

# Sheep Grazing Reduces Chemical Weed Control in Rubber

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## Abstract

A review of weed control methods in Malaysian rubber estates showed that the complementary use of grazing sheep reduces the overall costs of weed control by between 16 and 36%. Sheep selectively graze grass and some palatable broadleaved species resulting in a desirable purification of the legume *Calopogonium caeruleum* in cover crop mixtures under rubber. The environmental benefits of integration of sheep under rubber are the reduced use of chemical herbicides and less bare ground susceptible to soil erosion.

MALAYSIA has 1.8 million ha of rubber and spends approximately 100 million ringgit per year on herbicides to control weeds. These herbicides are mainly used for circle and strip spraying during the immature period of rubber growth (the first five years) when 24 to 30 spraying rounds are carried out (Chee 1989).

Most of the natural vegetation found in the interrow of rubber plantations is palatable to ruminants. Investigations by Wan Mohamed (1978) showed that many of these plant species were highly nutritious and that they could be utilised to support sheep production. Compared to using herbicides, which need protective measures to minimise contamination, use of sheep is safe for operator and environment. It is also a practical and important method for the expansion of sheep production in Malaysia. This paper reviews the latest weed control practices by involving sheep and chemicals in rubber plantations.

## Plant Species

Species that are frequently found in immature and mature rubber are given in Table 1. In immature rubber of 1 - 5 years, most of the species are grazed by sheep except *Imperata cylindrica* and weedy shrubs such as *Chromolaena odoratum*, *Melastoma malabathricum*, *Lantana camara* and *Clidemia hirta*. Among legume species, the sheep graze *Pueraria phaseoloides* and *Centrosema pubescens* but will only feed on the young shoots and leaves of *Calopogonium caeruleum*. In mature rubber areas, sheep feed on most species except the woody shrubs and ferns. Young shoots of the ferns *Nephrolepis biserrata* and *Dicranopteris linearis* are also eaten.

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## Weed Control by Sheep

Tan and Abraham (1981) found that there was a reduction in undergrowth cover in grazed treatments over an experimental period of one year (Table 2). The decline in percentage of undergrowth cover in grazing treatments, either rotationally or free range, was twice as much as in the field where no sheep were kept.

In the maintenance of rubber plantations, purification of cover crop legumes is normally achieved by spraying glyphosate and paraquat + diuron herbicides. Ani Arope et al. (1985) found that in immature rubber, where *C. caeruleum* was infested with various mixed weeds, sheep grazing could be used to advantage. The selective grazing habit of sheep mainly for *M. micrantha*, *P. conjugatum* and *O. nodosa* helped to purify the legume and increase the percentage of *C. caeruleum* in the stand. Similar results were also demonstrated by Pillai et al. (1985), as shown in Table 3. The sheep preferred first to graze on grasses, followed by legumes (*P. phaseoloides* and *C. pubescens*) and then broadleaved species. After eight months of grazing, the percentage composition was significantly altered. The composition of *O. nodosa*, *P. conjugatum* and *P. phaseoloides*, which were dominant before grazing, was reduced from 30 to 15%, 15 to 5%, and 15 to 2%, respectively. *C. caeruleum* increased to become dominant after grazing. *A. intrusa* increased from 10 to 25% of herbage available.

## Effect of Sheep Grazing on Growth of Rubber

The effect of sheep rearing on the growth of rubber was recorded by Tan and Abraham (1981). They found that the girth increment of trees in fields where undergrowth was grazed by sheep, either in rotational or free range grazing systems, was generally higher

**Table 1.** Plant species frequently present in the interrow of rubber.

	Age of rubber (years)		
	1-2	3-5	6-10
Legumes	<i>Pueraria phaseoloides</i> * <i>Centrosema pubescens</i> <i>Calopogonium cueruleum</i>	<i>Pueraria phaseoloides</i> * <i>Calopogonium caeruleum</i>	<i>Calopogonium caeruleum</i> <i>Centrosema pubescens</i> *
Grasses	<i>Paspalum conjugatum</i> * <i>Axonopus compressus</i> * <i>Digitaria spp.</i> * <i>Ottlochloa nodosa</i> <i>Imperata cylindrica</i>	<i>Paspalum conjugatum</i> * <i>Ottlochloa nodosa</i> * <i>Axonopus compressus</i> *	<i>Cyrtococcum spp.</i> <i>Centosteca lappacea</i> * <i>Ottlochloa nodosa</i> *
Broadleaved	<i>Asystasia intrusa</i> * <i>Mikania micrantha</i> *	<i>Asystasia intrusa</i> * <i>Mikania micrantha</i> * <i>Borreria latifolia</i> *	<i>Asysrasia intrusa</i> * <i>Mikania micrantha</i> *
Ferns			<i>Nephrolepis biserratu</i> <i>Dicranopteris linearis</i>
Woody shrubs		<i>Chromolaena odoratum</i> <i>Melastoma malabathricum</i> <i>Lantana camara</i> <i>Clidemia hirta</i>	<i>Chromolaena odoratum</i> <i>Lantana camara</i> <i>Clidemia hirta</i> rubber seedlings

\* preferred by sheep.

