

Contract Design and Multiple Environmental Outcomes: an Economic Perspective

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Foreword

Market-based instruments (MBIs) are policy mechanisms that can be used to manage environmental problems and assets in a more cost-effective way than current prescriptive approaches, at least theoretically. The National Market-based Instruments Program has been implemented to test designs of MBIs on real environmental problems. \$5 million has been allocated to the program in the first round to trial ten MBI designs across Australia. The Victorian Department of Primary Industries is leading a trial called the ‘Multiple-Outcome Auction of Land-Use Change’ or the Multiple Outcome Pilot (MOP).

The MOP is designed to use a BushTender style auction mechanism to encourage private landholders to manage salinity, water quality, water quantity and biodiversity on their land. The trial is designed to trial the feasibility of using one mechanism to simultaneously encourage land-use change for multiple environmental purposes.

MOP represents a significant advance towards implementing a comprehensive market-based approach to managing environmental problems. The design of a successful pilot requires implementation of an auction mechanism that can process the information elicited from landholders to ensure cost effective use of Department funds. However, allocation is one side of the story; how the relationship between the Department and the landholder is managed is important in determining the overall success of the program. These relationships can be managed through the use of *contracts* that will describe both the Department’s and a contracting landholder’s role and obligations during the course of the relationship. This raises the question of how to design contracts. If contracts are designed poorly, the landholder may be given *perverse incentives* to breach the terms of the contract. Conversely, well-designed contracts can be powerful tools to manage environmental problems.

The purpose of this report is to provide some guidance on how to design contracts without giving perverse incentives. In the first chapter, Arthur Ha, Loris Strappazon, Michael Crowe and James Todd first outline the economic theory relevant to contract design. In chapter 2, the authors then apply these concepts to an actual BushTender contract. By taking explicit account of landholders’ incentives, contracts could be designed to maximise the chances of an environmental program succeeding.

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Executive Summary

This report contains two parts: first, we explain how economic theory views contracts; second, we apply theory to analyse the incentives for contract compliance in an actual BushTender contract and suggest modifications for the multi-outcomes pilot.

The economic literature on contract design delivers some broad messages about the way to design contracts. These are as follows:

- design contracts to elicit *information* about the landholder's type by offering a *menu of contracts*;
- design contracts to provide incentives to comply with the terms of the contract;
- schedule incentives to secure *commitment* over the life of the contract;
- the Department should not bear all the *risk* in these contracts; and
- *monitoring* and *enforcement* is dependent on the *verifiability* of the objectives and actions.

When we apply the theory, we make the following recommendations for the multi-outcome pilots:

- the agency should think hard about the relationship between actions on the ground, and overall outcomes;
- where cost-effective, the agency should contract landholders to produce outputs, rather than inputs;
- where the above is not cost-effective, the agency can contract landholders for inputs;
- whether contracting for inputs or outputs, the agency should link the contract services to a monitoring, compliance and enforcement regime including self-monitoring; and
- payments for services should be linked to the outcomes of the monitoring (this is the 'compliance' aspect).

In this report, we have checked how current BushTender contracts match with the above points. We found that BushTender contracts are very well designed; they accord well with what economic theory would predict is an appropriate contract. We have undertaken this analysis so as to inform the multi-outcomes pilot project team about whether the BushTender contracts need to be altered substantially for their pilot. We do not think that substantial alterations are needed in contract design for the multi-outcomes pilot. However, there are a few minor outstanding issues in terms of contracting for environmental goods:

- If final contract payment is to occur prior to the end of contract then an agency needs some form of incentive mechanism to ensure a landholder fulfills her obligations in the

post-payment period (e.g. legislation). The benefits of these other mechanisms need to be considered relative to cessation of payments.

- The Department will use separate contract types for different activities: remnant management; revegetation; and water pumps. These contracts will vary in their schedule of payments, catering to the timing of input application, or output production. Each landholder has to place a bid for every activity that they undertake. Hence, if a landholder undertakes remnant management plus revegetation, she will have to place two bids.
- *In addition to separate bids* for each activity, the Department could allow a landholder to place a 'total' bid that covers the group of activities she is undertaking. This would provide a measure of scope economies, but it would also add to transaction costs.
- In the long-term, if contracts were predominantly output-based then there are some issues about landholders' abilities to self report. Potentially this would require education and training to provide landholders with the appropriate skills.
- In the multi-outcomes pilot the Department will experiment with new methods of self-reporting such as the use of photo-images.

These small steps in the multi-outcomes pilot should provide additional information to Australian governments about contract design.

1. Economics of Contracts

1.1. Introduction

Contracts are used in everyday economic life, such as when we buy car insurance or make a verbal promise. People use contracts to formalise and enforce promises in delivering goods or services. Without enforceable contracts, much economic progress would not have occurred. Contracts can be written to provide incentives to deliver goods and services in efficient ways but it is equally possible that contracts may be written to provide perverse incentives to be inefficient. For example, in the case of car insurance, an insurer could offer a policy that fully covers damages incurred as a result of an accident without any payment of excess. However, by fully insuring a motorist, the insurer may distort the behaviour of the insured motorist by inadvertently encouraging them to be a less cautious driver.

Contracts have been used for environmental management, notably in the BushTender trial. The question we ask in this paper is: can the BushTender contracts be improved for the multi-outcomes auction? How the incentives are structured in a contract is crucial in determining whether or not contract compliance is achieved and whether or not landholders would participate in the program in the first place. If contract design is not well thought out, the objective of an environmental program may not be achieved no matter how efficient the allocation mechanism is; allocation does not deal with contract compliance.

This paper looks at how economics contributes to the design of contracts. First, we discuss the key concepts in economic theory that can be used to analyse the problem of contract design for multi-outcomes: asymmetric information; moral hazard; adverse selection; verifiability; risk; and credible commitment. Second, we apply these concepts for contract design, specifically we discuss payment schedules, monitoring and enforcement. Finally, we define what an ‘efficient contract’ means in the context of multiple environmental outcomes pilot.

1.2. Economic Concepts, Contracts and the Environment

In economics, contracts are written by a *principal* and offered on a take-it-or-leave-it basis to *agents*. In our case, the Department is the principal and the landholder is the agent. The realities of contract design are different than economic theory assumes, but there are some lessons we can draw on for contract design. In this paper, we assume it is the Department’s role to design a contract that *efficiently* implements the mutually agreed outcomes between it and the landholder. By ‘efficiently’ we mean resources have been allocated to the most socially valuable end use; economists call this *allocative efficiency*. Essentially, we are *not* assuming the Department offers its own terms and conditions on a take-it-or-leave-it basis but

firsts negotiates the contract terms with the landholder, formalise these terms in a contract and *then* offers it to the landholder on a take-it-or-leave it basis. When the multi-outcomes auction is run, the landholder can then submit a bid to the Department signalling his acceptance of the contract. Alternatively, the landholder may not submit a bid, which indicates rejection of the contract. If the landholder accepts the terms of the contract(s) and the Department accepts the bid, the terms of the contract are then implemented. The timing of the contracting process is summarised in Figure 1.

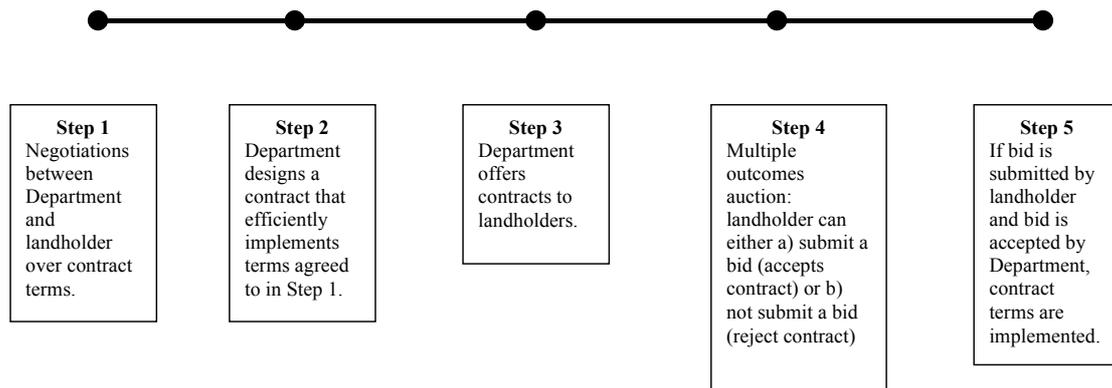


Figure 1 Contracting Process

When contracts impose perverse incentives for landholders to behave in an inefficient way, we say there are *distortions*. Understanding the economics of contracts is vital in eliminating or at least minimising the costs of these distortions. Designing contracts for environmental management to minimise distortion is similar to writing contracts in the private sector economy: agents may attempt to gain an economic advantage by hiding useful information or hiding harmful actions (or hiding lack of beneficial actions). For example, in the case of biodiversity, a term of the contract may be to exclude stock from a remnant vegetation area, but the landholder can attempt to hide the action of running stock in the remnant vegetation area. Economic theory can help us think how these problems arise and how to design contracts to minimise the costs of these problems. First, we explain how asymmetric information, adverse selection and moral hazard affects the design of contracts.

1.3. Asymmetric Information, Adverse Selection and Moral Hazard

How the Department designs a contract for environmental management on private land is an important question because the problem is characterised by *asymmetric information*. In the case of environmental management on private land, there is the Department and a landholder. The Department wants to contract landholders that are willing to offer up land for environmental management at relatively low opportunity cost. Assume that all landholders know this is the aim of the multi-outcomes auction; this assumption is called *common knowledge* because both the Department and landholders know the aim of the auction. However, the Department does not know if the landholder has land suitable for environmental management or the landholder's opportunity cost in undertaking environmental management; such information is called *private information*. On the other hand, the individual landholder knows their respective private information. The Department wants to know this private information because it is *valuable* in contract design. The fact that the Department is ignorant of whether or not a given landholder has suitable land or the opportunity cost of environmental management is asymmetric information in the context of multiple outcomes.

