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Approaches to cost sharing for incentives: a practical guide for regional NRM groups in Queensland

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Introduction

Regional NRM bodies are encouraging landholders to improve their natural resource management practices in order to meet regional resource condition targets. It is accepted that to achieve this change the regional bodies will often have to enter into joint funding arrangement with landholders and community groups through the provision of incentives. The purpose of this guide is to provide information for regional NRM bodies on approaches for developing cost sharing rules when providing funding for landholders and community groups so that both private and social costs and benefits are taken into account. Getting the cost sharing allocation wrong can result in overpayments if private benefits are underestimated. This then may result in less natural resource management change than is possible from the regional body's limited incentive budget. Alternatively if the private benefits are overestimated it may result in low participation, as this will not provide sufficient incentive for a landholder to engage in improved natural resource management.

Before entering into funding arrangements for improved natural resource management other arrangements for achieving change should be examined. For example, funding should not be provided for landholders to undertake actions required under relevant environmental and natural resource legislation. Limited public funding requires a commitment to maximise the environmental outcome for the dollars invested. It is therefore assumed throughout this paper that other arrangements have been considered and it has been decided that some form of cost sharing is the most appropriate way to achieve improved natural resource management. This beneficiary pay approach is consistent with the institutional powers held by regional NRM bodies.

An ecosystem services framework is employed to aid in the understanding of where social and private benefits lie so that cost sharing reflects this split. This is followed by some background to the basic economic theory which discusses cost sharing options. The methods available for determining cost sharing are provided followed by some current examples of cost sharing arrangements.

Ecosystem services framework

The management of natural resources is of importance for society as it is the transformation of these assets via ecosystem functions, which provides a range of ecosystem services (Cork and Sheldon, 2001). Society depends on the services of nature to provide the air we breathe, the food we eat and the water we drink. Examples of ecosystem services given by Binning *et al*., (2001) include: provision of clean water, maintenance of liveable climates and fertile soil, pollination and fulfilment of cultural and intellectual needs. Ecosystem services are of particular importance for agricultural producers as they support the production of food and fibre. Thus, the maintenance or improvement of the natural resources base will provide benefits both for agricultural producers and for the general public.

Determining how the benefits (and hence costs) of improved management actions are shared is difficult as the benefits accrue to differing individuals and groups on differing spatial and temporal scales. In the case of private benefits the scale is at the farm level for the individual landholder or farm family. These benefits will usually be the result of increases in production or fixed capital improvements and be produced over the short to medium term (up to thirty years). The social benefits however are by their nature experienced by many individuals and may be

experienced at a far greater scale and occur over the longer term. Benefits that accrue over a large scale and long periods are difficult to value as they are not traded on markets and hence have no easily discernable price.

For example, an improvement in vegetation management practices are likely to provide social benefits such as reduced soil erosion, dust storms and sediment input into water bodies and hence improve water quality. This improvement in water quality may occur hundreds of kilometres from where the action took place. The Reef Water Quality Protection Plan (2003) explicitly acknowledges the need to improve practices many kilometres upstream from the Great Barrier Reef in reef catchments. However, the benefits of the management actions may take many years to become apparent. The same actions may also provide many private benefits, such as:

- Nutrients and sediments are maintained on farm so it would be expected that there would be an increase or maintenance of soil fertility and productive capacity.
- Increased levels of groundcover may limit weed encroachment due to competition and also support retention of sediment and nutrients on-farm.
- Increase in some forms of vegetation may provide shade and shelter, timber and other products

That is, the identified biophysical changes will provide for a number of ecosystem services along a continuum of scales. This concept is represented in Figure 1. Any action that improves the natural resource base will occur at some point along this continuum. The difficulty is determining at which point a particular action may be on the continuum so that cost sharing arrangement reflect these benefits. It should be noted that social benefits include the private benefits that may accrue to landholders.

