

# PLANT SPECIES COMPOSITION AND THE CARRYING CAPACITY OF GRAZING FIELDS IN TAMAN JAYA WEST JAVA

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## Abstrak

Telah diadakan suatu penelitian komposisi jenis tumbuhan dan daya dukung padang penggembalaan di Taman Jaya Jawa Barat. Ternak yang digembalakan adalah kerbau (*Bubalus bubalis*), kambing (*Capra hircus*) dan domba (*Ovis aries*).

Di daerah ini terdapat tiga tipe padang penggembalaan, yaitu : padang rumput, belukar dan perkebunan kelapa. Urutan jumlah jenis dan persentase biomasa penyusun utama ketiga tipe padang penggembalaan adalah tumbuhan yang tergolong gulma (forbs), rumput (grasses) dan sangat sedikit leguminosa. Jenis gulma utama yang terdapat di padang penggembalaan ini adalah : *Eupatorium odoratum*, *Ageratum conyzoides*, *Stachytarpheta indica*, *Melastoma malabathricum*, *Dryopteris amboinensis* dan *Hyptis rhomboidea*. Hampir semua jenis utama ini adalah jenis pakan bermutu rendah bahkan dihindari oleh ternak. Jenis lain yang mempunyai nilai pentig agak tinggi dan dimakan oleh ternak adalah : *Imperata cylindrica*, *Isachne miliacea*, *Cyperus* spp. dan *Paspalum conjugatum*. Jenis-jenis leguminosa sangat sedikit jumlahnya, biomasanya, frekuensi keterdapatannya dan nilai pentingnya.

Daya dukung padang penggembalaan sangat bervariasi dari satu tipe ke tipe padang penggembalaan lain. Hal ini adalah merupakan akibat langsung dari produktivitas biomasa ketiga tipe padang tersebut. Proporsi perbandingan produktivitas biomasa dan daya dukung antara padang rumput : belukar : kebun kelapa = 1 : 1,32 : 2,02. Berdasarkan produktivitas hijauannya, maka untuk mendukung satu satuan ternak kerbau dewasa diperlukan area penggembalaan tipe vegetasi padang rumput paling tidak seluas 1,99 ha. Hal ini memperlihatkan ketiga tipe padang penggembalaan tersebut bermutu rendah.

## Introduction

The succeed of animal husbandry is most depended on availability of feed in grazing field. The feed species must be high productivity, good nutrient, palatable and adaptable to their environment (4). The plant also must be capable to survive and developed in some environment stress, vegetative and generative multiplied and yielded greenish in all year round. However, it is difficult to find out plant species which are complied with those stipulation, especially in natural grazing field.

In Indonesia generally, most of grazing field are constitute of natural grassland or shrubs. In that field usually grow plant species which are worst productivity and evenmore less palatable. Subsequently, the productivity and quality of livestock are low (9).

In fact, it is difficult to group plant species in palatable or not, it depended on quantity and number of plant species available for livestock feeding in grazing field. In India, for example, where a large proportion of cattle live in a state of semi-

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starvation, everything containing chlorophyll is eaten. Whereas the hungry animals eat *Chrysopogon aciculatus* and *Heteropogon contortus*, two grasses which are usually avoided by animals because of the sharp callus of the former and the dangerous awns and callus of the latter (1). In Bali, Bali's cattle also eat *Lantana camara* during the dry season nevertheless that species less palatable and presumed give occasion to "Bali ziekte" (3).

The main feed species during the dry season in West Java are *Ischaemum* spp., *Fimbristylis miliacea*, *Leersia hexandra* and *Digitaria violascens* (10). Whereas in Bali, during the rainy season are species members of *Paspalum*, *Schima* and *Penisetum* (8). The nutrient of those species were varies, however, generally is low and mature early (13). Their protein content usually range between 6.4 and 9.71% (5). Therefore, they are required in a great amount of greenish for sufficiently livestock necessity in protein. In South Celebes for example, is required 20 — 100 ha of natural grazing field to fulfil protein requirement of an animal unit (9). The productivity of this grazing field is not sufficient because the livestock required too much energy to traverse the field for feeded and also difficult to prepare a large of land for grazing field, especially for a great number of animal.

