Mechanisms for Funding Biosecurity Measures

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Tables & figures

Executive summary

Biosecurity can be usefully viewed as consisting of a continuum of policy responses to the risk posed by diseases, pests and other threats to plant, animal and human health. Though the precise elements of this continuum are a function of the biosecurity hazard at issue, common elements include preparedness, prevention, management through containment and surveillance, post incursion responses (including eradication and containment of outbreaks), and adaptation. A biosecurity policy response is some combination of these various types of activities.

From a public policy point of view, the key challenge is to identify the policy combination of activities that yields the greatest net social gain. The net social gain is driven by the balance of benefits and costs associated with particular combinations of biosecurity activities. By benefit we generally mean avoided losses associated with damages to assets (whether these be privately owned agricultural assets, such as crops of livestock, or publicly owned assets such as environmental assets) and human health. The costs associated with these biosecurity activities are largely comprised of implementation and managerial costs of pursuing these actions (e.g. capital and recurrent costs associated with maintaining intervention capability, or financial costs such as compensation).

An increasingly common observation is that there are gains from emphasising activities such as preparedness, prevention, surveillance and containment, and reducing reliance on post incursion management. In other words, there has been an increased emphasis on the "upstream" elements of biosecurity policy. While this has implications for the pattern of public investment, it also requires that attention be paid to the incentives private parties face in regard to biosecurity activities. This is because biosecurity responses usually need to be mediated through the action of private parties (e.g. livestock owners, cultivators, organisers of markets). While the activities of private parties can be prescribed through regulation, it is frequently not possible to rely solely on executive fiat to achieve desired outcomes, given costs associated with enforcing compliance. The key therefore is to ensure that the actions taken by private parties are aligned with the public interest.

Cost recovery mechanisms have an important role to play in this respect because they can signal the "price" associated with a particular biosecurity response. From an efficiency point of view, it is important that this price be correct i.e. that actions which are less beneficial from a social perspective do not appear "cheaper" from a private view point than more beneficial ones. One problem that has affected biosecurity policy in the past is that the prospect of largely publicly financed post-incursion responses have made that form of biosecurity action appear too "cheap" relative to upstream activities. In other words, the incentives private parties would have had to invest in actions such as preparedness, prevention and so forth, are likely to have been blunted even though it may have been in both their interests (and the public interest) for this to happen.

When considering cost recovery mechanisms, it is important to consider how cost recovery is implemented across the continuum of biosecurity activities, and not just particular activities taken in isolation. Cost recovery will be efficient, from a public policy point of view, if it encourages both public and private resources to be allocated to those combinations of activities that deliver the greatest net benefit. In particular, efficient cost recovery should ensure that private behaviour is aligned with the public interest, in the sense that private parties undertake particular types of investments (e.g. in preventing the spread of pest or diseases) that are consistent with the public good.

In theory, for cost recovery to deliver perfect price signals, it would be necessary to have a cost recovery mechanism for each specific biosecurity action within each broad category of actions. In practice, the administrative costs of doing this would be prohibitive and far outweigh gains that may stem from allocating resources more efficiently. There are a number of different sources of administrative costs in administering any type of cost recovery mechanism, and these need to be taken into account when alternatives are considered.

Other issues that need to be taken into account when considering approaches to cost recovery include institutional constraints (such as restrictions on revenue raising instruments available to different levels of government); equity issues; and distributional concerns. The last topic relates in particular to the impact that imposing new cost recovery measures in Victoria could have on pattern of production and interstate commerce if other jurisdiction do not follow a similar approach.

If we consider current arrangements at a national and state level, we observe that there is a patchwork of cost recovery mechanisms that have developed under a range of arrangements and initiatives over time. Taken together, these cost recovery mechanisms do cover a number of major categories within the biosecurity continuum. Thus we have:

- Cost recovery mechanisms for post incursion responses under the EPPRD and EADRA
- Cost recovery mechanisms for funding intervention readiness through the PHA and AHA, as well as for industry biosecurity plans and other upstream activities developed by these institutions.
- Cost recovery for research and development, through the levies collected to support the work of RDCs. While the remit of RDCs extends well beyond biosecurity activities, these form a priority component of their research programme. Moreover, closer links between RDCS and institutions such as PHAs have emerged over time.

The cost recovery mechanisms are quite "broad brush", in that there is no strong linkage between funds collected and particular types of activities, and there is a substantial amount of pooling across sectors and programmes. This probably captures a trade off between pure allocative efficiency and administrative efficiency.

Executive summary

While current cost recovery arrangements have a number of desirable properties, there are also a number of gaps that need to be addressed. The most important ones concern upstream activities (preparedness, prevention, surveillance and containment) at the state level. There are two alternative proposals that could be implemented to meet this gap.

The first is a state level approach, that would draw on existing (but underutilised) instruments such as Industry Development Orders to recover costs to support: post incursion management at the state level; upstream activities; and research and development. This would involve developing an institutional apparatus (notably Industry Development Committees) that are mandated to administer cost recovery and the use of funds.

The alternative would be to adapt the existing national model, by ensuring that a proportion of appropriated funds are allocated back to jurisdictions for bio-security activities that are specific to them. Such an approach needs to meet the requirement of "additionality". By this we mean that funds collected for state specific activities are additional to funding for national level activities and do not detract from the pursuit of these priorities. In practice this is likely to mean an increase in the levies collected from producers. This solution would have to be implemented across all jurisdictions, and not Victoria alone, given concerns regarding the constitutionality of increasing levy collections from Victorian producers alone.

Ideally, in a setting where funds are collected and then partly repatriated to support bio-security initiatives specific to jurisdictions, it would be appropriate to set differential rates for levy collection across jurisdictions. This is because of differences in the nature and intensity of biosecurity threats varies across jurisdictions. However, the same concerns regarding constitutionality that we referred to in the preceding paragraph would preclude such an approach.

The main differences between the two proposals are in terms of:

- Administrative efficiency. The second approach does not involve the compliance and administration costs associated with the development of new mechanisms. However, it does require the development of arrangements to manage issues arising from implementing common levies across jurisdictions to fund jurisdiction-specific activities when there are differences across jurisdictions in the nature and intensity of hazards.
- The national framework offers a more obvious basis from which to tackle issues related to inter-jurisdictional cooperation. Indeed, inter-jurisdictional cooperation is essential for the second approach to work.

Regardless of the approach chosen, the following issues will need to be addressed:

- Credible commitment: In both cases, efficiency depends crucially on the ability of government to credibly committing to limiting funding, particularly for post incursion responses, in line with magnitude of private benefits that are likely to accrue to producers.

- Inter-jurisdictional cooperation: Both approaches would require efforts to ensure that there was some alignment in approaches towards cost recovery across different states. This is on account of:
  - The impact on patterns of competition and production if there is a significant cost impost on producers in Victoria (under the first model).
  - The need to address cross-border externalities in bio-security activities. These will arise when third parties benefit from bio-security activities undertaken in a particular state (for example, Victoria benefiting from efforts in Queensland to address fruit-fly issues).
- Localised issues that require specific attention. These are primarily issues that occur with the state or in specific areas across state boundaries. Examples include:
  - Weed management, which tends to be a localised issue insofar as weed characteristics are local – even though their impact can be widespread.
  - Fruit-fly management. For example, detection and control efforts undertaken in metropolitan regions within Victoria have an impact on benefits of growers elsewhere in Victoria. As alluded to before, there are also likely to be spillovers between efforts undertaken either side of the NSW border

1 Introduction

1.1 BACKGROUND AND CONTEXT

Frontier has been commissioned by the Department of Primary Industries (DPI), Victoria, to advise it on the development of cost sharing mechanisms in relation to bio-security activities. In undertaking this assignment, Frontier recognises that a significant amount of work on the subject has already been undertaken, under DPI's aegis, and elsewhere. Our objective is therefore not to replicate this work, particularly in relation to the design of specific mechanisms for specific industries or organisations. Rather, it is to consider the economic rationale and principles for cost recovery, and on that basis suggest avenues for cost recovery from private parties for the funding of bio-security activities. In particular, we seek to examine to what extent current approaches to cost recovery may be applicable to domains and activities in regard to which they are not yet implemented.

DPI has provided Frontier with a list of specific points it would like to see addressed by recommendations made in regards to costs recovery. These are:

1. Possible cost recovery mechanisms, their advantages and disadvantages, and applicability to different cost recovery scenarios (for example, a different mechanism may be applicable to weeds than may be applicable to horses)
2. Ease of collection, and advice on minimising both the administrative costs of government and the compliance costs of industry
3. Potential constitutional issues (but not legal advice on such issues)
4. The potential to 'piggy back' on existing state and federal revenue collection mechanisms (for example, local government rates, Commonwealth industry levies).
5. Methods of dealing with fluctuating commodity prices (a price collapse may lead to reduced collections if 'value of sales' forms part of the collection base)
6. The likely final incidence of each recommended option (how much of the charge is likely to passed forward to the consumer, and back to the producer)
7. The potential of each recommended option to alter where economic activity may take place
8. Choices as to the collection point (for example, collecting at the packing shed/processor rather than from individual farm businesses)
9. Dealing with small and emerging industries.
10. Design issues which promote incentive compatibility and commitment and adherence to stated policy.

As explained in section 2.2. these various criteria can be grouped under the headings of allocative efficiency, administrative efficiency, equity and

distributional concerns. Section 2.2 further explains what these broad headings are.

1.2 STRUCTURE OF THE PAPER

The paper consists of the following sections:

- Section 2 sets out an economic framework for understanding cost recovery in relation to bio-security activities
- Section 3 reviews current arrangements and policy practice, and then evaluates these in the light of the principles articulated in section 2, in order to understand strengths, weaknesses, and possible points of extension.
- Section 4 sets out recommendations for managing cost recovery.

2 Economic framework for funding biosecurity

2.1 OVERVIEW OF BIOSECURITY ISSUES

2.1.1 Typology of biosecurity risks

There are many different ways of categorizing biosecurity hazards. One generally accepted convention divides biosecurity risks to plant and animal health into the following categories:

- Exotic threats: those whose provenance lies outside Australia and that are not normally observed to operate in the Australian eco-system; and
- Non-exotic threats: those that are at least to some extent prevalent in the Australia eco-system. From a Victorian point of view, we can further differentiate these into those that are;
  - Exotic to Vic but endemic in Australia; and
  - Endemic to Vic but exotic to the rest of Australia,

From an economic point of view, these forms of differentiation are of importance since they influence the relative costs and benefits of different types of policy actions and, consequently, the configuration of overall policy responses.

2.1.2 Typology of biosecurity activities

There are a number of broad categories of biosecurity activities. These might include the following[1]:

Preparedness

This can involve research, the maintenance of information databases, the development of diagnostic capabilities, communications planning, the development of emergency response agreements, contingency planning and coordination with other jurisdictions. Typically, preparedness will also involve maintaining some basic level of response capability so that other types of biosecurity actions can be implemented (e.g. increased testing and eradication measures) at short notice.

Prevention

For exotic diseases, this will involve pre-border and border control measures. The former can include the development of risk assessment approaches and protocols (e.g. mutual recognition agreements, harmonisation principles) with other jurisdictions. The latter includes physical inspection, disinfestations and quarantine. Behind-the-border prevention methods can include immunisation

[1] This draws on the classification presented in DPI Victoria (November 2006c).

programmes. With regard to endemics, it involves efforts to ensure that the incidence of a particular pest or disease is kept below a certain threshold level, and confined to specific geographic areas or activities such that the overall costs are below a target level. Specific strategies can include trapping or exterminating pests and the use of detection and surveillance systems (which could rely on either the use of dedicated experts or on community/producer efforts).

Management through containment and surveillance.

This is particularly applicable to endemic pests and involves, *inter alia*, controls on the movement of produce and on certification requirements. It also involves detection through the use of human and physical assets.

Incursion/outbreak managements through eradication

Eradication efforts are most usually associated with exotic diseases. Such efforts involve the destruction of contaminated crops or animals, quarantine measure and/or the deployment of treatment measures such as vaccines or pesticides. For endemics, eradication usually involves re-establishing pest freedom in certified pest-free zones within a jurisdiction. The measures available are similar to the ones outlined above and can be supplemented through strengthened internal controls on the movement of produce or livestock from areas where the pest or disease is endemic.

Incursion management through adaptation.

This refers to the deployment of techniques that lead to changed crop management and husbandry techniques that reduce the impact of a pest – including the development of new plant varieties. Producers may adopt de-infestation processes (e.g. cold treatment, fumigation or chemical treatment) prior to the point of commercialisation. In the extreme case, if certain threats become increasingly difficult to contain, adaptation may involve wholesale changes such as the abandoning of cultivation practices or changes to the way natural and environmental assets are exploited.

2.1.3 Implications of this typology

Several points can be made in relation to the typology set out above, and the actions that it encompasses.

- The costs of implementing a particular biosecurity strategy will depend on the nature of the biosecurity activities in question and the environmental and productive assets in relation to which they are implemented. This is considered in greater detail in Section 2.2 below.
- They are not mutually exclusive, indeed, most biosecurity policy responses will invariably involve some combination of actions.
- The characteristics of an effective biosecurity strategy will be directly related to the characteristics of the threat.
- The various categories of activities may work as part of a continuum of responses.

