

Cost of Compliance

Report to Ministry of Agriculture and Forestry

November 2001

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Preface

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- by exposure of the team's work to the critical review of a broader range of Institute staff members at internal seminars;
- by providing for peer review at various stages through a project by a senior staff member otherwise disinterested in the project;
- and sometimes by external peer reviewers at the request of a client, although this usually entails additional cost.

Authorship

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EXECUTIVE SUMMARY

On July 2nd 2001 the Hazardous Substances and New Organisms Act (HSNO) and the Agricultural Compounds and Veterinary Medicines Act (ACVM) came into force replacing the Pesticides and Animal Remedies Acts. The combined force of these two new Acts produces a substantial change in the regulatory environment associated with the agricultural remedies and pesticides. The broad impact of the regulatory change is to increase the costs of compliance, and add some degree of complexity, and uncertainty to the participants in the agricultural chemicals industry.

Information sources

Apart from the material from interviews, most of the information contained in this report has been available for some time in the public arena. The information in this report has been drawn from three main sources:

- the report to the Ministry for the Environment by Penman et al (1989).
- the report to the Ministry of Agriculture and Forestry by Holland and Rahman (1999).
- the interviews conducted with various interested groups (see Appendix C).

The Changing Acts

In brief the main changes are:

- the replacement of Pesticides and Animal Remedies Acts by the HSNO and ACVM Acts. The Pesticides and Animal Remedies Acts were both administered by MAF. Under the new Acts, MAF will have jurisdiction over the ACVM Act, while the newly created Environmental Risk Management Authority (ERMA) will be responsible for the HSNO Act (see 2.1.1, The HSNO and ACVM Acts).
- as part of any pesticide or animal remedy application there are four modules required. Under the HSNO Act ERMA will be responsible for the toxicology and environmental toxicology packages, while the chemistry and use rate packages will fall under MAF's jurisdiction (see 2.1.1 The HSNO and ACVM Acts).
- a substantial increase in costs to apply for the introduction of a pesticide or animal remedy, particularly under the HSNO Act (see Appendix A, A.3 Impact of market conduct).
 - under the Pesticides and Animal Remedies Acts the proprietor was licensed (e.g. Monsanto). Under HSNO Act the substance is licensed (e.g. glyphosate), while under the ACVM Act the tradename is licensed (e.g. Roundup) (see 2.1.1 The HSNO and ACVM Acts).
- the Pesticides and Animal Remedies Acts were under an administrative government process. The new Acts require open hearings and public consultations. This creates a completely new process, which has implications for costs (for both government and the private sector), complexity, risks, uncertainty, and ensuring that due process is followed (see Appendix A, A.3 Impact of Market Conduct, sections A.3.6 to A.3.10).

The frameworks used

In this paper we have combined two different frameworks to show the impact of an increased cost of compliance. These are:

- a Structure, Conduct, and Performance framework, an industry view; and
- a policy framework, a government view.

Why have we done this? These together show how the introduction of the HSNO Act (and to a much lesser extent the ACVM Act) is likely to impact on agricultural chemical industry behaviour. The investigation of change in the regulatory environment cannot be divorced from industry reaction to those changes, and most importantly, how the intended objectives of the policy change are matched by the probable outcomes.

Can the HSNO Act fulfil its stated purpose?

An understanding of industry reaction to the HSNO Act is important because the objectives of the Act, which are set out in the purpose statement to “protect the environment and health and safety of people and communities”, seem unlikely to be achieved. This is because, under the HSNO Act somewhat paradoxically, agricultural chemicals already in use, which are more toxic, have an advantage over newer less toxic chemicals. Agricultural chemical companies will consider withholding new applications for innovative products because of the increases in: the cost of compliance; risk and uncertainty; and complexity that are associated with the HSNO process.

Do the costs outweigh the benefits?

Even if the broad goals of the HSNO Act could be achieved, there remains a question whether the costs of the Act would outweigh the benefits. If we examine the probable benefits of introducing the HSNO Act and put them against the probable losses the outcome presents substantial regulatory risk to New Zealand. The probable cost, i.e. the loss of competitiveness of the vegetable, horticultural, and agricultural sectors, could be substantial. The details are shown in the Table below.

While the aims associated with the Act and thus its probable benefits are worthwhile, it is unclear the extent to which they can be achieved or even measured. Quantification of these benefits – even in broad terms – is elusive.

Commodities most at risk

(impacts over the long run)

Most at risk	Face significant risk	Will have an impact
Vegetable exports (worth approx \$300 million in 2000)	Fruit (worth approx \$1075 million in 2000)	Agricultural Products (worth approx \$10,000 million in 2000)
Asparagus	Apples	Sheep
Carrots	Kiwifruit	Beef
Onions	Other fresh fruit	Dairy
Potatoes	Wine	Deer
Squash	Processed fruit	Wool
Tomatoes		
Seeds, plants and foliage		

Source: Horticultural Facts and Figures 2000, NZIER Quarterly Predictions 2001.

Risk, uncertainty, and complexity

The implementation of the HSNO Act is a move to a more sophisticated and complex system of managing animal remedies and pesticides. This in itself creates uncertainty and cost as the new system has to be understood and complied with. The issues of complexity, and uncertainty and risk are increased by:

- the HSNO Act catching all pesticides and the vast majority of animal remedies. According to the industry it will catch products with active ingredients that no other regulatory agency has tested because of their benign nature. Since no other regulatory agency has tested these products there is no existing data to support an application (see Appendix A, A.3.7 Risk and uncertainty).
- the change in the regulatory process changing the nature of the relationship with industry. The introduction of the HSNO Act has the potential to diminish the goodwill that has been built up in the past between regulatory agencies and industry participants. This will increase the transaction costs to government in administering the regulatory regime (see Appendix A, A.3.6 Incentive to avoid regulations).
- the HSNO Act exposes agricultural chemical companies to risk by:
 - the nature of the new public process, that allows competitors to obtain information about research in New Zealand. Given the size of the investment in R&D, to expose such data on projects possibly to competitors looking at similar products is a considerable commercial risk to those companies (see Appendix A, A.3.7 Risk and uncertainty).
 - the design of the HSNO Act means agricultural chemical companies are encouraged to group products under “generalised substance” headings. The ability to utilise or extend products’ higher priced life through patents and supporting data packages is crucial to those companies bringing in new innovative product. Broadening the substance definition may mean that some companies carry the full cost of exposing products to the risk of “free-riding” (see Appendix A, A.3.7 Risk and uncertainty).
- the new processes adopted by ERMA and MAF being subject to final decision in court. The way the regulations are interpreted may be subject to lengthy and expensive judicial process (see Appendix A, A.3.8 Application process and due process).
- concerns about the application processes, particularly the ERMA process. There is also uncertainty about how MAF will administer the ACVM Act, particularly on what is known as “off-label” use and how well they will be able to protect the data supplied by agricultural chemical companies (see Appendix A, A.3.11 Off label use).
- the risk averse nature of agricultural chemical companies which means that if there is a chance that a product will be rejected by any developed country’s regulatory authority, agricultural chemical companies will not apply for approval in that country. The introduction of the HSNO Act increases the chances that agricultural chemical companies will only introduce agricultural chemicals into New Zealand after most other developed countries have approved the product for use. This would reduce the chance of rejection here, while delaying access to agricultural users in New Zealand of that product (see Supply factors, 2.1.2, Nature of world agricultural markets and its impact on New Zealand and Appendix A, A.4, Impact of market performance).

- Complexity is another source of uncertainty. For example:
 - historically, experimental products have been controlled in their use by placing the condition on them that treated animals and plants must not be allowed to enter the food chain. They have also only been available to ‘research workers’. Under HSNO, the same controls that are applied to GMO’s have been allocated to pesticides. This means that trials must be carried out “in containment”. This new term has yet to be fully operationally defined, so uncertainty has occurred over the words “in containment” and how this will be different under the new HSNO rules (see Appendix A, A.3.9 Complexity).
 - the time it takes to process research applications under HSNO rules. If approval times are extended then researchers from agricultural chemical companies will have difficulty helping farmers with the problems they face. For many annual crops this presents a problem because growers do not know two years and more in advance what crops will be grown where. Agricultural chemical companies will lose the ability to place trials in the relevant situations, where problems exist (see Appendix A, A.3.9 Complexity).
 - attempts to do out of season research could also create similar complexity. Under HSNO the time taken to apply to carry out research increases and the costs of doing so increase. This makes New Zealand a less attractive place to carry this research out (see Appendix A, 3.10 Out of season research).

Issues

In world terms, the New Zealand market for agricultural chemicals is very small – approximately 0.26% of world demand. Therefore New Zealand’s ability to influence the strategic economic behaviour of international agricultural chemical companies is small. For instance, agricultural chemical companies are loath to redesign research data bases to suit New Zealand regulatory authorities, particularly if no other country’s regulatory authority requires it.

The substantial increase in costs associated with the HSNO Act are said to be comparable with overseas costs. But, typically a chemical company will weigh up the costs and benefits of each market. So if 400 pallets are being sold in the US then the application fees will be recouped from the sale of those 400 pallets. If 1 pallet is sent to New Zealand then the costs of approval in New Zealand would have to be covered by the sale of that 1 pallet. If compliance costs are set at the same levels as in the US, the cost of the compliance process on a per unit basis will be much higher in New Zealand than in the US. Therefore comparing the costs of compliance, on a per unit basis, between New Zealand and the US does not reflect the potential sales base from which the costs paid for each new application must be recovered.

The structure and operation of ERMA seem to be based on a return to “business as usual” after an initial settling down period. Applications will be forthcoming and ERMA will be able to cover its costs. The indications from the industry are that for them the HSNO Act represents a “phase change” and that there will be a major re-evaluation by agricultural chemical companies of their position in the New Zealand market.

For a small country, one of the possible competitive edges it has over larger countries is its regulatory system. The flexibility of government agencies and the ability to meet government objectives through a least cost solution is something that larger countries

can find very difficult to replicate. The HSNO Act seems likely to constrain the ability of New Zealand to take full use of this natural advantage because of the:

- significant increase in the cost of compliance, particularly the ongoing out of pocket costs).
- the risk of the process some of which could be expected to lessen over time. These are mainly outcome related, i.e., the introduction of a new Act, new standards, new definitions, and likely possibility of court action to define the intent of the Act.
- the uncertainty generated by new process requirements, which on the surface at least, seem to require new data, elements of which seem to be unique to this jurisdiction. Added uncertainty is introduced with open ended public hearings and public consultation.
- and, added complexity with the change in how trials will be conducted and the practical difficulties associated with conducting the trials.

In this report we have not speculated as to why it was deemed necessary to change from the Pesticide and Animal Remedies Acts to the HSNO and ACVM Acts.

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1. INTRODUCTION

This research report assesses the likely impact of the increased costs of compliance that agricultural chemicals businesses will face with the introduction of the Hazardous Substances and New Organisms Act (HSNO) and the Agricultural Compounds and Veterinary Medicines Act (ACVM).¹

The NZIER has been commissioned by Ministry of Agriculture and Forestry (MAF) to undertake a study into the economic aspects of the agricultural chemicals market in New Zealand. MAF's objective is to gain a "fuller" understanding of the economic workings of the agricultural chemicals market. This includes gaining a clearer understanding of how the industry operates, the magnitude of the cost increases associated with the two new Acts, the economic factors at work, and the likely economic outcomes.

The *ex ante* nature of project has some disadvantages. The main disadvantage is that we can not anticipate unexpected scientific discoveries or improved understanding of how agricultural chemicals impact on the environment and human health – we do not have perfect foresight, therefore we are working with assessments and estimates rather than actual costs and impacts.

What we have is a "snap shot" of how science views a particular agricultural chemical, today. With our knowledge of that "snap shot", our understanding of economics, and how economics impacts on the industry, we can project the likely impacts of the increased compliance costs.

To investigate the impacts of an increased cost of compliance we have broken the task into two parts. In these we have:

(Part one)

- suggest the factors that should be included when formulating an Act of Parliament. The HSNO and ACVM Acts are matched against this standard. This means examining the objectives of the Acts, the trade-offs made, the costs imposed, and whether or not the costs outweigh the benefits.

(Part two)

- as background information in Appendix A we have developed an understanding of the salient economic factors within the agricultural chemicals industry. The approach we have used is a Structure, Conduct, and Performance (SCP) framework (see Figure 2 in Appendix A). While there are possible conceptual problems with the SCP framework, the approach has been to use the SCP framework merely as a "check list" to describe and understand the economic interactions that occur in the agricultural chemicals industry.
- explained the important aspects of Conduct (increased costs, impacts of those costs, incentives to cheat, and the impact of uncertainty) and Performance (dynamic efficiency) that will be most affected by increases in the cost of compliance.

¹ In simple economic terms the increase in the cost of compliance is measured by the change in compliance costs when moving from the previous Pesticides and Animal Remedies Acts to the ACVM and HSNO Acts.

The aim is to show – given what we know about the industry, its products, and the impacts of using these products – if there are any unintended consequences of putting in place the HSNO and ACVM Acts. In particular, we are considering whether or not the objectives of both Acts are likely to be fulfilled in the presence of the imposition of a substantial increase in the cost of compliance.

Compliance costs are an issue because it is the products with new and innovative active ingredients that are the life-blood of the agricultural chemicals industry. They provide the innovative solutions to farmers' problems and keep them at the competitive edge.² It is also these products which face a substantial increase in the cost of compliance.

1.1 Approach

Why are we combining two different frameworks to show the impact of an increased cost of compliance? We have used the SCP framework (to examine industry performance) and a policy framework (a government view) because to understand the impact of the introduction of the HSNO Act and to a much lesser extent the ACVM Act, an understanding of how the industry operates is essential.³ The change in the regulatory environment can not be divorced from industry reaction to those changes and most importantly how the intended objectives of the policy change match the actual outcomes.

The focus in this report has been on:

- how the new policy regime will impact on the supply chain. What are the likely impacts of a substantial increase in the cost of compliance? How will those costs impact on the supply of new innovative product with new active ingredient?
- to what degree does the new policy regime mean a modification of the “business as usual” approach or will it cause a “phase change” in the approach taken by industry? In the past industry has reacted by noticeably constraining supply when much smaller increases in the cost of compliance have been introduced. Will industry behaviour change in response to the increased cost of compliance? Will there be unintended outcomes? For example, will there be more toxicity in the environment relative to what would have otherwise been the case under the old Acts? What will be the impact on sectors such as horticulture? How will it affect the ability to export vegetables into northern hemisphere markets?
- how the smallness of the New Zealand market compared to other OECD markets affects response. If regulatory costs are comparable to other OECD countries then the cost burden will be spread over much fewer units, increasing the unit costs dramatically.
- the link between an efficient regulatory structure and the competitiveness of New Zealand agricultural businesses. In a small country one of few comparative

² We draw a distinction here between new products and the products that come on to the market with new active ingredients. At any given time, there are any number of new agricultural chemicals being bought to market – however, most are copies of chemicals which have come off patent. Their impact on the market is to reduce prices for those off patent agricultural chemicals. However, we are most interested in how an increased cost of compliance impacts on those products with new active ingredients.

