

**PROCEEDINGS OF THE AUSTRALIAN RANGELAND SOCIETY
BIENNIAL CONFERENCE**

Official publication of The Australian Rangeland Society

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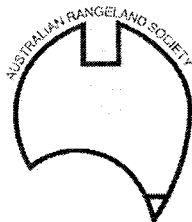
Author family name, initials (year). Title. *In*: Proceedings of the nth Australian Rangeland Society Biennial Conference. Pages. (Australian Rangeland Society: Australia).

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FUTURE OF GOAT PRODUCTION IN AUSTRALIAN RANGELANDS

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ABSTRACT

Goats have two main roles in the rangelands; woody weed management and diversification of income (meat, fibre production). Goat stocking is one option within a policy of integrated woody weed management. Goats readily defoliate some woody weeds, especially when pasture biomass is low, offering an alternative to management burning. A strategy of goat stocking for areas dominated by *Dodonaea attenuata* is discussed. The gross margin of a goat enterprise used to manage woody weeds, estimated at \$7.90/ha, generates an internal rate of return of approximately 19% over a ten year period.

However, a greater understanding of the ecology of rangeland plants is needed to confidently develop stocking strategies that manage woody weeds without causing permanent pasture damage. A stronger marketing framework, particularly for goat meat, is required to stabilise the market and improve prices.

INTRODUCTION

Rangeland areas of Australia have supported mobs of feral goats since early pastoral settlement, when goats were introduced for milk and meat. Goats that escaped or were released from early settlements were well adapted to the semi-arid regions and have become established throughout the rangelands, particularly the woodlands and hilly regions of NSW, Queensland, South Australia and Western Australia.

Free ranging feral goats compete with domestic stock for food and water, pose a threat in the event of an exotic disease outbreak and can have undesirable environmental consequences, for example, in National Parks. On the other hand, they are a source of cash income when captured and sold to abattoirs. They have also been the genetic base in higher rainfall regions for the cashmere and mohair industries, and in the rangelands when domesticated for pastoral enterprises.

Pastoralists became interested in domesticating feral goats because of their ability to survive dry times and provide an alternative income to wool. Today, the industry's future is in using goats to reduce woody weed density. Unlike other methods used in woody weed management, goat products can generate income while being used for range improvement.

This paper outlines the potential of goat stocking for woody weed management, and discusses the factors presently limiting this option. Most comments are based on the situation existing in the rangelands of the eastern states, particularly NSW.

MANAGING WOODY WEEDS USING GOATS

Woody weeds are a major problem faced by pastoralists in the semi-arid woodlands of NSW (1). Ideally, woody weed management involves long term property planning based on the integration of options including management burning, stocking with goats, mechanical clearing, or herbicides; each selected to suit the particular situation (2).

Given a sequence of favourable seasonal conditions, management burning is accepted to be the most effective, cost-efficient technique to manage woody weeds (3). Goats, however, have the potential to be included when it is not possible to implement management burning.

In the semi-arid woodlands of western NSW, the opportunity of accumulating sufficient fuel for a management burn only occurs at a frequency of one in 10-50 years (4). The heavy stocking strategies that pastoralists believe they are forced to practise because of low income flexibility, mask the pattern of natural fire frequency. Pasture biomass is suppressed in densely shrubbed areas, which further limits the opportunities for management burning.

In contrast, goats offer a technique to manage woody weeds when pasture biomass is low. Although goats always take some roughage, their diet includes a large proportion of herbaceous species if available (5) (6). However, when pastures are limited, goats are forced to increase their browse intake which results in heavy defoliation of palatable woody weeds. Therefore, the common scenario of a rangeland environment, featuring low pasture levels and palatable woody weeds, presents ideal conditions for using goats in a woody weed management programme.

Goats should not be regarded as the only option for woody weed management. In situations where pasture is readily available it may be better utilised by sheep, or preserved to promote an opportunity for management burning. In other cases, the primary role of goats may be to reduce shrub biomass to encourage pasture accumulation for management burning. Alternatively, burning, mechanical clearing or herbicides may be necessary to "clean-up" areas of unpalatable woody weeds, or shrubs that have coppiced after defoliation by goats. These options are all part of the policy of integrated management of woody weeds.

