TREASURY WORKING PAPER 01/23

Regulatory Issues in Biosecurity

Chris Pinfield

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The management of biosecurity risks (risks to the production sector, to indigenous biodiversity, and to public health) involves the exercise of extensive regulatory powers both at the border and within New Zealand. This paper reviews the Biosecurity Act 1993, paying particular attention to its requirements for risk analysis and decision-making. These are generally of a high standard. Requirements at the border are significantly influenced by New Zealand's trading obligations and opportunities. Requirements for domestic pest management strategies are elaborate but can be sidestepped. Cost recovery practices for biosecurity differ widely and have been controversial.

JEL classification: H40 Publicly Provided Goods, General; K32 Environment, Health and Safety Legislation; Q17 Agriculture in International Trade.

Keywords: biosecurity, pests, regulation, risk management, cost recovery.

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1. INTRODUCTION

Biosecurity concerns protection from the risks posed by organisms to the economy, to the environment and to people's health, through exclusion, eradication and control. In November 2000 the Government decided to develop a comprehensive biosecurity strategy for New Zealand.

Part of the context for the strategy is that growing trade and passenger traffic has increased the risks to:

- the production sector;
- the indigenous plant and animal environment that is unique in many respects and is also fragile;
- public health through the establishment of disease vectors such as mosquitoes.

New Zealand is not alone in seeking to manage these risks, which constitute a global problem, often exacerbated by institutional, management and research deficiencies (Green, 1999).

The purpose of this paper is to review, at a general level, the regulatory issues involved. The paper also addresses the related issues of risk analysis and cost recovery. These issues are addressed under two headings: biosecurity at the border and beyond, and biosecurity within New Zealand. The rationale for treating these two areas separately is that their regulatory frameworks, and associated risk analysis and cost recovery issues, differ considerably. The two are of course related: biosecurity measures within New Zealand only arise where unwanted organisms have crossed the border. Biosecurity measures are applied at both stages on the grounds that:

- biosecurity measures at the border or pre-border stages are normally more cost-effective;
- there can be additional gains to eradicating or controlling pests or unwanted organisms that have got past the border and have become (or are becoming) established[1].

Biosecurity regulation both at the border and beyond, and within New Zealand, is mostly contained in the Biosecurity Act 1993, which consolidated a number of earlier statutes. This paper focusses on that Act. The paper does not address the Hazardous Substances and New Organisms Act 1996 (HASNO), which regulates the deliberate (as opposed to accidental) introduction of new organisms.

Biosecurity programmes have particular features that are of interest from a regulatory perspective. First, they contribute to public (or in some cases club) goods, by maintaining or reducing the current level of biosecurity risk to primary production, and to biodiversity and public health. Second, some biosecurity breacjhes are practically irreversible once they occur. Third, the need for them arises from the actions –

[1] Note though that the 'law of diminishing returns' can apply markedly in these circumstances. Even if a high percentage of pests can be eradicated at any one time, if reproductive ability and food supply are not affected then the population will recover quickly – so biosecurity measures will bring temporary benefits only.

deliberate or inadvertent - of particular groups such as importers and incoming passengers. Incursions cannot usually be traced back to individuals, though, which points to a regulatory- rather than a tort- or liability-based approach[2].

Bertram (1999) has estimated the annual cost of defensive expenditures on biosecurity, and of production losses from major pests:

	$m
Defensive expenditures	
- central government	195
- regional councils	25
- production sector	220
Production losses	
- Argentine stem weevil	165
- rabbits	50
- possums	40
- other	145
Total quantified	840

NZIER (2000) surveys general economic issues in biosecurity. It concludes that:

- the same economic principles apply to biosecurity as to other accident protection;
- biosecurity programmes can be assessed against effectiveness, efficiency, and equity criteria;
- equating the marginal costs and benefits of additional biosecurity will likely show that some residual level of risk is too costly to eliminate;
- economics offers useful principles for allocating and recovering the costs of biosecurity programmes.

[2] A liability-based approach might also run foul of New Zealand's obligations under the SPS agreement. See Sinner and Gibbs (1998).

