DEVELOPMENT OF A NATIONAL INVESTMENT PLAN FOR WEEDS RESEARCH, DEVELOPMENT AND ENGAGEMENT

FOR THE CENTRE FOR INVASIVE SPECIES SOLUTIONS

CONSULTATION PAPER

CENTRE FOR
INVASIVE SPECIES SOLUTIONS

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What is this document about?

This consultation paper is the first stage of a consultation process to develop a national weeds RD&E investment plan for the Centre for Invasive Species Solutions (the Centre). Such a plan would guide the Centre's future investment in weed RD&E. It will also help determine where and how the Centre could facilitate greater coordination of the national RD&E effort addressing weeds.

Essentially, we are seeking stakeholder input on:

- Where are the critical (market failure) gaps in weeds RD&E that need to be filled to achieve the highest impacts over the greatest areas of Australia?
- What kinds of collaborative investment models will work to enable stable funding that avoids the negative impact of boom/bust funding regimes?

Who can provide feedback on this paper?

Anybody interested or involved in weeds research, management, policy or practice.

How to provide feedback?

The paper is accompanied by a more detailed situation analysis and discussion document, which we would encourage you to read ahead of providing any feedback. You can find it at www.invasives.com.au

Comments can be made by completing an on-line questionare based on the questions circled in this paper.

You can access the survey via:
https://invasives.com.au/weeds-rde-feedback/

Alternatively comments on this paper can be provided to
sigrid.tijs@invasives.com.au

Feedback on the questions outlined in this paper are due:

Preferred date: Monday 21 May 2018

Critical Date: Monday 11 June 2018

Why do we need an investment plan for weeds RD&E?

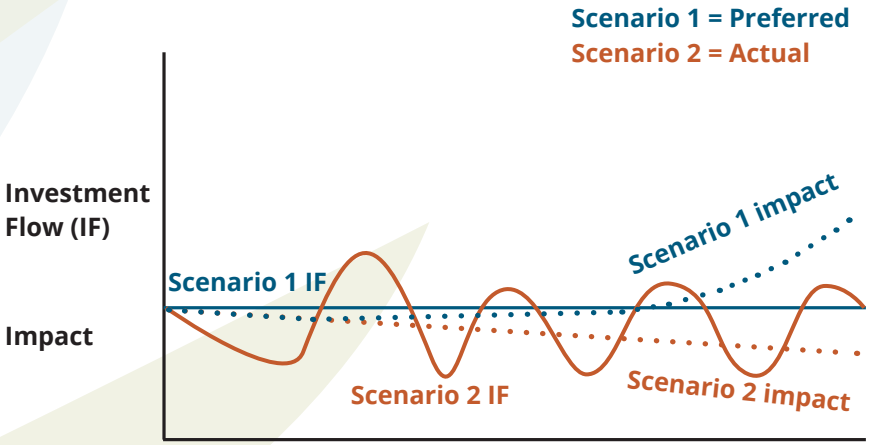
- Australia has reached a point where it must choose new paths to improve development of cost-efficient systems to tackle the breadth of Australia's weed problem.
- Regrettably, research, development and engagement (RD&E) on weeds in Australia suffers from boom-bust funding and competition for resources that is resulting in declining RD&E capabilities and on-ground impact.
- For the development of new biocontrol options, for example, the precipice of the next bust comes in 2020.
- This discussion paper is premised on the belief that more funding is not the issue so much as the need for a sustainable and collaborative investment model for ongoing weed RD&E.
- Such a model must generate the collaboration required to achieve the critical mass of effort to deal with weeds; both in the labs and through an ongoing pipeline of management solutions needed by stakeholders.
- The paper sets the scene in respect to current RD&E investment and seeks stakeholder views, through specific questions about what the scene should look like in the future.
- The final Investment Plan however will emerge through discussion, feedback, planning and testing.

Who commissioned this project?

The Centre for Invasive Species Solutions is a national collaborative research centre, focusing on RD&E to enhance invasive species management. The Centre's current focus is on invasive animals, with clear plans to include weeds in the near future.

