# Review of Benefit-Cost Analyses, Cost Sharing Frameworks and Valuation of Landholder Environmental Activity for the USEDSFMP

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for the

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## LIST OF ACRONYMS

BCA = Benefit Cost Analysis

BCR = Benefit Cost Ratio

CSIRO = Commonwealth Scientific Investigative Research Organisation

COAG = Council of Australian Governments

DEH = Department of Environment and Heritage

Dse = Dry sheep equivalent

DWLBC = Department of Wildlife, etc…

EIS = Environmental Impact Statement

EU = European Union

GLCP = Gum Lagoon Conservation Park

HA = Heritage agreement

IRR = Internal rate of return

LAP = Local Action Plan

MDB = Murray Darling Basin

NAP = National Action Plans

NHT = Natural Heritage Trust

NLWRA = National Land and Water Resources Audit

NPV = Net Present Value

NPWS = National Parks and Wildlife Service

PIRSA = Primary Industries and Resources South Australia

SA = South Australia

SACES = South Australian Centre for Economic Studies

SAFF = South Australia Farmers Federation

SEWCDB = South East Water Catchment and Drainage Board

SENRCC = South East Natural Resource Consultative Committee

USEDSFMP = Upper South East Dryland Salinity and Flood Management Plan

USE = Upper South East

WW = Wetlands and Wildlife

# *EXECUTIVE SUMMARY*

This study reviewed and updated the costs and benefits associated with implementing the Upper South East Dryland Salinity and Flood Management Plan (USEDSFMP); provided information on past and future cost-shares and identified and valued landholder environmental activity. The results of this study are complemented by another Rural Solutions report - USE Revegetation Strategy and Regional Targets.

## Cost Share Methodology

There are two main principles of cost sharing that can be used by Government in determining 'who pays?', namely the ***polluter pays principle*** and the ***beneficiary pays principle***. The polluter pays principle is generally the first principle that is used in any cost-sharing framework. That is, those who have caused the problem have to pay for the problem to be fixed/removed. However, the polluter pays principle is in practice very hard to implement, and is not strongly supported on some equity or efficiency grounds (ie. identifying the people responsible for the problem is usually not easy, regulation is difficult and costly to enforce and past Government policy has played a role in the problem). Therefore, it is the beneficiary pays principle (those who benefit from the action share the costs of it) that is usually applied because of the difficulties associated with the polluter pays principle. This study has used these principles to advise on future cost shares.

The cost share process is generally estimated from the economic analysis. If the 'beneficiary pays principle' is used to determine cost shares, then the methodology is:

$$\frac{\text{Benefits received by Specified Beneficiaries over a Predetermined Period and Discount Rate}}{\text{Total Benefits of the Project over a Predetermined Period and Discount Rate}} \quad (\%)$$

Theoretical cost shares, estimated from various economic principles, forms a starting point basis for negotiation with landholders. At the very least, the maximum amount that landholders should pay is the theoretical cost share. Cost sharing is essentially a process of bargaining and negotiation. There is no 'correct' solution to a cost sharing problem and no analytical tool that can simply deliver an exact answer. The fundamental principle driving cost sharing arrangements is that each landholder will only be involved if they perceive their benefits to be greater than their costs. The amount offered to private stakeholders must make the perceived net benefits positive. However, in doing so, Government must recognise the social benefits that are to be derived from any activity.

*Note: See Section 2 for more detail on the methodology of cost-shares.*

## Review of Economic Analyses of USEDSFMP

This study reviewed all identified relevant literature detailing costs and benefits of the USEDSFMP. In particular it looked at two main facets of the scheme: the drainage component; and the USEDSFMP as a whole.

### (A) Drainage Scheme

This study updated the economic analyses that were completed in 1993. The original benefit cost analyses found positive net present values for the drainage options, with only the agricultural benefits included. These results suggested that all things held equal, the private agricultural benefits from the development of the proposed drainage system (at the initial estimate of $36 million) clearly outweighed all its associated costs. Government's role in such a scheme could have been limited to planning, organisation and construction of the preferred option, but not financing.

In addition, the original drainage cost share framework developed by Walsh *et al* (1993) was reviewed. It had suggested that local contribution to the drainage scheme should be 25 per cent, with State and Commonwealth each providing 37.5 per cent.

In 1995, the plan changed from a $36 million deep drain project to a $24 million surface water drainage scheme. There was never a complete costing undertaken for the revised scheme, and as a result not all project management costs and maintenance costs were accounted for.

The Combined Councils Salinity Committee working group suggested that rural landholders pay 90 per cent of the local contribution, with 10 per cent paid by urban dwellers (through councils). To collect funds from rural landholders a complex levy system was developed with differential rates according to different zones within the catchment. This system went through many different stages, with a variety of zones developed in the wider USE area. The final levy was based on four zones. There were four main conditions that were used to estimate the determination of the final levies:

(a) Direct benefit from scheme;

(b) Indirect benefit from scheme;

(c) Contribution to the problem via ground water;

(d) Contribution to the problem via surface water; and

(e) Social and moral obligation to overcome a regional problem.

*Note: For more detail on the history of the drainage cost share framework, see Section 4.1*

Our review of the economic analyses and cost-sharing frameworks found that a variety of benefits were included incorrectly, as according to Federal/State guidelines and economic principles. Corrections were made wherever possible and it was found that if there are no environmental values associated with the drainage project, then the scheme would probably not be economic. The total net benefits from improved agricultural productivity do not outweigh the costs of the scheme.

*Note: For more detail on the problems associated with the previous economic analyses and the changes made to them, see Sections 3.2 to 3.2.1.*

Due to the significant increase in capital costs of the drainage scheme, a new cost-sharing framework was required. As stated previously, the beneficiary and polluter pays principles were used to estimate two different drainage cost-share frameworks.

***Drainage Cost share Framework under a Beneficiary Pays Principle***

Application of the beneficiary pays principle would suggest that landholders should have paid a far larger proportion of drainage scheme costs. This principle suggests direct farm beneficiaries should have paid 88 per cent of the total costs of the scheme. Direct farm beneficiaries include farmers in Zones A and some in B with the revised scheme. The cost share framework is illustrated in the table below.

**Drainage Cost Sharing Framework under a Beneficiary Pays Principle**

| Beneficiary | % Share |
|---|---|
| On-farm (Direct farm beneficiaries) | 88 |
| Local (USE urban community) | 1 |
| State | 5 |
| Wider | 6 |
| **TOTAL** | 100 |

Local urban communities in the USE should contribute at least 1 per cent towards total costs. There is no justification for landholders in Zones C to D (and some of B) to pay anything towards total costs. State and Commonwealth bodies should theoretically provide, *at the very least*, around 10 per cent of the total costs of the drainage scheme.

Under an extreme testing of environmental values (allowing for all Australians to place values on USE wetlands and revegetation), private benefits represented 60 per cent of total benefits of the scheme.

*Note: For more detail on the breakdown of benefits and costs of the revised economic analysis, see Section 3.2.2*

***Drainage Cost Share Implications under a Polluter Pays Principle***

An implication of the polluter pays principle is that costs are attributed primarily to parties who caused the salinisation in the USE. Costs are therefore not distributed as widely as it would have been under a beneficiary pays principle. Commonwealth funding is restricted to the percentage of outside contribution towards the problem.

In order to implement the polluter pays principle effectively, some understanding is needed of the reasons for the environmental problem in the first place. The argument put forward with the introduction of the first drainage levy suggested that Zones B to D contributed to the groundwater salinity and surface water problem in Zone A and therefore should help pay to fix it up.

The lack of concrete information about the contribution of various landholders to the salinisation problem in Zone A means that a polluters pays principle could not be applied with any level of certainty. Indeed, it is questionable whether it should have ever been used as a principle in determining drainage levies.

Nevertheless, if the polluter pays principle was to be used, using the current available information (and several assumptions), then Zones B, C and D should pay no more than 19 per cent of the total costs of the project. Commonwealth funding should be sought for around 11 per cent of the total costs. Zone A should fund 71 per cent of the total maintenance and capital drainage scheme costs.

**Drainage Cost Sharing Framework under a Polluter Pays Principle**

| Area | Contribution towards Problem % |
|---|---|
| Zone A | 71 |
| Victorian farmers/outside funding | 11 |
| Zone C | 9 |
| Zone B | 6 |
| Zone D | 3 |
| **TOTAL** | **100** |

Note: Totals do not add due to rounding. More contribution could have been attributed to Zone A.

*Note: For more detail on the polluter pays principle, see Section 5.1.2*

***Cost Shares considering different Principles***

The SEWCDB final drainage levy across the four rural zones and council area utilised both the beneficiary and polluter pays principles in allocating responsibility for surface water contribution and groundwater recharge. As discussed, the theoretical justification of this is questionable. If a sole principle was used to estimate contribution to cost shares, then given the current state of scientific information and past Government policy, the most appropriate principle to implement is beneficiary pays. A combination of beneficiary and polluter pays principles has not been attempted in this report as a judgement is required as to how much weighting should be given to each principle. Such a judgement is political and cannot be formed from economic theory.

Another way of considering the beneficiary pays principle is to look at what the contribution from Government might have to be to justify landholder investment. Without environmental benefits, at a discount rate of 7 per cent, private landholder benefits represent 83 per cent of the *total costs* of the scheme (a BCR of 0.83). It is commonly thought that farmers require a rate of return of 2 before they go ahead with any farm action. Using this assumption, farmers might not enter the drainage scheme until they were only sharing 41.5 per cent of total costs. Therefore, taking into consideration the above factors, one could suggest that direct farm beneficiaries should contribute in the range from 42 to 88 per cent of total costs. The corresponding State and Commonwealth contribution each is therefore between 5 to 29 per cent, with local Government remaining unchanged.

*Note: For more detail on the above, see Sections 5.2 and 5.3.*

**(B) USEDSFMP as a Whole**

Over the whole original USEDSFMP on a 30-year time period (for example, including research, revegetation, saltland agronomy and wetlands), landholder contribution was planned to be no higher then 47 per cent.

Calculations suggest that landholders are currently paying 43 per cent towards the whole scheme. The original contribution (47%) was established prior to the availability of NHT funds for environmental activities. This report also reviews the economic analyses that have been completed for on-ground activities. Estimates of the incentive landholders' require in undertaking environmental activity were inserted into the overall USEDSFMP cost share framework. Allowing for landholder contribution changes in drainage, perennial pasture, farm plans, revegetation and wetlands, the overall landholder contribution to the whole USEDSFMP now ranges from 44 to 65 per cent, under a minimum and maximum landholder contribution scenario. Currently, landholders are paying the minimum theoretical cost-share amount recommended.

*Note: For more detail on past, present and future landholders contribution to the USEDSFMP, see Sections 4.2 and 5.5.*

***Factors to Consider When Negotiating Cost-Shares***

Taking into account the discussion above, Government needs to consider the following issues when negotiating cost shares:

- The original drainage cost share framework was set at 25 per cent of total costs;
- Most communication with landholders by Government has emphasised the drainage scheme costing $24 million, with a $6 million contribution by landholders. Less emphasis has been given to the 25 per cent cost share of the total project. Consequently there is disagreement between landholders and the Government as to whether landholders signed up for a 25 per cent share of the total costs of the drainage scheme, or a $6 million total contribution;
- Many landholders in Zone A have paid a drainage levy for six years without receiving any benefits from the scheme;
- Under a beneficiary pays principle, landholders in Zones C to D (and some of B) should not pay any more for the drainage scheme;
- Stakeholder consultation has been poor and many landholders feel that this scheme has been unfairly imposed upon them;
- Some landholders (predominantly in Zones B to D) feel that the drainage scheme has been unnecessary, and more effort should have gone into native revegetation and perennial pastures;
- Incentives paid for activities with high public benefits (such as revegetation and wetland management) may need to be considerably higher than amounts currently on offer to encourage large-scale environmental activity;
- Ability of landholders to pay; and
- That management of the drainage system needs to improve to ensure the environmental benefits are delivered to justify funding involvement from the State and Commonwealth.

**Environmental Benefits of USEDSFMP**

The USEDSFMP aimed to manage and reinstate wetlands to provide habitat and drought refuge for waterbirds. To date there has been little successful monitoring of the impact of the drains on surface water flows in inland wetlands and there is a great deal of scientific uncertainty and debate about the impact on the Coorong. The USEDSFMP also aimed to achieve large-scale native revegetation, and have 75 per cent of the study area covered by high water use vegetation in the long term. Concerns have been raised that the drainage system has caused some negative impacts on native vegetation (such as separating ecosystem populations, clearing native vegetation, invasion by weeds and plant disease; and the lowering of the watertable near the drain may have caused some plants to die or become less vigorous).

While the above concerns have been noted, due to the lack of quantitative information about negative impacts, this study has assumed that overall, the USEDSFMP will lead to an improvement in wetlands and revegetation by the end of thirty years. This improvement was the original predicted increase in wetlands and revegetation under the USEDSFMP.

*Note: For more detail on the figures used for the predicted improvement in the wetlands, see Section 6.1.2 and for comment on some of the potentially negative consequences of the drainage system on wetlands and revegetation, see Sections 6.1.2 and 6.2.1 respectively.*

Values associated with wetlands and native vegetation were quantified using the latest environmental valuation estimates (choice modelling) from the National Land and Water Resources Audit (NLWRA). The choice modelling approach endeavours to capture the values people associate with wetlands, landscape aesthetics (includes both area of farmland repaired and/or bushland protected) and benefits of the regional employment (NLWRA 2002).

Using rules of benefits transfer, the relevant population was assumed to be the number of households in both Adelaide and the USE. The result of this analysis illustrated that:

- The non-market value associated with increases in the area of healthy wetlands because of the drainage scheme is $8.3 million. This equates to approximately $85 per hectare of healthy wetland per year.
- The value of planting 41,000 hectares of native vegetation is estimated to be approximately $18.9 million. This equates to approximately $30 per hectare per year of remnant native vegetation restored; and
- The value that the wider community gains from these aspects of protecting agricultural production is $5.45 million. This equates to approximately $2 per hectare of farmland protected per year.

Where applicable, some of the above values were used in the modelling results and the development of the beneficiary pays principle discussed earlier.

*Note: For more detail on the environmental valuation figures, see Sections 6.1.3, 6.2.2 and 6.2.3.*

**Environmental Activity of Landholders**

Landholder consultation undertaken to create awareness of the study and to collect information within the regional community included a radio interview, a large-scale telephone survey and visits to selected landholders. The key points of current landholder activity in the SEWCDB levy area include:

- Most privately funded environmental activity has been in: pest management; establishing lucerne or perennial pastures; providing habitat protection; managing remnant vegetation; providing weed control and linking native vegetation areas;
- Government funds were primarily focussed towards: whole farm plans; planting native vegetation; fencing off native and remnant vegetation; planting commercial trees; providing weed control in native vegetation areas; and lucerne or salt tolerant establishment;
- Substantial private costs have been incurred over the last five years in establishing and maintaining activities with perceived high public benefits (such as wetlands and native vegetation);
- The majority of capital costs were incurred by landholders in: establishing and rehabilitating wetland areas; establishing lucerne or perennial pastures; developing whole farm plans; and planting native vegetation; and
- The majority of ongoing costs were incurred by landholders in: managing lucerne or perennial pastures; undertaking weed and pest control; and managing native vegetation.

When asked what environmental activities they expected to undertake in the next 5 years, two thirds of landholders nominated at least one activity, however many were unsure about the scale of work planned. The key areas of action included planting native vegetation, establishing perennial pastures and undertaking pest management activities. Only a few farmers planned to obtain Government funds for the activities.

*Note: For more detail on private landholder environmental activity, see Section 7.2.*

As well as the costs incurred by farmers, the five case studies depicted in this study all illustrate the value of landholder environmental activity.

*Note: The case studies are described in Section 7.3.*

**Value of Landholder Environmental Activity**

Table I illustrates the social value generated by USE landholders environmental activities. It is suggested that such activity may create large social benefits. These figures do not represent net environmental values as no allowance has been made for the cost of environmentally degrading actions by farmers.

**Table I**
**Once-off Environmental Values Created by USE Landholders**

| Environmental Value | Area Protected[1] | Specific Environmental Values | % Funded by Government | % of Privately Contributed Environmental Value |
|---|---|---|---|---|
| | Ha | $ million | % | $ million |
| Remnant Vegetation | 84,486 | 38.9 | 15 | 33.2 |
| Perennial Pasture and Fodder Shrub development | 220,854 | 6.9 | 11 | 6.1 |
| Wetlands in Good Condition | 10,000 | 13.0 | 30 | 9.1 |

Note: Values are not net estimates of environmental value. Area protected represents private area only.

*Note: For more detail on the values created by private landholder environmental activity, see Section 7.4.*

**Policy Implications for Future Agreements**

When considering the value generated by landholders, it is important to consider exactly what land management activity landholders are responsible for. Implementing sustainable agriculture in the USE and Australia involves considering what the responsibility is between landholders and the environment. A common definition of farmers' 'duty of care' or 'good farming practice' is needed to help define the responsibility. Establishing credible definitions of good agricultural practice is extremely important as it creates the foundation for Government policy to address environmental issues. Questions about whether farms should be paid for benefits that they have provided in the past must be raised. The House of Representatives (2001) recommended that:

- Landholders have a duty of care to manage the land in their charge in a way that is ecologically sustainable, given the particular geographical location, and based upon latest scientific information;
- That all legislation in all jurisdictions be amended to incorporate this duty of care, as a minimum standard of land management;
- All Commonwealth funding for public good conservation activities and ecologically sustainable use of Australia's resources be dependent upon the recipient accepting this duty of care;
- Activities that fall under the definition of a duty of care are to be funded solely by landholders. Activities that are beyond a landholder's duty of care are to be funded by society as a whole.

In the past Governments have often made the decision that past activities, even if they exceeded any definition of duty of care, are not to be paid for. Payments are usually concentrated upon current or future activity, and landholders usually cannot get credit or payment for past activity. The equity of this situation is questionable, however given the constraints on environmental funds it is not surprising.

*Note: For more detail on duty of care, see Section 7.5.*

**Management Agreements**

Management agreements may be struck between the Government and a landholder. A landholder may guarantee to undertake certain environmental activity, at a direct cost to them, in order to be precluded from paying future drainage levies. Any future management agreements that Government strikes with farmers should attempt to target environmental activities of high significance and value, in order to maximise the benefits from any such arrangement. Some ideas that exhibit potential include developing and adhering to a whole farm plan; revegetating areas along the drainage system (or elsewhere); and providing corridors to link native vegetation areas. Other ideas have been explored in the revegetation study by Rural Solutions SA.

For any farmers to enter into any management agreements, the benefits of doing so must at least equal or outweigh the costs. For some farmers these costs will be considerably high, as many farmers are averse to

striking any management agreement with Government. A survey of USE landholders has found that 33 per cent of farmers said yes, they would be willing to be part of a management agreement, 40 per cent said *no* and the remaining 28 per cent being non committal – even in principle.

There are two main ways that Government could consider offsetting future drainage levies with in-kind contributions. These methods include:

(a) Using costs of activities as a proxy for value; and

(b) Using society's estimate of the value of environmental activity.

It is probably easier and more encompassing to use costs of environmental practices as a proxy for environmental value created.

Government must decide if it strikes management agreements with landholders regarding past environmental action, or if it negotiates new 'in-kind' contributions. It is our view that management agreements should, on the whole, be struck for future planned environmental activity by landholders. Ideally, such future activity should be above and beyond landholders' duty of care. A 'duty of care' standard must be established to provide the baseline for management agreements. If Government chooses to recognise past environmental activity, it could establish a precedent for farmers elsewhere to make similar claims for offsets. However, a degree of flexibility is needed in the establishment of any management agreements, so that outstanding environmental management, above and beyond 'duty of care', can be recognised.

*Note: For more detail on offsetting future drainage scheme contributions with in-kind contributions, see Section 7.6.*

**Other Policy Changes**

Within the course of this study, many landholders commented on the equity of various environmental policy issues. There are many policy changes that could be made to encourage environmental activities and sustainable land management by farmers. It is recognised that the current policy structure could be reformed and that some environmental problems have resulted because of the disincentives that it creates. Farmers have suffered financially (in terms of the degradation of land resources) as a result.

A first best solution is to always reform policy at the source of a problem. Just recognising that farmers have suffered, and providing them with a credit in terms of offsetting future drainage share costs is not the most efficient and effective way of dealing with such policy inequities. A number of suggestions have been made in this report (for more detail, see Section 7.7).

**Future Research**

Facets of future potential research include the: 'duty of care' landholders should face; environmental outcomes of wetlands; environmental consequences of drainage system; feasibility of various management plans for offsetting future program costs; value that the SA community places on biodiversity; costs associated with environmental activity; potential new boundaries for the drainage levy; changes to Government policy that could be made to encourage sustainable agricultural practice; net social benefits from environmental activity; changes in agricultural net benefits as a result of the delayed drainage scheme.

**Conclusions**

This study suggests that large-scale changes are necessary to the current cost-share framework of the USEDSFMP. The current drainage levy framework should be recalculated, with careful consideration given to the application the beneficiary pays principle.

In terms of future environmental activity, there is a real opportunity for Government to establish long-term, environmentally beneficial agreements with landholders, which may serve as a model for other regions to

implement. The importance of revegetation and pasture establishment must be highlighted and implemented within the region.

# 1. BACKGROUND

## 1.1 Introduction

The economics team of Rural Solutions SA was asked to review and update the costs and benefits associated with implementing the Upper South East Dryland Salinity and Flood Management Plan (USEDSFMP). In particular, we were asked to identify and value in-kind ways in which landholders will contribute to future cost sharing. This report provides information to assist current and future beneficiaries to understand the level and nature of the relevant cost-share (and how it evolved).

At the same time and within the same timeframe, the revegetation team of Rural Solutions SA was asked to complete a study on the USE Revegetation Strategy and Regional Targets. A number of outputs of the economic study depended on the results from the revegetation study, which restricted the analysis in this report.

The timelines for both projects were extremely short (two months). Therefore, it was not possible for Rural Solutions SA to thoroughly explore many of the issues that arose throughout the study. The need for further research and detail is therefore outlined in Section 8.

## 1.2 Background History

The Upper South East (USE) is a significant agricultural area of South Australia supporting mainly beef and sheep grazing enterprises, with a rural population of around 2,300. The total area under the original USEDSFMP study area was around 691,000 ha, with around 40% of the area degraded by salinisation as a result of high groundwater levels and flooding.[1]

As a result of the concerns about decreasing agricultural productivity, the USEDSFMP was developed in 1992-93. The USEDSFMP is an integrated catchment management plan, which comprises of four key components:

1. *Coordinated drainage schemes*: construction of about 450km of drains throughout part of the region;
2. *Surface water and wetland management*: protect and enhance over 10,000 ha of wetlands;
3. *Revegetation (regional and targeted*): revegetate 41,000 ha of land to reduce water table recharge and protect biodiversity; and
4. *On-farm measures to increase agricultural productivity*: Increased adoption and understanding of saltland agronomy.

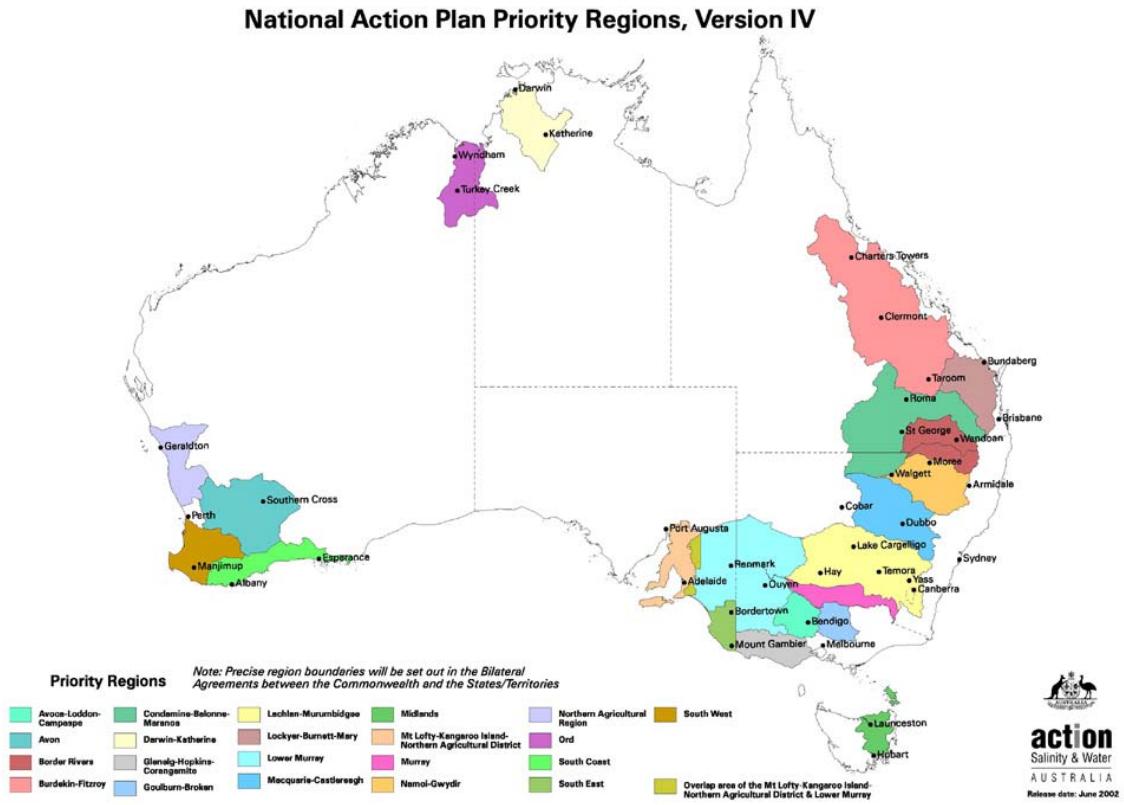
Following a long planning and environmental impact assessment process, the State Government approved the Plan in June 1995. The State Government agreed to contribute 37.5 per cent of the estimated $24 million drainage scheme, provided that the Commonwealth agreed to match the funding and the local community agreed to contribute 25 per cent. It was felt that without adequate drainage, other components of the Plan would not be effective.

