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# **Future of Pest Management**

# **Physical Control and Monitoring Tools**

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**Working Paper 3**

**Final report of Workstream E Working Group**

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## **I Purpose**

This paper describes the functions, contents, characteristics and governance of the toolbox proposed for the management of pests in New Zealand. It is a working paper of the Future of Pest Management project which was charged with identifying proposed improvements to pest management systems in New Zealand to fit them for the challenges of the next twenty five years. This paper is one input into the preparation of a national plan of action which will set out the proposals for improvement.

The New Zealand Biosecurity Central Regional Forum (BCR) commissioned MAF Biosecurity to manage the work on behalf of the BCR. The paper collects together the analysis of a cross sectoral working group. It does not represent the formal policy views of any of the agencies, research organisations nor sectors involved.

## **II Summary of Proposals**

An integrated toolbox is a priority for pest management. The working group has recommended that:

- a) That a governance body, with limited resourcing, is formed as soon as possible to act as the tool box manager.
- b) That the governance body will progress the transition to an integrated tool box.
- c) That a staged approach is taken to the development of the toolbox transitioning from the current distributed approach to an integrated model.

## **III Discussion**

### ***Defining the toolbox***

1. Pest control tools and the associated toolbox are referred to in a number of reports on the Future of Pest Management (FoPM) but are not accurately defined. For the purposes of this paper the Webster dictionary definition of a 'tool' as a means of accomplishing a task or purpose will be used. Pests are defined under the Biosecurity Act 1993 as risk organisms that have, or have the potential to cause, harmful effects on environmental, economic, social or cultural values in New Zealand.
2. Therefore the pest management toolbox is the collective name for all tools available for use in the physical control and monitoring of pests present in New Zealand.

3. This toolbox is not a physical entity but instead refers to the information that describes a tool and how it is used. As such it will include information on all the tools needed to physically control pests and to monitor pest populations and their impacts. Information should cover all facets of tool use and include not only operational details associated with the method (e.g. the application rate of a chemical) but also information to support its use (e.g. facilitation strategies for interaction with the community prior to the application of a chemical).
4. This paper uses the LECG report definition of pest management to state that pest management is the activity undertaken to manage the risk of pests already known to be present in New Zealand and includes pests found in both natural ecosystems and in primary production settings. It is noted that these definitions will need to be validated with key stakeholders in any future development of the toolbox.

#### **Agreements to date**

5. The BCR has already agreed a set of principles to guide the future pest management system; three of these influence the design of the toolbox. They are:
  - Decisions will aim to provide the best overall outcome for New Zealand's economy, society, environment and health.
  - Decisions will be informed by the best information available at the time and uncertainty will not prevent or delay decisions; and,
  - The system supports continuous improvement, learning and innovation.
6. The Biosecurity Strategy established a clear expectation "That there are transparent and effective performance measures to monitor and forecast the establishment of pest and weed impacts and pathways".
7. The FoPM Project steering group (December 2009) indicated support for the toolbox described in this paper. This support was conditional on:
  - Further describing the need for the pest management toolbox.
  - Describing how governance of the toolbox by a single entity (integrated management) can be undertaken to facilitate sector endorsement by all agencies involved in pest management and minimise additional costs.
  - Identifying barriers to successful establishment .

## Why is a toolbox needed?

8. The Future of Pest Management reports completed by LECG and ENFOCUS in 2008, identified:
  - An increasing pest burden from new pests that may become established in New Zealand.
  - The emergence / re-emergence of a number of established pests (e.g. rabbits) present in New Zealand.
  - A decrease in the number / range of control tools that are available as:
    - the public become increasingly opposed to the use of some tools<sup>1</sup>; and,
    - the size of the New Zealand market makes the registration and / or importation of some pest specific chemicals un-economic.
9. Workstream participants agreed that frameworks and coordination are needed so that the pest management toolbox is fit for purpose and pest managers have access to an effective and sustainable suite of physical control and monitoring tools. Analysis of the gap between this current state and what is needed to sustain pest management in the future was undertaken and is summarised in Appendix 1.
10. The development and maintenance of potential contents of the toolbox have traditionally occurred organically across a range of organisations. This has resulted in a fragmented often inaccessible toolbox which is spread over a wide number of organisations in different formats with some duplication and conflicting information. These organisations are inter-dependent; they are vulnerable to 'the weakest link in the chain' whereby inaccurate or incomplete information and poor standards of tool use by any party can undermine acceptability, access and increase costs for all organisations.
11. There are a number of efforts underway to collate information and make it available from specific sites. However; without coordination, or, active management, it is unlikely that the current problems will be overcome and the sub-optimal use of tools will continue.
12. The LECG report states that there is variability in the level of pest surveillance and monitoring undertaken throughout the country and that which does occur is not integrated and often lacks sufficient resource. Monitoring tools are available but use varied and inconsistent methodologies that produce data that are not always comparable. A current state study carried out as part of the development of the Pest Management Performance Measurement framework found that often the reasons for carrying out the monitoring themselves are unclear and decision makers do not understand its potential value. This creates difficulties in developing effective indicators and

