CONTROLLING SCRUB WEEDS WITH GOATS

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Summary

Observations from a continuing developmental research study of goats browsing common scrub weeds have shown that they can provide a practical alternative to other control methods. Stocking rates and management are discussed in relation to species.

INTRODUCTION

Goats have a biological requirement for a high fibre content in their diet, usually obtained from shrub and tree species. Their agility and mobile upper lips enable them to browse foliage not normally available to other livestock, and they eat a wider range of plant species. Their browsing can result in the death of weed species.

New Zealand farmers have used goats to eat scrub type weeds on a casual basis for many years. Farming journals of the 1920's contain several references to problem weeds on developing land of that period being controlled with goats. Then mechanisation and development of agricultural chemicals provided easier, quicker and more certain control, especially in the last 25 years. Now rapidly increasing machine and fuel costs, curtailment of burning, plus increasing costs and emotional hazards of chemicals, have created renewed interest in biological control.

Goats can be an all purpose, low cost, income earning, ecologically acceptable biological alternative to mechanical, chemical and fire control methods.

Goats have been used in other countries, too, for weed control. In Africa, goats are part of the defence against bush encroachment following clearing. In U.S.A. considerable research has taken place into developing management systems of goats, sheep and cattle for maximum production of rangeland.

Despite the considerable number of observations on the effects of goats on scrub plants in New Zealand, there is little reliable data on the effects on scrub weed growth. In fact, there is little measurement of scrub weed growth - this is ironical in a country where so much time, money and effort has been spent on trying to get rid of it.

Any weed control operation must assess costs against benefit. With goats the balance sheet is

COSTS	RETURNS
Capital cost of goats.	Income from goat products.
Goat management costs.	Saved cost of other weed control measures.
Loss of sheep/cattle feed.	

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Observations over many years, and especially in the Nelson district in recent years, have to some extent determined dietary preferences, browsing habits and have defined production parameters, costs and returns. The Sherry River trial was established to study goat stocking rate in relation to weed control and pasture consumption.

METHOD

A paddock of 8 ha was divided into two, resulting in Paddock North 2.85 ha with 40% scrub cover (1.15 ha) and Paddock South 5.22 ha with 30% scrub cover on a 2.25 ha section (0.67 ha).

Pasture was typical of fairly low producing Nelson hill country with dominant browntop (*Agrostis* spp), suckling clover (*Trifolium dubium*) and *Lotus* spp, with a small proportion of higher fertility species.

Scrub weeds present and studied were blackberry (*Rubus fruticosus*), manuka (*Leptospermum scoparium*), kanuka (*L. ericoides*), Spanish heath (*Erica lusitanica*), bracken (*Pteridium aquilinum*), rush (*Juncus gregiflorus*) and sweet brier (*Rosa rubiginosa*).

Blackberry and rush tended to be localised in parts of paddocks, and sweet brier was a minor species; other species were spread generally throughout Paddock North and a section of Paddock South. Scrub species were mainly more than 3 years old and there was little juvenile growth.

Paddock North was stocked with 15 goat equivalents/ha* of scrub cover from August 1977 to April 1978 when it became obvious that stocking rate was too high for goat survival; it was reduced to 12 goat equivalents/ha of scrub cover until July 1978. Paddock South had no goats.

From the results of the first year, a stocking rate was calculated to maintain scrub species in equilibrium, i.e., goats would consume only annual growth. This gave 7.5 goat equivalents/ha of scrub weeds in Paddock South (the previous control paddock) and was further adjusted downwards to 5.66 goat equivalents/ha of scrub weeds for Paddock North to allow for unthrifty plants following the first year. Both paddocks were grazed by sheep and cattle in both years when pasture feed supply dictated.

The trial area was assessed three monthly, when goats were weighed, control of weed species assessed generally and 2-4 randomly selected marked specimens of each species in each paddock photographed from a fixed reference point. Slides were then projected onto a screen, changes in density of each plant specimen and degree of control assessed. However, the plant density assessment was not carried out in year two because of interpretation difficulties. Control assessment in year two related to the start of that year.

The pasture "frame technique" was used to measure goat pasture consumption. Four cages were placed on the flat and hill section of each paddock after pasture was trimmed. Areas outside the cages were also trimmed. Pasture growth inside and outside cages was compared while goats only were present.

RESULTS YEAR ONE

Goats at the stocking rates used reduced scrub weed growth and populations markedly (Table 1). Sheep and cattle also had some effect.

General observation showed that blackberry growth was pruned and only weak shoots emerged from crowns the following spring. Manuka was strongly preferred to kanuka and many plants less than 1.5 m were killed

* A standard goat equivalent is a goat weighing 40 kg liveweight.