2. BIOSECURITY AT AND BEYOND THE BORDER

2.1. Benefits and costs

Identifying the benefits and costs of biosecurity restrictions on the entry of goods and people can be complicated by different views of the 'counterfactual': benefits and costs compared to what? No biosecurity restrictions at all, or no biosecurity risks at all? In what follows we adopt an incremental approach. This involves starting off from the current state of the world – including its current risks and restrictions – and identifying the benefits and costs of incremental changes. Not all actions may constitute restrictions. For example the issue of an import health standard, that sets conditions under which a particular risk good[3] may be imported, will not constitute a biosecurity restriction if it replaces a complete ban on imports of that good.

That said, the potential benefits of additional biosecurity restrictions imposed at the border (or beyond) take the form of a reduction in biosecurity risks to production, to biodiversity and to public health.

On the cost side, additional biosecurity restrictions at the border or beyond constitute a restraint on trade. Biosecurity measures can apply not just to plant and animal materials and products, but also to any other goods that have been packed in or have been contaminated by them. Economic costs arise in that goods are subject to inspection, and possibly to treatment, destruction, or a ban on entry. Some goods will not be shipped in the first place. These will all be reflected in reduced opportunities to import, or more expensive imports of, consumption and investment goods and inputs to domestic production.

Worldwide, biosecurity restrictions on goods imports have often constituted a form of economic protection for domestic agriculture and other primary industries. Overall for developed countries such as New Zealand, that combine generally low tariffs with a strong awareness of biosecurity issues, they probably now constitute the most significant restraint on trade. A country's trading partners will accordingly monitor its biosecurity policies and practices with a sceptical eye. Countries' international obligations are codified in the WTO Agreement on the Application of Sanitary and Phytosanitary Measures (the SPS Agreement) that took effect in 1994. This is making it harder for countries to use biosecurity restrictions for anything other than biosecurity objectives. As a net exporter of food products, New Zealand gains from an effective SPS. Conversely, should New Zealand's biosecurity measures fail to satisfy its WTO obligations then the export sector is vulnerable to retaliation.

Biosecurity restrictions applied to incoming passengers involve compliance and processing costs. In the case of visitors to NZ these could be negative for tourism - though might also have positive effects, by signalling that we are serious about protecting biodiversity that they have come to visit.

[3] These terms have statutory definitions, see below.

Benefits and Costs of Additional Biosecurity Restrictions

Benefits	*Costs*
Reduction in risks to	Lower supply, more expensive or less efficient imports for
- production sector	- consumption
- indigenous flora, fauna, marine life	- investment
- public health	- production
	Risk of trading-partner retaliation
	Compliance and processing costs for passengers

For example, suppose that New Zealand's biosecurity restrictions were intensified by imposing a ban on all imports of fruit, both as goods imports and those brought in by passengers, accompanied by more rigorous inspection procedures. Then:

- New Zealand would face fewer incursions of unwanted organisms. There would be less need for new containment and control programmes within New Zealand, and/or less potential damage to the production sector, to indigenous flora and fauna and marine life, and to human health.

- Consumers would only be able to buy fruit that could be grown in New Zealand, and then only when in season. Passengers would face additional delays and searches. Fruit exporting countries might initiate dispute proceedings under the WTO and, if successful, impose retaliatory tariffs against New Zealand exports.

Both the benefits and costs of biosecurity restrictions depend importantly on the extent of compliance with them. A restriction that is circumvented (by for example a false declaration) will not realise benefits but will still involve costs.

Comment

Biosecurity measures at the border impose costs on the New Zealand economy, and measures that are inconsistent with our SPS obligations risk further costs. So getting the right balance between benefits and costs is important. The risk management approach seeks to balance these costs against the risk of the establishment of unwanted organisms, by applying restrictions (and inspection and clearance resources) on a targeted basis. This requires, for a start, a good scientific understanding of unwanted organisms, of their chances of becoming established and of the damage they could do if established. It would be appropriate to go to great lengths to prevent the entry of an organism that could easily become established and would likely cause significant damage.