The Centre initiated this investment planning exercise with the intent of formulating a plan for coordinated and collaborative weeds RD&E investment over the next decade.

Conceptual model of alternative weed investment flows



The conceptual model here suggests that for an equal investment overtime impact will be higher where the investment is consistent rather than boom-bust, given loss of capacity following each bust.

The situation as we see it

- Weeds are the focus of much activity in the NRM, agriculture and conservation. Increasingly they are being incorporated into Australia's broader biosecurity policies, where invasive plants, animals and pathogens are conceived of collectively as biosecurity threats that require targeted policy responses.
- Weeds policy, management, and research, development and extension (RD&E) responsibilities in Australia are shared across many agencies, different spheres of government and the private sector—leading to a range of difficulties for efficient scale, accountability and coordination.
- While the threats posed by weeds have increased, the resourcing for weeds RD&E has declined.
- Over the past decade, several national R&D programs have aimed to target national priorities for weeds, although actual funding has been skewed towards established weeds, rather than prevention. When these programs conclude, there are inevitable losses of scientific and technical capacity, due to the stop-start nature of the funding models.
- There are also several biosecurity and weeds strategies; however, for these to be effective, sustained national RD&E investment mechanisms are required.
- While there is an abundance of strategies, there are is no effective platform for collaboration on implementing those strategies—either across sectors (e.g. agriculture, biosecurity and environment) or between the many actors involved in funding, policy, regulation and RD&E.
- Collaboration is critical to bring the interested and affected parties together to provide critical mass, prioritisation and targeting of investments.

Note about expectations:

- While weed problems will always be with us, weeds RD&E can make a major contribution to the prevention and reduction of weed related costs, ensuring that management is more targeted and effective. However, there is never likely to be sufficient funds to undertake all of the weeds RD&E expected, and so a clear framework for priority setting is needed to focus available funds and resources on the most effective RD&E.

What are the major issues that need to be taken into account for planning sustained collaborative investment in weeds RD&E?

What investment collaboration models are needed to enable investment in high impact RD&E?

Towards a national plan for RD&E

» Weeds are a major concern of farmers, land managers and NRM groups around Australia and will remain a major focus of landscape management and biosecurity because:

- weeds affect agricultural productivity and profitability;
- weeds impede the achievement of conservation objectives; and
- weed management is expensive, demanding and ongoing.

Cost of weeds

The estimated cost of weeds to agriculture and the environment amounts to billions. The most comprehensive study on weed impacts undertaken to date, undertaken by the University of New England in 2004, remains conservative even today. Professor Jack Sinden's UNE team measured the of costs in excess of $4.4 billion per annum.

» Australia has no shortage of strategies and plans addressing weeds. Moreover, there is considerable investment flowing from these strategies and plans. Sharing lessons and expertise across farms, regions, states and industries appears variable in practice. Nationally, coordination is potentially a critical issue affecting the value of the total investment.

» With weeds RD&E responsibilities dispersed across multiple agencies there is need for establishing a platform for national collaboration in order to target national weed issues, from prevention of new invasions to effective control of established weeds.

Given the need for new pooled funding models for weeds RD&E, are there clear principles that could be used to prioritise investments?

Weeds will always be with us

Many well-established and emerging weeds have taken a foothold in Australia, many others have already naturalised, and there remains the perennial risk of new incursions from overseas.

The numbers reveal the stark reality:

- of the estimated 26,000 exotic plant species in Australia nearly 3,000 species have become naturalised
- nearly 65% of naturalised plants have come from gardens
- a further 6,000 species of garden plants have demonstrated weediness overseas
- of those naturalised, approximately 3,000 species are deemed to be weeds of which 1,800 species are defined as weeds to natural environments and about 1,200 species are weeds in agriculture.

Tackling root causes

Before CISS can embark on developing an effective national RD&E plan, it would seem important that it addresses the root causes of the weed problem and not just its symptoms. This begs a fresh look at weeds.