- The parts of this continuum that are chosen (or given particular emphasis) as part of a biosecurity strategy will be very much a function of the characteristics of the relevant pest or disease and the assets that are affected. These factors also determine the costs of a particular pest or disease (and by implication the benefits that arise from taking action) and the costs of the biosecurity actions required to mitigate or remove the threat they pose.
- From this it follows that the set of socially optimal biosecurity strategies is the one that achieves the best balance of costs and benefits amongst alternatives.
- The cost characteristics of the options that are chosen may also have other implications that are of policy interest, such as the distribution of costs between producers, and between producers and other parties (such as the state and consumers)

2.2 ECONOMICS OF BIOSECURITY ACTIVITIES

The impetus for recovering costs incurred by bio-security stem from a number of policy concerns. We do not aim to provide a comprehensive review of these issues, as such reviews have already been undertaken in other contexts. [2] As already mentioned in the introduction, DPI itself has presented a list of specific issues that in its view warrant investigation.

When assessing policy options on matters such as cost recovery, it is useful to search for an overarching issue that can act as central organising principle for both the discussions and recommendations that ensue. In economic terms, that organising principle is that of efficiency. There are various types of efficiency, and the ones that are most applicable in the context of cost recovery are:

- Allocative efficiency, which means ensuring that resources and effort (both public and private) are directed to producing results that are the most valued by society.
- Efficiency in administration, which in this case is mainly a function of the costs associated with the implementation of particular cost-recovery mechanisms.

A number of the specific points in DPI's list can be reduced to either one of these two issues. For example, point 10 on incentive compatibility is a fundamental issue relating to allocative efficiency. Points 1 – 6 and 8 are issues of administrative efficiency. We shall explore these different issues in detail below. Issues relating to allocative efficiency and incentive compatibility will be accorded prime importance, since the extent and manner in which these issues can be addressed are critical to both cost recovery and bio-security more widely.

Alongside efficiency issues, other types of policy concerns relate to institutional and legal issues (such as the division of responsibilities and competencies in regard to revenue collection between various tiers of government) and various

[2] See, for example, PC (2001).

equity and distributional issues. These other issues account for the remainder of the issues provided in the DPI list.

2.2.1 What are the main costs and benefits of biosecurity activities

The main benefits from biosecurity activities accrue from the avoided costs of the impact of the disease or pest. These avoided costs are generally broken down into market costs and non-market costs. The main market costs include loss of sales revenue due to loss of access to markets (whether national or international), or because of lower product quality and/or higher costs of production. These may be confined to a particular industry or may flow-on across multiple industries. For example, certain pests or diseases may affect the output of particular agricultural sectors while also affecting other industries such as tourism. Spill-overs may extend beyond productive activities to include impacts on environmental assets and human health. The extent of flow-on will be determined to a large extent by the specific characteristics of the pest or disease.

Non-market avoided costs are essentially those which affect environmental assets, such as the health of local flora and fauna or water quality. The valuation of these costs is more complicated – some indication can be drawn from the value attached by consumers to these assets.

The costs of biosecurity activities will generally be a function of a number of factors, chief of which is the type of activities that need to be implemented and the duration over which they are to implemented. These will, in turn, be determined by the epidemiological characteristics of the pest or disease, its regional prevalence, whether it is endemic or not and the nature of the industry or industries affected.

Importantly, many of these factors also determine the benefits that accrue in terms of costs foregone. For example, the extra benefits of attempting to contain the incidence of a disease below a certain level may be relatively small compared to the added costs of the action involved. Alternatively, the nature of sanitary and phytosanitary rules prevailing in markets in which an industry sells its products, which determine market access losses, will also be influential in determining the type of control actions undertaken, the intensity (in terms of frequency or duration) with which such actions are undertaken and finally the costs such actions incur.

Given these linkages, it is perhaps useful to think of the optimal choice of biosecurity measures as the one that minimizes overall costs, where these costs are a combination of both the management costs of biosecurity actions and the direct impact costs of the disease or pest.

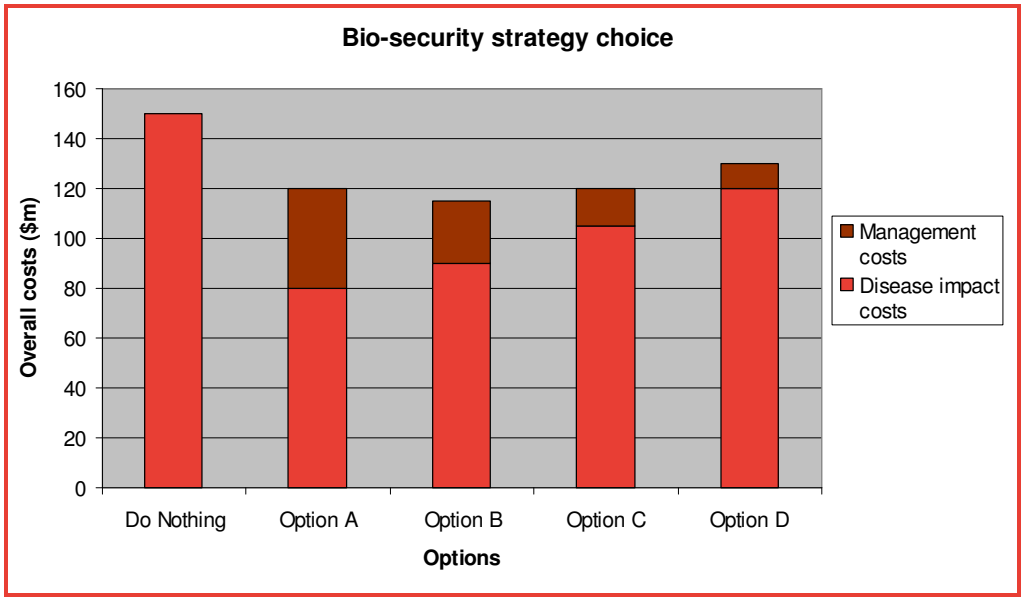

Figure 1: Least-cost biosecurity strategy choice

Source: Frontier Economics

The costs that are depicted here are social costs. Disease impact costs are rarely, if ever, known with certainty and therefore any quantification of these will be done typically on a probabilistic basis, using various simulation techniques. A way of representing such probabilistic outcomes is by referring to confidence intervals – these intervals attach a probability value to the impact costs being equal to or below a certain amount. As a result, the policy problem can be formulated in terms of how much society is willing to pay (with certainty) to avoid damages up to a given level of probability. The higher the degree of probability chosen, the greater the degree of risk aversion implied.

The central challenge, from the point of view of a public policy maker, is to ensure that the set of biosecurity options that is chosen is the one that is the least-cost from the point-of-view of society, given estimated damage profiles and preferences regarding risk. The ability of policy makers to do so will in part be a question of how good policy makers are at identifying and funding cost-effective biosecurity options.

Least-cost management is further contingent on developing an incentive structure that leads private parties to undertake actions that are consistent with minimising costs from the point-of-view of society. This requires an understanding of:

- The circumstances in which costs to society are privately borne, such that private parties have incentives, provided they are exposed to these costs, to undertake actions that are consistent with wider social benefits; and
- The circumstances in which there are discrepancies between private and social costs and benefits.

It is this cascading set of requirements that is a major motivation for the introduction of cost recovery mechanisms to fund biosecurity services. The essential issue is one of incentive alignment – i.e. to what extent do private parties have incentives (i) to undertake actions that are consistent with wider social benefits and (ii) to avoid actions that may cause a detriment to social welfare?

2.2.2 Efficient provision of biosecurity and public funding

To ensure the efficient provision of biosecurity activities, consideration must be given to the following issues:

- The over-riding aim is to ensure that the social benefits from biosecurity activities are equal to the costs of these activities at the margin.
- Pressure on government budgets lead agencies to prioritise actions. For example, it appears that in Victoria, DPI does not necessarily have the resources to undertake strategic preventative and pro-active work. This raises the question as to which types of activities should be under the public remit and which types should be undertaken by industry.
- There are differences between private and social costs and benefits. This implies the existence of market failure and thus provides a rationale for state policy instruments.
- These are a number of different sources of market failure. The ones most applicable to the issue of funding biosecurity activities are those stemming from the extent to which benefits or actions are appropriable to the party undertaking them.

Factors affecting appropriability

The degree of appropriability is partly a function of spill-overs. A pest or disease may affect a range of assets.

- While private producers may have incentives to invest in biosecurity to preserve the value of their own assets, they are unlikely to take into account the effect of those efforts in preserving other (non-market) assets. Thus, the level of effort may be sub-optimal from the point-of-view of society as whole. In regards to these non-market assets, the benefits from biosecurity efforts may not be excludable or rivalrous in consumption, so no single private beneficiary would have incentives to fully bear the costs of the efforts. Even where the benefits of a biosecurity response occur in relation to marketable assets, there may be problems of appropriability if:
  - There are spillovers from actions taken by producers to contain biosecurity risks or alternatively from the risky behaviour of producers. For example, producers in an exclusion zone benefit from the level of effort in a containment zone, given that a minimal level of containment is necessary to preserve the integrity of the exclusion zone.
  - Spillovers can occur where a number of industries are affected by the same pest or disease, but the impact costs differ. This might be due to a

combination of product or market characteristics. (e.g. in the case of fruit fly, stone fruit are less amenable to cold storage treatment, and therefore producers are more reliant on eradication/containment. Moreover, producers of some sorts of fruit face more stringent sanitary and phytosanitary requirements in export markets).

Two other factors affecting appropriability are asymmetries in, and incompleteness of, information. Both are pervasive in the management of biosecurity issues. One particular issue is that of private information – when parties have knowledge that is not accessible on a costless basis to others. In particular, producers are likely to have knowledge about outbreaks which are critical to response management. The key issue is whether they find it privately beneficial to reveal this information. They may not if, for example, the revelation of such information imposes high levels of costs on them (for example, through the destruction of crops or through their own exclusion from certain markets). This may be handled through compensation.

A variant on this theme is that private producers are likely to have better knowledge of the benefits they derive privately from biosecurity measures taken collectively. However, in instances where such measures are non-rivalrous and/or non-excludable, they will have an incentive to understate the true nature of their benefits (in order not to bear the costs of those measures). This is particularly relevant where there are economies of scale and/or scope in the delivery of biosecurity activities, such that coordination between parties is necessary to achieve socially efficient responses. A practical consequence of this is that individual producers may not actively 'demand' pest control activities that are in their own best interests. This problem may be addressed in part through representative industry bodies that are sufficiently broad so as to internalise the spillover benefits attributable to control actions.

The problem of hidden actions is a variant on the same theme – the level of effort that a producer may undertake in managing biosecurity risks may not be costlessly verifiable. Again, if the benefits of undertaking actions are not excludable and/or rivalrous, private parties may have incentives to undertake a lower level of effort than is socially optimal. Moreover, if parties expect, *ex-post*, that other parties (such as the state) will bear the impact costs of a pest or disease, they may have incentives not to undertake the appropriate levels of effort in managing risk (this is an issue that stems from the ability of the state to credibly commit against bailing private producers out, and one we shall touch on in greater detail in Section 2.2.3 below).

Both these types of informational hazards are especially problematic where the behaviour of a party can have systemic consequences (i.e. across a range of parties).

These different forms of market failure provide a basis for public policy intervention, though they do not necessarily, in and of themselves, constitute a case for the use of public funds. The main justification for the use of public funds lies in the issue of incentive alignment – ensuring that the benefits to private parties from taking certain actions increase in line with the benefits to society. Incentive misalignment may reflect appropriability issues as much as

informational hazards – indeed, such incentive misalignment often results from a combination of both.

The challenge for the policy maker in using public funds is to structure the use of these funds in a manner that, given the scope for incentive misalignment, promotes the relative attractiveness of actions that are in the public interest over those actions that are not.

2.2.3 Cost recovery and challenges

The reasoning used to justify the use of public funds can also be used to justify cost recovery. This is desirable because:

- At least some of the gains from biosecurity are appropriable and thus cost recovery can avert the subsidisation of private profits.
- Following on from the first point, cost recovery has the potential to "price" different types of biosecurity actions. As outlined before, the central policy challenge is to identify biosecurity responses that minimise overall costs. Part of this depends on actions taken by private parties. If some forms of biosecurity are free of charge, there may be an over provision of these services from a social point-of-view. For example, if the costs of eradication or containment are not borne by beneficiaries, these categories of activities may appear too cheap relative to other preventive actions. The under supply of the latter may generate higher overall costs from societies perspective.

