

PREScribed BURNING FOR PROFITABLE SHRUB MANAGEMENT IN THE
SEMI-ARID RANGELANDS OF N.S.W.

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Summary. Prescribed burning in the semi-arid rangelands involves planning a controlled fire in a specific area, for the purpose of managing shrub encroachment. The economics of this practice are outlined in this paper. Having examined the costs and benefits of prescribed burning it becomes apparent that it is an economically appropriate option for broadacre shrub management. Nevertheless, it is important for users to understand the possible cash-flow impacts of prescribed burning, in an effort to identify the maximum area of a property that can be burnt during an appropriate year.

INTRODUCTION

The encroachment of native shrub species is recognised as the most serious ecological problem and impediment to agricultural production in some areas of western N.S.W. (2,3,4,). Years suitable for prescribed burning occur only when reasonably wet seasons produce sufficient fuel. During these seasons it is imperative for users to recognise the opportunity and plan to burn as many paddocks as possible. However, like any program of property development, there are costs and benefits which must be evaluated.

COSTS

Building firebreaks. The necessary width for firebreaks depends upon the type and density of the plant community, the amount of fuel, and the incidence of natural firebreaks (e.g. claypans, stony ridges or existing roads). Firebreaks can be graded using owner-operated machinery, or contractors may be employed. Firebreaks are less expensive, and burning less risky, if backburns are used to widen the firebreaks.

Lighting and controlling the fire. These include costs for lighter fuel, labour and operating fire units. These requirements are different according to the size of the burn and perimeter of the paddock. Labour on the day of the burn is usually voluntary. Public liability insurance is often adequately covered by standard policies held by landowners.

Loss of income due to reduced grazing. Prior to the burn it may be necessary to "spell" the paddock so as to allow the accumulation of dry matter as fuel for a burn. The decision to spell a paddock must be made after sufficient rain has fallen. Six to twelve months is a reasonable period for fuel accumulation. In fact, during good seasons the period of paddock spelling may be much less.

Post-burn spelling may impose a considerable cost upon graziers conducting a prescribed burn. Having completed the burn it is advisable to keep livestock from the burnt paddock until sufficient rainfall induces pasture recovery and the re-seeding of desirable grasses, particularly perennials. The fire will be more effective because perennial grasses will compete for moisture and nutrients with any shrub seedlings that emerge after the burn. To implement this practice it may be necessary to sell stock or more heavily concentrate them onto the remainder of a property. The spelling period for a burnt paddock may range from a few months to two years or even longer.

BENEFITS

Livestock production resulting from prescribed burns. Livestock production is extremely variable from one year to the next in the Western Division of N.S.W., being very much dependant upon seasonal conditions. Nevertheless, production characteristics are substantially better on properties with low densities of shrubs. Production figures for the self-replacing merino flock are likely to be characterised by an average lamb weaning of 70%, and an adult wool cut of 5.5 kg. A carrying capacity of one dry sheep equivalent (DSE) per 5 ha is consistent with this. In comparison, a reasonably typical property suffering from the effects of shrub encroachment, would experience variables such as a 45% lamb weaning, 4.5 kg wool cut and carrying capacity of one DSE per 6 ha. (G.J. Markwick, pers. comm. 1986). A single prescribed burn is unlikely to completely turn back the ecological landslide that has taken place. A second or third burn may be required to achieve this, and so reinstate animal production. Thus, it is necessary for prescribed burning to become an integrated part of property management.

Livestock production will continue to deteriorate further if burning is not adopted (Burgess, unpublished data). Shrub encroachment reduces grass and herbage growth, increasing run-off and soil erosion because of the lack of ground cover. Evidence from some of the most badly encroached areas of the semi-arid woodlands indicate that sheep productivity may be drastically reduced. The self-replacing merino flock production is typified by a 30% lamb weaning, 4 kg wool cut and carrying capacity of one DSE per 8 ha. Such characteristics may evolve over 20 to 30 years unless burning is used to prevent their gradual decline.

Reduced mustering costs. Conventional mustering (with motor bikes or other vehicles) is extremely difficult in paddocks infested with mature, dense shrubs. The vegetation presents a physical barrier, reducing visibility and movement. In some instances graziers have found it necessary to muster by aircraft, or trap stock at watering points; in the latter case a "clean" winter muster is virtually impossible. The time taken to muster a paddock is reduced by as much as 50% after a burning, and up to 60% after a second burn. When motorbike running costs and labour are valued the savings are significant.

Land value. Open country, with easier management, higher carrying capacity and superior animal production is valued more highly. Prescribed burning has an impact on land value because these aspects are improved after a burn program. Although an increase in land value is not realisable during the continuing process of agricultural production, higher land prices will be realised in the event of property sale. Similarly, the capital improvement is beneficial for future generations.

