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**The Economic Language
of Landcare**

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1. Landcare: a public and private problem¹

This report is written for two audiences -- Landcare participants and policy makers concerned with Landcare. These audiences view Landcare from different perspectives and, to some degree, use differing concepts and terminology to describe it. The objectives of these two groups also differ. Broadly speaking, the objectives of Landcare participants is to improve land management to the extent that it benefits land-holders now and in the future. The objective of policy makers is broadly to advance society's interest in seeing the land well managed.

As a result of these varying objectives and ways of viewing Landcare, the methods of evaluating Landcare -- that is, deciding what are the advantages and disadvantages of Landcare activities and determining the extent to which the advantages outweigh the disadvantages -- differ. In other words, different groups ask different questions about Landcare.

It will be useful to specify three types of analysis that might be undertaken:

Financial analysis: this is the level of analysis relevant to the bank manager asked to lend money to a land-holder to finance activities to overcome land degradation. The question is this: will the increased money income from improved land management exceed the financial costs by enough to allow repayment of the loan on time?

Economic analysis: this is the level of analysis at which government policy makers and economists have traditionally operated. It goes further than a financial analysis in trying to take account of the impacts of Landcare on society as a whole, including land-holders. The question is this: given competing demands for government funding, is public funding of Landcare generating an adequate economic return to the taxpayer? Just what constitute an 'economic' return is discussed in this paper.

Sustainability analysis: this is the level of analysis at which government policy makers are moving to in response to the idea of sustainable development. It goes beyond the traditional boundaries of economics and brings in ecological constraints on land management. The question is this: to what extent is Landcare contributing to the long-term management of the land so that each of the range of functions it serves are sustained?

While financial analysis and economic analysis are commonly carried out and well understood, sustainability analysis is only now being developed in response to a changing understanding of the role of the land. As a result this paper can only provide an outline of some of the important elements.

Where does the land-holder fit into this? The land-holder is especially concerned with the first and the third forms of analysis, but adds some new elements as well. Section 4 of this paper explores the objectives of land-holders in more detail. Before we get to that it will be valuable to explain how land degradation has traditionally been evaluated in the economic framework.

¹ I would like to acknowledge the very valuable comments received from Colin O'Keefe.

2. The economic approach to land-use decisions

The traditional economic approach to land use focuses on the productivity of land as an income-generating asset. The objective of land management is then to choose the resource use that maximises the net returns of using the asset.² The net income from a unit of land depends on three main factors: the cost of agricultural inputs (labour, fertiliser, tractors, interest on capital, etc.), yields or outputs per unit of land area, and the prices of outputs.

In the economic approach, land degradation is seen as a problem because it leads to long-term loss of agricultural productivity (or requires more inputs to maintain yields). This loss of output is the 'opportunity cost' of land degradation, that is, what is given up in order to have the 'benefits' of land degradation, which can be thought of as higher output in the short term. The costs of degradation include on-site costs (lost output on the land in question) and off-site costs (such as effects on water quality).

Conserving the land involves costs, such as the costs of earth works, additional farm planning, changes in cropping patterns, and so on. This leads to the idea of the net benefits (benefits less costs) from conservation activities, as shown in the formula below (Walpole, Sinden and Yapp 1992, p. 25):

$$\text{Net benefit of conservation} = \text{Increase in value of agricultural production} + \text{Reduction in off-site costs} - \text{Costs of conservation}$$

It is important to recognise that these costs and benefits occur at different times. In particular, we might expect that once a decision has been made to undertake conservation activities, the costs will occur mostly in the first couple of years while the benefits (in terms of improved productivity) may begin slowly but grow over the years. Output may actually fall in the short term as stocking rates are reduced and marginal land is left fallow. This general situation is illustrated in the figures below. Figure 1 shows an improvement in productivity (output from a given area of land) due to conservation measures compared to declining productivity due to unrepaired land degradation.

Figure 2 translates the physical outputs of Figure 1 into incomes (for given agricultural prices) and takes into account the fact that expenditures will be necessary to achieve improvements in productivity. Without conservation activities, net incomes will decline over time as the land degrades further causing falling yields or increasing input costs. It is likely that in the first years of conservation activity the improvements in productivity (if there are any) will be insufficient to outweigh the additional costs, but that as time proceeds the reverse will be the case.

² For an extremely useful analysis of the costs and benefits of land degradation in Australia see Walpole, Sinden and Yapp (1992), which is used here as a 'template' for the traditional economic approach.

