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COMMUNICATION II

Biomass Production and Biomass Relationship of Young *Callicarpa pentandra*

ABSTRAK

Callicarpa pentandra *adalah sejenis pokok yang sering dijumpa di hutan sekunder di Malaysia. Biojisim pokok yang berusia enam tahun di kawasan "fallow" pertanian pindah ditentukan dan persamaan biojisim diperolehi. Biojisim petak kajian dianggarkan dengan menggunakan persamaan. Biojisim dirian adalah 44 t/ha. Ini terdiri daripada 2.7 t daun, 8.5 t dahan dan ranting dan 32.6 t batang.*

ABSTRACT

Callicarpa pentandra *is a common tree of Malaysian secondary forests. The biomass of six-year-old trees from a shifting agriculture fallow was determined and biomass regressions were obtained. Biomass of the plots was estimated using the regressions. The total tree biomass of the stand was estimated at 44 t/ha, comprising 2.7 t leaf, 8.5 t branch and 32.6 t stem.*

INTRODUCTION

Many species of trees grow in secondary or disturbed forests. Some of them can grow rapidly and yield useable wood within periods of less than ten years. In Malaysia, the genera that are commonly found in secondary forests are *Macaranga, Vitex, Callicarpa, Mallotus, Trema, Anthocephalus, Octomeles, Ficus, Artocarpus, Fagraea, Morinda* and many others (Corner 1988; Anderson 1980).

The genus *Callicarpa* (Verbenaceae) is a common tree of many secondary forests in Malaysia. In Sarawak, the tree *Callicarpa pentandra* Roxb. can be locally abundant in secondary forests especially in areas abandoned after shifting agriculture. The species yields a medium hard and heavy timber which is used locally but is not exploited commercially, probably because of its small size and relatively poor form. However, considering that it can grow in rather poor soils and in disturbed secondary forests, it may have potential use for the production of wood for fibre or fuel and for rapid revegetation of degraded forest areas.

The study was conducted in a secondary forest over alluvial soils. The study site was near (within 10 m) the alluvial plots of the study of Ewel *et al.* (1983). The soil is alluvium and the area experiences a rainfall of approximately 4000mm and a mean temperature of about 29°C. The area was previously cultivated approximately five years prior to the study and at the time of the study was under fallow. The other trees (over 5 m in height) were from the genera *Macaranga, Ficus* and *Anthocephalus.* Maximum height of the trees in the stand was approximately 15 m. The understorey species included members of the families Myristicaceae, Fagaceae, Rubiaceae and Moraceae.

MATERIALS AND METHODS

When the study began, the area was being marked for replanting with *Swietenia* sp., *Durio* sp. and *Shorea* spp. Four plots were established and all trees with diameter at breast height (dbh) > 5 cm were tagged and measured. Six sample trees with dbh covering the entire range found in the area were selected for destructive sampling. Each tree was cut at ground level; the dbh remeasured and the total length (height) of the main stem recorded. As the trees did not have a clear stem, the branch that formed the straightest continuation with the bole was considered as part of the main stem. The other branches were removed and the stem cut into 1 to 2 m lengths and weighed in the field with a 25 kg capacity spring balance. Disc samples of about 5 cm thick were cut from the base, middle and top of the main stem, weighed in the field with a beam balance and sent back to the lab for dry weight determination. Leaves were separated from the twigs, amalgamated and then weighed. Two samples of approximately one kg each were taken per tree for dry weight determination. Twigs and branches were also bulked and weighed and representative samples were also collected. All samples were oven-dried at 80° C.

RESULTS AND DISCUSSION

Callicarpa pentandra constitute about 50 per cent of the trees over 5 cm dbh in the area (Table 1). The high numbers in the area could be due to the highly effective dispersal mechanisms of the plant. The biggest tree sampled had a dbh of 14 cm and total height of 12.3 m (Table 2). Assuming the tree started growing soon after the forest area was cleared for the cultivation, the age of the trees when sampled would have been approximately 6 years. Thus, the mean annual increment (MAI) in dbh and height of the tree is fairly rapid at over 1.7 cm and 2 m per year, respectively. While this may not be comparable to the increments reported for the fast growing *Acacia mangium*, it is still higher than many other trees (Lim 1986, 1988).

The biomass equations (*Figure 1*) of different components of the trees were derived and found to be highly significant with correlation coefficients, r, mostly over 0.90, with the exception of the branch fraction. These equations were used on the dbh data of the trees in the plots to estimate the biomass of the whole tree, leaf and stem in each of the plots (Table 3). The branch biomass was estimated as the difference between the total and the stem and leaf biomass.

