Little River Catchment Best Management Options: Cost Benefit Analysis

Prepared for

Little River Landcare Group

SUMMARY

Prepared by

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SUMMARY REPORT

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Contents

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1. INTRODUCTION

Little River Landcare Group has undertaken a comprehensive Catchment Planning process which identified up to 20 Best Management Options (BMO's) to achieve specified natural resource management objectives and targets throughout the catchment. These BMO's have been assessed, and different targets set, for each of nine Land Management Units (LMU's) which describe the varying landscapes of the Little River region. These LMU's are largely based on soil type. For a full report of the LMU's, objectives, targets and the basis for development of the BMO's, see Donaldson 2001 – Stage 2 – Little River Catchment Plan.

2. BACKGROUND TO THIS COST BENEFIT ANALYSIS

Little River Landcare saw the need to evaluate the relative costs and benefits to Little River landholders and the broader community, of implementing the BMO's suggested in the Catchment Plan. This step was seen to be essential to enable the Landcare group and landholders to decide where investment should be targeted and to provide a basis for determining cost sharing arrangements between individual landholders and the government on behalf of the broader community. Hassall & Associates were contracted to conduct such an analysis on 14 of the highest priority BMO's across five of the major LMU's which account for approximately 75% of the area of the Little River Catchment. The following table (extracted from Donaldson, 2001) summarises the BMO's and their relevance to each of the major LMU's.

Best Management Option	**Red Brown Earth**	**Non Calcic Brown**	**Siliceous Sands**	**Riparian**	**Red Podzolic**
1. Match land use to land capability	✓✓	✓✓	✓✓	✓✓	✓✓
2. Reduce fallow length	✓✓	✓✓			✓
3. Crop-pasture rotations	✓✓	✓✓			✓✓
4. Conservation farming	✓✓	✓✓			✓
5. Strategic / rotational grazing	✓	✓	✓✓	✓✓	✓
6. Perennial mixed pastures	✓✓	✓✓	✓✓	✓✓	✓✓
7. Native pastures			✓✓	✓✓	✓
8. Diversity – nature conservation and habitat enhancement	✓	✓	✓	✓✓	✓
9. Farm forestry / agroforestry		✓	✓		✓✓
10. Strategic tree planting	✓✓	✓✓	✓✓	✓✓	✓✓
11. Vegetation conservation	✓	✓	✓✓	✓✓	✓
12. Ameliorants (eg: liming)	✓✓	✓✓	✓✓		✓✓
13. Buffer strips for riparian zones				✓✓	
14. In stream management				✓✓	

✓✓ - designates a perceived high priority for that LMU.
✓ - designates that the BMO is beneficial for that LMU.

Hassall & Associates reviewed published information (eg: Watson *et al*, 2001 – Sustainability Profile for the Little River Catchment) and consulted with landholders in the Little River region as well as professional staff in NSW Agriculture and the Department of Land and Water Conservation

and developed "model" farm enterprises for each of four sub-catchment regions. These models reflected the productivity and profitability of a range of cropping and livestock enterprises, the proportion of farms devoted to different enterprises, the current levels of tree cover and average and range of farm sizes. The four sub-catchment regions were Baldry district, Yeoval district, Cumnock district and the Suntop / Arthurville area.

A detailed description of the characteristics of these enterprises and the economic and productivity assumptions used in our modelling, is given in our full report.

3. RESULTS OF THE COST BENEFIT ANALYSES

Hassall & Associates are confident that they have accurately estimated the costs of implementing each priority BMO by the targeted proportion of landholders or on the targeted proportion of each LMU area within the Little River catchment. In many cases, these costs are both direct costs (eg: for fencing or planting perennial pastures or trees) and opportunity costs. This latter cost is where a landholder changes from one form of landuse (eg: cropping) to a less profitable form of landuse, in order to achieve natural resource conservation goals.

The quantification and financial valuation of many of the benefits of implementing BMO's has been much more difficult. Where a BMO has a direct and tangible benefit on on-farm productivity (eg: crop or pasture responses to liming) we have been able to financially quantify that benefit. Where the benefits of implementing BMO's are predicted to impact on biophysical parameters such as watertable recharge, salinity, erosion, water quality and biodiversity, we were faced with two difficulties:

- quantifying the physical magnitude of these changes (very little local data or modelling results are available); and

- financially valuing the changes.