Challenges to cost recovery

The sources of market failure discussed above also impose constraints on the way in which cost recovery can be implemented. Incentive alignment requires that attention be given to the manner in which the structure of costs is allocated towards different parties. This can be complicated by a host of factors which also underpin the market failures discussed above. These include:

- Heterogeneity across affected parties. The impact of a particular pest or disease on a particular producer will depend on its epidemiological traits, the nature of the activity undertaken and the structure of the industry and markets in which these activities are conducted. As mentioned before, the impact of fruit-fly varies depending on the type of fruit produced as well as the markets in which the fruit is sold. In these cases, in order to be incentive compatible, cost recovery mechanisms would have to be calibrated to the specifics of particular groups of producers. Otherwise, the result would be that the 'price' of such activities would be above the willingness to pay of some parties. The more diverse these factors are the greater the difficulties and costs of calibration. [3]
- If the benefits of particular biosecurity responses are diffused over a large group (i.e. multiple different producers and/or consumers) then the difficulty

[3] In practice most cost recovery mechanism involve a degree of rough justice, since there is not a direct link between the activity undertaken and the levy imposed. A challenge in implementing cost recovery options is to strike a balance between meeting efficiency, incentive alignment and other objectives such as equity and administrative efficacy.

of developing cost recovery mechanisms is increased. This can be compounded if the production side involves different stages of processing, all which may have different private balances of costs and benefits.

- As noted above, spill-over effects tend to be pervasive in biosecurity issues. The challenge is to create incentives for particular parties to undertake actions of the appropriate type and level of effort that take into account the impact such actions have on others. For example, the maintenance of fruit-fly exclusion zones is contingent in part on the appropriate level of effort being undertaken in containment zones (where parties do not necessarily have as much benefit from biosecurity responses to fruit-fly). The challenge for the cost recovery mechanism would therefore be to reward parties for the effort that confers benefits on others – in effect, to incorporate some from of transfer. Doing so would require identifying and verifying the level of effort undertaken by various parties.
- The nature of costs associated with particular types of biosecurity activities varies across these activities. For example, certain types of surveillance or detection activities can exhibit economies of scope – it is generally more efficient for an agent providing surveillance or detection activities to undertake these activities for a range of pests and diseases. Economies of scope raise the challenge of allocating common costs to a range of parties – this is a situation where the degree of private versus public benefits may vary depending on the nature of the specific pests or diseases that are the object of detection and/or surveillance activities.
- Ability to accommodate cost recovery – if the manner in which costs are allocated imposes a particular burden on certain parties, the implementation of cost recovery may be compromised. The problem might be that the cost burden imposed may undo the benefits sought by the biosecurity measures. For example, if the parties are sellers in markets (such as export markets) where they are price takers, the cost impact of cost recovery could be strong enough to price them out of the market. This could in turn undo an important portion of the benefits (in terms of avoided market access losses) that were expected to accrue through biosecurity.
- Finally, recall that biosecurity actions form a continuum. From a social welfare point-of-view the optimal policy is the combination of actions that yields the best cost-benefit outcome. In such cases, what matters is the *relative* importance of each type of action (e.g. how much investment is to be made in relation to pre-border efforts relative to detection, and how much relative to incursion management?). This profile of activities may look very different depending on the pests or diseases considered. From a cost recovery point of view this means, in principle, estimating what the optimal "quantity" of any given type of action is, estimating the costs of these actions (taking into account costs common across a range of activities and/or pests or diseases) and finally apportioning these costs and activities efficiently.

These different factors drive the administrative and implementation costs associated with cost sharing. These factors also affect the feasibility of cost sharing, and indeed the overall social benefits that stem from their

implementation. While the nature and extent of these costs are case-specific, the preceding observations suggest that the following factors will play an important role in determining the ease or otherwise of administration and implementation:

- The number of parties involved, and the manner in which productive activities are organised. In regard to the latter point, it is often noted that the more concentrated nature of livestock activities (as compared to plant productive activities) can act as a factor lowering costs of administration and implementation.
- The degree of heterogeneity of parties involved. This heterogeneity can be horizontal or vertical. By horizontal heterogeneity we mean that agents at the same level of production (e.g. growers for fruit products), may differ in their product and product market characteristics. By vertical heterogeneity we mean that agents at different parts of the supply chain may face different commercial constraints.
- The degree of interaction between the actions of parties and the manner in which pests or diseases affect different parties.
- Difficulties in verifying and enforcing actions, and imposing and collecting charges. The more diffuse potential payers are, the greater the possibility that some of these could escape the burden of cost recovery. This issue is partly one of information collection, but more fundamentally is an issue of incentive alignment – there are strong incentives for any one party to avoid the financial burden of cost sharing.
- The nature of the costs of services provided *and* of administering revenue collection. As mentioned above, there may be economies of scope in the delivery of certain types of activities. At the same time, there may be economies of scope in the administration of cost recovery mechanisms. Rather than implementing a cost recovery mechanism for every single type of activity, it might be more efficient to implement a mechanism that raises revenue to cover a range of activities.

In addition to this the implementation of cost-sharing mechanisms, and the implementation of biosecurity measures more generally, need to take into account institutional constraints. These can take two main forms. The first set of constraints relate to legal and statutory constraints, such as geographic boundaries to jurisdictions that do not match the spill-over characteristics of a particular pest or disease (this may be exacerbated by differences in the pattern of incentives faced by producers and policy makers across jurisdictions). There are also constitutional limits on the extent to which funds can be appropriated from private parties, and the nature of instruments that are available for use. Finally, the set of feasible cost recovery instruments is typically limited. By "feasible" we mean the extent to which the costs associated with the implementation of a mechanism are sufficiently low as compared to the revenue recovered, so as to justify their imposition.

The second set of constraints consists of issues of political economy. These stem from the fact that, in the event of outbreaks, it might be politically difficult to recover costs or limit compensation. In these circumstances, governments are

unable to credibly commit against bearing costs at a future date (or conversely, to commit to allowing private parties to bear costs). If private agents know this, or at least attach a certain probability that the government is of a type that is unable to risk the political costs of allowing private parties to bear costs, then the likely outcome is that private parties will shift reliance away from undertaking preventative measures that impose costs on themselves towards relying on *ex-post* compensation or government-financed measures. From the perspective of our analysis, the impact of credible commitment is that it reduces the relative price of post-incursion or post-outbreak actions vis-à-vis preventative actions. This may, in turn, send signals that are inconsistent with the configuration of biosecurity activities that is optimal from the viewpoint of society.

2.2.4 Context of cost recovery re-stated

We have emphasised that the policy objective is to find the optimal biosecurity policy, where 'optimality' is defined in terms of the minimum overall costs associated with a policy (the sum of implementation costs and impact costs) and 'policy' is defined in terms of the combination of biosecurity actions. We emphasised that specific actions were part of a continuum, and that implementation costs were specific to actions. We also noted that what mattered, from the point of view of optimality, was the combination of actions along this continuum and the *relative* degrees of importance given to certain types of actions versus alternatives.

The relative weight that should be placed on a particular type or types of actions within this continuum is likely to be specific to the type of disease or pest, and moreover may be specific to the geographical region under consideration. From the point-of-view of cost recovery principles, the fact that it is the *relative* importance of certain activities that matters has several implications:

- It is necessary to understand the cost characteristics associated with each type of activity, but also the types of market failure that may inhibit their implementation. This is important because the implementation of any type of biosecurity measure will be, to some extent, mediated by the agency of private parties.
- Cost recovery, for a particular type of action or set of actions, cannot be considered in isolation from the cost recovery of other types of actions. For example, one cannot consider cost recovery for detection in isolation from cost recovery measures for post incursion/post outbreak management. In a sense, the degree of cost recovery sets the relative "price" of one type of action vis-à-vis another. Private parties will typically substitute cheaper types of action for more expensive ones (taking into account their overall expected returns). This is important because from a policy perspective, optimality is achieved by having the right "quantity" of a particular type of action within an overall combination of actions.

One general trend that is observable both from policy documentation and from discussions with biosecurity practitioners is the increasing importance attached to strengthening the pre-incursion or pre-outbreak end of the continuum of activities. This appears to be the case in relation to both plant and animal health.

Drawing on the discussion above, the question arises as to what factors might have inhibited the development of a response along these lines. The question also arises as to what role cost recovery mechanisms can play in this process. Following from the arguments developed above, we need to examine whether cost recovery principles can play a part in creating the right signals that would favour a switch in emphasis towards the pre-incursion or pre-outbreak end of the spectrum.

The role cost recovery can play in terms of setting relative prices is not reducible to the notion of "polluter/risk creator pays" (see below). The latter presumes a direct link between the activities of certain parties and a risk (e.g. infestation risks created by importers of fruit or vegetable products). The perspective we set out here is broader: we posit that there are private parties who face a spectrum of returns from specific biosecurity actions and combinations of these actions, as well as a range of costs associated with these. These actions may include those that create or mitigate risks; or they may be actions that parties, as beneficiaries of these actions, seek to rely on to safeguard the gains from mitigating impact costs of pests and diseases.

Other policy objectives relevant for cost recovery besides efficiency

Our discussion of cost recovery mechanisms has been couched thus far in terms of incentive alignment. This is a fundamental determinant of whether cost recovery is efficient. We also considered issues of administrative and implementation costs, the factors that drive these and the extent to which such costs could potentially outweigh any efficiency gains.

Other criteria include:

- Equity issues – this is related to the first point. There may be a trade off between equity and efficiency if cost recovery mechanisms impose a disproportionate burden on parties that are unable to accommodate them.
- Distributional issues and other issues of political economy. Besides the equity impacts described above, policy may also have concerns if approaches to cost recovery have a significant impact on the location of economic activity e.g. if parties try to relocate activities to jurisdictions that are less constraining in terms of cost recovery. Moreover, policy maker preferences may be weighted in favour of particular types of activities – such as small and emerging industries – that may have a lower capacity to absorb charges.

2.2.5 Summing up

Our approach thus far has focused primarily on developing a framework within which to understand cost recovery as a matter of principle, and its consequences in terms of promoting welfare through efficiency. The framework thus sets out how cost recovery should ideally work. In particular, we have emphasised the question of incentive alignment and in this context, the role played by the relative price signals that emanate from cost recovery.

The discussion raises the question as to what extent approaches to cost recovery are consistent with the principles we have set out, and if they are not, to what

extent the principles we have developed could be implemented. In relation to the latter question, the complexity of what is contemplated should not be underestimated, given the number of actions that are involved in a biosecurity policy response for any particular disease or pest, and the overlaps between these in terms of the sectors and parties involved. Against this backdrop, we need to bear in mind the points raised earlier regarding administrative and institutional factors and the prevalence of informational hazards. There are also a number of other policy objectives that policy makers may take into account when considering cost recovery measures (as outlined above).

If we were to translate the different principles for cost recovery into specific criteria for examining cost recovery options, the following criteria would be applicable:

- Efficiency- this is the fundamental and overarching criterion, and is broken down into issues of incentive alignment.
- Administrative efficiency- these relate to the costs of implementing cost recovery solutions, including those that stem from institutional and legal constraints.
- Institutional issues– including statutory and legal constraints on cost recovery, and issues relating to credible commitment.
- Equity issues.
- Distributional issues.

Consequently, in order to assess the extent to which the principles we have developed are, and can be implemented, it is opportune to review standard cost recovery instruments and current practice in regard to cost recovery.

2.2.6 Standard cost recovery instruments

Background

A common practice in regard to cost sharing arrangements is that they should follow a "cascading approach", whereby[4]:

- User fees are instituted whenever practical and cost effective;
- Levies on output or consumption in affected industries are used when user fees are infeasible; and finally
- Public funding through general taxation is used as a last resort when both user fees and industry levies are infeasible.

While user fees are feasible where a direct relationship between payment and use of the service is available, in cases where this relationship does not exist taxation (including levies) must be used.[5] There is a natural trade-off between the precision of cost sharing arrangements and the inherent administrative costs of

[4] DPI Victoria (2006), p.4.

[5] PC (2001), p.83.

those arrangements – while user charges target those individuals that benefit from a particular service accurately, the administrative costs of collection and compliance are likely to be high. Conversely, while general taxation provides no localised targeting of users or industries, the relative ease of collection and administration is likely to be reflected in the costs of such an arrangement. Naturally, industry levies are likely to lie somewhere in between these two 'extremes'.

Related to the collection mechanisms of user fees, levies and general taxation are the principles of cost sharing – these can be broadly classified as beneficiary pays, user pays, risk-creator pays and capacity to pay[6] and are further discussed below.

Cost sharing principles

Beneficiary pays is generally applied by defining beneficiaries as those who derive benefit from the provision of a good or service. Costs are then allocated between beneficiaries in proportion to the benefit each group derives from the good or service. The beneficiary pays approach is generally considered the most equitable cost sharing principle – however, this approach is generally problematic to implement due to the public-good nature of most biosecurity initiatives.

User pays is generally applied by defining the direct users of a given good or service. Costs are then allocated according to the relative intensity of use. While the user pays approach is relatively easy to administer, provided the users of goods or services are identifiable, this approach has equity concerns since 'free riding' by non-users, who still derive benefits from the good or service in question, is possible.

Risk-creator pays is analogous to the 'polluter pays' approach frequently utilised in environmental regulation. This risk-creator pays approach is feasible when there is a clear and traceable link between market participants and a potential biosecurity threat. However, when the biosecurity threats are diffuse, making the identification of responsible individuals difficult (if not impossible), this approach is generally infeasible. The issue of assigning responsibility is also relevant – thus the question of whether failing to take all possible steps to prevent an outbreak constitutes being responsible for that outbreak becomes relevant.

Capacity to pay is somewhat more pragmatic in its design – this approach allocates costs between parties according to their capacity to pay. While this approach has a strong 'fairness' considerations, in that groups of users less able to pay for provided goods or services are subsidised by groups more able to pay, this approach lacks any formal link between the consumption of a given good or service and that good or service's associated cost.

