Land Resource Study

18 Land Resources of the Solomon Islands Volume 6 Choiseul and the Shortland Islands

Land Resources Division, Ministry of Overseas Development

Land resources of the Solomon Islands Volume 6 Choiseul and the Shortland Islands

A deep, well drained, reddish clay Tropohumult overlying finely banded Moli Sediments on Moli Island

Land Resources Division

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Land Resource Study 18

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THE LAND RESOURCES DIVISION

The Land Resources Division of the Ministry of Overseas Development assists developing countries in mapping, investigating and assessing land resources, and makes recommendations on the use of these resources for the development of agriculture, livestock husbandry and forestry; it also gives advice on related subjects to overseas governments and organisations, makes scientific personnel available for appointment abroad and provides lectures and training courses in the basic techniques of resource appraisal.

The Division works in close co-operation with government departments, research institutes, universities and international organisations concerned with land resources assessment and development planning.

List of volumes

Title:	Land resources of the Solomon Islands. J R F Hansell and J R D Wall
Volume 1	Introduction and recommendations
Volume 2	Guadalcanal and The Florida Islands
Volume 3	Malaita and Ulawa
Volume 4	New Georgia Group and the Russell Islands
Volume 5	Santa Isabel
Volume 6	Choiseul and the Shortland Islands
Volume 7	San Cristobal and adjacent islands
Volume 8	Outer Islands

During the course of the production of these reports, the name of the British Solomon Islands Protectorate was changed to the Solomon Islands. The former name has been used throughout the first two volumes to be published (2 and 3), in the text (but not on the covers) of Volumes 4 and 7, and not at all in the remaining volumes (1, 5, 6 and 8).

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CORRECTION
LAND RESOURCE STUDY 18 VOLUME 6

Page 26, paragraph 1, line 2, *for* eroding *read* erode

Page 26, paragraph 6, line 2, *for* convex *read* concave

Page 39, paragraph 3, line 2, *for* or *read* that

Page 138 last line, *for* the *read* and

Part 1

Introduction

PREFACE

This volume deals with the major island of Choiseul, an archipelago of small islands in the east dominated by Vaghena and, to the west, the Shortland group with the main islands of Mono (Treasury), Alu (Shortland) and Fauro. This report is one of a series of volumes describing the land resources of the Solomon Islands. Each is concerned with a major island or island group and incorporates the results of fieldwork, the subsequent land classification and the assessment of its agricultural potential. Reports are issued on an island-by-island basis to simplify district planning and to facilitate access to the recommendations.

Landforms and soils are described fully in this volume as together they form the basis of the land classification, but other aspects of the physical environment such as geology, climate and vegetation are given only cursory attention, having been more fully described in Volume 1. Similarly, aspects of the cultural environment which are unique to the islands are discussed in this volume while a fuller discussion of population and subsistence agriculture, for example, can be found in Volume 1. With this method of presentation, unnecessary repetition is avoided and it is possible to separate fieldwork data from information largely derived from published material.

The system of measurement used in this report is metric, with the exception of the sample area studies of Appendix 4 for which original measurements were in the imperial system. Parallel versions in imperial units are given of tabulated areal data where they deal with opportunity areas.

ABSTRACT

Choiseul and the Shortland Islands cover an area of 3 714 km^2. The islands have been studied on a reconnaissance basis and their physiography, landforms, soils, forest types and present land use are mapped and described. There are eight land regions subdivided into 33 land systems; component land facets are described in detail with areal measurements. The agricultural potential of the land regions is discussed and Agricultural Opportunity Areas (areas having a large proportion of land suitable for large-scale, cash crop agriculture), together totalling 228 km^2 are mapped.

RÉSUMÉ

On a fait une première étude des 3714 km^2 des îles Choiseul et des îles de Shortland. La physiographie, la topographie, les sols, les forêts et l'emploi actuel des térres de ces îles sont décrits et présentés en forme de cartes. Les îles sont divisées en huit régions comprenant 33 zones physiographiques ('land systems'). On décrit aussi les éléments constitutifs (land facets) de chaque zone physiographique et on a calculé la superficie de ces éléments. On discuté dans le rapport les ressources agricoles potentielles des diverses régions et on établit des zones d'aptitude spéciale montant à 228 km^2, chacune desquelles possède une importante partie de terres adaptées aux grandes exploitations devouées aux cultures commerciales.

DESCRIPTORS FOR CO-ORDINATE INDEXING

Solomon Islands (Choiseul and Shortland), geomorphology, land classification, land region, land system, landform, land facet, soil survey, soil classification, soil Great Groups, soil profile, soil erosion, land capability, land use (current), potential land use, subsistence farming, cash cropping, forest mapping, coconut palm, oil palm, cacao tree, yam, sweet potato, *Colocasia esculenta,* cattle.

Part 2

The environment

INTRODUCTION

Factors in the determination of potential land use (Parts 2-4)

In Part 2 are described the physical and human aspects of the environment which play a dominant role in determining the agricultural potential of specific types of land.

In Part 3 the specific types of land are identified: the landscape is analysed and described in detail, the land being divided into land systems each of which is characterised by a uniform pattern of geology, landform, soils, vegetation and land use. These land systems are grouped into land regions which are generally dispersed, not discrete areas, constitute "regions" only in an abstract sense and are essentially an analytical tool for the determination of potential land use described in Part 4. The same land region may be found in many different islands.

Environmental factors (Part 2)

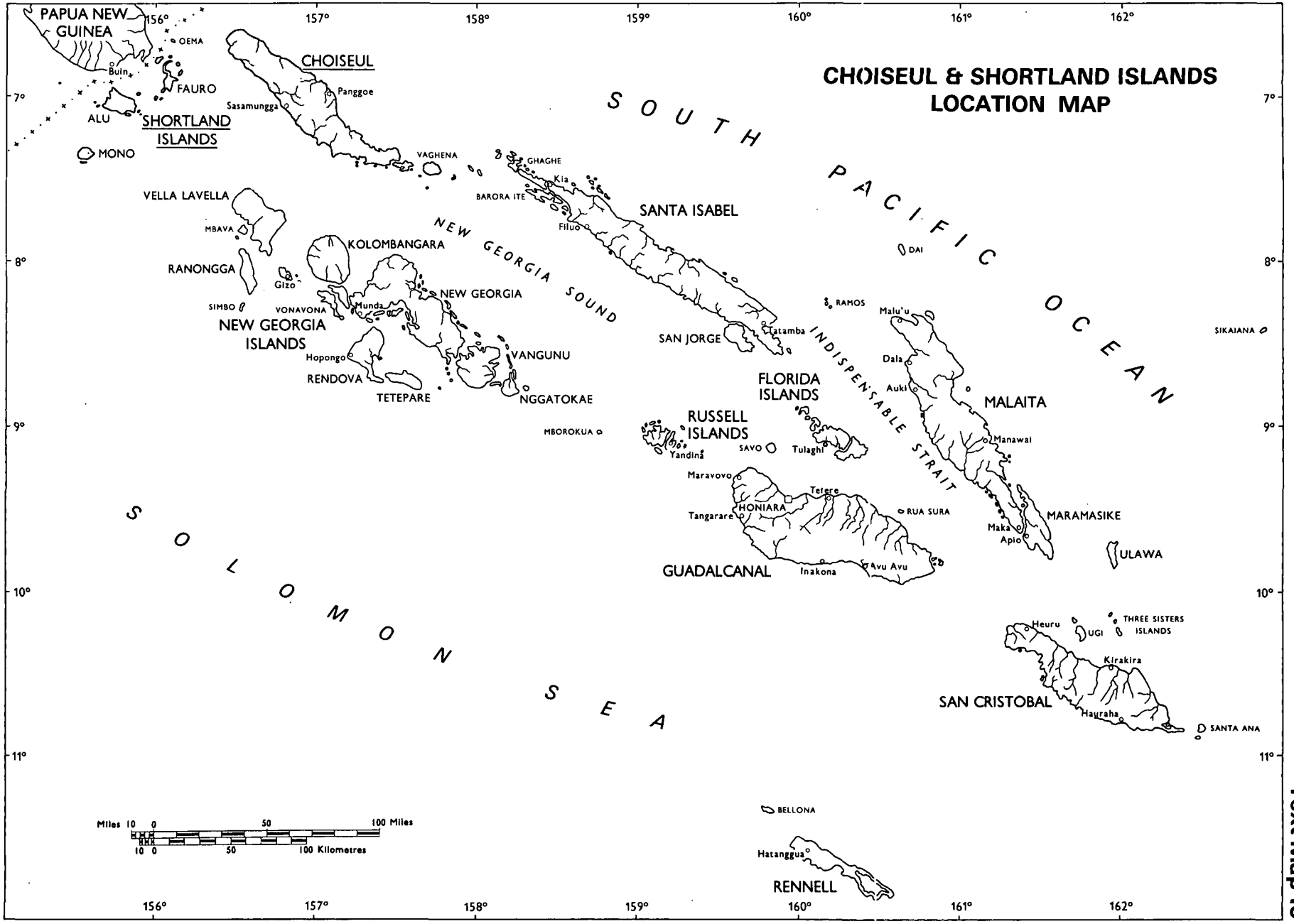
In Part 2, after a brief account of the location of the islands, the environment is first described in broad and traditional terms, that is,by physiographic regions which are readily related to regional aspects of development planning. They represent a geographical division of land into discrete, coherent areas defined by altitude, shape and drainage, each region being a unique entity not recurring elsewhere. The physiographic regions are not synonymous or necessarily conterminous with the land regions defined above and described in Part 3.

The account of the physiographic regions is followed by a description of those environmental factors which have to be considered,in conjunction with landscape analysis,in arriving at a classification of land according to potential land use.

The first factor described is *landform,* the major landforms of the islands (for instance fluvial plains or volcanic cones) being the features used in landscape analysis and consequently the most overt and consistent constituents of land systems.

Individual *soils* are next described in detail and at the scale of mapping used are grouped into soil associations. Soil,like the landform,has a very obvious role in determining potential land use.

The third environmental factor described is *current land use,* representing an interaction between biophysical and specifically human factors. Like landform and soil it is taken into consideration in determining the agricultural potential of land regions, which is described in Part 4.


CHOISEUL & SHORTLAND ISLANDS
LOCATION MAP
PAPUA NEW GUINEA
OEMA
Buin
FAURO
ALU
SHORTLAND ISLANDS
MONO
CHOISEUL
Panggoe
Sasamungga
VAGHENA
GHAGHE
Kia
BARORA ITE
Filuo
SANTA ISABEL
VELLA LAVELLA
MBAVA
RANONGGA
Gizo
SIMBO
VONAVONA
KOLOMBANGARA
NEW GEORGIA
Munda
NEW GEORGIA ISLANDS
Hopongo
RENDOVA
TETEPARE
VANGUNU
NGGATOKAE
NEW GEORGIA SOUND
SAN JORGE
Tatamba
DAI
RAMOS
Malu'u
SIKAIANA
Dala
Auki
MALAITA
INDISPENSABLE STRAIT
FLORIDA ISLANDS
RUSSELL ISLANDS
MBOROKUA
SAVO
Yandina
Tulaghi
Manawai
Maravovo
Tetere
HONIARA
Tangarare
RUA SURA
Maka
Apio
MARAMASIKE
ULAWA
GUADALCANAL
Inakona
Avu Avu
SOLOMON SEA
SOUTH PACIFIC OCEAN
Heuru
UGI
THREE SISTERS ISLANDS
Kirakira
SAN CRISTOBAL
Hauraha
SANTA ANA
BELLONA
Hatanggua
RENNELL
Miles 10 0 50 100 Miles
10 0 50 100 Kilometres
156°
157°
158°
159°
160°
161°
162°
7°
8°
9°
10°
11°

Text Map 15

LOCATION

The mainland of Choiseul occupies an area of 3 208 km^2 and extends for a distance of 185 km along a north-west to south-east axis: Vaghena and adjacent islands provide an additional 86 km^2 in the south-east in the form of an archipelago of slightly raised reefs. This group of islands lies between 156° 23' and 157° 53' E, and 6° 35' and 7° 32' S (Text Map 15). To the west and separated from Choiseul by the Bougainville Strait are the scattered islands of the Shortland Group, Mono, Alu and Fauro, which together cover 420 km^2. Mono at 156° E is the most westerly of the Solomon Islands.

PHYSIOGRAPHIC REGIONS

Choiseul is a structurally complex island with a lithological pattern which is similar in part to that of Guadalcanal and Malaita. It has been intensely faulted and has a prominent fracture pattern although folding has not been important. The underlying basement rocks are pre-Tertiary metamorphics which originated as basaltic or andesitic lavas and pyroclastics. They outcrop chiefly as blocks in central and eastern areas;overlying the basement rocks in many areas are the thick Vosa Lavas, consisting of mixed andesites and basalts with some doleritic intrusions. These in turn are capped by sediments of Lower Miocene age which range from gritstones to limestones and occur mainly in west-central areas. In the east,and probably predating these early sediments,are distinct, fault-bounded areas of flat-lying ultramafic rocks provisionally dated as Upper Oligocene. Later sedimentation in the Middle and Late Tertiary was concentrated in western Choiseul forming well-banded tuffaceous greywackes, marls and siltstones. Contemporaneous or younger offshore reef limestones have been uplifted in several areas in the west and andesitic Quaternary volcanics have been laid down from Mt Maetambe and Kumboro Peak. Reef formations at the eastern and western extremities have been raised slightly above sea level.

Fauro in the Shortland Islands is part of a caldera rim of Pliocene or younger age, comprising mainly andesitic lavas, tuffs and agglomerates. Alu consists of a volcanic basement in the north faulted against Late Tertiary tuffaceous sandstones, calcarenites and limestone in the south-centre. The extreme south is formed of slightly elevated young reefs and modern alluvium. Mono is similar to Alu in having a volcanic basement, although exposed only in the south-east, capped by tuffaceous siltstones and limestones. Smaller islands and islets in the Shortland Group are predominantly volcanic.

Some of the islands of the Shortland group are too small to have developed distinctive physiographic regions and to facilitate the following discussion these have been grouped into a larger physiographic region (Separate Map 6a).

The physiographic region is simply a discrete area unified by the altitude, disposition and character of the land, and commonly drained by a single main or few major rivers. That the underlying rocks, the soils, forest types and land use are often uniform throughout the region is largely incidental. The land region, with which the physiographic region can be confused, is described in Part 3. It is characterised by a uniform lithology and as such is usually dispersed and not present in any one area. These concepts are differentiated more fully in Volume 1.

Choiseul

1. Eastern islands

This is a region of small isolated reefs, an emerged atoll (Stereopair 6.7) and the island of Rob Roy with a submerged coastline. The total area is approximately 210 km^2. Apart from the central peak of Laena which attains 200 m, the highest parts, along the axis of Rob Roy Island, reach 150 m, while Vaghena and adjacent islands do not exceed 40 m. The region is therefore characterised by low-altitude ridges and hills, low terraces and sea level islands and islets.

Rob Roy and Laena Islands are underlain by basic and ultramafic volcanics which form ridges and low hill-with-spurs systems. Fine grained, calcareous sedimentary strata occur beneath islands and promontories to the south with a topography of disconnected, swamp-separated hills. In the east are limestones and widespread contemporaneous reef growths. Terraces and parallel ridge patterns are found over the limestones while young, coarse sediments and peats form the bands of alluvium fringing the larger islands and make up the newer lagoonal and offshore islands.

There is no coherent drainage system. The region is unified simply by the abundance of low-lying islands and promontories in a shallow sea area.

II. Eastern ridges

This region of 180 km^2 consists essentially of a block of high, rounded ridge systems developed from ultramafic rocks, with inclusions of lower ridges over Basement schists. In the east, the young volcanic peak of Kumboro rises to 600 m in the classic conical shape (Stereopair 6.8). The ultramafic ridges have an altitude of 200-600 m and are unusual in the Solomon Islands in being little dissected. The rolling crests have many gently convex, rounded slopes separated by shallow valleys. Some valleys however, are deep and steep-sided, specifically those near to the coast and adjacent to the fault-bounded inclusions of schist. These latter areas contrast with the former in consisting primarily of low, sharp-topped, short ridge systems.

The drainage system is sparse but varies in character. In the east is a small radial net around Kumboro Peak, while the remainder appears superficially to be dendritic but with common angular segments. Valleys are moderately well developed in south-draining systems and tend to be swampy at the coast. To the north there is little alluvial deposition and the coastline is relatively smooth and free of reef formation.

III. Eastern lowlands

The wide, swampy Oaka Valley which drains this small low-lying area of 140 km^2 almost bisects the island, as the headwaters are only separated from Kila Bay by one 25 m-high ridge (Separate Map 6b). The hills and short ridges forming the lowlands are mostly lower than 300 m with crests less than 60 m above adjacent valleys. They are also weakly orientated and in some areas produce a distinctive ripple-like pattern on air photographs. They are underlain by Basement volcanics possibly with ridge cappings of younger sediments.

The Oaka River system unifies this region as the only divergent drainage is that of a few small streams draining north to Ologholata Harbour. Submergence of the southern and northern coasts is evidenced by drowned valleys, highly irregular shore-lines and scattered offshore islands. The boundary with region II is marked by a major fault system and it seems probable, therefore, that the region occupies an area of downward block movement.

IV. East-central highlands

The long volcanic ridges of this region form a compact, rugged block of 510 km^2. They are aligned north-west to south-east, parallel to the main axis of the island, except around the deeply eroded volcanic core area of the upper Ndoroko River and Mt. Keleve. In places the ridges rise to 800 m and enclose small hilly basins. The amplitude of relief exceeds 150 m, locally reaching 400 m (Stereopair 6.5), and typically the ridge slopes are steep, unstable and rocky.

The angular drainage pattern is well developed with the headwaters being strongly orientated north-west to south-east while larger streams and rivers tend to break through the ridges at right angles towards the coast. Lower valleys are moderately wide and swampy. The coastline is irregular with several offshore islands. Reef development is not extensive except around these islands.

PLATE 6-1 Drowned cockpit karst at Poro, west-central Choiseul: amplitude of relief approximately 40m

PLATE 6-2 The Mbina Land System of eastern Choiseul with specialised lowland forest vegetation. In the foreground and middle distance *Dacrydium xanthandrum* emerges above a fern-rich ground cover while in the background it is co-dominant with *Casuarina papuana*

V. Maetambe volcanic centre

This area of 290 km^2 consists of the main breached cone of Maetambe Volcano, whose rim reaches 600-1 000 m, and its associated strongly dissected debris slopes. The volcanic material is lightly eroded around Ghaghara. Ridges radiate from the crater and tend to be unstable and narrow except to the north where an extensive subregion of rounded, low-amplitude ridges occurs (Stereopair 6.6) and in the smaller Ghaghara area. A major fault separates this region from the east-central highlands.

The drainage pattern is simple and radial with deeply incised streams away from the coast. Near the coast,valleys widen rapidly and there is an almost continuous line of swampy valley mouths separated from the sea by narrow sand beaches. The coastline is relatively smooth and free of reef except for the extreme north.

VI. Southern karstlands and ridges

There are three separate areas of karst in the 220 km^2 of this region. Each comprises extensive blocks of limestone that have been tilted south-eastwards to form a submerged, ria-like coast, rising gradually inland to heights of 400-800 m. They are typical examples of cockpit karst with numerous, weakly patterned, short, lumpy ridges or low conical hills separated by shallow, concave, dry valleys. Limestone outcrops are widespread and the margins of the blocks are marked by steep to cliffed slopes (Stereopair 6.5).

Inland is an area of generally low hills and ridges in the lower valleys of the Vurulata, Kakaza, Manggo and Rarapa Rivers (Stereopair 6.1). It extends behind the karst and forms a low-lying zone south of regions IV and V. The altitude is usually less than 250 m with individual ridges rising to 400 m. The underlying rocks are a mixture of old volcanic material and younger arenaceous sediments in the less-dissected land. The drainage pattern is dendritic with only the main rivers occupying floodplains.

The karst blocks separate two major bays which form the foci of the main drainage systems. The bays are formed by narrow sand beaches backed by extensive swamps joining the lower river valleys. Modern reef fringes the coast.

VII. Central plateaux

This is a composite region of 480 km^2 in which several subregions may be distinguished. The central feature, however, is the presence of medium-altitude plateaux which are best developed in the headwaters of the Vuruleke, Manumanu and Nonggiro Rivers where they range in height from 400 m in the south-east to about 600 m in the north-west. They consist of an extensive,featureless to lightly dissected landscapes of low hills and ridges having an amplitude of 40-100 m and merging in places with high-level valleys (Stereopair 6.4). They are commonly bordered by distinct escarpments. Apart from two or three main areas there are several smaller disconnected blocks, occupying watershed positions among more strongly dissected ridged landscapes. The plateaux appear to belong to one major surface which once extended over the whole of this region. Subsequent river erosion has reduced the plateaux, especially in coastal areas. Subsidiary, lower levels appear to the west. It is assumed that the underlying rocks are a mixture of Basement volcanics and younger,possibly tuffaceous,sediments.

The northernmost area comprises steep-sided, narrow ridges overlying basement volcanics with ridge crests reaching an altitude of 400-600 m. This type of ridged landscape appears wherever the plateaux have become dissected. There is an exception to this however, in the lower Vuraleke-Koloe Valleys, where east-dipping, arenaceous sediments have formed rather weakly defined cuestas centred on a large bay. This is the only part of the region where there are extensive swamps and floodplains.

The headwaters of all the large rivers of central Choiseul drain parts of this region and almost all the valleys are narrow with minimal floodplain development. The northern coastline is relatively smooth and hilly but there are a few small bays, sand spits and headlands. Reefs are developing some 1-4 km offshore.

VIII. Central ridges and hills

This is an area of mixed high ridges, lower hills and basins together totalling 580 km^2. To the south is a distinct block of high, long and narrow ridges,reaching an altitude of 500-800 m and with residual limestone capping some of the highest summits. Rivers in this area are deeply incised, boulder-floored and structurally orientated.

The middle and lower Kolombangara River basin forms a subregion of lower ridges, hills and alluvial plains (Stereopair 6.4). They have developed over mixed sedimentary and volcanic rocks and have a maximum height of around 200 m. Moderately dissected hills with moderate slopes are interspersed with more strongly sloping blocks of narrower ridges. A wide floodplain with low terraces has developed in the lower reaches of the Kolombangara River.

A third subregion in the north-west comprises a compact block of higher ridges. With a maximum altitude of 400-500 m, the ridges have steep, unstable slopes characteristic of landforms developed from old volcanic rocks. Rivers and streams are deeply incised and there is no floodplain development.

The coastline, although not endowed with large bays, headlands and offshore islands, is slightly irregular as though nearing a stage of relative stability after recent slight submergence. The shoreline consists of long, narrow beaches separating shallow but extensive freshwater swamps from the sea at the mouths of the larger rivers, and fringing triangular riverine alluvial land at the mouths of smaller streams. There is no visible offshore reef development.

IX. Northern karst and hills

The region, which covers an area of 700 km^2, is underlain by lime-rich rocks ranging from limestone to calcareous sandstones and marls. There are few areas of volcanic rocks. A number of subregions can be distinguished.

In the south from the upper Vachö River to the coast between Ghazalata and Vangavanga is an area of low rolling hills interspersed with small blocks of low ridges and karstic scenery (Stereopair 6.3). It is drained by the Mbareghosongga, Vangamole and Pavora Rivers. Inland it barely reaches 400 m altitude, while nearer the coast most land is lower than 250 m.

North and east of the subregion the land is dominated by limestones and karstic topography. This area also attains 400 m maximum altitude but, because surface drainage is less and river erosion less effective, there are large areas of undulating or rolling hills with gentle to moderate slopes interspersed with rocky outcrops and gorge-like valleys. The Vachö is probably navigable by small boats for the longest distance of any river in the Solomon Islands and drains the majority of the subregion. In its upper course it has cut down through limestones to expose arenaceous sediments. The karst centred around Mt Talaevondo is outstanding in terms of its physical development and forms its own microregion.

The land in the extreme north forms a low-lying subregion of rolling hills, karst plains, terraces and swamps. The highest points are at 200 m but most land lies below 100 m and substantial coastal tracts are within a few metres of sea level. An important feature of this area is the presence of a low-lying corridor between Choiseul Bay and Chirovanga. The extensive terrace at this tip of Choiseul echoes that at the other extreme of this island group on Vaghena Island.

The coastline of the region has built up substantially in recent times as seen by extensive mangrove swamps, freshwater swamps and young, onshore reef formations. Offshore reef occurs in most areas, with noticeable gaps facing major rivers such as the Vachö. There are incipient lagoons at Choiseul Bay and along the north-east coast.

Shortland group

X. Fauro, Alu and nearby islands

This island group of 340 km^2 is widely scattered but in the regional sense forms a disparate unit off the southern coast of Bougainville Island. The islands lie in a shallow sea and, although varying greatly in size, have a number of features in common.

Fauro is a long hilly island with steep volcanic ridges rising to a maximum of 600 m. There are few streams, no rivers and the coastline is mostly bounded by reef, as are the neighbouring smaller islands.

Alu is a lower, more compact island. The interior hills comprise a belt of karst, a low plateau-like area of rolling hills and low ridges to the north, none of which exceed 150 m in height. The southern coastal lands consist of low terraces merging into swamps. There are a few short streams but no rivers and again there is considerable development of onshore and offshore reef. Some adjacent islands are formed entirely of reef or reef detritus.

XI. Mono

This isolated island of reef and sedimentary rock has been tilted northwards so that flights of terraces grading to cuestas rise from sea level to 320 m in the south. Deep erosion at the southern coast has exposed an area of steep volcanic ridges (Stereopair 6.2). Stirling Island consists of a raised reef platform. The combined area of the two islands is 80 km^2.

LANDFORMS

There is a great variety of landforms in Choiseul and the Shortland Islands,largely because of the wide range of rock types (Figure 6.1). Volcanic rocks are predominantly andesitic, basic or ultramafic varying in age from Early Tertiary to Pleistocene and include both extrusive pyroclastics and lavas. Sedimentary rocks vary both in grain size and calcium content,having been deposited in terrestrial, estuarine and marine environments. Continuing structural and eustatic movements have contributed to the formation of many landforms with block faulting being particularly significant. Vulcanism is no longer active but has been in the recent past. The erosional processes vary from place to place but the intensity of erosive agents does not differ greatly.

The distribution of the main landforms is shown in Text Map 16, from which it can be seen that landform boundaries are the basis of units in the land system and soil maps. Definitions of landform parameters can be found in Appendix 2.

High ridges

This unit mainly comprises high ridged land, predominantly underlain by volcanic rocks with less extensive areas of arenaceous sediments. Calcareous sediments may occupy some ridge crests.

Figure 6-1

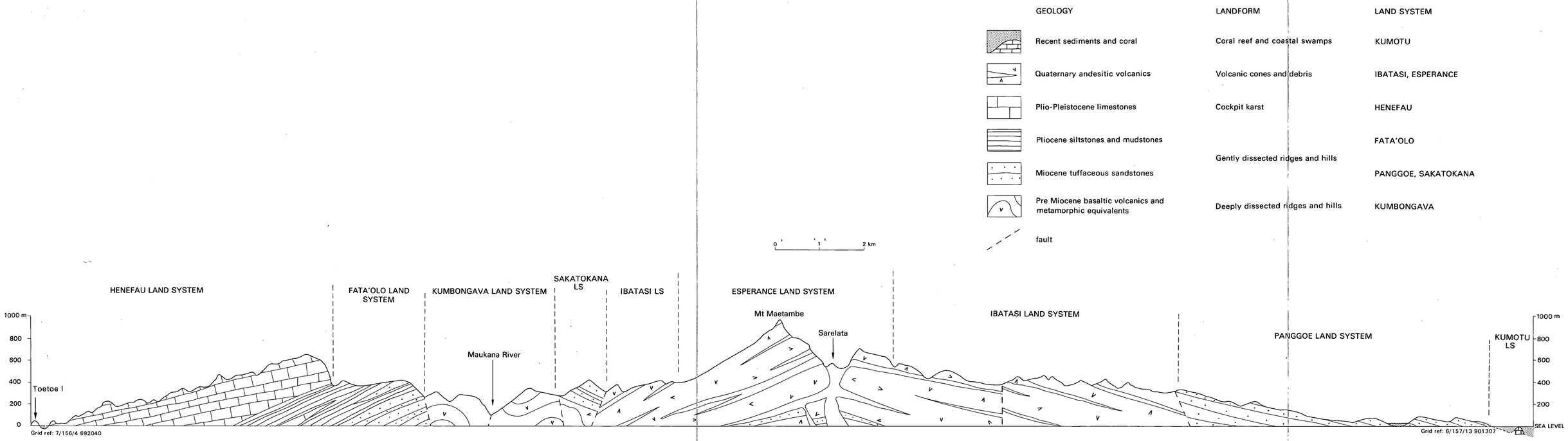


FIGURE 6-1 Cross-section of central Choiseul showing inferred relationships between land systems, geology and landforms

D.O.S. 3218L

Prepared by the Directorate of Overseas Surveys, 1977

LANDFORMS

1:500,000 Solomon Islands

CHOISEUL AND SHORTLAND ISLANDS

TEXT MAP 16

1 High ridges
2 Rounded ridges
3 Young Volcanic centres
4 Hilly plateaux
5 Low hills and ridges
6 Cuestas
7 Karstic areas
8 Karst
9 Terraces
10 Fluvial plains
11 Swamps
12 Littoral landforms

Road

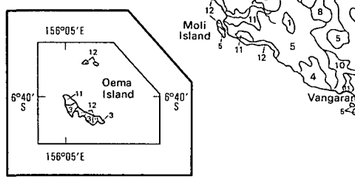
156°30′E 157°00′ 157°30′

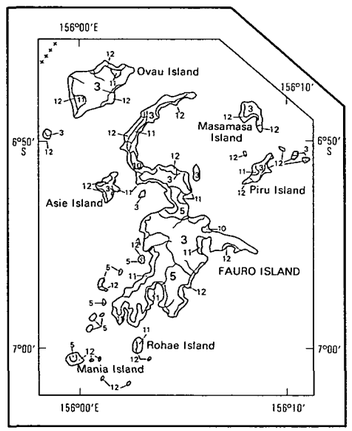
7°00′S 7°30′S

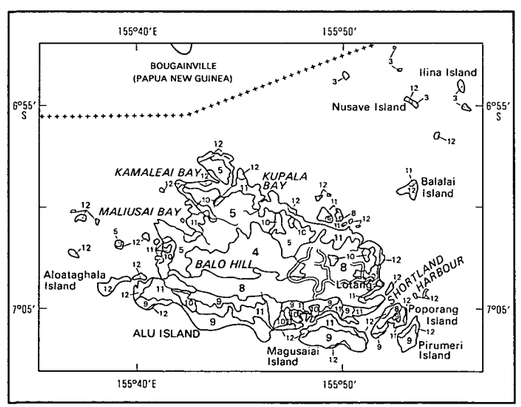
SOUTH PACIFIC OCEAN

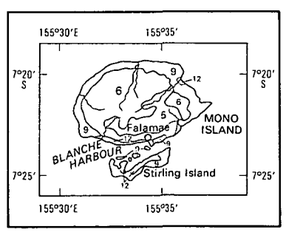
SOLOMON SEA

PEMBA INLET
Chivoko
Chirovanga
Vuranggo
Masabrara
Poroporo
Kondakanimboko Island
CHOISEUL BAY
Taro Island
Mt TALAEVONDO
Nukiki
Ghazalata
Moli Island
Sharubaruba
Pupuku
Bakolo
MANUMANU BAY
WANANGO HARBOUR
Vangaranga
Lukuvaru
Panggoe
Sasamungga
Malangoro
Mboe
Sarelata
Mt MAETAMBE
Ghaghara
Ndazara
Kakalokasa
Ndungurava
Katurasele
SISIATA BAY
Varungga Point
Zambanayarungga
KILA BAY
LUTI BAY
Sumbi Point
MANGGO BAY
Mt SAMBE
Zongga
Poro Island
Mt KELEVE
OLOGOSOSA HARBOUR
OLOCHOLATA HARBOUR
KUMBORO PK. 602m
Laena Island
Mt SISIRIPUTU
PISUKA BAY
Rob Roy Island
VAGHENA ISLAND
Mboemboe
Ndololo Island
NGOGOSIPE PASSAGE
ORA PASSAGE
HAMILTON CHANNEL
Ararik
Nikomaroro
NEW GEORGIA SOUND









Scale 1:500,000

Miles 5 0 5 10 15 Miles

Kilometres 5 0 5 10 15 20 Kilometres

Prepared by Directorate of Overseas Surveys, 1977. Published by the British Government's Ministry of Overseas Development (Land Resources Division).

D.O.S. 3218K

The highest ridges are those of central (Stereopair 6.5) and southern Choiseul whose summits commonly exceed 600 m and locally attain 720 m. These have developed from extensively faulted Tertiary basaltic volcanics. They are characteristically long, straight and narrow with amplitudes of 100-300 m: slopes are mostly steep, unstable and extensively gullied. Lower ridges extend from this higher land into north-central and eastern Choiseul. Ridges underlain by sedimentary rocks tend to have more rounded summits and less uniformly steep slopes, although cliffed segments are not uncommon where strata outcrop or where large streams are deeply incised.

Slope lengths range from ultra-short to long and their shape from straight to convex or irregular; large, concave slope segments are rare. Lower slopes are commonly steepest adjacent to large streams and gullies, as a result of an overall high stream density and activity in a region of high rainfall. Upward movement of blocks of land increases the ability of streams to erode vertically. Microrelief features range from those due to outcropping rock, to tree-fall scars and terracetting which results from surface wash. Spurs are features of this landform and mostly originate close to major ridge crestlines: they tend to have moderate to steep profiles and are separated by steep-sided gullies.

Valleys are invariably narrow-floored,with irregular or stepped gradients caused by rock outcrops. Bouldery floors occur in gullied headwaters but downstream, gravels and sands are more common. Lateral river erosion is restricted to land near the coast, but floodplains rarely exceed 300 m in width. The smaller streams and gullies appear to have many straight segments that are structurally controlled. Larger rivers, however, are less strongly influenced by faulting.

Rounded ridges

As in other parts of the Solomon Islands rounded ridges are mainly associated with ultramafic rocks and in this island group such rocks are confined to south-east Choiseul. They are pre-Miocene peridotites forming a tabular or sheet-like layer with boundaries marked by fault lines. Block faulting has exposed windows of Basement schists (Stereopair 6.8).

Typically the crests are moderately even in height at 400-600 m and contain both distinctly rounded (Figure 6.5) and narrower ridges and small rocky peaks. There is no particular orientation. The crestal areas are predominantly convex in shape and form rolling summit areas which extend up to 1 km in length before being interrupted by a valley system. Ridged crests occur in places, notably where deeply eroding streams lie close together and where broader summits have been removed by erosion. The rocky peaks occur in a random fashion and give a somewhat lumpy or pustular appearance to parts of the landscape. They are most common on upper slopes or crests and have dimensions of 100-200 m length and up to 40 m breadth and height. The general amplitude of the ridges is in the order of 200 m.

Upper and middle slopes (Plate 2) are characteristically gently convex to straight, very long and separated abruptly from lower slopes which are shorter, steep and straight. The latter are produced by powerful stream incision and are marked by tree-fall scars, rocks and debris slides. Elsewhere, surface wash is the only evidence of erosion but even this is minimal due to a cover of deep, friable, well drained soil. Narrow ridges are flanked by straight, moderately steep slopes.

Narrow, incised, deep valleys are typical of the margins of the areas, but inside, these are interspersed with shallow valleys and only lightly incised, even sinuous streams in some headwater areas (Stereopair 6.8): these are locally associated with minor concave slope segments. Valley alignment is not closely controlled by structural features. Valley floors are rocky with little or no floodplain development. Gullies are not as extensive as in other landforms and where they occur are shallow: similarly, spur development is minimal.

Young volcanic centres

Northern Fauro is believed to be a large drowned volcano and there are four recognisable volcanic centres on Choiseul. They are of Pliocene origin although some may still have been active in Quaternary or Recent times. The material erupted is mainly andesitic pyroclastics with subsidiary lavas. The craters can be distinguished from each other by detailed landform analysis but there are several common features.

The volcanic centres are of the strato-volcano type (Ollier, 1969), owing their origin to successive explosive eruptions. Each has a single main vent although Laena might be considered a subsidiary cone on Kumboro's lower, drowned flanks. The craters have all suffered some degree of erosion so that their rims are of uneven height (Figure 6.1) and breached by the headwaters of rivers. Laena crater is compact and is the lowest volcano, reaching only 200 m. In contrast the presumed crater or caldera of Fauro volcano measures some 8 km in diameter, although the relic rim is generally less than 200 m high and only in the south attains 350 m. Kumboro Peak and Keleve reach 600 m while parts of the rim of Maetambe almost reach 1 000 m.

From the narrow, uneven rims the inward slopes of the original crater tend to be steep, unstable, stony and straight. The outer slopes range from steep to gentle depending on the degree of dissection by streams. Only Maetambe and Kumboro retain relatively little dissected debris slopes but these are restricted to areas far from the high centres (Stereopairs 6-6 and 6-8). Streams radiating from the peaks have eroded deeply into the pyroclastics forming steep-sided valleys and knife-edged ridges. With increasing distance from the peaks the gradient decreases and vertical erosion decreases; as a result long, narrow, triangular areas of uneroded land remain, particularly in the vicinity of Ghaghara.

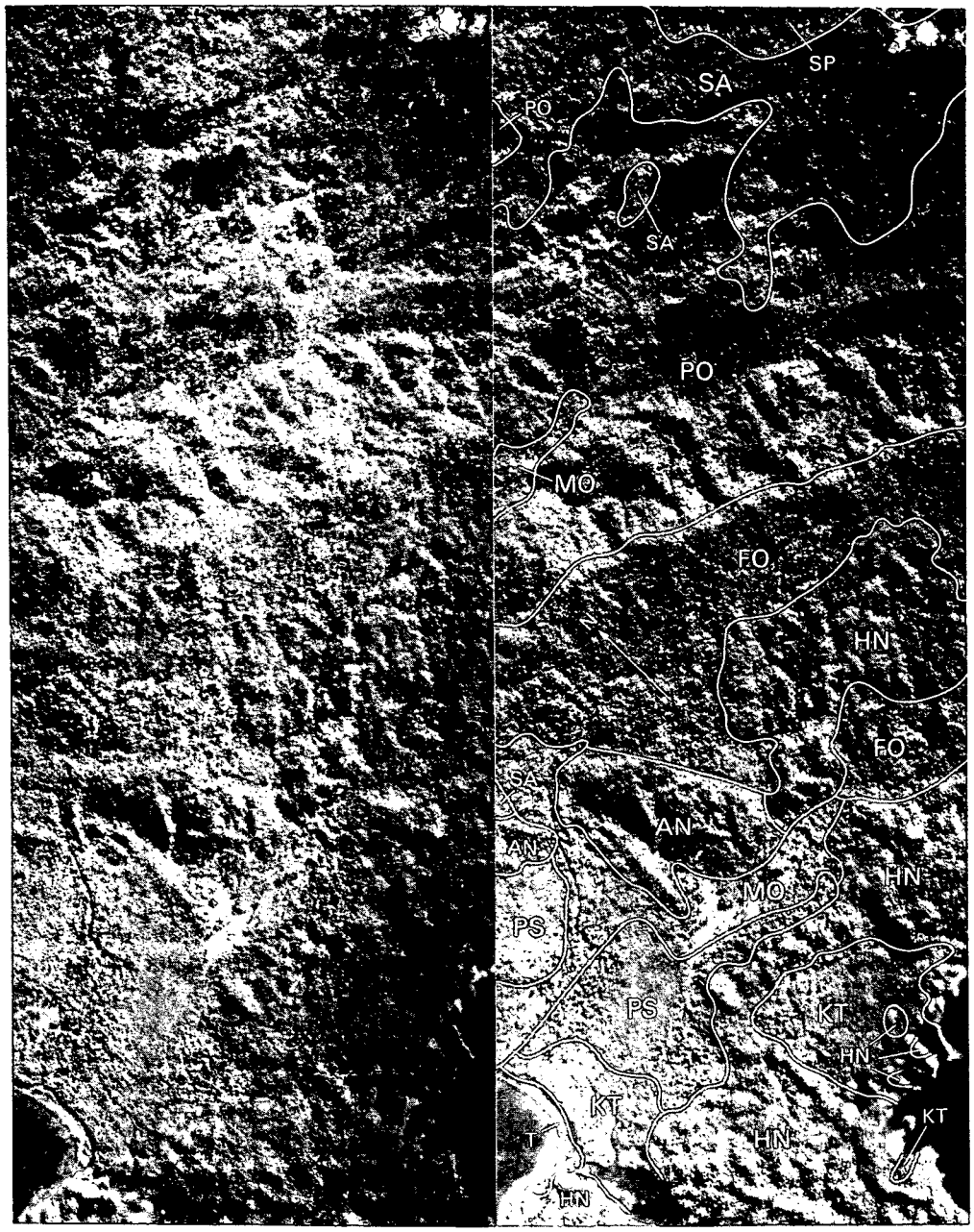
Valley floor development is poor and only at the coast are the beginnings of floodplains identifiable. The largest of these are occupied by swamps.

Hilly plateaux

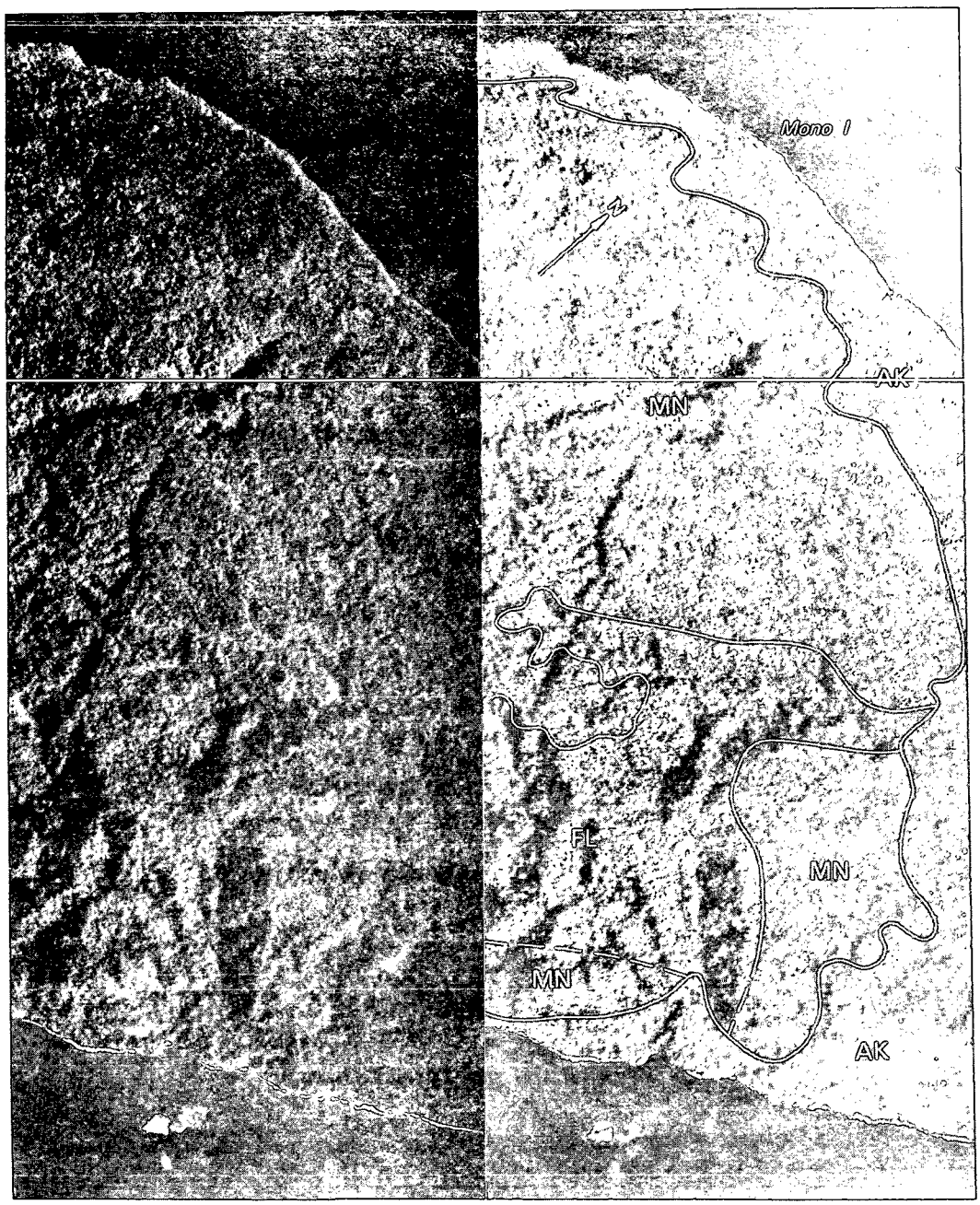
East-central Choiseul was formerly occupied by an extensive, moderately high plateaux of low hills and ridges, 400-600 m high. It has since been eroded by rivers eating back from the coast and is separated into several large and small areas. Almost all areas are bounded by abrupt breaks of slopes against a lower, strongly ridged or hilly landscape (Stereopair 6.4). The underlying rocks are a mixture of Early Tertiary volcanics capped by Middle or Late Tertiary coarse sediments. The plateaux surfaces consist of low amplitude, 20 to 60 m-high hills and short ridges with narrow crests and moderately steep slopes: they are locally gullied and have irregularly sloping flanks. The ridges and hills have no pattern. Valleys are numerous and in places develop small floodplains, even swamps, but in the main the streams have little lateral development.

A similar but lower plateaux is found on the island of Alu. It occurs in the centre as a compact area of rolling hills and wide valleys at an altitude of 90-140 m. They have an amplitude of less than 30 m with ultra-short, gentle to moderate slopes with both convex and concave segments. A few gullies occur with steep, unstable slopes adjacent to the gully floor. Valleys tend to be wide and ill-defined giving no discernible pattern on air photographs. Small swamps were noted locally. The rocks beneath the plateau probably consist of Tertiary sediments overlying an andesitic volcanic base.

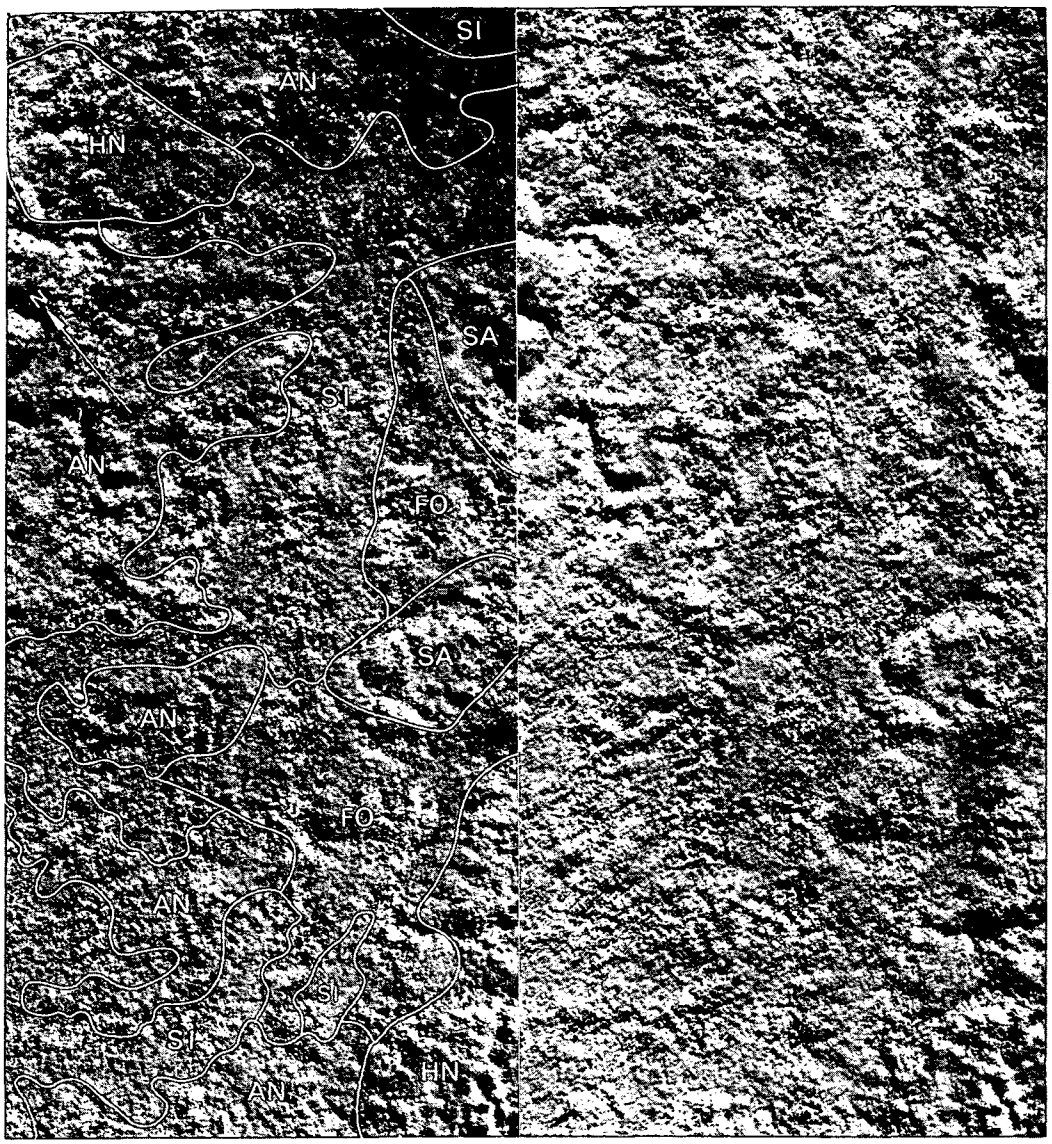
In south Choiseul, flanking the Oaka Valley, is a low-lying area of ridges which, in several places, contain weakly-dissected summit areas of low hills or ridges at 100-200 m. The Basement rocks are schists and less altered volcanic material but there is evidence of coarse tuffaceous sediments (Coleman, 1960) which are believed to underlie the plateau-like areas of this region. The ridges are mostly short with an even profile and narrow crests. Their flanks are ultra-short and irregular with common slumps and gullies. The amplitude of relief is 20-40 m. The ridge pattern is ripple-like and the drainage pattern is dendritic.



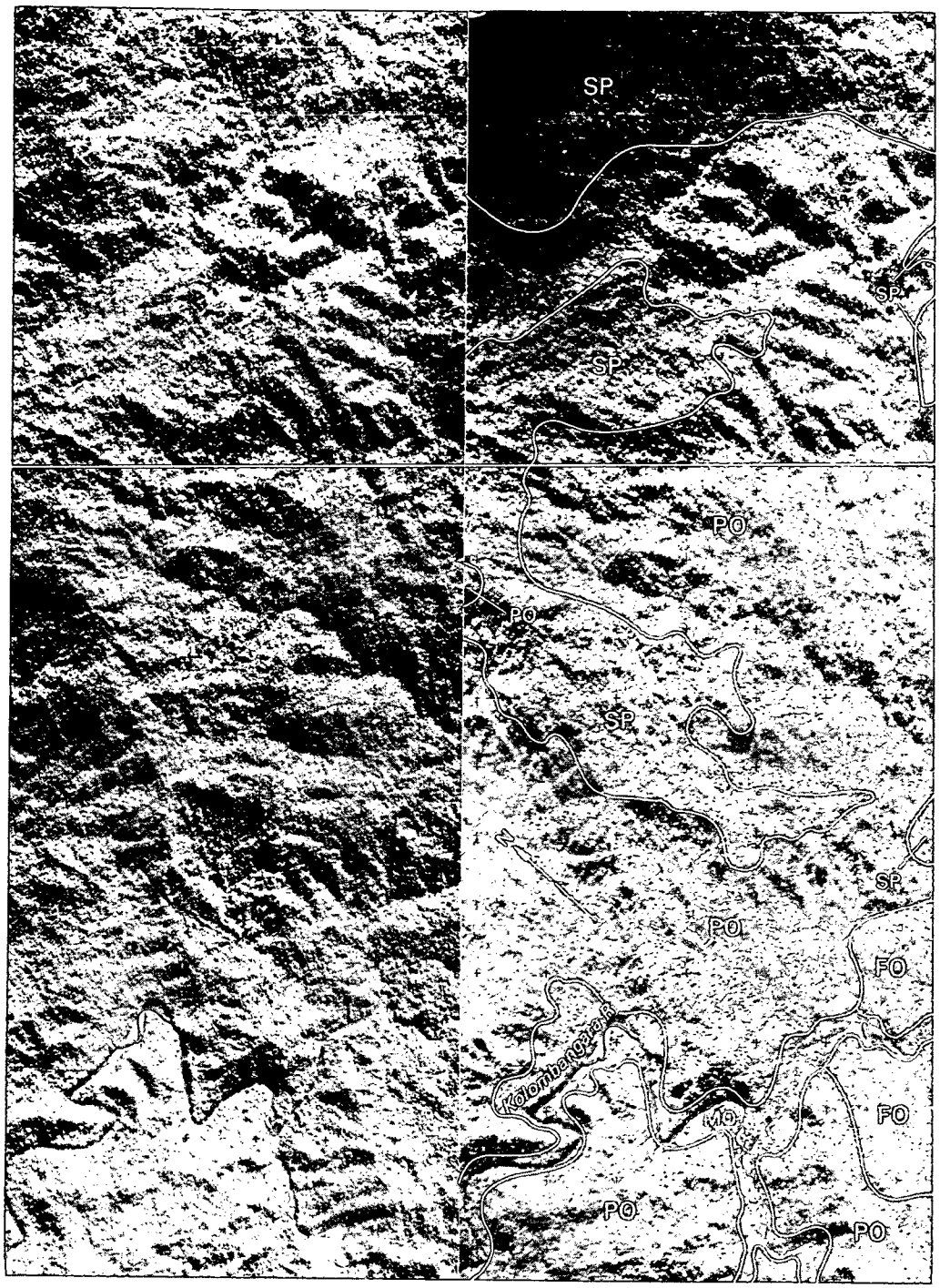
STEREOPAIR 6.1 An area of mixed geology in which limestones are predominant in the south forming partly drowned cockpit karst of the Henefau (HN) Land System. Northwards, Fata'olo (FO) LS, fine-grained calcareous sediments form rolling hills separating the HN and Andi (AN) LS limestones. Sakatokana (SA) LS occupies summit areas in the north: it is derived from arenaceous sediments and has been eroded in central areas to reveal basaltic ridges of the Posarae (PO) LS. Pusuraghi (PS), Tenaru (T) and Kumotu (KT) LS form the coastal plain while Manggo (MO) LS alluvium fills the valleys. Approximate airphoto scale 1:60 000.



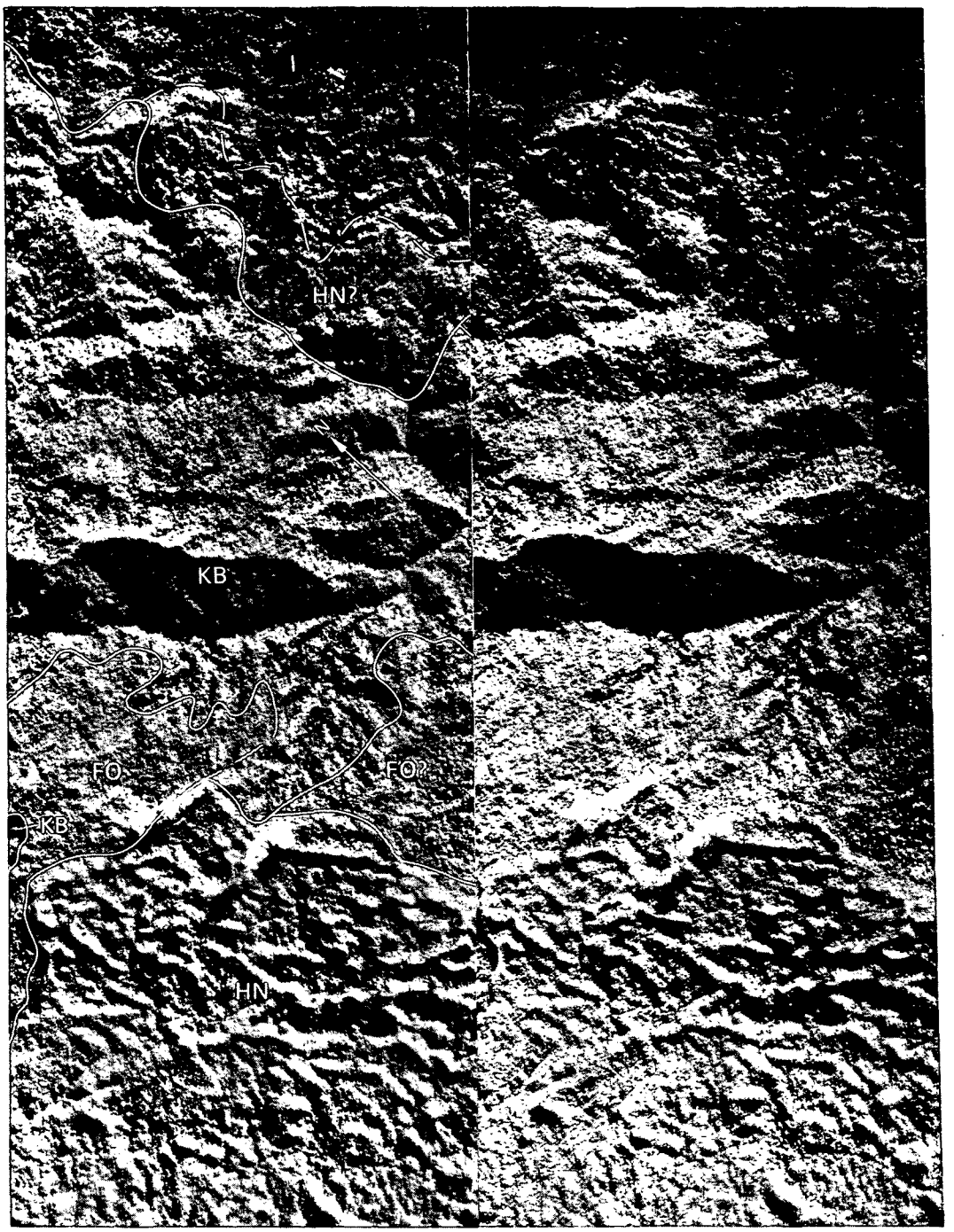
STEREOPAIR 6.2 The island of Mono consists of raised and tilted beds of limestone and fine-grained calcareous sediments (the Mono (MN) Land System), which have formed stepped platforms or terraces. The coast is fringed by a recent coral terrace, the Alokan (AK) LS, while in the south vigorous stream erosion has exposed basaltic rocks of the Falamae (FL) LS. Approximate airphoto scale 1:66 000.



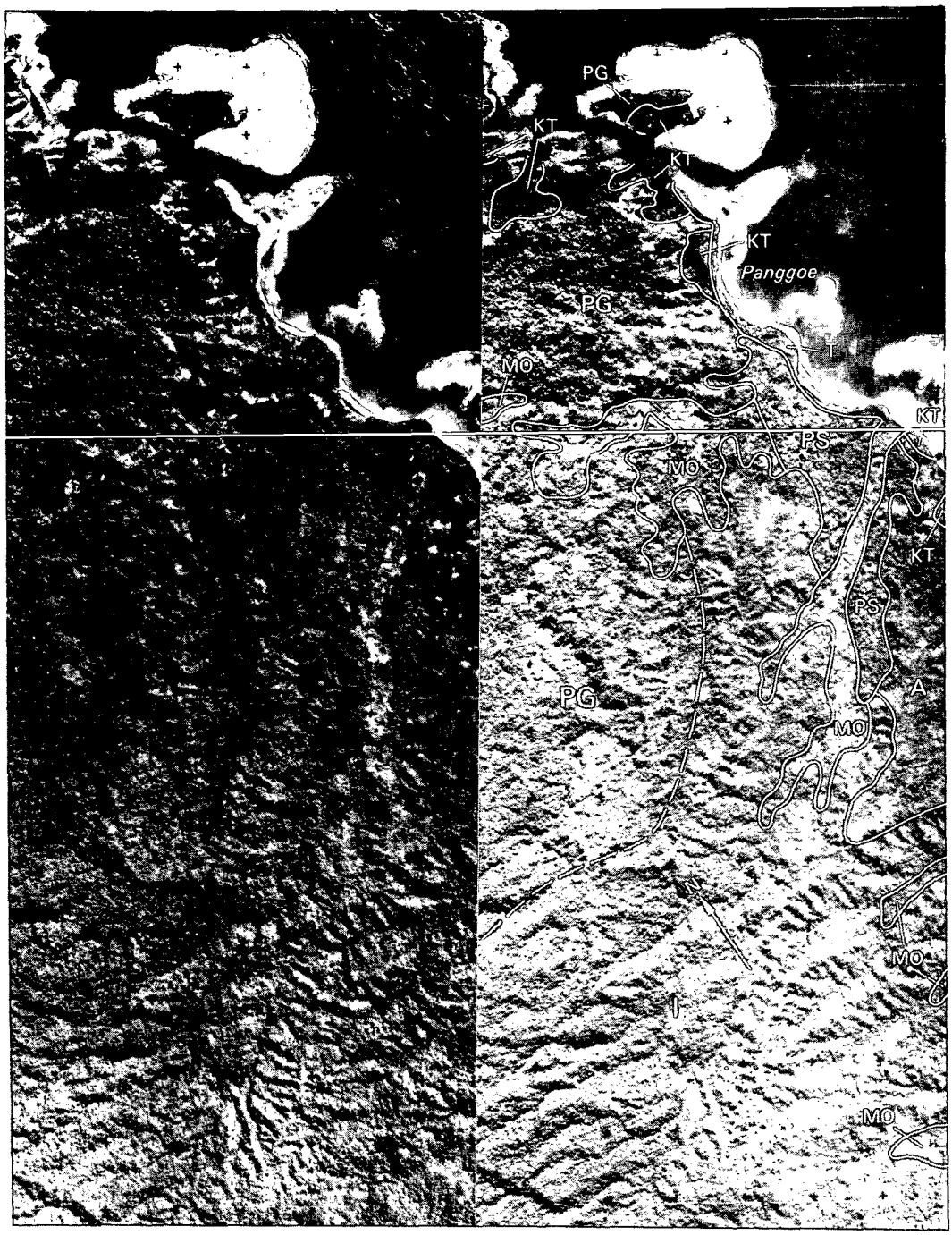
STEREOPAIR 6.3 This stereopair of north Choiseul is of an area underlain almost entirely by limestone or calcareous, fine-grained sediments. The Henefau (HN) Land System forms cockpit karst while the impure limestones beneath the Andi (AN) LS form less developed karstic hills. Fata'olo (FO) LS hills are lightly dissected and rolling in contrast to the steeper slopes of the Sakatokana (SA) LS, while Sui (SI) LS areas are linear depressions resembling valleys between the hills. The whole area is uncultivated. Approximate airphoto scale 1:60 000.



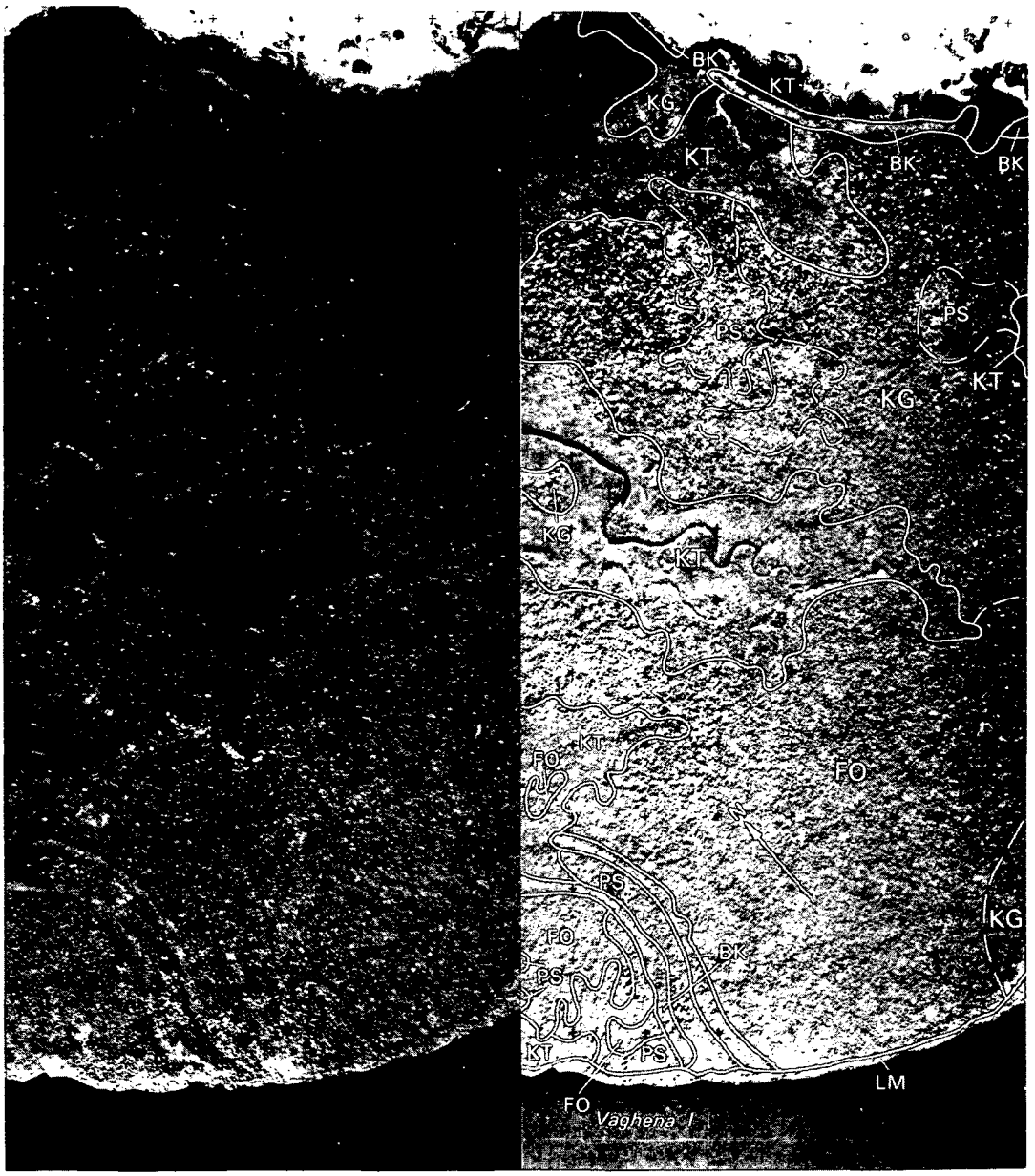
STEREOPAIR 6.4 This ridged landscape of north-central Choiseul, comprises mainly early Tertiary basalts of the Posarae (PO) Land System. Forming less strongly dissected summit areas, is the Sepa (SP) LS which may contain recent volcanic sediments. Close to the Kolombangara River is a narrow band of alluvium, the Manggo (MO) LS, and a small patch of Fata'olo (FO) LS calcareous sediments forming rolling low ridges. Approximate airphoto scale 1:60 000.