³ The SCP framework is primarily a statement about how the agri chemical industry works (“positive” economic analysis), which is used to inform *how* an efficient regulatory regime should work (“normative” economic analysis) using an *ex ante* with/without analysis.

advantages over larger countries is the nimbleness and flexibility of the regulatory environment. Constraining the relative efficiency of the regulatory environment restricts New Zealand's ability to exploit its comparative advantage.

- how the funding of the regulatory regime and the choice of charging mechanisms impact on the industry and what are the wider impacts for dependent sectors? The current approach automatically assumes that no public goods are involved and that a totally new bureaucracy can be built up to regulate a complex set of regulations which have not been attempted anywhere else in the world.
- To what extent does the introduction of a new regime exacerbate uncertainty, particularly when it introduces new layers of complexity? This could increase the risks associated with the new HSNO regulatory regime.
- what is the “ideal” regulatory framework given what we know about structure, conduct, and performance of the agricultural industry. If the purpose is to extract the benefits or “goods” out of the available agricultural chemicals and mitigate the possibility of harmful side effects or “bads” then this lends itself to a “horses for courses” approach rather than a “one size fits all” process. This calls for a more discretionary use of regulations where selection of the process type is proportionate to risks faced by the public.
- whether the broad costs associated with introducing the new policy regime outweigh the broad benefits, given what we know about agricultural chemical industry behaviour.
- what are the approaches used to value the costs and benefits. While a higher standard of test needs to be applied to products which have not been tested anywhere else in the world, what should be done about products that have been tested extensively elsewhere?

1.2 The HSNO and ACVM Acts

According to Holland and Rahman (1999) there have been very few systematic surveys of the use of pesticides in New Zealand. This is also true for animal remedies. For pesticides, Wilcock (1989, 1990) examined sales data reporting pesticide use by quantity on regional basis. This work is dated, since chemicals such as 2,4,5-T and phosmet have been withdrawn and the pattern of use has changed dramatically (e.g. the decline in pastoral agriculture; increases in horticulture and forestry plantings; and the use of more selective spraying approaches, rather than spray programmes). Penman (1989) also summarised pesticide data by type and use in each sector. There have also been more up-to-date surveys of pesticides most notably Holland and Rahman (1999) which provides useful information on pesticide usage and gives a solid overview of the pesticides industry. Holland and Rahman found that while the mix of pesticides had changed dramatically, the tonnage being applied was roughly the same as that found by Penman ten years earlier.

Pesticides and Animal Remedies Act

Up until 2nd July 2001, the Pesticides Act (1979) and the Animal Remedies Act (1967) have been the key statutes controlling the use of pesticides and animal remedies. Without approval under those statutes, agrichemicals could not be sold or used in New Zealand. The Pesticides Act registered and the Animal Remedies Act licensed all pesticides and animal remedies in New Zealand. The two Acts were administered separately by two Boards and serviced by the Agricultural Compounds Unit of the

Ministry of Agriculture and Forestry (now called the Agricultural Compounds and Veterinary Medicines Group, ACVMG). Both Boards issued approvals for research and general release. For research use, Experimental Use Permits (EUP) were issued. ⁴ EUPs are issued for:

- research.
- crops not for sale.
- limited sale.

As part of the application for general release four modules are required:

- a chemistry package.
- a use package (for use rates).
- a toxicology package (known as a tox package).
- an environmental toxicology package (known as an eco tox package).

Under the Pesticides and Animal Remedies Acts the proprietor was licensed (e.g. Monsanto).

The new Acts

This situation changed on July 2nd 2001 when the new HSNO (1996) and ACVM (1997) Acts were introduced. Essentially, the ACVM Act will cover the first two packages (chemistry and use rates) while the HSNO Act will cover the toxicology and environmental toxicology packages.

The purpose of the HSNO Act is to protect the environment, and health and safety of people and communities by preventing or managing the adverse effects of hazardous substances and new organisms. (HSNO Act 1996). The ACVM Act is based on trying to regulate as little as possible and manage the risks associated with pesticides, animal remedies, stockfeeds, and fertilisers. The purpose of the ACVM Act is to:

“ (a) Prevent or manage risks associated with the use of agricultural compounds, being

- (i) Risks to trade in primary produce; and
- (ii) Risks to animal welfare; and
- (iii) Risks to agricultural security.

(b) Ensure that the use of agricultural compounds does not result in breaches of domestic food residue standards.

(c) Ensure the provision of sufficient consumer information about agricultural compounds.”

(ACVM Act 1997)

Pesticides and most veterinary medicines, along with a large number of non-agricultural chemicals, will be approved through the Environmental Risk Management Authority (ERMA). The ACVM Act, administered by MAF, will be responsible for ensuring that pesticides and veterinary treatments meet domestic standards (Figure 1).

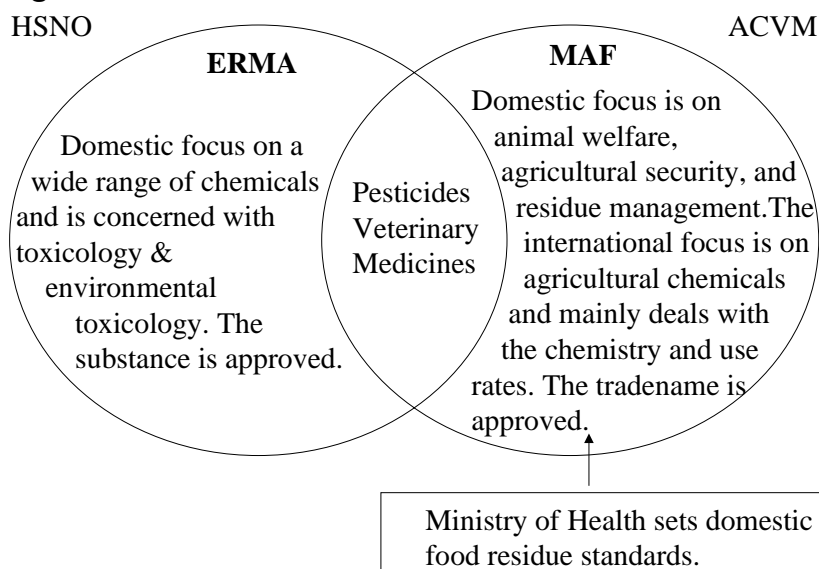
Under the ACVM Act the trade name of the product is registered (e.g. Roundup) while the HSNO Act registers substances (e.g. glyphosate). This means that under the HSNO Act only the composition of the product is registered. The HSNO Act has criteria

⁴ Under the Animal Remedies Act a provisional licence is granted under sections 1,2, and 3.

including thresholds and skin sensitivity tests. The thresholds are set at a level so that it catches all pesticides and a significant proportion of the animal remedies – this is the application of the biocide rider.⁵

ERMA, who administer the HSNO Act, are operating on the basis of full cost recovery. A transition period of three years has also been budgeted for to transfer over substances already approved under the Pesticides and Animal Remedies Acts. This period is likely to be extended.

Figure 1: Interaction between HSNO & MAF



Notes: (1) the HSNO Act is administered by ERMA and the ACVM by MAF.

Source: NZIER

Changes have been made to both the ACVM and HSNO Acts. The most significant of these has been the HSNO Amendment Bill No. 2. Main changes to the Act include⁶:

- amending the Act so that it is the substance that receives approval not the person importing the product.
- bringing the Act into line with our international trade commitments under the Uruguay Round (section 39.3 of the TRIPs Agreement).
- the introduction of a rapid assessment process whereby a substance can be fast tracked if the substance meets the criteria of “similarity with previously approved substances”, or is of “low hazard”;

⁵ The biocide rider is a threshold in the HSNO Act regulations to ensure that all new pesticides will be have to go through the HSNO Act – it will also catch a high proportion of animal remedies. Also note that most products will also be caught by the environmental thresholds.

⁶ This is taken from the ERMA newsletter Perspective, Issue 11, December 2000.

- a number of other (economically) minor changes which allow for more user-friendly forms, extending the time for transferring existing substances over and translating them into HSNO terms, and providing more flexible ways of advertising the public hearings.

The ACVM Act is based on risk management (see above). According to MAF it will apply the Act in a way so that transaction costs are kept to a minimum.⁷ As an example, it recognises that there is a large variation around standard products such as pet food – while there are all sorts of different pet food varieties available, it classifies it all as one product. Important features of the ACVM are:

- under the Pesticides and Animal Remedies Acts off label use does not have to be specified – it is silent on off label use.⁸ Under the ACVM Act, the enabling regulations will specify (pesticide) use. MAF’s intent is that as long as the products meet trade and domestic food standards and all other requirements are met, then the products can be used on crops that they were not originally intended for. This also applies to many seed treatments used on minor and small crops.⁹
- the ACVM Act allows parallel importing of trade name product from approved factories in other countries i.e. Roundup produced in India is not the same as Roundup produced for the US or Australian markets. Only those factories with formulations (likely to be in the US and Australia) that are approved in New Zealand will be allowed to engage in parallel importing.¹⁰
- data protection processes will carry on under the ACVM Act. MAF, under the regulations developed, have interpreted the Act as giving full protection for companies that develop products with new active ingredients for five years. This is an important issue because it goes to the heart of an agricultural chemical company’s competitive advantage – protection of its intellectual property.¹¹

The changing responsibilities for:

- investigating the animal remedies and pesticides.
- the registration procedure.
- the costs associated with the regulatory regime, and
- the changing processes.

are illustrated in Table 1.

⁷ Interview with Debbie Morris, MAF.

⁸ Off label use occurs where chemicals are used on crops that they are not specifically designed for (or use has not been approved for). Under the Pesticides Act, as long as the Maximum Residue Limit (MRL), set by the Ministry of Health, is not breached then use was permitted.

⁹ Interview with Debbie Morris, MAF.

¹⁰ Interview with Debbie Morris, MAF.

¹¹ Interview with Debbie Morris, MAF.

Table 1: The major changes to the regulatory regime

	Pesticides and Animal Remedies Act (MAF)	ACVM Act (MAF)	HSNO (ERMA)
Investigation of chemical (see above in 1.2)			
Chemistry package			
Use package			
Toxicology package			
Environmental toxicology package			
Registration procedure (see above in 1.2)			
What is registered?	Proprietor	Product	Substance
Cost of compliance (see Table 12 in A.3 Market Conduct)			
Application process	\$11,000	\$4,000 - \$5,000	\$500 – 250,000
Supporting trials ¹	\$60,000 - \$70,000	Unknown cost, but the added complexity and locational issues could increase costs well above the previous regulatory regime, particularly for HSNO process.	
Process (see A.3 Market Conduct)			
	Administrative	Public	Public
Notes:	Costs for an “average” trial.		
Source:	NZIER		

1.3 Policy Objectives

The first and most important task in designing any regulatory regime is to identify very clearly the rationale for regulating the area in question. It is important to have a clear statement of the objectives of the regulation. This allows any proposed regime to be tested against those objectives, to ensure that it does what is desired, and does not have other outweighing, undesired or unintended consequences.¹² The assessment framework is documented in Table 2.

Table 2: Assessment framework

Effectiveness	Does it achieve its intended aim?
Efficiency	Allocative choices, administrative costs, and compliance costs.
Equity	Distribution of impacts.
Source:	NZIER

¹² This step is just as important when reviewing an existing regime as it is when developing a new regulatory regime from scratch. The most powerful tool for such a review is to ask what the objectives of regulation are in the field in question. The practical effectiveness of the existing regime can then be measured against those objectives, identifying where it fails to advance them, and where it has other consequences.

In the context of the HSNO and ACVM Acts, any description of the regulations needs to take into account:

- can the stated objectives be achieved with the powers given by the Acts?
- can the effectiveness of the methods used lead to the desired outcomes? That is does it reduce the particular risk?
- do the trade-offs in the Acts take into account the likely reaction of all parties associated with or affected by the agricultural chemicals industry?

All three factors are interrelated and prominent in the case of pesticides and animal remedies. They have important implications for both the substantive rules, and the implementation process and institutions – any regime needs to incorporate mechanisms for taking account of, and reflecting, relevant changes and developments.

There is a fundamental difference between the two Acts (see purpose of the Acts under background conditions). The purpose of the ACVM Act is to:

- manage risks associated with agricultural chemicals.
- balance the risks between proper use of agricultural chemicals.
- weigh up the costs and benefits of their use.

The purpose of the HSNO Act is the:

- protection and management or prevention of the adverse impacts of agricultural chemicals.
- make a judgement given the environmental, cultural, and economic implications.
- protection of individuals and communities from the adverse impacts of agricultural chemicals.

How will the design of the HSNO Act; which is focused on the protection of the environment, human health, and communities; fulfil its objectives? To understand the HSNO Act impact requires consideration of the following:

- what are the current trends in the agricultural chemicals industry? (i.e. more specific use focus, increase in numbers of remedies available, and less toxicity of chemical ingredients, see Appendix A, A.2, Market structure).
- what will be the reaction of key players in the industry? Will there be unintended consequences under the Act? (see Appendix A, A.3, Market conduct).
- how efficient is the regulatory framework? In small countries the smallness, flexibility, and nimbleness of the regulatory environment can be an important competitive advantage, relative to larger countries.

Paradoxically, the new HSNO Act regime could mean that chemicals already on the market (which are more toxic) are favoured over the newer less toxic chemicals because agricultural chemical companies are unwilling to pay the increased costs and/or subject agricultural chemicals to the uncertainty of the HSNO Act process. The HSNO Act, as a piece of environmental protection legislation, does not take this possible reaction into account (see Appendix A, A.3 Impact of market conduct).

Different parties that are affected by chemical use have differing objectives and these interests will not always coincide. For example, farmers are interested in the cheapest and most effective chemical for the crop they are growing. They procure those chemicals from the cheapest source – either foreign or domestic.

2. INDUSTRY DESCRIPTION

2.1 Background conditions¹³

The agricultural chemical industry is relatively new, with modern pesticides being developed in the post World War II era. Some products still in use were discovered at the “birth” of the industry. These include 2,4-D (1942) and MCPA (1945). There have been major advances with many new families of chemicals invented in the late 1960s, early 1970s, and in the 1980s (see market structure in Appendix A).

Pesticides and animal remedies have provided a considerable impetus to New Zealand’s land based production systems. New Zealand’s agricultural export industries would be undermined, over the long term, without these products. The industry is dynamic with the trend being for products with new active ingredients to be of lower toxicity (i.e. “softer” products), while older products, usually with higher toxicity (or “dirtier” products) are being withdrawn.

The drive towards “softer” products is consumer driven since food safety is a highly sensitive subject. Consumers are demanding that the food that they eat has minimal residues. Agricultural chemical companies have responded by reducing toxicity in the chemicals produced and applied. To survive, agricultural chemical companies are being forced to produce “softer” and “softer” chemicals.

Despite the successful results of pesticide use in New Zealand, food safety concerns have highlighted the use of agricultural chemicals (and particularly pesticides) in the food chain. Apart from DDT, which precludes the use of some land for dairying and organic farming, there is little evidence that the careful use of pesticides does long term harm to the environment or human health. As the Agrichemical Manual 2000, Environment Section, p1 states:

“Through the correct use of agri-chemicals, we can substantially prevent pollution and virtually eliminate the risk of environmental damage.”

2.1.1 Supply factors

The production sectors

Table 3 shows the range of land uses where pesticides and animal remedies are most commonly used.