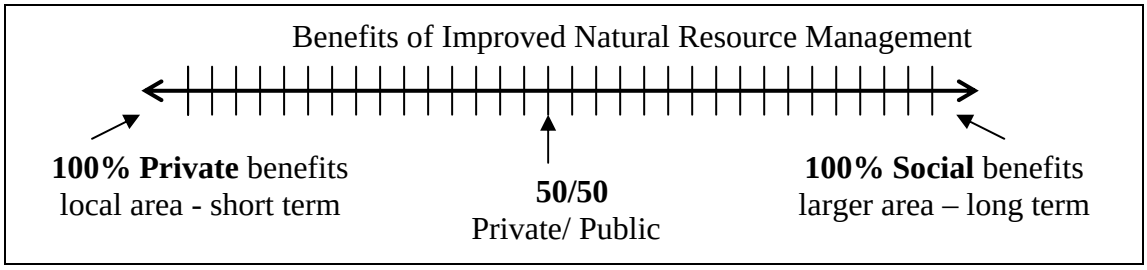

Figure 1: The continuum of benefits from improved natural resource management

The problem of defining private and social benefits is further complicated by the existence of some natural assets that are critical to maintain due to their uniqueness or irreversibility if they are lost or damaged beyond repair. Maintaining habitat to conserve unique and threatened species or ecosystems is an example. Once a unique ecosystem (such as mound springs at the edge of the Great Artesian Basin) or species is lost they are impossible to replace. Thus, there is a case for society to provide the majority of funds for management actions that preserve these features particularly where they provide few private benefits. As noted, incentives should only be provided when other legislative requirements have been met.

Although the benefits of improved land management may occur over a range of scales the direct costs of undertaking these actions often falls on private landholders, who are encouraged to provide a level of resource management over and above that required by legislation. Private costs include materials, time and labour incurred when undertaking the management action. However, it is reasonable to expect that landholders will only be willing to incur private costs equal to the private benefit they

expect to receive. It should be noted that social costs include the total costs incurred by the community including private costs, and are likely to exceed private costs.

Programs that provide incentives attempt to cover the difference between private and social costs in order to achieve improved natural resource management. Following sections discuss ways in which both the cost and benefits can be estimated to assess the correct level of support to be provided.

Background to economic theory

There are two principles that underlie the concept of cost sharing: impacter (or polluter) pays and beneficiary pays. As noted the costs of changing management actions are usually borne by individuals, whilst the benefits of change may be experienced at many levels from individuals through to society as a whole. Yet there is sometimes disagreement over who should bear these costs – the impacter (that is, the person causing the natural resource management problem), the direct beneficiaries, or society in general? With their 'catchment care' framework, the Wentworth Group (2003) and Hatfield Dodds (2004) recommend that the farmer bears the costs of actions that are necessary for the long term health of rural industries, the local farming community contributes to the costs of actions that improve the condition of their local area and the wider community pay for the public goods generated by the landholders. The costs borne by farmers correspond to mandatory standards that are based on scientific standards that prevent the degradation of the local resource base. Similar standards are not clearly defined in Queensland. Under these circumstances an approach for regional NRM bodies is to identify which actions they believe are the reasonable responsibilities of individual landholders, and use these actions as a baseline.

The polluter or impacter, pays principle means that the person responsible for the environmental problem should bear the cost of mitigation. Regulation, taxes and tradeable permit schemes work off this principle (Aretino *et al.,* 2001). However, due to institutional constraints regional NRM bodies are unable to implement these policies as tools to improve natural resource management, and so realistically they need to operate from the beneficiary pays principle when developing incentives.

The beneficiary pays principle requires those that benefit from improved environmental standards to bear the cost of meeting the higher standards. As these benefits accrue at a range of scales, from the local to the national, tax revenue is often used to share the cost on behalf of the whole society. Regional NRM bodies in Queensland are unable to compel payment from a community group through mechanisms such as catchment levies. For these reasons, grants, stewardship payments and other incentive mechanisms (sourced from public money) are practical methods of cost sharing with landholders. The beneficiary pays principle is demonstrated in Figure 2, where landholders are paid by the community, government or beneficiaries to provide environmental services above the minimum acceptable standards. These minimum standards are usually underpinned by regulation. To achieve the community preference above the minimum standards will require a number of programs and services to be paid for by the beneficiaries.

