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An Outline of Soil Surveys Conducted in Brunei Darussalam

By

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Summary : An outline of soil surveys and maps of Brunei Darussalam are described in order to provide basic information for afforestation. Four soil survey reports have been made and are available in this country. The soil Survey of Brunei, British Borneo, conducted in 1958, covers 2 areas in the north-east of Bandar Seri Begawan and in the lower Tutong Valley. A map was drawn for the former area on a scale of 1 : 50 000. Unfortunately, this survey is of almost no use now, except for analytical data, as nearly all the areas have been converted into artificial land. The survey for the Land Capability Study (1969) includes 3 maps on a scale of 1 : 100 000, which cover nearly all the country. They are now useful as these is no substitute covering the whole country. The one on Brunei Agricultural and Forestry Development Study (1982) includes several soil maps on scales of 1 : 12 500, 1:25 000 or 1 : 50 000 for some parts of the Labi area and the Inter-Riverine Zone. These are the largest scale soil maps to have been published for public use in the country. The one of the Proposed Plantation Area (1989) includes a map on a scale of 1 : 2 000, which covers about 13ha. This map has almost no practical meaning due to its very limited area, but provides an example of a large-scale map for forestry management.

Advantages and disadvantages of the above maps are compared to clarify their uses. In addition, soil classification systems employed in these surveys are briefly discussed.

Contents

1 Introduction

The Forestry Department of Brunei Darussalam has recently proposed a plan for an afforestation project of 50 000 ha in the Inter-Riverine Zone (IRZ.) in order to improve stand structure and productivity in logged-over natural forests. Before this plan is put into practice, it is necessary to classify the site conditions using basic data such as topography, soils and vegetation. Since such information is limited in Brunei Darussalam, the best possible use must be made of the available data. Here, the author will provide an outline of soil survey data and maps up to the present.

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(1) Forest Environment Division

2 The Soil Survey of Brunei, British Borneo (1958)

In 1955 the Division of Soils, Commonwealth Scientific and Industrial Research Organization, was asked through the Commonwealth Department of External Affairs to conduct a soil survey in Brunei, which was then a State under British protection. At that time, the Brunei Government proposed a re-settlement plan near Brunei Town and in the lower Tutong Valley. In order to obtain basic data for this plan, about 30 000 acres (=12 000ha) were inspected in each area and one soil survey map was drawn of the area near Brunei Town on a scale of 1 : 50 000. It covered the areas along Jalan Gadong, Jalan Berakas and Jalan Muara. Perhaps this was the first attempt to survey the distribution of soils systematically in this country, although it covered only a limited area (BLACKBURN, 1958).

In this survey, soil profiles were described according to local classification systems, which had been in use, possibly for hundreds of years, by the Kedayan people. Soils were classified into 5 classes based on features of surface soil and subsoil, such as colour, and content of sand and clay. The nature of the vegetation was also taken into account. Indeed, this system may have been primitive, but features of each soil class were described precisely and each class may be now identified as a soil type in a modern classification system.

Unfortunately, the soil map of this survey is of little use nowadays, as nearly all the areas covered by it have been converted into commercial areas, an airport and residential areas, etc. But the data of the profile description and analysis of soils at 48 points and water at 22 points are still very useful, as the collecting points are shown precisely on the maps.

3 Land Capability Study (1969)

This study was carried out by Hunting Technical Services in England on commission from the Brunei Government in 1968. The survey covered the entire State, and involved the study of land forms from aerial photographs, a soil survey in the field and the collection of data relevant to the development of natural resources. The report published in 1969 was composed of 3 volumes and including 3 soil maps on a scale of 1 : 100 000, which covered all of the land of Brunei except about 8 500ha of the most interior part of the Temburong District.

In this soil survey, the 1966 Sarawak System was adopted for soil classification. This scheme employed Great Soil Groups for the highest taxonomic criteria and Soil Families as a mapping unit. According to these soil maps, 8 Great Soil Groups, namely Red-Yellow Podzolic Soils, Podzols, Recent Alluvial Soils*, Gley Soils, Saline Gley Soils, Regosols, Skeletal Soils* and Organic Soils were found. (The meaning of * will be explained in the next chapter.) These were subdivided into 25 Soil Families in total. A definition of each Soil Family is given briefly in Table 1.

These Soil Families are too large to be used as the mapping unit for several areas where a few Soil Families are intricately distributed. For such areas, Soil Family Association is used as a mapping unit by combining 2 or 3 Soil Families. (for instance, as ME/BK or ME/NY/MA. A definition of these abbreviations is given in Table 1.) In Fig. 1, sections of these maps are shown.