Use of agricultural chemicals depends on a number of different factors:

- climatic conditions lead to a high levels of pests. Sub-tropical growing conditions combined with good moisture levels mean that a wide range of weed species, insects, and fungal infections flourish. Furthermore, global warming has the potential to spread tropical pests more widely, (Holland & Rahman, 1999).
- while pastoral farming is relatively intense (although less so compared with industrialised nations), limited use of labour restricts the options for controlling pests. New Zealand agricultural and horticultural industries are only economic if inputs, such as labour, are at optimal levels (i.e. labour is expensive therefore there is pressure to keep the numbers employed down) and production levels are high.

¹³ This section is based on Holland and Rahman (1999) and Penman et al (1989).

There is some diversification occurring with boutique farming operations, new crops being grown, and organic farming techniques introduced, Holland & Rahman (1999).

Table 3: Pesticides and Animal remedy categories

Arable farming	Cereal (wheat and barley) Maize Herbage seed crops
Horticulture	Apples Kiwifruit Grapes Avocado Citrus Berryfruit
Vegetables	Potatoes Onions Asparagus Sweet corn Field tomatoes Field peas Brassicas (cauliflower and broccoli) Lettuce
Pastoral agriculture	Sheep, beef, and dairy
Forestry	Exotic plantations

Source: Holland & Rahman (1999)

- the regulatory environment faced by the industry. This topic is covered extensively in this report (below).
- a combination of the agricultural farming techniques and climate produce a complex and crop specific pattern of weeds, insects, and diseases. It is further complicated by pest problems not being fixed but changing from season to season. Disease resistance can also be a major threat to the viability of any one crop, Holland & Rahman (1999).
- market pressure has also impacted on the use of agricultural chemicals with the development of systems that depend less on pesticides. These strategies are associated with Integrated Pest Management (IPM), biological production, and other strategies. The effectiveness of these strategies has to be evaluated against a large range of off and on farm factors e.g. market premiums from organic farming in the market place may be offset by lower yields per hectare, or higher labour costs, Holland & Rahman (1999).
- the export orientation of New Zealand's agricultural and horticultural industries means that growers have to meet strict tolerance levels set by international organisations (mainly by the Codex Alimentarius Commission). Furthermore, to maintain high standards and confidence, both domestically and internationally, New Zealand standards are usually tighter than Codex standards.
- producer groups are also being proactive about pesticide reduction. Specific guidelines have been drawn up to ensure that market requirements are met for

export commodities and the reputation for quality is maintained. The emphasis is on controlling residues, meeting phytosanitary standards, and general environmental and sustainability issues.

- application, storage, and disposal of waste are also important issues. More thought is now being put into systems that use chemicals more effectively and efficiently. Similarly, guidelines for empty containers, surplus formulation, and storage are being introduced. The Agrichemicals code of practice (Growsafe) guidelines are now being more widely used by farmers, Agricultural Chemicals Manual (2000).
- it is an understatement to say that pesticides have a poor public image. Coverage of the impacts of insecticides such as DDT has left a lasting impression on the public debate. Penman (1989) highlighted, in the New Zealand context, the negative public perception of pesticides, while a survey conducted in 1994 (Williams, 1997) showed that 35% of New Zealanders regarded pesticides as extremely dangerous and a great threat to the environment.

International agricultural chemicals industry

Typically, agricultural chemicals are expensive and complicated products to bring to the market place. This has major implications for the structure of the agricultural chemicals industry. Large multinational companies, who are solely responsible for bringing products (with new active ingredients) to the market, dominate the agricultural chemicals industry. These companies have large R&D capabilities and are critical to innovation in the agricultural chemicals market. Some of the trends in the market include:

- the growth of company mergers. Increased globalisation and the increasing size of other food businesses have forced agricultural chemical companies to rethink their world-wide strategy.
- rationalisation of product lines with an emphasis on supporting pesticides for major global crops (cereals, rice, maize, soybeans, and cotton).
- reduced support for out-of-patent pesticides and minor crop uses.
- development of biological pesticides.
- on-going research into genetically modified crops.
- the withdrawal of older chemicals.

The scale of R&D efforts is one of the most important considerations in the development of agricultural chemicals. In recent years, increased competition through increased globalisation, improved technology, and the costs of bringing new technology to market has led to a wave of mergers and strategic acquisitions. It is estimated that it costs \$NZ 200-\$300 million¹⁴ to bring a new chemical to market. Not only are costs substantial but the risks involved in the development stage are also significant, since at any time the product can fail for any number of reasons e.g. regulatory, hidden or unintended side effects, lack of efficacy etc.

Part of the research effort is the development of data packages to show, among other things, residues left in the soil, meat, and or plants after the agricultural chemical has been applied. The data packages are extensive and are typically a minimum of 100,000

¹⁴ Agcarm estimate.

pages. These packages are required by regulatory authorities to justify the consideration of sales of any new chemical.¹⁵

Agricultural chemical companies are willing to invest large amounts of money on R&D for new products because of the patent protection (20 years) and the data protection (5 years). This gives agricultural chemical companies a window of opportunity to exploit (as a legal monopoly) the market for new innovative chemicals and a chance to recoup R&D expenditure and make a profit. Once patent protection has been removed the product formulations are relatively easy to mimic and market prices fall dramatically.

Typically a large agricultural chemical company will spend 10% of global revenue on R&D. For example, Aventis screens up to one million molecules per annum using sophisticated robotic techniques – most major companies have a strong pipeline of products at various stages of development.¹⁶

Key to any company's performance is the distinctive capabilities that it can bring to the market (see among others Kay (1993)). While they have other attributes, the most important distinctive capability of agricultural chemical companies is the patents they hold.¹⁷ Without those patents, the R&D efforts could not be sustained, at least, not at the same level presently being achieved.

The distinctive capability will be protected at all costs by the company. Therefore products presented for regulatory approval will be highly specified to protect their position in the market and maintain their competitive edge.¹⁸ The link between competitive advantage of agricultural chemical companies and the cost of compliance under the HSNO Act will have important ramifications for New Zealand agriculture. This is discussed in more detail in Appendix A.

Domestic agricultural chemicals market

Multinational agricultural chemical companies are strongly represented in New Zealand reflecting New Zealand's reliance on agricultural export industries. The benefits of using agricultural chemicals, since World War II, have been detailed by Penman (1989) p18-31. These include:

- improvements in land productivity. Growers being able to select less rigid but more intensive crop rotations. Use of these rotation methods has improved crop yields and quality substantially since the late 1940s.
- improvements in labour productivity. Crop and animal systems have improved production resulting in a significant increase in the amount of land that can be effectively farmed by one person e.g. the use of pour on drenches and other agricultural chemicals has allowed farming families to significantly increase stocking rates.
- economic returns to producers are variable, though often substantial. The generally accepted average rate of return is between \$3-4 dollars gained for every \$1 spent on pesticides and their application – for export horticultural products this return may be substantially greater (Penman et al, 1989).

¹⁵ Agcarm interview.

¹⁶ Aventis interview.

¹⁷ International protection is enshrined in the TRIPs Agreement of the Uruguay Round (article 39.3 of the TRIPs agreement).

¹⁸ Unless in the unlikely event that for some reason the distinctive capability is enhanced by joining with other companies in the application process or generalising the description of the substance.

- the ability to access markets and meet overseas quarantine standards by eliminating pests with agricultural chemicals has been made possible.
- minor pest damage can result in crop rejection, particularly in the Japanese market. Therefore the cost of using pesticides and preventing crop damage greatly outweighs economic losses from other countries border authorities detecting pests (or any damage pests may cause) and rejecting crops.

As stated earlier, multinational chemical companies bring all innovative agricultural substances to New Zealand. Since innovation is the key to the continued success of any industry, continued access to innovative products is an important part of the competitiveness of the New Zealand agricultural sector. In Appendix B, the table shows that the bulk of the companies in the market are selling generic chemicals – straight chemical copies of product developed by multinational companies.

Despite the importance of the multinational chemical companies, small New Zealand agricultural chemical companies have also been able to carve out niches in the New Zealand market (see Appendix B). These companies are nimble enough to exploit markets that multinationals consider to be too small to make profits from. Their cost structures are lower and they are flexible in the way they approach their research. Typically they are involved in the small volume New Zealand crops (Elliott Chemicals) or the animal remedies market (Ancare and Bomac). They develop slightly differentiated products based on already available chemistry. The small volume of agricultural chemicals that they deal in makes these companies very vulnerable to any increases in the cost of compliance – the smaller the volume of crops the greater the increase in cost per hectare.

This implies that small volume pesticides and animal remedies are disadvantaged by the way the HSNO Act has been implemented. This is because the cost of compliance is primarily a fixed overhead for chemical companies, no matter what volume of product will be sold on the New Zealand market.

Economies of scale or scope

The multinational agricultural chemical companies are large scale. See Market structure, A.2, in Appendix A.

Nature of the world agricultural market and its impact on New Zealand

Agriculture

A substantial increase in the costs of compliance of agricultural chemicals in New Zealand will have an impact on New Zealand agriculture. To understand why this is, requires an understanding of the subtleties and nuances of how New Zealand export orientated agriculture interacts with the agricultural chemicals market.

New Zealand agricultural trade is essentially commodity-based. A characteristic of commodity trade is the significance of controlling costs and the competitive nature of the markets. Small cost increases or changes in competitiveness anywhere along the marketing chain have major impacts on the profitability of any commodity. A substantial increase in compliance costs will limit the availability of product with new active ingredients in New Zealand. If competitor suppliers in other countries have access to chemicals at lower cost, New Zealand producers may be less competitive in the long run.

The average compliance cost on small volume products is higher than large volume crops – it is, in effect a fixed cost of doing business. As an example, crops dominate

world agriculture and agricultural trade. Wheat, barely, rice and cotton are traded internally and internationally on a scale that dwarfs New Zealand production. Furthermore, in the United States a minor crop is classified as anything under 20,000 hectares. In New Zealand the kiwifruit crop is roughly 10,000 hectares.

The scale of the issue is illustrated in Table 4. Farmers will not be able to use newer innovative pesticides because they will not be available. The cost of compliance and or the risks of putting new innovative chemicals through the HSNO process may be perceived to be too high by agricultural chemical companies. Since “older” chemical products, still used by New Zealand farmers, are being withdrawn (and banned in importing nations), market access is threatened. At most risk are the small export orientated vegetable crops that depend on pesticide use – these were worth roughly \$300 million in 2000. The most significant crop affected by an increased cost of compliance are onions (see Table 13 for onion export earnings).

Table 4: Commodities most at risk

(impacts over the long run)

Most at risk	Face significant risk	Will have an impact
Vegetable exports (worth approx \$300 million in 2000)	Fruit (worth approx \$1075 million in 2000)	Agricultural Products (worth approx \$10,000 million in 2000)
Asparagus	Apples	Sheep
Carrots	Kiwifruit	Beef
Onions	Other fresh fruit	Dairy
Potatoes	Wine	Deer
Squash	Processed fruit	Wool
Tomatoes		
Seeds, plants and foliage		

Source: Horticultural Facts and Figures 2000, NZIER Quarterly Predictions 2001.

The cost of compliance will also impact on New Zealand’s major horticultural products. Where in the past growers have had access to the very latest agricultural chemicals, in some cases faster than competitors. The industry viability is threatened by the HSNO Act process because the increased cost of compliance may stop horticultural industries from buying the latest innovative pesticide products (see Appendix A, A.3 Market conduct). This will force the industry to rely on “older” pesticide product that will eventually be banned by importing nations. While this process is not expected to happen as quickly relative to vegetables, it will raise similar problems over the longer term.

The lack of access to products with new active ingredients will also impact on traditional agricultural sectors. Animal health and productivity, for example, will be affected by the inability to access product with new active ingredient. The lack of access to new animal remedies will impact, for example, on: the ability to manage larger dairy herds, the ability to control all manner of parasites, and the ability to control pasture pests and or weeds.¹⁹ As with horticultural products it will bring about successive incremental losses in competitiveness, rather than a one off loss in competitiveness (see Appendix A, A.4, Market performance).

¹⁹ Interview with Ancare.

It should be stressed that there are a number of important impacts brought about by the introduction of the HSNO Act:

- the behaviour of the economic agents within the agricultural chemicals industry will change in response to the introduction of the HSNO Act in the short term. After the rush of applications prior to the introduction of the HSNO Act has subsided, the industry will adopt a wait and see approach to the HSNO application process. Eventually when “test” applications do come forward the industry will watch the process carefully i.e. the costs involved, approach taken by ERMA staff, the public process and any other area that involves costs to the applicant. It will be at this time that they make decisions about the extent of the business activities they will undertake in New Zealand.²⁰
- on day one there will be no discernible change in competitiveness of these industries. It is only over the longer run, that losses in competitiveness will become apparent.
- under the Animal Remedies and Pesticides Acts there were few problems with getting industry participants to comply with regulatory issues. The introduction of the HSNO Act has the potential to diminish the goodwill between regulatory agencies and industry participants built up under the previous Acts – the process changes from working with industry to controlling industry activity. This will increase the costs to government in administering the regulatory regime.
- agricultural chemical companies are naturally risk averse. If the agricultural chemicals companies believe that the expected value of the (small) New Zealand market is less than the compliance costs of gaining access and the risk to other markets (by a rejection) then they will proceed with an application. Furthermore, the increased complexity and uncertainty of the process brought about by the HSNO Act means that agricultural chemical companies will introduce agricultural chemicals into New Zealand only after most other developed countries have approved it for use. This reduces the chances of an agricultural chemical being rejected and denies access to agricultural users in New Zealand until after their competitors already have access to the chemical.

Agricultural chemicals

In world terms, the New Zealand market for agricultural chemicals that supports the crops mentioned in Table 4 is small, for example:

- a typical chemical company may produce in one year 1,000 pallets of a product – 1 pallet will come to New Zealand (and, for example, 400 pallets would be used in the US).²¹
- New Zealand is 0.026% of the world pesticides market.²²
- Australia’s turnover is roughly \$NZ2 billion dollars and New Zealand’s is below \$NZ400 million.²³

²⁰ Industry representatives considered this approach outlined above “conservative”. It was their opinion that the decision to re-consider their approach to, and investments in, the New Zealand market would happen much more quickly (industry interviews).

²¹ Agcarm interview.

²² Ancare interview.

²³ Ancare interview.

This has implications for the impact of application costs charged by varying regulatory authorities. Typically a chemical company will weigh up the costs and benefits of each market. You would expect that if 400 pallets are being sold in the US then the application fees will be recouped from the sale of the 400 pallets. If 1 pallet is sent to New Zealand then the costs of approval in New Zealand would have to be covered by the sale of that 1 pallet. If compliance costs are set at the same levels as in the US, the cost of the compliance process on a per hectare basis will be much higher in New Zealand than in the US. Therefore comparing the costs of compliance between New Zealand and the US does not reflect the true costs paid for each new application. Significant increases in the cost of compliance for agricultural chemical companies will require a re-evaluation of their position in the New Zealand market i.e. a “phase” change rather than a continuation of the status quo.

Competition in the market

There are a bewildering array of agricultural chemicals on the market in New Zealand, however, most chemicals are straight copies of products that have come off patent. By their very nature these generic products do not have new chemistry and the economic impact of this supply competition is to erode prices.