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<sup>1</sup> Including chemical (eg 1080) and trapping tools (recently sticky boards)

measures. This lack of clarity and understanding makes it difficult to access dedicated and long term funding for monitoring.

13. The need for both physical control and monitoring tools is likely to increase because of anticipated changes in natural, social and economic factors. Currently the tools that are available do not provide comprehensive control of existing pests and resourcing is insufficient to fund additional pest control, so either new tools or efficiencies in use of current tools are needed. Duplication of tool and system development is, to some extent, a characteristic of the system and individual organisations work independently to accommodate changing rules and regulations. Information is spread over multiple sources and gaps and duplication in the wider system is difficult to identify.
14. An integrated centralised toolbox accessible through one site endorsed and used by all stakeholders must create savings for those involved in pest management through increased efficiencies and effectiveness. Savings would be achieved for those pest managers not already supported by an information system by providing easy to access information which would result in:
  - Less time spent identifying the information required to design, undertake and evaluate control / monitoring.
  - Less time updating organisations internal information systems to accommodate new regulations and techniques.
  - Less use of inefficient tools as a consequence of accessing out of date or less robust advice.
  - Less time spent on regulatory issues through standardisation and rationalisation of regulations and standards associated with pesticide use.
  - Easy identification of toolbox gaps allowing planned augmentation of toolbox contents.
15. The question has been asked – ‘Is a centralised toolbox required, and are there examples of how it would be more efficient than the present system?’ There is a range of indirect evidence that indicates there are significant benefits associated with a centrally organised integrated toolbox. The working group noted that the following examples provide evidence that an integrated toolbox with the functions described in this paper will have distinct advantages over the status quo:
  - Internationally there is currently no country with a single integrated pest management system however Australia, the USA and Canada are currently constructing such systems to support their pest management sectors.
  - In New Zealand organisations as diverse as the Department of Conservation, Weedbusters and industry groups such as Zespri have and are placing considerable resource into developing / maintaining in-house systems to satisfy the need for information. Even with the high resource demands of these systems these organisations consider them as essential to support their own pest control activities. Spreading the resourcing and

information over a larger base must lead to an overall gain to the pest management sector.

- Improved return on funds invested in pest control by reducing the risk of operational failure.
- Improved accessibility to recent research findings; increasing their uptake and so efficiency of control.
- Improved ability to measure and report nationally on pest levels and responses to control activities.
- Improved access to reliable advice will increase the effectiveness of smaller organisations and in particular community based groups.
- Lack of standardisation in current regulations has resulted in inconsistent requirements for resource consents in different jurisdictions throughout the country. This results in considerable wastage nationally through the re-working of documentation to account for regional variations which do nothing to improve the safety or reduce the risks associated with tool usage. For example; the content of resource consent applications for a given water borne pesticide varies between councils and also between government agencies. Practitioners have indicated that standardising resource consent applications would allow one detailed application to be prepared and reduce the cost<sup>2</sup> of rework required for different location.

16. The working group considers there is little doubt that an integrated pest management toolbox will add value. The challenges in establishing such a toolbox will be to ensure that:

- The tasks that it undertakes and services it supplies are cost effective and add value.
- Users contribute to the cost of its establishment and maintenance.