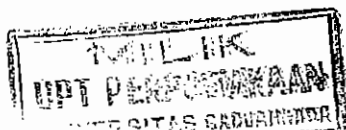
The livestock in Taman Jaya are buffalo, goat and sheep which are they take care in the natural grazing field around the village-cluster. So far, there is no research has been done yet, especially on feed species composition and their carrying capacity. For those reason, in the dry season of 1983 we had carried out a research to find out plant species composition and carrying capacity of Taman Jaya's grazing field.

### Study Site

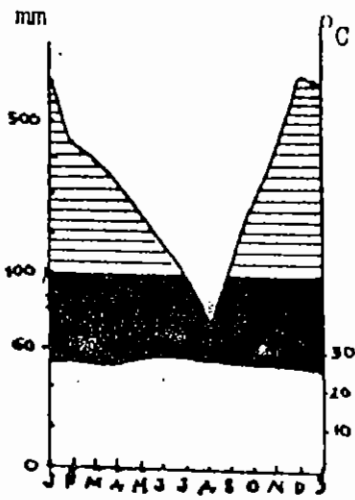
Taman Jaya is located in west end of West Java coast with belong to Cimanggu district, Pandeglang regency. That area jammed between Sunda strait in south and west wards and Ujungkulon National Park in the east and north wards. The annual rainfall was recorded from Cimanggu station and the range was between 3000 — 3800 mm with rainy season occurred during November — April and dry season on March — October. The highest rainfall occurred on December and the lowest on August (Fig. 1).

The main livestock are buffalo (*Bubalus bubalis*), goat (*Capra hircus*) and sheep (*Ovis aries*). Those livestock take leave of for feeding in grazing field during the dry season, however, in the rainy season they keep the livestock at the same grazing field because the area surrounding it were planted with rice.

In their habit and types of vegetation occupied, grazing field of Taman Jaya can be divided visually in 3 types i.e. coconut plantations, scrub and grassland. Coconut field also constitute of some trees, shrubs, herbs and grasses with reached in 20 — 30 m height of vegetation. Some plant species are *Cocos nucifera*, *Pongamia pinnata*, *Hibiscus tiliaceus*, *Lagerstroemia* sp., *Lantana camara*, *Eupatorium odoratum*, *Melastoma malabathricum*, *Paspalum conjugatum*, *Panicum* spp., *Cyperus* spp. etc. Usually, this area is closed to home yard and dried along year round. The vegetation of scrub are composed by small trees, shrubs, herbs and grasses with 1.5 — 5 m in height. The principles species are *L. camara*, *E. odoratum*, *Piper aduncum*, *Mikania cordata*, *M. malabathricum*, *P. conjugatum*, *Panicum* spp. and others grasses in floor. It is also dry along year round. In grassland area are found some species belong