From a public choice perspective, an issue is whether the line-up of the different interest groups involved is likely to push decision-making on biosecurity in the direction of inappropriately high, or inappropriately low, levels of biosecurity. As it happens, a variety of interest groups have a stake in biosecurity at the border, and are well organised and able to scrutinise regulatory behaviour. The balance of lobbying pressure will likely vary from issue to issue though. For example, the tourism industry can be expected to oppose onerous inspection procedures applied to incoming passengers, and similarly our major trading partners can be expected to do so in respect of incoming goods. Environmental groups will likely support strict biosecurity measures to protect indigenous biodiversity. Primary producers are in an ambivalent

position: they will favour strict controls to protect primary production - but not to the point of triggering retaliation in export markets.

2.2. Regulation

The statutory basis for biosecurity measures applied at the border is Part III (Importation of Risk Goods) of the Biosecurity Act 1993. The key concepts in Part III are those of *risk goods, import health standards,* and *biosecurity clearance*.

Risk goods are (s2):

> any organism, organic material, or other thing, or substance, that (by reason of its nature, origin or other relevant factors) it is reasonable to suspect constitutes, harbours, or contains an organism that may –
> (a) cause unwanted harm to natural and physical resources or human health in New Zealand; or
> (b) interfere with the diagnosis, management or treatment, in New Zealand, of pests or unwanted organisms[4].

Whether or not a particular shipment constitutes risk goods is basically a matter of judgement by inspectors appointed under the Act, on the basis of the information available to them. The definition is a wide and risk-averse one: an inspector is only required to have reasonable grounds to suspect that a shipment may cause unwanted harm.

Import health standards are at the heart of biosecurity restrictions at and beyond the border. They can apply to risk goods of a certain kind or description imported from one or more countries or locations. A standard specifies (s22):

> the requirements to be met for the effective management of risks associated with the importation of risk goods before those goods may be imported .. or given a biosecurity clearance.

Both current and proposed import health standards are available on the MAF web site, and their preparation must include consultation with affected interest groups and departments. There is no obligation to develop an import health standard if imports of the risk good (even under restrictions) would pose unacceptable risks. An import health standard can be revoked, which has the effect of banning the entry of the goods.

Lastly, an inspector cannot give a *biosecurity clearance* (for entry into New Zealand) unless (s27) satisfied that the goods are either not risk goods, or alternatively satisfied:

> (a) that the goods comply with the requirements specified in an import health standard .. and
> ..
> (d) that the goods display no signs of harbouring organisms that may be unwanted organisms.

[4] These terms have statutory definitions in domestic biosecurity legislation. See below.

In effect, any goods that are held to be risk goods will not be allowed entry unless they are covered by, and comply with, an import health standard, *and* show no obvious signs of unwanted organisms.

These provisions apply to the personal effects and baggage of arriving travellers as well as to all other goods imports. They are accompanied by powers to direct the movement of craft, goods and travellers, by powers to obtain information, by powers of search and detention, and by powers to treat, destroy or refuse admittance to risk goods.

Comment

Regulatory powers for biosecurity at the border are very extensive, but it is not apparent that they could or should be scaled back. On the assumption that they will need to be used in certain circumstances, the issue is more the quality of the analysis that precedes their application – see below.

It is interesting that the exercise of these regulatory powers does not normally involve any role for the Minister of Biosecurity. This is in contrast to domestic biosecurity regulation.

While the content of import health standards is on the public record, there seems to be less transparency over what other goods – in addition to those covered by health standards – have been assessed to be risk goods, and why. There could be a case for a public database of decisions on risk goods.

2.3. Risk analysis and the level of protection

This section describes the requirements that apply to risk analysis. Explicit requirements apply to the preparation of import health standards. Under the Act, the preparation of a standard must have regard to:

(a) the likelihood that goods of the kind or description to be specified in the import health standard may bring organisms into New Zealand;

(b) the nature and possible effect on people, the New Zealand environment, and the New Zealand economy of any organisms that goods of the kind or description specified in the import health standard may bring into New Zealand;

(c) New Zealand's international obligations.

Two terms in this requirement are of particular significance. First, 'environment' is given a wide definition in the Act:

(a) ecosystems and their constituent parts, including people and their communities;

(b) all natural and physical resources;

(c) amenity values;

(d) the aesthetic, cultural, economic and social conditions that affect or are affected by (a) to (c).