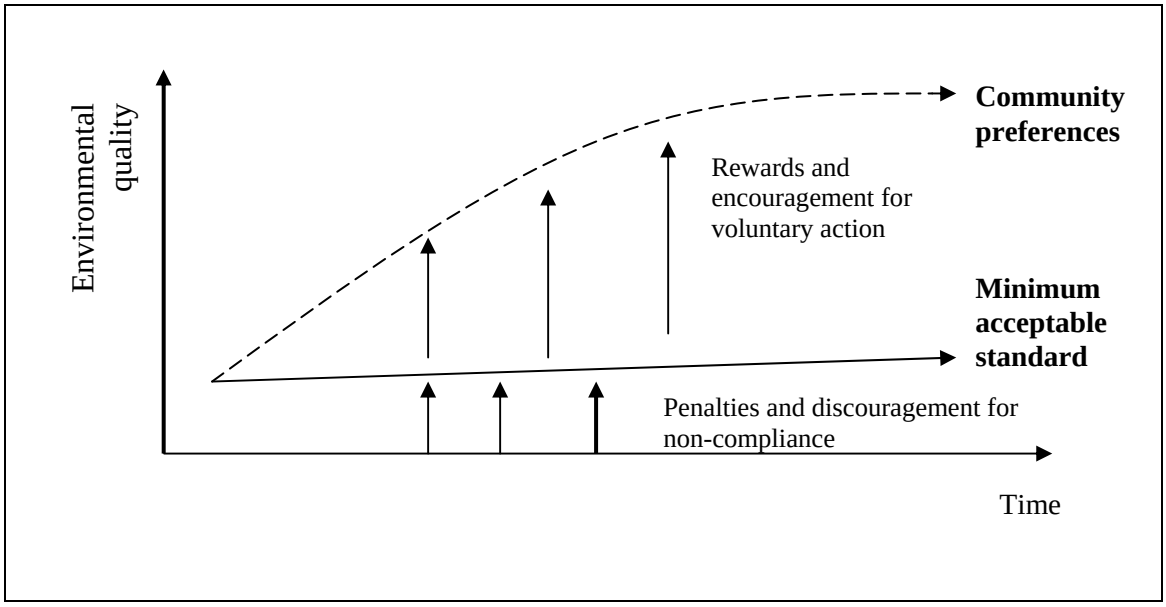

Figure 2: Beneficiary pays approach (Adapted from Hatfield Dodds, 2004:5)

A combination of the impacter and beneficiary pays approaches is shown in Figure 3 which depicts a slowly increasing minimum standard over time as community preferences change. The preferences may be a result of increasing information that provides knowledge of the extent and source of impacts. This means that the impacter pays principle gradually becomes dominant. The beneficiary pays approach, such as incentives, is used to encourage voluntary action as the transition to higher standards occurs. However these incentives may only be temporary. Regional NRM bodies can assist with supporting voluntary activity as minimum acceptable standards increase in their regions.