CIMANGGU (98 m ALT)  
3718 mm



..... National Park's border

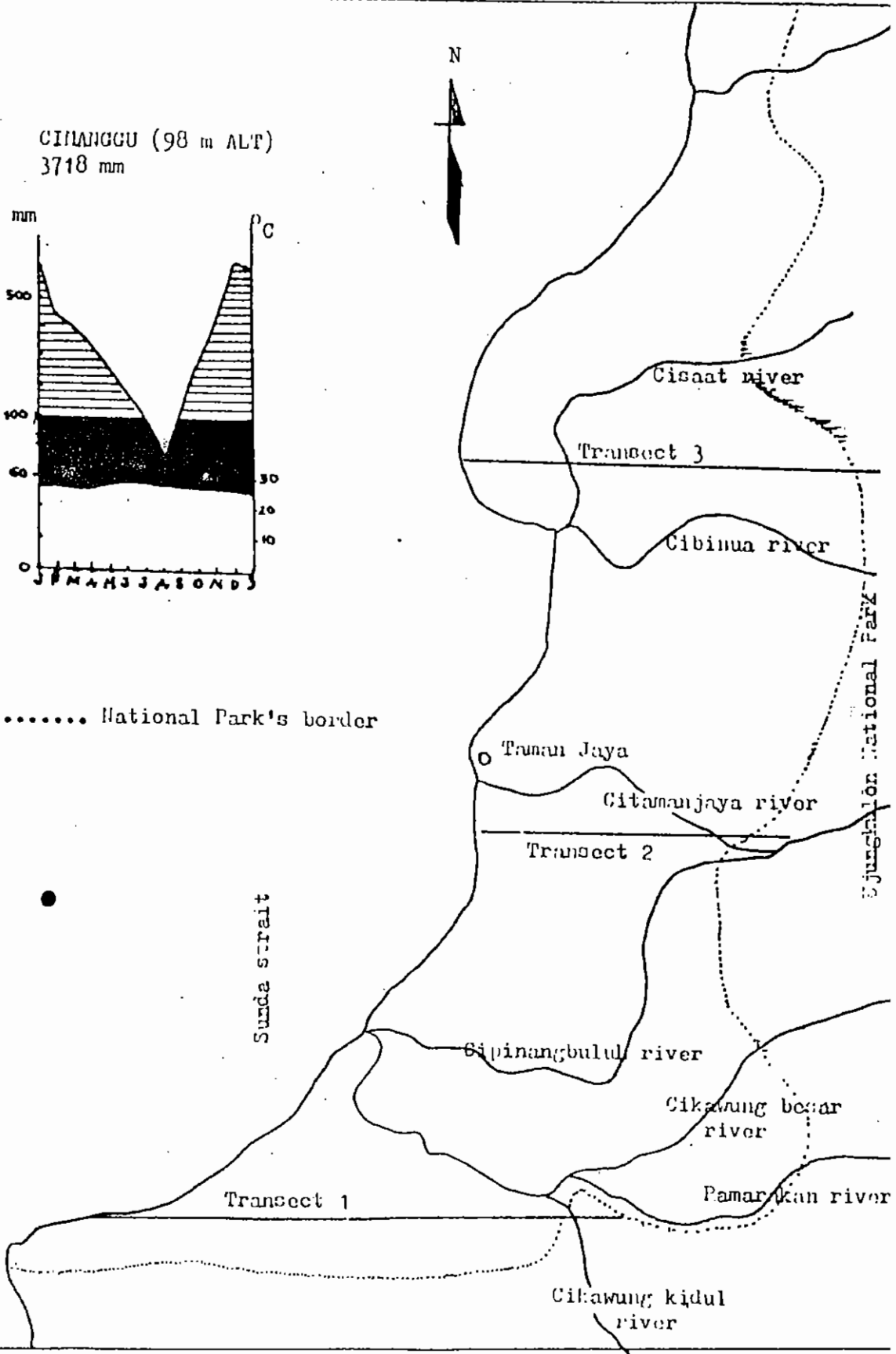


Fig. 1. Map and climate diagram of Taman Jaya, West Java.

to grasses and herbs and accidentally also are find out some species of shrubs with the height of the vegetation less than 1.5 m. The main species of grassland are composed by *Imperata cylindrica*, *M. cordata*, *Ageratum conyzoides*, *Stachytarpheta indica* and other species of Cyperaceae. In the rainy season some of this area are flooded and the people did the area into paddy rice field. Since a part of grassland changes to rice field, the grazing field usually move to scrub and coconut plantations.

## Method

Visually study site was devided according to their vegetation types and then 3 transects had been laid down paralel which were passed by all of vegetation types. As long as transect, some plots of 1 m<sup>2</sup> had been laid down sistematicly with 200 m distances between one and another. There were 36, 28 and 16 plots respectively in each of grassland, coconut plantations and scrub vegetation types. Herbs and seedling plants occupied in those plots were identified and estimated their canopy coverage and then arranged the list of prevalent species. This list was obtained by calculated the importance value of each species in each type of grazing field. All species are arranged in a descending order of importance value and the 10-top species were selected as prevalent. The importance value was the sum of relative frequency and relative coverage.

Each species was grouped into grass, legume and forb. Grass is the plant species belong to Poaceae and Cyperaceae, Legume is the plant species of Leguminosae, while Forb is the plant species other than Poaceae, Cyperaceae and Leguminosae.

