The significance of *Eremocitrus glauca* (Lindl.) Swingle in Southern Queensland

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Summary

Limebush (*Eremocitrus glauca*) is a native woody weed of pastures in the western and southern Darling Downs region of Queensland. During 1988 a questionnaire survey of 244 grazing properties was conducted to assess its significance in five shires (Waggamba, Tara, Chinchilla, Murilla and Taroom). Limebush occupied a total of approximately 96 984 hectares in the survey area, of which 8426 hectares was classed as dense to impenetrable. Annual expenditure on control of limebush for the combined properties surveyed was in excess of $400 000. Expenditure was greatest in the Waggamba Shire, where landholders spent an average of $3161 on control of limebush per property per year. Sixty one percent of respondents indicated that limebush had reduced the carrying capacity of their grazing land. The survey concluded that limebush poses a significant problem on valuable grazing land in southern Queensland.

Introduction

Limebush (*Eremocitrus glauca* (Lindl.) Swingle; Rutaceae) is a native shrub or small tree growing to a height of 5 m. In Queensland, limebush is common in inland districts between the 300 and 640 mm rainfall isohyets, between the latitudes 22–27°S. It occurs as an understorey of brigalow/belah (*Acacia harpophylla* F. Muell. ex Benth./*Casuarina cristata* Miq.) forest communities, but may also occur in association with poplar box (*Eucalyptus populnea* F. Muell.) woodland (Flanders 1932). Limebush grows on soil types that range from heavy clay "brigalow" soils to lighter, red duplex forest soils.

Following the clearing of these types of forest for pastoral development, limebush may regenerate vigorously by producing thorny suckers along its extensive lateral root system. In certain areas of southern Queensland, repeated unsuccessful attempts by graziers to destroy limebush regrowth using either bulldozers or fire have exacerbated the problem. The end result often being the production of impenetrable thickets of thorny regrowth that smother large areas of pasture. Well developed limebush regrowth not only eliminates pasture growth, but also hinders property access, harbours feral pigs and prevents effective stock mustering.

The number of studies investigating the control of limebush is limited. Back (1988) reported that shallow cultivation is an effective control option for limebush, despite the observation that isolated plants may regrow from root-stock 30 years after the commencement of annual cultivation. Scanlan and Anderson (1981) and Csurhes (unpublished) have recorded 92–100% reductions in limebush density following cultivation with a heavy duty blade plough. The cost of blade ploughing can be prohibitive, however, ranging in price from $100–130 per hectare. Chemical control of limebush may be achieved by the foliar application of herbicides containing picloram (Back 1988, Csurhes 1988, McDonald unpublished).

In 1987, the South East Queensland Grazier's Association expressed concern regarding the impact of limebush and the associated high cost of control. The Association formally requested the Department of Lands to undertake research into more cost-effective control options. As a precursor to a decision as to whether or not the Department should allocate resources to the development of improved control strategies for limebush, an assessment of the plant's economic significance was required. Since quantitative data on the impact of limebush had never been previously collected, a survey was initiated.

Methods

A postal questionnaire survey was conducted in 1988 seeking information from graziers in five shires of southern Queensland, viz., Waggamba, Tara, Chinchilla, Murilla and Taroom. The decision to select these shires was based on the fact that they were known to contain the state's major limebush infestations (Kay, Diatloff personal communication). The addresses of 354 graziers residing in the survey area were supplied by the South East Queensland Grazier's Association. The survey thus targeted the grazing industry since it was considered most at risk from losses incurred due to limebush proliferation.

The questionnaire was designed to quantify the total area covered by the survey, land use in the survey area, the area and type of land infested, the impact of limebush on carrying capacity/land utilization, property value and annual income, expenditure on control (total dollar cost as well as labour component), the total cost to clear existing limebush and the personal opinion of landholders regarding the economic impact and spread rate of existing limebush infestations.

Landholders were asked to estimate the area and density of limebush occurring on both high quality land suitable for either grazing or cultivation and moderate to low quality land suitable for grazing only. Within these two land types, respondents were asked to indicate the density of limebush as dense to impenetrable, abundant but penetrable, or scattered.

Respondents were asked to express limebush control expenditure/labour as total expenditure/labour incurred over the previous three consecutive financial years (1985–88). Variability in expenditure, which can be expected from year to year, was thereby taken into consideration.

Table 1. Landholder response to the question: "Is limebush reducing the value of your property? If yes, by how much?", collected from a mail survey of 244 properties located in five shires of Southern Queensland.

Response	Shire (% of returns received per Shire)					Average
	Chinchilla	Murilla	Tara	Taroom	Waggamba	(% of total no. of returns)
Yes	44	48	76	42	57	57
No	56	52	21	58	38	41
Don't know	0	0	3	0	5	2
Estimated reduced value ($000)						
< 1	76	83	30	73	48	54
1–5	6	14	19	15	8	13
5–10	12	3	18	6	7	9
10–20	6	0	21	4	12	11
20–50	0	0	3	2	12	6
> 50	0	0	6	0	8	5

Table 2. Landholder response to the question: "Has limebush reduced the carrying capacity of your grazing land? If yes, by how much?", collected from a mail survey of 244 properties located in five shires of Southern Queensland.

Response	Shire (% of returns received per Shire)					Average (% of total no. of returns)
	Chinchilla	Murilla	Tara	Taroom	Waggamba	
Yes	50	62	77	48	57	61
No	50	38	19	52	43	39
Don't know	0	0	4	0	0	0
Estimated % reduction in carrying capacity						
< 1	75	90	37	86	50	62
1–5	6	7	31	12	21	19
5–10	19	3	15	2	13	10
10–20	0	0	13	0	10	7
20–50	0	0	0	0	6	2
> 50	0	0	0	0	0	0

Table 3. Estimated area and density of limebush occurring on two classes of grazing land, recorded in a mail survey of 244 properties located in five shires of Southern Queensland.