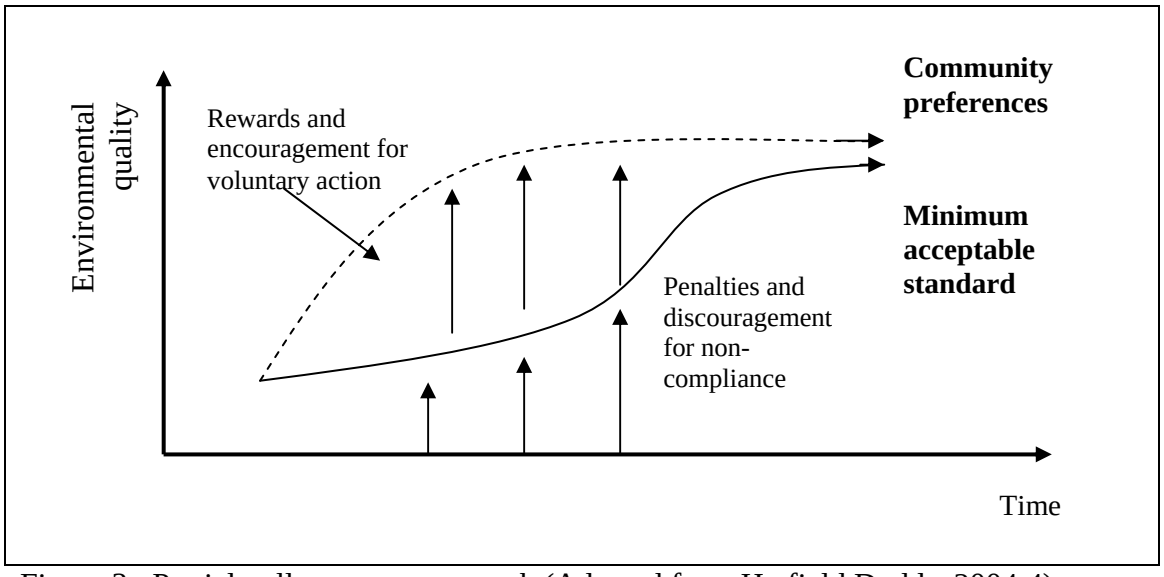

Figure 3: Partial polluter pays approach (Adapted from Hatfield Dodds, 2004:4)

The gap between social and private benefits

The underlying rationale behind providing public money to support natural resource management outcomes is that the private benefits from an action are less than the private costs. This results in an under provision of improved natural resource management, as the landholder may have no incentive to carry out an action if there are not enough private benefits to be gained. For example, preventing soil running off a property can benefit a farmer's production of crops. Nevertheless, they may not carry out expensive soil retention works if the cost of doing so outweighs the benefit they think they will gain from the increased production. However, society may prefer for them to carry out the works, as the social benefit (for example improved water quality) is greater than the private costs.

This can be seen in Figure 4, where A is the level of improved natural resource management that will probably occur without government intervention. That is, where the private benefit equals the cost. However, B (a higher level of improved natural resource management) is the level that society would prefer to achieve. This is where social benefit (which includes private benefits) equals the cost.