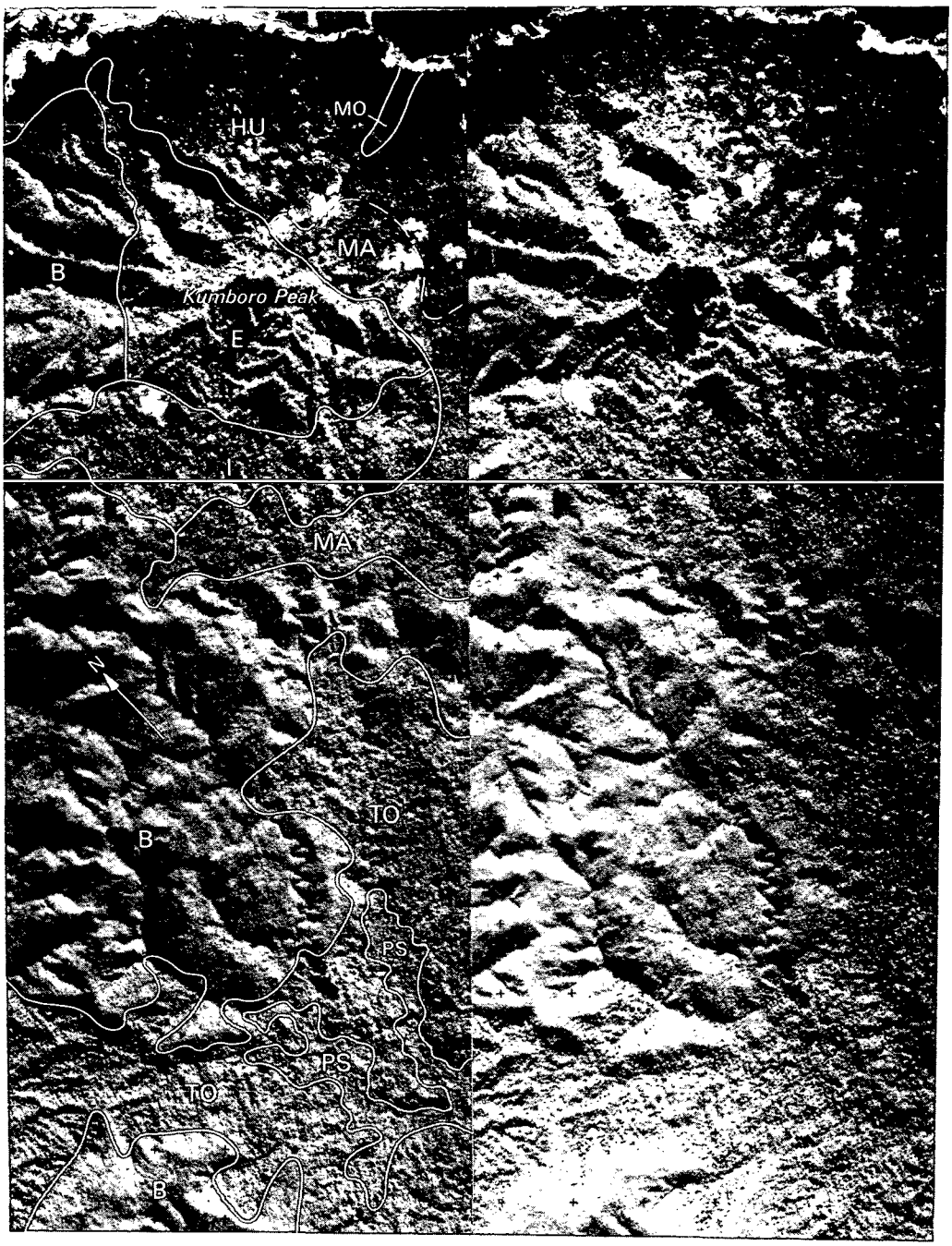
STEREOPAIR 6.5 The volcanic footslopes of Mt Maetambe in the north-east are marked by parallel ridges of the Ibatasi (I) Land System. These are separated from the massive ridges of the Kumbongava (KB) LS formed from metamorphosed basement rocks, by an inferred zone of limestone which reoccurs as clearly recognisable karst terrain of the Henefau (HN) LS in the south. Rolling hills and ridges of the Fata'olo (FO) LS occupy uneroded summit areas. Approximate airphoto scale 1:60 000.



STEREOPAIR 6.6 Tuffaceous sediments, derived from Mt Maetambe to the south, form the lightly ridged Panggoe (PG) Land System. Pyroclastics and lavas underlie the Ibatasi (I) LS and the small flat-topped hills of the Aruliho (A) LS in the east. Coastal parts are formed of narrow volcanic sand beaches, the Tenaru (T) LS,backed by shallow but extensive Pusuraghi (PS) LS swamps. The larger valleys are mapped as the Manggo (MO) LS while mangrove of the Kumotu (KT) LS forms tidal swamps in the north. Approximate airphoto scale 1:66 000.



STEREOPAIR 6.7 Vaghena Island is low-lying and contains large tidal mangrove swamps of the Kumotu (KT) Land System in the north and west which grade into small Pusuraghi (PS) LS freshwater swamps in the interior. Former fringing reefs have been uplifted and exposed as the Mbaeroko (BK) LS while the lagoonal sediments form either, almost level platform areas of the Kohinggo (KG) LS or, are eroded into low rolling ridges and hills of the Fata'olo (FO) LS. A low coral sand beach has developed as the Lomousa (LM) LS on the southern coast. Approximate airphoto scale 1:64 000.



STEREOPAIR 6.8 The underlying rocks are clearly differentiated through the vegetation and geomorphic patterns in this stereopair. Kumboro Peak is a recent but extinct volcano with andesitic, pyroclastics, and the Esperance (E), Ibatasi (I) and Malanjili (MA) Land Systems form a sequence of decreasingly rugged ridges radiating from the centre. The Huranja (HU) LS, a mixture of volcanic material overlying limestone forms the northern slopes and incorporates small swampy valleys of the Pusuraghi (PS) LS. The fine-grained vegetation associated with broadly rounded ridges of the Mbina (B) LS in the west is dominated by *Casuarina papuana* and *Dacrydium xanthandrum* and becomes heathlike in appearance where photo tone is lightest. This landscape is directly associated with a thrust-sheet of ultramafic rocks and where erosion has been effective, underlying metamorphic schists of the highly ridged Taora (TO) LS are exposed. Approximate airphoto scale 1:66 000.

Low hills and ridges

Forming this unit are a mixture of rolling hills and low ridges with a low amplitude of relief which mostly occur near sea level. They have developed from both sedimentary and volcanic rocks. At a larger mapping scale,landforms over the various rock types have been differentiated as the basis of land systems (Separate Map 6e). The unit can be considered essentially a low-amplitude version of the High Ridges.

In the east of Choiseul (Stereopair 6.8), and forming Rob Roy and parts of Vaghena Island (Stereopair 6.7) are extensive tracts of low hilly land which have developed from schist, basic and ultramafic rocks and Late Tertiary sediments. Their altitude is generally less than 150 m, rising in places to 240 m but their amplitude rarely exceeds 80 m and is commonly as little as 40 m; that of the sedimentary rocks is less than 40 m. The hills and ridges tend to have narrow crests and steep to moderately steep slopes of varied shape; lower segments tend to be steepest. Valleys are narrow and commonly swampy (Stereopair 6.1).

The lower Kolombangara River and coastal areas to the south comprise low hills and scattered blocks of higher ridges developed from old basaltic volcanic rocks (Stereopair 6.4). The general altitude of the land is less than 120 m with the more pronounced ridge systems locally reaching 300 m. Crests of hills and ridges are predominantly narrow and the slopes moderate to steep with irregularities caused by small gullies and slumping. The slopes are usually too short to have developed pronounced spur and gully systems. The Kolombangara River drains most of this area and has formed a wide floodplain, described under Fluvial plains below. Elsewhere, the tributaries and smaller streams occupy only narrow and rather stony valleys, although coastal valleys tend to be swampy.

In northern Choiseul a belt of low hills and ridges occurs between Choiseul Bay and Pemba Inlet. Although of low amplitude and with altitudes of 40-120 m they are narrow-crested and have irregular, commonly steep and unstable slopes marked by slumps. Lower slopes are commonly gullied.

The northern part of Alu Island and parts of southern Fauro with smaller islands between consist of low hills and ridges less than 150 m high. They are formed of volcanic rocks and are largely narrow-crested with steep or moderately steep, irregular slopes. The amplitude of relief is 20-50 m. Valleys are numerous but do not form part of a large integrated system, even in the larger areas of Alu. The smaller islands have virtually no surface drainage system and are fringed by coral reef.

Cuestas

This landform occurs in both Choiseul and the Shortland Islands but is less well developed than on Santa Isabel, for example. It only occurs in association with sedimentary rocks that have been tilted but not tightly folded; there must also be relatively hard or durable cap rock.

The northern two thirds of Mono Island consists of lagoonal and reef sediments which appear to have been raised at least four times and tilted to the north (Stereopair 6.2). The result is a flight of sloping terraces which can be considered as one large cuesta (Figure 6.2); that is a landform with long, gentle slopes opposed by steep, short slopes.

The character of the north-facing dipslopes of the cuesta vary with altitude. Near sea level the original limestone terraces are more or less intact and there are long, narrow and smooth surfaces bordering the north of the island broken only by a few large streams. Limestone outcrops at the coast,and faces the toe of each terrace step. With increasing altitude, however, the number of valleys increases and the depth and steepness of valley sides increases to become gorge-like. Gorges may be up to 100 m deep with precipitous limestone slopes. At levels of 200-300 m, the number of small valleys is such that smooth, undissected areas are rare and low, narrow and broad ridges are more common. These parts are probably not underlain by limestone. The drainage pattern is markedly angular throughout.

The scarps of the cuesta generally face southwards. They descend steeply into a strongly ridged landscape of volcanic rocks. Streams of this area rapidly eroding headwards into the cuesta by undercutting the relatively resistant cap rocks.

A small area of calcareous sedimentary rocks in the middle Kolombangara Valley has the form of cuestas. The escarpments are less than 100 m high and the dipslopes have been eroded into low rounded ridges with an overall gradient to the north-east. Limestone is the main cap rock. A small area of cuestas is also mapped west of the Manggo River occupying an extension to a tilted block of karst.

In the north-east the Vuraleke-Koloe Rivers drain towards a large bay. These are faced by the dipslopes of several small fragmented cuestas which are formed of arenaceous, gritty sediments capping volcanic rocks. Streams have destroyed much of their original form, however, and the dipslopes consist of many parallel shallow valleys and low ridges sloping seawards. Further inland these cuesta remnants merge with the Central Plateaux.

Karstic areas

The term 'karstic' embraces a number of landforms which at larger mapping scales could be distinguished. In addition, several of the cuestas described above could be termed karstic in that they overlie lime-rich rocks, have underground drainage and common dry valleys. Karstic landforms, therefore, include most of those which overlie calcareous sedimentary rocks, including impure limestones, and which have poorly developed features of karst landscape. They occur almost entirely in northern Choiseul.

The most extensive karstic areas of northern Choiseul may be termed rolling plateaux. They occur in three blocks; to the east and west of the lower Vachö and to the north of the Pachö River (Stereopair 6.3). Their altitude ranges from 80-120 m in northern coastal regions, increasing rapidly to 200-300 m in central-northern areas and rising gradually southwards, as though part of the same general surface, to isolated areas of 400-500 m. Within the blocks the amplitude of relief is less than 80 m and commonly as little as 20 m. The external relief at the block margins is up to 200 m adjacent to major rivers such as the Vachö.

The surface of the land is essentially rolling with rounded hillocks and low limestone ridges and escarpments. Locally there are dry, shallow convex valleys, slightly swampy areas, sinkholes, disappearing streams and other karst phenomena. Some areas of less calcareous strata have more steeply sloping, broad, rounded ridges, locally grading to narrow crests with gullied flanks.

Incorporated within this unit are areas of unknown origin termed the Sui Land System. They occupy linear, low-lying tracts between Chirovanga and Choiseul Bay (Stereopair 6.3). In many ways they resemble floodplains but they are not uniformly level and they are underlain by limestone with sinkholes and disappearing streams. Segments of the landform are separated by steps of up to 30 m and, in addition, low limestone hillocks occur in a random fashion.

Karst

Three types of karst are identified and are described later (Part 3) as the Henefau, Huranja and Mbaeroko Land Systems. They are moderately widespread and mostly occur in well-defined blocks.

Cockpit karst of the Henefau Land System is the most extensive and occurs in four major areas of Choiseul and on Alu. Its chief characteristic is the presence of curvilinear arrays of lumpy ridges with similar amplitude of relief, separated by narrow, parallel dry valleys (Stereopair 6.5). The ridges are formed of limestone, and rock outcrops and loose surface stones are numerous. The crest lines of the ridges are highly broken and in places they resemble rows of conical hills (Stereopair 6.1). Slopes are convex near ridge tops and are commonly separated from concave footslopes

Figures 6-2 & 6-3

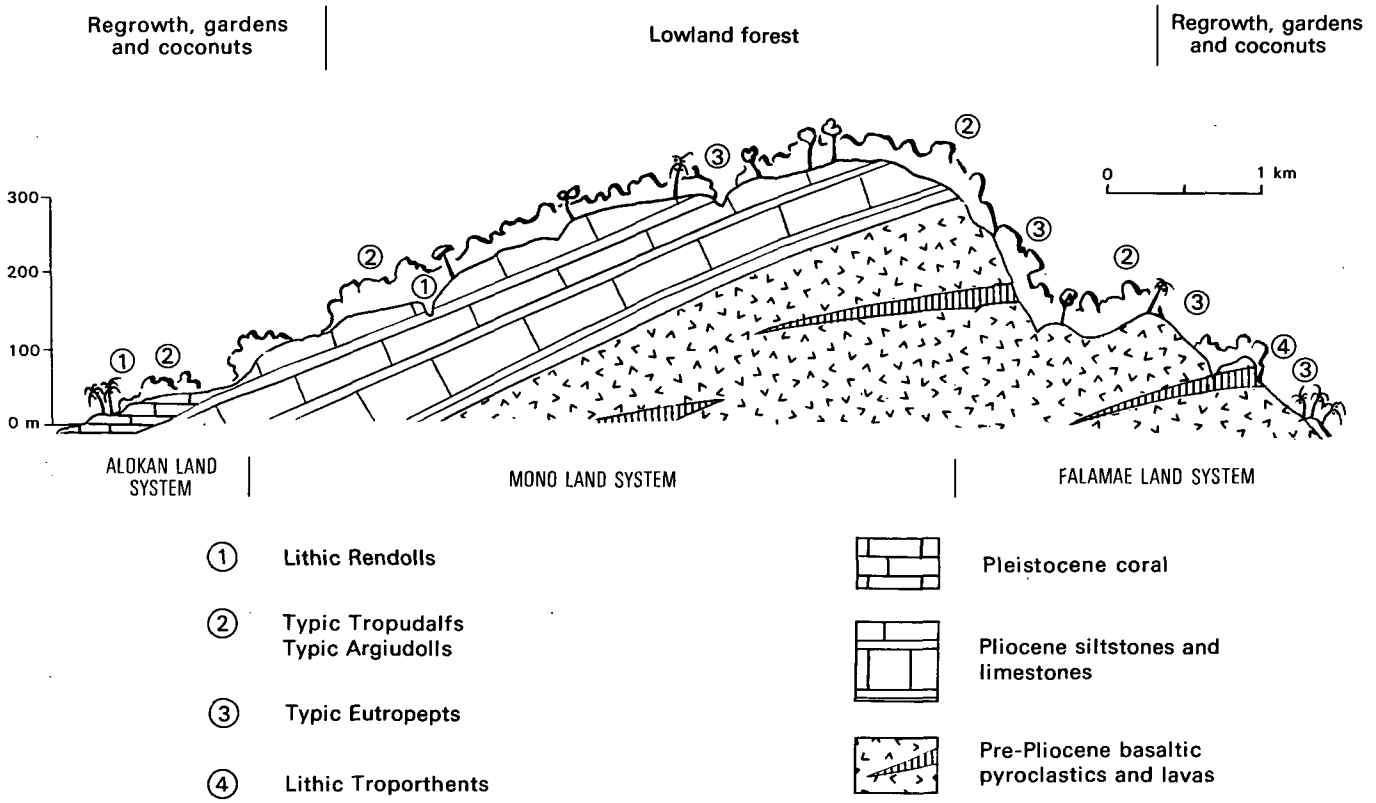


FIGURE 6-2 Diagrammatic cross-section across Mono Island showing lithology/soil/landform/vegetation relationships

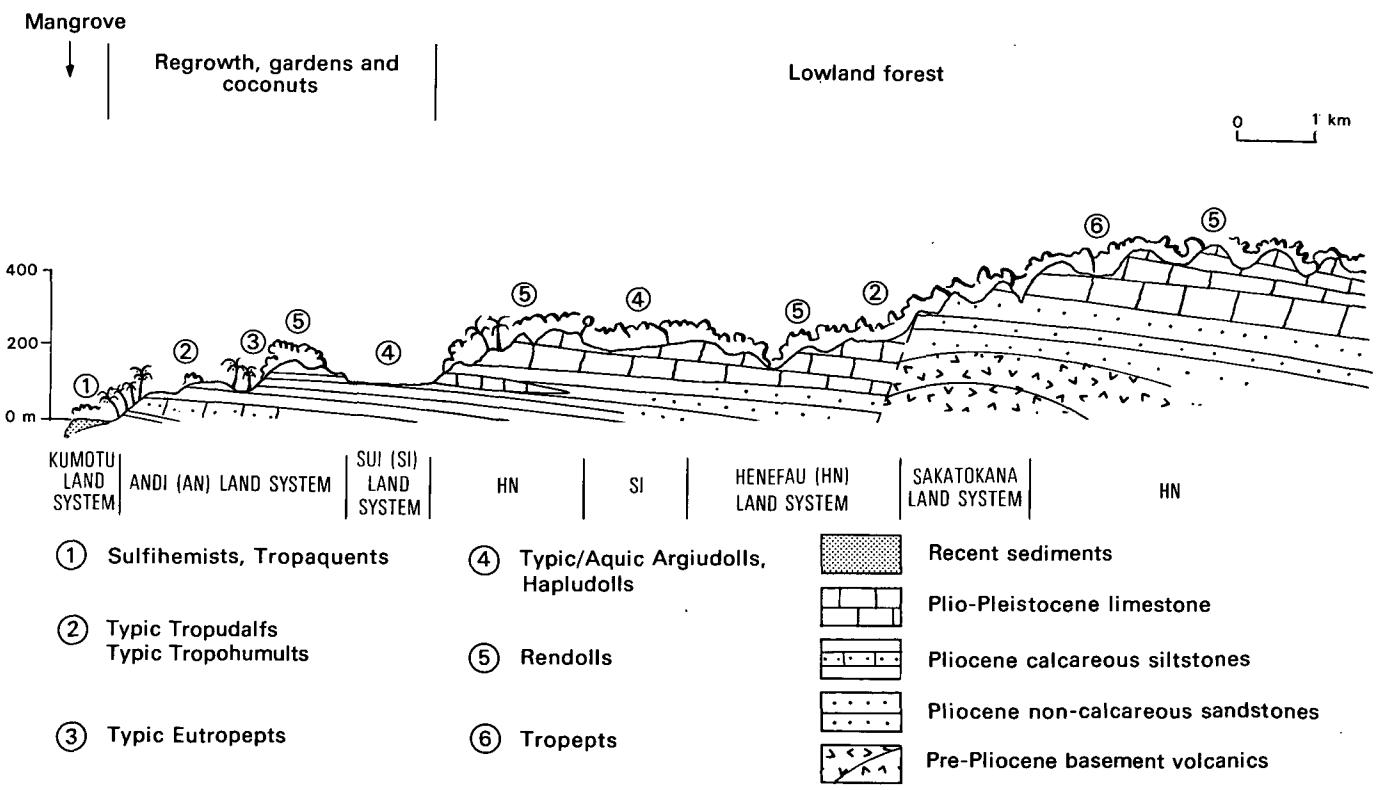
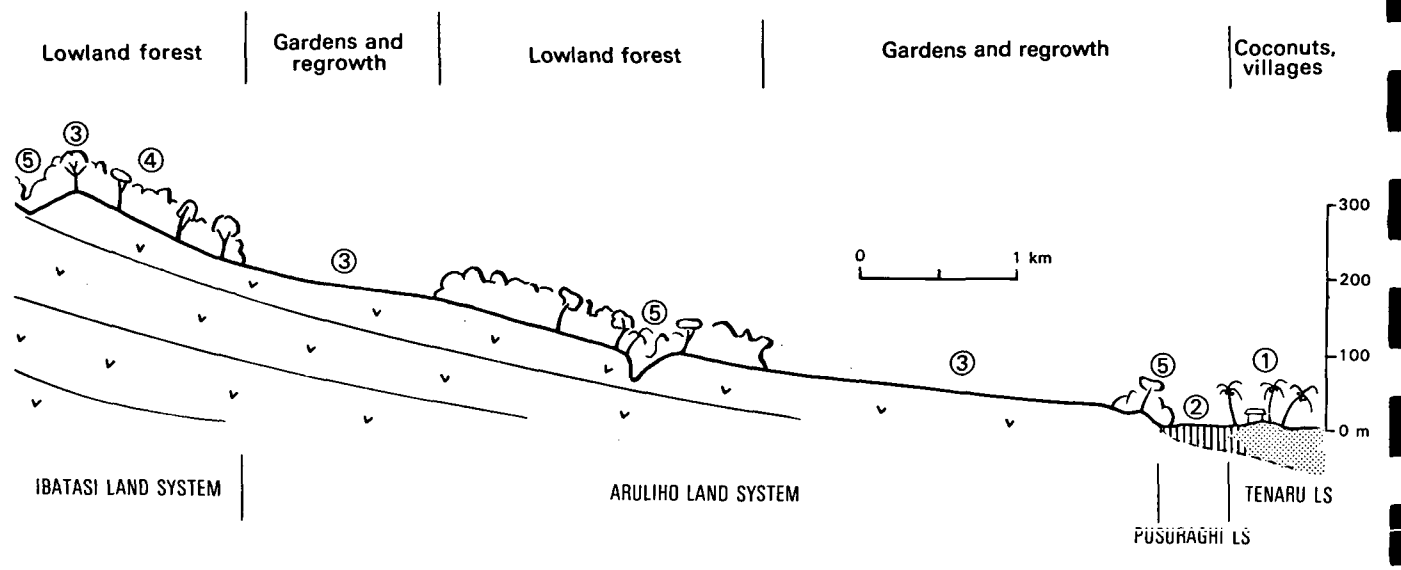


FIGURE 6-3 Diagrammatic cross-section across north-east Choiseul showing lithology/soil/landform/vegetation relationships



① Typic Tropopsamments

② Tropohemists, Tropaquents

③ Typic Haplorthox, Haplohumox

④ Typic Tropohumults

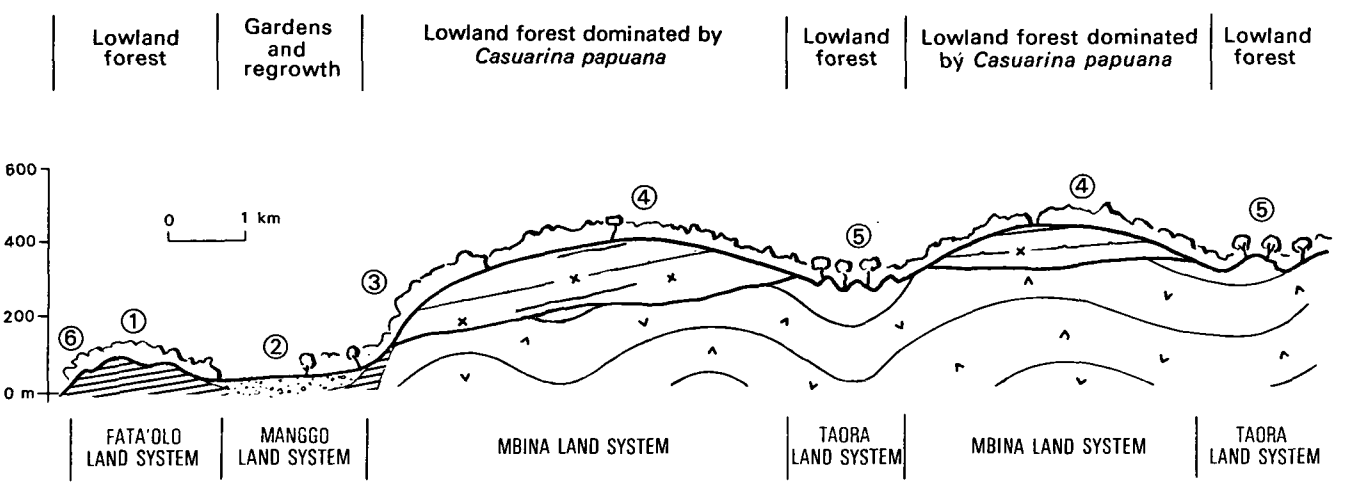
⑤ Tropepts

Recent beachsand

Recent fine-grained alluvium

Pleistocene andesitic lava

FIGURE 6-4 Diagrammatic cross-section near Ghaghara, east Choiseul showing lithology/soil/landform/vegetation relationships



① Haplorthox, Tropudalfs

② Tropaquents, Eutropepts, Tropofluvents

③ Dystropepts

④ Haplorthox, Acrorthox

⑤ Tropepts, Tropohumults

⑥ Eutropepts

Recent alluvium

Pliocene siltstones

Pre-Miocene ultramafics

Pre-Tertiary schists

FIGURE 6-5 Diagrammatic cross-section of area near Mböemböe showing lithology/soil/landform/vegetation relationships

by limestone cliffs. The valleys are gently concave in section and while dry for most of the year may have temporary streams during rainstorms. Sinkholes, caves, collapse holes and disappearing streams are all present. Gullies do not occur.

The blocks of limestone on Choiseul, which probably originated as patch-reef complexes, have been tilted and raised by tectonic movements so that they rise from the coast to the highest parts inland at 400 m to slightly more than 800 m (Figure 6.1). The coastal areas are drowned (Plate 1) making the seaward margin of the karst highly indented and irregular. The inland margins are mostly bounded by steep escarpments. Small outliers of this landform occupy mainly crestal areas of ridged country well inland.

A form of lumpy ridge karst, the Huranja Land System, occurs only on the lower flanks of Kumboro Peak (Stereopair 6-8). It occupies mainly ridge crests in this small area and is divided by closely spaced streams radiating from the volcanic cone. The ridges are slightly uneven in profile and have a low amplitude of 20-80 m. Limestone outcrops are common on the ridges. The valleys are largely cut into underlying volcanic strata.

The third type of karst is also localised but is mapped both in the eastern and western extremities of Choiseul. It originated as offshore barrier reef either as single lines or, as more commonly occurs in the Solomon Islands, multiple lines of so-called ladder reef (Stereopair 6.7). Emergence of the land has isolated the reef as pronounced narrow ridges reaching a maximum of 80 m but mostly less than 40 m. The crestline tends to be even, except in detail where irregularities are caused by much loose and outcropping, highly weathered limestone. Slopes are steep, convex to straight and rocky with no gullies or spurs. Land between the ridges is low-lying to swampy or may be below sea level as in the vicinity of Vaghena.

Terraces

Terraces of marine origin are confined to Vaghena (Stereopair 6.7), the western tip of Choiseul, southern Alu and northern Mono: riverine terraces are considered separately.

Marine terraces in these islands are low-lying,usually less than 50 m above sea level. They have been formed from raised reef-lagoon complexes and consequently are faced with limestone at the steep seaward edge. The inland areas may be underlain with fine-grained, lime-rich sediments such as marls, interspersed with patches of limestone.

In all areas there is a single main terrace. This is level to undulating with scattered hollows, possibly due to cave collapse, and very low limestone ridges. A subsidiary lower terrace level is thought to occur on Vaghena and higher levels are known on Mono (Stereopair 6.2). Where the terrace surface is close to sea level the small depressions in the surface may be occupied by swamps, as on Vaghena and southern Alu.

Fluvial plains

On Choiseul there are several river catchments of sufficient size for small fluvial plains to have formed,but in the Shortland Group all rivers are small and floodplains are virtually absent (Separate Map 6b). Some valley systems are occupied by swamps due to regional subsidence while in others vertical river erosion has been reactivated by regional uplift so that sedimentation does not take place. Valley floors range up to 1 km in width.

The main fluvial plains are formed of gravel to silt sized particles and occur in the lower 3-5 km of the main rivers of Choiseul. There is crude sorting of the particles with the finest and lightest being transported closest to the sea leaving mainly gravels and sands in middle and upper parts of the valleys. Headwaters are too small and narrow to be mapped but bouldery courses are prevalent.

Gradients of the river plains are low with overall downstream slopes of only a few degrees. Local reversals of slope are due to the presence of abandoned channels, levees and point bars and there are frequent local increases in gradient in the river bed due to shoals and rapids.

In fluvial plains it is usually possible to distinguish the floodplain proper, which comprises the river or stream channel and adjacent land liable to frequent flooding, from slightly higher and drier terraces and which are rarely flooded for any length of time. Close to the sea these two facets tend to merge as the general level of the land is very low and even with a moderately heavy rainfall bank overflow is likely. The distinction between terrace and floodplain is greatest in middle courses of the large rivers and in the Kolombangara and Vachö valleys, for example, there are extensive areas of 4-6 m high terraces. With increasing distance upstream the fluvial plains narrow with the floodplain area increasing at the expense of terraces until terraces no longer occur.

The rivers are typically shallow and depths only exceed 2 m within 100-1 000 m of the sea where tidal effects may be felt. For the remainder of their courses the river channels are less than 60 m wide and floored with sand, gravel or larger stones and boulders which form point bars, channel bars, rapids and the occasional deep pool on outer meander bends. The last tend to be particularly common within limestone areas where the river flows between high cliffs to form a gorge, such as on the upper Vachö. Floodplains are generally narrow and discontinuous due to channel meanders. They have low, irregular microrelief from abandoned channels, levees and bars and in many cases are stony. Normally the load carried by rivers is very low and the water is clear; only during flood conditions is the water discoloured by sediment.

Terraces vary little in character from place to place apart from their height above channels as described above. There tends to be one main surface which is level to gently undulating with gentle downstream gradients. Former levees are not usually identifiable or are very subdued. Near the coast the terraces are low and commonly merge into backswamps, while at their junction with hills there may be a discontinuous narrow zone of gently sloping colluvium. The larger, higher terraces tend to be incised by small streams draining nearby hills while in lower areas there may be small stream-fed areas of stony fan debris at the break between hill slope and terrace.

Swamps

This landform is extensive around Choiseul and Alu coastlines and occurs in isolated areas of inland Choiseul. Both freshwater and tidal swamps are described in this unit.

Freshwater swamps are located in infilling lagoons, in river valleys where there is continuing slight submergence of the land, behind aggrading or prograding beaches, and at higher levels within karst depressions. They are characteristically flat with no internal drainage system.

Swamps of infilling lagoons are predominantly found near Choiseul Bay and on southern Alu where former offshore reefs lying several hundred metres from the coast are now joined to mainland hills by swamp. The initial infilling consisted of sandy to silty, calcareous sediments but as the lagoons become shallow colonisation by vegetation was possible. At first these would be mangrove species but subsequently freshwater species would succeed them as riverine sediments continued to flow into the lagoon. This is a transitory phase and with time the infilled swamps will become part of the Fluvial Plains. The surface sediments in many such swamps are organic but little is known of their average or maximum depths. Some depth records exceed 1 m but most appear to be less than 50 cm. The watertable is permanently high and near tidal swamps may be brackish.

Swamps in river valleys are common, generally occupying the full valley width except for that part taken up by river or stream channels and narrow banks. At the coast there may be a tidal swamp or a narrow beach separating the freshwater swamp from sea (Stereopair 6.1); further upstream the banks become more pronounced and

extensive until the swamp disappears. In areas of submergence, however, swamps spread far inland and in the case of the Oaka River its swampy valley virtually bisects the island of Choiseul.

Freshwater swamps behind beaches resemble and may join the previous type; they coalesce at the coast, however, and do not extend far inland. The best examples on Choiseul are at the Kolombangara River mouth, Luti Bay and the coastline around Ghaghara. Swamps forming behind the advancing beach consist of peat and muck of irregular depth depending on the position of former beach lines and swales.

Swamps in karst terrain in north Choiseul have only been observed by air photograph interpretation. The vegetation of *Terminalia brassii* is typical of waterlogged areas but it does not necessarily mean that surface peat is present. These areas are entirely surrounded by pervious limestone and it must be assumed, therefore, that in order to retain a higher watertable the depressions are floored by impervious sediments.

Tidal swamps are scattered along many parts of the coasts of Choiseul in Vaghena (Stereopair 6.7) and the Shortland Islands where they are directly asscoated with the presence of colonising mangrove vegetation. Typically, tidal swamps occur in infilling lagoons, on sheltered reef flats, at the mouths of river valleys and behind some sand beaches in bays. Being within tidal influence the groundwater is saline or at least strongly brackish and the watertable is permanently high. The sediments forming the swamps range from thin organic debris resting on coral reef, to coral debris, sands, silt and clay, or mixtures of all. The ground surface is commonly flat but some micro-relief may occur due to the presence of outcropping coral and minor creeks. There is no integrated drainage system.

Littoral landforms

Littoral landforms on Choiseul and the Shortland Islands can be grouped into two basic types, namely those associated with coral debris and with volcanic debris.

Where large river mouths yield considerable amounts of sediment of volcanic origin during periods of flood the sediment contains a high proportion of dark mineral grains. Consequently beaches formed of this sand sized material are dark or olive in colour, such as those extending southwards from the Kamangga River. The build-up of beaches across bay heads requires a continual supply of sand from large rivers draining into the bay. Once the bay headlands have been reached by the advancing beaches their position and form is determined by wave action and longshore drift. Aggrading or prograding beaches are characteristically narrow and low being less than 100 m wide and no more than 2 m high, although extending for considerable distances along the coast in some cases (Stereopair 6.1). There is usually a single beach but in some areas subsidiary older beach lines may be distinguished, separated from the contemporary beach by a low swale, locally occupied by a creek or small stream. Inland the beach gradually merges to riverine alluvium or, more often, it is encroached upon by swamp.

Headlands, reefs and other exposed parts of the coastline commonly have narrow beaches formed of coral debris. They are also low but are usually pale coloured, with relatively steep and stony slopes facing the ocean and gentle landward slopes of a sandier nature. The coral is entirely derived from submarine reef which grows in the vicinity. Reef is not usually present close to the mouths of rivers hence its presence on headlands and around all the smaller, stream-free islands.

SOILS

Introduction

The variety of soils (Separate Map 6d) in Choiseul and the Shortland Islands equals that of the other major islands, a result mainly of the large number of rock types, a diversity of landforms and rapid, intense weathering.

The lithological composition of the rocks largely governs the mineral make-up of the overlying soil and hence strongly affects soil fertility. The oldest rocks in these islands are foliated and schistose amphibolites of presumed pre-Tertiary age, thought to have originated as doleritic and andesitic lavas or pyroclastics before metamorphism (Coleman, 1960). They form a basement complex of schists which outcrop principally in the east and centre, the largest blocks being bounded by faults. Younger than these, are a complex of lavas intruded into and extruded over the schists. They range from andesitic flows to basaltic pillow lavas and doleritic dykes and sills (collectively called the Vosa Lavas). This group is exposed mainly in central and eastern Choiseul and is largely of Middle Miocene age. Miocene, mainly andesitic rocks also form the basement of Mono, Alu and Fauro Islands.

Ultramafic rocks (the Siruka Ultrabasics) cover a large area of eastern Choiseul and have distinctive soil-forming characteristics. They are dunites, harzburgites and peridotites in the form of flat-lying slabs, separated and bounded by faults and overlying the basement schists. They are probably of Upper Oligocene age.

Late Tertiary sediments, derived partly from the erosion of older volcanics and partly from marine organogenic accumulations, are widespread particularly in western and west-central areas. Those of volcanic origin are coarse grained sandstones and greywackes (Kamangga Grits) north of Mt Maetambe, while those that have accumulated in a marine environment are largely calcareous, fine grained, banded siltstones and fine sandstones (Moli Formation, Pemba Siltstones) mainly of western Choiseul. Limestones occupy distinct areas along the southern coastline of Choiseul, its western and eastern extremities, parts of central Alu and considerable areas of Mono. Some are younger than the Pliocene and the youngest belong to the Recent period.

Vulcanism was renewed in the Quaternary at Mt Maetambe, Kumboro Peak and on the nearby island of Laena with the eruption of ash and lava of andesitic composition. The vents are no longer active. Ash from the volcanic centres on adjacent Bougainville Island is also believed to have fallen, in recent times, over large areas of the Shortland Group and possibly western Choiseul. Mts Balbi and Bagana on Bougainville are still active and with favourable winds probably contribute small amounts of ash. The addition of fresh ash to soil is an important rejuvenating factor in soil genesis (Quantin, 1972).

Landforms can be closely associated with rock structure and lithology. The multiplicity of ridge forms (Text Map 16) also reflects the vigorous erosion by rivers and streams; continuing structural instability perpetuates the imbalance between erosion and deposition. The importance of landforms to soil pattern and soil development is based on slope stability. Unstable slopes with the continual depletion of surface soil by surface wash or more intensive erosion have young or immature soils. Hill and ridge summits and terraces or other little-eroded areas, however, allow soil development to continue unhindered. In this context it is paradoxical that the youngest landscapes, being the least eroded, commonly contain the most strongly developed or most mature soils. Weathering throughout these islands is intense with continually high humidity, rainfall and temperature so that mineral breakdown and leaching is rapid.

The biotic factor in soil formation in these islands is not considered to be important. The effect of man on the soils is limited as no deep cultivation or manuring is practised and the long-term effects of shifting cultivation with adequate fallow periods is superficial. The influence of specific vegetation communities is also believed to be minimal. Firing of vegetation in dry periods is practised in some islands and there is some evidence for this on Choiseul. The result can be a severe depletion of topsoil nutrients so that eventually only hardy species survive. It is possible that some of the heath-like areas over ultramafic rocks originated in this way.

Formal soil surveys have not been undertaken in these islands but the Department of Agriculture has examined land for the purpose of Gilbertese resettlement on Vaghena Island and collected soil samples for analysis from near Chirovanga (Clarke and McLeod, 1966) where cocoa, with coconuts, was being introduced. Samples have been taken from Vaghena Island by Conzinc Rio Tinto, Australia, to assess the quality and extent of bauxite deposits and soils overlying the ultramafic areas have been extensively explored to determine their nickel potential. Reconnaissance land resource studies in the neighbouring territory of Papua New Guinea have proved useful for comparative purposes, specifically that of Bougainville and Buka Islands (Scott, 1967).

In the present survey 1 808 soil augering profiles were described and at a further 59 sites soils were described and sampled, mostly from pits. These have been classified into 18 Great Groups and mapped as 20 Soil Associations (Separate Map 6d). The mean observation density is only 1.9/km^2, including three high-density sample areas (Appendix 4), and it is possible therefore that other soils from the lower categories of the classification have been omitted.

Within the soil classification used (USDA, 1973) seven soil orders have been identified in this island group (Table 1). These are subdivided and described below under great group headings. In addition to these generalised accounts, Appendix 1 gives descriptions and analytical data of key profiles. The classification scheme is widely used throughout the world and despite some technical drawback enables comparisons to be made with soils in other countries. Subdivisions of the great groups are made on the basis of soil climate, types of sand and clay minerals, drainage, depth and other pedogenic features. Definitions of soil parameters and methods of analysis can be found in Appendix 3.

The USDA soil classification requires precised chemical data and, therefore, sampled profiles have normally been used to establish soil classes. Augering descriptions are used as supporting data, and where great groups have been established solely on profile morphology without supporting analysis they must be regarded as provisional. Soil fertility ratings in the text, defined in Appendix 3, Table 3.1, relate mostly to subsoils since topsoils, where present, are commonly thin and have a higher nutrient status.

Detailed studies were made in three sample areas of 20-30 ha each in areas considered to have reasonable agricultural potential (Appendix 4). Their soil pattern tends to be complex although there is generally a clear relationship between topography facets and soil type.

Δ,E,A. Organic soils with mostly well decomposed peat (Histosols: Folists, Hemists)

Histosols are predominantly organic soils containing at least 12% organic carbon by weight. Over half their volume is organic matter occupying more than half of the upper 80 cm of the profile either as a single horizon or as thin subhorizons. Most are permanently saturated.

Δ. *Shallow, freely drained, dark reddish brown, very friable organic material (Tropofolists)*

These are more or less freely drained Histosols developed from decaying leaf litter, twigs and roots resting in cracks, hollows and crevices of fissured and etched limestone. They have not been examined in detail but are known to be common in areas of pure limestone karst. They tend to be less than 10 cm deep covering small areas separated by outcropping bare limestone; they are, therefore, unsuitable for agriculture.

The soil is almost entirely organic and beneath surface litter consists of finely decomposed vegetable matter resting abruptly on limestone; larger pockets may contain limestone fragments. The 'profile' may be ramified, supported and sustained by living and dead roots. Unlike peaty organic soil there is no permanent groundwater and the soils are normally well aerated, highly porous and friable.

TABLE 1 United States Department of Agriculture (1973) soil classification units and major subunits with local equivalents

Soil map unit and local equivalent	Order	Suborder	Great group	Subgroup
Δ Shallow, freely drained, dark reddish brown, very friable organic material	Histosol	Folist	Tropofolist	Not specified
E. Deep to shallow, very poorly drained, saline, brownish peat or muck		Hemist	Sulfihemist	Typic, Lithic
A. Deep to shallow, very poorly drained, dark reddish brown peat or muck			Tropohemist	Typic, Lithic
F. Deep, very poorly drained, saline, pale, gleyed clays and loams	Entisol	Aquent	Sulfaquent	Typic
B. Deep, very poorly drained, grey to bluish green clays and loams			Tropaquent	Not specified
C. Deep to shallow, freely to excessively drained, pale to dark loose sand		Psamment	Tropopsamment	Typic, Lithic
H. Deep to shallow, freely to imperfectly drained dark brownish loams		Fluvent	Tropofluvent	Typic, Aquic
D. Deep to shallow, excessively to poorly drained, stony coarse sands and loams		Orthent	Troporthent	Typic, Lithic, Aquic
O. Deep to shallow, freely drained, humus-rich, dark brownish loams and clays	Inceptisol	Tropept	Humitropept	Typic, Andic, Lithic
G. Deep to shallow, freely drained, brownish loams and clays			Eutropept	Typic, Lithic
I. Deep to shallow, freely drained, brownish to red clays and loams			Dystropept	Typic, Oxic, Lithic
M. Shallow, freely drained, stony, dark brown clay overlying limestone	Mollisol	Rendoll		Lithic
W. Deep, imperfectly to freely drained, dark brown to strong brown clay		Udoll	Argiudoll	Typic, Aquic
L. Deep, freely drained, yellowish brown to red clay	Alfisol	Udalf	Tropudalf	Typic, Oxic, Ultic
K. Deep, freely drained, humus-rich, yellowish red clay	Ultisol	Humult	Tropohumult	Typic, Aquic, Humoxic
S. Deep, freely drained, dark brown to red clay	Oxisol	Orthox	Acrorthox	Not specified
Y. Deep, imperfectly to freely drained, brown to strong brown clays			Eutrorthox	Typic, Aquic
J. Deep, freely drained, strong brown to red and reddish brown clay			Haplorthox	Typic, Tropeptic

The soil appears to be well humified and can be expected to have a high cation exchange capacity (CEC) probably saturated with calcium and magnesium. As a result, the pH is probably high although in similar situations elsewhere in the humid tropics (Wilford and Wall, 1965) strongly acid soil develops on ridge summit sites where leaching exceeds the ability of the vegetation to recycle limestone weathered products.

Tropofolists are not mapped but may be locally common in the M and ML Associations.

E. *Deep to shallow, very poorly drained, saline, brownish peat or muck (Sulfihemists)*

These soils consist essentially of accumulations of mangrove forest debris and are found only within the zone of saltwater influence (Figure 6.3). They are permanently saturated although at low tide the upper few centimetres of inland areas may be aerated. The debris consists mostly of decayed leaves and litter. The soils range from shallow to deep and may rest directly on coral rock or coral debris.

Sulfihemists contain iron disulphide derived from the reduction of sulphates in sea water, often deposited as pyrites. If the soil is aerated by drying or drainage, chemical reactions occur assisted biochemically by sulphur oxidising bacteria. This produces sulphur, sulphuric acid and sulphates, and would eventually yield ferric oxide. The reaction rarely proceeds to completion, however, as basic iron sulphates are formed, the most widespread of which is jarosite (Bloomfield and Coulter, 1973). In its field-wet condition the peat is neutral to slightly alkaline, but on drying the acidity increases to around pH 3.5 (Choiseul 1, Appendix 1) and in this environment hydrogen clays undergo almost spontaneous decomposition to form aluminium-saturated clays. Where coral fragments occur close to the surface of the profile the reduction in pH is less marked. Bases and free salts are abundant causing the soils to be strongly saline with the high CEC saturated with sodium ions. Phosphorus and magnesium appear plentiful in available and total forms but potassium is deficient. The C:N ratio is wide, indicating slow and incomplete breakdown of the organic matter.

Soil Association EBF contains Sulfihemists and they may also be present in small areas of DC.

A. *Deep to shallow, very poorly drained, dark reddish brown peat or muck (Tropohemists)*

These organic soils are associated only with central areas of large, mostly freshwater swamps in the lower valleys and estuaries of main rivers. They are permanently saturated and some may be subject to tidal flooding. The peat is predominantly shallow and tends to be featureless with few identifiable plant remains below the upper few centimetres. Roots are common in the topsoil which may be aerated at times, but become rare at depth. Layers of inorganic material derived from periodic flooding of rivers are found in some profiles but are generally thin and tend to be intermixed with peaty material to form muck. The peat generally rests directly on riverine or estuarine sediments. A few shallow profiles occur beneath mangrove and contain considerable quantities of limestone fragments throughout.

The Tropohemists have not been sampled in this island group but by analogy with those elsewhere they are probably poorly decomposed and raw with a wide C:N ratio (Guadalcanal 125, Appendix 1). The soil is acid and has high levels of bases except for potassium and available phosphorus.

Tropohemists are only mapped in Soil Association BA but may be found in small areas of GH, EBF and C.

F,B,C,H,D. **Young soils with little or no horizon development (Entisols : Aquents, Psamments, Fluvents, Orthents)**

Entisols show little or no evidence of pedogenic horizon development except for the accumulation of a dark organic-rich surface horizon. Some are forming in recent alluvial deposits, others occur on steep, actively eroding slopes and a few have impeded development due to a high watertable.

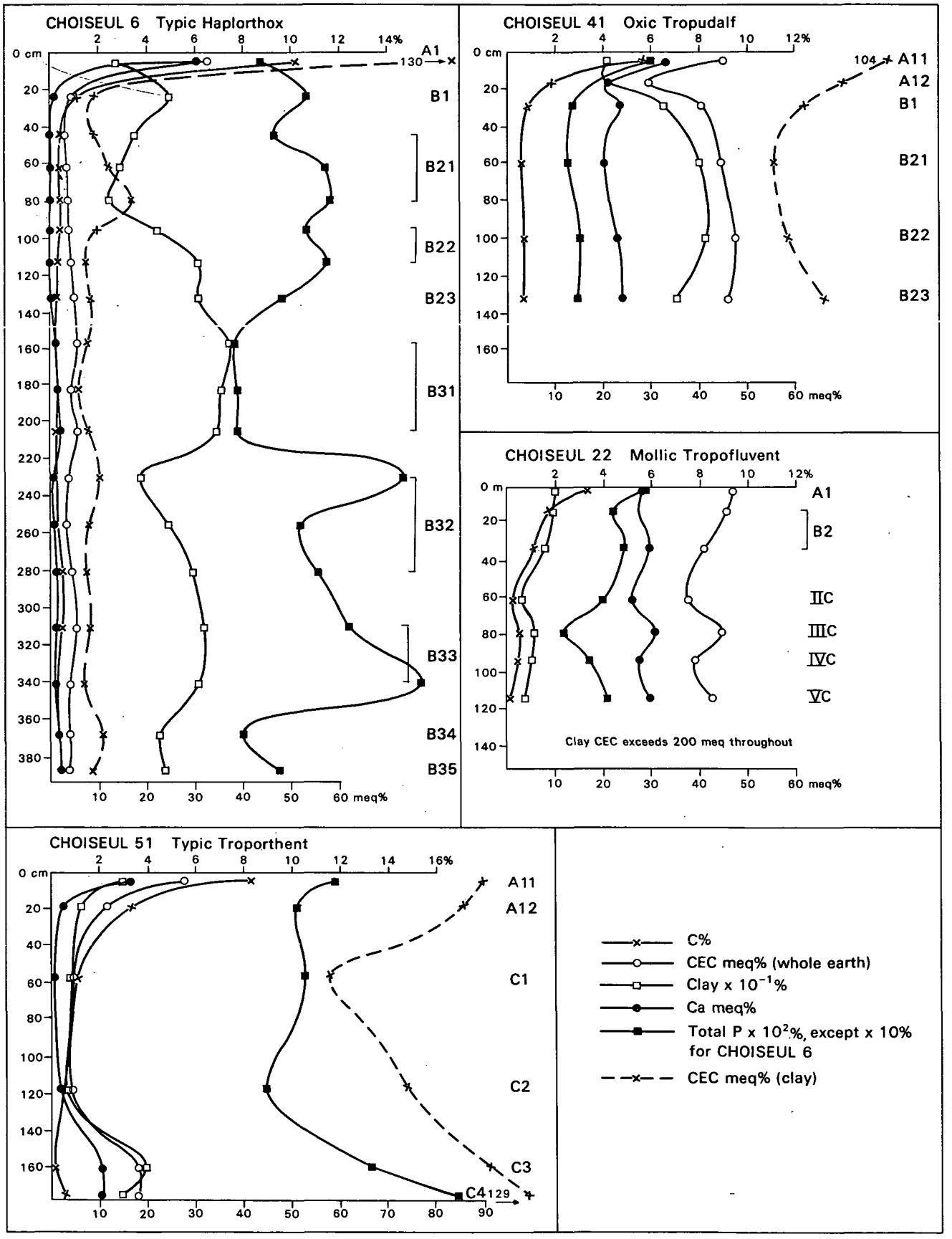


FIGURE 6-6 Changes of soil properties with depth in selected Choiseul profiles

F. Deep, very poorly drained, saline, pale, gleyed clays and loams (Sulfaquents)

These are the wet Entisols found in inner tidal swamps and are expected to have an appreciable amount of sulfides close to the soil surface. They have not been sampled in these islands but from field evidence they are likely to be present in places under mangrove forest.

Most Sulfaquents are deep but some overlie coral or stony subsoils. They are all very poorly or poorly drained with a brackish or saline watertable close to the surface throughout the year. Tidal flooding is frequent but not usually deep and only the upper few centimetres of soil are exposed when the watertable drops. The profiles consist of thin superficial peat or muck overlying grey or greyish brown clays or loams commonly incorporating patches of organic matter; olive mottles may be found in the deep subsoil and reddish mottles in the upper subsoil.

The most distinctive chemical feature is that they are potential acid sulphate soils with properties similar to those described for Sulfihemists. It is these properties that cause difficulties of improvement and utilisation elsewhere in the world. However, they are expected to resemble Tropaquents in having high base saturation and high mineral reserves.

Sulfaquents are only mapped in Soil Association EBF but may also occur in GH close to river mouths. They are not expected to be present where there is a substantial amount of coral in the subsoil.

B. Deep, very poorly drained, grey to bluish green clays and loams (Tropaquents)

Tropaquents are associated with the margins of freshwater swamps of lower riverine tracts where the regional watertable is permanently high (Figures 6.3-6.5). Shallow flooding is frequent. It is possible that profiles with stronger colours and some horizon development should be classed as Aquepts.

The profiles are normally deep and very poorly drained with thin surface peat in many areas; peat or muck may also be interlayered within the profile. Matrix colours are pale but mottles range from olive brown to red. Textures vary but clays are more common than loams and sandy or coarser textures are rare except in deep subsoils.

Tropaquents have not been analysed in these islands. By comparison with those from other islands with mixed-lithology drainage basins, however, they can be expected to have high levels of nutrients in both available and reserve form, with the possible exception of potassium. Their main drawback for use is their poor internal drainage and slow surface run-off.

Tropaquents are mapped in Soil Association BA in which they are believed to be dominant. They may form small areas in GH and at the landward limits of EBF.

C. Deep to shallow, freely to excessively drained, pale to dark, loose sands (Tropopsamments)

These soils are well sorted sands deposited as narrow beaches (Figure 6.4) by longshore drift and wave action either in sheltered bays fed by large rivers or on reefs. The watertable is lower than 50 cm by definition and generally it exceeds one metre except at the seaward and landward margins. The Psamments are differentiated from some Orthents by their sandy as opposed to gravelly or cobbly texture. There is no surface drainage.

In bays the profiles have developed largely from resorted riverine alluvium derived from mixed volcanic and sedimentary rocks. There is a large component of dark mineral grains ranging from black to olive brown and relatively few light minerals, such as carbonate debris. A few profiles have developed over reef flats and these, in contrast, are virtually white consisting almost entirely of comminuted coral debris.

Because of their coarse texture Tropopsamments are excessively drained in the subsoil and well drained in the dark, organic-rich topsoil. They are very weakly structured or massive and the textures vary from sand to loamy sand. Gleying occurs in the lower subsoil below the watertable, which is normally fresh within a few metres of the coast.

There are no analyses available of Tropopsamments in these islands but those elsewhere in the Solomon Islands are known to have low mineral reserves. The subsoils are depleted of available nutrients except reef decomposition products in the case of those soils developed over coral. Profile Outer Islands 40 (Appendix 1, Volume 8) is representative of this soil and has such a low subsoil CEC that the retention of added fertilisers would be very low. The gross deficiency of potassium is also exacerbated by the predominance of calcium on the exchance lattice. This nutrient imbalance is not present in the dark sands where the pH levels are lower, rather there is an overall near-absence of exchangeable subsoil nutrients.

Tropopsamments are only mapped in Soil Association C but may also occupy small areas of DC and GH.

H. Deep to shallow, freely to imperfectly drained dark brownish loams (Tropofluvents)

These are soils formed in recent, water-deposited sediments mainly on floodplains, fans and deltas of rivers and small streams (Figure 6.5). They are flooded frequently and stratification within the profile is normal. By definition levels of organic carbon fluctuate with depth.

Depths of Tropofluvents range widely and rapidly from deep to shallow depending on the presence of subsoil gravel or cobble beds. They occur in riverine areas where gradients are low and, because they lie within a metre of river level, they commonly have impeded subsoil drainage marked by mottles. Colours are usually brown to dark brown but some older profiles are yellowish to strong brown. The surface horizons may be dark or light depending on the presence of recent flood deposits. Most profiles have a friable or even loose consistency with sandy or loamy textures. Gravelly or stony layers are common at any depth. Structure is only weakly developed in the subsoil.

The fertility of Tropofluvents depends on the type of source rocks. Most derive from mixed basaltic/andesitic and calcareous rocks and have a high total magnesium which increases with depth. In such soils total phosphorus tends to be medium to high but increases with increasing organic carbon levels. Total potassium is invariably low throughout. The clay CEC values are high denoting minimal mineral weathering and in addition the whole-earth CEC is high, almost entirely as a result of high levels of organic carbon in the profile (Choiseul 22, Appendix 1). The soil acidity decreases from slightly acid in the topsoil to near neutral or slightly alkaline in the subsoil. The levels of bases also decrease from topsoil to subsoil. Exchangeable calcium and magnesium are generally high throughout the profile with the former exceeding the latter by a factor of three or four. Unusually, exchangeable potassium and sodium are also present in high quantities commonly to depths of one metre or more. Only available phosphorus is locally deficient.

Where source rocks include ultramafic outcrops, such as in eastern Choiseul, the soil chemistry is liable to differ substantially. Profile Choiseul 7 (Appendix 1) demonstrates that the clay fraction is more strongly weathered, the whole-earth CEC is medium and that there are lower concentrations of all bases resulting in a lower base saturation. Total major mineral values are similar. Trace elements have also been determined for this profile and it can be seen that levels of chromium and nickel in particular are abnormally high and comparable to these of some Acrorthox (see below).

Recent flood deposits are beneficial in that they add to the profiles considerable amounts of nutrients. For example, Choiseul 54 (Appendix 1) is a sample of one-month-old flood material, 10 cm thick. It has been calculated that with a uniformly thick covering the dried soil would contain: 7 159 kg exchangeable calcium, 376 kg exchangeable potassium, 4 000 kg total nitrogen, 350 kg total phosphorus and 25 t total magnesium per hectare. This benefit accrues to the detriment of other soils for the flood material originates as eroded and leached particles in suspension or solution from soils further inland.

Tropofluvents are common only in Soil Association GH but may also occur in small areas of BA.

D. Deep to shallow, excessively to poorly drained, stony coarse sands and loams (Troporthents)

These are Entisols of recent erosional and depositional surfaces and are characterised by coarse, stony textures or rest on rock at shallow depth. Steep volcanic lands (Figure 6.2) and unstable, erodible areas contain common small patches of Troporthents, for example on landslip and debris slide sites. Beaches developed over coral reefs also contain Troporthents, especially where exposed to active wave erosion. Some Troporthents may be found adjacent to large braided river courses.

The most widespread Troporthent in Choiseul and the Shortland Islands is that associated with young coral reefs. Beneath a thin topsoil it is generally a pale loose, structureless coral sand containing large coral fragments, terminated at depths of up to (lithic subgroup) one metre by a solid coral platform, calcrete or large coral boulders. Surface water run-off is absent and all incoming rain is rapidly absorbed, much of it passing directly to the fresh or brackish watertable. The depth of the watertable varies from a few centimetres on seaward and lagoon margins (where the soil is termed aquic) to more than one metre in the most extensive areas; it is fairly static in height and coincides with a zone of gleying. Chemically, Troporthents resemble some Tropopsamments: Outer Islands 38 (Appendix 1), for example, has a very low CEC saturated with calcium, high levels of exchangeable carbonates and a strongly alkaline pH in the lower subsoil. Potassium is extremely deficient in all forms. Only the topsoils have a reasonably balanced nutrient composition but this depends almost entirely on the organic matter present. This aspect of the soil's fertility is extremely important in their utilisation.

The Troporthents on eroded steep land have not been studied extensively. In one sample (Choiseul 51, Appendix 1) the soil is markedly base deficient in the weathering parent material just beneath the topsoil. There are high total mineral values except potassium and a distinct peak in phosphorus content in the upper C horizons where the carbon content increases. It is possible that this profile contains buried surface horizons resulting from volcanic ash falls or due to the instability of the 40° slope.

Troporthents of floodplains are similarly inadequately studied and they vary considerably in stoniness.

Soil Association DC is dominated by Troporthents. They also occupy minor areas of IJG, GI, IKL, C and GH.

O,G,I. Slightly weathered soils with little horizion development (Inceptisols: Tropepts)

These soils have been leached of bases or iron and aluminium but have retained some weatherable minerals, and they do not have subsoil horizons showing accumulation of clay, carbon or certain soluble salts. They are associated with a wide range of parent materials, are weakly structured, fine to medium textured and on steep slopes may be subject to considerable erosion. There is evidence from a few analysed profiles that these soils have formed in, or partly in, volcanic ash; it is suspected that the influence of ash showers on stable soils, in the Shortland Islands particularly, is more widespread than surveys have revealed.

Tropaquepts have been identified in a few low-lying areas but are not believed to be extensive. As they are not included in any mapping unit, they have not been assigned a letter symbol and are only described briefly here. They are mostly a yellowish or brownish clay or silty clay loam overlying dark to light grey, sticky, plastic clay containing the fresh watertable. In some cases the watertable is perched above more or less impermeable rock, such as marl. One profile analysed (Choiseul 38, Appendix 1) is calcium-rich with low values of potassium. The gleyed deep subsoil is alkaline, saturated with bases and has a conductivity of 3.75 mmhos.

O. Deep to shallow, freely drained, humus-rich, dark brownish loams and clays (Humitropepts)

These are soils with high levels of organic carbon in the surface horizons. They occur on stable slopes not subject to surface wash, usually at high altitudes but also on lower rolling areas in the Shortland Islands where volcanic ash has been deposited.

One profile (Shortlands 11, Appendix 1) appears to be derived partly from young volcanic ash. On drying there is distinct pseudo-aggregation of the clay and silt fractions into stable, sand-sized particles and tests for the presence of allophane are positive. However, as the subsoil CEC and carbon levels are too low to meet the requirements of Andepts the profile is considered andic. It is probable that other soils of stable sites in the Shortland Group and western Choiseul have been similarly affected by ash showers from volcanoes on nearby Bougainville Island although typical Andepts have not been recognised among any profiles sampled for analysis.

Shortlands 11 is acid, base-poor in the subsoil and has low base saturation. Phosphorus levels are medium to low and potassium levels are very low; the C:N ratio is narrow beneath the topsoil which is the only relatively fertile part of the soil.

Humitropepts of high-altitude areas commonly overlie soft weathering parent material; they are dark in colour, freely drained and loamy in texture. They are, by definition, base-poor and usually moderately acid. The C:N ratio is wide denoting poor humification of organic matter.

Humitropepts have only been mapped in Soil Association JO1 where they are believed to be common.

G. Deep to shallow, freely drained, brownish loams and clays (Eutropepts)

Eutropepts have developed over a variety of parent materials and occur in flood plains, on fans and on the slopes of volcanic hills (Figures 6.2-6.5). They are mainly well drained, dark in colour, base rich and tend to be stony. Most common are the Eutropepts of volcanic hillsides which usually consist of dark, loamy topsoils over yellowish brown to dark brown B horizons containing soft and hard weathering parent material. Field textures of this material range from a clay to sandy clay loam matrix with patchy inclusions of soft sandy or gritty loams. Laboratory textures, which emphasise the silt fraction, are the result of mixing and grinding the matrix and soft parent material during mechanical analysis preparation (Choiseul 21, Appendix 1). The underlying strata of profiles in Fauro Island are particularly soft and pale in colour in contrast to the dark, hard volcanics beneath some Choiseul profiles.

By definition, all Eutropepts have high base saturation. The level of bases however, differs considerably between rock types. The most base-rich are the soils developed over the basaltic volcanics of Choiseul (where inclusions of residual sedimentary rocks in summit areas is possible). These are rich in calcium and magnesium and poor in potassium (Table 2). Base-poor are the Eutropepts of the Shortland Islands and a single profile over schists in eastern Choiseul: the CEC of both their clay fraction and whole earth is lower and while the exchangeable calcium and magnesium status is distinctly inferior the potassium levels are higher. A further notable feature is that almost all Eutropepts are rich in total magnesium and those from Fauro Island have as much as 2% potassium in the weathering rock, the highest figures recorded in the Solomon Islands. This is probably attributable to the presence of orthoclase minerals

in the rock. Phosphorus in both available and total forms tends to decrease to low levels beneath the organic-rich topsoil, although in profiles over schist and the volcanics of Mono Island there appears to be an increase in the deep subsoil, probably of inorganic phosphorus. All profiles show a trend of decreasing acidity from topsoil to subsoil.

TABLE 2 Mean analyses of A, B and C horizons of (a), five Typic Eutropepts from volcanic rocks in the Shortland Islands and from schist in Choiseul, and (b) four Typic Eutropepts over basaltic volcanic rocks in Choiseul

	Depth cm	pH (H_2O)	Exchangeable meq%					Percentage			Total ppm			Available P ppm (Bray)
			Na	K	Mg	Ca	CEC	BS	N	C	P	K	Mg	
A horizon (a)	15	6.2	0.2	0.3	6.6	20.5	30.0	87	0.4	5.7	600	4 980	4 280	18.3
(b)	33	5.9	0.9	0.3	9.4	27.6	53.5	72	0.4	5.9	390	760	11 400	7.0
B horizon (a)	24	5.8	0.3	0.1	5.9	5.7	16.6	72	0.05	0.5	170	9 950	7 350	6.8
(b)	61	6.1	1.0	Tr	10.7	23.9	44.3	81	0.04	0.6	140	660	13 110	7.4
C horizon (a)	51	6.2	0.6	0.3	5.6	4.4	13.4	81	0.03	0.2	280	9 620	8 460	22.8

Eutropepts are dominant in Soil Associations GLJ, GH and GI and are common in IGJ. They are also likely to occur locally in many other associations.

I. Deep to shallow, freely drained, brownish to red clays and loams (Dystropepts)

These Inceptisols have neither humus-rich surface horizons nor high base saturation at depth. They are common throughout the islands and are mainly associated with strongly ridged volcanic landscapes. Most profiles have stony subsoils and all are well drained.

The Dystropepts in Choiseul and the Shortland Islands are redder than those of other islands, the subsoils commonly being yellowish red, red or dark red (Choiseul 50, Appendix 1). The field textures are clays or clay loams but laboratory mechanical analysis gives mainly silty clays or silty clay loams due to the incorporation of soft weathering rock fragments. Most sampled profiles are deep but on some steeply sloping sites they may be only moderately deep to shallow.

The clay fraction of the Dystropepts is more strongly weathered than that of the Eutropepts and the clay CEC of some B horizons is sufficiently low for them to be termed oxic. This feature apart, the Dystropepts have similarly low to medium levels of exchangeable and total nutrients beneath the topsoil. Their potassium status is particularly poor (Table 3).

TABLE 3 Average topsoil and subsoil analyses of four Oxic Dystropepts overlying andesitic and basaltic volcanics

	Depth cm	pH (H_2O)	Exchangeable meq%					Percentage			Total ppm			Available P ppm (Bray)	Clay CEC meq%
			Na	K	Mg	Ca	CEC	BS	N	C	P	K	Mg		
Topsoil	23	5.8	0.3	0.5	2.8	12.5	25.7	57	0.37	5.80	490	830	2 500	8.4	51
Subsoil	119	5.6	0.1	0.1	1.3	2.2	10.0	33	0.05	4.17	220	830	4 080	5.1	28

Dystropepts are widespread, and are dominant in IGJ and IKL Soil Associations, common in GI and JI and present in JSI.

M,W. Weakly weathered soils with a thick dark topsoil and high base status (Mollisols: Rendolls, Udolls)

These are soils closely associated with limestone, specifically those of coral terraces, karst and karstic landscapes. They are freely drained with deep, dark, carbon-rich and base-rich topsoils. They are also commonly characterised by a highly irregular and abrupt interface between subsoil and underlying fissured limestone so that shallow (lithic) soils are common.

