

Madang province – Cambisol (disturbed) in tuffaceous silty colluvium



Site description

Occurrence: Madang province, on dissected lowlands below 300 m altitude; rainfall 3000-4000 mm

Parent Rock: Weakly consolidated silty tuffaceous Quaternary or Pliocene sediments of estuarine origin

Parent Material and Landform: Silty colluvium on hills and undulating land; may include some fans

Drainage Class: Moderately well drained

Vegetation: Secondary regenerating lowland rainforest



Distinguishing Soil Properties

Profile features:

- Very weak structure (peds) in topsoils (tending to massive) – compacted by machinery; thin A1 horizon
- Silty clay loam to clay loam textures throughout
- Grey mottles below 75 cm depth

Chemical and physical features

- Very high exchangeable calcium and magnesium values in all horizons
- Slightly acid to near neutral pH
- Low to very low carbon values
- Medium P retention in topsoil

Previous description

Moderately well drained soils of the Karamsarik and Warwin families (CSIRO Land Research Series 37, pages 83 and 84) are similar

Degradation potential

- Moderately erodible
- Soils readily damaged and compacted by heavy machinery, particularly when wet

NFI reference

Baisarik profile. The profile site is within NFI cluster 65768; see profile description for site details



NFI 65768 Baisarik

Location Map



Site Productivity

High; intensive and frequent rotational use and clearing and burning may reduce productivity; phosphorus may be limiting for some crops. The regenerating forest on site is likely to mature in 40-80 years and selective harvest may be suitable at this time. Evident soil compaction and damage to soil structure means that machinery use should be limited to the dry season only.

Soil Management

Limit machinery use in wet soil conditions; limit number of skid tracks; avoid compaction and mixing of topsoils. Gap planting with selected native species should be undertaken in degraded areas. Burning, if undertaken, should be by cool fires.

Suitability for Plantations or Alternative Land Uses

Plantation suitability: moderately to highly suitable for plantations on slopes <20°. Periodic applications of nitrogen may be required for plantations where deficiencies are identified

Gardens: moderately suitable (because of compacted topsoils)

Intensive horticulture: low to moderately suitable (because of compacted topsoils); regular cultivation not recommended because of weakly developed to massive soil structure (poorly developed peds)

Alternative tree crops: cocoa, rubber, palm oil plantations

Fertilisers required: nitrogen may be required once topsoil reserves are depleted

Profile

Profile name: Baisarik

NFI reference: The site is immediately north of NFI cluster 65768

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Date: 16 March 2016

Location: Pit near crest of rise west of track that runs southwards from Duem village, between a creek (on east side) and the low hill (on west side). The area was previously cleared for *Acacia* plantations (in 1980s?) by machines but this area was never planted.

Map reference: GDA 55G 331552 9420736

Landform: Colluvium on low angle slope.

Vegetation: *Pometia pinnata*, *Dracontamelon* sp, *Pterocarpus indicus*, *Intsia bijuga*, *Octomeles sumatrana*, *Terminalia complanata*, *Kleinhovia hospita*, *Dysoxylum* sp, *Myristica* sp, *Melanolepis* sp, *Paraserienthes falcata*, *Ficus* sp, *Alphinia* sp, *Calamus* sp

Parent material: Colluvium derived from Quaternary tuffaceous siltstone

Drainage: Moderately well drained

Slope: 5°

Aspect: South

Altitude: 84 m (from Google Earth)

Photographs: Held in file UN REDD 3 at FPA, Hobart, Tasmania; copies held at FRI, Lae.

FAO Classification: Cambisol

A1	0-10 cm	Very dark greyish brown (2.5Y3/2) (moist) sandy clay loam; firm strength; very weak 5-20mm sub angular blocky structure; few very fine, fine, medium and coarse roots.
AB	10-51 cm	Light olive brown (2.5Y5/4) (moist) clay loam; firm strength; very weak 10-30 mm angular blocky structure; common very fine and few medium roots.
Bw	51-75 cm	Light yellowish brown (2.5Y6/3) (moist) silty clay; firm strength; very weak 10-20 mm angular blocky structure; common very fine and medium roots.
Cg	100+cm	Light brownish grey (2.5Y6/2) (moist) silty clay; 10% bluish grey 5 mm and 5% greenish grey 3 mm mottles; weak strength, weak 0-5 mm polyhedral structure, few medium roots.

