BEST PRACTICE MANAGEMENT (BPM) FOR THISTLES ON THE NORTHERN TABLELANDS OF NSW AND ITS POTENTIAL IN WEED RESEARCH

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Abstract  Thistles are a major problem of pastures on the Northern Tablelands of NSW. Best Practice Management (BPM) can be defined as the search for industry best practices that lead to superior performance, and it has been used successfully over the last 20 years in several industries to increase productivity. BPM was used in this study to examine thistle management in pastures on the Northern Tablelands of NSW.

A postal questionnaire was sent to 289 graziers in order to provide information on the occurrence of thistles, the problems they cause and the most effective control strategies in the region. The questionnaire was also used to identify graziers who had achieved success with thistle management. These graziers were then interviewed by telephone to determine more precisely the control strategies which gave them most success.

Spear thistle (Cirsium vulgaris (Savi) Ten. was the most widespread and problematic species, followed by saffron (Carthamus lanatus L.) and nodding (Carduus nutans L.) thistles. Thistles were more of a problem on properties with sheep than on those with cattle alone. In general, BPM involved maintaining a vigorous pasture by sowing perennial species, regular fertiliser application, use of a rotational grazing system, and spraying and chipping when necessary. BPM for nodding thistle included a ‘no-tolerance’ attitude to this weed, so that graziers attempted to eradicate all plants, often by chipping. This intolerance to nodding thistle presumably related to its relatively recent occurrence in the region (compared with many other thistles) and its declaration as a W2 noxious weed. With refinement, BPM has considerable potential for use in future weed research. The results of this study, once extended into the agricultural community, will assist graziers endeavouring to overcome thistle problems.

INTRODUCTION

Thistles are a major problem of pastures throughout much of temperate Australia, including the Northern Tablelands of NSW, where there are approximately 700,000 beef cattle and 4,000,000 sheep across 7,000 individual grazing properties. It has been estimated that the average property income in the region is reduced by 15% as a result of the presence of non-noxious weeds (Townsend and Sinden 1999). Of the 10 most troublesome species in the region, six are thistles (Sindel 1996). Thistles compete with pasture species, hinder livestock movement, inhibit grazing, cause injury to stock and contaminate wool clips.

Mill (1848) wrote In every department of human affairs, Practice long precedes Science: systematic enquiry into the modes of action of the powers of nature, is the tardy product of a long cause of efforts to use those powers for practical ends. In other words, the most successful control strategies for weeds may be in farmers’ paddocks rather than within the realms of scientific research. If so, it would be worthwhile asking farmers what works best for them. This concept has been labelled Best Practice Management (BPM), and otherwise defined as the search for industry best practices that lead to superior performance. BPM has been successfully developed over the past 20 years in the manufacturing and service industries, but has not been widely applied in Australian agriculture. Where it has been implemented, it has been reported as being successful (Boyce 1995, Lacy 1998, Williams and Walcott 1998).

The objective of this study was to determine the Best Practice Management for thistles in pastures on the Northern Tablelands of NSW. Two surveys were conducted, a postal questionnaire and a telephone interview, with the combined aim of identifying graziers who had successfully controlled their thistles and determining the strategies they used.

MATERIALS AND METHODS

Postal questionnaire  A questionnaire was mailed to 289 graziers from Tenterfield in the north to Nowendoc in the south of the Northern Tablelands in May 1998. To aid identification, colour photographs of the major
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The thistles found in the region were enclosed with the questionnaire. For the purposes of this study, *Onopordum* spp. were grouped together as Scotch thistle, and *Carduus pycnocephalus* and *C. tenuiflorus* as slender thistle.

The strategies used to encourage a high return rate are described in Trotter (1998). All responses were entered into a Microsoft Excel worksheet and analysed using the SPSS statistical program.

**Telephone interview** Best Practice Managers were identified as those graziers who had good success at controlling thistles on their property and who demonstrated an understanding of the processes behind the techniques they were using. Because of time constraints, only six graziers were telephoned for each of the three major thistle species.

**RESULTS**

**Postal questionnaire** The return rate for the survey was 51%. Despite the inclusion of coloured photographs in the mail out, 16% of the graziers apparently confused spear thistle (*Cirsium vulgare* (Savi) Ten.) with Scotch thistle. As a result, the findings for Scotch thistle need to be treated with caution.

Spear thistle was clearly the most widely-occurring thistle, being found on all but 5% of properties. Saffron (*Carthamus lanatus* L.) and slender thistles were the next most prevalent, followed by variegated (*Silybum marianum* (L.) Gaertn.) and nodding (*Carduus nutans* L.) thistles. St. Barnaby’s (*Centaurea solstitialis* L.), stemless (*Onopordum acaulon* L.) and star (*Centaurea calcitrapa* L.) thistles were limited in distribution (Table 1).

For all thistles except spear, a lower percentage of graziers with beef cattle as their main enterprise reported an occurrence compared with those with sheep. For example, the percentages for slender thistle were 52 and 83% respectively. Likewise, a greater percentage of sheep graziers consider thistles to be a moderate to major problem compared with cattle graziers. For example, the figures for saffron thistle were 44 and 14% respectively.