[6] CIE (2007), p.30.

3 Review of key sector/product issues

3.1 NATIONAL BIOSECURITY INITIATIVES

3.1.1 Institutional arrangements

The broad division of responsibilities and competences is that:

- The Commonwealth manages quarantine issues at the national borders (including import risk assessments); and
- States manage, *inter alia*, intra- and inter-state health certification programs to minimise the spread of pests and diseases that are harmful to industries.

Although international quarantine is constitutionally a Commonwealth responsibility, policies have been, and are developed in consultation with, the States/Territories at ministerial level through the Primary Industries Ministerial Council (PIMC) and its subordinate committees.

Commonwealth biosecurity arrangements for plant and animal health in Australia are the responsibility of two bodies[7]:

- The Department of Agriculture, Fisheries and Forestry Australia (DAFF); and
- Plant Health Australia (for plant health) and Animal Health Australia (for animal health).

DAFF

Within DAFF, three key operating groups exist: Product Integrity Animal and Plant Health, Biosecurity Australia: Plant Biosecurity and the Australian Quarantine and Inspection Service.

- Product Integrity Animal and Plant Health – is responsible for the development and implementation of national policies and programs that aim to maintain or improve Australia's plant health status, as well as the national coordination of the management of plant related pest incursions.
- Biosecurity Australia – is part of Market Access and Biosecurity, an operating group within DAFF, which aims to enhance the competitiveness of Australia's agriculture and food industries through policy and technical advice and by participating in negotiations for market access and trade agreements in international forums.
- The Australian Quarantine and Inspection Service (AQIS) – is the operating group within DAFF charged with protecting Australia from exotic pests and diseases while facilitating the international movement of people and goods and providing export certification for agricultural produce and other commodities.

[7] DAFF (2003).

Plant Health Australia

Plant Health Australia (PHA) is a company jointly established by the Commonwealth and State/Territory governments and industry to facilitate a genuine industry/government partnership approach to the development and implementation of plant health policies and programs. PHA manages or is involved in the following programs on behalf of its members:

- PLANTPLAN – Provides a set of nationally consistent guidelines covering management and response procedures for emergency plant pest incursions affecting the Australian plant industries. PLANTPLAN is [to be] endorsed by all signatories to the EPPRD and is underpinned by individual Industry Biosecurity Plans.
- EPPRD – The Emergency Plant Pest Response Deed (EPPRD) is a formal legally binding agreement between Plant Health Australia, the Australian Government, all State and Territory Governments and plant industry signatories covering the management and funding of responses to Emergency Plant Pests (EPPs). The EPPRD replaces previous informal arrangements and provides a formal role for industry to participate and assume a greater responsibility in decision-making in relation to Emergency Plant Pest responses.[8]
- IBPs – Industry Biosecurity Plans (IBPs) aim to bring together industry representatives, government officials and other relevant experts to identify key pests for particular plant industries and to develop comprehensive means of reducing and managing biosecurity risks to those industries. PHA has finalised IBPs for the apple & pears, banana, citrus, cotton, grains, mangoes, nursery & garden, potato, rice, strawberries, sugar, summerfruit, tropical fruit and viticulture industries and is working with the avocadoes, cherries, nuts, plantation timber, onions and vegetables industries to develop and finalise their own IBPs.[9]

PHA's operations are divided into core activities that are funded through member subscriptions[10], and to other activities that are funded by non-subscription funding. The respective amounts for each type budgeted for 2008-9 are $3.216 million and $0.391 million. By and large, core activities are subscription funded activities and are of cross-sectoral nature. The exception lies in industry on-farm bio-security implementation activities, which are core activities but funded through specific (i.e. non-subscription) funds raised by particular member industry groups. The development of IBPs is also funded separately from subscription contributions.

Subscription funding is broken down on a roughly tripartite basis between the commonwealth, states, and industry. The industry contribution is further broken

[8] PHA (2007a).

[9] PHA (2007b).

[10] These comprise six different areas including bio-security planning and implementation; emergency plant pest response deed; national strategies and policy coordination; capacity and capability; member engagement; company management. These broad areas are determined on a periodic basis through member consultation.

down into contributions by some 30 industry representative bodies, with the contributions to be made by these bodies determined as a function of local value of production.[11]

Each industry body has two separate levy mechanisms: one that is earmarked specifically for emergency responses (the EPPRD levy), and one that is geared to financing PHA membership. The manner in which the levy is to be administered is left to the industry body in question. Most industries set a zero rate for the EPPRD levy, with the option of activating it in the event of an incursion, while some set the levy at an operative level and spend the excess on other bio-security efforts. By necessity the PHA membership levy needs to be set greater than zero; when excess revenues are collected, these can be spent on other bio-security activities through PHA or they can be redirected towards the relevant RDC.

Information on the types of levy mechanisms used by industry bodies is far from complete. Of those for which information was available, most used a volumetric basis for their levies, while AusVeg (for vegetables, but not potatoes) and the GCA have adopted value based levies.

There are several inter-linkages between PHA and RDCs. As pointed out above, funds that are surplus to subscription requirements can be redirected from PHA to an RDC. The link can operate in the other direction insofar as PHA can act as a service provider to an RDC. PHA and RDC may also act as partners in a joint venture – for example both PHA and GRDC are among the core partners in the CRC for national plant bio-security, and support for this institution is part of PHA's core activities.

Animal Health Australia

Animal Health Australia was created in 1996 to promote collaboration and resolve funding arrangements between governments and industry. AHA provides scope for national industry representation and involvement in policy development and for industry to share funding of national programs. AHA manages or is involved in the following programs[12]:

- AUSVETPLAN – A coordinated national response plan for the control and eradication of a range of emergency diseases and certain emerging or endemic animal diseases; and
- EADRA – The Emergency Animal Disease Response Agreement (EADRA) is a formal agreement which brings together Animal Health Australia, the Commonwealth, State and Territory governments and the livestock industry and provides an innovative means to combine approaches to combating emergency animal diseases. The agreement identifies and determines to what extent the signatory groups are responsible for funding certain emergency

[11] By far the largest contributor is the Grains Council of Australia (GCA), who accounted for over 42% of the 2008-09 contributions.

[12] DPI Victoria (May 2005).

responses to a particular disease outbreak and sets out a framework for a nationally coordinated emergency response.

AHA's operations can be categorised into subscription-funded and specially-funded programs. The financial burden of subscription funded programs is largely shared equally between the three member categories of AHA – the Commonwealth government, the state/territory governments and represented livestock industries via various funding obligations. Programs of particular relevance to a limited number of member organizations are funded directly by those organizations, as primary beneficiaries, and are referred to as "special programs".[13] The Commonwealth government's funding obligations are outlined in the *Australian Animal Health Council (Live-stock Industries) Funding Act 1996* (the Act). The Commonwealth government is to pay the Australian Animal Health Council (AHA) the amount:

- collected or received by the Australian Animal Health Council levy on behalf of the Commonwealth on or after 1 July 1996; and
- paid due to penalties under section 15 of the *Primary Industries Levies and Charges Collection Act 1991* in relation to a failure to pay the Australian Animal Health Council levy by the time it became due for payment.

The Commonwealth government is to pay the Australian Animal Health Council (AHA), net of the Commonwealth's costs of collection and recovery, the amount:

- collected by levies or charges imposed by regulations under Schedule 27 to the *Primary Industries (Excise) Levies Act 1999* or Schedule 14 to the *Primary Industries (Customs) Charges Act 1999* on an animal product; and
- paid due to penalties under section 15 of the *Primary Industries Levies and Charges Collection Act 1991* in relation to a failure to pay such levies or charges.

3.1.2 Research Development Corporations

There are 15 Research Development Corporations (RDCs) across the Australia, 9 of which were established under the *Primary Industries and Energy Research and Development Act 1989* while the remaining six are constituted under Corporations Law.[14] While the functions of RDCs extend well beyond bio-security related activities, the latter are nevertheless an important component of many RDCs' work programme. This is partly by virtue of the fact that one of the ministerial priorities is "Protecting Australia from Invasive Pests and Diseases". Moreover, particular industries have their own concerns relating to bio-security issues that extent beyond the concern for invasive pests (as reflected, for example, in the GRDC's work on weeds or the Grape and Wine RDC's work on phylloxera.)

RDC activities are funded on a co-financing basis between industry and public sources. Industry funding is done on the basis of product levies. In some cases, a

[13] AHA (2004).

[14] A detailed description of the RDC model and the governance arrangements is provided in Centre for International Economics [CIE] (2003) The Rural Research and Development Corporations, prepared for DEST.

product levy will cover a number of sectors. For example, the Grains Research Development Corporation (GRDC) collects a levy on grain growers that is collected on 25 crops spanning temperate and tropical cereals, oilseeds and pulses and is determined each year by the grains industry's peak body, the Grains Council of Australia (GCA).

3.2 PRIORITIES IN VICTORIA

3.2.1 Plant biosecurity

In Victoria, plant health is administered by the Department of Primary Industries' (DPI) "Plant Standards Branch".

- The total Plant Biosecurity budget is about $10.5m annually. Expenditure for endemics is about $7m annually, pests exotic to Vic about $1m and pests exotic to Australia (EPPRD sensitive) about $2.8m.
- For 2008/9 Plant Standards BV is seeking $2.5m for additional fruit fly funding to eradicate fruit fly from inner metro Melbourne to minimise impacts on interstate trade through the Melbourne Markets.

Victoria's contribution to national plant health initiatives for 2007/08 is $3.2m. This is additional expenditure that provides funding to other states in order to meet EPPRD and other exotic pest response cost sharing responsibilities. The breakdown of costs incurred in participating in these initiatives for 2007/08, along with the benefiting jurisdiction(s) of each program, is outlined below:

Program	Jurisdiction	Activity	Cost
Red Imported Fire Ants	Qld	Eradication	1,758,000
European House Borer	WA	Eradication	519,312
Plague Locusts Commission	National	Ongoing	310,066
Branched Broomrape	S.A.	Eradication	176,375[15]
Tri-state Fruit Fly (2006-07)	S.A., Vic, NSW	Ongoing	163,000
PHA Subscription	National	Ongoing	148,231
Citrus Canker	Qld	Eradication	126,268
Torres Strait Fruit Fly	Qld	Surveillance	17,820
PHA National Fruit Fly Strategy	National	Ongoing	15,000
PHA Fruit fly	National	Cost-benefits analysis	4,000

[15] This amount is a 50% share with DSE.

Total	**-**	**-**	**3,238,072**

Table 1: DPI Victoria expenditure on national plant health initiatives ($)

Source: DPI Victoria

Endemic to Victoria

DPI currently spends $7m per year managing endemic (to Victoria) plant disease control programs targeting the following four diseases[16]:

- Fruit fly[17];
- Phylloxera (grapevine aphid);
- Potato cyst nematode (PCN); and
- Western flower thrip (WFT).

The breakdown of costs incurred by the state government of Victoria in managing endemic plant diseases and pests is outlined below:

	Fruit Fly	Phylloxera	PCN	WFT & Other
Surveillance	1.30	0.43	0.14	0.14
Control /Eradication	1.10	0.37	0.12	0.12
Prevention	0.70	0.23	0.08	0.08
Policy /Market access liaison	0.50	0.17	0.06	0.06
Certification	0.50	0.17	0.06	0.06
Diagnostics	0.30	0.10	0.03	0.03
Communication & awareness	0.10	0.03	0.01	0.01
Totals	**4.5**	**1.50**	**0.50**	**0.50**

Table 2: DPI Victoria expenditure on endemic plant pests ($m)

Source: DPI Victoria

Exotic to Victoria

Victoria DPI currently spends $1m managing exotic (to Victoria) plant disease control programs targeting the following diseases[18]:

- Red imported fire ants

[16] DPI Victoria (August 2005).

[17] Technically exotic to Victoria by spuriously referred to as endemic.

[18] DPI Victoria (August 2005).

- Asparagus blight
- Mediterranean fruit fly
- Lupin anthracnose
- Branched broomrape
- Annual ryegrass toxicity

The breakdown of costs incurred in managing exotic (to Victoria) plant diseases and pests is outlined below:

Activity	Cost
Surveillance	0.4
Prevention	0.3
Policy /Legislation	0.2
Awareness	0.1
Total	**1.0**

Table 3: DPI Victoria expenditure on exotic (to Victoria) plant pests ($m)

Source: DPI Victoria

Exotic to Australia

Victoria DPI currently spends $2.8m managing exotic (to Australia) plant disease control programs. This spending is primarily used to meet normal commitments of the EPPRD. Victoria does have a number of exotic detections on a range of commodities/crops but cumulative expenditure on surveillance rarely exceeds $300,000 per year.

Victoria has not had a major exotic disease incursion since fire blight was detected in the Royal Botanic Gardens in Melbourne in 1996. The cost of this outbreak was about $3m of which;

- $2m was spent on state and national surveillance to delimit spread and prove area freedom in host orchards and nurseries; and
- $1m was spent on eradication of the organism from the Gardens and on communication and administration.