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TABLE 1: Percentage plant density assessment.

	blackberry	manuka	Spanish heath	fern	rush	sweet brier
goats	+ 3	- 56	- 47	- 29	- 28	- 50
control	+ 17	- 13	- 50	- 1	- 12	+ 29
net goat effect	- 14	- 43	+ 3	- 28	- 16	- 79

by browsing and ring barking; taller plants grew above goat reach. Sweet brier was practically eliminated, but the few specimens possibly received preferential browsing. Bracken fern was eaten mainly in the dried autumn/winter stage. Rushes were eaten throughout the year giving basically a reduction in height. Spanish heath, while reduced in density, was not killed.

Control was assessed by five experienced observers comparing density, vigour and cover on projected slides of specimen plants and general view of the trial area (Table 2).

TABLE 2: Percentage plant growth compared with start.

	Paddock North (goats)	Paddock South (control)
blackberry	75	135
manuka	29	81
Spanish heath	23	49
fern	45	73
rush	80	75
sweet brier	19	122

RESULTS YEAR TWO

Results for the first nine months of the second year are shown of individual plant assessments (Table 3).

General observations showed that while fern, rush and Spanish heath were held relatively static, there was a dramatic reduction of sweet brier. Blackberry was reduced substantially and manuka reduced by about 20%.

Regardless of stocking rate and pasture availability (up to 1700 kg DM/ha measured) goats were eating 50-70% of available pasture. No preference was shown for hill or flat areas.

TABLE 3: Percentage plant growth compared with start.

	Paddock North	Paddock South	Paddock South Year One
blackberry	46	59	147
manuka	71	72	90
Spanish heath	94	79	80
fern	82	30	95
rush	72	91	81
sweet brier	33	52	128

Growth in Paddock South in year one (with no goats) is included for comparative purposes.

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ANIMAL DATA

Goats were weighed at the same time of the day to minimise the effect of gut fill. Liveweights of some individual animals was affected by foot scald at various times and stock numbers were too small for statistical significance (Table 4).

Only two does produced live kids to weaning, the stocking rate used being severe enough to cause abortion or birth of weak kids that died. (Goats have the ability to gain weight rapidly with improved feed and liveweights should have increased with pregnancy).

TABLE 4: Goat liveweights.

Date weighed		Mean Wt. (kg)	
8 August	1977	20.2	Start of trial 15 g.e./ha of scrub weeds.
14 November	1977	21.6	
13 February	1978	22.8	
19 April	1978	22.8	Stocking rate reduced to 12 g.e./ha scrub. Both paddocks stocked at different rates.
10 July	1978	22.1	
Year 2			
2 October	1978	20.6	
22 January	1979	30.1	
23 April	1979	27.9	

DISCUSSION

The technique used to measure individual plant density was inclined to give anomalous results in that while especially blackberry and Spanish heath were severely browsed by goats, cane and branch density with and without leaf at assessment did not show the marked visual effect. In addition, photographic records in one plane tended to ignore plant depth. The results shown for year one can therefore be questioned for accuracy. As only occasional cuts were possible and insufficient cages were used, pasture consumption data is also questionable. However, control assessment and general observations support the following conclusions.

There is a direct relationship between goat stocking rate and degree of weed control. A farmer has a choice of using goats to hold reversion, through the scale of increasing stocking rates to one that will eliminate some species. In part this decision lies within his overall development time plan and the extent to which he is prepared to accept the cost of little or no income from goats and the cost of sheep and cattle feed eaten by them.

The study suggested that 15 goat equivalents/ha of mixed scrub cover is near the maximum carrying capacity for a 12 month period when using dry adult goats. Over the same period of time, six goat equivalents/ha of mixed scrub weeds, including manuka and Spanish heath, will just hold reversion.

To some extent the success of goats depends on weed species present. Blackberry and sweet brier are preferred species; manuka can be eliminated if not too tall. Of the other species, rush and bracken can be controlled adequately by other stock. It is yet too soon to evaluate Spanish heath.

Species occurrence is also significant in that a minor occurrence of a less preferred species will lead to greater than normal browsing.

The feed requirements of pregnant/lactating and growing goats do not suit a severe browsing stocking rate such as that used in year one.

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Furthermore the growth pattern of scrub species with most growth in summer requires stocking adjustment to avoid winter feed shortage.

There will be no goat income from a weed control operation, but where reversion is merely being held, gross income from meat could be in excess of \$70/ha. However, there is some cost in terms of lost sheep and cattle feed. Capital cost of goats range from \$10 - 30 for feral does and \$5 - 10 for wethers. Goat proof fencing need be no more than good standard hill country fencing. Husbandry costs of adult goats need perhaps be no more than curing foot troubles. As set stocking and constant browsing give better results than rotational browsing, internal subdivision and stock movement is not required.

Used at the maximum rate, goats will open up a block for later oversowing and topdressing and can be followed by cattle to smash down dead and weakened weed growth. Goat grazing habits will not affect seedling growth from oversown species, and fertiliser response on existing pasture, tends to force goats off it.

Scrub weed control by goats is a practical alternative to chemical and mechanical methods. The study will be continued to measure accurately pasture consumption by goats and to evaluate further the effect on scrub species of stocking rate manipulation.

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