Economics of controlling serrated tussock (*Nassella trichotoma*) on the tablelands of New South Wales

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SUMMARY

Investment in long term control of serrated tussock (*Nassella trichotoma*) by pasture improvement in New South Wales, under the economic condition of 1976-77, was profitable at an 11% rate of discount. The net present value of control was greater than zero and the internal rate of return exceeded 11%. However, profitable control of the weed depended on: the availability of large amounts of capital over long periods; superior farm management ability; basically fertile land in a relatively high rainfall zone; and a predominance of arable land on the property.

INTRODUCTION

Serrated tussock (*Nassella trichotoma*) has greatly reduced animal production on large areas of the central and southern tablelands of N.S.W. It has been estimated that every hectare of dense serrated tussock reduces wool production by 95% (or approximately 60 kg greasy Merino wool per ha) compared to production from weed free improved pastures (Campbell, 1974).

Current estimates show that moderate to heavy infestations of serrated tussock occur on 218,300 ha, whilst a further 461,700 ha are lightly infested and are in danger of becoming totally infested (Campbell, 1978).

The successful control of serrated tussock requires a heavy capital outlay for long periods and complex agronomic procedures which place a premium on managerial ability. Despite these requirements Byrne (1964) found that it was profitable to control serrated tussock under the economic conditions of that time. However, the long run ratio of prices received to prices paid by farmers involved in pastoral enterprises has significantly declined since 1970 (B.A.E.) and thus a re-assessment of the profitability of controlling serrated tussock was necessary.

This paper reports the findings of research into the economics of controlling serrated tussock recently undertaken by the authors (Vere and Campbell, 1977 a and b).

MATERIALS AND METHODS

Discounted cash flow analysis was used to determine the profitability of controlling serrated tussock on a heavily infested 600 ha property. The three rates of development (fast-6 years, medium-9 years, and slow-12 years) were considered based on the time taken to achieve full pasture production, which in turn was determined by the rate of capital injection. Cash flow budgets spanning a 20 year planning horizon were prepared to determine the timing of cash inflows and outflows, the amount and timing of peak debt, and

the time taken to recover investment capital.

The profitability of investment was assessed by means of the net present value (N.P.V.) and the internal rate of return (I.R.R.) investment criteria. The results were sensitized using N.P.V. curves.

Results

Investment in the long term control of serrated tussock under pasture improvement was profitable at an 11% rate discount for all three rates of development. The N.P.Vs. were all greater than zero and the I.R.Rs. exceeded 11% (Table 1).

The fast rate of development was the most profitable because it resulted in the highest N.P.V. and I.R.R. However, a greater financial input was required, although a shorter period was taken to recover investment capital.

Whilst the fast rate of development resulted in the highest peak debt, four years of profits were earned before the slow rate reached break-even point. Cash flow leakages for non-development expenditure such as for the provision of living allowances were seen to substantially increase peak debts, the lengths of the investment period and subsequently the time taken to cover investment capital.

The results were sensitized by examining the effects of the rate of investment, level of input costs, the cost of superphosphate, and stocking rate on the profitability of controlling serrated tussock (Table 2). The general conclusion was that, given the effects of these variables, serrated tussock control remained profitable for investment periods of up to 20 years.

Variations in the rate of investment had no effect on the estimated rate of return to investment; increasing input costs reduced investment profitability if it was assumed that there was no compensating increase in the price of farm products over the life of the investment; increases in the cost of superphosphate (of up to 100%) caused only marginal reductions in profitability; and heavier stocking rates were seen not only to increase investment profitability, but also to increase the risk of re-infestation through overgrazing.

Table 1. Investment profitability in the control of serrated tussock for three rates of development over a 20 year period

Rate of development	N.P.V. at 11% ($)	I.R.R. ($)	Peak debt (%)	Payback period (years)
Fast	+151527	21.5	-127958	11
Medium	+124810	20.5	-100920	13
Slow	+ 99837	19.5	- 90922	15

Table 2. Sensitivity of investment profitability (as measured by the I.R.R.) to percentage increases in the values of three important variables*

Percent increase	Economic variable		
	Level of input costs I.R.R. (%)	Cost of superphosphate I.R.R. (%)	Stocking rate I.R.R. (%)
25	10.9	17.9	20.7
50	8.8	17.0	22.1
75	7.1	16.4	23.7

* Sensitized relative to the fast rate of development.

DISCUSSION

The results of this analysis showed that control of serrated tussock was still profitable in the mid 1970s, as it was in the mid 1960s (Byrne, 1964). This was because of the substantial production increases which followed pasture improvement.

However, successful long term control places heavy resource demands on the landholder which include:

- large amounts of investment capital over long periods
- superior farm management ability
- basically fertile land in a relatively high rainfall zone, and
- a predominance of arable land on the property.

If any of these resources are lacking there is a definite risk of economic failure. Perhaps the major restriction on the use of control techniques in practice is the large amount of finance necessary to develop an infested property. In this analysis we assumed that the subject property was fully infested with serrated tussock. This is an extreme case as there are only 92 fully infested properties in N.S.W. out of a total of 3352 infested properties (Vere and Campbell, unpublished data). However, finance would still be difficult to raise for the properties that have more than half of their area infested (439) with serrated tussock, particularly if they are in a low rainfall zone, have infertile soils, a predominance of non-arable land or an existing overdraft. This suggests there is a need to review the ability of landholders to obtain large amounts of finance for serrated tussock control and, if there are obstacles preventing landholders from obtaining finance, they should be removed.

On the other hand, it is not wise to supply finance to landholders who lack the managerial ability to control serrated tussock. Part of the management requirements for control are to graze sown pastures below optimum stocking rates and to apply superphosphate annually, both of which were shown above to be necessary to ensure profitable investment. The manager must also be able to contend

with increasing costs, as these reduce profitability and be able to decide on the rate of development necessary to control the weed. Fast development, although more profitable, would not be suitable where finance was limiting, as a greater peak debt would be incurred. Finally, the landholder should recognize that the control program must be rigidly adhered to, otherwise re-infestation will occur and productivity gains lost. Once commenced, the control program cannot be deferred without deterioration in productivity and profitability.

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