

LUCERNE CROPPING ON FIREBREAKS

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SYNOPSIS

Lucerne (*Trifolium pratense*) is proving to be an efficient firebreak in Balmoral Forest. In addition to providing a green break through most of the hot, dry summer months, it is yielding hay and seed which are valuable products to the local farming community. Lucerne establishment and management are outlined, and, in the face of widely fluctuating costs and returns, an attempt has been made to evaluate the profitability of the crop. Although modest by farming standards, the net annual profit per hectare of \$67.63 compares more than favourably with the cost of keeping conventional firebreaks weed free.

INTRODUCTION

Forest perimeter firebreaks can be considered a necessary waste of potentially productive land. To fulfil its protection function, a firebreak must be kept clear and this usually involves an annual task of eradicating weed growth. The amount spent on maintenance must be justified by the indirect benefit of protecting the forest, and this raises the problem of how much to spend on fire protection.

One way of lessening the problem is to make firebreaks pay their way with direct cash benefits, leaving the protection benefit as an unquantified "extra" (albeit the main aim). There have been several attempts at this and most involve growing a relatively fire-safe crop. This may take the form of: trees which will not burn as readily as those being protected; trees that are the same as those being protected but which receive intensive tending to remove dead wood; or an agricultural crop.

The alternatives are generally less efficient at protecting a forest than a bare area free of trees and weeds. In Balmoral Forest, however, lucerne (*Trifolium pratense*) is proving effective and profitable. Its success is attributable to the site and the nature of the plant. Lucerne is a perennial legume with a vigorous and sappy annual shoot and a long taproot. The root can tap deep ground-water, enabling the plant to survive in relatively dry conditions. The shoot will remain leafy and green through most of the summer, dying off only in winter

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and in periods of extreme drought. In most circumstances it would be impossible for lucerne to carry a fire in summer and this makes it one of the most efficient firebreaks short of bare ground.

Lucerne is valued as a stock food. Apart from being grazed it can be converted into hay or silage or compressed into feed pellets. For sustained production of quality hay and seed, lucerne must be sown on a weed-free site which should be fertilized annually and sprayed periodically to eliminate invading weeds. With proper maintenance the lucerne should thrive for twenty years or more.

LUCERNE ESTABLISHMENT AND MANAGEMENT AT BALMORAL FOREST

Balmoral Forest offers a site which is reasonably amenable to the establishment and maintenance of lucerne. Soils are light silts with a high proportion of stones, and weeds are not a great problem owing to the relatively low fertility of the soils and the low annual rainfall (505 mm/annum*). The plant appears to thrive in the high summer temperatures (23.5°C for the February mean daily maximum*) and the hard winter frosts (—4.5°C for the June mean daily grass minimum*) apparently do it no harm. It was first sown on firebreaks in 1963 and the first hay was sold a year later. Some lessons were learned from these early sowings. Initial advice to sow cocksfoot with the lucerne proved a costly error for two reasons. First, the cocksfoot presented a serious fire hazard when it dried off in summer, negating the benefit from the lucerne. Secondly, as an aggressive competitor, it choked out the lucerne in places. Poor ground preparation prior to sowing caused extensive failure in other areas.

Current practice includes the preparation of a weed-free site by repeated cultivation over at least a twelve-month period. Liming, if necessary, is done two months before sowing and reverted superphosphate is mixed and drilled with the seed. A number of different lucerne strains are available and the seed is freshly inoculated before being sown in autumn or spring. Stony sites are stone picked one year after sowing and earlier (before sowing) if necessary. In order to protect the mowers all sites are rolled prior to cutting the first hay 12 or 18 months after sowing. The best weed control is effected by heavily grazing the stand over the winter but, as an alternative, weeds can be controlled by boom spraying in late winter before the lucerne recommences shoot growth. Spraying should be necessary only about once every 5 years. Being a legume, lucerne is very sensitive to hormone sprays and this limits the choice of suitable weedicides to paraquat, atrazine/2,2-DPA and a few others. Maintenance fertilizer applications are made annually in winter by spreading superphosphate.

*Climatic data: average for 4 years 1967-70 inclusive, recorded on the forest.

The hay is sold standing by tender, but as prices fluctuate greatly within any one season, the hay is cut and baled on contract for the Forest Service if all tenders fall below an acceptable minimum. Hay cut on contract is stacked and covered to await sale in winter, while all standing hay sold by tender must be cut, baled, and removed from the forest within two weeks of notification of acceptance of the tender (weather permitting). Payment is made according to the number of bales removed. Up to three cuts a year have been taken from the best stands but the third cut usually precludes the prospects of harvesting any seed, which can be a lucrative product. Seed is harvested on contract for the Forest Service and the yield is cleaned, graded and tested. Sufficient seed is kept for new sowings and the surplus is offered for sale.

ECONOMICS

Costs and returns fluctuate according to site, season (climatic and market), and the general buoyancy of farming. This applies especially to returns, as tenders for hay can drop from 26c a bale (standing) for the first cut of a season to 5c a bale for the second cut only a few weeks later. However, this does not always happen and an attempt has been made to average the variables in Table 1 which summarizes direct costs (excluding overheads) per hectare in Balmoral.

TABLE 1: LUCERNE ESTABLISHMENT COSTS

Operation								Cost (\$/ha)
1	Pre-sowing cultivation (chisel ploughing and harrowing four times)							16.05
2	Pre-sowing stone picking							up to 17.29
3	Pre-sowing fertilizing with 5 tonnes lime							24.20
4	Drilling with 13.5 kg inoculated seed plus 250 kg reverted superphosphate							27.42
5	Heavy rolling							3.70
								88.66

Allowing for a stand life of 20 years, the total cost of establishment can be converted into an annual replacement cost. Annual costs, returns and net annual profit per hectare are detailed in Table 2.

Although a net annual profit per hectare of \$67.63 does not compare with the annual gross margin return of \$147.58/ha suggested by Tocker (1970), it compares more than favourably with an annual firebreak maintenance charge of \$9.00/ha for one double-discing to keep unproductive firebreaks free of weeds. Other bonuses include the higher productivity of forest land by way of multiple use and the improved appearance of a forest with green firebreaks.

TABLE 2: PROFITABILITY OF LUCERNE

<i>Operation</i>		<i>Cost Return (\$/ha)</i>
A. Annual Costs		
1	Annual replacement cost	4.43
2	Annual fertilizer topdressing with 250 kg reverted super-phosphate	8.64
3	Five-yearly liming with 2.5 tonnes at \$12.10 gives an annual charge of	2.42
4	Five-yearly weed spraying at \$14.82 gives an annual charge of	2.96
<i>Total annual cost/ha</i>		18.45
B. Annual Returns		
1	First cut of 62 bales of hay at 25c/bale (standing)	15.50
2	Second cut of 62 bales of hay at 25c/bale (standing)	15.50
3	Seed harvest of 81 kg of cleaned seed valued at 88c/kg minus harvesting, cleaning, grading, and testing charges of 20c/kg	55.08
<i>Total annual return/ha</i>		86.08
C. Net annual profit per hectare		67.63

THE FUTURE

The first sowings are now 10 years old and are still producing well. With an apparently sound future market for lucerne products it is intended to increase the current area of productive firebreak lucerne in Balmoral from 47 ha to approximately 245 ha by completing the establishment on all firebreaks along public roads and all major internal breaks, including those for high-tension electric power lines.

REFERENCE

- Tocker, H. H., 1970: Lucerne as a cash crop in Canterbury. *N.Z. J Agric.*, 120 (5): 65.