THE RABBIT CALICIVIRUS DISEASE (RCD) SAGA

A biosecurity/bio-control fiasco

Office of the

PARLIAMENTARY COMMISSIONER FOR THE ENVIRONMENT

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PO Box 10-241, Wellington

September 1998

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Acknowledgments

The Parliamentary Commissioner for the Environment would like to thank the many individuals who generously assisted by providing information and comment on this report.

ISBN 0-908804-84-9

PREFACE

The introduction of rabbits to New Zealand in the 1840s proved disastrous. By the 1880s, large tracts of land were being devastated and major control effort, by Government and landowners, was under way. With little respite, the battle to protect land from rabbits continued until the 1970s. By this time major collective Government and landholder investment in control, in combination with improvements in the management and productivity of pastoral systems, and the effects of predators, reduced rabbits to relatively low numbers in all but the driest parts of New Zealand. The 100-year war was perceived to be over; controlling rabbits was no longer considered to need a national approach, its own governance system, or taxpayer investment in control costs. So began, in 1979, a series of policy changes, ultimately swept up in the public sector and economic reforms of the 1980s which resulted in rabbit control costs becoming entirely a farm business cost, while legislative responsibility for their management shifted to local government; regional councils via the Biosecurity Act 1993.

An understanding of why a citizen, or citizens, would illegally import rabbit calicivirus disease (RCD) and, in so doing very publicly dent New Zealand's creditable biosecurity record, requires detailed examination of many factors over the 18 years 1979-1997. The illegal act did not happen in isolation. It was one component of a complex decision making "system" involving central and local government policies over many years, costs and benefits, risks and hazards, public perceptions of fairness, and signals from scientists and science investors. The biosecurity breach was in reality a major systems failure akin to the February 1998 power failure in Auckland. Simply focusing on finding the perpetrators of the illegal introduction, or discovering how they did it, constitutes a gross lack of appreciation of the enormity of what happened and the complexity of factors that led to it. Much more comprehensive evaluation is needed to determine why, and how to prevent similar failures in the future.

In this discussion paper I have endeavoured to unravel some of the elements of the "system" and to consider them in the context of societal attitudes to risks and hazards, matters of trust, and why people obey the law. My ultimate aim is to encourage others to take a more holistic view of what this extraordinary breach of biosecurity might mean in the context of a largely urban society in New Zealand and a very competitive trading world where food purity and the sustainability of production systems are attracting more attention. This is essential to ensure that the circumstances that could lead to future biosecurity breaches are fully understood. In respect to RCD, it is evident that the decision-maker either did not adequately assess, or address, the risks of an illegal importation, or considered it was outside their immediate area of responsibility. In making this observation I am not suggesting that the risk of an illegal importation should have influenced the actual decision to allow or not allow importation; however, I do consider that there was insufficient account taken of the enormous financial and emotional pressure landowners in the worst affected areas were under, and had been under for many years. In addition, the general public, and some officials, appear to have a poor understanding of the complexities of sustainably managing land for either production or conservation purposes. The tensions this generated, in association

with more fundamental concerns regarding the possible hazards associated with viruses, have led to extensive criticism of the perpetrators of the illegal importation of RCD, and too little consideration of why it happened and whether it could happen again.

As New Zealand land managers face increasing efforts to sustainably manage their resource, the land, and maintain the financial viability of their businesses in a global market economy, there will continue to be increasing demand for and need for new technologies. Ensuring that there is a fully informed debate on proposals to introduce or release new biological control organisms is essential. But how is this big challenge to be met? Who will be trusted to supply the information? What is the role of the Environmental Risk Management Authority? Who in the wider New Zealand community has a stake in the decision, particularly in the context of who carries the risks of sustainably managing land and any unwanted hazards arising out of a new organism introduction? These are some of the questions I believe should now be examined in the light of the RCD experience. The maintenance of New Zealand's biosecurity while managing our many pests, weeds and diseases demands we do.

Dr J. Morgan Williams

Parliamentary Commissioner for the Environment

EXECUTIVE SUMMARY

Background

The illegal importation of rabbit calicivirus disease (RCD) by a person or persons unknown in mid 1997 was a major breach of New Zealand's biosecurity. There was extensive government and public criticism of the illegal action and the subsequent widespread dissemination of the virus by farmers. While the breach of biosecurity is unacceptable, there has been relatively little consideration or public debate as to why a citizen or citizens would take such a drastic action other than for perceived personal benefit. Even more importantly, there has been little consideration of what policies or other government activities, and changes in the farming business conditions, might have contributed to this extraordinary breach of biosecurity. This issue is important because the final, illegal act was not done in isolation. It was more one component of a complex decision making system involving central and local government policies and other matters over many years. If we are to reduce the risk of similar biosecurity breaches in the future, along with its attendant impacts on public and international market confidence in biological controls, it is essential to examine the elements in the system that have failed. That is the prime objective of this discussion paper.

The paper examines two crucial components of the sustainable land management/rabbit control/biosecurity system with a view to identifying those elements within them which may have contributed to the biosecurity failure. Factors considered are those that (a) increased the demand for, and expectations of, obtaining rabbit bio-control agents from 1979 to 1997; and (b) the Ministry of Agriculture's approach to its 2 July 1997 decision to decline the application to introduce RCD.

This study does <u>not</u> seek to challenge the Director-General of Agriculture's decision. It is a review that draws on a range of literature, correspondence, and personal experience of the Commissioner and his staff.

Biological controls in New Zealand

For over 20 years New Zealand has been developing and implementing legislation and administrative frameworks intended to improve the sustainable management of all natural resources and to prevent the entry of unwanted organisms into the country. Over this period pest control development world-wide has increasingly focused on a more sophisticated integration of chemical, biological and production system manipulations. During this period there has been a general trend to more targeted use and reduced use of pesticides and increased use of pest-specific biocides and biological controls in the development of pest resistant plants and animals. Control options for pests such as rabbits and possums tended to be limited to a few chemical agents, mainly 1080, Pindone, Talon and cyanide, as well as shooting and trapping.

New Zealand has a long history of introducing potential biological control agents, starting last century with attempts to control rabbits with a suite of predators: cats, ferrets, stoats and weasels. These early introductions often caused greater problems than the original pest. Since 1874 at least 321 species have been introduced to New Zealand to control pests, weeds and to disperse animal dung. Seventy-five of the bio-control species have become established. None of these generated much public debate with the exception of the proposals to introduce the myxoma virus, the European rabbit flea, the gorse mite and RCD.

In assessing the risks and benefits of biological controls for New Zealand, the welfare of indigenous species has rightly been the prime focus of evaluations. Judging the agent's efficacy (how effective it is likely to be as a biological control) has usually been a relatively minor part of the decision as to whether or not to allow its import. However, when the RCD decision was made, contrary to previous practice, the potential efficacy of the organism was an important part of the decision. This appears to establish a significant precedent in terms of assessment methodology. Assessment of the potential risks associated with the importation of biological controls for old man's beard, heather and the Argentine stem weevil illustrate that assessment focused on the risks to other species, particularly New Zealand indigenous species, rather than on the potential biological control efficacy of the agent. In these cases the assessments acknowledge the uncertainties in relation to the control effect that the agent would have; hence risk assessment focused on potential impacts on non target species.

Signposts to the illegal introduction

Most members of a society uphold laws that they consider to be fair and just. Biosecurity laws are particularly dependent on public acceptance of their fairness and value; in essence they have to be self policing. However, in the case of RCD, many members of normally law abiding rural communities received and spread the illegally introduced virus, even before it was discovered and sanctioned by government agencies.

The lead up to the illegal importation was a long one - 18 years. It involved policy changes, both in terms of costs and responsibilities for rabbit control and research focus. The first phase, beginning in 1979, was a shift in the legislative responsibility for, and costs of rabbit control, from primarily central government to almost totally local government and land holders. The second phase involved a rising expectation by land holders that biological control was considered a necessary and acceptable option by government, research providers and decision-making agencies. These two streams of change resulted in the full cost of controlling rabbits falling on farm businesses while research was increasingly focusing on biological controls as a more cost effective and market acceptable option than large-scale poisoning. Figure 1 on page 15 outlines the most important milestones in these two streams of change, together with a pictorialisation of the perceived need for and desire for biological controls against rabbits.

By mid 1997, the land holders who could most benefit from a bio-control programme were:

- carrying the full cost of rabbit control using the best available conventional methods efficiently applied;
- well aware of the frequent acknowledgment by government ministers of the need for more cost effective controls, particularly biological controls;
- witness to over six years substantial investment in research on RCD and very well informed on the results;
- convinced that the application to release RCD in New Zealand was considered to be one of the most exhaustive prepared for the importation of any organism; and
- feeling that, in their struggle with the rabbit, they had been abandoned by governments with the exception of research on RCD, and a largely urban public was becoming increasingly risk averse to the introduction of new organisms.

Thus the climate of expectation, which was a precursor to the illegal importation, developed over a long period within the farming community. A series of funding policy changes, plus signals from Ministers, officials and research funders clearly favouring biological controls, greatly increased the probability that a "No" decision, or that a pre-signalling of it, would not be respected.

The RCD decision

On 2 July 1997, Dr P J O'Hara, Deputy Director-General of Agriculture, declined the application to import and release RCD. The most fundamental aspect of the Director-General's decision is that it involved two clearly different considerations: one that focused on the risks of RCD to ecosystems and other species; while the other examined its potential as a biological control agent and the organisational arrangements for its management. Allowing the second consideration to tip the balance against the application to import appears to represent a significant departure from past precedent-making decisions on importing biological controls. Past decisions specifically acknowledged that the level of pest population control to be expected after release of a biological control was highly unpredictable. This shift in the focus of the decision-making frame of reference is significant for two reasons. First, it has the potential to generate public perceptions that the decision-making is unfair since different criteria were apparently applied to RCD compared to other bio-controls. Secondly, inclusion of a judgement on the potential efficacy of the control agent has potential (in a cost-benefit framework) to influence the assessed level of hazard to humans or other species. If the potential efficacy of an agent were high, this could influence the process of assessment of the risks of the organism to the wider environment. Extremely high efficacy does not, in the case of biological controls, warrant lowering the environmental damage threshold, ie accepting greater risks. Neither does low efficacy warrant raising the threshold. However, this is precisely what

the RCD decision-making process appears to have done. By concluding that the health and welfare of humans and other species in New Zealand would not be threatened by the introduction of this virus, and then declining the application on the basis of efficacy and organisational capacity, the scene would now appear to be set for environmental risk thresholds to be compromised in future. It is essential that future decision-makers clearly acknowledge the independence of these two clearly different areas of assessment: one relating to the hazards the agent poses to other species or ecosystems; the other its efficacy as a bio-control agent.

Public perceptions of risk

Any substantive understanding of why the RCD biological control development ended the way it did requires appreciation of many other aspects of the wider social and political context of the final decision. People's perception of risk is socially constructed; therefore these perceptions should be considered in their social and cultural context. Public perceptions of pests and pest control methods, and their risks, have not been extensively studied in Australia and New Zealand. However, three surveys between 1991-95 revealed widespread understanding of the need to control rabbit populations but considerable variation in the acceptability of current and future control methods (Sheppard and Urquhart, 1991; Fitzgerald *et al*, 1994; Anon, 1995). Most importantly, the studies also showed some strong ethical and moral concerns about control methods which, when linked to the distrust of science and government which has emerged from other investigations, clearly indicated that it was going to be difficult to get a balanced debate on RCD if and when an official release was formally proposed.