In July 1996 the Commonwealth Government endorsed the scheme and agreed to the cost share arrangement for the drainage component.

In recognition of the potential national and international importance of the natural assets (in particular wetlands) within the USE, the region was designated as part of a key region within the National Action Plan (NAP) for Salinity and Water Quality in 2001. This has significantly boosted the funding available to the region to undertake many of the initiatives identified in the Plan. Figure 1.1 illustrates the priority regions in Australia.

[1] Under ABS definitions, as at 1996-97, the land area in the USE was around 1.32 million ha, with 1,480 landholders. The SEWCDB used a rateable area of 877,705 ha for the drainage levy. One of the problems for this study has been the difference in areas used by various groups.

**Figure 1.1**




Source: http://www.napswq.gov.au/images/napswq_small_priorityregion.jpg

## 1.3 Structure of Report

The remainder of the report is structured as follows:

- Section 2 defines the key economic analysis rules which are reviewed and used in this review;
- Section 3 reviews the economic analyses that have helped generate the current cost shares;
- Section 4 explains the evolution of the current cost share frameworks;
- Section 5 discusses the proposed changes to the cost share framework of the USEDSFMP;
- Section 6 explores the environmental outcomes of the drainage scheme and the valuation methodology used;
- Section 7 details the environmental activities (and associated costs) of USE farmers and the value that society attaches to certain activities;
- Section 8 details future research needed; and
- Section 9 provides conclusions.

# 2. ECONOMIC ANALYSIS GUIDELINES

## 2.1 Overview

Benefit Cost Analysis (BCA) is a widely used tool in economics for assessing whether a particular program is a sound investment of public funds. BCA provides an estimate of the size of the net social benefits (ie. social benefits minus social costs) associated with a program. Within such an analysis beneficiaries are identified and these can be used to identify appropriate cost shares (discussed in more detail later in this Section).

### 2.1.1 Financial vs Economic Analysis

To understand the approach taken in this study, a consideration of the difference between finance and economics is needed. A financial analysis of a project is undertaken to assess whether or not it is commercially profitable. It provides an indication of the impact of the project on the enterprise's balance sheet. A financial appraisal looks at what is the net benefit from a decision to an individual person, firm or organisation. It does not consider how that decision may affect others.

Unlike a financial analysis, an economic analysis does consider outside effects. It looks at net benefits to the region or society. Economics and finance are often confused. For example, it is often stated that landholders do not implement sustainable practices on their land because the economics do not support the activity. What is meant, however, is that the net financial returns by themselves, would not support the required investment in the activity. Wherever possible, economics considers the entire results of the activity, from the financial returns (if any) of the undertaking, as well as the increase in the sustainability of the farm, and the effects on the surrounding environment such as adjoining paddocks, streams and animals. It is quite possible that when the entire benefits of the sustainable practice are taken into consideration, the activity is supported, at least by society, providing one justification for Government involvement.

### 2.1.2 Guidelines for Economic Analysis

In order to make sure that results are of highest use to decision-makers, there are a number of standard assumptions and established criteria to follow when conducting BCA. For this review, the Natural Resource Economics team has used State (Department of the Treasury 1997) and Federal guidelines (Department of Finance 1997) for BCA. Appendix One illustrates some of the key guidelines that were used to review the relevant USE economic evaluations.

### 2.1.3 Outcomes from Economic Analysis

The primary role of BCA is in option appraisal. BCA can reduce or eliminate the uncertainty about whether or not to proceed with a project. The more uncertain a project decision, the greater the value derived from an economic evaluation. Another direct benefit of BCA is that it allows cost-sharing frameworks to be identified among the various beneficiaries of the project.

While a BCA is often criticised for its lack of quantification of all the community benefits that are to be gained from implementing various management strategies (such as biodiversity), it does provide a list of all the possible effects that need to be included. As non market valuation techniques improve, it will become more possible to include these values into the BCA framework.

A BCA provides three common indicators of net social benefits, namely:

- Benefit cost ratio (BCR);
- Net present value (NPV); and
- Internal rate of return (IRR).

A BCR provides an indication of the result achieved from a project, by comparing it to a without (W/O) project scenario. The BCR is calculated in the following way:

$$\frac{\text{PV (With Project – W/O Project scenario benefits)}}{\text{PV (With Project – W/O Project scenario costs)}}$$

A BCR above one indicates that the economic returns from undertaking a particular activity outweighs the associated costs, and a BCR below one indicates that the benefits did not outweigh the costs.

NPV is the sum of a flow of annual net benefits, each of which has been discounted to present day estimates. Discounting is required because a dollar available for spending (or investing) today is more valuable than a dollar that won't become available until a later period.

The IRR is the discount rate at which the present value of benefits equals the present value of costs. Or, alternatively, it is the rate at which the NPV is zero.

### 2.1.4 Benefits of Economic Analysis

High quality BCAs will provide the following key benefits: assumptions will be transparent, missing gaps of knowledge will be identified and results are repeatable by other analysts (note: this assumes standard guidelines are followed). High quality environmentally relevant BCAs can help to:

- Make the economic dimension of environmental degradation (or improvements) clearer; and
- Direct scarce financial resources to those areas of the environment where they are most urgently needed.

The benefit of economics is that it makes decisions explicit, even though it may be painful to say that we cannot afford to invest a certain amount to achieve an environmental objective. It allows the tradeoffs we will make, or may have to make, to be viewed by the public. There is a strong case for using BCA to increase understanding of the efficiency consequences of a policy and to harness the market through economic instruments to minimise the resource costs of improving environmental quality.

In summary, the main objectives of BCAs are:

- to highlight all the relevant costs and benefits in the area, in the base case (ie, the with project situation) versus the scenario(s) of implementing various management strategies;
- to identify and quantify wherever possible non-market values of rehabilitation or other options, etc;
- to perform sensitivity analysis on key assumptions to illustrate whether utilising different assumptions critically changes the net social benefits of the plan;
- to discount the benefits and costs over a certain time period identified; and
- to provide guidance on the strength of the socially optimal situation.

## 2.2 Valuing the Environment

For projects that primarily benefit the environment, hence have mainly public benefits, the BCR will often be below one when non-market benefits are not quantified. Although it is usually possible to quantify environmental benefits in physical terms, it is much harder to place monetary values on environmental benefits without substantial effort. Briefly, there are three main ways to estimate the value of environmental benefits:

(1) **Environmental Valuation**: Estimates the specific benefit/costs for a given project through various environmental economic approaches (such as contingent valuation, choice modelling, hedonic pricing or travel cost method);

(2) **Benefits Transfer**: Transferral of values obtained from other economic environmental valuations if they meet some prior criteria; and

(3) **Threshold Approach**: Provides an estimate for what the minimum value of environmental benefits has to be in order to justify the existence of the project.

Environmental valuation can be an expensive and resource intense exercise. Although many projects may have several unpriced benefits and costs associated with them, a choice needs to be made on when and how values are attributed to the environment. Such unpriced benefits or costs are referred to as externalities. A first best policy is always to try and accurately estimate the value of all externalities, but in reality this is rarely possible. This is why many BCAs will employ the method of benefits transfer.

Benefits transfer is only a valid method if it meets some established criteria, such as:

- the primary study cannot be fundamentally flawed;
- the study site and the policy site need to be similar;
- the environmental change at the policy site needs to be similar to the environmental change at the study site; and
- the socio-economic characteristics of the populations affected by the environmental changes at the two sites needs to be similar.

If these conditions are not satisfied then benefits transfer should not be applied, and the threshold approach utilised. This approach is utilised in the event where the BCR is less than 1 (so that the project for environmental improvements is not recommended to go ahead). It provides a figure for what the minimum willingness to pay for the environmental benefits would need to be for the project to be justified. This figure is then presented to the community/government and they are asked whether this figure seems reasonable given the presence of environmental improvements/costs. The decision is then made whether or not it is worthwhile going ahead with the project.

Within this current study the method of benefits transfer has been applied. Further explanation, and the validity of this, is provided in Section 6.

## 2.3 Determining Cost Shares

### 2.3.1 Why is a Cost Sharing Process Needed?

In many cases, left unattended the (competitive) market will guide resources into the production of goods and services most wanted by society using the most efficient techniques. This so called allocative efficiency makes economists hesitate over government intervention unless there is a very compelling reason to do so. One justification for government intervention is when market failure exists. Market failure occurs when the unregulated market is unable to achieve allocative efficiency in all circumstances.

For example, market prices do not always reflect the activities of the producers and consumers. The market may fail to register all the benefits and costs associated with the production and consumption of certain goods and services. Some benefits and costs are external to the market because they accrue to persons other than the immediate buyer or seller. Such benefits or costs are called externalities. When environmental issues are concerned, there are likely to be very substantial differences between market and socially desired outcomes.

A ***public good*** is one where benefits accrue to many individuals, and no one person can be excluded from consumption of the good. In addition, one more person's consumption cannot reduce another's consumption. Where the aggregate benefits of a public good exceeds its costs, non-provision constitutes a market failure. For example, the amenity and biodiversity benefits to society of the establishment of native vegetation can often outweigh the net costs incurred by farmers in maintenance and provision. A better social outcome may be achieved if Government intervenes to provide the good and compels the community (or preferably the sub-section of the community such as the beneficiaries of the public good) to pay for all or part of the good.

Cost sharing is often called 'investment sharing', to reflect the notion that investments in activities or practices promoting the long term health of the environment earn an implicit return (Leybourne and Crawford 2000).

### 2.3.2 Principles of Cost Sharing

There are two main principles of cost sharing that can be used by Government in determining 'who pays?', namely the ***polluter pays principle*** and the ***beneficiary pays principle***.

The ***polluter pays principle*** is where the polluter is expected to bear the cost incurred in reducing environmental damage. Government outlays are minimised with this principle as producers (and potentially consumers) bear the cost of the remedial action.

If community demands for environmental standards are considered to be in excess of the original polluters responsibilities, or where the original party cannot be identified, then the ***beneficiary pays principle*** is the most relevant principle. This is where individuals, bodies or society that receive a benefit from removing/alleviating the environmental problem are expected to contribute to the expenditure incurred. The beneficiary pays principle is sub-divided into two other principles:

*(a)* *user pays*: where anyone who derives a direct benefit should pay for the works (*where costs are fully distributed among beneficiaries pro rata to their shares of total benefits)*; and

(b) *beneficiary compensates*: where anyone who derives an indirect or intangible benefit should also contribute (Different definition includes – all beneficiaries meet some portion of the costs and that together the beneficiaries cover full costs).

The cost share process is estimated generally from the economic analysis. If the 'beneficiary pays principle' is used to determine cost shares, then this is estimated by:

$$\frac{\text{Benefits received by Specified Beneficiaries over a Predetermined Period}}{\text{Total Benefits of the Project over a Predetermined Period}} \quad \%$$

A cost share process is usually only entered into when the project has been determined to be economic. Therefore, the assumption is made that the sum of the benefits received by various parties outweighs the costs of the project. Beneficiaries are generally divided into direct beneficiaries (ie, those who benefit directly from on-ground works), state beneficiaries and wider (national) beneficiaries.

Once the rights (in other words legal responsibilities) of landholders and other affected parties are established, the relevant principle can be applied to the cost sharing process. Generally, it is the beneficiary pays principle that is applied because of the difficulties associated with the polluter pays principle (ie. identifying the people responsible for the problem is usually not easy and regulation is difficult and costly to enforce). In many instances, the problems were caused by earlier settlers and Government policy of the day (such as land clearance).[2]

If the 'beneficiary pays principle' is used to assign cost shares, a Government's share need not be equal to the full public benefits generated. Governments need contribute only the minimum amount necessary to encourage appropriate conservation by landholders (Productivity Commission 2001).

There are a number of issues that need to be considered when developing a cost-sharing process. Some of these include:

- Whether benefits/costs are public or private. There is a formal process for identifying and quantifying public and private benefits:
    - The stakeholder groups that will benefit, ie. landholder, local community, wider community. At times, wider community is divided into state and commonwealth communities;
    - The share of total benefits gained by each of the stakeholder groups (ie. each stakeholder benefit is divided by total benefits of the project) is generally used to provide some indicative cost shares;

[2] Past inefficiencies are often treated as sunk costs, as it is impossible to change behaviour from an earlier period. On equity grounds, there is also not much scope for applying the polluter pays principle, as many landholders were operating under the accepted rules of the day, and the error now lies with public policy at the time that the pollution occurred, or alternatively, with a changed public preference for environmental resources (Marshall 1998).

- Community service obligations; and
- Possible distorting effects of cost sharing.

Taking into consideration the above factors, the indicative cost shares become the starting point for negotiations between government and private beneficiaries such as landholders and the local community.

The capacity to pay is a principle that many feel the Government should consider when formulating cost-shares. If the beneficiary pays principle is used correctly to calculate cost shares, then the benefits received from the project should outweigh the costs attributed to beneficiaries. An issue arises when, because of adverse seasons or prices, farmers are temporarily unable to fulfil a cost-share arrangement. This only becomes a real problem when financial institutions are unwilling to provide credit, and an efficient response by Government may be to provide short-term credit in terms of the costs involved (Marshall 1998).

### 2.3.3 COAG and NHT Cost Sharing Principles

Taking into account the economic principles outlined above, the Council of Australian Governments (COAG) developed the following cost-share principles for government programs:

1. The full cost of providing services to specific identifiable beneficiaries or polluters should be recovered by way of charges to them;
2. Public costs or impact management which are unable to be attributed and charged to specific beneficiaries or polluters should be treated as community service obligations;
3. Where costs are subsidised by Government, they should be defined explicitly so that unsustainable precedents are not established.

COAG also outlined that Government should only resort to cost-sharing if education about the environmental problems in the community had increased, policy and legislative impediments to addressing problems removed; point-source polluters identified and addressed; and that Governments are prepared to invest on behalf of the wider community (Murray-Darling Basin Commission 1996).

Many NHT proposals require an assessment of the potential benefits and costs to support the application. NHT funding expects some level of contribution from the community for all projects that it funds. Generally, the Trust will provide up to one dollar for every dollar contributed by other eligible organisations and individuals. In other words, the Trust expects eligible organisations and individuals to fund at least 50 per cent of the project, hence ensuring that there is a greater ownership and interest in the project. Exceptions where the Trust will contribute more funding include projects in the MDB, river water quality investments, the National Reserve System and projects of significant native habitat (PIRSA Rural Solutions 2000).

The original cost share framework of the drainage system was developed prior to NHT funding. As such, it was not subject to the same level of rules/cost-sharing as compared to other environmental activities that have been recently funded.

### 2.3.4 'In-kind' Contributions

A number of cost-sharing arrangements have relied partly on farmers agreeing to pay a substantial share of their cost share 'in-kind'. Most cases include landholders investing in 'best practice' on-farm works, which have conservation benefits. Marshall (1998) states that this ignores the fact that these sorts of works usually provide considerable private benefits to the landholders that adopt them. An economic approach to 'in-kind' contributions is that only farmers' costs in excess of what they would have incurred without the remedial environmental activity would be eligible to be counted as in-kind contributions.

Another issue associated with in-kind contributions is delivery. If the activities are part of an integrated conservation program, failure to honour such contributions will lead to rendering the cost-sharing arrangement inequitable, and the original agreement will have to be revisited.

### 2.3.5 Theoretical Cost Shares as a Starting Point for Negotiation with Landholders

As commented upon earlier, theoretical cost shares, estimated from various economic principles, form a starting point basis for negotiation with landholders. At the very least, the maximum amount that landholders should pay is the theoretical cost share. When it comes time to negotiate with landholders, Government must consider other issues such as capacity to pay and in kind contributions. As the House of Representatives (2001) report recommends, the Government should work to achieve conservation outcomes and consider the full range of equity concerns held by landholders.

### 2.3.6 Summary

Cost sharing is essentially a process of bargaining and negotiation. There is no 'correct' solution to a cost sharing problem and no analytical tool that can simply deliver an exact answer. The fundamental principle driving cost sharing arrangements is that each landholder will only be involved if they perceive their benefits to be greater than their costs. The amount offered to private stakeholders must make the perceived net benefits positive. An individual can obtain benefits from receiving financial returns, or contributing to social and ethical outcomes. So called psychic income can be just as important to people as financial income. However, in doing so, Government must recognise the social benefits that are to be derived from any activity.

# 3. ECONOMIC ANALYSIS REVIEW

## 3.1 Studies Reviewed

One of the objectives of this project was to review all relevant literature identifying costs and benefits of the USE Program. The studies that were considered for review in this project (in alphabetical order) include:

- AACM International (1999) 'Cost Benefit Analyses and Cost Sharing Frameworks for Pilot NRM Projects in SA', prepared for PIRSA.
- Barber A. (1993) 'Benefit Cost Analyses of On-Farm Renovation Strategies and Catchment Drainage Options', prepared for the Upper South East Dryland Salinity and Flood Management Plan.
- Bennett J. and Whitten S. (2002) 'The Private and Social Values of Wetlands: an Overview', prepared for the National Wetlands Research and Development Program, Land and Water Australia, March.
- Bennett J. and Whitten S. (2002a) 'Duck Hunting and Wetland Conservation: Compromise or Synergy', prepared for AJARE conference, 29th January 2002.
- Jensen A. (1993) 'Assigning Values to Wetlands and Natural Resources in the South East of South Australia', Department of Environment and Land Management background paper, March.
- SACES (1998) 'Review of South Eastern Water Conservation and Drainage Act 1992', prepared for PIRSA, June.
- SACES (1999) 'The Upper South East Dryland Salinity and Flood Management Plan: A Review of the Benefit Cost Analysis of On-farm Renovation Strategies and Catchment Drainage Options', paper for PIRSA, November.
- Upper South East Dryland Salinity and Flood Management Plan Steering Committee (1993) *Upper South East Dryland Salinity and Flood Management Plan*, report for the Natural Resources Council of South Australia.
- Upper South East Dryland Salinity and Flood Management Plan Steering Committee (USEDSFMPSC) (1994) *Upper South East Dryland Salinity and Flood Management Plan: Supplement*, report for the Natural Resources Council of South Australia, October.
- Walsh *et al* (1993) 'The Upper South East Dryland Salinity and Flood Management Plan: A Strategic Economic Overview', paper for the Steering Committee of the Upper South East Dryland Salinity and Flood Management Plan, August.
- Whitten and Bennett (2001) 'Non-market Value of Wetlands: A choice modelling study of wetlands in the USE of SA and the Murrumbidgee River floodplain in NSW', Research Report No. 8, Report for Land and Water Australia.
- Whitten and Bennett (2001a) 'A Bio-economic Analysis of Potential USE Regional Wetland Management Strategies', Research Report No. 9, Report for Land and Water Australia, May.
- Whitten and Bennett (2001b) 'Policies for Wetland Management Change on Private Land: Case studies of wetlands in the USE of SA and the Murrumbidgee River Floodplain in New South Wales', Research Report No. 11, Report for Land and Water Australia, November.
- Whitten and Bennett (2001c) 'A Travel Cost Study of Duck Hunting in the USE of SA', Research Report No. 7, Report for Land and Water Australia, April.
- Whitten S. and Bennett J. (1998) 'Farmer Perceptions of Wetlands and Wetland Management in the USE of SA, Research Report No. 2, Report for Land and Water Australia, November.
- Whitten S. and Bennett J. (1998a) 'Wetland Eco Systems and landuse in the USE of SA', Research Report No. 1, Report for Land and Water Australia, August.
- Whitten S. and Bennett J. (1999) 'Potential USE Regional Wetland Management Strategies', Research Report No. 3, Report for Land and Water Australia, July.

It is important to note that we appreciate the level of effort that has gone into producing the above models and reports. It is always easier to review models than to construct them. In addition, we have the benefit of a later period and further research to review the validity of assumptions used. Therefore, our comments should not be interpreted as criticism but rather an update.

After an initial review, three economic analyses were examined in depth. These studies were chosen because they formed the basis of the historical cost-sharing framework of the USEDSFMP. The reviews are presented in chronological order.

### 3.2 'Benefit Cost Analyses of On-Farm Renovation Strategies and Catchment Drainage Options', by Barber in 1993

Barber's comprehensive 1993 analysis laid the foundation for the choice of on-farm renovation strategies and catchment drainage options. 28 options were analysed and the drainage scheme was a combination of:

- Catchments – Southern, Central and Northern;
- Drainage Standards – landholder, limited surface, major surface and major groundwater; and
- Outlets – the Coorong, ocean and evaporation basins/wetlands.

The key assumptions of the analyses include:

(a) The total catchment study area was 684,360 ha, made up of three main regions.

(b) The three catchment areas to be drained were Southern (52,020 ha of agricultural land), Central (97,200 ha of agricultural land) and Northern (94,240 ha of agricultural land). These three catchments represented 43% of the study area of the entire plan.

(c) Land was categorised into five classes: 1 = dunes and ridges, 2 = flatland unaffected by salinity, 3 = flatland mildly affected by salinity, 4 = flatland moderately salinised and 5 = flatland severely salinised.

- Of the land that was affected by degradation, it was suggested that 130,000 ha of 2 to 4 land was at risk.
- The annual land degradation rates from one category to the next were: nil from 1 to 2, 4.5% from 2 to 3, 12% from 3 to 4, and 7.5% from 4 to 5.
- Without action, it was assumed that there would be a 41% decline in carrying capacity over 30 years.

(d) Gross margins for farms were based on dry sheep equivalents (dse). Cropping enterprises were not considered for this area. Different types of gross margins were used, including current (September 1992) and a 12 year average.

(e) Pasture renovation included weighted costs for a variety of programs.

(f) It was assumed that 20% of land categories from 2 to 5 had already been renovated with pasture prior to the drainage scheme being put in place.

(g) Before drainage, stocking rates were assumed to be 3.5 dse per ha in category 1, 8.0 dse in 2, 3.5 dse in 3, 2.5 dse in 4 and 1.5 dse in 5. After drainage, it was assumed that stocking rates could realistically increase to 5.5 dse in 1, 10.5 dse in 2, 6.5 dse in 3, 6.0 dse in 4 and 5.5 dse in 5.

(h) Four standards of drainage were analysed (landholder, limited surface, major surface water and major groundwater).

(i) The estimates of pasture renovation on flats varied from 21% (landholder drainage scheme only) to 40% (major groundwater scheme).

(j) Costs of on-farm drains were $2,500 per km, with $2,000 per km cost for new farm fencing.

(k) Land values were included.

(l) Salvage values for livestock and land were included.

(m) Sensitivity analysis was used for key assumptions.

The results concluded that the project was economic at both the farm and catchment levels, except for sub-schemes that had high capital costs for new ocean outlets.

Taking into consideration other factors than just the identified agricultural benefits, the Environmental Impact Statement (EIS) (1993) recommended the following sub-schemes:

- S7 – major ground water, discharge to Blackford Drain, cost $5m
- C12 – major ground water, discharge to Ocean via Henry Creek, cost $17.8m
- N8 – major surface with some groundwater, discharge to Coorong via Currawong, cost $10.6m

### 3.2.1 Benefits and Costs not Included within the Analysis

Given the variety of models developed by Barber, time constraints and the outdated software, it was only possible to thoroughly review the BCA that was constructed for the farm level in the Central catchment.[3] This farm level BCA was assumed to be 'outside the direct influence of groundwater deep drains but was adequately serviced by a major surface water control network'. Therefore, it is assumed that this model sufficiently represented the drainage system that has been developed in the USE.[4]

Some of the costs of the scheme that were not considered (or included incorrectly) in the original model and the consequent changes that were made are detailed below:

- *Capital Costs*: In the farm level economic analysis, the full share of capital costs was not included in the model. Only a fraction of the costs was included.[5]
  - Therefore, the full range of capital costs associated with a 1,000 ha was inserted into the model. In addition, the capital costs have now increased, so the total cost of the scheme was revised from the original $36m to the current predicted cost of $40.6m.
- *Land forfeited for Drains*: Compensation was only considered for drain options including evaporation basins and new wetland/ponding basins. No payments were made for land acquisition for drains.
  - The loss of gross margins associated with this loss of land was included in the revised model.[6]
- *Maintenance Costs*: Maintenance costs of the drainage scheme were not included in the original economic model.
  - The original predicted estimates ($75-350 per km annually and $2,000 per km every 15-20 years) were inserted.
- *On-farm capital costs associated with Pasture Renovation Program:* Costs associated with surface drains, realigned fencing, altered stock water points and new farm/tracks/causeways/culverts/bridges was estimated, but not included in the original model.
  - On-farm capital costs were added into the model.
- *Timing of Pasture Establishment Costs:* The original model assumed that the drainage scheme would be in place in a few years, allowing pasture establishment to occur. The lateness of construction means that not all pasture establishment costs have been incurred, decreasing the overall costs of the scheme. (See below for discussion on the timing of gross margin benefits).
  - It was not possible to make this revision to the model.

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3 This farm level BCA was presented in detail in Barber's (1993) report, allowing thorough crosschecking. It had a BCR of 1.56 and a NPV of $130,460 (using a discount rate of 7%).

4 The assumptions used about changes in stocking levels in the BCA were cross-checked with what farmers said they were currently receiving and were found to be similar.

5 It was not clear if this resulted from a mistake or from allowing an element of capital cost-sharing (which was removed). When we allocated capital costs, the whole catchment (not just agricultural land) that benefited was used as a basis for working out per hectare estimates in the revised model. It was found that the catchment area that benefits has increased, from Barber's estimate of around 292,000 ha to around 337,000 ha currently.