17. The formation of a centralised toolbox will not remove the need for any of the current organisations involved in pest management. While the current activities of some organisations are concentrated on the provision of information none are exclusively established for this purpose. The working group considers these organisations are more likely to change their emphasis and focus more on delivery outcomes. Examples of organisations that may change emphasis include the NPCA and Weedbusters. Such organisations will potentially become important conduits in promoting the toolbox, socializing the information it contains and encouraging interaction with the toolbox.

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<sup>2</sup> Costs include resourcing for applicants to reworking the document but also time and the resulting delays in writing the document which can delay pest control. Costs must also include the costs incurred by individual councils/agencies being required to review each application as if from scratch. A standardised form would ensure that a consent being awarded by one council could facilitate the rapid consenting by a second council or agency for use in a different area since only the site details and their effect on application would need to be updated.

## The tool box of the future

18. The working group reviewed the potential functions of the toolbox and consider that if it is to best service the needs of all those involved in pest management. It must ensure that there are:

- Coordinated and planned approaches to maintenance and development of the physical control and monitoring toolbox over time.
- Mechanisms in place to:
  - identify gaps in the toolbox
  - share information about available tools
  - ensure that learning and best practice is captured
  - ensure there is consistent application of standards relating to tool use
  - streamline regulatory approvals that ensure safe use of tools
  - share costs.
- Surveillance and monitoring tools available to support local, national and regional performance reporting<sup>3</sup>.
- Active identification and prioritisation of research needs as to improve and increase the range of tools.

## Proposed toolbox functions, contents and characteristics

19. The FoPM has reviewed the current state of the toolbox and compared it to the outcomes sought for the toolbox (Appendix 1). From this analysis the working group has identified the functions that the toolbox must fulfil, its contents and their characteristics. To assist in determining the toolbox's functions users of the toolbox have been reviewed and classified according to the level at which they work. The levels are similar to those described by Workstream F and are:

- **Central Government** / policy / strategy - including the strategic component of Regional Government.
- **Regional** / sectoral / operational – including the operational activities of Regional and Central Government, industry organisations and major pest control companies.
- **Public** / landowners.
- **Commercial** pest control companies supplying either pest control services or the tools themselves.

20. **The tool box's functions** The functions required of the toolbox will vary according to the level at which the user is operating. The functions required by each user level are:

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<sup>3</sup> Fit for purpose' monitoring tools be designed to allow: Monitoring of specific pests pre, during and post-control; monitoring indicators to track progress towards agreed outcomes for example of pest populations, ecosystem parameters, economic returns and broad scale surveillance to identify new pests to a region, or that have arrived in New Zealand.

- An assessment of which physical control or monitoring tool is best suited to their particular problem and location (Public / Commercial / Regional / Government).
- Access to all the components required to run a successful control programme or design and undertake a suitable monitoring programme (Public / Regional / Government).
- Evidence to encourage joint initiatives to fund new tools by identifying gaps and justifying the expense of tool development (Commercial / Regional / Government).
- Information to decision makers to allow them to determine priorities and inform decision making (Government / Regional).

**21. The tool box contents:** To satisfy these functions the toolbox will need to cover:

- All the physical control tools (chemical, mechanical and biological) available in New Zealand that are required for use in terrestrial, freshwater and marine habitats.
- The surveillance and monitoring tools required to measure performance and outcomes at all levels.
- Information on the use of tools (strategies and best practice) and on how their use can be facilitated.
- All the information required for the safe and legal use of a given tool e.g. information on a chemical would include details of its strengths and weakness, details of how it should be physical applied, good practice standards, health and safety requirements and regulations that must be satisfied and provide links to obtain this information.
- Information on tools used internationally that may be applicable to New Zealand conditions (in the long term).
- A list of research priorities for new tool development, evaluation of international tools for use in New Zealand and improved use of existing tools.

**22. Tool box characteristics.** To ensure that the information in the toolbox can service the needs of all those involved in pest management the toolbox must be:

- Endorsed by key stakeholders and the majority of pest management agencies, pest managers or their representatives. Unless the toolbox is widely endorsed it will not gain the necessary support to ensure it is up to date and well resourced. Key stakeholders<sup>4</sup> must be appropriately engaged and be prepared to provide resources.
- Known as the place of choice to identify the best physical control or monitoring tool for a given pest / ecosystem. This flows out of the previous attribute and unless the toolbox is recognised as the place of choice it will not be endorsed.