Second, 'international obligations' are international agreements that are of treaty status, and include the WTO Agreement on the Application of Sanitary and Phytosanitary Measures (1994) (the SPS agreement); the Convention on Biological Diversity (1992); and the International Plant Convention (1952). The most directly applicable is the SPS agreement, in particular its Article 5. Biosecurity measures (including but not limited to import health standards) are to be

> based on an assessment .. of the risks to human, animal or health, taking into account risk assessment techniques developed by the relevant international organizations .. Members shall take into account available scientific evidence; relevant processes and production methods; relevant inspection, sampling and testing methods; prevalence of specific diseases or pests; existence of pest- or disease-free areas; relevant ecological and environmental conditions ..

In assessing the risks and determining the biosecurity measures to be applied for achieving the appropriate level of protection

> Members shall take into account as relevant economic factors: the potential damage in terms of loss of production or sales in the event of the entry, establishment or spread of a pest or disease; the costs of control or eradication in the territory of the importing Member; and the relative cost-effectiveness of alternative approaches to limiting risks."

The appropriate level of protection should

> take into account the objective of minimising negative trade effects ..
> avoid arbitrary or unjustifiable distinctions in the levels appropriate in different situations, if such distinctions result in discrimination or a disguised restriction on international trade.

The application of precaution is constrained by the requirement that

> in cases where relevant scientific evidence is insufficient, a Member may provisionally adopt sanitary or phytosanitary measures on the basis of available pertinent information .. In such circumstances, Members shall seek to obtain the additional information necessary for a more objective assessment of risk and review the sanitary or phytosanitary measure accordingly.

In these requirements the term 'appropriate level of protection against risks' is peculiar to the SPS agreement. The concept is, however, the familiar one of striking an appropriate balance between biosecurity risks and the resource costs and restrictions involved in mitigating them.

Comment

The requirements for risk analysis for import health standards, which are set out in legislation and in the SPS agreement, are comprehensive and rigorous. The Biosecurity Authority's policy statement on risk analysis (Ministry of Agriculture and Forestry, 2001) together with a casual (and non-technical) review of some of the

analyses and explanatory material on the Authority's web site, provide a degree of assurance that these requirements are being professionally implemented.

Neither the Act nor the SPS require biosecurity risk analysis to incorporate any explicit consideration of the trade related-costs of proposed restrictions. Indeed the SPS agreement (quoted above) does not include them in its list of 'relevant economic factors'. On the other hand "there appears to be nothing in the SPS agreement that prevents a wider consideration of costs and benefits as being the basis for distinctions between situations of comparable risk, when determining levels of protection" (Sinner and Gibbs, 1998, p51).

One route by which they can be brought into account would seem to be the SPS requirement that the 'appropriate' level of protection should take into account the objective of minimising negative trade effects. It has proven to be difficult, however, to establish benchmarks for this level. While it is feasible to achieve a consistent approach to closely related biosecurity measures, it is difficult to do so in other circumstances, or at an overall level. The issues here are being addressed in the context of the current development of a biosecurity strategy.

Barrat et al (2000) examine the adequacy of current procedures for integrating considerations of risk to indigenous flora and fauna into biosecurity risk decisions at the border. Their view is that practice in New Zealand and Australia is farther advanced than elsewhere but improvements could be made in risk identification, in information availability and in the use of expert advice.

Risk analysis and management methodology varies somewhat across biosecurity-related international agreements, and there are also differences with the Australia-New Zealand standard on risk management (Standards New Zealand,1999). These are all compared in Sinner and Sinner and Gibbs (1998). They mostly involve differences in terminology and how the various steps in the process are ordered.

2.4. Resource allocation and cost recovery

The allocation of resources to biosecurity functions at the border – for example, decisions on the number of inspectors to employ – is the outcome of both:

- the biosecurity standards that have been set (on which see above):
- inflows of passengers and goods and the level of risk associated with them.