The RCD debate ultimately polarised into two distinct arenas: one pertaining to the perception of risks that rabbits posed to New Zealand's natural and managed ecosystems (and perceptions of who bore those risks); and the other focused on the risks and benefits of RCD as a biological control. The RCD applicant group clearly saw the risk posed by rabbits to their livelihoods and farming ecosystems as considerable, while many of those expressing concerns regarding RCD perceived that rabbits did not pose a major ecological or business risk, or that there were other methodologies that could effectively deal with rabbits as pests. Groups and individuals concerned with the introduction focused on what was not known rather than what was known about RCD, and in particular on perceived inadequacies in the whole process of assessing the application to introduce RCD to New Zealand. Their scenario of risk was further strengthened by the contribution of international scientists who expressed concerns about the long-term safety of the virus as a biological control. They appeared to be strongly influenced by the unknown risk factors as characterised in a 1980 study (Slovic *et al*, 1980), plus such factors as:

- the feeling that the risks were seen to be inequitable;
- the risks were not balanced by the benefits;

- that the exposure to the risks of RCD would be involuntary rather than voluntary;
- that the risks were under the control of an external body (the Ministry of Agriculture) rather than the individual or community concerned; and finally
- that information about the risks, provided by the applicants in good faith and government agencies, was perceived to come from untrustworthy or doubtful sources.

Means of trust

In the context of biotechnology and bio-control in New Zealand, the matter of who is trusted by individuals and communities will be crucial to the future development of sustainable management of our ecosystems. While studies have shown that being better informed is an important element of realistic risk perception, equally important is who provides the information and hence what information can be trusted. By mid 1995, the need to ensure wider understanding of the risks and benefits was recognised by a number of stakeholders in the RCD development arena. As a consequence a group was formed (the Rabbit Bio-control Advisory Group - RBAG) to advise the chief executives of the Ministries of Agriculture, Conservation, Environment, and Research, Science and Technology on research, communication and other matters relating to RCD. This group produced a comprehensive information kit in May 1996; a kit which was distributed to all secondary schools, public and university libraries, local government offices, media interests and community agencies.

The key question is: what effect did this effort to improve understanding of the risks and benefits have on the final outcome? The probable answer is “very little”, with the possible exception that it may have provided some of the information that enabled landowners to make their own assessment of the risks and benefits of an RCD introduction and so choose to become involved in an illegal introduction and subsequent distribution. This attempt at an information campaign probably did little to allay concerns of many other stakeholders because they did not trust the RBAG, or did not accept that rabbits posed an ecological threat greater than that posed by RCD. The group was simply seen as an instrument of government and government was seen to favour the introduction. Despite government funding of the activities of the RBAG, government was nevertheless a very reluctant information provider because of a general view that this was not government’s role.

But that raises the question: if it is not government’s role, whose role is it? Who can provide adequate information on complex matters of science, risks and benefits and be trusted? If provision of information is left solely to future applicants seeking to release or introduce new organisms, as required by current legislation, the research on trust indicates it will not be accepted. Does this suggest the need in New Zealand for some organisation ‘at arm’s length’ (from government) which has the role of advancing understanding of complex matters of technology, ethics, risks and benefits? Can the Environmental Risk

Management Authority (ERMA), as currently mandated, fill this role? Probably not, given its relationship to government and the level of its funding for educational roles. However, when decisions are finally made by ERMA, or by a Minister if a decision is called in, it is essential that all interested parties are able to judge it as fair and reasonable, even if the decision is not totally acceptable to all parties. Ensuring a wider ownership of future decisions, increased trust in those making decisions, and a greater sense of fairness are all essential for the future of biosecurity in New Zealand.

Implications for decision making under HSNO

The RCD saga is acknowledged as having potential implications for decision-making under the Hazardous Substances and New Organisms legislation. The Minister of Biosecurity's Council has announced, in May 1998, that it will investigate "the lessons" of the RCD application reporting in December 1998. The purpose of the HSNO Act is "to protect the environment, and the health and safety of communities, by preventing or managing the adverse effect of hazardous substances and new organisms" (s 4). The purpose statement of the Act does not specify the degree of risk averseness to be adopted by decision-makers. In theory, it gives equal weight to environmental and economic principles. The Act therefore suggests two important principles: first that there can be variation in the degree of risk considered acceptable by the decision-maker; and secondly, that there is expectation of the capacity of people and communities to provide for their economic, social and cultural well-being. This second principle could be construed to indicate that decisions relating to the efficacy of a bio-control agent (or indeed any control agent) should primarily be the prerogative of users rather than the risk assessing agency. This implies that efficacy is a matter that should largely be excluded from the decision-making process, given that efficacy is mostly a financial risk to the beneficiaries, product developers and research investors in the product or agent. The RCD decision included an element of judgement regarding the efficacy of RCD as a biological control. However, given the history of predicting the efficacy of bio-controls, it seems more appropriate that regulatory agencies such as ERMA should decide on safety matters and potential users should decide on the level of efficacy that is acceptable.

The future

The illegal importation of RCD, a far-reaching biosecurity failure, was the product of a long gestation of a very complex array of interlocking sociological, economic, scientific, trust and organisational matters. It was not an unexpected event: in fact it was highly probable. However, it is one thing to predict an event or action and quite another to do something to avert it.

From this limited analysis of the RCD saga, I suggest that prevention of future illegal importations will require, as a minimum, a focus on:

- the degree and duration of stress being experienced by the main beneficiaries of the proposed introduction or release;
- the beneficiaries' perceptions of the risks and benefits of the proposed agent to themselves and to the wider society;
- the beneficiaries' perceptions of the acceptability of the proposed agent to decision makers/influencers in society;
- the acceptability to the participants in the debate of the decision-making framework (by which an agent is assessed); and the trustworthiness/representativeness of the decision-maker and those providing information on the agent/organism;
- a level of knowledge about the proposed agent, its implementation process, and accessibility of knowledge to any interested parties;
- the beliefs about the risks and consequences of being caught for illegally importing the desired agent - ie, how much of a deterrent is provided by the law;
- the difficulty, or ease, with which the organism could be introduced; and
- what other methods of control and control funding are potentially available to the beneficiaries of a proposed introduction.

Only if such factors are well understood and appreciated, and systems developed to accommodate them, is there any hope of averting the illegal importation of future agents or plants where the anticipated benefits are high.

In addition, I would conclude that there is also a need to ensure that:

- the potential risks of a biological control should be assessed independently of benefits;
- there should not be a trade off against judgements of control efficacy;
- community acceptance of future bio-control agents necessitates information and education processes that are trusted and independent of both proponents and agency decision-makers;
- a detailed investigation of the impact of this biosecurity failure and the factors generating it, is essential.

For these reasons I strongly endorse the Biosecurity Council's review of RCD and urge that the terms of reference for the review take account of the matters I have raised.

CONTENTS

1. INTRODUCTION

The illegal importation of rabbit calicivirus disease (RCD) by a person or persons unknown, in mid 1997, generated an amazing level of bureaucratic and political activity, plus extensive criticism from members of the general, predominantly urban public. The focus was on finding the perpetrators of the breach of biosecurity laws and, particularly in legal and local government circles, on determining whether the Ministry of Agriculture and Forestry (MAF), (formerly the Ministry of Agriculture) and other Government responses had been adequate (van Roy, 1997). Throughout all this internal reaction there appeared to be no consideration by the public, and virtually none by any agency, of why a citizen or citizens would take such a drastic action, other than for perceived personal benefit. Even more importantly, there has been little consideration of what policies or Government activities and changes in farming business conditions might have contributed to this extraordinary breach of New Zealand's biosecurity. This issue is important because the final illegal act did not take place in isolation. It was one component of a complex decision-making "system" involving central and local government policies over many years, estimates of costs and benefits, risks and hazards, public perceptions of fairness, and signals from scientists and science investors. The biosecurity breach was in reality a major systems failure, akin to the January 1998 power failure in central Auckland City, and the spate of deaths at Christchurch Hospital in the mid 1990s. If we are to reduce the risk of a similar biosecurity fiasco in the future along with its attendant impacts on public and international market confidence in bio-controls, it is essential now to examine the elements in the "system" that have failed. That is the prime objective of this discussion paper.

I aim firstly to encourage a more substantive analysis of the whole socio-economic-legal framework within which New Zealand can assess new organisms and their implications for biosecurity, and secondly to discuss the future acceptability of bio-control technology.

This study has been undertaken by the Parliamentary Commissioner for the Environment (PCE) within the powers of section 16 of the Environment Act 1986. It examines the two crucial components of the sustainable land management/rabbit control/biosecurity system with a view to identifying those elements within them that may have contributed to the RCD biosecurity failure:

1. the factors that increased the demand for, and expectations of obtaining rabbit bio-control agents from 1979 to 1997;

2. the Ministry of Agriculture's approach to its 2 July 1997 decision to decline the application to introduce RCD.

These will be considered in the context of: (a) the evolution of bio-control technology in New Zealand, (b) trends in public attitudes to risks and hazards, and (c) why people obey (or disobey) the law. This study does not seek to challenge in any way the Director-General of Agriculture's decision. In fact, it seeks to emphasise that this decision was made against a complex background, including Government policy, research investment, land user expectation, and public controversy. In turn, this background was a primary determinant of the subsequent illegal importation. Similar backgrounds will presumably influence future decision-makers considering decisions that must soon be made on bio-controls for possums and other animal pests, weeds and diseases. Similar outcomes are likely again unless we learn from history.

This study is essentially a review which draws on a range of literature, correspondence, and the personal experience of the Commissioner and his staff. It has not involved a formal process of consultation, which would be more appropriate to a wider investigation of the lessons to be learnt from the RCD saga. The resultant report has been peer-reviewed, as is standard practice for PCE investigations.

2. BACKGROUND

The decision not to permit the release of rabbit calicivirus disease (RCD) for use against rabbits, and the events that followed that decision, appear to have precipitated New Zealand into a new and extremely challenging phase in an already long history of attempts to develop the sustainable management of ecological systems severely affected by pests, weeds or diseases. Our biosecurity credibility and our national capability to implement the products of research are under critical scrutiny. The significance of the historical background, and of the way the decision was made and communicated, must be fully documented because the story has significant implications for New Zealand's future efforts to control other species, and for the effectiveness of our biosecurity laws.

For over 20 years New Zealand has been developing and implementing legislative and administrative frameworks intended to improve the sustainable management of all natural resources and to prevent entry of unwanted organisms into the country. The commitment that New Zealand, as a nation, has made to sustainable management is demonstrated by the Resource Management Act 1991, the Biosecurity Act 1993 and the Hazardous Substances and New Organisms Act 1996, and policies such as *Environment 2010* (Ministry for the Environment, 1996) and the Sustainable Land Management Strategy. In addition to this commitment, our markets (those who buy the products we export, and those who visit New Zealand) are demanding continually increasing levels of environmental stewardship. This stewardship includes the effective management of the many invasive plants and animals (including insects) that have already reached New Zealand. ENZA's[1] integrated fruit production programme, (IFP)[2] which seeks to reduce reliance on pesticides and increase the use of biological controls in orchards is one indicator of our national commitment to sustainable management of our life-supporting systems; New Zealand's commitment to the development of a biodiversity strategy is another.