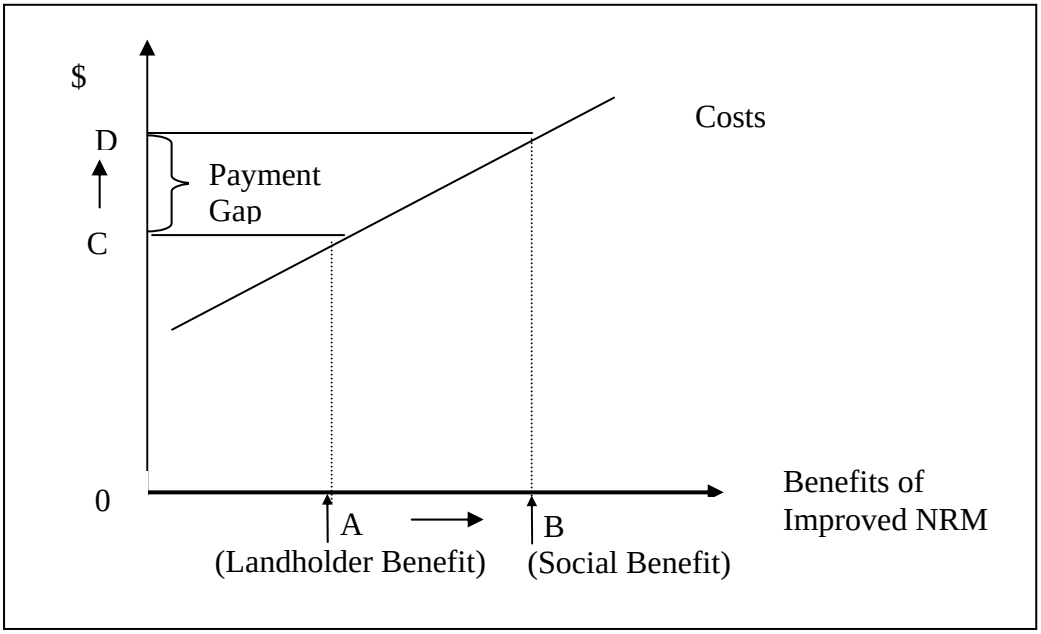

Figure 4: Gap between social and private benefits

The gap between private and social benefits will vary depending on the natural resource management practice sought. For example, protecting a unique ecosystem (such as a mound spring) may provide little private benefit but a high level of social benefit, creating a large gap. Spelling cattle on grazing land may provide a fairly high level of private benefits through the maintenance of pasture cover so the gap will be small. It is important to remember that there may not be a gap between the private and social benefits, and in this instance there is usually no need for public funds to be invested.

Sometimes private landholders will not be operating at a level that produces A, the point where the private benefits justify their actions and costs. This might be because they lack the information to understand the private benefits that arise from a change in actions. This is why many programs are aimed at demonstrating to

landholders the benefits of such actions. Alternatively, the private benefits may only become apparent after a certain period of time. Thus, a higher level of contribution towards costs may be required in the first instance if there are substantial social benefits associated with such a change. Once the private benefits of change become apparent then the landholder should be able to bear the costs without further support.

Estimating the costs and benefits of natural resource management actions

Given that public funds are being used to support changed natural resource management actions the first step in developing a cost sharing protocol requires undertaking a benefit cost analysis to determine if there are net benefits from the investments (Murray-Darling Basin Commission, 1996). As noted, it will be easier to determine the private benefits than the social benefits due to the scale over which these benefits accrue. In many instances the information on the value of social benefits is not revealed in markets and needs to be estimated using non-market economic valuation methods, such as travel cost analysis or choice modelling. This information then needs to be compared to the cost of the project to determine if there are net benefits. The benefits to this approach are that it is more precise than creating a "rule of thumb" and the regional NRM body can be assured that their money is being spent on an activity with net benefits. However, valuation studies can be time consuming and expensive, and the values derived may not be transferable between sites. The high cost of conducting such studies will be least justifiable in instances where the total budget is small. In many cases the decision has already been made to provide funding through government programs such as the *National Action Plan for Salinity and Water Quality*. In these cases it is assumed that the benefits of actions will outweigh the costs even if they cannot be readily measured.

If the project is expected to yield net benefits then the second step is to determine what proportion of the costs and benefits accrue to individual landholders as a basis for cost sharing. The maximum level of a payment to a landholder should reflect the gap between social and private benefits, which is the difference between C and D in Figure 4. The full amount of the social benefit does not need to be paid. The aim should be to give the amount needed for the landholder to change their behaviour (Aretino *et al*., 2001). This is because limited public funding requires a commitment to maximise the environmental outcome for the dollars invested.

If it is not possible to determine both the private and social benefits and costs of an action then regional bodies will need to develop "rules of thumb" or consider using a tender for conservation contracts mechanism (Aretino *et al*., 2001).

"Rules of thumb"

Creating rules of thumb is a pragmatic approach to cost sharing rules. While this approach is less theoretically rigorous, it is likely to be a more practical option, at least in the short term, as it does not require a separate valuation study for each project. The total social benefit from the program (based on scientific advice and community preferences) is assumed to have been taken into account when funding allocations were made. Instead of quantifying the social benefits of an individual's actions, the costs of undertaking the actions can be used as a substitute (Miller and Binney, 2003). Box 1 outlines some of the questions that a regional NRM body will

need to answer to help set up cost sharing rules. This is followed by an example of creating a cost sharing rule using weed control in figure 5.

- What are the social benefits? (Identify rather than quantify)
- What are the private benefits? If possible, identify rough values for the increased revenue expected for landholders.
- About how much does the activity cost (in direct cost and foregone income)?
- Will the private benefits cover these costs? If so, probably no need for cost sharing from regional NRM body. Information tools may be necessary instead.
- Taking the difference between the expected private benefits and the costs into account, approximately what is the average amount of assistance that will be required to get a landholder to undertake the action?