If individuals are not self-interested and rational individuals as economic theory assumes but instead had preferences that were identical to the Department's then asymmetric information is not a problem. Let us call such individuals whose preferences are identical to society as 'model citizens'. These model citizens would not hide any private information they possess even if it is valuable to the Department. This is because these model citizens will know the Department will value such information in order to design a socially optimal policy. These model citizens also value the design of a socially optimal policy and so would voluntarily reveal their private information. But this assumption that individuals behave like model citizens is untenable because there is no evidence that individuals generally behave in this way. So, while the assumption that individuals are rational and self-interested (ie, individuals are *rational*) is not entirely satisfactory it is the most appropriate assumption of individual behaviour in an *economic* situation. Throughout this paper, we will assume that individuals are rational.

Given the rationality assumption, asymmetric information is a problem when the Department is designing contracts for environmental management. To see why, recall that landholders' private information is valuable to the Department. Implicitly, we have assumed that landholders know the Department values landholders' private information. Asymmetric information allows rational landholders to take advantage of their private information in two ways: 1) the landholder can misrepresent what type of landholder they are (*adverse selection*) and 2) misrepresenting what management actions they have undertaken (*moral hazard*). The terms 'adverse selection' and 'moral hazard' have their origins in the insurance literature

when insurers saw risk in moral terms. In economics, these terms do not have the moral overtones that insurers attached.

1.3.1. Adverse Selection

Adverse selection is a problem when the Department wants to target a group of individuals for participation in its program. Adverse selection is where individuals who do not belong to that target group have an incentive to misrepresent which group they belong to. Individuals may have private information that the Department would find valuable in distinguishing individuals for resource allocation purposes.

To see how adverse selection causes resource allocation problems assume there are two types of landholders. Let us divide landholders into two groups in terms of their opportunity cost of environmental management: one group are the 'high cost' landholders and the other 'low cost' landholders. Each type knows information that would classify them as a high cost or low cost landholder because they are aware of the environmental features present on their property, they know how costly agriculture production is on their property, etc. Knowledge of whether or not an individual landholder is high cost or low cost is private information to that landholder. Imagine that the Department announced a multi-outcome auctions that was based solely on submitted bids; ie, the Department will award contracts to the lowest bids. Low cost landholders would then have some incentive to misrepresent themselves as high cost landholders if the benefits from misrepresentation outweigh the cost. The benefits of adverse selection, in this case, for a low cost landholder are assumed to be monetary. The cost of adverse selection to low cost landholders could be the financial penalty of being caught by the Department. Economists call the net benefit from individuals misrepresenting their type the *information rent*. So, if the information rent in engaging in adverse selection by a viable landholder is positive they will do so.

The implication of this for the Department is that if the difference in landholders' cost characteristics was very high, low cost landholders will have a stronger incentive to misrepresent themselves as high cost because the information rent would be higher. Auction mechanisms help to reduce the information rents paid to low cost landholders but only partially. Given information asymmetries, adverse selection is likely to cause inefficiencies if there are differing cost characteristics among landholders because low cost landholders will attempt to gain information rents by submitting bids above their opportunity cost.

From this example, we can see that adverse selection is a potentially serious problem in the design of contracts for environmental management. In the absence of perfect information, the Department will find it very difficult to design contracts that are free from adverse selection.

The implication of this is that an efficient allocation mechanism is required to reduce information rents arising from adverse selection.

1.3.2. Moral Hazard

In insurance, the moral hazard problem is where an individual purchases insurance but changes their behaviour to become less careful. Insurance distorts behaviour, which is caused by the individual shifting the risk of his/her actions to the insurer. This could mean, from an insurer's perspective, insurance distorts the individual's risk profile from being an *actuarially fair* risk (risk burden is shared between the parties optimally) to becoming actuarially unfair (the insurer bears more risk than is willing to). Take the example of car insurance: a motorist who purchases car insurance may become a riskier driver by speeding more or taking less precautions when driving than would be the case if the motorist had to bear all the risk of driving. From this discussion, moral hazard is the problem where insurance has the perverse effect of encouraging insured agents to take more risks.

Moral hazard stems from asymmetric information because if the insurer was able to monitor insured individuals' actions in reducing risk then the insurer could penalise individuals who do not undertake preventative measures. However, asymmetric information is a reality insurers (and the Department) face. Undertaking preventative measures (management actions) is costly for insured individuals so there is an incentive for them to avoid these costs.

Moral hazard in the case of multi-outcomes is the risk of breach of contract by not undertaking the contracted management actions. Returning to the livestock exclusion example, moral hazard could be where a landholder could violate this term of the contract by letting livestock into the remnant vegetation area. Moral hazard arises in the case of environmental management because contracted actions are costly to the landholder. Preventing moral hazard is an important determinant of the overall success of the multi-outcomes project because if landholders do not undertake the contracted management activities then it is unlikely any of the objectives of the program will be achieved. Designing contracts that provide incentives for individuals to undertake the contracted management actions is vital to the success of the multi-outcomes project.

The elimination of moral hazard does not necessarily lead to an ideal efficient outcome because *risk premia* are needed to pay risk-averse landholders to undertake costly management actions. By *risk*, we mean in this paper the uncertainty of achieving the Department's objectives (ie, multiple environmental outcomes). We will discuss risk in greater detail in 1.4 but briefly, risk premia are analogous to information rents in the adverse selection case: risk premia are needed to induce risk-averse individuals to accept more risk of

achieving the Department's objectives. Management actions are risky because of the scientific uncertainty of the causality between management actions and multi-outcomes. This means for contract design, how the contract payments relate to the Department's objective may not be a straightforward relationship. For example, in the case of dryland salinity, the scientific uncertainty surrounding the causality between management actions and dryland salinity is especially acute. To write contracts based on a reduction in dryland salinity would impose substantial risk on landholders that accept these contracts; if landholders are risk-averse, they will incorporate a substantial risk premium into their bids. This example suggests that some kind of risk-sharing arrangement is needed to reduce risk premia. If all the risk was borne by the landholder, a substantial risk premium would need to be paid for the landholder to accept the terms of the contract. Conversely, it is not efficient for the Department to bear all the risk for contracts because full insurance provides landholders with an incentive to not undertake costly management actions. The solution to the moral hazard problem entails a sharing of risk between the Department and landholders so as to induce the latter to make the necessary expenditures for environmental management.

In the context of multi-outcomes, if contracts were written with little or no consideration of whether or not the landholders have implemented any management actions, moral hazard arises because the landholder has no incentive to undertake the contracted management actions. This is inefficient from the Department's and tax-payers' perspective because if landholders put less effort into management actions, then the actions are less likely to produce beneficial environmental outcomes. This means securing contract compliance is complicated if moral hazard is a problem.

1.3.3. Information Revelation, Monitoring, Enforcement, Transaction Costs and Verifiability

Up until now, we have not discussed how the Department is able to confirm whether or not individual landholders are engaging in adverse selection or moral hazard. While the Department is ignorant of individual landholders' attributes or actions when designing policy this does not mean this information could not be revealed to the Department later. There are several ways this can happen; it could be revealed to the Department because the policy design may have *information revelation* properties or through *monitoring* and *enforcement* of the contracted landholder.

Information revelation is where an individual's choice reveals some private information of the landholders' type. Consider a health insurance example, an individual wants to buy health insurance but is faced with the choice of policy A and policy B with different premium rates. Policy A is the low premium health insurance policy with minimal benefits. Policy B is the high premium policy with many benefits. Assume the premium rates are actuarially fair for

different classes of individuals: the premium for policy A is actuarially fair for healthy individuals whereas the premium rate for policy B is actuarially fair for unhealthy individuals. Assume also that the individual can afford both health insurance policies. Because the premium rates are actuarially fair, there is no incentive for the individual to misrepresent their health status. So, if the individual chooses policy A, the individual reveals the private information that he is healthy. Conversely, if the individual chooses policy B, he reveals the private information that he is unhealthy. Private information can be revealed by presenting individuals a *menu of contracts*: if the contracts are well designed to provide a clear choice for different types of individuals, then there is an incentive to *truthfully reveal* their private information through the individual's choice of contracts. By designing contracts that provide landholders with an incentive to truthfully reveal their private information, the Department can minimise adverse selection problems.

Moral hazard can be partially dealt with through monitoring and enforcement of policy. This assumes that the Department is able to monitor landholders' actions and enforce any contract the Department and landholder have agreed on at relatively low cost. Monitoring could be based on explicit measures specified in the contract such as outputs or inputs. However, explicit measures may not be available to use for monitoring landholders. Measures may not be an accurate indicator of whether or not the landholder engaged in moral hazard behaviour. For example, a potential indicator for contract compliance is increase in the size of remnant vegetation within the management area. The Department may use this data as an objective indicator to determine contract compliance. However, there is scientific uncertainty surrounding the relationship between remnant vegetation growth and landholders' management actions which makes vegetation growth data an imperfectly correlated measure of contract compliance. The possibility that there may not be an error free way of monitoring landholders' on-site actions is not a trivial problem. There may be no practical way of monitoring landholders' actions short of expensive electronic surveillance. Monitoring may be infeasible because there is no *verifiable* measure of landholders' actions; in other words, there may be no practical way to prove a landholder did or did not undertake preventative actions.

Assuming the Department has some way of monitoring landholders, let us now consider the enforcement problem. Also assume that the Department has a legally enforceable contract with a landholder. When the Department finds verifiable evidence that the landholder is in breach of contract, the Department can choose to enforce penalties against the landholder or not. Enforcement may not be feasible because of *transaction costs*. Transaction costs are the cost of undertaking an action such as administrative or legal costs. For example, the cost of enforcing contracts through the law courts may outweigh the expected benefits of completion

of the contract. This may mean enforcement is not *credible*; if landholders believe that the Department will not enforce contracts even if the landholder was caught in breach of contract, then there is no expected cost of engaging in moral hazard behaviour. Then the incentive to violate the terms of the contract becomes even stronger.

Verifiability of moral hazard is a problem for enforcement if not more so than in monitoring. If the Department cannot provide evidence of the landholder's moral hazard in court, there is little chance of enforcement succeeding or having a deterring effect. If landholders know that evidence of moral hazard is difficult to verify, then the incentive of engaging in moral hazard becomes higher (Laffont and Martimort, 2003). Together with non-trivial transaction cost of enforcement and non-verifiability of evidence, enforcement of contracts may be *non-credible*.