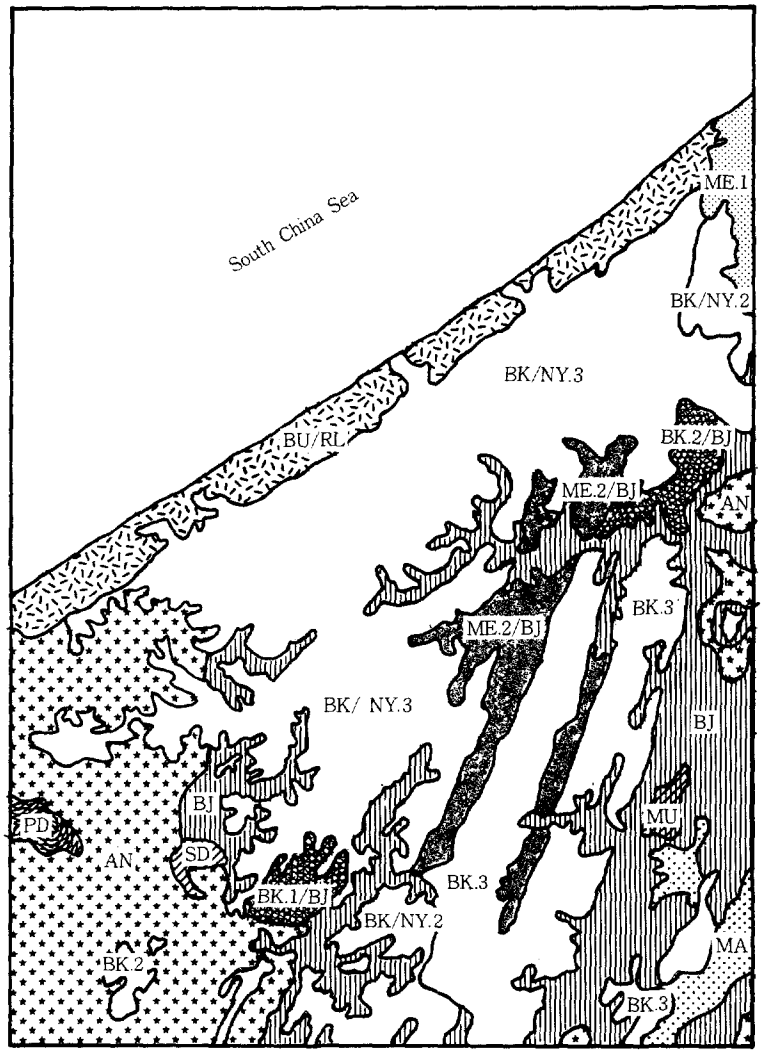
In this survey, the names of Soil Families which had hitherto been used in Sarawak, were still used for those distributed in Brunei. Therefore, they should be replaced by local names according to the correlation table (ULG Consultants, 1982) to enable more detailed surveys. But these maps are still useful as there are no substitutes which cover the whole country.

Table 1. Soil Families in Brunei Darussalam from the Soil Map of the Land Capability Survey (1969)

Great Soil Group	Soil Family	Abb. on the map	Parent Material	Physical Property	Equivalent in Brunei
Red-Yellow Podzolic Soils	Merit	ME	Residual	heavy	Bukit
	Bekenu	BK	〃	medium	Benutan
	Nyalau	NY	〃	light	Sukang
	Malang	MA	Young Riverine	heavy	Asam* (Alluvial)
	Semilajau	SM	〃	light	Kukup* (Alluvial)
	Lupar	LU	Old Alluvial	heavy	Rambai**
	Sabangang	SB	〃	light	Banggarang**
Podzols	Miri	MR	Old Alluvial	cemented	Telisai**
	Buso	BU	〃	uncemented	Mapol**
Recent Alluvial Soils	Kayan	KY	Young Riverine	light	Merangking
Regosols	Regosol	RL	Old Alluvial		Tungku or Takalit
Skeletal Soils	Meluan	ML	Residual	A / R	Puan
	Kapit	KP	〃	A / C	Andulau
Gley Soils	Bijat	BJ	Young Riverine	heavy (non-peaty)	Tutong**
	Sebandi	SD	〃	heavy (peaty)	Singap**
	Plan	PL	〃	light (non-peaty)	Rampayoh**
	Tatau	TA	Young Marine & Estuarine	light (non-peaty)	Buaya**
	Matu	MT	〃	light (peaty)	Pantai**
Saline Gley Soils	Rajang	RG	Young Marine & Estuarine	heavy(strongly saline)	not named as yet
	Pendam	PD	〃	heavy(weakly saline)	not named as yet
	Belat	BE	〃	light(strongly saline)	not named as yet
Organic Soils	Anderson	AN		deep	Anduki
	Mukah	MU		shallow heavy	Keduan
	Igan	IG		shallow light	Sibut
	Limbang	LB		saline	not named as yet