Box 1: Questions Regional NRM bodies need to answer to create cost sharing rules

Social Benefits	Reduced infestation of natural vegetation areas leading to maintenance of natural areas and increased habitat for biodiversity.	
Private Benefits	Decreased loss of land from production due to weed infestation. If the area is equal to 3% of productive land then profits might be expected to increase by 3 %.	
	Profit before weed control	$40 000
	Profit after weed control (= + 3%)	$41 200
	Private Benefit of weed control	$ 1 200
Costs	Cost of herbicide	$ 1 000
	Cost of hiring spray equipment	$ 200
	Wages (or opportunity cost of landholder)	$ 400
	Total cost of weed control	$ 1 600
Net Benefit/Loss	**Total Cost** of weed control	$ 1 600
	Private Benefit of weed control	$ 1 200
	Net Loss	$ 400
Assistance Required	Assistance required is up to $400 or 25% of the total cost. So, the "*Rule of Thumb*" is a 25/75 split with the funding body providing 25% of total costs.	

Figure 5: An example of creating a cost sharing rule for weed control

A "rule of thumb" can be created for an activity that either specifies a percentage contribution expected from the landholder (for example, 20% of costs) or a set rate of support (for example, $1 000 per kilometre of fencing). However, creating accurate rules about the social-private benefit split is not simple. If the split underestimates the social benefit from a program, and thus increases the contribution required from the landholder then they may not have an incentive to participate. But if the social benefits are overestimated, and contribution levels are too low, then public funds will

be used to support private businesses. Regional NRM bodies will need to monitor the uptake of incentives and adjust the 'shares' depending on participation rates.

As was noted earlier, some activities have a large gap between private and social benefits, and other activities have a smaller gap. Any rules about cost sharing need to consider the likely difference between the social and private benefits, and may need to differ between property type. For example, destocking of improved pastures on flat land will be more costly than destocking of native pastures on hilly country. That is, the percentage of the activity funded should increase as the percentage of private benefits decreases.

One method to answer the above questions it to hold focus groups with landholders in the target area to gather the information. This would assist with setting the contribution rules at a level that would lead to participation as well as recognise private benefits. It is necessary to be careful that strategic behaviour on the part of landholders does not lead to an underestimation of private benefits or an overestimation of social benefits. This may be achieved by including people with expertise in the subject but no vested interest in the outcome, for example, farm financial counsellors.

Tenders/Auctions

Tenders for conservation contracts (also commonly called auctions) still require an assessment of the benefits to warrant public investment however this mechanism avoids the need to establish cost sharing rules as each individual reveals through their bid the amount of money they need to implement appropriate management change. Tenders for conservation contracts are especially suited to situations where there is a wide range of opportunity costs of undertaking an action, as it is less efficient in these situations to use the average cost as a guide for cost sharing rules. Tenders for conservation contracts are also useful when a package of management actions is to be developed, as they allow for negotiation over the management actions with all participants. Please see the guidance product *Guidelines for the conduct and evaluation of tenders for conservation contracts* for more information.

Examples of different approaches

Looking at how other grant programs are managed can assist regional NRM bodies develop their own cost sharing guidelines. It is hoped that information gained from Queensland regional NRM bodies about the social-private benefit splits of various activities in their regions will also inform future programs run by either regional NRM bodies, the state or other non-government organisations.

Envirofund and National Landcare Community Support

Many Australian government grant programs expect a participant contribution of at least 50%, often as an in-kind contribution. For example, Envirofund and the community support component of the National Landcare Program requires that government funds be at least matched by the applicant. The reason underlying this contribution rate is not clear (Aretino *et al.,* 2001). Perhaps this level is a simple and seemingly equitable way of dealing with a wide range of activities.