The breakdown of costs incurred in managing exotic (to Australia) plant diseases and pests is outlined below:

Activity	Cost
Biosecurity policy & PHA liaison	0.6
Passive & target surveillance	0.6
Diagnostics	0.3
Preparedness and training	0.5
Awareness	0.5
Non-EPPRD response activities	0.3
Total	**2.8**

Table 4: DPI Victoria expenditure on exotic (to Australia) plant pests ($m)

Source: DPI Victoria

3.2.2 Animal

In Victoria, animal health is administered under the Agricultural Quality Assurance Program (now Biosecurity Victoria) through the Chief Veterinary Office Unit (CVO) and the Animal Health Operations Branch (AHOB).

The Key Project, managed by the Animal Standards Branch (ASB), underpins DPI's ability to manage disease control and eradication operations in response to an emergency animal disease outbreak.[19]

The breakdown of costs incurred by DPI's 'Key Projects' for 2007/08 is outlined below. These figures are based on budget revenues and an estimated 'portfolio balance' by activity, both provided by DPI.

Activity	Cost
Applied research	0.7
Extension /practice change	0.7
Compliance /regulation	9.5
Policy	2.7
Total	**13.6**

Table 5: Key Projects expenditure ($m), 2007/08

Source: DPI Victoria

[19] DPI Victoria (May 2008a), p.1.

Value-at-risk

- Victoria's livestock industry is worth approximately $5.2bn per year.[20]
- By value, roughly 80% of this is derived from exports.[21]
- Victoria's dairy export industry was valued at $2.17bn in 2006 and accounted for 87% of the value of Australia's dairy exports. Victoria's primary dairy export markets are Japan, Malaysia, Indonesia and Singapore.[22]
- Victoria's meat export industry was valued at $1.47bn in 2006. Beef accounted for 45% of total meat value ($656m), sheep accounted or 36% ($524m) while offal accounted for 10% ($141m). Victoria's primary meat export markets are the US, Japan and South Korea.[23]

Key threats

- Foot and mouth disease (FMD)
- Newcastle's disease (NCD)
- Classical swine fever (CSF)
- Highly pathogenic avian influenza (HPAI)[24]

Disease	Recent disease outbreaks	Ongoing disease management
FMD	Brazil, China, South Africa	Afghanistan, China, India, Malaysia, Nepal, Saudi Arabia, Thailand, Vietnam
NCD	Italy, Romania, Sweden, Turkey	India, South Korea, Philippines, Sri Lanka, Vietnam
CSF	Bulgaria, Bolivia, Croatia	China, India, South Korea, Philippines, Thailand, Vietnam
HPAI	Russia, Egypt, Sudan, Serbia & Montenegro	Thailand, Vietnam

Table 6: International incidence of key threats to Victoria

Source: DPI Victoria

Other threats

- Bovine johne's disease
- Ovine johne's disease
- Anthrax

[20] DPI Victoria (May 2008b), p.1.

[21] DPI Victoria (May 2008b), p.1.

[22] DPI Victoria (May 2008c), p.2.

[23] DPI Victoria (May 2008c), p.2.

[24] DPI Victoria (November 2006b), p.4.

- Enzootic bovine leucosis
- Bovine tuberculosis
- Ovine brucellosis
- Footrot
- Small-hive beetle [25]

3.2.3 Weeds

We discus weeds in a category of its own given that they cut across animal and plant health issues, as well as between private and public assets. The direct costs of weeds to Agriculture in Victoria were estimated at 360 million per year in 2002.[26] Moreover, some weeds are endemic while other weed threats are exotic.

Within Victoria, the principal piece of legislation dealing with the management of weeds is the Catchment and Land protection Act of 1994 (CaLP Act), which is administered by the Department of Sustainability and the Environment. The CaLP Act classifies weeds into 4 categories: state prohibited weeds, restricted weeds, regionally prohibited weeds and regionally controlled weeds. The institutions responsible for advising the minister on what weeds to proclaim and in what category are the nine Regional Catchment Management Authorities (CMAs) and the Port Philip Catchment and Land Protection Board, who work in conjunction with Victorian Catchment Management Council.

The CMAs have a wide range of functions in weed management, including the development of regional catchment strategies, and the coordination and monitoring of their implementation. The CMAs can also make recommendations relating to the funding of the plans and strategies they have developed.

In practice, the Victorian government has pursued a two-pronged strategy in dealing with weeds, through specific initiatives targeting, respectively, public and private land. The Weeds and Pests on Public Land initiative ran from 2003 and 2007, during which time about $14 million were invested in weed and pest control management programmes. The funds were directed primarily to supporting community based volunteer initiatives that sought to implement weed control and eradication methods, and raise awareness on public land. Some of these initiatives received additional funding from other public sources such as the Australian Science Teacher's association.

The Tackling Weeds on Private Land Initiative dealt with weed management issues in a number of different sectors and industries. The Initiative is an umbrella for various sector and industry based initiatives. Much of weeds management centres around compliance, in relation to industry based codes and ultimately the requirements of the CaLP. The particular policy challenges that emerge in this context are very industry specific. For example, in the gardens

[25] Discussed during meetings with DPI Victoria animal health experts.

[26] See DNRE (2002), p 2

industry markets segment[27], compliance is a sensitive issue owing to the costs associated with it and the largely volunteer-based nature of these activities. Consequently, the emphasis has shifted to dissemination of information on what sorts of practices and plants to avoid.[28]

By contrast, in the grains industry, a particular issue stems from the fact that industry standards which by and large reflect the receivals standard implemented by the AWB, allows a higher threshold level of noxious weeds than permissible under the CaLP act before penalties are imposed. One estimate found that 59-61% of cereal and pulse seed samples did not meet certification standards, while another estimated that some 65.4 tonnes of feed grain are moved into and used in Victoria each year.[29] Empirical estimates suggest that the gains from reducing weeds contamination are large - over 1.1 billion dollars across Australia as a whole, and 513 million in the "southern region" (that is, grain growing regions of central and southern NSW, Victoria and South Australia). The bulk of these gains would be borne by producers.[30] The fact that these gains are unrealised may be connected to the structure of the industry. About 75% are for export or domestic consumption, and it is the remaining 25% destined for livestock feed or for seed which pose the main problems in terms of weed propagation pathways. Imposing tighter receivals standards would impose costs across the whole industry, even though the problem appears to stem from two of its smaller components.

3.3 EXISTING COST SHARING METHODOLOGIES

3.3.1 Arrangements under PHA and AHA

The two most comprehensive and current cost sharing arrangements for biosecurity initiatives and responses are the Emergency Plant Pest Response Deed (the Plant deed) and the Emergency Animal Disease Response Agreement (the Animal deed). Both of these deeds are formal agreements between selected industries and government to share the costs of emergency responses to new incursions or outbreaks that threaten plant and animal health, and include the following features[31]:

- Industries party to the cost sharing agreement;
- Explicit identification of key risks and threats;
- Detailed cost sharing proportions and formulae;

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[27] This refers to the organisation of local and regional markets on a periodic basis, usually by community and volunteer associations

[28] DSE/ DPI "Stakeholder Analysis, Gardens Industry Market Segement", *Tackling Weeds on Private Land Initiative*

[29] See DSE/ DPI (2006), "Stakeholder Analysis, Grains Industry", *Tackling Weeds on Private Land Initiative*

[30] See Jones, R., Alemseged Y,. Medd R, Verre D. (2000) *The Distribution, Density and Economic Impact of Weeds in the Australian Annual Winter Cropping System, CRC* for Weed Management Systems. Technical Series 4.

[31] CIE (2007), p.33.

- Limits on the total costs that can borne by a given industry;
- Mechanisms by which industries will meet their cost shares; and
- A 'sliding scale' of how costs are apportioned between government and industry, depending on the level of public vis-à-vis private benefit from pest or disease prevention.

The sliding scale of how costs are apportioned between government and industry is evidence of the deeds' 'beneficiary pays' approach. This approach identifies to what extent the benefits of pest or disease prevention accrue to either the public (and hence are publicly funded) or to industry (and hence are privately funded). Table 7 below briefly summarises both deeds.

Category	Cost share	Description of category
1	100% government	Major pests or diseases that can or do seriously harm human health and have relatively little impact on commercial industries.
2	80% government 20% industry	Pests or diseases that can or do cause sever socio-economic costs due to trade losses, severe production losses or environmental damage and impose significant costs on industry.
3	50% government 50% industry	Pests or diseases that primarily harm the industries concerned but which also impose moderate socio-economic costs due to trade losses and/or production losses.
4	20% government 80% industry	Pests or diseases that pose little to no human and environmental costs and purely affect the concerned industries through moderate production losses and increased costs.

Table 7: Plant and animal cost sharing deeds
Source: Frontier Economics

In addition to this, the periodic subscriptions to AHA and PHA by industry bodies is a way of cost sharing in the delivery of on-going preventive and surveillance activities undertaken by these institutions. Because core activities are of a cross-sectoral nature, the subscription fees essentially pool funding across different groups of sectors. The exceptions to this lie in industry on-farm bio-security implementation activities, and the development of integrated bio-security investment plans, which are funded through specific contributions by industry and government.

Moreover, the sector plans developed by both institutions provide scope for further cost sharing with specific sectors and industries.

3.3.2 Industry Development Orders

Industry Development Orders are provided for in Victoria under the Agricultural Industry Development Act of 1990. An Order allows an industry to collect a compulsory charge (a levy) from producers to provide specific services, which may include bio-security services. The compulsory nature of the Order

distinguishes it from a voluntary scheme. However, the Order still retains to some extent a voluntary aspect since the request for the order must emanate from industry itself, and there must be a demonstration that the request has substantial support from within the industry itself before the Minister can begin consultations on whether the Order should be made. Consultations are followed by a vote, and a majority of producers in the relevant industry must vote in favour of the order. The process is essentially geared towards limiting the scope for free riding on the part of some producers if the majority of the producers accept that private contributions are appropriate to fund a particular activity or sets of activities.

The legislation also provides for institutional machinery, in the form of an Industry Development Committee, to collect funds and administer their use for certain agreed projects. The project list requires approval by a majority of growers. Projects are usually reviewed annually, and new projects may be added as part of the review process. The actual degree to which funds are hypothecated can thus vary – it may be that as part of the process of making the case of the establishment of a committee, particular projects or activities are identified. At the same time, it is likely that new projects and activities are identified post the establishment of the Committee. For example, in addition to its regular review process, the Committee can call a special meeting to request that funding be directed at any emergency (such as a disease outbreak) that may develop. Emergency projects can be funded out of reserves or by changing the levy rate.

The Committee comprises industry representatives and a government representative. The Committee can contract with private or government service providers for the delivery of services. This raises the issue of how the operations of these committees can be tied in with the operation of other agencies that are also engaged in bio-security activities. For instance, both PHA and AHA deliver at a national level sector and industry specific activities, on the basis (in part) of industry contributions. In practice this is likely to mean that IDO funded activities are likely to be directed towards state-specific issues that do not necessitate a nation-wide approach.

3.3.3 Research Development Corporations

The broad funding arrangements for RDCS were described above in section 3.1.1. There are similarities between these arrangements and those applying to IDO's, in that both involve funding of a portfolio of activities or projects through levies, with project oversight exercised by industry through board of representatives of committee. An important point of departure is the extent of public funding, which is in principle more significant in the case of RDCs due to the one-for-one co-financing rule.

3.3.4 Other arrangements

Industry specific arrangements

These include voluntary arrangements such as the plant pot levy or the bee-hives levy which are collected and administered within specific sectors for certain

identified purposes. They contrast with the other arrangements as they do not have their basis in formal legislation. Also, in contrast with activities funded and implemented through the RDCs or bodies such as PHA or AHA, they do not involve several sectors and extensive portfolios of projects.

Local or area authorities

Local and regional authorities such as city councils or Catchment Management Authorities typically take on a variety of functions that are of relevance to bio-security. Local government authorities, for example, are usually tasked with managing weeds. Catchment Management Authorities are usually involved in managing bio-diversity. In principle, these authorities can engage in cost recovery through the imposition of levies. These can be implemented on the population as whole, which tends to be the case for projects related to the preservation of environmental assets. These authorities also have the scope to impose levies on production.

In practice, there seems little evidence of local or area authorities engaging in cost recovery from producers. The fact that local or area authorities usually have implementation and management responsibilities can potentially give them a comparative advantage over others in implementing cost recovery mechanisms, particularly when there is a concern on the part of contributors to monitor and verify the use of their funds. Moreover, these institutions also potentially have an important role to play if the implementation of bio-security measures, and cost recovery mechanisms that go with them, require coordination across different regions within the state (for example, if actions taken in one area or region have spill-over effects in another).

3.4 REVIEW OF ISSUES

3.4.1 Development of more systematic approaches to cost recovery

Institutional developments have taken place mainly at a national level

At a national level, the development of protocols such as the EPPRD and EADRA, as well as the implementation of bio-security responses implemented through agencies such as PHA and AHA, are indicative of attempts to put cost recovery on a more systematic and formalised footing. This involves, notably, the development of criteria for classifying pests and diseases in terms of their impact on market and non-market assets, with a view to then determining the degree of private versus public cost sharing.