Resource requirements do not solely depend on the overall volume of goods and passengers. They are also affected by the number of different entry points (which has been rising as more regional airports provide international services), by peaks in the pattern of daily arrivals, and by changes in the biosecurity risks associated with different pathways or countries of origin.

The Annex to this paper contains a very simple model of the comparative statics of resourcing biosecurity measures. The main result is that whatever is the optimal rate of detection of unwanted organisms in particular circumstances, it should be maintained as traffic volumes increase. The implication is that total costs will rise.

Cost recovery is subject to ss135-142 of the Biosecurity Act. Costs are to be recovered "in accordance with the principles of equity and efficiency", while any levies

are only to be raised from persons who will either benefit from the provision of the service whose costs are recovered, or create risks, which make it necessary (s139).

Cost recovery for border and pre-border biosecurity measures is directed at the latter category (NZIER, 1999). Actual practice varies, though (Crump 2000):

- container and cargo (including vehicle) biosecurity costs are recovered from importers;
- mail biosecurity costs are funded by the Crown (i.e., the taxpayer);
- passenger, aircraft and vessel biosecurity costs are mostly not being recovered.

On the last point, the previous government decided in 1997 to extend cost recovery from regional international airports (where costs had been recovered since they opened to international traffic in the early 1990s) to Auckland, Wellington and Christchurch airports in 1998 (Ministry of Agriculture and Forestry, 1998b). As a result of litigation this extension was postponed to 2000. The present government has extended this delay indefinitely, and is also in litigation with the regional airports.

Comment

There is a contrast between cost recovery for containers and cargo, which is well established, and the arguments around cost recovery for passengers and craft. The latter has involved disputes about the rights and obligations of passengers, carriers and port companies, about which can be regarded as creating biosecurity risks, and the effect of new charges on existing rights. These are in part issues of equity, and a consensus seems unlikely. The efficiency case for cost recovery for passengers and craft, from port companies or carriers, is summarised in the table below. This sets out the potential contribution that cost recovery could make to different biosecurity and efficiency objectives[5].

Inspection and Clearance of Passengers, Aircraft and Vessels: Potential Effects of Cost Recovery

Issue	*Potential effcect*	*Effect if costs recovered from port companies*	*Effect if costs recovered from carriers*
Biosecurity risks – passengers	Passengers comply with requirements	Recovery will not affect behaviour	Recovery will not affect behaviour
Biosecurity risks – aircraft and vessels	Carriers comply with requirements	Depends on structure of port charges to carriers	Depends on structure of charges
Processing and inspection outputs	Those charged are able to monitor allocation of resources and efficiency of use	Well placed	Some ability to monitor
Investment by port companies	Decisions on additional capacity take account of implications for biosecurity costs	Yes if location-specific costs are recovered at all ports	Yes if location-specific costs are recovered at all ports

[5] See also NZIER (1998).

3. BIOSECURITY WITHIN NEW ZEALAND

Biosecurity measures within New Zealand comprise:

- monitoring programmes such as bait traps and visual searches that are intended to ascertain the presence and extent of unwanted organisms in New Zealand;,
- control and eradication programmes such as sprays and poisoned bait that are intended to either eradicate unwanted organisms if that is cost-effective, or limit or manage them if not.

3.1 Benefits and costs

Disentangling the benefits and costs of domestic biosecurity measures is not entirely straightforward, for they can be closely inter-related. It is important to avoid double counting or omissions.

In particular, the benefits of domestic biosecurity include:

- the reduction in production losses (or in biodiversity, or in health status) associated with controlling or eliminating an infestation;
- the removal of any biosecurity restrictions that have been imposed on us by our export markets.

The costs of domestic biosecurity comprise:

- the compliance and administrative costs of assembling information on the presence and distribution of pests and unwanted organisms;
- the costs of vaccination, fumigation or poisoning, and of the precautionary destruction of livestock;
- the value of the livestock destroyed;
- the compliance and administrative costs of movement controls;
- collateral damage, for example by biological control agents to indigenous flora or fauna;
- the costs of monitoring and enforcing compliance with the biosecurity programme.

