

Nutrient stocks and nutrient cycling of fallows in the humid lowlands of Papua New Guinea

Alfred E. Hartemink

International Soil Reference and Information Centre (ISRIC), PO Box 353, 6700 AJ Wageningen, The Netherlands Hartemink@isric.nl

Nutrient stocks (soil, vegetation, litter) of one-year old fallows with *Piper aduncum*, *Gliricidia sepium* and *Imperata cylindrica* were assessed in the humid lowlands of Papua New Guinea. The experimental site was a high base status soil (Typic Eutropepts) and in Papua New Guinea such soils are most intensively used for agriculture.



Results

Gliricidia had accumulated the largest amounts of all major nutrients except for K, which was highest in the above ground piper biomass. *Imperata* biomass contained the lowest amount of nutrients. The largest stocks of C, N, Ca and Mg were found in the soil, whereas the majority of P is found in the above ground biomass and litter. Almost half of the total K stock of piper and *gliricidia* is found in the biomass. When the fallows were slashed *imperata* returned more C than piper and *gliricidia* that have more than half of the C removed with the wood. Soil organic C significantly increased under *gliricidia* fallow whereas no net changes occurred in piper and *imperata* fallows.

Conclusions

The study has shown large differences in biomass and nutrient stocks between the two woody fallows (piper, *gliricidia*) and between the woody fallows and the non-woody fallow (*imperata*). There is a higher potential for woody fallows compared to grass (*imperata*) fallows in the humid lowlands of Papua New Guinea.

Carbon (Mg ha^{-1}) and nutrient content (kg ha^{-1}) of the topsoil and above ground biomass of one-year old *Piper aduncum*, *Gliricidia sepium* and *Imperata cylindrica*

Fallow	Compartment	C	N	P	K	Ca	Mg
<i>Piper aduncum</i>	Stems	2.7	23	7.4	92	10	5
	Branches	0.6	11	4.5	58	10	6
	Leaves	1.7	67	8.2	125	78	23
	Litter	0.7	19	1.7	23	59	11
	Total vegetation	5.8	120	21.8	299	157	45
	Soil (0-0.15 m)	80.3	8081	5.9	377	4981	879
Total		86.1	8201	27.7	675	5138	924
<i>Gliricidia sepium</i>	Stems	6.9	164	24.2	159	90	23
	Leaves	2.4	145	8.6	81	127	24
	Litter	1.1	47	3.0	8	95	17
	Total vegetation	10.4	356	35.9	248	312	64
	Soil (0-0.15 m)	86.2	8059	4.7	327	4600	868
	Total		96.6	8415	40.6	575	4912
<i>Imperata cylindrica</i>	Whole plant	6.7	76	11.9	89	56	29
	Soil (0-0.15 m)	85.7	8311	5.2	508	5329	871
	Total		92.4	8387	17.1	597	5385

