a significant proportion of producers of commodities would be likely to support some of their levies being devoted to a Joint Resource Maintenance R&D Program.

We recommend that the commodity R&D corporations seek agreement from their shareholders to set aside 5% of current funds to establish a Joint Resource Maintenance R&D Fund under the joint control of all participating R&D corporations. As an incentive, and in recognition of the fact that the JRM would provide benefits to the broader community, *we further recommend that the*

Commonwealth be requested to match these contributions on a three for two basis (Commonwealth/Industry) for the first five years. In addition, we recommend that businesses and private individuals be encouraged to contribute to the fund by allowing a tax concession of 150% for expenditure on this form of R&D. The Joint Resource Maintenance R&D Fund would be allocated between the major forms of land and water resource degradation issues according to a procedure to be agreed amongst the R&D corporations.

We recognise that this issue of joint funding will require considerable discussion and may not be able to be introduced immediately. *We recommend that the JRM Program structure be established and that agreement be sought amongst all participants on a timetable to introduce joint funding. We recommend that in the meantime a Program Review Group for Dryland Salinity be established as soon as possible and that it could function in a manner similar to the National Plant Improvement Program until agreement was reached on collaborative funding.*

Use of NSCP Funds

We support the concept behind the Decade of Landcare Plan for use of NSCP funds which requires the states to develop strategic plans as a basis for Partnership Agreements. Having agreed on the strategy, NSCP plans to devolve greater discretion but also responsibility and accountability to the states for their use of funds. We see this approach as being relevant and appropriate for those activities that NSCP has been supporting to date: ie for initiatives of the states in the Major Program Support and the Landcare support activities which are beyond the capacity of the state to support but which are in the national interest.

It is premature to speculate how the devolved NSCP funds might be allocated by the states. Some states have indicated a desire to use such funds to support investigations, monitoring and demonstration activities. Under some circumstances this may be seen by the Commonwealth to be in the national interest but generally it would seem to be a state responsibility unless there were something innovative being attempted.

It is our opinion that there is much more at stake in this issue of use of NSCP funds than simply the level of support for dryland salinity management activities. As a consequence, it will take a considerable time to reach agreement on the devolution process. For this reason we accept it as a desirable change in emphasis but we do not envisage significantly larger NSCP support for dryland salinity management activities.

Against this background we note that several of the states see devolution as providing security of funding which could enable them to employ permanent, competent staff members in their land management research programs. The other members of the consortium will need to consider whether some of their own funds should be passed on to the states in a similar fashion. *Our recommendation is that the consortium should allocate a nominal proportion (perhaps 10%) in this manner and observe the effectiveness over the next three years along with the success of the DOLP approach. Should it prove effective, the consortium could increase the proportion after that period.*

The Next Steps

The Key Recommendations for future action arising from this Review are summarised below.

The R&D needs of dryland salinity cannot be determined in isolation from those of other forms of land degradation, but at present there is no objective basis to determine relative priorities.

1. *We recommend that the consortium initiates discussion that will enable the establishment of a framework and procedure for setting priorities amongst the various degradation threats.*

2. *We recommend that a the framework for setting priorities (Recommendation 1) take the form of a Joint Resource Maintenance Program to be directed by a Program Advisory Group comprising representatives of the Commonwealth agencies, the R&D corporations and the state R&D agencies.*

It will take some time to complete this prioritisation process and it would not be sensible to delay further work on dryland salinity while awaiting the findings. There is a need to establish an interim group to advance the recommendations contained in this report for a national dryland salinity R&D program. The implementation of a national program will require greater collaboration amongst those agencies involved in dryland salinity R&D. This will require that the Commonwealth agencies coordinate their funding programs to a greater extent, that the R&D corporations recognise their inter-dependencies in this area and that the state agencies recognise the opportunities to benefit from the experience of others and appreciate the scope for collaboration.

3. *We recommend that the consortium invites the commodity R&D corporations and the state agencies to nominate representatives to form a Dryland Salinity Program Review Group to finalise the Dryland Salinity R&D Program and to provide the operational basis for a national program approach.*

There is sufficient evidence that dryland salinity is a major and growing threat to justify an interim expenditure target at least equal to current expenditures estimated to be about $12 million per year, of which the Commonwealth contributes about $5 million.

4. *We recommend that the indicative expenditure target for Commonwealth support of dryland salinity R&D be maintained in real terms until the prioritisation process has been completed.*

A coordinated national approach to dryland salinity R&D is warranted to overcome the deficiencies in the present *ad hoc* approach and to improve overall effectiveness of the resources available. This will require that the Program Review Group take an active role in the finalisation of the national program proposed in this report.

5. *We recommend that the Program Review Group:*

- *review the outstanding applications for funding against the proposals for a national R&D program made in this report;*
- *designate LWRRDC as the agency with overall responsibility for the management of the program;*

and that

- *LWRRDC appoint a national coordinator to finalise the national program by drafting contracts for selected applications, calling for tenders to fill identified gaps and by coordinating the overall program.*

The past method of identifying and funding projects on a project-by-project basis has limited the opportunity for a strategic approach and increased the likelihood of duplication and oversights. It has contributed to the tendency to deal with important issues in a partial fashion with the result that the R&D has often been inconclusive and has had to be repeated.

6. *We recommend that the national program be based on a program approach with a concentration on those aspects of R&D most likely to be of practical use in developing salinity control programs.*

The content of the national program should reflect the particular strengths and capabilities of the Commonwealth agencies and complement the strengths and capabilities of the states.