6 Based on estimates of land forfeited to drains, it was assumed that an average farm lost 4% of its land area to drains, therefore lost 4% of the gross margin that it would have achieved under the 'without project' scenario. The 30 year cost of lost gross margins was extremely higher than the cost of lost land valued by what it would have sold at. Therefore, the costs to farmers weigh in on the high side here, rather than the low side.

Some of the benefits of the scheme that were not considered (or included incorrectly) in the original model and the consequent changes that were made are detailed below:

- *Land Value*: As well as increased productivity from land, the increase in land values was also included in the original model. This means that the benefits of the drainage scheme were double counted (see Appendix One for more detail).
  - Land values were deleted from the revised model.
- *Capital Residual Value*: The original model estimated no residual value associated with the drainage scheme.
  - Instead of including a residual land value, a value was inserted for the residual value of the drain in the revised model. It was assumed that the drainage scheme would last for 100 years (Drainage Implementation Group, personal communication 27th June 2002), hence a residual value of the capital costs was included in Year 30.[7]
- *Livestock Residual Value:* The original model included a residual value for livestock.
  - Including values for livestock residuals is not common practice; hence it was removed in the revised model.
- *Changed Land Use:* The original model assumed no change in production mix.
  - Anecdotal evidence suggests that the drainage scheme has allowed some land use change to occur, from livestock to crops. However, there is currently not enough evidence to suggest how significant such a change is, hence no allowance could be made for it within the revised model. Therefore, the private benefits of the drainage scheme are most likely underestimated.
- *Timing of Gross Margin Benefits*: The original model assumed that the drainage scheme would immediately benefit most of the catchment, and assumed target rates for development of perennial pastures.
  - However, as at 2002, just over a third of the current proposed scheme has been completed. This means that the timing of some of the gross margin benefits would have occurred in later years, decreasing the overall benefits of the scheme. The lack of information and the complications associated with the various spreadsheets precluded any revision of the model with regards to benefits occurring later.
- *Increases in Stocking Rates*: It has been suggested that the original model estimates of increases in stocking rates were conservative and experience has shown that there has been significantly large increases in stocking rates above and beyond predicted levels.
  - However, it was not possible to review all the models that were developed of the stocking rates, hence no revisions in this area were included in the model.
- *Changes in Gross Margins*: The original model calculated a variety of average dse gross margins.
  - It has been suggested that gross margins (especially for beef enterprises) have increased considerably since the values used in the original model. Such values were not updated as a downturn in beef prices is expected, and on a long-term basis gross margins have not changed considerably (although they have increased slightly).
- *Council Maintenance Costs:* The original model did not include any decrease in council maintenance costs from decreased surface water flooding.
  - A value for decreased council maintenance costs was estimated from Walsh *et al* (1993) and inserted into the revised model.

***Environmental Values***

The original model did not take into account any environmental benefits (it was not one of its objectives to do so). This study has attempted to identify and quantify the environmental benefits associated with the drainage scheme. Sections 6.14, 6.2.2 and 6.2.3 provides more detail on how these environmental values were estimated. It must be noted that only environmental benefits were included, no allowance was made for environmental costs created by the drainage scheme. These negative consequences are elaborated on further in Section 6.[8] Environmental values estimated include:

[7] Note, according to Treasury guidelines, only a residual value of items that could be resold was included. Other capital works that are permanent structures are considered to be sunk costs.

[8] The current scientific uncertainty over the environmental outcomes did not allow any formal valuation.

- *Wetland Values*: The drainage scheme was predicted to lead to an improvement in wetland area, from degraded to good condition. Values per ha of wetland area improved were included.[9]
- *Tourism Values*: Increases in tourism were related to the area of wetland improvement. The change in producer and consumer surplus from changing wetland value was included.[10]
- *Landscape aesthetics:* Values were attached to the area of farmland repaired as a result of the drainage scheme (because of the social values associated with regional employment and landscape aesthetics).

No estimate was included for remnant vegetation, as the capital costs of the drainage scheme did not involve any revegetation (apart from revegetating areas in native vegetation that had to be cleared because of the scheme). It could be argued that if there were more scientific certainty over the effect of the drainage scheme on native vegetation (such as the dewatering effect), values could be attached to the loss of native vegetation as a cost of drainage. This would result in a fall in environmental values.

### 3.2.2 Results from Revised Economic Analysis

Implementing the changes cited above, the BCR fell from 1.56 to just below one with a discount rate of 7 per cent. All discount rates below 7 per cent have BCRs above one, as shown in Table 3.1 below.

**Table 3.1**
**Revised Benefit Cost Analysis Results for the 1000ha Central Farm over a Twenty Year Period**

| DISCOUNT RATE % | NET PRESENT REVENUE $ | NET PRESENT COSTS $ | BENEFIT-COST RATIO |
|---|---|---|---|
| 5.00 | 489,034 | 445,443 | 1.10 |
| 6.00 | 420,052 | 410,532 | 1.02 |
| 7.00 | 363,029 | 380,140 | 0.95 |
| 8.00 | 315,604 | 353,506 | 0.89 |
| 9.00 | 275,931 | 330,019 | 0.84 |

Note: Net present value is net present revenue take net present costs.
Sources: Barber (1993) and Rural Solutions analysis

Some changes could not be made within the model, and it is hard to predict the effect of some of these qualitative changes. On the whole, it is likely that the private benefits represent a conservative estimate (because of the conservative stocking rate assumptions, and no allowance for change in land use (ie. from sheep/beef to grains) or increases in gross margins).

It is not as easy to categorise environmental values. On the one hand, because they are based on the population of Adelaide and USE (using benefit transfer rules), they could be an underestimate of the total potential size of environmental benefits. However, allowing for sensitivity testing, using the entire SA population only increases the BCR slightly. An extreme test of the benefits transfer rules (allowing for all of Australia to place environmental values on wetlands created by the drainage scheme) means that the BCR jumps to 1.38. The size of these environmental values is not realistic, but provides an interesting comparison to the original environmental value results.

On the other hand, there have been negative environmental consequences of the drainage scheme, and if these effects were fully known and accounted for, then the overall values would be a lot less. The lack of quantitative data and knowledge at this stage has meant that such effects cannot be included. As such, the environmental values currently included are an overestimate of the true value.

[9] For the farm level BCA, the improvement in wetland area was distributed across the catchment to get an average wetlands improvement figure per hectare.

[10] An assumption was made that 50% of tourism in the area was from SA residents, and that their expenditure would have been displaced from elsewhere in the state (hence this value could not be included in the BCA). Only tourism value from interstate and international visitors was included.

If there are no environmental values included in the analysis, then the scheme is not economic. The total net benefits from improved agricultural productivity do not outweigh the current costs of the scheme. The BCR under such a scenario is 0.83; making it all the more critical that there are net environmental benefits from the scheme.

If there are more increases in capital costs of the drainage scheme, then it is likely that the project will no longer be economic.

The share of benefits from the drainage scheme, as well as the breakdown of costs, is shown in Table 3.2 below. Further commentary on beneficiaries is provided in Section 5.1.1.

**Table 3.2**
**Beneficiaries and Costs from the Revised Benefit Cost Analysis for the 1000ha Central Farm Over a Twenty Year Period using a 7% Discount Rate**

| Distribution of Benefits | PV Benefits | % Share of Benefits | Distribution of Costs | % Share of Costs |
|---|---|---|---|---|
| **On-Farm Benefits** | | | **On-Farm Pasture Costs** | **55%** |
| • Revenue from Pasture improvement and increases in enterprise gross margins from stocking rate increases | $315,660 | 87% | • Pasture Maintenance<br>• Restocking costs | |
| • Salvage fencing structures from drainage system | $3,687 | 1% | | |
| • **Total** | **$319,347** | **88%** | | |
| **Local Community Benefits** | | | **Drainage Scheme Costs** | **30.2%** |
| • Reduced council infrastructure costs | **$2,561** | **1%** | • Capital costs<br>• Maintenance | |
| **State Benefits** | | | **Lost Production Costs** | **5.4%** |
| • Additional Tourism value | **$17,051** | **5%** | • Revenue foregone | |
| **Wider** | | | **On-Farm Costs associated with Drainage Scheme** | **9.4%** |
| • Landscape and social impact aesthetics | $10,209 | 2.8% | | |
| • Environmental value associated with wetlands | $13,861 | 3.8% | • Subsidiary Drains<br>• New fences | |
| • **Total** | **$24,070** | **6.6%** | • Roadways and Bridges | |
| **TOTAL** | **$363,029** | **100%** | **TOTAL** | **100%** |

Sources: Barber (1993) and Rural Solutions analysis

### 3.3 'The Upper South East Dryland Salinity and Flood Management Plan: A Strategic Economic Overview', by Walsh *et al* in 1993

Walsh *et al's* (1993) economic overview used Barber's BCA results to estimate the total economic impact of the drainage scheme and to help establish the proposed cost-sharing framework.

Two principal drainage scheme options were evaluated in the Walsh *et al* report: (a) deep drains and surface water drains (cost $33.5 million) and (b) surface water drains ($18.7 million). The potential impacts of the drainage scheme were analysed on a variety of sectors:

- Agriculture;
- Conservation areas, parks and wetlands;
- Tourism;
- The labour force;
- The public sector; and
- The external sector.

As is to be expected, not all impacts in all sectors could be fully quantified. The agricultural sector (from Barber's analysis) had the most quantitative work undertaken. The quantified results are shown in Table 3.3. The split of cost shares is also depicted.

Walsh *et al* (1993) went on to discuss the issue of relative affordability in terms of implied cost shares for different spheres of government. They suggested that some landholders might struggle to pay a beneficiary tax in the early years of the government scheme. As a result, it was suggested that a more balanced sharing of costs should be borne by the State and Commonwealth Governments than the above breakdown suggests, especially since some of the environmental values associated with the scheme were not quantified (such as values associated with land degradation issues). The final recommendation proposed the following cost shares:

- 25 per cent local community;
- 37.5 per cent State; and
- 37.5per cent Commonwealth.

**Table 3.3**
**Original Cost Sharing Framework Developed by Walsh *et al* 1993**

| Benefits | Groundwater plus surface drainage ($m) | Surface Drainage only ($m) |
|---|---|---|
| ***Local Government*** | | |
| Gain in rate revenue from capitalised benefits into property values | 3 | 2.8 |
| Landowner output gains, net of exports | 20.4 | 19 |
| Drainage maintenance costs avoided as a result of surface flooding damage | 1.3 | 1.3 |
| Increase in region's economic activity | 4.7 | 4.5 |
| **Local Government Total** | **29.4** | **27.6** |
| ***State Government*** | | |
| Share of increased indirect tax revenue | 0.5 | 0.4 |
| Pro-rata gain in state land quality resulting from drainage | 3 | 2.8 |
| Increase in interstate exports from SA | 10.2 | 9.5 |
| Increase in state economic activity | 31.2 | 30.1 |
| **State Government Total** | **44.9** | **42.8** |
| ***Commonwealth Government*** | | |
| Taxation receipts - income | 1.5 | 0.8 |
| - indirect | 1 | 0.9 |
| Welfare costs avoided | 0.7 | 0.4 |
| Wetlands Waterlink | 5.5 | 5.5 |
| Ocean (rather than Coorong) outlets | 2 | 0 |
| Across-border share of damage cost allocated to the capital cost of drainage | 2.3 | 2.3 |
| External sector (export) gain | 10.2 | 9.5 |
| Increase in national economic activity | 3.8 | 3.5 |
| **Commonwealth Government Total** | **27** | **22.9** |
| **Total** | **101.3** | **93.3** |
| ***%*** | | |
| Local Government Share | 29.0 | 29.6 |
| State Government Share | 44.3 | 45.9 |
| Commonwealth Government Share | 26.7 | 24.5 |
| Total | 100.0 | 100.0 |

Source: Walsh *et al* (1993)

### 3.3.1 Benefits Incorrectly Included Within Cost Sharing Framework

A variety of benefits were included incorrectly within Walsh *et al's* cost sharing framework. As stated previously, Rural Solutions SA used Federal and State economic analysis guidelines to review the above benefits. A significant proportion of these benefits did not conform to the guidelines and hence had to be removed and/or not included in the revised BCA (see previous section for categories). A brief description of why benefits were removed or altered is provided in Table 3.4, and Appendixes One and Two elaborate further on these guidelines. Table 3.4 illustrates the benefits as presented by Walsh *et al*, and it must be recognised that these benefits have not been reordered.

Section 5.1.1 illustrates the main beneficiaries from the project, taking into consideration further research on environmental benefits and proper inclusion of benefits and costs of the drainage scheme.

**Table 3.4**
**Revised Historical Cost Sharing Framework[1]**

| Benefits | Surface Drainage only ($m) | Validity of Estimate |
|---|---|---|
| ***Local Government*** | | |
| Gain in rate revenue from capitalised benefits into property values | 3 | Transfer Value – not included in BCA |
| Landowner output gains, net of exports | 20.4 | Full net present values are received by landholders, hence this is their benefit |
| Drainage maintenance costs avoided as a result of surface flooding damage | 1.3 | This is a real benefit of the drainage scheme, and is accrued by local government. |
| Increase in region's economic activity | 4.7 | Multiplier benefits are not to be included in BCA. Some allowance was made for tourism benefits |
| **Local Government Total** | **29.4** | Figure no longer valid |
| ***State Government*** | | |
| Share of increased indirect tax revenue | 0.5 | Transfer value – not included in BCA |
| Pro-rata gain in state land quality resulting from drainage | 3 | Transfer value – not included in BCA |
| Increase in interstate exports from SA | 10.2 | Not applicable. - value accrues to landholder, not state |
| Increase in state economic activity | 31.2 | These are predominantly multiplier benefits, state specific tourism value only should be included here |
| **State Government Total** | **44.9** | Figure no longer valid |
| ***Commonwealth Government*** | | |
| Taxation receipts - income | 1.5 | Transfer value – not included in BCA |
| - indirect | 1 | Transfer value – not included in BCA |
| Welfare costs avoided | 0.7 | Transfer value – not included in BCA |
| Wetlands Waterlink values | 5.5 | True value of drainage scheme, estimates of WTP for environmental benefits used instead of costs of activities |
| Ocean (rather than Coorong) outlets | 2 | True value of drainage scheme, estimates of WTP for environmental benefits used instead of costs of activities |
| Across-border share of damage cost allocated to the capital cost of drainage | 2.3 | This is a polluters pays principle and does not fit within this beneficiary pays principle |
| External sector (export) gain | 10.2 | Not applicable. - value accrues to landholder, not Cwlth |
| Increase in national economic activity | 3.8 | Multiplier benefits are not to be included in any benefit cost analysis. Some allowance was made for tourism benefits |
| **Commonwealth Government Total** | **27** | Figure no longer valid |

Note: (1) Only the surface drainage estimates are reported above, but comments also directly refer to the groundwater plus surface water figures.
(2) Shaded rows represent values that should not be included in a cost sharing framework. A framework cannot be derived from the above table because other values (as discussed in Section 3.2.1) have to be included first.
Sources: Walsh *et al* (1993) and Rural Solutions SA (2002)

## 3.3 'Cost Benefit Analyses and Cost Sharing Frameworks for Pilot NRM Projects in SA: Expanded Salt to Success', by AACM International (1999)

AACM (1999) developed the cost share framework for incentives paid to USE farmers for environmental activities. Their economic analysis of 6 main components of the plan is what helped establish the initial level of incentives. These incentives are discussed further in Section 5.

AACM International completed a number of BCAs for PIRSA in 1998, of which 'expanded Salt to Success' was one of them. Due to the inconsistency of the various economic tools used by community groups in evaluating on-ground works projects, a review was commissioned in 1999 of ten regional BCAs. AACM contributed to around half of these BCAs, and the framework they used, at this time, was similar for all regions. The SACES (1999) report has been used for this current review, as a thorough analysis was not possible because the spreadsheets were not available.

The economic analysis of the expanded 'Salt to Success' (the USE area) looked at 6 main components: Fodder shrubs; agroforestry; revegetation; remnant vegetation; clay spreading; and perennial pasture. It concluded that all components of the project returned positive NPVs, meaning that the overall benefits of undertaking the project outweighed the total costs.

However, there were some issues with the economic analyses that were completed. These include:

- *Inappropriate use of environmental values*: Transfer of environmental values (such as heritage value and willingness to pay for soil erosion) from other studies did not satisfy the guidelines of benefits transfer.
- *Overstatement of benefits from reduced soil erosion*: The assumptions adopted in the BCA most likely overestimated the benefits to be gained from reduced soil erosion.

The above factors and other assumptions have most likely resulted in the NPV of the project being overstated. At this stage, it is not possible to suggest by how much the values were overstated. The overstatement of values would have affected the cost-sharing arrangements that were proposed in the AACM study.

# 4. DEVELOPMENT OF THE HISTORICAL COST SHARING BASIS

There are a number of cost-sharing frameworks for the various components of the USEDSFMP. In the original plan, it was only the drainage and some wetlands component that had some element of cost sharing. Other wetland management, revegetation and catchment agronomy was to rely solely on farmer funding. The advent of the NHT, however, allowed for landholders to now seek funds for these components. This chapter explores cost-share frameworks of the drainage scheme, the original USEDSFMP and the USE NHT projects.

## 4.1 Original Basis of Cost Share Recommendations for the Drainage Scheme

Prior to the release of the Draft EIS in 1993, a series of public seminars and workshops were conducted in the region. Newsletters were produced periodically to update the community on the progress of the USE Plan.

***Drainage Scheme Options***

The original EIS released in 1993 recommended a drainage scheme worth $36 million. The specific sub-schemes were:

- S7 – major ground water, discharge to Ocean via Blackford Drain, cost $5m
- C12 – major ground water, discharge to Ocean via Henry Creek, cost $17.8m
- N8 – major surface with some groundwater, discharge to Coorong via Currawong, cost $10.6m.

Administration and design costs included $2.6 million, and monitoring and maintenance costs were included in the above estimates. Sub-schemes were chosen on the basis of economic, environmental and social factors.

The draft EIS went out for public consultation in September 1993 for eight weeks. 188 public submissions and numerous Government comments were received. Two public meetings were held, one in Adelaide and one in Keith. There were a number of complaints from landholders that the above sub-schemes (which incorporated deep drains) were not necessary and shallower drains would suffice. A review was commissioned by Coffey MPW on the advantages and disadvantages of groundwater and major surface water drains. This review provided a number of reasons why predominantly major surface water drainage was preferred to extensive groundwater drainage (DHUD 1995). The consequence was that three less costly alternatives were chosen. The sub-schemes that closest fit (as defined in the EIS) those chosen were:

- S5 – major surface water, discharge to Ocean via Blackford Drain, cost $3.5m
- C5 – major surface water, discharge to Coorong via Kercoonda, cost $7.1m
- N4 - major surface water, discharge to Coorong via Salt Creek, cost $9.9m.

It is worth noting that the current scheme (as at 2002), is different to the sub-schemes above.

The breakdown of project costs, as proposed originally, is depicted in Table 4.1.

The total drainage project was to be completed by 2002. There was never a complete costing undertaken for the revised scheme, and as a result not all project management costs and maintenance costs were accounted for.

The maintenance costs associated with this drainage scheme have recently been estimated at $550,000 per annum.

The detail of the proposed options and their costing were not as clearly thought through as the original costing. Section 5.1 further discusses some of the implications.

**Table 4.1**
**Costs of USEDSFMP**

| Project Component | Estimated Cost ($ million) |
|---|---|
| Stage 1 drainage works (trial in southern catchment) | 2 |
| Monitoring of drainage | 0.3 |
| Stage 2 drainage works (northern catchment) | 9.9 |
| Amelioration works in Messent Conservation park | 1 |
| Stage 3 drainage works (central and southern catchments) | 9.1 |
| Environmental assessment and monitoring | 0.8 |
| Project management | 0.9 |
| **Total** | **24** |

Source: SEWCDB (1996)

***Cost Share Basis***

The original cost share was based on the recommendation from Walsh *et al* (1993), see Section 3.3. The cost share was completed prior to the release of the draft EIS, and hence was based on the original scheme of $36 million.

Walsh *et al* recommended that costs (capital and maintenance) be shared 37.5 per cent by State Government, 37.5 per cent by Commonwealth Government and 25 per cent by the local community. In 1995 the State Government agreed to fund its share of the capital costs of the drainage component with the provision that the local community contributed 25% of the drainage scheme (which was now at a cost of $24 million). Public meetings were held at Keith and Adelaide. Originally, the only area that was proposed to share the drainage cost was the study area defined by USEDSFMP. A year later the Commonwealth Government agreed to match State funding as long as a number of environmental conditions were met.

As the $24 million drainage cost estimate only represented the capital cost (with the State picking up some of the maintenance costs), then from the beginning the local community's cost share was less than 25% per cent.[11]

### 4.1.1 Rural and Urban Local Community Contribution to the Drainage Scheme

The Combined Councils Salinity Committee working group was formed to help develop mechanisms for collecting the local community's contribution. It was suggested that rural landholders pay 90 per cent of the contribution, with 10 per cent paid by urban dwellers (through councils). The reluctance of some councils to contribute meant that the urban community funded only 9 per cent of the capital costs. Therefore, landholders ended up contributing to 23% of the drainage capital costs.

To collect funds from landholders a complex levy system was developed with differential rates according to different zones within the catchment.

***Exemptions from Drainage Levy***

It was decided that landholders should not pay a levy on land that was under Heritage Agreements, or native vegetation in a single block greater than 40 ha. Other land that was excluded from the levy includes crown land and wetland areas (greater than 10ha) with a management plan endorsed by the SEWCDB.

***Development of the Rural Levy***

The rural levy contribution has gone through many different stages. The main phases are described below.

1. *Levy based on Salinity Rating:* For the remaining rural land that was not exempt, the original idea was to have a levy based on the salinity rating of the land. It was suggested that land classified as the most saline should pay more than land that was not yet saline (implementing the polluter pays principle). The lack of specific geophysical data on salinity precluded the use of this system.

[11] The lack of information about exact maintenance costs precludes any exact analysis of cost shares.

2. *Levy based on Two Zones:* The next best option was to divide the USEDSFMP area into 2 zones (Zones A and B). It was agreed that Zone A would receive the most benefit from the scheme hence should be expected to pay more (70 per cent of the costs). The scheme was passed to the drainage board for further development. It was at this stage that the area of the drainage levy began to differ from the original scheme.

3. *Levy based on Three Zones:* Not all areas in Zone B were thought to be equal in terms of contributing to the dryland salinity problem. As a result Zone B was broken into two zones. Zone boundaries were based on a variety of factors, including creek catchments, land characteristics, situation of urban communities and native vegetation.

   Zone A represented the direct benefited area and divides the lower lying areas from the higher range country. Zone B represented higher value land east of the direct benefited area. It defines creek catchments (these catchments shed water in Zone A and therefore contribute to the salinity and flooding problem). Zone C represented the lower value sandy country without significant surface run-off. The approximate proposed share of costs was:

   - Zone A = 77 per cent
   - Zone B = 18 per cent
   - Zone C = 4 per cent

4. *Final Levy based on Four Zones*: Following further consultation and visits with landholders, the levy was broken down into four zones. There were four main conditions that were used to estimate the determination of the final levies:

   (f) Direct benefit from scheme
   (g) Indirect benefit from scheme
   (h) Contribution to the problem via ground water
   (i) Contribution to the problem via surface water
   (j) Social and Moral obligation to overcome a regional problem

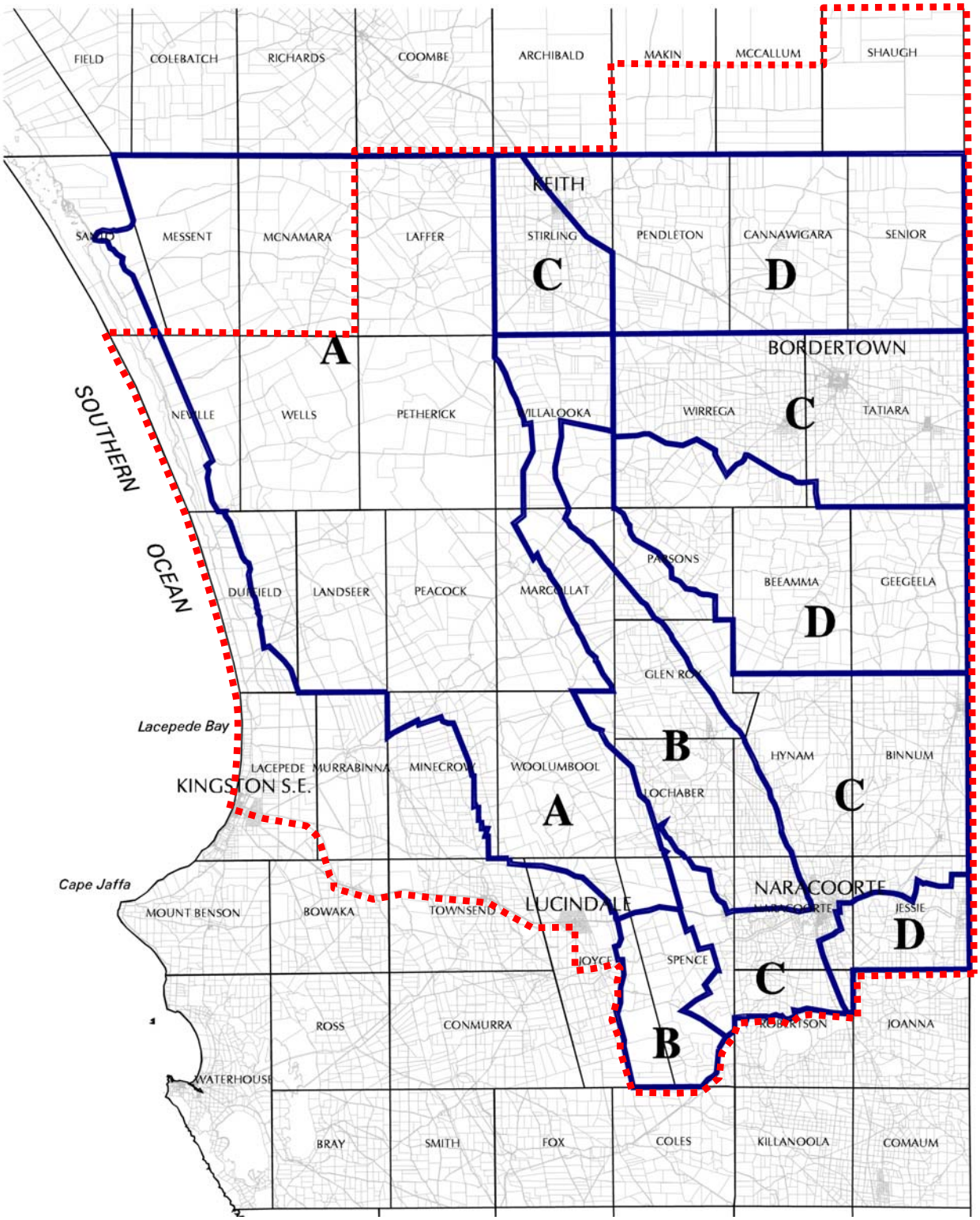
Boundaries of the four zones are depicted in the figure on the following page.

