

Improving regional adoption of weed control: a case study

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Summary Effective control of invasive weeds such as serrated tussock (*Nassella trichotoma*) requires collective action by land managers across the landscape. We explored the impediments to adoption of weed control practices amongst private and public land managers, and the potential of collective action programs to overcome these impediments. A case study approach was adopted, involving serrated tussock control in two contrasting grazing regions of NSW, the Northern Tablelands and the Southern Tablelands.

Although there are important barriers to adoption of serrated tussock control practices, collective action has potential to improve adoption amongst public and private land managers alike. An effective collective action program requires trust and willingness to reciprocate to develop between participants. Existing landholder networks may be employed to ensure ongoing success over the longer term. Concurrent enforcement may be required so that non-participants also attempt to control serrated tussock on their land.

Keywords Collective action, regional adoption, serrated tussock, land use diversity.

INTRODUCTION

Control of weeds is largely the responsibility of individual land managers, but the impact of invasive weeds is often felt at a landscape scale (Fiege 2005). This is because weed seeds can be dispersed across the landscape, and across property boundaries, by natural processes and human activity alike. Therefore, from an individual perspective, land managers often have little incentive to undertake weed control if control actions are not conducted on neighbouring properties as well (Pannell 1994, Hersbdorfer *et al.* 2007).

Effective control programs of invasive weeds therefore require widespread adoption of control strategies by land managers in order to reduce the population of weeds across the landscape as a whole. Any solution will need to involve collective action, where individuals can trust that a critical mass of their neighbours will be adopting weed control just as they are. Community-based approaches may be useful here, helping to foster this trust by strengthening supportive social norms and informal monitoring and sanctioning.

The aim of this research was to explore the impediments to adoption of weed control practices amongst private and public land managers, and the potential of collective action programs to overcome these impediments. A case study approach was adopted, comparing serrated tussock (*Nassella trichotoma*) control in both the Northern Tablelands and Southern Tablelands of NSW.

MATERIALS AND METHODS

The research was completed in three stages. First, Australian and international literature was reviewed to explore weed control adoption and issues relevant to collective action. Second, a telephone survey was conducted of 100 rural landholders in each of the two case study regions. Of these, 50 managed properties of greater than 100 hectares, and 50 managed properties of less than 100 hectares. The survey explored the various barriers and incentives to control of serrated tussock, and the viability of community-based collective action to improve control adoption rates amongst various landholder 'types'. Third, workshops were held in each region (Armidale and Yass) to discuss the findings of the literature review and survey with landholders, weed experts and government agency staff, and to refine future approaches to the problem.

RESULTS AND DISCUSSION

Serrated tussock control barriers The most significant barrier to serrated tussock control amongst survey interviewees was poor management on neighbouring properties (Table 1). Other important barriers included drought, lack of resources to control the weed effectively (time, labour and money), difficult country, and off-farm work commitments (Table 1). Drought was a significantly more important issue amongst Southern Tablelands interviewees (59%) than those from the Northern Tablelands (26%).

Workshop participants thought that apathy and a sense of futility regarding effective management prospects, and difficulty identifying the weed, were significant barriers, particularly amongst lifestyle farmers. Lifestyle farmers were also considered reticent to use herbicide to control weeds on their farm. Participants

Table 1. Barriers to serrated tussock control, as a percentage of telephone survey interviewees.

| Barrier | Yes | No |
|---|------|------|
| Neighbouring private landholders who don't attempt control | 63.0 | 37.0 |
| Drought | 42.5 | 57.5 |
| Lack of time due to other property management tasks | 41.0 | 59.0 |
| Lack of labour to help with serrated tussock control | 37.5 | 62.5 |
| Difficult country, such as steep or rocky country | 35.0 | 65.0 |
| Lack of money | 33.0 | 67.0 |
| Work commitments off-property | 26.0 | 74.0 |
| Dislike of using chemicals | 25.5 | 74.5 |
| Control methods don't work well | 22.0 | 78.0 |
| Shared boundary with public land where serrated tussock is not controlled | 22.0 | 78.0 |
| Lack of information about serrated tussock control | 18.5 | 81.5 |
| Lack of appropriate training/ skills | 17.5 | 82.5 |
| Lack of appropriate equipment | 15.5 | 84.5 |
| Medical problems such as injury or illness | 15.0 | 85.0 |
| Herbicide resistance problems | 11.0 | 89.0 |

