

# Forage Resources in Malaysian Rubber Estates

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## Abstract

A survey of forage resources was undertaken in three age groups of rubber (1-2, 3-5 and 6-10 years) in five estates in the central region of Malaysia. Standing forage dry matter declined from 2600 kg/ha in young rubber to just over 500 kg/ha in mature plantations. Botanical composition varied with age of rubber and therefore light transmission. *Pueraria phaseoloides* was the dominant species in the interrows during the first 1-2 years. In 3-5 years old rubber the dominant plant species were the volunteer grass *Ottochloa nodosa* and the planted legume *Calopogonium caeruleum*. In 6-10 year old rubber ferns made up nearly 50% of the vegetation but volunteer grasses also contributed to the total biomass.

The Botanal method of sampling used in this study permitted the recording of larger numbers of samples in the field for yield and botanical composition than was possible using conventional systems of cutting and weighing quadrats.

In Malaysia, the area planted with rubber is estimated at 1.86 million ha (RRIM 1988). This vast cultivated area has tremendous potential for integration with livestock. To date sheep have proven to be very successful because their husbandry is sound economically and there is no requirement to clear new land purely for the purpose of growing pastures for animal production. The system maximises the use of agricultural land, provides returns from the sale of animals, and reduces the use of herbicides and the cost of weed control.

The amount and quality of forage resources have been shown to be important factors in sheep production under perennial crops of rubber and oil palm. Chen et al. (1978) reported that there were up to 60 different plant species in plantations, and 70% of these have been reported to be palatable to livestock (Wan Mohamed 1978). The age of the tree crops has a marked influence on the botanical composition and yield of forage (Wan Mohamed 1978, Chen and Othman, 1983). They reported a rapid decline in legume composition (except *Calopogonium caeruleum*) with age, and legume species accounted for less than 20% of the total dry matter yield when the tree crops were more than three years old. The standing dry matter biomass under rubber declined rapidly from 1600 kg/ha during the first two years to less than 600 kg/ha when the trees were 3-3.5 years old. These forage yields were much lower than those

reported earlier by Mahyuddin et al. (1978) and Devendra (1982) and need further verification under the variable agro-management, climatic and soil conditions that can be found under the plantations of Malaysia. There is also a need for an appropriate survey methodology which can be used to quantify the forage resources under rubber. These data can then be used as base data for the estimation of the sheep production potential under rubber.

This study reports the results of a survey of factors influencing forage yield and composition in the rubber plantations of the central region of Malaysia.

## Materials and Methods

The survey method adopted in this study of forage yield and botanical composition was a modified version of the Botanal method (Jones and Tothill 1985). Five rubber estates in the central region of Malaysia which did not raise sheep were selected for the survey. The estates were Sg. Rinching, Sg. Chinoh, Galloway, Bradwall and Sg. Jemih. At each site, the survey was conducted for 3 age groups of rubber: 1-2 years, 3-5 years and 6-10 years. Initially, a general view of the fields was obtained with the aid of field maps and the staff of the estates. A representative site was then selected. The survey was carried out with a series of 6-8 quadrats (1.0 x 0.5 m) taken across the rubber interrows in a band pattern. The bands were chosen every 10 trees in a systematic grid pattern. In each quadrat, the botanical composition was visually estimated and the relative yield was ranked between 1 and 10, based on

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the Botanal method where 1 = lowest yield, 5 = medium yield and 10 = highest yield. This ranking system was calibrated against quadrats which served as references and were subsequently cut at 2 cm above ground level, dried and weighed. Three recorders were involved who independently scored each quadrat. A total of 30 bands were ranked by each recorder. After sampling the field, each recorder cut a total of 20 samples to determine the relationship between yield and individual Botanal ranking. For each rubber age group, photosynthetically active radiation (PAR) readings were taken to determine the light transmission under the rubber trees. These readings were taken with two integrating PAR recorders, one outside the plantation in full light while the second was moved in a systematic pattern through the plantation. Integrated readings were taken over a 10-minute period between 1000 and 1400 hours.

### Site Description

The soil texture of the estates is as follows: Sg. Rinching (clay), Sg. Chenoh (clay/laterite), Galloway (clay/sandy clay), Bradwall (clay/laterite), and Sg. Jernih (clay, quartzite/laterite). The rubber clones were Sg. Rinching (RRIM 600, PB 235, 314 and 340), Sg. Chenoh (PB 260, 310 and 314), Galloway (PB 312, 235 and 260), Bradwall (PB 217, 260, 310, 311 338 and RRIM 600), Sg. Jernih (PB 255, 260 and RRIM 600). The planting distances between the rows varied from 6.3 x 2.7 m to 3.0 x 8.0 m for 1-2 years old rubber, 4.2 x 4.2 m to 5.7 x 4.1 m for 5 years old

rubber, and 3.7 x 4.8 m to 4.0 x 8.1 m for 6- 10 years old rubber. At these planting distances, the number of plants/ha for 1-2, 3-5 and 6-10 years old rubber were 417-588, 428-567 and 309-563, respectively. The mean girth of rubber trees at 127 cm above ground level for 1-2, 3-5 and 6-10 years old rubber was 8.4, 35.4 and 63.5 cm, respectively. Mean legume seeding rates planted in the interrows were 3.6 kg/ha of *Pueraria phaseoloides*, 1.6 kg/ha of *Calopogonium mucunoides*, 0.5 kg/ha of *Centrosema pubescens* and 0.6 kg/ha of *Calopogonium caeruleum*. The average annual rainfall varied from 1566 to 4232 mm/year.

## Results and Discussion

### Forage yield

The mean standing dry matter yield of forage (kg/ha) and PAR values in the interrows of the three age groups of rubber in the five estates are given in Tables 1 and 2 respectively.

The mean yield of forage was highest (2602 kg/ha) for 1-2 years old rubber while the lowest yield (537.5 kg/ha) was recorded for the 6-10 years old rubber.

The low yield under the 6-10 years old rubber was due to the closure of the canopy and the reduced light transmitted to the inter-rows. This was confirmed by the light transmission data which was 92% for 1-2 years old rubber and only 9% for 6-10 years old rubber. Forage yields obtained in this study were higher than the yields reported by Wan Mohamed (1978) for all age groups. The amount of forage

**Table 1.** Standing forage dry matter yield (kg/ha) in three different age groups of rubber.

Age of rubber (years)	Estates					Mean	S.E.
	Sg. Rinching	Sg. Chinoh	Galloway	Bradwall	Sg. Jernih		
1 - 2	3250	2493	2974	2323	1970	2602	228
3 - 5	2080	995	1187	1032	940	1247	212
6 - 10	700	694	432	324	470	524	95

**Table 2.** Photosynthetically active radiation (%) in three different age groups of rubber.

Age of rubber (years)	Estates					Mean	S.E.
	Sg. Rinching	Sg. Chinoh	Galloway	Bradwall	Sg. Jernih		
1 - 2	85	89	93	94	99	92	1.4
3 - 5	31	27	16	15	19	21	1.7
6 - 10	14	8	6	9	12	10	0.9