Pest control development world-wide is increasingly focusing on a more sophisticated integration of chemical, biological, and production system manipulations. In short, a more ecological approach is being taken to the control of pests and weeds in production and conservation systems. Health and safety concerns regarding pesticide residues on and within food products have led to progressive improvements in the safety, effectiveness and use of pesticides, and in the routine detection of residues. Reductions in pesticide residues in products and in production systems have been achieved by the introduction of more specialised, less toxic chemicals and their integration with biological control agents, particularly in our horticultural industries. This trend away from pesticides, and

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1 ENZA is the export, marketing and distribution arm of the New Zealand Apple and Pear Marketing Board.

2 The Integrated Fruit Production programme aims to ensure fruit is grown in an environmentally safe way that minimises pesticide use. It covers all aspects of fruit production from plant nutrition, to tree pruning and spraying. It has been under trial by the New Zealand Apple and Pear Marketing Board since March 1996 with the aim of having all growers operating under the scheme by the year 2001.

an increase in the use of pest-specific biocides (biological agents that are applied and used in a similar way to chemically-derived pesticides), are expected to continue in the future, in combination with plant and stock breeding that improves the resistance of many production species to pests and diseases (Williams 1993a, 1997).

Most of the above applies to both insect and weed pests in our more intensive production systems, and also to our major vertebrate pests - possums and rabbits. Control options for these vertebrates have tended to be limited to a few chemical agents, mainly 1080, Pindone, Talon and cyanide, as well as shooting and trapping. At present, control of both possums and rabbits is critically dependent on compound 1080, which remains the single most important control agent (Livingstone, 1994). This very high dependence on one compound is a major strategic risk for New Zealand even though it poses little ecological risk. New Zealand uses more 1080 than any other country in the world, and we are exposed to potential consumer boycott of products that are considered exposed to it, or to boycott of organisations that permit its use. This vulnerability, and the advantage of developing alternative controls for rabbits and possums, was noted in the 1996 OECD Environmental Performance Review (OECD, 1996) and earlier publications (Williams, 1993b, 1994). The OECD review recommended that consideration be given to maintaining efforts in possum and rabbit control and finding alternatives to the use of compound 1080.

3. PAST INVESTIGATIONS BY THE PCE[3] INTO RABBIT AND POSSUM CONTROL

In the last decade there has been increasing controversy over the management of rabbits and possums. One of the first investigations of the PCE's office after its establishment in 1986, was an audit of the proposal to introduce the myxoma virus and its vector, the European rabbit flea, as a biological control agent (PCE, 1987). While the PCE did not recommend the importation of the virus and flea as a biological control, the PCE did recommend a more detailed examination of the complexity of issues affecting the sustainable management of lands severely affected by rabbits. The PCE's recommendations, concerning the establishment of a Rabbit and Land Management Task Force (R&LMTF, 1988), were accepted by Government. A five-and-a-half-year Rabbit and Land Management Programme (R&LMP 1989-95) endeavoured to unravel the economic, ecological and social dimensions of land management in tussock grasslands severely affected by rabbits. While it focused on the dry tussock grasslands, it also, as the programme evolved, became relevant to other areas of New Zealand. It was also a partial compensation, by Government, for the decision not to allow the importation of the myxoma virus.

The R&LMP was implemented by the then Ministry of Agriculture and Fisheries in partnership with the newly-established regional councils, the affected farming community, the Department of Conservation (DOC), the Ministry for the Environment (MFE), and Landcorp. The programme led to a greatly improved understanding of the land management needs of the dry tussock country (Stafford-Smith and Foran, 1993). The limitations of the then current rabbit control technologies, and the interrelationships between rabbit numbers, their predators, and Tb management, were also examined (Robertshaw and Foran, 1991; Norbury *et al*, 1998). For the first time, the needs for, and the challenges to, the effective control of rabbits were put into the bigger picture. This wider context included management of the whole ecological system (the pasture, livestock etc), as well as working on the links between rabbit control and the management of animal disease caused by predators sustained by rabbits.

Conventional control technologies (primarily poisoning and shooting), in association with rabbit-proof fencing and changes in grazing management, can result in lower rabbit numbers. But the R&LMP and associated research, clearly established that the cost of sustained control using these methods frequently exceeds the productive capacity of the farm businesses, at least in more rabbit-prone areas (Ogle, 1993; Saunders, 1992). This conclusion indicated the need for changes in farming practice and land use, to be assisted by more cost-effective rabbit control technology. The need for biological control became evident during the early stages of the R&LMP, as noted in the PCE's review of the Programme in 1991 (PCE, 1991). For example, the PCE (1991) stated:

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[3] Parliamentary Commissioner for the Environment.

New, more affordable options for weed and pest control are required and *the introduction of a viral control such as myxomatosis is likely to provide savings on rabbit control costs*.

In 1994 the PCE reviewed possum management and the use of 1080 (PCE, 1994). This study similarly concluded that while 1080 was a valuable and desirable compound for use against possums under current conditions, alternative controls would ultimately be required.

Among the PCE's findings was that:

Continuing heavy reliance on 1080, or any other single toxin, is not advisable over the long term. Even if other environmental risks of 1080 use are not felt on balance to be significant, the risk of developing bait and poison-shy populations must be considered. Widespread use of 1080 may not be viewed as "clean and green" by our trading partners. Biological controls or other breakthroughs in technology might offer sustainable alternatives over the long term. In the meantime other control methods are available as alternatives to 1080 use where appropriate.

Recommendations from this report on the use of alternative controls were made to the National Science Strategy Committee on Possums and Bovine Tuberculosis:

Ensure that in research prioritisation, continuity of adequate long-term funding of biological control (including immuno-contraception) is not compromised; and reassess its research priorities in the light of the conclusions of this report, in particular giving higher priority to the following:

a technical development for cost-effective trapping/poisoning ground control;

g strategies and methods for maintenance/low density control.

In summary, the thrust of findings from both the R&LMP and PCE reviews of rabbit and possum management was that alternative controls, including biological, were desirable for both species.

4. BIOLOGICAL CONTROLS IN NEW ZEALAND

The term "biological control" means the deliberate human use of a natural organism (an agent) intended to manipulate another, usually a pest species. Agents of biological control may include predators, disease-producing agents (viruses, bacteria etc), and parasitoids (Lynch, 1998). Some biological agents, once released, may become self-sustaining regulators of pest numbers; others may require reapplication, and are then generally termed biocides. Biological control can also be achieved via artificial selection for natural plant resistance to pests and pathogens, the insertion of genes for resistance via molecular techniques, the use of natural pheromones to disrupt insect behaviour, or even the manipulation of farming practices to induce habitat change in farming ecosystems unfavourable to pest species. In terms of public perception, however, the term "bio-control" will usually be equated with introduced organisms deliberately released to attack pest species and later develop into self-sustaining populations that need no further human help.

New Zealand has a long history of introducing potential biological control agents, starting last century with the attempt to control rabbits with a suite of predators: cats, ferrets, stoats and weasels. These early introductions, some of which have ended up producing even bigger pest problems in their own right, have increased public awareness of the fact that introductions of biological control agents are generally irreversible. In recent decades, introductions have been preceded by much more rigorous assessment, and there has been much greater focus on the host specificity of a proposed biological control agent. Since 1874, at least 321 species have been introduced to New Zealand to control pests, weeds and to disperse animal dung. Seventy-five of the bio-control species have become established (Moller *et al*, 1993; Cameron, 1994). None of these generated much public debate. This contrasts with the proposals to introduce the myxoma virus and the European rabbit flea. Since the late 1980s, the only proposed introductions that have been seen as controversial have been those for the gorse mite and RCD. The preferred agents are those that are extremely host pest specific.

In assessing the risks and benefits of biological controls for New Zealand, the welfare of indigenous species has rightly been the prime focus of evaluations. Judging the agent's efficacy (how effective it is likely to be as a biological control) has usually been a relatively minor part of the decision on whether or not to allow its import, particularly for control of insects and weeds. However, when the rabbit calicivirus disease (RCD) decision was made, contrary to previous practice, the potential efficacy of the organism was an important part of that decision. This appears to establish a significant precedent in terms of assessment methodology.

Recent introductions to control three pests on weeds provide good examples of this previous focus on risk to other species as opposed to biological control effectiveness, despite the seriousness of the conservation and production problems caused by old man's beard, heather and the Argentine stem weevil. Old man's

beard and heather are two species that, in their respective forest and alpine land habitats, seriously affect indigenous ecosystems. Argentine stem weevil is a major threat to the rye grasses that are the mainstay of New Zealand's pastoral agriculture.

1. *Phytomyza vitalba*

The first case is that of the leaf-mining fly *Phytomyza vitalba*, a potential agent for the control of old man's beard, *Clematis vitalba* (Hill *et al*, 1995). Evaluations of this fly focused on tests in its home range, Europe, and, in quarantine in New Zealand, its potential to attack New Zealand native plants. It was found to be very host specific to old man's beard when experiments were done under natural conditions.

The effectiveness of many biological controls is extremely dependent on the ecological context within which they operate**.** European and laboratory studies of the leaf-mining fly could only conclude that *defoliation of old man's beard would limit seed productivity and directly reduce shading of underlying vegetation*, but that the environmental benefits of this were difficult to predict accurately. In relation to seed production, Hill *et al* (1995) concluded: *overall it is not possible to predict what level of control could be achieved by reducing seed production.*

Previous political acceptance of the uncertain art of predicting the efficacy of bio-control, even when combined with other control methods, is illustrated by the following extract from a letter to the Minister of Agriculture from the then Minister of Conservation, Hon Simon Upton, on 16 September 1996:

Therefore, having considered the advice received from my officials, my assessment is as follows. Notwithstanding the absence of any predictions from Landcare (Landcare Research NZ Ltd), *the cumulative effect of the array has a chance of providing control. Given that the agents making up the array are the most promising of the finite number of organisms known to attack Clematis vitalba, it may be the only chance for effective biological control in the foreseeable future. Thus, taking all factors into consideration, I concur with the advice of my officials, that the benefits of Phytomyza vitalba as part of an array would probably offset the possible risks identified.*

Consequently, my judgement is that the importation and release of P. vitalba is in the public interest.

Other agencies similarly supported the introduction which was ultimately approved for release by MAF in late 1996.

The same Ministerial position as outlined for *Phytomyza vitalba* was taken by the current Minister of Conservation in relation to a 1997 decision to release another old man's beard biological control agent, the tenthredinid

sawfly *Monophadnus spinolae* into New Zealand. In a submission reported 8 October 1997[4] the Hon Nick Smith concluded that:

Release was in the public interest. Possibility of detrimental effect on New Zealand's environment is negligible and potential benefits, although tenuous, outweigh potential costs. Monophadus spinolae provides one of the few chances for effective biological control of old man's beard for the foreseeable future.

I am advised that the inability to predict success of biological control projects with any precision is not unusual and should not be used as a reason to not go ahead with a particular project.

2. Lochmaea suturalis

The heather beetle, *Lochmaea suturalis* was proposed for the control of heather (*Calluna vulgaris*) and an application lodged in 1995 (Keys and Syret, 1995). In common with *P. vitalbae*, the cost-benefit assessment focused on the risk to other species in New Zealand. In terms of the potential of *L. suturalis* as a biological control, Keys and Syret (1995) concluded that *it is difficult to predict the degree of control a biological agent is likely to exert especially as realistic simulation experiments are difficult to perform; therefore we have taken the approach of projecting the worse case/best case scenarios.*

Worse case scenarios:

- *heather beetle fails to establish;*
- *heather beetle establishes but its impact on heather is insignificant.*

Best case scenarios:

- *heather is reduced to the level where it is only a minor component of the vegetation and natural grasslands areas;*
- *heather is no longer invasive.*

The authors then concluded in their import impact assessment that *the degree of control able to be achieved by the heather beetle cannot be predicted accurately as is always the case with biological control*.