The ability to utilise or extend products’ higher priced life through patents and the data packages that support their application are crucial to those companies bringing in new innovations. Since this is their only competitive edge in the market there is little likelihood that companies will co-operate and combine to broaden the definitions of their product (as suggested by ERMA and MfE)²⁴, particular when they sell so little into the New Zealand markets. Broadening the substance definition may mean that some companies carry the full cost of exposing products to the risk of “free-riding” (see Appendix A, A3.7 Risk and uncertainty).

2.1.2 Demand factors

Buyer preferences

As agricultural chemical companies have increased in size through mergers and acquisitions so too have the food companies who supply consumers. The market for food is dominated by large (and getting larger) trading houses, intermediaries, and supermarkets. The strong competition in this sector means that these companies closely monitor consumer preferences.

The clear message from the consumer is that food safety is an overriding concern. This has forced food companies to demand traceability and ever-tighter product specifications – they do this through tighter contracting. The reason for doing this is so they can trace where the commodities have come from and dictate how they should be grown.²⁵ This has had a major impact on the use of animal remedies and pesticides used on farms. For example, Holland and Rahman (1999) have illustrated the changes in approach to agricultural chemical use in different crops brought about by buyer pressure. This includes:

- an adapted Integrated Pest Management (IPM) programme called Kiwigreen. Over 90% of kiwifruit are grown in the Kiwigreen programme. This is an integrated pest control system, which includes a limited range of pesticide options. Kiwigreen

²⁴ ERMA and MfE interviews.

²⁵ They have this power because they can always source alternative product in other parts of the world. For New Zealand growers this means other Southern Hemisphere producers.

programme uses pest monitoring to guide insecticide spraying, using a reduced choice of pesticides applied in the long preharvest intervals. It involves greater use of “softer” pesticides, and modified canopy management to reduce disease pressure. The Kiwigreen programme leaves no detectable pesticides residues, meets all phytosanitary standards and has a low incidence of post-harvest rots, Holland & Rahman (1999).

- the application of IPM protocols in the apple industry by introducing an Integrated Fruit Production (IFP) programme. Rather than relying on a calendar based spray programme the IFP programme places broad emphasis on biological control and reduced pesticide use with the adoption of “softer” products, Holland & Rahman (1999).
- strict use of IPM techniques for avocados and citrus to meet the requirements of importing countries have also been introduced. This includes a very limited range of pesticides, Holland & Rahman (1999).
- other horticultural crops require specific treatments, which can vary from region to region and particular variants of IPM programmes are being employed depending on the problems faced in each region, Holland & Rahman (1999).

The approach is a direct response to the growing power of food companies acting in response to consumer demands. The response of the chemical companies has been to produce less and less toxic products that treat specific problems and either have nil residues or residues that last only a short time in the soil. Farmers may use three or four different products to treat a problem, whereas in the past they would have used one broad-spectrum product (which was more toxic).

This has implications for amount of chemicals entering the New Zealand market. In the past one product was used for a wide variety of uses (i.e. paraquat and 245 T), now less toxic products are being produced but there are more of them. In the past one application for a broad spectrum high volume product would have been needed, now three or four applications are required for products that will be used considerably less by farmers. If more “softer” chemicals are being brought on to the market the applications costs will increase. Furthermore, the cost burden will be amplified further because the volumes of each “softer” pesticide used will be less (relative to the amount broad-spectrum product used in the past).

Is demand seasonal?

Demand (mainly overseas) for commodities is highly seasonal and also changes markedly from year-to-year. This is particularly so for some of New Zealand’s smaller agricultural sectors, for example, squash, onions, and the arable sector. Table 5, as an illustration, shows how planting of different varieties changes over time in the arable sector. A four year average is compared with the plantings carried out in 1999/2000 to show the difference in crops grown on a year-to-year basis. One of the characteristics of the arable sector is that it is dependent on demands of customers who use Southern Hemisphere growers for out of season seed production – what is planted depends on customer demands in the Northern Hemisphere. This allows those growing the seeds to have two growing seasons in the same year.

For new varieties of seeds – including those that have been genetically modified – not only is the cost of the application an issue, but the time taken to approve applications is also important. Under the HSNO Act, ERMA have indicated that the time it takes to get an approval will increase – how much time is not yet certain, but it will be at least double the three week approval time taken under the existing administration. This

could potentially have economic consequences particularly if other regulatory regimes (most notably Australia) have less stringent rules, which cut down the transaction costs associated with testing new products (see Appendix A, A.3.10, Out of season research).

Table 5: Arable sector production

Hectares

	Average area planted previous four seasons	Area planted 1999/2000
White clover Huia	7,460	5,800
White clover proprietary	5,970	4,200
Brassica seeds	-	5,000
Fodder radish	110	650
Phacelia	150	680
Borage	-	5,000
Chicory	120	20
Lotus	220	120
Red clover	1,000	1,280
Seed multiplication areas	-	300
Yarrow	-	160
Lucerne	60	70
Hybrid vegetables 1		100
Hybrid vegetables 2		1000

Source: MAF

3. REGULATORY FRAMEWORK

What are we looking for in a policy framework? The policy framework should aim to maximising welfare over time with respect to the environmental risk and cost as well as production and consumption. In an ideal world the market takes care of these outcomes. In real world situations, however, market failure can occur which necessitates regulatory intervention.

In general economic terms the less regulation is preferred to more. This reflects the general starting point of our laws that people should be free to engage in activities unless they are prohibited for some good reason. Also, more specifically, good regulatory design should signal the importance of innovation for economic growth, and the maintenance and enhancement of New Zealand's standard of living. This is why, for example, New Zealand has signed up to international agreements (under the TRIPs Agreement of the Uruguay Round) on intellectual property laws that give patent holders uniquely powerful property rights.

When it comes to environmental protection, it is widely accepted that the pursuit of economic growth by itself may increase the risks of environmental damage and that some restraints are needed on the types of activities that may be undertaken, and the manner in which they are undertaken. This is "sustainability", which is at the core of the Resource Management Act (1991). The policy question then becomes, how to design a balanced and appropriate regulatory regime, in terms of the substantive rules, and the associated processes and institutions.

What should a regulatory framework look like? Below are set out some of the fundamental questions that need to be addressed when designing any regulatory regime, if it is to be effective and appropriate. These questions are based on simple principles in relation to regulatory policy design, which are reflected in many publications (which are specific to New Zealand conditions) and from the NZIER's practical experience in developing and advising on policy in a range of fields.²⁶

The important questions are:

- *what are the policy objectives?*
- *will the proposed regime advance those objectives? In principle? In practice?*
- *what are associated costs?*
- *do the benefits from the regime (measured in terms of advancing its aims) justify the full costs associated with the regime? Can the costs be reduced without appreciably compromising the benefits?*

3.1 Is the act workable in principle? In practice?

This requires an examination of the substantive rules, procedures, and institutions. It involves asking whether:

- the substantive rules accurately capture the policy objectives; and

²⁶ See for instance: Gruensprecht and Lave (1989), and Rose Ackerman (1996), which contain good background material. For New Zealand policy, see Hawke (1993) for a sound overview.

- the institutions and processes involved will, in practice, apply those substantive rules, in an appropriate and timely way, so that the objectives will be actually achieved.

The regime will need to deal with various types of (possibly overlapping) issues, and strike balances between them. The list includes:

- technical/scientific issues.
- environmental issues.
- cultural and ethical issues.
- other social issues.
- economic issues.

One of the major criticisms levelled at the HSNO Act is that, while it takes into account cultural and environmental issues it takes no account of economic issues.²⁷ Specifically, that it is not based on an evaluation of the risks faced by society using a cost benefit framework. This means that the operation of the Act may well cause completely unintended results such as increasing or maintaining the amount of toxic substances within the New Zealand environment – relative to the environment under previous legislation.²⁸

Different institutions and process are likely to be more appropriate for identifying and weighing different types of issues. Technical issues, in general, are more likely to be case specific, and require different, more specialised, inputs and evaluation, with the results typically being of limited application.

If “environmental and human protection” is the objective then a better understanding of:

- how costs and benefits are measured.
- the effectiveness of the methods employed to encourage less toxicity in the environment.
- how the uniqueness of the agricultural chemicals industry in New Zealand and the economics of the industry interacts with the regulatory regime.

As it stands, the HSNO Act does not adequately demonstrate, given the above points, how “protection” can be achieved effectively and at minimum cost. This is despite the HSNO Act placing heavy emphasis on protection of the environment and communities.

3.2 Quantifying costs and benefits

One of the more challenging valuation exercises is valuing the costs and benefits of changes in the environment. These include direct costs for the Government and for participants and indirect costs such as opportunity costs. The main form of indirect cost is what economists call opportunity cost. That is, if the regime results in some valuable activity not being pursued, the loss of the potential contribution is a cost of

²⁷ Ancare interview with Colin Harvey and Richard Paxman.

²⁸ While we recognise that new management techniques will improve the effectiveness of “older” chemical technology (i.e. with the use of IPM type systems and use of biological control methods), newer “softer” innovative chemicals are more specific in purpose and will cause less toxicity and be less persistent in the environment.

the regime. This may occur where a prohibition catches not only the target “evils” but also innocent “bystanders”. It can also arise where the regime would, in theory allow the activity, but, in practice, the cost and delay involved in obtaining the necessary permissions:

- is seen as prohibitive by the promoter; or
- is greater than the cost of doing something else, which is actually less socially valuable, and which is done instead; or
- is greater than the cost of doing the proposed regulated activity in another country, under a different regime.

The approach taken by economists, despite the very real difficulties in measuring the impact of regulation (see Appendix D), is a cost benefit framework. The strength of this approach is not that it provides an answer – which may be elusive any way given limited information – but rather that it helps clarify the effects, which are implicit in all decisions. Economic appraisal is valuable if used as an informative, rather than prescriptive tool, since it provides a consistent approach to harnessing available information and ordering priorities. This process is gone through so that we can clearly identify (either qualitatively or if possible quantitatively) whether the benefits outweigh the costs.

For example **Error! Reference source not found.** illustrates the important costs and benefits that need to be identified and quantified.

Table 6: Costs and benefits of agricultural chemical innovation

<p>Private Benefits</p> <p>Improved productivity - land and labour. (reduced input per unit of output)</p> <p>Improved market acceptance. (reduce expected value of crop rejection)</p>	<p>Private costs</p> <p>Cost of approvals process. (recovered from applicant and ultimately end users)</p> <p>Risks of unforeseen damage of new chemicals.</p>
<p>Public benefits</p> <p>Increased use of “softer” chemicals. (reduction in food residues and reduction in environmental concentration and consequent risks)</p> <p>Source: NZIER</p>	<p>Other costs</p> <p>The cost of applying chemicals to crops. (Contribution to R&D development and fixed costs)</p>

3.2.1 Specific benefits and costs

The introduction of the HSNO Act could bring the following benefits:

- farmers may find new and innovative ways of dealing with pests, parasites, and weeds. In this way the Act is creating incentives for farmers to innovate, so that new markets, for perhaps new products, could be found for produce that uses less agricultural chemicals or animal remedies.
- by using less agricultural chemicals or animal remedies production costs could be less.

- being able to secure a price premium on products with lower residues. Farmers, for example, could increase the amount of organic product grown, although this would depend on its profitability and the availability of suitable land.
- securing access to markets with ever tightening standards.
- improve environmental outcomes (if measurable).
- the public aspect of the process may improve public accountability of the process of approving pesticides.

The costs are primarily to do with the incentives, response of the implementation, and the expected value of environmental damage (i.e. the product of a very small probability and a potentially large cost). The HSNO Act has, over the long term, the capacity to potentially:

- constrain and eventually undermine some of New Zealand's vegetable and horticultural export industries.
- constrain the ability of traditional agricultural industries from being as productive as they would be over the long run relative to the previous regime.
- increase the uncertainty involved in the agricultural chemicals business and thereby reduce economic activity in the industry.
- increase the complexity associated with compliance with a more complicated and bureaucratic process.
- scale back and/or transfer agricultural chemicals R&D from New Zealand.
- to possibly increase, rather than decrease, toxicity in the environment over the long run relative to the previous regulatory regime.
- cause New Zealand to miss out on opportunities to increase production of some crops or plant entirely new crops (opportunity cost).

3.3 Do benefits outweigh costs?

A common theme from a number of those interviewed²⁹ was the view that extra resources were being put into both ERMA and ACVM for no apparent benefit. Why add complexity to the legislation when none was required, particularly when farming competitors in other Southern Hemisphere nations do not face these types of costs? This can be best illustrated by looking at how Australia has managed its agricultural chemicals industry (see, for example, Table 11 and Figure 3 in Appendix A).

Once the ability of the proposed regime to deliver the desired outcome, and the associated costs have been identified, it is essential to step back and ask whether the benefits that will be achieved in practice (not the maximum theoretical benefit) justify the costs that will be incurred. This is not a crude arithmetic process – many of the benefits and costs are unlikely to be able to be quantified in any useful or meaningful way. But a general weighing of the gains against the price that New Zealand will pay for those gains is essential, since it is rare that a particular goal is worth pursuing at any price, however great.

If we examine the probable benefits of introducing the HSNO Act and put them against the probable losses, mentioned in the last section, the outcome presents substantial regulatory risk to New Zealand. The probable cost, i.e. the loss of

²⁹ Elliott Chemicals, Ancare, and Aventis.

competitiveness of the vegetable, horticultural, and agricultural sectors, are very large. While the aims associated with the probable benefits are worthwhile, it is unclear the extent to which they can be achieved (or in some cases measured). Furthermore, the HSNO Act may have the opposite effect than what was intended – the environment maybe more “toxic” than would otherwise have been the case under the Animal Remedies Act and Pesticides Act.

A closely related issue is whether it is possible to achieve essentially the same gains at lower cost. Once the costs associated with a regime have been clearly identified, it is often possible to see ways in which those costs can be reduced (perhaps through an alternative regulatory structure) without compromising the policy goals. In order to maximise the benefit of regulation for New Zealanders it is important to find the least costly way of achieving the regime’s objectives, rather than simply fastening on one option, even if that option would work and would deliver benefits that justify its costs.

3.4 Other wider and more basic issues

Apart from the costs and benefits it is worth noting that the regulators’ problem with agricultural chemicals and animal remedies is that it is very difficult to control the use at the stage of application – despite voluntary codes of practice and well defined industry standards. It is also difficult to enforce liability if they are misused and create harmful side effects. Relative to other products bought and sold in the economy there is a case for stringent entry regulations because of the lack of control once released onto the market, since the costs associated with monitoring the application of pesticides are too high, and practically unenforceable.

The questions is: how stringent? There are various criteria that could be used:

- Positive net benefits. If the benefits of the HSNO Act outweigh the costs then the Act is a positive contribution and should be implemented.
- Positive cost benefit ratio. In some areas sectors, such as roading, the benefits have to exceed the costs by some multiple of the costs before a project can proceed.
- The precautionary approach, which suggests if we do not know exactly what the impacts of a particularly pesticide or animal remedy are going to be then it should not be introduced. The precautionary approach, in effect, freezes the risks taken, favouring risks taken in the past over risks that could be potentially taken in the future.
- Safe minimum standards regulation provides a guide to the development of regulation so that risks can be managed up to the point where costs become “unacceptably high”. It should be noted that what constitutes an unacceptably high cost is driven by political imperatives e.g. distribution of job impacts etc.

