RADIATA MANAGEMENT TECHNICAL NOTE

Number: 01

What will the vegetation management research programme deliver to the forestry sector?

Summary

The vegetation management research programme was recently aligned to meet the needs of Future Forests Research. The aims and objectives of the programme are outlined below with a brief description of relevant research projects.

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Introduction

The FFR Forest Vegetation Management Research programme was developed during 2007 and 2008 through consultation between scientists and the FFR Vegetation Management Sub-Committee. It was agreed that the greatest return to the forestry sector would be gained by research that:

- *Supports (FSC) certification.* This requires research to support alternatives to herbicides as well as the safe use of existing herbicides approved by certification programmes.
- *Ensures the continued availability of cost-effective vegetation management options* i.e. strives to reduce (herbicide) treatment costs.
- *Prevents the spread of competitive and difficult-to-control weeds*.

To meet these outcomes two main objectives were identified:

Objective 1: *Understanding & Managing Weed Risks*. Determine the effect of management systems on the development of weed population dynamics in the short and long term.

Objective 2: *Sustainable Weed Control Treatments.* Provide forest managers with cost-effective, environmentally sensitive and scientifically robust weed control options.

To ensure the research is both scientifically robust and commercially applicable the programme includes long term, fundamental research required to increase understanding of key biological processes, as well as short to medium term, applied research required to meet the needs of commercial tree growers.

Objective 1. Understanding & Managing Weed Risks

Research to meet this objective is aimed at understanding weed population dynamics of difficult-to-control weeds, such as broom and buddleia. The value of this understanding is in its application to the development of vegetation management systems that negatively affect difficult-to-control weeds in the short and long term.

Some key questions include:

1. What short and long-term effects do management regimes have on broom and buddleia growth and spread?
2. Could different management strategies reduce competition from difficult-to-control weeds?
3. What are the long-term consequences of managing weed populations to economic or competition thresholds?

Some examples of projects associated with this objective include:

- Developing a population dynamics model for broom to quantify the effect of different management regimes on broom development and spread. This understanding will be used together with weed/tree competition models and field studies to optimise broom management across a range of site types.
- Investigating alternative control measures for *Buddleia davidii* in young and mature *Pinus radiata* stands. A process based population dynamics model is being developed to assess the potential impact of a classical biological control agent, *Cleopus japonicus,* on buddleia growth and spread. The model indicates that barring an encounter with a natural enemy, *C. japonicus* has the potential to provide sustained control of buddleia throughout the North Island (Kriticos *et al.*, 2009). Field trials

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are being implemented to benchmark model predictions and also assess the potential of over-sowing with grass to reduce competition from buddleia during plantation establishment.

- Investigating the costs and benefits of alternative vegetation management regimes for difficult to control species. This information will help to optimise vegetation management practices and also source alternatives to herbicides to support FSC requirements. Specific projects will include:
    - Documenting weed communities across one or more plantations where there is a history of alternative management regimes (e.g. oversowing).
    - Implementing trials to contrast alternative weed control treatments, including the use of
        - different herbicides and rates
        - over-sowing
        - other non-chemical treatments

Objective 2. Sustainable Weed Control

Maintaining cost-effective weed control treatments was identified as one of the most important objectives of vegetation management research. Research to address the use of herbicides and mycoherbicides (using weed pathogens) therefore underpins this objective.

Some examples of projects associated with this objective follow:

Certification support: FSC certification requires that herbicide use is minimised and that certain herbicides are avoided due to their negative impacts on the environment. Both hexazinone and terbuthylazine have been banned by FSC, largely because of their leaching potential. Research to address the continued availability of these herbicides has been started - soil samples have been submitted to a laboratory to determine the leaching characteristics of terbuthylazine across a range of New Zealand forestry soils (e.g. Rolando and Watt, 2008). Due to the unique characteristics of some these soils it is possible that on some sites there may be no risk associated with the use of these herbicides.

As potential alternatives to Valzine for management of broom, dose response relationships for Versatil and Tordon are currently being evaluated at two contrasting sites in the South Island. Early results indicate that Versatil and Tordon applied at 3.75 L/ha and 0.375 L/ha provide effective broom control with minimal phytotoxicity to pine seedlings (e.g. Watt, 2009). However, further pot trials are required to examine more closely the effects of Tordon application rate on pine seedling growth at different ages (newly planted up to 18 months).

Mycoherbicides are bioherbicides based on pathogens that provide an alternative control mechanism to classic chemical herbicides and could be the environmentally acceptable 'herbicides' of the future. Fundamental research to understand the underlying mechanisms that influence mycoherbicide efficacy is currently being carried out.

Optimising herbicide treatments: The aim of this research is to enhance the efficacy and/or efficiency of herbicide treatments compared to standard practice. A reduction in herbicide application costs can be achieved though a reduction in water volumes and herbicide rates. Research is focused on optimising application technology for the most commonly used herbicides for pre- and post-plant weed control. Pot trials are currently being undertaken with broom and gorse to assess the potential for organosilicone adjuvants to reduce pre-plant application volumes of glyphosate and metsulfuron from 150L/ha down to, potentially, 25 L/ha. Results from the pot trials will feed into field trials to test commercial application efficacy. This research has the potential to increase the cost-effectiveness of preplant herbicide applications.

Making it work!

The research programme represents a collaborative effort between several research organisations including Scion, Plant Protection Chemistry NZ and AgResearch. The programme is structured to provide the forestry sector with applicable technologies backed by robust science. The strength of the programme moving forward, relies on continuous feedback between the growers and scientists to ensure that the research and communication there-of remains relevant and focused within the programme objectives.

References

Kriticos, D.J. *et al* (2009). Modelling the likely impacts of a weed biological control agent. IUFRO International Forest Biosecurity Conference 16-20 March, Rotorua. Popular Summaries, Scion, New Zealand.

Rolando, C.A. and Watt, M. (2008). Review of the soil carbon partition coefficients for hexazinone and terbuthylazine with reference to their use in certified forests. Internal Report No. 43849. Scion, New Zealand.

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