There were 32 submissions on the application to import

L. suturalis[5]. Most considered that the benefits outweighed the possible hazards to other species.. None of the summarised submissions made any mention of the uncertainty of predictions of the level of control the beetle

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4 Letter to Dr O W Sutherland, Landcare Research New Zealand Ltd from Barry O'Neil, Chief Veterinary Officer, MAF Regulatory Authority.

5 Letter of 12 January 1996 from Kevin Corrin, National Manager, Animal Quarantine, MAF, to Barry O'Neil, Chief Veterinary Officer, MAF.

might provide. Approval to import the heather beetle was granted by the Ministry of Agriculture (MAF) in January 1996.

1. Microtonus hyperodae

The parasitoid *Microctonus hyperodae* was proposed in 1990 (Goldson *et al*, 1990) for biological control of the Argentine Stem Weevil (ASW). This species was found in South America after extensive research in Brazil, Argentina and Chile. In common with the two cases above, the focus of the risk assessment for the purposes of the import impact assessment was on the potential hazard that this parasitoid might attack New Zealand native weevils. Extensive assessment was done in quarantine in New Zealand, and it was established that although there was some risk of the parasitoid affecting native weevils, such parasitism was likely to be opportunistic and would possibly have little impact on their populations.

The field research and laboratory studies on this ASW parasitoid provided only limited quantitative information on its possible contribution to the control of ASW in New Zealand. However, it was known that even partial reduction in ASW populations could give major production benefits to rye grass users. On this basis, MAF approved the release of the parasitoid from quarantine in February 1991. A subsequent research programme has established that *M. hyperodae* is making a major contribution to the control of ASW in New Zealand (Goldson *et al*, 1992 and 1994).

This chapter has provided some examples of recent decisions on biological control in New Zealand. The decisions have, rightly, focused on the potential risk of the proposed biological control agent to native plants, insects or animals. The relative efficacy of these proposed agents was stated in all cases to be poorly understood, an acknowledged constraint to assessments of any biological control which involves shifting a species from one habitat (ecosystem) to another. Despite the limited understanding of the potential efficacy of the agents, all four proposals were approved for release in New Zealand. In addition, it is important to note that in one case (*Microtonus hyperodae*) the research programme tracking the performance of the agent has confirmed the pre-release apprehensions of the risks it poses to other insects. Limited attack on an indigenous weevil has been recorded (Goldson *et al*, 1994).

5. EIGHTEEN YEARS OF RABBIT MANAGEMENT: SIGNPOSTS TO THE ILLEGAL INTRODUCTION

Most members of society uphold laws that they consider to be fair and just (Tyler, 1990). Biosecurity laws are particularly dependent on public acceptance of their fairness and value; in essence they have to be self policing. Yet recent events show that many members of normally law-abiding rural communities received and spread the illegal RCD virus before it was discovered by Government agencies. Why did they do this? Factors leading to the reasons why had a long gestation.

Could it happen again, given a similar set of circumstances? I believe it could, if the necessary information and skills were in the hands of major beneficiaries.

The argument about rabbit control has passed through two main phases. The first was a shift in the legislative responsibility for, and costs of, rabbit control from (primarily) central government to (almost totally) local government and landholders. The second was a rising expectation by landholders that biological control was considered a necessary and acceptable option by Government, research providers and decision-making agencies. Government encouraged an RCD applicant group to be formed and to develop an application to import and release RCD.

Figure 1 outlines the most important milestones in these two streams of change that together increased the perceived need and desire for bio-controls against rabbits, and the perception of their acceptability to government agencies.

5.1 Changing responsibilities and trends in costs of rabbit control

From 1948 to the late 1970s, 50-85 percent of national rabbit control costs were being met by government grants (Williams, 1993c). In 1979, Cabinet directed a review of the current state of vertebrate pest management (primarily possums and rabbits) as delivered by pest destruction boards. As a result, funding was capped at $7 million for the next three years. In 1983 a more substantive review was commissioned by the Minister of Agriculture (Agricultural Pest Destruction Review Committee, 1983). The review concluded that there was no justification for subsidising the control of one specific agricultural pest, the rabbit. The review considered that the cost of rabbit control was a normal farm business expense and should therefore be met by the farm business. The phasing out of all subsidies over 10 years was recommended and adopted by Government.

In 1989, the reorganisation of local government overtook all previous policies on pest management. The Agricultural Pest Destruction Council and all local pest boards were abolished (Local Government Amendment Act, No. 2, 1989). All grants for pest control ended with the exception of those related to Tb-possum

management and the Rabbit and Land Management Programme (R&LMP) (Rabbit and Land Management Task Force 1988; Williams, 1993c). The R&LMP ended in June 1995, and with it, all grants for rabbit control. It concluded 47 years of substantive government investment in rabbit control (Taylor Baines, 1996). Thus, between 1979 and 1989, funding for rabbit control was phased out over most of New Zealand, in line with the general policy of removal of Government support from many sectors of the economy. Support was sustained in the worst-affected areas for another 5-6 years, via an integrated rabbit land management programme (Rabbit and Land Management Task Force, 1988).

At the same time, the primary legislative responsibility and accountability for pest destruction shifted to local government ie, regional councils. Most councils initiated policies which ensured that all control costs were met by the beneficiaries - landholders - while the councils retained responsibility for surveillance of infestation levels. For lands at high risk of rabbit infestation, these changes carried significant increases in rabbit control costs. In most cases these were additional to other costs that had flowed through to New Zealand farmers as a result of the extensive restructuring of the economy since 1984, plus fluctuations in world prices for primary products. As a result, in 1991/92 some 72 percent of properties in severely rabbit-infested areas were running cash deficits; on 33 percent of farms debt servicing exceeded 25 percent of gross income; and 28 percent of farms were no longer financially viable (Saunders, 1992). During this period all sectors of the economy were being exhorted to increase efficiency and to be more cost-effective. However, costs of rabbit control by traditional methods remained high in the mid 1990s, even when carried out by landholders using new poison compounds such as Pindone.

The ultimate expression of all these changes and pressures was that the demand for more cost-effective controls for rabbits, including biological control, was high in most parts of New Zealand that require regular rabbit control. This demand was being expressed not only by landholders but also by those regional councils which recognised the risks that rabbit control failures represented both to their ratepayers and to the council in regard to their responsibilities under the Biosecurity Act 1993.

In summary, there were two big shifts in the organisation of rabbit control over little more than a decade: one of control costs from central government to landholder; and the other of legislative accountability (and fiscal risk) from central to local government. Both were substantive “drivers” for more cost-effective control methods. They were reinforced by the whole trend of government reform towards improving efficiency, and by the globalisation of the New Zealand economy, that developed during the 1980s and 90s.

5.2 Biological control expectations

The 1979 decision to cap Government’s funding of pest destruction, followed by the 1983 decision to phase out all tax-based funding, triggered two applications (1985, 1992) to import the myxoma virus and the European rabbit flea required to

transmit it (see Figure 1). Each application was followed by an environmental impact report and audit (Bamford and Hill 1985; PCE 1987) or by departmental assessment (1992/93) of the risks and benefits of biological control using the myxomatosis disease. These evaluations concluded that:

- more cost-effective controls were required, particularly for the worst-affected areas;
- myxomatosis could be expected to be effective for many years;
- it would be affordable;
- the alternative of doing nothing to improve the management of rabbits on areas of high infestation was not acceptable.

Nevertheless, the assessments recommended against the introduction of myxomatosis, for a variety of reasons but principally:

- the high level of public opposition to the release of a disease perceived to be cruel; and
- the potential for the vector, the European rabbit flea, to affect native species (though not to breed on them).

In 1991/92, in association with the R&LMP, the then Ministry of Agriculture and Fisheries began investing in the Australian programme to develop the Rabbit Haemorrhagic Virus Disease (RHVD), later also called Rabbit Calicivirus Disease (RCD) as a bio-control. A formal contract was developed in 1992 by the Australian lead agency, the Meat Research Council, ensuring New Zealand rights to all research results (Anon, 1992). This programme was run under the stewardship of two Australasian Councils: the Australian and New Zealand Environment and Conservation Council (ANZECC) and the Agricultural Resource Management Council of Australia and New Zealand (ARMCANZ). New Zealand had recently become a full member of these councils and was represented on them by the current Ministers for Environment, Conservation and Agriculture. There was extensive interaction between the stakeholders (science, government at all levels, government agencies and landholders) in both countries via workshops and science symposia (eg Munro and Williams, 1994).

In mid 1993, the Government declined a second application to import the myxoma virus and European rabbit flea in favour of further investment ($1 million over three years) in RCD research. The urgent need to find an effective bio-control for rabbits was again acknowledged. Additional funding was provided for ongoing investment in the Australian partnership, and also in New Zealand research on rabbit predator/prey relationships, plus other aspects such as cost-benefit analyses. Government funding for RCD bio-control developmental research, via MAF, was maintained until the application to import was lodged in mid 1996, and (so far) has been sustained since the illegal importation.

What emerges from a review of the myxoma applications, and the investment in RCD and associated biological control research needs, is that there has been growing acknowledgment by Government, that a biological control is desirable,

plus an apparent willingness to invest in its development (Figure 1). Farmer expectations that RCD would eventually be released were encouraged by the fact that Government commitment was at top Ministerial levels, by the duration of Government's investment in RCD development (over six years), and by research data that indicated the virus was species specific and considered relatively humane by animal welfare interests. These expectations further increased with the discovery on 10 October 1995 of the accidental escape of RCD from the Wardang Island (South Australia) quarantine station and the major effect of this on Australia's mainland rabbit numbers, and the additional testing of the effects of RCD on New Zealand wildlife.

5.3 Landholder perceptions by mid 1997

By mid 1997, the landholders who could most benefit from a rabbit bio-control programme were:

- carrying the full cost of rabbit control using the best available conventional methods efficiently applied;
- well aware of the frequent acknowledgment by Government ministers of the need for more cost effective controls, particularly biological controls;
- witness to over six years of substantial investment in research on RCD, and very well informed of the results;
- convinced that the application to release RCD in New Zealand was considered to be one of the most exhaustive prepared for the importation of any organism into New Zealand; and
- feeling that, in their struggle with the rabbit, they had been abandoned by governments (with the exception of research on RCD) and by a largely urban public who were becoming increasingly risk averse to the introduction of new organisms.

There was a high level of perception by landholders of the need for bio-controls, and official support indicated by research investment. Landholders also believed that they had a good appreciation of the virus risk/benefit data (to other species and New Zealand ecosystems). These beliefs were clearly "primers" to the eventual illegal importation. An additional, possibly important, factor was the opening up of provincial airports, with rudimentary biosecurity capabilities, to trans-Tasman flights, thus providing a lower risk importation route.

In summary, the “climate of expectation” in the farming community, which was a precursor to the illegal act, developed over a long period. A series of funding policy changes, plus “signals” from Ministers, officials and research funders clearly favouring bio-controls, all greatly increased the probability that a “no” decision, or a pre-signalling of it, would not be respected. In seeking an explanation as to why the people involved took this attitude, it is necessary to have some appreciation of why people choose to obey (or disobey) the law. (see Chapter 7.3). It is central to understanding how the same scenario might recur in the future, which in turn underlines the fragilities of our biosecurity laws.