Total biomass of the trees ranged from 29 to 58 t/ha, with an overall mean of 44 t/ha. This compares well with the estimate of total tree biomass from the study by Ewel *et al.* (1983) of 46.62 t/ha. Of the total biomass, leaf accounted for about 6% of the total biomass while branch accounted for approximately 22% and the stem for the rest of 72%. Ewel *et al.* (1983), however, obtained a value of 7.3% of leaf but did not separate the woody fraction into branch and wood. The closeness of the total tree biomass values suggests that the method followed in this study of using the main species present for estimating the biomass of an area is feasible and sufficiently reliable.

If we assume that all the trees in the plots were only *Callicarpa pentandra*, then the MAI in biomass would average 7.3 t/ha. The MAI in biomass of stem wood of 5.4 t/ha makes the species worthy of consideration as a source of wood for chips and fibre. This value could be higher if the species is managed more intensively such as in a plantation. The basic biological productivity of the stand is of course higher than the MAI in total biomass as litter production and herbivory has not been considered.

TABLE 1
Numbers of *Callicarpa pentandra* trees and non *Callicarpa* trees (greater than 5.0 cm dbh) in the study area (no/0.01 ha).

Plot	*Callicarpa pentandra*	Others	Total
1	18	15	33
2	5	9	14
3	16	14	30
4	7	8	15
Total	46	46	92

TABLE 2
Summary of trees in the area and trees sampled for the study.

Characteristic	Mean	Range
Plot		
Dbh	10.1	5.0 - 17.1
Sample trees		
Dbh (cm)	10.4	6.3 - 14.0
Height (m)	8.3	3.5 - 12.3
Biomass (kg/tree)		
Leaf	1.6	0.4 - 2.5
Branch	5.5	1.1 - 11.7
Stem	18.2	3.2 - 27.0
Total	25.3	6.5 - 34.2

TABLE 3
Biomass of various components in the plots estimated from regression equations. (kg/0.01 ha plot)

Plot	Leaf	Branch	Stem	Total
1	31.94	99.52	396.94	528.40
2	17.66	71.13	204.12	292.91
3	35.06	113.22	432.06	580.34
4.	21.41	62.40	270.15	353.96
Mean	26.52	86.57	325.62	438.75
SE	4.15	11.90	53.34	68.71
Percentage	6.1	19.4	74.5	100.0*
t/ha basis	2.7	8.5	32.6	43.8