Information revelation is an important way of improving the efficiency of a contract. However, if monitoring and enforcement is weak, the information revelation properties of a contract may be useless. Information revelation reduces the cost to society of adverse selection but weak monitoring and enforcement regimes may result in an increase of moral hazard behaviour and therefore increase in costs to the Department in using contracts.

1.3.4. Adverse Selection and Moral Hazard

In the discussion above, we have looked at the adverse selection and moral hazard problems in isolation of one another. But the reality is that adverse selection and moral hazard occur jointly in the context of multi-outcomes contracts. What are the policy implications when they occur together?

We would think that when adverse selection and moral hazard occur jointly that allocative efficiency is unambiguously worse. However, according to the economics literature this may not be the case. There are two cases considered by Laffont and Martimort (2002):

1. Adverse selection followed by moral hazard.
2. Moral hazard followed by adverse selection.

In general, when adverse selection and moral hazard are possibilities in the same economic situation, they cause distortions. However, whether or not these joint distortions are *second-best* is arguable. By second-best, we mean the most efficient (distorted) outcome given asymmetric information. In contrast, *first-best* is the ideal outcome where landholders fully reveal their type and decisions are not distorted by asymmetric information. Let us consider each case individually in the context of the multi-outcomes auction. In this discussion, we will assume there are two types of landholders in terms of opportunity cost of environmental management: 'low cost' and 'high cost' landholders. Both types of landholders are assumed to be risk-averse. We will also assume there are two types of management actions in terms of environmental value: 'low value' or 'high value'. We assume actions are verifiable. We will

also assume the multi-outcomes auction seeks to reward low cost landholders to undertake high value actions for monetary amounts as close to their opportunity cost as possible.

In case 1, the landholder knows his type before running the auction. Because of adverse selection, the landholders submit bids that incorporate information rents. The distortions caused by information rents represent the first efficiency cost. When the contracts are accepted, moral hazard becomes a possibility. As discussed before, a risk-averse landholder may incorporate a risk premium into her bid that imposes additional costs on the Department. The distortions caused by the risk premium represent the second efficiency cost in case 1. In summary, when adverse selection occurs before moral hazard, allocative efficiency is harmed by bidding landholders incorporating both information rents and risk premia.

We can think of case 2 as a situation where the landholder is first offered a contract by the Department and then chooses whether or not to undertake management actions. In this situation, the landholder does not know what type he is until after he chooses to undertake the action or not. This situation could arise if the landholder was not sure of the costs of the management actions before undertaking them. Distortions from information rents and risk premia may be *second-best* because the outcome may not be as harmful as in the pure adverse selection case (see 1.3.1) (Laffont and Martimort 2002). However, in this case *high-powered* incentives are needed to minimise these distortions; high-powered incentives are payments more closely related to the Department's desired outcome.

When adverse selection and moral hazard occur together, it is not clear that allocative efficiency will be adversely affected. In what sequence adverse selection and moral hazard occur has implications on the overall efficiency of contracts. Another policy implication could be to design a policy that solved moral hazard first then adverse selection.

1.4. Risk

Risk is an integral part of agriculture and environmental management. How landholders behave given risk — whether from income variability or contracted risk — has implications for policy design as we saw in the discussion of moral hazard and adverse selection. Here, and in the rest of this paper, we take risk to mean the uncertainty of achieving the Department's multiple environmental objectives. In this Section we will first define risk preferences and explain what this means for landholders' economic behaviour. Second, we will explain the concept of risk-sharing. Third, we will discuss how risk preferences interact with adverse selection and moral hazard. Finally, we relate these discussions to the design of an efficient contract.

1.4.1. Risk Preferences

Landholders may have widely diverging risk preferences: some could be very cautious when it comes to farm management whereas others may be more risk-taking and readily accept new ideas despite the lack of evidence of the idea's practical worth. Landholders who are cautious when it comes to risk are called *risk-averse* in economics. Risk-averse landholders will only accept a risky alternative if they are paid a *risk premium* above the *expected value* of the proposition. The idea of expected value can be explained by way of an example: the landholder is offered a risky proposition where it is expected 50 per cent of the time the proposition returns \$10 and the other 50 per cent of the time \$100. The expected value of this proposition (neglecting any costs for simplicity) is $0.5 \times \$10 + 0.5 \times \$100 = \$55$. A risk-averse landholder will only accept this gamble if its expected value exceeds the expected value of the landholder's best alternative plus a risk premium; ie, will accept a certain payment of \$55 less the risk-averse individual's risk premium.

To a risk-neutral landholder, risk is irrelevant, what matters is the expected value of the gamble. This means risk-neutral landholders do not require a risk premium to accept a gamble. Using the previous example, a risk-neutral landholder will accept the gamble if it exceeds the expected value of best alternative the landholder has. There is a third class of risk preference called *risk-lovers*, these type of individuals would *pay* to take on risk. We ignore this class because we believe very few landholders exhibit risk-loving preferences.

1.4.2. Risk-sharing

Risk-sharing is how two parties spread the risk of a relationship between them. For example, in a relationship of insuring a motor vehicle between an insurance company and a motorist, the excess charged by the insurance company indicates how much of the risk is borne by the individual. If the excess is high relative to the replacement value of the vehicle, the individual bears most of the risk. This is because when a loss occurs, the individual bears a relatively high proportion of the cost of repairing the vehicle. Conversely if the excess is low relative to the replacement value of the vehicle, the insurance company bears relatively more of the risk. Likewise, for premium rates, the higher the actuarially fair premium the more the agent has to pay the insuring principal to share risk.

In multi-outcomes, risk can be shared between landholders and the Department. The Department can share risk by delegating the responsibility of the environmental outcome to a landholder. For example, in the case of water quality, the Department can design a contract that delegates to a landholder all the responsibility for water quality of a nearby stream which means the landholder bears all the risk for improved (or reduced) water quality. Or the Department can choose to share some of the risk for water quality by choosing an

intermediate (albeit imperfect) measure of water quality such as making contract payments contingent on reduced fertilizer intensity; by doing this, the Department assumes a greater share of the risk of water quality improvement. *Perfect* insurance can be achieved by the Department making contract payments contingent on an easily achievable measure that may (or may not) be correlated with the desired environmental outcome; in this case, the Department bears all the risk. In the water quality case, an example of perfect insurance is where the landholder agrees to not using fertilizer in paddocks near the riparian zone. Perfect insurance is socially optimal if there is no possibility of moral hazard; in other words, if there is no asymmetric information.

1.4.3. Risk Preferences, Adverse Selection and Moral Hazard

Differences in risk preferences do not generally affect the solution to the adverse selection problem; in other words, payment of information rents is needed to induce truthful revelation regardless of risk preferences. However, differences in risk preferences affect the moral hazard problem.

When a landholder is risk-neutral, moral hazard is not a problem because the Department can design a contract that rewards ‘good’ behaviour (ie, non-moral hazard behaviour) and punishes moral hazard behaviour. The outcome of the policy is *first-best*. This holds if a landholder’s actions are verifiable not because the Department can design contracts that induce ‘good’ behaviour (Laffont and Martimort 2002). From the definition of risk-neutrality, a contract can be designed that discourages moral hazard by ensuring the landholder’s *expected* gain from entering the contract is greater than his next-best feasible alternative. But if the Department was restricted in punishing landholders who engage in moral hazard behaviour, landholders may no longer behave in an undistorted fashion. In the incentive literature, the landholders have *limited liability* (Laffont and Martimort 2002). A *limited liability rent* may be required to distort landholders to not engage in moral hazard; this rent is analogous to information rents except that it deals with moral hazard by risk-neutral landholders rather than adverse selection. The limited liability rent is only paid if the Department’s desired outcome is achieved; this provides risk-neutral landholders with an incentive to not engage in moral hazard. Therefore, when the Department is unable to impose appropriate punishments because of limited liability the outcome of the contract is likely to be *second-best* because of the need to ‘bribe’ landholders with limited liability rents.

If a landholder is risk-averse then moral hazard is a problem. This is because there is a trade-off between efficiency and insurance in this case. A risk-averse landholder prefers more insurance to less but more insurance provides more scope for moral hazard and therefore allocative inefficiency; hence the trade-off between insurance and efficiency. To solve the

moral hazard problem the Department does not provide full insurance to a risk-averse landholder; if the risk-averse landholder faces some of the cost of risk then the landholder is less likely to engage in moral hazard. But, as we discuss in 1.4.4 shifting risk to a risk-averse landholder requires the payment of a risk premium. Analogous to the limited liability case for risk-neutral landholders, the risk premium is paid to the landholder when the Department's desired outcome is achieved. When the landholder does not achieve the Department's outcome, the Department provides less than full insurance whereas when the outcome is achieved the landholder gains a rent in the form of the risk premium. This implies that payments need to be contingent on outcomes or actions to eliminate moral hazard if a landholder is risk-averse.

1.4.4. Contracts and Risk

How does risk affect the design of efficient environmental management contracts? We have touched on some of these issues in 1.4.2. Risk affects contract design because risk preferences determine how landholders behave given the scientific uncertainty of the causality between management actions and environmental outcomes. Risk affects the contract design through moral hazard.

If landholders are risk-neutral, the Department has greater scope to achieve allocative efficiency in contract design; the Department can exploit these landholders indifference to risk by rewarding landholders who undertake environmental management actions and punish those who do not. However, this assumes the Department is unrestricted in choosing the severity of punishment and assumes that courts of law will always enforce the Department's punishment. These assumptions may be too strong to provide us with solid guidance on how to design efficient contracts.

A more realistic case is when we assume landholders are risk-averse. Risk-sharing is needed between the Department and landholder to lower (but not completely eliminate) risk to the landholder but also to ensure that landholders undertake management actions. This entails the payment of risk premia to the landholder to bear some risk. Unlike the risk-neutral case, contract design to deal with risk-aversion cannot result in a first-best case.

Recall from 1.3.4 that adverse selection and moral hazard can occur jointly. In both cases, contracts are relatively more efficient if landholders are risk-neutral rather than risk-averse. As we have discussed before, the distortions from moral hazard are lower when landholders are risk-neutral (assuming there is no limited liability) than when landholders are risk-averse. However, risk preferences do not change the relative efficiency of timing of when adverse selection and moral hazard occur; a contract is likely to be more efficient when moral hazard occurs before adverse selection.