Our full report refers to a number of examples from published literature where attempts have been made to quantify and financially value environmental outcomes. In the absence of dollar values being placed on these environmental outcomes in this analysis, the cost estimates for the actions to bring about these environmental outcomes will provide an excellent starting point for the Little River community and government (as potential investors in these actions) to ask and answer the following important questions:

- ***"Am I prepared to pay this identified cost to achieve a certain environmental outcome?"; and***

- ***"Is the environmental outcome we are seeking of sufficient value to the whole community, to justify incurring this identified cost?"***

The following table summarises the total costs and, where available, total financial and non-financial benefits, of implementing each BMO to achieve the outcomes targeted in the Little River Catchment Plan. Financial values are presented in the form of Net Present Values (NPV). This parameter accounts for:

- total expenditure and total financial returns over the 10 year period of the Catchment Plan; and

- applying a standard inflation factor to expenses incurred in future years and a standard discount rate to income received in future years.

Best Management Option	NPV costs ($ million)	NPV benefits ($ million)	Non-financial benefits
1. Match land use to land capability	41.2	2.8	Improved water quality Reduced salinity Improved biodiversity
2. Reduce fallow length	1.4	*	Reduced recharge Improved water quality
3. Crop-pasture rotations	1.3	*	Reduced recharge Improved water quality
4. Conservation farming	0.5	*	Improved biodiversity Improved water quality
5. Strategic / rotational grazing	2.2	*	Reduced recharge Reduced salinity Improved water quality
6. Perennial mixed pastures	0	*	Reduced recharge Reduced erosion Improved water quality
7. Native pastures	0	*	Reduced recharge Improved biodiversity
8. Diversity – nature conservation and habitat enhancement	0.2	0.2	Improved biodiversity
9. Farm forestry / agroforestry	7.5	*	Salinity mitigation Improved biodiversity Improved water quality
10. Strategic tree planting	20.7	*	Salinity mitigation Improved biodiversity Improved water quality
11. Vegetation conservation	2.5	2.4	Improved biodiversity
12. Ameliorants (eg: liming)	17.5	57.0	Reduced recharge Reduced erosion Improved water quality
13. Buffer strips for riparian zones	2.7	*	Improved water quality Improved biodiversity Aesthetic beauty In-stream habitat
14. In stream management	0.8	*	Improved water quality Improved biodiversity Aesthetic beauty In-stream habitat

* - financial value of benefits not calculated

Main Messages from the Table of Costs and Benefits

- Matching land use to land capability is a high cost series of actions; particularly involving high opportunity costs for landholders to reduce cropping and grazing in favour of trees.

- BMO's 2, 3, 4 and 5 are all relatively low cost actions to adopt management changes. However, the production and profitability benefits are equivocal and sometimes difficult to quantify.

- Strategic tree planting at a large scale and agro-forestry are expensive and the income benefits from forestry are in the long term and somewhat uncertain in this environment.

- Liming - the apparent benefit : cost ratio is high. Incentives in the form of interest free loans may help overcome the initial cost barrier to more widespread adoption.

- Protecting and enhancing diversity and vegetation conservation involve high fencing costs. The value of benefits shown are very subjective community valuations.

- Buffer strips for riparian zones and in-stream management – it needs to be noted that fencing and other action is quite targeted. Not all streams are involved.

Other comments about Costs and Benefits

- Some examples from the literature of attempts to financially value environmental outcomes include:

  - previous studies (eg: Lockwood and Carberry, 1998) have indicated that NSW households, on average, value a 1% increase in abundance of threatened or endangered native species at between $1.69 and $11.39/household, and an increase of 10,000ha of native vegetation conserved is valued at $3.80/household. There are approximately 2 million households in NSW;

  - the estimated value of carbon credits produced by forestry in the 400 to 600mm rainfall zone (30 year production cycle) is $300/ha planted (in iCAM 2002 – Plantation Forestry Economics for the Lachlan and Macquarie Catchments); and

  - the estimated value of salinity credits from forestry in the Macquarie Catchment range from a negative value on heavy clay soils up to $450/ha planted with an average of around $260/ha (in iCAM 2002).