Rates were first advertised for the four zones in September 1995. Final amounts increased approximately 7 per cent due to the finalisation of property and exclusion specifications. The final levies and their contribution to total costs (as a percentage of actual rates only) were:

- Zone A = $2.24/ha/yr (57 per cent)
- Zone B = $1.07/ha/yr (27 per cent)
- Zone C = $0.54/ha/yr (14 per cent)
- Zone D = $0.11/ha/yr (3 per cent)

It was recognised that there were some anomalies within these zones, especially in fringe areas, however it was thought that overall the design of the scheme was fair. The transaction costs associated with more detail were considered to be too high as compared to the benefits to be derived from such a process.

# FUNDING AREA AND DRAINAGE LEVY ZONE BOUNDARIES
## UPPER SOUTH EAST DRYLAND SALINITY & FLOOD MANAGEMENT PLAN




**A** Drainage levy zone

Hundreds

Drainage levy zone boundary

Funding program boundary

Map production by PIRSA Geographic Information Services

Many landholders in zones B to D were upset about paying the drainage levy. They felt that they had not been part of the consultation process as the Riddoch road bound the original study area. In many instances, the first that they knew of their expected contribution was when the drainage levy bill arrived in the post. Despite this, 98 per cent of the landholder's contribution has been paid.

The number of landholders and revenue paid per zone is shown in Table 4.1.

**Table 4.1**
**Landholdings and Revenue from the USE Levy**

| Zone | Landholdings (No.) | Area (ha) | Rate ($/ha/yr) | Revenue ($) | % of Revenue |
|---|---|---|---|---|---|
| A | 230 | 295,666 | 2.24 | 662,292 | 70 |
| B | 312 | 114,722 | 1.07 | 122,753 | 13 |
| C | 953 | 246,178 | 0.54 | 132,936 | 14 |
| D | 469 | 221,139 | 0.11 | 24,325 | 3 |
| **Total** | **1964** | **877,705** | | **942,306** | **100** |

Source: Funding File (Roger Ebsary)

## 4.2 Original Cost Share Recommendation for the Upper South East Dryland Salinity and Flood Management Plan

Table 4.2 provides a broad indication of the cost shares expected from landholders at the beginning of the USEDSFMP. These costing are indicative only, and they represent a total maximum amount as it was expected that landholders could seek some of their costs from elsewhere (such as Rural Adjustment Funds). The extent and availability of such funds is unknown, however, it can be stated that landholders' share of total costs in the *original* scheme was at the most 47 per cent, and could have been a lot less if outside funds were sought.

**Table 4.2**
**Original and Current Calculation of Landholder Contribution to USEDSFMP**

| | Original Costs $ million | Original Landholder Contribution % | Original Predicted Source of Funds | Current Landholder Contribution % |
|---|---|---|---|---|
| **Capital Costs** | | | | |
| ***Drainage*** | 36 | 25% | | 23% |
| On farm measures | | | | |
| Salt tolerant pasture | 18 | 100% | (Some Rural Adjustment funds) | 91% |
| Lucerne Reestablishment | 7 | 100% | (Some Rural Adjustment funds) | 91%[2] |
| Farm Plans | 1 | 100% | (Some Rural Adjustment funds) | 2% |
| ***Environmental Management*** | | | | |
| Wetlands Waterlink | n/a | partly | | 50% |
| Revegetation, tree planting | 13 | 100% | (Some Rural Adjustment funds) | 74% |
| **TOTAL CAPITAL COSTS** | **75** | **64%** | | **54%** |
| **Recurrent Costs** | | | | |
| ***Drainage*** | | | | |
| Maintenance | 0.35 | Partly[1] (assume 25%) | Post scheme funding, assume 25% of maintenance was accounted for originally | 0% |
| Monitoring | 0.2 | 0% | State and local gov | 0% |
| On Farm measures | 0.2 | 100% | State and local gov, Landcare | 91% |
| Research | 0.25 | 0% | CSIRO | 0% |
| ***Environmental Management*** | | | | |
| Wetlands Waterlink | 0.25 | 0% | Gov, SEWCDB (from some scheme funding) | 50% |
| Revegetation strategy | 0.1 | 0% | Gov, SEWCDB (from some scheme funding) | 74% |
| ***Management Plan Implementation*** | 0.25 | 0% | Government | 0% |
| **TOTAL RECURRENT COSTS** | **1.5** | **17.6%** | | **25%** |
| **TOTAL COSTS and PRIVATE COST SHARING OVER THIRTY YEAR PERIOD** | **120.4** | **46.5%** | | **43%** |

Notes (1) This assumes that landholders would be asked to contribute to post scheme maintenance of the drainage scheme (at original rate of 25%) and that they bore the total costs of on-farm measures (which was unlikely). This was in the USEDSFMP, but it is unknown if this would have been implemented.
(2) It has been suggested that landholders have contributed more than 91% of funds to lucerne establishment. However, even if landholder contribution to salt tolerant pasture and lucerne establishment was 100%, the current contribution would be 45.6%.

Sources: Upper South East Dryland Salinity and Flood Management Plan Steering Committee (1993), Trustcott Research spreadsheets (2002) and Rural Solutions SA analysis

Using estimates of landholder pasture, wetland and revegetation activity, and the percentage of Government funds paid for those activities,[12] it is likely that the USE local community has paid around 43 per cent of the total costs of the scheme so far (column four in Table 4.2 above). Therefore, the original cost share framework, as proposed by USEDSFMP (1993), is currently around the mark.[13]

Of course, the advent of NHT in 1998, Bushcare and Landcare has meant that USE farmers can now seek funds for activities that have public benefits. At this time, the availability of Commonwealth funds allowed priority regions in Australia to be developed and certain environmental actions targeted. It has been stated by some that if the drainage system had not been undertaken, funds would not have been available for environmental activities. This scenario is not true, the USE would have still have received an allocation of funds for environmental activities, even if the drainage system was not in place. However, it is possible that because the USEDSFMP was already established, the USE received funds as a priority region faster than it would have otherwise.

The allocation of funds to landholders subsidises some of their environmental activities. The South East Natural Resource Consultative Committee (SENRCC) decides what type of actions is a priority for the region. The cost of such activities is subsidised according to an evaluation of the benefits and costs that accrue to private landholders (discussed further below). Some of the schemes that are now available to farmers include the Upper South East Revegetation and Salinity Control Project (formerly Salt to Success) and Wetlands Waterlink.

Categories for Salt to Success are: windbreaks, native blocks, native corridors, protecting remnants and revegetating to enhance remnants (either high quality conservation assets or scattered trees), fencing creeklines, creekline revegetation, fodder shrubs (tagasaste and saltbush) and farm forestry. Categories for USE Revegetation and Salinity Control project are the same as Salt to Success but in addition include clay spreading, lucerne pasture and salt tolerant pastures (puccinellia or tall wheat grass). Categories for Wetlands Waterlink are wetland protection and rehabilitation of (a) high quality conservation (b) degraded wetlands (c) stock management only and may include earthworks and weed control.

### *Current Cost Sharing Process*

AACM (1998) developed the initial BCA and cost-sharing framework for the Pilot Natural Resource Management Project in the USE. This economic analysis was reviewed in Section 3.3.

The cost shares are depicted in Table 4.3.

**Table 4.3**
**Expanded Salt to Success Cost Sharing Framework for its 6 Main Components**

| Activity | Stakeholder Contribution to Total Costs (%) | | |
|---|---|---|---|
| | ***On-farm*** | ***Local*** | ***Wider*** |
| Fodder Shrubs | 94.4 | 4.9 | 0.7 |
| Agroforestry | 82.2 | 15.6 | 2.3 |
| Native Revegetation | 50.4 | 29.3 | 20.3 |
| Remnant Vegetation | 4.8 | 15.8 | 79.4 |
| Clay Spreading | 89.8 | 8 | 2.2 |
| Perennial Pasture | 87.9 | 10.7 | 1.4 |
| **Total Project** | 85.1 | 12.6 | 2.3 |

Source: AACM (1998)

The cost shares estimated in the BCAs provide the start for negotiation with landholders. The actual rates that were offered to landholders are detailed in Table 4.4 below. There was no BCA completed for Wetlands Waterlink but incentives were estimated on the basis of how much was needed to get landholder participation. Table 4.4 illustrates how the incentive rates offered tend to be higher than the theoretical BCA cost shares.

[12] These figures are sourced from the survey undertaken in conjunction with the project. Results are discussed in Section 6 further.
[13] Given the unavailability of current scheme costs, this figure was calculated using the original budget shown in the table above.

**Table 4.4**
**Expanded Salt to Success Cost Sharing Framework for its 6 Main Components**

| Activity | Unit | Incentives (rates from USE Revegetation and Salinity Control and Wetlands Waterlink programs) | Costs of Activities[1] | Incentives as a percentage of Costs |
|---|---|---|---|---|
| | | $ | $ | % |
| **Native Revegetation** | | | | |
| Windbreaks | ha | 350 | 711 | 44 |
| Fencing windbreaks | km | 1,000-1,200 | 2,700-3,500 | 31-41 |
| Block revegetation | ha | 450 | 711 | 63 |
| Wildlife corridors and creekline revegetation | ha | 450 | 711 | 63 |
| Fencing for blocks, corridors and creeklines | km | 1200 | 2,700-3,500 | 31-41 |
| **Remnant Vegetation Protection & Rehabilitation** | | | | |
| Revegetation to extend or enhance | ha | 450 | 711 | 63 |
| Fencing scattered trees | km | 1,200 | 2,700-3,500 | 31-41 |
| Fencing high quality remnant vegetation | km | 2,000 | 2,700-3,500 | 31-41 |
| Fencing high quality veg with heritage agreement | | full cost (materials and labour) | 2,700-3,500 | 100 |
| **Wetland Protection and Rehabilitation** | | | | |
| Revegetation around wetlands | Ha | 450 | 711 | 63 |
| Weed/pest control | | cost of materials | | 50-100 |
| Earthworks | | cost as per receipts | | 50-100 |
| Fencing for stock management | km | 450 | 2,700-3,500 | 13-17 |
| Fencing of degraded wetlands | km | cost of materials (up to 2,000) | 2,700-3,500 | 74 |
| Fencing high quality wetlands | km | full cost (up to 3,500) | 2,700-3,500 | 100 |
| **Agroforestry** | | | | |
| Establishment of seedlings | | 50% of seedling costs | | Less than 50 |
| New fencing | km | 450 | 2,700-3,500 | 13-17 |
| **Fodder shrubs** | | | | |
| Tagasaste/saltbush planting | ha | 50 | 300 | 17 |
| New fencing | km | 450 | 2,700-3,500 | 13-17 |
| **Clay Spreading and Perennial Pasture** | | | | |
| Clay spreading | ha | 45 | 200 | 23 |
| Salt tolerant pasture | ha | 40 | 150 | 27 |

Notes: (1) Some costs are those estimated by AACM in 1998. These have been updated where possible. Recent costs may have increased further.
Sources: SENRCC (2001), Zita Stokes and AACM (1998).

# 5. FUTURE THEORETICAL COST SHARES

This section looks at revised cost shares for the drainage scheme and the overall USEDSFMP.

## 5.1 Changes to the Drainage Scheme Cost Share Basis

The reason that cost shares are being revisited is that the capital costing of the drainage scheme has significantly increased from its original budget. As discussed in Section 4.1, a thorough costing of the proposed drainage scheme was never undertaken but was estimated at $24 million. This costing was never fixed from the beginning, because of the revisions that were necessary to obtain Commonwealth funding. At this stage, the proposed capital cost of the drainage scheme has increased significantly (though it is no longer directly reasonable to compare it to the original scheme that was planned). It is currently estimated that at least $16 million more is needed. Some of the reasons for the increase include:

- The length of drainage works required has increased by over 30%, with an increased volume of excavation of 15% (from 480 to 630 km and 6.6 to 7.6 million cubic metres excavation);
- The cost of civil engineering projects increased around 18% (in nominal prices) from 1992 to 2000;
- Costs of excavating certain areas has been more than double the initial estimates;
- Fencing and structures have cost up to 40% (real and nominal price increases) more than initial estimates;
- Commonwealth environmental considerations have added over $2 m to the drainage scheme; and
- Delays caused by some landholder actions have added to costs.

Figure 5.1 illustrates the current and proposed future alignment of the drainage scheme.

These increases in costs have led to the need for a revision of original cost shares and the development of future cost shares. The discussion in the previous chapter has shown, for a variety of reasons, that the benefits of the original agricultural BCA were most likely overestimated. Barber's analysis found positive NPVs for the drainage options. Agricultural benefits were the only values included. These original results suggested that all things held equal, the private agricultural benefits from the development of the proposed drainage system (at the initial estimate of $36 million) clearly outweighed all its associated costs. Therefore, landholders in the area that directly benefited from the drainage scheme, could receive a return in agricultural production value that would outweigh their contribution to the total costs of the drainage scheme. Government's role in such a scheme could have been limited to planning, organisation and construction of the preferred option, but not financing.

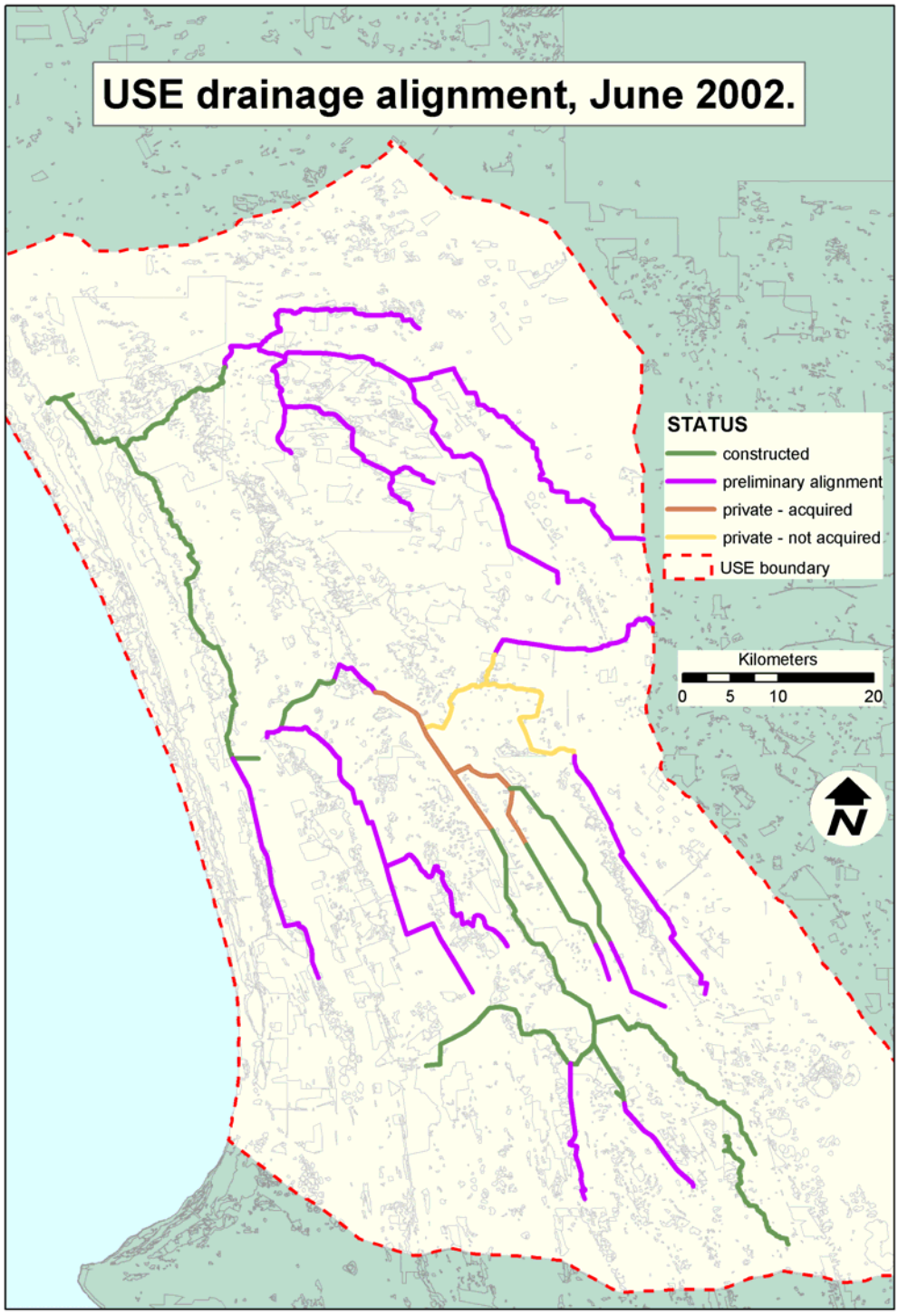
Of course, this ignores the issue of landholders' ability to pay for the initial costs of the scheme, especially if they do not have the chance to recoup some of the benefits of production value for a number of years. Other landholders may also fail to recognise the need for further investment such as on-farm drains and pasture that would help them capture the potential increase in production value.

The remainder of Section 5.1 discusses drainage cost share implications under two principles:

a) Beneficiary Pays; and

b) Polluter Pays.

**Figure 5.1**


USE drainage alignment, June 2002.
STATUS
constructed
preliminary alignment
private - acquired
private - not acquired
USE boundary
Kilometers
0 5 10 20
N

### 5.1.1 Drainage Cost Share Implications under a Beneficiary Pays Principle

This study has revised the original BCA model. Costs and benefits were updated and changed. Without environmental and social values, the result was that the NPV became negative and the BCR fell below one. This meant that the private agricultural returns received by landholders in the direct vicinity of the drains now no longer outweighed the total costs of the drainage options (which was estimated at a cost of $36 million). Therefore, for the drainage scheme to be socially beneficial, it had to have positive environmental and tourism values associated with it.

Table 5.1 illustrates the NPV of the revised drainage scheme and the split of beneficiaries under a beneficiary pays principle (note: Table 3.2 provides more detail on benefits and costs).

**Table 5.1**
**Drainage Cost Sharing Framework under a Beneficiary Pays Principle**

| Beneficiary | Present Value of Benefits | % Share |
|---|---|---|
| On-farm (Direct farm beneficiaries) | 319,347 | 88 |
| Local (USE urban community) | 2,561 | 1 |
| State | 17,051 | 5 |
| Wider | 24,070 | 7 |
| **TOTAL** | **363,029** | 100 |

Note: Percentage shares do not add to totals due to rounding.
Sources: Rural Solutions SA (2002) and Barber (1993)

The above table illustrates that, on a beneficiary pays basis, landholders should pay a large proportion (88 per cent) of total project costs. Walsh *et al's* (1993) economic overview analysis incorrectly prescribed many benefits to the drainage scheme, as according to State and Commonwealth Treasury guidelines. Our analysis removed these benefits and added new knowledge about environmental values. This resulted in the landholder contribution increasing from the original 29 per cent share of total benefits. Even under an extreme testing of environmental benefits (allowing for all Australians to place value on USE wetlands, pasture and revegetation), private benefits represented 60 per cent of total benefits of the scheme.

New estimates of benefits imply that direct on-farm beneficiaries should theoretically contribute, under a beneficiary pays principle, to total cost share of 88 per cent. The extension of the drainage scheme means that new boundaries of direct on-farm beneficiaries needs to be established, as some landholders in Zone B will now directly benefit. Local urban communities in the USE should contribute at least 1 per cent towards total costs. There is no justification for landholders in Zones C to D and some in Zone B, to pay anything towards total costs. State and Commonwealth bodies should theoretically provide, *at the very least*, around 10 per cent of the total costs of the drainage scheme.

### 5.1.2 Drainage Cost Share Implications under a Polluter Pays Principle

An implication of the polluter pays principle is that costs are attributed primarily to parties who caused the salinisation in the USE. Costs are therefore not distributed as widely as it would have been under a beneficiary pays principle. Commonwealth funding is restricted to the share of outside contribution towards the problem.

In order to implement the polluter pays principle effectively, some understanding is needed of the reasons for the environmental problem in the first place. The argument put forward with the introduction of the first drainage levy suggested that Zones B to D contributed to the groundwater salinity and surface water problem in Zone A, therefore should help pay to fix it up.

Although it is hard to estimate any contribution to the problem from different areas, implicitly this is what the development of the drainage levy did when it calculated contributions from various zones.

The groundwater discharge leading to salinity can be conceptualised as local flow cells and regional groundwater flow cells. The local recharge generally dominates regional flow effects although this relativity will vary over the region. Therefore, in determining various recharge contributors to discharge that would have occurred prior

to drainage, it should be noted that at least 90 per cent of the discharge has probably resulted from recharge in the local area (past and current landholders). The contributors to regional recharge are more difficult to ascertain, as potentially it includes everybody in the region. Contributors to changes in surface water potentially include the whole upgradient surface water catchment and would be difficult to define more specifically, though not all zones contribute to surface water problems in Zone A (Glen Walker, CSIRO and Rural Solutions SA, personal communication 13th August 2002). Walsh *et al* (1993) reported that surface water contributes to 30% of the problem, with another 30% of this water coming from Victoria. Zone C is said to be the outside zone that contributes to surface water problems in Zone A, as it predominantly represents creek catchments. Zone A contributes to surface water runoff as well. Zones B and D generally can't be considered as contributing towards surface water problems (though there are exceptions). Therefore, the implementation of the polluters pay principle would rely on the following (albeit hazy) information for the original boundaries of the drainage scheme:

- Surface water contributes towards 30 per cent of the total problem, with groundwater contributing 70 per cent;
- Zone A has contributed at least 90 per cent towards its own groundwater salinity problems, Zones B, C and D and parts of Victoria have contributed towards a maximum 10 per cent of Zone A's groundwater problems (and each zone contribution is assumed to be equal);
- Victoria has contributed 30% of the surface water problem, Zones A and C are the next largest contributors (assume 25 per cent each), followed by Zone B (assume 15 per cent) and Zone D (assume 5 per cent).

The revised boundaries of the current proposed drainage scheme means that assumptions for Zone B would have to be altered. It is not possible to incorporate this information at this stage.

The lack of concrete information about the contribution of various landholders to the salinisation problem in Zone A means that a polluters pays principle could not be applied with any level of certainty. In addition, salinisation problems can also be attributed to past Government policy. For example, successive South Australian governments encouraged land clearance and the establishment of crops and pasture. Until 1983, perpetual leases issued by the Crown had a condition requiring clearance (Harris 1996). It is questionable whether the polluter pays principle should have ever been used to determine drainage levies.

Nevertheless, if the polluter pays principle were to be used, it is our estimate that, Zones B, C, D should pay no more than 19% of the total costs of the project. Commonwealth funding should be sought for around 11 per cent of the total costs. Zone A should fund 71 per cent of the total costs. These figures assume that the areas relate exactly to the original planned scheme. The increases in the length and protection of the drainage scheme could mean that parts of Zone B become part of the rating category Zone A, hence falls into a different rating category. Table 5.2 depicts the cost shares.

**Table 5.2**
**Drainage Cost Sharing Framework under a Polluter Pays Principle**

| Area | Contribution towards Problem % |
|---|---|
| Zone A | 71 |
| Victoria/outside funding | 11 |
| Zone C | 9 |
| Zone B[1] | 6 |
| Zone D | 3 |
| **TOTAL** | **100** |

Note: Totals do not add due to rounding. More contribution could have been attributed to Zone A.
(1) These figures are based on the boundaries of the original drainage scheme. If the new boundaries extend into Zone B, then this calculation needs to be redone when there is further certainty.
Source: Rural Solution SA analysis

## 5.2 Drainage Cost Share Implications under Polluter and Beneficiary Pay Principles

The SEWCDB final drainage levy across the four rural zones and council area utilised the beneficiary and polluter pays principles in allocating responsibility for surface water contribution and groundwater recharge. The theoretical justification of this is questionable. If a sole principle was used to estimate contribution to cost shares, then given the current state of scientific uncertainty and past Government policy, the most appropriate principle to implement is beneficiary pays. If the two principles were to be used, a political/social decision would have to be made as to how much weighting to give each principle. Therefore, the two principles have not been used in this report to calculate a cost-sharing framework as there is no theoretical basis on how to do this weighting.