- The Australian Weed Strategy (2017) states that a "weed is considered pragmatically as a plant that requires some form of action to reduce its negative effects on the economy, the environment as well as human health and amenity."
- However, weeds have always, and will always, be a feature of gardening, forestry and agricultural production systems, constantly requiring "some form of action to reduce … harmful effects".

Weeds are not always what they seem

There are some problems and issues with current definitions of weeds, including that they fail to deal with conflicting or pluralistic values in any given landscape, where, for example one party's weeds may be another party's resource. For example, exotic grasses that produce abundant animal feed (biomass) may also contribute to hotter more damaging fires or cause other problems to people outside the grazing industry[1].

Taking a landscape and ecosystems approach to thinking about weeds

Three things worth thinking about:

1. Defining plants as unwanted or costly, either explicitly or implicitly tells us something about what is wanted from the landscapes in which the unwanted plants are thriving. For this reason, it is as important to consider people's expectations about the landscapes as a precursor to taking any steps to modify the landscapes themselves.
2. Reinforcing this stepwise approach is that, in many cases, the interventions adopted to reduce harmful effects of weeds on conservation values are proving ineffective, resulting in sites being recolonised by the same or similar weeds[2]. This finding suggests the need for more critical evaluations of weed reduction practices based on ideals of ecosystem restoration.
3. Weeds often tend to be indicative of ecosystem disturbance, like changes in grazing pressures, fire regimes or an increase in nutrients. In this way, weeds may be an indicator of other ecosystem changes, including poor land management practices. In other cases, weeds are contributing to ecosystem changes.

Do we need to define, or redefine, the nature of weeds and weed problems before considering how investments in RD&E can be used to 'fix' these problems?

How does the way we conceptualise weed problems determine the kinds of R&D undertaken? Are there unrealistic expectations about what can be achieved?

Given the need to develop and apply risk based approaches to detection, prevention and eradication of weeds, what kind of national investment models are needed for this kind of RD&E?

Do we need R&D into the ecological functions of weeds that more explicitly examines their benefits and the risks they pose to specified values like conservation and production?

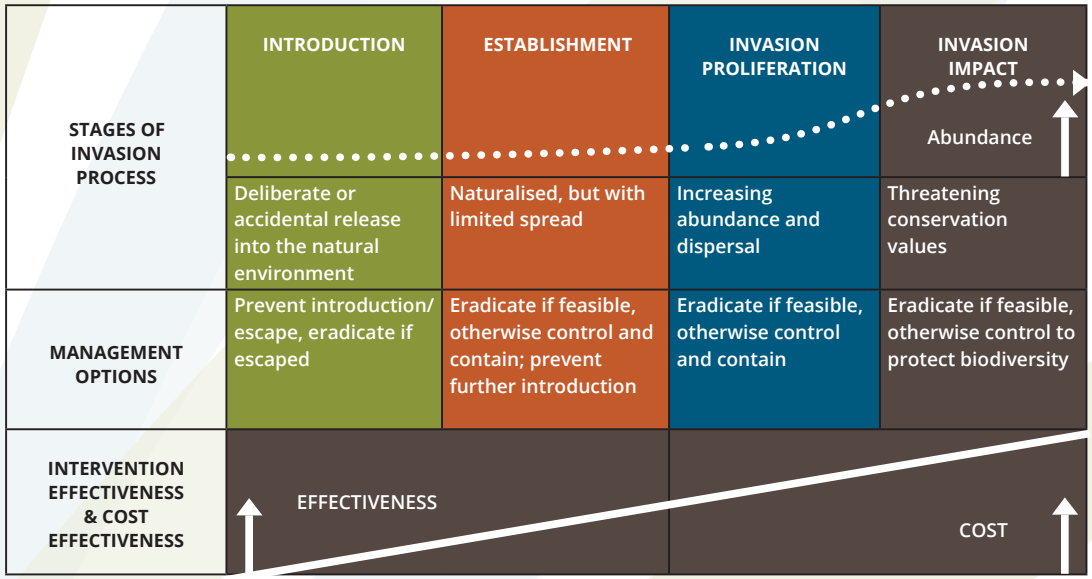
1 Grice, Tony, Weeds of Significance to the Grazing Industries of Australia, MLA Sydney 2005
2 Reid et al 2009, Does invasive plant management aid the restoration of natural ecosystems? Biological Conservation 142 (2009) 2342–234

Redefining weed management approaches

» The concept of an invasion curve (see figure) is increasingly being used as a way of thinking about where to intervene in invasion processes and the relative cost effectiveness of different kinds of interventions.

