Productivity of Cover Crops and Natural Vegetation under Rubber in Malaysia

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Abstract

The productivity under regular cutting of leguminous cover crops and naturalised forages was measured under a wide range of light transmissions in a rubber plantation at the RRIM Research Station in Sg. Buloh in Central Malaysia. Annual dry matter production ranged from just under 7 t/ha/yr in young rubber (light transmission 60–100%) to less than 0.5 t/ha/yr in mature rubber (light transmission < 15%).

FORAGES under rubber plantations are a major source of feed for cattle, sheep and goat production in Malaysia and they consist of various grasses and broadleafed species which form a 'naturalised pasture'. If legume cover crops are sown at the time of rubber planting, these legumes usually dominate the naturalised species in the interrows of young rubber for the first 3-5 years of growth.

There is little information on the biomass production of forages under rubber. The level of production may be influenced by light transmission, age of rubber, type and fertility of soil, temperature, moisture and management practices. In rubber plantations, light is probably the most limiting factor controlling the productivity of forages. Chee and Faiz (these Proceedings) recently conducted a forage survey under rubber and reported that the standing forage biomass ranged from 2600 kg/ha in 1-2 years old rubber (light transmission of 92% of photosynthetically active radiation - PAR) to less than 600 kg/ha in 6-10 years old rubber (light transmission of 9% PAR). However, standing biomass is a measure of forage availability and not of forage productivity which is the determinant of the number of animals that can be supported.

To estimate the productivity of forages in the declining light regime under rubber, an experiment was designed which measured the yield of forages under a regular cutting regime in both immature and mature rubber.

Materials and Methods

The experiment was established in two clonal trial areas at the RRIM Experimental Station at Sg. Buloh in Central Malaysia. Sites in five-year-old rubber trees with light transmissions (LT) of 10%, 20%, 40% and 60% PAR, and in three-year-old rubber trees with light transmissions of 80% and 100% PAR were selected for the trial. There were 3 replicates of the 10%, 20%, 40% and 60% light regimes and 6 replicates of the 80% and 100% light regimes.

Plot size was 3 x 10 m across the rubber interrows and plots were fenced individually. The vegetation in the fenced area was initially cut at 15 cm above ground level and the cut material was discarded. The forages were then allowed to regrow for 2-3 months before the first harvest was carried out. Subsequent harvests were taken according to the rate of regrowth and varied from 2-3 months for the 80 and 100% PAR plots, 3-5 months for the 20 and 40% PAR plots, and 6-9 months for the 10 and 20% PAR plots. At each harvest, a 0.5 m wide band which extended across the interrow from one tree row to the next was cut at 15 cm above ground level. The cut material was separated into species and dried in an oven for dry weight determination. Light transmission was measured every two months using two integrating PAR meters. One was used to measure the incoming radiation over 10-minute periods outside the plantation in full sun, while the second was carried through the experimental area for simultaneous measurements in the plantation. Measurements were done on reasonably clear days between 1000 hours and 1400 hours.

Results and Discussion

At the time of the workshop the experiment had not been completed. Because of the different harvesting intervals in the various treatments, the availability of yield data varied from 6-12 months in the different treatments. All yield data have been converted by

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extrapolation to annual yields and have been plotted against the mean light transmission experienced in respective plots.

Overall, forage dry matter yield was strongly related to light transmission (Fig. 1). At high light transmissions of 60-100%, yields varied predominantly from 4.5 - 6.5 t/ha/yr. Within this high light transmission range, there appeared to be no relationship between light transmission and yield. However, dry matter yield was greatly reduced when light transmission fell below 50%. Chen and Othman (1983) and Wan Mohamed (1986) also reported standing biomass reductions from 5.5- 9.5 t/ha under rubber and oil palm during the first two years of growth to below 1 t/ha when canopies closed.

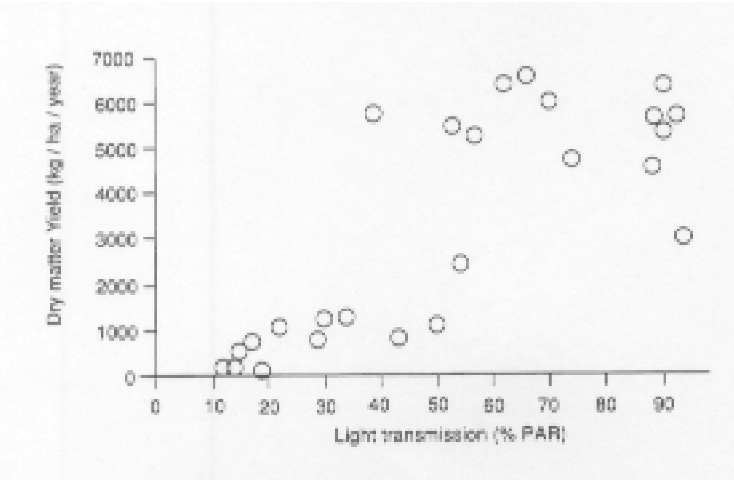

Fig. 1. Dry matter productivity of cover crops and naturally occurring forages under different light levels in rubber.

The forage composition in the various light transmission treatments varied (Table 1) even though the same leguminous cover crops were sown initially in both fields (experimental areas) and the management of these areas was identical. At high light transmission, the major forage species were *Calopogonium caeruleum, Paspalum conjugatum* and *Mikania micrantha,* while at low light transmissions the dominant species were *Asystasia intrusa* and *Paspalum conjugatum.* The rapid decline in yield between the light levels of 60 and 40% may have been related to a change in botanical composition. However, *Paspalum conjugatum* was present at both the high and low light levels.

Conclusions

Forage productivity under rubber was related to light transmission. The yield of forages was highest at light transmission levels of 60 - 100% but declined sharply once light transmission fell below 50%. Distinct changes in species composition were evident as light transmission declined.

Table 1. Forage composition under various light regimes of rubber.

Light transmission range (% PAR)	Species	Composition (%)
80-100	*Calopogonium caeruleum*	97
	Paspalum conjugatum	3
60-80	*Calopogonium caeruleum*	56
	Paspalum conjugatum	31
	Mikania micrantha	13
40-60	*Asystasia intrusa*	70
	Paspalum conjugatum	19
	Pueraria phaseoloides	6
	Mikania micrantha	2
30-40	*Asystasia intrusa*	89
	Paspalum conjugatum	12
10-20	*Asystasia intrusa*	55
	Paspalum conjugatum	38
	Mikania micrantha	8

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