Grazing field productivity was computed by conversion of biomass which were sampled from some plots of 1 m<sup>2</sup>. Biomass above the ground in each types of vegetation were trimmed and after 10-days of growth period biomass were harvested, scarified in species and weighed their fresh weight. Biomass weight of 10-days growth period was multiplied with 3 and assumed as productivity of grazing field per area per month.

The potential carrying capacity of grazing field along year round was measured according to Voisin's who based their calculation on an adult cattle as an animal unit (11), that is :

$$(Y - 1)S = r \quad \text{where,}$$

Y = The smallest area of grazing field for feeding of an animal unit  
 S = Stay period of an animal in a grazing field in each month.  
 r = Rest period of the grazing field which was needed to keep their regrowth.

In the tropic areas the rest period are range between 10 — 14 weeks (4). In this case, because the grazing field is located in West Java with relatively high rainfall and the different of the dry and rainy season was not significance, the rest period is assumed 10 weeks (70 days). The "proper use factor" (the forage available for livestock feed to keep their well regrowth) was assumed 45% of the biomass productivity (9). The period of stay was 30 days per month and an animal unit (adult cattle) needed 45 kg fresh greenish/day (9). The conversion of livestock need for feeding of cattle : buffalo : goat : sheep = 1 : 1.15 : 0.16 : 0.14 (2).

## Result

In number of species, each types of grazing field was dominated by forb species followed by grass and only a few amount of legume species (Table 1 and Appendix 1).

**Table 1. Species numbers of each group in each vegetation type**

Vegetation types	Number of species						Total	
	W	%	G	%	L	%		
Coconut plantations	49	70.000	19	27.94	2	2.06	70	100.00
Scrub	27	64.29	14	33.33	1	2.38	42	100.00
Grassland	57	60.64	32	34.54	5	5.32	94	100.00

W = forb      G = grass      L = legume

The prevalent species ordering in each type of grazing field is shown in table 2. Some of them are not palatable for livestock, for example *E. odoratum*, *A. conyzoides*, *S. Indica*, *Dryopteris amboinensis*, *M. malabathricum* and *Hyptis rhomboides*. Legume species less importance in their number of species and thier important value. Those legume species which occurred in grassland are *Derris elliptica*, *Phaseolus radiatus*, *Desmodium heterocarpum*, *Flemingia strobilifera* and *Des. heterophyllum*. In coconut plantations are *Des. trifolium* and *Des. heterocarpum*, while in scrub area is *Des. heterocarpum*.

The percentage of canopy cover of each plant species group is shown in table 3.

**Table 3. Canopy cover percentage of each species group in each vegetation types.**

Vegetation types	Canopy coverage (%)			
	W	G	L	Total
Coconut plantations	71.49	27.94	0.57	100.00
Scrub	60.89	38.86	0.25	100.00
Grassland	50.12	47.45	2.43	100.00

W = forb      G = grass      L = legume

Table 1 and 3 show that there is a similar trend between number of species and percentage of canopy coverage. In coconut and scrub area forb species usually grown among shrubs or trees and grasses grown under forbs canopy. In grassland, conversely, forb species grown sparsely among grass carpet covers land surface with 30 — 40 cm in their thick. Forb group nevertheless grown sparsely among grass species, they have

had a high value of canopy cover percentage due to their habit had usually width canopy. It seems that there is a correlation between canopy coverage and fresh biomass where the high canopy cover percentage will occurred a high fresh biomass (Table 4).

Table 2. Prevalent species occurred in each type of grazing field.

No.	Species		IV		
			GL <sup>*)</sup>	CP	SC
1.	<i>Mikania cordata</i> (Burm. f.) B. L. Robinson	W	22.73	19.69	24.92
2.	<i>Imperata cylindrica</i> (L.) Beauv.	G	12.27	4.99	22.30
3.	<i>Hyptis rhomboidea</i> Mart. & Gal.	W	8.64	7.91	15.69
4.	<i>Isachne miliacea</i> Roth. ex R. & S.	G	6.59	8.30	—
5.	<i>Cyperus halpan</i> L.	G	6.47	—	—
6.	<i>Cyperus sanguinolentus</i> (Vahl) Nees	G	5.67	—	—
7.	<i>Paspalum conjugatum</i> Berg.	G	5.31	11.77	16.11
8.	<i>Grangea maderaspatana</i> (L.) Poir.	W	5.16	—	—
9.	<i>Fuirena ciliaris</i> (L.) Roxb.	G	4.89	—	—
10.	<i>Eupatorium odoratum</i> L.	W	4.18	22.71	19.97
11.	<i>Ageratum conyzoides</i> L.	W	—	9.05	6.66
12.	<i>Stachytarpheta indica</i> (L.) Vahl	W	—	8.62	6.66
13.	<i>Dryopteris amboinensis</i> O. K.	W	—	8.20	—
14.	<i>Melastoma malabathricum</i> L.	W	—	5.13	4.68
15.	<i>Ipomoea eriocarpa</i> R. Br.	W	—	—	8.04
16.	<i>Rungia blumeana</i> Val	W	—	—	5.64