6. THE RCD DECISION

On 2 July 1997, Dr P J O'Hara, Deputy Director-General of Agriculture, released his decision on the application to import RCD (O'Hara, 1997). The decision focused on seven areas of potential risk to New Zealand ecosystems. Four of them related to the perceived danger to other species and ecosystems, while three pertained to the likely efficacy of RCD in New Zealand and the organisational capability of the applicant agencies.

The four that related to species and ecosystems, described by Dr O'Hara as *issues (that) stood out above the others in terms of level of interest*, were:

1. *the risk of RCD to humans;*
2. *the risk of RCD to species other than the rabbit;*
3. *the potential of the RCD virus to mutate and initiate an adverse epidemiological event;*
4. *the risk associated with prey switching by rabbit predators and the potential for change in predator guilds.*

Dr O'Hara concluded, on the basis of the Ministry's assessment of hazards and risks in these areas, that *these issues would not in themselves be the reasons for not permitting the importation of the RCD virus*. He then specified the three principal reasons for deciding not to permit the introduction of the virus. These were:

1. *the poor understanding of the epidemiology of the RCD virus and the disease it produces;*
2. *the significant uncertainty as to the likely effectiveness of the virus as a bio-control agent (as proposed by the Applicant Group) or even to act cost-effectively as a biocidal agent;*
3. *the inadequacy of the biological control management programme proposed by the Applicant Group to deal with the uncertainties and risks which are now apparent, and the legal basis for management of the virus.*

As noted in Chapter1, it is not the intention of this analysis to challenge the decision per se, but to consider it in terms of its implications for future decisions on the introduction of bio-controls. The components of Dr O'Hara's decision, ie the reasons for the "no", had no influence on the community decision to illegally import if that community decision had already been taken on the anticipation, or pre-signalling, of a "no".

The most fundamental aspect of the Director-General's decision is that it involved two clearly different considerations: one that focused on the risks of RCD to ecosystems and other species; and one that examined its potential efficacy as a biological control agent and the organisational arrangements proposed for its management. Allowing the second consideration to tip the balance against the application to import appears to represent a significant departure from past precedent-making decisions on importing biological controls.

Past decisions, as outlined in Chapter 4, specifically acknowledged that the level of pest population control to be expected after release was highly unpredictable. No past decisions appear to have questioned the organisational capabilities of the applicants, and demonstration of this was not a specified requirement within the application guidelines. Previous applications had mostly focused on the risks the proposed control agent might pose to other species or to the ecosystem as a whole.

This shift in focus of the decision-making "frame of reference" is significant for two reasons. Firstly, it has the potential to generate public perceptions that the decision-making framework is unfair, since different criteria were apparently applied to RCD compared with other bio-controls.

Secondly, the inclusion of a judgement on the potential efficacy of the control agent has the potential (in a cost-benefit framework) to influence the assessed level of hazard to humans, or other species. If the potential efficacy of an agent were high, this could influence the process of assessment of risks of the organism to the wider environment. In other words, an efficacious bio-control that could directly affect humans could be assessed as **less** dangerous than it possibly is, or **less** dangerous than the general public may perceive it to be.

Because the result of a decision to release a bio-control agent is usually irreversible (ie once released and established it cannot be eradicated), it is critical that the decision-makers focus on whether the new organism is likely to have a significant negative effect on any component of New Zealand's ecosystems. In the case of predators of insects and weeds, the potential impacts on New Zealand's indigenous biodiversity become an important area of risk assessment. This is a matter distinctly different from the assessment of whether or not the agent can contribute to the sustainable management of a particular ecosystem, such as agriculture, forestry or conservation. Long-term secondary damage is a disadvantage; reduction of pest populations is an advantage. For biological controls, it is critical that the **disadvantage** risks be very rigorously assessed. It is also essential that the **disadvantage** risk threshold is not significantly influenced by evidence of, or perceptions of, the efficacy of a particular agent. In Resource Management Act 1991 terms, another way of approaching this, is that while the Act seeks to promote "sustainable management", the primary mechanism it uses to do this is to avoid, remedy or mitigate adverse effects. Extremely high efficacy does not, in the case of biological controls, warrant lowering the fundamental environmental damage threshold. Neither does low efficacy warrant raising that threshold. However, this is precisely what the RCD decision-making process appears to have done. By concluding that the health and welfare of humans and other species in New Zealand would not be threatened by the introduction of this virus, and then declining the application on the basis of efficacy and organisational capability, the scene would now appear to be set for fundamental environmental risk thresholds to be compromised in the future. It is essential that future decision-makers clearly acknowledge the independence of two clearly different areas of assessment: one relating to the hazards the agent poses to other species or ecosystems; the other its efficacy as a bio-control agent.

7. THE WIDER SOCIO-POLITICAL CONTEXT

The discussion so far has focused on historical, technical and legislative matters, and the interests of landholders, the major potential beneficiaries of rabbit calicivirus disease (RCD). Any real understanding of why the RCD bio-control development effort ended the way it did, requires appreciation of many other aspects of the wider social and political context of the final decision. Some of these are briefly outlined below. A more detailed consideration is needed for a fuller appreciation of the implications of RCD development for New Zealand's biosecurity integrity.

7.1 Public perceptions of risk

Social science research on risk and hazards has identified a range of issues, including the differences between the perceptions of lay people and experts; the analysis of uncertainty; risk communication; and management of risk. In the fields of engineering, medicine and nuclear energy, perceptions of risk have been extensively researched. These perspectives are particularly relevant to understanding public attitudes to biological controls for animal pests. In general, risk perception involves *people's beliefs, attitudes, judgements and feelings, as well as the wider social or cultural values and dispositions that people adopt towards hazards* (Pidgeon *et al*, 1992, p 89). *Essentially a hazard is a situation or event that presents a "threat" to people and what they value* (Kates and Kasperson, 1983). *All risk assessments (ie the weighing up of the likelihood or potential impact of a hazard), whether done by the public on the basis of attitudes or values, or by experts on the basis of mathematics of probability, involve some subjectivity*. (Fischhoff, 1989).

Two key factors describe lay people's ratings of risk: the "dread factor", and the "unknown factor" (Slovic *et al*, 1980). The "dread factor" is a combination of:

- the perceived controllability of the risk;
- the extent of the fear it evokes;
- the frequency of the fatal impact;
- the extent of personal equity in the distribution of the risk;
- the extent to which the risk extends to future generations;
- how far the risk can be reduced;
- the increased risks to life in general;
- the degree to which exposure is voluntary; and
- the extent of effect on the individual (ie the severity of the hazard).

The “unknown factor” is a combination of:

- the perceived degree to which the hazard can be observed;
- the familiarity of the hazard to those exposed;
- the delay in time between exposure and impact;
- scientific familiarity/knowledge about the hazard; and
- the novelty of the hazard.

One of the issues central to the RCD debate is the degree of risk, especially technology involving a perceived hazard (a virus) which is closely related to dread. Chess *et al*, (1989) have shown that dread increases when:

- exposure to the hazard is involuntary rather than voluntary;
- the hazard is under the control of an external body, eg Government (rather than under the control of the individual or community);
- the risks are seen to be inequitable (ie unequal sharing of benefits, versus equal sharing of costs and risks);
- the risks are not balanced by benefits;
- risk information is seen to come from untrustworthy or doubtful sources;
- the hazard arises from man-made rather than natural sources;
- the hazard is considered to be ethically objectionable or challenging;
- the hazard is exotic or novel rather than familiar (eg those associated with driving cars); or
- the hazards can be associated with some other memorable event (such as a disaster or public problem).

The possibility of public concern about the risks of a particular procedure increases with the number and severity of these factors, regardless of the scientific data/information available about them. An example of such a situation is the persistent public fear of 1080 contamination of drinking water. Despite extensive research over several decades, the fear persists, even though little contamination has been documented and the hazards to human health or other species are very low. (Parfitt *et al*, 1994). A similar situation has emerged in relation to public concern regarding cellphone towers near schools (PCE, 1996).

People’s perceptions of risk are socially constructed; therefore these perceptions should be considered in their social and cultural context. People think about risks with reference to their significance to other individuals or groups, and receive information about hazards through various communication “channels”. These include the media, groups of activists, agencies, politicians, friends and families - all of which ‘amplify’ or interpret messages about hazards (Kasperson *et al*, 1988). These areas of specific concern are also responsible for generating

secondary impacts or "ripples" from the initial impact out to a whole industry, other technologies or even a whole field of endeavour (Slovic, 1987).

Public reactions to the proposed introduction of the myxoma virus, to RCD, and to the use of 1080, show the effect of social amplification on risk perception. The New Zealand public's anxieties about introducing the myxoma virus and its flea vector involved both "dread" and "unknown" risk factors. Dread was present in concerns over the mutation of both the myxoma and RCD viruses which might affect humans and other species in unknown ways in the future; over the irreversibility and uncontrollability of the diseases, once introduced; and over the equity (or lack of it) of the distribution of the risks and benefits within society.

Social amplification effects have been evident in the public debates over the use of 1080 for possum and rabbit control, and in the emergence of the anti-1080 lobby groups in New Zealand. There was already a broad concern in society about environmental toxins, and the public reaction to the proposal to introduce the myxoma virus further directly shaped the social environment within which the RCD debate has been conducted. Media coverage of the escape of RCD from its quarantine island test site in Australia, and highly publicised comment by American virologists (Smith, 1995 and 1998; and Smith and Matson, 1995), also amplified the general public's perception of the risks of releasing viral controls, while casting doubt on the credibility of scientists and government agencies directly involved in developing a proposal for an official New Zealand release.

Public perceptions of pests and pest control methods have not been studied extensively in Australia and New Zealand but three studies have provided some clues relevant to current and future control methods (Sheppard and Urquhart, 1991; Fitzgerald *et al*, 1994; Anon, 1995). Sheppard and Urquhart surveyed a thousand New Zealanders by telephone. Rabbits, possums and wasps were considered to be serious or very serious pests by 93 percent, 90 percent and 80 percent respectively of the respondents. Shooting, disease and 1080 were considered to be suitable or very suitable controls for rabbits by 68 percent, 46 percent and 45 percent respectively. Commercial harvesting at 74 percent was most favoured, indicating a preference for programmes that derive a benefit from a control operation. Men and women of different age groups held sharply different opinions about pest control. Women appeared more concerned about new biological controls than men: 43 percent of women and 49 percent of men favoured introductions.

Fitzgerald's research, three years later, involving telephone and focused study group work, produced similar results. Rabbits were considered harmful by 75 percent of respondents; doing nothing about rabbits was not acceptable to this group. Trapping and shooting were the most acceptable controls (83 percent and 65 percent respectively). The introduction of RCD to New Zealand was supported by 51 percent, but further analysis of responses ("yes", "no" and "depends" categories) revealed ethical and moral concerns about new organisms, and distrust of scientists and decision-making agencies. This survey indicated that approximately 60 percent of New Zealand's population might have ultimately rejected the official release of RCD, even with further information about the organism.

A Roy Morgan survey in 1995 (Anon, 1995) revealed differences in attitude to rabbits between countries. Australians considered a virus that causes infertility most acceptable and poisoning the least. New Zealanders favoured shooting/hunting the most and myxomatosis the least. When prompted, 60 percent of Australians and 50 percent of New Zealanders considered that RCD may be an acceptable control agent. Young people and women were the least accepting of RCD. There was little difference between countries in views on rabbits as a pest: 86 percent of Australians and 88 percent of New Zealanders thought it important to reduce rabbit numbers.