Figure 1 Output per hectare with and without conservation

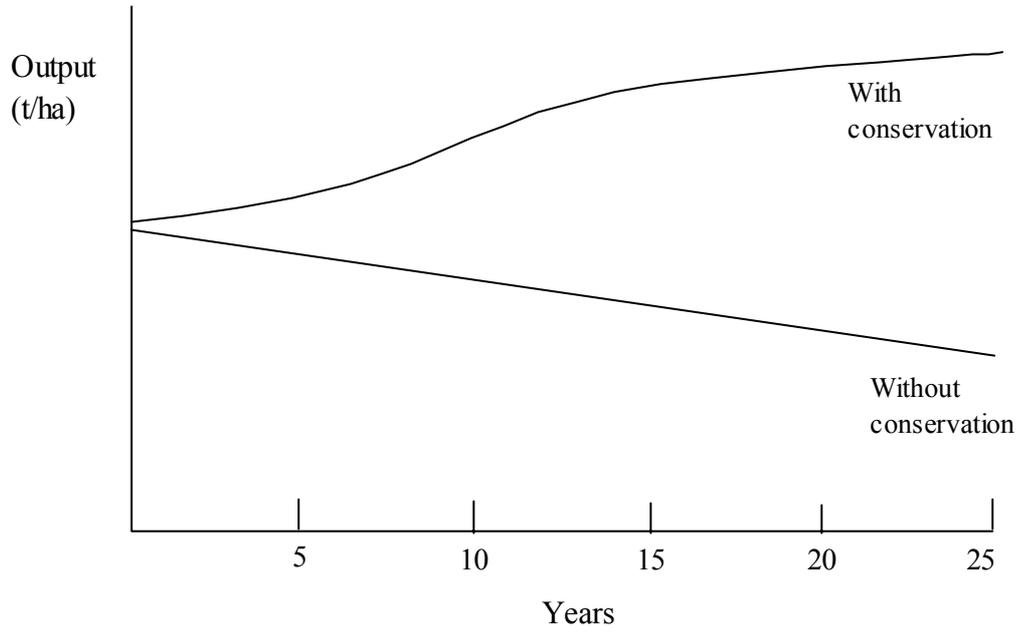
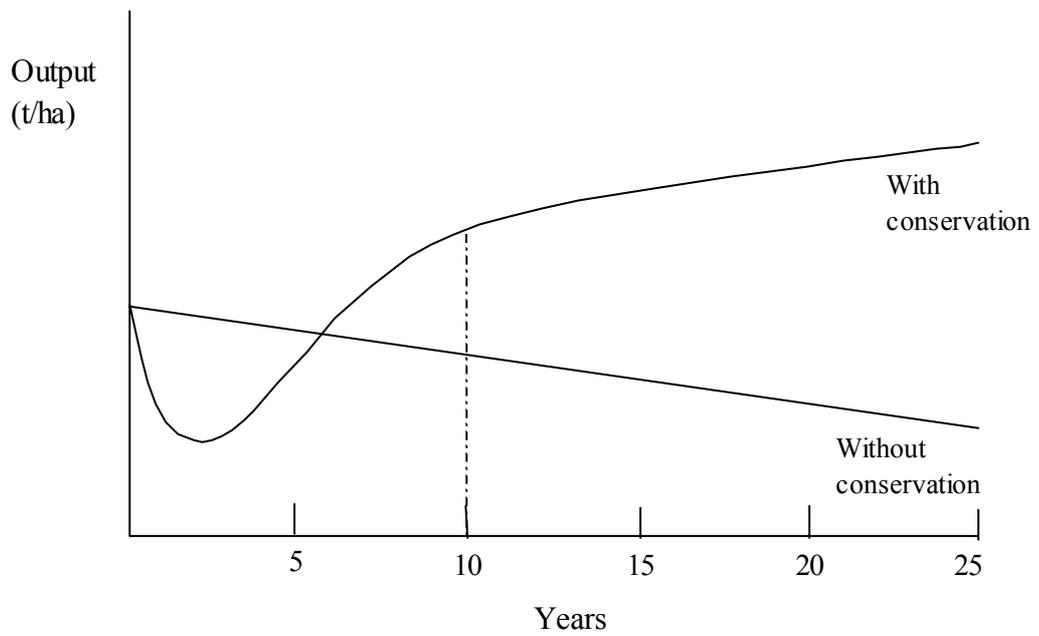


Figure 2 Net income per hectare with and without conservation



However, in order to decide whether conservation is worthwhile we need to add up the costs and benefits over time. Since it is usually thought that people prefer a dollar now rather than a dollar in the future, the costs and benefits must be ‘discounted’ to take account of the value of time. By this means we end up with a single number that represents the value of investments in conservation activities. This number is known as the *net present value*. If it is positive then the longer-term benefits of conservation outweigh the shorter-term costs. This approach assumes an ‘infinite time horizon’; in practice, land-holders may want to see a net return in a shorter period, say 5 or 10 years.

This method of assessing the benefits of conservation measures to offset land degradation has been used in a number of studies, some of which are summarised in Table 1. Several studies have measured the costs of degradation due to lost production (i.e. the costs of not conserving) rather than the net benefits of conservation.

Table 1 Some estimates of the costs of land degradation

<i>Authors</i>	<i>Area covered</i>	<i>Types of degradation included</i>	<i>Value of land degradation or conservation</i>
Walpole, Sinden & Yapp 1992	NSW northern wheat-sheep zone	gully erosion	Net present value of conservation = \$349/ha
Flavell 1988	Forest Creek catchment	soil erosion	Annual productivity loss = \$6.30/ha/an
Sinden & Yapp 1987	Non-arid NSW	sheet and gully erosion	Annual productivity loss = \$5.75/ha/an
Blyth & McCallum 1987	Gunnedah region	soil erosion	Annual productivity loss = \$0.43/ha/an

Source: Cameron and Elix 1991, p. 138; Walpole, Sinden and Yapp 1992

The vital question to emerge from these and similar studies is this: If allowing the land to degrade is so economically costly, why does it happen? This question leads us to consider a broader framework in which to assess land management and the role of Landcare.