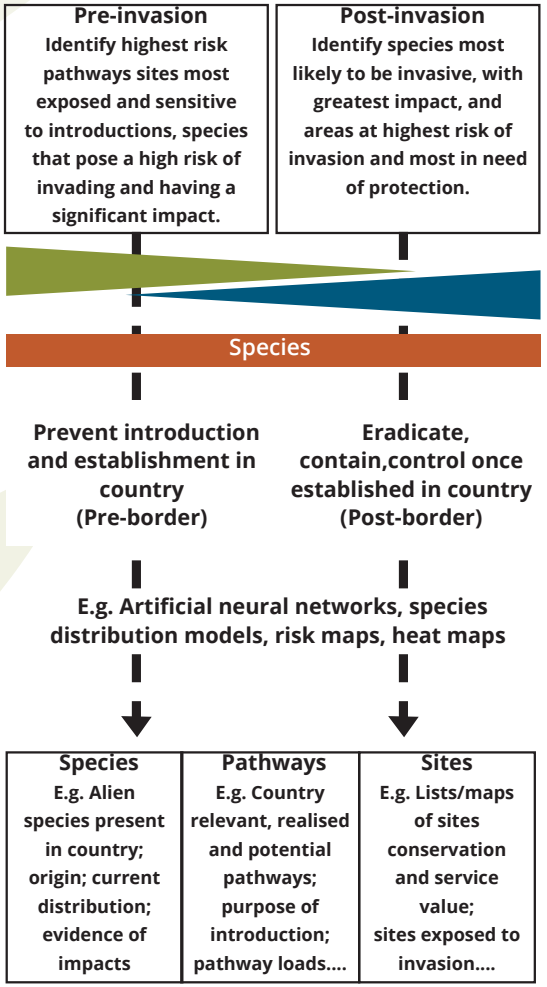
» It is useful to think of established and potential weeds and associated problems as existing along an invasion curve from pre-introduction to establishment of species and to use this framework to think about the kinds of interventions required at different stages depending on where along this curve the species (and its risks) sits. Strategies and responses to potential or established species differ in character and likely cost effectiveness.

Weeds invasion curve



» The invasion curve approach RD&E investment has already been adopted by the Centre for Invasive Species Solutions in respect to invasive animals, such as foxes, rabbits and pigs. The question requiring feedback is could this approach be readily adapted to weeds within the Centre's collaborative RD&E investment framework?

» Another framework for prioritisation is one proposed by McGeoch et al based on pathways, sites and species. Should this too be pursued in the Centre's national plan?[3].



3 Melodie A. McGeoch, Piero Genovesi, Peter J. Bellingham, Mark J. Costello, Chris McGrannachan, Andy Sheppard (2015) Prioritizing species, pathways, and sites to achieve conservation targets for biological invasion. Biological Invasions. 18:2, pp 299–314

Focus on solutions, management pipelines and

- Solutions to invasive species problems must take into account the social, institutional and economic environments within which different stakeholders operate and co-operate. Investment in R&D without E lacks impact and therefore return on investment at every level, from funds provided through government grants through to the time of individual farmers and other community members.
- Biocontrol research has historically achieved high rates of return achieving an estimated average benefit cost ratio of 23:1.[4], however this form of weeds research has suffered from stop-start funding, opaque policy settings and complex institutional accountabilities.
- As a consequence, there has been a dramatic decrease in capacity in weed biocontrol research, from a peak of thirty scientists working in the 1980s to approximately five in 2014 resulting in a substantial decline in the number of weeds and agents being researched[5]. While a recent boost in funding has led to the recruitment of a few new scientists and thus increased research in biocontrol, without sustained funding the overall declining trend will resume and continue.

