Insights into motivations and barriers for weed control in grazing districts of southern Australia

A.W. van der Meulen¹, I.J. Reeve¹ and B.M. Sindel²

¹ Institute for Rural Futures, University of New England, Armidale, New South Wales 2351, Australia
² CRC for Australian Weed Management, University of New England, Armidale, New South Wales 2351, Australia

Summary Weeds in pasture systems are a major factor reducing productivity of grazing enterprises. While a broad range of weed management products and practices have been developed, their adoption has not been widespread across the grazing industry. Weed control, like any other aspect of land management, is influenced by a complex interplay of social, economic and biophysical factors. Social research can offer valuable insights into graziers’ decisions concerning weed control and may help to identify opportunities to improve weed management practices on grazing properties.

Keywords Weed control, grazing, pasture, social research, extension, decision-making, motivations, barriers.

INTRODUCTION
The temperate perennial pasture zone of southern Australia covers an estimated 26 million hectares, and produces nearly half of southern Australia’s sheep and cattle products. Pastures in this zone are typically complex mixtures of species, sown, volunteer exotic and native plant species. Species that are considered weeds for at least part of their lifecycle will usually represent a significant part of the total biomass (Kemp et al. 1999).

Weeds compete directly with more desirable pasture species, lowering livestock productivity and reducing profit margins because of the costs of control (Taylor and Sindel 2000). Management practices that sustain and revive the pasture resource and provide long-term solutions to weeds have been developed (Burton and Dowling 2004). However, the conversion of research findings into change of practice on farm is a major challenge facing agricultural extension (Keeble et al. 2004) and this certainly appears true for weed management.

Few studies have specifically examined the processes relating to adoption of weed management strategies in grazing systems. Graziers are a diverse group of individuals, and their differences will be reflected in their perception of weeds and their approach towards adopting new weed innovations. Social research may be useful in identifying motivations, or triggers, that are likely to prompt graziers to adopt better weed management practices.

The objectives of this research were to understand weed management decision-making in the southern Australian sheep and cattle grazing industries and to identify motivations for, and barriers to, better weed management.

MATERIALS AND METHODS
A literature review was completed to establish the broad scope of issues underlying weed control in grazing industries. This literature, together with discussions with weeds regulatory staff in the New England region of northern New South Wales, informed the development of a written questionnaire and a set of face-to-face interview questions.

Grazing properties were visited in the New England Tablelands and the Southern Slopes of New South Wales and in the South East of Victoria. Face-to-face interviews were conducted with the property owner (or manager) about their approach to managing weeds. Participants were left with a mail-back survey, covering weed control methods, basic farm attributes, attitudes, information preferences and demographics. For each property visited an assessment of weed incidence and management effort was made by an accompanying weed authority officer, using a simple eight point rating system.

The data resulting from interviews and mail surveys were analysed using an extension-orientated approach. That is, the analysis distinguished between those characteristics of graziers and their properties that are not amenable to modification through extension efforts and those that are amenable to modification. For example, the ages of graziers cannot be changed, but can be taken into account in the design of extension strategies. By contrast, knowledge may be amenable to change through extension, leading to changes in weed management practices.

In consideration of the small sample size and since the focus of the analysis was on explanatory relationships, a slightly relaxed threshold for statistical significance of 0.10 rather than 0.05 in analyses of variance or chi-squared tests was considered appropriate. The
information resulting from this analysis has been verified through focus group, email and telephone discussion with weed regulatory and extension staff located in New South Wales, Victoria, Tasmania, South Australia, and Western Australia.

RESULTS

Methods of weed control There were substantial differences in the popularity of, and familiarity with, the various methods of weed control. Boom spraying and selective use of herbicides were almost universally well regarded, while slashing and burning were not generally well regarded.Awareness of spray grazing and spray topping methods was higher among graziers with some sheep and cropping than among those with no sheep or cropping. Graziers with a higher mean proportion of their property under cropping tended to use the greatest range of approaches. Almost three-quarters of respondents did not use granular or pelletised herbicides. Producers appear to fall into four groups with respect to the mix of weed control methods they use: 1) those using few methods; 2) those using mainly mechanical methods; 3) those using mainly grazing-related methods; and 4) those using a variety of methods (and having the lowest incidence of weeds).