**Table 2.** Effect of sheep grazing at 8 sheep/ha on percentage cover of undergrowth.

Treatments	Ground cover (%)	
	Pre-treatment	After one year
Rotational grazing	100	38
Free range grazing	100	37
Control (no grazing)	100	70

Source: Tan and Abraham 1981.

than those in the fields where undergrowth was not grazed (Table 4). The differences in the growth of the tree may be attributed to a reduction in weed competition and the manure from sheep.

### Damage by Grazing of Sheep on Rubber Trees

Tan and Goh (1988) found that in immature rubber, 3m and more in height, ewes did not chew the brown bark of the trees although rams rubbed their heads and horns on the trunk of trees and caused bark to crack. When these sheep were grazed on rubber trees of 2 m and below, rams were able to stand on their hind legs and devour the whole canopy.

Pillai et al. (1985) also reported damage to rubber trees as given in Table 5. Rams caused severe bark damage with their horns and had a habit of rubbing their bodies against trees.

### Weed Control by Chemicals

In the past, manual weeding was practised. However, with the present constraint in labour availability in the plantation sector, there is now no alternative but to use herbicides. The herbicides currently used are given in Table 6. The usage of these herbicides depends on cost effectiveness, weed species present, phytotoxicity to rubber and toxicity to operators.

### Economics of Combined Grazing and Chemical Control

Ani Arope et al. (1985) obtained a cost saving and increased effectiveness of weed control in rubber by the use of grazing sheep. They found that the flock could effectively weed 430 ha, consisting of 265 ha of immature rubber of 3-6 years and 165 ha of more than 6-year-old rubber. Using herbicides, the cost for the control of weeds ranged from 48 000 to 54 000 ringgit. Using grazing sheep the cost was brought down to 40 000 ringgit, showing a saving of between 8000 and 14 000 ringgit, or 17-26% of the overall

**Table 3.** Composition of plant species before and after grazing by sheep in the interrows of immature rubber.

	Composition of vegetation (%)		Difference (%)
	June 1984 before grazing	Feb. 1985 after grazing	
<i>Calopogonium caeruleum</i>	5	40	+35
<i>Asystasiu intrusa</i>	10	25	+15
<i>Ottlochloa nodosa</i>	30	15	-15
<i>Pueraria phaseoloides</i>	15	2	-13
<i>Paspalum conjugatum</i>	15	5	-10
Other grasses	10	6	-4
Other weeds/legumes	10	7	-3
<i>Centrosema pubescens</i>	3	0	-3
<i>Desmodium ovalifolium</i>	2	0	-2

Source: Pillai et al. 1985.

**Table 4.** Effect of sheep grazing at 8 sheep/ha on growth of rubber.

Grazing treatments	Rubber girth measurement (cm)		
	Pre-treatment	After one year	Growth increment
Rotational	14.1	21.6	7.5
Free range	14.1	22.1	8.0
Control (no grazing)	14.0	20.0	6.0

Source: Tan and Abraham 1981.

**Table 5.** Effect of sheep grazing at 7.5 sheep/ha on damage of 1.5-year-old rubber trees.

Degree of damage	Proportion of rubber trees (%)	
	Local sheep	Wiltshire crossbreds
Slight	4	19
Severe	1	1
Body rubbing	8	5
Total	13	25

Source: Pillai et al. 1985.

cost of weeding. This was further confirmed by Abdul Karim (1990) who found that sheep grazing in rubber schemes resulted in a drastic reduction in weeding cost. In most cases, only occasional spraying of herbicides was necessary and this was limited to spot spraying of unpalatable weeds. A saving of 30% was achievable in immature rubber 24 years old. Tajuddin et al. (1990) found that there was a saving of 18-36% on chemical weed control when sheep were grazed in immature and mature rubber. These variations in level of savings in weed control cost

**Table 6.** Herbicides used for general weed control in rubber.

Herbicides	Mixtures
Paraquat	Paraquat + 2,4-D amine Paraquat + diuron
Monosodium acid Methanearsonate	MSMA +2,4-D amine + NaClO <sub>3</sub> MSMA + diuron
Glufosinate ammonium	GA + 2,4-D amine GA + DSMA + diuron + 2,4-D amine
Glyphosate	Glyphosate + dicamba Glyphosate + picloram Glyphosate + fluroxypyr Glyphosate + metsulfuron methyl

depend on grazing management, stocking rate and age of rubber.

Weed control using herbicides is most expensive for circle, strip and interrow spraying during the five-year immature period of rubber. Chee and Goh (unpublished data) found that the cost of chemical weed control during the first five years of rubber growth was 1484 ringgit/ha. During that time 23 spraying rounds were made along the planting strips and 15 spraying rounds in the inter-rows.

## Discussion and Conclusion

Results show that using sheep to graze the weeds in rubber will save 16-38% of the total weeding cost. The integration of sheep with rubber will both reduce the amount of imported herbicides for weed control and the chemical pollution of the environment. Integrating sheep with rubber will also increase the

returns per unit of farming land. Another beneficial effect of grazing sheep, as compared to herbicides, is that they do not completely kill the weeds and expose land to soil erosion.

Some noxious weeds such as *A. intrusa* and *M. micrantha* are easily controlled by sheep while frequent spraying of herbicides would be required to control them. In immature rubber, the selective grazing habit of sheep of species such as *P. conjugatum*, *M. micrantha* and *A. intrusa* will lead to a purification of *C. caeruleum*. The management of sheep to control weeds needs further refinement and needs to be made complementary to the standard management practices in rubber plantations.

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