No silver bullets: An ongoing collaborative RD&E effort

In the 1970's, Paterson's curse was the most widespread, costly, and toxic broadleaved agricultural weed in Australia, covering more than 10 million hectares, and costing nearly $40 million a year in lost production. CSIRO initiated a biological control program for Paterson's curse in France in the 1970's.

Over its 30 year life, the program developed into a national network across all southern states[12]. Seven biological control agents were selected, import risk assessed, and released into Australia of which six established and spread. Most of these agents were mass reared in most states and redistributed to contracted numbers of nursery sites in each of the affected areas, where impacts were monitored. Farmers were trained in biological control practices, and the Paterson's curse biocontrol agents in particular. These farmers obtained agents for their own properties/locations via field days leading to community led redistribution programs. The need for broader distribution of agents also led a state-based federally funded national redistribution program (covering other weed biological control programs as well) from 2006-2009.

While no funding has been available to formally evaluate the effectiveness of this program, the historic "blue hills", or even fields, of Paterson's curse in spring have progressively disappeared over the last 10 years. All collaborating farmers have confirmed that their horses and livestock are no longer dying from consumption of the weed; and that they no longer need to spray their properties for the weed. Surveys in northern Victoria suggest that weed densities and biomass have dropped between 80 and 90 per cent, with similar results being observed in South Australia and Western Australia. An economic assessment for this control program has shown that for a research and development investment of $23.1 million, the net present value benefits are on target to be $1.2 billion by 2050.

4 Coordinated weeds RD&E in Australia: despair or opportunity? John Virtue, Andy Sheppard, John Tracey, Cameron Allan, Ken Young and Jim Thompson use the 23:1 benefit cost ratio based on work by Page and Lacey 2006

5 Coordinated weeds RD&E in Australia: despair or opportunity? John Virtue, Andy Sheppard, John Tracey, Cameron Allan, Ken Young and Jim Thompson

Innovation networks

- The way in which R&D is organised depends on our conceptual models of how innovation and practice change occur. It may be through:
  - very formal and high-tech lab research
  - involving communities of interest in exploring innovative practices,
  - citizen science networks, or
  - specialist projects and combinations of all of the above.
- There are many ideas about how innovation systems are changing but increasingly networks are recognised as important, in part because of the impact of information technology enabling information to flow rapidly within and between networks.
- The innovation literature has relevance to the challenges of weeds RD&E, which needs to work across sectors. Ideas about what is likely to be effective, and the models of innovation invested in, have a bearing on the kinds of projects that are funded. Linear and network innovation models have different strengths and weakness.
- Similarly, there are tensions in the allocation of funds between basic and applied research. These kinds of innovation systems have been defined as co-innovation systems and rely on favourable institutional settings, including ensuring that science is not limited or placed into siloes.
- Processes of research supply and demand require a juggling or negotiation of priorities but research targeted to end-users' needs is more likely to be valuable to society.
- Weeds RD&E should be conceived of as a cooperative venture across the public and private sectors. As a 'networked' innovation system, the approach acts as an evolving co-learning system where the application of solutions results in a kind of trialing and testing and all participants, scientists and land managers alike, actively explore new possibilities, investigate new options and devise new strategies co-operatively (Turner et al 2015)[6].

What is needed to realise opportunities such as citizen science, international collaborations, and innovative partnering with primary industries and the non-government sector?