The particular funding arrangements for institutions such as PHA and AHA are worth noting since they involve the use of levies specifically for the funding of bio-security activities. A substantial proportion of these levies are directed either at supporting eradication activities or maintaining the capability to manage incursion responses. But an important function of these levies is also to fund bio-

security planning and initiatives such as the IBPs that cover the whole biosecurity response continuum. Moreover, some industries such as Grains and the Apple and Pear industry have sought to leverage off their existing funding mechanisms to fund on farm bio-security implementation activities through the PHA.

The funding arrangements for PHA and AHA also provide mechanisms for raising revenues from industry groups, though participation in these mechanisms by the private sector appears to be largely on a voluntary basis. The trend for bodies such as the PHA to participate increasingly in the delivery of bio-security activities across the continuum, including in implementation efforts, points to the economies of scope that exist in the delivery of bio-security activities.

Primacy of "beneficiary pays" principle

The underlying principle behind the cost recovery mechanisms referred to above is that of "beneficiary pays". This is evident in the basis for cost sharing under the EPPRD and EADRA, and more generally the arrangements for levies funding bio-security actions through the PHA and AHA. It also underpins the contributions made to RDCs. The use of this approach is unsurprising given our previous observations on the relative merits between this approach and others such as risk creator pays or pollute pays in the context of bio-security activities.

The cost sharing arrangements that have been developed are generally of a broad-brush nature, i.e. scales with fixed percentage requirements, or periodic contributions that cover a range of activities. There may be some efficiency loss in these arrangements, in that they are may imply that the magnitude of contributions at any one time do not map precisely to the cost of a particular activity or to its benefits. However, as against this, the approach is likely yield an increase in efficiency when there are economies of scope in the delivery of activities, and where the set contributions and/or scales offer greater stability and predictability in funding.

It should also be noted that the scales developed, broad as they are, show a greater level of refinement than what is observed in areas other than bio-security (e.g. one-for-one matching in research and development expenditures)

3.4.2 Cost recovery through a patchwork of arrangements

Taking stock of existing arrangements, we find that cost recovery takes place along a number of different lines:

- National arrangements involving government and the private sector, that tend to focus primarily on exotic pests and on post-incursion management rather than more "upstream actions" in the bio-security continuum (though admittedly this is changing with the development and implementation of instruments such as the IBP's in relation to plant health).
- The operations of RDCs, which provide an important vehicle for cost recovery in regards to the more upstream bio-security measures such as prevention and preparedness.
- Industry arrangements, at national or state level. These include industry standards, where compliance needs to be demonstrated through testing,

which is often administered by private specialist service providers (that is, 100% of bio-security costs are borne by private parties).

These arrangements have developed through separate process in response to specific needs. Together they cover a wide spectrum of bio-security activities, at least for certain pests and certain sectors, even if not primarily as a consequence of deliberate planning. In this context, it is important to consider the impact of these arrangements when taken together.

Current gaps

Cost recovery mechanisms focus primarily on bio-security responses to some exotic pests and diseases.

- Existing cost sharing arrangements apply primarily to exotic pests and diseases.
- There are limitations to the coverage of these arrangements, in terms sectors and invasive species groups. For example, diseases and invertebrate pests of some plants (including forestry, amenity plants and native species), pests and diseases of aquatic animals, pest plants, pest animals, and marine pests.[32]
- Outside of the work of RDCs, and to some extent work pursued through industry-specific initiatives under PHA and AGA, the focus has been primarily on post-incursion management
- The cost sharing arrangements operate primarily at a national, rather than state, level.

The focus on exotics requires some explanation. One reason may be that exotic pest and diseases provided a more obvious starting point since the problem (preventing incursions from overseas) could be articulated fairly clearly. At the same time, it is not immediately obvious that the relative characteristics of exotic versus endemic pests and diseases are such that the implementation of cost recovery is inherently more complex in the latter as opposed to the former.

In terms of coverage of activities the relative neglect of activities upstream from pre-incursion management may reflect a lack of awareness of the differences in relative costs (in terms of implementing activities and overall disease impact costs) of various options along the bio-security continuum. However, there are examples where the recognition of the value of pre-incursion action has translated into an expansion of both bio-security actions and cost recovery at a more "upstream" level. For example, Virulent Newcastle Disease (vND) was first addressed through eradication measures under the provisions of the EADRA. The impact of several outbreaks, however, emphasised the importance of preventative action, particularly through vaccination. The approach currently pursued sees government playing a relatively limited coordinating role, and industry bearing most of the costs of prevention, which include the costs of vaccines and the administrative costs of ensuring the efficacy of the vaccination programme. [33] Similarly, the development of industry-specific initiatives through

[32] See DPI (2006), *op.cit*

[33] DPI (2006), *op.cit*

PHA is also reflective of the trend towards emphasising the more up-stream categories of bio-security actions.

Another important gap stems from the fact that these arrangements are primarily ones that focus on national-level activities. This leaves out more localised risk factors. For example, while there are aspects to weeds management that are common across states, specific weeds are much more of a local issue, as reflected in the fact that weed classification systems operate at a state level, and it is the CMAs that are entrusted with identifying areas of priority action.

A further gap is that there are few coordination mechanisms to address cases where the issue are localised but nevertheless cross state boundary lines, or where there spill-over effects of these pests and diseases from one state to another.[34] An example of the latter can be found in fruit-fly management. Weeds are arguably in the former category – for example, three of the four agro-ecological zones of relevance to grains in Victoria span borders with either NSW of South Australia. Some of these "local-but-cross-border" issues can be handled through institutions such as RDCs, but there are limitations to this, given the remit of RDCs.

Current gaps also include instruments and institutions which are not used or little used at present, but which could play a role in the administration of bio-security measures and cost recovery. These include Industry Development Orders. Local authorities have the competence to advise on fund raising measures to support their activity, but in practice have not exercised this option in regard to bio-security.

The role of RDCs

RDCs have an important role to play in the conduct of bio-security activities given that R&D projects related to bio-security are part of the RDCs work programme as a result of both government and industry priorities. Admittedly the importance and specifics of RDC projects relating to bio-security vary considerably across sectors. On the whole they are dominated by issues of prevention and preparedness the to prevail. RDCs offer a mechanism for cost recovery because of the co-financing principle that underpins them. In particular, because RDC levies in most sector are differentiated from other levies (such as levies to finance subscription fees to PHA) they offer a mechanism for through which costs for upstream activities in the bio-security continuum can be developed and implemented.

There are, however, a few limitations to the role played by RDCS. First, their focus is largely driven by nation-wide priorities, so it is not always clear how and whether state level bio-security issues can be handled. Secondly, the 1 for 1 co-financing principle may not be socially efficient if the actual gains from research are privately appropriable – that is, the principle could end up using subsidising private profits through public funds. Consider for example the case of weeds management. Estimates suggest that 80% of the returns from investment in weed control and management accrue to the private sector (principally through

[34] See DPI (2006), *op.cit*

avoided costs stemming from production losses).[35] The number by themselves would suggest that a different split between private and public funds might be appropriate, or at least that efforts that were co-funded were directed at projects that affected non-market assets in equal proportion to market ones.

A third issue is the extent to which the degree of cost sharing embodied in RDC arrangements affects behaviour by parties in relation to bio-security activities. Even if a certain body of privately funded research has been undertaken in relation to, say, preparedness or prevention, it does not automatically follow that this will translate into modified practices. This could stem from several factors: the link between funders and projects can be relatively loose. That, is projects may be run over several years, and may be funded from a general pool of funds collected from private parties who may not automatically see that the implementation of these results deliver value for the "price" they have paid through their contributions. To some extent this can be addressed through activities geared at on-farm implementation (such as training). As noted previously, PHA have become involved in such initiatives.

A second factor may be that there are still uncompensated externalities that stem from implementing the results of research. This may be an issue in the case of weeds, for example, given that the spread of weeds can be checked through the actions of particular growers (e.g. modified cultivation practices), but the benefits will be likely reaped by other parties.

Finally, the incentives to undertake actions upstream may be blunted if the cost of post-incursion management is limited by the provision of substantial government funding. This is particularly likely if the damages of incursion are not borne by parties whose actions would normally limit the spread of weeds.

Distinction between institutional arrangements and instruments

It is important to draw a distinction between the actual arrangements governing cost recovery mechanisms and the instruments used. The latter refer primarily to the type of charges that are used as part of the arrangements. The instrument of choice is a levy on production. This is usually collected by peak or representative bodies, and channelled either as contributions to specific actions (for example, eradication) or as periodic contributions.

As mentioned before, the levy mechanism serves to pool funding, in the sense that producers end up contributing towards the costs of a range of activities. There is, however, some degree of differentiation across broad categories of bio-security activities because of the way institutional arrangements related to bio-security have developed over time. At present we have:

- A levy that is directed towards post incursion management, in the form of PHA and AHA levies that are intended to finance actions under the relevant response deeds. In many sectors these are set at zero as a matter of routine.

[35] see Jack Sinden, Randall Jones, Susie Hester, Doreen Odom, Cheryl Kalisch, Rosemary James and Oscar Cacho, (2004) "The economic impact of weeds", *CRC for Australian Weed management, Technical Series, No. 8*

- A levy that is directed in part towards other types of bio-security activities, in the shape of PHA or AHA subscription levies.
- A levy that is directed at research and development activities in the form of RDC levies.

There are obviously inter-linkages between these: subscription levies also finance post incursion response capability; some of the R&D levies flow through to other types of activities to the extent that RDC's contract institutions such as PHA or AHA as service providers. And in some cases RDCs and institutions such as PHA are joint venture partners.

The degree of control exerted by any particular producer over what activities are funded is difficult to establish. To the extent that consultative processes explicitly determine hypothecation in advance of the levy being collected, some direct control may be exerted. Where funding is collected and allocation decisions are made at a later point in time by a board, direct control will be weaker.

In principle, it is preferable from an efficiency point of view if there is a direct link between cost recovery predicated on current production and the mitigation of risks relating to current (as opposed to future) production. Moreover, the more granular the form of cost recovery, the greater the linkage between the amount paid and the actual activity and hence the precise price signal associated with the activity.

In practice, there are several reasons why levies are the more obvious candidate for cost recovery. First, there are administrative reasons that favour a levy – rather than develop a separate levy for each particular activity, it is simpler from the perspective of compliance costs to develop one levy. Secondly, there are economies of scope in the delivery of bio-security activities, meaning that a particular agency or service provider will incur a set of common costs to provide a range of activities. Thirdly, the absence of hypothecation allows flexibility in planning, which can allow needs to be met over time. For example, some industries set their contributions under the EPPRD levy at a rate greater than zero even in the absence of an incursion, but allocate the funds for other purposes. Moreover, flexibility allows agencies to smooth volatility in revenue in the presence of volatile producer sales, by postponing or bringing forward projects. Smoothing could also be achieved through a flat charge but this is liable to lead a to a fluctuating degree of burden borne by the producer if producer revenue is volatile.

3.4.3 Differences in the extent of cost recovery are not always explained by issues of market failure and appropriability

The extent to which private parties bear costs associated with bio-security responses is influenced by the degree to which private assets and returns are affected by pests and diseases, but this does not appear to be a systematically determinative factor. Indeed, one observation that emanates from the policy documents and discussions with bio-security practitioners is that there are a number of instances where disease and pest impact have an important impact on

private returns, yet private funding has not been forthcoming. One example the sheep industry, where the degree of cost recovery is much lower than in relation to beef, despite the fact that both are exposed to potential losses in export markets as a consequence of bio-security hazards. Another example concerns branch broomrape, in regard to which cost recovery has been minimal notwithstanding the impact of that particular hazard on private returns to the oilseed industry.

One possible explanation is that industry actors are unaware of the benefits of undertaking systematic bio-security responses, and therefore have not been forthcoming with the relevant investments. The experience with Virulent Newcastle Disease (described above) illustrates how the awareness of the benefits of bio-security actions develops over time. However, that explanation is difficult to sustain. Given that the hazards affect the profitability of industry activities, it is hard to conceive that private parties would be unaware of the benefits of investing in bio-security. Moreover, the development of bio-security responses in other industries in principle provides a demonstration effect of the benefits of investing in bio-security. Finally, private producers appear willing to fund more general research and development activities, even though the benefits of these are uncertain and tend to materialise over the long run.

An alternative explanation is that some industries are aware that government is unable to pre-commit against funding bio-security responses in the event of a hazard. By this we refer specifically to cases where the costs of an incursion are primarily of a private nature, the government is unable to limit compensation. This may be due to a number of reasons, including the concentrated and politically visible nature of the costs.

If this is the case, then private parties may have fewer incentives to incur costs in relation to preventative actions, since they know that, ex-post, government will bear them anyway. In other words, post incursion management appears cheaper than it would otherwise be. In this context, cost recovery in relation to upstream activities (such as preparedness and prevention) may be impeded by government or institutional failure in relation to downstream activities. These sorts of government or institutional failures are not infrequent in public policy. An analogy might be drawn with flood control. The overall impact costs of flood damage can be greatly reduced if private parties incur private costs (such as locating in more expensive but non-flood prone zones, appropriately fitting buildings, and so forth) in relation to preparedness or prevention. However, these incentives can be blunted by the inability of the government to commit against ex-post compensation in the event of flood damage.