While economic analyses such as those referred to in Table 1 provide extremely valuable information on aspects of the problem, there are a number of short-comings of the traditional economic approach to evaluating land use. These are:

- it does not explain why land degradation has occurred, i.e. the economic and other pressures under which land-use decisions are made;
- by concentrating on financial returns, it does not capture and reflect the variety of motivations and objectives that land-holders have in managing their land; and
- it seems to take a short-term perspective, one that is at odds with the new concern for sustainability and the variety of values of land resources.

Perhaps the most fundamental fact underlying the issue is that when put under intense and continuing financial pressures, most farmers are extremely reluctant to leave the land. There are strong cultural and social forces that keep farmers on the land. These may include the life-style of family farming, love of the land, lack of alternatives and community solidarity. The implication is that the economic signals that have the dominating impact on other sectors of the economy are less important in the farming sector. The economic approach implicitly assumes that land-holders are “economic agents” who engage in economic activities in order to maximise their money income. Thus if an activity is unprofitable it will be abandoned. Most land-holders do not fit the clothes of the economic agent.

3. Why has the land been degraded?

Improving the state of the land in Australia requires the owners and managers of the land to change their practices. In order to understand behavioural change we need first to understand the circumstances in which the land has become degraded. There are three reasons that might explain the phenomenon.

The *first reason* is simply that it is profitable to use the land in a way that results in its degradation. In other words, from the point of view of the land-holder there is a rate of land degradation over time that maximises the profitability of the land. The traditional economic approach reflects this view for it assumes that the only motive is maximisation of financial returns from the land. It views the land as a mine of fertility that is gradually extracted until depletion. In the case of an iron ore mine, there is a fixed supply of iron ore that is extracted at a rate that maximises profits over time given the costs of extraction. Existing ore deposits may be depleted, at which point either substitutes for iron products may have been developed or scarcity makes it worthwhile to spend more on searching for new deposits. When land is treated this way, the benefits of driving the land so that it is degraded are judged to be greater than the on-site costs of degradation. In this case, land-holders know the effects of land degradation and could prevent it, but do not see the need to.

Although the attitude that treats farm land strictly as a depletable resource is not widely accepted, it is true that in difficult times the land is driven harder than it should be because farmers want to stay on the land and can see little alternative. In this case, while there may be other motivations for farming, economic pressures result in a ‘mining approach’, at least for a time.

The *second reason* for allowing the land to degrade occurs when land-holders cannot afford conservation measures. This view is reflected in the aphorism ‘It’s hard to be green when you’re in the red’. In this case land-holders are aware of the problem, are motivated to rectify it but do not have the resources to do so.

The *third reason* for allowing the land to degrade is lack of information about the extent of degradation, the effects of degradation (especially in the long term) and how to counter degradation. In other words, if land-holders and managers had more information then they would change their behaviour. In this case land-holders either do not know the effects of land degradation and so are not motivated to rectify it, or they know the effects but do not know how to prevent it and therefore do not.

However, it should be observed that the solution to land degradation may not be simply a change in a particular practice or the introduction of a new technology. It may require a completely new approach to land management, a holistic approach. If so, then identifying ‘lack of information’ as the problem gives a misleading impression since a whole new way of thinking is required, something that cannot be had from a visit by an extension officer or a trip to a demonstration day.

The *fourth reason* for allowing the land to be degraded is that it is being caused by management practices of other land-holders. These ‘external effects’ are discussed below. In this case, land-holders know the effects of land degradation but cannot control it.

It should be pointed out that even if ignorance were banished, land managers had sufficient capital and external effects were eliminated, we may still be left with the fact that, from an economic perspective in which maximisation of financial returns on investments is the sole objective, there will still be an optimal rate of land degradation that would see the land run down until it is no longer economically productive.

It would appear that each of these reasons applies to all land but with differing intensity. In some areas the causes and solutions to land degradation are well understood, in others they are not. Some types of farming are driven solely by maximisation of financial returns while others have multiple objectives. The four reasons for allowing the land to degrade are summarised in Table 2, along with some solutions.

Table 2 Reasons for land degradation

<i>Reason</i>	<i>Cause and solution known?</i>	<i>Controllable under present conditions?</i>	<i>Solutions</i>
1. Profitable to degrade	Yes	Yes	Impose conditions on land use Change managers' objectives
2. Lack of capital	Yes	No	Debt relief, subsidies Retire land
3. Ignorance Wrong approach	No	No	Information programs
4. Caused by others	Yes	No	Compensation mechanisms Cooperation

The four causes of land degradation give rise to different solutions to the problem. In the first case, land degradation is not seen as a problem to the owner of the degrading land, and so no solution is called for. However, there may be other stakeholders for whom land degradation is a problem, in particular holders of other land affected and society at large. For example, society at large may be concerned at the impact of land degradation on the survival of native species. Other land-holders who experience negative effects need mechanisms whereby the external costs of land degradation can be 'internalised', that is, met by the land-holder causing the problem. This now becomes the fourth reason listed in Table 2. It may be the case that while external costs are large, eliminating them by better land management may not impose large costs on the offending land-holder. Indeed, it may even be beneficial in terms of increasing the sustainable yields of the offending farm. This requires the offending land-holders to change their behaviour.