### 5.3 Consideration of Landholder's Financial Rates of Return

Further analysis on the cost share required of landholders was considered. Another way of looking at the beneficiary pays principle is to exclude the environmental benefits and see how much the private agricultural benefits represented of the entire scheme costs. Excluding environmental benefits, at a discount rate of 7 per cent, private landholder benefits represent 83 per cent of the *total costs* of the scheme (a BCR of 0.83). It is commonly thought that farmers require a rate of return of 2 before they undertake any on-farm changes. Using this assumption, farmers would not enter the drainage scheme unless they were only sharing 41.5 per cent of the total costs.[14]

Taking into account the above factors, the broad cost-sharing framework may take the following form:

- On-farm (Direct farm beneficiaries) — 42 to 88 per cent;
- Local (USE urban community) — 1 per cent;
- State — 5 to 29 per cent; and
- Wider — 6 to 29 per cent

During the negotiation process, it should be recognised that landholders might not be prepared to support a large percentage share of total costs.

### 5.4 Issues for Government to Consider when Negotiating Final Drainage Cost Shares

Government needs to consider the following issues when negotiating cost shares:

- The original landholder cost share framework was set at 25 per cent of total costs;
- Most communication with landholders by Government has emphasised the scheme costing $24m, with a $6m contribution by landholders. Less emphasis has been given to the 25 per cent cost share of the total project. Consequently there is disagreement between landholders and the Government as to whether landholders signed up for a 25 per cent share of the total costs of the drainage scheme, or a $6m total contribution;
- Many landholders in Zone A have paid a drainage levy for six years without receiving any benefits;
- Under a beneficiary pays principle, landholders in Zones C to D (and some in Zone B) should not pay any more for the drainage scheme;
- Stakeholder consultation has been poor, and many landholders feel that this scheme has been imposed upon them without their desire;
- Some landholders (predominantly in Zones B to D) feel that the drainage scheme has been unnecessary and more effort should have gone into native revegetation and perennial pastures;
- Some landholders say that they are losing fresh water on their properties as a result of the scheme; and

[14] This is estimated by deriving the private agricultural return from a BCR of 2. This must be treated as a very broad estimate. As stated previously, economic analyses are very different from financial analyses. Financial analyses would include taxation benefits, which would increase the private returns and make a BCR of 2 much easier to achieve than an economic return of 2. In this example, a cost share of 41.5% assumes that environmental benefits and private financial returns offset each other.

- Ability of landholders to pay.

## 5.5 USEDSFMP Cost Share Implications

Section 4.2 illustrated that the original landholder cost share contribution to the USEDSFMP was capped at 47 per cent. It also suggested that it is likely that landholders have currently paid around 43 per cent of the total costs of the scheme so far. Therefore, in terms of the original cost share framework, landholders' contribution is currently around the mark.

However, estimates have to be made on what landholders *should* be paying for the USEDSFMP, taking into consideration conclusions drawn in this report. These conclusions include the incentive rates landholders' are paid to undertake environmental activity (from Table 4.4). Allowing for changes in landholder contributions to drainage, perennial pasture, farm plans, revegetation and wetlands, Table 5.4 illustrates the revised landholder cost share contribution (over a thirty year period). The overall landholder contribution now ranges from 44 to 65 per cent, under a minimum and maximum landholder contribution scenario. Therefore, landholders are currently contributing the very minimum theoretical amount towards the USEDSFMP.

**Table 5.4**
**Revised Calculation of Landholder Contribution to USEDSFMP**

| | Landholder Contribution | | |
|---|---|---|---|
| | **Min** | **Max** | **Other Sources** |
| | **Capital Costs** | | |
| ***Drainage*** | 42% | 88% | |
| On farm measures | | | |
| Salt tolerant pasture | 73% | 73% | NHT funds |
| Lucerne Re-establishment | 73% | 73% | NHT funds |
| Farm Plans | 2% | 2% | PMP/Farmbis |
| ***Environmental Management*** | | | |
| Wetlands Waterlink[1] | 33% | 33% | NHT funds |
| Revegetation, tree planting | 37% | 37% | NHT funds |
| **TOTAL CAPITAL COSTS** | **51%** | **73%** | |
| | **Recurrent Costs** | | |
| ***Drainage*** | | | |
| Maintenance | 42% | 88% | Scheme costs |
| Monitoring | 0% | 0% | State, Cwlth funding |
| On Farm measures | 73% | 73% | NHT funds |
| Research | 0% | 0% | Cwlth funding |
| ***Environmental Management*** | | | |
| Wetlands Waterlink | 33% | 33% | NHT funds |
| Revegetation strategy | 37% | 37% | NHT funds |
| ***Management Plan Implementation*** | 40% | 88% | Scheme costs |
| **TOTAL RECURRENT COSTS** | **34%** | **52%** | |
| **TOTAL COSTS and PRIVATE COST SHARING OVER THIRTY YEAR PERIOD** | **44%** | **65%** | |

Note: (1) Wetlands incentives were based on an average of total wetland activity under Wetlands Waterlink.
Sources: USEDSFMP (1993), AACM (1998), SENRCC (2002), Rural Solutions SA (2002)

The above table reflects a conservative estimate of landholder cost-shares. For example, the incentives paid to farmers for environmental activities do not directly represent the share of public benefits and environmental activity is usually not funded on an ongoing basis. Therefore, it could be argued that the landholder contribution to revegetation, wetlands and on-farm ongoing costs should be 100 per cent.

# 6. ENVIRONMENTAL OUTCOMES OF THE DRAINAGE SCHEME AND VALUATION METHODLOGY

One of the objectives of the South Eastern Water Conservation and Drainage Act 1992, in addition to preventing flooding and achieving an improvement in the quality and productiveness of rural land, was to help:

*'Develop or enhance wetlands and the natural environment in general'.*

The extent to which the above objective has been achieved is questionable and unknown at this stage. SACES (1998) attempted to measure such an objective and suggested that data on the number and area of wetlands, biological indicators of resident species, and watering regimes of the wetlands would be useful.

This section looks at the impact of the drainage scheme on the environment and the possible valuation of those impacts. Again, the revegetation study by Rural Solutions SA (2002) provides more specific detail.

## 6.1 Wetlands

The USEDSFMP aimed to improve management and reinstatement of wetlands to provide habitat and drought refuge for waterbirds. It was estimated that by 1981 the area of wetlands had reduced to 7 per cent of their original area due to extensive drainage and agricultural development. The inclusion of coordinated management of the wetlands through the creation of the Wetlands Waterlink is a conservation measure aimed at restoring some of the traditional wetlands in the USE. This also recognises the important role that wetlands play in maintaining and regulating an environmental balance. The major aims of the Waterlink include:

- Re-establishment of natural hydrological cycles as far as possible, incorporating seasonal and annual variations of flow;
- Management of individual wetlands or complexes to take account of habitat needs, particularly water level fluctuations, and wetting and drying cycles appropriate to the vegetation;
- The retention of water levels at appropriate times to assist waterbird breeding;
- The retention and rehabilitation of fringing native vegetation in appropriate areas;
- Seasonal ponding in wetlands to the height of natural sill levels;
- Where drains are established using wetland watercourses, weirs with removable boards should be placed in the drains to enable ponding to natural sill heights and to allow maximum flexibility of water management for both environmental requirements and flow control;
- Maximum use of good quality surface water for wetland habitat benefit; and
- Minimum flood and salinisation impacts (USEDSFMP 1994).

### 6.1.1 Benefits of Wetlands

Wetlands generate a lot of private and social benefits. Wetlands in the USE provide the following benefits outlined in Table 6.1.

**Table 6.1**
**Benefits of USE Wetlands**

| Pure Private Benefits | Private and Social Benefits |
|---|---|
| Grazing production | Flora and fauna values |
| Timber and firewood collection | Beautify the farm and regional landscape |
| Water supply | Attracts birds that helps reduce pests |
| Drainage storage/basin | Existence Values |
| Tourism | Flood mitigation |
| Recreation | Water quality benefits |
| Hunting | Natural Fire break or hazard (wetland type dependent) |
| | Hunting and to a small extent fishing |
| | Public tourism and recreation |
| | Groundwater recharge |
| | Erosion control |
| | Ecosystem values (such as carbon sequestration) |

Source: Whitten and Bennett (2001a)

In 1998 Whitten and Bennett surveyed farmers perceptions of wetlands and wetland management in the USE. The proportion of respondents undertaking activities in their wetlands can be summarised as:

- 86 per cent of respondents regularly graze their wetlands;
- 38 per cent of respondents extract timber for use as firewood or farm timber;
- 62 per cent of respondents alter the hydrological regime either via water extraction or drainage into their wetland; and
- 96 per cent of respondents indicate undertaking some form of recreational use such as hunting or pleasure.

However, not all benefits derived from wetlands are positive. They also contribute to disease, weeds, feral and pest animals, reduced productivity, fire danger, foul odours and access difficulty (Whitten and Bennett 2001a). Overall, the benefits of wetlands clearly outweigh their costs, but this is not guaranteed for new wetland scheme developments. As the majority of wetland benefits are public, and the majority of wetland costs are private, then there is often an imbalance between the socially desired area of wetlands and that, which is privately provided.

### 6.1.2 USE Wetland Areas and Consequences of the Drainage System

Table 6.2 illustrates the estimated wetlands in the USE. Table 6.3 illustrates the waterbodies coverage in the USE. Waterbodies coverage incorporates other areas apart from wetlands. Figures are based on Planning SA and DEHAA databases.

Whitten S. and Bennett J. (1998a) provide a comprehensive overview of wetlands in the USE. Because of different descriptions they have different figures for wetlands. For further details see this report.

**Table 6.2**
**USE Wetland Areas**

| DESCRIPTION | NAME | HECTARES |
|---|---|---|
| Biological Wetlands | Wetlands other than Coorong | 28,650 |
| Biological Wetlands | Coorong | 8,798 |

Note: This layer represents biological wetlands only.
Source: Lee Heard (CSIRO)

**Table 6.3**
**USE Waterbodies[1]**

| AS2482 | DESCRIPTION | HECTARES |
|---|---|---|
| 44010 | Perennial Area Feature: Lake – Lagoon –Backwater - Oasis etc | 661 |
| 44020 | Intermittent Area Feature: Lake – Lagoon –Backwater - Oasis etc | 7,753 |
| 44030 | Mainly Dry Area Feature: Lake – Lagoon –Backwater - Oasis etc | 413 |
| 44070 | Flood Plain Subject to Inundation – River Flat – Mud or Sand Flat - Wash | 31,373 |
| 44100 | Gnamma Hole - Native Well – Sink Hole – Doline – Clayhole - Blowhole | 2 |
| 48100 | Tank – Small Dam (not on watercourse) | 1 |

Note: (1) The waterbody layer represents waterbodies that have been topographically mapped. Where waterbodies are intermittent vegetation may have been mapped over the lake.
Source: Lee Heard (CSIRO)

For any analysis on wetlands, this study has used the original predicted improvements in wetlands that was meant to occur with the implementation of the USEDSFMP. (These figures are provided in the section on 'Background Assumptions of Bennett and Whitten's Wetlands Values). However, during the course of this study there has been severe debate over the validity of those improvements. Some of these concerns are noted below (however the lack of quantitative data has precluded their use in the analysis).

***Negative Consequences of the Drainage System***

To date there has been little successful monitoring of the impact of the drains on surface water flows in inland wetlands and there is a great deal of scientific uncertainty about the impact on the Coorong. Some of the information presented below is anecdotal. Significant effort is required over the next few years in monitoring and evaluating to ascertain the impact of the drains and the success of the Wetlands Waterlink strategy.

There is considerable debate surrounding the impact of the drainage scheme on wetlands in the region. There is little doubt that the wetland environment is changing, but there is question about whether the *natural* state has been restored. Many of the inland wetlands are seasonal with only a small number of permanent wetlands, and there is concern that the number of permanent wetlands being established is too high.

During the period of prevented natural inundation, some of the wetland basins had become colonised by endangered species such as Large-fruited fireweed and Metallic Sun-orchid. Resuming the inflow to these areas will obviously result in the loss of these colonies (Environment Australia 2001).

There are also grave concerns about changes in the ecological character of the Coorong arising from increased water levels and changes in water salinity. Some of these concerns include:

- Possible flooding of the high conservation value ephemeral salt lakes south and south east of the Southern lagoon;
- Loss of stromatolites which require hypersaline water;
- Implications for the breeding success of Australian pelicans and fairy terns;
- The distribution of important food plants;
- Impact on aquatic plant species, phytoplankton, invertebrates and fish; and
- Feeding opportunities for wading birds (Environment Australia 2001).

### 6.1.3 Wetland Valuation

As commented on earlier, there is a range of valuation methodologies that can be applied to estimate the total values associated with wetlands. It was not within the scope of this study to estimate the environmental values that may be derived from the USEDSFMP. This study has therefore relied upon existing studies, taking into consideration benefit transfer rules (see Section 2.2). As can be seen from Table 6.4, some existing studies of wetland value have varied considerably.

**Table 6.4**
**Some Economic Values of Wetlands**

| Location of Wetland | Author | Method | Value | Value ($A 1997) | Evaluation |
|---|---|---|---|---|---|
| Jandakot Wetlands, Perth, Western Australia | Gerrans, 1994 | Contingent Valuation | Median WTP to preserve the wetlands in their current state per annum per household | $34.80 | Results considered plausible, valid and consistent with economics |
| Sale Wetlands, Victoria | Sappideen, 1992 | Contingent Valuation | WTP to preserve water quality from increased salinity to maintain recreation value, per person per visit | $3.32 | Evidence of response bias and starting point bias. |
| Barmah Wetlands, Victoria | Stone, 1991 | Contingent Valuation | WTP for recreation at and to preserve wetlands, per person | $33.18 | Evidence of information bias |
| Macquarie, NSW | Bennett and Blamey, 1998 | Choice Modelling | Implicit price (WTP) for an extra irrigation related job preserved | $0.13 | There is some potential for benefit transfer, however the technique is experimental |
| | | | Implicit price (WTP) for an additional endangered species | $4.00 | |
| Broadlands Wetland, United Kingdom | Gren, Folke, Turner and Bateman, 1994 | Contingent Valuation | WTP for conserving non market assets of recreation and environmental quality from flood damage per household per year | $156.39 | Usefulness of study for benefit transfer is limited by lack of data on the site and socio-economic characteristics and the fairly unique threat scenario. |
| Whangamarino Wetland, New Zealand | Kirkland, 1988 | Contingent Valuation | WTP for improved wetland quality per household | $7.72 | Not available |

Source: Envalue (NSW EPA website)

With respect to the benefits transfer approach, it should be noted that there are very few Australian studies that have attempted to estimate the value of wetlands (as illustrated in Table 6.2). One past study that provides some idea of wetland environmental values in the USE was by Bennett *et al* (1997) who estimated that the median value nominated by households in SA and NSW for avoiding damage to Tilley Swamp and the Coorong was a once-off payment of $200 per household.

The studies that are the most relevant for the USE wetlands is the recent work by Whitten and Bennett (2001, 2001a, 2001b, 2001c) and Bennett and Whitten (2002, 2002a). This work has contributed extensively to knowledge known about wetland values and environmental valuation methodology. A choice modelling approach was developed by Bennet, Whitten and others over the last few years to estimate values that the wider community places on environmental attributes. Of the stated preference techniques for this type of evaluation, the Choice modelling approach appears to currently have the most support amongst economists for the ability to transfer the estimates from one study to another. The results from this study were used to estimate the value of wetlands in the BCA.

The choice modelling approach endeavours to take account of the various attributes that people associate with wetlands. The attributes that were included in the Upper SE choice modelling study were:

- Wetland area;
- Area of healthy remnants;
- Threatened species that benefit, and
- Number of ducks hunted.

***Background Assumptions of Bennett and Whitten's Wetlands Values***

Key assumptions that were utilised within this work include:

- Under the 'business as usual' (otherwise known as the 'without project' scenario) (BAU) the following happens:

- Area of healthy wetlands is 44,000 ha
- Area of healthy remnant vegetation is 50,000 ha
- Number of ducks hunted is 6,000

- The BAU or (no change to wetland management) is explained in Whitten and Bennett (1999) as including management changes at the margin made possible by completion of the drainage component of the USEDSFMP and continued degradation of wetlands and remnants without changes in management.
- Common staring point (1998) assumptions are

- 40% (25,267 ha) of the current area of wetlands (ie wetland type vegetation including riparian vegetation) are degraded, 70% (44,217 ha) of current wetland area is managed for conservation (40% formally, 30% informally)
- Remnant vegetation is non-wetland or riparian vegetation. 40% (34,183 ha) of current area is 'degraded', 60% (51,275 ha) of current remnant area is managed for conservation (46% formally and 14% informally)
- Only targeted farm forestry outside of the USEDSFMP catchment has an impact on wetlands
- There is continued salinity degradation from 1993 to 1998 but there is no additional adoption of improved pasture between 1993 and 1998.
- The total area for hunting is estimated from total wetlands area less that area where hunting is prohibited (formal reserves except game reserves for waterbirds)
- All areas managed for conservation are fenced (includes heritage agreement and informal areas)
- Wetland management is unchanged from 1998. Completion of the drainage component of the USEDSFMP allows 10% of wetlands (part of the 70% (44,217 ha) managed for conservation to return to a healthy ecosystem. Completion of the drainage component includes wetlands works managed for conservation.
- Remnant vegetation is unchanged from 1998.
- No significant farm forestry is undertaken in targeted areas.
- Completion of the USEDSFMP halts salinity degradation in the southern catchment in 2000, central catchment in 2001 and northern catchment in 2002.
- Adoption of improved pasture following completion of the USEDSFMP drainage component follows Barber (1993) (ie 80% (408,850 ha) adoption on existing pastures over 10 years including currently highly salinised land. There is no change to wetland and remnant grazing.
- 'degraded' wetlands and remnants (30% (18,950 ha) and 40% (34,183 ha) respectively of total area) become too degraded to supply hunting amenity by 2029.
- No additional area is fenced.

Based on this information:

- There were 37,900 ha of healthy wetland in the USE in 1998 (of a total of 63,167.5 ha).
- The USEDSFMP would increase this by 6,316.7 ha over 30 years (ie. this is the value at year 30).

The drainage component was expected to increase the area of healthy wetlands over its 1998 level by 6,317[15] ha and, by itself, to result in no increase in the area of healthy remnants over 1998 levels. From Bennett and Whitten (2002a) it would seem that the 10,000 hectares of 'Wetlands and Wildlife' area lead to the protection of 21 species of water birds. This equates to approximately 2 species of endangered water birds for every 1,000 hectares of healthy wetland. The healthy wetlands also support duck shooting. Whitten and Bennett (2001) suggest that 44,000 hectares of wetland in the USE will support an annual shoot of 6,000 ducks.

[15] Wetlands include both wetland and riparian vegetation.

The values that people ascribed to these attributes are presented in Table 6.5 below.

**Table 6.5**
**Implicit Price estimates of Environmental Values for the USE ($2000)**

| Attribute | Mean Implicit price | Units |
|---|---|---|
| Wetland area (pro conservation respondents) | 1.51 | $/'000ha |
| Wetland area (non pro conservation respondents) | -1.22 | $/'000ha |
| Remnant area | 0.92 | $/'000ha |
| Species protected | 4.81 | $/species |
| Ducks hunted (duck hunter respondents) | 3.01 | $/'000 ducks |
| Ducks hunted ( non duck hunter respondents) | -4.35 | $/'000 ducks |

Note: Using a discount rate of 5 per cent and a time period of 30 years
Source: Whitten and Bennett (2001)

From this table it can be seen that the value that respondents ascribed to increases in healthy wetland area depended on whether they described themselves as pro-conservationist or not. (Approximately 35 per cent of the respondents from the Adelaide population expressed that they favoured conservation to development). Similarly, duck shooters (approximately 15 per cent of respondents from the Adelaide population) valued duck shooting more highly than non duck shooters. Following Bennett and Whitten (2002), differences in implicit prices were multiplied by their respective shares to give a weighted average implicit price.

The estimate of the aggregate annual non market value associated with the increase in healthy wetlands caused by the drainage component of the USEDSFMP also needs to take account of both the response rate to the survey (approximately 30 per cent for South Australian respondents) and the relevant population. In this case the relevant population was assumed to be the number of households in both Adelaide and the USE.

The result of this analysis is that the non-market value associated with increases in area of healthy wetlands associated with the drainage component of the USEDSFMP is estimated to be $8.3 million. This equates to approximately $85 per hectare of healthy wetland per year.

## 6.2 Revegetation and Perennial Pastures

The USEDSFMP aimed to achieve environmental benefits including protection of native vegetation. One of the plan's long term strategies is to have 75 per cent of the study area covered by high water use vegetation. To achieve this, it was proposed that a further 6 per cent be covered by native vegetation either through revegetation or enhancement, resulting in 20 per cent (136,000 ha) of the study area under native vegetation. It was proposed that a further 55 per cent of the study area be under perennial agriculture (agroforestry, fodder shrubs, lucerne, salt tolerant and perennial pastures). 2005 was set as the completion date for this target.

CSIRO (2002) undertook a statistical analysis for Rural Solutions SA, which indicates that the current extent of native vegetation in the study region is 134,931 ha. These estimates include known areas of clearance estimated from Native Vegetation Council approvals, estimates of clearance for the drainage scheme to date (ie does not include northern drain) and anecdotal evidence of alleged clearing. The current extant native vegetation is estimated to cover approximately 19 per cent of the total area (691,035 ha). This figure is significantly larger than original estimates of 13 per cent in the USEDSFMP.

### 6.2.1 Benefits and Costs of Revegetation and the Impact of the Drainage Scheme on Vegetation

Revegetation generates a lot of private and social benefits. The expected benefits from revegetation in the USE are summarised in Table 6.5.

**Table 6.5**
**Benefits of USE Revegetation**

| Pure Private Benefits | Private and Social Benefits |
|---|---|
| Grazing (fodder crops) | Flora and fauna values |
| Shelter and shade (pasture and livestock) | Beautify the farm and regional landscape |
| Increased lamb survival rate | Attracts birds that help reduce pests |
| Increased productivity of pasture | Existence Values |
| Timber and firewood collection | Reducing groundwater recharge |
| Recreation | Hunting |
| Hunting | Soil protection |
| | Ecosystem values (such as carbon sequestration) |
| | Public tourism and recreation |

Source: Rural Solutions SA (2002)

However, revegetation does not always produce positive benefits. In addition to the costs of establishment, there has been the forgone production cost of the forfeit of agricultural land to native vegetation. In some instances these costs can be significant, explaining the reluctance of some landholders to undertake revegetation activities. As the majority of revegetation benefits are public, and the majority of revegetation costs are private, then there is often an imbalance between the socially desired revegetation level and that which is privately provided.

For any analysis on revegetation, this study has used the original predicted improvements in vegetation that was meant to occur with the implementation of the USEDSFMP. (These figures are provided in the section on 'Background Assumptions of Bennett and Whitten's Wetlands Values). However, during the course of this study there has been severe debate over the validity of those improvements. Some of these concerns are noted below (however the lack of quantitative data has precluded their use in the analysis).

***Negative Consequences of the Drainage Scheme on Native Vegetation***

The drainage system has also lead to negative impacts on areas of native vegetation. Such negative impacts are only commented on briefly here.

Firstly, the drainage scheme has often had to pass through significant areas of native vegetation, separating ecosystem populations. It has been estimated that 245 ha of native vegetation have been destroyed as a result of the construction of the drains (Roger Ebsary, personal communication, 2002). The native vegetation impacted upon varies from scattered individual plants in pasture to reasonably dense clumps of trees and shrubs. Sharrad *et al* (2000) note that the following adverse impacts may be possible:

- Some plants will be directly destroyed or damaged during the construction phase;
- The drain might provide a route for an invasion by weeds and plant disease; and
- The lowering of the watertable near the drain might cause some plants to die or become less vigorous and less able to compete for space and nutrients and less able to survive attacks by disease, pests or grazing animals.

Early monitoring in Deep Swamp and Tilley Swamp suggests that the presence of the drain is having a deleterious effect on the health of *M.brevifolia* and *M.halmaturorum ssp* (Milne *et al* 2001). While no pre-drain data were collected at any of the sites, health at the control site (Kilmorey Road) has remained fairly constant, suggesting that the decrease in health cannot be attributed to seasonal effects. The monitoring concludes that if these two species are considered to be indicators for the vegetation community then at present, it is possible that the health of the entire community is affected, in excess of 500 m from the drain (Milne *et al* 2001). One suggested outcome of drains lowering water tables is the fresh water lens being released into the drains, leading to a dewatering effect on native vegetation (Matt Giraudo, Mark de Jong, personal communication 2002).

Evidence of weeds not previously seen, has also been noted in native vegetation through which the drains have been constructed. It has been stated that if the environmental consequences of the drainage scheme had been known beforehand, permission would not have been granted for the system to go through privately owned native vegetation (personal communication from a landholder, 2002).

An appropriate assessment of the benefits of the drainage scheme needs to be balanced against the estimated loss of native vegetation destroyed as a result of the construction of the drains, alleged vegetation clearing and the potential loss of vegetation within (at least) the 500 m transect.

### 6.2.2 Revegetation Valuation

As commented on earlier, there is a range of valuation methodologies that can be applied to estimate the total values associated with revegetation. It was not within the scope of this study to undertake an environmental evaluation exercise to estimate the environmental values that may be derived from the USEDSFMP. This study has therefore had to rely upon existing studies. Earlier estimates of revegetation values are reported in Table 6.6.