3.4.4 Implications for the further development of cost sharing arrangements

Extension of cost recovery principles

As noted before, cost sharing arrangements are more clearly articulated and implemented in relation to emergency responses to exotic pests and diseases (bearing in mind that several categories of pests and diseases, as well as sectors

are omitted from existing arrangements). One question that arises concerns the extent to which current arrangements, or at least the principles captured by them, can be extended to close existing gaps. For example, one approach would consist in augmenting the coverage of exotic pests and diseases by adding industries and sectors currently not included to the EPPRD, EADRA and IGA. In relation to pre-incursion management actions, an option would be to work through existing coordinating bodies – such as PHA, AHA, or DAFF – to place surveillance and prevention actions on a firmer footing. There is also scope to consider mechanisms for inter-state transfers in order to ensure that appropriate levels of bio-security efforts are undertaken in a given jurisdiction when there are spill-overs from these efforts into other jurisdictions.[36]

While these recommendations represent a sensible starting point, it is also necessary to consider a further number of issues. First, having set out the recommended institutional architecture, it is also necessary to examine what sort of cost recovery instruments might be implied by these, and how these might affect the relative price of particular types of bio-security actions, and the incentives faced by various parties.

For example, the implementation of the results of research might require that private parties incur further costs. If so, this effort may require some form of remuneration if the benefits are not completely internalised. For example, the future direction of fruit fly strategy reflects a determination to recover a larger proportion of costs from industry, as well as to emphasise prevention, early detection and pest freedom. The main issue that needs to be addressed is the different pay-offs to parties that deal with the fruit fly threat. For example:

- Containment and detection are dependent on the actions of parties in urban areas, but the benefits are borne by parties in other areas.
- Some producers can access various treatment options, whereas such options may not be open to others for reasons of cost, product characteristics or market requirement.

What is in effect required is a cost recovery mechanism that involves some transfer mechanism between parties to compensate for the externalities in effort, or for the difference in actual benefits.

Developing credible pre-commitment

As pointed out, one of the difficulties impeding the development of cost recovery mechanisms is the inability of the government to pre-commit against, ex-post, bearing the bulk of response costs. This leads to social welfare costs because:

- It likely leads to a public subsidy to private returns.
- It lowers the relative price of post incursion management, thus deterring private parties from taking on preventative actions which might be more socially beneficial.

[36] Both these options have been considered in DPI (2006), *op.cit.*.

The key challenge is to send a credible signal of the government's pre-commitment. One alternative would be to make ex-post government funding conditional on private parties having undertaken a sufficient level of effort in regards to preventative measures. But this is contingent on monitoring the actions of private agents in a context of informational scarcity, which, if at all possible, would incur high costs. An alternative may be to ensure that discretion in making decisions relating to ex-post government funding is tightly circumscribed.

4 Recommendations for cost recovery mechanisms

The development of cost recovery mechanisms for specific industries or sectors must necessarily be informed by a detailed analysis of the sectors or industries in question. This is beyond the scope of this paper. What we propose to do in this section is to set out recommendations for cost recovery which address the main issues raised in section 3.4, as well as the main desirable criteria for cost recovery mechanisms that were discussed in section 2.2. Some types of recommendations (such as the inclusion of additional sectors in existing response deeds, inter-state coordination) which have been discussed earlier and which are largely matters for administrative decisions, are not considered at length here.

4.1 RECOMMENDATIONS RELATING TO INSTITUTIONAL ARRANGEMENTS

4.1.1 Coherence across the range of arrangements

Pattern of cost recovery and consistency with policy objectives

As already discussed, cost–recovery operates through a patchwork of arrangements that address the range of activities in the bio-security continuum, albeit to varying degrees depending on the sector or pest/disease involved. This is not in and of itself a bad thing – it may reflect the manner in which initiatives developed over time to address issues of concern to both producers and society. Indeed, there may be gains from institutional specialisation that could outweigh the costs of trying to achieve more centralisation.

What is necessary, however, is to ensure that the actual incentives that emanate from the structure of cost recovery across these different arrangements coheres with an understanding of what is socially efficient. As already emphasised, an important issue lies in how the arrangements for cost recovery along various aspects of the bio-security continuum interact with each other. In particular, if post incursion management is too cheap relative to upstream measures, the latter will tend to be neglected. Because a significant amount of cost recovery for preparedness and prevention actions will be driven through RDCs, it is important to ensure that the cost recovery mechanisms for post-incursion actions take into account the co-financing rules in place for RDCs. If public funds bear the brunt of post incursion management costs, this could represent an inefficient allocation of resources where there are greater benefits from directing funds to more upstream measures. For example, if post incursion actions are financed predominantly from public sources, then given the 50:50 split for RDC funding, the post-incursion actions may appear too cheap. This is all the more likely to be an issue if what is called for is greater investment by the private sector in prevention and preparedness.

The steps need to be accompanied by greater measures to develop credible pre-commitment by government against ex-post funding, particularly when benefits

of this expenditure accrue predominantly to industry. For example, the schedules for public funding for post-incursion management could take into account the degree of investment in more "upstream" measures such as preparedness and prevention. This approach would need to take into account the possibility of perverse incentives– the possibility that industry might invest in low quality research simply to "make up the numbers" to meet government requirements.

4.1.2 Drawing on existing models

As pointed out previously, institutions such as the PHA, AHA and RDCs carry out bio-security related activities, and also incorporate explicit cost sharing principles. The extent to which RDCS are involved in bio-security research and development varies, but the importance of bio-security as a research priority is set most by the commonwealth and industry, as well as emerging patterns of collaboration with PHA and AHA. Moreover, the development of initiatives such as Industry Biosecurity Plans underscores the extent to which entities such as the PHA, which have primarily focused on response issues, are increasing involved in more upstream activities. Finally research and development activities underpins the efficacy of other types of bio-security activities

In terms of improving the efficiency of these arrangements, it is also important to ensure that activities that do come under the 50:50 rule for RDCs are in reality ones which split their benefits relatively evenly between private and public returns. In doing this, one must bear in mind that increasing the incidence of cost-recovery will make research and development more "expensive". This does not pose a problem, provided it is done in tandem with measures to ensure that private agents bear the costs of post-incursion responses as well.

Secondly, while the institutions discussed here deal with certain fundamental aspects of "up-stream" bio-security activities (research and development, and other activities that depend on this) there are also some limitations that flow from their remit. In particular, they are limited to the extent to which they can work on state level and other regional issues. For example, they may not be able to work on research and development projects that are specific to certain states or regions within states, and which thus do not get taken up in the process of setting priorities at a national level. Perhaps more importantly, they are not able to address issues of surveillance and monitoring efforts which are almost by nature of a more localised nature.

This raises the question as to whether there are mechanisms through which some of the benefits of the approaches pursued by institutions such as the RDCS and PHA and AHA can be derived from adapting some of the underlying principles of their model to more localised activities.

4.1.3 Alternative models

Model 1: A state based model

This approach draws on instruments that are available within Victoria, principally the Industry Development Orders. This approach would allow industry groups to raise funds and, through the IDC's establish bio-security priorities attuned to

local needs. These needs could cover the full range of bio-security activities, including contributions to post incursion management. Options for collecting funds could be modelled on the mechanisms used for PHA or AHA, with some degree of ear-marking for post incursion responses versus other types of activity. Thus for example, it could be possible to have:

- A levy set to fund emergency responses; and
- A levy for ongoing readiness and other biosecurity initiatives, notably upstream projects.

(for a further elaboration of the specific revenue collection mechanisms see section 4.2 below.)

In parallel with this process, the state could develop an approach to matching the contributions made by private parties. Any co-financing would need to take into account the possible split between private and public benefits. In this respect, the EPPRD and EADRA formulae might offer a model for post-incursion responses. In regard to other types of activities, it would be opportune for the state to consider closely the basis on which cost sharing is undertaken. In particular, a fixed 1 for 1 rule may not be appropriate to cases where returns accrue primarily to private parties. Given that the classifications for post incursion responses take into account the split between public and private damages for particular pests, it should be possible to develop a similar classification for other types of activities.

An important issue bear in mind is that structures such as IDCs, though they are provided for by legislation, are not mandated by it. The impetus must come from industry. The question then arises as to what particular incentive producers have to impose costs on themselves. This in turn underscores the importance of governments credibly committing to limiting funding where benefits are privately appropriable. This could be achieved by:

- Announcing that programmes are under revision and that decisions on continued funding or appropriation are conditional on steps taken by industry; and
- Introducing conditionality, linking the delivery of post incursion funding to appropriate investments in the more upstream biosecurity activities.

Evaluation against criteria

Allocative efficiency

The use of IDO's could be used to address a gap in current arrangements, namely state-level actions relating to preparedness and prevention. The IDCs could act as vehicles through which bio-security actions that do not fall under the purview of arrangements such as RDCs and IBPs, could be commissioned.

The proposals should strengthen the allocative efficiency impacts of the arrangements by covering existing gaps, and increasing the link between private sector funding of bio-security activities and returns gained from these activities. This in turn could create the correct signals for private parties to invest more in activities such as preparedness, prevention and surveillance.

One possible drawback lies the fact that the elements of conditionality, discussed above in the context of credibly limiting the extent of government funding, can worsen the incentives for good project selection. This can come about if industry decisions regarding biosecurity investment are made with an eye to "making up the numbers" in order to ensure that conditionality requirements relating to private sector expenditure commitments are met so that government funding for post incursion responses can be secured.

Administrative efficiency

These proposals also carry a number of potential administrative costs. These stem from a number of factors:

- The proposals envision the creation of new levies on industry, which would be in addition to the levies that are imposed on these industries in the context of existing arrangements (particularly in relation to the bureaucratic apparatus to go along with IDOs. Besides the additional cost impost involved, this creates additional costs relating to compliance and administration for industry. This runs counter to current trends in fiscal administration which seek to rationalise and streamline revenue collection mechanisms.[37]
- Closer monitoring by the government of the types of investment in bio-security.
- Costs associated with avoiding perverse incentives for low quality activities that may emanate from a greater linkage of post-incursion funding to pre-incursion bio-security R&D.

The materiality of these effects depend on the industry in question, and the diseases and pests involved.

Institutional issues

One question that might arise is whether the contemplated approach in effect amounts to an excise by stealth. Strictly speaking, because the levy system would be introduced on the initiative of industry, the arrangements contemplated do not amount to a revenue raising exercise by the State. On the other hand, industry might be argued that it is compelled into that action by the State. Though the legal basis for challenge by industry is far from clear, and outside the scope of this paper, the possibility that such pressure could be brought to bear by industry could increase the costs – politically if not economically – of this proposed arrangement.

Equity issues

The impact of the proposals could be proportionately quite large on smaller producers and sectors (this is also an efficiency issue insofar as the smaller the sectors or production value, the greater the costs of administering the levy system in relation to its putative benefits). This could be met by implementing the proposals with exclusions based on de minimis principles (e.g. excluding producers or sectors under a certain size or value of production).

[37] Commonwealth Treasury (2008), Architecture of Australia's Tax and Transfer System.

Other distributional issues

The implementation of this proposal is likely to depend on the ability to secure inter-state cooperation. This is because introducing a new impost on Victorian production could have an effect on patterns of competition and production in sectors which are exposed to interstate competition. This is particularly true when sectors and activities straddle jurisdictional borders, as is the case with certain fruit growing activities on the border with NSW.

The cost impact of implementing the proposals in Victoria in the absence of action in other states may not be detrimental from an overall efficiency point of view – Victoria might be better off as a whole from more efficient arrangements for biosecurity regardless of what other states do- but it is liable to cause concentrated costs which may make implementation politically difficult.

There may also be an efficiency angle involved as well, if there are spillovers across jurisdictions in bio-security efforts. In such circumstances, increased private investment in certain types of biosecurity might confer a benefit on third parties across the border, though this benefit is not compensated. Moreover, if there is a relocation of activity across the border in response to increased cost pressure in Victoria, we could have a situation in which biosecurity risks have increased. This is because there could be more intensive activity in an area with lower biosecurity requirements, and these activities create risks for producers in Victoria (which in turn demands a greater level of investment in bio-security in Victoria than would be otherwise desirable).

Model 2: Adapting the national model

The previous model sought to adapt and extend current approaches by establishing arrangements within Victoria that mirrored arrangements at the national level. The aim as to address gaps at the state level, particularly in relation to upstream bio-security efforts. An alternative would be to try and address these gaps by amending existing arrangements.

For example, rather than establishing a new set of levies at the state level, an alternative would be to try and ensure that some proportion of funds appropriated was redirected towards meeting state level bio-security needs. In keeping with the arguments set out in the paper so far, such a system would need to be consistent with the following principles:

- Increasing the extent to which governments can credibly commit against funding privately appropriable benefits of biosecurity initiatives, particularly in relation to post-incursion funding;
- Ensuring that key areas such as preparedness, prevention, surveillance and at the state level are addressed; and
- Additionality, by which we refer to the fact that the contemplated augmented arrangements will serve to fill in existing gaps, rather than detract from the ability of existing arrangements to meet existing priorities.

The last point is worth emphasising. This approach cannot be predicated on simply redirecting existing funds contributed by Victorian producers under

current arrangements, since these contributions play a vital role in sustaining biosecurity initiatives at a national level that confer benefits to Victoria.