In summary, risk preferences are important considerations for the design of environmental management contracts because it determines how incentives are structured to deal with the moral hazard problem.

1.5. Commitment and Renegotiation

Another aspect of the economists' view of contracts is how *commitment* to the contract by the Department is maintained. Without either the Department being committed to completing the terms of the contract, neither the Department and the landholder is likely to be better off by entering into the contract. How to design contracts to ensure commitment is maintained is one focus of this Section. Another focus is when commitment can no longer be maintained, can contracts be *renegotiated* to ensure both the Department and landholders are still better off? We will also examine whether it is better for the Department to remain inflexibly committed to the contract or is it better for the Department to be flexible enough to renegotiate? We will start by looking at commitment.

1.5.1. Commitment

Commitment is a term describing the ability of a contracted party to restrict future actions to those allowable within the terms of the contract (Salanie 1997). Economists distinguish between two types of commitment: *credible* and *non-credible*. Credible commitment is where a contracted party is able to commit to a contract because it has an incentive to do so. Non-credible commitment on the other hand is where a contracted party undertakes a commitment but it is non-credible because there is no incentive for that party to maintain commitment.

Credible commitment by the Department is necessary to ensure contract compliance. If the Department cannot credibly commit to uphold the terms of the contract, two things can happen depending on how the Department breaches the contract. If the Department is likely to behave in a 'predatory' fashion, ie, exploit its stronger bargaining position by imposing unfair terms on contracted landholders, then landholders are unlikely to participate in the multi-outcomes auction. If landholders participate in the auction, they may bid higher amounts because of the risk of the Department exploiting its superior bargaining position; this is called the *expropriation* risk. On the other hand, if the Department is unable to credibly commit to enforce the contracts when landholders are found to be in breach of contract, then landholders are likely to engage in moral hazard behaviour. This is because if the Department is unlikely to enforce contracts, landholders can make themselves better off by committing moral hazard.

1.5.2. Renegotiation

Renegotiation relates to a situation where both the Department and the landholder agree to change the terms of an existing contract. Renegotiation differs from breach of contract because the former is a mutual decision whereas the latter is unilateral (Salanie 1997); breach of contract occurs when either party cancels the contract because it no longer serves its interest. Renegotiation may occur when both parties agree to renegotiate the contract because they both believe they would be better off under new contract terms. This may be an efficient response by both parties because both sides will be better off under a new contract. Renegotiation may be one way of reducing the cost of non-credible commitment and moral hazard. However, for renegotiation to pay off for both the Department and the landholder, both parties have to be at least not worse off.

When contracts are *incomplete*, renegotiation may be necessary to ensure the objective of the outcome is achieved. Incomplete contracts do not take into account all the possible contingencies; it would be very costly to draft a contract that could take in account all contingencies. With incomplete contracts, a contingency may occur that may cause both the Department and the landholder to be worse off if the contract was to be inflexibly maintained. Renegotiation may then be an efficient response to unforeseen contingencies if the costs of renegotiation are relatively low. Throughout this document, we have implicitly assumed contracts are incomplete.

The Department has to be careful when it chooses to renegotiate. There is a great temptation to use information collected during the operation of the contract. It is quite possible that when the contract was being implemented that the landholder revealed information about its management costs. If the Department chooses to use this information to impose a less favourable contract on the landholder (but one that still makes the landholder better off), this may further distort landholders' behaviour. If landholders believe the Department will use renegotiation to remove any information rents or risk premium, this may distort bids upward because landholders will know the Department will try to expropriate their rents. The threat of expropriation may also deter landholders from participating if they believe the Department will exploit its strong bargaining position to expropriate rents.

1.5.3. Implications of Commitment and Renegotiation

The implication of commitment and renegotiation is how it relates to contract duration. With short contract duration, commitment is easier to maintain; this is because there is a lower probability of unforeseen contingencies occurring and the cost of commitment is lower with shorter contracts. Conversely, if contract duration is relatively long, commitment is more difficult to maintain because the likelihood of unforeseen contingencies occurring is relatively

higher and the cost of commitment is higher. Given this, it appears there is a trade off between contract duration and commitment.

The trade off between contract length and commitment may not be so stark if renegotiation is allowed. Renegotiation allows both parties to mutually agree to new terms of a contract without cancelling the contract outright. However, this depends on whether or not the Department can negotiate in a non-predatory fashion and commit not to expropriate rents as part of renegotiation. This may be a difficult task since there is a strong (short-term) economic incentive to expropriate rents during renegotiation.

Given the possibility of expropriation, it may be more efficient for the Department to only issue short-term contracts. To enable the Department to encourage long-term management, a renewal clause can be written into these contracts that allows the Department to renew the contract if the landholder is willing to continue the contract at the existing terms. If the Department does not want to renew the contracts but wants to continue some kind of contractual relationship, it can ask the landholder to submit a bid in another auction, which allows the landholder to submit the same contract without the threat of expropriation.

Short-term contracts have a disadvantage if the Department is seeking long-term investments in capital from landholders. In this case the duration of the contract may be shorter than the capital life; the Department will have to fully fund the capital but gets only part of the benefit therefrom. This may not be cost-effective from the Department's perspective. Further, after the contract ends the landholder will make decisions about how the capital may be used. If the capital is transferable the landholder may benefit by transferring it. If the capital is specific to a certain use, then the landholder may cease using it, or alter its use in some way. For example, a water pump may be used in several ways: extracted groundwater may be placed in evaporation basins, or used to water crops, etc. If the landholder changes the manner that the capital is used (perhaps towards uses that are more profitable), then it could completely alter the effects on the environment. The negative effects of post-contract use of the capital may eliminate, or worse overtake, the positive effects sought via the contract.

Similarly, short-term contracts may not correspond with the length of time it takes for a management action to have any environmental outcome.

To summarise, commitment and renegotiation are linked to contract duration. Long-term contracts may be preferable from an investment perspective but it is harder to maintain commitment, especially when renegotiation is not an option. Short-term contracts are attractive because it is easier to maintain commitment without resorting to renegotiation but there is a trade off between commitment and investment certainty. When designing contracts, the Department needs to take into account the appropriate duration for maintaining

commitment and ensuring there are incentives to encourage landholders to invest in socially beneficial capital.

1.6. Issues for Multi-outcomes Contracts

Now that we have reviewed the main lessons of contract theory, how do we apply it to multi-outcomes contracts? The key point is that contract design is about managing the trade offs between: reducing adverse selection or bids; reducing moral hazard or bids; extending contract length and diminishing incentives for commitment; etc. In theory, *optimal* contracts can be designed that efficiently manage these trade offs so both the Department and the landholder are better off. But these optimal contracts are designed under strict assumptions about landholders' behaviour and assume that contracts are complete. But we know from our discussion that the Department is unlikely to be able to predict all the possible contingencies and, even if it could, it would be very costly to write them into a contract.

In this Section we will apply the lessons of contract theory in designing efficient contracts for the multi-outcomes auction. We will draw the main implications for contract design but will stop short of prescribing how contracts should be written. In the multi-outcomes auction, contracts are called 'agreements' that are jointly developed by the Department and the landholder. We apply contract theory by breaking down the agreement into four components: site specific objectives, management actions, monitoring and payment schedule. We start with site specific objectives.

1.6.1. Site Specific Objectives

The site specific objectives of an agreement are the desired *outputs* of the contractual relationship between the Department and the landholder. In many cases, the site-specific objectives may not be written in terms of the desired environmental outcomes. This is because of the scientific uncertainty of the causality of how management actions lead to environmental outcomes. For this reason, the outputs of the contract may differ substantially from the environmental *outcomes* the Department is aiming for. For example, the Department may want to improve the water quality of a river system. However, because of the complexity of how surface runoff from a specific source contributes to water quality, writing a contract in terms of water quality may impose an excessive amount of risk on the contracted landholders. Such a contract may be so unattractive for the landholder that he chooses not to participate in the program; or the landholder may bid a very high amount so that he is not successful in the auction. Instead of writing the site-specific objectives in terms of environmental outcomes, the Department may write it in terms of contracted *outputs* that may contribute to achieving environmental outcomes. In the water quality example, the

Department could write the objective in terms of reducing fertilizer use in paddocks adjacent to the riparian zone.

Contracted outputs may not be environmental outputs but may instead be *inputs* into environmental outcomes. The distinction between outputs and outcomes is important because the contracted outputs may have an uncertain contribution to the environmental outcome. When contracted outputs are inputs into environmental outcomes (ie, when they are not the same) the Department is essentially contracting on an uncertain environmental outcome. The implication of writing agreements in terms of inputs into environmental outcomes is that the Department is effectively accepting the risk of achieving the environmental outcomes. We discussed before under moral hazard that the Department should not bear all of the risk in a contract because this may provide a perverse incentive to engage in moral hazard. Given moral hazard, the contracted outputs should be related at least partly to environmental outcomes.

Contracted outputs also need to be verifiable. If this was not the case, moral hazard may not be preventable because even if the landholder was found to be in breach of contract, the Department may not be able to enforce penalties because there is no verifiable evidence. But there is a trade off between the verifiability of site objectives and environmental outcomes. More verifiable site objectives may be less related to environmental outcomes. This means that the Department may have to bear more risk. By the Department bearing more risk, there may be a greater incentive for landholders to engage in moral hazard. The trade off between verifiability and environmental outcomes is important in determining what site objectives to use as the contracted output.

There is also a trade off between verifiability of contracted outputs and environmental outcomes in terms of monitoring costs. The closer the contracted outputs are to environmental outcomes the less verifiable outputs are and the higher the monitoring costs are. Monitoring costs are higher the less verifiable outputs are because more monitoring is needed to verify output. Conversely, the more verifiable outputs are, the lower monitoring costs are. The implication of this trade off between verifiability and monitoring costs is that if monitoring costs increase sharply with verifiability, the Department may prefer to choose a contracted output that is not strongly related to environmental outcomes.