Overall, these studies revealed widespread understanding of the need to control rabbit populations, and considerable variation in acceptability of current and future controls. Most importantly, the studies also showed some strong ethical and moral concerns which, when linked to distrust of science and government, clearly indicated that it was going to be difficult to get a balanced debate on the potential risks and benefits of RCD if and when an official release was formally proposed.

The RCD debate ultimately polarised into two distinct arenas: one pertaining to the perception of risks that rabbits posed to New Zealand's natural and managed ecosystems (and perceptions of who bore those risks); and the other focused on the risks and benefits of RCD. The applicant group clearly saw the risks posed by rabbits to their livelihoods and farming ecosystems as considerable, while many of those expressing concerns regarding RCD perceived that rabbits did not constitute a major ecological or business risk, or that there were other means to deal with rabbits as pests. In contrast, the risks that RCD would have undesirable effects, as perceived by the beneficiaries of the proposed introduction, were viewed as acceptable, presumably on the basis of the research that had been carried out and the apparent widespread support for biological control in science and government. Further information about the relative acceptability of the risks of RCD having unwanted impacts was conveyed in the way Dr O'Hara structured his final decision. In the national context he conveyed the message that the risks were acceptable, while at the local operational/efficacy level the risks were deemed unacceptable. Given that the virus was apparently in New Zealand before the final decision was announced, the "messages" in Dr O'Hara's two-part decision would have played no part in the decision to illegally import. However, they may have set a precedent for the future.

Groups and individuals concerned about the introduction focused on what was **not** known rather than what was known about RCD, and in particular on perceived inadequacies in the whole process of assessing the application to introduce RCD to New Zealand. Their scenario of risk was further strengthened by the contribution of international scientists, who expressed concerns about the long-term safety of the virus as a biological control. They appeared to be strongly influenced by the "unknown" risk factors as characterised by Slovic (Slovic *et al*, 1980), plus such factors as the feeling that the risks were seen to be inequitable; that the risks were not being balanced by the benefits; that exposure to the risks of RCD would be involuntary rather than voluntary; that the risks were under the control of an external body (the Ministry of Agriculture) rather than of the individual or community concerned; and finally, that information about the risks,

provided by the applicants in good faith, and government agencies, was perceived to come from untrustworthy or doubtful sources.

Full appreciation of the multitude of factors generating the RCD "perception of risks profile" ultimately requires an understanding of how New Zealanders consider other similar science developments, and the results of science in general. A 1993 International Bioethics Survey (Macer and Bezar, 1995) provides additional insights. In ten countries (including Australia and New Zealand) attitudes to the release and consumption of new organisms were surveyed across the general public and university and high school teachers. In all ten countries, over 75 percent agreed that science makes an important contribution to the quality of life; in Australia and New Zealand over 90 percent agreed. Highly worthwhile areas of science were considered to include: computers (89 percent); biotechnology (70 percent); pesticides (67 percent); *in vitro* fertilisation (66 percent), and genetic engineering (63 percent).

While the mean level of public support for biotechnology was 70 percent, there were big differences between countries: 90 percent in Thailand, 59 percent in Australia and 46 percent in New Zealand. Of particular significance was the fact that 20 percent of New Zealanders had never heard of biotechnology, compared with only 6 percent in Japan. This is a significant level of ignorance, given the composition of the survey sample. Ignorance creates a very fertile basis for perceptions of risk being based on the "unknown factor".

The survey found strong negative attitudes to genetic engineering amongst Australians and New Zealanders. The perception of significant risk (very worried) was higher in New Zealand (39 percent) and Australia (34 percent) than in Japan (15 percent) and Thailand (7 percent).

Perceptions of the value or appropriateness of the proposed use for new organisms are of particular relevance to understanding the public opposition to RCD. The Bioethics Survey revealed that the highest level of support was for bacteria to clean oil spills, and for maintaining disease-resistant crops. There was less support for genetic manipulations to increase cows' milk production, and very little support for larger sporting fish.

From this research it is evident that there is a spectrum of cultural differences in perceptions of the hazards associated with the introduction of new organisms, with New Zealanders appearing to be fairly risk-averse. There is increasing demand for elimination of "unknown risks", which in the RCD case led to a very protracted decision-making process that ultimately did not meet the expectations of any of the stakeholders! In addition, the degree of hazard is clearly judged in terms of "relevance", or overall benefit to society. This factor appears to be an important element fuelling opposition to RCD. Will future bio-controls for possums, now attracting considerable research investment (Lynch, 1998), be perceived to be more relevant, and therefore more acceptable to society?

In summary then, the public perception of the risks relating to the introduction of RCD ended up being highly polarised between those interested in its introduction and those opposing it. Conservation, environmental and science proponents were represented on both sides of the debate. In the middle between these polarised positions was the decision-maker, MAF; it was in a no-win "location". To make

matters worse, MAF was probably suffering a diminution of trust, by both public and landowners, to make an "environmentally correct" decision. Trust is now recognised as an important aspect of risk perception (Slovic, 1987), (and see Chapter 7.2 below). Pervasive distrust, as Slovic points out, has also been shown to be strongly linked both to the perception that risks are unacceptably high and to political activism to reduce them.

In the case of RCD, those objecting to the introduction, and those formally involved in the application to introduce RCD, did not become involved in overt political activism. However, the beneficiaries, the landholders, certainly did, with their illegal introduction of the virus. It is important to note that the RCD Applicant Group, while clearly not agreeing with MAF's decision, did not support the illegal introduction; in fact, the group condemned it and accurately predicted the consequences of some initial RCD distribution practices.

7.2 Matters of trust and decision making

Paul Slovic, a leader in risk research, noted that *another important aspect of the risk perception-problem has come to be recognised. This is the role of trust* (Slovic, 1987). In recent years there have been numerous articles and surveys pointing out the importance of trust in effective risk management of the environment (and in other areas), documenting the extreme distrust we now have in many of the individuals, industries and institutions responsible for risk management. This distrust has been heightened in recent years by matters such as the BSE-CJD* public health debate in the United Kingdom and ongoing revelations that government Ministers, officials and scientists knew there was a public health risk attached to BSE but did not disclose the full extent of the risk (Pearce, 1996).

In New Zealand, MAF's assessments of BSE risks associated with livestock ova importations have not been supported by some sections of the farming community. They considered MAF was taking too cautious an approach given the scientific evidence; trust in their decisions declined.

A recent British study (Marris and Langford, 1996) revealed that people reserve their greatest trust for family and friends (over 80 percent). Environmental groups (79 percent), doctors (75 percent) and scientists (60 percent) were next in the trust league. In sharp contrast, government, companies and the media were trusted by only 8, 12 and 16 percent respectively of those surveyed.

In the context of biotechnology and bio-control in New Zealand the matter of who is trusted by individuals and communities will be crucial to the future development of sustainable management of our ecosystems. While the Marris and

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* BSE: Bovine Spongiform Encephalopathy;

CJD: Creutzfeld/Jakob Disease.

Langford study and Consensus Conferencing (The Danish Board of Technology, 1992) have shown that being better informed is an important element of realistic risk perception, equally important is the matter of who provides the information and hence what information can be trusted.

By mid 1995, the need to ensure a wider understanding of risks and benefits was recognised by a number of stakeholders in the RCD development arena. As a consequence a group was formed (the Rabbit Bio-control Advisory Group [RBAG]) to advise the chief executives of the Ministries of Agriculture, Conservation, Environment, and Research Science and Technology, on research, communication and other matters relating to RCD as a possible bio-control for rabbits. The group included representatives of local and central government, environmental NGOs, animal welfare, farming, veterinary services, research, tangata whenua and animal health production. While not representative of the wider society of New Zealand, it did give a voice to a spectrum of individuals with opinions ranging from those who perceived the rabbit itself to be the worst risk to the New Zealand community to those whose concerns focused on RCD and the risks it posed.

In an effort to ensure an informed debate on the risks and benefits of RCD, at least in the context of sustainable management, RBAG produced a comprehensive information kit in May 1996 (RBAG, 1996). The kit was provided to all secondary schools, public and university libraries, local government offices, media interests and community agencies. Over 3000 copies were ultimately distributed. Two years later copies are still being requested, presumably because of the paucity of alternative accessible, comprehensive material on the various dimensions of the debate on RCD, rabbit control and sustainable management in general. The most comprehensive compilation of material in this field, however, was undoubtedly the official application to import RCD. However, it was not widely available.

The key question is: “what effect did this effort to improve understanding of risks and benefits have on the final outcome: that is, on the concerns expressed to MAF via submissions on the application; on MAF’s decision; and on the illegal importation?” The probable answer has to be “very little”, with the possible exception that it may have provided some of the information that enabled landholders to make their own assessments of the risks and benefits of an RCD introduction, and so choose to become involved in an illegal introduction and subsequent distribution.

Why would I conclude that the information campaign had so little effect? Primarily because I believe that most of those individuals and groups expressing major concerns about the introduction did not trust the RBAG, or did not accept that rabbits posed an ecological threat greater than that posed by RCD. RBAG was simply seen as an instrument of Government, and Government was perceived to favour the introduction. The irony of this interpretation is that Government, via the four Ministries involved, was a very reluctant investor in this effort to improve community understanding of the risks and benefits. The total investment was minimal. The Government’s reluctance to be an information provider was not due to any appreciation of the degrees of public acceptance of information perceived to be from government sources; rather it was based on the view that this was not

Government's role. But that raises the question: "If it is not Government's role, whose role is it? Who can provide adequate information on complex matters of science, risks and benefits, and be trusted?" If provision of information is left solely to future applicants seeking to release or introduce new organisms, as required by current legislation, the research on trust indicates it will not be accepted. Does this suggest the need in New Zealand for some organisation "at arm's length" (from Government) which has the role of advancing understanding of complex matters of technology, ethics, risks and benefits? Can the Environmental Risk Management Authority (ERMA), as currently mandated, fill this role? Probably not, I suspect, given its relationship to Government and the level of its funding for "educative roles". However, when decisions are finally made by ERMA, or a Minister if a decision is called in, it is essential that all interested parties are able to judge it as fair and reasonable, even if the decision is not totally acceptable to all parties. Ensuring a wider ownership of future decisions, increased trust in those making them, and a greater sense of fairness is essential for the future of biosecurity in New Zealand.

7.3 Why people obey the law

Earlier sections of this review outlined the background factors that contributed to the illegal importation of RCD. However, the most important question that must be asked in the RCD saga is: Why did a normally law-abiding group of citizens finally break the law, widely supported by their peers? Was it a "one-off" event, a matter of intense frustration, huge economic pressures, and the ease with which RCD could be obtained and brought into New Zealand with little risk of being caught? Or does this breach represent some fundamental shift in attitude to biosecurity laws, a product of a diminution of trust in decision-makers? These questions will not be easy to answer because of the complexities associated with the consequences of breaches: that is, who or what will be affected, or who will even know? There are probably regular breaches of biosecurity in the form of seed and plant introductions. Most go undetected and attract little attention unless they, sometimes decades later, become noxious weeds.

Tyler (1990) outlines the two main attitudes to compliance, the instrumental perspective and the normative perspective, in a book primarily devoted to examining the latter.

The instrumental perspective considers the extent to which people shape their behaviour by responding to changes in the tangible, immediate incentives and penalties associated with obeying (or refusing to obey) the law. When policy makers think about how to obtain compliance, they often adopt implicitly an instrumental approach (Tyler, 1990, p 3). For example, fines or other penalties are set.