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<sup>4</sup> Key Stakeholders will include those in a leadership and decision making roles namely MAF, BNZ, Regional Councils, DOC, Animal Health Board and Maori as a treaty partner.

- Adequately resourced to deliver the contents.
- Accessible from, or through, a single site (probably based on electronic access with some hardcopy support). Contents of the toolbox must be easy to access and download or they will not be widely used.
- Easy to understand information using common and consistent terminology. Currently the use of words and terms varies between organisations, regulations and source. (For example standards may be called standards, best practice or guidelines in different organisations).
- Comprehensive and include information on the integration / compatibility of different tools.
- Supported by access to expert advice that may include personnel and / or supporting documentation such as decision support systems (potentially online and hard copy).
- Knowingly incorporating Māori perspectives in the methodologies described.
- Grounded in research.
- Coordinated and maintained to ensure all information is current.
- Supported by training initiatives to provide practitioners with the information and skills to best use the contents of the toolbox.

High level parameters supporting the characteristics of physical control tools and monitoring tools are provided in Appendix 2.

### ***Toolbox governance***

23. A governance body will be crucial to the successful establishment and operation of the toolbox. The working group as part of its review has considered the functions of the governance body and has determined that its overarching brief must be to establish an entity that actively reconciles the supply and demand of knowledge<sup>5</sup> and as such will:

- Be accountable to the major stakeholders (it is important that the toolbox is not seen to belong to a single organisation).
- Work positively with contributory organisations and mediates in areas where different approaches exist so that the approaches used / information provided is acceptable to all users.
- Access information from and accommodate the needs of all stakeholders.

24. The governance functions of the toolbox must include:

- Determining responsibility for management of the toolbox components.
- Utilising research, policy and management to determine priorities for the toolbox to allow for the management of risks and allow trade offs associated with the maintenance and development of the toolbox.

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<sup>5</sup> As such the Toolbox Manager will act as a Boundary Organisation by facilitating effective communication between parties, performing tasks useful to all parties and ensuring that information provided to parties is credible, salient and gathered by a legitimate process. Boundary organisations have demonstrated their advantages in improving communication at the science policy interface resulting in meaningful communication and enhanced outcomes for all parties.

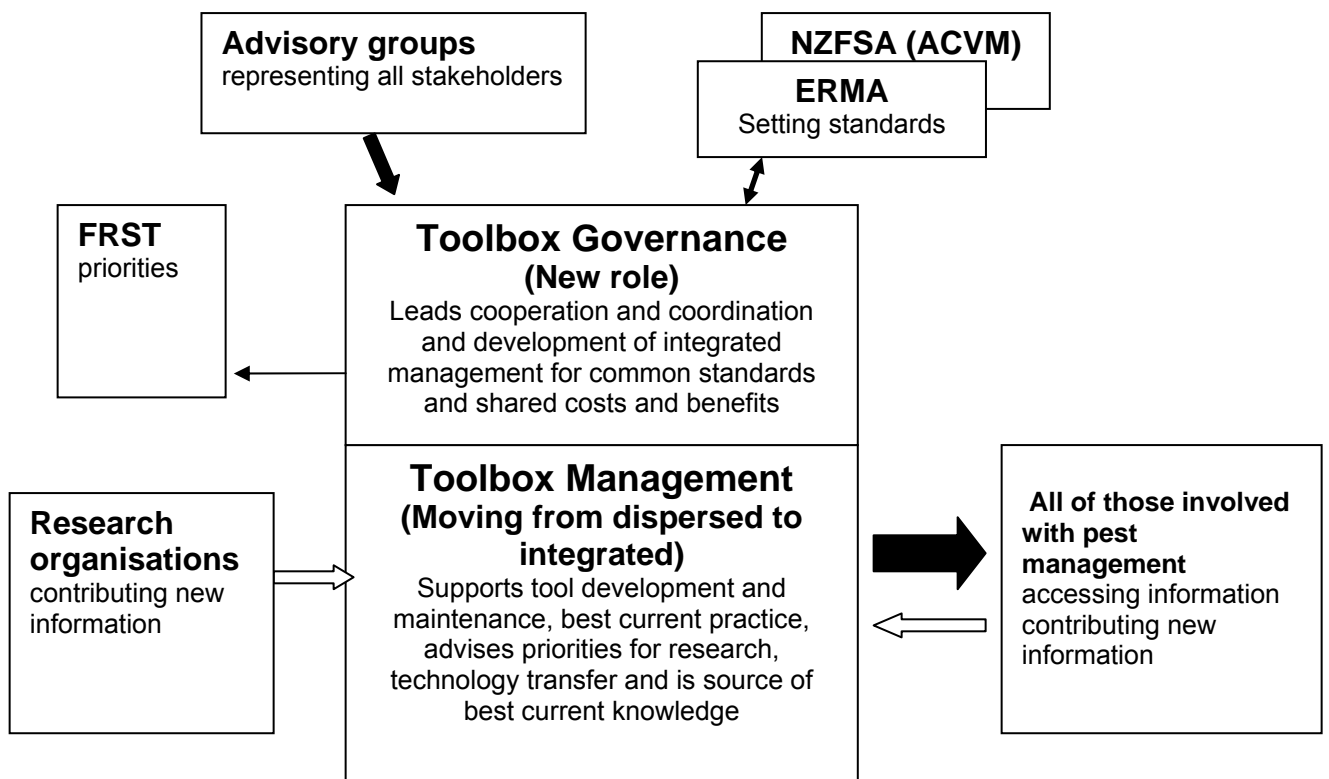
- Ensuring the development of tools to service all of the country's pest management requirements (including incursion responses) is encouraged.
- Encouraging ongoing refinement of existing tools.
- Facilitating efficient, effective and responsible use of tools.
- Promoting best practise use of control tools, monitoring methodologies and reporting.
- Eliminating duplication of effort in tool development and operational pest management.
- Representing the toolbox to ensure that it receives on-going and adequate funding (Note: it is important that the toolbox receives reliable and consistent funding if it is to fulfil the desired functions).