**Table 6.6**
**Some Economic Valuations of Native Vegetation**

| Location of Study | Author | Method | Value | Value ($A 1999) | Evaluation |
|---|---|---|---|---|---|
| Camp Hill in Brisbane | Windle and Cramb | Contingent Valuation | WTP per local resident household to preserve, upgrade and maintain an area of natural bushland | $36.76 | Strong evidence of starting point bias and end point bias. Small sample size with high proportion of low income earners. |
| Native forests in East Gippsland | Lockwood, Loomis and De Lacy | Contingent Valuation | WTP per household per year to know that forests are used to produce wood products | $12.59 | Found that intrinsic production value of timber is small in comparison to non-market WTP for reserving the same forest in national parks |

Source: Envalue (NSW EPA website)

***Environmental Values from Whitten and Bennett's Work***

As discussed previously, Whitten and Bennett (2001) have estimated values held by the wider population in regards to remnant vegetation. Further consideration of this value and the rules for benefits transfer are provided in the National Land and Water Resources Audit (NLWRA) (2002).

The method for estimating the values that the wider community gains from the replacement of agricultural, grazing land with remnant vegetation is presented below. Individual attributes of values that the wider community would gain from the replacement of grazing with remnant vegetation include:

- Increase in the area of remnant vegetation;
- Increase in the number of threatened species protected; and
- Reduction in regional employment.

Using the relationships and assumptions developed previously (see Table 6.5 for unit values), the value of replacing 41,000 ha of remnant native vegetation is approximately $18.9 million. This equates to approximately $30 per hectare per year of remnant native vegetation restored.

### 6.2.3 Landscape Aesthetics Valuation

Establishing perennial pastures in the USE was another key component of the USEDSFMP. In addition to the wetland-related benefits, the wider community also derives benefits from landscape aesthetics (includes either area of farmland repaired or bushland protected) and benefits from regional employment (NLWA 2002).

The implicit prices associated with these attributes are presented in the table below.

**Table 6.7**
**Implicit Price estimates for the Upper South East ($2000)**

| Attribute | Mean Implicit price | Units |
|---|---|---|
| Landscape aesthetics | 0.07 | $/10,000 ha |
| Social impact | 0.09 | $/10 people staying |

Note: Using a discount rate of 5% and a time period of 30 years
Source: NLWA (2002)

From Walsh *et al* (1993) the area of farmland protected by the drainage component of the USEDSFMP is 144,100 hectares and the number of jobs protected is approximately 700. Given the growth of the drainage scheme, recent estimates suggest that the area of agricultural land protected is now 175,000 ha (personal communication, Roger Ebsary, DWLBC, 13/08/02). It is further assumed that, in the absence of the drainage component, these jobs would have been lost over 30 years, and that the families would have left the area. Applying the methods developed by Van Beuren and Bennett for the NLWRA (2002), the value that the wider community gains from these aspects is $5.45 million. This equates to approximately $2 per hectare of farmland protected per year.

## 6.3 Summary of USEDSFMP Environmental Values

The result of this section illustrated:

- The non-market value associated with increases in the area of healthy wetlands because of the drainage scheme is $8.3 million. This equates to approximately $85 per hectare of healthy wetland per year.
- The value of planting 41,000 hectares of native vegetation is estimated to be approximately $18.9 million. This equates to approximately $30 per hectare per year of remnant native vegetation restored; and
- The value that the wider community gains from these aspects of protecting agricultural production is $5.45 million. This equates to approximately $2 per hectare of farmland protected per year.

The above values are not net values, they do not allow for any decrease or reduction in environmental quality.

Where applicable, some of the above values were used in the modelling results and the development of the beneficiary pays principle discussed earlier.

# 7. ENVIRONMENTAL ACTIVITIES OF USE FARMERS AND THEIR COSTS

One of the purposes of this study was to identify the extent and range of environmental activities in the USE to allow identification and clarification of non-direct benefits. The study has attempted to identify a range of feasible, in-kind methods for landholders to contribute to future Program costs, which has included a quantification of costs of land committed to revegetation, weed management, fencing and maintenance.

## 7.1 Landholder Consultation

Significant consultation was undertaken to create awareness within the regional community to allow interested landholders a chance to participate in the study. A radio interview was conducted with SE Country Hour that explained the purpose of the study and asked for any interested landholders to contact the economic Rural Solutions SA team for further detail and/or to provide information. The economics team received no queries or comments from the landholders in the region.[16] Telephone contact was made with identified landholders in the region, as well as contacts to SAFF representatives to advise them of the study.

The main landholder consultation was via a large-scale telephone survey by a professional marketing group. This was conducted throughout the drainage funding area, focussing on revegetation and environmental activity questions. The telephone survey asked a number of questions about the environmental activities of USE farmers and the benefits/costs that they experienced as a result. Around 98 telephone interviews were conducted, using an established sampling methodology. This represented a significant proportion of landholders in the region (Truscott Research 2002).

In addition, contact was made with a number of farmers in the region (including the landholders on the USE Program Board steering committee) to ask them to participate in specific case studies. Landholders who agreed to participate as case studies included James Darling (Duck Island), John Delfabbro (Alamon), Cameron Grundy (Springfield) and Miles Hannemann (Camelot). In addition, a case study was conducted on Wetlands & Wildlife, with information provided by Janice White and Michael Lewis.

## 7.2 Extent and Costs of Environmental Activities in the USE

Truscott Research (2002) provided a breakdown on the total capital and operating costs incurred by respondents undertaking environmental activities in the USE. Farmers were asked if they participated in eighteen environmental activities. These figures were used to calculate averages for the region and then they were multiplied upwards to obtain total region estimates (based on the SEWCDB rateable area of 877,705 ha). There is the possibility that the survey results were not representative, because although farmers were reminded that they might need their records to answer questions, many chose to rely on their memory solely. However, the size of the survey meant that a sampling tolerance of $\pm$10% was achieved (Truscott Research 2002).

Table 7.1 provides an estimate of the total area (split into Government and private funded) and costs (split into capital and ongoing costs) of environmental activity. When interpreting any figures from this table it must be borne in mind that there is the possibility that some figures were doublecounted. Nevertheless, some key points include:

- Most privately funded environmental activity has been in: pest management; establishing lucerne or perennial pastures; providing habitat protection; managing remnant vegetation; providing weed control and linking native vegetation areas;
- Government funds were primarily focussed towards: whole farm plans; planting native vegetation; fencing off native and remnant vegetation; planting commercial trees; providing weed control in native vegetation areas; and lucerne or salt tolerant establishment;

[16] Rob England suggested that a radio interview would reach a broader audience than newspaper adverts.

- Substantial private costs have been incurred over the last five years in establishing and maintaining activities with perceived high public benefits (such as wetlands and native vegetation).
- The majority of capital costs were incurred by landholders in: establishing lucerne or perennial pastures; developing whole farm plans; and planting native vegetation.
- The majority of ongoing costs were incurred by landholders in: managing lucerne or perennial pastures; undertaking weed and pest control; and managing native vegetation.

**Table 7.1**
**Areas and Costs of Environmental Activities over the Past Five Years[1]**

| Environmental Activity | Land covered by Government (ha) | Land covered by Private funds (ha) | Capital costs incurred $ | Ongoing costs $ pa | PV of ongoing costs over past 5 years ($) | Amount paid by Government $ |
|---|---|---|---|---|---|---|
| Planting commercial trees | 1,035 | 677 | 1,220,408 | 145,918 | 598,294 | 541,224 |
| Planting native revegetation | 4,669 | 3,755 | 3,786,714 | 275,255 | 1,128,600 | 998,214 |
| Linking native vegetation areas | 27 | 33,508 | 89,541 | - | - | 13,265 |
| Revegetating drainage & creek areas | 1,327 | 40 | 59,694 | - | - | - |
| Fencing off native & remnant veg | 8,914 | 5,041 | 1,191,224 | 45,102 | 184,927 | 742,857 |
| Managing remnant vegetation | 80 | 49,851 | 1,631,633 | 298,469 | 1,223,783 | - |
| Fencing drainage/creek areas | 265 | 0 | 677 | 11,939 | 48,951 | - |
| Pest mgmt for wildlife purposes | 6,964 | 466,010 | 718,184 | 586,526 | 2,404,870 | 29,847 |
| Habitat protection | - | 102,740 | 663,265 | 132,653 | 543,904 | - |
| Establishing fodder shrubs | - | 1,857 | 61,020 | 13,265 | 54,390 | - |
| Establishing lucerne or salt tolerant pastures | 6,142 | 212,855 | 26,864,898 | 9,562,681 | 39,208,879 | 257,347 |
| Weed control, especially in native vegetation areas | 6,765 | 46,972 | 665,918 | 669,235 | 2,743,994 | 403,318 |
| Whole farm plan | 19,056 | - | 4,810,000 | - | - | 1,020,500 |

Notes: (1) No information is provided on wetland activities due to a very small sample size.
Figures cannot be added as there is the very real possibility that farmers included the same figures for a number of activities, hence the overall figures would be overestimated.
Sources: Rural Solutions SA 2002 and spreadsheets from Truscott Research 2002

It must be recognised that the costs reported above do not represent farmers' net costs (ie costs minus benefits). As elaborated in Section 6, farmers receive many private benefits from undertaking environmental activities. Landholders were asked to indicate the expected private benefit from undertaking a list of environmental activities. Table 7.2 summarises some of the benefits reported.

Another area of environmental activity is placing native vegetation under heritage agreement. Appendix 3 discusses this scheme in more detail.

### 7.2.1 Environmental Actions Planned for the Next Five Years

Truscott Research (2002) asked landholders what environmental activities they expected to undertake for the coming 5 years. Two thirds nominated at least one activity, however many were unsure about how many hectares they would be undertaking. The key areas of action included planting native vegetation, establishing perennial pastures and undertaking pest management activities. Only a few farmers planned to obtain government funds for the activities. Graph 7.1 illustrates the type of environmental activities planned.

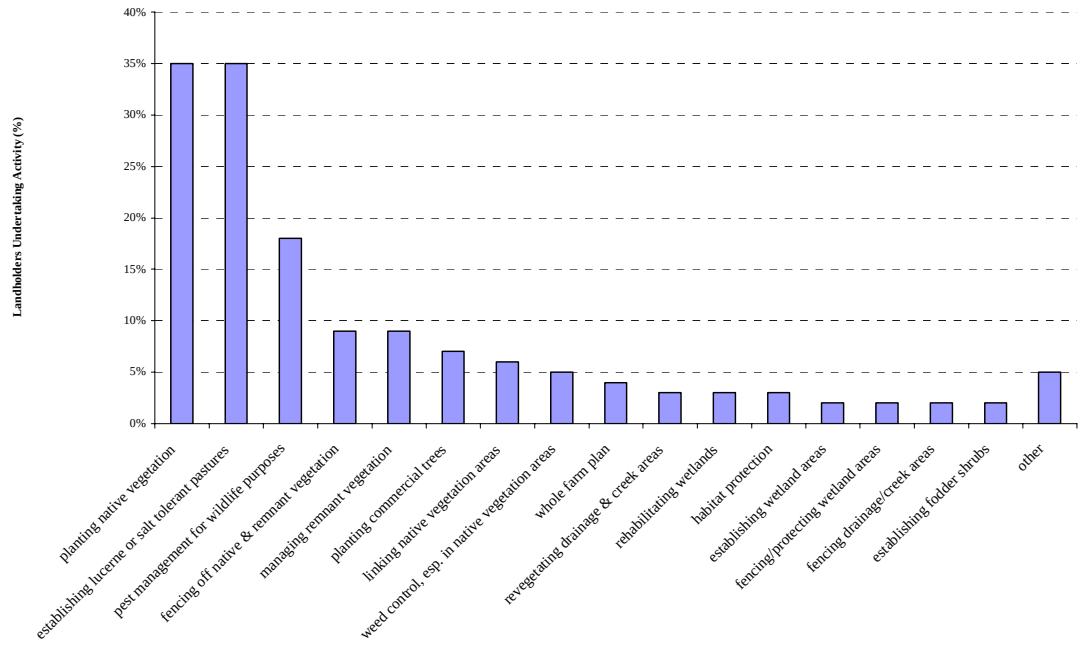
For further discussion on how the USEDSFMP has achieved its environmental targets, see the USE Revegetation Strategy and Regional Targets study (Rural Solutions SA 2002a) that has been undertaken in conjunction with this report.

**Table 7.2**
**Benefits Received by Landholder Respondents from doing Environmental Activities**

| Environmental Activities | Environmental Benefits Reported |
|---|---|
| Planting Commercial Trees | • Shelter<br>• Aesthetic |
| Planting Native Vegetation | • Shelter for stock and crops<br>• Salinity control<br>• Enhances birdlife |
| Linking Native Vegetation Areas | • Shelter<br>• Encourages birdlife |
| Revegetating Drainage & Creek Areas | • Stops erosion |
| Fencing off Native & Remnant Veg | • Protect vegetation<br>• Shelter<br>• Aesthetic |
| Placing Native Vegetation under Heritage Agreement | No respondents |
| Managing Remnant Veg | • Shelter<br>• Encourages birdlife |
| Establishing Wetland Areas | • Aesthetic |
| Rehabilitating Wetlands | • Retain the Area |
| Fencing/protecting Wetland Areas | • Attract Wildlife<br>• Increase biodiversity |
| Fencing Drainage/creek Areas | • Lower water table |
| Pest Management for Wildlife Purposes | • Wildlife protection<br>• Erosion control |
| Habitat Protection | • Maintain wildlife |
| Establishing Fodder Shrubs | None mentioned |
| Establishing Lucerne or Salt Tolerant Pastures | • Lower water table<br>• Ground cover to reduce erosion |
| Weed Control, especially in Native Vegetation Areas | • Keeps weeds out of pasture |
| Whole Farm Plan | • Five year plan of objectives |
| Other | • Clay spreading to allow for lucerne planting |

Source: Truscott Research spreadsheets 2002

**Graph 7.1**
**Future Environmental Activities by USE Landholders**




Source: Truscott Research spreadsheets 2002

### 7.3 Specific Case Studies

The objective of these case studies was to appreciate the types of activities currently being undertaken by landholders. Case studies were chosen using a variety of criteria. These criteria included:

- *Zone area*: The objective was to have two case studies in zones B to D, and three or more case studies in Zone A;
- *Landholder advice*: Suggestions were gained from certain landholders in respect to farms we should visit;
- *Environmental Activities*: The objective was to make sure we got landholders who were doing a wide range of environmental activities on their farms, and incurring substantial in-kind contributions;
- *Size*: For example, Wetlands and Wildlife reports that it owns significant areas of private wetlands in the USE.

Nearly all landholders contacted were willing to participate as case studies (only one landholder refused). On-farm visits were conducted over a number of days by the economics team. It is recognised that in terms of environmental activities, the farmers visited are innovators and motivators within the region. The landholders that were interviewed in the case studies were all progressive and innovative. They all recognised the intrinsic importance of farming sustainably and the need for environmental activities on their farms. Important lessons could be drawn from the farms as a whole. The case studies are explored in Box 7.1.

**Box 7.1**

**Wetlands and Wildlife**

**Background**

Wetlands and Wildlife (WW) is a public company established in 1991, and admitted to the Register of Environmental Organisations in 1992. Admittance to the Register ensures long-term conservation of the land. Land owned by the company can not become the property of individual members of the company and, in the event of the company being wound up, such land can only pass to another registered environmental company. The company's assets are currently valued at more than $7 million.

WW has 58 members with five elected directors and a company secretary appointed by the directors. The members elect directors for terms of four years with one director retiring each year. Directors are eligible for re-election with no limits on the number of terms they may serve. The directors elect the chairman. The company directors are currently: Tom Brinkworth (chairperson); Janice White; Milton Weinert; Keith Frost; Don Shepherd, with the secretary being Michael Lewis.

The accounting firm of which the secretary is a partner currently receives $5,000 per annum for some of the services provided to WW, however it is well acknowledged that the contribution made far exceeds this amount. The Directors receive no remuneration for their time.

WW also operates the Wetlands and Wildlife Public Fund, which accepts donations of money and property that are applied exclusively for the purposes of conservation. All donations of money over $2 and property are tax deductible. In 2000 nearly $420,000 was received in donations. This jumped to nearly $1.3 million in 2001 with a significant contribution made by the Brinkworth family for the purchase of land. With the exception of Morella (recently provided by the State Government in exchange for land to construct the drains), the Brinkworth family has been the main contributors of land and funds to WW.

**Environmental Practices**

WW reports that it currently owns nearly 20,000 ha of land set aside for conservation in the USE, known collectively as Watervalley. A further 1,500 ha of wetlands is owned by the Brinkworth family but is in the same management unit as WW's properties.

All land purchased has a high Conservation value and some is also under Heritage Agreement. Management of the land is guided by an approved Management Plan formulated in cooperation with the South Australian Department of Environment and Heritage (DEH). Until a permanent manager is employed, on ground management is currently handled by the Brinkworth family in conjunction with WW, SEWCDB and other advisers (eg Uni SA, Dr. Paul Boon and Mr Mike Harper).

In 1998 documentation was prepared for the nomination of 12,500 ha of wetlands and surrounding native vegetation as Wetlands of International Importance under the Ramsar Convention of 1972. The deferral of a decision of support by the SA Government (until the USEDSFMP is complete) has delayed the process.

WW actively encourages research on its properties. The Universities of South Australia, La Trobe and New South Wales are involved in research projects such as managing wetlands for wildlife, other aspects of wildlife management, methods of revegetation of wetlands, the ability of the wetlands to absorb nutrients, effects of wildfire, the ecology of the common wombat, opportunities for nature-based tourism and the economics of conservation. A program of monitoring water chemistry, vegetation, invertebrates and the use of wetlands by waterbirds has been in place since 1992.

**Motivations for Environmental Practices**

Since 1984 Mr Tom Brinkworth has set aside land for conservation purposes. The initial incentive for the conservation of these areas was to ensure the continued availability of wetlands for hunting purposes however broader conservation objectives soon became the priority. It was soon recognised that a formal structure was required to ensure the long-term conservation of the land, resulting in the formation of WW. Whilst the initial incentive has changed through the years, hunting still features in the WW agenda.

WW aim to:

- Conserve, protect and enhance the natural environment, including wetlands and flora and fauna for the benefit of the public;
- Maintain a public fund to which the public is invited to subscribe funds or property for the environmental purposes of the company; and
- Acquire new areas of land for the conservation of the natural environment.

To fulfil these aims WW will strive to:

- Acquire new land, especially that which may be adjacent to, or near, established parks;
- Foster research;
- Improve methods of nature conservation and park management;
- Foster education; and
- Hold or arrange workshops, seminars, and conferences on matters of conservation and park management.

**Future Plans**

The future aim is for the day to day management of the land owned by WW to be self-funding and undertaken by salaried staff. It is hoped that revenue from limited tourism and other recreational activities may be supplemented by consultancies undertaken by staff, similar to the operations of Shortland Wetlands Centre in Newcastle NSW.

WW hope to provide a viable model for conservation in the private sector and inspire, throughout Australia, a network of conservation reserves complementing the National Parks system.

It is envisaged that eco-tourism should become the major source of funds. Accommodation is now available and when a manager is employed and the transfer of Morella is completed these activities will begin in earnest. Also other activities conducted in association with other educational bodies, eg Westminster School are providing a broader range of activities and subsequent sources of funds, eg. biennial art exhibition. It is expected that in future there will be wider community involvement resulting in income from entry and camping fees.

**Economic Evaluation of Wetlands and Wildlife Activities**

Duck hunting is, in part, one of the reasons why WW conserve wetlands. Many believe that this controversial activity is contradictory to conservation, and whether the wetlands are managed to maximise the benefits to the wetland (with appropriate wetting and drying cycles) or to increase the number of ducks is questioned.

Bennett and Whitten (2002a) conducted an interesting study in the USE to ascertain whether or not society as a whole should permit or restrict duck hunting. At one level, the results of the non-market valuation indicated that duck hunting creates a net cost to society. The benefits received by hunters were outweighed by the costs incurred by the wider community from factors such as animal welfare concerns from duck shooting.

However, if duck hunting also increases the area of healthy wetland and provides for the protection of threatened species, then the evidence supports the contention that duck hunting improves the well being of society (Bennett *et al* 2002). There is little doubt that without duck hunting and alternative 'approaches', the USE would not have the area of wetlands it does today. In addition, the wetlands have been identified as priorities for conservation due to their importance as threatened flora and faunal habitat. As a result, it is likely that duck hunting in the USE creates net benefits to society.

**Duck Island**

**Background**

James Darling was 30 when he took over day-to-day management of his 4,850 ha property, Duck Island, in the Hundreds of Laffer and Petherick by going to live there in November 1976. 1,600 ha was taken from Duck Island and added to Gum Lagoon Conservation Park in 1980. Since 1991 the area under Duck Island Partners (James Darling and Lesley Forwood) management has grown to 6,700 ha. The property is a premium cattle-breeding enterprise, as well as being EU and Cattlecare accredited. The last sheep was on the property in 1983.The property is located within Zone A of the SEWCDB region.

**Environmental Practices**

Darling considers that the separation of the Duck Island agricultural zone from its conservation zone by a high fence, with netting dug into the ground, is crucial to the management balance of 3,800 ha of native vegetation and 2,900 ha of agricultural land. Approximately 15 kilometres of fence has been constructed over the last 10 years at a cost of $6,500 to $8,000 per km. The boundary along Cantara Road remains to be done.

The objective for each of the paddocks is to have green feed, dry feed, bush and individual trees. The extent of each of these elements will depend on the use of the paddock. For example, paddocks closer to the cattle yards are predominantly used for calving, so the bush coverage is not as extensive for improved visibility.

Since the mid 80's, 1,000 trees per annum have been planted on the property. Each planting is strategically placed with regard to reducing the watertable, tree replacement and providing shelter. In addition to revegetating activities, 6ha of hard wood commercial trees have been planted on a non-wetting sandhill and a 4ha plantation of cork oaks has been established.

Other land management practices include extensive application of saltland agriculture, the planting of lucerne on hills, minimum chemical use, zero tolerance of rabbits within the fence area and clay spreading from saline swamps.

Duck Island has been working with NPWS and DEH to develop a Management Plan for Gum Lagoon Conservation Park (GLCP) and Duck Island to be managed as a single environmental area. This is a groundbreaking Management Plan, which may well serve as a model. While the objectives and actions of the Plan have jurisdiction for only GLCP, the integration of management between the Park and privately owned land recognises the significant neighbourhood benefits of a coordinated approach. This ensures implementation of a coordinated and strategic approach to management issues such as surface water, fire, weeds and vermin (DEH, 2001). As a consequence of the Plan, DEH reimburse Darling for activities such as: fox baiting to protect the malleefowl population and fire break maintenance. On-ground costs including time and expenses are covered.

**Motivations for Environmental Practices**

In 1976 James Darling considered himself a failed artist who might, as a prospective farmer, find some originality in the establishment of compatible conservation farming practices and make economic sense out of farming with salt. It was, and still is, Darling's belief that Australian farmers need to learn to do both (Darling, 2001).

Darling recognises that the native vegetation has evolved to deal with salt. He says that uninformed and over-zealous clearing of native vegetation activates existing salt. Traditional farming methods can also activate salt. On Duck Island native vegetation and pasture are managed under the same system. Native vegetation management underlies the Duck Island farming system. Darling readily acknowledges that Duck Island has plenty of salt, but not a salt problem (Darling, 2001).

**Future Plans**

Darling has a long-term management plan for Duck Island that includes an environmental partnership with Gum Lagoon Conservation Park. His plan includes making economic sense of farming while conserving as much bush as possible. He will continue to complete the environmental design of Duck Island while improving the health and capital value of the property.

**Springfield**

**Background**

In 1987 the Grundy family purchased 800 ha in the hundreds of Lochaber and Glenroy. In 1996 Cameron Grundy took control of the property. The farm is currently operated as a mixed grazing property (two-thirds sheep, one-third cattle), with 100 ha planted to crops and lucerne hay predominantly for on farm use.

The property is located within Zone C of the SEWCDB region. Rising water tables are not a problem for the property.

**Environmental Practices**

Due to the extensive clearing of the property by previous owners, the Grundy family has been establishing 22 metre width windbreaks across the property since 1994. It is estimated that to date 10 ha have been fenced off and planted to native vegetation.

It is estimated that for ¾ ha it costs on average $3,500 to $4,000 to spray out the area, erect a stock proof fence and plant native vegetation by direct seeding. The Grundy's received NHT funding to cover approximately 50 per cent of the costs. In addition to the costs of establishment, there has been the forgone production cost of the forfeit of agricultural land to native vegetation, although there is the argument that the shelter benefits to stock and pasture may outweigh the loss of production.

Fox baiting for protection of livestock and wildlife is also undertaken. Effort is made to encourage neighbouring landholders to also participate to ensure a more successful outcome. The annual cost is approximately $70 per annum excluding the labour time involved.

Other land management practices include spraying for broad leaf weeds using MCPA and red-legged earthmite using Lemat costing approximately $5 per acre; controlling acidification by liming 400 ha in 2000 and planting lucerne.

Approximately 1.5 km of the drain passes through the property and the adjoining property (owned by Cameron's brother). In 1995, the Grundy's spent $15,000 on the banks of the overflow drain from Cockatoo Lake to reduce the on-going maintenance requirements.

**Motivations for Environmental Practices**

Although NHT funding is considered a great incentive to undertake these activities, the Grundy family has always recognised the importance of trees on a farm, and Cameron has been strongly influenced by his parents. The main motivation for undertaking this activity is the recognition of shelter benefits to pasture and livestock, aesthetic appeal, providing habitat to birds and wildlife and increasing the property value.

**Future Plans**

The long-term aim is to provide each paddock with shelter and to link corridors of native vegetation. Another aim is to cut a channel through the property to better control the surface water during wet years and channel it into a nearby salt lake for bird life.