The greatest challenge using goats to manage woody weeds is to develop stocking strategies that reduce woody weed density while encouraging pasture growth. NSW Agriculture & Fisheries is currently investigating various goat stocking strategies to manage the woody weed *Dodonaea attenuata*. As this investigation will continue for another year, no definite conclusions can yet be made, but indications so far suggest that:

- *goats heavily defoliate *D. attenuata* when pasture biomass falls below 100-200 kg/ha.

- *grassbutts are grazed but not removed under heavy stocking. In this case, stocking decisions after rain will be critical. Instigating conservative stocking that favours pasture regeneration may also give woody weeds an opportunity to regenerate.

- *shrubs reshoot after defoliation without impetus from rain, whereas grasses require rain to reshoot. Stocking strategies that promote continual removal of re-emerging shoots will cause shrubs to eventually expend their energy reserves. This feature confirms the role of goats during drier seasons to manage woody weeds.

In light of these observations, the "best-bet" strategy of using goats to manage *D. attenuata* in this environment could involve heavy stocking (up to 4 goats/ha) over a short period (six months). This strategy will reduce the likelihood of pasture growth in response to rain before significant shrub impact is achieved. After the initial period, goat stocking at a lighter level (1-2 goats/ha) will continue to defoliate coppicing shrubs. Conclusion of goat

stocking would depend on the level of shrub mortality and rain. For flexibility, this strategy requires a system of several paddocks to receive goats removed after the initial six months stocking.

The ecology of important plants needs to be better understood when using grazing management to manipulate the balance between shrubs and pasture. The response of plants to the frequency, duration, and intensity of defoliation over a range of seasonal conditions is integral to the development of goat stocking strategies that manage woody weeds and promote pasture growth. Goat stocking would be most effective if synchronised to periods when woody weeds are most vulnerable because of inherent fluctuations in their level of stored energy. Further research is required in these areas before goat stocking strategies for woody weed management can be confidently recommended to pastoralists.

Some problems associated with goat stocking (7), (8) are reduced under the policy of using goats as a option within an integrated woody weed management programme.

Some woody weed species are not palatable to goats.

The palatability of dominant woody weed species is a vital issue when considering goats. *D. attenuata*, *Acacia aneura* and *Callitris glaucophylla* are highly palatable to goats. Pastoralists in western NSW have achieved significant shrub mortality while encouraging pasture growth using goats in environments dominated by these species (9), (10).

However, goats do not indiscriminately eat all woody weed species. For example, *Eremophila sturtii* and *E. mitchellii* are unpalatable to goats, even at stocking pressures that provide few alternative feed sources (6). The unpalatable nature of these plants restricts the potential for using goats. An integrated policy of managing woody weeds by stocking goats on shrubs reshooting after another treatment has improved the palatability for goats in other environments (11).

Goat stocking encourages encroachment by less palatable woody weeds.

With careful management, it is unlikely that unpalatable shrubs would increase due to goat stocking. Such species germinate infrequently in response to a sequence of above average seasons, when a management burn would kill the young seedlings as well as a proportion of established shrubs.

Dietary preferences of sheep and goats overlap.

If stocked together sheep and goats have a similar diet, particularly when the season becomes drier and the opportunity for selecting preferred plants is reduced (5). Usually, woody weed management using goats involves removing other stock and introducing goats separately so there is no direct competition for feed. This is a cost of woody weed management (and not of goat stocking per se), and should be accepted as a short term loss that achieves longer term benefits of land improvement.

AN ECONOMIC PERSPECTIVE OF GOAT STOCKING TO MANAGE WOODY WEEDS

Like other methods of woody weed management, an evaluation of goat stocking is based on estimating the costs (including both cash and non-cash) and benefits (productivity increases, labour savings) associated with the technique. Gross margins (gross income less variable costs) are useful for comparing returns from different enterprises. The internal rate of return enables the investor to determine if the enterprise generates an adequate return on invested capital.

A description of the major costs and benefits of using goats for woody weed management follows.

Costs

Foregone income

While the paddock is stocked with goats it is unavailable to the sheep enterprise. In addition, once the goats are removed it should not be stocked until the pasture has regenerated. These opportunity costs are reduced if pasture biomass is low because the feed shortage restricts the number of sheep that can be grazed. The total cost of spelling can be estimated from gross margins of the sheep flock.