25. To encourage widespread endorsement it is important that key stakeholders are actively involved in the governance of the toolbox or have the opportunity to make their views known. The skills set for the governance group should include; policy, management, strategy, research (scientific), Māori, government agencies, local authorities, primary producers.

26. The governance group must also provide formal opportunity for input / advice from the full range of stakeholders including other government agencies, the public, pest control companies, conservationists and voluntary organisations (clubs). A mechanism to achieve this could be a two tier system in which the governance group is supported by advisory groups.

The essential features of the toolbox and its governance are described in Diagram 1 below.

**Diagram 1 Toolbox structure and interaction with other parties**



**Frameworks for managing the toolbox**

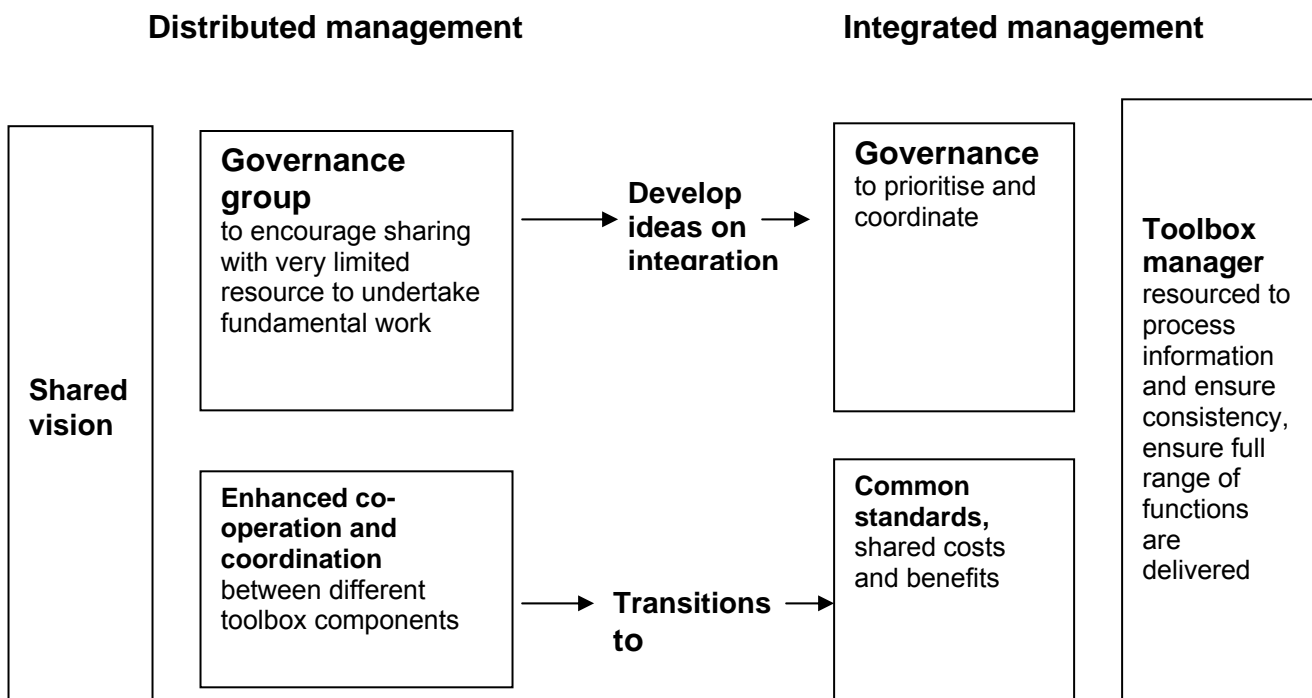
- 27. Without some form of framework that provides for coordination or active management of the toolbox the functions, contents and characteristics described above are unlikely to be delivered. The term ‘toolbox manager’ will be used in this paper to describe the implementing mechanism for the framework.
- 28. A range of possible formats for a toolbox manager exist in New Zealand and internationally. They vary in their ability to influence change. Existing models can be separated into either a distributed or integrated approach.
- 29. The **Distributed model** consists of a toolbox manager that provides recommendations on toolbox details to any organisation that holds information on pest management tools. The toolbox manager would rely on information owners to align their information with these recommendations. This would result in information being owned and managed on many sites by different organisations, similar to arrangements that currently exist.

30. This model could be enhanced by providing a single web site that provides links to all other information sites making access easier. It will struggle, however, to provide consistent information that is validated and avoids duplication or conflicting information. A distributed model is unlikely to deliver the full range of benefits associated with the more active management of an integrated model.