I.V. (importance value) = relative frequency + relative dominance

W = forb

G = grass

GL = grassland

CP = coconut plantations

SC = scrub

\*) Source : Simbolon, 1984.

Table 4. Fresh biomass productivity of each vegetation types (kg/ha/month)

Vegetation types	Fresh biomass productivity			
	W	G	L	Total
Coconut plantations	916.96	358.37	7.31	1282.64
Scrub	1197.40	764.18	4.92	1966.50
Grassland	1299.86	1230.62	63.02	1593.50

W = forb      G = grass      L = legume

Forage productivity of grassland is higher than scrub than coconut plantations. It is deal with that grassland more opened than scrub than coconut plantations. In the coconut plantations, the canopy cover was occurred by 2 storey i.e. cocos canopy storey and shrubs storey, so caused only a few of undergrowth capable to well developed. This is also will influence the carrying capacity of each typegrazing field vegetation (Table 5).

**Table 5. The potential minimum area to carry an animal unit livestock (Calculated according to Voisin's)**

Vegetation types	minimum area (ha) to carry an unit livestock of		
	buffalo	goat	sheep
Coconut plantations	4.02	0.56	0.49
Scrub	2.63	0.37	0.32
Grassland	1.99	0.28	0.24

Vegetation type of grassland seems to be potential for grazing field than coconut plantations and scrub area. The carrying capacity proportion of grassland : scrub : coconut plantations = 1 : 1.32 : 2.02. It is mean that grassland more productive than others and needed more tight land to keep an unit of livestock than scrub than coconut plantations.

## Discussion

There are many species of undergrowth grown in study site. However, these species are grown naturally with low productivity and low source nutrition (13, 5). Evenmore, there are some species might be developed, for example *P. conjugatum*, *I. miliacea*, *Cyperus halpan*, *C. sanguinolentus* and some other species. Some species are palatable and they also have had high importance value in study site and might had adaptable to their habitat and environment.

Principally, productivity and nutrition of greenish can be improve by intensive cultivation and management (9, 5). Grazing field improvement mainly deal with removed of plant species of less palatable, reduce competition between species and well maintenance. The main species which occurred in grazing field that should be remove are *E. odoratum*, *L. camara*, *M. malabathricum* and *S. indica*. Those species are not palatable and have a width canopy coverage which can retard development of feed species usually grow as an undergrowth species. This is will improve productivity and nutrient quality of feed, subsequently, the carrying capacity of grazing field will be increase.

Biomass ratio of forb, grass and legume are show a worst proportion as a grazing field. The good grazing field should be consist of 60% of grass and 40% legume (9). Legume species are mainly important as a protein source for livestock. Subsequently,

the grazing field should be planted with other legume, for improving the quality of greenish and increasing grazing field productivity (9). Some legume species that could be improve grazing field quality are *Desmodium intortum*, *Stylosanthes guyanensis*, *Macrophilum lathyroides*, *Centrosoma pubescens* and *Clitoria ternatea* (6). Those species can be planted among the natural grass or among the new grass species that might be introduced to the grazing field.

The difference of biomass productivity between each type of grazing field might be influenced by the competition and the storey of canopy cover. In coconut plantations there are three storey i.e. trees, scrubs and under-growth canopy, while in scrub are shrubs and undergrowth canopy. Generally, in grassland only consisted of one storey and more exposure. It's indicated that to remove the shrubs or small tree in scrub or coconut area will be improve the biomass productivity of undergrowth, especially grasses.