Graziers perceived spear, saffron and nodding thistles as the biggest concerns on the Northern Tablelands and attempted to control these three species more than the others. However, a greater percentage of graziers successfully controlled saffron and nodding thistles (both 44%) than spear thistle (20%). The level of use and effectiveness of various control methods is shown in Table 2.

**Telephone interview** None of the BPM graziers interviewed reported an economic loss from spear thistle. All had sown perennial pastures, applied at least 110 kg ha\(^{-1}\) of superphosphate or equivalent annually (or had adequate phosphorus levels), boom sprayed sheep camps with MCPA in spring where necessary and did not use hand chipping or spot spraying. The majority used rotational or cell grazing.

For saffron thistle, the majority of graziers used sown perennial pastures and applied at least 170 kg of superphosphate or equivalent. A variety of grazing systems were used. Boom spraying was not necessary on most properties, however, some graziers spot sprayed with MCPA or MCPA + Lontrel\(^{\circledast}\) whenever necessary. No saffron thistle BPM graziers used slashing. Chipping was used by the majority but was not the preferred control measure.

For nodding thistle, there are a variety of pastures, fertiliser rates and grazing management systems used. Boom spraying was not necessary on any of the properties whilst spot spraying was used on two of the six. Chipping was carried out on all properties and a hoe was carried in the farm vehicle at all times.

**DISCUSSION**

Thistles may be more of a problem on properties with sheep than cattle because they are spread more easily by sheep, they directly affect profitability by contaminating wool, and because cattle tend to graze at a higher level and less intensively than sheep, leading to more competitive pasture growth that is able to restrict thistle emergence and establishment.

**BPM for spear thistle** Because of its common occurrence, control techniques such as pasture competition and herbicide application are more widely used than methods such as chipping (Table 2).

Perennial pastures provide a dense canopy throughout the year preventing the emergence of spear thistle seedlings. Using rotational or cell grazing seems to be the best grazing system for controlling spear thistle. Two graziers who changed grazing specifically commented on reductions in spear thistle associated with the increase in grazing management intensity. Rotational or cell grazing systems may encourage more vigorous pasture growth which is better able to compete with spear thistle. Through cell grazing, animals may also trample thistle seedlings more and graze the generally unpalatable species to some extent.
Applying fertiliser encourages pasture competition which is essential for successful thistle control. By controlling spear thistle through pasture competition, the use of more intensive control techniques such as spot spraying and chipping can be avoided. However, sheep camps which provide ideal habitats for spear thistle will invariably host this plant and it will be necessary to control this weed in these areas to avoid the spread of seed by wind.

**BPM for saffron thistle**  As with spear thistle, BPM for saffron thistle was centred on a sown perennial pasture providing competition in autumn when saffron thistle was establishing, and on the application of superphosphate. Saffron thistle is less responsive to high nutrient levels than most other thistles and many pasture species.

The best grazing system for controlling saffron thistle was less well defined, however, a rotational system was used by most BPM graziers interviewed. One aim of most rotational grazing systems is to avoid overgrazing, a contributor to saffron thistle invasion, and to promote better utilisation of the non-palatable species. One grazier stated that sheep are better control agents for saffron thistle than cattle, perhaps because they can more effectively graze the relatively flat rosettes of saffron thistle. Therefore, it could be possible to use sheep on badly infested pastures where cattle may not be effective.

Unlike spear thistle, there was no requirement to spray sheep camps as saffron thistle did not thrive in these higher fertility areas. Spot spraying with MCPA or MCPA + Lontrel was necessary to control isolated

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**Table 1.** Percentage of respondents with thistles on their farms.

<table>
<thead>
<tr>
<th>Thistle occurrence</th>
<th>Spear</th>
<th>Saffron</th>
<th>Nodding</th>
<th>Slender</th>
<th>Variegated</th>
<th>Scotch</th>
<th>Barnaby’s</th>
<th>Stemless</th>
<th>Star</th>
</tr>
</thead>
<tbody>
<tr>
<td>Not occur</td>
<td>5</td>
<td>16</td>
<td>38</td>
<td>22</td>
<td>36</td>
<td>62</td>
<td>91</td>
<td>95</td>
<td>97</td>
</tr>
<tr>
<td>Small nos</td>
<td>8</td>
<td>59</td>
<td>56</td>
<td>53</td>
<td>59</td>
<td>24</td>
<td>5</td>
<td>5</td>
<td>3</td>
</tr>
<tr>
<td>Mod. nos</td>
<td>48</td>
<td>18</td>
<td>4</td>
<td>23</td>
<td>4</td>
<td>10</td>
<td>2</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Large nos</td>
<td>39</td>
<td>7</td>
<td>2</td>
<td>2</td>
<td>1</td>
<td>4</td>
<td>2</td>
<td>0</td>
<td>0</td>
</tr>
</tbody>
</table>

**Table 2.** The percentage of respondents who reported using a technique and the success they achieved (expressed as a percentage of total used) against spear thistle, saffron thistle and nodding thistle.