Note : * One of the series of Alluvial Soils

** One Series



Scale 1 : 100 000

0　2　4　6　8　10km

Fig.1. Part of soil map in Land Capability Study (1969)

4 Brunei Agricultural and Forestry Development Study (1982)

The final report of the Brunei Agricultural and Forestry Development Study contains soil survey data and soil maps which, although they do not cover the whole of Brunei Darusalam, cover a fairly wide area(ULG Consultants, 1982). In 1981 the Brunei Government commissioned ULG Consultants Ltd. to carry out land use, forestry, agricultural, economic and social investigations in the Labi area and the IRZ. The report of these investigations published in 1982 and 1983 consisted of 12 volumes and 3 boxes of maps. They include 2 soil maps on a scale of 1 : 12 500 for the Labi area, 2 soil maps on a scale of 1 : 50 000, 4 soil maps on a scale of 1 : 25 000 for the IRZ., and 4 volumes of soil survey data. They are the soil maps on the largest scale that have been published for public use in this country.

In order to implement these soil surveys, the 1979 version of the Sarawak Classification was basically adopted. This scheme employed Great Soil Groups for the highest taxonomic criteria, as in the soil survey on the Land Capability Study (1969). Soil Series which were identified by subdividing Soil Families,were used as a mapping unit. In addition, the names of Soil Families and Soil Series were replaced by local equivalents in Brunei.

In this soil survey, 8 Great Soil Groups, namely Red-Yellow Podzolic Soils, Grey-White Podzolic Soils, Podzols, Alluvial Soils, Gley Soils, Regosols, Lithosols and Organic Soils were found. The 2 names in the soil survey on the Land Capability Study (indicated by * in the last chapter.) were replaced by Alluvial Soils and Lithosols respectively, and Saline Gley Soils were included in Gley Soils. On the other hand, Grey-White Podzolic Soils were newly identified as a result of a more detailed survey.

As the subdivided unit, 30 Soil Families and 66 Soil Series are classified in total. Each of them is defined as per Table 2. But among this large number of Soil Series, only 5 Red-Yellow Podzolic Soils (Bukit, Benutan, Pipit, Sukang and Gesah) and each of the following : Alluvial Soils, Gley Soils, Regosols and Organic Soils (Biadong, Tutong, Takalit and Anduki) are used as individual mapping units. Only 2 of the Alluvial Soils (Buau and Kukup), 2 of the Organic Soils (Keduan and Bebatik) and each of the Red-Yellow Podzolic Soils and Gley Soils (Rambai and Ungar) can be drawn in the form of a Soil Series Association. The others cannot be shown on the maps due to very limited distribution at the site. Sections of these maps are shown in Fig. 2.

Although this scheme was constructed only for the Labi area and the IRZ., it seems to be applicable to the other areas, except the Temburong District, because of resemblance to the soil distribution pattern on the soil maps of 1 : 100 000. In the Temburong District, a wider distribution of Saline Gley Soils, saline type of Organic Soils and Skeletal Soils can be found. Therefore, the establishment of other new Soil Series for these soils can be expected.

Table 2. Soil Series in Brunei Darussalam from the Soil Map for the Brunei Agricultural and Forestry Development Study (1982)

Family	Series	Colour	Parent material	Landform	Texture	A_1 cm	A_2 cm	B cm	Mapping unit	Remarks
				Red-Yellow Podzolic Soils						
Bukit	Bukit	yel. Br. /br. Y.	Shale Mudstone Siltstone	Undulating to steep terrain	CL/C	<10	10< <30	10< <60	BKT BKT-BTN BKT-PPT	
	Rambai	yel. Br. /br. Y.	Old riverine allvium	High riverine terraces	CL/C	<10	10< <30	10< <60	RMB-PPT	Limited distriribution in IRZ.
	Asin	str. Br. /red. Y.	Argillaceous High in iron content		CL/C	<10	10< <30	10< <60		Less extensive than Bukit Ser.
Benutan	Benutan	yel. Br. /br. Y.	Mixed Shales & sandstones	Undulating to steep	SCL	<10	20< <50	20< <25	BTN BKT-BTN BTN-SKN	
	Pipit	yel. Br. /br. Y.	Old riverine alluvium	High level terraces	SCL	<10	20< <50	20< <25	PPT BKT-PPT RMB-PPT	Higher exchangeable base. Rarely recorded.
	Dungun	str. Br. /red. Y.	Mixed Shales & sandstones High in iron content	Upland sites	SCL	<10	20< <50	20< <25		Sporadically recorded in IRZ.
Sukang	Sukang	yel. Br. /br. Y.	Sandstone	Undulating to hilly terrain	SL / SCL	<10	20< <50	50< <100	SKN BTN-SKN	
	Banggarang	yel. Br. /br. Y.	Old riverine alluvium	Terrace remnant	SL / SCL	<10	20< <50	50< <100		Rarely recorded.
	Ukong	str. Br. /red. Y.	Sandstone		SL / SCL	<10	20< <50	50< <100		Very rarely recorded.
	Gesah	yel. Br. /br. Y.	Sandstone	Steeper slope>20°	SL	<10	20< <50	50< <100	GSH	Rarely recorded.