M. Shallow, freely drained, stony, dark brown clay overlying limestone (Rendolls)

Only one sampled profile has been identified as a Rendoll (Choiseul 13, Appendix 1) but many augering descriptions among the karst landscapes of western Choiseul conform to the requirements of this suborder. They occur chiefly where outcropping limestone is common, such as on terrace margins, the ridges of cockpit karst and where rivers have incised deeply into limestone landscapes (Figures 6.2, 6.3).

Rendolls are predominantly shallow and below the thick surface litter and well rooted humus they consist of very dark brown to dark brown, well structured, friable to firm clay resting on hard limestone. In clefts and pockets in the limestone there may be lighter, stony clay or clayey rubble. Drainage is free in spite of the heavy textures.

Chemically, the soil is calcareous and dominated entirely by calcium which saturates the CEC in the lower subsoil. Total nutrients except phosphorus are low but even in the topsoil there is little available phosphorus. The ratio of exchangeable calcium to the other bases is extremely wide resulting in a complete nutrient imbalance.

Rendolls are dominant in Soil Association M and ML, common in LM and form a minor part of LWM.

W. Deep, imperfectly to freely drained, dark brown to strong brown clay (Argiudolls)

These soils are only found in areas of level to rolling limestone, generally softer or less pure than that associated with Rendolls. They have, beneath the dark deep topsoil, considerable depths of lime-saturated firm clay which has a moderate to strong angular blocky substructure. Subsoil mottling occurs (aquic subgroup) due to a fluctuating, possibly perched, watertable; this is not necessarily restricted to areas of level topography.

Argiudolls show an increase in clay with depth which is sufficient to distinguish them from the otherwise similar Hapludolls, which have not been identified in these islands. Paleudolls are soils with a clay increase and reddish colour at depth: only one profile from Choiseul has been classed in this Great Group and it is considered to be unusual.

The clay CEC of the Argiudolls is high and shows relatively weak weathering; similarly, the whole-earth CEC is high and typical of expanding lattice clays such as montmorillonite. The large quantities of calcium and the very high base saturation cause the remaining bases to be insignificant by comparison. Potassium is severely deficient in all forms beneath the topsoil. Total phosphorus is high in all profiles with peaks in the upper topsoil and lower subsoil; this may be explained by leaching or by a vegetation recycling effect once the mineral is released by weathering of limestone and adsorbed by roots. Available phosphorus, however, is invariably low (Choiseul 36, Appendix 1). Most profiles are weakly acid in the topsoil becoming neutral and weakly alkaline in the deep subsoil in the presence of fragments of weathering limestone (Table 4).

TABLE 4 Average topsoil and subsoil analyses of four Argiudolls and one Paleudoll

	Depth cm	pH (H_2O)	Exchangeable meq%					Percentage			Total ppm			Available P ppm (Bray)	Clay CEC meq%
			Na	K	Mg	Ca	CEC	BS	N	C	P	K	Mg		
Topsoil	19	6.4	0.3	0.4	3.9	42.5	57.2	83	0.70	8.9	1 261	655	5 410	12.2	114.2
Subsoil	104	6.7	0.2	0.1	11.1	34.0	41.3	84	0.10	0.95	630	718	5 656	8.7	61.2

Soil Association WL is believed to be dominated by Argiudolls and LWM contains common occurrences.

L. Moderately to strongly weathered and leached soils with high base status (Alfisols: Udalfs)

These are soils associated primarily with base-rich parent materials, which show evidence of leaching of clay particles and bases, but which have a moderate to high base saturation. They appear to be more widely distributed than in the other major islands.

L. Deep, freely drained, yellowish brown to red clay (Tropudalfs)

These Alfisols are usually found over limestones, marls and other calcareous sediments but have also developed in subrecent alluvium and over some volcanic rocks in slope positions where base-enrichment from above is possible (Fugures 6.2, 6.3). They are mostly deep and profile drainage is good.

Subsoil colours vary widely from dark brown, to red. Textures are heavy with more than 80% clay being recorded in many subsoils. Soft or hard weathering stones feature in some lower subsoils. The consistence is friable or firm and the soil structure is weakly to moderately developed (Choiseul 17, Appendix 1).

Depletion of bases from the upper subsoil is evident in many profiles and, by definition, Tropudalfs show clay increase with depth, of at least 8%. They are moderately weathered, but some horizons with strong weathering and a low clay CEC may be classed as oxic; such profiles are Oxic Tropudalfs (Table 6). The dominant cation is calcium except over areas of basaltic volcanic rock where magnesium exceeds calcium: each reaches high values with the CEC of most profiles being virtually completely saturated. Total but not available phosphorus is high in calcareous soils but overlying volcanic rocks the subsoil values are low (Table 5). In contrast, total magnesium levels are high in soils over volcanic rocks but may be low in those over calcareous strata. Total potassium is invariably low.

TABLE 5 Mean analyses of A, B and C horizons of Typic Tropudalfs; four over volcanic rocks (a), three over weakly calcareous sediments (b) and four over lime-rich sediments (c)

	Depth cm	pH (H_2O)	Exchangeable meq%					Percentage			Total ppm			Available P ppm (Bray)	Clay CEC meq%
			Na	K	Mg	Ca	CEC	BS	N	C	P	K	Mg		
A horizon (a)	25	6.3	0.4	0.2	10.6	23.1	43.4	81	0.31	3.8	360	730	8 300	6.5	108.0
(b)	18	6.1	0.3	0.4	5.7	32.1	46.9	80	0.56	5.0	298	575	9 340	8.6	95.3
(c)	23	6.4	0.1	0.3	4.0	34.8	43.2	89	0.51	5.4	920	650	4 010	6.7	97.9
B horizon (a)	82	6.0	0.5	0.1	14.7	14.6	35.6	84	0.05	0.48	140	670	9 750	6.0	75.5
(b)	84	5.3	0.2	0.2	5.6	13.3	28.2	61	0.06	0.35	78	790	4 785	6.7	41.7
(c)	63	6.2	0.2	0.2	2.6	35.8	38.1	85	0.12	0.85	640	860	5 580	9.6	62.2
C horizon (a)	66	6.2	1.2	0.0	18.2	21.6	45.0	88	0.01	0.21	92	530	12 510	17.2	130.2
(b)	–	7.0	0.4	0.1	2.3	44.7	43.7	94	0.02	0.18	335	550	7 600	–	237.9
(c)	16	7.9	0.2	0.2	2.1	>50	24.2	100	0.11	0.99	1 080	1 000	8 900	–	53.9

TABLE 6 Average topsoil and subsoil analyses of three Oxic and one Ultic Tropudalfs

	Depth cm	pH (H_2O)	Exchangeable meq%					Percentage			Total ppm			Available P ppm (Bray)	Clay CEC meq%
			Na	K	Mg	Ca	CEC	BS	N	C	P	K	Mg		
Topsoil	10	6.6	0.2	0.2	3.5	19.2	29.0	74	0.39	3.00	1 900	610	2 310	31.6	62.4
Subsoil	72	5.8	0.3	0.1	1.7	9.0	19.7	60	0.07	0.42	1 940	610	2 460	27.8	24.4

Tropudalfs are the major soils of Soil Associations LM and LWM but are common in GLJ, ML, KLJ, WL and IKL.

K. Strongly weathered and leached soils with low base status (Ultisols: Humults)

These soils are characterised by an appreciable amount of translocated clay but few bases. The release of bases by weathering is equal to or less than that removed by leaching. Most of the bases tend to be held in the vegetation and in the upper few centimetres of soil. This effect and that of decreasing base saturation with depth is the result of nutrient recycling by vegetation. Ultisols are associated with a variety of parent rocks (Figures 6.3-6.5) but are found predominantly on stable sites where leaching is maximal and surface erosion minimal (Frontispiece): probably for the same reason only humus-rich Ultisols have been distinguished. They appear to be widely scattered throughout Choiseul but have not been recorded in the Shortland Islands.

K. Deep, freely drained, humus-rich, yellowish red clay (Tropohumults)

These are Ultisols with an accumulation of finely divided organic matter near the surface. This has not however resulted in the formation of a dark, deep topsoil and in most cases, the reddish subsoil colours are found within a few centimetres of the surface (Choiseul 35, Appendix 1). Profiles are freely drained except in low-lying areas where subsoil mottling indicates impeded rainage or a fluctuating watertable; these soils (described as aquic), however, are rare. The soils have a friable to firm consistence with a weak blocky structure and moderate blocky substructure.

The low base status of Tropohumults, in comparison with Alfisols, is mainly due to the low levels of calcium ions in the subsoil (Table 7). The CEC is medium but there are insufficient bases at depth to reach 35% base saturation. Soil reaction is markedly more acid than in Alfisols. Only total phosphorus reaches high values beneath the topsoil but in available form the soils are deficient. Weathering is well advanced and in some profiles the low clay CEC can change the classification from typic to humoxic.

TABLE 7 Average topsoil and subsoil analyses of six Tropohumults (three Typic, two Humoxic and one Aquic)

	Depth cm	pH (H_2O)	Exchangeable meq%					Percentage			Total ppm			Available P ppm (Bray)	Clay CEC meq%
			Na	K	Mg	Ca	CEC	BS	N	C	P	K	Mg		
Topsoil	8	5.5	0.3	0.4	3.3	9.9	32.6	42	0.64	0.8	690	700	2 590	18.1	78.4
Subsoil	129	5.2	0.1	0.1	1.4	1.4	18.9	15	0.08	0.83	340	1 040	3 030	4.8	30.7

Tropohumults are dominant in Soil Association KLJ, common in IKL and are known to be widely scattered elsewhere.

S,Y,J. Very strongly weathered and leached soils (Oxisols: Orthox)

This group of soils occurs over a wide range of parent materials but mainly on sites where there is an absence of surface erosion; these range from rounded ultramafic hill summits, ridge crests of volcanic and sedimentary rocks, debris slopes of young volcanoes and terraces underlain by coral. They have, therefore, a wide distribution in Choiseul and the Shortland Islands. They are predominantly deep, stone-free and

reddish in colour. Weathering is advanced and the leaching of bases is intense. Most are gibbsitic but gibbsite occurs as clay-size particles and does not form the gravel-sized aggregates that are found in Oxisols elsewhere in the tropics.

S. Deep, freely drained, dark brown to red clay (Acrorthox)

These soils are so strongly weathered that they have lost virtually all ability to retain bases in their mineral fraction. They are rare in the Solomon Islands only having been identified over ultramafic rocks in Guadalcanal and Choiseul (Figure 6.5).

Profiles are deep with free drainage and are stone-free in the upper subsoil. The macro-structure is massive but breaks down to a moderately developed fine angular blocky substructure. The consistence is friable.

The chief chemical characteristics are strong acidity, decreasing with depth, severe depletion of all bases, a whole-earth CEC which is high in the topsoil but virtually absent at depth where there may be a net positive charge, a wide C:N ratio probably due to inhibited microbiological activity, low total nutrients and high values of chromium and nickel with cobalt in the lower subsoil. Profile Choiseul 2 (Appendix 1) displays all these features, although technically the clay CEC at 1.6 is slightly in excess of the maximum required for an Acrorthox.

Acrorthox are only mapped in Soil Association JSI where they are thought to be common.

Y. Deep, imperfectly to freely drained, brown to strong brown clay (Eutrorthox)

These soils are strongly weathered but their association with limestone terraces gives high base saturation due mostly to the presence of limestone fragments in the subsoil. Unexpectedly they have not been identified from terrace soils in Choiseul, the two sampled profiles being classed as a Tropudalf and a Haplorthox respectively. However, this is believed to be the result of an omission of sampling rather than an absence of conditions suitable for their development; on this basis the Eutrorthox are mapped as part of Soil Association YJB. Elsewhere in the Solomons where coral terraces occur having deep, strong brown clay soils, Eutrorthox figure prominently (Volumes 4, 7 and 8). The description below is derived from these volumes.

Soils are mostly brown to dark brown or strong brown in colour with little subsoil mottling, a weak structure and friable to firm consistence. There is no surface drainage on the terraces, all incoming rain not utilised by vegetation disappearing underground. Low-lying areas on Vaghena may have impeded subsoil drainage.

Beneath thin but fertile topsoils the Eutrorthox are deficient in nutrient with the exception of phosphorus which may locally reach extremely high levels. The potassium status is particularly poor. Because of the highly weathered bauxitic nature of the soil it has a low ability to retain added nutrients.

Eutrorthox are dominant only in YJB.

J. Deep, freely drained, strong brown to red and reddish brown clay (Haplorthox)

This is the most common group of Orthox in Choiseul and the Shortlands, paralleling the distribution in other major islands of the Solomons. They are typically deep, stone-free, strongly coloured and weakly structured and are associated with stable sites of less than 20° and mostly less than 10°. One unusual profile was recorded on a 48° middle slope, however, but the inclusion of large rounded core boulders throughout the profile suggested that the material originated from upslope where it had already undergone considerable weathering.

Oxisols locally develop thick surface organic layers but the organic matter may be so finely divided that it does not greatly discolour the reddish hues of the mineral soil. Where the organic carbon level in the upper profile is high the soil is defined as a Humox. These have only been identified in two instances in Choiseul but may be more common on stable sites at high altitudes such as around the rim of Mt Maetambe volcano (Figure 6.4).

Haplorthox resemble the Acrorthox chemically except that the clays have a higher exchange capacity, an improved base saturation due to slightly higher calcium levels, a narrower C:N ratio and higher values of total phosphorus (Choiseul 10, Appendix 1). However, one profile on Vaghena Island (Choiseul 6), consisting mainly of bauxitic earth, has extremely high total and available phosphorus, comparable to the Eutrorthox of Rennell and Bellona (Volume 8); this profile is excluded from Table 8. Tropeptic Haplorthox are those with a relatively thin, strongly weathered (oxic) horizon.

TABLE 8 Average topsoil and subsoil analyses of eight Typic and three Tropeptic Haplorthox

	Depth cm	pH (H_2O)	Exchangeable meq%					Percentage			Total ppm			Available P ppm (Bray)	Clay CEC meq%
			Na	K	Mg	Ca	CEC	BS	N	C	P	K	Mg		
Topsoil	15	5.4	0.1	0.2	1.0	2.9	17.5	24	0.38	5.12	470	640	1 690	6.7	30.0
Subsoil	127	5.3	0.1	0.0	0.5	0.6	8.1	19	0.08	0.86	220	990	2 630	3.7	13.9

Haplorthox are dominant in Soil Associations JSI, JI and JOI, common in YJB, and present in IGJ, GLJ and KLJ.

CURRENT LAND USE

Introduction

The population of Choiseul and the Shortland Islands is predominantly coastal with a residue of hill villages on Choiseul. According to Hackman (1968) there are eight languages spoken on Choiseul although locally the boundaries merge, representing the median lines of a dialect transition. The people of the Shortland Islands speak a language with close affinities to the language of southern Bougainville and which differs from the Choiseul vernaculars. In addition Gilbertese is spoken by the Micronesian settlers on Vaghena and Alu Islands while 'pidgin' is spoken by most males throughout the islands.

The population of Choiseul was 8 017 in 1970 and of these 6 689 were recorded as having been born on the island (Groenewegen, 1972). People born outside Choiseul comprise 16% of the population with 453 people originating from elsewhere in the Western District while the Gilbertese, who were resettled on Vaghena from the Phoenix Islands in the early 1960s, number 662 or 8% of the population. The same census data recorded 1 038 Choiseul-born people living elsewhere in the Solomons.

The Shortland Islands had a population of 1 950 in 1970, 70% being Melanesians born in the Shortlands and 18% Gilbertese migrants and their Solomons-born children. Although 163 Shortland Islanders were recorded living elsewhere in the Solomon Islands the number living in Bougainville is unknown.

The population distribution in Choiseul is eccentric with less than 2 000 people living south of a line from Sumbi Point to the Kao River. With the exception of Vaghena Island, eastern Choiseul is sparsely populated with only two small villages east of Varunga Point on the north coast and one village east of Mboemboe village on the southern coast. Sarelata (760 m) and Bakolo (440 m) are the only remaining villages deep in the interior of Choiseul, an area that was once inhabited by a much larger population judging by the widespread occurrence of old village sites and pagan 'tabu' areas.

The combined population of these two villages did not exceed 50 persons in 1970. There are also several hundred people living in the foothills adjacent to the coast, mainly behind Chirovanga.

The population of Choiseul is divided into more than 100 major group estates which are subdivided into lesser group and family estates (Scheffler, 1971). Major estates may cover many square kilometres, each being the corporate property of a social unit giving its' people the rights to reside on and make use of this land.

TABLE 9 Population and population densities, 1970

Island	Area km^2	Population	Density; persons/km^2
Choiseul	3 208	7 332	2.3
Vaghena	86	685	7.9
Shortland Islands	420	1 950	4.7

Investigations into the bauxite potential of Vaghena Island have resulted in the construction of a road along the southern coast. On Choiseul wide coastal tracks have been cleared, south of Sasamungga and inland from Chirovanga but at the time of the survey they were unsuitable for wheeled vehicles along much of their length.

In the Shortlands logging roads have been constructed, centred on the timber company headquarters at Lofang on Alu Island. Second World War airstrips at Sterling and Balalai in the Shortlands have been reopened and a new airstrip has been built on Taro Island in Choiseul Bay.

Shifting cultivation

The production of staple food crops in both Choiseul and the Shortlands is based on shifting cultivation. All gardens produce several crops from the same plot although crops are often segregated or divided by lines of fruit bushes or trees.

In both island groups sweet potato *(Ipomoea batatas)* is the major root crop dominating the subsistence gardens. Prior to World War II, taro *(Colocasia esculenta)* was dominant but the ravages of leaf blight brought about by *Phytophthora colocasiae* led to a decline in its importance and although it is still grown in many gardens it is no longer the major source of starch. Cassava *(Manihot esculenta)* was recorded in a large number of gardens while yams *(Dioscorea* spp.) were rarely seen and do not appear to play an important role in subsistence farming on Choiseul or the Shortland Islands. A variety of other crops are grown including hibiscus cabbage *(Hibiscus manihot),* sugar cane, pineapples, bananas and pawpaws and these may remain in the fallow for some years after the garden has been abandoned.

Most subsistence gardens are close to the village and cover only a limited area of land. However, behind some of the large centres of population, such as Sasamungga and to a lesser extent Chirovanga, large areas of regrowth are interspersed with current garden areas and coconuts at different stages of growth.

Cash crops

Coconuts

Choiseul provides between 4 and 8% of the country's copra while the Shortlands contribute between 1 and 4%. By 1931, some 2 550 ha of coconuts had been planted by expatriate-owned companies on Choiseul and the Shortlands (Great Britain Colonial Office, 1932). These estates were abandoned during the war and forest regrowth became well established; many estates did not recover from this period of neglect and were never again worked effectively. The deterioration of some estates is such that large areas are now almost indistinguishable from secondary forest.

Since the war copra production from estates declined while production from Solomon Islanders has increased to 94% of the total output. For the decade prior to 1972 copra production from Choiseul remained steady at 1 200 - 1 600 t/yr. This increased to 1 760 tons in 1972 but fell dramatically to 560 tons in 1973. The fall in production was partly due to cyclone damage during the latter part of 1972 and, perhaps more important, to the low market price for copra in 1973 which resulted in a lower incentive to process this crop. The Shortlands appear not to have been influenced by cyclones and the lower prices do not seem to have depressed output, so that production in 1973 was almost as high as 1971 but, as a result of the overall fall in production throughout the country its percentage of total output rose to 3.8%. The high price of copra in 1974, markedly increased the production from both islands as is shown in Table 10.

TABLE 10 Copra production from Choiseul and the Shortland Islands, 1970-4

	Choiseul		Shortland Islands	
	tons	% of Solomon Islands production	tons	% of Solomon Islands production
1970	1 261	5.2	671	2.7
1971	1 399	5.4	662	2.5
1972	1 766	8.4	404	1.9
1973	560	3.5	609	3.8
1974	1 973	7.0	1 012	3.6

Many coastal areas are being planted with coconuts on a community basis while others are being planted by individual farmers.

Cocoa

In 1973, Choiseul and the Shortland Islands produced 1 344 kg (1.3 tons) of cocoa, approximately 1.6% of the total Solomon Island production. Cocoa production on Choiseul has fallen from 3 180 kg in 1969 to 508 kg in 1973 while the figures from the Shortlands show more erratic fluctuations with output in 1973 exceeding that of Choiseul. These islands, in 1969, accounted for 12.6% of all cocoa produced in the Western District and 21% of the cocoa produced by Solomon Islanders in that district but by 1973 these figures had fallen to 6.3% and 17% respectively. Cocoa on Choiseul and the Shortlands is produced entirely by Solomon Islanders.

TABLE 11 Cocoa production from Choiseul and the Shortland Islands (kg)

	Choiseul	Shortland Islands	Total	% of Solomon Island production
1969	3 180	762	3 942	4.1
1970	3 139	877	4 016	3.1
1971	1 797	1 588	3 385	2.8
1972	1 525	127	1 652	2.6
1973	508	826	1 334	1.6
1974	1 568		1 568	0.7

Yield figures from these islands are not available although an estimated yield of 29.0 kg/ha has been obtained for the Western District based on production figures and a survey of cocoa producing areas carried out in 1966. Since this time the area under cocoa has been considerably reduced but the abandonment of many overgrown and non-productive plots has meant that the present production level is obtained from fewer trees.

Cattle

Livestock returns on 31 March 1931 recorded 758 head of cattle in the Shortlands District, an area which then covered Choiseul and the Shortland Islands (Great Britain Colonial Office, 1932). This represented 4.7% of the national herd and all the animals recorded were owned either by expatriate-owned coconut estates or by missions. Cattle numbers declined drastically during the war when Choiseul estates were abandoned and those on the Shortlands were occupied by the Japanese from 1942 until 1945. The first complete cattle census after the war, in 1967, counted 122 cattle in nine separate herds on Choiseul and the Shortlands, and of these Solomon Islanders owned four herds totalling 10 head (Blair Rains, 1969). The census also showed that Choiseul and Shortlands contained 50% of cattle recorded in the Western District but the share of the national herd had fallen to 1.3%.

By 1970, cattle numbers on Choiseul and the Shortlands had risen to 153 head in 11 herds and this increased to 291 head in 17 herds by 1973 (Eele, 1974).

Solomon Islanders are showing an increasing interest in cattle both for keeping coconut plantations cleared of undergrowth and as a source of income from meat sales. Between 1967 and 1973 cattle owned by Solomon Islanders increased in number from 10 to 79 head, that is 27% of all cattle on Choiseul and the Shortland in 1973.

Land use pattern

The land use map (Separate Map 6f) is derived from air photograph interpretation. Complete photographic cover of Choiseul was last flown in 1962 at scales varying between 1:60 000 and 1:64 000. Some parts of the island were covered by photography flown in 1968 at a scale of 1:24 000. Most of the island, therefore, was mapped using photographs flown in 1962 but in Choiseul Bay and Hamilton Passage the 1968 photography was used.

The 1962 photography was used for Fauro and Mono Islands in the Shortlands Group while 1968 photography at 1:20 000 scale was used for Alu Island.

The small size of many clearings and the limited period of cultivation leads to difficulties in interpretation. At photo-scales up to 1:40 000 present subsistence gardens and formerly cultivated areas now under old garden regrowth can be distinguished. Present subsistence gardens are defined as:- land that is currently being cleared, cultivated or that has been recently abandoned and is covered by low, mainly herbaceous regrowth. On airphotos this category is recognisable by its checkerboard pattern, low vegetation height and associated light grey tone. The nature of the farming practices used often results in a gradual transition between different land use units; subsistence gardens commonly merging into older regrowth and each occurring as pockets within the other.

Older garden regrowth is clearly distinguishable from present-day gardens and normally distinguishable from well established secondary and primary forest by its low (<5 m), generally uniform regrowth canopy dominated by quick-growing, light-demanding species and by the irregular patchwork appearance reflecting the different ages of the regrowth. The practice of not felling economically useful trees results in individual, large-crowned trees standing as emergents above a low, fine-crowned canopy. The age of the regrowth cannot be accurately estimated from air photographs as factors affecting plant growth vary considerably from site to site.

At a photo-scale of 1:20 000 very small land use units can be identified but the smallest area of land that can be transferred and delineated on to the 1:50 000 base maps is approximately 1.25 ha. In some areas covered by the larger scale photography, therefore, the complexity of the land use pattern has necessitated the merging of some small discrete units, for example, a small block of coconuts enclosed by a large area of gardens. Areas were measured on the 1:50 000 scale land use maps using a dot grid, a method incorporating a degree of error which increases as the area measured decreases.

TABLE 12 Areas of land use within land systems*

Land system	Total area	Subsistence gardens and young regrowth		Old garden regrowth		Coconuts		Towns, villages and airstrips		Logged areas		Total area used	
	km^2	ha	%	ha	%	ha	%	ha	%	ha	%	ha	%
CHOISEUL													
Alokan	25	60	2	120	5	90	4	5	<1			275	11
Andi	170	65	<1	240	1	75	<1	5	<1			385	2
Aruliho	16	45	3	115	7	–	–	–	–			160	10
Esperance	31	5	1	65	2	–	–	–	–			70	2
Fata 'olo	223	210	1	450	2	160	<1	5	<1			825	4
Henefau	205	25	<1	185	1	35	<1	–	–			245	1
Huranja	8	–	–	–	–	–	–	–	–			–	0
Ibatasi	107	5	<1	10	<1	–	–	–	–			15	<1
Kohinggo	19	15	<1	–	–	50	3	–	–			65	3
Kumbongava	327	60	<1	450	1	15	<1	–	–			525	2
Kumotu	111	65	<1	160	1	240	2	10	<1			475	4
Lomousa	21	50	2	100	5	650	31	65	3			865	41
Malanjili	9	–	–	–	–	–	–	–	–			–	0
Manggo	118	165	1	1 550	13	220	2	15	<1			1 950	17
Marapa	11	–	–	–	–	–	–	–	–			–	0
Mbaeroko	8	20	2	–	–	60	8	–	–			80	10
Mbina	116	–	–	–	–	–	–	–	–			–	0
Panggoe	93	40	<1	210	2	10	<1	5	<1			265	3
Posarae	819	95	<1	810	1	80	<1	5	<1			990	1
Pusuraghi	114	120	1	430	4	75	<1	5	<1			630	5
Rirama	74	10	<1	75	1	25	<1	–	–			110	1
Sakatokana	206	95	<1	195	1	–	–	5	<1			295	1
Sepa	304	40	<1	235	1	10	<1	–	–			285	1
Sui	32	20	<1	80	3	10	<1	–	–			110	3
Taora	69	20	<1	10	<1	10	<1	–	–			40	<1
Tenaru	14	70	5	235	17	440	31	45	3			790	56
Tirua	46	15	<1	35	<1	–	–	–	–			50	1
Total	3 296	1 315	<1	5 760	2	2 255	<1	170	<1			9 500	3
SHORTLANDS													
Alokan	52	365	7	–	–	410	8	30	<1	–	–	805	15
Aroaro	59	80	1	40	<1	80	1	5	<1	–	–	205	3
Balo	30	–	–	–	–	–	–	–	–	–	–	–	0
Falamae	12	5	<1	–	–	–	–	–	–	–	–	5	<1
Henefau	58	25	<1	30	<1	90	2	–	–	295	5	440	8
Hisiai	48	–	–	–	–	130	3	–	–	–	–	130	3
Kavakava	24	–	–	45	2	45	2	–	–	–	–	90	4
Kumotu	19	–	–	–	–	80	4	–	–	–	–	80	4
Lomousa	28	140	5	–	–	745	29	30	1	–	–	915	35
Manggo	13	35	3	–	–	125	10	5	<1	10	<1	175	13
Mono	37	45	1	50	1	25	<1	–	–	–	–	120	3
Pusuraghi	39	20	<1	15	<1	150	4	5	<1	10	<1	200	5
Tenaru	1	–	–	–	–	5	5	–	–	–	–	5	5
Total	420	715	2	180	<1	1 885	5	75	<1	315	1	3 170	8

*See text for date of photography

Some of the smallest areas have a measuring error of as much as 10% and all figures have been rounded to the nearest 5 ha. Land use area measurements were not calculated from the 1:150 000 land use map as this map attempts to show land use distribution patterns over the island rather than accurate land use boundaries in specific areas. For technical reasons, arising from the production of coloured maps, the smallest area that can be delineated on the 1:150 000 scale map is a rectangle with sides of 1-1.5 mm long, representing an area of 2.25-5 ha on the ground. Thus, rather than delete small areas and so alter the land use distribution, areas of 1.25 ha plotted on the 1:50 000 maps are exaggerated on the 1:150 000 map so that they represent

areas between 2.25 ha and 5 ha in extent and their boundaries are simplified. The printed 1:150 000 scale land use map, therefore, should not be used for the measurement of land use areas.

The sparse population of eastern Choiseul is reflected in the virtual absence of cultivation in that area, particularly along the north eastern coast where only one small area of cultivation occurs between Varungga Point and Rob Roy Island. The south-eastern coast has patches of widely scattered cultivation at Taora, Mboemboe and around Oaka Harbour. Although Vaghena Island has a continuous band of cultivation along its southern coast, linking the villages of Arariki and Nikomaroro, the remainder of the island is unused except for a badly overgrown coconut estate in the north-east.

Westwards, along the southern coast as far as the Vurulata River, settlements occur at the heads of bays separated from each other by rocky headlands. However, from the Vurulata River almost to the Kolombangara River, gardens and coconut plantings form an almost continuous strip along the coast. The largest concentration occurs around the village of Sasamungga which, with a population of around 550, is the largest centre of population on the island.

Attempts have been made to develop the alluvium of the Kolombangara River basin and some areas have been cleared for subsistence, coconut and cocoa gardens. These are not shown on Map 6f as clearing and planting took place after the air photography was taken in 1962.

North-west of the Kolombangara River, cultivation occurs along a narrow coastal strip as far as Nukiki with larger concentrations near Ghazalata and on Moli Island.

Choiseul Bay, in western Choiseul, has its coastline fringed by mangrove swamps which merge inland into freshwater swamps. Cultivation is largely confined to the islands forming the western margin of the bay. Several of these islands were formerly covered by coconut estates but since the war they have become derelict and Taro, the most southerly island, has been cleared and an airstrip constructed.

From Poroporo to Pemba Inlet the coastal area is being rapidly developed and gardens and coconuts are replacing forest over much of the Alokan Land System. Chirovanga, on the north coast, forms the centre of a large area of cultivation which extends eastwards to the Vachö River and southwards, inland for several miles. There are a number of villages on the ridges inland which are linked by a series of gardens and secondary regrowth with the coast. South-eastwards along the northern coast, narrow areas of cultivation occur, nowhere forming dense concentrations. Inland from Pupuka, near the headwaters of the Vachö River, is the village of Bakolo one of the two remaining villages in central Choiseul.

Between the Kamangga River and Sisiata Bay, extensive areas of gardens and garden regrowth extend inland as narrow fingers along the rivers or as larger blocks on the low coastal hills. Further inland still, within the crater of Mt Maetambe is Sarelata Village surrounded by subsistence gardens.

In the Shortland Islands, almost half the population of the group is concentrated on the south-eastern part of Alu Island and the offshore islands of Poporang, Pirumeri and Magusaiai. On Alu itself, there are several overgrown coconut estates, one of which, Lofang, has been used by Shortland Development Limited as a base from which to carry out commercial logging of the interior. The southern coast of Alu, west of Magusaiai Island, is only lightly used, mainly for coconuts. The western end of Alu and the small island of Aloataghala are used for both subsistence and cash crops. Northwards, as far as Maliulai Bay the western coastline is unused and only on the northern side of the bay is there any land use where a derelict coconut estate occurs on the low hills. Another moribund coconut estate in Kamaleai Bay, is the site of a Gilbertese resettlement scheme.

On Mono Island, the central area is unused and the village of Falamae and its adjacent gardens and coconut groves occur along the southern coast. To the south of Blanche Harbour lies Stirling Island, formerly the site of a coconut estate that was largely destroyed by the construction of a wartime airfield.

Fauro and adjacent islands are only lightly used for both subsistence and cash crops, mainly on the coast, while Balalai Island has a history of land use similar to that of Sterling Island.

Forests

In order to avoid repetition the forest types, many of which recur on each island, are only described in Volume 1. Separate Map 6h, Forest types of Choiseul and the Shortland Islands, is however, specific to and included in the present volume. The map has been derived from air photograph interpretation using photography of the years and scales previously used for the land use interpretation. The forest types were identified, plotted on to 1:50 000 contoured map sheets and finally reduced to a scale of 1:150 000. Very small areas which were recognisable at the larger photographic scale of 1:20 000 and were mapped at 1:50 000, were not directly transferable to the final map scale and were deleted. Areas of forest types were calculated from the 1:50 000 sheets and these are shown in Table 13.

Commercial logging on Alu Island in the Shortlands began in 1965 by Shortland Development Limited based at Lofang and up to 1972 the company is estimated to have logged 2 400 ha from a forest estate of 6 070 ha. The company ceased operations in May 1972 but from 1966-72 it logged 96 250 m^3 of timber including some logs obtained from native customary land outside the forest estate.

There has been no commercial logging on Choiseul although there are 6 000 ha of forest estate on Rob Roy Island. Much of this forest tract was badly damaged by a cyclone in 1967.

TABLE 13 Areas of forest types on Choiseul and the Shortland Islands (km^2)

Forest type	Choiseul	Shortland Islands	Total
Ms	13	2	15
Mt	102	20	122
Sg	3	–	3
Sh	–	<1	<1
Sk	1	–	1
Sm	58	25	83
Sp	7	<3	<10
Ss	–	<1	<1
St	22	16	38
Fld	21	23	44
Flk	1	–	1
Flm	79	13	92
Flr	54	30	84
Fhc	3	–	3
Fhd	146	20	166
Fhk	57	–	57
Fhm	2 276	232	2 508
Fhr	17	–	17
Fhs	176	5	181
Fht	–	<1	<1
Fhu	129	–	129
Frm	13	–	13
Gf	<1	–	<1
De	–	3	3
Dg	93	28	121
Ds	20	–	20
Dt	3	<1	3
Total	3 294	420	3 714

Part 3

Landscape analysis:

Land regions and land systems

INTRODUCTION

Choiseul and the Shortland Islands have a varied structure and lithology. The derived landforms are numerous (Part 2) and 33 land systems are recognised (separate Map 6e) predominantly on this basis with an average area of 112 km^2. A few land systems are identified primarily by their vegetation characteristics. The land system (the concept is elaborated in Volume 1) may be described briefly as a unit of land identifiable by characteristic landforms, geology, soils, vegetation and land use. The 33 land systems have been grouped into 8 land regions which are usually dispersed, not discrete areas. In this study these land regions have proved a convenient unit for the determination of agricultural potential which is described in Part 4.

Each land system is described here in two ways:

1. There is an annotated block diagram to illustrate the topography of a typical area whose location can be found in an inset small-scale map. Land facets are indicated on the model, such as ridge crests and valleys, which are important subunits of the land system. These are then described in tabulated form for rapid reference by their landform, soil, vegetation and land use.

2. Facing the model is an expanded description of the landform and geology which will both assist readers interested in specific development problems caused by the terrain and help to form a general picture of the characteristics of the land system.

The land systems are arranged alphabetically within land regions. Readers are referred to Appendix 2 for definitions of geomorphological parameters referred to here, including including the plan profiles of landforms. As an introduction to the full descriptions and as an aid in comparing Choiseul with the other major islands the geographic distribution and main characteristics of the land systems are summarised first.

Four lowland land systems – Tenaru, Lomousa, Kumotu and Pusuraghi – are common throughout the Solomon Islands, and the Manggo Land System is probably similar to other alluvial valleys with mixed lithology drainage basins, in Guadalcanal for instance.

Terraced areas of the Rokera Land Region are limestone-dominated and the component Alokan and Kohinggo Land Systems have an extensive distribution in the New Georgia Group particularly.

Among the hills is a group of land systems in the Mbetilonga Land Region which overlie tuffaceous, lime-poor, arenaceous sedimentary rocks. With the exception of the Tirua Land System they are not mapped elsewhere but have close equivalents in parts of Santa Isabel and Guadalcanal.

The Kwainangali Land Region extends to Santa Isabel and Malaita and is characterised by fine, lime-rich sediments. The Mono and Sui Land Systems are unique to these islands.

Limestone underlies the Manawai Land Region and as this rock occurs on all major island groups these are representative land systems throughout most of the Solomon Islands. They commonly occur together occupying large blocks of land.

Volcanic rocks tend to form high central areas of islands. The younger strata form the Paru Land Region and of the nine land systems mapped four are also found on Guadalcanal. Older volcanics of the Kaipito Land Region have developed land systems only mapped in Choiseul but which resemble those of similar age in other major islands.

LAND REGIONS AND LAND SYSTEMS

KAIPITO LAND REGION

1. Kumbongava Land System

Steep-sided, high and mountainous ridges overlying basement rocks found in central, south-western and north-western Choiseul form this land system. Soils are mainly reddish clays or dark brown loams and the land is forested with a very few small areas cleared for gardens.

Total area: 327 km^2.

Landforms

The altitudinal range is from 40 to 720 m with a maximum available relief of about 300 m. The very narrow to knife-edged ridges have uneven, gentle to steep crestal slopes and may be over 2 km long. The main ridge systems have a north-west to south-east orientation. A few low, broad ridges occur and may be up to 300 m long. The plan profile* is 4L//.

The median angle for all recorded slopes is 30° and the interquartile range is from 21° to 39°. Ridge slopes are medium length to very long, straight to concave and moderately steep to steep. They are intensely gullied and commonly unstable as shown by terracettes, surface boulders, and treefall scars. Short or very short, stable, convex, gentle to moderate slopes flank the broad ridges. In south-east Choiseul it is probable that faulting is responsible for the formation of a large colluvial footslope area about 2 km long and 200 m wide.

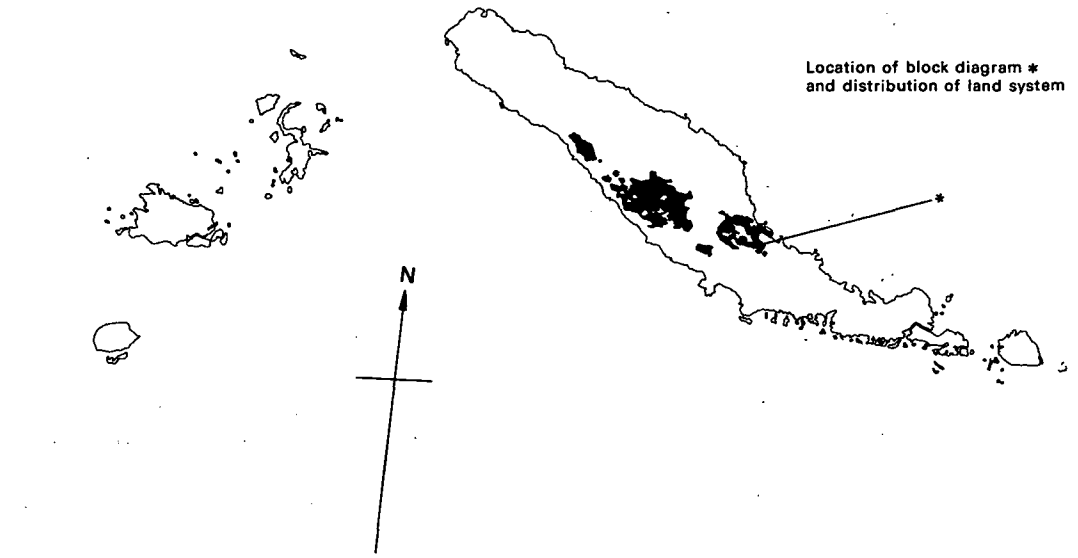
The narrow, incised valleys have steep sides and moderate gradients. The drainage pattern is rectangular to dendritic with a medium texture. Gullies form an ultra-fine drainage texture and parallel pattern on ridge flanks.

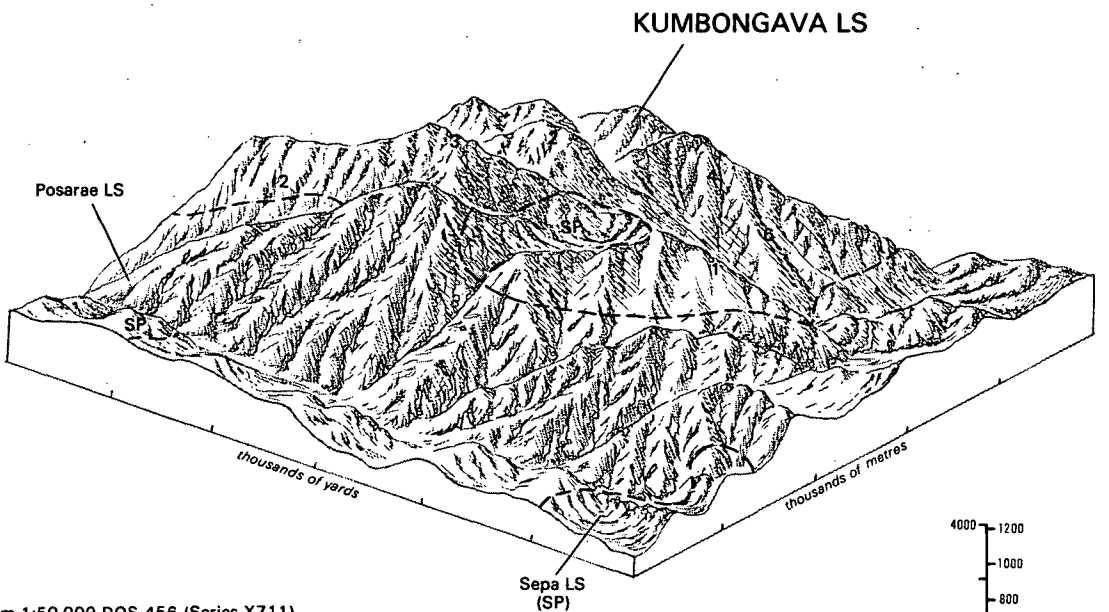
Geology

The underlying rocks are a mixture of pre-Tertiary Choiseul Schists, comprising metamorphosed, foliated and schistose amphibolites, around Upper Oligocene to Miocene Vosa Lavas of andesitic, basaltic and doleritic composition. The lavas have been intruded into and extruded over the Choiseul Schists. Lime-rich sediments have been noted capping some ridge summits.

Number of observations 39 Sample sites 3.

*See Appendix 2, Table 5 for definition of plan profiles.





Derived from 1:50,000 DOS 456 (Series X711)

Angle of Projection 25°

Note: In areas where land systems are repeated, abbreviations only are shown.

Land facet 5 is not present in area shown

Land facet	Area (km^2-%)	Landform	Soil	Vegetation and land use
1	23 7%	Broad ridge crests	Deep, yellowish red or red clay, locally with deep dark topsoil (Tropepts, Tropudalfs, Haplorthox)	Lowland forest with canopy containing mainly *Vitex cofassus* and *Canarium salomonense* but with common *Pometia pinnata, Calophyllum vitiense* and *Campnosperma brevipetiolata* (112 canopy spp. identified from 34 sites). Smaller trees varied with common *Aglaia* sp.(?), *Gomphandra* sp.(?), *Litsea* sp.(?), *Gnetum gnemon, Pimeleodendron amboinicum, Alangium javanicum* and *Gulubia* sp. Ground cover dominated by ferns and seedlings.
2	26 8%	Gentle to moderate, convex, stable slopes	Moderately deep to deep, strong brown gritty or stony clay or clay loams (Dystropepts)	
3	46 14%	Very narrow to knife-edged ridge crests		
4	199 61%	Steep, unstable slopes	Moderately shallow to deep, dark brown gritty or stony loams or clay (Tropudalfs, Eutropepts)	
5	3 1%	Colluvial footslopes		Small coastal areas used for subsistence crops and rarely for coconuts
6	30 9%	Narrow, incised valleys	Not examined	

KAIPITO LAND REGION

2. Posarae Land System

High, steep, irregular ridges overlying Vosa Lavas comprise this land system which is widely distributed over central Choiseul. Soils are brown to dark brown or reddish clays and the vegetation is lowland forest.

Total area: 819 km^2.

Landforms

The relief range is from sea level to 640 m with an available relief of about 300 m. Ridge crests are very narrow or narrow to broad. Very narrow ridges may be up to 750 m long with uneven to very uneven, gentle to moderately steep crestal slopes. Narrow to broad ridge, spur and hill crests are shorter with very irregular longitudinal profiles. The plan profile is 4L.

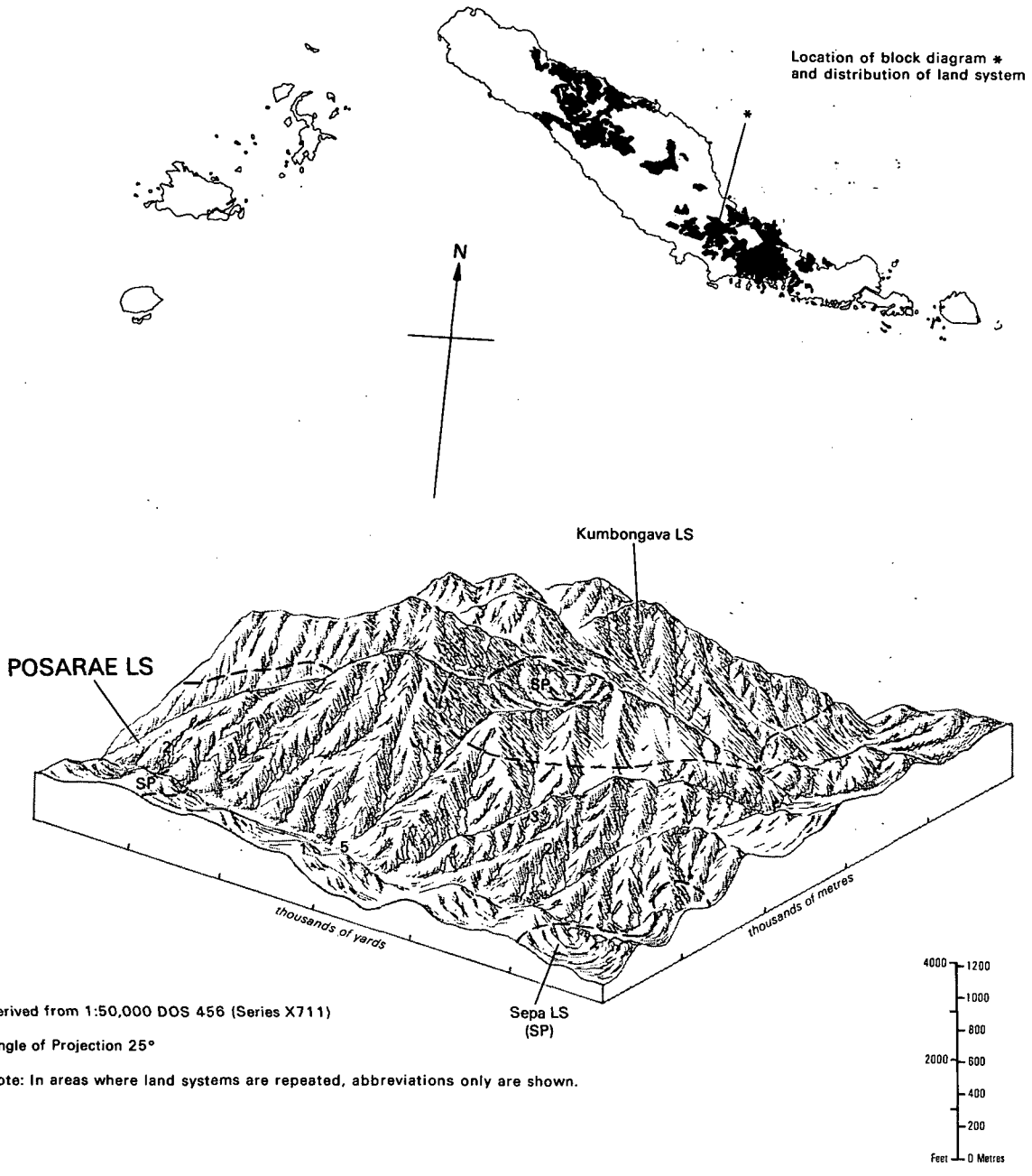
Recorded slope angles have a median value of 31° and an interquartile range from 24° to 38°. Most are short to very long, straight to convex or concave and steep to precipitous. Common instability features include terracettes, treefall scars, slumps, cliffed sections and gullies. Spurs are prominent. Some medium length to long slopes occur which are straight to concave, moderate to moderately steep and stable.

Narrow, incised valleys have gentle to moderate stream gradients and a medium drainage texture in a dendritic pattern. Gullies have moderate to steep stream gradients with waterfall sections and form an ultra-fine drainage texture on ridge slopes.

Geology

The Vosa Lavas consist of andesites, basalts and dolerites of pre-Middle Miocene age.

Number of observations 172 Sample sites 6.



Derived from 1:50,000 DOS 456 (Series X711)

Angle of Projection 25°

Note: In areas where land systems are repeated, abbreviations only are shown.

Land facet	Area (km²-%)	Landform	Soil	Vegetation and land use
1	57 7%	Narrow to broad hill, ridge and spur crests	Deep, yellowish red or red clay (Dystropepts, Tropudalfs, Haplorthox)	Lowland forest with canopy dominated by *Pometia pinnata.* Other common canopy species (81 spp. identified from 131 sites) include *Canarium salomonense, Neoscortechinia forbesii, Vitex cofassus* and *Campnosperma brevipetiolata.* Smaller trees vary widely with *Pimeleodendron amboinicum, Celtis philippinensis* (?), *Aglaia* sp. (?), and *Alangium javanicum* being common in addition to those above. Many palms, ferns and seedlings present in lower storeys.
2	139 17%	Moderately steep, stable slopes	Moderately deep to deep, reddish brown to dark reddish brown clay (Dystropepts, Tropohumults)	
3	115 14%	Very narrow ridge crests	Moderately deep to deep, strong brown clay, locally stony or gritty (Dystropepts)	
4	426 52%	Steep, unstable slopes	Moderately shallow to deep, dark brown stony or gritty clay and loams (Eutropepts, Tropudalfs) Shallow, dark loams over soft weathering rock (Troporthents)	
5	82 10%	Valleys	Not recorded	Some coastal areas cleared for subsistence crops, rarely for coconuts

KAIPITO LAND REGION

3. Taora Land System

These are areas of short, steep ridges overlying schists found in eastern Choiseul and Rob Roy Island. Soils are predominantly yellowish red to red clays and the vegetation is lowland forest.

Total area: 69 km^2.

Landforms

The altitude ranges from sea level to 240 m and available relief is 50-120 m. The narrow ridges are very short (less than 200 m long) with gentle to moderate, even crestal slopes. Their plan profile is 4L.

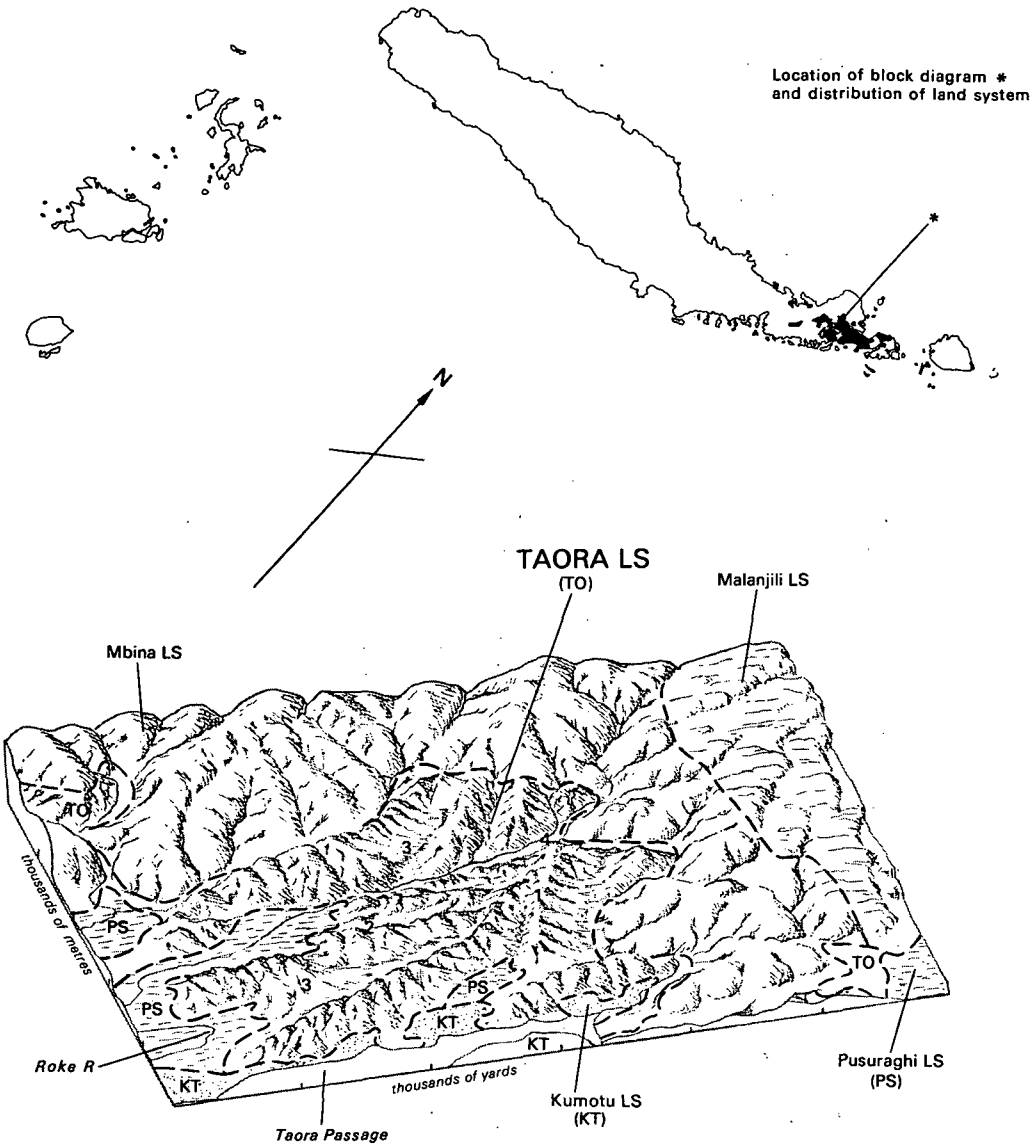
Upper and middle slopes are very short, straight to convex and moderately steep to steep with a few precipitous sections. Instability features such as treefall scars, terracettes and gullies may be found on these slopes. Lower slopes are ultra-short and locally gentle to concave.

Valleys are narrow, lightly incised and have gentle to moderate stream gradients. Large streams have a medium drainage texture but small tributaries have an ultra-fine texture. The drainage pattern is dendritic.

Geology

The pre-Tertiary Choiseul Schists are the most important rocks underlying this land system. They comprise finely foliated and schistose, or more granulitic amphibolites.

Number of observations 32 Sample sites 3.



Derived from 1:50,000 DOS 456 (Series X711)

Angle of Projection 25°

Note: In areas where land systems are repeated, abbreviations only are shown.

Land facet	Area (km^2-%)	Landform	Soil	Vegetation and land use
1	26 38%	Narrow ridge crests	Deep, reddish brown to dark red clay (Tropepts, Tropudalfs)	Tall, locally wind–damaged canopy (34 spp. identified from 29 sites) dominated by *Neoscortechinia forbesii*, *Dillenia* sp., *Campnosperma brevipetiolata*, *Maranthes corymbosa* and *Burckella obovata* (?). Smaller trees include, in addition to those above, *Aglaia* sp., *Trichospermum psilocladum*, *Guioa* sp. and *Aporosa papuana*. Small coastal areas cultivated for subsistence crops.
2	29 42%	Moderately steep to steep upper and middle slopes	Deep, yellowish red to red clay (Haplorthox, Tropohumults) Deep to moderately shallow yellowish brown, stony loams and clay (Eutropepts)	
3	6 8%	Gentle lower slopes	Shallow, stony loams (Troporthents)	
4	8 12%	Valleys	Not examined	

GHAUSAVA LAND REGION

4. Marapa Land System

This land system comprises an irregular arrangement of low ridges and hills largely underlain by ultramafic rocks and it is found in eastern Rob Roy Island. Soils are reddish brown and red clays and the vegetation is lowland forest.

Total area: 11 km^2.

Landforms

The altitudinal range is from near sea level to 80 m while available relief is less than 40 m. Broad ridges and hills, which form the main relief features, have rounded summits with uneven, gentle to moderate crestal slopes. The ridges may reach 400 m in length. A few narrow ridges of about 100 m length are found locally. The plan profile is 4 to 4L.

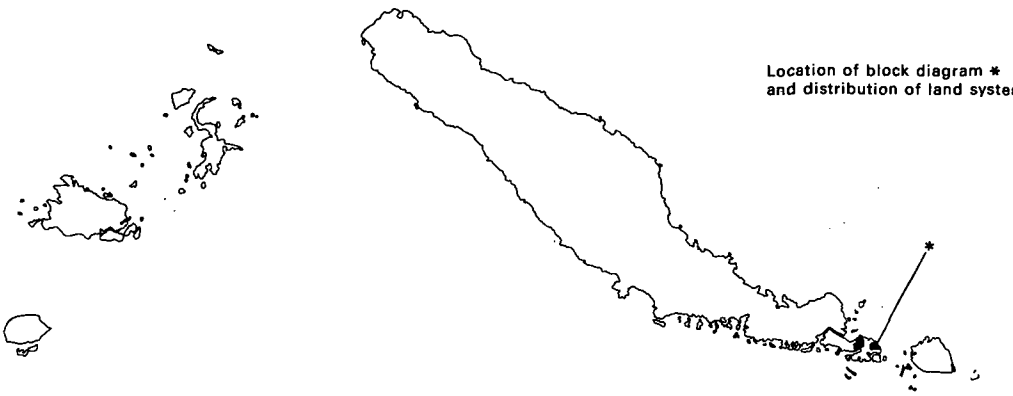
Gentle to moderate, short to medium length, convex upper slopes form the stable flanks of the broad ridges and hills. Very short, steep, unstable slopes are associated with narrow ridges and are also found as lower slopes near incised valleys. Treefall scars are common on unstable slopes.

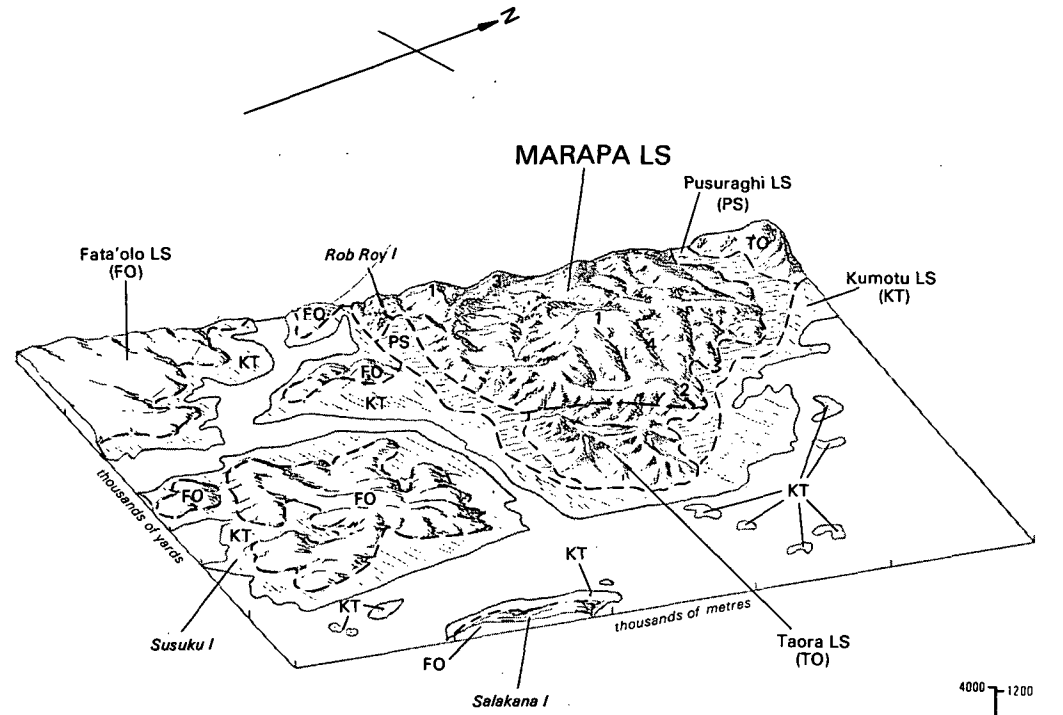
Valleys are narrow and locally incised with gentle stream gradients. At the margins of the land system they widen and merge into swamps. The drainage pattern is dendritic with a fine texture.

Geology

The underlying rocks form part of the Siruka Ultrabasic complex, of unknown age (perhaps pre-Middle Miocene) consisting mainly of serpentinised peridotites but also including some with asbestos fibre and less serpentinised eustatite peridotites.

Number of observations 3 No sample sites.





Derived from 1:50,000 DOS 456 (Series X711)

Angle of Projection 25°

Note: In areas where land systems are repeated, abbreviations only are shown.

Land facet	Area (km^2-%)	Landform	Soil	Vegetation and land use
1	7 62%	Rounded summits and convex upper slopes	Deep, yellowish red or red clay (Haplorthox) Deep, reddish brown clay (Tropudalfs)	Wind–damaged forest containing emergents of *Casuarina papuana, Fagraea gracilipes, Eugenia* spp. and *Amoora* sp. with thick undergrowth of palms, pandans and ginger
2	2 17%	Steep slopes	Moderately shallow to deep, brownish, stony loams and clay (Tropepts)	
3	1 13%	Narrow ridges		
4	1 8%	Valleys	Not examined	

GHAUSAVA LAND REGION

5. Mbina Land System

This land system comprises areas of both rounded and narrow, high ridges overlying ultramaf rocks in south-east Choiseul. The lowland forest vegetation is dominated by *Casuarina papuana* and the soils vary from yellowish red to dark brown clays.

Total area: 116 km^2.

Landforms

The altitude ranges from sea level to 600 m with an available relief of over 200 m. Very broad ridges, up to 800 m long, have smooth, gentle to moderate, even crestal slopes. Narrow ridge and spur crests are dominant in the vicinity of Mt Sisiriputu, some exceeding 1 km in length with uneven, 'lumpy' longitudinal profiles. The plan profile is 1 to 4L.

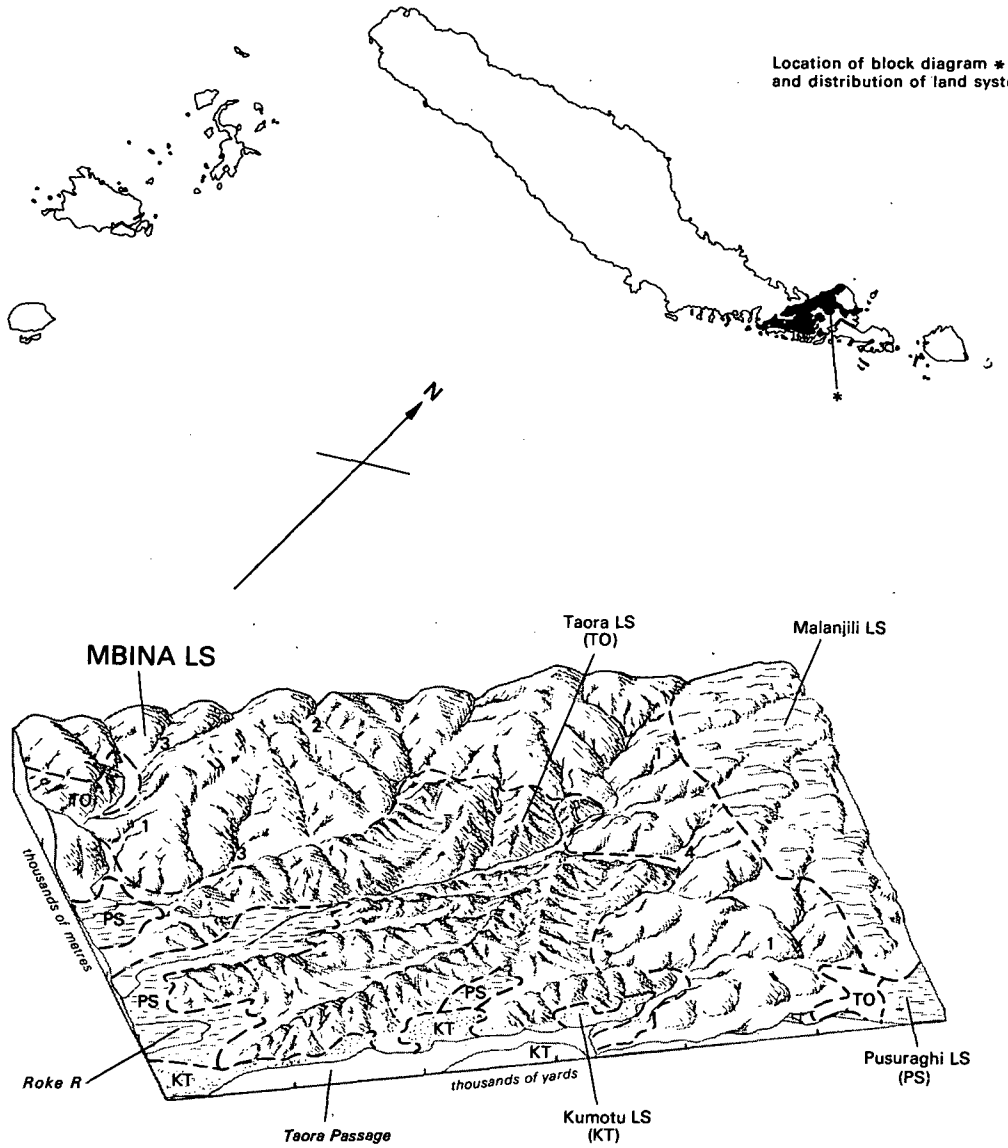
The median angle for all recorded slopes is 21° with an interquartile range of 11-30°. The gentle to moderate, convex, smooth slopes which flank the broad ridges are generally very long. Narrow ridges are flanked by moderately steep to steep or precipitous, straight to concave slopes, which are medium length to long. Lower slopes and gullies are short to medium length, steep and straight. Rock outcrops and treefall scars are common on all steep slopes.

Narrow, incised valleys follow very irregular courses through the land system. They have gentle to moderate stream gradients and a dendritic drainage pattern with some angular segments. The drainage texture is medium. Gullies have incised to ridge crests on narrow ridge slopes but are confined to lower slope segments on the broad ridges.

Geology

The underlying rocks are Siruka Ultrabasics, probably of pre-Middle Miocene age, consisting largely of serpentinised peridotites including some with asbestos fibre and less serpentinised eustatite peridotites.