31. Commercial producers of pest control products already make available significant amounts of information on their web sites. Recent initiatives by several agencies to collate information are also making a wider range of information available in the public space. These efforts are moving the current situation towards a distributed model. However lack of co-ordination, inconsistent language, duplication and conflicting advice continue to cause concern.
32. The **Integrated model** consists of a stand alone governance body supported by either a dedicated operational arm or a small number of key organisations that are contracted to deliver agreed outputs. This system may be enshrined in legislation and would result in information being delivered according to the toolbox managers recommendations. Information in the toolbox may be supplied from many sources (including stakeholders) but would be processed and standardised before being made available for use.
33. The integrated model is more likely to deliver a pest management toolbox that will support an effective pest management sector and is the preference of the Project Steering Group. The working group was asked to identify potential barriers to its adoption.
34. Barriers identified by the working group include:
- The need for dedicated additional resourcing and funding required to support the governance and the operation of the new entity in the present economic climate.
  - Current information owners may be unprepared to relinquish ownership of information to another organisation and refuse to have it included in the toolbox, creating information gaps.
  - Staff members responsible for or using existing systems may not be prepared to change to another information source.
  - It will be difficult (especially at the outset) to standardise advice while accommodating the requirements of different organisations.
  - The size and complexity of the task facing the new entity may delay the delivery of services resulting in disillusionment in users leading to a rejection of the toolbox.
  - The toolbox may not be accepted by all key users and so the anticipated benefits will not be realised.
  - Commercial capture by companies could limit the independent status and credibility of the toolbox.

- Ownership and liability issues associated with information may prove difficult to resolve.

35. A staged approach to the development of the toolbox is recommended to allow for transitioning from the current distributed approach to an integrated model. This would allow time for adequate input into the final design of the toolbox by all stakeholders and allow observed benefits to justify the need for additional funding. The essential features of this transition are detailed in Diagram 2.