Table 2. (Continued)

Family	Series	Colour	Parent material	Landform	Texture	A_1 cm	A_2 cm	B cm	Mapping unit	Remarks
Apak	Apak	1. Gr. /br. Y.	Sandstone	Undulating to hilly terrain	SL/SL or SCL	<10	10< <30	30< <100		Rarely encountered.
				Grey-White Podzolic Soils						
Jamaling	Jamaling	1. Gr.	Shale	Upland sites	CL / C					
Biang	Biang	1. Gr.	Mixed shales & sandstones	Upland sites	SCL/SC					
Tinjang	Kagu	1. Gr.	Mixed shales & sandstones	Upland sites	SL/SCL					
	Tinjang	1. Gr.	Sandstone	Upland sites	SL or c. SL					
Liang	Abang	1. Gr.	Alluvium / Shale	Riverine terrace	SL / C					
	Liang	1. Gr.	Alluvium	Riverine terrace	SL / C					
				Podzols						
Telisai	Ubok	1. Gr. /Bl. /Y.	Sandstone	Upland sites	S or LS /SL /SL					
	Telisai	1. Gr. / Bl. /pl. Y. or 1. Gr.	Alluvium	Terrace	S or LS /SL /SL					
Ingai	Ingai	1. Gr. /Bl. /Y.	Sandstone	Upland sites	S or LS /SL /SL					
	Mapol	1. Gr. /Bl. /pl. Y. or 1. Gr.	Alluvium	Terrace	S or LS /SL /SL					

Table 2. (Continued)

Family	Series	Colour	Parent material	Landform	Texture	A_1 cm	A_2 cm	B cm	Mapping unit	Remarks
Sewat	Sewat	1. Gr. /d. red. Br. /Y. or yel. Br.	Sandstone	Flat to undulating upland	S or LS / SL / SL	<10	20< <30	20< <60		
	Purau	1. br. Gr. or v. pl. Br. /d. red. Br. /Y.or yel.Br.	Sandstone	Upland sites	LS / SL / SL	<10	20< <30	20< <60		Only at one point in IRZ.
					Alluvial Soils					
Biadong	Biadong	yel. Br. (mottled)	Argillaceous alluvium	Riverbank Levee Bottomland	C	<10	···	50< <100	BDG BDG-BUU BDG-TTN	
	Asam	red. Y. (mottled)	Argillaceous alluvium	Riverbank Levee Bottomland	C	<10	···	50< <100		
Buau	Buau	yel. Br.	Riverine alluvium	Riverbank Levee Bottomland	SCL / SC				BDG-BUU BUU-KKP	Less extensive than Biadong Ser.
	Mendaram	yel. Br.	Riverine alluvium	Riverbank Levee Bottomland	SL/SCL					Less extensive than Biadong Ser.
	Kukup	yel. Br.	Riverine alluvium	Riverbank Levee Bottomland	SL				BUU-KKP	Less extensive than Biadong Ser.
Merangking	Merangking	yel. Br.	Riverine alluvium	Riverbank Levee Bottomland	S	Very thin				Very minor soils.