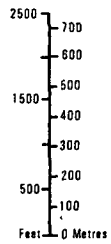
Number of observations 34 Sample sites 3.



Derived from 1:50,000 DOS 456 (Series X711)

Angle of Projection 25°

Note: In areas where land systems are repeated, abbreviations only are shown.



Land facet	Area (km²-%)	Landform	Soil	Vegetation and land use
1	47 40%	Broad ridge tops: convex slopes	Deep, yellowish red or red clay (Acrorthox, Haplorthox) Deep, reddish brown to dark reddish brown clay (Haplorthox) Deep, brown to dark brown clay (Haplorthox, Acrorthox)	Species–poor lowland forest with open canopy dominated by *Casuarina papuana, Xanthostemon* sp., *Dacrydium xanthandrum, Fagraea gracilipes* and *Burckella obovata.* Smaller trees and shrubs also include *Gulubia niniu, Homalium tatambense* (?), *Decaspermum fruticosum* and *Calophyllum vitiense* Large, summit, heath-like areas have thick ground cover of *Gleichenia* sp., climbers and plants typical of degraded land
2	31 27%	Narrow ridges and spurs: straight to concave slopes		
3	23 20%	Lower slopes and gullies	Moderately shallow to deep, dark stony loams and clay (Tropepts, Troporthents)	
4	15 13%	Valley floors	Not examined	

PARU LAND REGION

6. Aroaro Land System

This land system consists of ridges developed over mixed volcanics and tuffaceous sediments with brownish sandy soils. It is found in the Shortland Islands under cultivation and lowland forest.

Total area: 59 km^2.

Landforms

The altitude ranges from sea level to 500 m with an available relief of 30-300 m. Relief is dominated by low to high, short to long ridges with knife-edged to narrow crests. The crestal slopes are moderately steep to steep and uneven, commonly with boulder outcrops. The plan profile is 4L.

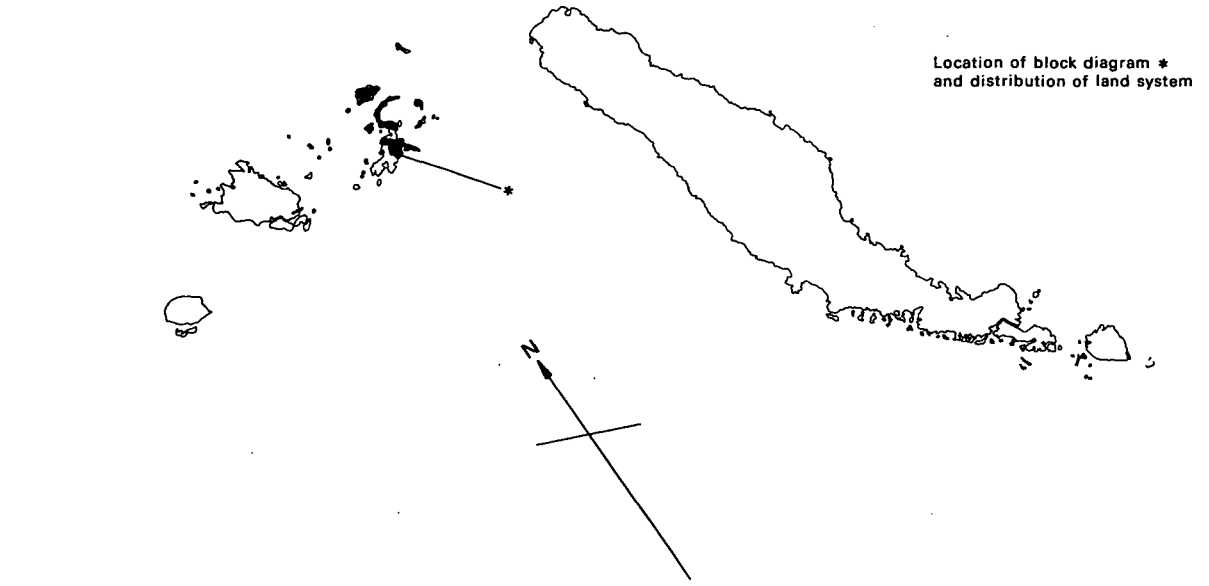
The median angle of all recorded slopes is 29° with an interquartile range of 20-36°. Upper and middle slopes vary from short to long and are generally straight and moderately steep to steep. Precipitous slopes occur where there are rock outcrops, gullies or marine erosion: these are very short, often cliffed and unstable. Footslopes occupy short, gentle to moderate and concave colluvial areas with stony surfaces.

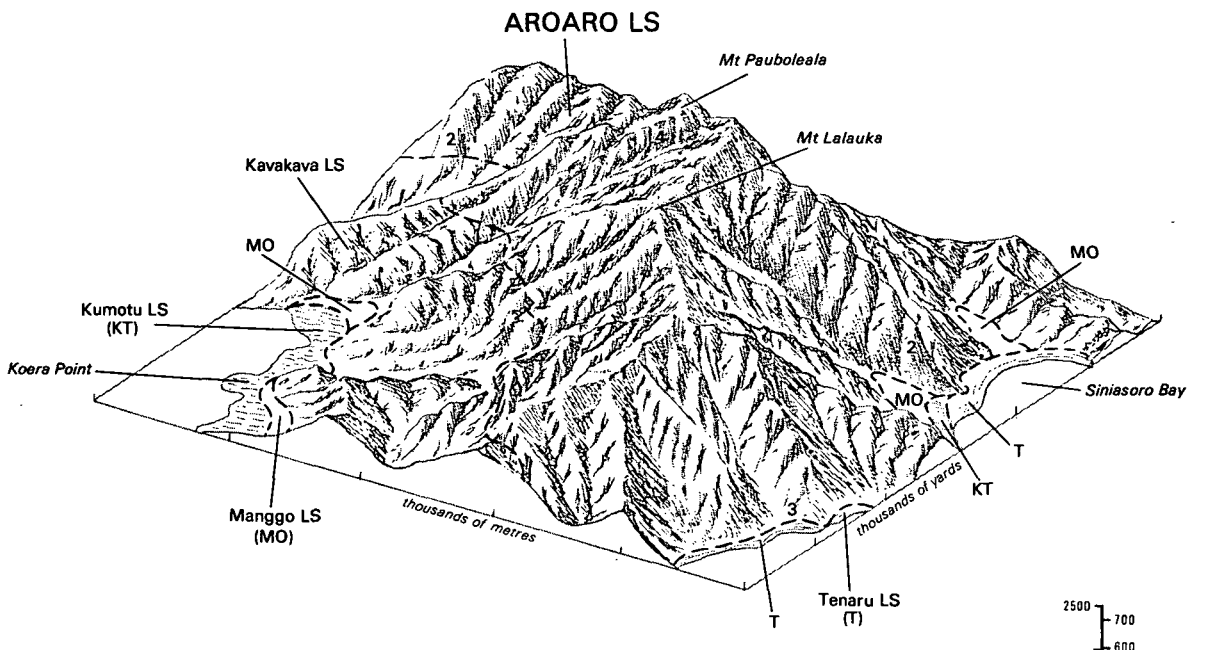
Valleys have gentle to moderate stream gradients. The drainage pattern is dendritic to angular and texture is medium. Gullies are common on valley sides and have moderately steep to steep gradients and a very fine drainage texture.

Geology

The rocks are Tertiary andesitic volcanics with tuffaceous sediments in places. There may be additions of recent volcanic ash from Bougainville.

Number of observations 46 Sample sites 5.





Derived from 1:50,000 DOS 456 (Series X711)

Angle of Projection 25°

Note: In areas where land systems are repeated, abbreviations only are shown.

Land facet	Area (km^2-%)	Landform	Soil	Vegetation and land use
1	8 14%	Ridge crests: knife-edged to narrow	Shallow to moderately deep, brownish loams and clay overlying pale, mottled, sandy weathering rock (Eutropepts)	Mostly old forest with tall canopy (156 spp. identified from 37 sites) dominated by *Pometia pinnata* or *Vitex cofassus.* Smaller trees include many *Myristica* sp., *Celtis philippinensis* or *Leucosyke salomonensis* and *Litsea* sp. or *Cryptocarya* sp. Palms, mostly *Strongylocaryum latius, Caryota rumphiana* and *Rhopaloblaste elegans*
2	40 68%	Moderately steep to steep slopes	Deep, reddish loams or clay over mottled sandy weathering rock (Dystropepts)	
3	8 13%	Footslopes	Moderately deep, dark brown, stony sandy colluvium	
4	3 5%	Steeper slopes: short, precipitous to cliffed	Bare rock and skeletal brown loams (Troporthents)	Secondary growth from shifting cultivation, mostly woody—*Vitex cofassus, Timonius timon, Alstonia spectabilis,* and Zingiberaceae and ground ferns

PARU LAND REGION

7. Aruliho Land System

Andesitic pyroclastic deposits underlie this land system of low, flat-topped ridges and hills found on the north-eastern coast of Choiseul. It has strong brown clay soils and much of the lowland forest vegetation has been cleared for garden cultivation.

Total area: 16 km^2.

Landforms

The altitude ranges from sea level to 160 m and the available relief is from 40-80 m. Coastal low areas are occupied by narrow ridges or flat-topped ridges and hills whose summits show very little dissection. The narrow-crested ridges have uneven, gentle crestal slopes and may be up to 400 m in length. Other ridges and hills which tend to be further inland are very broad with gentle, even crestal profiles. The ridges have a sub-parallel to radial orientation. Their plan profile is 1L to 4L.

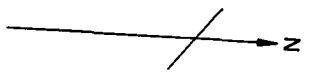
Slopes are very short to short and moderate to moderately steep. They are straight to convex and may be smooth or irregular with small hummocks and depressions.

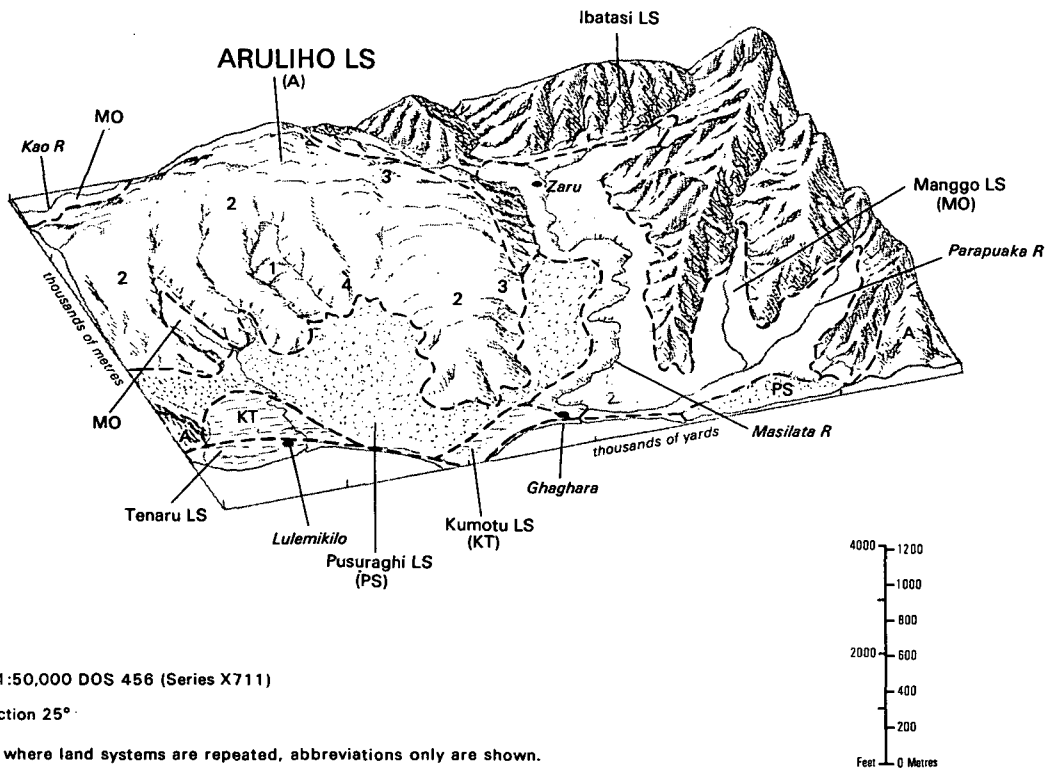
Valleys are narrow with gentle stream gradients but broaden towards the coast where they merge into swamps. The drainage texture is very fine and the pattern is sub-radial.

Geology

The main rock types are Pleistocene to Recent pyroclastics mainly of andesitic composition. They resemble the Gallego Pyroclastics of Guadalcanal.

Number of observations 9 Sample sites 3.





Derived from 1:50,000 DOS 456 (Series X711)

Angle of Projection 25°

Note: In areas where land systems are repeated, abbreviations only are shown.

Land facet	Area (km^2-%)	Landform	Soil	Vegetation and land use
1	3 16%	Narrow ridge crests	Deep, strong brown or reddish yellow clay (Haplorthox, Haplohumox)	Tall forest containing *Pometia pinnata, Campnosperma brevipetiolata* and *Canarium salomonense.* Varied undergrowth species of seedlings, ferns, herbs and climbers Large areas used for subsistence crops, principally sweet potatoes, vegetables and fruit
2	6 38%	Flat to rounded ridges and hill tops		
3	6 38%	Slopes: short, straight to convex	Brownish and greyish loams and clay (Tropepts)	
4	1 8%	Valley floors	Not examined	

PARU LAND REGION

8. Esperance Land System

This land system consists of high, dissected andesitic volcanic cones such as Mt Maetambe, Kumboro Peak in north-east Choiseul and nearby islands. Forest vegetation is dominant and the soils are brown and dark reddish brown clays and loams.

Total area: 31 km^2.

Landforms

The dissected volcanic cones rise from sea level to 200 m on the small islands, from 200 to 600 m on Kumboro Peak and from 400 to almost 1 000 m on Mt Maetambe. The available relief is between 100 and 300 m. Ridge systems radiate from a central crater or peaked area. The ridges are less than 800 m long, narrow to knife-edged, generally symmetrical with uneven profiles and have moderate to steep crestal slopes. Their plan profile is 4 to 4L.

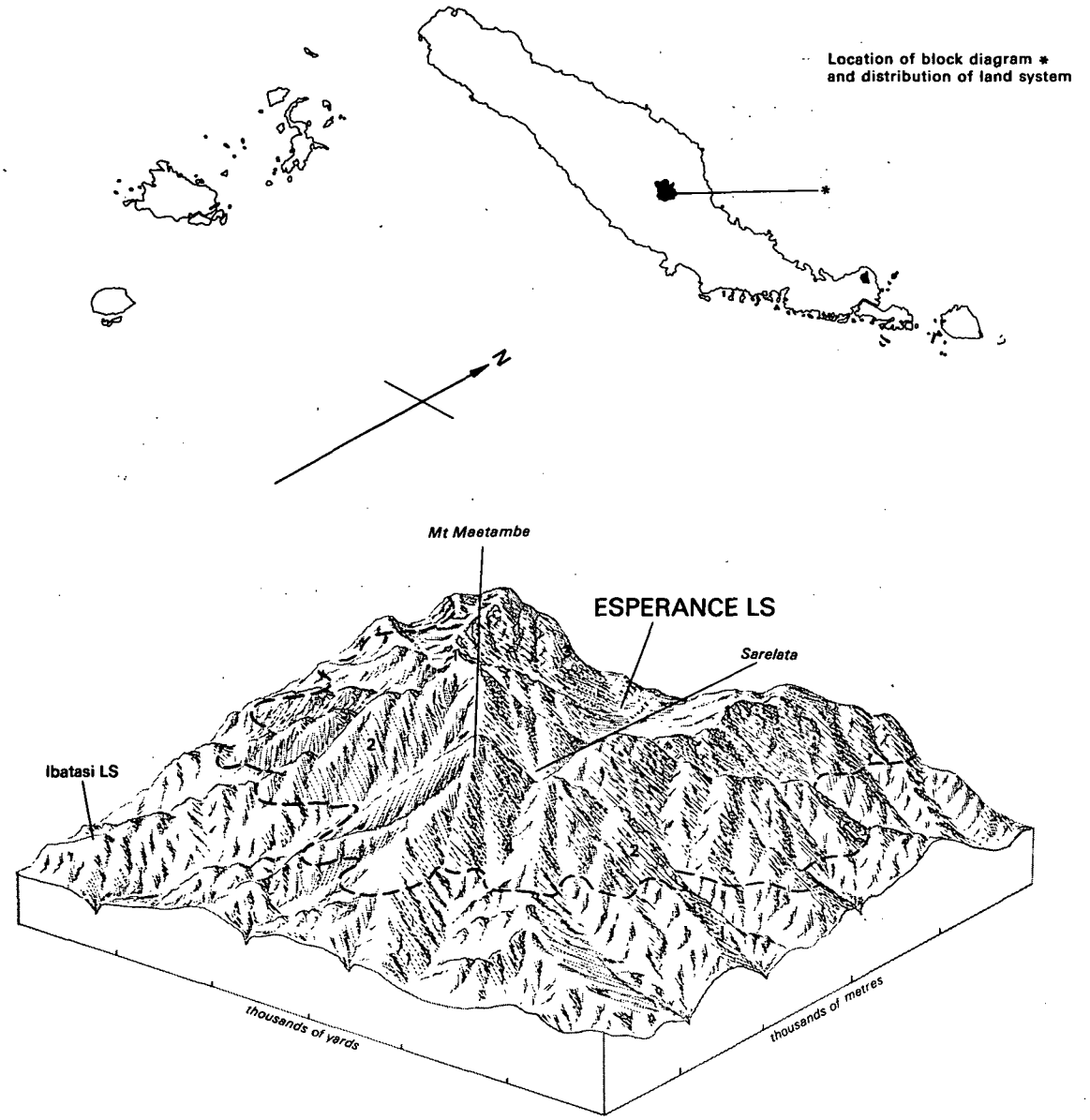
Slopes range from cliffed to moderately steep but most are moderately steep to steep. They range from short to medium length and are straight to concave or irregular. Deeply incised gullies and prominent spurs are marked features while terracetting, tree-fall scars and small landslides are evidence of instability.

Valleys are steep-sided and narrow with moderate stream gradients. They form a radial drainage pattern with a fine texture. The breached central crater of Mt Maetambe however, has a centripetal drainage system. Gullies with moderate to steep stream gradients have an ultra-fine drainage texture in a parallel pattern on valley sides.

Geology

Pliocene lavas and pyroclastics which are partly basaltic and partly andesitic form this land system. It is possible that dissection of Kumboro Peak has exposed schists on part of the valley floors surrounding the neck of the volcano.

Number of observations 86 Sample sites 2.



Derived from 1:50,000 DOS 456 (Series X711)

Angle of Projection 25°

Note: In areas where land systems are repeated, abbreviations only are shown.

Land facet	Area (km^2-%)	Landform	Soil	Vegetation and land use
1	9 27%	Ridge crests: narrow to knife-edged	Moderately shallow to moderately deep, dark reddish brown, stony loams and clay (Dystropepts, Tropohumults)	Disturbed, wind-damaged forest with a few emergents of *Vitex cofassus*. Dense undergrowth of shrubs, climbers and regrowth species such as *Macaranga aleuritoides, Hibiscus tiliaceus, Ficus* spp. and *Prosopis insularis*
2	11 36%	Slopes: moderately steep to steep	Moderately deep, brown to dark brown, stony loams (Dystropepts)	
3	6 20%	Scarps: precipitous	Shallow, dark, stony loams (Troporthents)	
4	5 17%	Valley and gully floors	Not examined	

PARU LAND REGION

9. Falamae Land System

This land system of low and high ridges over volcanic and sedimentary rocks with brownish loam soils is found on Mono Island in the Shortlands Group. The vegetation consists of lowland forest and much regrowth.

Total area: 12 km^2.

Landforms

The altitude ranges from 15 to 300 m with available relief of 60-150 m. Unorientated, short and long ridges with moderate and steep crestal slopes occur. Some ridges are broad with gentle, convex, stable slopes; while others are narrow to knife-edged with even profiles and unstable slopes. Their plan profile is 4L.

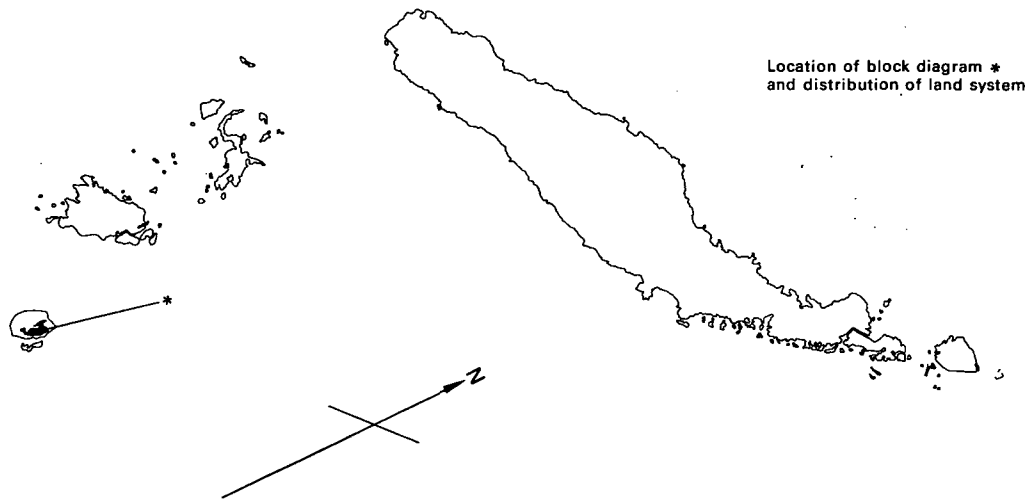
Slopes are moderate to steep or precipitous, very short to long, commonly irregular, unstable and gullied. Landslips are generally found at gully heads beneath knife-edged ridges.

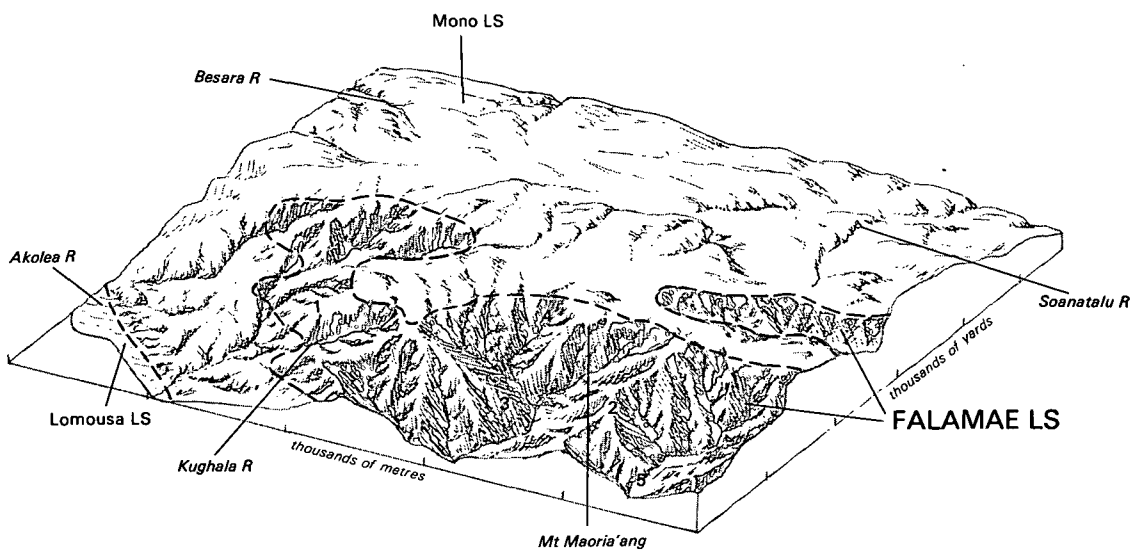
Valleys are narrow with boulder floors and steep stream gradients. Drainage has a dendritic pattern and a coarse texture.

Geology

The underlying rocks are believed to be mixed Pliocene sediments and pre-Pliocene volcanics as erosion of the former has exposed the latter in valleys.

Number of observations 4 Sample sites 2.





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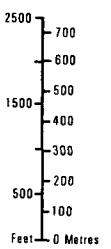
Angle of Projection 25°



Land facet	Area (km^2-%)	Landform	Soil	Vegetation and land use
1	1 11%	Broad ridges	Deep, brownish loams or clay over light yellowish brown, fine sandy clay loams, strongly mottled with weathering rock fragments (Eutropepts, Tropudalfs)	Two sites in old forest examined. One contains *Pometia pinnata* and *Ficus benjamini* in the canopy, the second has a high proportion of palms, notably *Actinorhytis calapparia* (?)
2	2 14%	Narrow ridges		
3	5 46%	Slopes: moderate to steep		
4	2 16%	Landslips	Skeletal, undeveloped stony loams and clay (Troporthents)	Regrowth at two sites contained shrubs such as *Macaranga* spp. and *Hibiscus tiliaceus* with much Zingiberaceae and Musaceae
5	1 13%	Valleys	Unsorted stones and coarse alluvium (Tropofluvents)	None observed

Prepared by Directorate of Overseas Surveys, 1977

PARU LAND REGION

10. Hisiai Land System

Low ridges and hills overlying andesitic volcanics with pink-mottled, red clay soils form this land system. It is mostly forested and is located in north-western Alu, in the Shortlands Group.

Total area: 48 km^2.

Landforms

The altitude ranges from sea level to 200 m with an available relief of 6-60 m. Relief features are unoriented low hills and short, broad ridges with rounded summits and gentle, convex slopes. The plan profile is 4.

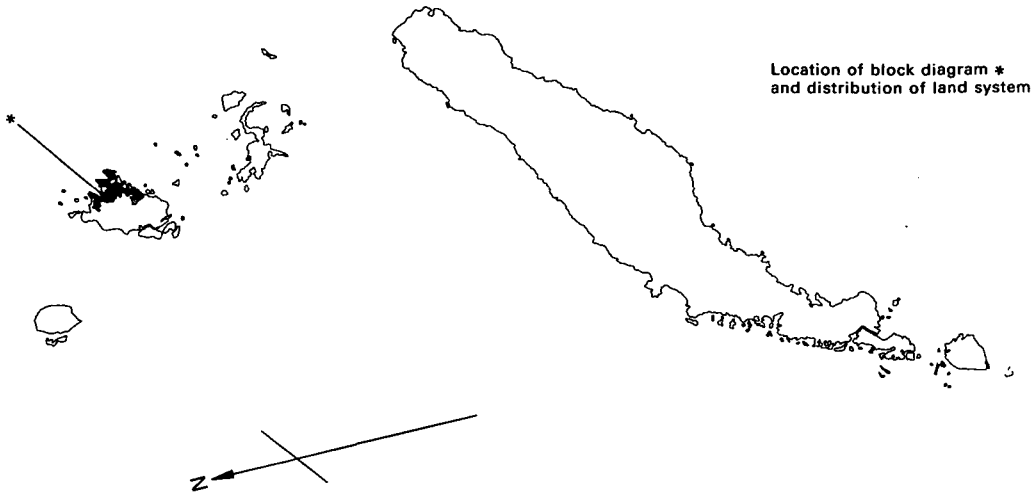
Slopes are moderately steep to steep and convex to irregular with local slumping and gullying. In some places patches of rounded, hard black rocks occur on the surface.

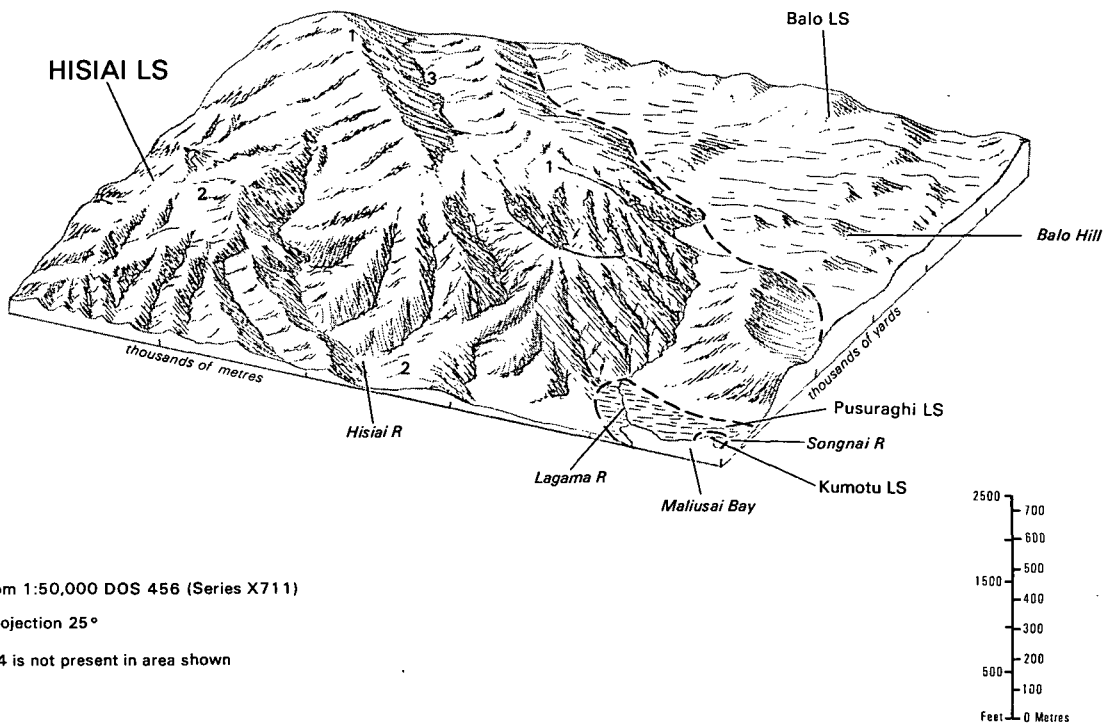
Valleys are narrow, commonly with boulder floors and are dry, but may be subject to flash flooding. Low terraces are found locally and narrow swamps occupy the lower courses of valleys.

Geology

Pliocene andesitic volcanics underlie the land system.

Number of observations 29. Sample sites 2.





Derived from 1:50,000 DOS 456 (Series X711)

Angle of Projection 25°

Land facet 4 is not present in area shown

Land facet	Area (km^2-%)	Landform	Soil	Vegetation and land use
1	21 44%	Rounded ridges and hill tops	Moderately deep to deep, brownish clay (upper subsoil) over red clay (lower subsoil) containing distinctive pink, white and yellow mottling from weathering rock (Haplorthox)	Mostly old forest with tall, closed canopy (22 spp. identified from 23 sites) dominated by *Dillenia* sp., *Teysmanniodendron ahernianum* (or *Guioa* sp,.), *Pometia pinnata*, *Neoscortechinia forbesii*, *Calophyllum kajewskii* and *Eugenia* sp. Smaller trees (80 spp. identified) include *Teysmanniodendron ahernianum* (or *Guioa* sp.), *Myristica* sp., *Aporosa papuana* and *Gironniera celtidifolia* with fern and young palm ground cover. Small areas cultivated mainly for subsistence crops. Small areas of coconuts.
2	21 42%	Slopes: convex to irregular		
3	6 13%	Valleys	Moderately deep, yellowish or brownish loams and clay, mottled at depth (Tropepts) Deep, brownish loose sand (Tropofluvents)	
4	<1 1%	Swamps	Not seen	Not examined

PARU LAND REGION

11. Ibatasi Land System

This land system consists of radially oriented volcanic ridges occupying the middle slopes of Mt Maetambe and Kumboro Peak. These areas are forested and have yellowish to reddish brown clay soils.

Total area: 107 km^2.

Landforms

The ridges lie within an altitudinal range of 40 to 480 m and the available relief is about 80 m. The ridges form a pattern which is sub-radial to the Esperance Land System. They may be up to 1.5 km in length, with narrow to knife-edged crests and uneven, gentle to moderate crestal slopes. The plan profile is 4L// or 4L.

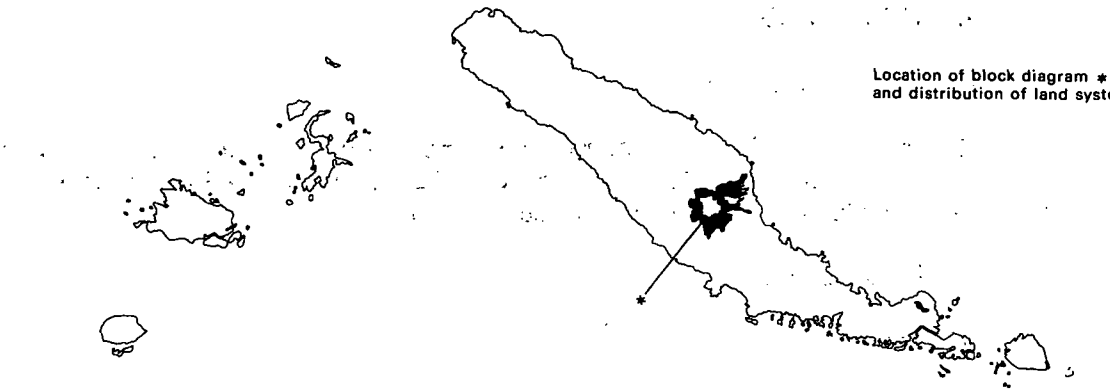
Slopes range from moderate to precipitous, but are mostly steep and straight to irregular. They are medium length to long and generally unstable. Gullies and terracettes are common on the slopes.

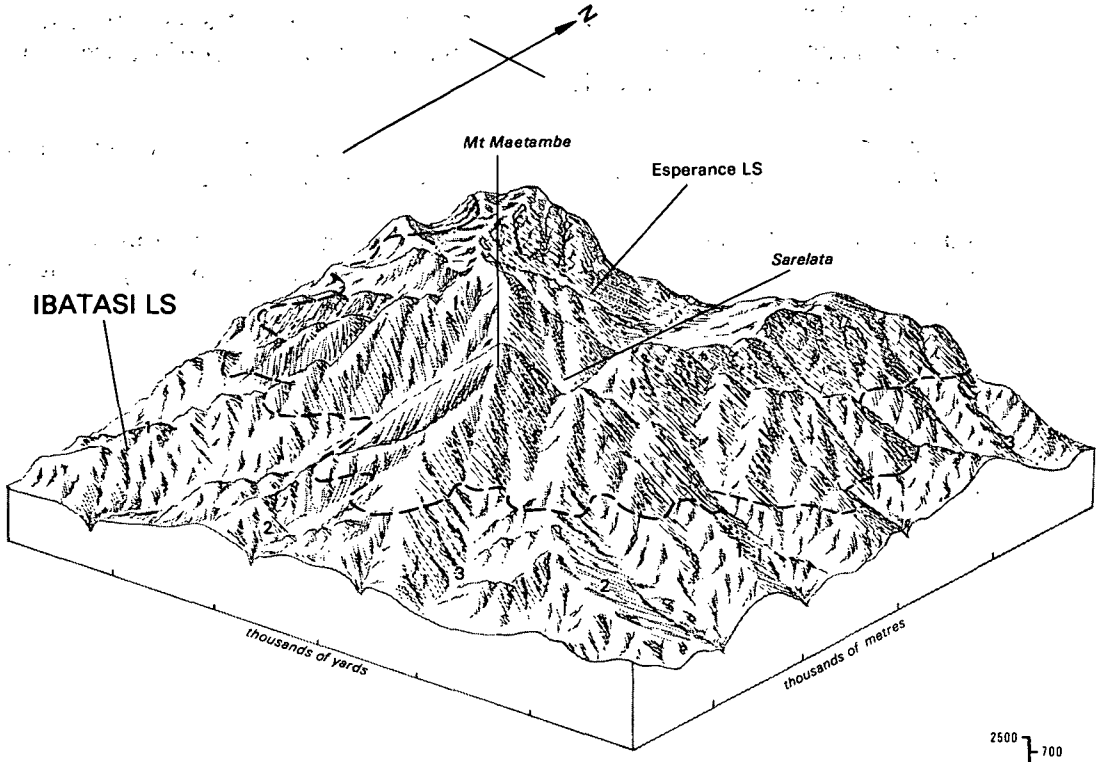
Narrow, locally incised valleys, form a sub-radial drainage pattern with a fine to medium texture. Stream gradients are gentle to moderate. Gullies are common on valley sides and have an ultra-fine drainage texture.

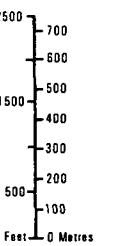
Geology

Volcanic lavas and tuffs which are andesitic and often porphyritic, including fine-grained basaltic types, constitute the Maetambe and Kumboro Volcanics of Pliocene to Recent age underlying this land system.

Number of observations 14. One sample site.







Derived from 1:50,000 DOS 456 (Series X711)

Angle of Projection 25°

Land facet	Area (km^2-%)	Landform	Soil	Vegetation and land use
1	28 26%	Ridge crests	Deep, yellowish red or red clay (Haplorthox) Deep, strong brown clay (Haplorthox, Dystropepts)	Tall forest, locally wind-damaged with a canopy containing many *Campnosperma brevipetiolata* and common *Canarium indicum, salomonense* and *Vitex cofassus.* A wide variety of smaller trees also includes palms, pandans and ferns, the last being the dominant ground cover
2	66 62%	Hillslopes: irregular, steep	Deep, dark red or dark reddish brown clay loams or clay (Tropepts,Tropohumults)	
3	13 12%	Valleys	Moderately shallow to deep, dark, stony loams (Troporthents, Tropepts)	

PARU LAND REGION

12. Kavakava Land System

Moderately high ridges on andesitic agglomerates with red clay and dark loamy soils form this land system. It is found only on Fauro Island. The lowland forest vegetation has been cleared in some areas for cultivation.

Total area: 24 km^2.

Landforms

The altitude ranges from sea level to 400 m and available relief varies between 60 and 150 m. Ridges may be up to 1 km in length and are broad to very broad or narrow to knife-edged. The broader ridges have even profiles, with flat to gently convex, stable slopes and rocky outcrops. Many rock outcrops and uneven profiles are typical of the narrower ridges. The plan profile is 4L.

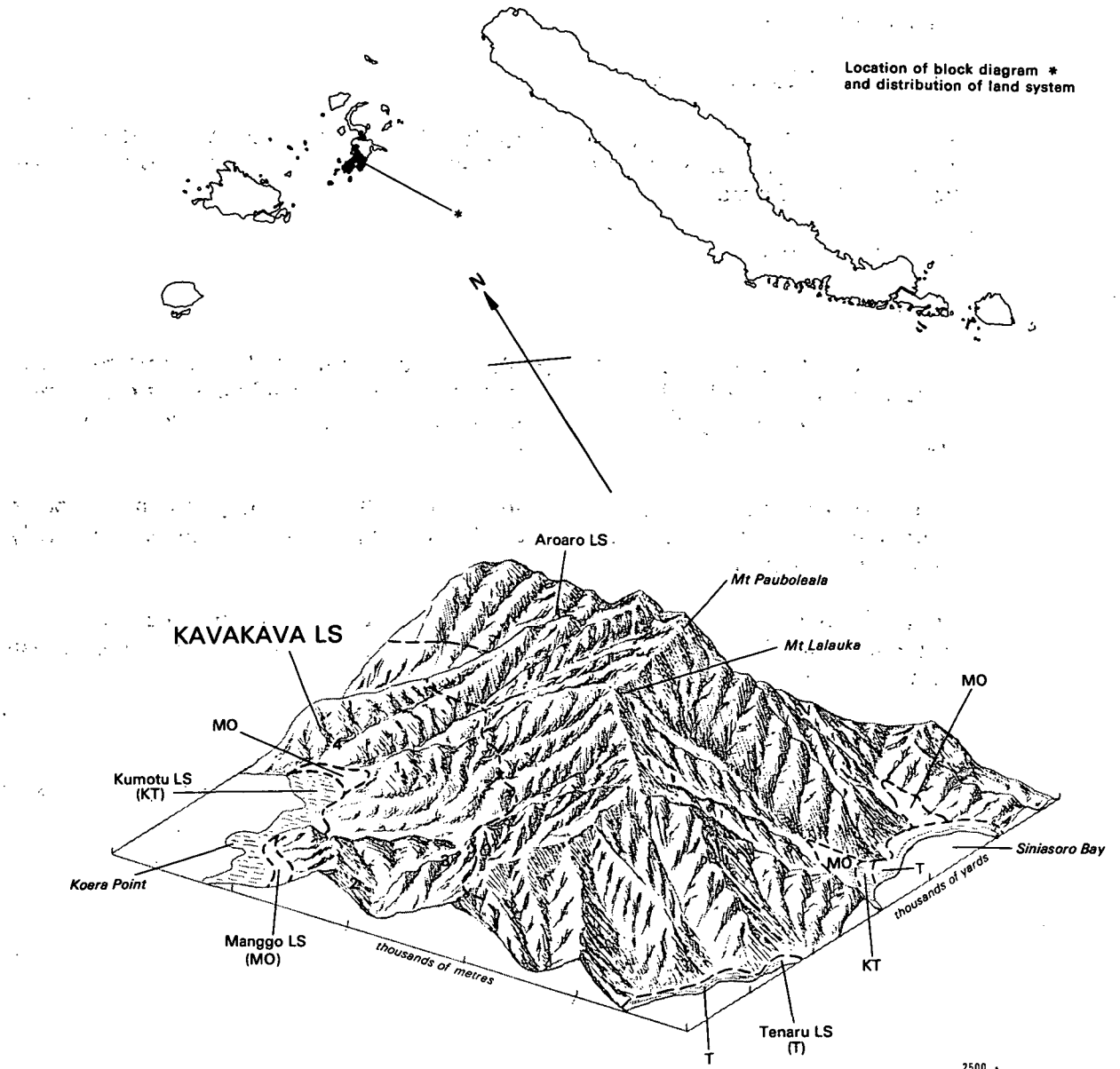
Slopes are moderately steep to steep, irregular and of short to medium length. They are generally unstable with many rock outcrops and surface stones.

Valleys, up to 120 m wide, have channelled microrelief and stony surfaces in places. Stream beds may be incised by 1 m amd stream gradients are mostly gentle. The drainage pattern is dendritic with a medium drainage texture.

Geology

The underlying rocks are Pliocene andesitic agglomerates.

Number of observations 27. No sample sites.



Derived from 1:50,000 DOS 456 (Series X711)

Angle of Projection 25°

Note: In areas where land systems are repeated, abbreviations only are shown.

Land facet	Area (km^2-%)	Landform	Soil	Vegetation and land use
1	3 11%	Broad ridge crests	Deep and moderately deep, red clay overlying soft multicoloured weathering rock (Haplorthox)	Mostly old lowland forest with a high canopy dominated by *Pometia pinnata*, *Vitex cofassus* and *Canarium salomonense*. Undergrowth contains many palms, *Litsea solomonensis* and *Myristica* sp.
2	15 63%	Slopes: moderately steep to steep	Shallow and moderately deep, brownish loams to clay overlying soft to hard multicoloured weathering rock (Tropepts)	
3	4 16%	Narrow ridge crests		Small areas cultivated for subsistence crops
4	2 10%	Valleys	Shallow and moderately deep brownish and yellowish clay, locally stony and imperfectly drained (Tropofluvents)	Small coconut plantations on footslopes in coastal areas

13. Malanjili Land System

This land system comprises an area of lightly dissected lava flows, to the east of Kumboro Peak. The soils are yellowish red clays and brownish loams and the vegetation is lowland forest.

Total area 9 km^2.

Landforms

The surface of the flows consists of gently rounded ridges which lie within an altitudinal range of 40 to 120 m. Available relief is less than 40 m. Ridge crests are narrow or broad with gentle, uneven crestal slopes. The unoriented ridges are up to 400 m long and provide a 4L plan profile.

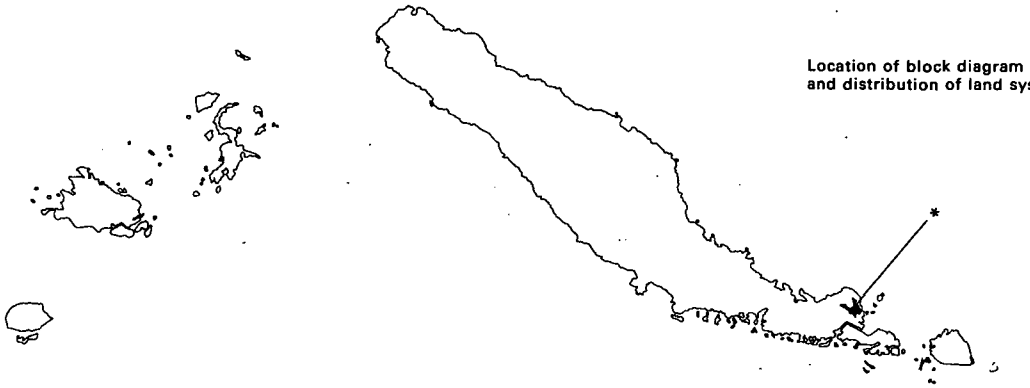
Gentle to moderate, medium length, upper and middle slopes may be convex, concave or irregular. Very short, lower and marginal slope sections are commonly moderately steep to steep and straight.

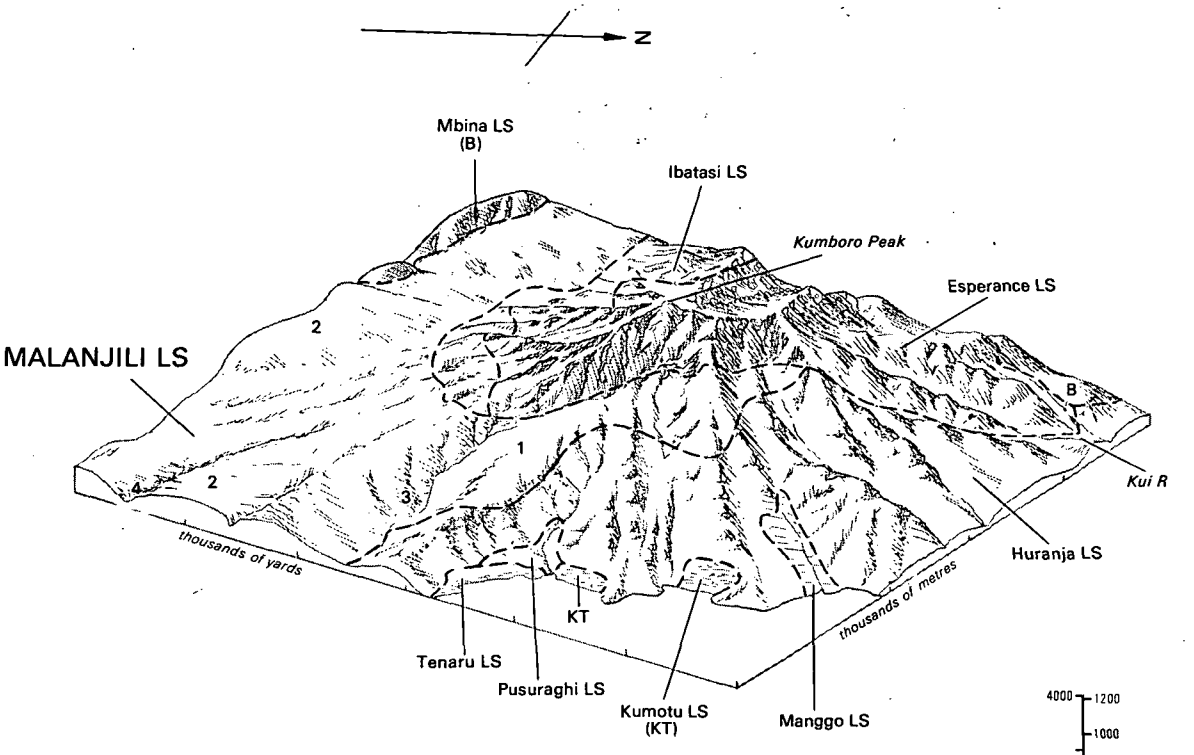
Allochthonous rivers flow in narrow, incised valleys with gentle stream gradients. Autochthonous drainage systems cause only ultra-shallow dissection and these streams have a dendritic pattern with a fine texture.

Geology

Kumboro Volcanics consisting of basaltic and andesitic lavas underlie this land system.

Number of observations 2. No sample sites.





Derived from 1:50,000 DOS 456 (Series X711)

Angle of Projection 25°

Note: In areas where land systems are repeated, abbreviations only are shown.

Land facet	Area (km^2-%)	Landform	Soil	Vegetation and land use
1	4 42%	Gentle to moderate slopes	Deep, yellowish red or red clay (Haplorthox)	Wind-damaged forest with emergents of *Campnosperma brevipetiolata, Burckella obovata* and *Neoscortechinia forbesii.* Smaller trees include in addition *Aglaia* sp(?), *Teysmanniodendron ahernianum* and *Macaranga urophylla* and many palms, gingers and pandans
2	3 31%	Broad and narrow ridges	Moderately shallow to deep, locally stony, brownish and yellowish brown loams and clay (Tropepts)	
3	1 14%	Steep, lower slopes		
4	1 13%	Valleys	Not examined	

PARU LAND REGION

14. Panggoe Land System

This land system, found to the north of Mt Maetambe, consists of low, narrow and rounded ridges overlying coarse tuffaceous sediments and andesitic volcanics. The soils range from dark brown to dark red clays and the predominantly lowland forest vegetation has been cleared in some areas for garden cultivation.

Total area: 93 km^2.

Landforms

The narrow ridges lie within an altitudinal range from sea level to 160 m and have an available relief of 40-80 m. They are less than 100-200 m long and their crests are sharp to rounded with gentle to moderate crestal slopes. The plan profile is 4L.

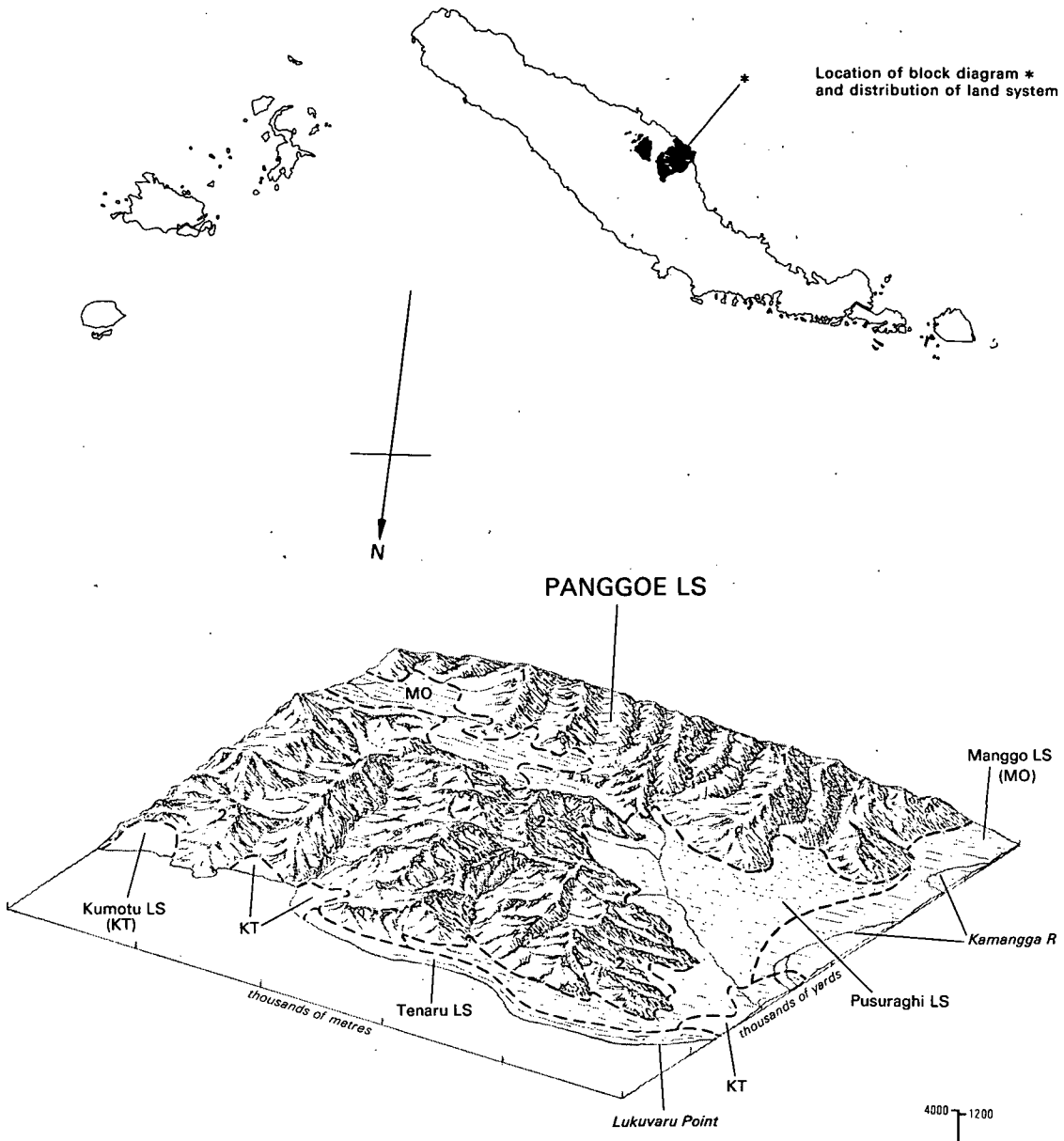
The median angle for all slopes is 25° with an interquartile range from 15° to 30°. Upper slopes are ultra-short, convex, stable and moderate to moderately steep. Middle and lower slopes are moderately steep to steep and ultra-short to short but may be of medium length adjacent to incised valleys. These steep slopes are generally unstable with terracettes, slumps and incipient gullies.

The narrow, incised valleys have gentle to moderate gradients and a medium drainage texture.

Geology

Underlying this land system is the Lower Middle Miocene Kamanga Grit. This is a coarse-grained clastic rock of poorly-bedded grits with fragments of andesitic and basaltic lava, tuffaceous mudstone and shell fragments in a tuffaceous matrix and with occasional layers of lithic sandstone and shale. Maetambe Volcanics of Upper Pliocene to Quaternary age are also present. They comprise andesitic, often porphyritic and fine-grained, rather basaltic types.

Number of observations 29. One sample site.



Derived from 1:50,000 DOS 456 (Series X711)

Angle of Projection 25°

Note: In areas where land systems are repeated, abbreviations only are shown.

Land facet	Area (km^2-%)	Landform	Soil	Vegetation and land use
1	44 47%	Ridge crests and stable upper slopes	Deep, dark red or reddish brown clay (Haplohumox, Humitropepts)	Tall lowland forest with canopy dominated by *Campnosperma brevipetiolata, Neoscortechinia forbesii, Pometia pinnata, Teysmanniodendron ahernianum* and *Calophyllum kajewskii.* Additional common smaller trees are *Parinari glaberrima* and *Litsea solomonensis* (?)
2	37 40%	Steep, unstable, middle and lower slopes	Deep, yellowish red or red clay (Haplorthox) Moderately shallow to moderately deep, dark brownish, stony loams (Tropepts)	
3	12 13%	Valley bottoms	Not examined	Moderately extensive, coastal and inland areas in use for subsistence crops

15. Andi Land System

Undulating areas with small rounded hills and ridges overlying calcareous sediments form this land system, found in western Choiseul. The vegetation is predominantly lowland forest with some shifting cultivation and coconut plots near the coast. Soils are dark brown and reddish clays.

Total area: 170 km^2.

Landforms

The absolute relief ranges between 40 and 440 m while available relief is mostly less than 80 m. Small, rounded hills and broad, short ridges are most common. Some narrow, linear ridges occur and may be up to 200 m long. Their plan profile is 5 to 5L.

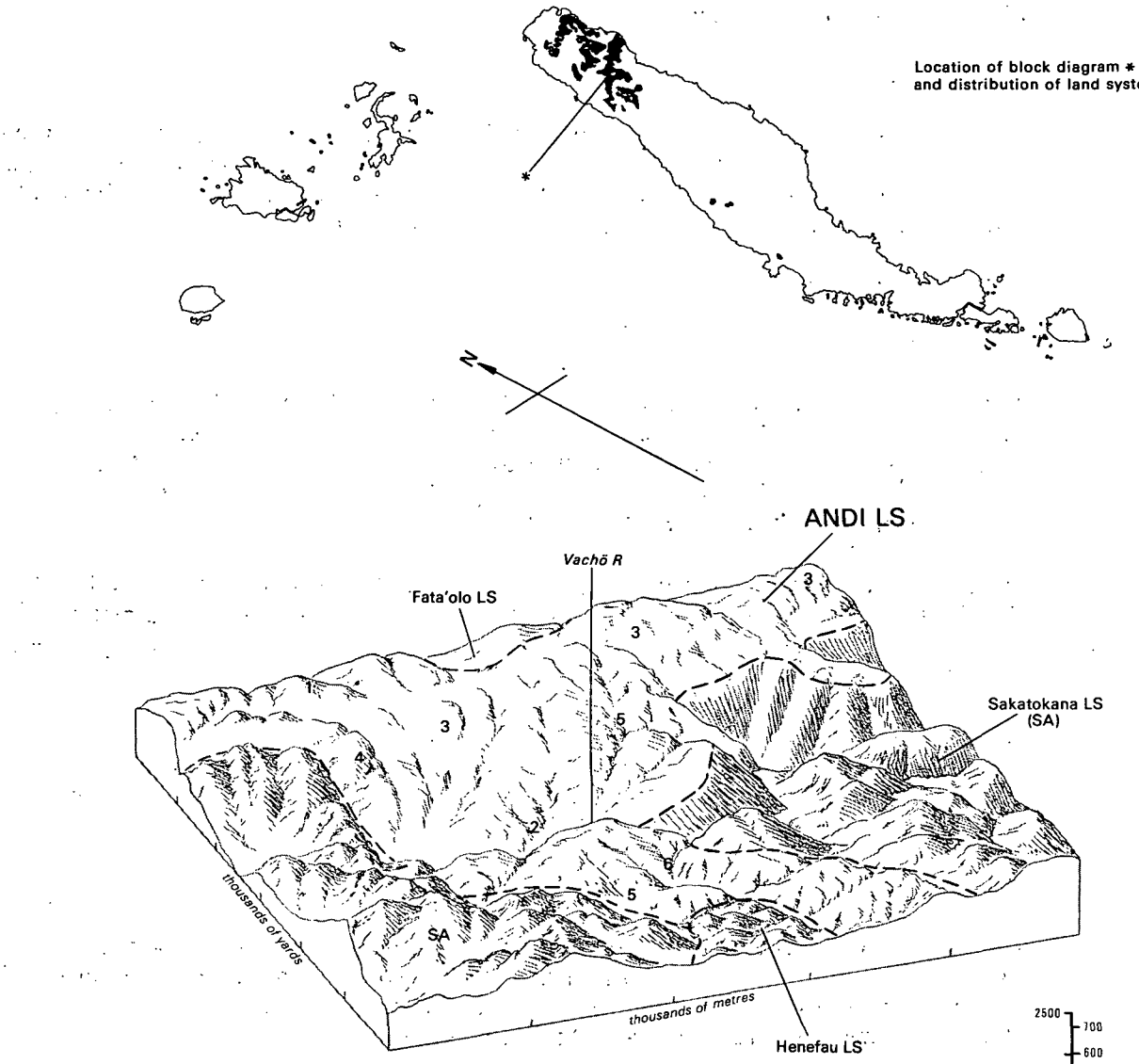
The median angle for all recorded slopes is 21° and the interquartile range is 12-29°. Slopes are generally irregular with rocky outcrops, benches and treefall scars. Straight to convex hillslopes are very short to short and moderately steep to steep. Footslopes tend to be concave, gentle to moderate and of medium length but steepen adjacent to incised valleys. In some places very low, limestone cliffs are found.

Surface drainage is rare on this land system. A few allochthonous rivers flow, via incised valleys and gorges, through the hills and may have irregular gradients and waterfalls. Dry valleys, sinkholes and cave-collapse hollows provide local surface features.

Geology

The underlying rocks are limestones and pale calcareous siltstones which resemble the lagoonal sludge which makes up the seabed between fringing and barrier reefs on the coast of Choiseul today. They are probably of Pliocene age.

Number of observations 36. Sample sites 4.



Derived from 1:50,000 DOS 456 (Series X711)

Angle of Projection 25°

Note: In areas where land systems are repeated, abbreviations only are shown.

Land facet	Area (km^2·%)	Landform	Soil	Vegetation and land use
1	14 8%	Ridge crests: narrow and linear	Moderately shallow to deep, dark brownish clay (Rendolls, Argiudolls)	Lowland forest with tall, irregular canopy (12 spp. identified from 20 sites) entirely dominated by *Pometia pinnata* and *Vitex cofassus*. Smaller trees also include *Alangium javanicum, Aglaia* sp.(?) and *Pimeleodendron amboinicum*. A wide variety of shrubs, palms, gingers and climbers occur in the undergrowth while ferns are dominant at ground level
2	5 3%	Rocky slopes: rock outcrops forming escarpments and cliffs	Deep, yellowish red or red clay, commonly mottled in lower subsoil (Tropohumults)	
3	77 45%	Rounded summits: broad, short ridges or hill tops	Deep to moderately deep, strong brown clay, commonly mottled in lower subsoil (Tropudalfs)	
4	27 16%	Straight slopes: moderately steep to steep, short to long	Moderately shallow to deep, yellowish brown loams or clay with much pale weathering rock in subsoil (Tropudalfs, Eutropepts)	Large areas are currently used for subsistence crops and from the type and extent of old regrowth, shifting cultivation has formerly been more extensive
5	32 19%	Footslopes: concave, medium length, gentle to moderate		
6	15 9%	Valley floors: narrow and incised	Deep, dark brown to yellowish brown loams and clay, locally poorly drained (Tropofluvents, Aquepts, Eutropepts)	Coastal areas are being planted with coconuts and there are scattered patches of cocoa

16. Henefau Land System

Cockpit karst consisting of conical hills and ridges formed over uplifted reef limestones comprises this land system. It is found at intervals along the southern coast of Choiseul and on Alu Island. The red to dark brown clay soils are mostly covered with lowland forest although a few areas have been cleared for cultivation.

Total area: 263 km^2.

Landforms

The total relief range is from sea level to 850 m while available relief is between 40 and 120 m. In some parts the conical hills are broadly convex but discontinuous curved lines of narrow ridges connect low to high areas. Elsewhere the hills and ridges seem to be unoriented. The ridges have an even crest, gentle to moderate crestal slopes and may be up to 1 km long. The plan profile is 4-4L// or 5-5L//.

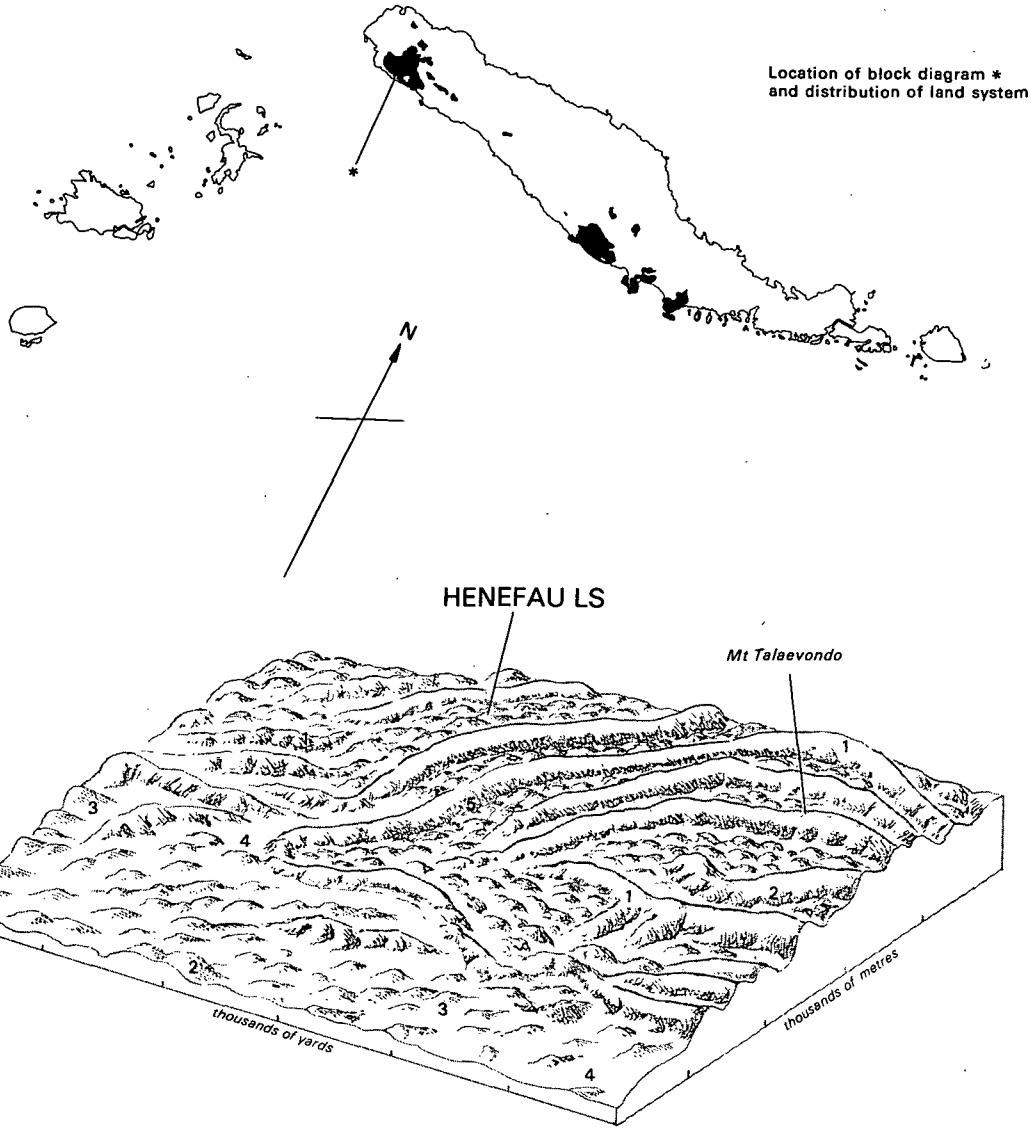
The median angle for all recorded slopes is 25° with an interquartile range of 15°-32°. Hill slopes are of very short to medium length, convex to irregular and are moderately steep to steep. Some short, moderate, concave lower slopes are found. Limestone outcrops cause hummocky microrelief on most slopes, and locally form cliffs.

Surface drainage is absent but dry valleys, sinkholes and cavern-collapse hollows are numerous providing a fine drainage texture. The sinkholes are separate entities but their arrangement in lines curving parallel to the margins of the limestone outcop is thought to represent depositional strikelines.

Geology

The underlying rocks are Pliocene/Pleistocene, recently elevated reef limestones (the Sambe, Bavuti, Tasure and Nukiki Limestones) consisting of calcarenites and algal and coral fragments. Some parts are no more consolidated than the present-day reef while other parts have been recrystallised into a massive form.

Number of observations 78. Sample sites 3.