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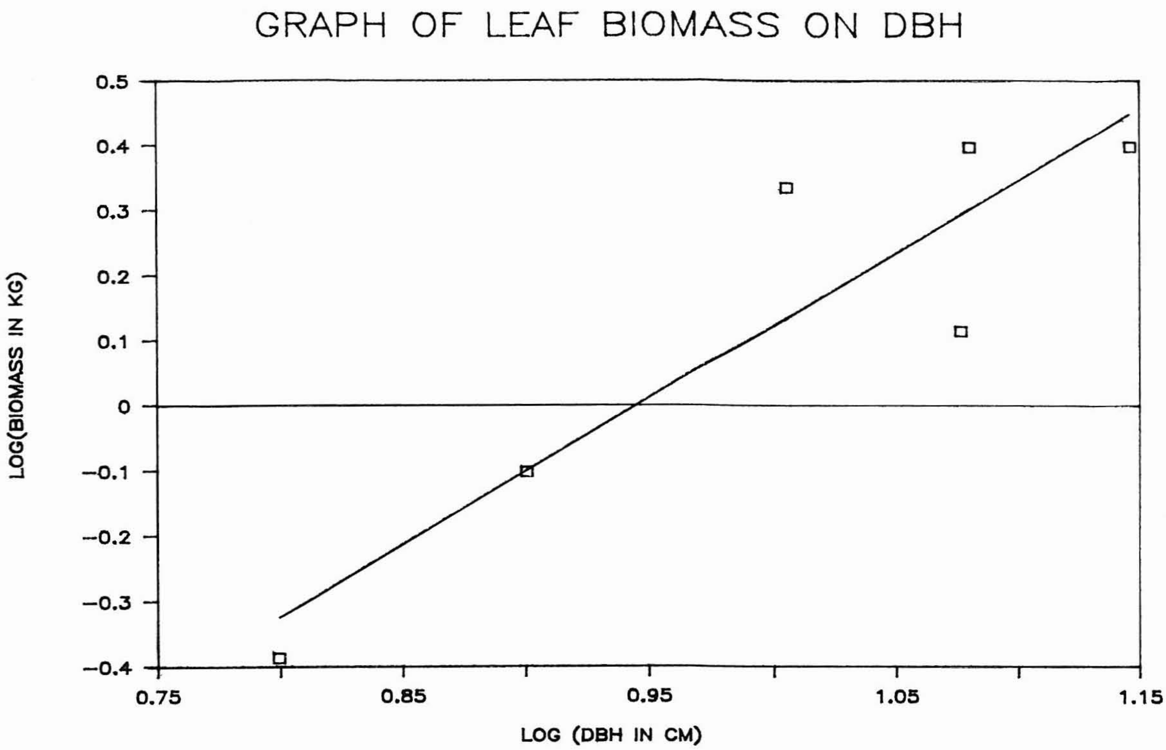
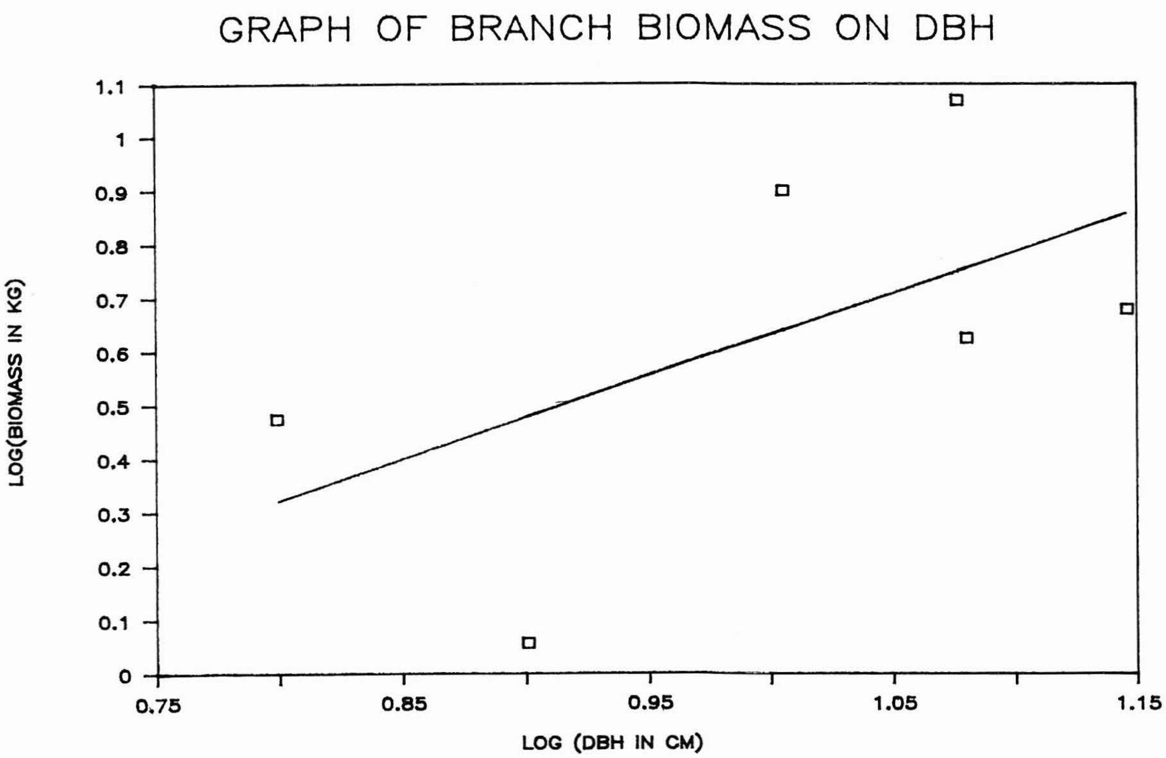
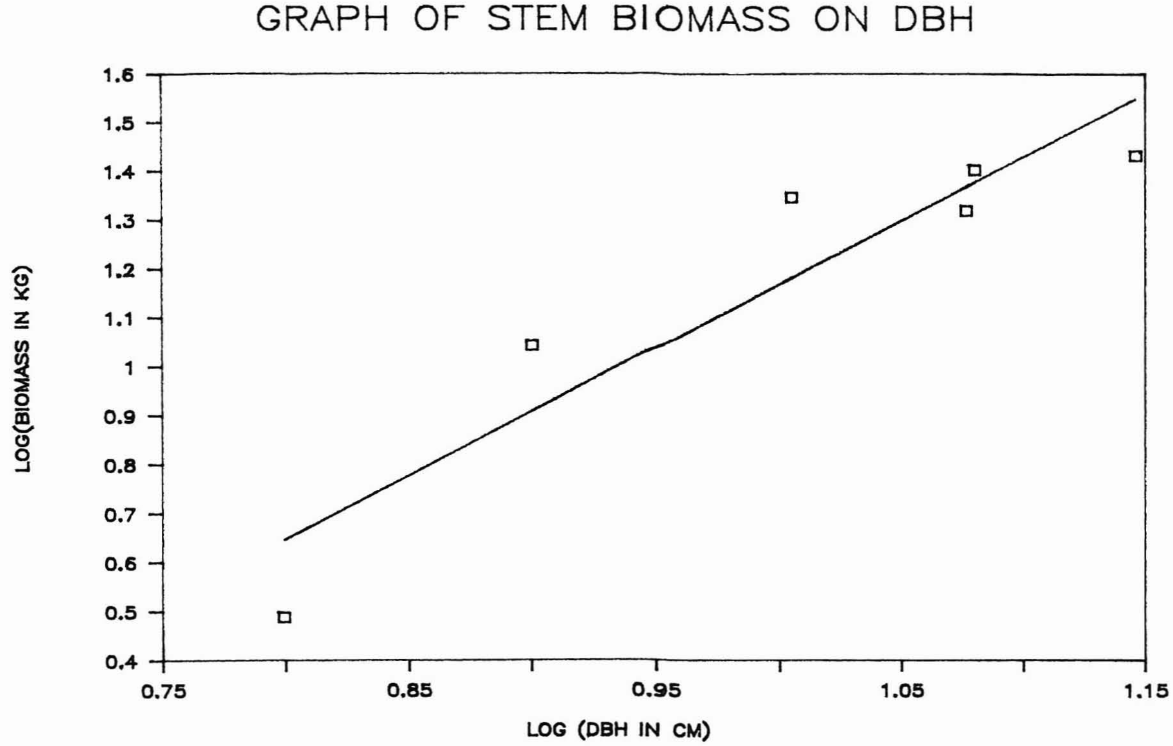