Table 2. (Continued)

Family	Series	Colour	Parent material	Landform	Texture	A_1 cm	A_2 cm	B cm	Mapping unit	Remarks
Terawan	Tapang	yel. Br.	Riverine alluvium	Bottomland	C /S or L					Contrasting texture profile.
	Tajok	yel. Br.	Riverine alluvium	Bottomland	CL /S					Contrasting texture profile.
	Kanapol	yel. Br.	Riverine alluvium	Bottomland	SL /C					Contrasting texture profile.
	Terawan	yel. Br.	Riverine alluvium	Bottomland	S /CL or C					Contrasting texture profile.
Muara	Muara	Y.	Beach deposit	Beach	S or LS					
					Gley Soils					
Tutong	Tutong	1. Gr. (mottled)	Riverine alluvium	Floodplain Bottomland Fringe of peat area	C	3< <30	20< <50	40< <60	TTN TTN-UNG TTN-KDN BDG-TTN	No surface peat or muck. Subsoil C.
	Singap	1. Gr.	Riverine alluvium		C	3< <30	20< <50	40< <60		Surface peat or muck. High water table.
	Damit	d. Gr.	Alluvium		C					Unripe subsoil. Very minor importance.
	Kijang	d. Gr.	Alluvium		C					Unripe profiles with an organic surface layer. Very minor importance.
Tempinak	Tempinak	1. Gr. (mottled)	Riverine alluvium	Bottomland	SCL	3< <30	20< <50	40< <60		No surface peat or muck. Subsoil CL or SCL. Sporadically recorded.
	Ungar	d. Gr.	Alluvium		SCL				TTN-UNG	Surface organic layer. Unripe subsoil. Only at one point in IRZ.
	Balai	1. Gr. (mottled)	Alluvium	Bottomland	SL					No surface peat or muck. Not so extensive.

Table 2. (Continued)

Family	Series	Colour	Parent material	Landform	Texture	A_1 cm	A_2 cm	B cm	Mapping unit	Remarks
Rampayoh	Rampayoh	1. Gr.	Riverine alluvium	Small valley Gully	S or LS					No surface peat or muck. Not so extensive.
	Merimbun	1. Gr.	Riverine alluvium	Small valley Gully	S or LS					Surface peat or muck (<25cm) Not so extensive.
Gatas	Tesilin	1. Gr.	Riverine alluvium	Bottomland	C / S					Contrasting texture profile. Peat or muck in lower layer. Locally important in Labi.
	Kandol	1. Gr.	Riverine alluvium	Bottomland	CL /S					Contrasting texture profile. Peat or muck in lower layer. Locally important in Labi.
	Luagan	1. Gr.	Riverine alluvium	Bottomland	SL / C					Contrasting texture profile. Peat or muck in lower layer. Locally important in Labi.
	Gatas	1. Gr.	Riverine alluvium	Bottomland	S / CL or C					Contrasting texture profile. Peat or muck in lower layer. Locally important in Labi.
Ratan	Ratan	1. Gr. (mottled)	Riverine alluvium & organic	Bottomland Swamp margin	C	Clay horizon 25<		<100 Subsurface peat layer at least 1m.		Contrasting texture profile. Important in Labi.
Buaya	Buaya	Gr. to 1. Gr.		Depression in coast	S					No surface peat or muck.
	Pantai	Gr. to 1. Gr.		Depression in coast	S					Surface peat or muck.

Table 2. (Continued)

Family	Series	Colour	Parent material	Landform	Texture	A_1 cm	A_2 cm	B cm	Mapping unit	Remarks
				Regosols						
Tungku	Tungku	Y.	Sandstone	Upland sites	S					
	Ara	Y.	Old alluvium	Riverine terrace	S					
Takalit	Takalit	1. Gr.	Sandstone	Very steep disected terrain	S	Top soil thin			TKL	
	Nyatan	1. Gr.	Old alluvium	Riverine or marine terrace	S	Top soil thin				
	Penaga	1. Gr.	Old marine	Marine terrace	S					Podzol Bh horizon present below 1m.
				Lithosols						
Puan	Puan	br. Y.	Shale or sandstone	Steeper main ridge	CSL	Soil <25cm				Gravelly loam overlying sandstone or conglomerate. Rarely extensive.
Andulau	Audulau	br. Y.	Shale	Steep slope	C	Soil <25cm				On State's borders.
Bunit	Bunit	br. Y.	Shale (residual)	Hill slope	C	Soil >25cm (Gravel >50%)				
	Lakang	br. Y.	Shale (colluvial)	Colluvial fan	C	Soil >25cm (Gravel >50%)				
	Supon	br. Y.	Shale and sandstone (colluvial)	Colluvial fan	CL, SL, or S	Soil >25cm (Gravel >50%)				Very minor, noted only in Labi.