**Alaman**

**Background**

In 1967 John Delfabbro took over management of the 3,035 ha family property in the hundred of Woolumbool and a further 3,640 ha purchased in the nearby hundreds of Marcollat and Peacock. Both farms are currently operated as a mixed grazing property with 1,050 beef cattle and 10,870 sheep.

The properties are located within Zone A of the SEWCDB region.

**Environmental Practices**

The Delfabbros have fenced off native and remnant vegetation - 1,416 ha on one property and 607 ha on the other. Grazing in these areas has not occurred since 1967. The Delfabbros rejected an offer of a Heritage Agreement for this area.

In 1983 a number of 2 ha blocks were fenced off and planted to native vegetation in the middle of paddocks to provide shelter and water table control in extensively cleared areas. The Delfabbros covered all costs involved with the establishment of the shelter blocks. In addition there was the cost of forgone production due to the forfeit of agricultural land to native vegetation, but shelter benefits were also gained.

All planting's of native vegetation are from seeds collected from the native vegetation on the property. They also collect a variety of native seeds for Greening Australia.

In the 1990s Delfabbros constructed a small weir (cost $1,800) to contain the water within the wetlands on the property for a little longer. Approximately 15 per cent of the property are covered by wetlands. This area has also been fenced off to protect it from stock.

General weed control is undertaken in the wetland and scrub areas. Since the construction of the drain there have been weeds in the scrub that have never been seen there before, they are suspected to have come from the rubble used. Rabbit and fox control is also undertaken.

Other land management practices include the planting of lucerne and veldt grass using direct drilling methods and avoidance of ploughing up hilly areas to reduce the possibility of wind erosion.

No whole farm plan has been developed, although advice on revegetation activities is regularly received from the Department of Environment and Heritage. Delfabbro also allows his farm to be used for scientific research.

**Motivations for Environmental Practices**

John Delfabbro's passion for the environment has been the main motivator for the activities undertaken on the property. The majority of the projects have been self-funded and it is the Delfabbro's belief that the property is currently being sustainably managed. As a result, an offer to place a Heritage Agreement on an area of native vegetation was rejected.

**Future Plans**

The construction of the drain requires a 15 metre wide strip either side of the drain to be fenced. Delfabbro requested instead that a 50 metre wide strip be fenced on their side of the drain to allow for more extensive revegetation. In 1998 NHT provided funding of $5,950 to plant this strip (totalling 58 kms of vegetation) which failed due to adverse weather conditions. Efforts to return the funds by Delfabbro because of the failure were rejected. Delfabbros' privately funded a successful attempt to replant a third of the area the following year. The aim is to develop a corridor of vegetation along the drain leading to the block of fenced-off native vegetation. There is 9 km of drain on the property.

**Camelot**

**Background**

In 1982 Miles Hannemann purchased the family farm in the hundred of Pendleton. In 1997 total land holdings increased to 1,241 ha with a purchase of land in the hundred of Stirling. The properties are currently operated as mixed grazing (1,600 merino ewes and 150 cows), with 40 ha irrigated for lucerne hay and seed and 400 ha planted to low risk crops, a proportion of which is for on-farm use.

Both properties are located within Zone D of the SEWCDB region.

**Environmental Practices**

Two years ago 150 ha of native vegetation was fenced off. Based on the perceived high conservation value of this area, NHT covered 100 per cent of the $10,500 cost of undertaking this activity.

In the late 90s 2 ha was fenced off and planted to native vegetation to provide shelter in extensively cleared areas. The Hannemanns covered all costs involved with the establishment of the shelter blocks, estimated at $400. In addition there was the cost of forgone production due to the forfeit of agricultural land to native vegetation, but shelter benefits were also gained.

Rabbits and foxes are controlled for to protect stock, wildlife and native vegetation. Burning of remnant wood has been ceased on the property and instead piles are made to provide homes for wildlife.

Other land management practices include controlling weeds and red-legged earthmite; improving non-wetting sands by clay spreading; reducing the risk of wind erosion through minimum tillage and stubble retention; placing rubble in gateways and on roads; and planting dryland lucerne (400-600 ha).

**Motivation for Environmental Practices**

While NHT funding has significantly contributed to the activities undertaken on Camelot, there is the recognition that farming practices need to change to improve the long-term sustainability of the land. Hannemann's motivations have been strongly influenced by the realisation of the destructive influence of his former practices on his land (such as land clearing and soil erosion).

**Future Plans**

Hannemann's have approval for nearly $30,000 of NHT funding to establish 7 ha of windbreaks, fencing off 30 ha of remnant vegetation and planting 40 ha of lucerne. It is estimated that the NHT funding will cover 50 per cent of the costs of the projects.

There are also plans to establish 3.4 ha of commercial tree plots with funding from Forestry SA. Hannemann would like to undertake more environmental activities, however the lack of cash flow is a current problem.

The case studies depicted in this study all illustrate differing motivations for investing in environmental practices. Some have been influenced by parental attitudes, others have always held very strong environmental motivations, one in particular has treated farming as a form of art, while some landholders' views have changed over time with the recognition of the need for environmentally-friendly practices to ensure a sustainable, economic farm.

## 7.4 Valuation of the Wider Environmental Values Held by Society

Sections 7.2 and 7.3 have provided some estimate of the costs incurred by farmers in undertaking environmental values. However, such an estimate of costs does not represent the value from society as a whole. Sections 6.14, 6.2.2 and 6.2.3 elaborated quite extensively on different methodologies in valuing environmental activities. Rural Solutions SA used the following information and sources to help calculate environmental value created by landholders:

- the extent of establishment of perennial pastures and fodder shrubs (spreadsheets from Truscott Research 2002);
- the area of wetlands in good condition on private land (Matt Giraudo and Brenton Grear personal communication 15/8/02 and Whitten and Bennett 1998);
- the area of remnant vegetation on private land (CSIRO 2002);
- environmental values held by society (Whitten and Bennett 2001 and NLWRA 2002); and
- percentage of Government funds received by farmers (spreadsheets from Truscott Research 2002).

The value of environmental activities undertaken by landholders is shown in Table 7.3.

**Table 7.3**
**Once-off Environmental Values Created by USE Landholders**

| Environmental Value | Area Protected[1] | Specific Environmental Values | % Funded by Government | % of Privately Contributed Environmental Value |
|---|---|---|---|---|
| | Ha | $ million | % | $ million |
| Remnant Vegetation | 84,486 | 38.9 | 15 | 33.2 |
| Perennial Pasture and Fodder Shrub development | 220,854 | 6.9 | 11 | 6.1 |
| Wetlands in Good Condition | 10,000 | 13.0 | 30 | 9.1 |

Note: Values are not net estimates of environmental value.
(1) Hectares of wetlands on private land were established by using an estimate that there are approximately 40,000 ha of wetland basins and watercourse environments privately owned in the USE, and about 75% are said to be in poor condition. (personal communication Matt Giraudo (PIRSA) and Brenton Grear (DEH).
Source: Rural Solutions SA (2002)

Table 7.3 illustrates that protection of remnant vegetation and wetlands in good condition and creation of perennial pastures has high community values attached. It is tentatively suggested that such activity may create environmental values of over $58 million. These are once-off values. Landholders in the USE have privately funded around 80 per cent of this value. Also, it has not been possible to attach society value to some environmental activities such as weed and pest control or specific work on habitat creation.

The above figures *must be treated with caution*. The caveats attached to the estimation of any environmental value apply. More importantly, they **do not** represent net environmental values as no allowance has been made for the cost of environmentally degrading actions by farmers (this was not one of the objectives of the study). It is possible that the cost of such actions may be significant (for example, see Environment Agency 2002).

Because of uncertainty surrounding landholders' future environmental work, it has not been possible to value such activity.

## 7.5 Landholders' Duty of Care

When considering the value generated by landholders, it is important to consider exactly what land management activity landholders are responsible for. Implementing sustainable agriculture in the USE and Australia as a whole involves considering what the responsibility is of landholders towards the environment.

As PIRSA Rural Solutions (2000) reports, NHT guidelines state that projects concerned with commercial production will only be funded if they are new to the area concerned or are expected to result in more sustainable

management of natural resources. The guidelines themselves are confusing, stating practices that are considered to be 'good' or 'normal' practice for that region will not be supported (pp 10 and 16) but that sustainable agricultural production will be supported. 'Good practice' is defined by NHT guidelines (p. 10) as 'good farm management that involves protecting some biodiversity values and preventing problems affecting nearby areas'. However, the definition of what is 'normal' practice for an area differs, which confuses the issue of what activity should be funded within the region. The confusion within the guidelines makes assessment/implementation of bids at the state/national level difficult.

A common definition of farmers' 'duty of care' or 'good farming practice' is needed to help define the responsibility. Indeed, the recent House of Representatives (2001) report on public good conservation called for:

> *"The Commonwealth to seek agreement with the states and territories for a commonly accepted definition in principle of a landholder's duty of care".*

Codes of good agricultural practice need to include a minimum standard of care required of farmers. For any legal borderline to be credible and operative it requires a rigorous and unambiguous definition. Establishing credible definitions of good agricultural practice is extremely important as it creates the foundation for Government policy to address environmental issues. Questions about whether farms should be paid for benefits that they have always traditionally provided in the past must be raised. And, should they be rewarded for being a good neighbour and undertaking action to prevent harm to others? Or, should they be paid funds for righting environmental wrongs that they have caused by being a bad neighbour? Questions like this suggest that the definitions of good agricultural practice are not stringent enough and need to be more clearly defined and enforced. It should also be recognised that standards of good agricultural practice are dynamic; they are subject to technological change and changes in political and social attitudes towards the rights and duties of landowners (Environment Agency 2002).

The House of Representatives (2001) recommended that:

- Landholders have a duty of care to manage the land in their charge in a way that is ecologically sustainable, given the particular geographical location, and based upon latest scientific information;
- That all legislation in all jurisdictions be amended to incorporate this duty of care, as a minimum standard of land management;
- All Commonwealth funding for public good conservation activities and ecologically sustainable use of Australia's resources be dependent upon the recipient accepting this duty of care; and
- Activities that fall under the definition of a duty of care are to be funded solely by landholders. Activities that are beyond a landholder's duty of care are to be funded by society as a whole.

In the past Governments have often made the decision that past activities, even if they exceeded any definition of duty of care, are not to be paid for. Payments are usually concentrated upon current or future activity, and landholders cannot get credit or payment for past activity. The equity of this situation is questionable, however given the constraints on environmental funds it is not surprising.

### 7.6 Offsetting Future Drainage Scheme Contributions with In-kind Contributions

The brief for the project specified exploring the possibility of offsetting future USE landholders' drainage scheme costs with 'in-kind' or past contributions.

Assessing the value of environmental activities provided by landholders is not an easy task. Landholders have a responsibility to undertake a certain amount of sustainable land management. What this amount is can be debatable. If the value of past environmental activities of farmers in the USE (as depicted in Table 7.3) is offset against future drainage share costs, this provision of funding can be perceived to be unfair. This is because Government provides extra funds in one region but not in others. It would be ambitious to suggest that the USE has undertaken land management activities above and beyond those which occur in other regions. Government needs to think long and hard before entering into any agreements over past environmental or in-kind contributions.

### 7.6.1 Future Management Agreements

Management agreements may be struck between the Government and a landholder. A landholder may guarantee to undertake certain environmental activity, at a direct cost to them, in order to be precluded from paying future drainage levies.

There are a few management agreements that have been struck between Government and landholders. Examples include agreements made to receive NHT funding, irrigator-related agreements, national park agreements and heritage agreements.

One scheme that is similar in some respects to the current proposed situation is 'safe harbour' agreements. 'Safe harbour' agreements have occurred in the United States where the agreement guarantees resource owners that they will not become subject to specified legislation due to improvements in specified environmental conditions or outputs that result from their management actions. That is, if landholders spend a lot of their own money undertaking activities that have high public benefits then they are not subject to changed legislation at a later point of time (such as not being allowed to change their land use). This agreement attempts to protect certain types of landholders from future controls by recognising the value of their current contribution (Whitten and Bennett 2001b).

Any future management agreements that Government strikes with farmers should attempt to target environmental activities of high significance and value, in order to maximise the benefits from any such arrangement. For example, it may not be in the best interests of biodiversity to spread works out across the area. It may be preferable to target certain areas only. Therefore, landholder contributions may not be limited to their own farm, they may be required to do work around the catchment area. It is beyond the realms of this report to suggest any schemes in detail here, although some areas that exhibit potential have been identified. See Rural Solutions SA (2002a) for more ideas. Some potentially beneficial management agreements may include:

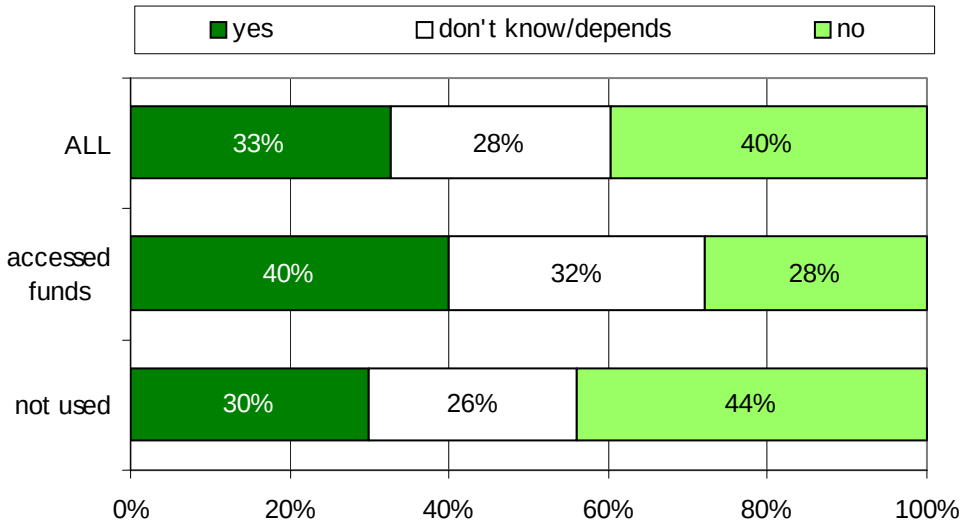
1. *Developing and adhering to a whole farm plan*: This whole farm plan may be similar to the Property Management Planning model, or may be designed to adhere to certain environmental practices;
2. *Revegetating areas along the drainage system*: As well as revegetating along the drainage system, additional land inland could be revegetated to provide a reasonable width; and
3. *Providing corridors to link native vegetation areas*: There are two ways that could help identify where corridors should be placed, either through whole farm plans or DEH identifying specific sites and areas.

When striking any future management agreements, Government should be flexible in regard to some past environmental practices. A number of farmers have undertaken considerable environmental practices (as detailed in our case studies), and there should be some recognition of past outstanding management. Indeed, a management agreement for some farmers may just involve a continuation of their current practice where the environmental benefits are demonstrated to be large.

For any farmers to enter into a management agreement, the benefits of doing so must at least equal or outweigh the costs. For some farmers these costs will be considerably high, as many farmers are averse to striking any management agreement with Government. Not all costs are directly measurable, for example the loss of individual control over an area of their land, the administrative burden and the frustration associated with Government control will increase the cost of any management agreement, above and beyond the direct actual net cost of an environmental activity. Therefore, the benefits received (for example, in terms of offset drainage costs), have to be significant enough for farmers to enter into any such agreements. For some farmers, the benefits may never be high enough. This is illustrated by the heritage agreement (HA) scheme, where some farmers chose not to enter and receive significant financial incentives, even though they no longer received any private return from that area of native vegetation (as the land was managed exactly the same as any land placed under HA). For some, the cost of losing ownership and management because of entering into a Government agreement was considered to be too high a price to pay.

Truscott Research (2002) raised the topic of management agreements offsetting future drainage costs in their survey of USE landholders. Farmers were asked if in principle, would they be willing to participate in such an agreement? The response was mixed, with 33 per cent saying *yes*, 40 per cent saying *no* and the remaining 28 per cent being non committal – even in principle. However, as illustrated in the graph below, those who have previously accessed funding were more likely to be open minded about this concept:

**WILLINGNESS TO PARTICIPATE IN OFFSET AGREEMENT**




Source: Truscott Research (2002)

People who were keen on management agreements with Government were of the opinion that environmental actions (such as revegetation and pasture establishment) provided greater benefits than the drainage system did, and that such an agreement was more equitable than the current situation of drainage levies. But, many were guarded in their response. Most of those giving a 'no' response felt that they would not be affected by future drainage costs, and indeed were puzzled by the purpose of the question asked.

These views and the indirect costs imposed upon landholders must be considered in any future management agreements. There are two main ways that Government could consider offsetting future drainage levies with in-kind contributions. These methods include:

1. *Using Net Costs of Activities as a Proxy for Value*: A management agreement could be struck that allows future contributions to the drainage scheme to be offset against the cost of future (specified) environmental activity; or
2. *Using the Society's estimate of the Value of Environmental Activity*: A management agreement could be struck that allows future contributions to the drainage scheme to be offset against the value of future (specified) environmental activity.

### 7.6.2 Net Costs of Environmental Practices

If the net costs of environmental practices are used as a proxy for environmental value contributed, then a broad range of environmental activities could be considered under a management agreement. Net costs include an estimate of the private benefits that farmers derive from such an activity. That is, only farmers' costs in excess of what they would have incurred without the remedial environmental activity would be eligible to be counted as in-kind contributions.

It has been impossible to fully explore all the costs of all environmental practices given the short timeline of this report. However, some figures are provided in this section to illustrate the costs incurred by farmers for environmental practices. Before any such costs are used in management agreements they need to be confirmed as a few farmers suggest that some these costs are no longer relevant. Some of these environmental practices may be considered in any management agreements struck between Government and landholders. It is important

to note that any management agreement struck by Government should consider the funding available for such activities, plus the private on-farm benefits gained.

**Table 7.4**
**Examples of Some Costs of Environmental Practices**

| Actual Activity | Unit | Cost $ |
|---|---|---|
| ***Native Revegetation*** | | |
| Establishing revegetation | One-off (per ha) | 515-711 |
| Fencing | One-off (per km) | 2,700-3,500 |
| Gross Margin foregone | Annual (per ha) | 747 |
| Capital costs of fencing remnants and revegetation | 1 in 30 yrs (per ha) | 48 |
| Labour costs of fencing remnants and revegetation | 1 in 30 yrs (per ha) | 40 |
| Materials cost of remnant vegetation maintenance | annual (per ha) | 10 |
| Labour cost of remnant vegetation maintenance | annual (per ha) | 6 |
| ***Whole Farm Plan*** | | |
| Establishment costs | per farm average | 988 |
| ***Wetland Activities*** | | |
| Capital costs to improve management of existing wetlands | One off (per ha) | 29 |
| Capital costs to recreate wetlands | One off (per ha) | 58 |
| Capital costs to re-establish wetland or native vegetation | One off (per ha) | 563 |
| Capital costs of fencing existing wetlands | 1 in 30 yrs (per ha) | 70 |
| Labour costs of fencing existing wetlands | 1 in 30 yrs (per ha) | 58 |
| Capital costs of fencing recreated wetlands | 1 in 30 yrs (per ha) | 80 |
| Labour costs of fencing recreated wetlands | 1 in 30 yrs (per ha) | 66 |
| Materials cost of existing wetland maintenance | annual (per ha) | 2 |
| Materials cost of recreated wetland maintenance | annual (per ha) | 2 |
| Labour cost of wetland maintenance | annual (per ha) | 13 |

Sources: Whitten and Bennett (1998), AACM (1998), Zita Stokes (Rural Solutions SA), PIRSA Rural Solutions (2000). Other costs of environmental actions could be derived from Table 7.1.

The benefits that farmers derive from such environmental practices must be considered. One way of establishing the maximum benefits that farmers receive is to use the incentive rates developed by SENRCC (2001), depicted in Table 4.4.

### 7.6.3 Value of Environmental Practices

If society's value of certain environmental practices is used as part of the management agreement, then only certain environmental actions could be included. Before applying the implicit prices, the information needed includes:

- The change in wetland, landscape aesthetics or remnant vegetation;
- The change in number of ducks hunted, and the number of threatened species in the area;
- The population of the region in question and its nearest capital city;
- The proportion of the population that hunts, and the proportion that is non-conservationist; and
- The time-frame that is going to be considered.

The implicit prices have been quoted previously in Section 6. It is suggested that using such a methodology would be information intensive and difficult to implement.

### 7.6.4 Summary of Management Agreements

Government must decide if it strikes management agreements with landholders regarding past environmental action, or if it negotiates new 'in-kind' contributions. It is our view that management agreements should, on the whole, be struck for future planned environmental activity by landholders. Ideally, such future activity should be

above and beyond landholders' 'duty of care'. If Government chooses to recognise past environmental activity, it could establish a precedent for farmers elsewhere to make similar claims for offsets. However, a degree of flexibility is needed in the establishment of any management agreements, so that outstanding environmental management can be recognised and rewarded. Government will have to establish what outstanding environmental management is.

A range of environmental actions should be considered, but Government should establish a ranking of the types environmental activities most desired from society as a whole. Some ideas that would have high public benefit include the development and implementation of whole-farm plans, linking corridors of native vegetation and revegetating areas along the drainage system.

It is probably easier and more encompassing to use costs of environmental practices as a proxy for environmental value created. The work on environmental values is still in its infancy, and only considers a certain section of environmental actions (although these are actions where society's values would be highest).

As discussed earlier, the amount offset from any future drainage components has to be at least equal to, or more than the estimated net environmental cost (both capital and maintenance). Maintenance costs should probably be considered for at least the next five years. The availability and use of Government funds in these activities must also be considered. Government may need to negotiate the gap between future drainage contribution and net cost of environmental activity.

### 7.7 Policy Changes Needed to Encourage Sustainable Land Management and Public Good Conservation

There are many policy changes that could be made to encourage environmental activities and sustainable natural resource management by farmers. It is recognised that the current policy structure could be reformed and that some environmental problems have resulted because of the disincentives that it creates. Farmers have suffered financially (due to degradation of natural resources) as a result.

A first-best solution is to always reform policy at the source of a problem. Just recognising that farmers have suffered, and providing them with a credit in terms of offsetting future drainage share costs is not the most efficient and effective way of dealing with such policy inequities. An objective of Government should be to reform policy, and indeed the House of Representatives (2001) made a number of strong recommendations in this respect. As well as the recommendations that have been previously cited, they included:

- Establishing a rural conservation fund or its like to provide direct financial assistance to landholders to move from an environmentally degrading land use system to an ecologically sustainable land use system in line with a landholder's duty of care;
- Reform the tax system to provide tax concessions for land donations and to remove any current disincentives that have been created and to allow for capital allowances for conservation activities;
- Establish a revolving fund to purchase and manage certain land holdings that have environmental value;
- Rebates to be provided to councils to help encourage conservation activities;
- Enforce/establish legislation to ensure landholders take into account weed/pest activities to reduce incursions into adjoining land;
- Establish an environmental arbitration and adjudication system to resolve disputes
- Examine future market based approaches for alleviating environmental degradation
- Establish a body to provide low interest loans for transition/development to ecologically sustainable management systems.

Whitten and Bennett (2001b) made a number of wetlands policy recommendations, derived from their studies of wetlands in the USE and NSW. Some of these recommendations include:

- Streamline local government processes to facilitate sales of wetlands to conservation groups

- Provide information sources to wetland owners interested in developing compatible alternative enterprises
- Extend rate exemptions to all wetlands managed for conservation outcomes
- Target education and extension programs at wetland owners, to promote conservation and assist in farm management courses and plans
- Remove stamp duty exemption for sales and donations to non-profit conservation groups and on revolving funds sales
- Waive all state government fees on subdivisions for the purpose of conservation
- Provide capital grants to cover part (or all) costs of changing wetland use
- Subsidise inputs to changing wetland management such as revegetation, management advice, equipment and labour inputs
- Use 'Safe Harbour' type schemes to reduce disincentives to rehabilitation of wetlands and remnant vegetation
- Use a 'duty of care' framework to help promote conservation
- Provide information and training resources to help promote NGOs
- Broaden taxation incentives targeted at reducing wetland owners costs of conservation management
- Finance revolving funds to signal wetland conservation values and reduce the search costs of potential private buyers.

Truscott Research (2002) have listed some reasons stated by USE farmers as to what would need to change before they undertook more revegetation activity on their farms. Their answers include:

- financial assistance - (20% of respondents stated this answer)
- money available earlier in project - (10%)
- need more info/should be promoted more - (7%)
- have enough already (would do more if had more land, if current veg died off etc.) - (6%)
- If farm was making more money - (4%)
- cover other activities - (3%)
- council rates rebates - (2%)
- If salinity/erosion got worse - (2%)
- If had water allocation - (2%)
- fewer conditions/restrictions - (1%)
- Other - (5%)
- Total – naming any – (56%)
- Nothing/don't know - (44%)

An article by Stephens (2002) found that the greatest gaps in support, as reported by farmers, in conservation covenants were in the following areas:

1. *Establishment Phase*: labour for on-ground works, advice on non-financial assistance and on funding sources, technical advice on management, advice on the value of the remnant vegetation or habitat to the landholder; and
2. *Ongoing*: labour for on-ground works, access to technical computer/database information, rate rebates/exemptions, field days (links with other landholders), financial assistance for on-ground works, technical notes and publications.

There is no doubt that the above represents only some of the policy changes that could be made to help encourage sustainable land management. Other issues have been raised within the context of this study, and two of the main issues, NHT and council rate changes, have been examined briefly below.

***Changes to Natural Heritage Trust***

Incentive payments, as currently structured, meet the requirements of the NHT guidelines. However, this current analysis and PIRSA Rural Solutions (2000) study of incentive payments across South Australia provides some support to the argument that there needs to be stronger priority setting in the future objectives of the NHT. It could be argued that funding needs to be invested to achieve the biggest return of public benefits, and incentives redirected to activities with high conservation value. This has implications for the level of in-kind contributions by landholders. For certain activities of high public benefits, landholders should not be contributing towards half of the estimated cost of the project. Guidelines should be more flexible to allow for more targeted action of environmental activity to occur. Funding piecemeal activities may be a lot less effective than concentrating an effort in one area.