a. Leaf: Log (leaf biomass) = 2.234(log dbh) - 2.111 (r = 0.91)

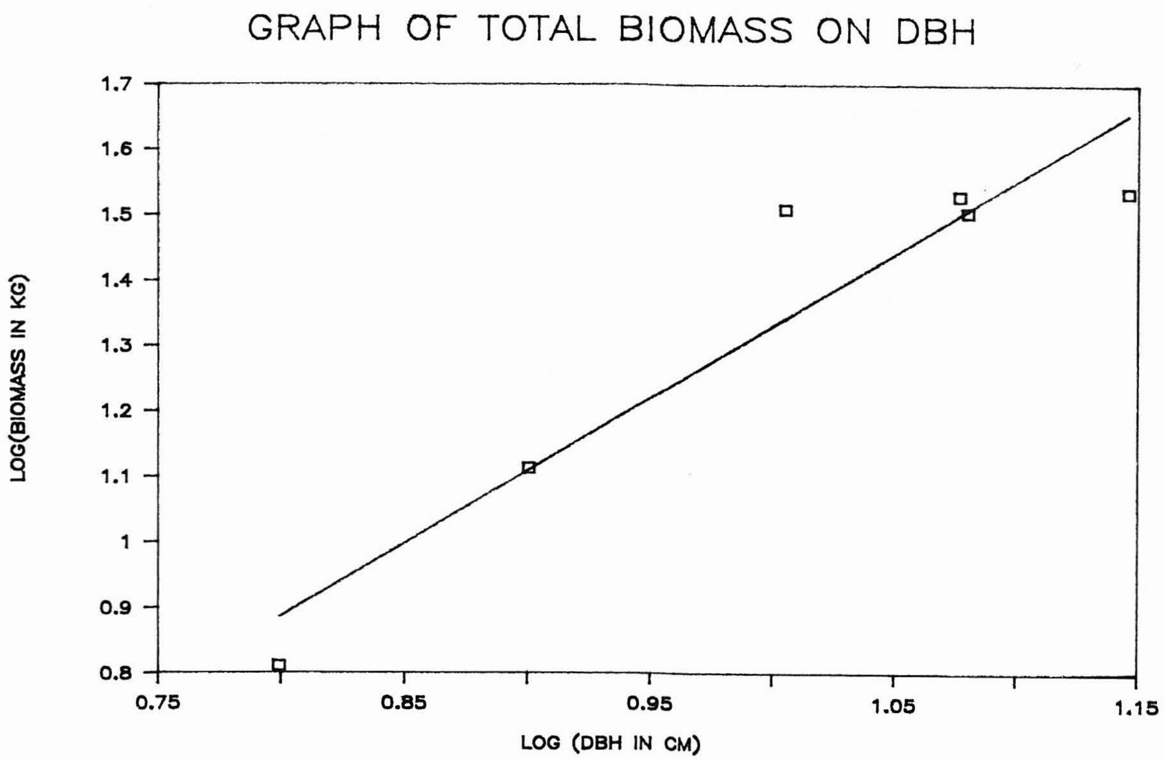


b. Branch: Log (biomass) = 1.549(log dbh) -0.917 (r - 0.57)

Fig. 1. Relationship of biomass of various components (kg) on dbh (cm) for Callicarpa pentandra.



c. Stem: Log (biomass) = 2.608(log dbh) - 1.439 (r=0.93)



d. Total: Log (biomass) = 2.218(log dbh) - 0.887 (r=0.95)

Fig. 1. Relationship of biomass of various components (kg) on dbh (cm) for Callicarpa pentandra.

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