Laboratory Analyses

Depth (cm)	pH (H ₂ O)	Total C (%)	Total N (%)	C/N	Oxalate Al (%)	Oxalate Fe (%)	Oxalate Si (%)	P retention (%)
0-10	6.55	3.50	0.40	9	0.46	1.25	0.19	37
10-20	6.43	1.33	0.18	7	0.35	0.90	0.12	32
20-30	6.19	0.64	0.09	7	0.33	0.61	0.07	29
30-60	6.13	0.40	0.06	6	0.36	0.48	0.11	27
60-100	6.77	0.32	0.05	7	0.39	0.31	0.17	18

Depth (cm)	Exchangeable cations (cmol/kg)				CEC (cmol/kg)	BS (%)	Bray P (mg/kg)	Total P (mg/kg)
	Ca	Mg	K	Na				
0-10	41.5	14.3	2.32	0.08	63.5	92	7	945
10-20	36.5	15.9	1.56	0.11	61.4	88	8	597
20-30	39.4	20.0	1.00	0.22	70.2	86	19	491
30-60	39.4	23.6	0.66	0.43	75.6	85	18	347
60-100	41.5	25.3	0.65	0.71	76.5	89	50	409

Fertility note, 0-30 cm soils

The soil is slightly acid to near neutral with very high exchangeable Ca and Mg levels in topsoils (and throughout the profile), very probably due to andesitic volcanic ash in the parent rock of the soil. K levels in topsoils are high to very high. The medium P retention value in the topsoil and peak of oxalate-extractable Fe and Al and P in the 0-10 cm layer is probably due to a dusting of recent volcanic ash. High Bray P in subsoils and medium to high total P in most layers may be derived from apatite in ash. The P increase towards the surface in these unfertilised soils may be due to either nutrient cycling or additions of recent volcanic ash. Oxalate Fe values support the latter explanation. The soil has high natural fertility - undisturbed soils with dark topsoils may classify as *Phaeozems* in the FAO classification.

Site C and N values

Depth (cm)	BD (t/m ³)	C (%)	C (t/ha)	N (%)	N (t/ha)	Site C (t/ha)	Site N (t/ha)
0-10	0.90	5.99	53.9	0.60	5.40	94*	10*
10-20	0.90**	2.28	25.1	0.27	2.97		
20-30	0.90**	1.36	15.0	0.17	1.87		
30-60	1.10**	0.40	13.2	0.06	1.98	27	4
60-100	1.10**	0.32	14.1	0.05	2.20		
Total to 1 m depth (t/ha)						121	14

Note: C, N and BD figures for 0-10 cm, 10-20 cm and 20-30 cm depths are means of ten replicates taken within 20 m of the pit including samples from the profile site; 30-60 cm and 60-100 cm figures are derived from single profile samples only; figures marked * have been corrected for slope angle. BD figures marked ** are estimates based on BD results on similar parent material at Paia Mountain (Forest Soil Fact Sheet 1) as BD measurement in the sticky soils at the Baisarik site was difficult. Analyses were by Landcare Research Environmental Chemistry Laboratory, Palmerston North, New Zealand. C and N were determined using a LECO furnace. Total P is acid-soluble P after ignition of the soil. No free carbonate was detected.

Reference

- Bain, J.H.C. and Mackenzie, D.E. (Compilers) 1975. Ramu. *Papua New Guinea 1:250 000 Geological Series Sheet SB 55-5*. Department of Lands, Surveys and Mines, Papua New Guinea.
- Robbins R.G. (Compiler) 1976. Lands of the Ramu-Madang area, Papua New Guinea. CSIRO Land Research Series No. 37. CSIRO, Australia.

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Citation

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