considered that the high 'turnover' of lifestyle farmers appears to result in loss of local weed management knowledge and an inflow of inexperienced managers. Lifestyle and absentee farm owners are often a target for criticism, particularly from commercial farmers, for ineffective serrated tussock management (Klepeis *et al.* 2009). Many survey and workshop participants concurred with this assessment, particularly with respect to absentee landholders.

Participants also believed the timing of the serrated tussock 'control window' (approximately August to December) was of particular importance as a barrier to control amongst commercial sheep producers in both regions. They were considered too busy during this time with sheep shearing, lambing and marking, to dedicate sufficient time to other tasks such as timely control of serrated tussock.

The workshop discussions confirmed that, for public land managers such as local government, barriers to effective weed management have often included: a lack of staff numbers and time to devote to weed control; limited financial and technical resources; unclear jurisdictional responsibilities; and a lack of opportunities to share technical expertise and knowledge between councils (see also Atkinson *et al.*

2003, Atkinson 2006). Similarly, the efforts of weed control authorities in both the Northern and Southern Tablelands were considered restricted by lack of staff and other resources, as well as other commitments.

Serrated tussock control incentives Important economic incentives to improve serrated tussock management amongst survey interviewees included controlling new outbreaks early, ensuring farm profitability, improving pasture production, and improving property value. There were significant correlations between a number of serrated tussock control incentives and the goal of running a productive and profitable farm enterprise: those who were motivated to control serrated tussock were also more likely to consider farm profitability very important. Profitability was likewise a higher priority amongst interviewees managing commercial properties than those on smaller lifestyle farms.

Incentives of a non-economic nature were also important, including a sense of community responsibility, enhancing the natural environment on the farm, and pride in having the farm clear of serrated tussock. Although lifestyle farmers are often derided for their relatively poor serrated tussock control efforts, many have a strong environmental stewardship ethic, and the financial resources to implement control actions (Hollier *et al.* 2003).

Overcoming barriers to adoption Improving adoption of serrated tussock control requires preferred modes of learning, land ownership/management goals, and relevant strategies to be taken into account. For example, workshop participants suggested that the message used to move landholders into action on serrated tussock control would need to be tailored according to whether they were more interested in farm profit maximisation, environmental preservation, or maximising property resale value.

Little significant difference was found in the survey regarding preferred personal and published information sources in the two case study regions, or between managers of small (lifestyle) and large (commercial) farms. However, previous research suggests that some lifestyle farmers feel marginalised by the education available to rural land managers, which they consider has a commercial focus (Hollier and Reid 2007).

Despite this, workshop participants identified a range of training options designed specifically for new lifestyle farm managers, suggesting that the educational options exist for these landholders, but that not all may be sufficiently aware of these opportunities. Workshop participants also recommended that a

'weed management kit' be provided to all new rural landholders, particularly lifestyle farm owners, at the time of sale, to inform them of their responsibilities. This approach would help minimise the impact on district-wide weed management of high turnover of land ownership.

Overall, survey interviewees favoured regional experts, weeds officers and spray contractors as personal information sources, and the serrated tussock best practice manual and other government fact sheets as written information sources.

Managers of public lands have many of the same educational requirements as private managers, and face many of the same barriers. However, workshop participants suggested that public land owners were often exempt from legal requirements to control weeds, leading to poor control on these lands, and sources of reinfestation for their neighbours. Holding public land managers legally accountable for weed management to the same extent as private land managers may improve management of weeds such as serrated tussock on public lands.