**Diagram 2 Toolbox Transition with time**



36. Prior to undertaking this transition the following steps must be agreed to by all key stakeholders:

- An integrated toolbox is a priority for pest management and that stakeholders are willing to support its development (with funding and / or time).
- The formation of a governance body with resourcing to act as the toolbox manager and progress action towards an integrated toolbox.
- Timetabled reviews of progress towards an integrated toolbox with an expectation that continued and enhanced support will be agreed as a consequence of the reviews.
- Support for any legislative changes required to support the formation of a toolbox manager that is independent of but responsible to key stakeholders for the production of defined outputs.

## **Appendix 1 Current state of the toolbox compared the outcomes sought for FoPM**

### **What is the gap between the current and the future state?**

1. Analysis undertaken as part of this project confirms that the toolbox of physical controls is not sufficient to allow effective pest management <sup>6</sup> in New Zealand and while the tools currently available do provide a good range of measures for controlling pests the tools are:
  - Currently limited in number and are not sufficient to control all pests present in New Zealand.
  - May control individual pests but are not appropriate in all situations and may not have alternatives.
  - May become unusable or limited by the beliefs of some of the community or by import requirements of trading partners.
  - Declining in number as older chemicals are withdrawn and the cost of registration limits development / implementation of new tools.
  - Particularly lacking in the aquatic environment.
  - Deficient of aids to assist in running physical control programmes e.g. programme planning aids, contract administration and social facilitation. (It is noted that some work is underway in this area).
2. Pest managers agree that for effective pest control there is a current need for new tools and there will be an on-going need for development of new physical control tools and the modification of existing tools to ensure that effective control can occur.
3. It is noted that performance outcome development is currently underway in initiatives led by MAF BNZ and Regional Councils. Once agreed these outcomes will inform National and Regional outcome measurement. When these projects are completed it will be important that appropriate monitoring tools are agreed and then overtime the monitoring regime itself is monitored and managed to ensure its continued relevance and to maintain consistency.
4. A systematic analysis was undertaken comparing the current state of the toolbox compared to outcomes sought for FoPM. These are documented in Table 1.

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<sup>6</sup> "Pest management is the activity undertaken to manage the risk of organisms already known to be present in New Zealand".

Table 1 Current state of the toolbox compared to outcomes sought for FoPM

Outcome required	Current system: pros	Current system: cons	Future state requirements
General comments	<p>A range of tools and products is currently available to agencies and the primary production sector.</p> <p>Primary sector has a good range of tools to manage most pests.</p> <p>Public / Political support for the need for pest control is good and NZ hasn't given up on some pests (as has happened elsewhere).</p>	<p>Tools available are not comprehensive.</p> <p>Failure by organisations to recognise that the skills / services are needed.</p> <p>Crop protection tools are very limited for the primary sector.</p> <p>Conservation sector has limited tools for some species (e.g. rats).</p> <p>Existing tools are being withdrawn.</p> <p>Lack of financial resources to develop new tools.</p>	<p>Active management of the toolbox and appropriate and ongoing resourcing</p> <p>A funding mechanism</p>
Coordinated approach to maintenance and development	<p>High level of sector buy in to the need for improvement</p> <p>Particularly strong interest in a better monitoring system</p>	<p>Communication across the pest management sector is variable.</p> <p>Regulation requirements for tool use are not aligned between organisations.</p> <p>Standards for use are often duplicated, use different language, and pursue different outcomes.</p>	<p>Requires information concerning tools to be readily available.</p> <p>A means of prioritisation is required that represent the wider sector and encourages coordinated action.</p> <p>Regulation needs to be standardised across NZ.</p> <p>Robust and consistent methods, reporting tools and quality of their application.</p>
Research will improve and increase the range of tools	<p>Biosecurity Science Strategy running in parallel to FRST investments but starting to converge.</p> <p>Good levels of research into tools and systems in some areas but not others.</p> <p>Biosecurity Science Strategy provides a focus for research prioritisation, delivery and uptake.</p>	<p>Current research spend is not well co-ordinated.</p> <p>Current funding system is not inflation proofed so real research funding drops every year.</p> <p>Currently losing some tools while at the same time there is a demand for others (esp. alternatives to broad spectrum pesticides).</p> <p>Poor understanding of some new pest / disease complexes.</p>	<p>Commercial imperative to develop new tools.</p> <p>Integrated with public good imperatives.</p> <p>Continued research to increase tools and improve efficiency of existing tools.</p> <p>A means of prioritisation</p> <p>A coordinated approach to funding tools.</p>
Identify gaps in the toolbox	<p>Biosecurity Science Strategy is new but has a framework to allow prioritisation of tool needs.</p>	<p>Range of tools available difficult to identify to allow gap identification.</p> <p>Many pest managers do not recognise or do not have the tools to manage the social aspects of pest management</p>	<p>Tools, processes and structure for the marine / aquatic sectors / environments.</p> <p>Tools for some invertebrate control required.</p> <p>Active management of the</p>