ECONOMICS

To illustrate the economic feasibility of prescribed burning it is necessary to consider the likely range of costs and benefits. Table 1 summarises the profitability of burning 2000 ha, over a range of differing seasonal and livestock production responses occurring after the burn. The outcomes are:

- Outcome 1. A modest livestock production response after an initial burn, with a post-burn spelling period of 6 to 12 months.
- Outcome 2. A modest livestock production response after an initial burn, with a post-burn spelling period of 18 to 24 months.

- Outcome 3. Stock production increases not occurring until after a second burn, with a post-burn spelling period of 6 to 12 months.
- Outcome 4. Stock production increases not occurring until after a second burn, with a post-burn spelling period of 18 to 24 months.

Table 1. The profitability of burning 2000 ha, for a range of post-burn seasonal and livestock production outcomes

| | Outcome | | | |
|--|---|--------|---------------|--------|
| | 1 | 2 | 3 | 4 |
| <u>Livestock production</u> | | | | |
| Pre-burn | 45% lamb weaning; 4.5 kg wool; DSE/6 ha | | | |
| After first burn | | | | |
| Lamb weaning (%) | 55 | 55 | No change | |
| Wool cut (kg) | 5 | 5 | from pre-burn | |
| Carrying capacity (ha/DSE) | 6 | 6 | production | |
| After second burn (10 yrs later) | 70% lamb weaning; 5.5 kg wool; DSE/5 ha | | | |
| Post-burn paddock spelling period (months) | 6-12 | 18-24 | 6-12 | 18-24 |
| <u>Measures of profitability</u> | | | | |
| Net return (\$) | 51,242 | 41,787 | 44,638 | 36,004 |
| Payback period (years) | 3 | 5 | 6 | 12 |
| Internal rate of return (%) | 42.8 | 29.8 | 28.1 | 20.4 |

The following measures are commonly used to assess the profitability of property development.

Net return. Net return is the difference between the total benefits and total costs accruing over a 20 year period when burning 2000 ha. Table 1 illustrates that for all four outcomes the net return is significantly positive, ranging from approximately \$36,000 to \$51,000.

Internal rate of return (IRR). Because very little capital investment is required to conduct prescribed burns there is little value in assessing the rate of return on the marginal investment involved. However, the internal rate of return represents the compound interest that the project would return.

An IRR that exceeds 20% for rural property development is recognised as desirable. Thus, prescribed burning presents itself as a most feasible option using this measure of profitability because the IRR's range from 20.4% to 42.8%.

Payback period. Pay-back period is the length of time after the first prescribed burn before the short-term costs are compensated by the longer-term benefits. This indicator may be important for many graziers whose annual

income and cash reserves are limited. While the payback periods for the possible outcomes vary, the range compares favourably with some pasture improvement practices in the more reliable, temperate production zones.

For example, in the most favourable situation when the post-burn dry spell is sufficiently short to have the burnt paddock destocked for 6 to 12 months, the payback period is three years, which is extremely favourable.

In the event of an unfavourable outcome, the withholding period is relatively long, with few livestock production benefits realised. In such situations the economic feasibility of prescribed burning relies on such benefits as reduced mustering time, prevention of further productivity decline and maintaining the value of the land. The present economic analysis revealed a 12 year period before the benefits offset the cost of burning and the loss of income. This result is further conditional on pasture production responses after a second burn. Property improvement via fire management is a long-term option.

DISCUSSION

Prescribed burning is a profitable technique for managing undesirable shrub species. Under the more favourable circumstances, the costs of burning are quickly compensated by the increased profitability of sheep production. Furthermore, even when post-burn seasonal conditions are not favourable, burning is still an economic option, despite quite long payback periods. However, it is important for intending users of fire management to evaluate the cash-flow impact of burns of various sizes, so as to determine the maximum area for burning in an appropriate season. Graziers should:

- * Calculate the costs of firebreaks for various sized burns
- * Calculate the costs of controlling the fire for these same areas.
- * What loss of livestock production in the year of burning, and the year after, will be experienced directly because of the burn, if significant rain does not fall? Estimate this cost for each area.
- * Using these estimates it is possible to calculate the total costs of conducting a burn over different sized areas, for each of the first two years after a burn.
- * The question, "how much area do I burn?" is determined by what is affordable. Anticipated cash-flows should be able to absorb the impact of carrying out a prescribed burn.

Entire paddocks must be burnt in preference to sections of paddocks. By withholding stock from a paddock in preparation for a burn, and later to allow pasture recovery after the fire, stock feed is being lost. Users should attempt to burn the whole paddock so that maximum benefits outweigh this cost. Secondly, because improved visibility and mustering are significant advantages from prescribed burning, large time savings for mustering and stock management such as blowfly control, will only accrue when most of the paddock is burnt. If only a portion of the paddock is burnt then as soon as mustering begins, the sheep seek refuge in the unburnt areas.

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