Also, many farmers have complained that it is their lack of cash flow that stops them from taking up NHT grants (for example, the survey by Truscott Research 2002 reported above has this factor as the second largest reason why farmers do not undertake more revegetation activity). The process is that farmers submit application forms, approvals are given, a signed Agreement is returned, and then it is up to farmers to organise, carry out and complete the works. As soon as works are complete they can request a site inspection. Site inspections are done as soon as possible (usually within 2 weeks) and then it is requested that SELGA/SENRCC send the farmer a cheque (in theory, a cheque can be sent/received within a week of being notified by farmers). On average, it takes 239 days from the time USE farmers sign their Agreement until the day the cheque is sent. It is hard to pay NHT funds directly to contractors or farmers as generally only a proportion of the total cost of works is funded (the exception being fencing for Heritage agreements) (Zita Stokes, Rural Solutions SA, email communication 5/8/02). Therefore, it is hard to suggest changes to future NHT grants to improve the situation of a lack of cash flow. It is suggested that this problem could be lessoned in some cases by landholder organising their time and resources differently.

***Council rate changes – Valuation of Natural Vegetation***

Within the course of this study, queries have been raised about council rates that are paid on areas of native vegetation, even though the farmer is not allowed to clear that land. Such a claim was investigated, and it was found that currently, native vegetation that has a heritage agreement on it does not pay council rates (this land is rated as zero). Native vegetation that is not under heritage agreement is valued by the Valuer General's, but at a lesser rate. This rate is usually established on a case-by-case basis, and depends upon the use of that native vegetation. If it is providing some shelter or grazing benefits, it could be valued at some nominal value. Some areas may be valued at zero value, such as vegetation under heritage agreement (Peter Lornie, Land Services, personal communication, 6/8/02). Therefore, it was found that council rates are paid on native vegetation but these rates are generally proportionate to the value that the native vegetation generates. If the values are thought to be questionable, farmers do have the right to request a review of their property's valuation. Hence, apart from advising farmers of their rights in regards to native vegetation, there is little scope for policy change in this area.

# 8. FURTHER RESEARCH

The tight deadline on this current study has meant that not all costs and benefits of the USEDSFMP could be thoroughly explored. Further research will be needed to estimate the detailed costs, benefits and environmental outcomes of the NAP plan. Facets of this additional research include:

- *Environmental Outcomes of Wetlands*: For example, data on the number and area of wetlands, together with biological indicators such as how the resident species are changing, and how the watering regime of the wetlands compares to that occurring under natural conditions would be useful.
- *Environmental Consequences of Drainage System*: Considerable questions have been raised over some of the environmental consequences of the drainage system. These questions include the dewatering of native vegetation by drains and the unintended effects of holding up water in wetlands. The impact of drains on the runoff relationship needs to be investigated.
- *Evaluate the feasibility of various Management Agreements for Offsetting Future Drainage Costs*: A range of potential management agreements was identified in this study. Before they are implemented, they need to be explored in greater depth. In addition, the value of landholder and native park management agreements should be considered in more detail.
- *Further research on the value that the South Australian community places on biodiversity and the use of benefits transfer from choice modelling results*: Some of the environmental values that this report relies upon had to be transferred from other studies. There would be considerable benefit in conducting further research on environmental values in South Australia, using new modelling techniques such as choice modelling. Sustainable Resources is about to fund such a project, although the budget is yet to be finalised. Another aspect is that there needs to be more consideration and time given to understanding the transfer of values from choice modelling studies. This study has used the latest research on wetland and revegetation values from choice modelling approaches to quantify environmental values. This research is still in its infancy, and given the time constraints of this project, there is a small risk that the numbers have been used incorrectly. Further clarification and testing of results would strengthen/validate any numbers used in this study.
- *Confirm Environmental Activity Costs:* If Government decides to press ahead with management agreements as an offset to drainage costs, the costs associated with environmental activities will need to be confirmed.
- *Investigate new boundaries for the drainage levy*: The development of the drainage system since the conceptual plan has changed considerably. Consequently, some areas, which were previously in zones B to C, may now benefit directly from the drainage system. As such, there needs to be new investigation and consultation over zone boundaries. Indeed, the boundaries of the whole USEDSFMP have changed from its original conception and the boundaries considered need to be reviewed in light of new information.
- *Establish 'Duty of Care' for USE farmers*: Management agreements cannot be successfully struck with landholders unless some consideration is given to what their 'duty of care' responsibilities are. This will be crucial in establishing baselines for environmental activity expected of landholders.
- *Further consideration of how Government policy can be improved to encourage sustainable agricultural practice:* This study has reported some of the changes that have been recommended for natural resource policy. There is a wide range of other policy changes that could be considered that would improve the state of the environment in Australia. Further consideration could be given to the changes required.
- *Estimate the net social benefits from environmental activity*: This study was only asked to estimate what types of environmental works farmers were doing on farms in the USE and place a value on the environmental benefits. This is only one half of the picture. To get a truly accurate value of the net environmental benefits that farmers in the USE contribute, some consideration must be given to the contribution of farmers to environmental problems and their cost.
- *Further research to confirm how the agricultural net benefits to landholders differed from the protracted development of the drainage scheme.* It has not been possible in this study to completely update the benefit cost analyses associated with the drainage scheme, especially at a total catchment level. Indeed, the changed nature of the entire drainage scheme (taking into consideration environmental conditions, changing boundaries, unexpected consequences of drawing down water-tables etc) means that a new BCA should

have probably been developed to estimate how net benefits changed from the scheme. Such an analysis was not possible in the current time frame, so assumptions have had to be made in regards to potential effects on the current benefit cost analysis. This further research could include using the Whitten and Bennett models to estimate a different scenario: the USEDSFMP as the 'with project' scenario vs the 'without project' scenario of what would have happened otherwise. Such models are state-of-the-art and represent a large improvement on previous benefit cost analyses.

# 9. CONCLUSION

This study reviewed and updated the costs and benefits associated with implementing the USEDSFMP; provided information on past and future cost-shares; and identified and valued in-kind landholder contributions.

In order to provide a sound economic basis on which to support all conclusions, this study has sought to establish clear guidelines and principles. Economic principles, not political or social factors, guide all recommendations. Two main strands of the USE plan were reviewed: the drainage component and the USEDSFMP scheme as a whole.

**Drainage Scheme**

The review of past economic analyses found that many costs and benefits of the scheme have not been adequately covered, or are incorrect. Past models were also updated to allow for changes that have arisen since the start of the scheme. The consequence of this revision is that the economic benefits of the drainage scheme have fallen considerably. In particular, the net agricultural benefits are suggested to be a lot less than what was originally thought. On the other hand, the inclusion of environmental values means that the scheme is still economic, but only just.

The original drainage cost share framework (25 per cent landholder, with State and Commonwealth each providing 37.5 per cent) and the development of the drainage levy over four rural zones were also found to not conform to economic analysis guidelines. There are two principles with which cost shares could be allocated: beneficiary and polluter pays.

Given the split of benefits of the drainage scheme (including social and environmental values), on a beneficiary pays basis, landholders should have paid a far larger proportion of the total project costs. A pure beneficiary pays principle suggests that landholders (direct farm beneficiaries only) should have paid 88 per cent of the total costs of the scheme. The expansion of the drainage scheme means that the classification of direct on-farm beneficiaries needs to change as well (some of Zone B landholders become direct beneficiaries). Local urban communities in the USE should contribute at least 1 per cent towards total costs. From this principle, **there is no justification** for landholders in Zones C to D (and some of B) to pay anything towards total costs. State and Commonwealth bodies should theoretically provide, *at the very least*, around 10 per cent of the total costs of the drainage scheme. Taking into account the above, the beneficiary pays principle recommends the following broad cost-sharing framework:

- On-farm (Direct farm beneficiaries) — 88 per cent;
- Local (USE urban community) — 1 per cent;
- State — 5 per cent; and
- Wider — 6 per cent.

An implication of the polluter pays principle is that costs are attributed primarily to parties who caused the salinisation. Costs are therefore not distributed as widely as it would have been under a beneficiary pays principle. Commonwealth funding is restricted to the percentage of outside contribution.

In order to implement the polluter pays principle effectively; information was gathered on who contributed to the problem in the first place. Using this information, then an application of the polluter pays principle means that Zones B, C, D should pay no more than 19 per cent of the total costs of the project. Commonwealth funding should be sought for around 11 per cent of the total costs and Zone A should fund 71 per cent of the total costs.

**Drainage Cost Sharing Framework under a Polluter Pays Principle**

| Area | Contribution towards Problem % |
|---|---|
| Zone A | 71 |
| Victorian farmers/outside funding | 11 |
| Zone C | 9 |
| Zone B | 6 |
| Zone D | 3 |
| **TOTAL** | **100** |

Note: Totals do not add due to rounding. More contribution could have been attributed to Zone A.

The lack of scientific information about the landholder contribution to the salinisation problem in the study area means that a polluters pays principle could not be applied with any level of certainty. Indeed, it is questionable whether it should have ever been used as a principle in determining drainage levies. Therefore, it is our recommendation that a beneficiary pay principle is used to allocate cost shares.

Allowances were made for the rate of return that farmers may require before going ahead with any farm action, and this decreases the costs that they should share. The cost shares could now range from:

- On-farm (Direct farm beneficiaries) — 42 to 88 per cent;
- Local (USE urban community) — 1 per cent;
- State — 5 to 29 per cent; and
- Wider — 6 to 29 per cent.

**USEDSFMP Scheme as a Whole**

An analysis of the original USEDSFMP over a 30-year time-period suggested that the landholder contribution be no more than 47 per cent. Taking into account the changes in drainage contribution; the level of public and private benefits of certain environmental activities, and the incentive rates farmers need to be paid to undertake such activities, the future proposed landholder contribution to the USEDSFMP was suggested to range from 44 to 65 per cent. It is estimated that landholders' are currently paying around 43 per cent of the USEDSFMP scheme, therefore they are contributing the minimum recommended amount to the scheme.

Theoretical cost shares, estimated from various economic principles, forms a starting point basis for negotiation with landholders. When it is time to negotiate with landholders, Government must consider other issues such as capacity to pay, in-kind contributions, original scheme agreements, consultation process with landholders and delays suffered.

**Environmental Benefits of USEDSFMP**

Calculations have been made in this report to estimate the value of USEDSFMP environmental activity. It was assumed that the scheme provides net environmental benefits. These environmental values include:

- the non-market value associated with increases in healthy wetlands is $8.3 m;
- the value of planting 41,000 hectares of native vegetation is estimated to be approximately $18.9 m; and
- the value that the wider community gains from aspects of protecting agricultural production is $5.45 m.

Where applicable, the above values have been captured in the development of the beneficiary pays principle of the drainage scheme. A value was also placed on landholder environmental activity, via costs incurred and value generated. Such estimates do not represent net environmental values as no allowance has been made for the cost of environmentally degrading actions.

**Policy Implications for Future Agreements**

The current situation represents a real opportunity for Government to establish long-term, environmentally beneficial agreements with landholders, which may serve as a model for other regions to implement. The importance of revegetation and pasture establishment must be highlighted, and implemented within the region.

Government must decide if it strikes management agreements with landholders regarding past environmental action, or if it negotiates new 'in-kind' contributions. There are questions to be answered over what activities should be included in any management agreement, and how should they be costed? This report has made a number of suggestions in this area. It is our view that management agreements should, on the whole, be struck for future planned environmental activity by landholders. Ideally, such future activity should be above and beyond landholders' duty of care. A 'duty of care' standard must be established to provide the baseline for management agreements. If Government chooses to recognise past environmental activity, it could establish a precedent for farmers elsewhere to make similar claims for offsets. However, a degree of flexibility is needed in the establishment of any management agreements, so that outstanding environmental management, above and beyond 'duty of care', can be recognised.

Further research has been identified in this study. One of the areas that would complement this study's conclusions are the changes needed to Government policy, to ensure that farmers across SA and Australia are treated equitably and encouraged proactively to implement sustainable agricultural practice.

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# GLOSSARY

**Additionality** The extent to which an activity represents a net increase (for example over and above any compensating reductions elsewhere). In regeneration terms, created jobs are additional only if they do not displace jobs elsewhere (displacement) or represent jobs that would have been created anyway (dead weight).

**Alternative** A possible course of action, in place of another that would meet the same purpose and need of the proposal.

**Assessment** An assessment is an activity designed to document the known facts about costs and benefits of an individual project, programme or policy, and to comment on the balance between them. It contains different options of achieving a stated aim, including the 'do nothing option', and results in the identification of the preferred option. An assessment should take into account and build upon the following:

- the technical feasibility of alternative options, including 'do nothing' or 'do the minimum' options;
- the results of any environmental impact assessments; and
- any assessments of risks, where these may include financial, engineering, environmental or human health risks.

An assessment may be qualitative, semi-quantitative or fully quantitative in form. A quantitative assessment may involve the monetary valuation of environmental, human health and other social costs and benefits, where cost benefit analysis is being used. Alternatively, it may take other forms, where other appraisal methodologies, such as multi-criteria analysis are adopted.

**Attribute** Characteristic or quality of an environment, which matters for sustainable development because it serves some ecological purpose or provides some service or benefit to humankind. Example - a scent garden in a park is a feature, which may have all the following attributes: providing visual delight for sighted people, olfactory delight for blind people, the source of honey for a local whole food business and a habitat for insects. The core idea of the approach, set out in this report, is that one feature may have many different attributes, each of which provides a different service, and each of which needs to be managed in a different way.

**Benefit Cost Analysis (otherwise known as Cost Benefit Analysis)** A term used to describe analysis which seeks to quantify in money terms as many of the costs and benefits of a proposal as possible, including items for which the market does not provide a satisfactory measure of economic value. The expression is sometimes confined to these monetary costs and benefits alone and sometimes used to describe an analysis of all the welfare costs and benefits.

**Benefits** The benefit of a project, programme or policy is the positive, expected aspect of an outcome, including the improvement in environmental protection or environmental quality, which will flow from it, but also including other improvements - for example, in cost savings, social benefits, such as health, convenience, or general welfare.

**Benefits Transfer** The method of transferring benefit estimates from past valuation studies to the present study, in order to reduce appraisal costs. The validity of the approach depends on the degree of similarity between the various studies and the quality of the benefit estimates, contained in past studies.

**Choice Modelling** A stated preference method of economic valuation where respondents evaluate a number of different options or scenarios. Each option has varying levels of attributes, taken from a common set. Respondents express their preference by making a choice between options.

**Community** It is not easy to agree a general definition, indeed almost every source in the literature varies. It has been described as '. . . total ways of life, complexes of behaviour . . .'. There are clearly different types of community, eg. regional, national, rural, urban, ethnic, status community. There are planned and unplanned communities, stable growth and rapid growth communities, disrupted or disturbed communities, declining communities. It is generally agreed that a community, whatever the type, has: (a) distinctive space or territory; (b) a specialised authority system; (c) distinctive patterns of social interaction; (d) commonly held symbols and feelings that bind members. In short, a community has elements of territory and function. Making reliable predictions of community behaviour can be a challenge.

**Contingent Valuation** Determination of willingness to pay, through use of structured questionnaire in which respondents answer yes/no to suggested prices (dichotomous choice) or provide a willingness to pay number themselves (open ended).

**Cost Effectiveness Analysis** A technique which seeks to identify how to meet. A particular objective, at least cost. It enables prioritisation between options, but ultimately cannot assess whether an option is

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| | economically worthwhile. |
| **Costs** | This includes 'costs to any person and costs to the environment'. The costs of a project are the opportunity costs - the full value of any resource in its best alternative use. This may be estimated by the financial expenses incurred by an operator or proponent in meeting the requirements placed upon them by the authorising body, or any expenses incurred in undertaking its actions. Similarly, the cost of a programme or policy is the expected financial expense of implementing the programme or policy by those it will affect. Costs also include any environmental, human health or other social impacts, which are detrimental in nature. Costs include any capital and recurrent expenditure, administrative costs, monitoring and enforcement costs, and research and development costs. |
| **Counterfactual** | The 'base case' or counterfactual is a statement of what would have happened without policy intervention, or if the policy intervention had taken a different (but specified) form. Any evaluation of a policy's effects should be made relative to what would otherwise have happened. Usually it is not enough to describe the starting position or 'baseline' since this is likely to change over time. |
| **Dead Weight** | Expenditure to promote a desired activity, which would in fact have occurred without the expenditure, and output that would have occurred anyway, without any policy intervention. |
| **Discounting** | The technique of applying a discount rate to convert future monetary amounts to their equivalent value in today's terms. |
| **Displacement** | The extent to which the extra output (or demand on resources), resulting from a policy intervention, leads to less output (or less supply of resources) from/to other firms in a given area (or industry). The amount of displacement will depend on how widely or narrowly the area (or industry) is drawn. At the national (Australia wide) level, if all industries are taken into account, displacement equates to crowding out. |
| **Do Nothing/Business as Usual/Without Project Scenario** | The predicted future environmental conditions, which would exist in the absence of any policy changes - also known as the business as usual or without project scenario. |
| **Economic Appraisal** | Appraisal or evaluation, which takes into account a wide range of welfare costs and benefits of options. How wide, depends upon the context; it may include all welfare costs and benefits, or all those, which affect GDP, or all those, which can be valued in monetary terms. |
| **Economic Efficiency** | Describes a situation where the total value of the end uses, to which the resources are put, is maximised. A consequence is that all resources will be put to their highest value uses. |
| **Economic Instruments** | Financial rewards, incentives and punishments that operate automatically via market forces, to encourage beneficial behaviour. |
| **Economic Value** | The monetary measure of the wellbeing associated with the change in the provision of some good. It is not to be confused with monetary value, unless the latter is explicitly designed to measure the change in wellbeing, nor with financial value, which may reflect market value or an accounting convention. The terms 'economic value' and 'welfare change' can be used interchangeably. |
| **Equivalent Annual Cost** | The constant annual cost (or annuities value) which is equivalent to cost (ie. has the same present value as) a project's actual costs. |
| **Externality** | An externality exists when the actions of one individual affect the wellbeing of other individuals without any compensation taking place. For example, the discharge of a CSO (combined sewer overflow) will be a negative extemality to informal recreational users to the extent that it will lead to an aesthetic degradation of the river corridor, for which they will not receive any financial compensation. |
| **Multi-Criteria Analysis** | Analysis of decisions in a context where there are multiple goals (objectives) that cannot usually be reduced to a single monetary measure. MCA seeks to identify those combinations of outcomes that are dominated by other combinations, and to show the trade-offs between the final set of potentially 'efficient' combinations. |
| **Multiplier** | The second round effects on the level of economic activity (output, income or employment), associated with a policy intervention (eg. where the employees of a new project spend their earnings and so increase consumer demand). There are several types of multiplier (income, local, long run, short run and supply) that are often estimated. The size of the multiplier depends on the time period over which it is measured, and the geographical area considered. |
| **Opportunity Cost (or Economic Cost)** | Value in most valuable alternative use. |
| **Present Value** | The capitalised value of a stream of future costs or benefits. The term 'net present value' (NPV) is often used to describe the difference between the present value of a stream of costs and a stream of benefits. |
| **Scenario** | A description of environmental and development conditions at a certain time to allow comparisons of change (eg. pre-development, current, and reasonably foreseeable). |
| **Stakeholder** | The term 'stakeholder' here is given to mean anyone with an interest in those who will be |

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| | impacted by the option in question. It is partly used in order to avoid the term 'the public', as this may give the impression of homogeneity amongst citizens, which has a detrimental effect when trying to characterise opinions and values. However, it is recognised that others have used the term 'stakeholder' specifically to mean those people who represent certain groups, with an organised interest in the decision. |
| **Stated Preference** | A method to value benefits or costs for which market prices do not exist. This involves deriving underlying valuations from individuals' answers to questions about the choices they would make between different hypothetical alternatives. The term 'stated preference' is often used with regard to choices in the transport sector to derive valuations of different types of travel time. |
| **Total Economic Value** | Total economic value of an environmental resource is made up of (i) use values and (ii) non-use values. Use values are composed of (a) direct use value, (b) indirect use values and (c) option values, whilst non-use values are made up of (a) altruistic, (b) existence values and (c) bequest values. |
| **Travel Cost** | A valuation method in which travel costs are used to impute a demand curve for recreational benefits. It is based on the assumptions that people spend more on travel to sites with high environmental or other values. |
| **WTP** | 'Willingness to pay' for an environmental gain. |

# APPENDIX ONE
# GUIDELINES FOR BCAS

The following guidelines are sourced from the Department of Finance (1997), Department of the Treasury (1997) and Sinden & Thampapillai (1995).

- Include only extra outcomes: The extra benefits or extra costs from the project should be included, not the total benefits or costs.
- Exclude Sunk Outcomes: Sunk costs and benefits do not change net social benefits of new projects, and they should be excluded
- Exclude Common (or fixed) costs: Common, or fixed, costs do not change the net benefits between alternatives and so they should be excluded
- Exclude transfer payments (where payments are not made in return for some productive service). Transfer payments do not measure benefits from goods, or costs of inputs, hence should be excluded.
- Take care with Taxes and Subsidies: Taxes and subsidies should sometimes be included and sometimes be excluded, depending on the choice of assessment population
- Check Government Charges: Include government costs at their true opportunity costs
- Avoid Double Counting: Do not include an outcome more than once – because an outcome changes net social benefit only once
- Exclude international outcomes: For primarily local or national projects, exclude benefits and costs that accrue outside the national border
- Consider changes in asset Value: For a project that has a finite life, include annual outcomes until the end, include replacement costs and when they occur, and include any change in asset value at the end of the project. For a project with an infinite life, include annual outcomes over the whole life and include any replacement costs, which are necessary to maintain asset value, as and when they occur
- Distinguish private from Social Outcomes: Benefits and costs that are relevant to a private firm or private household may not be relevant to society – and vice versa
- Include Externalities: Theoretically all externalities should be identified, valued and included, because they are real changes in net social benefit, however funds may limit valuing externalities.
- Consider Secondary benefits and Secondary Costs: In a competitive market, there are no real secondary benefits and costs so none should be included. But equally, in non-competitive markets secondary outcomes can exist and so should be identified and included. If production increases in a region without imposing opportunity costs elsewhere, then flow-on effects may be considered. This may occur in a region with large labour or surplus factory capacity.
- Include Unpriced Outcomes: Unpriced benefits and costs are real changes in net social benefit. So they should be identified, and included in the analysis.

# APPENDIX TWO
# PROBLEMS IDENTIFIED BY THE SA CENTRE FOR ECONOMIC STUDIES

The following was summarised in the report by the SA Centre for Economic Studies titled "A Review of the Economic Evaluation Tools Used by Community Groups to Justify Economic Investments in Natural Resources Management in South Australia" (1999). The most common problems that the Centre encountered with the BCAs were:

- Poor specification of 'Without project' scenario. A 'without project' scenario should always be used instead of a 'do nothing' scenario, because it is reasonable to expect that some action will be taken in the future to address the problem.
- Multipliers derived from input-output analysis used in estimating project benefits. Guidelines for BCA clearly state that multipliers should not be used. See Sinden *et al* (1995) for further comment.
- Changes to the Capital value of land used annually. Again, guidelines state that this should not be done in BCAs.
- Traded values for permanent water licences used to estimate annual changes to water availability. Permanent water licences represent the stream of profits that irrigators would expect to gain from the use of that water over several years, hence do not represent an annual value.
- Both changes to land value and production used to estimate annual benefits or costs. This implies double counting, because land values are based on their production possibilities.
- Inappropriate application of 'Benefits Transfer' Method for estimating changes to the values of environmental attributes. There was misuse of the benefits transfer method for placing values on environmental attributes. Some such values include the use of 'heritage value'. There have been four very clear guidelines established which must be met before the 'benefits transfer' method can be applied (see NSW EPA website). These are:
  - the primary study cannot be fundamentally flawed;
  - the study site and the policy site need to be similar;
  - the environmental change at the policy site needs to be similar to the environmental change at the study site; and
  - the socio-economic characteristics of the populations and other details need to be similar.
- Absence of sensitivity testing. All key assumptions should be tested in a BCA.
- Care must be taken with the choice and use of a population base for the BCA. The population should be realistic.

# APPENDIX THREE
# HERITAGE AGREEMENT

The Heritage Agreement Scheme was first introduced in 1980. At first it was a voluntary, cooperative scheme that provided incentives to landholders to participate (grants covered the cost of local government grants and stockproof fencing). After the first two years of operation, 15,000 hectares had been committed to the scheme, with an average of $30 per hectare paid as incentives (Harris 1996).

The scheme had limited effectiveness, as the clearance rates remained high. For example, between 1974 and 1981, 51% of the vegetation on farmland was cleared in the Upper and Lower South East. The Government introduced formal regulations in 1983 that required planning approval for land clearance, and further changes were made in 1985 with the introduction of the Native Vegetation Management Act. The cost of retaining vegetation was divided as follows:

- Landholders would retain up to 12.5% of a given property without compensation (which can be waived on biological grounds)
- Local government would not charge rates on heritage agreement land
- State government would provide financial assistance equivalent to any reduction in the market value of the land resulting from a clearance decision. Government would also bear the costs for fencing areas and some management costs for pest and animal control.

The program was refined in 1991. Over 500,000 ha of remnant vegetation has been protected, with average incentive payments around $130 a hectare (Harris 1996).

Information was sought to find out if land placed under heritage agreement in the USE differed from other regions in SA. Unfortunately, time constraints did not allow this comparison to be made.