- Another benefit arising from implementing a number of the BMO's which impact, for example, on reduced recharge and salinity, is the avoidance of loss of crop and pasture production which may occur if nothing is done and salinisation continues to affect more land. This has not been valued in the current analysis, but an indication can be gained from the following. Based on expected increases in area of land affected by salinity in the Macquarie Catchment (National Land and Water Audit, 2000) the area of salinity affected land in the Little River Catchment might be expected to increase from an estimated 5,000ha now to approximately 7,000ha in 10 years. Without taking into account the reduced capital value of salinised land, the value of foregone profitability (gross margin) is approximately $2.6 million over 10 years.

4. CONCLUSIONS

The total cost over 10 years of implementing all priority BMO's to the levels targeted in the Little River Catchment Plan would be approximately $100 million or approximately $380/ha over the whole catchment. We have valued the flow of tangible, financial benefits at approximately $60 million, the majority of this being generated from increased crop and livestock returns due to liming on acid soils.

If these financial benefits are fully realised, the net total cost over the 10 years of implementing all priority BMO's would be approximately $40 million, or about $150/ha over the whole of the catchment. Even this is a very significant cost – given the estimate of average whole farm business profits in the Little River of approximately $14/ha (Watson *et al*, 2001). Given the relativity of these last two numbers, it is not surprising that a recent survey of a sample of Little River landholders (Watson *et al*, 2001), found that the primary reason given for not adopting actions to mitigate salinity and other natural resource management problems was that the actions were not perceived to impact favourably on profitability or productivity.

There are likely to be substantial, tangible, if not currently financially valued, benefits to the downstream Macquarie River community, to the Murray Darling Basin and to the community in general of the environmental outcomes arising from implementation of the BMO's in the Little River Catchment Plan. These benefits are primarily from:

- improved water quality; and
- improved biodiversity

The challenge to the government, on behalf of the beneficiaries of these broader benefits is to determine if these benefits are valued at up to $40 million, the net cost of producing those benefits.

From a local point of view, the Little River Landcare Group faces the challenge of identifying which BMO's ought to be targeted as priorities for implementation of the Catchment Plan. From the perspective of this analysis, we suggest the following framework for assessing the priorities for implementation:

(a) Is implementation of the BMO to the targeted level, achievable - given the skills, attitudes, risks and level of advisory support available to landholders?

(b) Is implementation of the BMO affordable - through direct landholder investment and the capacity of the group to attract "outside", government funds on behalf of the whole community?

(c) Implementation of which BMO's will have the most tangible, on-farm and off-farm benefits?

(d) Is this action consistent with the priorities of the Central West Catchment Blueprint?

We have intuitively assessed all priority BMO's against this framework in the following table.

Best Management Option	Achievable	Affordable	Tangible Benefits	Consistency with CMB Priorities
1. Match land use to land capability	✓	✓	✓	✓✓
2. Reduce fallow length	✓✓	✓✓	✓	✓
3. Crop-pasture rotations	✓	✓	✓	✓✓
4. Conservation farming	✓✓	✓✓	✓	✓✓✓
5. Strategic / rotational grazing	✓✓	✓✓	✓✓	✓✓
6. Perennial mixed pastures	✓	✓✓	✓✓	✓✓✓
7. Native pastures	✓	✓✓	✓	✓
8. Diversity – nature conservation and habitat enhancement	✓	✓	✓	✓✓
9. Farm forestry / agroforestry	✓	✓	✓	✓
10. Strategic tree planting	✓✓	✓	✓✓	✓✓
11. Vegetation conservation	✓✓	✓✓	✓✓	✓✓
12. Ameliorants (eg: liming)	✓✓	✓	✓✓✓	✓✓
13. Buffer strips for riparian zones	✓✓	✓✓	✓	✓✓
14. In-stream management	✓	✓	✓	✓✓

On the grounds of this analysis, the following BMO's appear to offer the best outcomes in terms of costs, benefits and achievability:

- Use of soil ameliorants
- Strategic / rotational grazing
- Native vegetation conservation
- Conservation farming
- Perennial mixed pastures
- Strategic tree planting
- Buffer strips in Riparian zone.

The total cost of implementing this subset of BMO's is estimated at $46 million over 10 years. Subject to achieving the full value of benefits from liming, the analysis indicated that these actions are likely to return Little River landholders a profit over 10 years of approximately $13 million, before valuation of less tangible environmental outcomes.