Motivations A number of motivations for better weed control were identified. Those who gave answers relating to the health of livestock and the value of livestock products had significantly lower levels of weed infestation, as rated by the weeds officers assisting with the farm visits. Those who saw the invasive or competitive nature of plants as a problem were also more likely to have lower levels of weed infestation. Weed incidence, as rated by the weeds officers assisting with the farm visits, was also related to views about the usefulness of various information sources. Compared to those with higher levels of weed infestation, those with a lower incidence of weeds on their properties tended to have a higher opinion of expert producers, local councils, chemical and fertiliser company advisors and retailers, and stock and station agents as useful sources of information.

Barriers A number of barriers were identified that are demonstrably related to poor weed control. These included the inability to identify particular grass weeds, time and monetary constraints, difficult terrain and differences in perception of ‘weeds’. There was a consistent difference in awareness of the well-known broadleaf weeds and that of grassy weeds (e.g. Vulpia spp.), with generally higher levels of awareness for the former group.

Farm and farmer characteristics Effectiveness in controlling weeds was related to farmer demography and farm characteristics. There were higher levels of weed infestation occurring among older farmers with lower levels of education, who do not work off-farm, have relatively more cattle and less cropping.

The ‘three Ds’ From the face-to-face interviews and the results described above, it appeared that there are three critical factors leading to effective weed management. These are diligence, a diversity of methods, and deliberation (a planned and proactive approach to weed control). Diligence was examined using a score obtained on a series of attitude statements related to diligence. Diversity was determined on the bases of the number of weed control methods reported. Deliberation was analysed by rating weed control methods on a scale of one to three for complexity and planning. These ‘three Ds’ define a useful three dimensional space (Figure 1) within which can be placed the styles of weed management and the effectiveness of weed control encountered in the farm visits and alluded to by key informants.

![Figure 1. Proportions (%) of respondents in each of the eight octants defined by the median scores on each dimension.](image-url)
Sources of information  Field days, fact sheets and booklets from government departments were held in high regard by graziers as sources of weed information, particularly among better weed managers. Radio, TV and newspapers were generally less well regarded, but were more favourably viewed by the less effective weed managers. The Internet was not generally well regarded, but was perceived more favourably by those using grazing tactics and those employing a wider variety of different methods, and was used most by younger graziers.

DISCUSSION

Methods of weed control  Difficulties with terrain and herbicide resistance are the main problems where technological innovations may lead to improved weed control. Dislike of using chemicals may hinder weed control on some properties, suggesting more effort is required in research and extension of alternatives to herbicide application.

Cost of weeds  Communication and extension efforts focusing on production losses should be very specific about what plants cause the losses and make sure that graziers are able to recognise these plants in their pastures. Awareness of the costs of weeds does not necessarily lead to farmers improving their weed management. When the vaguely sensed costs of future productivity loss are weighed against the very specific and immediate costs of chemical purchase, doing nothing is an attractive option. Quantification of productivity loss in realistic farm situations is essential to influence those for whom economic considerations are uppermost in weed control decisions.

Information sources  Information sources that are regarded as useful by the better weed managers are local in nature. Fact-sheets and booklets from government departments and field days and workshops stand out as ways of communicating information about weeds that are widely regarded as very useful. The electronic media (radio, TV and Internet) are regarded as not useful by large proportions of respondents. However, it is worth pointing out that the Internet is a rich source of information about weeds and their management, and is often used by younger graziers. It is also likely to become increasingly important in the future as older graziers retire and the younger generation take over.