The normative perspective relates to people's internalised norms of justice and obligation. It explores what citizens think and tries to understand their values. By contrast, an instrumental perspective regards compliance as a form of behaviour that can be knowingly induced in response to external factors (Tyler, 1990). Penalties can, of course, lead to change in behaviours which become new societal

norms. For example, the targeting of drinking and driving has led to driving while intoxicated being less socially acceptable.

As Martin (1998) has noted, the RCD saga may have shifted the balance between these two attitudes to New Zealand biosecurity law. To date, biosecurity has been primarily dependent on normative behaviour based on the accepted legitimacy of the decision-maker and perceived fairness of the national-level decisions, even when they were not the outcome desired by certain groups, as in the case of the myxoma virus. Does the illegal RCD introduction denote a shift to the instrumental perspective, a judgement about the risk of being caught?

The success of biosecurity laws in New Zealand to date seems to have been the product of widespread acceptance of their value and the fairness of their administration. Researchers have found that people are almost always able to judge whether a procedure is fair or unfair, just as they can almost always intuitively judge outcomes. Thus, people have well-established frameworks for making judgements about justice (Tyler, 1990, p 168). The question now is whether the illegal RCD introduction represents an adjustment of these "frameworks", thus forcing New Zealand authorities to rely, for biosecurity, more on enforcement and punitive penalties. For organisms such as RCD, the probability that a deterrent approach will discourage future illegal importations/releases is relatively low. Despite this, penalties under the Hazardous Substances and New Organisms (HSNO) Act 1997 were substantially increased. This implies a belief in the validity of the instrumental approach to biosecurity law enforcement; a belief that may now require serious re-examination.

This very limited discussion of why people obey the law suggests some reasons why the official RCD decision or, more probably, advance signalling of it, created the right social conditions for a community decision for an illegal importation. One element influencing the beneficiary group (the farmers in the worst-affected rabbit-prone areas) was, no doubt, the very protracted assessment process in which MAF appeared to be having considerable difficulty evaluating the scientific evidence and providing acceptable information to an increasingly sceptical public. They therefore no longer respected the competency of the decision-maker, MAF and reached what they believed to be a rational decision, given all the circumstances generated by a multitude of government policy and economic "drivers". The really important question now is whether future beneficiaries to an introduction will recognise the legitimacy of ERMA decisions in any future comparable circumstance.

7.4 Implications for decision making under HSNO

The RCD saga is acknowledged as having implications for decision making under HSNO. The Minister of Biosecurity's Biosecurity Council has announced (May 1998) that it will investigate the "lessons" of the RCD application, reporting in

December 1998 (Helstrom, 1998). I do not wish to attempt a detailed analysis of the implications for HSNO, but believe it is appropriate to correlate the matters outlined above with some aspects of the HSNO Act 1997.

The purpose of the HSNO Act is "to protect the environment, and the health and safety of people and communities, by preventing or managing the adverse effects of hazardous substances and new organisms" (s 4). The purpose statement of the Act does not specify the degree of risk averseness to be adopted by decision-makers. In theory it gives equal weight to environmental and economic principles, stating that, to achieve the purpose of the Act "All persons exercising functions, powers and duties under the Act shall, to achieve the purpose of the Act, recognise and provide for the following principles: (a) the safeguarding of the life-supporting capacity of air, water, social and ecosystems; (b) the maintenance and enhancement of the capacity of people and communities to provide for their own economic, social and cultural well-being and for the reasonably foreseeable needs of future generations"(s 5).

The Act therefore suggests two important things. First, that there can be variation in the degree of risk considered acceptable by the decision-maker. This is a questionable attribute of the legislation if it allows a decision to be significantly influenced by costs and benefits to the extent that it influences the rigours of assessment of environmental risks as noted in Chapter 6 above. Secondly, the requirement to enhance the capacity of people and communities to provide for their economic, social and cultural well-being is presumably supposed to enable them to manage the costs of sustaining their ecosystems against such agents as pests. This second decision criterion could be construed to indicate that decisions relating to the efficacy of a biological control agent (or indeed any control agent) should primarily be the prerogative of the beneficiaries of that agent, rather than the risk assessing agency. This implies that efficacy is a matter that should be excluded from the decision making process, given that efficacy is mostly a financial risk to the beneficiaries, product developers and research investors in the product or agent. It is of note that subsequent to the RCD decision in July 1997, MAF appears to have changed its policy in relation to efficacy matters. In a letter[6] of 8 October 1997, it was stated: *It is now MAF's policy that the risk of failure to the introduction is borne by the applicant. So long as there is a reasonable level of assurance that the proposed new species will not do harm to anything except the target species, the application will be approved.*

In the light of the RCD experience, and the history of predicting the efficacy of bio-controls, it seems appropriate that regulatory agencies such as ERMA should decide on safety matters and potential users should decide on the level of efficacy that is acceptable.

Another aspect of the new HSNO legislation which could have significance for biological control agents is that it requires the applicants to meet all costs of the importation and release of an agent, including consultation with all stakeholders. The implications of this are that (a) the potential beneficiaries must be identified

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[6] Memo to Barry O'Neil, Chief Veterinary Officer, MAF Regulatory Authority from Elizabeth Stoddard, Technical Advisory Officer (Animal Quarantine), 8 October 1997.

before the agent is released; (b) those beneficiaries are required to invest in the application and its full implementation long before any benefits are derived; and (c) the costs incurred in (a) and (b) may be high enough to increase the probability that some potential beneficiaries will bypass the whole assessment procedure and illegally import and/or release the organism.

The raising of capital for making applications for future biological control agents is a significantly different exercise to that of financing an application to import a hazardous substance (ie a pesticide) or a biological control that can be used as a biocide (ie a product that is applied and is not a self-sustaining control agent). In the case of these agents or compounds, the cost of the application can be met from capital that is then recouped via the sale of the product if approved. While there is always a risk that applications to import new organisms or hazardous substances will be declined, the differences in the capital risk profile of self sustaining bio-controls and marketable products has the potential to increase the risk of illegal importations of the former.

This brings up the question of whose role it is to ensure that members of society have enough background knowledge to contribute to informed debate on what are complex science issues, and who will be trusted to fulfil that role? (Chapter 7.2). There appears to be little evidence that the proponent for any given organism will be trusted, nor, possibly, any agency closely aligned with the Government. This indicates some challenges for ERMA, which has to create a decision-making environment in which fair and just decisions can be made in order to reduce the risk of illegal importations. At present all the pressures within the public policy development arena appear to be towards **fewer** avenues for the impartial provision of information to the wider society, higher costs for applications to introduce biological controls, and therefore <u>increased</u> risk of illegal importations.

8. FUTURE IMPERATIVES

Maintaining New Zealand's biosecurity in a highly competitive global economy, with a vigorous internal economy strongly focused on economic efficiency, presents an enormous challenge. Its importance is recognised in that our governance system includes a Minister of Biosecurity; a Biosecurity Council to advise the Minister; a special agency (ERMA) to make judgements on what should and should not be permitted to enter New Zealand; and a Biosecurity Act 1993 detailing responsibility for pests within our shores. Our biosecurity should therefore be assured. Unfortunately that is not the case.

I have endeavoured to illustrate that the illegal importation of RCD, a far-reaching biosecurity failure, was the product of a long gestation of a very complex array of interlocking sociological, economic, scientific, trust, and organisational matters. It was not an unexpected event; in fact it was highly predictable. However, it is one thing to predict an event or action and quite another to do something to avert it. From this limited analysis of the RCD saga, I suggest that prevention of future illegal importations will require, as a minimum, focus on:

- the degree and duration of stress being experienced by the main beneficiaries of the proposed introduction or release;
- the beneficiaries' perceptions of the risks and benefits of the proposed agent to themselves and to the wider society;
- the beneficiaries' perceptions of the acceptability of the proposed agent to decision-makers/influencers in society;
- the acceptability to the participants in the debate of the decision making framework (via which an agent is assessed) and the trustworthiness/representativeness of the decision-maker and those providing information on the agent/organism;
- the level of knowledge about the proposed agent, its implementation process, and accessibility of knowledge to any interested parties;
- the beliefs about the risks and consequences of being caught for illegally importing the desired agent - ie how much of a deterrent is provided by the law;
- the difficulty, or ease, with which the organism could be introduced;
- what other methods of control, and funding of control, are potentially available to the beneficiaries of a proposed introduction.

Only if such factors are well understood and appreciated, and systems developed to accommodate them, is there any hope of averting the illegal importation of future agents or plants where the anticipated benefits are high.

A much more thorough examination of the RCD story is needed, particularly with regard to the following questions: whether any irrevocable damage has been done to national and international perceptions of our biosecurity capabilities; whether

New Zealand has entered a new phase of normative or instrumental attitudes towards biosecurity laws; and how trust (and thus confidence) in decision-makers can be enhanced in the eyes of applicants and the wider public. There are also many other matters of detail that I believe need more critical examination.

Any more substantive search for "lessons" in the RCD saga should be preceded by a review of some of the definitive studies that have examined other policy "failures" or unexpected outcomes of policies. An example from 20 years ago, which provides some clues to the depth to which we should probe, is detailed in *The Swine Flu Affair: Decision Making on a Slippery Disease* (Neustadt and Fineberg, 1978). This excellent investigation unravels the deficiencies in decision making associated with a failed or aborted plan to vaccinate most Americans against a feared outbreak of swine flu.

A more recent book *Understanding Policy Fiascos* (Bovens and 't Hart, 1996) examines the whole science of policy failure research and proposes a set of basic, interrelated principles for conducting a "fiasco" analysis. One of the five principles proposed is highly relevant to the RCD case. Identified as *Taking context seriously*, the authors point out that:

> *..it is important to view policy fiascos and other complex policy ventures in their broader historical, ideological and institutional context. In this context much of the rationale of the problem definitions, strategies, and actions of the policy makers in question can be found. At the same time, we have seen throughout this book that these contextual factors are also essential to reach an understanding of how the outcomes of policies are subsequently perceived and judged in the political system as a whole.* (Bovens and 't Hart, 1996, p 150.)

New Zealand policy, science and political institutions must make a substantive effort to learn from the RCD saga. We simply cannot afford not to, given the biosecurity risks we face as a nation, and our investments in technologies for possum control and other potentially contentious technologies aimed at ensuring sustainable management of our production and conservation lands.

9. CONCLUSIONS

The conclusions to be drawn from this review of the policy and science history preceding the illegal importation of RCD are as follows:

1. The outcomes of decision making in a biosecurity arena involving so many actual and potential stakeholders will always be greatly influenced by history and context. Given the history and context, the illegal importation of RCD was highly predictable because:

    - the stresses on the family and business units (farms) that were the major potential beneficiaries had increased significantly over the preceding 18 years as the New Zealand economy globalised and all production costs, including pest control, had to be met by the farm business;
    - under current legislation, the responsibilities for minimising the impacts of rabbits on land had largely shifted to local government;
    - consumers were increasingly supporting greater use of bio-control agents for pest management via their demands for reduced use of pesticides;
    - there was a good knowledge of RCD in the farming community due to widespread dissemination of MAF-funded research results and Australian study tours;
    - Government was perceived to support bio-controls because of views expressed by Ministers in relation to earlier importation applications for the myxoma virus, and their willingness to invest in research on RCD and possum bio-control;
    - the long delay in reaching a decision, if not the final decision itself (which was pre-signalled), was perceived as being unfair and unjust.

2. The potential risks of a bio-control should be assessed on their own merits and should not be traded off against judgements of control efficacy.