Table 2. (Continued)

Family	Series	Colour	Parent material	Landform	Texture	A_1 cm	A_2 cm	B cm	Mapping unit	Remarks
					Organic Soils					
Keduan	Keduan		Peat	Riverine bottomland	C(subsoil)	Peat <1m			TTN-KDN	On the margins of major swamps.
	Medit		Muck	Riverine bottomland	C(subsoil)	Muck<1m				Not found in the main swamp.
Sibut	Sibut		Peat		S(subsoil)	Peat <1m				Inland margin of coastal beach zone. Not extensive in inland.
	Sugo		Muck		S(subsoil)	Muck<1m				Not extensive in inland.
Anduki	Anduki		Peat	Coastal swamp plain	S or C (subsoil)	Peat >1m			AND AND-BBT AND-BKT AND-TTN AND-ALL	Covered widely by peat swamp forest. Very acid, Very low in plant nutrient.
	Bebatik		Muck	Interior river valley	S or C (subsoil)	Muck>1m			AND-BBT	Sporadically recorded in IRZ.

ABBREVIATIONS :

Br.	: Brown	yel.	: yellowish
Y.	: Yellow	br.	: brownish
Gr.	: Grey	red.	: reddish
Bl.	: Black	pl.	: pale
		str.	: strong
		l.	: light
		d.	: dark
		v.	: very
		c	: coarse

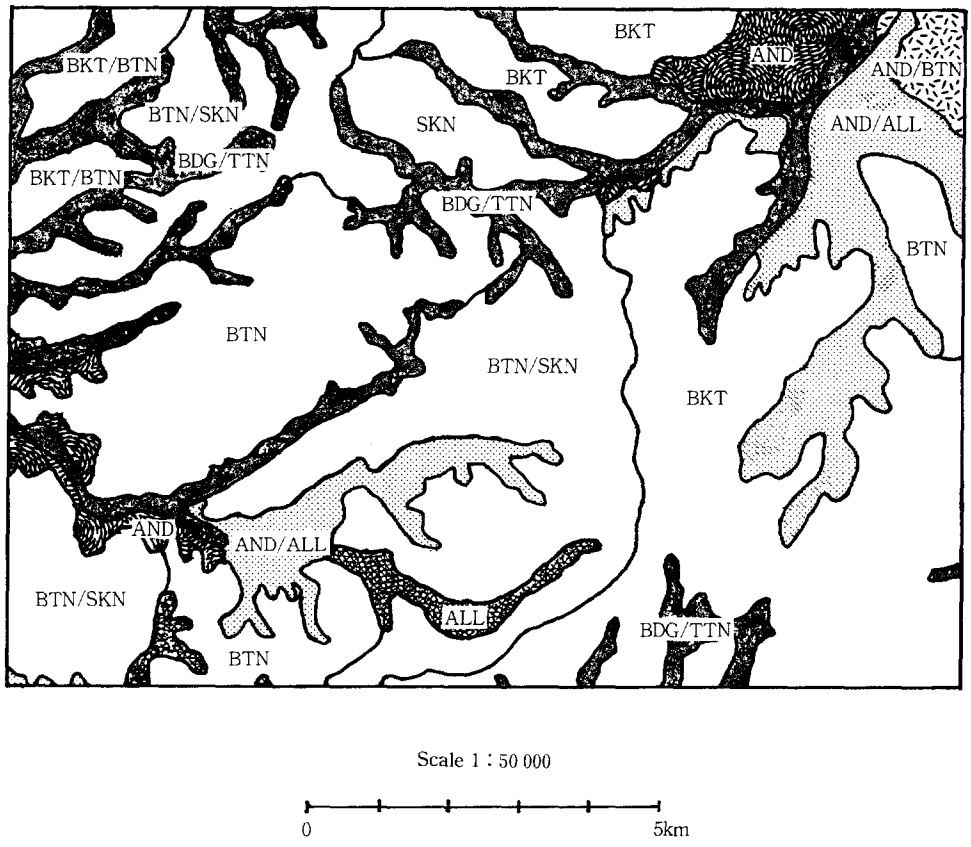


Fig. 2. Part of soil map in Brunei Agricultural and Forestry Development Study (1982)

5 Soil Survey and Soil Classification in the Proposed Plantation Area (1988)

In 1988 a JICA expert, Mr. Masamichi TAKAHASHI(1989), carried out a detailed soil survey in the Proposed Plantation Area in Compartment 7 of the Andulau Forest Reserve in order to obtain basic information for improvement of stand structure and productivity in this area. He surveyed an area of about 13ha and found 2 Great Soil Groups, namely Red-Yellow Podzolic Soils and Gley Soils. The former was classified into 8 mapping units, but the latter was not classified because of its very limited distribution. He drew a soil map for this area on a scale of 1 : 2 000. All the mapping units and the map are shown in Table 3 and Fig. 3 respectively.