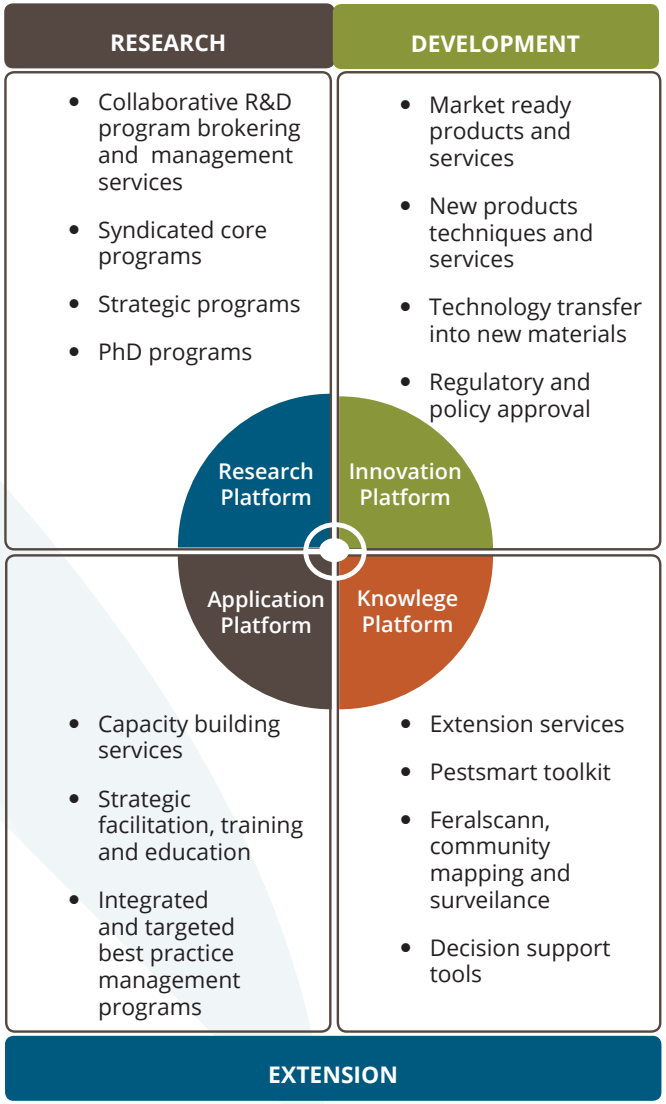
Defining the nature of the innovation systems may be critical to the kinds of RD&E investment undertaken. What kinds of innovation systems are best suited to dealing with weeds in Australia?

6 Turner J., A., et al. (2015) Systemic problems affecting co-innovation in the New Zealand Agricultural Innovation System: Identification of blocking mechanisms and underlying institutional logics, NJAS-Wageningen J.LifeSci. (2015)

Positioning a National Plan for Weed RD&E Investment

'There is currently no nationally coordinated weeds RD&E program, despite past demonstrated benefits from such investment. There continues to be industry focused weeds RD&E through bodies such as Grains Research and Development Corporation (GRDC) and Meat and Livestock Australia (MLA) but for environmental weeds and many noxious weeds there are few current investment options. Governments in all jurisdictions are under significant, long-term budget pressures. Policy drivers in biosecurity include beneficiary pays (with governments' focus on market failure) and achieving high benefit : cost from investments. There is ongoing end user demand for better weed control. How do we shift back to a pro-active approach to weeds RD&E?' [7]

- While this statement is largely true, the future of weeds RD&E is not without hope.
- There is no shortage of weed strategies and research and innovation plans in place across Australia. However land managers and researchers have been working hard to overcome weed challenges with significant success here and there. With critical mass of effort through networking and coordination greater success may be achieved.
- There is also a perception that far more can be done to improve early detection, intervention and prevention measures.
- However, Australia does have an Australian Weeds Strategy that covers the period 2017-2027. This strategy was developed by the Invasive Plans and Animals Committee (now the Environment and Invasives Committee) of the National Biosecurity Committee. There is now an opportunity to implement key elements of the strategy.
- It is preferable that the proposed Plan acts to implement Australian Weeds Strategy through the Centre for Invasive Species Solution's links through the national biosecurity system.