Note that the first two points are often not fully quantifiable so we end up making decisions under uncertainty. Precautionary approach and the safe minimum standards approaches (last two points) are a reaction to unquantifiability, i.e. in the absence of information, say no unless doing so is particularly onerous.

4. CONCLUSION

Two important issues are raised by the introduction of new regulatory environment on the agricultural chemicals industry. They are:

- what will be the practical impact on the agricultural chemicals industry and on other agricultural industries; and
- does this satisfy the requirements for the development of a robust regulatory framework?

There is a clear difference between the design of the ACVM Act and HSNO Act. The ACVM Act's objective is to intervene only where necessary, and to manage the risks associated with agricultural compounds by balancing social, economic, and environmental objectives. The HSNO Act seeks to protect the environment and people by preventing the use of or managing hazardous substances.

In considering the practical effects there are three aspects which seem salient:

- the costs of the proposed process.
- the time, uncertainty, and opportunity cost.
- the likely responses to the regulatory change within the chemicals industry.

In effect, the HSNO Act has taken into account the impact on people and the environment and not considered other factors, which may impinge upon the stated objective. By neglecting economic factors the objective that HSNO Act is attempting to achieve is at risk i.e. the protection of environment and human health. This is because the trend in new chemicals is to produce less toxic or “softer” and more targeted product.³⁰ If the substantial increase in the cost of compliance deters companies from bringing to New Zealand product with new and innovative active ingredients then farmers will be left with “older” product already on the market, compared with the prevailing situation. This will be a step back.

Good regulatory practice also involves weighing the costs and benefits of policy change. An examination of the potential costs and benefits of the new regulatory environment show that there are potential economic costs, which could be very substantial while benefits seem to be smaller. A legitimate question from the industry is could the objectives of the Act be achieved in a more cost-effective manner? The key factors that need examination are:

- who bears the costs? From an efficiency perspective, this is only important in ensuring that beneficiaries face the full marginal cost so there is no over-supply (under pricing) of effects causing externalities.
- what level of costs are appropriate? (including uncertainty, time delays and opportunity cost). This is the basic question addressed by the CBA.

A more extensive evaluation of one of the other regimes in place, say, Australia may provide some of these answers.

³⁰ The HSNO Act will have the impact of altering risk. It favours risks taken in the past over risks taken in the future.

The practical impacts on the agricultural chemicals industry of an increase in the cost of compliance, as discussed, are not new. The 1989 Penman Report to the Ministry for the Environment clearly illustrates the impact of increased costs of compliance.

To re-examine and categorise these impacts we have used a Structure, Conduct, and Performance (SCP) framework (see Appendix A), which illustrates the economic impacts. Two important structural impacts shape the agricultural chemicals industry:

- the importance of research and development. Companies spend significant proportions of their profits on R&D. To bring one new product to market requires investments of at least NZ\$200 million dollars.
- to support the research infrastructure and the risks of product failure, agricultural chemical companies tend to be large.

In relation to the world market, New Zealand's share of the agricultural chemicals market is small – in fact 0.026%. This means that if the regulatory process presents any sort of risk to product sales in other countries or it allows other companies to mimic their products, companies will not apply for approval in New Zealand.

The risk averse nature of agricultural chemical companies means that if there is any chance that a product will be rejected by any developed country's regulatory authority, agricultural chemical companies will not apply for approval in that country. The introduction of the HSNO Act substantially increases the chances that agricultural chemical companies will only introduce agricultural chemicals into New Zealand after most other developed countries have approved a product for use, thus reducing the chance of rejection and denying access to agricultural users in New Zealand of that product when their competitors already have access.

Two parts of the HSNO Act expose chemical companies to that risk:

- the public process means that their competitors can obtain information about what they are researching in New Zealand.
- the design of the HSNO Act means agricultural chemical companies are meant to group products under generalised substance headings.

The impact of a substantial increase in the cost of compliance has the potential to have a detrimental impact on the industry.

Uncertainty, combined with the complexity of the new regulatory environment was one major issue, which came through from the industry interviews. ERMA and MAF may well have the best intentions but the final way the regulations are interpreted may be decided in the courts. There are fears about the application process (particularly the ERMA process). There is also uncertainty about how MAF will administer the ACVM Act, particularly on what is known as off-label use and how well they will be able to protect the data generated by agricultural chemical companies.

Furthermore, the change in the regulatory process changes the nature of the relationship with industry. The introduction of the HSNO Act has the potential to diminish the goodwill that has been built up in the past between regulatory agencies and industry participants. This will increase the transaction costs to government in administering the regulatory regime.

Market performance issues are dominated by the possible impacts on dynamic efficiency. These are long term impacts, which will not show up for a number of years. Our analysis suggests that the present proposals will undermine positive environmental developments underway, and also affect the operation of New Zealand

agriculture. There are likely to be unintended consequences to the regulatory interventions proposed. Penman's (1989, p88) describes it in the following way:

“Increased difficulties in meeting importer’s quarantine and residue standards, as NZ continued to rely on older and dirtier pesticides, ultimately creating a comparative disadvantage for NZ export agriculture as overseas markets discontinued the use of these pesticides.”

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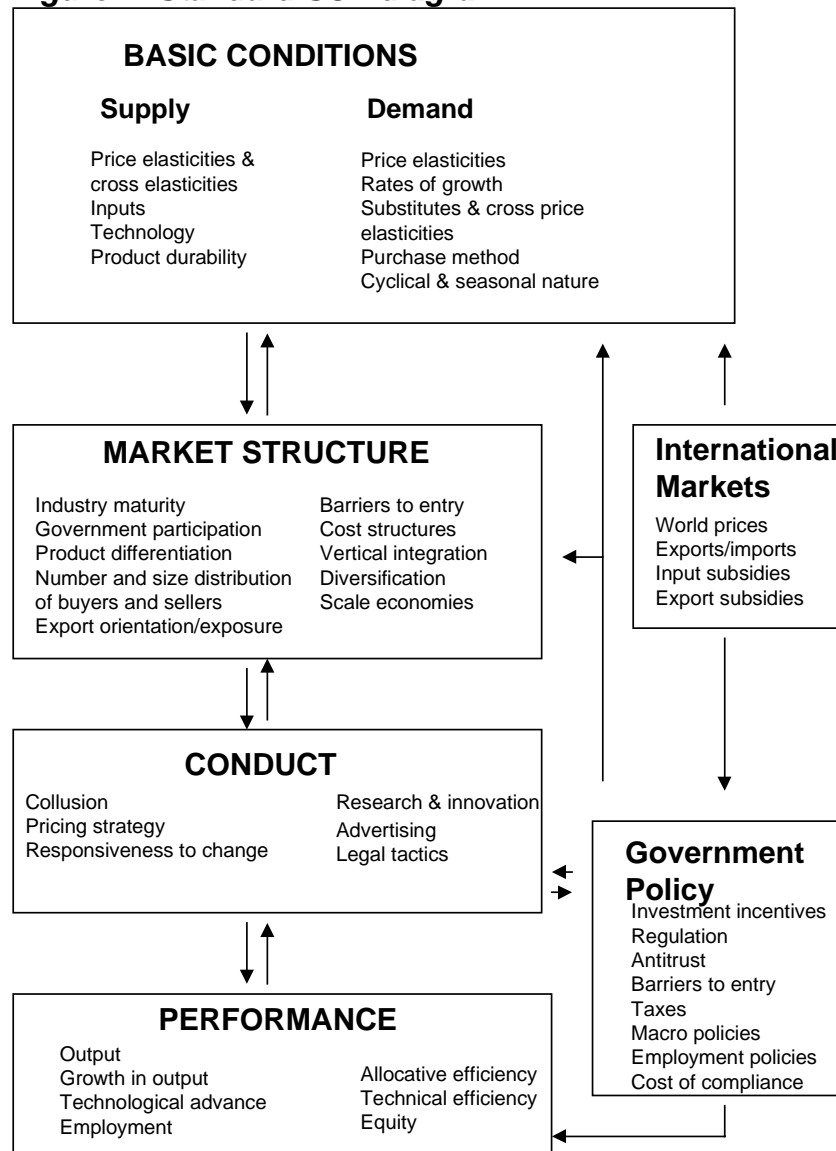
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APPENDIX A: STRUCTURE, CONDUCT, AND PERFORMANCE

A.1 Approach

To better understand the workings of the agricultural chemicals industry we have used a Structure, Conduct, and Performance framework. The SCP framework is used in the form of a “check list” (see Figure 2) so that we can describe how different economic factors impact on the agricultural chemicals industry.

Figure 2: Standard SCP diagram



Source: NZIER

The SCP framework has been widely used in economics (e.g. Schmalansee 1987, Scherer and Ross 1990) as an analytical tool. The basic assumption of the model is that

the market structure determines, or at least has a strong influence on conduct, which in turn influences performance of the industry.

The advantage of this approach is that very different industries can be evaluated by applying a general model. More importantly it also shows:

- how the unique and individual characteristics of the agricultural chemicals industry impact on economic behaviour in that industry (i.e. specifically on structure, conduct and performance).
- the interconnection between various parts of the industry (i.e. changes to one part of the industry will impact on structure, conduct, and performance).

The model has in the past been core to most studies of industry and was part of the so-called Harvard School (Grether, 1970). There are, however, a number of criticisms of the model:

- Posner (1979) believed that the SCP framework was over elaborate since the competitive market adequately explained most market behaviour and outcomes.
- others criticised the model for assuming causal linkages that might not always have been established empirically, and for being uni-directional in its focus.

In response to the latter criticism, the SCP model was modified to include feedback effects (included in Figure 2). These feedback effects have been added to recognise that the behaviour of firms and performance outcomes within industries can themselves alter market structure – whether it is because of mergers between rivals, statutory protection, or the increased costs of complying with government regulation. This recognises that all businesses operate in a dynamic setting and respond directly to changes in that setting. So when the cost imposed by government to do business increases – it will impact on the way businesses operates (see Figure 2).

The SCP framework is used here to describe the agricultural chemicals industry in New Zealand and illustrate the linkages between industry structure, conduct, and performance and how government can influence these linkages through increased compliance costs. Two important features of this paper are:

- the SCP and the use of a list of questions to identify elements of an “ideal” regulatory regime requires a certain degree of repetition since the sections are self-contained pieces of work. We have tried to cut down on repetition, where possible, by referring to other sections when different aspects of the same question are explored.
- apart from the specific information given in the interviews (see Appendix C) and the economic frameworks we have used to present the information the paper has pulled together already established material, particularly from Penman et al (1989) and Holland and Rahman (1999).

A.2 Market structure

A.2.1 Market trends

The pesticides and animal health markets in New Zealand are worth approximately \$190 million and \$170 million per annum respectively.³¹ The composition of agricultural chemicals is changing over time. The market is demanding “softer” and

³¹ Agcarm interview.

“softer” chemicals.³² The application of this product is typically part of an integrated pest management approach which lays down specific guidelines as how and when different products should be applied. The changes in pesticide use over the past decade are primarily due to the changes in land use, cost effectiveness, and the adoption of Integrated Pest Management (IPM). This means using more biologicals and less organophosphates and dicarboximides (Holland and Rahman (1999)).

It is generally viewed, within the industry, that further major breakthroughs such as the discovery of the glyphosate Roundup are unlikely. The advances now envisaged are focused on key global pests; these include the insecticides fipronil and imidacloprid (both discovered in the 1980s).³³ Agricultural chemical companies are spending huge resources in finding new products, for example Dow AgroSciences’ product spinosad, a new insecticide now registered for numerous crops in the US, came from a soil sample taken at a Jamaican rum distillery.

The Penman report (1989) prepared for the Ministry for the Environment highlighted the importance of pesticides to the New Zealand economy. “In horticultural production, the use of pesticides is vital to ensuring market access for fresh export crops” Penman (1989) p1.

According to Holland and Rahman (1999) the tonnage of pesticides used in New Zealand peaked slightly in 1998. Usage, however, has remained relatively constant through the 1990s at approximately 3,500 tonnes per annum. Herbicides (68%) dominate use followed by fungicides (24%) and insecticides (8%). Two thirds of total use is concentrated in four classes of pesticides (phenoxy hormones, phosphonyls, inorganic fungicides, and dithiocarbamates).³⁴

A.2.2 Commercial and research markets

The HSNO Act will impact on a number of different markets. The major impacts will be felt in the commercial market. (see Table 4 which shows the possible impacts on vegetable, horticultural, and agricultural products).

The agricultural chemicals industry also supports the domestic research industry by awarding contracts to New Zealand private sector, universities, and CRIs. Research is focused on trial work for new agricultural chemicals and animal remedies. While this is a much smaller market (than the commercial market), it does supply a vital base for agricultural research in New Zealand and is a natural and key part of New Zealand’s knowledge economy. In all interviews with industry players it was stressed that the increase in the cost of compliance would have a detrimental impact on agricultural

Indicative time line of herbicide development.

1940s	Development of pesticides
1942-1945	2,4-D and MCPA discovered
1954	Phenyl Ureas
1960	Trifluralion
1958	Bypyridyls
1962	Hydroxybenzotrioles
1971	Glyphosate
1980	Sulfonyl Ureas
1985	Diflufenican
Source: Aventis	

³² Agcarm interview.

³³ Interview with Aventis.

³⁴ These compounds have very low human and environmental risks if used as directed.

research including the withdrawal of contracts, switching of research (particularly to Australia), and loss of staff overseas.

A.2.3 Cost structures

When deciding to register a new product in the New Zealand market an agricultural chemical company will weigh the costs and benefits of so doing. Apart from the normal business costs associated with market development, the major costs are those of regulatory compliance. The small size of the New Zealand market means that, even small increases in compliance costs can have a major impact on the number of products with new active ingredients coming through the application pipeline.³⁵

Over time, the transaction costs associated with regulatory regimes governing the use of agricultural chemicals has increased (see Table 7). Also the research activity in New Zealand has been cut back. Companies claim that this is a direct result of the increased costs of compliance with public processing. However, this is difficult to prove because of the huge changes that have gone on in the agricultural chemicals market and any number of factors can contribute to the withdrawal or scaling down of operations in New Zealand.

Table 7: Pesticide Board cost increases

Average costs

	Costs for registering products with new active ingredients
1981	\$30
1991	\$1,600
1997	\$4,500
1999	\$11,000

Source: Paxman (2000)

A.2.4 Relative size of the competition

Table 8 describes the type of players in the New Zealand agrichemicals market (see also Appendix B). Most importantly for the development of the New Zealand market are the large multinationals (or their franchise operations) who bring innovative new chemistry onto the market. These companies are vital to the industry because all other agricultural chemical companies are dependent on their new products.

The enormous costs associated with R&D and the risks associated with such development, means that successful agricultural companies (i.e. those that produce products with new active ingredients) are tending to develop chemicals for the high volume crops only. This leaves niches for smaller companies to enter the market and service minor specialist crops such as onions, squash, asparagus, olives etc.

The bulk of the chemicals on the market are generic animal remedy products and pesticides. These constitute a volume market with relatively thin margins. The product sold depends entirely on active ingredients in products that have come off patent.