Derived from 1:50,000 DOS 456 (Series X711)

Angle of Projection 25°

Land facet	Area (km^2-%)	Landform	Soil	Vegetation and land use
1	50 19%	Broad to narrow ridges or hill crests	Deep, yellowish red or red clay (Eutrorthox, Tropohumults (?)) Deep, strong brown to dark brown clay (Tropudalfs)	Lowland forest with tall, irregular canopy dominated by *Pometia pinnata* and *Vitex cofassus*. Other common canopy trees are *Neonauclea* sp. and *Calophyllum* spp. Smaller trees contain many *Aglaia* sp.(?), *Alangium javanicum* and *Neoscortechinia forbesii*. There are also common palms and ferns in the shrub and herb layers
2	92 35%	Hillslopes: convex, irregular, short to medium length, steep		
3	29 11%	Lower slopes: short, concave or straight	Moderately shallow to shallow, stony, brown to dark brown clay (Lithic Rendolls)	
4	53 20%	Drainage depressions: dry valleys and enclosed basins	Deep, yellowish brown to reddish commonly mottled clay, locally overlying grey clay (Tropepts (?))	Coastal areas used for subsistence crops and, on Alu Island, for coconut and cocoa
5	39 15%	Cliffs and rocky knolls	Rock outcrops with patches of shallow, stony dark brown loams and clay (Lithic Rendolls)	Timber operations have logged areas on Alu Island

MANAWAI LAND REGION

17. Huranja Land System

Limestone ridges and hills of the lower, northern slopes of Mt Kumboro, in north-east Choiseul, comprise this land system. Lowland forest is the dominant vegetation and soils are red to dark brown clays.

Total area: 8 km^2.

Landforms

The total relief range is from sea level to 320 m with up to 80 m available relief. The ridges form continuations of the spurs radiating from the volcano. Most ridges are narrow, a few are broad but all have moderate, uneven crestal slopes and are up to 400 m long. Low, conical, karstic hills occur where ridge dissection has taken place. The plan profile is 1L// to 4L//.

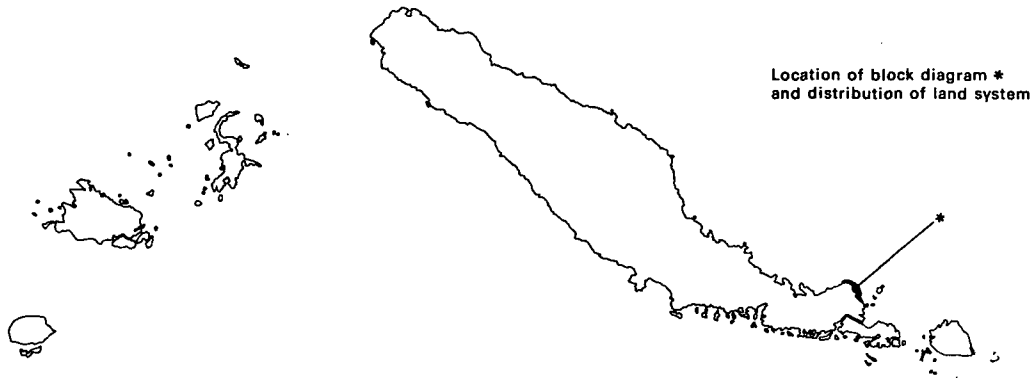
Most slopes are short, moderately steep to steep and convex to irregular. Short, precipitous to cliffed, straight slopes are found at gully heads and along the coast. Rock outcrops are widespread and slopes may be hummocky with solution hollows and treefall scars.

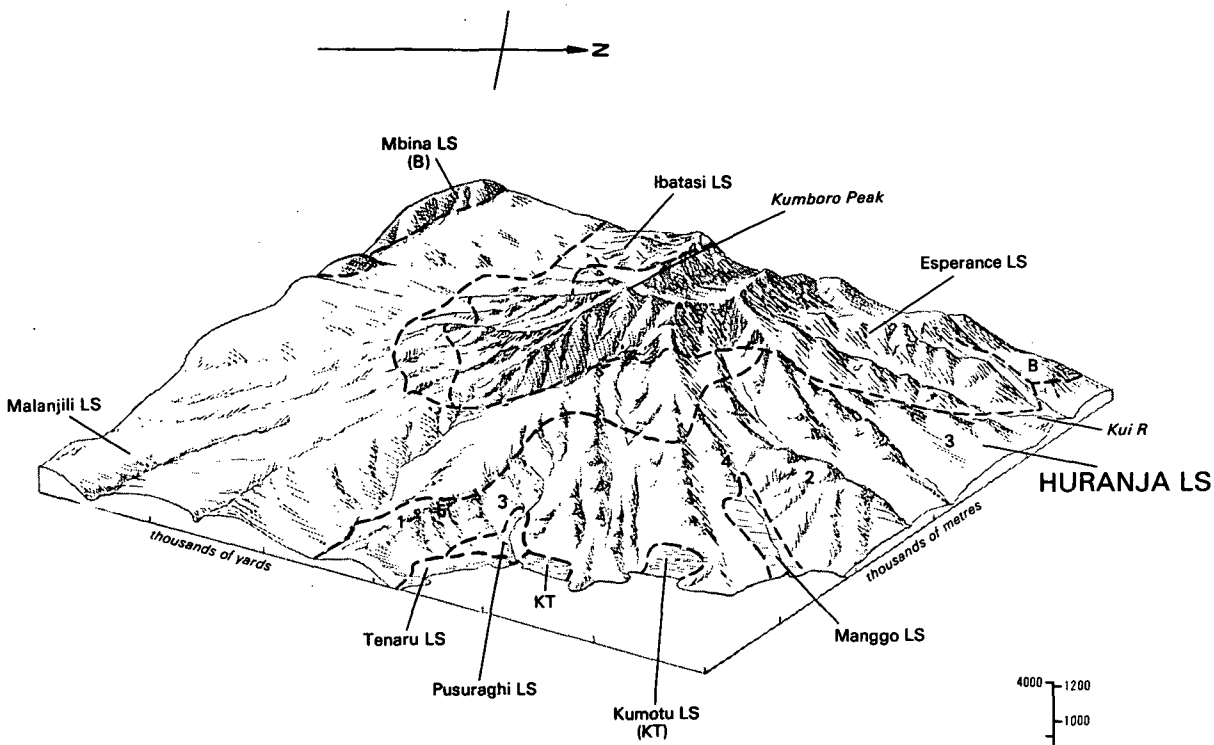
Narrow valleys and gullies form a sub-parallel drainage pattern with a very fine drainage texture. Stream gradients are moderate.

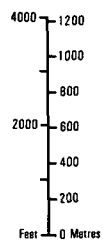
Geology

The lithology comprises reef limestones, probably of Pleistocene age, contaminated with volcanic material derived from Mt Kumboro as colluvial wash.

Number of observations 10. Sample sites 2.







Derived from 1:50,000 DOS 456 (Series X711)

Angle of Projection 25°

Note: In areas where land systems are repeated, abbreviations only are shown.

Land facet	Area (km^2-%)	Landform	Soil	Vegetation and land use
1	2 27%	Ridge crests	Moderately deep to deep, yellowish red or red clay (Haplorthox(?))	Cyclone-damaged forest with scattered emergents of *Pometia pinnata, Canarium harveyi* and *Intsia bijuga* near the coast. Smaller trees and shrubs include common regrowth species such as *Macaranga* spp., *Prosopis insularis, Trema cannabina* and many vines
2	<1 6%	Hill summits	Moderately shallow to deep, strong brown clay (Argiudolls, Paleudolls, Tropudalfs)	
3	4 47%	Slopes: short, convex		
4	1 15%	Gully and valley bottoms		
5	<1 5%	Precipitous and cliffed slopes	Shallow to moderately deep, dark brown clay (Rendolls)	There is evidence of former inhabitation on some ridge crests

MANAWAI LAND REGION

18. Mbaeroko Land System

Narrow, linear, limestone ridges with brown to dark brown clay soils and lowland forest vegetation comprise this land system. It is found on Vaghena and adjacent islands and in north-west Choiseul.

Total area 8 km^2.

Landforms

Ridges are up to 80 m high in north-western Choiseul but are generally less than 40 m with a very low available relief. The very narrow ridges which are former lines of off-shore reef may be up to 2 km long and form discontinuous, curvilinear, parallel groups separated by low-lying areas or sea. Their crests are symmetrical with gentle to moderate, even slopes. The plan profile is 4L//.

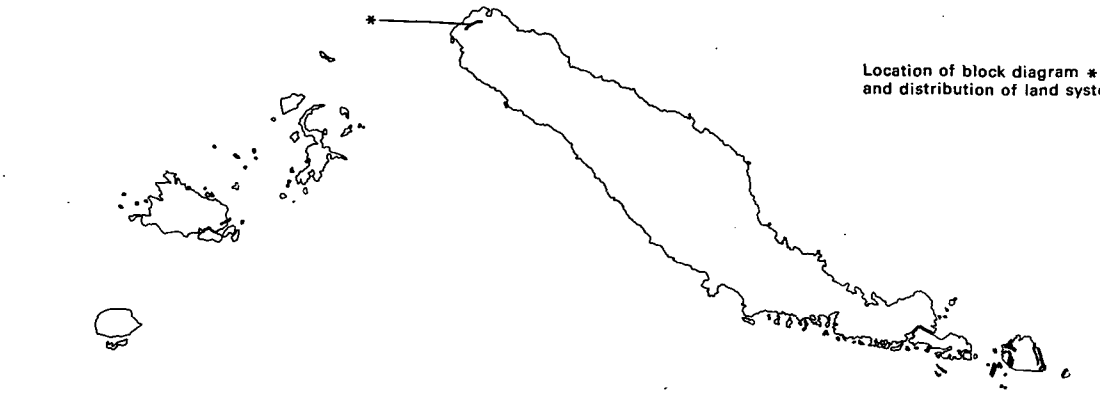
Most slopes are very short, straight but stepped and irregular in detail, and moderately steep to steep. Some gentle, very short, convex slopes are found locally. Coral outcrops and sinkholes are common features.

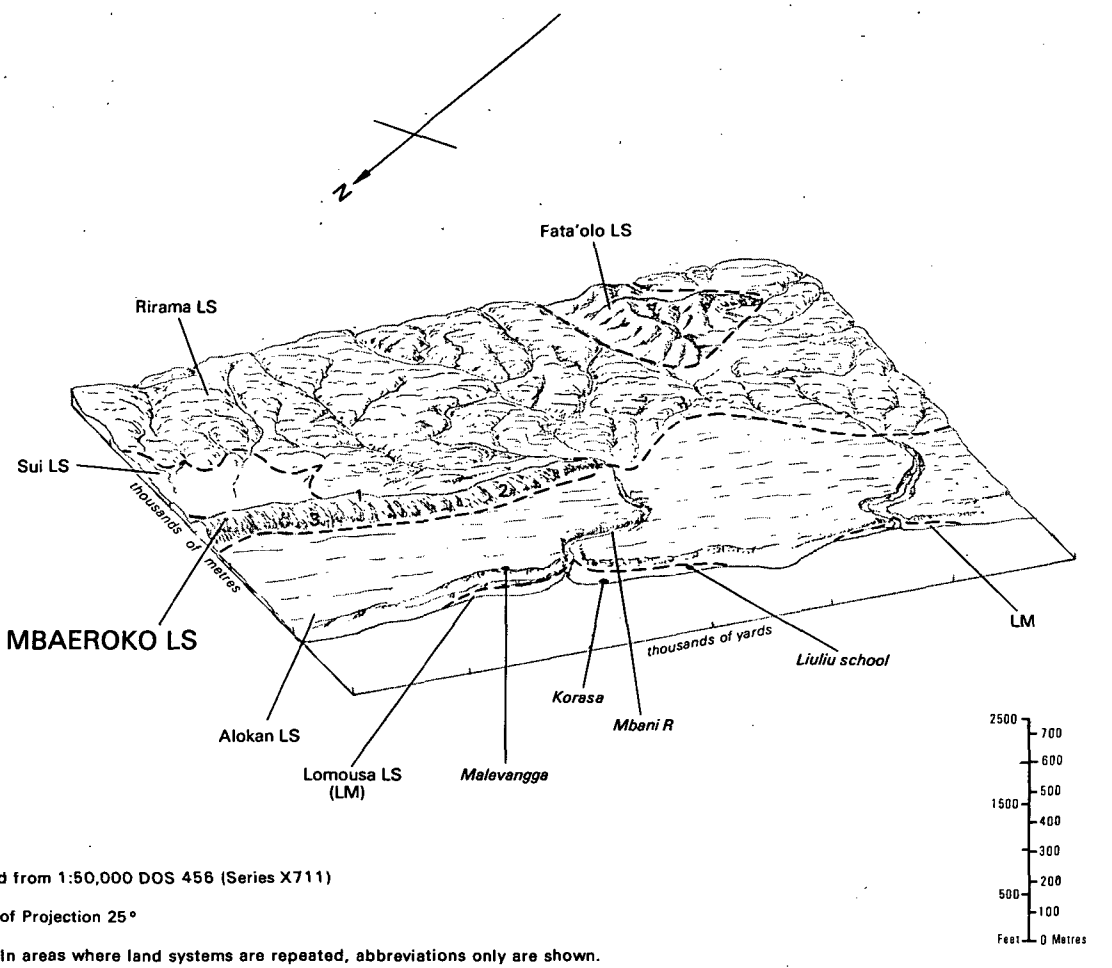
Surface drainage is undeveloped on the ridges and there are very few small valleys between ridges.

Geology

The underlying rocks are uplifted fringing reefs of subrecent limestones.

Number of observations 7. No sample sites.





Derived from 1:50,000 DOS 456 (Series X711)

Angle of Projection 25°

Note: In areas where land systems are repeated, abbreviations only are shown.

Land facet 4 is not present in area shown

Land facet	Area (km^2-%)	Landform	Soil	Vegetation and land use
1	3 40%	Ridge crests: narrow to very narrow, often sinuous	Shallow to very shallow, dark, stony brown clay (Lithic Rendolls) Rock outcrops with occasional thin patches of organic matter (Tropofolists)	Old regrowth containing *Ficus* spp., *Calophyllum kajewskii, Securinega flexuosa* and *Campnosperma brevipetiolata* with many shrubs and vines. Coastal species such as *Intsia bijuga* also present Old, derelict coconut plantations evident on and around Vaghena Island with a high regrowth canopy obscuring that of the coconuts
2	3 38%	Straight slopes: short, moderately steep to steep		
3	2 18%	Convex slopes: very short, gentle	Moderately deep to deep, yellowish brown to light yellowish brown clay or loams (Tropudalfs(?))	
4	<1 4%	Valleys: narrow, dry	Not examined	

19. Fata'olo Land System

Lightly rolling areas of ridges, hills and flat surfaces make up this land system found over sedimentary rocks mainly in small areas of northern Choiseul and on Vaghena Island. The soils are mainly yellowish, reddish and brownish clays and the vegetation is lowland forest with scattered areas under cultivation.

Total area: 223 km^2.

Landforms

The unorientated hills and ridges occupy an altitudinal range between sea level and 440 m with an available relief of 20-80 m. On Vaghena the land system is lightly ridged, and lies entirely below 40m with a very low to ultra-low relief. Very broad ridges and flat to undulating surfaces have even, gentle crestal slopes and lengths of about 800 m. A few narrow ridges are found which may be up to 200m long and have even, gentle crestal slopes. The plan profile is 1 to 4.

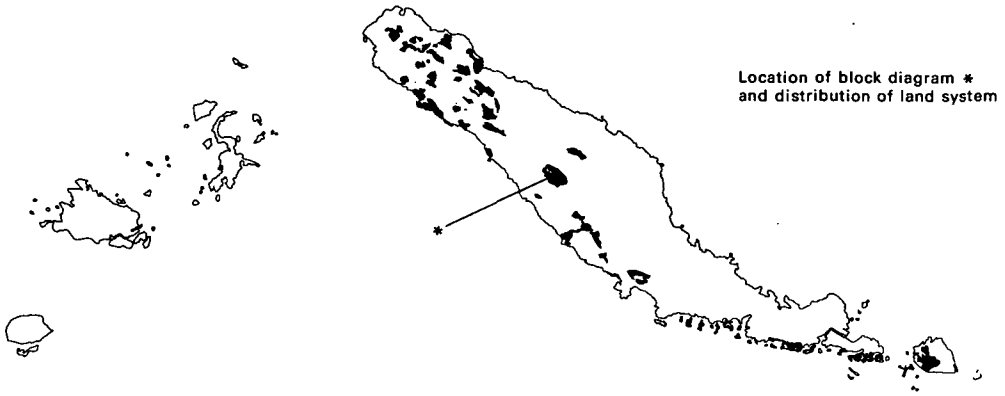
Slopes range from almost flat to precipitous. The median angle for all recorded slopes is 20^o with an interquartile range between 9^o and 27^o. Upper and middle slopes are mostly moderate to moderately steep, of short to medium length and convex to irregular. Lower slopes near gullies are steep, very short and straight. Rocky outcrops, slumps, treefall scars and teracetting occur on most slopes.

Semi-enclosed, linear depressions and dry valleys from a roughly dendritic drainage pattern and fine to medium drainage texture. Locally, gullying is common.

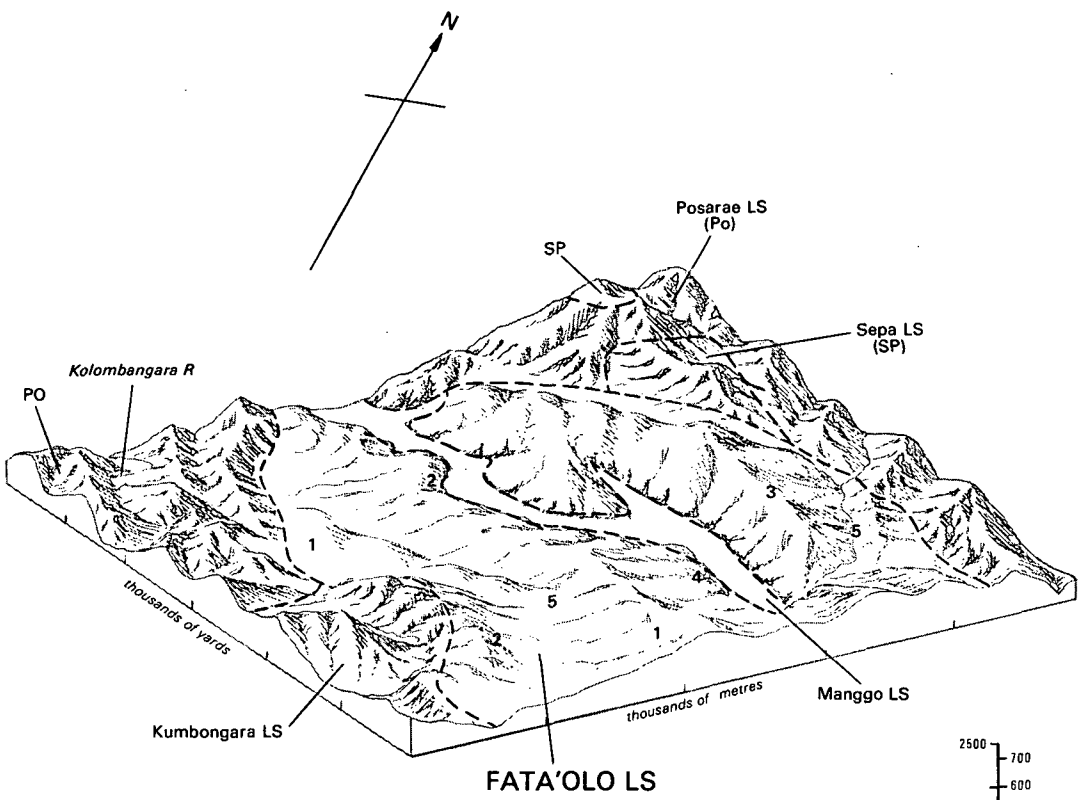
Geology

The land system mainly occurs in areas of Middle or Upper Tertiary, fine-grained, commonly calcareous sediments including some limestones. These are chiefly the Moli Formation and Pemba Siltstones.

Number of observations 201. Sample sites 8. Part of Sample Area CC.



Location of block diagram * and distribution of land system



Derived from 1:50,000 DOS 456 (Series X711)

Angle of Projection 25°

Note: In areas where land systems are repeated, abbreviations only are shown.

Land facet	Area (km^2-%)	Landform	Soil	Vegetation and land use
1	76 34%	Broad ridges and undulating surfaces	Deep, yellowish red or red clay (Haplorthox, Tropohumults)	Lowland, locally old, disturbed forest with tall irregular canopy dominated by *Pometia pinnata* and *Vitex cofassus*. Also common are *Neoscortechinia forbesii*, *Canarium salomonense* and *Ficus* spp. Smaller trees also include common *Aglaia* sp., *Alangium javanicum*, *Dysoxylum* sp. and *Guioa* sp. Palms are numerous and varied and ferns predominate as ground cover
2	80 36%	Upper and middle slopes: irregular or convex	Deep, reddish brown to dark red clay (Tropudalfs, Tropohumults)	
3	27 12%	Very narrow ridges	Deep to moderately shallow, brown to dark brown clay (Argiudolls, Rendolls, Tropudalfs)	
4	20 9%	Steep lower slopes	Deep, strong brown to reddish yellow clay (Tropudalfs, Eutropepts)	Large coastal areas used for subsistence crops and latterly for coconut planting. Large areas of regrowth in interior
5	20 9%	Valleys and drainage depressions	Deep, dark brownish or yellowish brown clay, commonly with mottled or gleyed subsoil (Aquepts, Eutropepts)	

KWAINANGALI LAND REGION

20. Mono Land System

This land system, found on Mono Island, comprises lightly dissected terraces of calcareous sedimentary rocks with brownish and reddish clay soils. The area is mostly forested with some clearance for subsistence cultivation near the coast.

Total area: 37 km^2.

Landforms

The altitudinal range is from 15 to 300 m and available relief varies between 1.5 and 60 m. The terrace surfaces are level to gently sloping and wide to narrow. Ridges have gentle to steep crestal slopes with common coral outcrops. The plan profile is 4L// and 1.

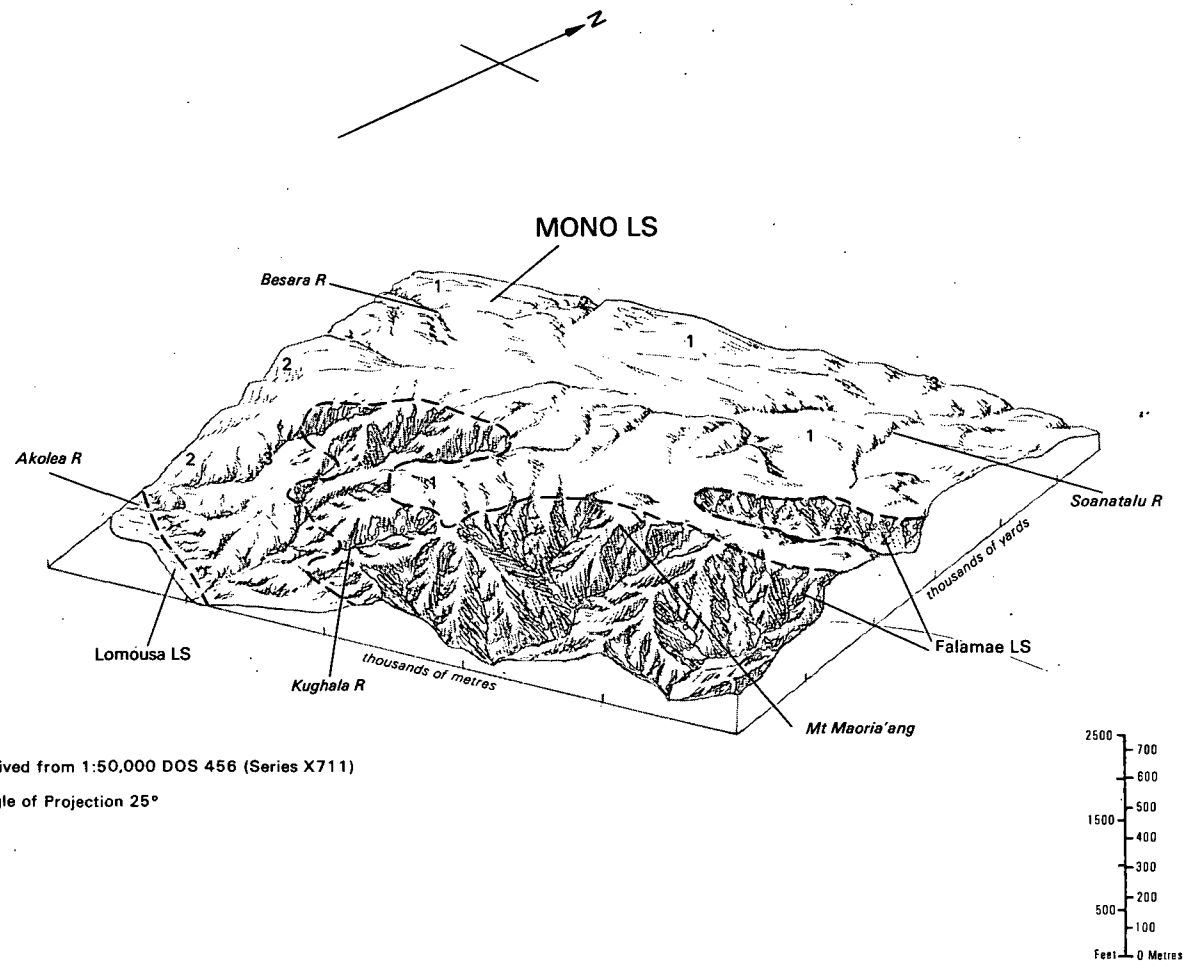
Terrace margin and valley side slopes are irregular and vary from gentle to cliffed, ultra-short to short. Rocky outcrops are associated with incised streams, stream beds and knolls on the terrace surface.

Valleys are narrow and incised with gentle stream gradients. The drainage system has a herringbone pattern and a very coarse texture.

Geology

Pleistocene sediments, mainly comprising coral limestones and marls, uplifted as a series of gently dipping concentric benches, underlie this land system.

Number of observations 134. Samples sites 2. Part of Sample Area CB.



Derived from 1:50,000 DOS 456 (Series X711)

Angle of Projection 25°

Land facet	Area (km^2-%)	Landform	Soil	Vegetation and land use
1	21 57%	Terrace surfaces: level to gently sloping, wide to narrow	Deep, brownish loams or clay over light yellowish brown mottled clay (Tropudalfs) Moderately deep to deep, dark brown clay commonly overlying hard limestone (Arguidolls (?)) Deep, brownish loams or clay over yellowish brown to strong brown clay (Tropudalfs)	Lowland, old forest with canopy dominated by *Pometia pinnata, Vitex cofassus,* with common palms in shrub layer and *Selaginella* sp., *Calamus* sp. and *Elatostema* sp. as ground cover
2	12 32%	Slopes: terrace margins and valley sides	Moderately deep or deep, yellowish red or reddish brown clay (Eutropepts (?))	Regrowth areas contain *Kleinhovia hospita, Hibiscus tiliaceus, Macaranga* spp., Musaceae and Zingiberaceae
3	4 11%	Rock outcrops	Shallow, dark loams or clay over soft to hard white limestone (Rendolls)	

KWAINANGALI LAND REGION

21. Sui Land System

Forming this land system are low-flying areas underlain by limestone in north-western Choiseul. Soils are brownish clays and except for near the coast the vegetation is lowland forest.

Total area: 32 km^2.

Landforms

The land system lies entirely within 120 m of sea level and has an amplitude of relief of 10 m. It forms low-lying, connected, linear belts of land commonly bounded by karst or karstic land systems, only in north-western Choiseul. The plan profile is 6L.

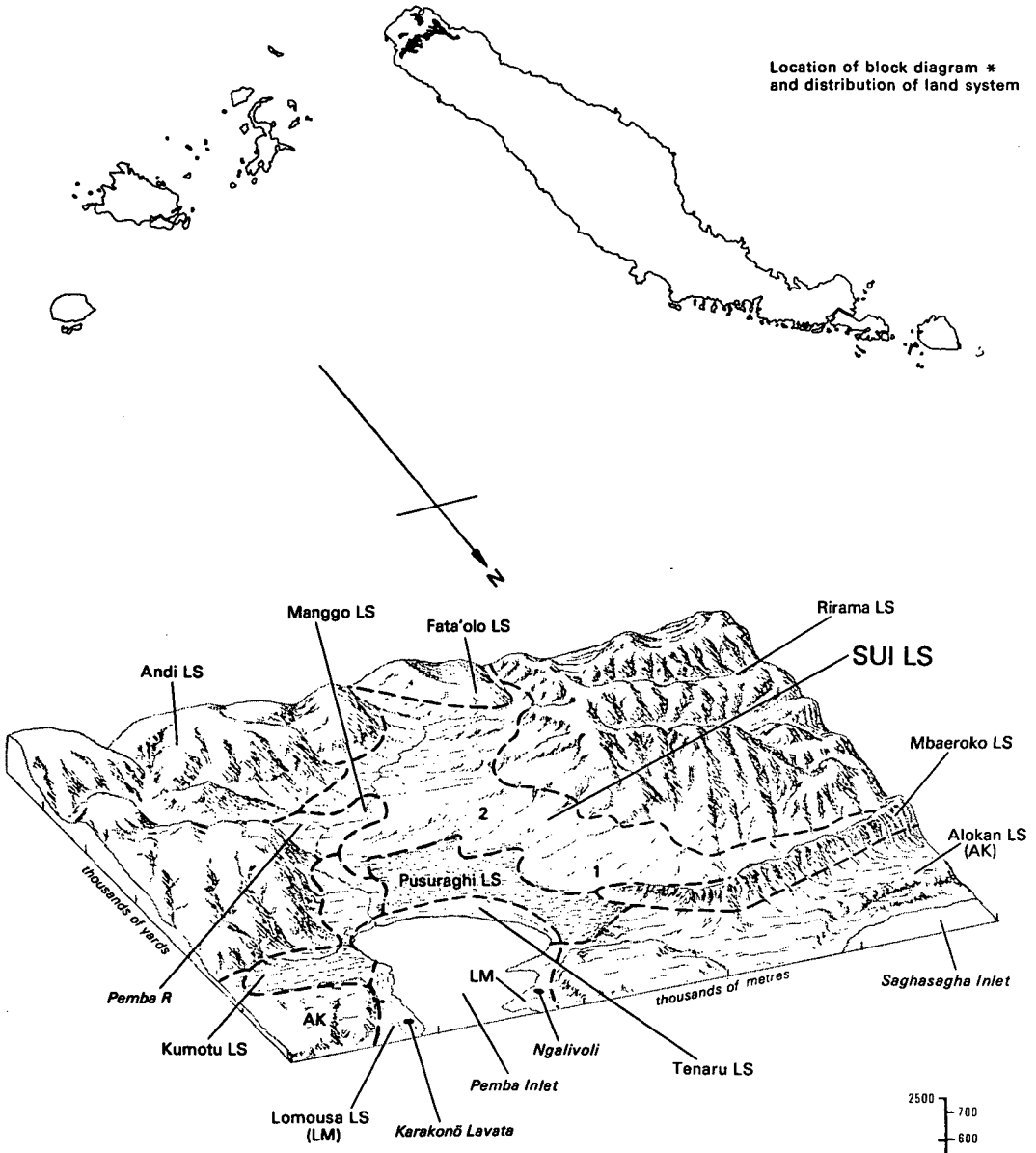
The main landform is level or gently sloping land varying from 100 m to 2 km wide and stretching for several kilometres in a branching fashion as though part of a valley system. The land tends to increase gradually in height with increasing distance inland but in places is interrupted by 10-30 m high steps, particularly in the Chirovanga area. These steps are moderately steep or steep and are formed by outcrops of limestone or marl. Swallow holes and collapse holes have been noted. Limestone outcrops covered by a thin veneer of soil form low hills in some areas.

Streams are present in places but because of the prevalence of lime-rich rocks commonly disappear underground to emerge some distance away. They are incised and tend to be edged by outcropping limestone but form no discernible pattern on air photographs.

Geology

These areas are underlain by limestone or lime-rich sediments probably of Pliocene age; they are believed to be relatively flat-lying.

Number of observations 78. Sample sites 4. Part of Sample Area CC.



Derived from 1:50,000 DOS 456 (Series X711)

Angle of Projection 25°

Note: In areas where land systems are repeated, abbreviations only are shown.

Land facet	Area (km^2-%)	Landform	Soil	Vegetation and lard use
1	27 est 85%	Almost level surfaces containing disappearing streams and sinkholes	Moderately shallow to deep, strong brown loams and clay, locally imperfectly drained (Tropohumults, Udolls) Deep, yellowish brown clay (Tropudalfs, Udolls) Deep, yellowish red or red clay (Haplorthox, Tropohumults) Moderately shallow to deep, brown to dark brown clay (Rendolls, Eutropepts)	Lowland forest dominated by *Vitex cofassus* and with common *Celtis* spp., *Neoscortechinia forbesii, Pometia pinnata* and *Ficus* spp. in the canopy. Undergrowth includes many *Caryota rumphiana, Areca macrocalyx* and *Heliconia* sp. The ground cover is mostly *Selaginella* sp. Large areas of young and old regrowth in east. Small patches used for subsistence crops
2	5 est 15%	Low hills and mounds: common limestone outcrops		

MBETILONGA LAND REGION

22. Balo Land System

Low hills and swamps on sedimentary and volcanic rocks from this land system which is found only in northern Alu. The mottled red and brownish clay soils are entirely under lowland forest.

Total Area: 30 km^2.

Landforms

The altitude ranges between 90 and 140 m while available relief is less than 30 m. Unoriented, low, rounded hills and ridges separate narrow alluvial areas and small swamps. The plan profile is 5.

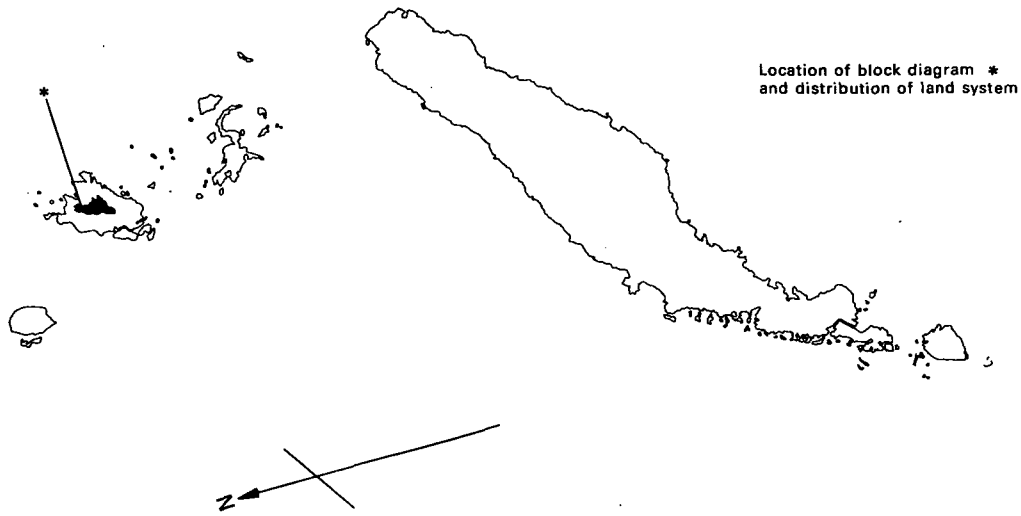
Slopes are ultra-short to medium length, gentle to moderate and convex or concave. Gentle footslopes are short and straight to concave.

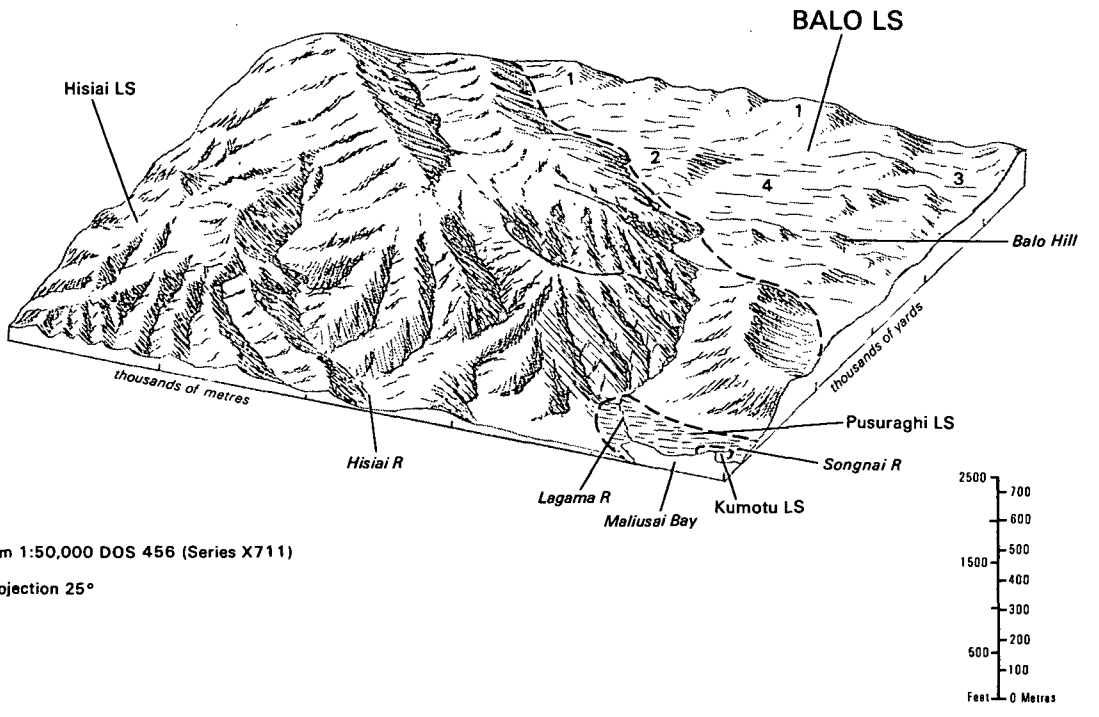
Alluvial land may be up to 300 m wide with flat to gentle slopes and is infrequently flooded. Swamps are flat, less than 150 m wide and commonly flooded.

Geology

Pliocene sediments with local andesitic volcanics underlie this land system. Recent alluvium occurs in valleys and it is probable that there have been recent additions of volcanic ash from Bougainville.

Number of observations 86. Samples sites 2. Sample area CA.





Derived from 1:50,000 DOS 456 (Series X711)

Angle of Projection 25°

Land facet	Area (km^2-%)	Landform	Soil	Vegetation and land use
1	17 57%	Low, rounded hills and ridges: gentle to moderate convex or concave and broad slopes	Deep, brownish or reddish clay loams over red clay, commonly mottled pink, white and yellow (Haplorthox)	Almost entirely under lowland forest with tall irregular canopy on higher ground of *Amoora* sp., *Eugenia* sp., *Calophyllum vitiense*, *Pometia pinnata* and *Dillenia* sp. Smaller trees principally *Guoia* sp., *Neoscortechinia forbesii*, *Astronidium* sp. (?), *Aporosa papuana* and palms. Ground covered by *Selaginella* sp., *Calamus* sp., *Elatostema* sp. and vines.
2	7 22%	Gentle footslopes: straight to concave, broad, more than 100 m long	Deep, dark yellowish brown loams over yellowish red clay, locally mottled in deep subsoil (Andic Humitropepts)	
3	5 18%	Alluvial land: gently sloping, less than 300 m wide, infrequently flooded	Deep, yellowish brown loams over brownish clay, locally mottled in subsoil	
4	1 3%	Swamps: flat, less than 150 m wide, commonly flooded	Deep, gleyed loams and clay, locally with dark, organic-rich topsoil (Tropaquents)	Valleys and poorly drained ground contain *Campnosperma brevipetiolata* and *Terminalia brassii*

MBETILONGA LAND REGION

23. Rirama Land System

Areas of low to moderately high rolling ridges and hills are typical of this land system. It is found in small areas of south-western, northern and north-eastern Choiseul. Soils are reddish to dark brown clays and parts of the lowland forest vegetation have been cleared for coconuts.

Total area: 74 km^2.

Landforms

The altitude ranges from 40-360 m with an available relief of about 80 m. Very narrow ridges and spurs, less than 400 m long, are found amongst rounded or irregular-shaped hills. The ridges have gentle to moderate, uneven crestal slopes. The plan profile is 1 to 4L.

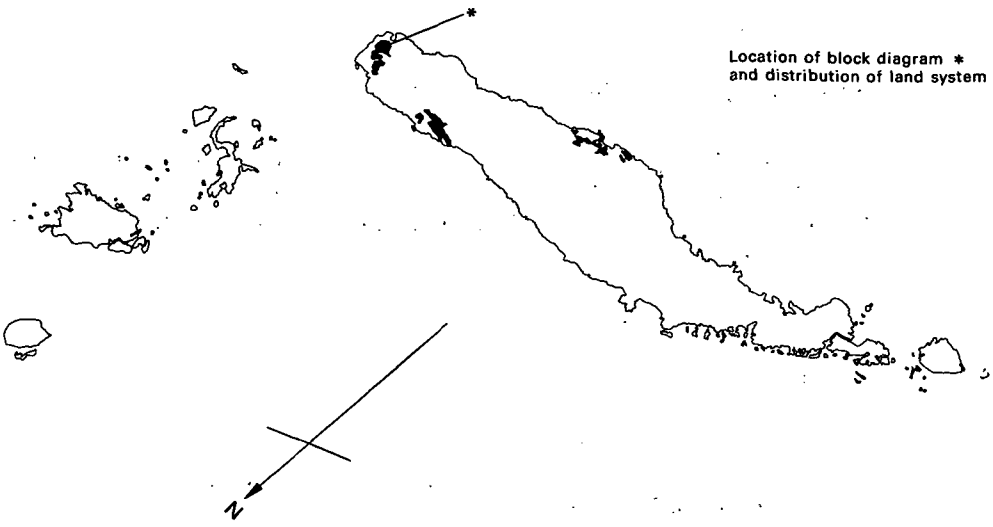
The median recorded slope angle is 25° and the interquartile range is 19-31°. Upper and middle slopes are short, straight and moderate to steep. Lower slopes are generally short, concave and gentle but become steep and very short adjacent to incised valleys. Instability features such as small terracettes, slumps, treefall scars and gullies are found on steep slopes.

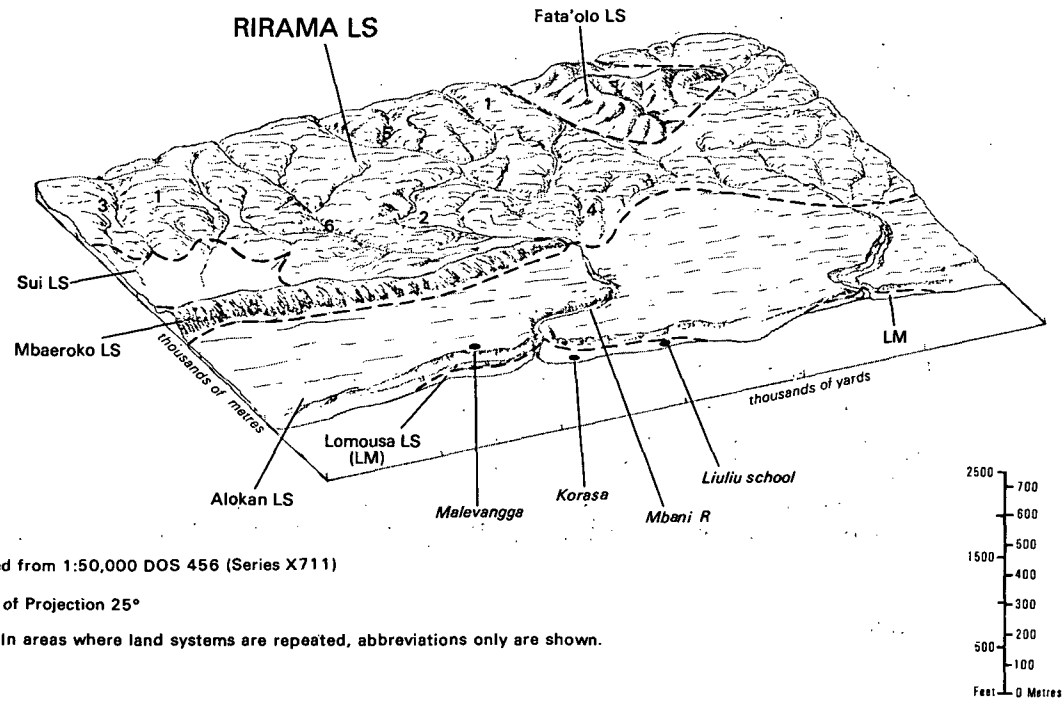
Valleys vary in width and have gentle stream gradients. The drainage texture is fine and there is a poorly developed dendritic drainage pattern.

Geology

The underlying rocks are banded sediments of the Moli Formation. This is probably of Upper Middle and Upper Miocene age and includes fine-grained clayey siltstones and coarser-grained lithic sandstones to coarse grits of lava fragments, pumiceous material and a clay matrix.

Number of observations 33. No sample sites.





Derived from 1:50,000 DOS 456 (Series X711)

Angle of Projection 25°

Note: In areas where land systems are repeated, abbreviations only are shown.

Land facet	Area (km^2-%)	Landform	Soil	Vegetation and land use
1	20 27%	Rounded hill summits	Moderately shallow to moderately deep, dark brown or dark yellowish brown loams over pale weathering rock (Tropepts)	Lowland forest with tall, regular and irregular canopy dominated by *Pometia pinnata*. *Ficus* spp., *Canarium salomonense*, *Vitex cofassus* and *Calophyllum kajewskii* are common tall trees while *Neoscortechinia forbesii*, *Aglaia* sp. and *Pimeleodendron amboinicum* are widespread in the undergrowth. Palms, gingers and ferns in the herb layer are also common
2	18 24%	Gentle, concave lower slopes		
3	19 26%	Moderate to steep upper and middle slopes	Moderately shallow to moderately deep, yellowish brown clay and clay loams over pale weathering rock (Tropepts, Tropudalfs)	
4	7 10%	Very narrow ridge and spur crests		
5	4 5%	Steep lower slopes	Deep, yellowish red or red clay with yellowish brown or pale brown mottled deep subsoil (Haplorthox, Tropohumults)	
6	6 8%	Valleys	Brown and strong brown loams over gravel (Tropofluvents)	Coastal areas utilised for subsistence crops and recently for the planting of coconuts

MBETILONGA LAND REGION

24. Sakatokana Land System

This land system comprises moderately high and high, irregular ridges over mixed sediments with reddish, yellowish brown or dark brown clays or sandy clay loam soils. It is found in western, northern and south-eastern Choiseul and is covered by lowland forest vegetation.

Total area: 206 km^2.

Landforms

The altitude ranges from 40 to 400 m with available relief of 100-250 m. Very narrow, uneven-crested ridges range in length to over 1 km and have gentle to moderate crestal slopes. Some sharp-crested hills occur, mingled with broad ridge and hill tops. The broad ridges range from very short to over 1.5 km long and have uneven and mainly gentle crestal slopes. The plan profile is 4L.

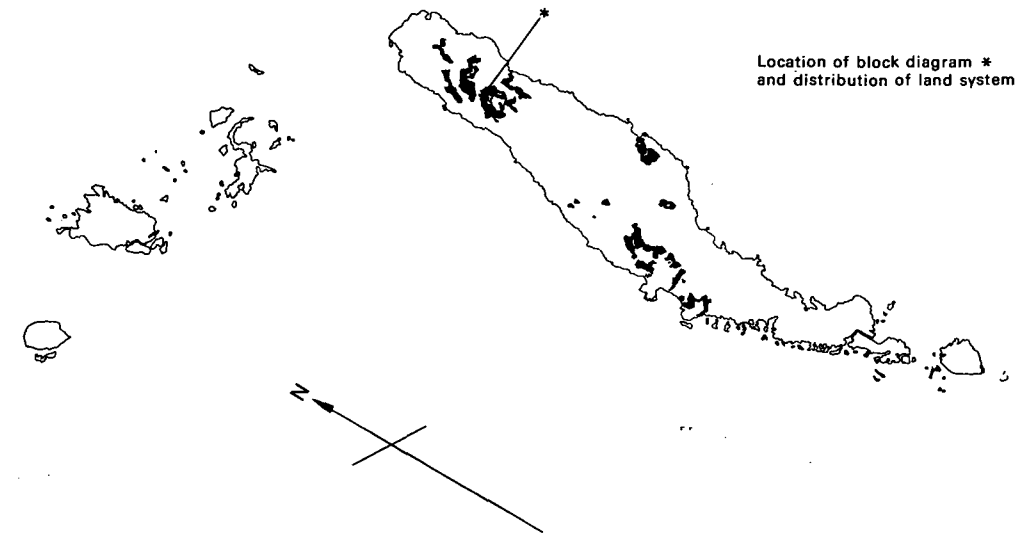
The median angle for all recorded slopes is 28° with an interquartile range of 16-36°. Generally steep, straight to irregular, medium length to long slopes flank the narrow ridges. Gentle to moderate slopes which are straight to irregular or concave and medium length to long are mostly found in association with broader ridges and hills or in lower slope positions on narrow ridges. Steep ridge slopes occur adjacent to incised valleys. Terracettes, treefall scars and slumps are commonly found on the steep slopes.

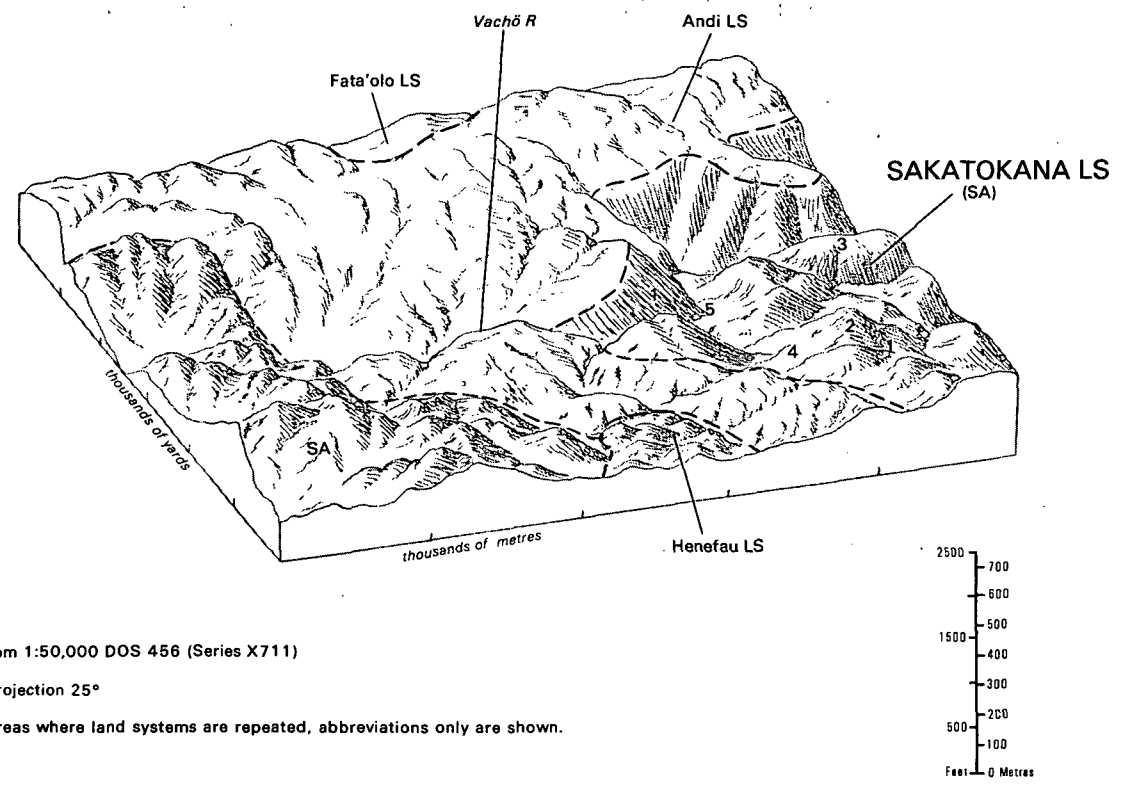
Valleys are narrow and locally incised with gentle to moderate stream gradients. The texture is fine to medium and the drainage pattern is dendritic.

Geology

The mixed sediments underlying this land system belong to the Moli Formation, the Kamanga Grit and Undifferentiated Sediments groups. Sandstones are common to all these but the composition varies from fine-grained lithic sandstones with coarse grits and lava fragments to tuffaceous grits and tuffaceous fine-grained and shaley sandstones. The Kamanga Grit is of Middle Miocene age, the Moli Formation is probably of Upper Middle and Upper Miocene age and the age of the Undifferentiated Sediments is unknown.

Number of observations 83. Sample sites 4.





Derived from 1:50,000 DOS 456 (Series X711)

Angle of Projection 25°

Note: In areas where land systems are repeated, abbreviations only are shown.

Land facet	Area (km^2-%)	Landform	Soil	Vegetation and land use
1	95 46%	Steep, straight or irregular slopes	Moderately shallow to deep, brown to dark brown, stony loams or clay (Tropepts)	Lowland forest with irregular canopy is dominated by *Pometia pinnata, Neoscortechinia forbesii, Vitex cofassus, Dillenia ingens* and *Canarium salomonense.* Undergrowth also contains *Aglaia* sp., *Alangium javanicum,* palms and gingers with ferns as main ground cover.
2	18 9%	Very narrow ridge crests	Deep, yellowish brown clay (Tropepts, Tropudalfs(?)) Deep, reddish brown clay (Tropudalfs(?))	
3	21 10%	Broad ridge and hill tops	Deep, strong brown clay (Tropudalfs, Tropohumults(?))	
4	60 29%	Gentle to moderate, straight to concave slopes	Deep, yellowish red or red clay (Tropohumults, Haplorthox, Tropudalfs)	
5	12 6%	Narrow valleys	Not examined	Small coastal areas utilised for subsistence crops and locally for new planting of coconuts

MBETILONGA LAND REGION

25. Sepa Land System

Low to moderately high, commonly plateau-like areas of ridges separated by broad, lightly dissected lower slopes this land system which overlies sediments and basaltic lavas in central Choiseul. The soils are mainly yellowish red clays and the lowland forest vegetation has been cleared locally for gardens and coconut plantations.

Total area: 304 km^2.

Landforms

Relief ranges from 40-400 m with available relief between 40-100 m. The very narrow to narrow ridges are less than 750 m long and have even, gentle to moderate crestal slopes. The plan profile is 5L.

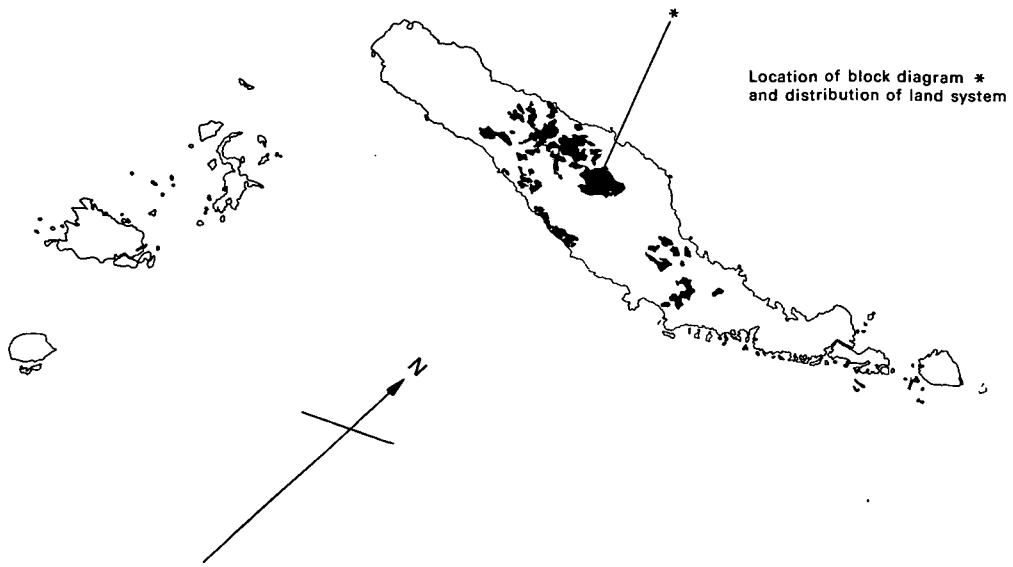
The median angle of all recorded slopes is 26° and the interquartile range is from 20-33°. Upper and middle slopes are short, straight to convex and moderately steep to steep. A few lower slopes are short, moderately steep to precipitous and commonly gullied and unstable adjacent to incised valleys. Most lower slopes however, are short to very long, straight to concave and gentle to moderate merging into low-lying, undulating areas.

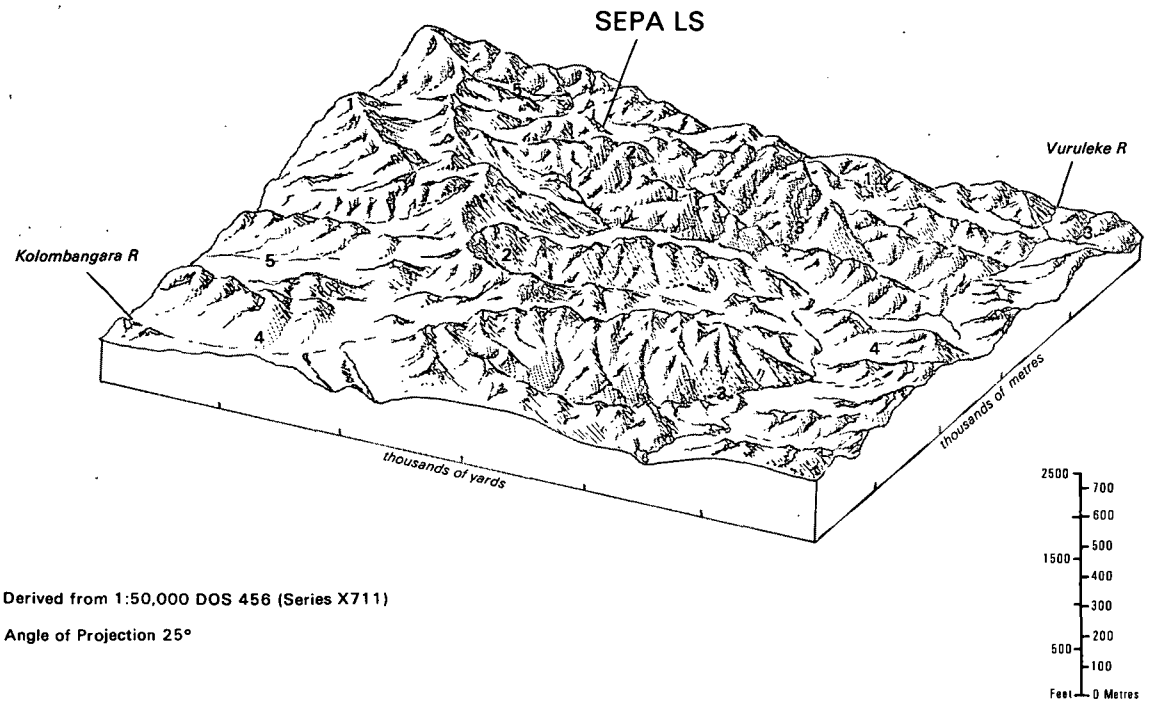
Valleys are narrow and locally incised with gentle stream gradients. They have a dendritic pattern with a fine to medium texture.

Geology

The main rocks underlying this land system are believed to be Mio-Pliocene sediments which rest on the Middle or Upper Oligocene Vosa Lavas. The former are probably coarse-grained, tuffaceous and only weakly calcareous occupying most of the central, higher areas while the Vosa Lavas include basalts, andesites and dolerites and are probably more common near the west coast and in the south.

Number of observations 91. Sample sites 2.





Derived from 1:50,000 DOS 456 (Series X711)

Angle of Projection 25°

Land facet	Area (km^2-%)	Landform	Soil	Vegetation and land use
1	70 23%	Very narrow to broad ridge crests	Deep, yellowish red to red clay (Tropudalfs, Haplorthox) Deep, dark red to reddish brown clay loams or clay (Tropepts)	Forest with tall, irregular, varied canopy (64 spp. identified from 65 sites) containing mainly *Pometia pinnata* and *Canarium salomonense* with common *indicum, Vitex cofassus* and *Dillenia* sp. Smaller trees widely varied (122 spp. identified) and containing in addition *Pimeleodendron amboinicum, Neoscortechinia forbesii, Alangium javanicum, Aglaia* sp. and *Litsea solomonensis*
2	64 21%	Steep, short, upper and middle slopes		
3	6 2%	Oversteepened lower slopes	Moderately deep to deep, yellowish brown or brown loams and clay, commonly with soft, stony subsoil (Eutropepts) Shallow to moderately deep, dark loams over soft, olive rock (Troporthents, Eutropepts) Deep, strong brown clay (Orthox, Humults)	
4	149 49%	Gentle to moderate, mostly lower slopes		
5	15 5%	Valley bottoms	Not examined	Locally, small areas cleared for subsistence crops. Some coastal sites newly planted with coconuts

MBETILONGA LAND REGION

26. Tirua Land System

This land system comprises groups of low, irregular ridges forming hilly plateaux in eastern Choiseul. The red and reddish brown clay soils are largely covered by lowland forest.

Total area: 46 km^2.

Landforms

The landforms resemble those of the Taora Land System, except that the ridges are lower and less well defined. Main ridges extend for 2-4 km, have an even or slightly uneven profile and are narrow to broad. Relief ranges from sea level to 400 m but is mostly less than 200 m and their amplitude of relief is less than 100 m. The ridges have almost symmetrical cross sections and a category 4L plan profile.

From the main crests many short ridges or spurs descend to valleys of permanent streams. These straight spurs may be several hundred metres long with moderate crestal slopes and amplitudes of 20-40 m. They are separated by short, steep-sided gullies containing temporary streams.

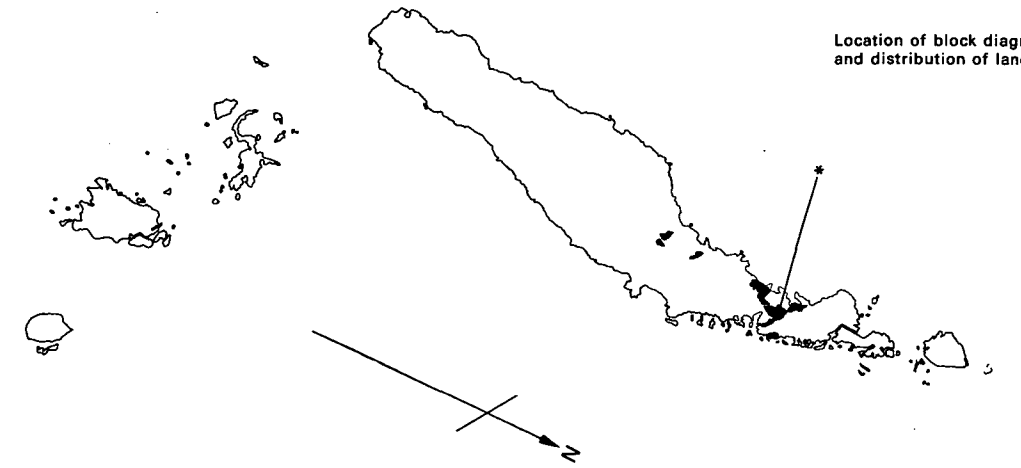
Slopes are ultra-short to short, straight or convex and moderate to steep. Microrelief is varied due to gullying, slumping and treefall scars. Lower slopes are commonly steepened by stream or gully undercutting.

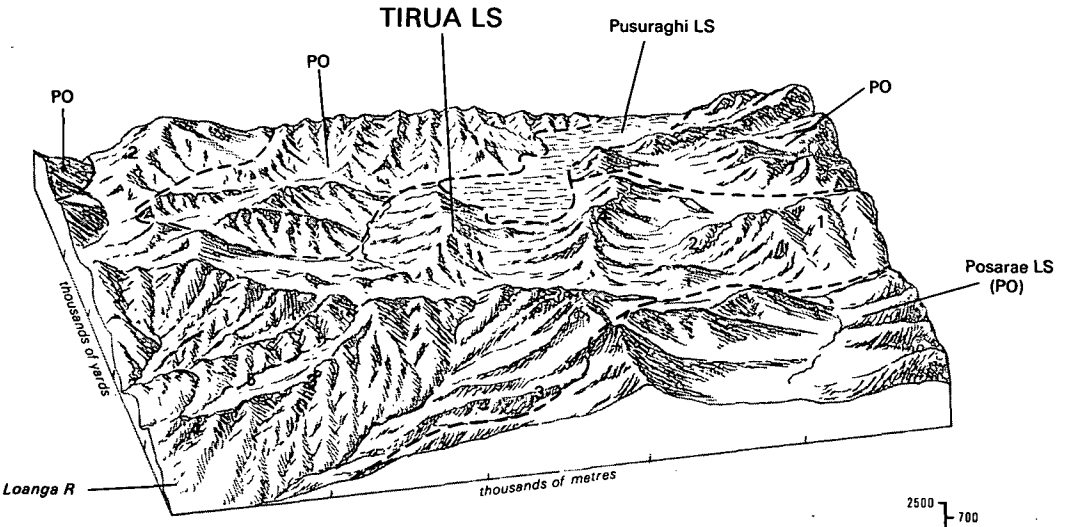
Valley systems are weakly developed as the land system mostly occupies watershed areas. Permanent streams or rivers are widely spaced in a dendritic pattern with a medium to coarse drainage texture, but extending this system considerably is an ultra-fine or very fine gully network.

Geology

Tuffaceous sediments and dark, fine-grained basaltic rocks have been noted. The former are possibly of Pliocene or Pleistocene age (Coleman, 1960) while it is assumed that the latter are older basal volcanics or schists.

Number of observations 16. One sample site.





Derived from 1:50,000 DOS 456 (Series X711)

Angle of Projection 25°

Note: In areas where land systems are repeated, abbreviations only are shown.

Land facet	*Area (km^2-%)	Landform	Soil	Vegetation and land use
1	3 est 6%	Broad ridges: gently convex summits	Deep, yellowish red or red clay (Haplorthox, Tropohumults)	Cyclone-damaged forest contains emergents of *Pometia pinnata, Canarium salomonense, Neoscortechinia forbesii* and *Burckella obovata.* Smaller trees are widely varied and include many saplings, palms, gingers, ferns and climbers
2	10 est 22%	Stable slopes: straight to convex, moderately steep, ultra-short to short	Deep, dark reddish brown or reddish brown clay (Tropudalfs)	
3	17 est 36%	Narrow ridges: slightly uneven profile flanked by moderate to steep slopes	Shallow to moderately deep, dark loams over stony subsoil (Troporthents, Tropepts)	
4	5 est 12%	Unstable slopes: straight to convex, steep, ultra-short to short		Small coastal areas used for subsistence crops
5	11 est 24%	Valleys: less than 100 m wide with gentle gradient merging to narrow, short gullies with stepped, steep gradients	Not examined	

* Assumed to be similar facet percentages to the Tirua Land System of New Georgia (Volume 4)

27. Alokan Land System

This land system consists of uplifted fringing reefs in extensive areas along the coast of north-western Choiseul, southern Alu, Mono and Stirling Islands. The dark brown, clayey soils have a lowland forest cover with many areas, particularly in the Shortland Islands, cleared for subsistence gardens and coconut plantations.