The ‘three Ds’  There appear to be three critical factors that lead to effective weed management on grazing properties. Diligence is adhering to routine practices, using them in a timely fashion and treating weeds as a high priority among all the other tasks competing for the farmer’s time and attention. Diversity is the number of weed control practices used, with multiple methods being used together to obtain better and more cost effective control. Deliberation is the planning of weed control, and undertaking it in a strategic fashion using knowledge of weed life cycles and knowledge of desirable (and less desirable) pasture species. These ‘three Ds’ provide a useful summary of opportunities and challenges for weed communication and extension strategies.

There is an identifiable group of farmers, the ‘diligent’, who are achieving reasonable to good weed control of declared and broadleaf weeds through diligently applying a small number of traditional approaches, such as spot spraying, boom spraying, and ‘chipping them out’. These graziers compensate for ‘imagination’ with persistence. They are often motivated by a sense of ‘pride in property’ and are also concerned about the productivity of their pastures. However, they may tend to focus on declared weeds and may not be aware of certain less well-known plants that are causing production losses. They may, therefore, be losing income through the impact of plants that they do not recognise as ‘weeds’, particularly grassy weeds. With these individuals it is likely that awareness will lead to action. That is, that once these graziers are aware that a plant is reducing farm productivity, they will include it in their regular weed control operations. These graziers are not likely to respond to information on new weed control practices, since their existing methods, in combination with diligence, have so far proved effective. It is worth noting that these producers are largely reliant on application of herbicides, and that they spend a large proportion of their time and energy controlling weeds. It is likely that factors such as increased costs of herbicides, the development of herbicide resistance, reduction in availability of labour, the appearance of new weeds and the influence of aging may reduce their ability to control weeds effectively.

Other graziers may achieve a high level of weed control through using a greater diversity of weed control methods in a more integrated fashion. This ‘diverse’ approach is typical of graziers in cropping systems with planned pasture rotations, where farmers are profit-driven and weeds are considered a source of lost income. The diversity of such mixed enterprises will lend itself to use of a broader range of tools to manage weeds. Wide scale application of herbicides is routine, and herbicide resistance is the major challenge faced by this group. Another factor, particularly relevant to many younger farmers in this group, is that off-farm work reduces the amount of time they have available for controlling weeds.
Turning effectiveness to excellence  As herbicide resistance is an issue for both the ‘diligent’ and the ‘diverse’ weed controllers, it is suggested that reduced reliance on chemical control methods is important to maintaining and improving weed control. Information on alternatives to chemical methods and training about how to use these methods in an integrated fashion should be a key focus for both these groups. In the case of younger graziers in cropping situations, increasing ease-of-access to information about weed control and hence saving the amount of time and effort spent looking for it, is also likely to assist with weed control. For ‘diligent’ weed managers, it is suggested weed extension efforts should raise awareness about the loss of income caused by some of the lesser-known weeds, particularly grassy weeds, as well as skills in identifying and controlling these weeds.

Improving effectiveness of the ineffective  This study found that the least effective weed managers tend to use a few methods of control in a casual and reactive way. An adoption path for this group can, at least in theory, include any combination of increased diligence, increased diversity and increased ‘deliberation’. In practice, a more planned, strategic approach to weed management will generally require the weed manager to be competent in the use of a range of weed control methods. In addition, it will require more than simple provision of information, and will probably involve educational approaches, such as have been used with Wool 4 Wealth, ProGraze and Grazing for Profit programs. This then leaves increased diligence and increased range of methods as the most effective adoption paths for the less effective weed managers. However, there is little point in adopting a wider range of control methods, unless they are applied diligently. This would suggest that improving diligence in weed control should be the primary focus for the less effective weed managers.

ACKNOWLEDGMENTS
The work described in this paper was funded by Meat and Livestock Australia (MLA) – Project number WEED.120. Cameron Allen and Bob Hannam, both of MLA, have provided useful feedback on the various stages of this research. Weed research and regulatory staff from several states of Australia have provided much valued assistance to this research. The contribution of graziers participating in this research is also greatly appreciated.

REFERENCES