3. Community acceptance of future bio-control agents necessitates public information and education sources that are trusted and independent of both proponents and agency decision-makers.

4 It is essential that a detailed investigation of the impact of this biosecurity failure, and factors generating it, be undertaken. For these reasons I strongly endorse the Biosecurity Council's review of RCD in New Zealand and urge that the terms of reference for the review take account of the matters raised in this review.

10. REFERENCES

Agricultural Pest Destruction Review Committee (1983): *Agricultural Pest Destruction:* Report of the Review Committee (the "James Report"). Ministry of Agriculture and Fisheries, Wellington, 55p.

Anon (1992): Agreement between the Ministry of Agriculture and Fisheries and CSIRO. *An assessment of the potential of rabbit haemorrhagic virus for the biological control of wild rabbits.* Ministry of Agriculture and Fisheries, Wellington, 15 June 1992, 50p.

Anon. (1995): *Rabbit Problem Survey*. Roy Morgan Research, Collins Street, Melbourne. 5p.

Bamford, J and Hill, J (1985): *Environmental Impact Report on a Proposal to Introduce Myxomatosis as Another Means of Rabbit Control in New Zealand*. Government Print, NZ, Wellington. 112p.

Bovens, M and 't Hart, P (1996): *Understanding Policy Fiascos.* Transaction Publishers, New Brunswick, USA. 173p.

Cameron, P J (1994): "Classical biological control and sustainable land use". **In:** *Proceedings of the 43rd Annual Conference of the Entomological Society of New Zealand*. Compiled by O R Green. NZ Entomological Society. Auckland. pp 33-43.

Chess, C; Hance, B; Sandman, P (1989): *Improving Dialogue with Communities: A Short Guide for Government Risk Communication*. Environmental Research Program, New Jersey Agricultural Experiment Station, Rutgers University, New Brunswick.

Fischhoff, B (1989): "Risk: A guide to controversy". Appendix C **In**: *Improving Risk Communication.* National Academy Press, Washington DC.

Fitzgerald, G; Saunders, J and Wilkinson, R (1994): *Public Attitudes to the Biological Control of Rabbits in New Zealand*. Ministry of Agriculture Policy Technical Paper 96/3. 25p.

Goldson, S L; Phillips, C B; and Farrell, J A (1990): "A report on *Microctonus hyperodae* as a potential biological control agent of the Argentine stem weevil *Listronotus bonariensis* in New Zealand". Ministry of Agriculture and Fisheries. Lincoln.

Goldson, S L; McNeill, C B; Phillips, C B; and Proffitt, J R (1992): "Host specificity testing and suitability of the parasitoid *Microctonus hyperodae* as a biological control agent of *Listronotus bonariensis* in New Zealand". *Entomophaga* 37 (3), pp 483-498.

Goldson, S L; Barker, G M; Barratt, B I P; and Barlow, N D (1994): "Progress in the biological control of Argentine stem weevil and comment on its potential". *Proceedings of the NZ Grassland Association 56:* pp 39-42.

Helstrom, J (1998). *Biosecurity,* No. 3, April 1998.

Hill, R L; Willenberg, R and Goulay, A H, (1995): "Introduction of *Phytomyza vitalba* for control of old man's beard: An Import Impact Assessment". Landcare Research NZ, Lincoln. 29p.

Kasperson R E et al 1988: "The social amplification of risk: a conceptual framework". *Risk Analysis* 8, no 2, pp 177-187.

Kates, R and Kasperson, J (1983): *Comparative Risk Analysis of Technological Hazards*. Proceedings of National Academy of Science, USA. 80. pp 7027-7038.

Keys, M J R and Syret, P (1995): "Introduction of Heather Beetle *Lochmaea suturalis* into New Zealand for Biological Control of Heather *Calluna vulgaris"*. An Import Impact Assessment. Landcare Research NZ, Lincoln. 62p.

Livingstone, P S (1994): "The Use of 1080 in New Zealand": *Proceedings of the Science Workshop on 1080.* The Royal Society of New Zealand, Miscellaneous Series 28, pp 1-9.

Lynch, R (ed) (1998): *Biological Control of Possums*. Report of workshop sponsored by the National Science Strategy Committee for Possum and Bovine Tb Control: 21-23, April 1997. Miscellaneous Series 45. Royal Society of New Zealand, Wellington.

Macer, D R J and Bezar, H J (1995): "Public Attitudes to the Release and Consumption of New Organisms". *Asia Pacific Agri-Industry Community Conference Proceedings.*

Marris, L and Langford, I (1996): "No Cause for Alarm". *New Scientist*, September 1996. pp 36-39.

Martin, J (1998): "Rabbit Control, RCD: Dilemmas and Implications". *Proceedings NZ Association of Science*, Wellington, March 1998. 7p.

Ministry for the Environment (1996): *Environment 2010 Strategy: A Statement of the Government's Strategy on the Environment.* 63p.

Moller, H; Townsend, C R; Ragg, J R; and Bannister, P (1993): *Invasions and Environmental Impacts of New Organisms: Can they be predicted?* University of Otago, Dunedin.

Munro, R and Williams R (eds) (1994): *Rabbit Haemorrhagic Disease: Issues in Assessment for Biological Control*: 168p. Bureau of Resource Sciences, Canberra, 168p.

Neustadt, R E and Fineberg, H V (1978): *The Swine Flu Affair: Decision Making on a Slippery Disease*. US Department of Health, Education and Welfare. US Government Printing Office, Washington DC. 180p.

Norbury, G L; Norbury D C; and Heyward, R P (1998): "Behavioural responses of two predator species to sudden declines in primary prey". *Wildlife Management* 62, (1995) pp 45-58.

OECD (Organisation for Economic Cooperation and Development) (1996): *Environmental Performance Reviews, New Zealand*. OECD, Paris, France. 201p.

Ogle, G I. (1993*):* "Climate Variability: A Challenge to Wise Resource Use - A case study of Longslip Station". *Proceedings of the East Asia Pacific Mountainlands Symposium:* Lincoln University, May 1993. 19p.

O'Hara, P J (1997): *Decision on the application to approve the importation of rabbit calicivirus as a biological control agent for feral rabbits.* Ministry of Agriculture, Wellington. 34p.

Parfitt, R L; Eason, C T; Morgan, A J; Wright, G R and Burke, C M (1994). "The fate of sodium monofluroacetate (1080) in water". **In**: Seawright, A A and Eason, C T (eds). *Proceedings of the Science Workshop on 1080.* The Royal Society of New Zealand. Miscellaneous Series 28: 178p.

Parliamentary Commissioner for the Environment (1987): *Investigation of the proposal to introduce myxomatosis for rabbit control:* Parliamentary Commissioner for the Environment, Wellington, 112p.

Parliamentary Commissioner for the Environment, (1991): *Sustainable Land Use for the Dry Tussock Grasslands of the South Island*. Parliamentary Commissioner for the Environment, Wellington, 76p.

Parliamentary Commissioner for the Environment, (1994): *Possum Management in New Zealand.* Parliamentary Commissioner for the Environment, Wellington, 196p.

Parliamentary Commissioner for the Environment, (1996): *Public Authority Planning for Cellphone Transmission Facilities.* Parliamentary Commissioner for the Environment, September 1996. 31p.

Pearce F (1996): "Ministers hostile to advice on BSE" *New Scientist,* 30 March 1996.

Pidgeon, N; Hood, C; Jones, D; Turner, B; and Gibson, R (1992): "Risk Perception". **In:** *Risk: Analysis, Perception and Management. Report of a Royal Society Study Group.* The Royal Society, London, 201p.

Rabbit Biological Advisory Group (1996): *Information Kit, Rabbit Calicivirus Disease:* Special publication, Ministry of Agriculture. 46p.

Rabbit and Land Management Task Force (1988): *The Report of the Rabbit and Land Management Task Force to the Minister of Agriculture:* Rabbit and Land Management Task Force, Mosgiel. 88p, and appendices.

Robertshaw, J D; and Foran, B D, (1991): "Rabbit research in the South Island of New Zealand". *Proceedings of 9th Australian Vertebrate Pest Control Conference 9:* pp 115-119.

Saunders, L, (1992): *Rabbit and Land Management Programme - Economic Monitoring, March 1992.* R&LMP. Ministry of Agriculture and Fisheries special report.

Sheppard, R; and Urquhart, L (1991): *Attitudes to pests and pest control methods: Results of a sample survey of the New Zealand population in February 1991*.

Agribusiness and Economics Research Unit, Lincoln University, Canterbury research report, 20p.

Slovic, P (1987): *Trust, Emotion, Sex, Politics and Science: Surveying the Risk Assessment Battlefield*: The University of Chicago Legal Forum, pp 59-99.

Slovic, P; Fischhoff, B; and Lichtenstein, S (1980): "Facts and Fears: Understanding Perceived Risk". **In:** Schwing, R C and Albers, W A. *Societal Risk Assessment: How Safe is Safe Enough?* Plenum Press, New York.

Smith, A W (1995): *Australian epidemic could hint at longterm problem.* News, Oregon State University, News and Communication Services, Oregon. 2p.

Smith, A W (1998): "Calicivirus Models of Emerging and Zoonotic Diseases". *Proceedings, NZ Association of Scientists Conference: Rabbit Control, RCD: Dilemmas and Implications,* March 1998.

Smith, A W and Matson, D O (1995): Letter to Biological Control Authority, Canberra, Australia and the Prime Minister, Paul Keating. 30 December 1995. Oregon State University, College of Veterinary Medicine, 4p.

Stafford-Smith, D M and Foran, B D (1993): "Problems and opportunities for commercial animal production in the arid and semi-arid range lands": **In:** Baker, M J, ed *Grasslands for our World* SIR Publishing, Wellington, pp 30-37.

Taylor Baines and Associates (1996): *Rabbit and Land Management Programme; End of Programme Social Assessment* Landcare Research Report. Rabbit and Land Management Programme April 1996, 68p.

The Danish Board of Technology (1992): *Consensus conferences.* The Danish Board of Technology, Denmark.

Tyler, T R (1990) *Why People Obey the Law.* Yale University Press, New Haven. 269p.

van Roy, Y (1997): "RCD and the Rule of Law". *New Zealand Law Journal,* November 1997. pp 397-401.

Williams, J M (1993a): "Biological Control and Market Access: Benefits and Risks, People and Politics:" pp 133-150. **In:** Suckling, D M and Popay A J (eds): *Proceedings of New Zealand Plant Protection Society Symposium:* Plant Protection: Costs, Benefits and Trade Implications, 161p.

Williams, J M (1993b): "Effects of Public Perceptions and Global Market Strategy on the Development of Biological Control Technology in New Zealand": *New Zealand Journal of Zoology,* pp 347-356.

Williams, J M (1993c): "The factors and forces shaping rabbit control policies and practices in New Zealand: What lessons for the future": **In:** Cooke, B D ed. *Proceedings of the Australian Rabbit Control Conference, Adelaide,* pp 42-50.

Williams, J M (1994): "Food and Fibre Markets and Societal Trends: Implication for Pest Management":. **In:** Seawright, A A and Eason, C T Eds. *Proceedings of the Science Workshop on 1080.* The Royal Society of New Zealand Miscellaneous Series 28. SIR Publishing, pp 20-32.

Williams, J M (1997): “Maintaining the Health of Ecosystems in the 21st Century; The Challenges Facing Plant Protection Sciences, Industry and Users:" pp 486-491. **In:** *Proceedings of the Fiftieth New Zealand Plant Protection Conference:* 567p.

ISBN 0-908804-84-9