The second reason, lack of capital, may be a short-term or a long-term difficulty. In the short term, farmers experiencing difficulties may be assisted with subsidies to repair the land, either direct subsidies for conservation works or through assistance in kind from other Landcare group members. If it is a long-term problem in which the land owner will never have sufficient capital to prevent land degradation then it must be asked whether the land in question should be farmed. It may need to be turned over to other uses, ones compatible with ecological sustainability, or left to rehabilitate.

In the case of information failures, the third reason given, the solution is to provide information on good land management. If a completely new approach to land management is required then change will be slower and will need to be tackled on several fronts. Demonstration of a new approach by innovative land-holders may be one of the most effective methods of inducing change.

The fourth reason arises when other land-holders are not managing their land in a sustainable way due to one of the first three reasons. In the case of external effects, one solution is to establish a legally enforceable system of compensation which enables aggrieved land-holders to recover damages from offending land-holders. This treats land-holders as if they are motivated only by the desire to maximise income over time. A second solution is to encourage land-holders to work cooperatively. This requires a group in which those who are more damaged than damaging persuade those who are more damaging than damaged to adopt better practices. In addition to moral suasion, this encouragement may take the form of financial assistance to overcome current problems.

Clearly, formation of Landcare groups plays a vital role in all of these processes. In order to understand the role of Landcare more clearly it will help to examine the pressures, motivations and goals of land-holders more closely.

4. Public and private objectives of land management

In this section, we will try to define the objectives that land-holders have in managing the land and the objectives that policy makers have in implementing the Landcare program. They are different but not inconsistent.

In order for land degradation to be tackled conservation measures need to be consistent with the objectives of land managers. These objectives are more complex than the simple economic assumption that the objective is maximisation of financial returns from the land. Landcare participants must deal with this complexity in their everyday land management decisions.

We should therefore ask what the objectives of using the land are. We have already indicated that for many land-holders economic incentives appear to be subordinate to life-style and cultural factors and that this helps to explain the tenacity with which farmers remain on the land in the face of sometimes overwhelming financial difficulties.

Perhaps a distinction should initially be drawn between the objectives of land owners and the objectives of land managers who do not own the land.³ However, for simplicity here we will assume that the managers (decision makers) are also the owners.

It is very important to start with the distinction between the land-holder as 'private economic agent' and the land-holder as a member of a community. Most land-holders act both as business people and as citizens with perceived social and civic responsibilities. In managing the land, the land-holder will be pursuing some or all of the following objectives:

³ In economics this is known as the principal-agent problem.

1. generating an income over time;
2. having a sense of personal pride that the land is being looked after well;
3. leaving the land in a good state for passing on to children;
4. avoiding practices that impose costs on others; and
5. being recognised in the community as a good land manager and contributor to the national good.

The traditional economic approach emphasises only the first of these. A broader conception of peoples' *individual* motivations would include the next two objectives - a sense of personal pride and the desire to leave the land in a good state for one's children. Land-holders also act as citizens, in which case they are likely to take into account the interests and perceptions of the community, expressed in the last two objectives of land management -- avoiding imposing costs on others and the desire to be recognised as good land managers. The last four objectives may be characterised as non-monetary objectives, although it may well be the case that conservation measures motivated by non-monetary benefits lead to monetary returns in the longer term.

It is apparent that the extent and type of conservation activities will depend on the relative importance of each of these objectives to land-holders. Some people are more community minded than others and will give greater weight to the opinions of their peers. Some take a longer term view of life and think in terms of future generations. In some respects, Landcare is about changing the weightings so that community and long-term objectives are given more importance. In addition, the relative importance of these objectives may change with economic and other circumstances. During hard times land-holders may give more weight to maintaining their income than avoiding imposition of costs on others because they give priority to staying on the land.

Conservation activities will also be influenced by the trade-offs that exist between the objectives of land management. The question of trade-offs is significant if the objectives are in conflict with each other, as they may well be in some circumstances. The last four objectives are closely related to each other, while the first may be in conflict with the others. In other words, it may be necessary to sacrifice some income (at least in the shorter term) in order to leave the land in a good state. Some land-holders will be more willing and able to do this than others. Whole farm planning is a technique that assists the land-holder to balance these objectives in making decisions. One way of measuring in money terms the 'non-monetary' benefits of conservation is to measure what farmers must give up to have them (the opportunity cost of conservation). In other words, if conservation activities mean that output must be reduced for a number of years then the value of this output can be thought of as a measure of the non-monetary benefits of conservation.