³⁵ Unfortunately the figures we have do not show the number of applications per year – only the dollar amounts received per annum. The revenue received by MAF does not give a good indication as to the number of applications because there is no consistent pattern to the number of applications coming through and the differing costs associated with each application.

Table 8: Description of industry players

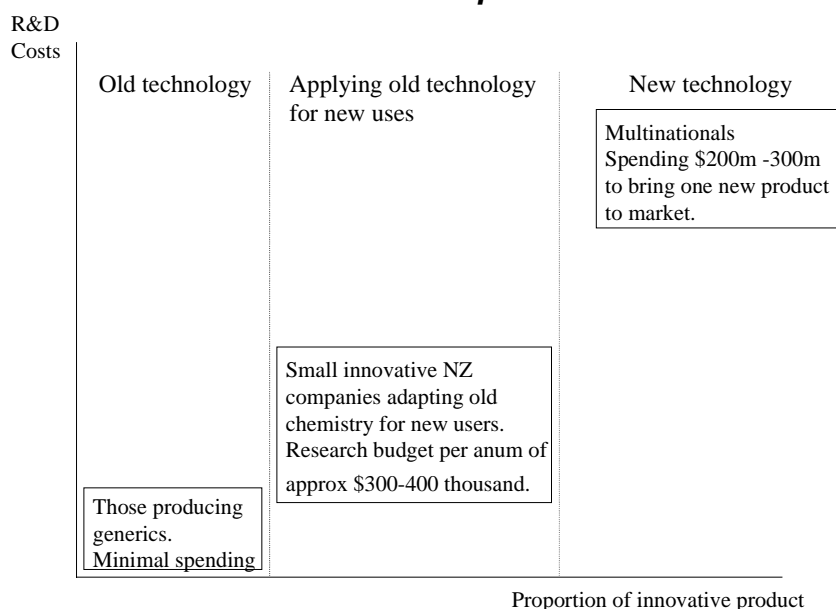
Company	Chemistry used	Protection
Large multinational	Innovative new chemistry and other branded product	Branded products with products still under patent protection
Small New Zealand companies	Uses current chemistry with new applications or additional active ingredients	Branded products with some patent protection and generics
Small New Zealand adopter companies	Current chemistry	Sell other companies' brands and generics

Source: NZIER

A.2.5 Product Differentiation

While new innovative products are the key to a dynamic market, these products make up only part of the market. Most product in the market place is generic. It is chemistry with “well known” ingredients, which has come off patent protection. Very little money is spent by the companies selling generic products on R&D (see Table 9) and the markets they operate in are highly price competitive. These companies are also completely dependent on products developed in the first place by multinational agricultural chemical companies.

Table 9: An indication of the importance of innovation



Source: NZIER

There has been, up till now, room for small New Zealand adopter companies operating in the New Zealand domestic market. As niche players they take generic agricultural chemicals and innovate and or adapt products to New Zealand conditions. Typically their research is hands-on, products are tested on designated sites where the problem

exists not in a laboratory. This has the advantage of trialing chemicals under actual field use conditions.

A.2.6 Scale economies

There is a high proportion of fixed costs in the development of new agricultural chemicals, therefore scale economies are important. The huge cost of researching and generating the testing data in the development stage means that the size of the business has to be large. Not only do agricultural chemical companies have to be large enough to stand the costs of the product development cycle, they also have to be multisided, so as to adsorb the cost of product failure.

Other factors contributing to growth of size of agricultural chemical companies includes:

- to access an increased number of markets requires more capital for market development. This requires increased access to capital. One way of being able to cheaply acquire to grow, perhaps through the acquisitions of other agricultural chemical or related businesses.
- pressure has come from retailers whose power and influence in agriculture has also grown. Supermarket chains, for example, have undergone widespread mergers increasing their purchasing power and global reach. This puts pressure on the ability of agricultural chemical companies to maintain their margins against forces seeking to lower costs.
- wholesalers – those who distribute agricultural products – are following the consolidation trend. For example, in the US, four companies pack 80% of the meat, four companies also crush 80% of the soybeans, and 50% of the broiler chickens are produced by four companies.

These trends have forced agricultural chemical companies to grow. Over the past five years there has been a wave of mergers and acquisitions so that they can continue to be important players in the market.

A.2.7 Government participation

A.2.7.1 New Zealand government

Government has a significant impact on the agricultural chemicals market. It is the government who decide the “rules” under which the agricultural chemicals companies can sell their products in the New Zealand market and the extent to which a small country can use its regulatory environment as a contributing factor towards its competitive advantage.

A.2.7.2 Foreign regulatory authorities

In world markets New Zealand is typically a price taker. It exports predominately agricultural commodities into large industrialised nations. What is commonly not understood is that New Zealand is required to adhere to international standards such as those set by the Codex Alimentarius Commission. Further, as an exporting country that relies on importers having confidence in its food production system, New Zealand standards are usually significantly tighter than international standards. These are typically set in terms of Maximum Residue Limits (MRLs) on products.

The agricultural chemicals market is not static. New chemicals are being released and older ones are being withdrawn. Typically an older chemical will be withdrawn

because the costs to the company of producing data to defend its use is more than the future profits the company can generate from that product. For example, the use of triazine herbicides is now restricted because of leaching and in the US increased restrictions are being placed on organophosphates.

This has consequences in New Zealand because once the product is withdrawn from a major market it usually can not be used on products exported to that country from New Zealand. This effectively bans the product in New Zealand as well. The continually changing nature of the market is an important issue if there are impediments to “newer” chemistry coming on to the market.

A.3 Impact of market conduct

This section analyses the conduct of the industry once it has to comply with the new activity charges. Our approach is to consider the increased cost of compliance as an “economic shock” which changes the equilibrium of the SCP framework (see Figure 2). These changes are fundamentally increases in transaction costs including:

- a new public process, and
- the uncertainty involved in the application process.

A.3.1 What are the new charges?

The new charges under the HSNO Act, ACVM Act, and the current charges are described below in Table 10. Indicative ACVM fees and fees associated with the current legislation are also shown in Table 10 and industry charges are shown in Table 12. While the exact amount of money each application will cost is not known, one thing is clear, the HSNO Act and ACVM Act are likely to mean a substantial increase on what previous charges have been. Under the HSNO Act the charges have been divided into four different categories ranging from importing into containment, through testing products in a “world first” situation.

These charges are only indicative since each application is different and ERMA, as a new body, has not gone through the process before. They have also suggested that “the first few applications are likely to have higher costs as we [ERMA] deal with issues and process for the first time” *Agcarm review January 2001*.

MAF’s charges change (from the Pesticides and Animal Remedies Act) because of the change in the servicing role required under the ACVM Act. The key differences are:

- charges on environmental and human health assessment are transferred to the HSNO Act, while the responsibility for product risk assessment is devolved to applicants.
- providing a public process and maintaining core capacity to handle applications within the legislative time lines imposes new costs.

The servicing requirements of the ACVM Act are significantly different to those provided under the previous regulatory regime. As a general rule of thumb (and depending on the application) applicants will pay about 33% less under the ACVM Act than under the previous regulatory regime. The reduction of fees is reflected in the transfer of the toxicology evaluation to ERMA.

Approximately 35% of compounds that currently require an Animal Remedies Act licence or Pesticides Act registration would be exempted from registration under the ACVM Act, reducing costs to importers and manufactures of those compounds.

The annual charges made under the ACVM Act are between \$282-\$440 (including GST) while under the previous Act annual fees ranged between \$337 and \$562 (including GST).

A.3.2 Australian regulatory regime

The New Zealand approach to charging (Table 10) can be contrasted with the Australian charges, which are detailed in Table 11. The general policy approach, by the Australian Government, calls for a partnership between business and government to provide a platform so that the most efficient policy infrastructure can be developed to obtain satisfactory outcomes for government and the private sector. As an example, the idea of partnership underpins the vision statement shown in Figure 3 for off-label use of agricultural chemicals.

The cost structures of both regulatory systems are dramatically different. In the worst case scenario (category 4 in the HSNO Act, which is equivalent to category 3 in the Australian charges) costs charged by the Australian regulatory regime are substantially lower than the *known* costs that ERMA will charge (There may be more unknown charges associated with ERMA regime).

Table 10: Proposed charges under the HSNO and ACVM Acts

	ERMA charges ²	ACVM charges	Previous charges
ACVM and current charges.		\$3,000 – \$4,000 ¹	\$11,000+ ¹
1. Import into containment.	\$500 - \$10,000		
2. Import/manufacture for release – rapid assessment.	\$400 - \$2,000		
3. Import/manufacture for release – standard processing.	\$5,000 - \$30,000		
4. Import/manufacture substance posing significant hazard, with an active ingredient being considered for the first time anywhere in the world.	\$50,000 - \$250,000		

Note: (1) Charges differ because of the differing legislative requirements changing from the previous Act to the ACVM Act. (2) These are “ballpark” figures giving an indication of the likely charges from a “standard” application. If ERMA believe that insufficient information has been given or it covers “new ground” then costs could be higher.

Source: ERMA. A quick guide to our fees and charges. No. 11: December 1999, Agcarm, and ACVM group.

The main difference between the two approaches is that the New Zealand approach is based on full cost recovery from the applicant. The Australian approach funds the cost of application and then applies a levy on sales. The time of the government officials and the costs associated with the hearings are not included in the charges.³⁶

³⁶ In the Australian case the government have funded the *structure* of the application process (the hearings, government officials’ time etc) and charged the industry the *processing* time for the application. This recognises that structural costs are largely fixed in nature and cannot sensibly be included in an application charge without distorting marginal signals.

Table 11: Australian agricultural chemical charges

(Australian dollars)	HSNO Act equivalent	
1. Repackaged chemicals	Category 2 & 3	\$620
2. A major formulation change	Category 2, & 3	\$12,370
3. A new active constituent (one that never has been approved)	Category 4	\$20,000

Note: There is also a levy on sales.

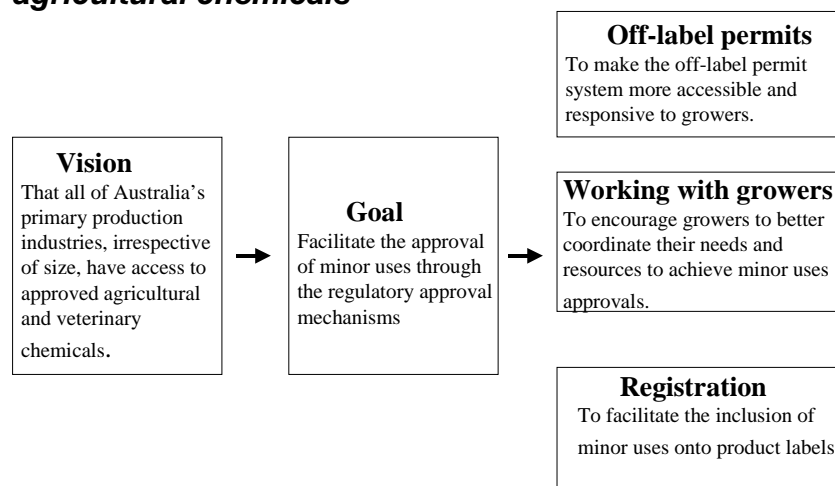
Source: National Registration Authority for agricultural and veterinary chemicals

The Australian stance appears more flexible than that of the HSNO Act, for example, small changes in formulation do not have to go through the application process again, the costs are certain (there are no uncontrollable factors), and the process is straight forward. The funding approach is akin to a two-part tariff. The up-front fixed costs are discussed above in Table 11 and the variable cost, which is sales dependent, is levied on a yearly basis.

The HSNO approach puts the full burden of costs on the industry. Therefore the policy prescription indicates that there is no public benefit from the introduction of products with new active ingredients into the New Zealand environment – this is hotly contested by the industry and the end users.³⁷

The emphasis in Australia is for access to agricultural chemicals so that industry will not be disadvantaged (see Figure 3). Rather than prescribing what an industry should produce or what its inputs should be, the Australian approach has been to make available, as cheaply as possible, agricultural chemicals that farmers require to remain competitive (within environmental and health guidelines).

Figure 3: Australian approach to off label use of agricultural chemicals



Source: National Registration Authority Fact sheet No. 9 May 1999

³⁷ The industry would point to a less toxic environment and a more competitive agricultural sector as important benefits from minimising the costs of compliance.

A.3.3 Cost recovery

In a small market (relative to much bigger OECD markets) the question of who covers overheads of an organisation such as ERMA is a major question (i.e. the overhead per unit of production in New Zealand is much higher than in a larger country, therefore the ability to sustain overhead costs of the regulatory system is much lower). As shown above, with the comparison between the Australian and HSNO charges the difference between full cost recovery and marginal costing can be very significant. This may have an impact on competitiveness, particularly if the supply of products with new active ingredients is constrained in New Zealand.

Notwithstanding the various cost structures which go into making both country's agricultural sectors competitive, it is certain that the regulatory environment in both countries contributes to the competitiveness of each industry (particularly in competitive export orientated agricultural industries in New Zealand and Australia). Therefore an efficient regulatory environment contributes to the efficiency and competitiveness of the industry it is regulating.

A regulatory regime which does not fully recognise the importance of the economic component of the industry it is regulating, may, as an unintended side effect, reduce the competitiveness of the industry it is regulating.

A.3.4 Possible impacts of increases in costs

The move to the new system under the ACVM and HSNO Acts entails a considerable increase in fees, which will have an impact on the agricultural chemicals industry. While there is very little data to demonstrate the impact on the industry in the past, MAF have noticed that once fees go up the number of applications noticeably drops.³⁸ While we can not state unequivocally, because of the *ex ante* nature of the study, there is a high expectation of a drop in the number of applications for pesticides and animal remedies.

The Penman Report (1989, p87) commissioned by MfE gives a clear indication of the impact on the pesticides industry:

- “if up-front regulatory costs were substantially increased, proprietors would find that these costs could not be recovered in sufficient time period to make a normal profit and hence could not justify registering many products” (this is covered in this section).
- “the economically more marginal products, most likely to not be registered where market entry costs are high, are those that anticipate smaller sales and use. These would include many herbicides and most of the selective, biologically sophisticated and low-impact insecticides and fungicides. In other words, some of the environmentally more desirable products” (see performance).
- “... imposing extra hurdles can have the startling unobvious effect of leaving us with some of the least desirable pesticides and precluding our access to the more environmentally-benign technologies” (see performance).

Penman (1989) p88 also point to two other costs:

- “a shortage of chemicals registered specifically for minor use crops which compels off-label use and decreases confidence in estimates of potential daily intake, thus strengthening the need for costly compliance residue monitoring” (this section); and

³⁸ Morris interview, MAF.

- “increased difficulties in meeting importer’s quarantine and residue standards, as NZ continued to rely on older and dirtier pesticides, ultimately creating a comparative disadvantage for NZ export agriculture as overseas markets discontinued the use of these pesticides” (see A.4, Impact on performance).

These five points identified by the Penman Report represent the core problems associated with a substantial increase in the cost of compliance and are discussed in this section and the section on performance.