Comment

While the same risk-management approach should be applied to domestic biosecurity measures as to those at the border, the options to be considered will differ. They centre on:

- the extent of active surveillance (in the form of additional traps and surveys) versus passive surveillance (relying on existing monitoring and reporting);
- whether to attempt to eradicate an incursion or established population;

- whether to attempt to limit its further establishment within New Zealand;

- whether to take no action.

If the organism is already widely established, or climatic or other natural barriers limit propagation between regions, then what are at stake may be regional, rather than national, costs and benefits. Hence the option (see below) of regional rather than national decisions on the appropriate level of biosecurity measures and of who should pay for what.

The benefits and costs of containment or eradication are subject to technical uncertainty when an organism is present in an environment that is novel to it. Climate, potential predators and potential food sources may all differ. As a result little may be known about its likely speed of establishment, environmental effects, or the effectiveness of treatment options. This argues for a 'learning by doing' approach in which initial measures are designed to generate information as well as yield short-term eradication or containment results.

3.2 Regulation: unwanted and notifiable organisms

The starting point for domestic biosecurity measures combines Part IV (Surveillance and Prevention) and part VI (Administrative Provisions) of the Biosecurity Act 1993. The key concepts are *unwanted organism* and *notifiable organism*.

An *unwanted organism* is (s2):

> any organism that a chief technical officer believes is capable or potentially capable of causing unwanted harm to any natural and physical resources or human health.

Significant powers and responsibilities follow from assessment as an unwanted organism. An inspector may:

- require any person to provide information on the presence of any unwanted organism (s43);

- may without a warrant enter and inspect any place (other than a dwelling or marae) to confirm the presence or absence of an unwanted organism, or to take any action necessary to eradicate it or stop its spread. (ss109, 114);

- direct the occupier of any place or the owner of any organism to treat or destroy any material that may be contaminated with or harbour an unwanted organism (s122).

Notifiable organisms involve additional reporting obligations: a person who suspects the presence of a notifiable organism has a duty to report it without delay and not wait to be asked (s46).

Unwanted Organisms

Department/ Category	*Number*	*Comment*
Agriculture and Forestry		
▪ subject to management strategies[a]	5	Includes bovine TB and American foulbrood.
▪ specified in import health standards[b]	210	
▪ notifiable	165	Includes BSE and foot-and-mouth disease.
▪ other	159	Mostly not established but includes RCD.
ERMA	48	Organisms prohibited entry under HASNO.
Dept of Conservation	16	Mostly frogs.
Health[c]	7	Mosquitoes.
Fisheries	1	Undaria seaweed.

a. See page 13 below.

b. Import health standards also address the risks posed by a very wide range of organisms that do not have the legal status of 'unwanted organisms' and the domestic reporting requirements that go with that status.

c. The Ministry of Health also has other legislative options for dealing with public health risks.

Comment

The list of unwanted organisms is the gateway to the domestic powers and obligations of the Biosecurity Act, in that inclusion on the list enables the Act's powers to be exercised, and its obligations to be enforced. This is the case regardless of whether or not an unwanted organism is the subject of a pest management strategy.

An organism can be included on the list if their entry or spread would cause 'unwanted harm'; or put another way, if its eradication or control would bring benefits. There is no obligation to take action simply because an organism is 'unwanted'[6]. In any particular case the costs of action has to be assessed against those benefits. But there is, nonetheless, a case for a regular review of the list.

3.3 Pest management strategies

Part V (Pest Management) of the Act establishes regulatory structures within which the powers that are available under Parts IV and VI of the Act can be exercised. Pest Management Strategies are intended to manage or eradicate particular unwanted organisms. They can apply at the national or regional levels. Simplified arrangements can be implemented for small-scale local programmes.

There are extensive legislative requirements for national strategies. A Minister must, even before publicly releasing proposals, be satisfied that they meet various statutory

[6] Though goods cannot be given a biosecurity clearance if they show signs of harbouring unwanted organisms (see page 6).

criteria, including that their benefits outweigh their costs and that the net benefits of a national intervention exceed those of a regional one (s57). The proposals themselves must provide information on the strategy under 22 headings (ss60, 61). A board on inquiry will normally be convened to consider and report on submissions (ss 63-67).