<table>
<thead>
<tr>
<th>Control method Use/Success</th>
<th>Competitive pastures</th>
<th>Grazing management</th>
<th>Herbicides</th>
<th>Slashing</th>
<th>Hand chipping / pulling</th>
<th>Goats</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Spear</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Used</td>
<td>60</td>
<td>45</td>
<td>67</td>
<td>39</td>
<td>30</td>
<td>2</td>
</tr>
<tr>
<td>Little success</td>
<td>25</td>
<td>26</td>
<td>11</td>
<td>48</td>
<td>28</td>
<td>33</td>
</tr>
<tr>
<td>Mod. success</td>
<td>50</td>
<td>52</td>
<td>38</td>
<td>42</td>
<td>35</td>
<td>0</td>
</tr>
<tr>
<td>Good success</td>
<td>25</td>
<td>22</td>
<td>51</td>
<td>10</td>
<td>38</td>
<td>66</td>
</tr>
<tr>
<td><strong>Saffron</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Used</td>
<td>43</td>
<td>32</td>
<td>71</td>
<td>19</td>
<td>50</td>
<td>2</td>
</tr>
<tr>
<td>Little success</td>
<td>29</td>
<td>37</td>
<td>11</td>
<td>46</td>
<td>18</td>
<td>33</td>
</tr>
<tr>
<td>Mod. success</td>
<td>43</td>
<td>37</td>
<td>39</td>
<td>54</td>
<td>24</td>
<td>0</td>
</tr>
<tr>
<td>Good success</td>
<td>28</td>
<td>26</td>
<td>50</td>
<td>0</td>
<td>59</td>
<td>66</td>
</tr>
<tr>
<td><strong>Nodding</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Used</td>
<td>30</td>
<td>23</td>
<td>44</td>
<td>4</td>
<td>61</td>
<td>2</td>
</tr>
<tr>
<td>Little success</td>
<td>24</td>
<td>35</td>
<td>2</td>
<td>60</td>
<td>5</td>
<td>0</td>
</tr>
<tr>
<td>Mod. success</td>
<td>44</td>
<td>42</td>
<td>37</td>
<td>40</td>
<td>18</td>
<td>0</td>
</tr>
<tr>
<td>Good success</td>
<td>32</td>
<td>23</td>
<td>62</td>
<td>0</td>
<td>77</td>
<td>100</td>
</tr>
</tbody>
</table>
infestations. None of the BPM graziers used spray-grazing or spray-topping which are widely recommended control techniques. Slashing is not used as a part of the BPM of saffron thistle. Two graziers were concerned that chipping thistles resulted in the production of a seed bed which only encouraged more weeds to germinate. The relative effectiveness of spot spraying thistles versus chipping is to be investigated.

**BPM of nodding thistle** An integrated BPM approach for the control of nodding thistle was less clearly defined in the results than for spear or saffron thistles. Most graziers have a zero tolerance level for nodding thistle, presumably because of its relatively recent occurrence in the region and its declaration as a W2 noxious weed. Graziers aim for complete control. By far the most successfully-used control technique for nodding thistle was hand chipping (Table 2). The success of this technique is likely to result from the small numbers in which nodding thistle is usually found (Table 1).

**Refining the information gathering process** The process of selecting graziers who used BPM for thistles was reasonably successful in that only those for whom thistles had negligible economic impact were identified by the postal questionnaire. However, a number of strategies can be used to further refine the process of BPM using survey techniques. In the postal questionnaire, questions asking for specific thistle densities and percentage economic losses would have been more appropriate and would have allowed better comparisons between farmers. One suggestion is to ask questions that provide ‘hard data’ rather than farmer perceptions. Farmer observations are useful, but they are limited when endeavouring to compare results between individuals.

**The potential for BPM in weed research** The basic concept behind BPM is identifying the individuals who are the best in their field and applying the processes they use with the idea of at least equalling their success. At its simplest, BPM is essentially about learning from others (Spendolini 1992).

While this practice of learning from others is by no means new, the origin of BPM as a recognised exercise is attributed to Xerox. In 1982 they found that their co-firm in Japan was selling products for as much as they cost to make in America. The American Xerox firm set about identifying what the Japanese did that allowed them to manufacture products so efficiently. Effectively, they were seeking out and establishing the best practices in their industry. The American Xerox company became an industry leader and subsequently many other firms started using BPM (Spendolini 1992).

BPM helps organisations, be they manufacturers or grazing enterprises, focus on the external environment and improve process efficiency. Without this external focus, an organisation can lose its competitive edge and market share. BPM is a process whereby farmers can look outside their own farm for better ways to do things.

**CONCLUSION**

The process of BPM as used in this study, has considerable promise as a research tool for future weed management. BPM still requires some refinements so that more meaningful results can be obtained. The most useful improvement to this process would be the inclusion of economic and sustainability data as the basis for the selection of ‘best practice’ individuals. After all, best practice managers must be those graziers who have achieved a sustainable and economically viable production system, and it is these producers that other farmers should be endeavouring to emulate.

**ACKNOWLEDGMENTS**

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**REFERENCES**


