ARE THERE NET BENEFITS FROM NOOGOORA BURR CONTROL IN WESTERN AUSTRALIA?

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Summary. Noogoora burr (*Xanthium occidentale* Bertol.) is confined to the predominant cattle producing Kimberley region in Western Australia and is causing little economic loss. However, it may have the potential to spread southwards into the sheep pastoral area and create severe damage. Spread is restricted by the APB's Noogoora burr control programme. The aim of this study was to evaluate the economics of this programme in a benefit cost framework. The results show that if, without the APB's control programme, Noogoora burr was to spread over all of APB Zones 2 and 3, contaminating 50% of the total sheep flock, or Zones 2, 3 and 9, infecting 25% of the sheep, the control programme would be economically justified. A sensitivity analysis of the important variables showed the results to be robust.

INTRODUCTION

Noogoora burr (*Xanthium occidentale* Bertol.) extends throughout central northern Victoria, South Australia, the Northern Territory and much of New South Wales and Queensland. In Western Australia the weed is mainly confined to the Kimberley region in the north of the State (3).

Since the Kimberley region is predominantly a cattle producing area, Noogoora burr is having little economic impact on the region. However, it does pose a threat to the pastoral sheep industry further south. It has the potential to cause significant economic losses through wool contamination, reduced carrying capacity, increased sheep handling costs, poisoning and discomfort to stock and increased control costs (4). The biology and ecology of Noogoora burr has been described by (5) and (6).

Noogoora burr was declared a noxious weed in Western Australia in 1951 and has since been extensively controlled by the Agriculture Protection Board (APB) to prevent its spread from the Kimberleys into the sheep pastoral areas. The control programme, costing $206 000 in 1985/86, includes inspection of interstate vehicles and stock, spraying of infestations and enforcing quarantine on infested properties.

The APB is reviewing several control programmes including that of Noogoora burr. An integral part of each review is a cost benefit analysis aimed at evaluating the resource level committed to controlling particular species. The resource commitment is considered justified if the control programme yields a net economic benefit, that is, the benefits of controlling the pest outweigh the control costs. The purpose of this paper is to report the results of a cost benefit analysis of the Noogoora burr control programme.

METHOD

The approach taken was to compare the net benefits, that is the benefits less the costs, accruing to all individuals 'with' and 'without' the APB's Noogoora burr control programme. A set of assumptions was established and used to estimate the costs and benefits associated with the 'with' and 'without' scenarios. As the costs and benefits accrued at different times they were discounted to a commensurable present value. The present values were then summed to give a net present value (NPV), which is a measure of the net economic benefit of the control programme. To test the robustness of the results, the assumptions were varied in sensitivity analyses.

The spread of Noogoora burr. The area and density of Noogoora burr infestations in the Kimberleys, Zones 1A and 1B (Fig.1), were assumed to increase with the control programme but were expected to remain in those zones. Without the control programme it was assumed that the burr would spread into pastoral Zones 2, 3 and 9 (Fig. 1). Rather than estimating rates of spread under these circumstances three spread scenarios were hypothesized; Noogoora burr would spread through Zone 2 only, over a 20 year period; Noogoora burr would spread through Zones 2 and 3 over a 20 year period; Noogoora burr would spread through Zones 2, 3 and 9 over a 20 year period.

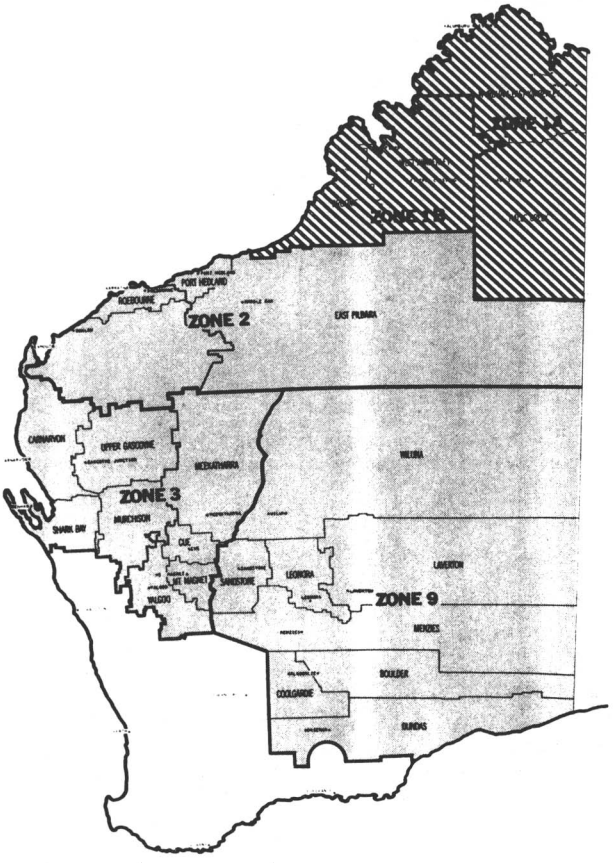

Figure 1. APB zones 1A, 1B, 2, 3 and 9 in Western Australia.