Total area: 77 km^2.

Landforms

The coral terraces range from 1 m above sea level to 50 m with almost level surfaces and an external relief range of up to 20 m.Lengths of the terraces vary from 1 km on a small area of Alu to 6 km on western Choiseul with widths of 400-750 m. The terraces are linear and parallel to the coast.

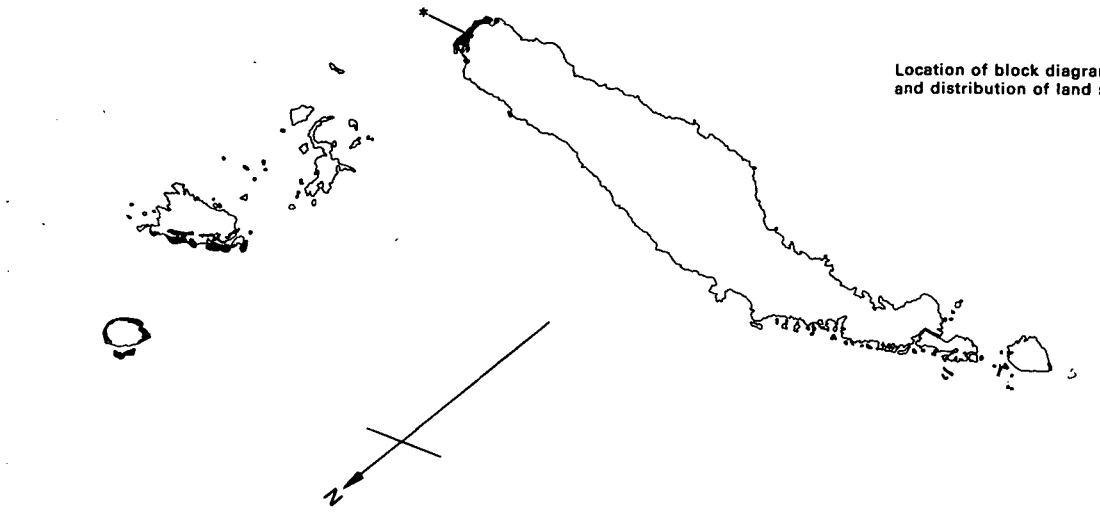
The median angle for slopes on the terrace surface is 4^o with an interquartile range of $2\text{-}7^o$. These almost flat to gently sloping surfaces are generally smooth but are locally irregular due to coral boulders on dry valleys and shallow depressions caused by cave-collapse. Marginal slopes are moderately steep to cliffed with outcropping limestone.

A few depressions and dry valleys form the only surface features on the terraces. In western Choiseul and Mono allochthonous rivers have incised courses through the terraces; on Alu the low terraces are interrupted by swamps and some small areas could be considered similar to the Kohinggo Land System.

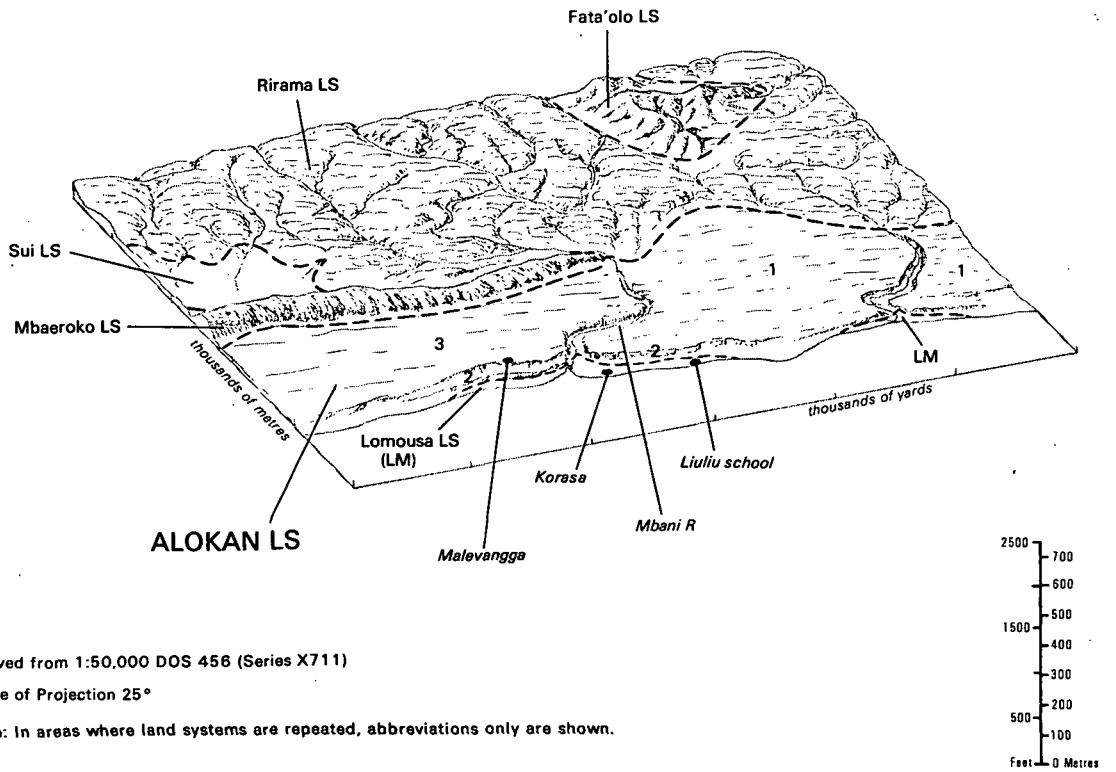
Geology

This land system is composed of uplifted fringing reef limestones of Quaternary age.

Number of observations 41. One sample site. Part of Sample Area CB.



Location of block diagram * and distribution of land system



Derived from 1:50,000 DOS 456 (Series X711)

Angle of Projection 25°

Note: In areas where land systems are repeated, abbreviations only are shown.

Land facet	Area (km^2-%)	Landform	Soil	Vegetation and land use
1	59 77%	Terrace surfaces: flat to gently sloping	Moderately deep to deep, yellowish brown to strong brown clay (Tropudalfs) Moderately deep to deep, brown to strong brown clay with a thick dark brown surface horizon (Hapludolls, Argiudolls) Deep, dark brown clay loams over yellowish red to red clay (Oxic Tropudalfs)	Forest dominated by *Vitex cofassus, Pometia pinnata, Ficus* sp., *Pterocarpus indicus, Celtis* sp. and on Alu Island *Canarium indicum.* Smaller undergrowth species include *Alangium javanicum, Alstonia* sp., *Zizyphus angustifolius, Neoscortechinia forbesii* and *Horsfieldia irya*
2	10 13%	Cliffed margins: moderately steep to steep, short, uneven profile with common rock outcrops	Shallow to moderately shallow, dark brown clay or loams over coral rock (Lithic Rendolls)	
3	8 10%	Drainage depressions: flat to gently concave, high water-table	Brown to dark brown clay overlying mottled, locally stony clay (Aquic Tropudalfs(?))	Coconuts and garden areas occur in Choiseul Bay and the areas of both are being extended. Small areas of Mono and Alu are also in use for these purposes

ROKERA LAND REGION

28. Kohinggo Land System

A very low, gently undulating terrace of uplifted reef limestone with dark yellowish brown to dark brown clay soils forms this land system, found on eastern Vaghena. Some small areas of this land system probably occur in southern Alu. Small areas of the lowland forest vegetation have been cleared for shifting cultivation and coconuts.

Total area: 19 km^2.

Landforms

The entire terrace is on one level below 40 m above sea level; the surface is higher in the south at 20-30 m and the internal relief is in the order of 5-10 m. The surface varies from flat to moderately sloping and is irregular only where rocky outcrops occur. Dissection is negligible with the topography representing the original reef surface. Depressions in the surface are widespread and commonly swampy. The plan profile is 1.

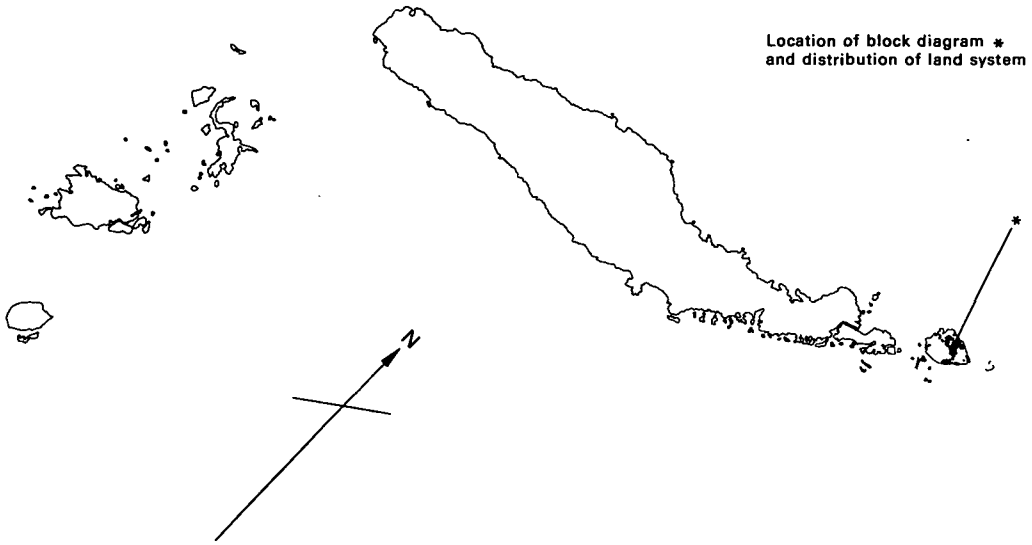
Internal terrace slopes are short to medium length and gentle to moderate while slopes at terrace margins are short and moderate to steep. Limestone outcrops occur on all slopes and may form cliffs on marginal slopes.

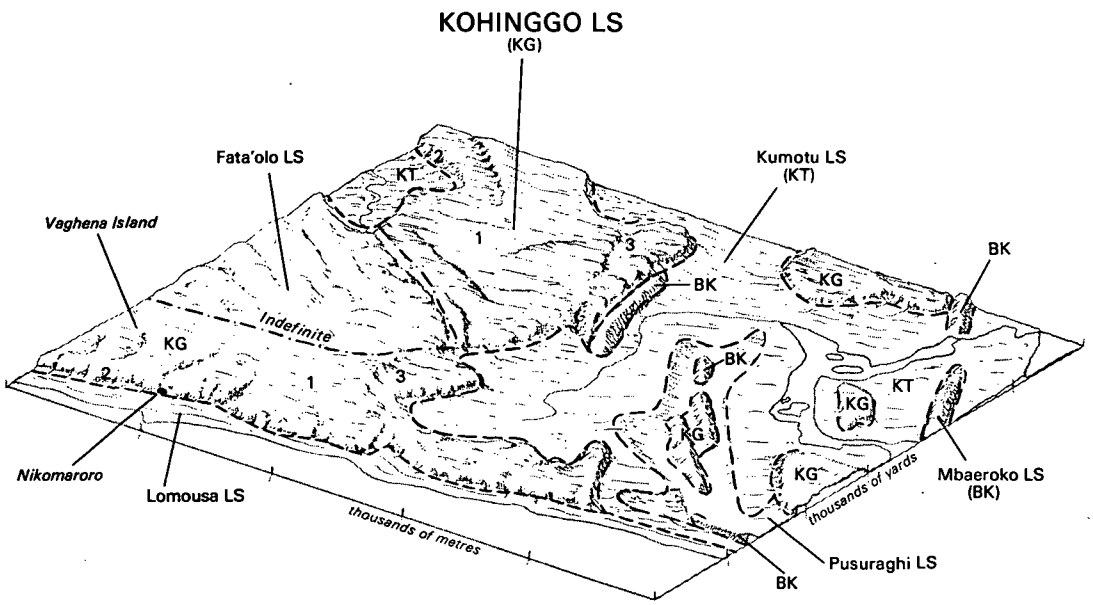
Swampy depressions probably represent former lagoonal areas now lying slightly above sea level. These areas are less than 100 m wide, almost flat to gently concave and linear in plan; most are interconnected.

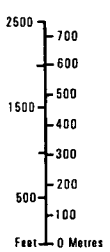
Geology

Uplifted Pleistocene to Recent limestone reef complexes.

Number of observations 19. One sample site.







Derived from 1:50,000 DOS 456 (Series X711)

Angle of Projection 25°

Note: In areas where land systems are repeated, abbreviations only are shown.

Land facet	Area (km^2-%)	Landform	Soil	Vegetation and land use
1	16 83%	Terrace surface: level to gently undulating, almost flat to gentle slopes	Deep, dark yellowish brown to strong brown clay, occasionally mottled at depth (Haplorthox, Eutrorthox)	Forest dominated by *Pometia pinnata* but other large trees include *Neoscortechinia forbesii, Alstonia scholaris, Amoora* sp. and *Ficus* spp. Common small trees include *Teysmanniodendron ahernianum, Dysoxylum* sp. and *Alangium javanicum*
2	2 13%	Terrace margin: moderately steep, irregular with common coral outcrops	Shallow to moderately shallow, brown clay overlying limestone (Lithic Rendolls)	
3	1 4%	Depressions: almost flat to gently concave, closed or linear	Brown to yellowish brown clay with mottles occuring within 1 m of the surface	Small areas of coconuts

FIU LAND REGION

29. Kumotu Land System

Forming this land system are deep peats, pale sands and dark loams in Recent littoral sediments in many small coastal areas of Choiseul and the Shortlands Group. They are covered almost entirely by mangrove forest.

Total area: 130 km^2.

Landforms

The land system lies within the intertidal range on abraded reef platforms of offshore islands and on infilled lagoons between onshore reefs and inland hills. It is not found for any distance along river courses.

The land surface is flat,only interrupted by scattered coral boulders or creeks. There are, however, identifiable facets or microlandforms. In many areas there is a protecting fringe of reef (Lomousa Land System) on the seaward margin, either adjacent to the Kumotu Land System or separated from it by a lagoon. In these situations, peat accumulates on old abraded reef or in shallow water beneath colonising mangrove vegetation: this is clearly seen around Vaghena Island, Choiseul Bay or southern Alu Island.

On the coastal margin of mangrove swamps open to the sea low, narrow beaches of coral sand and small stones develop, too small to be classed in the Lomousa Land System. They may be as little as 570 m wide, less than 1 m high and may extend parallel to the coast for several hundred metres.

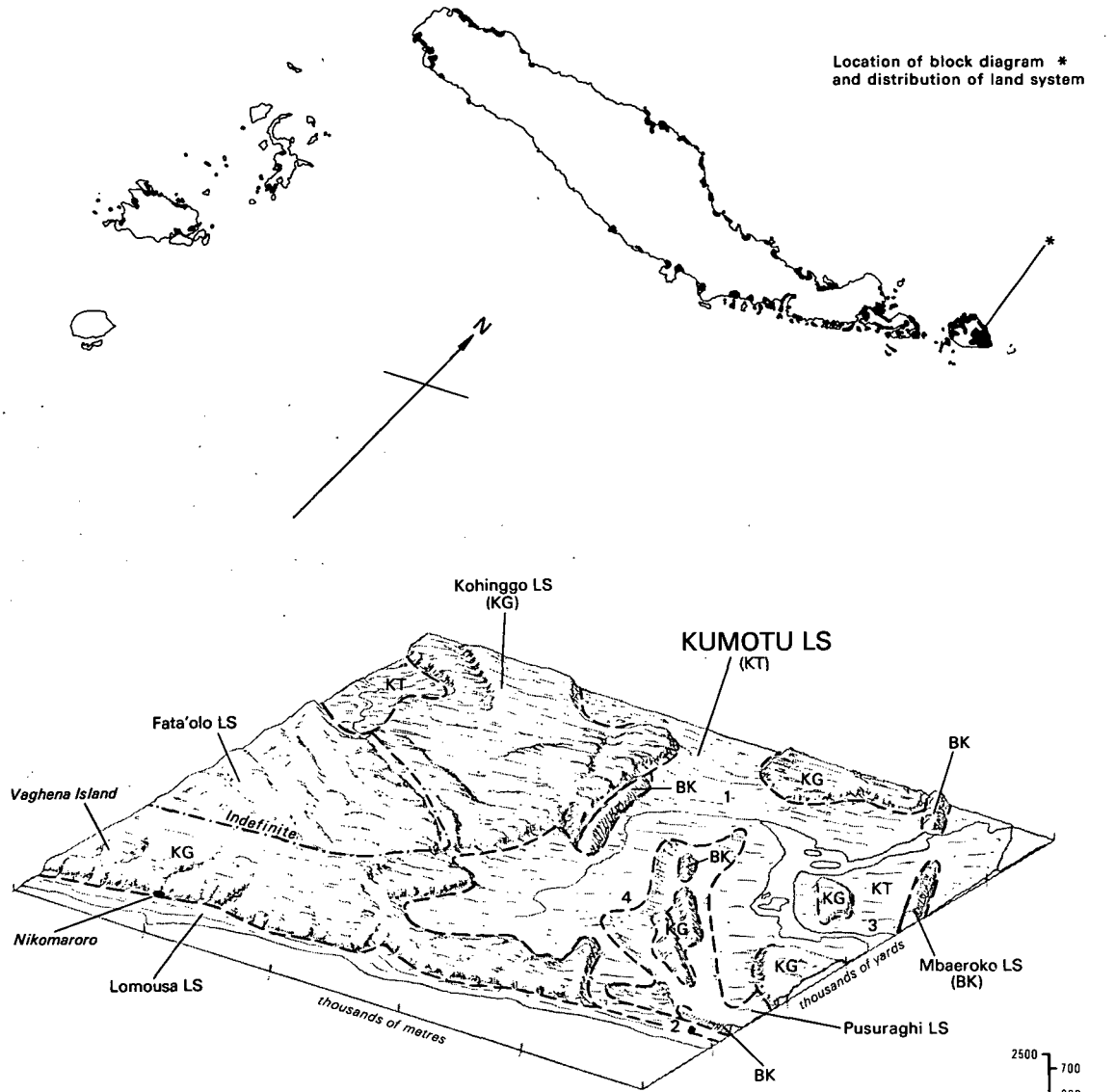
Mangrove forest occurs at the mouth of the largest rivers, such as the Vachö, on silts and clays within 100 m or so of the river course. These areas are flooded by the tides and are uniformly flat with no drainage pattern.

Areas of saltwater swamp may also occur landwards of river-mouth sand bars such as the Kolombangara mouth. These are underlain by sand and although largely flat may be traversed by small streams and creeks.

Geology

Underlying the land system are Recent sands, silts, clays and organic detritus deposited in a littoral environment.

Number of observations 20. One sample site.



Derived from 1:50,000 DOS 456 (Series X711)

Angle of Projection 25°

Note: In areas where land systems are repeated, abbreviations only are shown.

Land facet	Area (km^2-%)	Landform	Soil	Vegetation and land use
1	65 est 50%	Infilled lagoons: flat except for small creeks and outcropping coral	Deep to shallow, dark reddish brown peat on coral (Sulfihemists, Tropohemists)	Species-poor forest dominated by *Rhizophora apiculata, R. stylosa, Lumnitzera littorea* and *Xylocarpus granatum*
2	13 est 10%	Beaches: narrow, low and at times submerged	Deep to shallow, pale, loose, gravelly sand (Troporthents, Tropopsamments)	Littoral forest containing *Casuarina equisetifolia, Intsia bijuga, Terminalia catappa, Premna corymbosa* and *Pandanus* spp.
3	39 est 30%	River-mouth areas: uniformly flat except for small streams	Deep, dark grey, gleyed loams and clay (Sulfaquents, Tropaquents)	Similar forest to Facet 1 but also includes areas of *Nypa fruticans* adjacent to river
			Deep, dark olive grey sand (Tropaquents, Fluvaquents)	*Rhizophora* spp. and *Bruguiera* sp. common with *Pterocarpus indicus, Metroxylon sagu, Ficus hombroniana, Barringtonia asiatica* and *Pandanus* spp.
4	13 est 10%	Inner Swamp fringes: flat with locally irregular microrelief	Dark, peaty loams and clay commonly overlying coral or stones (Tropaquents, Fluvaquents)	Mixed-species forest including some mangrove species as above. Also present are *Fagraea gracilipes, Eugenia* spp. and *Calophyllum cerasiferum*

FIU LAND REGION

30. Lomousa Land System

The land system is formed of Recent coral beaches and stranded reef deposits, locally covered by a thin veneer of coral sand or sandy loam. It occurs in the Shortlands and on Choiseul and is commonly used for coconut gardens.

Total area: 47 km^2.

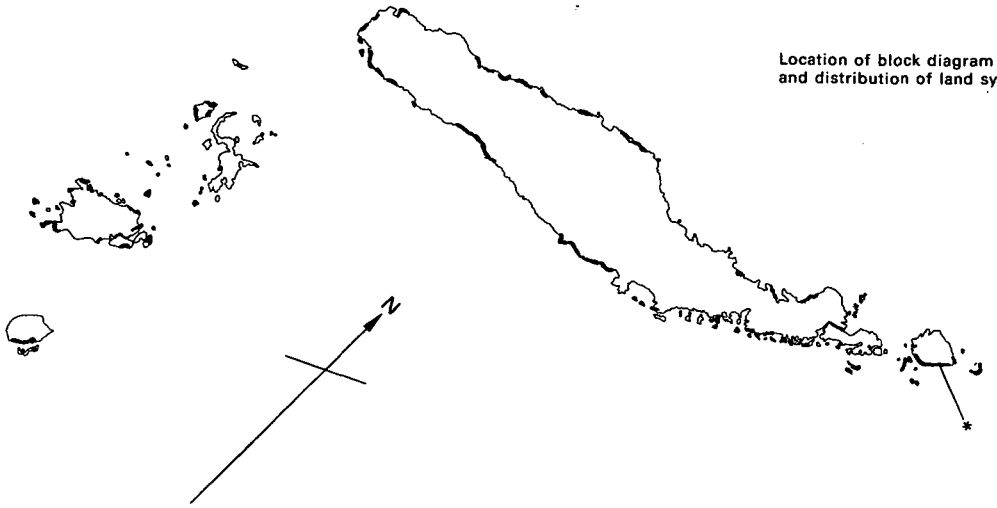
Landforms

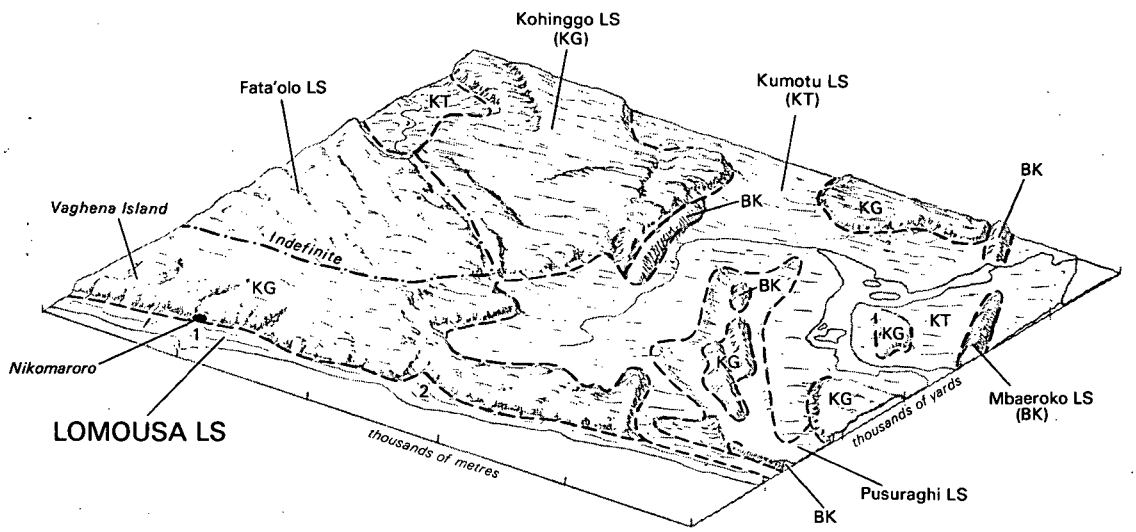
Narrow coastal beaches are the major landforms, often occurring within fringing reefs but also at the heads of small bays. Although extensive laterally they rarely exceed widths of 30 m individually and 300 m collectively and commonly form a narrow barrier between inland swamps and the sea. They are normally less than 3 m in height. The surface is level to slightly undulating with narrow swales between the ridges; locally a pronounced microrelief is formed by rock outcrops and small hollows. The beaches are too small to have formed an internal drainage system and the extremely porous nature of the parent material results in rapid drainage of rainfall except where the system occurs at or below sea level. The plan profile is 7.

Geology

Although coral rock and comminuted coral underlies most of the land system, fragments of basalt and sand-sized particles are locally common.

Number of observations 63. No sample sites.



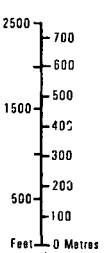


Derived from 1:50,000 DOS 456 (Series X711)

Angle of Projection 25°

Note: In areas where land systems are repeated, abbreviations only are shown.

Note: Land facet 3 is not present in area shown



Land facet	Area (km^2-%)	Landform	Soil	Vegetation and land use
1	9 est 20%	Coral platforms: up to 3 m high, irregular microrelief	Very shallow to shallow, stony, pale sand over coral (Lithic Troporthents)	Disturbed forest with several large trees including *Pometia pinnata, Vitex cofassus, Intsia bijuga, Celtis* sp. and *Canarium* spp.
2	33 est 70%	Beaches: linear, low, flat to gently undulating slopes 0-5°	Moderately shallow to deep, pale brown to yellowish brown sand and sandy loams (Tropopsamments) Moderately shallow to deep, greyish brown clay with coral fragments (Tropofluvents)	Many areas cleared and planted with coconuts but few areas used for subsistence crops
3	5 est 10%	Swales and swamp margins: low-lying, high saline to brackish water-table	Organic-stained sand with a variable thickness of peat (Aquic Tropopsamments)	Mixed swamp forest with *Terminalia brassii* common and also mangrove species such as *Bruguiera* sp. and *Lumnitzera littorea*

FIU LAND REGION

31. Manggo Land System

Recent alluvial valleys and plains form this land system. The soils are largely brownish loams and clays, subject to flooding or waterlogging in some areas. It is widespread on Choiseul but covers only a limited area in the Shortlands, mainly on Alu Island.

Total area: 131 km^2.

Landforms

Floodplains and terraces comprise the major landforms although they are not always clearly distinguishable. They occur in close association with the large rivers and their altitude varies from sea level to 100 m.

Terraces are of varied width, most less than 180 m although some less than 20 m wide were present particularly in the upper reaches of the rivers. Terrace surfaces are almost flat to gently sloping and their height above the floodplain varies from 3-9 m. Although one terrace level dominates, there may be several intermediate levels. Flooding of these terraces is rare and only occurs on the lower levels. Colluvial fans may occur on the boundaries of the terrace and the backing hillslope and on these slopes may increase to moderate.

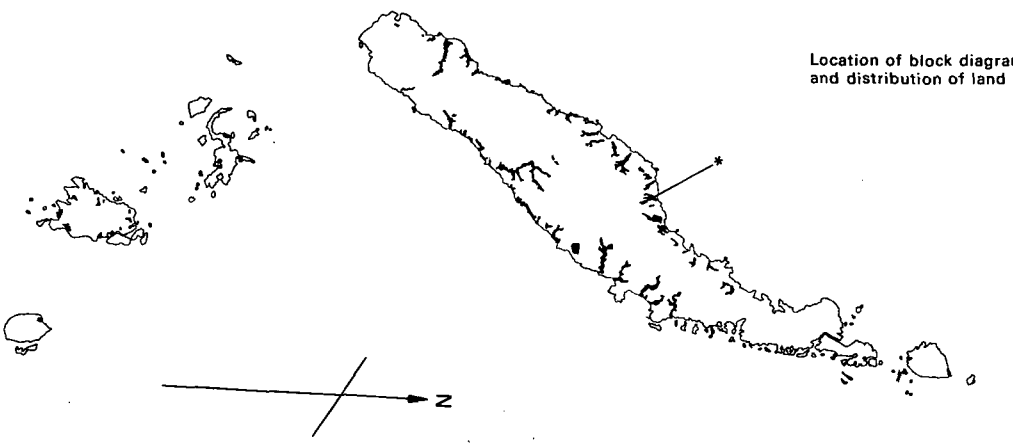
Narrow floodplains adjacent to rivers and streams flood during times of extremely heavy rainfall. They are low-lying tracts commonly only 1-2 m above the river channels and of variable width. Slopes are flat with a level to slightly hummocky microrelief due to surface stones or treefalls. They may be traversed by infilled channels or low levées and consequently soil drainage regimes change considerably from place to place. Depressions are commonly an extension of the low-lying, swampy Pusuraghi Land System and as such have a high watertable or standing water. as these areas often represent abandoned channel and cut-off meanders they are subject to frequent flooding.

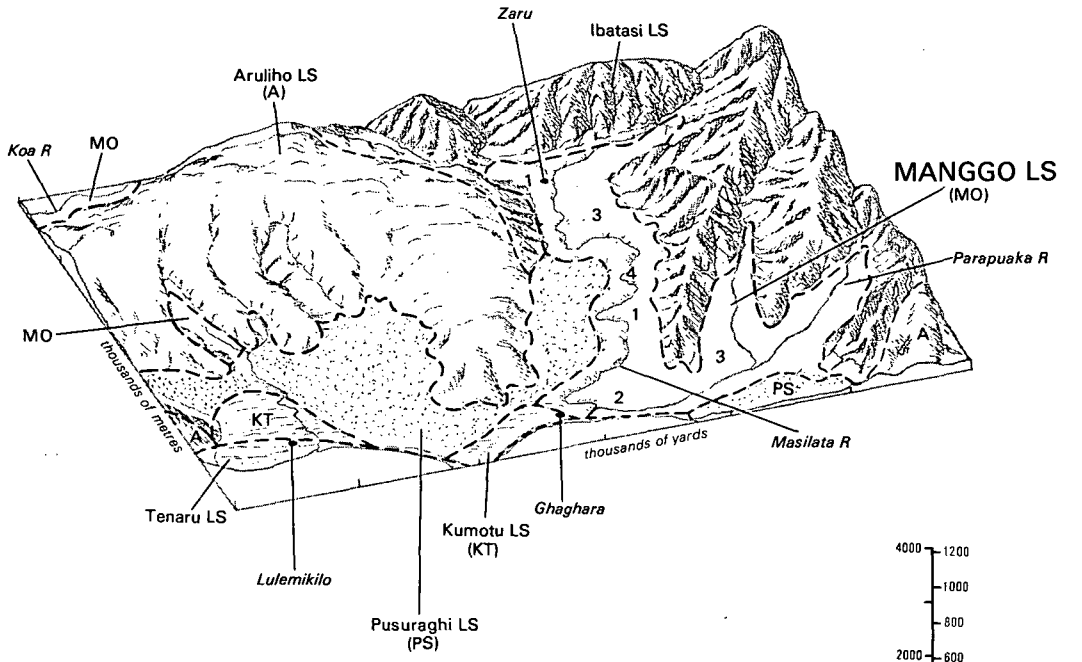
River channels are rarely wider than 60 m and the depth of water is usually less than 1 m except close to river mouths where tidal influence becomes dominant. Normally rivers are rapid flowing with shoals and numerous minor channels between gravel banks but when in flood rivers often fill the entire channel and overflow onto the floodplain.

Geology

Recent, fine and coarse sediments of mixed origin. At the coast there is some resorting by tidal action.

Number of observations 80. Sample sites 6.





Derived from 1:50,000 DOS 456 (Series X711)

Angle of Projection 25°

Note: In areas where land systems are repeated, abbreviations only are shown.

Land facet	Area (km^2-%)	Landform	Soil	Vegetation and land use
1	72 est 55%	Terraces: low to moderately high, slopes $< 2^o$, narrow, often sinuous	Deep, well to imperfectly drained, yellowish and brownish loams and clay with fine mottles or more rarely gleying below 1 m (Eutropepts, Tropofluvents)	Widely used for subsistence gardens and coconuts Tall forest, in places containing many secondary species. Common large trees include *Pometia pinnata, Vitex cofassus, Pterocarpus indicus, Ficus* spp., *Campnosperma brevipetiolata, Burckella obovata* and, in wet areas, *Terminalia brassii.* Small trees include *Alangium javanicum, Kleinhovia hospita, Semecarpus* sp., *Heritiera littoralis* and *Neoscortechinia forbesii*
2	39 est 30%	Floodplains: low-lying, flat, mound and hollow microrelief, subject to flooding	Imperfectly drained, brown and yellowish brown clay with mottles and gleying from 50 cm (Aquic Tropofluvents)	
3	13 est 10%	Depressions: flat to concave, waterlogged and regularly flooded	Imperfectly drained, yellowish brown and greyish brown sand (Aquic Tropopsamments) Poorly drained clay mottled or gleyed to the surface (Tropaquents)	
4	7 est 5%	Channels: narrow, often braided, unstable, subject to flash floods	Shallow to deep gravel and boulder beds	Unused, mainly unvegetated or with low pioneer grasses and shrubs

32. Pusuraghi Land System

Freshwater swamps with predominantly deep, very poorly drained clays and organic soils occurring throughout coastal Choiseul and on Alu and Fauro Islands in the Shortlands Group.

Total area: 153 km^2.

Landforms

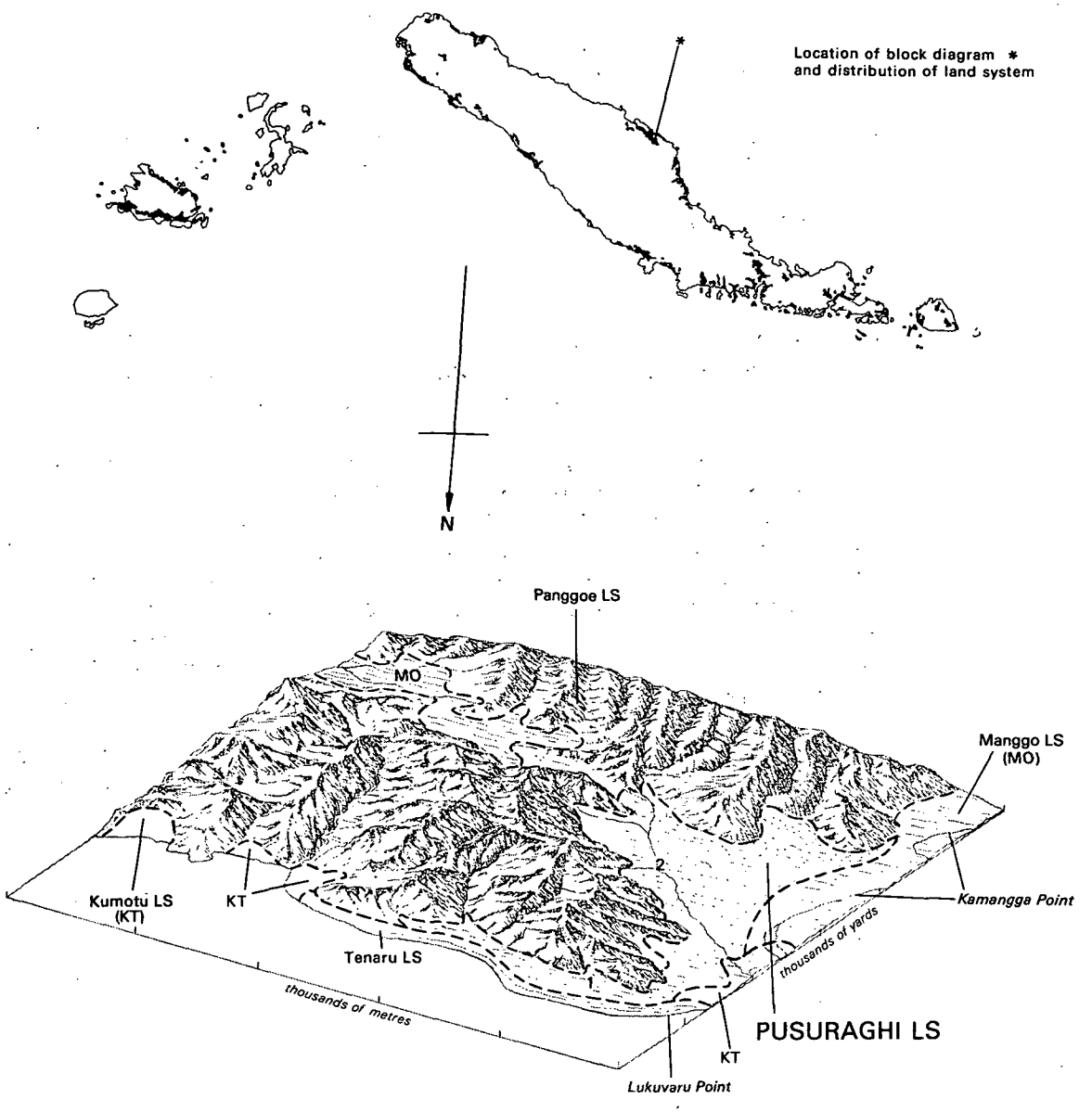
Level to very slightly concave areas at or close to sea level with a fresh or brackish watertable continually near the surface dominate the landforms. They are less than 5 m above sea level and the available relief is negligible although river channels and mounds and hollows of treefall scars provide clear microrelief features. The plan profile is 7.

Coastal-margin swamps develop between the littoral and the foothills or terraces inland. Small streams are ponded between these features and drainage takes place by seepage through the beach deposits or via small creeks. The coastal swamps vary in width from a few metres to 1-2 km. The outer edge of the swamps may be underlain by coral platforms or detritus. In places swampy river tracts occupy old river channels and those depressions are now either separated from present-day, active channels or occupy back-swamp areas separated from rivers by higher, drier levées. They are linear with a maximum width of 1.5 km, but more often between 300-500 m, and up to 8 km long. Some areas close to rivers may be subject to flooding.

Geology

Alluvium derived from a variety of rock types including some ultramafics. Parent materials are largely fine-textured loams and clays and organic deposits, but locally sands and coral rock occur.

Number of observations 69. No sample sites.



Derived from 1:50,000 DOS 456 (Series X711)

Angle of Projection 25°

Note: In areas where land systems are repeated, abbreviations only are shown.

Land facet	Area (km^2-%)	Landform	Soil	Vegetation and land use
1	61 est 40%	Coastal-margin swamps: discontinuous, low-lying zones behind the littoral deposits, maximum width 2.5km	Deep, dark brown to reddish brown peat (Tropohemists) Deep, poorly drained, dark grey to greenish grey clay or loams with or without mottling to the surface (Tropaquents)	Tall forest dominated by *Terminalia brassii* either singly or in stands. Other large trees include *Pometia pinnata, Campnosperma brevipetiolata* and *Pterocarpus indicus.* Smaller trees include *Inocarpus fagiferus, Eugenia* sp., *Calophyllum cerasiferum* and *Heritiera littoralis*
2	92 est 60%	Swampy river tracts: sinuous areas up to 1 km wide along river valleys merging into riverine alluvium	Moderately deep to deep, pale loams and clay mottled below 20 cm and gleyed below 50 cm (Aquic Tropofluvents) Deep, imperfectly drained, greyish brown clay or clay loams (Tropofluvents)	Mature coconut groves adjacent to areas of alluvium or beaches

33. Tenaru Land System

This land system comprises narrow beaches formed predominantly of dark volcanic sands. It occurs locally on Choiseul and the northern islands of the Shortlands Group.

Total area: 15 km^2.

Landforms

Beaches develop adjacent to the mouths of large rivers draining either volcanic or sedimentary areas and, by definition, contain little coral-derived material. This is in contrast to the beach deposits of the Lomousa Land System.

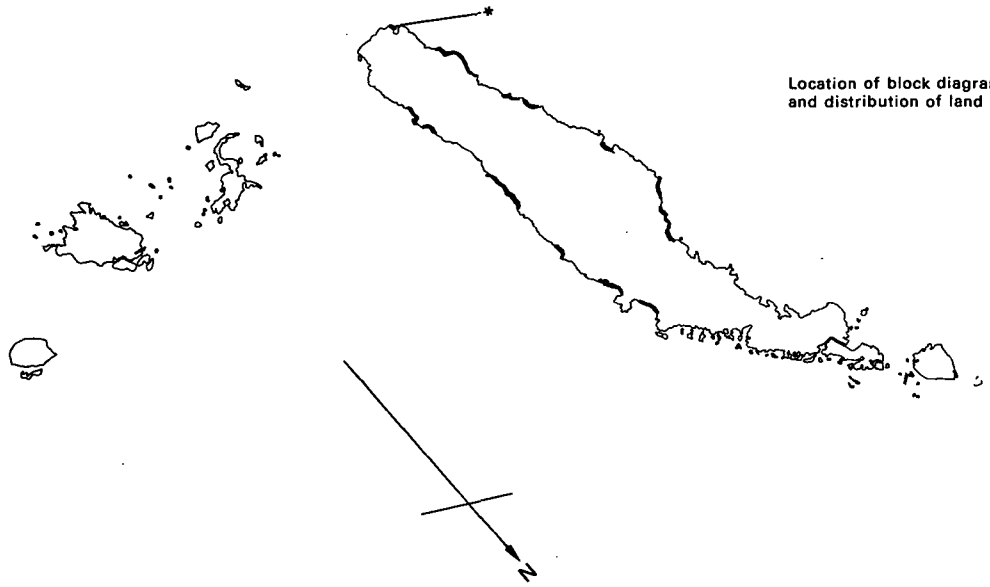
The beach ridges may be up to 4m above sea level but available relief rarely exceeds 2m. They do not form prominent features in the landscape and are usually less than 500 m long. They vary in width from a few metres to 100 m and there is generally one contemporary beach subject to wave action which merges indistinctly with older beaches inland. Within the beach area one or more linear depressions or swales occur, some containing narrow creeks running parallel to the shore and commonly with a beach bar separating the creek from the sea. Most swales do not have standing water but have a high water-table close to the ground surface. Slopes rarely exceed 5^o except where active wave erosion has resulted in shoreline depletion and slopes may be up to 12^o.

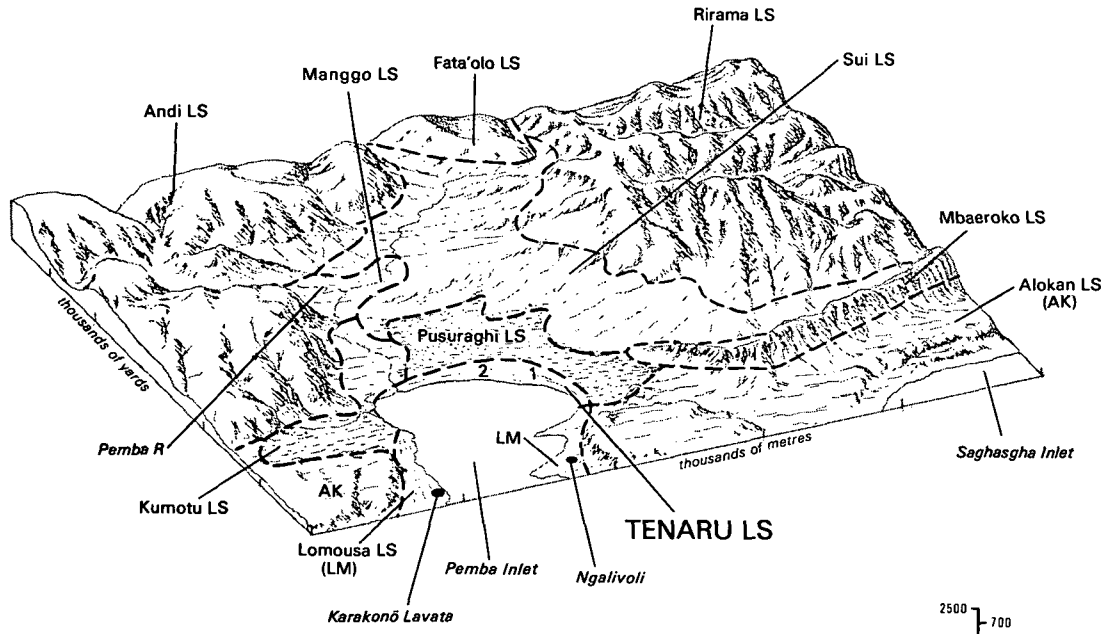
Inland, the swales tend to merge into the poorly drained land systems in alluvial areas, but where slopes increase wash deposits often cover the inland margins of the beach.

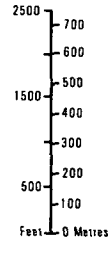
Geology

Coarse-grained sediments derived principally from non-calcareous sediments and basic rocks.

Number of observations 13. No sample sites.







Derived from 1:50,000 DOS 456 (Series X711)

Angle of Projection 25°

Note: In areas where land systems are repeated, abbreviations only are shown.

Land facet	Area (km^2-%)	Landform	Soil	Vegetation and land use
1	12 est 80%	Beach ridges: level to gently undulating, slopes 2-8°, up to 100 m wide and up to 4 m a.s.l.	Deep, yellowish brown to black sand (Tropopsamments) Deep, brown to yellowish clay overlying dark-coloured sand below 50 cm (Tropofluvents)	Many areas cleared from forest and planted with coconuts but few subsistence gardens
2	3 est 20%	Swales: concave, parallel or sinuous, narrow, at or slightly above sea level	Deep, imperfect to poorly drained, dark grey or greyish brown sand (Aquic Tropopsamments)	Disturbed forest with large and small trees. Those commonly present include *Burckella* sp., *Intsia bijuga, Heritiera littoralis, Terminalia catappa, Barringtonia racemosa, Ficus* spp., *Inocarpus fagiferus, Fagraea racemosa* and *Casuarina equisetifolia*

Part 4

The agricultural potential of the land regions

INTRODUCTION

Choiseul and the Shortland Islands contain a wide variety of soils and landforms some of which maintain a large, agriculturally based population. Alternatives to the present system of subsistence agriculture are proposed, where possible as a means of increasing the productivity of the land. These suggestions however, have taken only nominal account of socio-economic factors and must be seen as proposals to be used in conjunction with supporting specialist surveys which should be the topic of further studies. The main agricultural limitations of the land regions, and in many cases of specific soil types within the component land systems, are discussed and measures for improving crop productivity are suggested. It must be stressed that many inherent soil limitations can only be overcome by the use of fertiliser inputs and modern agricultural methods combined with a high standard of crop husbandry. A number of cash crops are suggested which are known to grow well in agricultural trials under Solomon Islands' conditions and where possible crops grown elsewhere in the humid tropics are mentioned. The selection of suitable varieties and the potential markets for these crops lie outside the scope of this report.

There has been no agronomic research on these islands and prior to this survey there had been little investigation of their soils and agriculture. However, many of the soils are similar to those of other islands where some research work has been carried out and in this context comments on the agricultural potential in Volume 2 on Guadalcanal for the Paru and Ghausava Land Regions and Volume 3 on Malaita for some of the other other land regions, are pertinent.

Choiseul is not favoured with many large blocks of land suitable for intensive agricultural development but small blocks occur throughout the island and there are many smaller areas suitable for development. The Shortland Islands are equally fortunate in possessing sizeable areas with a few physical constraints to their development.

As with all other large islands in the Solomon Islands, steep land is the major factor limiting agricultural development and hindering access. In addition, soil erosion is constantly present, whether by gradual surface wash or by abrupt slope failures resulting in debris slides or landslips. Where topography is not a limiting factor, as on terraces, shallow, commonly infertile soils may limit the range of crops that can be grown.

A high proportion of farmers on Choiseul currently use steep hill land for subsistence crops in a shifting cultivation system. Since it is probable that many of these hill lands will remain in use, it is important that the dangers of erosion be made known especially under increasingly intensive use. In this, as in the other volumes of the overall report, a policy of topsoil conservation is supported.

The hilly nature of much of Choiseul precludes its use for extensive arable cultivation and development will be mainly by tree crops.

KAIPITO LAND REGION

This land region consists of low and high ridges derived mainly from andesitic and basaltic lavas but also from schists. The region covers an area of 1215 km^2 in south-eastern, southern and northern Choiseul and reaches a maximum altitude of 720 m. Slopes vary from very short to long and are moderately steep to steep. Lower slopes may be precipitous, unstable and often intensely gullied while the river valleys are narrow and commonly incised (Stereopair 6.5).

Of the four component land systems the Taora Land System differs in having a lower altitude and amplitude of relief and a distribution restricted to eastern Choiseul and Rob Roy Island. However, the slopes and associated soils are similar to those of the other land systems within this land region and they will be discussed together. The agricultural potential of this land region has been discussed in Volume 5, Santa Isabel and the sections on the agricultural potential of the mountainous land regions in all the island reports are applicable here.

The large areas of steep slopes have a covering of young soils, many of which are leached and low in nutrients. On the less extensive, stable slopes more mature soils have developed and these are leached and strongly weathered: the general fertility of these soils is moderate to poor. Fertility is highest in the topsoil and is sufficient to allow short-term cropping within the shifting cultivation system. Prolonged cropping however will lead to soil exhaustion unless considerable amounts of fertilisers, particularly phosphate and potash are used.

Shifting cultivation has its advantages and disadvantages. The main advantage of the system, in a situation of plentiful land as on most of Choiseul, is that when crop yields begin to fall either because of declining fertility or because of a build-up in crop pests or diseases, the plot can be abandoned and a new site chosen and cleared. The major disadvantage of the system, as it is practised in Choiseul, is its failure to incorporate a any erosion control measures. Consequently, during the critical period of initial crop growth, before vegetative growth can provide adequate ground cover, erosion of the moderately fertile topsoil may expose the nutrient-poor subsoil.

As shifting cultivation on these slopes is likely to continue and may become increasingly important, improved land management and more understanding of the consequences of uncontrolled forest clearance will be required. With shifting cultivation the construction of permanent terraces to prevent erosion is uneconomic. It is however, feasible to attempt to arrest topsoil erosion by the application of simple methods requiring little effort but involving a greater degree of forward planning by the farmer.

Ideally slopes in excess of 25^{o} should not be used but, accepting that there is often little or no alternative land, the following recommendations are made. During the initial stage of forest clearance simple erosion barriers of cut branches and trash should be placed in swathes across the slope. This would entail little additional work and the traditional subdivision of gardens could be co-ordinated with barrier spacing. The barriers will not prevent large-scale erosion but will arrest downslope movement of topsoil. Strips of forest should be left across hillsides with cultivation confined to the intervening areas. The forest strips could gradually be replaced by bands of economic trees or food forests, although with the present lack of marketing arrangements it is difficult to foresee these food forests as a potential source of income. The overall steepness of slopes renders pasture unsuitable for most of the region.

There is a wide range of potential cash crops, the choice being limited by both physical and socio-economic factors. The cultivation of tree crops would necessitate a change from shifting agriculture to the permanent settlement of the area. Some arable crops, however, can be grown within the present system although on steep slopes it would be unwise to cultivate plots larger than those normally cleared for subsistence crops. Spices, particularly chillies, ginger and turmeric would be suited to this environment especially if tasks such as ground preparation and harvesting can be done on a community basis.

The overall hilly nature of the terrain and the ubiquitous steep slopes (Stereopairs 6.2, 6.4, 6.5) would require complex erosion control measures such as bench terracing if permanent tree crops were to be block-planted or grown in smallholdings.

Where terracing is required to utilise steeplands in a non-intensive farming system it has been shown by Sheng (1972) that, initially, hand-terracing and manual cultivation would be used, as the farmers labour may contribute up to 90% of the expense. Hand-built terraces can be constructed on slopes up to 30° while machines would be restricted to 7-20° slopes. Terraces provide a practical solution to the problems of shifting cultivation and Sheng has shown that farm production can be increased by an average of 10-30%. The easier application of fertilisers and the retention of topsoil on terraces would, in combination, increase the soil fertility of many areas. Incentive schemes would be needed, however, to encourage farmers to terrace and on-the-spot supervision would be essential.

These measures need not be immediately undertaken in all steepland areas of Choiseul, indeed the scattered nature of the population and the present availability of gentle or level alluvial land may preclude the use of terraces for some time. Also, the present system of scattered shifting cultivation is not greatly detrimental to the land and it could incorporate a limited range of minor cash crops using existing farming techniques. It is stressed, however, that any permanent or widespread utilisation of these areas must incorporate erosion control methods.

Walker (1948) investigated forested areas in southern Choiseul and concluded that the area of productive forest was limited. Much of this forest was severely damaged by a cyclone in 1967 and is therefore, unlikely to provide a source of timber for some time.

GHAUSAVA LAND REGION

This land region covering 127 km^2 occurs in south-east Choiseul and on Rob Roy Island. The region is clearly distinguished by its *Casuarina papuana*-dominated forest which is only found on soils derived from ultramafic rocks. The landscape consists of stable, rounded hills and ridges with moderate or gentle slopes separated by steep-sided, narrow valleys.

Despite large areas of favourable topography (Plate 2) the region is unsuitable for agriculture because of adverse soil fertility. The soils contain unusually high levels (in excess of 1%), of heavy metals particularly chromium and nickel, which may be toxic to many plants.

The soils have very low levels of available potassium, phosphorus and calcium and this may account for the specialised vegetation growth. There may be a connection between low levels of major nutrients and nickel toxicity (Crooke and Inkson, 1955), although on similar soils Spence and Millar (1963) and Proctor (1971) found no nickel toxicity, only deficiency symptoms particularly of phosphorus. However, the soil studied by Proctor did not have nickel or chromium levels as high as those sampled from Choiseul. Suggestions that magnesium levels greater than calcium levels may result in nutritional imbalances can probably be discounted as this phenomena occurs in other soils and does not result in a specialised vegetation.

These soils, in keeping with other ultramafic areas in the Solomons, are not used for shifting cultivation. Exploitation of the existing forest in this region would be limited to *Casuarina papuana* and possibly *Dacrydium xanthandrum.*

PARU LAND REGION

This land region is developed over young volcanic rocks mainly of pyroclastic or basaltic composition. The landforms range from high and steep-sided crater rims to gently sloping lava flows and debris slopes. The soils are predominantly brownish

loams and clays and more rarely reddish yellow to red clay. The land region covers an area of 399 km^2 and is found in central and eastern Choiseul and on the larger islands of the Shortlands Group.

To aid the presentation of recommendations the region is divided into three groups.

Areas of low agricultural potential

This group includes five land systems, namely Aroaro, Esperance, Falamae, Ibatasi and Kavakava. The major limitation to agricultural development is the steepness of slopes. Associated with this there is the likelihood of instability, rock outcrops and shallow soils. These land systems cover 58% of the Paru Land Region and over 80% of each land system contains slopes of over 25°. The remainder comprises less steep slopes, ridge crests and valley bottoms.

The land is used for subsistence cultivation on Fauro, Mono and parts of northern Choiseul but in most areas gardens are not widespread. The soils are well drained, moderately deep to shallow, stony loams and clays, many consisting of little more than stony colluvium washed downslope. Instability prevents the development of soils although some red clays on the Kavakava Land System appear to be considerably more weathered than those on the other land systems.

The agricultural potential of these land systems is low and the recommendations made for the Kaipito Land Region should also be applied to this area. Briefly, where shifting cultivation is to continue, the emphasis must be on simple methods of erosion control; with essentially transient land use, measures need not be permanent. Strip cropping and trash barriers will help to arrest surface soil movement.

Areas of low to moderate agricultural potential

The Panggoe and Hisiai Land Systems occur on Choiseul and the Shortland Islands respectively. Both land systems are formed of ridges and hills, with moderately steep to steep slopes. (Stereopair 6.6). Soils are mainly dark brown to reddish brown clays. The agricultural potential of these systems is enhanced by the rounded ridge tops which have moderate to moderately steep slopes and stable soils. The two land systems total 141 km^2 and, by facet analysis, it is estimated that 40-45% of this area comprises crests and upper slope sites. Valley sides and steeper slopes would be subject to the development limitations applied to slopes in the previous section and attempts to utilise them must be rigorously controlled.

A wide range of crops could be grown on the crestal sites but most of these areas are widely scattered and do not form large, coherent blocks. Consequently, large-scale agriculture would be at a disadvantage and it is suggested that small-scale, cash crop farming would be the most practicable way to develop this land. It is suggested that tree crops should predominate but there are small areas suitable for arable cultivation, possibly in conjunction with pastures and cattle.

The soils of stable sites are mostly well developed Haplorthox and base-poor Humitropepts; they will require fertiliser if permanent crops are to be established. The soils of the Hisiai Land System, although classified as Haplorthox, may have received additions of volcanic ash from nearby Bougainville: although there is no marked increase in available nutrient levels in the upper soil horizons,the reserve nutrient levels may be higher than would be expected in such highly weathered soils.

Areas of moderately high agricultural potential

The Aruliho and Malanjili Land Systems form this group and have a topography similar to their counterparts on Guadalcanal (Volume 2). They have a combined area of 25 km^2 and their major limitations are low soil fertility and moderately steep slopes (Stereopair 6.8). The dominant soils (Haplorthox and Humitropepts) are strongly weathered and leached with low available and reserve nutrients in the subsoil. Virtually all the nutrients available to plants are contained in the humic topsoil. The preservation of

this topsoil, therefore, is crucial in the almost closed nutrient cycle. While generally less weathered than equivalent soils in the New Georgia Group, comments on the problems of utilising these soils set out in Volume 4 are applicable here. Their main drawback is likely to be a high phosphate retention ability (Hasan *et al.*, 1970). The fertiliser requirements of these soils will have to be investigated as there is no data on yields or on crop response to fertiliser.

Erosion on the gentle slopes is not severe and there has been no gully development. Steeper slopes, however, particularly at lower slope sites, will be subject to erosion and consequently will require more careful management if they are to be used successfully. Erosion control methods similar to those outlined for the Kaipito Land Region should be applied to the more steeply sloping areas of the two land systems. It is probable that development of the broad ridges and flow surfaces would also involve some erosion control methods as slopes range from 2-14^{o} and rapidly increase towards the valley sides. Gently sloping areas tend to be of limited extent as they grade laterally into steeper valley sides. A sample area studied in detail on similar terrain on Guadalcanal (Volume 2, Sample Area GE) had ridge widths of 180-420 m. The extent of crestal areas on the Malanjili Land System is much less, with fewer gently sloping areas and a larger proportion of moderate to moderately steep slopes that will require physical soil conservation measures if they are to be developed on a permanent basis.

Parts of the Aruliho Land System would be suitable for arable cropping and the soils should support a wide range of cash crops. Soils would be suitable for coconuts and, with the use of fertiliser, mixed coconuts and cocoa or multiple cropping schemes using annual spice or root crops intercropped with coconuts. Cattle under coconuts is another alternative to a single crop plantation and on these soils, even with poor pasture management, the risk of soil erosion would be less than on valley sides.

MANAWAI LAND REGION

Limestone is the dominant rock type in this land region and the landforms are karstic or karst-like (Stereopair 6.5). Soils range from deep, red clays to very shallow, dark-coloured clays; most areas are characterised by surface stones and rock outcrops. The area of 449 km^2 can be broadly divided into two groups, one comprising the Andi Land System and the other the Henefau, Huranja and Mbaeroko Land Systems. The main limitations to agriculture, namely steep slopes, soil stoniness and rockiness, are more prevalent in the latter group.

The Mbaeroko Land System is particularly rocky with the shallow soil largely restricted to small pockets on gentle slopes. The rockiness combined with steep slopes and strongly calcareous soils gives this land system a very limited potential even for subsistence gardens. If the difficulties in establishing coconuts in these soils can be overcome they can often survive adequately in these adverse conditions, but with inferior yields, as somewhat similar soils support coconuts in drier parts of the Lomousa Land System. The Henefau and Huranja Land Systems are in many respects similar to the Mbaeroko Land System but have the advantage of deeper soils on hill-slopes and in valley bottoms. In places, they are used for subsistence agriculture but the small size and scattered nature of the deeper soils precludes widespread development. Coconuts would be one of the few successful cash crops under these soil conditions given appropriate fertiliser.

The Andi Land System is less stony and rocky than the previously described land systems and in some places is relatively undissected (Stereopair 6.3). Subsistence cultivation is consequently more widespread and is usually concentrated on the better land.

Most soils are calcium-dominated with particularly high levels both in the topsoil and in the subsoil directly above the parent material. Available and total potassium is low although slightly higher levels are found in the organic topsoil. Phosphorus is also higher in the topsoil but may fall to medium or low levels in the subsoil. this is unexpected as many soils developed over limestone have high levels of phosphorus. It is interesting to note that the soil sampled from the Huranja Land System and two

samples from the Henefau Land System showed total phosphorus levels in excess of 1 500 ppm in the subsoil, probably reflecting a different mode of limestone deposition from the other land systems. Magnesium in both exchangeable and total form varies between medium and low. Topsoil nitrogen levels are low to medium, falling rapidly, below the top 15 cm, to less than 0.1%.

Large-scale plantation agriculture would be impracticable throughout the region due to the broken nature of the terrain (Plate 1) and the considerable variation in soil depth and stoniness. Local smallholder or community development is possible although problems of soil depth would tend to rule out arable cultivation. Tree crops, particularly coconuts, would be suitable on a small scale particularly if combined with cattle rearing. Difficulties may arise, however, in providing adequate water supplies for cattle as subsurface drainage predominates in this limestone terrain. Large-scale erosion control methods would not be practicable because of the difficulties in constructing soil benches and such development would have to be confined to footslopes and areas of soil deposition.

The Henefau Land System has been logged on Alu Island but there has been no replanting. Attempts at replanting would encounter the difficulties facing any plantation crop on this land system, namely shallow soil causing uneven tree growth.

KWAINANGALI LAND REGION

The land region covers 292 km^2 and consists of dissected, commonly rounded hills and ridges largely derived from limestone and calcareous marl but locally containing considerable amounts of non-calcareous sandstones, grits and mudstones. The soils are predominantly clays and loams varying in colour from dark brown to yellowish red and red.

The least dissected land system in this land region is the Sui Land System which is largely confined to north-western Choiseul (Stereopair 6.3). The Fata'olo Land System occurs throughout the island whilst the Mono Land System is restricted to Mono Island.

Although the three land systems have a broadly similar topography they have a range of parent materials. Consequently soils and soil fertility are varied throughout the region. Levels of total potassium are generally very low but levels of other major nutrients vary considerably. While total phosphorus levels are medium to high in all the soils sampled from the Sui and Mono Land Systems it ranges from medium to low in the Fata'olo land system. The lowest values appear to be associated with the non-calcareous sandstones and grits largely derived from basalts with little marine influence. These basalt-derived soils show very high magnesium levels similar to those from soils overlying basic rocks. Magnesium levels from soil with a calcareous parent material vary from very low to medium in total and available forms.

The most widespread soils in the Fata'olo Land System are the strongly leached and weathered red and yellowish red clays (Haplorthox and Tropohumults). They have very low levels of available potassium and sodium, while in many, magnesium and even calcium may also be low. Their pH ranges between 4.8 and 5.4.

The dark brown and reddish brown clays which are less widespread in the Fata'olo Land System are similar to the dominant soils of the Sui and Mono Land Systems. These soils have low levels of potassium but higher levels of magnesium and particularly calcium. The subsoil pH does not fall below 5 and is generally between 6 and 7 increasing in the lower subsoil in the presence of fragments of calcareous parent material.

The major limitation to large-scale development in the Fata'olo Land System is its moderate to moderately steep upper and middle slopes. Although the crestal areas and some middle slopes could be used without erosion control, any widespread development would require the soil conservation measures described above.

On Mono streams have incised into the softer limestone of level to gently sloping terrace surfaces. The cliffed sections subdivide the terraces into small separate blocks. Rock outcrops are common, especially in the gorge-like valleys whilst on the terrace surfaces soil depth ranges from shallow to moderately deep.

The Sui Land System is the least dissected of the three land systems with gentle slopes prevailing and with few moderately steep slopes (Stereopair 6.3). The major limitations to agricultural development are shallow soils, rock outcrops and small sinkholes which would prevent large-scale arable cultivation. There are, however, limited areas which could be mechanically cultivated but these require careful selection. Tree crops particularly coconuts and cocoa would be suitable for these soils but the presence of rock outcrops would necessitate flexible planting distances and crop growth might vary throughout the area owing to differences in soil depth.

Pastures for cattle could be established readily either under coconuts or separately. If well managed grassland could provide a stable root mat that would stabilise the soils and help reduce soil creep in moderately sloping areas. A sample area at Chirovanga (Appendix 4, Sample Area CC) shows soil and slope relationships in an area of northern Choiseul. Water supplies may be difficult locally.

In Volume 5 several spice crops are recommended because of the remoteness of parts of this land region. The lightness of product and relative ease in transport make spices equally suitable for Choiseul where many areas of the Fata'olo Land System are distant from the coast. Neither the Mono nor the Sui Land Systems are remote, however, and the transport of produce would not be difficult; all parts of Mono Island are close to the sea and the Sui Land System could be linked by feeder roads to well sheltered harbours such as Choiseul Bay.

MBETILONGA LAND REGION

This land region includes low to high hills and ridges with an altitude ranging from sea level to 400 m. The soils include highly leached and weathered red clays, slightly leached brown loams and clays of unstable slopes and soils that have received additions of recent volcanic ash. The region covers approximately 660 km^2 mainly in north-western Choiseul and extending into central Choiseul. This land region includes the Balo Land System on Alu Island in the Shortlands although it differs in several important respects from the other component land systems. The Mbetilonga Land Region has been described in Volumes 2, 4 and 7 and suggestions on their agricultural potential are also relevant to Choiseul.

Owing to the variation in landforms within this land region it has been divided and is described in two parts.

Tirua, Sakatokana, Sepa and Rirama Land Systems

These land systems have low to moderately high hills and ridges with moderately steep to steep slopes. With the exception of some coastal areas of the Rirama and parts of the Sepa Land System their potential is generally similar to that of the Kaichui Land Region and is limited by steep slopes associated with narrow ridges and incised valleys. On broader ridges and gentler slopes there may be scope for agriculture but their limited size and scattered nature would severely restrict the choice of cropping systems. If there was a future need to develop these areas the points set out in the Kaichui Land Region would be applicable here.