7 Coordinated weeds RD&E in Australia: despair or opportunity? John Virtue, Andy Sheppard, John Tracey, Cameron Allan, Ken Young and Jim Thompson Nineteenth Australasian Weeds Conference, 2014

and giving meaning to “shared responsibility”

» Weed management is increasingly becoming embedded into the discourse of Australia’s overall national biosecurity system, with an eye on using limited resources for national and local economic, environmental and social benefits.

» Weed management in Australia is framed by policies about shared responsibilities. These responsibilities span local, state and national governments, NRM and catchment organisations, landholders and land managers. Therefore, any weeds RD&E that aims to target end-users’ needs, must work within this context and with multiple parties, each with different needs and responsibilities.

» Similarly, any RD&E Investment Plan needs to recognise this complex social and institutional ecology for weed management. For example, research is dispersed across many agencies, while on ground responsibilities often fall to management groups which are active in particular regions, focusing on priority weeds in that region, yet overall there are few ways of identifying and responding to common needs.

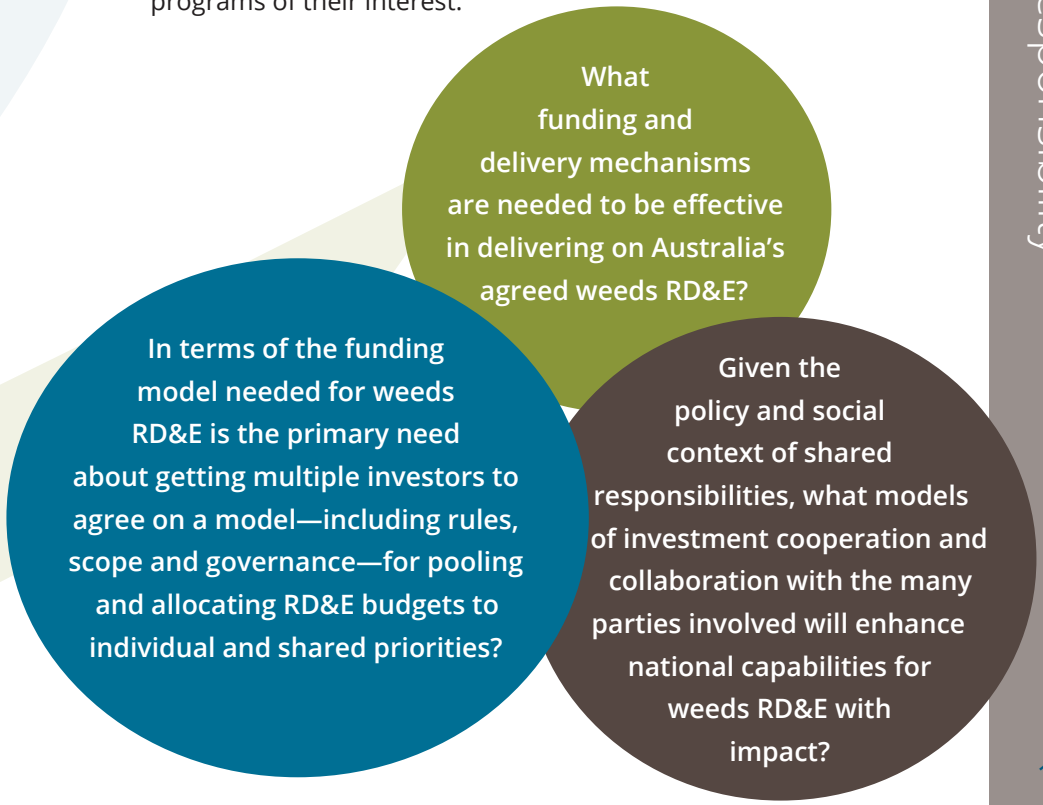
» All states, territories and regional NRM bodies, most agricultural industries and local land and water community management groups have weeds highlighted as a significant area of focus within their prioritisation and investment frameworks. However, within this context of shared responsibility, weeds RD&E is fragmented and could be strengthened through greater coordination.