		including how to encourage best practise by tool users (e.g. growers / farmers).	toolbox and active gap identification required.
Share information about available tools	Science and technology transfer is supported. Some organisation already makes information available e.g. weed busters. The public are actively seeking information on pest control. A pest management tools. 'inventory' in an electronic data base form has been collated by DOC and is being validated by BCR.	Difficult to identify relevant information regarding a pest or tool and its validity.  Information currently available is often conflicting, difficult to understand and duplicated.	A single site that is well known, actively managed and which contains rationalised, correct and comprehensive advice.
Learning's and best practise are captured	Occurs in some organisations. Best practise for vertebrate pests covered by NPCA. Best practise for weeds is available from Weed busters.	Best practise / identification of control tools lacking for invertebrate and aquatic pests. Systems currently developed in an ad hoc fashion and the resulting information / learning's not often recorded. Not occurring consistently across the system and if captured is not made widely available.	A toolbox owner who ensures learning's and best practise are captured and updated.
Streamline regulatory approval	Internationally robust regulatory process. Regulatory approval has been obtained and there are experts in the system who can provide mentorship.	Development of tools slow and expensive. Regulatory process not well understood and expensive.	Formation of consortia to fund development of new tools. Streamlined regulatory system across ERMA and ACVM. Regulations standards are consistent between government departments and regional authorities. Communication to facilitate efficient application for approval.
Monitoring toolbox supports performance reporting	Some agencies report performance using robust and consistent methods.	Generally poor standard of performance measurement and reporting using inconsistent methods, standards and terminology.	Toolbox contains appropriate methods for monitoring pest management outputs and outcome indicators. Agencies align with national pest management performance measurement framework.

## **Appendix 2: Detailed physical control tool and monitoring tool characteristics**

Analysis shows that the purpose of physical control and monitoring tools differs and this affects some of the characteristics the two different categories of tools require. Physical control tools are required to manage pests in a wide variety of situations. Consequently information on physical control tools will need to identify all possible uses of a tool and ensure that new information is made available to users as quickly as possible.

Information on physical control tools must therefore have the following characteristics

- Include comprehensive information on all chemical, mechanical and biological control tools.
- Offer multiple approaches allowing users to assess which option is best suited to their particular problem and location.
- Offer solutions that deal with the full range of pest management scenarios i.e. from individual's to communities involved in single species to multi species control programmes anywhere in New Zealand and in any ecosystem.
- Be coordinated or actively managed to ensure that all information is current i.e. new information is quickly added and redundant information is removed.
- Be acceptable to the majority of New Zealanders or have tools included for extraordinary circumstances which have concerns about their use clearly documented.

Monitoring tools on the other hand must provide information that is consistent between sites and over time to measure changes in species or ecosystems. Consequently information on monitoring tools will need to be controlled so that changes to these tools are minimised. Accordingly the characteristics for monitoring tools will vary in the following manner. Monitoring tool must

- Comprise of a set of agreed, scientifically robust measures that are nationally and regionally applicable.
- Suitable for the full range of pest measurement scenarios and be capable of detecting pests that are new to a region or to the country.
- Updated if more cost effective and efficient tools become available.
- Require careful consideration and validation before changes may be made or new methods adopted since tracking progress towards outcomes may require that trends are recorded over long time periods.
- Include agreed and statistically robust conversion factors (where possible) to any changes that are made to monitoring tools to ensure comparability of measure before and after such changes.
- Take into account New Zealand and Internationally applicable monitoring requirements. (Including those required for trade).
- Include one / a few recognised facilities to store, retrieve and collate the monitoring data collected<sup>7</sup>.

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<sup>7</sup> It is noted that some Research organisations currently store monitoring information if multiple sites continue to be used it is important that interoperability is established between storage facilities