Quality of grazing land	Limebush density	Area (ha) infested
CLASS A – high quality land suitable for either grazing or cultivation	Dense to impenetrable	5 672
	Abundant but penetrable	12 792
	Scattered	45 089
	Sub-total	63 553
CLASS B – low quality land suitable for grazing only	Dense to impenetrable	2 754
	Abundant but penetrable	10 194
	Scattered	20 483
	Sub-total	33 431
TOTAL		96 984

Table 4. Expenditure and time spent on limebush control (averaged over three consecutive financial years; 1985–88), recorded in a mail survey of 244 properties located in five shires of Southern Queensland.

Shire	No. of properties surveyed	Av. expenditure per property per year ($)	Av. labour per property per year (man-hours)
Chinchilla	16	105	6
Murilla	29	89	5
Tara	62	1348	60
Taroom	48	776	21
Waggamba	89	3161	37
TOTAL	244	1666	34

In order to maximize response and hence achieve a satisfactory sample size, attention was paid to the suggestions of Robinson and Agism (1951) and Freebairn (1967). The questionnaire was pre-tested by posting it to 50 randomly selected properties on the 7th May 1988. The remaining 304 questionnaires were posted on the 14th July 1988, after replies from the preliminary survey had been reviewed. All responses were coded and processed using frequency distribution analysis (SYSTAT PC software).

Results and discussion

Of the 354 questionnaires posted, 244 were answered and returned (a response rate of 69%).

The total area of land directly assessed by the survey was 926 340 hectares (244 properties). Land use in the survey area was dominated by grazing (77% of the total area). Cultivation (wheat, sorghum etc.) occupied a further 15% of the survey area, whereas the remaining 8% was classified as unused land.

The survey indicated that limebush regrowth can represent a significant economic problem in terms of a reduction in carrying capacity and property value. Fifty-seven percent of respondents believed their property value had been reduced by limebush. While most landholders (54%) indicated such a reduction was $1000 per property or less, 5% believed limebush had reduced their property value by more than $50 000 (Table 1).

On 61% of properties surveyed, infestations of limebush had reduced the carrying capacity of the land (i.e., the number of grazing animals carried per hectare per annum). Although most landholders (91%) reported less than 10% reduction in carrying capacity, 9% of respondents believed the carrying capacity of their land had been reduced by between 10 and 50% (Table 2).

Six percent of respondents indicated that their annual income had been reduced by more than $10 000 by limebush.

When asked to estimate the cost of clearing existing limebush infestations, 33% of respondents believed it would cost less than $5000 per property, suggesting that many limebush regrowth problems could be rectified quite cheaply if action was taken immediately. Twenty-three percent said it would cost between $5000 and $50 000 per property to control limebush, whereas 8% estimated the cost to be in excess of $50 000. The remaining 36% were unable to estimate the cost.

A total of 96 984 hectares (approximately 10% of the survey area) was reported to be infested with varying densities of limebush, of which 8426 hectares was described as dense to impenetrable. Although the majority of infestations reported were described as either abundant but easily penetrated or scattered (Table 3), there is the potential for such areas to eventually become dense and impenetrable unless suitable control is undertaken. Limebush appears to be primarily a problem on high quality grazing land, a proportion of which may have the potential to be cultivated for dry land crops.

Total expenditure on limebush control over a three year period (1985–88) for the 244 properties surveyed was $1 219 207 (an average of $406 402 per annum). The most significant expenditure occurred in the Waggamba and Tara Shires with average annual expenditures of $3161 and $1348 per property (Table 4). The average level of labour (expressed in man-hours) allocated to limebush control was greatest in the Tara Shire followed by the Waggamba Shire (Table 4). Whether control expenditure will increase in the future, as existing limebush infestations continue to expand, is open to speculation and cannot be determined from this survey. It is necessary to conduct another survey in 15–20 years to collect information on limebush spread rate and quantify potential increases in control expenditure over time.

Responses to the final question on the survey form provided information on the personal attitudes of landholders towards limebush and its control. Approximately 49% of respondents believed that limebush was either of no or low economic significance, with other species of woody weeds such as brigalow being considered more important. Forty-six percent of respondents, however, believed that limebush was moderately to highly significant in comparison to other regrowth problems encountered.

Sixty-five percent of respondents described the spread rate of limebush root-suckers, away from existing clumps and out into surrounding pasture, as being slow but constant with expansion rates being much the same as they were five years before. Several respondents commented that unsuccessful attempts to remove large clumps of limebush from grazing land using bulldozers or fire tended to trigger an increase in the density and extent of thorny limebush root-suckers produced in the pasture.

The majority of respondents stated that the most successful and widely used control measure was to change land use from grazing to long-term cultivation, particularly on the better quality soils. Several respondents praised the efficacy of the modern, heavy-duty blade-ploughs, which not only killed most of the limebush but also sowed improved pasture seed in a single operation. Chemical control was generally considered by respondents to be prohibitively expensive and only practical for small-scale spot treatment, where the emphasis was on eradication of minor infestations. Many comments conveyed a strong element of frustration, due to years of unsuccessful battle with the plant.

Conclusion

It is evident from the foregoing analysis that limebush is a major problem on many grazing properties in the Western and Southern Darling Downs of Queensland, particularly the Tara and Waggamba Shires where it has reduced carrying capacity, property value and annual income.

The plant is generally not considered a problem on land that is under cultivation. On land best suited for grazing, however, many graziers are faced with expanding limebush infestations which represent a costly barrier to sustainable pasture production. Most graziers are frustrated with the lack of low-cost control measures presently available.

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