Fencing costs

Most fences in western NSW require a substantial capital outlay to be made goat proof. An electrified wire attached to the existing fence provides adequate security.

Source of goats

Sufficient numbers of goats can usually be captured to adequately stock up to 500ha (12). Therefore the cost of obtaining goats has not been included in the calculations below.

Benefits

Income from goats

The gross margin for a self-replacing goat meat flock stocked at 4 goats/ha for six months is estimated to be \$1.97/dse (Appendix II). By comparison, the gross margin for a Merino wether flock on woody weed encroached country is \$9.40/dse (Appendix I).

However, the gross margin/ha for Merino wethers is \$1.57, while that for the self-replacing goats is \$7.90. It must be remembered that the stocking strategy of 4 goats/ha can only be sustained for six months, at which time most of the goats are redistributed to other paddocks or sold.

Productivity increases

Differences in wool cuts (up to 1kg of greasy wool), lambing percentages (25%) and stocking rates (15%) have been observed between woody weed infested areas and open woodland (3). Similar increases can be expected using goats to manage woody weeds. Additionally, further decline in land productivity by future woody weed encroachment is prevented.

Mustering costs

Goats improve the visibility across a paddock, which is reflected in substantial savings in labour costs.

Land value

Using goats to manage woody weeds enhances the value of land in two ways. Firstly, land with good productivity is valued highly in the land market. Secondly, capital improvements such as stock proof fences add to the market value of properties.

The outcome

Assuming modest increases in land value and productivity (0.5 kg wool and raising stocking from 1 dse/6 ha to 1 dse/5 ha) and small savings in mustering costs, the internal rate of return (I.R.R.) is approximately 19% over a ten year period (J Murphy, unpubl. data). Rural development projects with an I.R.R. of above 20% represent a good investment. Therefore, under the price

structure of these assumptions, goat stocking offers marginal returns as an option to manage woody weeds. However, implementing a policy of integrated woody weed management for follow up treatments will improve the I.R.R. by further increasing land value and productivity.

Other considerations

Although the above factors (gross margins and IRR) provide a base on which to make a decision on goat stocking, other issues of property management must also be considered.

- Does the property have adequate facilities and labour to handle the goat enterprise?
- How many other paddocks are suited to using goats in a programme to manage woody weeds?
- Is there a ready market for goats at the prices used in the budget?
- Does the landholder have the financial infrastructure to afford initial lending if it is required?
- What tax advantages/considerations are available with this enterprise?
- Will property development be reflected in increasing land values?

If these questions can be adequately answered, goat stocking may have a role in woody weed management.

THE FUTURE FOR GOAT ENTERPRISES

Although goats have the ecological potential to manage woody weeds, the adoption rate of goats has fluctuated since they were originally considered several decades ago. This can be attributed to several factors:

- Pastoralists are unwilling to acknowledge woody weed problems and implement management programmes.
- Many pastoralists traditionally regard goats as feral animals, and do not accept that they can be profitably integrated into the enterprise.
- There is lack of detailed scientific data on which to base sound management decisions for goat stocking.
- The profitability of sheep enterprises has fluctuated. Interest in goats may once again increase with the current uncertainty in the wool industry.
- Markets and prices for goat products are unstable.

Some of these issues are already being addressed at the property level by increasing the pastoralists' awareness of the woody weed problem and management options. Further research effort will provide a sounder base for goats in the rangelands. However, a stronger marketing framework for goat products will also add confidence to the industry.

Marketing of goat products

Goat meat

Approximately 75% of domesticated goats in western areas of NSW are classed as meat goats (13), destined for export as chilled carcasses or live animals, or

for the domestic carcass market (14). These markets require a lean goat that is typically derived from the rangelands.

In NSW in 1988-89, nearly 130 000 goats (or 75%) were slaughtered for the export carcass trade (NSW Meat Industry Authority, pers. comm.), with major buyers including Taiwan, Korea, Malaysia, Singapore, Fiji and the Caribbeans. Processors find it difficult to fill orders because the supply of suitable quality animals is inconsistent, but demand is also irregular and seasonal. Export markets are sensitive to changes in exchange rates and the domestic price of mutton, which can be used as a substitute.