In this survey, Red-Yellow Podzolic Soils are subdivided on the basis of colour, water regime and texture according to the Forest Soil Survey Method used in Japan. But in the Sarawak Classification, which was adopted in the Soil Survey of 1982, they were already subdivided into 11 Soil Series on the basis of colour and parent material. The difference in parent material causes the apparent difference in texture. Consequently, Mr. TAKAHASHI would have arrived at the same mapping units, if he had subdivided the Soil Series of Red-Yellow Podzolic Soils in the Sarawak

Classification on the basis of water regime. He should have done so, if he expected a wider use of his survey report in Brunei Darassalam.

The correlation between TAKAHASHI's mapping units and supposed units gained by subdividing the Soil Series in to the Sarawak Classification is shown here.

TAKAHASHI's unit	Supposed unit in the Sarawak System
RD-s	Dry type of Dungun* or Ukong
RD-c	Dry type of Asin
YD-s	Dry type of Benutan* or Sukang
YD-c	Dry type of Bukit
YM-s	Moist type of Benutan* or Sukang
YM-c	Moist type of Bukit

Table 3. Soil classification keys and mapping units in Compartment 7

1. Soil classification keys

Colour of subsoil

Red	Colour above 50cm is more reddish than 7.5YR 7/8.
Yellow	Colour below 50cm is more yellowish than 7.5YR 7/8.

Water regime

Dry	A horizon or upper part of B horizon is dry and well devoloped nutty or angular blocky structure is found in this part.
Moist	A horizon or upper part of B horizon is moist and moderately developed structure is found.
Wet	Upper part of B horizon is wet or grayish mottles are found upper than 50cm.

Texture

Clay	Upper part of B horizon is clayey.
Silt - Sand	Upper part of B horizon is silty to sandy.

2. Soil mapping units found in the surveyed area in Compartment 7

	Colour	Water regime	Texture Surface	Texture Upper B	Topography	Structure	Remarks
RD-s	red	dry	SiL	SiL	ridge	nutty angular blocky	Reddish weathered sandstone and tube hard ferricrete are sometimes found.
RD-c	red	dry	SiL ~S	CL ~C	narrow ridge logging tractor trail	nutty	Reddish weathered sandstone and tube hard ferricrete are sometimes found.
YD-s	yellow	dry	SiL	SiL	broad ridge	nutty blocky	
YD-c	yellow	dry	SiL ~L	CL	upper part of gentle slope		
YM-s	yellow	moist	SiL	SiL	middle part of gentle slope		
YM-c	yellow	moist	CL	CL ~C	middle part of steep slope		
YW-c	yellow	wet	SiL ~C	C	head of a river		
ER	yellow	moist		CL	very steep riverside slope		A horizon is eroded.
G	yellow	wet	SiL	SiL	river bed, wide valley and swamp		

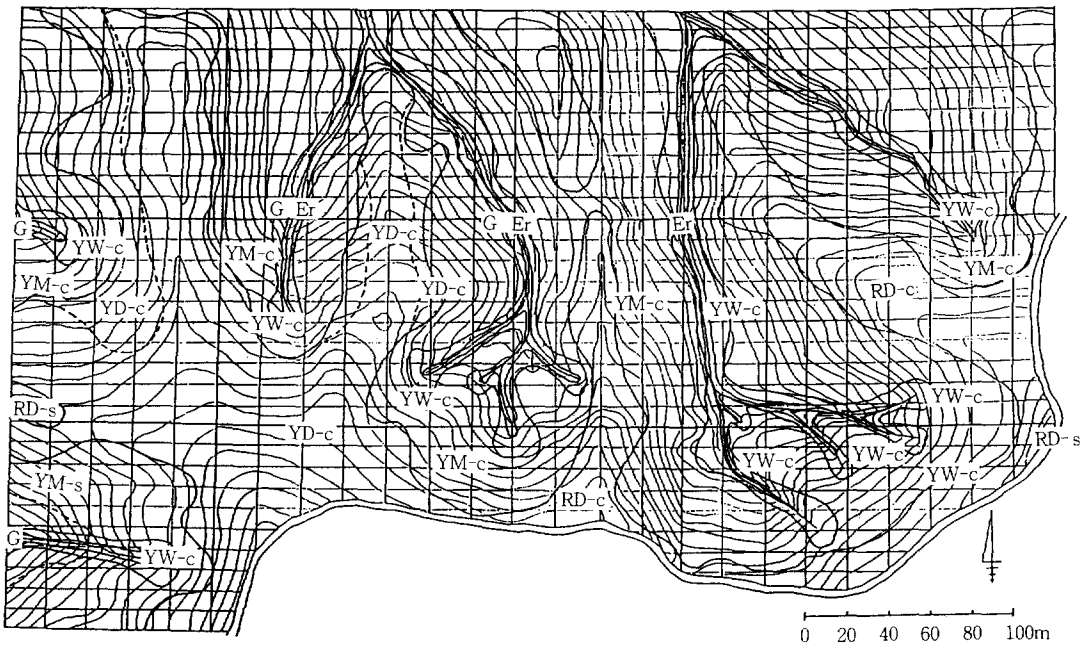


Fig. 3. Soil map of trial plantation site in the Proposed Plantation Area. Soils are classified into nine types. RD-s, RD-c, YD-s, YD-c, YM-s, YM-c, YW-c, Er and G soil types. (after TAKAHASHI *et al.* 1989)