1.6.2. Management Actions

Agreements may explicitly state the type of management actions the Department wants the landholder to undertake. These management actions should be related to achieving the site specific objectives. Obviously, if they do not, site specific objectives may not be achieved.

The cost of the same management actions may differ between landholders for a variety of reasons such as the type of enterprise or the bio-physical characteristics of the site. Because the Department is ignorant of how the opportunity cost of management actions differs among landholders, adverse selection may be a problem. Adverse selection in this case is where lower cost landholders raise their bids above their opportunity costs to gain information rents. An auction mechanism reduces information rents, albeit imperfectly. The problem of adverse selection can be handled by an auction design that introduces competition that compels bidders to bid close to their opportunity costs. However, it is unlikely that auction mechanisms can totally remove all information rents (see Cason et al (2003) for experimental evidence).

A more serious question for contract design is the possibility of moral hazard. In the case of multi-outcomes, moral hazard is where landholders claim to undertake management actions but in reality do not. Moral hazard can be eased by ensuring that actions are *verifiable*; if the landholder is found to be in breach of contract, the evidence should allow the Department to enforce penalties against the landholder. This may mean the Department is restricted to prescribing the number of management actions because some actions are more verifiable than others; verifiability is an important consideration when determining management actions. In the water quality example, reducing fertilizer may be verifiable but only after costly laboratory tests are carried out.

1.6.3. Monitoring

Contract design may contribute to reducing monitoring costs because incentives can be built into agreements to reduce moral hazard. We have discussed how to reduce moral hazard above but this is at the cost of reducing other incentives. Given the trade offs between moral hazard and other aspects of contract design, we are unlikely to completely eliminate moral hazard.

The Department can use monitoring as a way of reducing moral hazard without reducing the incentive effects of the contract. However, monitoring is costly and if the budget does not allow for extensive monitoring, the deterrence effects of monitoring may be significantly diminished. The costs of monitoring are lower the more verifiable the contract output; a contract can be designed where there is verifiable outputs, however, the trade off is the redistribution of risk to the Department and the resulting risk in moral hazard by the landholder.

Monitoring costs could be shared between the Department and the landholder by requiring the landholder to self-report actions undertaken during a reporting period. Self-reporting can take the form of photographs or written reports. By tying payments to the production of self-

reports, landholders will have an incentive to self-report. There is still a need for monitoring in the form of random checks to ensure that landholders are not misrepresenting their progress in the self-reports.

1.6.4. Payment Schedules

One of the strongest incentives the Department can use is the design of a payment schedule. The landholders will not sign up if there was no material benefit to them (unless they are altruistic). How the payment schedule is structured is important for the incentives of the overall contract.

If the contract outcomes and management actions are verifiable, there may be scope to use high-powered incentives in the contract. What this means is that payment instalments can be linked to actions and achievement of site specific objectives. Depending on the relative weighting of the payment schedules, the landholder may concentrate on a specific objective or action. But if the actions and objectives are related, concentrating payments on actions may ensure all the desired actions are undertaken and the objective is achieved.

When actions are not verifiable, the incentive effects of high powered incentives are diminished. This is because the Department is unable to verify if the action has been undertaken or if the objective has been achieved. Using low powered incentives may be more appropriate since payments have little or no incentive effect if actions and objectives are not verifiable. An example of low powered incentives is structuring payments on a purely annual basis with no link to actions or the objectives of the agreement.

Payment schedules need to take into account the effect on moral hazard. If payments are paid mostly at the beginning of the contract duration, the landholder has weak incentives to complete the contract. The Department should be able to eliminate landholder incentives for moral hazard by distributing payments according to the timing of their application of inputs, or the provision of outputs.

The design of the payment schedule can also influence risk. Risk to the landholder may be increased by placing the emphasis of the payments on achieving the objectives of the contract. By imposing more risk on the landholders, this may increase bids for such contracts because landholders will add a risk premium to the bid. The magnitude of risk premia depends on the degree of risk-aversion of each landholder. If landholders are predominantly risk-neutral, the magnitude of risk premia is negligible; the converse is true if landholders have a high degree of risk-aversion. By spreading risk evenly throughout the contract, this may neutralize the incentive effect of risk on landholders' behaviour. The design of payment schedules needs to take in account the trade off between risk premia and moral hazard.

Enforcement of contracts is an important factor in determining how to structure the payment schedules. The transaction costs of enforcing contracts may outweigh the financial loss of a contract if a landholder was found to be in breach of contract. In this case, enforcement is non-credible because the Department is unlikely to enforce contracts. To minimise moral hazard, payment schedules should be spread evenly, with slightly more payments at the end of the contract. This is so landholders do not have a strong incentive to engage in moral hazard.

In summary, payment schedules can maximise incentives for contract compliance by first linking payments to actions and objectives and, secondly, if actions and objectives can be decomposed on an annual basis, spreading payments relatively evenly through out the life of the contract. By doing so, reduces the costs of moral hazard.

1.6.5. Efficient Contracts for Multi-outcomes

Figure 2 summarises the discussion in Section 1.6.1 through 1.6.4. Objectives and actions are linked to monitoring. Payments are linked to monitoring which provides incentives for the landholder to comply with the terms of the contract.

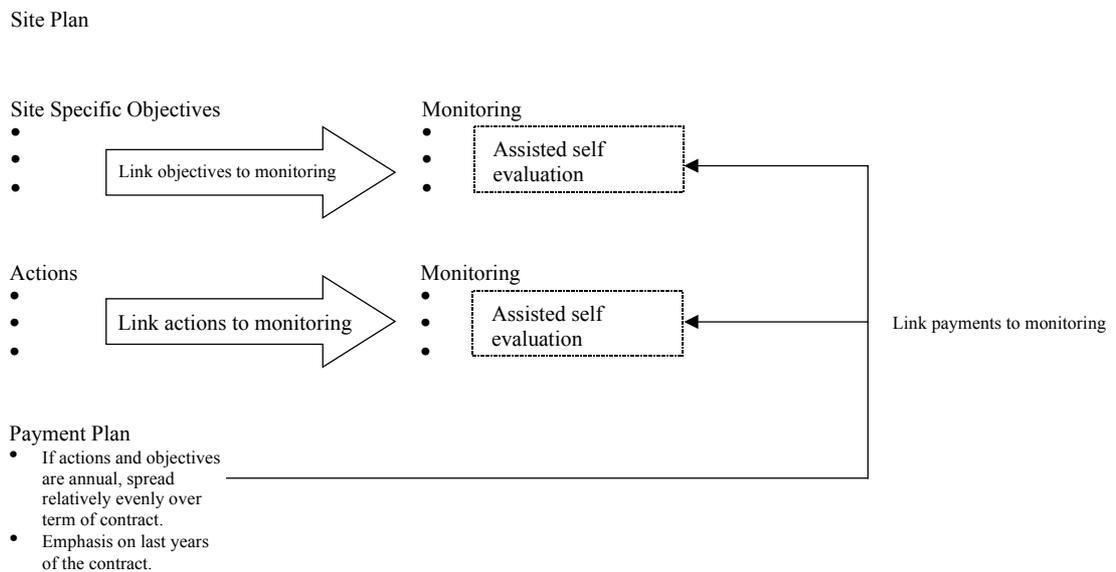


Figure 2 An efficient multi-outcomes contract

The contract in Figure 2 is efficient because payments are explicitly linked to evidence of achievement of objectives and actions. The landholder has an incentive to comply with the contract. This contract minimises the extent of moral hazard by reducing the incentive to violate the terms of the contract. Also, if actions and objectives can be decomposed annually, payments are spread over the life of the contract with an emphasis on the later years of the contract; this is to ensure commitment over the life of the contract.

2. Designing Multi-Outcomes Contracts

Figure 2 in Section 1 shows some key elements regarding contract design. In this Section, we compare the current biodiversity contracts to the recommendations of Figure 2.

2.1. Assessing the BushTender Contracts

2.1.1. Overview

A BushTender contract is given in the Appendix. This is a contract for 6 years of 'management', and then an additional 10 years of 'protection'. There are several sections to the contract, however for our purposes the most important component of the contract is the Third Schedule, which is called the Management Plan.

The management plan has two key sections: targets; and a landholder's commitments. In our parlance these are *environmental outcomes* and *management actions* respectively. The targets are general aims that the landholder should try to attain. The landholder commitments are specific things that landholder must do under the agreement. Under point 1 of landholder's commitments are overarching commitments. Under point 2 are specific actions for each year. Points 3, 4 and 5 outline additional specific requirements of the landholder, including the need for the landholder to submit a 'report' (point 6), which is a self-reporting requirement that the agency uses to monitor contracts.

The end of the contract outlines the Secretary's commitment in terms of the payment schedule. In the Gippsland contracts, these payment were made in the first six years of the contract. Note that payments are split into two components: those for "management" which is for the first six years; and those for "protection" which are for the subsequent ten years.

2.1.2. Incentives for Contract Compliance

The targets are very broad aims that are not perfectly related to the commitments. For example, point 1 ('protect site quality') is probably partly affected by the landholder's commitments. As discussed in Section 1, if the landholder's commitments are not closely related to the environmental outcomes, the landholder does not have a strong incentive to achieve the environmental outcomes. A possible improvement of this contract is to select a measure that is related to site quality but is also within the landholder's control. However, such a measure that is closer to environmental outcomes may be non-verifiable and, hence, cannot be contractible.

The landholder's commitments are focused on *inputs* into the environmental outcomes. Some of these commitments can be verified easily by site inspection. For example, the erection of fencing in the first year is easily verified by a site inspection since fencing is a physically

tangible output. However, some of the other commitments are not that easily verified such as controlling blackberry; it may be possible that the landholder did spot spray blackberry or an adverse climatic event may have destroyed any beneficial effect of spot spraying. The Department probably cannot verify controlling blackberry in the law courts and probably cannot enforce this part of the contract. Because of the lack of *verifiability*, moral hazard may be a significant problem in this contract. But this can be resolved partly by requiring the landholder to present evidence of the purchase of the sprays.