In principle, this would require extra contributions by Victorian producers - for example, amending the levy so that additional funds could be collected specifically for Victorian purposes. There is some debate as to whether such arrangements are constitutional, since they amount to a system of differential levies across states. This is an issue that Frontier is not best placed to investigate at great length.

To the extent that such an approach is unfeasible from a constitutional point of view, then the solution would be to revert to a uniform system of levies across all states and territories. This would still need to meet the "additionality" requirement that funds that are allocated for state- or territory- specific purposes are not diverted from existing national priorities. In other words, it is likely that there would have to be an increase in funds collected across all states and territories. (The need to increase collections could be circumvented if it were shown that the existing portfolio of national initiatives was not fully efficient and that some saving could be gained from terminating some types of projects – with the savings then directed to state or territory specific purposes).

Evaluation against criteria

Allocative efficiency

As with the previous model, there is scope for efficiency gains if there is a stronger linkage between private funding and private appropriability. This would require some adaptation to existing arrangements: as we argued before, the linkage between private funding and private appropriability could be strengthened at a number of levels. Moreover, if the idea is to repatriate funds to the state level, attention needs to be paid to how these funds reflect contributions. There may be a loss of efficiency if funds from other states are used to finance initiatives that confer a state-level benefit to Victoria. On the other hand, if there are externalities from biosecurity initiatives in Victoria that benefit others states, there may be efficiency gains from this pooling across states (to the extent that initiatives which produce these cross-jurisdictional benefits are not already captured by existing arrangements, which could be the case where spillovers are regional rather than national).

An inter-jurisdictional agreement would be needed that specified how funds would be targeted to address state specific bio-security issues, and how spillover issues would be targeted. One challenge will be to ascertain exactly how much additional funding is required. If some states have a number of specific hazards, then they may require an increase in funding which, if implemented across the board, may present other states and territories with increased funding levels which they are not prepared to meet (unless the state-specific hazards all have significant spillover effects).

In practice, meeting these requirements will involve substantial effort in monitoring and accounting for the relationship between funds collected, their disbursement to state level activities and to the nature of benefits (i.e. whether

they are private or public, whether there are any spillovers) that flow from these activities.

Administrative efficiency

This model avoids certain administrative difficulties because it does not introduce any new levies or institutions for their collection and use; rather it draws on existing mechanisms. The other sources of administrative costs that were identified in the previous model apply here. These are principally costs of monitoring the allocation of funds and project selection, which in this case would extend to ensuring that additional funds collected from producers specifically to meet the state level gaps are used for that purpose.

This point underscores one of the main differences between the two models: in the previous model, the separation between funds destined for specifically Victorian initiatives rather than the broader national framework took place at the point of levy imposition. Under the second model, we do not have a separation between Victorian and producers on other jurisdictions in the *collection* of funding. The differentiation takes place at a later stage, when funds are allocated to national and state-specific priorities, the separation now takes places after the levy has been collected.

Institutional issues

As already observed, increasing the magnitude of funds collected through levies in order to finance state specific hazards is complicated by the fact that these hazards are not uniform across all jurisdictions. But the requirement for uniformity in levy collection means that jurisdictions will either under-contribute or over-contribute to (and potentially cross-subsidize) funding initiatives that are specific to state or territories. One solution would be to develop a mechanism by which excess levies are returned to contributors in the relevant jurisdictions, or developing a reserve fund.

Equity issues

The principle of additionality alluded to above means that cost burden on producers stemming from the impost will be the same as under the previous model (i.e. this model will require that more money will be collected through the same levy mechanism). Thus the equity impact will be the same as under the previous model and could be addressed in the same way.

Distributional impacts

Because this model persists with uniformity across states and jurisdictions in terms of levies collected from producers, it does not have the same impact as the first model which could have increased costs to Victorian producers relative to others. However, as noted, it has distributional impacts of another kind, namely those associated with having uniform rates together with variations in the intensity and nature of hazards across states. As observed, there are some institutional mechanisms that may help to manage these distributional effects.

The national framework may provide some basis for addressing externalities across jurisdictions – for example, by compensating producers in Victoria for their bio-security efforts that have benefits on other states (and vice versa). It is

questionable, though, whether national arrangements in their existing form are able to handle spillover effects that are not national but confined to specific sub-regions e.g. along the Victoria/NSW border.

4.1.4 Summing up: relative merits of each model

Advantages of the adapted national approach

Table 8 sums up the points made in regard to both models, against the criteria we have set out.

It suggests that the main advantages of the adapted national approach lie in:

- Administrative efficiency. Though both approaches require an investment in an administrative capacity, the adapted national approach is less onerous in that it does not require parallel sets of institutions and levies at the state level. The separation of funds between those directed toward national purposes and those directed towards state level would take place after collection, which a priori would be less difficult.
- Distributional issues – avoids cost distortions created by differential levies, though there are separate costs stemming from the juxtaposition of uniform rates with differences across states and jurisdictions in the nature and intensity of hazards. A framework through which issues related to inter-jurisdictional collaboration could be handled.

Criterion	State Model	Adapted National Model
Allocative Efficiency	Gains if private contributions and private benefits aligned	Gains if private contributions and private benefits aligned. Need to ensure additionality – this is complicated in a world with uniform levies but differentiated hazard levels and intensity across jurisdictions
Administrative efficiency	New levies and arrangements can be onerous	Separation of funds between Victorian and other recipients happens after collection
Institutional Issues	An excise by stealth?	Need to manage under-or –over contributions by jurisdictions (a consequence of uniformity in collections but differentiation in nature and intensity of hazards)
Equity Issues	Particular burden on smaller sectors/producers	Particular burden on smaller sectors/producers
Distributional Impacts	Need for inter-jurisdictional cooperation to ensure that patterns of production not distorted	Avoidable since changes not specific to Victoria,

Table 8 Summary of model properties against criteria

Challenges that need to be addressed regardless of the approach

It is worth emphasising the issues that need to be handled regardless of the approach adopted.

Credible commitment

In both cases, allocative efficiency depends crucially on the ability of government to credibly committing to limiting funding, particularly for post incursion responses, in line with magnitude of private benefits that are likely to accrue to producers.

Inter-jurisdictional cooperation

- Under the first model, the need to manage the impact on patterns of competition and production if there is a significant cost impost on producers in Victoria. This may be primarily a political problem, rather than an economic one. However, there may be an efficiency angle involved too if activities relocate (for example in contiguous areas separated by a state border) from high biosecurity cost areas to lower ones and this increases the overall level or risks because of cross border spill-overs.
- Under the second model, the need to manage the juxtaposition of uniform rates across jurisdictions, and variations in the intensity and nature of threats faced.
- Under both approaches, there is a need to address cross-border externalities in bio-security activities. These will arise when third parties benefit from bio-security activities undertaken in a particular state (for example, Victoria benefiting from efforts in Queensland to address fruit-fly issues).

Some localised issues will need specific attention

These are primarily issues that occur with the state or in specific areas across state boundaries. Examples include:

- Weed management, which tends to be a localised issue insofar as weed characteristics are local – even though their impact can be widespread.
- Fruit-fly management. For example, detection and control efforts undertaken in metropolitan regions within Victoria have an impact on benefits of growers elsewhere in Victoria. As alluded to before, there are also likely to be spillovers between efforts undertaken either side of the NSW border.

Some of these localised issues could potentially be handled through local government institutions, such as CMA's or local government authorities. As noted before, CMA's have the authority to recommend funding mechanisms to support their involvement in biosecurity (see section 4.2.2 below).

4.2 RECOMMENDATIONS RELATING TO SPECIFIC INSTRUMENTS

4.2.1 Primacy of industry levies

As already discussed in section 3.4.2, there are a number of reasons as to why levies are the most plausible instrument for cost recovery, notwithstanding their relatively blunt nature. The key issues relate to the form and means of their implementation.

Form of levy

Levies can be implemented in respect of production or inputs, and levies on production can usually be in the form of ad valorem levies or specific charges. To some extent, decisions on these matters will depend on sector or industry specific traits.

One issue to take into account is that bio-security actions, particularly in at the more upstream ends of preparedness and prevention, are likely to depend on on-going and predictable funding over a period of years. Under an ad valorem approach, there will be greater stability of revenue in sectors where output and prices are negatively correlated. In sectors that are price takers, this relationship will tend not to hold so there may be greater fluctuations in revenue. However, it could be possible for the body responsible for collecting and disbursing these revenues to smooth out the volatility through the administration of a reserve function. There may also be gains in terms of equity and ability to accommodate cost recovery from an ad valorem approach relative to specific duties, given that the latter could impose a particularly harsh burden on producers if there is a significant downturn in prices.

An issue that is sometimes raised is the extent to which levies can be implemented at a state level on production, given that these levies may act as de facto excises. In principle this should not be a problem as long as these funds are administered by industry. Arrangements such as Industry Development Committees may represent a grey area, given the role played by the state in establishing them, and having a nominated representative. However, if the spending decisions are governed by industry and directed at industry benefits, the possibility of legal challenge is not likely to be material.

Hypothecation

Another issue relates to the extent of hypothecation that is desirable. In general, hypothecation can be costly given that it may lead to forms of bio-security actions that less cost effective. Allowing boards or industry representatives to make decisions relating to the type of action or projects to be undertaken allows for greater flexibility and responsiveness to new information.

4.2.2 Dealing with externalities

Section 3.4.4 highlighted the need for mechanisms that would cause individuals to take into account the external benefits (or costs) of particular types of action.

In principle, these externalities could be addressed by a combination of various sticks (charges, penalties) or carrots (credits or other payments). The latter appear to fit more naturally in the context of the discussion we have had so far, which places more emphasis on the notion of beneficiaries paying. Examples we have already cited include the need to compensate parties for implementing the R&D findings when there are benefits to other parties (including the general public) from doing so; and the specific example of fruit-fly in Victoria, where there are significant intra-state spillovers to effort.

The main requirement is to design a transfer mechanism that would allow the necessary compensatory payments to be made. One option would be to develop cost sharing/redistribution arrangements between collectives representing different types of producers. In the context of fruit fly control within Victoria this might involve transfers from producers in regional Victoria to parties in Metropolitan Victoria that have the ability to undertake actions that substantially minimizes the harm caused to fruit producers by fruit fly. Local government authorities could play an important role in administering these funds and the transfers out of them.

From the standpoints of both efficiency and equity such a proposal would have advantages. The main challenge in doing so lies in monitoring effort. Even if the specific actions that are expected from the payee can be identified, it may be difficult to manage effort levels, and even more so to link these to some form of payment. These difficulties depend on the nature of the activities and the number of parties involved. They are likely to be particularly significant in relation to pests such as weeds, where the number of parties involved is high, and where necessary actions happen on a continuous on a continuous basis and are difficult to verify. The extent to which this challenge can be overcome at reasonable cost will play a significant role in determining the extent to which cost recovery is feasible in relation to this class of bio-security actions

4.3 CONCLUSIONS

This paper has drawn on the idea of bio-security continuum to examine how cost recovery principles and their institutional underpinnings could be developed. A key issue we have focused on is that of allocative efficiency – the need to ensure that for different bio-security threats, the appropriate combination of response activities will be selected. A key issue here is the extent to which the incentives faced by private parties are aligned with the public good. Cost recovery mechanisms have an important role to play in this respect because they can signal the price associated with a particular biosecurity response. From an efficiency point of view, it is important that this price be correct i.e. that actions which are less beneficial from a social perspective do not appear "cheaper" from a private view point than more beneficial ones.

We have seen that, broadly speaking, the patchwork of different national arrangements that has emerged embody cost recovery principles that cover the most important categories of bio-security activities, albeit in a fairly rough way and with a number of gaps. These gaps include, in particular, state level responses that relate to preparedness, prevention and surveillance, and that also deal with

managing incentive issues that impact on private behaviour. Chief amongst these are externalities and spill-overs that occur at a localised level.

We considered two main approaches to tackling these gaps. The first was a state based approach that was predicated on the use of industry development orders. The second was a national approach that adapted existing arrangements, the main adaptation being the repatriation a proportion of funds collected through existing arrangements. Both approaches present specific challenges. The main advantage of the second approach is that it is likely to be less cumbersome from an administrative point of view, and seems to offer a more promising framework for ensuring inter-jurisdictional cooperation.

It is important to underscore the importance of such cooperation for the second approach to work. Agreement would be needed across all jurisdictions if collections from industries were to increase in order to fund jurisdiction-specific issues. This in turn depends on an acceptance across all jurisdictions that:

- That there are gaps in current biosecurity arrangements, particular as far as jurisdiction specific hazards are concerned.
- There is a need for increased industry contributions to meet these

As already emphasised, there will also be a need to establish institutional mechanisms to manage the combination of uniformity in levy rates, and differentiation in the nature and intensity of hazards.

To the extent that it is difficult for the Victorian state government to ensure a congruence in approach across states and across the broad range of biosecurity activities, an alternative is to initiate cost recovery and cooperation on a piecemeal basis on selected pests and threats. Initiatives to tackle fruit-fly might provide one such example.

Both approaches could be complemented by state level actions, including the use of local government institutions, to deal with externality and spill-over issues that occur at a localised level.

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