Yw-c	Wet type of Bukit
ER	Eroded moist type of Bukit
G	Tempinak

*indicates higher probability.

6 A Comment on the Classification System of Soils

A good many civilized countries in the world have their own soil classification system because the soils are influenced by climatic, geological and vegetational factors unique to that country. But such a situation is inconvenient for world-wide interest and correlation. Therefore, 2 world-wide classification systems, namely, the USDA Soil Taxonomy (1975) and the FAO-UNESCO Soil Map Legend (1974) were proposed in the 1970's.

The USDA Soil Taxonomy was originally proposed to classify soils in U.S.A., and may not necessarily be suitable in finer respects for other regions. Many problems exist in the recognition of diagnostic horizons for Soil Order placement. For instance, Red-Yellow Podzolic Soils in Brunei may be classified into 3 Soil Orders, namely, *Inceptisol, Ultisol* and *Oxisol*, by this system, although most of them are expected to be classified into *Ultisol*. In addition, it is necessary to use unfamiliar technical terms in order to classify soils according to this system.

The FAO-UNESCO Soil Map Legend provides less problems for soil classification in Brunei,

because it aims essentially at world-wide classification. As for Red-Yellow Podzolic Soils, a similar problem arises as with the USDA Soil Taxonomy. Most may not be classified into *Acrisol* but into *Cambisol*. On the other hand, Alluvial Soils, Gley Soils and Lithosols in Brunei coincide broadly with *Gleysols*, *Fluvisols* and *Lithosols*, respectively, in the FAO-UNESCO system. But in this system there are only taxonomic units of higher levels, namely, Unit and Sub-unit. We can find no taxonomic units suitable for the description of soil distribution on such a regional scale as in Brunei.

In the Sarawak System which was adopted in the 2 soil surveys mentioned above, Soil Series were used as the basic taxonomic unit. They were used at first in soil surveys conducted by the United States Department of Agriculture in the 1930's and later in England, Australia, etc. According to private information obtained from a soil scientist in Malaysia, an almost identical system is used for soil surveys on the Malay Peninsula. First of all, we should aim to correlate the soils in Brunei with those of the neighbouring countries. In this respect, it seems wise to have adopted the Sarawak System in the 2 soil surveys carried out in Brunei. In the Brunei Agricultural and Forestry Development Study some tables are provided to enable world-wide correlation of the soils in Brunei classifications with the USDA Soil Taxonomy and the FAO-UNESCO World Soil Map Legend. These will be useful when considering the soils of Brunei from a world-wide viewpoint.

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総説―ブルネイダルサラームの土壌調査―

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摘　　要

造林事業を実行するためには，基礎資料として土壌調査報告，土壌図が必要である。ブルネイダルサラール国では，このために現在4種類の土壌調査報告が利用できる。『英領ボルネオ，ブルネイの土壌調査（1958）』はバンダル・スリ・ブガワンの北東部とトゥトン河下流との2地域を対象とし，前者について5万分の1土壌図が描かれた。残念ながらこの図の対象地域はほぼすべてが人口改変地であり，今では分析データ以外はほとんど意味がない。『土地利用可能性調査（1969）』には3枚の土壌図が含まれ，縮尺10万分の1でほぼ全国土を覆っている。このように全国土を覆う土壌図は他にないので，役に立つ存在である。『ブルネイ農林業開発調査（1982）』には，ラビ地域と河間地域とを対象に12 500分の1・25 000分の1・50 000分の1土壌図が含まれ，全国土の約10分の1の調査が完了している。これらはこの国で公刊された最大の縮尺の土壌図である。『Proposed Plantation Areaにおける土壌調査（1989）』は，13haを対象とした2 000分の1の土壌図を含んでいる。この図は対象面積が狭いため実用的な価値はあまりないが，林業経営のための大縮尺土壌図の例として意味がある。これら4種の土壌図についてそれぞれの長所・短所を述べ，あわせてこれらの土壌調査に採用された土壌分類体系の利害得失についても言及した。

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