The last four objectives can be thought of as generating 'additional benefits' to the land owner from conservation activities or good land management. This is likely to change the decision framework that was depicted in Figure 2. In Figure 2 the only benefits shown of conservation were increased yields, a monetary benefit. For land

managers who stress the additional objectives (2 to 5), we should include the non-monetary benefits of conservation. These non-monetary benefits include the satisfaction from being a good land manager and community recognition. Although these benefits cannot in practice be compared directly to the monetary benefits (apples cannot be added to oranges), to illustrate the idea we might represent the decision process as in Figure 3 where the non-monetary benefits of conservation are “added” to the monetary benefits. Unless there are additional non-monetary costs of conservation, it is apparent from the figure that conservation measures become more attractive when non-monetary benefits are taken into account.

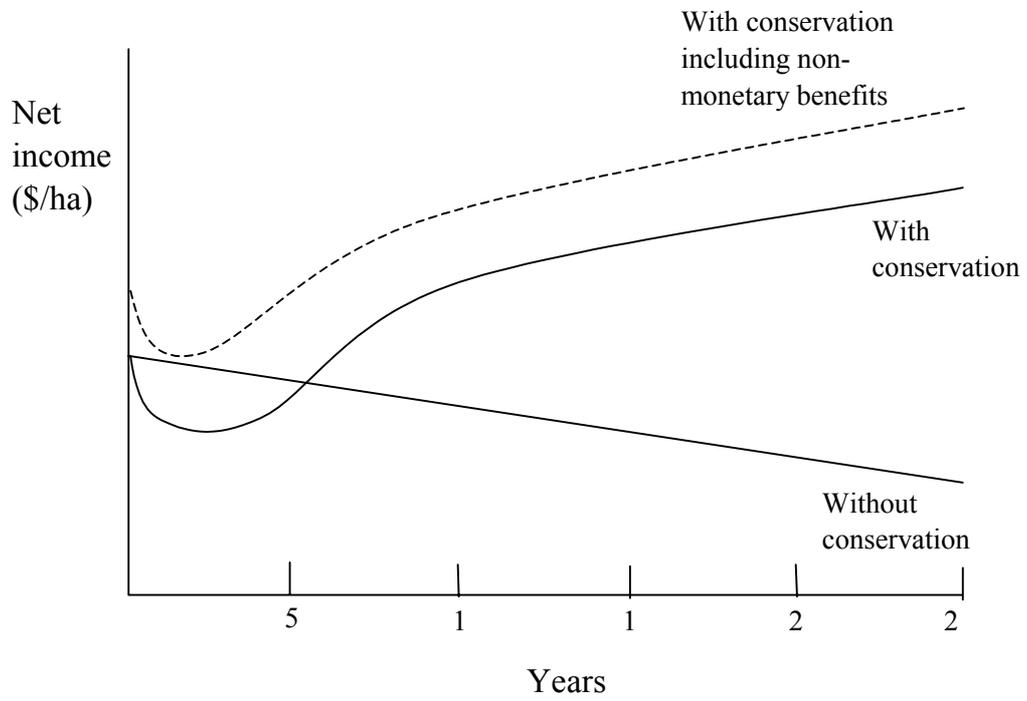
Now we ask what the objectives of public policy makers are. It seems reasonable to assume that, through the processes of government, taxpayers in general are willing to support Landcare because they see it as beneficial, not just to farmers but to Australians as a whole. The larger are these benefits to Australians the stronger is the justification for spending large sums on Landcare programs. There follows a list of the benefits that the general public (especially in the cities) might expect to enjoy from Landcare.

1. By supporting farmers, society might be seen as discharging its historical responsibility since, it is sometimes argued, many farmers were induced by government programs to farm land that was never going to be economically sustainable. This argument is not specific to public funding of conservation measures, but might apply to all forms of subsidisation of agriculture.
2. The public benefits from Landcare activities that result in the conservation of biological diversity, since the public appears to regard biodiversity as valuable and worth saving.
3. The public has a desire simply to see the bush well cared for and the best way of doing this may be to encourage land-holders to adopt land conservation measures.
4. Since in most areas the land can no longer simply be left to regenerate (it would, for instance, be overrun by woody weeds), there would be a significant public cost if farmers left the land. It may be worthwhile, therefore, to subsidise better land management because farmers provide a service to the community. This last item is not so much a ‘benefit’ of Landcare but an ‘avoided cost’.

The question now is this: How much money is the general public willing to contribute to obtain these benefits of better land management? One way of thinking about this is to say that if the current funding level of the Landcare program has general community support, then the public is content to contribute at least as much as is currently spent on Landcare. Continued support will depend heavily on whether the expected benefits of Landcare activities actually eventuate. If Landcare is perceived to be ineffective, then the public will not feel that it is getting the benefits it hoped for and will reduce its willingness to fund it.

Other economic techniques have been used to estimate the values that the public appear to place on environmental and other attributes. One of the principal ones is known as the contingent valuation method (see, for example, Wilks 1990). The public is surveyed and, after the environmental attribute in question is described in

Figure 3 "Income" from conservation including non-monetary benefits



detail, respondents are asked how much they would be willing to pay to have it. However, use of this method would not make much sense in the Landcare context because the 'environmental good' cannot be accurately defined. More importantly, while the effectiveness of Landcare is important, the public supports it as a civic responsibility rather than as a good investment on which it expects an economic return.