The payment schedule is split into two sections: one schedule for management payments and another schedule for protection payments. For the management payments, 55 per cent of management payments are paid at the beginning (35 per cent) or at the end (20 per cent) of the first year of the contract. This may cause *commitment* problems if the contract was only a six-year management contract because most of the management payments are ‘front-loaded’ in the first year of the contract. If the contract was a pure management agreement, there may be significant commitment problems because there is little or no incentive to fully comply with the terms of the contract. However, there is an additional 10-year protection agreement attached to the management agreement. According to the payment schedule, *all* of the protection payments are paid at the end of the management agreement (end of year 6). As we mentioned in Section 1, by allocating all the payments at the beginning of the agreement may place all the risk of the completion of the contract with the Department and fully insures the landholder. In effect, there is no risk-sharing between the Department and the landholder: the landholder is *fully insured* by the Department in terms of the protection agreement. In terms of the payment schedule, the Department undertakes a relatively large share of the risk to the point where moral hazard may be a significant problem, especially when it comes to the protection agreement. This probably reflects the short-term nature of government budgeting process; government agency budgets are allocated on a relatively short time frame, which precludes agencies from being able to commit to contracts longer than six years. In effect, the Department wrote the BushTender contracts’ payment schedules to signal that its commitment to administering and enforcing the contract would last for at least six years.

The moral hazard problem is particularly acute if a landholder perceives that the Department is unlikely to enforce a contract via legal proceedings. A landholder may think this unlikely because the benefits the Department derives from each individual contract are small, and the cost of legal proceedings may be large. However, this is not to say that the Department will never enforce a contract through the courts since there could be spillover benefits: it sends a signal to other contract participants about the Department's willingness to use the court process.

Another problem with the payment schedule is how the payments are only partly related to the commitments and the targets. The payments are related to specific commitments (ie, fencing and blackberry control) but there is little direct incentive to undertake the other commitments and to achieve the targets. As we mentioned above, many of the commitments and targets are not easily verified so this may not be such a problem. Incentives are relatively *low powered* in this contract because most of the targets and commitments are not *verifiable*. However, this is probably due to the infeasibility of linking commitments to payments due to the lack of scientific certainty.

2.1.3. Monitoring and Enforcement

As we mentioned in 1.6.1 many of the targets and the commitments in the example BushTender contract are not easily verifiable. We argued this may exacerbate moral hazard problems because of the non-verifiable nature of the commitments and targets. Non-verifiability may also complicate monitoring by increasing monitoring costs. Enforcement is also complicated because non-verifiability makes it difficult for the Department to enforce the contract.

As yet, there is no monitoring of Gippsland contracts, however, we would expect this to occur largely as for the first trial, which was held in the north-east and north-central.

All first trial contracts are three years. The Department intends to monitor all contracts over the three-year period. Landholders are required to self report on their contract compliance at the end of each year. When the Department visits a landholder, it inquires as to the landholder's progress, and the usefulness of the proposed actions. The Department also assesses whether the contract terms have been upheld. If some contract terms have not been upheld, then the Department withholds payment, and requests that the landholder undertake the actions in the management plan. If the landholder does not undertake the actions in a reasonable timeframe, the contract is terminated, and the Department requests that any initial payments be returned.

2.1.4. A Comparison of Theory to Practice

In this Section, we will compare the recommendations in Figure 2 to the contract given in the Appendix.

The BushTender contracts fit very well into the theoretical schema given in Figure 2. If Figure 2 is considered a good template on which to base contracts, then we can say the following positive things about BushTender contracts:

- They have a clear set of actions that need to be undertaken. The need to do these is reinforced by the fact that a landholder may be monitored.

- There is self reporting. The incentive to truthfully self-report is based on the probability of being monitored, as above.
- There is some link between actions being undertaken, and payments, given that a landholder is monitored. Landholders who self-report that they have not undertaken some actions are requested to undertake these. The same goes for landholders that are monitored (as explained above).

The areas for potential improvement are:

- relating targets more explicitly with commitments;
- moving some components of contracts further towards output-based payments;
- making some of the commitments more easily verifiable if feasible;
- if commitments and objectives can be decomposed on a yearly basis, alter the schedule of payments towards more even payments throughout the life of the contract and slight emphasis on later years of the contract to take in account the non-verifiable components of the contract; and
- altering the monitoring approach in ways that may provide more information about the state of the biodiversity patch.

So in summary the current BushTender contracts fit well with the schematic presented in Section 1, and there are a few minor alterations that could be made. We discuss these possible alterations in the next Section.

2.2. Possible Alterations to BushTender Contracts for the Multi-Outcomes Pilot

In this Section we examine, in further detail, the areas for potential improvement of BushTender contracts.

2.2.1. Moving towards Output-Based Contracts

One of the aspects of Figure 2, and discussed in Section 1, is that BushTender contracts focus to some degree on paying for inputs. This is sensible in the short-run given the nature of many biodiversity outputs and current knowledge: outputs are costly to measure, and the transformation function from inputs to outputs is not known with certainty. Hence, the agency pays landholders as long as they have provided the stated services in the contract. These services, we assume, allow the agency to move towards its goal of increased biodiversity.

Such a contracting arrangement means that the agency bears most of the contract risk. As explained in Section 1, this may provide the supplier with relatively little incentive to get the

stated outputs (ie, moral hazard). There may be a risk that suppliers 'go through the motions' of providing the inputs, without necessarily worrying about output quality.

In Section 1 we also stated that some outputs may be relatively less-costly to observe than others. Consider, for example, revegetation. In this case, an agency could observe, after a certain period of time, whether revegetation were established to an appropriate standard (type, density, etc.). Hence, a contract that involved revegetation could be based, at least in part, on payments for outputs.

How would this work? A possible scenario is as follows. A landholder volunteers to manage some remnant vegetation on her property via weed control, and to perform revegetation on an adjacent area. In terms of the weed control, the agency contracts for inputs, that is, for a landholder to buy weed-control materials, and to use labour to disseminate the material over the remnants in some orderly fashion. If the landholder undertook these activities to her best ability, but weeds did not decrease (due to say an unexpected weather change) then the agency may still pay for the inputs (see above). However, in terms of revegetation, the agency may think that it can observe successful regeneration: it can observe after some time period whether there has been sufficient recruitment of trees, with the appropriate mix of species.

In the above scenario, the payment schedule is affected: payments for weed control is on some ongoing basis, related to the timing of the inputs needed (see 2.2.2). Given the current yearly structure of self-reporting, the weed control component of the contract would be paid yearly. However, if this were a six-year contract, the agency may pay for the revegetation only at the end of the contract period, ie, after year six.

An issue here is whether outcome-based payments and input-based payments all fit under the one contract. There is a problem because if a landholder provides one bid for two types of action—one output-based and one input-based—the cost of the different actions is not 'split'. Consider an example. Landholder *A* bids \$100 to undertake weed control and revegetation. The Department wants to pay for revegetation after it is completed. Weed control is paid for in yearly installments. The Department would not know what proportion of the \$100 should be allocated to the final revegetation payment, and what proportion should go to yearly weed installments.

A possible solution is to use a standard formula to allocate activities to different payment schedules. For example, a standard contract may allocate payments based on land area. Say a possible contract proposes to revegetate 50 per cent of a proposed site and to manage the other half's remnant vegetation. Since the output of revegetation is verifiable, 50 per cent of the payments may be based on an output based payment schedule. Conversely, the remnant

vegetation activity is more input based so a payment schedule that is based on use of inputs is more appropriate. Thus, for this example contract, 50 per cent of payments are based on revegetation outputs (and more risk to the landholder) and the other 50 per cent based on an inputs based payment schedule (and less risk to the landholder). These type of contract relies on a good understanding of the costs of different activities for different landholders are in order to accurately allocate payments based on different schedules.

Another solution to this problem is to ask the landholder to place two separate bids: one for weed control and one for revegetation. The weed-control (input-based) component would then be paid according to when the inputs are applied. The revegetation (output-based) component would be paid when output is observed. In other words, there are effectively two contracts here: one for the inputs and one for the outputs. Since there are two contracts operating, these contracts would also have to be scored separately. The landholder may then be successful with both contracts, just one, or neither.

In the multi-outcomes pilot, we expect to see three broad types of contract:

- remnant management for biodiversity; and
- water pumps for water quality and potentially biodiversity.
- revegetation for carbon, water quality and biodiversity;

These three main types of activity may attract different contract types. Remnant management and water pump contracts will be relatively input-based. Revegetation will be relatively output-based. Therefore, a landholder in choosing to undertake a certain activity will also choose a contract type.

A potential problem with this approach is that a risk averse landholder may favour input-based contracts. Given that this is the case, the Department will receive relatively more bids for the input-based contracts, compared to the case where landholders were risk neutral. This may not be a problem: the Department may still receive enough revegetation bids to secure goods that satisfy its preferences. However, if it does not, it may need to induce landholders into revegetation (so as to produce the environmental goods) by offering greater incentives for revegetation. For example, the Department may increase its weighting for revegetation in its scoring system. Effectively this works as a risk premium. If the existence of this risk premium were communicated to Landholders, then they would know they could submit the same (or a higher) bid for revegetation with a higher (same) probability of acceptance. This would induce more bids for revegetation if the risk premium were large enough.

An option for the multi-outcomes project team is to allow bidders to submit a 'total' bid for more than one activity (contract), in addition to their separate bids. So a bidder undertaking

two contracts would place three bids, for example, a bid for remnant management, one for revegetation and one for both. However, the bidder would do so on the understanding that any of the three bids might be accepted. This would be interesting from an economic point of view because it would give a direct estimate of individual scope economies across these activities. The cost of this system is that it is more administratively difficult.

2.2.2. Payment Schedules

In this section, we recommend that payments occur according to a U-shaped schedule, where some proportion is paid up-front, and some proportion left to the completion of the contract. In this section we argue such an approach is appropriate, at least in the short term, because it should provide good incentives from the buyer's and seller's point of view. These incentives should help the Department achieve its aims at least cost. As stated above, elimination of moral hazard is intimately linked to the allocation of risk.

In the future, detailed contract-design in terms of payment schedules may require more theoretical investigation, or perhaps in-depth data collection, or both.

Now, we will discuss the key components of U-shaped payment schedules: up-front payments and end-of-contract payments.

Up-front Payments

There are (at least) two reasons why some portion of a multi-outcomes contract should be up-front. First, to service (some portion of) a seller's capital outlays. Second, to ensure buyer commitment (see 1.5), and therefore make the contract desirable from the seller point of view.