Consumers within the domestic market include the ethnic community which demands younger kid carcasses, and the smallgoods industry which requires larger framed animals. Some goat processors have identified an expanding local market that they are unable to fill (A Anderson, pers. comm). Live goats are exported mainly to Arab states. It is a seasonal market, and operators are presently experiencing difficulties in obtaining air-carriers.

For many years a primary restriction to the growth of the goat meat market has been a lack of coordination between supply and demand (15). Often the producer has not supplied the type of animal required by the trade. A system of carcass classification (Aus-meat) has been introduced which will allow the buyer to describe the product required, but this system is still being refined to suit goats. Additional markets must be developed to reduce the seasonality of demand. Producer cooperatives would also guarantee a more consistent supply of quality goats.

Cashmere production

Gross margins for a pastoral goat enterprise are sensitive to income received from cashmere (16). However, feral-based stock have low, variable cashmere yields, and pastoralists usually select only the higher yielding animals to shear. The impact on cashmere production of the low nutritional levels imposed under woody weed control programmes is unknown. Marketing is well organised in NSW, with increasing numbers of pools/year and cashmere prices.

Hides

Goat hides are an unexploited product within the goat industry (14). This industry would be valuable in terms of generating export income while replacing expenditure presently incurred when these products are imported.

Live goats

The rangeland areas have traditionally been an important source of goats introduced into higher rainfall areas for weed control and fibre production. However, this market has disappeared in recent years since those graziers can now obtain surplus stock from within their own region.

CONCLUSION

The goat's future in rangeland areas is based on its potential use in range improvement. Its specific role is to reduce the density of palatable woody weeds when conditions are unfavourable for management burning. The ecology of various shrub and pasture species must be better understood to develop goat stocking strategies that manage woody weeds and promote pasture growth. Although goats offer a secondary benefit through generating income, they are unlikely to be regarded solely as an alternative enterprise until the markets for products, particularly goat meat, stabilise and prices improve.

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APPENDIX I: MERINO WETHER GROSS MARGIN - COBAR/BOURKE SCRUBBY COUNTRY

<u>Variable assumptions:</u>		<u>Qty</u>
-Wool cut (kg)		5.50
-Crutchings (kg)		0.25
-Gross buying price (hogget)		\$14.00
-Net selling price (c.f.a 6 years)		4.00
-Death rate (%)		10.00
-Wool price (c/kg net)		361
-Crutchings price (net)		170
-Running cost/wether		5.95
<u>Variable income:</u>		<u>\$</u>
Wool (net) 5.50kg @ 361 c/kg		19.86
Crutchings 0.25kg @ 170 c/kg		0.43
		<u>\$20.28</u>
<u>Variable costs:</u>		
Depreciation (Purchase price less sale over 5 years)		2.00
Deaths - 10.00% of average value, plus wool not produced		2.93
Running costs		5.93
		<u>\$10.88</u>
<u>GROSS MARGIN:</u>		
Net return/wether		\$20.28
Variable costs/wether		\$10.88
Per d.s.e		\$ 9.40
Per hectare @ 1 d.s.e/6 ha		\$ 1.57

APPENDIX II: GOAT MEAT SELF REPLACING FLOCK GROSS MARGIN - WESTERN N.S.W.

<u>Variable assumptions:</u>		
Number of does		500
Number of ages in does		5
Buck (%)		3
Sale price		
- wethers		\$ 9.00
- cull doe maidens		\$11.00
- does c.f.a		\$ 3.00
- bucks c.f.a		\$ 7.00
Buck purchase price		0.00
Kids weaned (%)		90
Death rate		
- adults (%)		8
- kids (%)		20
Running costs (\$/head)		0.80
<u>Variable income:</u>		<u>\$</u>
Sales		
- wether weaners 178		1602
- doe hoggets 62		682
- does c.f.a 76		229
- bucks c.f.a 3		24
Total Variable Income		<u>\$ 2537</u>
<u>Variable costs:</u>		
Running costs (does & kids)		760
Buck purchase		0
Total Variable Costs		<u>\$ 760</u>
<u>GROSS MARGINS:</u>		
-Whole flock		\$1776.70
-Per doe		\$3.55
-Per d.s.e		\$1.97
-Per hectare @ 1 d.s.e / .25 ha.		\$7.90