It is mostly the case that the interests of land-holders and of the general public as described above coincide, so that if land-holders obtain the benefits they expect from Landcare then the general public will obtain theirs too. However, this depends on land-holders acting on the broader set of objectives than purely private financial interest (i.e. the first objective listed above). The more farmers act as far-sighted citizens the more support Landcare will receive from the general public.

5. Principles of sustainability

The discussion of the variety of motivations in managing land suggests a number of reasons why the land should not be treated like, or thought of as, a mine with an optimal rate of depletion of soil fertility. The variety of motivations means that we must go beyond the traditional economic way of thinking based on maximising the net present value of investments, and introduce the idea of sustainable development. Arguably, some of the concepts of sustainable development have been practiced by land managers for a long time. Following the Rio Earth Summit in 1992, the Australian Government, along with many others around the world, has said that it wants to pursue a number of principles of sustainability. These principles have been distilled down to the following:

1. intergenerational equity;
2. intragenerational equity;
3. conservation of biological diversity; and
4. the precautionary principle.⁴

The first three can be thought of as objectives required to achieve *sustainable* land management while the fourth is a guide to action.

The principle of *intergenerational equity* is in some respects the most important. It states that the present generation should ensure that the health, diversity and productivity of the natural environment is maintained or enhanced for the benefit of future generations. This principle suggests the idea of custodianship over the land on behalf of future generations. This gives land-holders certain obligations as well as rights over the land. Another way of thinking about intergenerational equity is to

⁴ See Harding, Young and Fisher 1994. Usually a fifth principle is included, that of 'internalisation of external costs'. However, this is not a principle but a measure that may be useful in pursuing the principles.

consider that rights over resources are held not just by the current generation but are distributed over the current and future generations.

While many farmers have perhaps always had a sense of these obligations, especially with respect to their own descendants, the Landcare movement may be thought of as strengthening and broadening the sense of obligation to future generations as a whole.

Traditionally, the economy -- and the economic theory that tries to describe it -- have operated on the assumption that the depletion of a resource is not a problem as long as the wealth that is generated is invested in other forms of capital that can in turn generate wealth for future generations. This introduces the idea of the 'substitutability' of 'built capital' (such as factories and machines) for natural capital (such as the land). In the case of land, the principle of intergenerational equity requires handing on the land in a good or better state, so this implies that other forms of capital cannot be substituted for the land.

The principle of *intragenerational equity*, or equity within our generation, is a complex issue even to define. Intuitively, however, we might say that inequity is present if there are gross disparities in the quality of life of individuals or if some people are not having their basic needs met (Harding, Young and Fisher 1994, p. 21). In the context of land degradation we might suggest that a minimum condition for intragenerational equity is that one person's land use should not impose large costs on others. In other words, external costs may be inequitable

Conservation of biological diversity refers to the preservation of the variety of life forms in their natural state -- plants, animals and micro-organisms, their genetic stocks and the ecosystems in which they flourish. Losses of biological diversity are irreversible and therefore diminish the opportunities for future generations. In addition to the ethical reasons for conserving biological diversity, there are of course many good practical reasons.

The *precautionary principle* states that where there are threats of serious or irreversible environmental damage, lack of full scientific certainty should not be used as a reason for postponing measures to prevent environmental degradation. This is particularly important in trying to conserve biological diversity since the scientific evidence on the impact of habitat loss, through land clearing for instance, is often uncertain.

How do we integrate the traditional objectives of land management with the principles of sustainability into a useable method of evaluation? There is no clear way of doing this as yet. The most appropriate way of dealing with the alternative goals of maximising income and achieving sustainability is to regard the objectives of sustainability as *constraints* within which good land management must operate. Thus income is maximised subject to a set of constraints. These constraints need to be developed and defined in terms of a number of practical indicators. At the broadest level they would include the following:

- the productivity of the land should be as good or better when passed on to the next generation. In assessing land productivity, the impacts of technological changes that may improve productivity should be excluded;

- rural communities should be maintained and enhanced;
- the biological diversity of the land should not be diminished and in many areas should be enhanced in appropriate ways; and
- off-site impacts of land management should be eliminated or at least minimised.

Acceptance of the goal of sustainability also means that the idea of discounting needs to be reconsidered.⁵ The process of discounting in practice leads to the mining perspective and is not consistent with regarding the land as a renewable resource. The reason for this is that discounting imagines a single generation with a life-time stretching indefinitely into the future. When we recognise future generations that have rights over resources and acknowledge on ethical grounds the need to hand on the land in good condition, then we need to choose a discount rate, or an alternative approach, that is consistent with that condition. A lower discount rate will mean that the value of the benefits of conservation that accrue in the future will not be reduced as much, and in general conservation measures will then be more worthwhile. However, imposing the requirement that the land should be passed on to the next generation in as good or better condition may obviate the need for discounting.