Great Artesian Basin Sustainability Initiative (GABSI)

The Great Artesian Basin Sustainability Initiative (GABSI) is a joint Commonwealth/States program to assist landholders to rehabilitate bores and/or replace bore drains with piped systems. There are a range of private benefits associated with capping and piping bores, such as more flexible and efficient property management, easier mustering, better water quality for domestic and stock consumption, increased security of water supplies and redcued costs of controlling weeds and pests (CIE, 2003). The pastoral industry as a whole benefits from maintained or improving water pressure. There are also significant social benefits, such as the maintanence of mound springs, reduced weeds and pests, improved native vegetation and reduced salinity problems near bores (CIE, 2003). The wider community also values the existence of the water resources of the Great Artesian Basin and the preservation of future opportunities to utilise the water.

The social benefits of capping bores were felt to be so high that there is an 80% subsidy on the rehabilitation and capping of bores. There is a 60% subsidy on bore drain replacement, which confers more private benefits than the capping.

As these subsidy rates are high, there is a waiting list for GABSI. This could indicate that the private benefits have been underestimated and that the subsidy offered overcompensates farmers for their costs. It has been recommended that a bidding system be established that allows landholders willing to accept a lower government contribution to move up the queue (CIE, 2003). To avoid queues a series of tenders could be run which would allow funding and capacity to do works to be spread out over time.

There do not appear to have been any quantitative studies undertaken on the social benefits from the capping of GAB bores (CIE, 2003). Rather, it has been assumed that the social benefits are high.

The Queensland Murray-Darling Basin Committee (QMDC) Sub-Catchment Project Funding

The QMDC sub-catchment grants program has a range of contribution rates for landholders dependent on the activity undertaken. These are shown in Table 1 below. The ratios are based on the perceived benefits for the landholder and for the community from these activities being undertaken. For example, an action such as controlling pests and weeds that may have high private benefits requires a 70% in-kind ratio, while an activity such as controlling stock access, that may have high social benefits only requires a 30% in-kind contribution. These rates were developed by the QMDC in consultation with catchment committees and landcare groups and through negotiation with the Australian government. A report that used cost-benefit ratio anlysis to evaluate landcare investments in the Condamine catchment of the Murray-Darling Basin also provided input into the development of the ratios (Page and Longmire, 2001).

Activities	Funded/In-kind Ratio
Reducing Soil Erosion	
• Earthworks	50/50
• Conversion of conventional planting equipment to zero tillage	50/50
• Establishment of pastures	40/60
Managing Riparian Condition	
• Controlling stock access to watercourses (e.g. fencing)	70/30
• Providing alternative watering points for stock	70/30
Managing Salinity Risk	
• Establishment of deep rooted permanent pastures	40/60
• Establishment of native local species	70/30
Managing Biodiversity	
• Controlling stock access to protect and preserve habitat (e.g. fencing)	70/30
• Planting of local native species for biodiversity conservation or habitat purposes	70/30
• Controlling pests and weeds	30/70
Monitoring	
• Water quality, species, habitats, or other resources identified as performance indicators in the sub-catchment plan	50/50
Communication	
• Field days/media stories/newsletters	90/10
Training	
• Workshops/training events	75/25
Other Activities	To be negotiated

Table 1: QMDC Minimum funded/in-kind contribution ratios (Source: QMDC 2004)

Conclusion

Use of costs sharing formulae is a simple approach to a complex problem. Costs of management change will vary across landholders, as will both the private benefits and the social benefits received from management changes. However, if public funds are to be used in the best manner possible and changes in natural resource management practices maximised, it is imperative that the difference between social and private benefits is articulated as much as possible. Although the optimal path may be to carry out a full valuation study, this may not be practical in some instances and rules of thumb can be used instead. Whatever approach is taken, it is necessary to be thoughtful and transparent about cost sharing guidelines and review the guidelines in light of participation rates. If a regional NRM body is to invest in improved natural resource management through the provision of incentives that promote land management activities, considering and developing cost sharing arrangements will result in significantly greater improvements in natural resource management outcomes from the level of investment made.

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