The Minister must take that report, and a report by the appropriate chief executive, into account, before finalising the strategy (s69). The strategy itself must specify 10 different matters and might include one or more of 19 categories of rules that require or prohibit particular actions (ss69A, 69B). Strategies must be reviewed at least every five years

Additional and detailed requirements apply where a strategy is to be funded by levies (ss90 to 96). In particular, the Minister must be satisfied that (s92f):

> Overall, the benefits to the group of persons who will be responsible for paying the levy outweigh the costs to them of the imposition, collection and payment of the levy.

The only two current national strategies are in respect of:

- Bovine tuberculosis, which is spread by possums and affects cattle;
- American foulbrood, which affects bees.

Regional pest management strategies are subject to similar process and content requirements. There are a large number in operation applying to both plant and animal pests. These commonly require landowners to organise and fund control or eradication activities, while recovering regional councils' inspection and other costs from general rates.

Comment

The structure of a pest management strategy – including objectives, planning and consultation requirements - is commensurate with the powers and obligations available under the Act. It is for this reason that a recent review of the response to the incursion of Painted Apple Moth in Auckland (Liebhold A and Simpson B, 2001) recommends that a pest management strategy be developed for that pest as a matter of urgency. The statutory requirements for pest management strategies are, however, very detailed, and complying with them requires significant resources and time. Pest management strategies in their current form can at best only constitute a medium-term response to a biosecurity problem. Even if a pest management strategy would be an appropriate institutional response to a biosecurity problem, departments may be reluctant to embark on the process, and opt for ad-hoc measures instead (see next section).

While the procedural hurdles also apply at the regional level, regional councils have been far readier to establish pest management strategies. This may be attributable to:

- while central government has options other than national pest management strategies (see below) that is not the case for regional councils;

- the landowner funding of control and eradication activities, along with funding regional councils' own costs from the general rates, seems to be generally accepted7.

3.4 Other domestic biosecurity responses

While the levy raising and rating powers of ss 90-100 of the Act are only available for pest management strategies, the Government can exercise the powers available for unwanted organisms independently of a pest management strategy - as long as it is prepared to meet the costs itself.

This currently the case for the varroa bee mite, for which a two-year management plan is now being implemented. It is intended that this be eventually replaced by a pest management strategy if this can be agreed.

Avocadoes are another case where biosecurity actions are being developed outside the framework of a pest management strategy. There is joint industry/government agreement on a surveillance programme and on a contingency plan that would be implemented in the event of the incursion of an avocado pest.

Another important example is plantation forestry, where a surveillance programme is managed and funded by forest owners.

Comment

While the development of pest management strategies is subject to extensive legislative requirements, there is no statutory requirement for any form of process to be followed, or analysis to be undertaken, before action is taken outside of a pest management strategy. The Government can take action on the basis of whatever analysis as it sees fit.

A quick review of some recent analyses, however, indicates that in practice quite extensive analysis has been undertaken to justify the funding sought (Ministry of Agriculture and Forestry, 2000a and 2000b, NZIER 1997). Guidelines for this process are now being drafted, which is a welcome development.

While there are statutory review mechanisms for pest management strategies, this is not the case for the use of the Act's powers when they are exercised outside of pest management strategies. There would seem to be a good case for an ex-post review both of the management process and of the benefits and costs of a biosecurity operation

4. CONCLUSION

There is a lot at stake in biosecurity, both for the production sector and for the environment and public health. The powers that are available to be exercised are also very extensive. It is therefore doubly important that biosecurity risk management responses are preceded by high quality analysis that is based on the best available information, and by a transparent decision-making process. The situation is somewhat

[7] Other approaches, involving for example separate and specific rates, might better align cost recovery with benefits, but are procedurally more complex.

uneven in these respects, as between incoming goods and passengers, and as between pest management strategies and other domestic responses. This partly reflects an uneven approach in the Biosecurity Act; the presence or absence of interest groups able to monitor or contest decisions; and (linked to that second point) different policies on cost recovery.