An agency paying for outputs may require a landholder to initially outlay some capital amount. For example, regeneration may require the purchase of seeds, and perhaps seeding equipment. If the Department based payments for regeneration purely on outputs, then the landholder would receive no funding for these initial capital outlays. If some landholders were loathe to incur an initial capital outlay when they would not be rewarded until some future time period, then they would either not enter this type of contract, or they would charge premium prices to do so.

In many contracts the Department uses an up-front payment to show commitment; to prevent the Department from reneging on the contract after the landholder has incurred some costs. For example, the Department could ask a landholder to undertake a few tasks *prior* to the first payment. If the landholder does so, and the Department then changes their mind about the contract, they may try to withdraw. Although the landholder may have recourse through the courts, this could be a very expensive way to enforce the contract. Instead, it may be more

efficient to ensure the Department's commitment by requiring some up-front payment. If the Department then decides to renege, this would come at the cost of the up-front outlay.

End-of-Contract Payments

Retaining some portion of the contract payment until the end provides two functions. First, it facilitates payments based on outputs, as discussed above. Second, it helps to provide sharp incentives for sellers, even if a contract is input-based.

An input-based contract will have sharper incentives if some payment is left to the end because as an input-based contract progresses, the unpaid proportion of the contract declines. If the punishment for non-compliance is cessation of payments, then a landholder's punishment declines as the contract progresses. The Department can prevent this problem, to some degree, by leaving a fixed proportion of the payment at the end of the contract. In that case, a landholder stands to lose the fixed proportion if they do not comply in the last few periods of the contract.

2.2.3. Self Monitoring in Output-based contracts

Taken to its extreme, we can consider a situation where all contracts were based on outputs after some time period. Hence, payments to landholders would be held-off until the work were shown to be successfully undertaken.

With respect to BushTender, the agency currently requires self-reporting of landholders regarding their operations (as explained in Section 1). Presumably, the agency would continue to require self-reporting even in output-based contracts. This raises the knowledge level required of landholders; they would have to be able to self-report on outputs. Currently, landholders are largely required to self-report about inputs (e.g. whether they undertook weed control). If output-based contracts were worthwhile, then an agency would need to consider the education of landholders. Such education may have beneficial effects other than improving the ability of landholders to self-report: landholders would learn more about the outputs the agency is concerned with, this would probably improve their appreciation of biodiversity, and their ability to focus on activities that generated these outputs.

2.2.4. Contract Length

Applying the ideas discussed in 1.5 and the arguments presented in Strappazon and Lansdell (2003) we can list some of the issues that should affect contract length as follows:

- the way that (potentially discounted) benefits flow—whether they are straight-line, or exponential etc.;
- uncertainty into the future, whether it be price or scientific uncertainty; and

- the willingness of landholders to partake in contracts of different lengths.

The general recommendations surrounding these issues, and their application to multi-outcomes, can be listed as follows:

- If benefits accrue exponentially during the early periods of the contract—perhaps due to some ecological response—then marginal benefits will be rising. The Department should set a contract length that is beyond the point at which marginal benefits start to decline. However, at this point in time the Department does not have precise knowledge about the shape of the benefit function due to scientific uncertainty. Hence, we have not used the notion of ecological response to structure contracts in the multi-outcomes pilot.
- More uncertainty about the future would generally lead the parties to favour shorter-term contracts, or contracts that can be renegotiated, since this allows contracts to be updated using the new information. This is akin to option value. With lots of uncertainty, credible commitment to long-term contracts will be a problem. BushTender contracts have a provision that allow the Secretary and a landholder to renegotiate the terms and conditions of a contract if this is mutually beneficial to both parties. This provision will be maintained in the multi-outcomes contracts.
- The less willing landholders are to engage in very long-term contracts, the more important it is that they are given some short-term options. In the Gippsland BushTender trial landholders were given the option of short- and long-term contracts. Hence, *in terms of remnant management*, the Department will offer a 'menu' in terms of contract length.

In addition to the considerations listed above, the Department must consider the fact that there is a budget constraint in this project. Hence the contract length needs to be chosen in conjunction with the pilot areas. Longer contracts are more expensive, *ceteris paribus*. If the Department chooses a long contract length and a large area, it will face the possibility of having to visit many landholders but then awarding contracts to a very small proportion of them. This could be a waste of resources in terms of the cost of visitations.

In terms of the multi-outcomes pilot, we need to match the above considerations with the three types of contracts that we expect to be offered: remnant management; water pumps; and revegetation.

Remnant Management

Remnant management has been handled in BushTender contracts. In the Gippsland BushTender trial the Department offered variable lengths. From this trial we observed that landholders preferred long- and medium-term contracts rather than short ones; nearly all Gippsland BushTender trial participants chose 6 year management agreements either with or

without an option to add a protection agreement for either a further 10 years or a permanent agreement. Nearly a third of all 6 year contracts included a 10 year protection agreement whereas nearly 9 per cent included a permanent protection agreement. However, we observed that 6 year contracts with 10 year protection agreements incorporated a higher bid than the six year contracts that included a permanent protection agreement. This may be because the landholders who bid for the former contracts may have incorporated the opportunity cost of agricultural production or other activities on the offered land whereas the landholders who bid for the latter contracts offered land that did not have costly alternative uses.

Given the experience of the Gippsland BushTender trial, contract duration of the management component will be 5 years but the Department will not offer shorter length management contracts. Landholders will also be given an option of including a permanent agreement. We will not offer 10 year protection agreements because we expect these type of contracts to be offered only at a premium.

Water Pumps

A water pump would extract groundwater, and thereby reduce either river salinity or land salinisation or both.

If water-pumps were found to be economic in the multi-outcomes pilot, then the pumps would need to be installed and used in certain restricted ways. However, a water pump is a capital item. As stated in 1.5.3 there can be problems if the Department funds capital investment when the contract length is shorter than the capital's life. With water pumps, if contract length is shorter than capital life, then a landholder may alter her use of the capital in a way that either substantially reduces the benefits to the Department, or perhaps even imposes costs due to negative environmental effects. In economic parlance, there could be a sharp dip in the benefit function if a water-pump contract were of a short length, and a landholder decided to subsequently alter the way it were used.

The benefits of a long-term contract are that this potential dip in the benefit function would be avoided. The costs of a long-term contract are that landholders may be less willing to enter into them, and those that enter would charge higher prices.

It is likely that due to the risk of a sharp dip in the benefit function, the Department will use longer-term contracts for water pumps. The team will use this approach based on the assumption that the benefits of avoiding a sharp dip in the benefit function outweigh the costs (of lower enrollment in these contracts, and potentially higher prices, due to uncertainty).

Revegetation

Whereas remnant vegetation is protected from clearing without a permit under legislation, revegetated land is not. Hence, the Department faces a risk that a landholder will revegetate an area and tend to it during a contract, but then clear the vegetation after the end of the contract. As with our water pump example above, this could produce a sharp dip in the benefit function.

In a project being undertaken in the Department of Sustainability and Environment, "Carbon Tender", the agency will buy revegetation, and certain other actions, from landholders via an auction mechanism. This should sequester carbon using flora that is native to the relevant bioregion. The current intention is to pay landholders for five years. Subsequent to this period, landholders will be bound to keep the patch revegetated and abide by certain restrictions on land use (for example, they will not be able to collect firewood).

CarbonTender contracts will operate under the Conservation, Forests and Lands 1987 (CF&L) Act. This is so that the permanent protection agreements can be registered on the landholder's property title. This means that if the landholder sells the property that contains a permanent protection agreement, then the obligations transfer to the new landholder. By registering the permanent protection agreement allows the Department legal recourse to prosecute present and future landholders who violate the agreement under the CF&L Act.

CarbonTender payments are only for five years then after this time the Department will lose the ability to provide incentives for contract compliance. Hence, after five years the Department has the option to enforce the contracts via the courts, with reference to the CF&L Act.

As stated in 1.5.3 long-term contracts are more susceptible to future uncertainty. To mitigate for uncertainty, the Department will allow the Secretary to alter the contracts, or terminate them, at some future date. However, this provision also weakens the commitment being shown by the Department.

The multi-outcomes pilot revegetation contracts will follow CarbonTender in terms of using the CF&L Act for a legal basis. By doing so, this requires that revegetation agreements have to be permanent. To alleviate moral hazard, renegotiation should be allowed under revegetation contracts that allow the Secretary of the Department to vary the terms of the contract.

2.2.5. Monitoring Procedures

Currently BushTender contracts entail self-reporting. For the multi-outcomes pilot we recommend that this be taken a step further by requiring that landholders use camera images

to self-report. This would involve landholders taking (perhaps digital) photos of their patch, and submitting these to the Department as part of their self reporting. This would provide an incentive for the landholder to comply with their management plan. Also, it could provide the Department with visual-based information about the biodiversity outputs being achieved using contracts. The Land for Wildlife program already uses cameras as a self-reporting tool but it is not known if this has been successful in securing contract compliance.

2.2.6. Summary

The economic literature on contract design delivers some broad messages about the way to design contracts. These are as follows:

- design contracts to elicit *information* about the landholder's type by offering a *menu of contracts*;
- design contracts to provide incentives to comply with the terms of the contract;
- schedule incentives to secure *commitment* over the life of the contract;
- the Department should not bear all the *risk* in these contracts; and
- *monitoring* and *enforcement* is dependent on the *verifiability* of the objectives and actions.

In an applied setting, these broad messages come down to the following recommendations:

- the agency should think hard about the relationship between actions on the ground, and overall outcomes;
- where cost-effective, the agency should contract landholders to produce outputs, rather than inputs;
- where the above is not cost-effective, the agency can contract landholders for inputs;
- whether contracting for inputs or outputs, the agency should link the contract services to a monitoring, compliance and enforcement regime including self-monitoring; and
- payments for services should be linked to the outcomes of the monitoring (this is the 'compliance' aspect).