Table 12: Breakdown of Costs

NZ \$

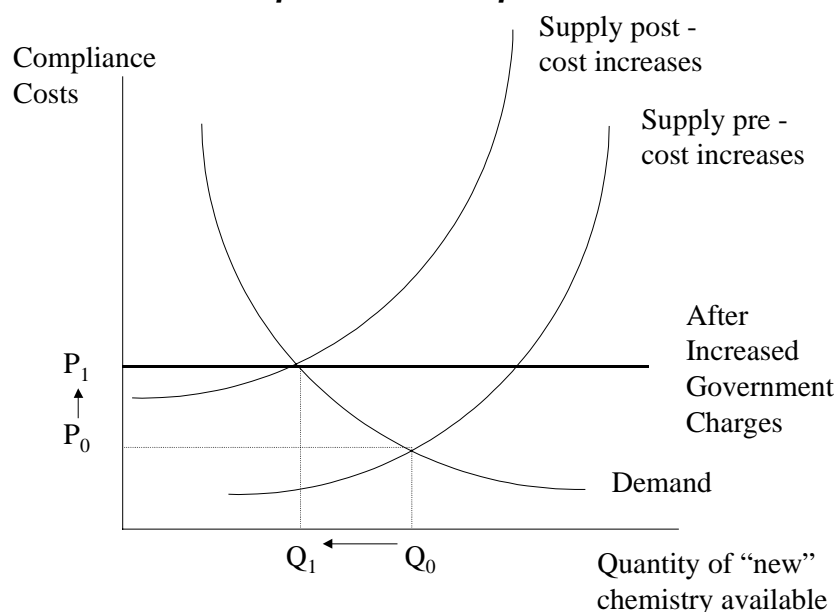
	<i>HSNO</i>	<i>Pesticides ACT</i>	<i>ACVM</i>
Application cost	(see table seven)	\$11,000+	\$3,000 – \$4,000
Consultation with Maori and general public ¹	Costs unknown		
Company expenses			
Trials ²	\$70,000 – \$100,000	\$70,000 – \$80,000	\$70,000 – \$80,000
Company time	Estimated on a 1:1 basis with ERMA costs. Depending on the type of application put forward (see table 2). These could be anywhere between \$500 - \$250,000.		
Risk assessment			\$2,000 – \$3,000

Notes: (1) ERMA is in the process of revising the subsidy for its own time in the public hearing case. Any cost overruns will be charged to the company making the application. (2) Trials are not all for the benefit of the application process. Companies are also testing for the efficacy of the product in New Zealand conditions. (3) ERMA charge out rates are \$100 per hour. (4) There is an annual fee charged under the Pesticides (\$337) and ACVM Acts (\$390) which covers the costs of activities such as standards setting and compliance which cannot be directly linked to an application

Source: ERMA Fees and charges schedule November 1999, ACVM, and Agcarm

Using a stylised demand and supply diagram (Figure 4) the impact of a large cost increase is illustrated by the shifting of the supply schedule upwards. The point of intersection with the (unchanged) demand curve moves to the left.

Figure 4: Stylised demand & supply interactions once extra costs are imposed on new products



Note: The intersection between P_0 and Q_0 is the equilibrium point before the introduction of the HSNO and ACVM Acts.

Source: NZIER

The upshot is to reduce the local availability and amount of products with new active ingredients. For example, in the worse case scenario, Elliott Chemicals estimates that an application fee of \$250,000 - \$300,000 on a product with a new active ingredient would require a market worth approximately \$1.2 million annual turnover. They have 1 out of 50 products that falls into this category. The local market is very limited in scale.

The onset of the two Acts already has had two impacts:

- an increase in the number of applications to the Pesticides and Animal Remedies Boards to get as many applications approved before the new legislation takes affect (Elliott Chemicals have employed extra staff to increase their ability to make applications);
- the transfer of research and development overseas (Ancare are using scientists in New South Wales to do research);

The industry also believes that while the impact of the HSNO Act will be damaging, there will be little incentive to change the Act in the short term. This is because in the first three years government will fully fund ERMA while they transfer over substances into the ERMA classifications (interview with Elliott Chemicals). Other impacts foreseen by the industry could then include:

- sharply reduced amount of applications because of the cost increases.
- no “world first” chemistry in the New Zealand market. New Zealand would become a follower not a leader because of the costs of an application costing

between \$250,000 and \$300,000. (see A.4.6 as an illustration of New Zealand's previous use of "world first" chemistry).

- smaller New Zealand agricultural chemical businesses specialising in minor crops (that the larger multinationals view as being unprofitable) will be unable to afford the application costs associated with altering "currently used" chemistry to apply to the minor crops they specialise in supporting. This places the long term viability of those agricultural chemical companies and the sectors they support in jeopardy (see Table 13). For example, if onions have an insect problem and there are no new chemicals coming on the market, sooner or later the chemicals that are being used against pests will not be acceptable to the buyers (supermarkets) in overseas markets. Other vegetables that are in a similar situation include squash, asparagus, and potatoes.
- larger multinational companies will play a waiting game. If a new product faces dramatically increased costs or they are exposed to undue risk by the application process so as to jeopardise other markets, they will scale back their operations in New Zealand.
- the animal health sector, because of its size, may be in a better position to withstand the new charges. However, over the long term they will be affected by the ACVM and HSNO charges, since there is a possibility that few products with new chemistry will enter the market.

Table 13: Export of onions

Value in \$NZ

1995	95,267,663
1996	69,379,359
1997	55,819,898
1998	100,905,750
1999	103,606,492
2000	81,241,844

Source: Statistics New Zealand, INFOS

A.3.5 Derived demand analysis

Usually when looking at an industry, such as the agricultural chemical industry, economists characterise its output as a derived demand i.e. its output is mainly consumed by another industry, which produces the final product for the consumer. Typically these industries are less price sensitive and costs (such as the increased in the cost of compliance) can be partially absorbed by industry participants.

In this case the increase in costs are such that chemical companies will not apply for product release in New Zealand. This is because farmers would not find it cost effective to use the products given the prices that agricultural chemical companies would be compelled to charge to cover costs and make a profit.

A.3.6 Incentives to avoid regulation

As the cost of compliance increases the incentives for farmers to take things into their own hands and smuggle unapproved product into New Zealand increases. MAF believe that New Zealand is too small a country for farmers to be able to consistently get away with this type of action – their systems and networks are good enough to detect non compliance at the moment. However, they do believe that if the economic

incentives are great enough – particularly in relation to Australia – non-compliance could become a problem.

The HSNO Act may have also set up unintended incentives for industry participants to circumvent the Act, since compliance costs are higher under the HSNO Act than other Acts that cover similar substances. This is particularly so for veterinarians who use some medicines which are covered by both the Medicines Act as well as the HSNO Act. Rather than getting an approval through the HSNO Act to use the substance, veterinarians may be tempted to use the Medicines Act to obtain product.

An example of the barriers farmers face under the existing legislation can be seen in small industries such as the deer industry. Ticks are a major problem with deer, especially new born fawns – ticks can kill a new born fawn very quickly. There are no specialised ‘tickicides’ registered for deer in New Zealand so farmers are having limited success in controlling ticks. The companies that market tickicide products will not register in New Zealand because they see the markets as too small and the costs of compliance as too high.

These problems are likely to increase under the HSNO Act and the incentives to find ways of circumventing the law will grow. For an example of how Australia deals with this problem see Figure 3.

A.3.7 Risk and uncertainty

A major issue voiced by many parts of the industry is uncertainty and increased risk. Risk and uncertainty is an economic issue because it can involve real economic costs. Certain strategies are normal responses. Faced with increased uncertainty:

- firms will delay investment.
- invest in other countries.
- scale down investment in New Zealand.

The mere institution of a new regime associated with the passing of the HSNO Act has created, albeit temporary, risk and uncertainty for the agricultural chemical companies and they have (and will) react in broadly economically predictable ways (see points above).

The HSNO Act goes further than this and creates additional sources of risk and uncertainty. These include:

- the HSNO Act is specifically geared towards environmental and cultural objectives and takes no account of the economic organisation of the agricultural chemical industry and how the economic factors impact on the environmental objectives of the Act (see below).
- the specific design of the Act. The biocide rider catches everything – it will catch chemicals and antibiotics that no other regulatory agency requires information on. Consequently there is no data anywhere in the world to satisfy the applications. The industry is uncertain how ERMA will approach these issues in a practical sense.
- what is being tested by ERMA and for what purpose? It is normal practice for agricultural chemical companies to structure their research activities (in order to get approvals for their products from regulatory authorities) around the active ingredient in the pesticide or animal remedy. ERMA will not be testing the active ingredient but the formulation that is intended to be imported. No data exists on

the formulation, only the active ingredient, and no company will do the necessary research to provide such information on the product formulation for such a small New Zealand market.

- the two different Acts create two different processes and two different data-bases. The application process adds complexity and cost to the process of getting products with new active ingredients on to the market.
- the public nature of the hearings are also a major concern for agricultural businesses. It means that competitors have easy access to information about companies' research and it also provides a vehicle for special interest groups. Not only does it add another layer of uncertainty it also adds cost to the application process. The Ministry for the Environment³⁹, the architects of the HSNO Act, believed that after a while there would be a lack of public interest in the application process. However, ERMA believed that interest groups would always be interested in particular pesticides.⁴⁰
- patents and the supporting data packages are crucial to those companies bringing in new innovations. This is their competitive edge in the market, so there is little likelihood that companies will group products together and apply to bring products in under a substance product description. Both ERMA and MfE⁴¹ have suggested this to lessen compliance costs. Broadening the substance definition may mean that some companies carry the full cost of exposing products to the risk of "free-riding". The "free-riding" risk could occur when generic producers use the extensive data packages (produced by the innovator company and required by ERMA in the approvals' process) to support their own case for entry. Thus using a broadly defined substance in an application could allow for generic products to free-ride on the expensive R&D process of the innovator company.

A.3.8 Application process and due process

The application process, with the change in law, also increases the uncertainty for agricultural chemical companies. Under the ACVM Act and the HSNO Act decisions made by ERMA and MAF are now more open to litigation even after the application for research has been approved. This has been underlined recently by the battle over research involved in inserting human genes into cows. ERMA approved the research but the courts have sent back the ERMA approved application because one of the seven conditions for approval was deemed not to have been investigated correctly. Reports since the decision indicate that this may have led to the loss of specialised staff from the CRI concerned.

The way courts see process is different from the way those administering the HSNO and ACVM Acts may see due process. While ERMA and MAF may seek to reduce costs of compliance to applicants by only dealing briefly with sections of the Acts, which the application has little or nothing to do with, other parties may see the process differently. In particular, if objectors take ERMA or MAF to court and all the relevant processes have not been adequately attended to, however minor, then the court will be forced to rule in favour of the objector. While that case is still on-going the implications are serious. These include:

³⁹ Interview with Steve Vaughan MfE.

⁴⁰ Interview with Kevin Currie, ERMA.

⁴¹ ERMA and MfE interviews.

- further increases in complexity.
- time delays, which can increase the economic costs.
- extra expense for ERMA or MAF, which will have to pass on costs to applicants in some way.

A.3.9 Complexity

The move to the ACVM and HSNO Acts is a move to a more sophisticated and complex system of managing animal remedies and pesticides. This in itself is creating uncertainty – some industry participants (Ancare for example) believe that this has been a mistake and that a simpler management system such as the Australian system should have been adopted.

Historically, experimental products have been controlled in their use by placing the condition on them that treated animals and plants must not be allowed to enter the food chain. They have also only been available to ‘research workers’.

Under HSNO, the same controls that are applied to GMO’s have been allocated to pesticides. This means that trials must be carried out “in containment”. This new term has yet to be fully defined in an operational sense, so uncertainty has occurred over practical application of these words under the new HSNO rules. ERMA define “in containment” as being where:

“Substances used in field trials can be regarded as being in containment if they have a robust containment regime (which can be provided by management systems such as separation distances, buffer zones, and other management systems).”

Interview with Kevin Currie, ERMA.

Another issue is the timing of the processing of research applications. If approval times are extended then researchers from agricultural chemical companies will have difficulty helping farmers with the problems they face. For many annual crops this presents a problem because growers do not know two years and more in advance what crops will be grown where. Agricultural chemical companies will lose the ability to place trials in the relevant situations, where problems exist.

From the interviews done with a wide range of groups, uncertainty generated by the complexity of the Acts, was an important element of industry complaint about the HSNO Act in particular and specific parts of the ACVM Act. This uncertainty has the potential to add considerably to the costs of doing business and could further limit applications for products with new active ingredients.

A.3.10 Out of season research

New Zealand competes with other Southern Hemisphere countries for the out of season research. The temperate climate, our pool of skilled people, and good infrastructure has meant that New Zealand has been a competitive destination for this research. The HSNO Act will have two equally important detrimental impacts:

- the costs of applying to bring research material to New Zealand will increase. Clients have a choice about where their research is undertaken. Cost increases make other temperate zone sites more attractive, particularly those in Australia and South Africa.
- the time taken to approve applications will increase. Under the existing legislation it takes three weeks to approve the applications – under HSNO it could take up to

six weeks – this increases the uncertainty, as well as transaction costs and could deter Northern Hemisphere clients.

A.3.11 Off label use

Off label use is a major concern as highlighted in the Penman Report (see above). This is because of the diversity of New Zealand agriculture and the small size of a number of crops.⁴² Table 14 gives examples of the type of products used “off label” on minor crops.

While the ACVM Act is based on risk analysis and trades-off environmental, cultural, and economic considerations the industry are concerned, particularly in the horticultural sector, that smaller crops such as asparagus, olives, avocados, small seeds (to name a few) will face further compliance costs that will impact on the ability to grow the product profitably. MAF maintain that they will be able to interpret the legislation in a way that “specifies use” and allows smaller horticultural industries to keep using the products.

However, the industry is particularly concerned that despite MAF’s best intentions, the way MAF may interpret the Act may be challenged in court with the effect of limiting or banning pesticide use where it has been traditionally effective.

We can not say, until the legislation is up and working, how the Act will impact on the industry. However, any increase in the cost of compliance for smaller horticultural crops will have a significant impact on that industry (see Penman’s conclusions above).⁴³ These crops have revenues that are too small to support specific applications for new products with active ingredients so the change in the law could have a major detrimental impact in the long-term flexibility of the types of agriculture and horticulture undertaken in New Zealand.

A.3.12 Reduction in R&D

Over the past ten years there has been a significant reduction in R&D in the New Zealand agricultural chemicals industry, while R&D into agricultural chemicals is increasing in the rest of the world.

It is difficult to point directly at any one cause for this, although industry claim that the movement of research off-shore is partly due to increased regulatory costs in New Zealand. These include New Zealand research (Ancare regularly use Australian based researchers) and companies (Nufarm have moved to Australia) and the scaling back of local activities of multinational agricultural chemical companies (BASF no longer do R&D in New Zealand).

This is an important issue because New Zealand has a large agricultural sector, relative to the rest of the economy. Unlike other OECD nations New Zealand is dominated by a temperate climate with extensive agricultural systems. Indigenous R&D is important therefore to underpin New Zealand’s agriculture development. If research activities are associated with economies of scale in either research or marketing we would probably expect that research to move off-shore. This reinforces the case for removing compliance obstacles for start-up R&D enterprises in order to promote New Zealand as a research generator or seed-bed for technologies that get expanded elsewhere.

⁴² It is not such a big problem overseas because the volumes in each crop are large enough to support products specifically geared to their needs.