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## Appendix I

List of species occurred in each type of grazing field and their importance value (IV).

No.	Species		IV		
			CP	SC	GL*)
1.	<i>Acanthus ilicifolius</i>	W	2.78		
2.	<i>Ageratum conyzoides</i>	W	9.05	6.66	3.36
3.	<i>Ardisia humilis</i>	W	3.24	1.55	
4.	<i>Blumea mollis</i>	W	2.87		0.86
5.	<i>Borreria ocymoides</i>	W			1.50
6.	<i>Borreria repens</i>	W			0.60
7.	<i>Borreria</i> sp.	W			2.60
8.	<i>Brachiaria ramosa</i>	G	3.73		
9.	<i>Brachiaria reptans</i>	G			0.86
10.	<i>Carex</i> sp.	G	1.22	1.31	
11.	<i>Centella asiatica</i>	W		1.55	0.51
12.	<i>Cerapopteris thalictroides</i>	W			1.69
13.	<i>Cerapopteris</i> sp.	W			2.34
14.	<i>Chrysopogon aciculatus</i>	G	1.08		0.77
15.	<i>Clibadium surinamense</i>	W			0.86
16.	<i>Columella nudiflora</i>	W	1.37		0.69
17.	<i>Costus speciosus</i>	W		1.55	2.20
18.	<i>Crecentia cujete</i>	W	0.94		1.22
19.	<i>Cyanotis axillaris</i>	W	2.03		
20.	<i>Cyperus aspera</i>	G			0.69
21.	<i>Cyperus complanata</i>	G			0.69
22.	<i>Cyperus elatus</i>	G			1.18
23.	<i>Cyperus halpan</i>	G	3.44		6.47
24.	<i>Cyperus irea</i>	G	2.08		5.66
25.	<i>Cyperus rotundus</i>	G			3.24
26.	<i>Cyperus</i> sp 1.	G	1.37		
27.	<i>Cyperus</i> sp 2.	G	1.37		
28.	<i>Cyperus</i> sp 3.	G			0.60
29.	<i>Derris elliptica</i>	L			1.38
30.	<i>Desmodium heterocarpum</i>	L	0.80	1.31	0.45
31.	<i>Desmodium heterophyllum</i>	L			3.36
32.	<i>Desmodium triflorum</i>	L			1.08
33.	<i>Digitaria longiflora</i>	G			1.37
34.	<i>Dryopteris amboinensis</i>	W	8.20		1.31
35.	<i>Echinochloa colunum</i>	G			0.69
36.	<i>Echinochloa pienctata</i>	G			0.51
37.	<i>Ecliptica prostrata</i>	W			1.36
38.	<i>Elephantopus scaber</i>	W	1.88	1.55	
39.	<i>Eugenia javensis</i>	W	0.94		
40.	<i>Eugenia polyantha</i>	W	1.08		