Local weeds authorities were regarded as providing a useful service to both public and private land managers. Their impact could be improved through increasing their resources, and fostering closer cooperation with a range of other public and government agencies and organisations that have a role in weed management.

Promoting trust and willingness to reciprocate on weed control activity Over 80% of survey participants indicated willingness to participate in a community-based control program for serrated tussock. An effective program must involve trust and willingness to reciprocate on weed control behaviour. A number of factors underpinning trust and willingness to reciprocate amongst neighbours were identified:

- A strong 'sense of community'.
- Acknowledgement that the weed problem is relevant on both sides of the fence.
- Peer pressure, motivating landholders to comply with good land management 'norms' such as effective weed control.
- A convergent interest in serrated tussock control or landscape preservation, such as Landcare group participation.
- Attendance at field days, allowing neighbours to get to know each other and discuss joint land management problems.
- Relatively small group sizes to allow trust to develop between group members.
- Achievable goals to maintain interest in reciprocal activity.

- Farmer willingness to provide advice to their peers.

Several successful community-based land management programs were identified in both case study regions. Some of these programs involved land managers, both public and private, working together to control serrated tussock across a landscape, while other groups focused their efforts on other weeds, or animal pests such as foxes and wild dogs. Key stakeholders in these groups included Landcare groups, Catchment Management Authorities, local and state government, the NSW Department of Primary Industries, and Live-stock Health and Pest Authorities. In many cases, a variety of these organisations came together to work on land management issues, and foster participation of individual land managers.

The success of these programs was based on strong participant interest in program outcomes (generally of an economic or environmental nature), converging land management interests, achievable goals, financial or environmental motivation to take part, and external management and/or funding. These networks and cooperative models offer useful lessons for a serrated tussock program.

Two models for leadership and coordination of a serrated tussock community-based program were suggested for the two case study regions. In the Northern Tablelands, a team leadership approach appeared to be the best option, given historically close cooperation between relevant organisations and agencies in the region, and differing land manager preferences for dealing with particular agencies. In the Southern Tablelands, local weeds authorities and Landcare groups appeared best placed to coordinate such a program, however lacked the resources to do so.

In both regions, strong involvement on the part of the local weeds authority was believed to be vital. Some workshop participants also believed that local government was the most suitable organisation to take responsibility for encouraging weed control on rural land, given they were in regular contact with all rural rate payers. However, it was acknowledged that under present funding arrangements both local government and weeds authorities lacked the resources to facilitate effective weed control amongst the large majority of rural land managers.

Participants recognised the importance of having the right people facilitate collective activity. Such an individual needed to be relatively impartial, knowledgeable about serrated tussock management, and respected by all group participants. It was argued that sustaining a community-based serrated tussock control program meant using existing networks (for example Landcare groups, producer groups and informal

relationships between landholders, weeds authorities and NSW DPI). Collective action was considered less sustainable over the longer term if new networks and group structures needed to be established and supported.

Many participants were strongly in favour of stricter enforcement requiring both private and public land managers to control serrated tussock sooner, to backstop educational and community facilitation approaches. It was argued that community-based approaches may at best foster cooperation between 'some of the people most of the time'. Concurrent enforcement was therefore considered necessary, motivating those land managers who were not willing either to participate in community-based weed control, or to control weeds effectively on their land without external intervention.

CONCLUSIONS

Community-based approaches offer a valuable opportunity to improve the uptake of effective weed management practices. Encouraging private and public land managers to build relationships and work together on weed control will improve the capacity of those who are already motivated to manage weeds on their land, and motivate some individuals who have otherwise been apathetic about weeds. Improving adoption rates for effective weed control across rural landscapes will benefit all land managers.

Future research in this area should trial community-based management programs for weeds such as serrated tussock, and apply the successful features of collective action land management programs already in operation. Existing community-based networks, and their applicability to weed management, need to be identified and utilised where possible. This will minimise the risk of 'burn-out' of collective action weed management, sustaining group activity over the longer term. Different community-engagement models should also be explored for their relevance to different regions in Australia, as well as different weed species.

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