In north-western Choiseul and particularly inland from Nananggo Harbour the Rirama Land System is much less dissected than in the southern part of the Island. Behind Nananggo Harbour it forms a lightly dissected cuesta or plateau area probably comprising a thin veneer of volcanic-derived sediments over volcanic rocks. North of Choiseul Bay it is closely related to and in parts is probably a more dissected variant of the Fata'olo Land System. The Sepa Land System forms extensive hilly plateaux (Stereopair 6.4). These areas have a higher potential than elsewhere in the land region, but the

more dissected steep slopes will be limiting. This land should be used with care and the more gently sloping areas should be developed as an extension of the Fata'olo areas near Nananggo and with the Alokan, Sui and Fata'olo Land Systems north of Choiseul Bay. Little is known of Sepa Land System rocks or soils but if it can be shown that the land is utilisable there are potentially large areas of central Choiseul that can be developed.

No soils were sampled from the Rirama Land System but several profiles were described from the similar Sakatokana Land System. The analyses show low to very low levels of total and available potassium and phosphorus and medium to low levels of magnesium. Soils are normally acid with a pH of 4.4 to 5.4 although over thin calcareous bands the pH rises to 6.0. To achieve satisfactory yields from these soils additions of fertilisers would be necessary.

Balo Land System

This land system only occurs on Alu Island in the Shortlands where it consists of low, rounded hills with an available relief of less than 30 m. The hills are interspersed with small swamps or very gently sloping to almost flat alluvial land. Hillslopes are mostly moderate, although moderately steep slopes occur locally. On the gentle slopes deep and moderately deep, strong brown, yellowish red or red mottled clays have developed. At least one of the two profiles examined appears to have received additions of volcanic ash probably from the active or recently extinct volcanoes on nearby Bougainville. Chemically the soils are low in available and total potassium but have medium levels of total phosphorus, increasing to high in the organic topsoil. Available phosphorus appears to be adequate only in the less weathered brown soils but research on volcanic soils in other parts of the tropics, (Fox, 1969) has shown that these soils may have the ability to immobilise phosphate. A series of trials to determine crop response to fertiliser applications would be advisable therefore before making decisions on large-scale development. Imperfectly and poorly drained soils are common on the level areas. Some have an organic surface horizon but others only show signs of poor drainage below 50 cm, being lightly mottled above this depth. These areas are not extensive and most could be readily drained by small surface drains leading into the lightly incised rivers. They are likely to be less limiting to development than the adjacent steeper hill-slopes.

This land system is not currently used for shifting cultivation. Expansion of shifting cultivation should be confined to the surrounding land systems, leaving the Balo area for large-scale or block development. Crops suitable for the development of this land system include coconuts, underplanted with pasture or with cocoa, or cocoa planted separately. On neighbouring Bougainville cash cropping is undergoing considerable expansion and rubber has been planted in the Buin area (McAlpine, 1967). The success of test crops on ash-covered soils should give an indication of which new crops could be tried in this area.

Logging has taken place on the adjacent Henefau Land System although the Balo Land System has a more favourable terrain for forest exploitation. There is a good case for the extension of logging activities into this land system, followed by either replanting or agricultural development.

ROKERA LAND REGION

The two component land systems are raised reefs and atolls, now forming terraces. They cover extensive areas in western Choiseul, around Choiseul Bay and on Vaghena Island and also occur on Alu and Mono Islands (Stereopair 6.2) in the Shortlands. They cover 44 km^2 on Choiseul and Vaghena and 52 km^2 on the Shortland Islands. The soils are predominantly dark brown, strong brown or yellowish brown, moderately deep clays with occasional coral outcrops or patches of shallow soil.

Slopes are almost flat to gentle but may increase to moderate particularly in the Shortlands where they merge into the Henefau Land System. The terrace margins also

contain a continuous band of up to 30° slopes but only occupies 10-15% of the total area.

Soil depth is related to slope with shallow and moderately shallow soils normally associated with the steeper slopes. Away from the terrace margins few shallow soils were noted in either the Kohinggo or Alokan Land Systems on Choiseul but they occurred more frequently on Alu Island.

The Kohinggo Land System on Vaghena Island contains much deeper soils and fewer coral outcrops than in the type area of Kohinggo Island (New Georgia, Volume 4). This may be due to a change in parent material from predominantly reef limestone to a lagoonal facies containing calcareous mudstones and marls with few reef structures.

The soils of the flat to gently undulating surfaces of the Alokan Land System are mostly well drained although small areas of imperfectly and poorly drained soils were noted on Alu Island. The Kohinggo Land System on Vaghena Island contains swampy depressions (Stereopair 6.7) and areas of imperfectly drained, mottled soils on the terrace surface.

Weathering of the terrace soils of the Alokan Land System does not appear to have progressed as far as on similar landscapes in the New Georgia Group. This could be due to more recent uplift in northern Choiseul and the Shortlands resulting in a shorter period of time for weathering to proceed. Alternatively or additionally these terraces may have received substantial additions of volcanic ash from the volcanoes on Bougainville. As ash-covered soils occur in the Balo Land System it is not unreasonable to assume that they also occur on the adjacent terrace surfaces although ash was not identified in the single soil sampled from this area. The soils, with brown and strong brown colours and higher levels of reserve and available nutrients, resemble the soils of the Alokan Land System on the Russell Islands which are presumed to be similarly influenced by ash falls from Savo volcano.

The soils of the Kohinggo Land System on Vaghena are chemically similar to soils in the type area of Kohinggo Island. Soils are bauxitic with up to 47% Al_2O_3 and contain very high levels of total (up to 1%) and available phosphorus. There is no sign of phosphorus accumulation in the organic-rich topsoil, probably because the levels of inorganic phosphorus are so high throughout the soil. On the Alokan Land System total phosphorus levels are still high although less than a quarter of the figure for soils on the Kohinggo Land System, but available phosphorus levels are medium to low with a concentration in the organic topsoil. Continuous cultivation of these soils may well result in a phosphorus deficiency. On the more highly weathered and acid soils, the application of phosphorus fertiliser might lead to phosphate fixation due to the formation of insoluble aluminium compounds, thus lessening the amount that plant roots can absorb.

On soils from both the Alokan and Kohinggo Land Systems total and exchangeable potassium levels are very low and consequently, any development will require the addition of potash fertilisers. Agronomic trials in the Russell Islands on the Alokan Land System have shown that low soil potash is responsible for small nut size and low yields from coconuts and Foale (1967) has confirmed the overriding importance of added potash to young palms. Experiments on the nutrition of cocoa under coconuts in the Russell Islands showed that nitrogen, phosphorus and potash had beneficial effects (Green, 1957).

If bauxite mining on Vaghena proceeds, much of the Kohinggo Land System will be strip-mined and rehabilitation and utilisation problems will be similar to those facing Rennell Island (Outer Islands, Volume 8). It is probable that removal of bauxite from Vaghena will involve excavating below the watertable in places so that reclamation will be faced with building up the soil level.

North of Choiseul Bay, new coconut plantings are being established on the Alokan Land System. This crop is highly suitable as similar soils without fertilisers on the Russell Islands produce over 2 610 kg/ha of copra (Foale, 1967). Output could be increased by

multiple cropping using either tree crops such as cocoa or intercropping with annuals. Nelliat *et al.* (1974) have shown that 77% of available land under a pure coconut stand is not effectively utilised by coconut roots and they suggest various combinations of crops such as pepper and cocoa or cinnamon and pineapple with coconuts. Multiple cropping, involving greater depletion of soil nutrients, would make fertiliser applications a necessity if high yields are to be obtained. Alternatively, pastures for beef cattle could be established under the coconuts and the use of legumes in the pasture and the beneficial effect of animal manures might offset the need for heavy fertilisers, although additional potash would probably still be required.

FIU LAND REGION

The potential of this land region is varied, reflecting the wide range of environments it incorporates. They range from both freshwater and saline swamps to sandy beaches and flat alluvial areas.

Many areas are cultivated for subsistence and cash crops yet there remain unused areas of alluvium. The total area of 476 km^2 is discussed under groups of land systems below, each with broadly similar potential.

Kumotu and Pusuraghi Land Systems

These land systems are considered to have a low agricultural value although each could be utilised to some degree if reclaimed. The Pusuraghi Land System consists of freshwater swamps with a watertable at or close to the surface. Organic soils with deep peat deposits are not common and most soils are very poorly drained, greyish or pale clays and loams.

There is no analytical data for the soils but comparison with similar soils on New Georgia and Santa Isabel and well drained alluvial soils from Choiseul indicate an adequate nutrient status. Swamps adjacent to, or deriving their sediments from ultramafic areas, will be low in available nutrients and may also have high levels of nickel and chromium.

Most swamps are at or close to sea level (Stereopairs 6.1, 6.7) and reclamation would require extensive drainage works. Many are small and occur in isolation or as linear features in small valleys. There are some areas where swamps, by themselves or associated with low-lying alluvium, cover up to 1 000 ha, as at the mouths of the Vurulata and Kakaza Rivers, the Kolombangara River, the Kamangga River, along the valley of the Ndoroko River and on Alu Island. There is no immediate pressure to develop this land and proposals to do so would entail detailed soil and engineering studies probably related to the catchment area of each of the rivers involved.

The Kumotu Land System is covered by mangrove forest and is unused for agriculture. The soils are inundated by tides and consequently are both saline and poorly drained. They occur mainly as narrow coastal features and are only widespread north of Rob Roy Island and on Choiseul Bay, often in association with the Pusuraghi Land System. Both deep peats and sandy soils occur and analysis of the former (Choiseul 1, Appendix 1) has shown that they become extremely acid on drying. Elsewhere in the world areas of mangrove swamp have been reclaimed and used for rice cultivation and tree crops. However, it is likely that these deep, organic-rich soils on Choiseul will become very acid on drying and that non-acid soils would suffer disadvantages such as stoniness or be shallow and calcareous. Because of the importance of mangrove forest in beach protection and in providing an environment for inshore fish and mollusc breeding it is recommended that these areas be left under natural forest.

Lomousa and Tenaru Land Systems

These coastal land systems are formed of sand-size or coarser materials. On beach ridges or areas above the local watertable the soils are excessively drained and rapidly dry out, while in swales and low-lying areas merging into the Kumotu or Pusuraghi Land Systems

the soils may be poorly drained or flooded by saline water during high tides. In the higher, drier areas particularly of the Lomousa Land System soil depth and excessive rockiness are limiting to agricultural development and even where topsoil exists overall fertility is low.

Their chemical status is unusual as the soil is largely composed of comminuted coral with humic material forming a few centimetres of dark-coloured topsoil. There are few nutrients below the topsoil and maintenance of topsoil fertility is the key to successful productivity. The high levels of calcium in the soil will adversely affect non-tolerant crops and may result in lime-induced chlorosis and depression of growth. This would apply particularly to citrus and pineapples although yields of groundnuts would also be reduced. Coconuts, however, grow well on these soils and the productivity of these areas can be increased by underplanting with legumes or by establishing pastures for cattle.

Manggo Land System

Although this land system is not extensive, it is widespread throughout Choiseul and plays an important role in the agriculture of the island. It has a very varied water regime and parts are subject to both flooding and poor drainage. Land flooded by rivers after heavy rain is restricted to narrow floodplains although occasional extensive flooding during cyclonic periods may cover up to an estimated 20% of the land system. A high watertable associated with the low-lying alluvial plains is the most widespread problem. The alluvial areas often occur close to and merge into freshwater swamps so that their boundaries are only discernible by detailed ground observation. Watertable heights vary considerably throughout the year. This land is rarely cultivated and is usually covered by tall forest with species such as *Terminalia brassii* occurring in the wetter areas.

Individually most areas are too small to reclaim. However, in association with other swamp soils, there are large tracts of land which may warrant further investigation for paddy rice.

The terraces are usually above flood levels and this elevation results in well drained to imperfectly drained soils. These areas are presently being used for subsistence agriculture along the Kamangga, Vanga and Masilata Rivers.

Soil fertility is unusually high for the Solomon Islands and levels of available potassium locally reach 1.0 meq% in the subsoil. However, care should be taken to avoid alluvium derived from ultramafic areas of the Mbina Land System as there is likely to be high chromium and nickel contents and a generally low fertility.

These soils would be suitable for a wide range of tree and arable crops and initially fertiliser might not be needed; to maintain a high level of production, however, additions of fertilisers would be needed, particularly phosphorus.

Part 5

Agricultural opportunity areas

INTRODUCTION

The concept of the Agricultural Opportunity Area (AOA) is discussed fully in Volume 1. Briefly, it can be defined as a largely unused or under-utilised area exceeding approximately 2 500 ha in which the prospects for cash crop farming are good. It does not signify that they are suitable only for agriculture and, for example, forestry could be an equally feasible occupation in all the opportunity areas. In Choiseul and the Shortland Islands seven AOAs covering 228 km^2 (88 mi^2) are shown on Separate Map 6g whose size and characteristics are tabulated in the following pages. It is stressed firstly that these AOAs represent only the largest blocks of land with outstanding potential and the coloured areas within the boundaries indicate the individual land systems. Secondly, there remain many other smaller parcels of land with equally good inherent potential outside the AOAs, many of which coincide with specific land systems and are coloured on Separate Map 6g. Thirdly, there are in addition small (<20 ha) uncoloured pockets of land with good to moderate potential in some of the remaining land systems which individual farmers can utilise for cash crops. Conversely, there are land facets and land systems in the AOAs which are of only moderate or even poor potential, but these amount to a low proportion of their total area.

The AOAs are selected primarily on the basis of their undissected topography since it is presumed that steep lands cannot be developed easily and economically over large areas. Soils are also important, and clearly it is preferable to have fertile soils to those requiring large inputs of possibly expensive fertiliser. Saline, shallow and swampy soils are excluded as far as possible. The AOAs, therefore, consist of rolling, level or low hilly areas with moderately deep, well drained soils of varied fertility. Areas already used extensively for shifting cultivation or cash crops are excluded (Table 14).

In the following descriptions the tabulated area data for each AOA shows a grouping of land facets within each land system rated according to their suitability for agricultural development.

High suitability: land with few physical limitations to development having either slopes that do not require complex soil conservation measures or soils with few drainage and no salinity problems.

Medium suitability: land having some limitations to development, particularly drainage, salinity and flooding problems or steep slopes requiring some measure of erosion control.

Low suitability: land that, because of the major limitations of slope steepness, drainage, salinity, flooding or soil toxicity problems, is unsuitable for development.

In northern Choiseul there is a considerable area of land 93 km^2) that could be combined into one large AOA. However, the large number of land systems contained within the area and the inclusion of blocks of steeper marginal land, has necessitated its subdivision into three discrete areas.

TABLE 14 Agricultural opportunity areas: a summary of land use data*

Agricultural Opportunity Area†		Total area	Subsistence crops and young regrowth	Coconuts	Towns, villages and airstrips	Total used area
	%		9	4	<1	13
Poroporo	ha	2 350	200	100	5	305
1968	ac	5 810	495	245	15	755
	%		2			2
Pemba	ha	4 030	80			80
1962	ac	9 960	200			200
	%		6	1	<1	7
Pachö	ha	2 880	184	25	2	211
1962	ac	7 120	455	65	5	524
	%		16	1	<1	17
Ghaghara	ha	2 815	450	25	5	480
1962	ac	6 955	1 115	65	10	1 190
	%		4	1	<1	5
Vaghena	ha	3 230	120	25	5	150
1968	ac	7 980	290	60	10	360
	%					
Balo	ha	2 800				
1968	ac	6 920				
	%		1	<1		1
Mono	ha	4 800	45	10		55
1962	ac	11 850	115	20		135

* All conversions from acres have been adjusted to the nearest 5 or 10 ha
† With date of photography

POROPORO (24 km^2, 9 mi^2)

TABLE 15 Area of component land systems of Poroporo AOA

Land system: % of AOA and area	Land facets: % of AOA and area		
	High suitability	Medium suitability	Low suitability
27. Alokan 96% 2 270 ha, 5 610 ac	Facet 1 74% 1 750 ha, 4 325 ac	–	Facets 2 and 3 22% 520 ha, 1 285 ac
30. Lomousa 4% 80 ha, 200 ac	–	Facet 2 3% 60 ha, 150 ac	Facets 1 and 3 1% 20 ha, 50 ac
Suitability totals	74% 1 750 ha, 4 325 ac	3% 60 ha, 150 ac	23% 540 ha, 1 335 ac

The AOA is dominated by the Alokan Land System which, in this area, comprises an extensive terrace with low cliffs on its coastal margin. Small areas of the Lomousa Land System fringe the coast. The inland margin is marked by steeper hills of the Rirama Land System or the long sinuous limestone ridges of the Mbaeroko Land System. The southern edge of the AOA consists of low-lying swampy areas, and some of these penetrate the AOA giving rise to swampy depressions.

The soils on the widespread terrace surface are mostly well drained, brown to dark brown clays and loams overlying limestone at varied depths. They are mainly moderately deep to deep although there may be shallow patches and rock outcrops are common at the cliffed terrace margins. With their dark colours, high base saturation and low levels of available and total potash these soils resemble those of the Alokan Land System in the Russell Islands. The major soil limitations in the AOA will be shallowness and rockiness, particularly on the Lomousa Land System. Additions of potassium will be required for continuous crop production and phosphorus may eventually be needed as the available reserves are depleted. The terrace surfaces have a high potential for a wide variety of agricultural practices and crops. The results of research programmes on the Russell Islands will be applicable, with the added advantage of not having to introduce new cultural practices to an existing system as the AOA is still relatively undeveloped. Various tree crops would grow successfully on these soils and the terrace surface with well drained soils would be suitable for pasture development, either separately or in combination with tree crops. Arable cultivation would be feasible although care would have to be taken to avoid shallow patches of soil.

The coastal margin of the AOA is used for agriculture and for coconuts (Separate Map 6f); in 1968 subsistence gardens and low regrowth covered 200 ha and coconuts covered 100 ha. Since that date the area planted with coconuts has been increased considerably. The population of the area in 1970 was approximately 250, giving a density of 10 persons/km^2. There are no roads within the area but Taro Island in Choiseul Bay to the south has an airstrip suitable for light aircraft and the bay itself provides a safe anchorage for small ships. A road servicing this area could be built easily to run inland, parallel to the coast from Pemba Inlet in the north to Poroporo Village in the south. Unfortunately Choiseul Bay is very shallow at its northern end. To reach deeper water the road would have to be extended through the mangrove and freshwater swamps on the eastern side of the bay or be connected by a causeway across the narrow, shallow channel to Kondakanimboko. There is ample limestone throughout the AOA, suitable for road surfacing.

Further survey work is not considered necessary in this AOA.

PEMBA (40 km^2, 15.5 mi^2)

TABLE 16 Area of component land systems of Pemba AOA

Land system: % of AOA and area	Land facets: % of AOA and area		
	High suitability	Medium suitability	Low suitability
21. Sui 44% 1 780 ha, 4 400 ac	Facet 1 37% 1 515 ha, 3 745 ac	–	Facet 2 7% 265 ha, 655 ac
19. Fata'olo 32% 1 270 ha, 3 140 ac	Facets 1 and 2 22% 890 ha, 2 200 ac	Facet 3 4% 150 ha, 370 ac	Facets 4 and 5 6% 230 ha, 570 ac
15. Andi 19% 770 ha, 1 900 ac	–	Facets 3 and 5 12% 490 ha, 1 210 ac	Facets 1,2,4 and 6 7% 280 ha, 690 ac
31. Manggo 1% 30 ha, 75 ac	Facet 1 0.5% 20 ha, 50 ac	–	Facets 2,3 and 4 <0.5% 10 ha, 25 ac
32. Pusuraghi 3% 130 ha, 320 ac	–	–	All facets 3% 130 ha, 320 ac
23. Rirama and 33. Tenaru 1% 50 ha, 125 ac	–	–	All facets 1% 50 ha, 125 ac
Suitability totals	59.5% 2 425 ha, 5 995 ac	16% 640 ha, 1 580 ac	24.5% 965 ha, 2 385 ac

This is an irregularly shaped AOA with a central core and several narrow appendages. Two of the appendages link it with the Poroporo AOA in the north and west and it abuts onto the Pachö AOA in the east. The AOA contains a wide range of land types but it is not dominated by a major land system and there are no large areas of a single land system.

The Sui Land System is the unifying feature of the AOA with low relief and level or gently sloping land broken by steep or moderately steep limestone hills and mounds, 10-30 m high. It forms narrow, linear corridors of partly alluvial land between the higher, more dissected, rounded hills and ridges of the Andi Land System, dominated by moderately steep to steep slopes. Within the AOA there are three discrete blocks of the Fata'olo Land System; the lightly rolling ridges and hills have a wide slope range but are generally less dissected than the Andi Land System. The remainder of the AOA comprises alluvium, swamps and a small area of low hills in the Rirama Land System.

The parent material of the AOA is predominantly calcareous and ranges from limestones through soft marls to sandstones. Although subsoil pH generally reflects the calcareous nature of the parent material, the range in parent materials produces a varied soil fertility. Levels of potassium are uniformly low and initially, applications of potassium will be required to obtain optimum yields from all crops. Phosphorus levels are medium to high in the Sui Land System and medium to low in the Fata'olo and Andi Land Systems; some soils will require additions of phosphorus and possibly magnesium if they are to be heavily cropped. The soils are well drained with the exception of small imperfectly drained areas of the Sui Land System, and range from deep to moderately shallow. Rock outcrops are not widespread but locally steep slopes will limit development.

The broken nature of the terrain will probably exclude the development of enterprises that require large blocks with regular spacing and numerous access roads. It is, however, an area suited to small-scale block development of tree crops or pasture and possibly limited areas could be cultivated for arable crops. If small-scale development is successful, expansion to adjacent land systems outside the AOA would be practicable by selecting those areas with suitable slope and soil factors. This could, in effect, expand the boundaries of the AOA to include large parts of the Andi Land System to the north-east and selected areas in the Rirama Land System to the north-west which separate the Pemba and Pororporo AOAs.

The area is currently uninhabited and unused, although there is evidence of cultivation in the past. Development would be closely tied to road construction in the two nearby AOAs as its only direct access to the coast is at Pemba Inlet. There are no roads in the AOA and the central core is separated from Choiseul Bay by steep land and swamps. Access roads would probably have to link up with roads constructed in the other AOAs unless a direct road was built inland from Choiseul Bay across 4 km of swamp.

Further survey work is needed to identify the extent of the rock outcrops and to delimit the more steeply sloping land.

PACHÖ (29 km^2, 11 mi^2)

This AOA is elongated in a north-west to south-east direction with a marked narrowing inland behind Chirovanga. The greater part is dominated by the Sui and Fata'olo Land Systems (Stereopair 6.3) except for the extreme east where the Manggo and Pusuraghi Land Systems associated with the alluvium of the Pachö River predominate. The soils of the Sui and Fata'olo Land Systems have been described in the Pemba AOA where their depth, rock outcrops and steep slopes are the major limiting factors. The Pusuraghi Land System which has developed in low-lying basins between the hills and low river levees, has a high watertable throughout the year. Low terraces of the Manggo Land System are above flood level and have soils of moderately high fertility. Near the river mouth and on the flood plain they may be subject to periodic flooding.

The Pachö AOA has a higher potential than the Pemba AOA as the Sui Land System dominates the forms a discrete block rather than a number of sinuous areas.

TABLE 17 Area of component land systems of Pachö AOA

Land system: % of AOA and area	Land facets: % of AOA and area		
	High suitability	Medium suitability	Low suitability
21. Sui 49% 1 405 ha, 3 475 ac	Facet 1 42% 1 195 ha, 2 955 ac	–	Facet 2 7% 210 ha, 520 ac
19. Fata'olo 30% 875 ha, 2 165 ac	Facets 1 and 2 21% 610 ha, 1 510 ac	Facet 3 4% 105 ha, 260 ac	Facets 4 and 5 5% 160 ha, 395 ac
15. Andi 3% 75 ha, 185 ac	–	Facets 3 and 5 2% 50 ha, 125 ac	Facets 1,2,4 and 6 1% 25 ha, 60 ac
31. Manggo 17% 480 ha, 1 185 ac	Facet 1 9% 265 ha, 655 ac	Facet 2 5% 145 ha, 360 ac	Facets 3 and 4 3% 70 ha, 170 ac
32. Pusuraghi 1% 45 ha, 110 ac	–	–	All facets 1% 45 ha, 110 ac
Suitability totals	72% 2 070 ha, 5 120 ac	11% 300 ha, 745 ac	17% 510 ha, 1 260 ac

The Sui Land System is suitable for both arable and tree crops. Arable cultivation, however, should only take place in areas where further surveys have established the extent of the rock outcrops and the severity of waterlogging in the poorly drained areas. During the survey of Sample Area CC, Appendix 4, small sinkholes were noticed in parts of this land system; the degree to which these are an impediment to development must be clearly established.

Pastures, either separately or combined with coconuts, would be suitable on the Sui Land System and on parts of the Fata'olo Land System, although on both, an adequate water supply may not always be available because of the tendency to underground drainage. The higher terraces of the Manggo Land System on both sides of the Vachö River will be ideally suited to arable cultivation as they have few soil limitations and a moderately high inherent fertility. Development of the remainder of the valley land would be hazardous, however, as it is subject to occasional flooding. Short duration arable catch crops would probably be most successful here, although the risk of total crop loss would always be present. The Pusuraghi Land System in its present form contributes little towards the productivity of the AOA although it could be utilised more fully for growing traditional wet-land crops such as swamp taro and sago palm.

The Pachö AOA is almost entirely surrounded by the Andi Land System and with careful selection of the more gently sloping areas, there is scope for the expansion of agriculture into this land system, possibly linking up with the less dissected, but isolated inland areas of the Fata'olo Land System.

For a sparsely populated island such as Choiseul the area around Chirovanga is quite heavily settled. In addition to the villages within the AOA, other villages utilise land within the AOA as part of their traditional gardening areas. The number of persons living within the AOA and the population density of 21/km^2 does not, therefore, accurately reflect the intensity of population pressure on the AOA. The population of the area around Chirovanga, and that adjacent to the AOA, was 610 in 1970. This figure includes the large population of Vuranggo which, although situated on the coast outside the AOA, has most of its garden land on the Fata'olo Land System within the AOA. It excludes the populations of Mamarana Village west of the Vachö River and Chivoko where gardens probably do not extend into the AOA (Separate Map 6f).

There has been an attempt, initiated by the mission at Chirovanga, to utilise part of the Sui Land System on a co-operative basis. To provide access into the area a track was bulldozed from the coast, but at the time of fieldwork in 1972 it had fallen into a state of neglect and was becoming overgrown. The offshore reef provides a sheltered

anchorage between Vuranggo and Chivoko but, although there is a jetty at Chirovanga, small ships currently have to anchor offshore. A road from the AOA could follow the Vachó River to the coast but port facilities would have to be improved, including the lengthening of the jetty and possibly the deepening of the channel into the lagoon. The proximity of this anchorage at Chirovanga to the AOA should be useful for the shipment of produce from the immediate hinterland but the transport of produce from the western parts of the AOA could be linked more conveniently with the development of the Pemba AOA. Limestone for road surfacing is probably adequate throughout the area.

Additional soil survey work will be required if it is decided to use parts of the area for arable cultivation. A topographic survey at 1:10 000 scale would provide information on the extent of the steeper slopes.

GHAGHARA (28 km^2, 11 mi^2)

TABLE 18 Area of component land systems of Ghaghara AOA

Land system: % of AOA and area	Land facets: % of AOA and area		
	High suitability	Medium suitability	Low suitability
7. Aruliho 56% 1 585 ha, 3 915 ac	Facets 1 and 2 30% 855 ha, 2 110 ac	Facet 3 21% 605 ha, 1 495 ac	Facet 4 5% 125 ha, 310 ac
31. Manggo 25% 690 ha, 1 705 ac	Facet 1 14% 380 ha, 940 ac	Facet 2 7% 205 ha, 505 ac	Facets 3 and 4 4% 105 ha, 260 ac
11. Ibatasi 1% 25 ha, 60 ac	–	–	All facets 1% 25 ha, 60 ac
33. Tenaru 1% 30 ha, 75 ac	–	All facets 1% 30 ha, 75 ac	–
24. Sakatokana 6% 170 ha, 420 ac	Facet 3 1% 20 ha, 50 ac	Facets 2 and 4 2% 65 ha, 160 ac	Facets 1 and 5 3% 85 ha, 210 ac
29. Kumotu and 32. Pusuraghi 11% 315 ha, 780 ac	–	–	All facets 11% 315 ha, 780 ac
Suitability totals	45% 1 255 ha, 3 100 ac	31% 905 ha, 2 235 ac	24% 655 ha, 1 620 ac

The AOA consists basically of a series of low, volcanic debris slopes dissected into three blocks by alluvial valleys and swamps which coalesce to form a narrow band behind the coastal beaches.

The undissected surfaces of the Aruliho Land System are gently sloping and are not subject to severe erosion but they have a low soil fertility with strongly leached and weathered soils. Adjacent valley side slopes are short and moderately steep to steep and these slopes will be limiting in the development of this land system.

The Manggo Land System is composed of low, alluvial valleys which penetrate into the hills. Rivers are not large and flooding is restricted to narrow floodplains flanked by low terraces. Subsoil drainage may be poor, particularly in depressions on the terraces which may merge into the swampy Pusuraghi Land System in parts of the valley floors. Along the coast there are quite extensive areas of freshwater swamp which grade locally into mangrove swamp near the coast. These swamps have a permanently high watertable and contain poorly drained, pale-coloured clays or organic-rich soils.

The development of this AOA will be by and large the development of the Aruliho Land System as it covers the largest area and is still mostly unused. The alluvium is currently used for subsistence crops, coconuts and to a much smaller extent cocoa, but there is need for a

more rational use of the alluvial areas as they contain some of the most fertile soils on Choiseul. It is suggested that they should be used for multiple cropping systems with cattle or cocoa under coconuts and with subsistence crops utilising the steeper slopes of the surrounding valley sides, carefully managed to minimise surface erosion. Alternatively, these alluvial areas should be cultivated for arable crops mixed with pastures and the subsistence crops forming part of the arable rotation. Although a wide variety of crops could be grown, selection of the major crop types must depend on the availability of markets. The soils of the Aruliho Land System will also support a wide range of tree and arable crops given adequate fertilisers but any development of arable cultivation will require some erosion control measures as slopes increase rapidly towards the valley sides. Tree crops would require less erosion control after their establishment, particularly if underplanted with pasture but it would be inadvisable to encourage large-scale cattle holdings on the hills. Some of the valley swamps could possibly be reclaimed by means of simple gravity-drains into the nearest incised rivers. The problem of the large coastal swamps at, or possibly below sea level would remain and their reclamation is not thought feasible without the introduction of considerable amounts of capital and expertise.

The population of the AOA in 1970 was 269 at a density of about 10 persons/km^2. Villages are well distributed along the coast and there is a village inland along the Masilata River. Just north of the AOA is the large village of Panggoe with 500 inhabitants in 1970.

A large part of the area has been used for shifting cultivation particularly along the river valleys and in the hills behind Patumbelo. There are no roads serving the area at present and the construction of a coastal road would be hindered by the large areas of coastal swamps. The Tenaru Land System could be utilised along some stretches of the coast but inland spur roads would be required and would be most easily constructed along the river valleys if it could be determined that flooding is never severe. The development of the large southern block of the Aruliho Land System would require at least one feeder road either connecting directly with the coast or leading to the adjacent river valley. There is no suitable all-weather anchorage in the AOA and only small ships can anchor safely at Panggoe. To the south, however, Kukumuni Bay would provide a suitable harbour, sheltered from most winds.

VAGHENA (32 km^2, 12 mi^2)

TABLE 19 Area of component land systems of Vaghena AOA

Land system: % of AOA and area	Land facets: % of AOA and area		
	High suitability	Medium suitability	Low suitability
28. Kohinggo 46% 1 500 ha, 3 705 ac	Facet 1 38% 1 245 ha, 3 075 ac	Facet 2 6% 195 ha, 480 ac	Facet 3 2% 60 ha, 150 ac
19. Fata'olo 45% 1 435 ha, 3 545 ac	Facets 1 and 2 32% 1 005 ha, 2 485 ac	Facet 3 5% 170 ha, 420 ac	Facets 4 and 5 8% 260 ha, 640 ac
32. Pusuraghi 6% 200 ha, 495 ac	–	–	All facets 6% 200 ha, 495 ac
30. Lomousa 3% 95 ha, 235 ac	–	All facets 3% 95 ha, 235 ac	–
Suitability totals	70% 2 250 ha, 5 560 ac	14% 460 ha, 1 135 ac	16% 520 ha, 1 285 ac

The Vaghena AOA forms a bilobate area with the Fata'olo Land System dominating the western lobe and the Kohinggo, and to a lesser extent the Pusuraghi Land System, common in the east.

The AOA is bounded on three sides by mangrove swamp or by steep, linear limestone ridges; it only reaches the coast along the southern margin. The Kohinggo Land System is a low marine terrace less than 40 m high with its surface higher in the south at 20-30 m and with an internal relief of only 5-10 m. Dissection of the surface is negligible and the level to moderately sloping surface represents the unevenness of the original lagoonal complex. Local limestone outcrops give rise to an irregular surface and may form cliffed sections along some marginal areas. Some depressions may be swampy and the larger, wetter depressions have been separated into the Pusuraghi Land System (Stereopair 6-7).

The Fata'olo Land System forming the eastern part of the AOA is slightly ridged with a low to ultra-low relief and does not rise above 40 m. The Fata'olo is generally higher and drier than the Kohinggo and contains few poorly drained patches.

The soils overlying the Fata'olo Land System are mostly yellowish red to red, strongly leached and weathered clays. However, dark brown and reddish brown clays also occur and these have higher nutrient levels although potassium levels are universally low. The soils of the Kohinggo Land System are highly weathered and bauxitic with very low levels of most nutrients, particularly potassium, mainly held in the organic surface layer. The soils are, however, high in phosphorus probably inherited from the parent material.

The major limitation of both land systems will be a low soil fertility particularly due to potassium deficiency. In addition, the Fata'olo Land System contains some steep to moderate slopes subject to surface erosion whilst the Kohinggo has occasional rock outcrops and patchy, poorly drained to swampy soils.

These land systems have a similar agricultural potential although minor modifications will have to be made to any agricultural system to take into account the steeper slopes encountered on the Fata'olo. Both the land systems are suitable for tree crops and expansion of the present coconut areas could be accompanied by the establishment of pastures to combine coconuts and cattle.

The area involved is large enough to enable the establishment of large-scale commercial estates and they are sufficiently extensive for the island's population to considerably expand their agricultural enterprises.

A decision to initiate the mining of bauxite from this island will have profound effects on its potential, by removing most of the deeper soil pockets from the Kohinggo Land System. Any exploitation of this land must be followed by rehabilitation which, in the long run, could result in a ground surface that is as good or possibly better for arable cultivation than the existing soil surface. Arable cultivation of both the Kohinggo and Fata'olo Land Systems would be hindered by rock outcrops, limiting cultivation to small irregular-shaped pockets. The elimination of this uneven surface by mining, levelling and reclamation could lead to a substantial increase in the arable acreage and, as Morgan (1974) showed on very similar land in Jamaica, 30 cm of soil spread over limestone rubble produced yields of yams exceeding those obtained before mining.

The population of Vaghena Island in 1970 was 685 giving an overall population density for the AOA of 21 persons/km^2 although nearly all live on the coastal part of the AOA.

Current land use is confined to the Lomousa Land System in the south, which contains most of the village houses and the southern margins of the Fata'olo and Kohinggo Land Systems which contain the garden and coconut groves of the villagers.

A road has been built along the southern coast and this should be extended into the AOA. One of the beneficial effects of mining would be an infrastructure of roads and port facilities which could be maintained and utilised by the people of the AOA once mining has ceased. If mining does not go ahead feeder roads into the area will have to be constructed with facilities for shipping produce, probably situated near Arariki in the Hamilton Channel.

BALO (28 km^2, 11 mi^2)

TABLE 20 Area of component land systems of Balo AOA

Land system: % of AOA and area	Land facets: % of AOA and area		
	High suitability	Medium suitability	Low suitability
22. Balo 100% 2 800 ha, 6 920 ac	Facets 1 and 2 79% 2 210 ha, 5 460 ac	Facet 3 18% 505 ha, 1 250 ac	Facet 4 3% 85 ha, 210 ac

This AOA is unique in that it consists of a single land system. It occurs inland on Alu Island where it forms a compact triangular area surrounded by hilly and more dissected terrain.

The Balo Land System has an altitude range of 90-140 m but an available relief of less than 30 m. It consists of low, rounded hills separated by small alluvial areas and occasional swamps. The area was the subject of a detailed survey (Sample Area CA, Appendix 4) which identified two major soils on the hills and several imperfectly to poorly drained soils on the intervening level land.

The limitations to development will be the occurrence of steep slopes in some areas and poor drainage in the depressions. Chemically the soils are low in potassium but have medium to high levels of total phosphorus; available phosphorus appears to be adequate only in the brown soils. Because the area has been influenced by recent ash falls, phosphate fixation may be a problem and before any development of the area commences a series of fertiliser trials would be advisable to determine crop responses on these soils. The poorly drained areas are not extensive and most could be inexpensively drained by small surface drains leading into the lightly incised rivers. Poor drainage may well prove to be less limiting to agricultural development than the scattered steeper hillslopes.

The hilly nature of the AOA would tend to make it most suitable for tree crops and development of the area could lead to selective expansion into favourable parts of the adjacent Hisiai Land System.

Many level areas and lower slopes could be used for arable cultivation but their small size and irregular nature would probably preclude mechanisation. Pastures for cattle could be established throughout the area. Ideally, the combination of cattle with coconuts, or cocoa under coconuts would provide a suitable mixed cropping system for these soils while steeper slopes could be left under natural forest or converted to productive food forests.

The AOA is currently unused and uninhabited; consequently there are no roads into the area, but should Shortland Development Limited recommence logging activities they may penetrate into the area from their Lofang base. Alternatively, a road into the AOA could be constructed from the south, thus linking the AOA with the Alokan Land System terraces and indirectly opening them up for development. There is, however, a lack of suitable anchorages on the southern coast and an access road to Maliusai Bay might be more feasible if wharf facilities are to be developed.

Further survey work to delimit the extent and nature of swamps will be required as will a more detailed topographic map of the area to identify steeply sloping land.

MONO (48 km^2, 18.5 mi^2)

The Mono AOA is a compact area covering most of north-western and eastern Mono Island. The Alokan Land System forms an outer rim to the island and within it the Mono Land System is a series of raised and tilted terraces with a maximum elevation of 300 m (Stereopair 6.2).

TABLE 21 Area of component land systems of Mono AOA

Land system: % of AOA and area	Land facets: % of AOA and area		
	High suitability	Medium suitability	Low suitability
20. Mono 69% 3 320 ha, 8 200 ac	Facet 1 39% 1 890 ha, 4 670 ac	Facet 2 22% 1 065 ha, 2 630 ac	Facet 3 8% 365 ha, 900 ac
27. Alokan 30% 1 455 ha, 3 590 ac	Facet 1 23% 1 120 ha, 2 765 ac	–	Facets 2 and 3 7% 335 ha, 825 ac
31. Manggo 1% 25 ha, 60 ac	Facets 1 and 2 0.5% 15 ha, 35 ac	–	Facets 3 and 4 0.5% 10 ha, 25 ac
Suitability totals	62.5% 3 025 ha, 7 470 ac	22% 1 065 ha, 2 630 ac	15.5% 710 ha, 1 750 ac

The Mono Land System comprises gently sloping terrace surfaces with narrow, deeply incised streams that result in an available relief of as much as 60 m. Associated with these steep valley sides are shallow soils and rock outcrops. On the terrace surfaces, soils are predominantly deep, dark brown or dark yellowish brown clays; similar soils occur on the Alokan Land System, In both land systems the soils overlying calcareous rocks characteristically have low levels of available and total potassium. Phosphorus and magnesium levels, however, are expected to vary from medium to high and are unlikely to be limiting to plant growth.

The major limitation to development will be the gorge-like river valleys which subdivide the gently sloping terrace surfaces into small separate blocks. These gorges have very little soil cover and will restrict movement parallel to the coast. In addition, scattered areas of shallow soils and rock outcrops occur on the terrace surfaces and on the coastal margin.

Areas of both Alokan and Mono Land Systems occurring outside the AOA form elongated extensions of the area along the southern coast and these could be incorporated into any development plan for the AOA.

Soil depth is variable throughout the area and may be limiting to arable cultivation; consequently tree crops, particularly coconuts, are recommended. Cocoa would be suitable under coconuts on the deeper soils and pasture on shallow soils.

Falamae is the only large village on Mono and although this is outside the AOA there are some subsistence gardens within the AOA. The population of Falamae was 309 in 1970 giving a population density for the AOA of 6 persons/km^2. It should be stressed, however, that most of the existing gardens and coconut groves are outside the AOA (Separate Map 6f).

There is now no access into the area although a road was built on the island by the Japanese during World War II and the route of this road should be resurveyed to see if it could be repaired. There is a well protected anchorage in Blanche Harbour and the roadhead would ideally be sited at or near Falamae. Stirling Island on the southern side of Blanche Harbour has an airstrip and the island itself is a raised terrace of the Alokan Land System.

Although a sample area was surveyed on Mono (Sample Area CB, Appendix 4), further survey work will be required to establish the extent of the gorges and the variation in soil depth throughout the area.

Part 6

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Appendixes 1-4

Appendix 1

Selected soil profile descriptions representative of Choiseul and the Shortland Islands

The locations indicated are on Directorate of Overseas Surveys Maps, Series 456, and the profiles are in alphabetic (islands) and numerical sequence.

CHOISEUL 1 — **LAND SYSTEM KUMOTU**
SOIL GROUP SULFIHEMIST

Location	Choiseul, Vaghena Island, north side, 15 m from river adjacent to wooden walk of CRA; DOS 7/157/8 635799
Site	Estuarine swamp; water 30 cm deep at high tide. Alt sea level
Parent material	Mangrove debris
Microrelief	Flat
Stoniness	No surface stones
Erosion	Not evident
Vegetation	Primary mangrove forest, 21-24 m canopy; thin shrub layer, no herb layer. Species dominated by *Rhizophora apiculata* and *Xylocarpus granatum*
Land use	Unused
Soil surface	Slightly muddy

Horizon	Depth cm	Description
1 01	0-15	Dark reddish brown (5YR 2/2, moist); finely divided peat; very poor drainage; common fine and medium roots:
2 02	15-61	Dark reddish grey (5YR 3/2, moist); fibrous peat; very poor drainage; many fine roots:
3 02	61-91	As above:
4 02	91-137+	As above:

Remarks — Horizon 02 divided for sampling

CHOISEUL 1 **LAB. NO. 9548-9551**

Characteristic	Horizon (depth in cm)			
	1	2	3	4
	0-15	15-61	61-91	91-137+
Moisture (100-105°C) %	11.0	8.6	8.1	6.9
Bulk density g/ml	0.58	0.50	0.61	0.73
Loss on ignition %	55.2	4.74	45.4	61.2
pH (1:2.5) soil: water	5.4	3.6	3.4	3.5
Conductivity mmhos	27.3	26.4	27.4	28.0
Carbonate meq %				
Exch. Na meq %	44.1	40.8	41.0	32.2
Exch. K meq %	3.6	2.2	0.8	0.3
Exch. Mg meq %	56.0	25.6	24.4	17.0
Exch. Ca meq %	60.0	28.8	28.0	23.3
TEB meq %	163.7	97.4	94.2	72.8
CEC meq %	110.5	76.2	71.0	58.1
Base saturation %	100	100	100	100
Total N %	1.02	0.74	0.49	0.38
Organic C %	<0.1	<0.1	<0.1	15.98
Total P ppm	4 110	3 250	2 920	3 500
Total K ppm	2 500	2 250	1 900	1 800
Total Mg ppm	10 850	9 050	7 350	6 550
Available P: (Bray) ppm	47.3	39.0	42.4	46.3
Trace metals ppm				
Cobalt Co	20	20	40	40
Copper Cu	70	60	80	80
Chromium Cr	70	80	100	100
Manganese Mn	100	80	130	180
Nickel Ni	90	80	80	80
Zinc Zn	50	50	70	60

CHOISEUL 2 — **LAND SYSTEM MBINA**
SOIL GROUP ACRORTHOX

Location	Eastern Choiseul near Kumboro Peak; about 1 km north-east of unnamed river mouth; DOS 5/157/7 400873
Site	Upper slope of gently rounded hill; slope 16°; gently convex; normal drainage. Alt. 58 m
Parent material	Probably ultramafic judging by soil and vegetation; rock sample from hill foot
Microrelief	Smooth
Stoniness	No surface stones
Erosion	Not evident
Vegetation	Old forest, severely wind-damaged; scattered emergents. Canopy species *Casuarina papuana* (1), *Canarium harveyi* or *Haplolobus spp.* (1), *Burckella sp.* or *Chelonespermum sp.* (2). Small trees include *Guoia sp., Canarium harveyi* or *Haplolobus spp., Stemonurus sp., Gironniera celtidifolia, Diospyros sp.*. Thick herb and shrub layer; species include *Psychotria sp., Dolicholobium sp., Gnetum sp., Casuarina papuana, Gulubia macrospadix, Pandanus sp.* and *Alpinia spp.*
Land use	Unused
Soil surface	Thick mat of litter and well rooted humus

Horizon	Depth cm	Description
1 01	8-0	Black humus; free drainage; many small to large roots:
2 A1	0-8	Red (5YR 4/4, moist): clay loam; moderate to strong, very coarse, crumb to subangular blocky structure; very friable, moist; free drainage; many fine interstitial pores; common large and small roots; gradual smooth boundary:
3 B21	8-25	Yellowish red (5YR 4/6, moist); clay; moderate, medium, sub-angular blocky structure; friable, moist; few (1 cm) pieces of charcoal; free drainage; common fine tubular and interstitial pores; few medium roots; few clayskins in lower part of horizon; gradual smooth boundary:
4 B22	25-84	Red (2.5YR 4/6, moist); clay; massive, breaking to fine and medium angular blocky structure; friable, moist; few irregular, hard and soft, brownish yellow weathering rock; free drainage; few fine interstitial pores; few fine and medium roots; clayskins present; gradual wavy boundary:
5 B23	84-127	Yellowish red (5YR 4/8, moist); common diffuse faint yellowish red mottles; clay; massive, breaking to moderate angular blocky structure; friable, moist; free drainage; few fine tubular and interstitial pores; few small roots; common shiny ped faces, possibly clayskins; gradual wavy boundary:
6 B24	127-160	Yellowish red (5YR 5/6, moist); faint red and yellowish red mottles; clay; massive, breaking to moderate medium angular blocky structure; friable moist; free drainage; few small roots:
7 B25	160-221	Yellowish red (5YR 4/6, moist); silty clay loam; massive, breaking to moderate fine and medium angular blocky structure; very friable, moist; free drainage; few small roots:
8 B31	221-249	Brown to dark brown to reddish brown (7.5YR 4/4 to 5YR 4/4, moist); common fine/medium prominent black and yellow mottles; silty clay loam; firm, moist; plastic, slightly sticky, wet; much soft black and yellow weathering rock:
9 B32	249-304+	Reddish brown (5YR 4/4, moist); common fine/medium prominent black and yellow and fine distinct white mottles; silty clay loam; firm, moist; few coarse patches of black and yellow weathering rock; common fine white soft weathering rock.

Characteristic	Horizon (depth in cm)									
	1	2	3	4	5	6	7	8	9	
	8-0	0-8	8-25	25-84	84-127	127-160	160-221	221-249	249-304+	Rock sample
Moisture (100-105°C)%	7.4	2.6	2.2	2.1	2.0	1.8	2.0	2.2	2.1	
Bulk density g/ml	0.22	0.78	0.94	0.84	0.81	0.90	0.97	0.84	0.89	
Loss on ignition %	80.1									
pH (1:2.5) soil: water	4.9	4.8	4.8	4.9	5.2	5.2	5.8	5.4	5.3	
Conductivity mmhocm^2	0.23	0.12	0.04	0.03	0.04	0.04	0.12	0.04	0.04	
Carbonate meq %										
Exch. Na meq %	2.3	0.1	0.1	0.1	tr	0.1	tr	0.1	tr	
Exch. K meq %	1.4	0.1	tr	nil	nil	nil	nil	nil	nil	
Exch. Mg meq %	3.2	0.3	0.1	nil	nil	nil	nil	nil	nil	
Exch. Ca meq %	9.1	0.9	0.2	0.1	0.1	nil	1.2	0.1	tr	
TEB meq %	16.0	1.4	0.4	0.2	0.1	0.1	1.2	0.2		
CEC meq %	56.4	12.4	5.6	3.7	1.5	0.8	0.9	0.6	0.6	
Base saturation %	28	11	8	6	8	14	100	40		
Total N %	1.53	0.36	0.13	0.06	0.03	0.02	0.02	0.01	0.02	
Organic C %	L.O.I.	6.26	2.00	0.96	0.65	0.51	0.43	0.26	0.33	
Total P ppm	300	210	160	150	160	90	70	60	60	20
Total K ppm	800	1 200	1 300	1 300	2 300	2 500	2 050	2 350	2 350	250
Total Mg ppm	2 700	1 700	1 450	1 250	3 850	4 750	3 200	4 250	3 500	169 500
Available P (Bray) ppm	8.1	3.3	2.0	2.2	2.4	2.0	2.7	2.5	2.7	
Mechanical analysis										
2 mm – 200 μ %		1	1	1	1	2	1	1	0	
200 μ – 50 μ %		4	4	3	4	7	9	6	5	
50 μ – 20 μ %		9	9	7	18	27	26	36	32	
20 μ – 2 μ %		21	18	20	19	21	26	23	26	
<2 μ %		65	68	69	58	43	38	34	37	
Trace metals ppm										
Cobalt Co	40	140	130	130	330	350	470	2 360	980	160
Copper Cu	30	50	60	60	80	100	110	170	100	20
Chromium Cr	470	4 430	3 590	1 610	10 460	13 670	7 310	7 810	7 410	210
Manganese Mn	630	600	460	410	1 710	1 900	2 990	9 150	5 170	670
Nickel Ni	320	1 660	1 200	1 320	1 080	4 840	4 220	5 370	6 750	3 180
Zinc Zn	50	130	130	120	290	510	240	240	200	20

CHOISEUL 7 — **LAND SYSTEM MANGGO**
SOIL GROUP TYPIC TROPOFLUVENT

Location — South-west Choiseul; river bank site estimated 1 km upstream, true right bank; campsite; DOS 7/157/6 234832

Site — Levee of large river, almost at limit of tidal zone. Alt. less than 3 m

Parent material — Alluvium derived from ultramafics and minor schists; possibly with estuarine mud at depth

Microrelief — Smooth

Stoniness — No surface stones

Erosion — Not evident at site

Vegetation — Used for garden. Regrowth species include *Trichospermum psilocladum, Horsfieldia sp., Semecarpus sp., Euodia sp., Ficus sp., Morinda citrifolia, Timonius timon, Cordyline fruticosa* and *Litsea sp.*

Land use — Garden ?1971, mainly cassava, now for pineapple; both look fair. Subsistence farm - hunting garden sub-type, only periodically attended

Soil surface — Cassava litter

Horizon	Depth cm	Description
1 A1	0-13	Dark yellowish brown (10YR 3/4, moist); few medium and fine, distinct dark brown mottles; sandy loam; plastic, slightly sticky, wet; 3 cm layer of rounded, less than 3 cm diameter ultrabasic pebbles at base of horizon; free drainage:
2 B21	13-41	Brown to dark brown (7.5YR 4/4, moist); loam; very friable, moist; slightly plastic, slightly sticky, wet; free drainage:
3 B21	41-69	As above:
4 B21	69-99	As above:
5 B22	99-117	Strong brown (7.5YR 5/6, moist); common diffuse, faint yellowish brown and dark yellowish brown mottles; loam; plastic, slightly sticky, moist; free drainage:
6 B22	117-137+	As above.

Characteristic	Horizon (depth in cm)					
	1	2	3	4	5	6
	0-13	13-41	41-69	69-99	99-117	117-137+
Moisture (100-105°C) %	1.4	1.5	2.2	2.0	2.0	2.2
Bulk density g/ml	1.09	0.96	0.91	0.91	0.88	0.87
Loss on ignition %						
pH (1:2.5) soil: water	6.7	6.5	6.5	6.4	6.6	6.6
Conductivity mmho/cm^2	0.12	0.05	0.04	0.03	0.04	0.05
Carbonate meq %						
Exch. Na meq %	nil	tr	tr	0.1	tr	tr
Exch. K meq %	0.1	0.1	nil	tr	nil	nil
Exch. Mg meq %	3.7	5.3	5.2	5.6	5.5	3.6
Exch. Ca meq %	3.9	1.6	1.5	1.4	1.6	1.1
TEB meq %	7.7	7.0	6.7	7.1	7.1	4.7
CEC meq %	11.3	11.0	10.4	10.2	10.6	9.3
Base saturation %	68	63	64	70	67	51
Total N %	0.15	0.08	0.05	0.03	0.04	0.05
Organic C %	2.40	1.11	0.84	0.50	0.60	0.67
Total P ppm	380	360	320	270	160	220
Total K ppm	1 100	1 050	1 200	1 400	1 250	1 250
Total Mg ppm	30 000	18 700	15 400	14 900	11 450	10 200
Available P:						
(Olsen) ppm						
(Bray) ppm	5.3	4.2	3.7	4.1	4.1	5.5
Mechanical analysis						
2 mm – 200 μ %	56	8	11	12	10	9
200 μ – 50 μ %	13	28	23	27	18	16
50 μ – 20 μ %	8	20	18	18	15	15
20 μ – 2 μ %	11	24	25	22	25	25
<2 μ –	12	20	23	21	32	35
Trace metals ppm						
Cobalt Co	170	250	270	250	220	190
Copper Cu	30	60	70	180	60	60
Chromium Cr	1 500	3 760	3 360	3 370	4 040	4 650
Manganese Mn	1 300	2 050	1 860	1 730	1 100	700
Nickel Nl	1 170	1 700	2 050	1 740	1 600	1 420
Zinc Zn	100	130	130	130	130	140

CHOISEUL 10 — **LAND SYSTEM TAORA**
SOIL GROUP TYPIC HAPLORTHOX

Location East Choiseul, about 1 km east of Taora village; DOS 7/157/6 329824

Site Crestal site, narrow (9 m); convex; on a col between two crestal heights; upper flanking slope 33°; shedding drainage. Alt. 80m

Parent material Chlorite schist; rock sample from stream at hill foot

Microrelief Smooth

Stoniness No surface stones

Erosion Probably a little surface wash

Vegetation Old secondary forest, canopy now at 24-30 m. Canopy trees *Campnosperma brevipetiolata* (6), *Ficus* sp. (1), *Alstonia scholaris* (1), *Artocarpus incisus* (1), *Canarium indicum* (1) and *Canarium salomonense* (2). Thick shrub/small tree layer, species include *Pometia pinnata, Vitex cofassus, Macaranga* sp., *Gmelina moluccana, Canarium indicum, Rhopaloblaste elegans, Gnetum gnemon* and *Ficus* sp.

Land use Unused

Soil surface Scattered fresh litter

Horizon	Depth cm	Description
1 A11	0-10	Dark reddish brown (5YR 3/4, moist); clay; strong, fine and medium, crumb and subangular blocky structure; friable, moist; free drainage; many interstitial pores; many small, few medium and large roots; krotovinas present; gradual smooth boundary:
2 A12	10-25	Reddish brown (5YR 4/4, moist); clay; moderate to strong, very fine to medium angular blocky structure; friable, moist; few sub-angular, hard black schist and angular quartz; free drainage; common interstitial and tubular pores; common small, few medium and large roots; gradual smooth boundary:
3 B21	25-71	Yellowish red (5YR 4/6, moist); clay; massive, breaking to moderate fine and medium angular blocky structure; friable, moist; common soft and hard schist and quartz; free drainage; few fine tubular pores; few small and medium roots; some shiny ped faces especially around stones; gradual wavy boundary:
4 B22	71-112	Yellowish red (5YR 4/6, moist); clay; massive, breaking to moderate medium and coarse angular blocky structure; friable, moist; common soft and hard schist and quartz (?); free drainage; few small roots; some shiny ped faces around stones; gradual smooth boundary:
5 B23	112-163	Yellowish red (5YR 5/6, moist); few diffuse, faint black mottles; clay; massive, breaking to moderate medium and coarse angular blocky structure; friable to firm, moist; common soft and hard schist; free to slightly impeded drainage:
6 B24	163-218	Yellowish red (5YR 5/6, moist); clay; firm, moist; free to slightly impeded drainage:
7 B25	218-279+	Yellowish red (5YR 4/8, moist); silty clay loam to silty clay; firm, moist; few soft to hard black and yellowish brown weathering schists; free drainage:

CHOISEUL 10 **LAB. NO. 9441-9447**

Characteristic	Horizon (depth in cm)						
	1	2	3	4	5	6	7
	0-10	10-25	25-71	71-112	112-163	163-218	218-279+
Moisture (100-105°C)%	3.0	2.6	2.1	1.7	2.1	2.0	2.1
Bulk density g/ml	0.86	0.83	0.84	0.84	0.83	0.82	0.83
Loss on ignition %							
pH (1:2.5) soil:water	5.5	5.1	5.3	5.4	5.6	5.5	5.7
Conductivity mmhos/cm^2	0.14	0.06	0.03	0.03	0.02	0.03	0.03
Carbonate meq %							
Exch. Na meq %	0.1	0.1	tr	tr	0.1	0.1	0.1
Exch. K meq %	0.2	0.1	nil	nil	nil	nil	nil
Exch. Mg meq %	2.8	0.7	0.2	0.5	0.5	0.5	0.6
Exch. Ca meq %	6.3	0.7	tr	0.5	0.5	1.3	2.2
TEB meq %	9.4	1.6	0.2	1.0	1.1	1.9	2.9
CEC meq %	21.4	14.0	7.0	7.5	6.4	7.3	7.8
Base saturation %	44	12	3	13	17	27	37
Total N %	0.49	0.21	0.08	0.05	0.04	0.03	0.01
Organic C %	6.86	2.70	0.84	0.41	0.20	0.16	0.13
Total P ppm	930	830	480	360	370	390	470
Total K ppm	700	850	850	750	900	950	1 300
Total Mg ppm	2 700	2 800	2 700	2 350	2 400	2 500	2 500
Available P (Olsen) ppm (Bray) ppm	13.0	5.6	4.2	4.4	3.8	3.9	4.3
Mechanical analysis							
2 mm – 200 μ %	8	11	9	7	4	3	1
200 μ – 50 μ %	6	5	5	3	3	3	2
50 μ – 20 μ %	12	10	11	10	12	14	20
20 μ – 2 μ %	18	18	19	18	23	29	37
< 2 μ %	56	56	56	62	58	51	40
Trace metals ppm							
Cobalt Co	100	110	110	120	110	100	110
Copper Cu	60	70	60	70	70	80	80
Chromium Cr	70	90	60	70	40	40	40
Manganese Mn	2 200	2 020	2 150	1 780	2 210	1 130	730
Nickel Ni	170	200	180	190	240	190	170
Zinc Zn	80	80	70	80	120	80	90

CHOISEUL 13 — **LAND SYSTEM HENEFAU**
SOIL GROUP LITHIC RENDOLL

Location — Choiseul, south-west facing coast, 1 km west of inlet off Kokamba Harbour, Sumbi Point; DOS 7/157/1 798959.

Site — Hill crest, convex; upper flanking slopes 17°, 21°; middle flanking slopes 39° and 40°; shedding drainage. Alt. 107 m

Parent material — Tertiary limestone and one subangular piece of pyroxene andesite (?)

Microrelief — Slightly irregular from treefall scars and limestone boulders

Stoniness — Many surface limestone boulders; mostly covered by litter and humus

Erosion — Not evident

Vegetation — Cyclone-damaged old forest; irregular open canopy, 9m to more than 37 m. Tall trees include *Pometia pinnata* (1), *Eugenia* sp. (2), *Buchanania arborescens* (1), *Neoschortechinia forbesii* (1), *Crudia* sp. *(?)* (1), *Calophyllum cerasiferum* (2). Small trees include *Gomphandra* sp., *Parinari glaberrima, Calophyllum cerasiferum.* Thick shrub layer of woody saplings; thin ground cover

Land use — Unused

Soil surface — 25-0 cm organic horizon; 25-10 cm litter; 10-0 cm humus

Horizon	Depth cm	Description
1 O1/2	10-0	Very dusky red (10R2/2, moist); humus; 'single grain' structure; loose to very friable, moist; some limestone penetrates this horizon from above; free drainage; abundant interstitial pores; many small to large roots; abrupt smooth boundary:
2 A1/B	0-25	Very dark brown (10YR 2/2, moist); common diffuse, faint, very dark greyish brown mottles; clay; moderate to strong, medium subangular blocky structure; friable moist; few irregular, less than 5 cm diameter limestone fragments; free drainage; common tubular and interstitial pores; common small to large roots; abrupt irregular boundary:
3 C1	25-41	Brown to dark brown (10YR 4/3, moist); few coarse, distinct, very dark greyish brown mottles; stony clay; moderate to strong, fine subangular blocky structure; friable, moist many irregular, mostly hard limestone fragments; free drainage; probably common fine interstitial peres; few medium roots:
4	41+	Limestone; more or less solid but joints in pit bottom 23 cm wide and more than 23 cm deep, filled with clayey rubble;

Remarks — Top 5 cm of horizon — locally very humus stained.

CHOISEUL 13 LAB. NO. 9469-9471, 952

Characteristic	Horizon (depth in cm)			
	1	2	3	4
	10-0	0-25	25-41	Rock
Moisture (100-105°C) %	10.3	5.6	3.2	
Bulk density g/ml	0.51	0.92	0.99	
Loss on ignition %	75.3			
pH (1:2.5) soil: water	6.3	7.3	8.1	
Conductivity mmhos/cm^2	0.29	0.18	0.32	
Carbonate meq %			940	
Exch. Na meq %	0.8	0.3	0.2	
Exch. K meq %	0.4	0.1	0.1	
Exch. Mg meq %	7.8	0.8	0.6	
Exch. Ca meq %	85.7	46.7	750.0	
TEB meq %	94.7	47.9		
CEC meq %	118.1	52.0	28.9	
Base saturation %	84	92		
Total N %	1.91	0.52	0.23	
Organic C %	<0.1	5.14	2.19	
Total P ppm	630.	320	270	230
Total K ppm	350	250	400	800
Total Mg ppm	1 950	2 900	2 300	1 650
Available P				
(Olsen) ppm	9	1	2	
(Bray) ppm	18.8	7.3		
Mechanical analysis				
2 mm – 200 μ %		1	22	
200 μ – 50 μ %		5	4	
50 μ – 20 μ %		8	9	
20 μ – 2 μ %		8	16	
<2 μ %		78	49	
Trace metals ppm				
Cobalt Co				40
Copper Cu				10
Chromium Cr				<10
Manganese Mn				90
Nickel Ni				100
Zinc Zn				20

CHOISEUL 17 — **LAND SYSTEM SAKATOKANA**
SOIL GROUP TYPIC TROPUDALF

Location — Choiseul, inland from Rarapa River, about 2 km from coast along ridge running south-east towards Mount Sambe; DOS 7/157/1 913924

Site — Upper slope near junction with middle slope; dominant slope 30°; middle slope 42°; shedding to normal drainage. Alt. 33 m

Parent material — Calcareous and non-calcareous sandstone

Microrelief — Irregular, stepped hillslope with scarplets measuring 20-75 cm

Stoniness — Rock outcrops present but not common above site; below, small cliffs 1-2 m quite common

Erosion — Surface wash considerable with much exposed soil

Vegetation — Disturbed old forest; few large trees; canopy 18-24 m. Dominant species *Pometia pinnata* (2) and *Endospermum medullosum* (2). Some large palms, notably *Gulubia*, in lower tree storey. Shrub layer dominated by saplings and tree ferns

Land use — Unused

Soil surface — Litter-covered except where recent terracetting has exposed ground surface

Horizon	Depth cm	Description
1 02	5-0	Dark reddish brown (5YR 2/2, moist); fibrous humus; structureless; very friable, moist; few subangular, small sandstone fragments; free drainage; many coarse to fine interstitial pores; many fine and medium fibrous and fleshy roots; clear smooth boundary:
2 A11	0-15	Brown to dark brown (7.5YR 4/4, moist); few large dark brown (7.5YR 3/2) inclusions; silty clay; moderate fine and medium subangular blocky structure; friable, moist; common angular and subangular, small and few medium sandstone fragments; free drainage; common fine and tubular pores; common small fibrous and fleshy medium rhizomatous roots:
3 A12	15-23	As above; clear wavy boundary:
4 D2	23-33	Yellowish red (5YR 4/6, moist); common fine, faint strong brown (7.5YR 5/6) mottles; clay; weak medium angular blocky structure; friable, moist; free drainage; few medium vesicular and common interstitial pores; few fine fibrous roots; clear wavy boundary:
5 03	33-58	Strong brown (7.5YR 5/6, moist); many coarse distinct yellowish red (5YR 4/8) and black (5YR 2/1) weathering rock colours; clay loam to clay; weak coarse angular blocky structure; friable, moist; few soft very weathered stones; free drainage; few medium tubular pores; few fine fibrous roots:
6 C1	58-104	Yellowish red (5YR 4/8, moist) mixed with yellowish brown (10YR 3/6, moist), black (10YR) and light yellowish brown (10YR 6/4); gritty loam; massive; friable, moist; many soft weathering stones; free drainage; few, fine tubular pores; rare, medium woody roots:
C2	104-142+	Soft weathering rock:

Remarks — Inclusions of material from upslope contained in 0-25 cm horizon. Original sedimentary structure still visible in horizon.