Sheep numbers. The proportion of sheep contaminated with the burr was assumed to reflect the density and extent of spread within each zone. For each spread scenario it was assumed that either 10, 25, 50, 75 or 100% of the total flock in the zone or zones would become contaminated (Table 1). Sheep numbers in Zone 2 were estimated to be 389 000, in Zone 3, 1 553 700 and in Zone 9, 736 100 (1). It was assumed that the number of sheep contaminated with Noogoora burr would increase linearly reaching a maximum after 20 years.

Table 1. The scenarios for various percent sheep infested with Noogoora burr in the zones over a 20 year period.

	Percent sheep infested				
Zones	10	25	50	75	100
2	1A	1B	1C	1D	1E
2&3	2A	2B	2C	2D	2E
2,3&9	3A	3B	3C	3D	3E

Benefits of the Noogoora burr control programme. Sheep pastoralists benefit from the control programme because they do not have income losses from Noogoora burr contaminated wool. In addition the programme ensures they do not have reduced carrying capacity, livestock deaths, extra sheep handling costs and chemical costs, attributive to Noogoora burr. Due to lack of data, the only benefit included in the analysis was the effect on income of Noogoora burr infested wool. The average wool production per head was assumed to be 4 kg and the penalty for Noogoora burr in the wool was estimated to be 20 c/kg.

Costs of the Noogoora burr control programme. The cost of the programme was assumed to be $206 000 per year. Despite APB control efforts it is likely that the weed will spread so the cost was increased by 1% per annum to ensure this spread would be contained within Zones 1A and 1B.

RESULTS AND DISCUSSION

Net present values for the base analysis using a real discount rate of 4% are presented in Table 2. The NPVs or net benefits for scenarios 2C to 2E and 3B to 3E were positive. That is, it is worthwhile for the APB to stop Noogoora burr spreading, over a 20 year period, through Zones 2 and 3 with greater than 50% of the sheep becoming contaminated, or through Zones 2, 3 and 9 with greater than 25% of sheep becoming contaminated. In other words the reduction of income due to burr contamination in the wool is greater than the costs of the APB's control programme.

Table 2. The net present value ($x10^6$) ($) for the various scenarios.

	Scenario				
Number	A	B	C	D	E
1	-2.84	-2.54	-2.04	-1.54	-1.04
2	-2.07	-0.60	1.84	4.28	6.72
3	-1.70	-0.32	3.68	7.04	10.40

Increasing the wool price penalty from 20 c/kg to 40 and 80 c/kg increased the NPVs and therefore the number of scenarios showing a positive NPV. At 80 c/kg wool penalty all scenarios were positive except for 1A and 1B.

Increasing the discount rate from 4% to 8% acted to discount future costs and benefits more heavily, resulting in a reduction in the NPV. Overall, varying the discount rate between 2% and 8% did not alter the number of scenarios yielding a net economic benefit.

The time period of the analysis was varied from 10 to 50 years to account for the possibility of different rates of spread. Varying the time period did not alter the number of scenarios yielding a net economic benefit.

To account for an increase in expenditure, the cost of the programme was increased by $250 000 as part of the sensitivity analyses. This increased APB expenditure reduced the number of scenarios showing a positive NPV at a wool price penalty of 20 c/kg.

The sensitivity analysis showed that the wool price penalty was the only assumption which changed the overall result. It also showed that a large increase in expenditure could only be justified if Noogoora burr was to spread extensively through Zones 2, 3 and 9.

On the basis of the results it can be argued, that there is economic justification for continuation of the current control programme. Moreover, there may be a case for increasing expenditure on Noogoora burr control but a definitive conclusion will hinge on which scenario is most likely to occur. Due to the difficulty in predicting the likely spread and establishment of the weed in Zones 2, 3 and 9, further work on the biology and ecology of Noogoora burr in Western Australia may be necessary.

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