7. *We recommend that the national program <u>should</u>:*

- *fund projects that are in the national interest;*
- *support the development of techniques that could be used widely;*
- *fill gaps in previously neglected area;*
- *provide support for some R&D in more innovative areas;*
- *stress the importance of sound research and encourage peer review and scientific rigour where appropriate; and*

- *facilitate improvement in collaboration amongst dryland salinity specialists through the operation of a coordinator, conduct of workshops, publication of newsletters and circulation of reports.*

8. *We recommend that the national program should not:*

   - *fund routine activities such as monitoring or investigations unless they could be shown to be in the national interest; or*
   - *fund demonstration activities unless they could be shown to have application beyond the immediate project site and were clearly based on sound research findings.*

Dairy pasture production increased with centre pivot

KEY POINTS:

- *Centre pivot improves water efficiency*
- *Improved pasture production*
- *Improved pasture quality*
- *Improved environmental results*

A research project in the Harvey Water Irrigation Area in Western Australia has found the use of a centre pivot irrigation system greatly improved water use efficiency and pasture production on the dairy farm where the project was carried out.

Funded through Land & Water Australia's National Program for Sustainable Irrigation, the two-year demonstration project examined both centre pivot and surface (or flood) irrigation to centre pivot over two seasons on a dairy farm owned by Dale Hanks.

The Harvey Water Irrigation Area is Western Australia's prime irrigated dairy area, supplying the city of Perth and the south west with more than 40 per cent of its milk.

In 1916, the Harvey Weir was built for the first irrigation system in Western Australia, to ensure the continuing agricultural prosperity of the region. Since that time, pastures have been watered through surface irrigation of paddocks.

According to principal investigator Ken Moore, when this project was envisaged in 2001 there were no centre pivots being used for dairy pasture in the Harvey Water Irrigation Area.

"Rob Kuzich, the owner of a south west agricultural water management company approached Harvey dairy farmer, Dale Hanks, about trialling the centre pivot system on his property. Before the project started in 2003, a lot of time was spent planning and setting up the demonstration," Ken said.

More and better pasture

The project has demonstrated that water savings, along with increased pasture production and better quality pasture can be achieved with centre pivot irrigation.

Another economic and environmental benefit of centre pivot irrigation is minimal water and nutrient run-off.

"There was no water and nutrient run-off from the centre pivot site during irrigation, but we found it is quite high with surface irrigation." Ken said.

In the on-farm demonstration, the centre pivot irrigation system used 29 per cent less water in the first year and 31 per cent less in the second year.

The demonstration also saw an increase in pasture yields. In 2003-04 the centre pivot site grew 54 per cent more pasture per hectare than the surface bay and in 2004-05, pasture production on the centre pivot was double that of surface bay.

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Not only did the centre pivot system provide increased yields, it also improved the quality of the pasture. The pivot site recorded a higher average percentage of crude protein and energy and a lower average percentage of both fibre measurements, which indicated better quality pasture.

"Our research also found that in the second year, we were able to improve the performance of surface irrigation. The amount of water applied was reduced and more pasture was grown. It appeared that water logging from surface irrigation slowed down pasture growth and resulted in more unwanted weeds," he said.

Although the project clearly demonstrated the benefits of centre pivot irrigation, it found that farmers require information, technical support and time to learn about centre pivots to become proficient in their use. A 'learn and grow' approach is required in integrating water application and scheduling, and pasture, grazing and nutrient management.

"Do sums properly"

"Purchase of a centre pivot is a major investment, so farmers need to do their sums properly and examine returns from their existing irrigation system and what could be achieved from investing in a centre pivot. The results achieved in this project may not be able to be achieved to the same degree on other farms due to differences in soils, in the farmer's skills and their management practices," Ken said.

"For those who can not afford the switch, there is potential for farmers to improve their surface irrigation through better monitoring of water applied to irrigation bays to gain information about the flow of water across the bay and infiltration. Depending on the observations, adjustments could be made to management which may produce improved results."

Ken said a plan to fully pipe the Harvey Water Irrigation Area over time would create new opportunities for irrigators to invest in an expansion of irrigated agriculture and to change to more efficient sprinkler systems such as centre pivot irrigation for pasture.

"This project has generated a lot of interest from local farmers in centre pivot irrigation and improving the performance of their existing surface irrigation."

About the Program

The National Program for Sustainable Irrigation focuses research on the development and adoption of sustainable irrigation practices in Australian agriculture. The aim is to address critical emerging environmental management issues, while generating long-term economic and social benefits that ensure irrigation has a viable future. The Program has 14 funding partners: Land & Water Australia (Managing Partner); Sunwater, Queensland; Horticulture Australia Limited; Goulburn-Murray Water, Victoria; Cotton Research and Development Corporation; Harvey Water, Western Australia; Lower Murray Water Authority, Victoria; Wimmera Mallee Water, Victoria; Ord Irrigation Cooperative, Western Australia; Australian Government Department of Agriculture, Fisheries and Forestry; Department of Natural Resources and Mines, Queensland; Department of Primary Industries and Resources South Australia; Department of Environment Water and Catchment, Western Australia; and Department of Agriculture, Western Australia.

Visit the Knowledge Base and current research projects section National Program for Sustainable Irrigation website for detailed information about the research project referred to above, at:

www.npsi.gov.au

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