⁴³ The smaller the crop volume the more vulnerable the industry will be.

Table 14: Examples of niche crops dependent on specific agricultural chemicals

Crop	Agricultural chemical	To control
Export seeds	Jaguar herbicide	Field Pansy
Citrus	Fipronil ¹	Kelly Citrus Thrip
Kiwifruit	Fipronil	Fuller Rose Weevil
Avocados	Fipronil	Greenhouse Thrips

Notes: (1) Registration pending.

Source: Aventis interview

A.4 Impact on market performance

The main impact of the increased cost of compliance on market performance will be the impact on efficiency, in particular, dynamic efficiency. This has implications for output, technological advance, and employment.

A.4.1 Dynamic efficiency

Efficiency is an important issue in welfare economics because a more efficient economy contributes directly to greater welfare in the economy. Economics is primarily concerned with highlighting where impediments to improved efficiency occur (e.g. the impact of monopolies).

One of the more difficult economic concepts to measure and get across in general debate is the concept of dynamic efficiency i.e. innovation at the margin. It is difficult to see because it consists of a myriad of small, sometimes imperceptible changes to economies, industries, and firms that advance economic performance. Economics has yet to come up with a way of measuring dynamic efficiency because of the data difficulties of measuring performance over time. However, since dynamic efficiency is about maximising the present value of current and future welfare, a dynamically inefficient economy will clearly have less economic advancement over the long run.

The HSNO Act is expected to hamper dynamic efficiency because of the inability of farmers to access new innovative agricultural chemicals, which competitors will be able to obtain.

A.4.2 Likely impacts

The changes in cost of compliance from the institution of the new regime will force companies to rethink the way they operate their businesses in New Zealand. The likely long term impact will be to:

- force some of the smaller New Zealand companies out of the agricultural chemicals business⁴⁴;
- redirect research efforts away from New Zealand because of the prohibitive costs;⁴⁵

⁴⁴ Elliott Chemicals estimate that the applications bill will be as high as their R&D expenditure for one year, therefore it was no point in getting involved in research and development of new chemicals.

⁴⁵ Ancare are already redirecting some of their research to New South Wales in Australia.

- force multinational agricultural chemical companies to scale back operations in New Zealand.⁴⁶

Because dynamic efficiency impacts on a firm, industry, and economy over the longer term, in the short run the HSNO Act is not expected to have a dramatic impact – except for the drying up of applications.⁴⁷ This will impact on the market for new agricultural chemicals.

A.4.3 The changing market

As we have explained above, these newer chemicals, are softer (i.e. less toxic to the environment) and more specific (and more numerous) focused on treating particular problems in crops and animals, relative to the broad spectrum chemicals that were used in the 1970s and 1980s (i.e. paraquat and 2,4,5-T).⁴⁸

A.4.4 Regulatory impact

Trade-offs between economic concerns and environmental protection under the regulations prescribed under the HSNO Act are very limited.⁴⁹ This will result in unintended consequences because of the way the application process is designed. For example, it will be cheaper for agricultural chemical companies to group their applications under generalised substance headings – in fact the Ministry of Environment and ERMA have designed the process so this is actively encouraged.

Unfortunately, it has not been recognised that this approach could jeopardise the distinctive capabilities of the agricultural chemical companies. The large sums it takes to develop these products is committed on the basis of patents being enforced and these are highly specific. Registering an application for a new substance at a generalised level opens up the opportunity for other companies to piggy-back on the R&D already done and register products in the same area. Agricultural chemical companies will seriously consider not taking the risk of applying to import product with new active ingredients preferring to forego opportunities in the small New Zealand market.

Furthermore, the proposals mean that if a slightly improved version of the same product is produced then it will have to go through the same process, incurring the same costs as the original product. This does not take into account how these products are developed. Moving the products from the laboratory to the commercialisation stage is not straight-forward. The product generally goes through a stage of progressive improvement, most of which relates to the development of formulations more suited to field application. The initial formulations are often very rudimentary. It is not unusual for a brand new product to go through six or more formulation derivations prior to a final one being settled upon.⁵⁰ This is particularly so for the

⁴⁶ While no decisions have been made yet by multinationals or their representatives, this is under consideration (interviews with all industry participants).

⁴⁷ Industry sources point out that it will four or five years before the real effect is noticed, since ERMA will be busy transferring existing chemicals over to the new chemicals regime. Furthermore, the reverse applies; thus were there to be amendments to reverse the current expected changes associated with the HSNO Act, it will be four or five years before new chemicals go through the necessary trial process to bring products with new active ingredients on to the market.

⁴⁸ The point here that the agricultural chemicals market is not a static market – what was used 10-20 years ago is not used today, similarly what is used today will not be used in 10-20 years time.

⁴⁹ Section five illustrates why trade-offs are important.

⁵⁰ Interview with Elliott Chemicals.

smaller New Zealand agri-chemical companies who take generic chemistry and adapt it to New Zealand conditions and specific small volume crops, such as onions.

For example, current pesticide legislation requires proprietors to define their products to 0.1% of the levels of technical active ingredient. Under current law (in common with law in other developed countries) any change in composition above this trivial amount constitutes a change in formulation.⁵¹ Against this background, industry believes that ERMA will require re-registration/approval for all formulation changes adding significant cost.⁵²

This will blunt dynamic innovation signals in the agricultural chemicals market in New Zealand since agricultural chemical companies will only put the improved version of the product on the market if they can recoup the costs. Given the small nature of the New Zealand market, agricultural chemicals companies are unlikely to make multiple applications on slight variations of the same product. New Zealand farmers will not get access to new improved formulations of innovative agricultural chemicals.⁵³

A.4.5 Incentives and environmental effects

If the proposed increase in the cost of compliance means that less of the “softer” chemicals are able to be sold in New Zealand, or even that their introduction is delayed, then, in effect, the purpose of the Acts – to protect the environment from toxic products – may be negated (see above Penman, 1989). This is because the impact of, the HSNO Act, in particular, will tend to “freeze” the available chemistry on the market.

The active ingredients of the approved available chemistry are, in general, more toxic than the products with new active ingredients becoming available. So regulatory changes with effects of the type discussed could mean that the environment would miss, or is delayed in receiving, “softer” treatment. There could be a narrower range of products grown because minor crops will not be able to sustain the costs of the applications for new chemicals needed to underpin the viability of their crops.

Because New Zealand is an international policy taker, it can only export agricultural products, which have approved treatments and specified residue levels for the destination markets. Because some chemicals are being withdrawn in the importing nations (see Penman, 1989) (and thus struck off their approvals lists) this restricts the chemicals New Zealand farmers can put on their products for exports. Any lack of availability of new active ingredients in New Zealand, coupled with the withdrawal of previously used chemicals (forced by regulatory regimes in New Zealand’s major markets), means that agricultural and horticultural industries could be undermined.

A.4.6 “Early” of new and innovative agricultural chemicals

New Zealand has been at the forefront of the introduction of chemical products with new active ingredients to agriculture. This has been part of the set of distinctive capabilities that keeps New Zealand products competitive in the international commodity trade.

⁵¹ Note that the Pesticides Act allows for small changes in formulation without additional significant charges.

⁵² Interview with Elliott Chemicals.

⁵³ Industry also point out that even when two established compounds are used to make a new substance the companies have to go through the full HSNO process all over again (Ancare interview).

New Zealand has had the benefit of products with new active ingredients being registered in New Zealand at the same time as other competitors. Table 15 illustrates this point by showing some recent examples of the products New Zealand farmers have been able to use either before, or at the same time as their competitors. The ability to access such products early has kept New Zealand farmers at the cutting edge of agricultural chemical development and improved the ability to innovate. These early introductions are threatened, given the proposed costs increases for this type of application. If competitors are able to use products which New Zealand farmers are unable to obtain without substantial time lag, then local farmers' ability to compete will be hampered.

Table 15 : Recent examples of products registered “early” in New Zealand

Company	Products
Syngenta (Novartis)	Chorus, Cruiser, Flint, Maxim, Promet, Ridomil Gold, & Wakil
Novartis Animal Health	Capstar & Clik
Bayer	Calypto, Telzenac ¹ & Zubrin

Notes: (1) Telzenac was registered in New Zealand following approvals in the UK and Italy, but before numerous other countries

Source: Agcarm

APPENDIX B: COMPANIES IN THE CHEMICALS MARKET

Agricultural chemical companies involved in the NZ market

Multinational companies	Companies creating innovative products from “existing” chemistry	Companies selling generics
APS Chemicals (NZ) Ltd	Ancare NZ Ltd	Aakland Chemicals Ltd
Aventis CropScience Pty Ltd	AGPRO NZ Ltd	A B Annand & Co Ltd
Aquis (NZ) Ltd	AgVax Developments Ltd	AgBioResearch Ltd
Ausrichter (NZ) Ltd	Animal Control Products	AgConsult Ltd
BASF NZ Ltd	Bomac Laboratories Ltd	Agricultural Fumigations Ltd
Bayer NZ Ltd	C-Dax Systems Ltd	Agri-feeds Limited
Boehringer Ingelheim (NZ)	Chemagro NZ Ltd	AgTech Marketing
BP	Livestock Improvement Corp	Alex McDonald Merchants
Captac (NZ)	Elliott Chemicals Ltd	Arnold Products
Caltex	HortResearch	Aspiring Animal Services
Chemavet Div, Pharmaco (NZ) Ltd	Parnell Lab NZ Ltd	Betta-Crop Organics
Chemcolour Industries (NZ)		bioForce Ltd
Crop Care Holdings Ltd		Carann Horticultural Supplies
CSL (NZ) Ltd		Carlyle Veterinary Clinic Ltd
Cyanamid of NZ Ltd		Chemiplas NZ Ltd
Dow AgroSciences (NZ) Ltd		Cundy Technical Services Ltd
Du Pont (NZ) Ltd		DT Horticultural Supplies
Elanco Animal Health		Dominion Chemicals
Fort Dodge Animal Health		Ecolab Ltd
Headland Agrochemicals (NZ) Ltd		Environmental Health Products
Jurox (NZ) Ltd		Ethical Agents Ltd
Lloyd Lab (NZ) Ltd		Evans Turf Supplies
Merial (NZ) Ltd		Feral Control
Mobil Oil NZ		FIL Industries Ltd
Monsanto (NZ) Ltd		Fruitfed Supplies
Novartis (NZ) Ltd		Grevillia Ag
NRM NZ		Immuno-Chemical Products Ltd
Nufarm Ltd		Independent Cropcare Distributors
Pfizer Animal Health		InterVet Ltd
Pharmacia & Upjohn (NZ) Ltd		JATRA
Phoenix Pharm Distributors Ltd		Javita Ltd
Reamor (NZ) Ltd		Jolyn Holdings Ltd
Roche Products (NZ) Ltd		Kenpat Industries
Rohm & Hass NZ Ltd		Key Industries Ltd

Table continued

Multinational companies	Companies creating innovative products from "existing" chemistry	Companies selling generics
Schering-Plough Animal Health Ltd		Kiwicare Corporation Ltd
Stockguard Lab (NZ) Ltd		Lefroy Valley Marketing
Vetpharm (NZ) Ltd		Leicester Fumigations Ltd
Virbac Lab (NZ) Ltd		Mark Bell-Booth Ltd
		Newfield Marketing
		Nutritech International Ltd
		National Veterinary Supplies
		Orion Crop Protection Ltd
		Pacific Growers Supplies
		Pacificvet Ltd
		PCL industries
		Pest-Gone Services Ltd
		Pest Management Services
		Phosyn PLC
		Prebble Seeds Ltd
		Pro-Active NZ Ltd
		Professional Veterinary Distributors
		Swift NZ Ltd
		R MacKay Ltd
		Taranaki NuChem Ltd
		Tollesbury Enterprises
		Veg-Gro Supplies
		Wrightson Seed
		Yates NZ Ltd
		Zenith Technology Corp
		Zonda

Notes: (1) This table as been put together on information available in 2000. Changes to the market after 2000 are not incorporated in this table.

Source: Index of Veterinary Specialities (2000), New Zealand Agrichemical Manual (2000)

APPENDIX C: CONTACTS

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APPENDIX D: COST BENEFIT ANALYSIS

Administrators often justify government intervention on grounds of it being in “the public interest”, a term which is subject to various interpretations by those exercising powers of intervention. Economics has a more tightly defined rationale for public intervention, reflecting its concern with the utilisation of finite and scarce resources in satisfaction of potentially unlimited human needs, and its focus on economic efficiency – enhancing economic well-being by maximising outputs from a given set of inputs, or minimising inputs for a given set of outputs.

While such an approach has ready application in decisions concerning private enterprises with clearly defined activities, where market prices of inputs and outputs can be taken as the correct marginal values, there are difficulties in applying it to more complex issues in the public sphere. Marginal effects are blurred where outputs are joint products of input packages, which can be adjusted only in lumpy rather than continuous increments. Also, where there are different technologies with different cost structures for achieving the same outputs, equating marginal costs to marginal benefits may not result in a unique solution (Sinner, 1991).

Under such conditions the allocation decision is better guided by examining the total net gain from one option over others. In relation to environmental policy aimed at resource decisions, the prime criterion for selecting policies on the grounds of efficiency is to maximise net benefits from policy, i.e.:

$$\text{Maximise NB} = \text{TB} - \text{TC}$$

where TB, TC are total benefits and total costs for each respective policy option.

This is the approach adopted by cost-benefit analysis, whose basic formulation is:

$$\text{NPV} = \sum (B_t - C_t) / (1 + r)^t$$

where NPV is the Net Present Value of the project/option

B_t , C_t are costs and benefits occurring in each year over the life time of the project

r is a discount rate applied to future benefits and costs

and t is each successive year over the project's life.

Cost benefit analysis procedure compares benefits and costs from the project for each year in its life, applies a discount factor appropriate to that year, and sum the results to obtain the Net Benefits of the project over its lifetime in Present Value terms. An environmentally sustainable project would be considered worthwhile in efficiency terms if:

- It yields a positive net benefit ($\text{NPV} > 1$); and
- Its return is higher than that available from using the funds in any other way ($\text{NPV}_{\text{sc}} > \text{NPV}_0$)

A distinctive feature of cost benefit analysis is that it need not be confined to the effects felt by any particular agency or body – effects on third parties can be explicitly allowed for (as, for instance, effects on individual vehicles are routinely factored into roading appraisals) so that the result corresponds to an economic cost for the community rather than a financial cost to any one section within it. Within this broad

framework, however, it is possible to structure the analysis to distinguish different sectoral effects within the community, which may serve as a guide to distributing costs across the community.

Another characteristic of CBA is that, by aggregating benefits across the community, its decision criterion inherently presumes the desirability of coercive change, i.e., if the sum of gains exceeds the sum of costs the project is deemed to be welfare enhancing, irrespective of the distribution of gains across the community, or of the unwillingness of some members to contribute to it. This presumption of coercion is not universally adhered to within mainstream economics, and it can be viewed as less desirable than market exchanges, which are usually entered into voluntarily. Conversely, institutional commentators (e.g. Bradsen 1992) regard the voluntary nature of past conservation policies as their major weakness. The varying opinions about the coercive presumption are less of a problem if CBA is used as an analytic rather than as a prescriptive tool, aimed at determining the opportunity cost of inaction rather than whether to act.