6. Towards an economic evaluation of the National Landcare Program

Landcare can be thought of in different ways -- a public benefit, a community movement, a government assistance program, or a farm management scheme. From a public policy perspective it is vital to be able to assess the impacts of the National Landcare Program so that decisions about its development are well-informed. The evaluation of the NLP depends on the question being asked of it. The biggest and most difficult question is this: Compared to other forms of government spending, is the NLP a good way of spending public funds? The answer would tell us the level at which the NLP should be funded or indeed whether it should continue to be funded at all. A more manageable question may be this: Which of the programs or activities within the National Landcare Program are generating the greatest economic returns? The answer would tell us which programs should be expanded and which should be cut. As we will see, answering these questions with any accuracy is going to be extremely difficult.

Beneath these big questions there are many subsidiary questions concerning the delivery and effectiveness of Landcare programs, such as how many people belong to groups, how much information has been disseminated, and how many farmers have adopted conservation measures. Information on these questions is very important, but alone it will not tell us whether Landcare is a good investment or not.

Although it may not be possible to do it very well in practice, it is worth asking how we would go about trying to evaluate Landcare as a whole, where the question is

⁵ See the seminal paper by Norgaard and Howarth 1991 pp. 88-101.

‘How much is the National Landcare Program contributing to the welfare of Australians?’ In tackling this difficult task, it is necessary first to identify the inputs into and the impacts of the NLP.⁶ Table 3 sets out the main inputs and impacts divided between monetary and non-monetary items. On the input side, it is relatively easy to identify the financial outgoings of the Commonwealth and States on Landcare programs. It is more difficult to assess the private contributions of land-holders, not least because some of their inputs will be ‘non-financial’, notably additional labour that is not paid a wage and other farm inputs that are not bought specifically for Landcare projects.

Table 3 Inputs into and impacts of the National Landcare Program

INPUTS	IMPACTS
<i>Monetary</i>	<i>Monetary</i>
Financial costs of publicly-funded Landcare programs	Net increase in value of farm outputs
Additional private financial costs of conservation activities	Reduction in measurable off-site costs of land degradation (eg. costs of dredging dams)
Unpaid labour and other shared costs*	
	<i>Non-monetary</i>
	Increased satisfaction from good land management -- for land-holders -- for the general public
	Improved conservation of biological diversity
	Greater community cohesiveness and purpose

* The value of unpaid labour can be measured by applying market wage rates.

On the impacts side, the benefits are both monetary and non-monetary. The principal monetary benefit is the net increase in the value of farm outputs. There may be a net decrease in this value in the short term, offset by longer-term increases. However, some marginal lands may go out of production altogether. Among the non-monetary

⁶ In this context the use of the traditional terms ‘costs’ and ‘benefits’ would imply too narrow an evaluation.

benefits we have mentioned the satisfaction derived by land-holders from adopting good land management practices. The general public will also benefit from the knowledge that the bush is being well cared for. There are also benefits to rural communities from the Landcare movement, especially in the form of increased community cohesiveness and sense of purpose. In addition, there are the benefits of improved conservation of biological diversity. While there may be economic benefits from the latter, biological diversity is better regarded as an ethical value which is valuable for its own sake.

How can we measure non-monetary impacts? They are all difficult to measure. Opinion surveys or 'focus groups' with both land-holders and the general public can be used to gain an indication of levels of satisfaction from improved land management. Scientific surveys can provide hard information on the state of biological diversity. Surveys can also be used to gauge changes in community cohesiveness. Informal evidence already suggests that Landcare groups have had a major impact on community aspects of welfare in some areas. However, it is not valid to put dollar values on any of these benefits.

Monetary impacts present fewer difficult valuation problems, but still have some severe limits. It is worth discussing these since an economic evaluation, however imperfect, will be very valuable for assessing the long-term impact of Landcare. The principal monetary benefit of Landcare is increased productivity of land (or a slower decline in productivity). Assessing productivity improvements presents the following problems:

- since there are many influences on farm productivity other than Landcare, it is difficult to separate out the effects of Landcare from other effects, i.e. from what would have happened anyway. This is known as the 'with-without' problem of project evaluation;
- Landcare activities are likely to have substantial demonstration effects on farm managers who are not formally part of Landcare. These should be counted as benefits of Landcare because they would not have occurred without Landcare. They will be difficult to estimate with any accuracy but informed guesses may give a good indication;
- since Landcare can be viewed as a program that is bringing forward in time changes that may have occurred anyway, the question arises of when these changes would have occurred without Landcare. It is only the difference that can be counted as a benefit of Landcare;
- the nature of farm production may change under the impact of Landcare including the introduction of new products; and
- in most instances the effects of Landcare programs on productivity will take several years to become fully apparent, so the most basic information is not yet available.

Despite these formidable difficulties, it may well be possible to obtain a reasonable estimate of the likely impact of Landcare programs on future productivity. This could be done by relying on the best sources of information available -- experts in the field.