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6. ANNEX: RESOURCING BIOSECURITY PROGRAMMES

We are interested in how the resourcing of biosecurity activities might vary in response to changes in such factors as the volume of trade or the expected damage from an incursion. Here is a very simple model that throws some light on the issue.

We consider a pathway of possible entry for unwanted organisms into New Zealand, for example passenger or container entry through a particular port. Let:

D = expected or risk-adjusted cost of the entry of an unwanted organism (taking into account the likelihood of its subsequent establishment and other factors)

N = number of units (passengers or containers) entering the pathway

s = the detection rate, being the proportion of organisms intercepted. We take this as the decision variable, as it can be monitored ex-post and inspection procedures adjusted so as to attain it (Whyte, 1996a, and Whyte, 1996b). We are interested in the optimal detection rate and how this would vary with changes in the other parameters

c = unit variable costs of inspection, which is an increasing function of s, characterised by diminishing returns to additional spending

p = proportion of units conveying unwanted organisms; taken to be a function of s in that a higher level of *s* will have a signalling or deterrent effect on *p*, so that $\partial p/\partial s < 0$

The total number of organisms entering undetected is *(1-s)pN* and so the expected cost associated with the pathway is:

(1-s)pND.

The marginal reduction in this cost, as a result of a marginal increase in the detection rate of ds, is:

$$pdsND + (-\partial p/\partial s)ds(1-s)ND$$

The first term in this expression represents the direct impact of a change in *s* on the number of undetected entries. The second represents the indirect impact via a signalling effect on *p*, the proportion of arriving passengers or containers that are conveying unwanted organisms.

The increase in the variable costs of the inspection programme, as a result of a marginal increase in the detection rate of ds, is:

$$(\partial c/\partial s)dsN$$

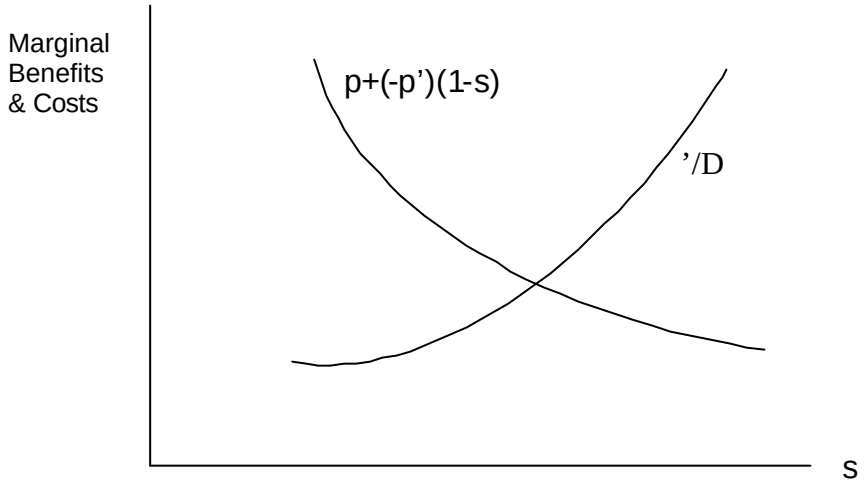
The marginal benefit of increasing the programme is accordingly greater than its marginal cost if:

$$p + (-\partial p/\partial s)(1-s) > (\partial c/\partial s)/D$$

The left hand side is a function of s, which (as $\partial p/\partial s < 0$) declines as s increases. The right hand side is an increasing function of s.

If the inequality holds for all values of *s* then it will be worthwhile to allocate sufficient resources so as to detect everything. If it does not hold for any value of *s* then the detection programme should be abandoned.

If the inequality only holds up to some value of *s* then the programme should target that level of detection. This is illustrated below, with partial derivatives indicated by a '.



Several conclusions can be drawn:

1. The optimal level of *s* (the proportion detected) is **not** affected by *N* (the number of passengers or containers entering). So if traffic volumes rise, the detection rate should be maintained by increasing inspection activity. Costs will rise in consequence.

2. If *D* (the risk-adjusted cost of entry of an unwanted organism) is revised upward/downward then *s* should be increased/reduced.

3. If *p*, the proportion of units conveying unwanted organisms, rises/falls, then so should *s*.