In this report, we have checked how current BushTender contracts match with the above points. We found that BushTender contracts are very well designed; they accord well with what economic theory would predict is an appropriate contract. We have undertaken this analysis so as to inform the multi-outcomes pilot project team about whether the BushTender contracts need to be altered substantially for their pilot. We do not think that substantial alterations are needed in contract design for the multi-outcomes pilot. However, there are a few minor outstanding issues in terms of contracting for environmental goods:

- If final contract payment is to occur prior to the end of contract then an agency needs some form of incentive mechanism to ensure a landholder fulfills her obligations in the

post-payment period (e.g. legislation). The benefits of these other mechanisms need to be considered relative to cessation of payments.

- The Department will use separate contract types for different activities: remnant management; revegetation; and water pumps. These contracts will vary in their schedule of payments, catering to the timing of input application, or output production. Each landholder has to place a bid for every activity that they undertake. Hence, if a landholder undertakes remnant management plus revegetation, she will have to place two bids.
- *In addition to separate bids* for each activity, the Department could allow a landholder to place a 'total' bid that covers the group of activities she is undertaking. This would provide a measure of scope economies, but it would also add to transaction costs.
- In the long-term, if contracts were predominantly output-based then there are some issues about landholders' abilities to self report. Potentially this would require education and training to provide landholders with the appropriate skills.
- In the multi-outcomes pilot the Department will experiment with new methods of self-reporting such as the use of photo-images.

These small steps in the multi-outcomes pilot should provide additional information to Australian governments about contract design. However, in the long-term the Department will need to do further research. Some topic for future research involve:

- The magnitude of landholder risk aversion, and hence the degree to which landholders may substitute away from output-based contracts, given a similar input-based contract is on offer;
- The price premium that landholders may charge for undertaking an output- versus input-based contract for different activities;
- The magnitude of improved performance, if any, when a task is undertaken according to output- versus input-payments;
- The nature of the benefit function in terms of the physical reactions of the environment (e.g. remnant vegetation) to landholder management;
- The effect of government commitment (or lack of) has on contract compliance;
- Monitoring and enforcement mechanisms that are lower cost than current mechanisms;
- Investigate whether or not formally including rigid time frames for renegotiations is preferable to informal renegotiation.

References

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- Laffont, Jean-Jacques and Martimort, David (2002), *The Theory of Incentives: the Principal-Agent Model*, Princeton University Press, Princeton.
- Salanie, Bernard (1997), *The Economics of Contracts: A Primer*, The MIT Press, Cambridge.
- Strappazzon, Loris and Lansdell, Nicola (2003), 'How to score short-term versus long-term contracts in a BushTender Trial: an economic point of view', unpublished paper, Victorian Department of Primary Industries — Economics and Policy Research Branch.

Appendix: Example BushTender Contract

DEPARTMENT OF SUSTAINABILITY AND ENVIRONMENT

-and-

Landholder name

BushTender

**AGREEMENT FOR HABITAT SERVICES
(SINGLE PURCHASE)**

SIX YEARS + 10 YEARS PROTECTION

Contract Number: ID-XXX

© 2003 State of Victoria

BushTender
Agreement for Habitat Services

This Agreement is made on the.....day of.....200.... between the Landholder specified in the Second Schedule and the Secretary of the Department of Sustainability and Environment of the State of Victoria in respect of the land described in the Second Schedule.

It is agreed:

Terms and Conditions

1. The parties to this Agreement agree that they will comply with the terms and conditions set out in this clause and the First Schedule.
2. The parties to this Agreement acknowledge and agree as follows:
 - 2.1. This Agreement will commence and terminate on the dates referred to in the Second Schedule unless otherwise specified.
 - 2.2. The Secretary may terminate this Agreement at any time by notice in writing to the Landholder if the Landholder breaches any of the 'Obligations of the Landholder' or as otherwise permitted in this Agreement, and is entitled to withhold from the Landholder any outstanding payments under this Agreement.
 - 2.3. The Parties may vary this Agreement but any variations only have effect if they are in writing and have been executed by the Parties.
 - 2.4. This Agreement cannot be assigned by either party.

Signed by the Landholder

Landholder signature.....	Landholder signature.....
Print name.....	Print name.....
Before me: Witness signature.....	Before me: Witness signature.....
Print name.....	Print name.....

Signed by the Secretary

Signature.....	Affix Seal
Print name.....	
Before me: Witness signature.....	
Print name.....	

FIRST SCHEDULE

1. Obligations of the Landholder

The Landholder:

- 1.1. Will carry out all aspects of the execution and completion of the Landholder's Commitments set out in the Third Schedule.
- 1.2. Is responsible for ensuring that the Landholder's Commitments comply with the lawful requirements of any Authority, and with all Acts, regulations and other laws which may be applicable to the Landholder's Commitments.
- 1.3. Indemnifies the Secretary for any liabilities, loss, claim or proceeding arising out of the Landholder's Commitments or in the course of the execution of the Landholder's Commitments.
- 1.4. From Commencement until termination of this Agreement, agrees not to clear native vegetation from the land or to apply for a permit under the *Planning and Environment Act 1987* to clear native vegetation from the land.
- 1.5. Will notify the Secretary before selling the land or any part of it. If the land is sold before termination of this Agreement, this Agreement will come to an end and the Secretary will not be liable to make any further payments, except a payment relating to a completed year of the Agreement for which the Landholder submits a Report.
- 1.6. Will provide to the Secretary written notice from the registered owner of approval of the Agreement prior to Commencement if the Landholder is not the registered owner of the land. If the Landholder ceases to occupy the land, the Secretary may terminate the Agreement.
- 1.7. Will allow the Secretary and the Secretary's officers, employees, agents, contractors, invitees and licensees access to, and entry onto, the land on reasonable notice being given to the Landholder.

2. Obligations of the Secretary

The Secretary:

- 2.1. Will pay the sums specified in the schedule of payments in the Third Schedule. The initial payment will be made as soon as practicable after Commencement. Subsequent annual payments will be made by the Secretary in accordance with the schedule of payments in the Third Schedule. Each annual payment will be subject to receipt of a Report from the Landholder.

3. Interpretation

- 3.1. This Agreement is governed by the laws of Victoria.
- 3.2. Where there is more than one Landholder the terms and conditions of this agreement bind the landholders jointly and severally.

- 3.3. The singular includes the plural and the plural includes the singular.
- 3.4. 'Commencement' means the date of commencement of this Agreement specified in Schedule 2.
- 3.5. 'Land' means all that piece of land or pieces of land identified in the Second Schedule and shown on the plan attached.
- 3.6. 'Landholder' means the person or persons named and described in the Second Schedule and, where the context requires, includes the Landholder's employees, agents, contractors and invitees.
- 3.7. 'Parties' means the Landholder and the Secretary.
- 3.8. 'Report' means a written report in a form provided by the Secretary demonstrating completion of all the Landholder's Commitments specified for the preceding year in the management program to the satisfaction of the Secretary.
- 3.9. 'Secretary' means the Body Corporate called The Secretary to the Department of Sustainability and Environment and, where the context requires, includes the Secretary's officers, employees, agents, contractors, invitees and licensees.

SECOND SCHEDULE

Management Agreement No. ID-XXX

Date of Commencement of Agreement:

Date of Termination of Agreement:
(or the date on which the Secretary terminates this Agreement)

The Landholder

Name of Landholder	
Mailing Address	
Telephone	
Fax	
Contact name of person who should receive correspondence	

The Landowner (if not the Landholder)

Name of Landowner	
Mailing Address	
Telephone	
Fax	

Details of property within which the Agreement applies

Property name	

Description of land to which the Agreement applies

Site one (ID-XXX/1)

Part of the land in Certificates of Title set out below being the land delineated in *red* on the attached plan.

Volume:	Folio:	Parish:	Area xx ha.
Allotment:	Section:	County:	

THIRD SCHEDULE

MANAGEMENT PLAN – ID-XXX/1

Landholder **Landholder name**

Site Identifier ID-XXX/1

(A) Targets

The targets for the management plan are:

1. Protect current site quality
2. Increase the tree canopy cover
3. Increase the cover and diversity of understorey life forms
4. Eliminate identified high threat woody weed species
5. Increase the recruitment of woody plant species
6. Increase the cover of organic leaf litter

(B) Landholder's Commitments

1. Land-use commitments
From the date of Commencement of Agreement to the date of Termination of Agreement, the Landholder agrees to:
 - Retain all standing large trees (dead or alive)
 - Retain all other standing trees
 - Exclude stock from the site at all times
 - Retain all fallen timber
2. Management commitments
The Landholder will complete the management actions specified in the table below on the land for six years from the Commencement date:

MANAGEMENT ZONES **ID-XXX/1A, 1B, 1D - Shrubby Foothill Forest & ID-XXX/1C - Wet Forest (see attached site plan)**

Year from Commencement	Management actions to be completed	Timing
First	• Erect approx 3440m of fencing around perimeter of site as per minimum standards	Any
	• Control Blackberry : spot-spray as per minimum standards or hand-pull seedlings	Summer
Second	• Control Blackberry : spot-spray as per minimum standards or hand-pull seedlings	Summer
Third	• Control Blackberry: spot-spray as per minimum standards or hand-pull seedlings	Summer

Fourth	<ul style="list-style-type: none">Control Blackberry: spot-spray as per minimum standards or hand-pull seedlings	Summer
Fifth	<ul style="list-style-type: none">Control Blackberry: spot-spray as per minimum standards or hand-pull seedlings	Summer
Sixth	<ul style="list-style-type: none">Control Blackberry: spot-spray as per minimum standards or hand-pull seedlings	Summer

3. Fire prevention
The Landholder will take all reasonable steps to prevent fire on the land, provided these steps are not inconsistent with the Landholder's Commitments.
4. Fencing
For a period of 10 years from Commencement, the Landholder will maintain all fencing on the land constructed under this Agreement in a stockproof condition.
5. Reporting
As soon as practicable after the end of each year of the Agreement the Landholder will submit a Report.

SECRETARY'S COMMITMENT

1. Schedule of payments

To pay a total of \$XXXX over the term of the Agreement, subject to Clause 2.1 and in accordance with the following schedule:

Year	% for mgt. payments of bid total (approx. 60%)	% for protection payment of bid total (approx. 40%)
Commencement	35	
1	20	
2	10	
3	10	
4	10	
5	10	
6	5	40
Total	60	40