The Delphi method is a statistical technique which asks a panel of experts to make forecasts about key variables, in this case changes in farm output as a result of conservation activities. A questionnaire would need to ask, for each major region and for each major type of farm industry, what are the expected impacts over time of various types of conservation activities on farm productivity. It would need to cover on-site and off-site effects, the extent to which Landcare itself, rather than other factors, are responsible for conservation activities and changes in farming systems. The experts' forecasts are then averaged or summarised and fed back to the experts for revision so that we end up with the 'best guess' of those in the best position to know.

The information gathered from experts would refer to 'averages' for a region and farm type and would thus need to be combined with 'harder' information on factors such as the uptake of Landcare programs, including membership of groups, and specific conservation activities undertaken by Landcare members. Much of this information is already available as a result of an extensive survey of Landcare and land management practices carried out by ABARE for the year 1992-93 (Mues, Roper and Ockerby 1994). The survey involved 1800 interviews with representative samples of producers in the broadacre and dairy industries. Some of the key results of the ABARE survey are summarised in Table 4. Differences between Landcare members and non-Landcare members are not necessarily due to Landcare. For example, it may be that farmers with worse land degradation are attracted to Landcare groups, or that farmers who are already 'conservation minded' are more likely to join Landcare groups.

The information from experts and from surveys are then combined to provide best predictions of future productivity of land. However, in order to incorporate the sustainability criteria (which need to be transformed from broad principles into measurable indicators) we also require assessments from our experts as to the 'likely state of the land' at the end of each period, say after 20, 40 and 60 years. The state of the land at the end of each period needs to be assessed with respect to its future productivity, its biodiversity and the external impacts of land management.

**Table 4 Some results of ABARE survey of land management practices, 1992-93
(% unless otherwise indicated)**

<i>Characteristic</i>	<i>Landcare member</i>	<i>Non-Landcare member</i>	<i>All</i>
Landcare membership - broadacre	na	na	28
Landcare membership - dairy	na	na	19
Perceived degradation problem (all broadacre, pastoral zone)			
- wind erosion			10
- water erosion			33
- dryland salinity			3
- loss of soil structure			11
- woody weed spread			51
- rundown of rangeland productivity			17
Aspects of Landcare groups most highly valued			
- information exchange	54	na	
- tree plantings and community works	10	na	
Possession of a farm plan (broadacre)	51	22	
Existing land degradation problem (broadacre)	78	56	
Farm area operated (ha.)	9026	4345	
Farm cash income (broadacre) (\$'000)	24.7	36.0	
Farm practices used on broadacre farms			
- conservative stocking rate	76	84	
- use of perennial pasture species	70	63	
- subdivision of land classes	51	33	
- minimum/reduced tillage	59	40	
- tree/shrub planting	64	38	

Source: Mues, Roper and Ockerby 1994

7. Key economic questions for Landcare participants

This section is aimed only at providing some initial questions that Landcare participants might ask about the objectives, incentives, constraints and impacts of land management. Some of the key questions are as follows.

- What are the motivations of land-holders for being on the land? What do they want to leave? The latter question -- what do farmers want to leave -- should be elaborated in terms of measurable indicators of land quality etc.
- Who loses and who wins from land degradation -- within the current generation and between generations?
- What are the objectives of land managers i.e. what are we trying to maximise through Landcare? Is it enough to just pick out specific problems of land degradation such as gullying and weed infestation and tackle them individually, or does it require a complete rethinking of our approach to farm management?
- Why has the land been allowed to degrade and what needs to change to provide the right incentives to manage the land sustainably?
- What constraints are imposed on land management and what should be imposed? Should there be limits to running the land down, limits on activities that impose costs on other land-holders, and requirements to preserve habitat?
- What constraints on farm management and the wider economic system are acceptable in order to ensure sustainability? What measurable indicators of land quality etc. are to be used?
- What are the costs of conservation and what are the costs of not conserving the land?
- Who should meet the costs of conservation activities? To what extent does the general public have a role to play, and what are its motives for doing so?

References

- Cameron, J. and J. Elix (1991) *Recovering Ground: A Case Study Approach to Ecologically Sustainable Rural Land Management* (Australian Conservation Foundation, Melbourne)
- Harding, Ronnie, Young, Michael and Fisher, Elizabeth 1994 'Sustainability: Principles to practice', Background paper for the Fenner Conference on the Environment (ANZECC, Canberra)
- Mues, C., Roper, H. and Ockerby, J. 1994, *Survey of Landcare and Land Management Practices: 1992-93* ABARE Research Report 94.6 (Canberra)
- Norgaard, R. & R. Smith 1991, 'Sustainability and Discounting the Future' in R. Costanza (ed.) *Ecological Economics: The Science and Management of Sustainability* (Columbia University Press, New York)
- Walpole, J. Sinden and G. Yapp (1992) *The Opportunity Costs of Land Degradation on Agriculture in New South Wales* (Land and Water Resources Research and Development Corporation)
- Wilks, Leanne (1990), *A Survey of the Contingent Valuation Method*, Resource Assessment Commission Research Paper No. 2, AGPS: Canberra

Figure 1 Output per hectare with and without conservation

Figure 2 Net income per hectare with and without conservation

Figure 3 Net 'income' from conservation including non-monetary benefits