41.	<i>Eupatorium odoratum</i>	W	22.71	19.97	4.18
42.	<i>Excoecaria agallocha</i>	W	0.94		
43.	<i>Ficus ampelas</i>	W	1.37		
44.	<i>Ficus septica</i>	W	1.37		
45.	<i>Fimbristylis complanata</i>	G			2.23
46.	<i>Fimbristylis ovata</i>	G	2.08		1.27
47.	<i>Fimbristylis polytrichoides</i>	G		6.83	4.62
48.	<i>Fimbristylis spathacea</i>	G	2.87		
49.	<i>Fimbristylis sp</i>	G	0.80		
50.	<i>Flemingia strobilifera</i>	L			0.60
51.	<i>Fuirena ciliaris</i>	G			4.89
52.	<i>Glochidion sp</i>	W			1.10
53.	<i>Grangea maderaspatana</i>	W	2.96		5.16
54.	<i>Hedyotis auricularia</i>	W	0.94		
55.	<i>Hedyotis pseudocorymbosa</i>	W			1.10
56.	<i>Heliocharis speralis</i>	G			0.51
57.	<i>Heliotropium sp</i>	W	0.80		0.95
58.	<i>Hemigraphis sp</i>	W		3.12	0.60
59.	<i>Homalomena sp</i>	W	2.08		
60.	<i>Hydrocera triflora</i>	W			0.60
61.	<i>Hydrocera sp</i>	W	0.94		
62.	<i>Hydrolea zeylanica</i>	W			1.20
63.	<i>Hymenachne amplexicaulis</i>	G			2.25
64.	<i>Hymenachne interrupta</i>	G			1.18
65.	<i>Hymenachne sp</i>	G	1.93		
66.	<i>Hyptis rhomboidea</i>	W	7.91	15.69	8.64
67.	<i>Imperata cylindrica</i>	G	4.99	22.30	12.27
68.	<i>Ipomoea eriocarpa</i>	W	2.17	8.04	0.69
69.	<i>Isachne miliacea</i>	G	8.30		6.59
70.	<i>Kyllengia brevifolia</i>	G	2.96	2.30	0.60
71.	<i>Lantana camara</i>	W	0.94		0.69
72.	<i>Leea indica</i>	W	1.22		
73.	<i>Leucas aspera</i>	W			0.77
74.	<i>Limnocharis flava</i>	W	0.94		4.43
75.	<i>Lindernia anagalliss</i>	W			1.70
76.	<i>Lindernia crustacea</i>	W			1.01
77.	<i>Lindernia parviflora</i>	W			0.60
78.	<i>Lindernia procumbens</i>	W			1.31
79.	<i>Lindernia viscosa</i>	W	0.80		
80.	<i>Lindernia sp 1</i>	W	0.94		2.11
81.	<i>Lindernia sp 2</i>	W			0.69
82.	<i>Ludwigia parviflora</i>	W			1.78
83.	<i>Lygodium cyrsinatum</i>	W	2.88		
84.	<i>Lygodium fleculosa</i>	W		1.55	
85.	<i>Lygodium flexosum</i>	W			0.69
86.	<i>Melastoma malabathricum</i>	W	5.13	4.68	
87.	<i>Melastoma sp</i>	W	0.80	1.55	
88.	<i>Mentha arvensis</i>	W	0.80		
89.	<i>Mikania cordata</i>	W	19.69	24.92	22.73
90.	<i>Monocera sp</i>	G			2.14

91.	Murdannia sp	W			0.51
92.	Musa paradisiaca	W			0.60
93.	Oplismenus compositus	G	1.08	1.55	
94.	Oryza sativa	G	1.08		12.18
95.	Panicum ambiguum	G		1.55	
96.	Panicum luzonense	G		5.58	
97.	Panicum repens	G		1.55	
98.	Panicum umbellatum	G		1.55	1.69
99.	Panicum sp	G	1.37		
100.	Paspalum conjugatum	G	11.77	16.11	5.31
101.	Paspalum cf. reptans	G	0.94		
102.	Paspalum vaginatum	G			0.51
103.	Phaseolus radiatus	L			0.86
104.	Phyllanthanirum sp	W	3.10	3.12	1.27
105.	Piper aduncum	W		1.80	
106.	Piper sp	W	0.94		
107.	Polygonum pulchrum	W	0.80		
108.	Rungia blumeana	W		5.64	
109.	Scirpus grossus	G			2.14
110.	Scirpus litoralis	G			0.51
111.	Scirpus mucronatus	G			2.31
112.	Selaginella sp	W	1.37		
113.	Sida acuta	W			0.60
114.	Solanum torvum	W	0.80		
115.	Spilanthus iabadicensis	W		3.37	2.97
116.	Stachytarpheta indica	W	8.62	6.66	0.86
117.	Stephania hernandifolia	W		1.55	
118.	Strombosia sp	W	0.94		
119.	Struchium sporogonophorum	W	1.37		
120.	Turpinia sp.	W			0.86
121.	Urena lobata	W	0.80		
122.	Wedelia sp	W	1.37		
123.	Xanthochea latifolia	W	3.63		
124.	Zea mays	G			0.86
125.	Zingiber sp	W	4.43		
126.	Cyperus sanguinolentus	G		3.04	5.67

CP = coconut plantations

SC = scrub

GL = grassland

W = frob group

G = grass group

L = legume group

\*)See also Simbolon, 1984.

There were 28 species unidentified.