» Shared responsibility will remain an important principle in Australian Government investment in biosecurity related matters, and so the challenge is to design an Investment Plan that avoids falling into shared-responsibility pitfalls and ensures there is:

- clarity about what must be done,
- critical mass of effort to have impact at scale, and
- process in place to avoid sub optimal outcomes in terms of knowledge generation and information management and application.

» An Investment Plan should also take into account lessons from a workshop convened by CSIRO in 2013, which aimed to elicit the key issues and problems with the current approaches for funding weeds RD&E. These lessons suggest that possible future investment models need to:

- align with, and link to, relevant national RD&E strategies, such as the Intergovernmental Agreement on Biosecurity and the Australian Weeds Strategy
- support national research and promote local/regional development and extension
- coordinate in ways that allows participants to commit their cash, people or infrastructure to support specific and targeted weeds initiatives
- enable multiple investors to specifically contribute to themes/programs of their interest.



Proposed investment principles

- The former Australian Weeds Committee (AWC) identified the following needs for national weeds RD&E that should be taken into account in any National RD&E Investment Plan for weeds:
  - ability to demonstrate the economic, environmental and/or social outcomes arising from widespread adoption of best practice
  - efficiency and maximising value from investment (i.e. high benefit:cost)
  - adoption of beneficiary pays, so that governments primarily invest where there is market failure
  - long-term investment to maintain key capabilities and infrastructures
  - capacity to leverage traditional funders' investments by attracting new investors
  - investment models that balance national, jurisdictional and industry interests
- In relation to collaboration and RD&E capability, the Plan should also note AWC suggestions, namely:
  - end-user involvement along the RD&E continuum, to meet needs and foster effective adoption
  - a larger focus on extension of research findings, to ensure they reach end users
  - greater collaboration between RD&E providers, rather than competition for limited resources
  - increased collaboration between environmental and agricultural sectors
  - recognising and fostering national specialist capacity to deliver on specific RD&E needs
- There are a number of investment principles emerging from the situation analysis complementing this paper that could be used to inform the development of the plan. These include:
  - public benefit and national interest test
  - balance across invasion curve as per the Australian Weed Strategy
  - alignment of national priorities
  - portfolio assessment framework and use of investment criteria
  - results in collaboration across multiple scales
  - prospects of success and likely impacts

Given that the National Environment and Community Biosecurity RD&E Strategy identified that "lack of funding to maintain capabilities and support coordination frameworks" is a major weakness, what needs to be done to ensure adequate funding, effective coordination and the maintenance of adequate R&D capabilities?

What would success look like?

To inform this planning process we are asking what success of an RD&E investment would look like.

- By 2030, what will success look like for weeds RD&E investment in Australia? How did the 2018 investment plan contribute to this success?
- In what ways will weeds RD&E have made a substantial difference to weeds management?

Some possibilities:

- Improved delivery with greater impact on the land (not just more reports)
- Critical mass of coordinated RD&E (and less competition for scarce resources)
- Less fragmentation of RD&E (less projectisation)
- Higher levels of adoption
- More secure funding
- Greater numbers of researchers
- Established platforms for coordination and collaboration
- An agreed framework for governing collaboration and co-investment mechanisms
- Resilient communication and engagement mechanisms
- Robust monitoring and evaluation mechanisms that improve decisions and management and help share lessons across networks

Consultation process

DISCUSSION PAPER—FORMULATE QUESTIONS ON KEY ISSUES

March - April

- review literature
- consult with experts
- prepare and distribute discussion paper

SEEK FEEDBACK AND REFINE

April - May

- seek feedback and refine (Preferred date: Monday 21 May 2018, Critical Date: Monday 11 June 2018)
- interviews
- national workshop

PREPARE AND EXPOSE DRAFT PLAN

May - June

- exposure draft of investment plan
- final exposure draft of plan
- post project consultation on plan with CISS

TOWARDS NATIONAL ENDORSEMENT

July - September

- testing the exposure draft with national Commonwealth and State biosecurity institutions, including Environmental and Invasives Committee
- final testing of the exposure draft with weed community culminating at the 21st Australasian Weeds Conference

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