Characteristic	Horizon (depth in cm)						
	1	2	3	4	5	6	7
	5-0	0.15	15-23	23-33	33-58	58-104	104-142+
Moisture (100-105°C) %	10.8	7.5	7.0	6.9	7.8	9.0	5.4
Bulk density g/ml	0.28	0.75	0.83	0.85	0.73	0.71	0.80
Loss on ignition %	52.5						
pH (1:2.5) soil: water	6.9	6.0	6.0	6.0	5.8	6.2	7.8
Conductivity mmhos/cm^2	0.26	0.08	0.06	0.05	0.03	0.03	0.16
Carbonate meq %							155
Exch. Na meq %	0.7	0.3	0.2	0.4	0.3	0.4	0.4
Exch. K meq %	1.1	0.1	0.1	0.1	tr	0.1	0.1
Exch. Mg meq %	12.1	5.2	2.2	1.9	1.8	2.3	2.3
Exch. Ca meq %	88.2	31.3	24.3	23.9	27.4	40.1	49.3
TEB meq %	102.1	36.9	26.8	26.3	29.5	42.9	52.2
CEC meq %	98.6	46.3	43.3	32.2	37.7	48.5	39.0
Base saturation %	100	80	62	81	78	89	100
Total N %	1.52	0.27	0.15	0.07	0.05	0.03	0.01
Organic C %		2.24	1.17	0.59	0.40	0.24	0.12
Total P ppm	470	180	140	80	70	70	600
Total K ppm	650	500	500	550	400	500	600
Total Mg ppm	3 950	5 800	5 500	4 050	4 400	6 050	9 150
Available P							
(Olsen) ppm	12	<1	<1	<1	<1	<1	2
(Bray) ppm	17.8	7.6	8.1	7.1	7.8	8.2	
Mechanical analysis							
2 mm – 200 μ %		1	0	0	0	1	5
200 μ – 50 μ %		10	7	4	21	23	41
50 μ – 20 μ %		15	14	5	15	19	30
20 μ – 2 μ %		27	24	15	19	17	13
<2 μ %		47	55	76	45	40	11

CHOISEUL 21 — **LAND SYSTEM SEPA**
SOIL GROUP TYPIC EUTROPEPT

Location	Choiseul Island, 0.4 km inland from Mboe village; DOS 7/156/4 578177
Site	Top of small ridge, gentle, convex crestal slope of 3°; upper slopes 11°, 28° and 29°; shedding drainage. Alt. 46 m
Parent material	Tertiary volcanics
Microrelief	Smooth
Stoniness	Few rare angular 5 x 5 cm surface stones; volcanic
Erosion	Not evident
Vegetation	Secondary regrowth with young coconuts. Few fruit trees still remain: *Canarium indicum* (4), *Canarium salomonense* (2), *Barringtonia* sp. (1), *Parinari glaberrima, Ficus septica* and *Eugenia malaccensis.* Herb layer dominated by grass with very common woody regrowth. Ferns become increasingly common downslope
Land use	Two year old coconuts with slight yellowing of lower leaves. Some sweet potato vines and cabbage still remain
Soil surface	Covered by garden regrowth and debris from former forested area

Horizon	Depth cm	Description
1 A11	0-13	Dark brown (10YR 3/3, moist); silty clay loam; moderate, medium crumb to fine subangular blocky structure; friable, moist; few angular, medium volcanic stones; free drainage; many fine interstitial pores; many fine fibrous and common medium woody roots; clear smooth boundary:
2 A12	13-23	Dark brown (10YR 3/3, moist); common coarse, distinct strong brown (7.5YR 5/6) mottles; silty clay loam; moderate, medium to coarse angular blocky structure; friable, moist; free drainage; common fine tubular and common fine interstitial pores; few coarse woody and common fine fibrous roots; clear smooth boundary:
3 B21	23-43	Yellowish brown (10YR 5/4, moist); silty clay loam; weak, medium angular blocky structure; firm, moist; few soft weathering rock fragments; free drainage; few fine tubular, few fine interstitial pores; few coarse woody, few fine fibrous roots:
4 B22	43-53	Yellowish brown (10YR 5/4, moist); common coarse, distinct strong brown (7.5YR 5/6) mottles; silty clay loam; massive, breaking to weak medium angular blocky structure; friable, moist; mottles due to common coarse weathering rock fragments; free drainage, common fine tubular pores; few coarse woody, few fine fibrous roots; gradual smooth boundary:
5 B3	53-97	Weathered rock colours, strong brown and greenish grey; patchily mottled parent material; silt loam; friable, moist; abundant weathered rock; free drainage; few fine tubular pores; few, fine woody roots:

Remarks — Weathered rock limits root development from 25 cm.

Characteristic	Horizon (depth in cm)				
	1	2	3	4	5
	0-13	13-23	23-43	43-53	53-97
Moisture (100-105°C) %	4.5	4.5	4.6	4.0	3.0
Bulk density g/ml	0.76	0.85	0.82	0.83	0.95
Loss on ignition %					
pH (1:2.5) soil: water	6.5	6.4	6.3	6.2	6.2
Conductivity mmhos/cm^2	0.16	0.07	0.03	0.03	0.03
Carbonate meq %					
Exch. Na meq %	0.05	0.6	0.6	0.7	0.5
Exch. K meq %	0.1	tr	tr	nil	nil
Exch, Mg meq %	5.9	8.6	12.2	11.3	8.2
Exch. Ca meq %	26.4	22.6	21.8	15.9	11.9
TEB meq %	32.9	31.8	34.6	27.9	20.6
CEC meq %	46.4	37.1	41.2	30.5	22.2
Base saturation %	71	86	84	92	93
Total N %	0.43	0.20	0.06	0.04	0.02
Organic C %	5.82	2.24	0.69	0.39	0.22
Total P ppm	260	140	80	70	60
Total K ppm	400	350	400	450	400
Total Mg ppm	8 200	10 050	11 400	10 050	9 150
Available P (Olsen) ppm (Bray) ppm	8.5	5.9	6.7	7.6	8.5
Mechanical analysis					
2 mm – 200 μ %	1	1	0	0	1
200 μ – 50 μ %	9	7	7	7	23
50 μ – 20 μ %	23	24	25	30	32
20 μ – 2 μ %	32	32	35	35	26
<2 μ %	35	36	33	28	18

CHOISEUL 22 — **LAND SYSTEM MANGGO**
SOIL GROUP MOLLIC TROPOFLUVENT

Location — Western Choiseul, Pandii River, 8 km south-east of Sasamungga. Estimated 550 m from coast and 23 m from true right bank of Pandii River; DOS 7/156/4 567185

Site — Stream floodplain; almost level, 2°; receiving drainage. Alt.less than 6m

Parent material — Recent alluvium mostly derived from Tertiary basaltic volcanics

Microrelief — Smooth

Stoniness — No surface stones, stream contains gravel to 23 cm mainly basaltic

Erosion — Not evident

Vegetation — Coconut garden. Regrowth shrubs include *Canarium salomonense, Pterocarpus indicus, Pipturus argenteus, Ficus sp., Celtis philippinensis or Leukosyke sp., Kleinhovia hospita, Dendrocnide sp., Ficus copiosa, F. septica.* Thick undergrowth

Land use — Reasonably healthy coconut garden with good fruit bunches on some trees but none on others. Leaf count 18, 19, 22, 20, 23, 30

Soil surface — Grass and fern litter

Horizon	Depth cm	Description
1 A1	0-5	Very dark greyish brown (10YR 3/2, moist); silt loam; moderate to strong, medium crumb and fine subangular blocky structure; very friable, moist; few small, rounded stones; free drainage; many interstitial pores; common medium roots; clear smooth boundary:
2 B2	5-20	Dark brown (10YR 3/3, moist); loam; moderate, medium angular blocky structure; friable, moist; few small, rounded stones; free drainage; common small tubular pores; common medium and large roots:
3 B2	20-48	As above; clear wavy boundary:
4 IIC	48-74	Brown to dark brown (10YR 4/3, moist); gravelly sandy loam; structureless; loose, moist; many small to medium rounded stones; free drainage; many interstitial pores; few small fibrous roots; abrupt smooth boundary:
5 IIIC	74-84	Dark brown (10YR 3/3, moist); few coarse, faint greyish brown and strong brown mottles; sandy loam; massive to moderate, fine to medium subangular blocky structure; very friable, moist; few small rounded stones; free drainage; common fine tubular pores; abrupt wavy boundary:
6 IVC	84-107	Brown to dark brown (10YR 4/3, moist); stony sandy loam; massive to weak, fine subangular blocky structure; very friable, moist; many small to medium rounded stones; free drainage; common fine tubular pores; abrupt wavy boundary:
7 VC	107-122	Most stones have black staining (manganese or humus?); Many small to large rounded black coated stones in gravelly loamy sand; structureless; loose, moist; imperfect drainage; many interstitial pores.

Remarks — Coarse gravel limits root development at 107 cm.

CHOISEUL 22 LAB. NO. 9602-9608

Characteristic	Horizon (depth in cm)						
	1	2	3	4	5	6	7
	0-5	5-20	20-48	48-74	74-84	84-107	107-122+
Moisture (100-105°C)%	5.3	5.2	4.7	4.3	4.8	4.0	4.4
Bulk density g/ml	0.80	0.85	0.86	1.15	0.91	1.00	1.09
Loss on ignition %							
pH (1:2.5) soil:water	6.3	6.4	6.7	6.8	6.9	7.0	7.3
Conductivity mmhos/cm^2	0.09	0.06	0.05	0.05	0.04	0.04	0.05
Carbonate meq %							
Exch. Na meq %	0.4	0.4	0.6	0.7	0.5	0.6	0.6
Exch. K meq %	1.0	0.4	0.3	0.4	0.5	0.4	0.5
Exch. Mg meq %	8.1	7.3	8.5	7.6	9.8	8.8	9.5
Exch. Ca meq %	28.1	27.4	29.8	25.4	30.8	27.0	29.5
TEB meq %	37.6	35.5	39.2	34.1	41.6	36.8	40.1
CEC meq %	46.8	45.9	41.6	37.3	45.2	39.8	42.1
Base saturation %	80	77	94	91	92	92	95
Total N %	0.33	0.17	0.13	0.02	0.03	0.03	0.02
Organic C %	3.54	1.73	1.14	0.24	0.47	0.43	0.17
Total P ppm	570	430	490	400	230	340	410
Total K ppm	1 900	1 600	1 350	1 600	1 850	1 500	1 650
Total Mg ppm	13 800	14 850	13 650	16 000	16 450	16 150	17 800
Available P							
(Olson) ppm	15.3	11.7	9.9	29.1	10.9	18.1	30.8
(Bray) ppm							
Mechanical analysis							
2 mm – 200 μ %	2	3	7	53	16	26	66
200 μ – 50 μ %	22	30	26	19	37	30	13
50 μ – 20 μ %	32	26	28	12	20	19	6
20 μ – 2 μ %	24	23	23	10	16	15	8
<2 μ %	20	18	16	6	11	10	7

CHOISEUL 35 — **LAND SYSTEM FATA 'OLO**
SOIL GROUP TYPIC TROPOHUMULT

Location	Moli; DOS 6/156/15 257446
Site	Crestal margin above sea cliff; gently concave; shedding drainage Alt.32 m
Parent material	Moli Sediments
Microrelief	Small hummocks, amplitude 0.3 m
Stoniness	No surface stones
Erosion	Little erosion
Vegetation	Open coconut grove, closed grass cover. Saplings: *Alstonia spectabilis, Decaspermum fruticosum, Ficus septica*
Land use	Coconut grove; planting distance irregular, 3-8 m
Soil surface	Grass cover over loose soil

Horizon	Depth cm	Description
1 A1	0-5	Dark brown (7.5YR 3/2, moist); clay; weak crumb structure; free drainage; many fine to large, fibrous roots; distinct boundary:
2 B1	5-30	Yellowish red (5YR 4/8, moist); clay; subangular blocky structure; firm, moist; free drainage; many large, fibrous roots; faint boundary:
3 B2	30-46	Yellowish red (5YR 4/6, moist); clay; weak, subangular blocky structure; firm moist; few small, subangular pebbles; free drainage; common fine to medium, fibrous roots; distinct boundary:
4 B3	46-102	Yellowish red (5YR 5/6, moist); common coarse, distinct yellowish red (7.5YR 6/8) and greyish brown (10YR 5/2) weathering parent material mottles; clay; subangular blocky structure; firm moist; many small to medium, subangular pebbles; few fine to medium, fibrous roots; free drainage distinct boundary:
5 C1	102-157	Many different colours, dark yellowish brown, yellowish brown, dark red; many coarse prominent mottles; stone silty clay; many small to large angular fragments; free to imperfect drainage.

Remarks — Weathered parent material shows little sign of mixing; strata of sediments still visible at base of pit.

CHOISEUL 35 LAB.NO. 9679-9683

Characteristic	Horizon (depth in cm)				
	1	2	3	4	5
	0-5	5-30	30-46	46-102	102-157+
Moisture (100-105°C) %	4.3	3.8	4.7	4.9	5.1
Bulk density g/ml	0.53	0.79	0.80	0.72	0.65
Loss on ignition %					
pH (1:2.5) soil:water	5.7	5.6	5.4	5.4	5.3
Conductivity mmhos/cm^2	0.16	0.07	0.06	0.04	0.05
Carbonate meq %					
Exch. Na meq %	0.6	0.5	0.6	0.6	0.9
Exch. K meq %	0.8	0.1	0.3	0.3	0.6
Exch. Mg meq %	4.5	5.3	6.3	5.1	8.3
Exch. Ca meq %	8.3	4.6	3.6	2.2	2.9
TEB meq %	14.2	10.5	10.8	8.2	12.7
CEC meq %	29.6	19.6	24.9	25.7	39.8
Base saturation %	48	54	43	32	32
Total N %	0.45	0.19	0.10	0.06	0.02
Organic C %	9.25	2.43	1.08	0.69	0.23
Total P ppm	220	250	280	300	400
Total K ppm	800	1 300	1 650	1 900	2 450
Total Mg ppm	1 900	3 450	4 150	4 900	6 750
Available P (Olsen) ppm (Bray) ppm	5.0	3.7	4.5	5.5	6.5
Mechanical analysis					
2 mm – 200 µ %	5	1	0	0	0
200 µ – 50 µ %	9	4	1	1	1
50 µ – 20 µ %	19	9	6	7	18
20 µ – 2 µ %	17	17	21	26	35
<2 µ %	50	69	72	66	46

CHOISEUL 36 — **LAND SYSTEM SUI**
SOIL GROUP TYPIC ARGIUDOLL

Location — Inland of Choiseul Bay; DOS 6/156/10 186591

Site — On flat limestone terrace(?) region, approximately 0.8-1.6km long, 120-150m wide; free to imperfect drainage. Alt. 50m

Parent material — Limestone

Microrelief — Practically smooth nearby, elsewhere on flat plain outcrops of limestone produce hillocks, less than 1m amplitude

Stoniness — Marked in lower profile, little at surface

Erosion — Not evident

Vegetation — Old forest with some secondary growth species. Tree species include *Vitex cofassus* (5), *Ficus crassiramea* (1), *F. benjamina, F. theophrastoides.* Palms very common in second storey

Land use — Unused

Soil surface — Thin, closed humus cover

Horizon	Depth cm	Description
1 A11	0-5	Very dark brown (10YR 2/2, moist); clay loam; friable to loose, moist; free drainage; common medium, fibrous and few medium, woody roots:
2 A12	5-33	Dark brown (10YR 3/3, moist); clay loam; firm, moist; free drainage; few small, fibrous roots:
3 B21	33-97	Yellowish brown (10YR 5/6, moist); common coarse distinct dark brown (10YR 3/3) mottles; clay loam; firm, moist; free drainage; few medium, woody roots:
4 B22	97-127	Dark brown to brown (10YR 4/3, moist); many medium, faint very dark greyish brown (10YR 3/2) and yellowish brown (10YR 3/6) mottles; clay; firm, moist; few small, distinct brownish yellow (10YR 6/6) coarse material; imperfect drainage:
5 B3	27-140	Dark greyish brown (10YR 4/2, moist); few medium, distinct yellowish brown (10YR 5/6) and yellowish red (5YR 4/8) mottles; clay loam; firm, moist; weathered grains of bedrock and grains of black magnetite(?); poor drainage.
6		Rock sample

Remarks — Unlike all previous limestone areas en route. Extensive, flat, with relatively little microrelief. Soil depth irregular; deep at pit site but limestone occasionally exposed at surface.

Characteristic	Horizon (depth in cm)					
	1	2	3	4	5	6
	0-5	5-33	33-97	97-127	127-140+	Rock sample
Moisture (100-105°C) %	7.7	4.4	5.2	4.4	4.1	
Bulk density g/ml	0.59	0.90	0.89	0.92	0.89	
Loss on ignition %						
pH (1:2.5) soil: water	6.5	5.9	6.0	7.2	7.6	
Conductivity mmhos/cm^2	0.38	0.07	0.06	0.09	0.16	
Carbonate meq %					85	
Exch. Na meq %	0.3	0.2	0.2	0.1	0.1	
Exch. K meq %	0.8	0.1	0.1	0.1	0.1	
Exch. Mg meq %	5.8	0.7	0.7	0.8	1.7	
Exch. Ca meq %	79.2	29.1	32.1	34.5	51.2	
TEB meq %	86.1	30.1	33.1	35.5	53.1	
CEC meq %	85.1	38.3	38.9	39.3	41.5	
Base saturation %	100	79	85	90	100	
Total N %	0.80	0.34	0.10	0.14	0.21	
Organic C %	15.89	2.73	0.82	1.10	2.01	
Total P ppm	2 030	950	670	1 080	1 470	270
Total K ppm	700	550	750	750	750	950
Total Mg ppm	4 250	5 400	6 000	7 100	7 100	5 500
Available P:						
(Olsen) ppm	16	<1	<1	2	9	
(Bray) ppm	22.1	6.2	6.2	16.2		
Mechanical analysis						
2 mm – 200 µ %	14	3	5	9	12	
200 µ – 50 µ %	11	14	11	21	24	
50 µ – 20 µ %	16	13	9	10	10	
20 µ – 2 µ %	12	18	14	15	15	
<2 µ %	47	52	61	45	39	
Trace metals ppm						
Cobalt Co						50
Copper Cu						10
Chromium Cr						10
Manganese Mn						120
Nickel Ni						120
Zinc Zn						10

CHOISEUL 38 — **LAND SYSTEM FATA 'OLO**
SOIL GROUP TYPIC TROPAQUEPT

Location — North Choiseul, middle valley of Vachö River; estimated 8km north-east of Ghazalata, on watershed between Vachö and Pavora Rivers; DOS 6/156/15 297519

Site — Inland floodplain or swamp; slopes 2°, 1°, 0°, 5°, 2°; flat; receiving drainage. Alt. 229m

Parent material — Weathered calcareous marl and derived alluvium

Microrelief — Flat to very gently undulating with amplitude of about Im

Stoniness — One small, rounded volcanic stone

Erosion — Not evident

Vegetation — Old forest; irregular canopy 15-37m. Tree species include *Terminalia brassii* (4) and *T. calamansanai* (1). Small trees include *Dillenia ingens, Dysoxylum* sp., *Myristica* sp., *Horsfieldia* sp. and *Amoora* sp.. Mostly woody herb and shrub layer

Land use — Unused

Soil surface — Scattered fresh litter

Horizon	Depth cm	Description
1 A1	0-13	Dark yellowish brown (10YR 3/4, moist); common diffuse, distinct dark reddish brown mottles; silty clay; plastic, sticky, wet; free drainage:
2 B2	13-33	Strong brown (7.5YR 5/6, moist); common fine, distinct light brownish grey mottles; clay; plastic, sticky, wet; imperfect drainage:
3 C1g	33-64	Dark grey (10YR 4/1, moist); few fine prominent olive grey mottles; clay; plastic, sticky, wet: strongly impeded drainage:
4 C2g	64-79	Dark yellowish brown (10YR 3/4, moist); many diffuse, faint dark reddish brown mottles; clay loam; plastic, slightly sticky; strongly impeded drainage:
5 C3	79-97	Greenish grey (5GY 6/1, moist); friable, moist; weathered soft parent material; free drainage.

Remarks — Parent material limits root development at 76cm.

Characteristic	Horizon (depth in cm)				
	1	2	3	4	5
	0-13	13-33	33-64	64-79	79-97
Moisture (100-105°C) %	5.8	5.2	4.7	4.5	2.5
Bulk density g/ml	0.71	0.87	0.94	0.74	0.86
Loss on ignition %					
pH (1:2.5) soil: water	5.9	5.2	5.0	7.2	7.5
Conductivity mmhos/cm^2	0.18	0.56	0.54	0.12	3.75
Carbonate meq %					930
Exch. Na meq %	0.4	1.1	0.9	0.4	0.3
Exch. K meq %	0.6	0.2	0.2	0.3	0.3
Exch. Mg meq %	4.6	3.2	1.5	0.8	1.4
Exch. Ca meq %	33.9	24.4	21.8	37.2	750.0
TEB meq %	39.5	28.9	24.4	38.7	
CEC meq %	59.9	41.8	39.9	40.7	23.1
Base saturation %	66	69	61	95	
Total N %	0.95	0.28	0.18	0.10	0.07
Organic C %	10.12	1.95	1.67	1.27	1.15
Total P ppm	1 480	720	320	520	830
Total K ppm	900	950	850	1 000	1 950
Total Mg ppm	3 900	4 950	4 550	5 300	6 900
Available P:					
(Olsen) ppm	0	1	1	9	8
(Bray) ppm	13.4	8.4	10.4	27.9	
Mechanical analysis					
2 mm – 200 μ %		0	3	13	1
200 μ – 50 μ %		2	11	24	8
50 μ – 20 μ %		9	10	8	17
20 μ – 2 μ %		29	22	17	38
<2 μ		60	54	38	36

CHOISEUL 50 — **LAND SYSTEM POSARAE**
SOIL GROUP OXIC DYSTROPEPT

Location — East-central Choiseul, south-east of Pupuku; DOS 6/156/16 527507

Site — Just below a ridge crest on slightly convex slope 9°; adjacent upper slope 20°; flanking slopes 29° and 40°. Alt. 289 m

Parent material — Probably Tertiary volcanics

Microrelief — Small hummocks and depressions associated with slight soil accumulations around tree roots

Stoniness — Few surface stones

Erosion — Slight soil creep

Vegetation — Old lowland forest with secondary regrowth. Tall tree species include *Canarium salomonense* (4), *Maranthes corymbosa* (2), *Ficus* sp. (1), *Cananga odorata* (2). Second storey species: *Rhopaloblaste elegans, Vitex cofassus, Mangifera indica, Fagraea racemosa, Ficus* sp.

Land use — Unused

Soil surface — Fresh leaf litter up to 5 cm thick

Horizon	Depth cm	Description
! A11	0-3	Dark reddish brown (5YR 3/2, moist); clay; friable, moist; free drainage; many (60%) coarse interstitial pores; many small to medium fibrous and woody roots; diffuse boundary:
2 A12	3-18	Reddish brown (5YR 4/4, moist); clay; subangular blocky structure; firm, moist; few medium subangular volcanics; free to imperfect drainage; few (10%) fine, interstitial pores; common small to medium, fine to woody roots; diffuse irregular boundary:
3 B21	18-84	Red (2.5YR 4/6, moist); silty clay; weekly prismatic structure; very firm, moist; few medium, subangular volcanics; free to imperfect drainage; few (10%) fine, interstitial pores; few small, fibrous roots; diffuse irregular boundary:
4 B22	84-178	Dark red (2.5YR 3/6, moist); common medium distinct yellowish red (5YR 5/6) and strong brown (7.5YR 5/6) mottles; silty clay; weak prismatic structure; very firm, moist; many small to medium, subangular volcanics; free to imperfect drainage; few (10%) fine, interstitial pores:
5 B3	178-244	Yellowish red (5YR 4/6, moist); many medium, distinct yellowish brown, dark red, dark brown, dark reddish brown mottles; stony silty clay; firm, moist; many, medium subangular volcanics; few (10%) fine, interstitial pores:
6 C	244 +	Brown to dark brown (7.5YR 4/4, moist); many diffuse mottles as above; stony silty clay; friable to firm, moist; many small to medium, soft and hard, subangular volcanics; few (10%) fine, interstitial pores:
7		Rock sample:

Remarks — Soil colour not the deep red of some extensive ridge crests.

CHOISEUL 50 **LAB. NO. 9720-9725, 938**

Characteristic	Horizon(depth in cm)						
	1	2	3	4	5	6	7
	0-3	3-18	18-84	84-178	178-244	244+	Rock Sample
Moisture (100-105°C) %	6.6	3.8	3.5	4.1	4.5	4.8	
Bulk density g/ml	0.48	0.86	0.81	0.77	0.74	0.75	
Loss on ignition %							
pH (1:2.5) soil:water	6.1	5.6	5.7	5.6	5.6	5.7	
Conductivity mmhos/cm^2	0.23	0.05	0.04	0.04	0.03	0.03	
Carbonate meq %							
Exch. Na meq %	0.6	0.2	0.1	0.1	0.1	0.3	
Exch. K meq %	0.6	0.1	tr	tr	tr	tr	
Exch. Mg meq %	7.1	3.1	2.2	1.6	1.9	3.6	
Exch. Ca meq %	30.0	9.1	4.8	3.4	3.4	2.7	
TEB meq %	38.3	12.5	7.1	5.1	5.4	6.6	
CEC meq %	50.8	21.3	10.5	12.1	16.5	26.7	
Base saturation %	75	59	68	42	33	25	
Total N %	0.66	0.23	0.05	0.02	0.01	0.02	
Organic C %	13.82	2.89	0.60	0.24	0.22	0.24	
Total P ppm	480	490	190	200	220	220	380
Total K ppm	800	750	750	750	700	700	1 000
Total Mg ppm	3 950	4 350	3 950	4 600	8 050	11 050	19 150
Available P (Olsen) ppm (Bray) ppm	9.4	5.5	3.6	4.3	4.5	5.1	
Mechanical analysis							
2 mm – 200 μ %	3	1	0	1	0	0	
200 μ – 50 μ %	2	3	0	0	1	0	
50 μ – 20 μ %	5	6	4	9	9	12	
20 μ – 2 μ %	34	27	41	41	50	49	
< 2 μ %	56	63	55	49	40	39	
Trace metals ppm							
Cobalt Co	80	80	80	130	200	190	70
Copper Cu	40	30	30	40	50	50	100
Chromium Cr	<10	10	<10	<10	10	10	< 10
Manganese Mn	830	760	440	1 305	2 290	2 250	830
Nickel Ni	100	120	140	130	150	140	120
Zinc Zn	80	90	60	90	170	200	70

CHOISEUL 51 — **LAND SYSTEM ARULIHO**
SOIL GROUP TYPIC TROPORTHENT

Location	East Choiseul, Panggoe area, about 3 km west-south-west of Ghaghara; DOS 6/157/13 891195
Site	About 12 m downslope from hill crest just above gully head. Middle slope, 40°, convex; adjacent upper slope 20°; normal to shedding drainage. Alt. 46 m
Parent material	Quaternary andesite, possibly ash beds
Microrelief	Irregular from terracetting, treefall scars and gullying
Stoniness	None at surface
Erosion	Surface wash and gullying
Vegetation	Secondary forest, more than 25 years old. Canopy 15-30 m 60% closed. Tall tree species include *Campnosperma brevipetiolata* (4), *Vitex cofassus* (3), *Endospermum medullosum* (1) and *Planchonella thyrsoidea* (2). Banana/palm/fern lower storey and fern/herb ground cover
Land use	Unused now
Soil surface	Scattered fresh litter

Horizon	Depth cm	Description
1 A11	0-10	Dark brown (10YR 3/3, moist); clay loam; strong fine to medium crumb structure; very friable, moist; one large, round andesite stone; free drainage; many fine to medium, tubular and interstitial pores; many small and medium, few large fibrous to to woody roots; clear wavy boundary:
2 A12	10-28	Brown to dark brown (10YR 4/3, moist); loam; massive, breaking to moderate fine and medium subangular blocky structure; very friable, moist; few small subangular andesite stones;free drainage; few fine/medium intersitial pores; common medium, woody roots; clear broken boundary:
3 C1	28-84	Olive grey (5Y 5/2, moist); soft weathering parent material with bands and patches of brown to dark brown, sandy clay loam between; clear wavy boundary:
4 C2	84-152	Olive grey (5YR 5/2, moist); soft parent material with common fine, distinct dark brown to black mottles and faint linear, olive brown weathering front streaks at base of horizon:
5 C3	152-168	Light olive grey (5Y 6/2, moist); soft sandy parent material with streaks of olive brown to reddish brown mottles:
6 C3	168-183+	As horizon C2.

Remarks — Possibly sedimentary andesitic material but no bedding grain size variations. Beds visible in C horizon traversed by weathering front colours.

CHOISEUL 51 **LAB. NO. 9726-9731**

Characteristic	Horizon (depth in cm)					
	1	2	3	4	5	6
	0-10	10-28	28-84	84-152	152-168	168-183+
Moisture (100-105°C) %	4.7	3.1	1.7	1.3	6.2	3.9
Bulk density g/ml	0.80	0.87	1.00	1.07	0.62	0.75
Loss on ignition %						
pH (1:2.5) soil: water	6.2	5.9	5.8	6.1	6.6	6.5
Conductivity mmhos/cm^2	0.14	0.06	0.03	0.04	0.04	0.04
Carbonate meq %						
Exch. Na meq %	0.3	0.2	0.2	0.3	0.6	0.4
Exch. K meq %	0.3	0.1	0.1	0.1	0.3	0.3
Exch. Mg meq %	4.5	0.9	0.2	0.7	2.7	2.8
Exch. Ca meq %	16.0	2.5	0.6	2.1	10.8	10.9
TEB meq %	21.1	3.7	1.1	3.2	14.4	14.4
CEC meq %	27.9	10.3	4.6	4.4	18.2	18.0
Base saturation %	75	37	24	72	80	80
Total N %	0.48	0.25	0.05	0.01	0.02	0.01
Organic C %	8.14	3.53	1.10	0.52	0.23	0.54
Total P ppm	1 180	1 020	1 050	890	1 320	1 670
Total K ppm	1 300	1 450	1 750	1 900	1 150	1 400
Total Mg ppm	8 400	10 250	12 350	11 200	8 800	12 550
Available P (Olsen) ppm						
(Bray) ppm	29.6	45.0	192.2	174.1	26.6	29.6
Mechanical analysis						
2 mm – 200 μ %	4	19	15	17	6	15
200 μ – 50 μ %	18	20	30	28	23	30
50 μ – 20 μ %	15	25	23	23	17	22
20 μ – 2 μ %	32	24	24	26	34	19
< 2 μ %	31	12	8	6	20	14

CHOISEUL 54 — **LAND SYSTEM MANGGO**
SOIL GROUP TROPOFLUVENT

Location	North Choiseul, Manumanu River, about (3 km) upstream on true left bank, less than 30 m from river bank DOS 6/156/16 678419
Site	Flood channel in floodplain; receiving drainage. Alt. 15 m
Parent material	Recent sediments
Microrelief	Channelled
Stoniness	No surface stones
Erosion	Surface wash
Vegetation	No vegetation
Land use	Unused
Soil surface	Scattered fresh litter

Horizon	Depth cm	Description
1 A1	0–10	Greyish, yellowish brown; sandy loam; loose.

Remarks Recent (one month old) flood deposit after cyclonic weather.

Characteristic	Horizon (depth in cm)
	0–10
Moisture (100–105°C) %	6.7
Bulk density g/ml	1.01
Loss on ignition %	
pH (1:2.5) soil: water	7.2
Conductivity mmhos/cm^2	0.09
Carbonate meq %	
Exch. Na meq %	0.8
Exch. K meq %	0.9
Exch. Mg meq %	11.2
Exch. Ca meq %	33.1
TEB meq %	46.0
CEC meq %	47.9
Base saturation %	96
Total N %	0.04
Organic C %	0.66
Total P ppm	350
Total K ppm	1 650
Total Mg ppm	25 850
Available P	
(Olsen) ppm	
(Bray) ppm	38.9
Mechanical analysis	
2mm – 200 μ %	19
200 μ – 50 μ %	34
50 μ – 20 μ %	16
20 μ – 2 μ %	15
<2 μ %	16
Trace metals ppm	
Cobalt Co	80
Copper Cu	50
Chromium Cr	10
Manganese Mn	1 110
Nickel Ni	100
Zinc Zn	90

GUADALCANAL
125

LAND SYSTEM PUSURAGHI
SOIL GROUP HYDRIC TROPOHEMIST

Location Near Mongga River, traverse on 300° bearing from garden house south of Nazareth S.D.A. school. Chain 40. About 46 m from hill edge; AMS 7829/1 575499

Site Embayment between long hill spurs; series of these with no draining streams resulting in swamps; level slope; ponded drainage. Alt. 0–6 m

Parent material Peat swamp

Microrelief Mounds accumulate around some palm bases; mound and hollow microrelief

Stoniness No surface stones

Erosion Not evident

Vegetation Sago swamp, over 95% *Metroxylon sagu,* many sago suckers; no fruiting trees seen. Shrubs include much Hanguana malayana, *Pandanus, Fagraea racemosa* and *Calophyllum cerasiferum*

Land use Unused

Soil surface Covered by rotting palm fronds; at present 10–15 cm water on surface increasing to 46 cm in wet season

Horizon	Depth cm	Description
1 021g	0–36	Very dark brown (10YR 2/2, moist); organic peat; non sticky, slightly plastic, wet; very poorly drained; many medium and small, fibrous and fleshy roots, many form surface mat:
2 022 g	36–56	Dark brown (7.5YR 3/2, moist); organic peat; non sticky, slightly plastic, wet; very poorly drained; few medium and few fine roots:
3 023g	56–117+	Dark reddish brown (5YR 2/2, moist); organic peat; non sticky, slightly plastic; very poorly drained; few fine roots.

Remarks High watertable 15–46 cm above ground level limits root development.

Characteristic	Horizon (depth in cm)		
	1	2	3
	0–36	36–56	56–117+
Moisture 100–105^{0}C %	13.7	12.8	14.2
Bulk density g/ml	0.15	0.26	0.23
Loss on ignition %	76.0	78.0	74.2
pH (1:2.5) soil: water	5.9	5.0	5.6
Conductivity mmhos/cm^2	0.03	0.14	0.13
Carbonate meq %			
Exch. Na meq %	1.2	0.7	1.0
Exch. K meq %	0.7	0.1	0.3
Exch. Mg meq %	10.8	7.1	12.6
Exch. Ca meq %	31.5	15.3	32.7
TEB meq %	44.2	23.2	46.6
CEC meq %	68.6	56.3	69.8
Base saturation %	64	41	67
Total N %	2.33	2.05	
Organic C %			
Total P ppm	750	388	558
Total K ppm	375	nil	125
Total Mg ppm	2 950	3 125	3 200
Available P (Olsen) ppm			
(Bray) ppm	12.0	4.1	7.2

OUTER ISLANDS 38 **LAND SYSTEM LOMOUSA**
SOIL GROUP TYPIC TROPORTHENT

Location Liuaniua Island, Lord Howe; BSI 1:60 000; Ontong Java F3 125

Site About 2.4 km from Liuaniua Village; on a storm beach 9 m from the sea; less than 2°, straight slope; no surface drainage. Alt. less than 3 m

Parent material Coral debris, comminuted coral and pumice fragments

Microrelief Smooth

Stoniness Coral cobbles less than 15 cm diameter over entire surface

Erosion Not evident

Vegetation Mixed strand line vegetation with storm-damaged coconuts of various ages. Regrowth trees include *Intsia bijuga, Macaranga tanarius, Terminalia catappa* and *Pandanus* spp.

Land use Coconuts

Soil surface Scattered fresh litter

Horizon	Depth cm	Description
1 A11	0-8	Very dark greyish brown (10YR 3/2, moist); loamy sand; weak very fine, crumbly to single grain structure; loose, moist; many large to small coral stones; free drainage; many interstitial pores; many small to large roots; clear smooth boundary:
2 A12	8-38	Brown (10YR 5/3, moist); sand; single grain structure; loose, moist; many large to small coral stones; free drainage; many interstitial pores; many small to large roots; sharp irregular boundary:
3 C1	38-58	Very pale brown (10YR 8/4, moist); common small reddish yellow sand grains; sand; single grain structure; loose, moist; many large to small coral stones; excessive drainage; many interstitial pores; few small roots; smooth abrupt boundary:
4 C2	58-69	Very pale brown (10YR 8/4, moist); common prominent black streaks; sand; single grain structure; loose, moist; many large to small coral stones; excessive drainage; many interstitial pores; many small and large roots; smooth abrupt boundary:
5 C3	69-102	Very pale brown (10YR 8/3, moist); many small reddish yellow sand grains; sand; single grain structure; loose, moist; many large to small coral stones; excessive drainage; many interstitial pores; few large roots; smooth clear boundary:
6 C4	102-152+	Very pale brown (10YR 8/3, moist); many small reddish yellow sand grains; sand; single grain structure; loose, moist; common coral debris; excessive drainage; many interstitial pores; few small roots.

Characteristic	Horizon (depth in cm)					
	1	2	3	4	5	6
	0-8	8-38	38-58	58-69	69-102	102-152
Moisture (100-105°C) %	1.0	0.4	0.2	0.1	–	0.2
Bulk density g/ml	0.97	1.08	1.14	1.04	1.10	1.19
Loss on ignition %						
pH (1:2.5) soil: water	8.0	8.4	9.00	9.0	9.1	9.3
Conductivity mmhos/cm^2	0.24	0.22	0.15	0.16	0.13	0.12
Carbonate meq %	1 770	1 875	1 910	1 915	1 920	1 930
Exch. Na meq %	0.4	0.4	0.3	0.4	0.4	0.3
Exch. K meq %	0.1	tr	tr	tr	tr	nil
Exch. Mg meq %	4.5	3.8	3.2	4.5	4.8	4.5
Exch. Ca meq %	50.2	>50.0	41.1	41.4	>50.0	>50.0
TEB meq %	55.2		44.6	46.3		
CEC meq %	11.0	3.33	0.3	0.9	0.2	0.2
Base saturation %	>100		>100	>100		
Total N %	0.29	0.11	0.03	0.03	0.02	0.02
Organic C %	2.94	0.92	0.21	0.31	0.17	0.13
Total P ppm	530	340	190	280	190	190
Total K ppm	700	800	750	750	800	750
Total Mg ppm	8 850	10 250	13 000	16 350	13 600	10 750
Available P:						
(Olsen) ppm	19	5	6	3	2	2
(Bray) ppm						
Mechanical analysis						
2 mm – 200 μ %	76	78	87	85	86	89
200 μ – 50 μ %	11	13	8	8	6	8
50 μ – 20 μ %	2	2	2	2	6	2
20 μ – 2 μ %	3	2	1	2	1	0
<2 μ %	8	5	2	3	1	1

OUTER ISLANDS 40 **LAND SYSTEM LOMOUSA**
SOIL GROUP TYPIC TROPOPSAMMENT

Location Liuaniua Island, Lord Howe; BSI 1: 60 000; Ontong Java F1 125

Site Some 1.6 km from Liuaniua Village, 9m from the sea, inside first beach ridge; less than 5° convex slope; no surface drainage. Alt. less than 1.5 m

Parent material Mixed coral debris with minor addition of pumice

Microrelief Slightly hummocky

Stoniness No surface stones

Erosion Not evident

Vegetation Coconut grove of mixed age; oldest trees >50 yrs, all look healthy but few fruits. Thick shrub layer of *Pandanus* present

Land use Coconut groves

Soil surface Thin surface litter

Horizon	Depth cm	Description
1 A11	0-8	Very dark grey (10YR 3/1, moist); loamy sand; weak fine, crumbly to single grain structure; loose to very friable, moist; few rounded 2.5 cm pumice stones; free drainage; many interstitial pores; many small and large roots; clear wavy boundary:
2 A12	8-30	Pale brown (10YR 6/3, moist); few coarse, diffuse, very dark grey mottles; loamy sand; single grain structure; loose to very friable, moist; few large shell fragments; free drainage; many interstitial pores; many small and large roots; clear irregular boundary:
3 C11	30-79	Very pale brown (10YR 8/3, moist); few prominent, coarse, pale brown mottles; sand; single grain structure; loose to very friable, moist; few large shell fragments; free drainage; many interstitial pores; common large roots:
4 C11	79-107	Very pale brown (10YR 8/3, moist); few prominent, coarse, pale brown mottles; sand; single grain structure; loose to very friable, moist; few large shell fragments; free drainage; many interstitial pores; common large roots; clear smooth boundary:
5 C2	107-127	White (10YR 8/2, moist); few prominent, coarse, pale brown mottles; sand; massive to single grain structure; friable to firm, moist; common shell fragments; watertable present in this horizon; few large roots; abrupt smooth boundary:
6 C3	127-142+	Too wet to colour but mostly pale brown sand and shells; sand; massive structure; non sticky, non plastic, wet; many shells; watertable present in this horizon:
7		Pumice sample.

Characteristic	Horizon (depth in cm)						
	1	2	3	4	5	6	7
	0-8	8-30	30-79	79-107	107-127	127-142	pumice
Moisture (100-105°C) %	1.4	1.0	0.3	0.2	0.2	0.1	0.1
Bulk density g/ml	0.80	0.88	1.06	1.04	1.00	1.08	1.08
Loss on ignition %							
pH (1:2.5) soil: water	8.0	8.2	8.7	8.9	8.7	8.9	
Conductivity mmhos/cm^2	0.30	0.24	0.14	0.14	0.16	0.16	
Carbonate meq %	1 745	1 835	1 890	1 910	1 915	1 925	
Exch. Na meq %	0.5	0.3	0.3	0.3	0.2	0.3	
Exch. K meq %	0.3	0.1	tr	tr	tr	tr	
Exch. Mg meq %	4.4	4.0	3.0	3.4	2.8	4.3	
Exch. Ca meq %	>50.0	>50.0	>50.0	25.0	50.0	>50.0	
TEB meq %					53.0		
CEC meq %	13.9	7.8	1.2	0.4	0.8	0.6	
Base saturation %					>100		
Total N %	0.28	0.18	0.06	0.03	0.04	0.03	
Organic C %	3.82	2.39	0.59	0.28	0.41	0.30	
Total P ppm	360	270	190	200	250	270	130
Total K ppm	600	750	750	700	750	850	400
Total Mg ppm	2 150	5 600	6 200	6 900	9 200	10 150	200
Available P: (Olsen) ppm	12	4	1	1	3	4	
(Bray) ppm							
Mechanical analysis							
2mm – 200 μ %	48	48	59	55	76	79	
200 μ – 50 μ %	31	37	37	41	19	14	
50 μ – 20 μ %	5	4	1	2	1	2	
20 μ – 2 μ %	7	4	1	0	2	1	
<2 μ %	9	7	2	2	2	4	
Trace metals ppm							
Cobalt Co	40	50	50	40	50	40	10
Copper Cu	<10	<10	10	<10	<10	<10	<10
Chromium Cr	<10	<10	<10	<10	<10	<10	nil
Manganese Mn	10	<10	10	<10	<10	<10	20
Nickel Ni	90	100	100	100	100	100	20
Zinc Zn	<10	<10	10	<10	<10	<10	20

SHORTLANDS 11 **LAND SYSTEM BALO**
SOIL GROUP VITRANDEPT

Location Alu (Shortland) Island, south of Kupala Bay, 2 km inland on line 3/1700 of Sample Area CA; DOS 6/155/15 052224

Site Low hill top, 122 m wide; dominant slope 1°, other slopes 12° and 6°; shedding drainage. Alt. 91 m

Parent material Volcanics with later addition of volcanic ash

Microrelief Few small treefall scars

Stoniness Rare subangular, hard, volcanic stones 5-6 cm diameter

Erosion Not evident

Vegetation Old forest with 30-37 m canopy. Large trees include *Pometia pinnata* (2), *Neoscortechinia forbesii*, *Neonauclea* sp. and *Amoora* sp. Small trees and palms include *Horsfieldia irya*, *Areca macrocalyx*, *Strongylocaryum latius* and *Calamus* sp. Herb layer dominated by *Selaginella*

Land use Unused

Soil surface Thin leaf litter

Horizon	Depth cm	Description
1	0-20	Very dark greyish brown (10YR 3/2 moist); clay loam; fine crumb structure; very friable, moist; free drainage; many small and medium, fibrous and woody roots:
2	20-33	Very dark greyish brown (10YR 3/2 moist); clay; fine crumb structure; very friable, moist; free drainage; common small, fibrous and woody roots:
3	33-76	Dark yellowish brown (10YR 3/3 moist); friable, moist; free drainage:
4	76-130	Dark brown (7.5YR 4/4 moist); friable, moist; common medium, soft weathered volcanic fragments; free drainage; common medium and coarse woody roots:
5	130-183	Dark yellowish brown (10YR 4/4 moist); clayloam; friable, moist; common medium, soft 5-12 mm weathered rock fragments.

Remarks Laboratory analyses show that there is considerable aggregation of claysize particles in this profile and that field estimates of texture are misleading. Textures of horizons 1, 3 and 4 are estimated; those of horizons 2 and 4 are known.

SHORTLANDS 11 **LAB. NO. 8155-8159**

Characteristic	Horizon (depth in cm)				
	1	2	3	4	5
	0-20	20-33	33-76	76-130	130-183
Moisture (100-105°C)%	8.0	8.5	9.7	12.0	12.6
Bulk density g/ml	0.71	0.85	0.89	0.80	0.80
Loss on ignition %					
pH (1:2.5) soil:water	5.4	5.3	5.7	5.6	5.6
Conductivity mmhos/cm^2	0.16	0.03	0.02	0.02	0.01
Carbonate meq%					
Exch. Na meq %	0.1	0.1	0.1	0.1	0.3
Exch. K meq %	0.4	tr	tr	tr	tr
Exch. Mg meq %	4.2	1.1	0.8	0.5	0.6
Exch. Ca meq %	14.5	2.2	3.0	2.9	2.4
TEB meq %	19.2	3.4	3.9	3.5	3.3
CEC meq %	38.5	24.7	19.0	19.6	21.9
Base saturation %	50	14	21	18	15
Total N %	0.99	0.29	0.09	0.05	0.04
Organic C %	11.08	3.00	0.75	0.37	0.28
Total P ppm	1 190	830	280	270	320
Total K ppm	450	400	350	300	400
Total Mg ppm	1 990	2 010	2 160	1 920	2 830
Available P (Olsen) ppm					
(Bray) ppm	17.6	19.0	22.0	23.4	19.2
Mechanical analysis*					
2 mm – 200 μ %	24	7	4*	23	20	29	4*
200 μ – 50 μ %	45	69	22	58	57	52	25
50 μ – 20 μ %	3	12	24	11	12	10	39
20 μ – 2 μ %	14	10		7	9	8	
<2 μ %	14	2	49	1	2	1	32

*Subsequent to routine analysis clay fraction known to be grossly underrated in horizons 2 and 5. These values inserted for comparison.

Appendix 2

Definitions of geomorphological parameters

Most of the following definitions and descriptions are based on those used by Speight (1967) pp 174-179, unless otherwise stated. The definitions and class limits are applicable to conditions throughout the Solomon Islands. Other definitions made by the authors are denoted thus*.

ALTITUDINAL RANGE

Mountains are distinguished from hills when all the following conditions are met:

1. The maximum altitude exceeds 1 000 m
2. The average altitude is greater than 350 m
3. The characteristic slope exceeds 30°

SLOPE CATEGORIES

TABLE 1 Definition of slope categories

Category	Angle (degrees)	Category	Angle (degrees)
Almost flat	<2	Moderately steep	20-30
Gentle	2- 8	Steep	30-45
Moderate	8-20	Precipitous	45-70
		Cliffed	>70

DRAINAGE PATTERN

No rigid quantitative definitions exist, but the patterns referred to are all described by Thornbury (1954).

DRAINAGE TEXTURE

The modal value of half the distance between major stream beds (Wood and Snell, 1960).

TABLE 2 Definition of drainage texture categories

Category	(m)
Ultra fine	<75
Very fine	75- 150
Fine	150- 300
Medium	300- 600
Coarse	600-1 200
Very coarse	>1 200

RIDGE TEXTURE

This can be defined in the same categories as drainage texture; it is not necessarily reciprocal.

AMPLITUDE OF REFLIEF (available relief, relief)

The largest difference in height commonly occurring within a land system between the altitude of a ridge crest or summit and that of the nearest valley floor. The term can refer to both microrelief and macrorelief features.

TABLE 3 Definition of categories of amplitude of relief

Relief category	Relief (m)	Relief category	Relief (m)
Negligible	<10	Moderately high Moderately deep+	75-105
Ultra-low Ultra shallow+	10-20	High Deep+	150-300
Very low Very shallow+	20-40	Very high Very deep+	>300
Low Shallow+	40-75		
+Applied when describing degrees of dissection.			

INTERNAL RELIEF*

This term is used in description of terraces in particular, and refers to the amplitude of relief within the relatively undissected terrace surfaces.

EXTERNAL RELIEF*

This term is used in ddscriptions of terraces in particular, and refers to the amplitude of relief at terrace margins where the sea or rivers have incised deeply. This expression and that above are also employed in the description of lava flows and cockpit karst.

TERRACETTES*

These are microrelief features similar to steps or small benches and found principally on steep, long slopes. Characteristically they have scarps or risers of 5-50 cm height and flats or treads of 10-50 cm depth and 30-300 cm width. They are covered mostly by surface wash material being trapped behind surface obstructions such as boulders or roots.

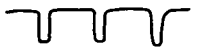
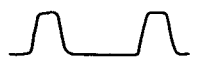
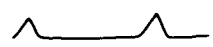
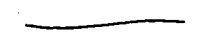
LANDFORM TERMS AND PARAMETERS

TABLE 4 Landform terms and parameters with methods of measurement and standard categories

Landform	Parameter	How measured	Categories
Crest	Width*	Horizontal distance between limits of summit convexity	Knife-edged: 0- 2 m Very narrow: 2- 5 m Narrow: 5- 15 m Broad: 15- 30 m Very Broad: 30-150 m
	Profile	Visual estimate	Even: small variation in crestal slope; reversals rare Uneven: moderate variation in crestal slope; some reversals Very uneven: great variation in crestal slope Stepped: few reversals Saw-tooth: reversals common
	Crestal slope	Along the ridge crest	Defined in Table 1
High-angle planes (e.g. scarp, hill slope, valley side slope, bench)	Length	Down line of greatest slope	Ultra short: <40 m Very short: 40- 75 m Short: 75-150 m Medium length: 150-300 m Long: 300-600 m Very long: >600 m
	Curvature	Visual estimate	Straight Concave Convex Irregular Undulating
	Slope	Down line of greatest slope	Defined in Table 1
	Spur characteristics	Visual estimate	Crestal slope: defined under landform category of crests Prominence: prominent inconspicuous absent
	Microrelief	Visual estimate	Slump alcoves Slump scars Debris slide tracks Gullies
Low-angle planes (e.g. plain, terrace, flood-plain, valley floor)	Gradient of slope	Parallel to the major drainage	Defined in Table 1
	Width	Perpendicular to the major drainage across uninterrupted areas of the land unit	Not classified; expressed in m or km
	Microrelief	Visual estimate	Height: expressed in m Type: undulating hummocky channelled terraced Local slope: expressed in degrees
Watercourses	Gradient	Along the channel	Defined in Table 1
	Width	Between bank tops or between the bases of confining hill slopes	Not classified; expressed in m

TABLE 4 (continued)

Landform	Parameter	How measured	Categories
Watercourses (continued)	Depth	From bank top level to mean thalweg	Not classified; expressed in m unless the stream is incised, when no depth is stated
	Levee character	–	Continuous Discontinuous Absent
	Bank slope	Visual estimate	Defined in Table 1
	Bar characteristics	–	Channel bars Point bars Bars absent
Miscellaneous (e.g. lava flow, doline, beach, swamp)	Not specified; to be compatible with those defined for other landform categories.		

HIGHS OCCUPY		HIGHS ARE → / SCHEMATIC PLAN / SCHEMATIC PROFILE	NON-LINEAR AND RANDOM	LINEAR AND RANDOM	NON-LINEAR AND PARALLEL	LINEAR AND PARALLEL
> 60% OF AREA	FLAT-TOPPED		1	1L	1//	1L//
40-60% OF AREA	FLAT-TOPPED		2	2L	2//	2L//
< 40% OF AREA	FLAT-TOPPED		3	3L	3//	3L//
> 60% OF AREA	CRESTED OR PEAKED		4	4L	4//	4L//
40-60% OF AREA	CRESTED OR PEAKED		5	5L	5//	5L//
< 40% OF AREA	CRESTED OR PEAKED		6	6L	6//	6L//
NO PRONOUNCED HIGHS OR LOWS			7			

Prepared by Land Resources Division LRD/BSIP/DW '1

TABLE 5 Plan-profiles of landforms (after van Lopik and Kolb, 1959)

Appendix 3

Soil analysis methods and definition of pedological parameters

1. METHODS OF SOIL ANALYSIS

Bulk density and moisture: a known volume of soil is weighed and calculated for 1 ml, the soil is then heated and % moisture calculated.

pH: measured in 1:2.5 soil-water ratio.

Conductivity: measured in 1:5 soil-water ratio.

Free carbonate: effervesces with addition of HCl : carbonate determined on samples which react.

Carbonate determination: reaction with HCl and back titration with NaOH.

Soluble cations Na and K: leaching with 80% Ind. methylated spirits; determination by flame photometry.

Exchangeable bases: leaching with neutral N ammonium acetate; Na and K determination by flame photometry on Auto Analyser and Mg and Ca by atomic absorption spectroscopy.

Cation exchange capacity: leaching with KCl at pH 2.5 after removal of excess ammonium acetate; NH_3 released determined by Auto Analyser.

Total nitrogen: a Kjeldahl digestion with a selenium catalyst followed by colorimetric determination by Auto Analyser.

Organic carbon: by Walkley and Black's method followed by colorimetric determination by Auto Analyser.

Total element analysis: perchloric acid digest and determination by Auto Analyser.

Phosphorus:	Colorimetrically using ascorbic acid as reducing agent
Potassium:	by flame photometry using Li as standard
Magnesium:	by atomic absorption spectroscopy with Sr as releasing agent
Trace elements:	by atomic absorption spectroscopy
Available phosphorus:	Olsen's method for soils with pH >7.0 Bray's method 2A for soils with pH <7.0

Mechanical analysis: Pretreated with H_2O_2 to remove organic matter and dispersed. Particles <20 μ are determined by settling. Clay and fine silt fractions (2 μ-20 μ, <2μ) are separated and calculated, and particles of <2μ determined by settling. Sand fraction >50 μ is sieved into coarse and fine sand fractions (200 μ-2 mm; 50 μ-200 μ) and % of each calculated. Coarse silt (50 μ-20 μ) is determined by difference.

2. DEFINITIONS AND PARAMETERS

All terms used in soil descriptions are those defined by the USDA soil Survey Staff (1951). Colour names and notations are from the Munsell Soil Color Chart.

The following are categorised or defined in Tables 1, 2 and 3 respectively: subsoil fertility; degree of clay weathering and leaching; soil depth.

TABLE 1 Subsoil fertility: component ratings for BSIP

Fertility	Bulk density g/ml	pH (H_2O)	Exchangeable meq %						Percentage			C/N ratio	Total ppm			Available P ppm	
			Na	K	Mg	Ca	TEB	CEC	BS	N	C		P	K	Mg	Olsen	Bray
High (more than)	1.00	7.0	0.5	0.5	4.0	10.0	15	25	60	0.5	10	15	500	10 000	10 000	15	50
Medium	1.00 – 0.70	7.0 – 5.0	0.5 – 0.1	0.5 – 0.2	4.0 – 0.5	10.0 – 2.0	15 – 3	25 – 6	60 – 20	0.5 – 0.1	10 – 2	15 – 8	500 – 250	10 000 – 5 000	10 000 – 4 000	15 – 5	50 – 15
Low (less than)	0.70	5.0	0.1	0.2	0.5	2.0	3	6	20	0.1	2	8	250	5 000	4 000	5	15
The ratings high, medium and low are a general assessment and do not represent the optimum or critical levels for any particular crop.																	

TABLE 2 Degree of clay weathering and leaching

Rating	Very strong	Strong	Moderately strong	Moderately weak	Weak
Weathering: $\frac{\text{CEC} \times 100}{\%\ \text{clay}}$	<1.5	1.5-16	16-24	24-40	>40
Leaching: $\frac{\text{TEB} \times 100}{\%\ \text{clay}}$	<1.5	1.5-10	10-12	12-30	>30

TABLE 3 Soil depth categories

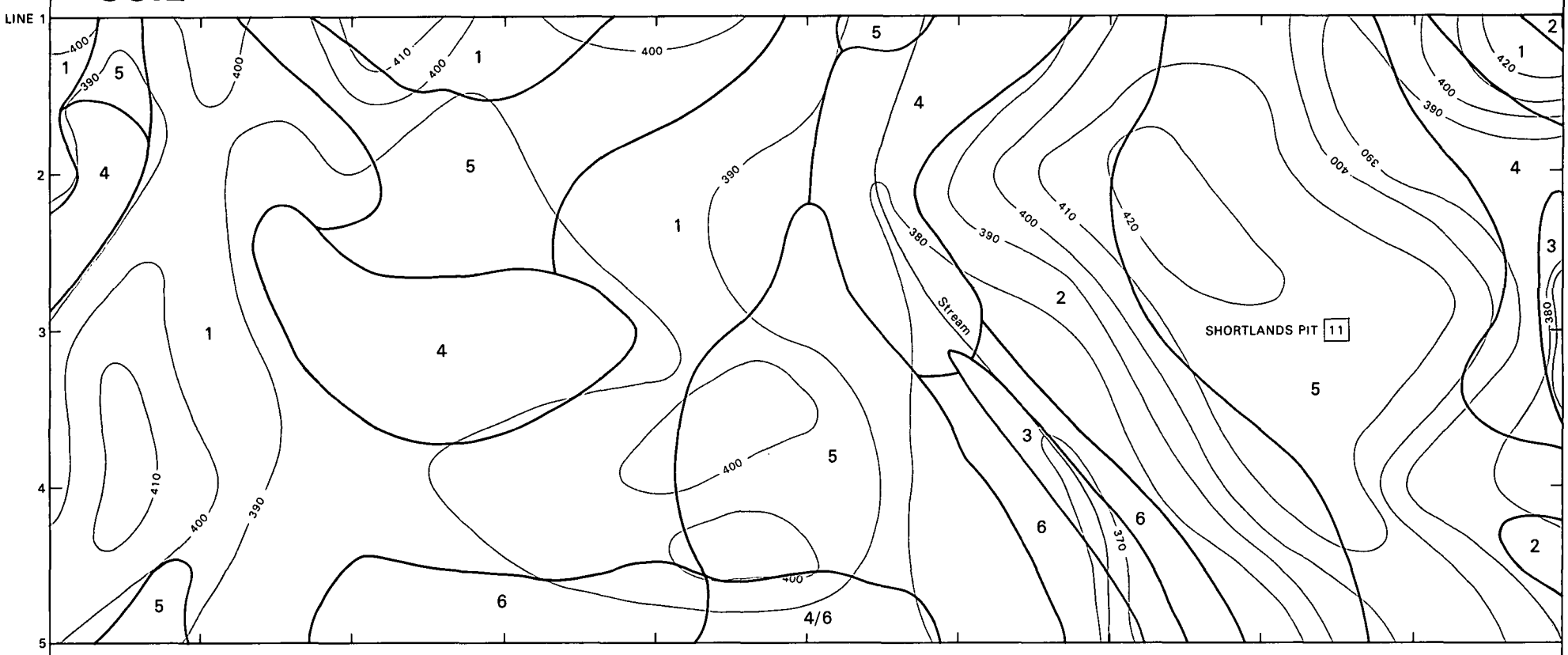
Category	Depth	
	cm	in
Shallow	0-25	0-10
Moderately shallow	25-50	10-20
Moderately deep	50-90	20-36
Deep	>90	>36

Appendix 4

Sample area studies

MAPS CA ALU
CB MONO
CC CHIROVANGA

SOIL



1 Deep, moderately well to imperfectly drained, strong brown to yellowish red clay loam overlying deep red clays. Common yellowish and brownish mottles in subsoil (Haplorthox)

2 Deep, well to moderately well drained, dark yellowish brown to strong brown loamy upper subsoil with yellowish red sandy clay to clay subsoil, locally reddish yellow and yellowish brown mottles (Andic Humitropepts)

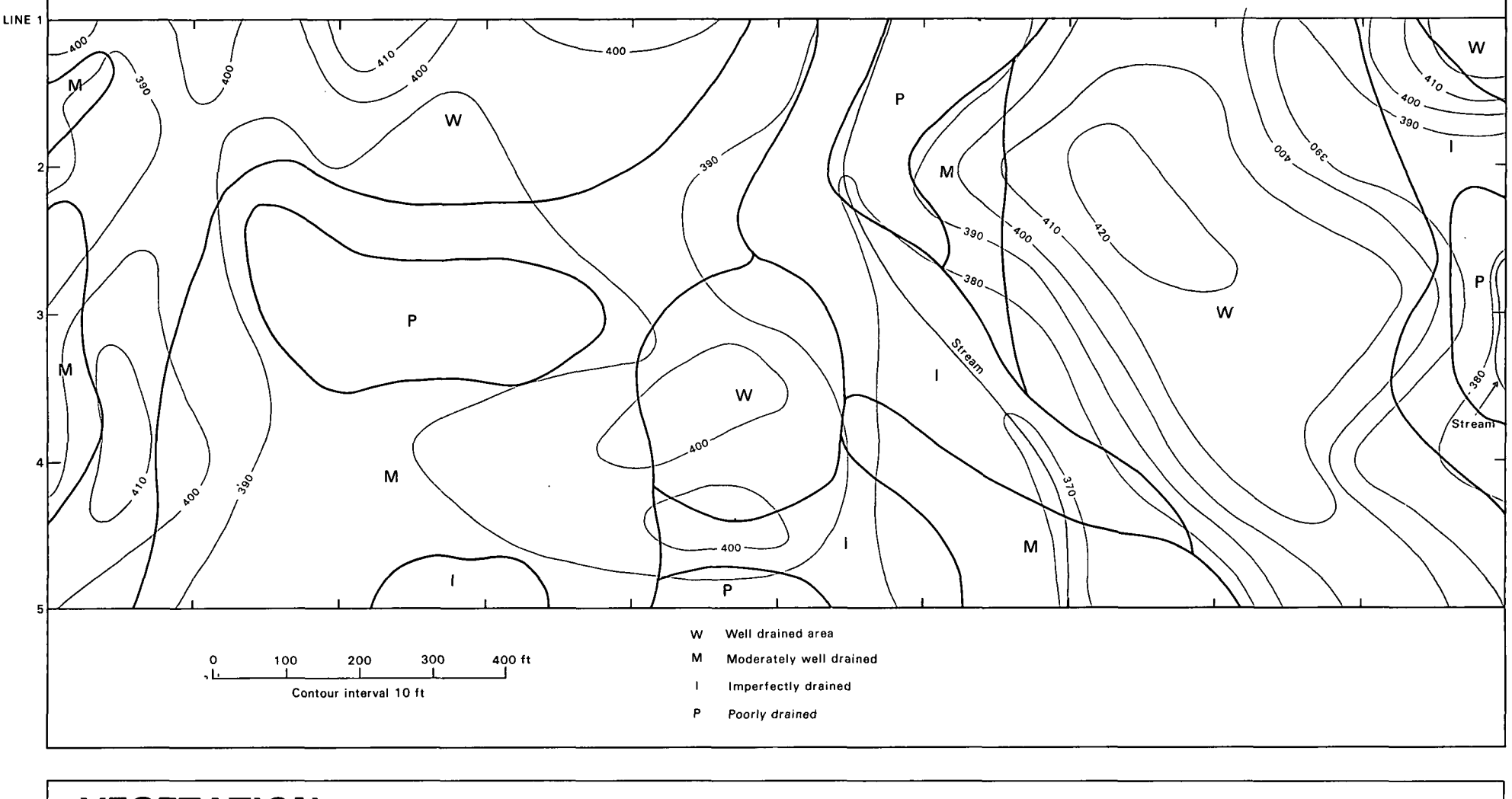
3 Shallow, dark yellowish brown clay loam, less than 25cm deep, along steeper river valleys (Fluvents)

4 Deep, poorly drained, gleyed greenish grey to light grey loams, locally underlying thick, dark, organic-rich topsoil commonly with a water table at the surface (Tropaquents)

5 Deep, moderately to imperfectly well drained, brownish silty loam to loam topsoil and upper subsoil overlying mottled, strong brown to yellowish brown clays. Olive brown to dark grey brown lower subsoils are common (Andic Humitropepts)

6 Deep, imperfectly drained, dark yellowish brown loam with grey and greenish grey mottles. Below one metre subsoils may include a greenish grey clay (Aquic Tropofluvents)

SOIL DRAINAGE



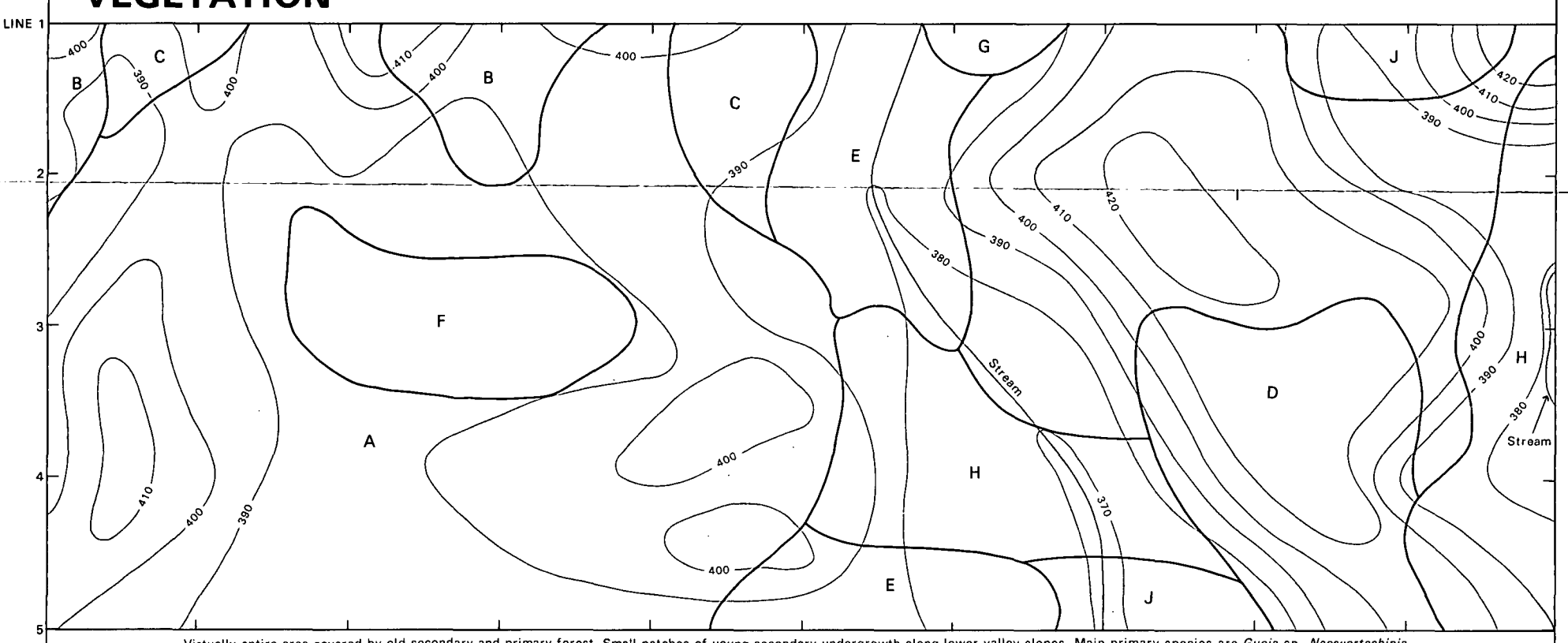
W Well drained area

M Moderately well drained

I Imperfectly drained

P *Poorly drained*

VEGETATION



Virtually entire area covered by old secondary and primary forest. Small patches of young secondary undergrowth along lower valley slopes. Main primary species are *Guoia* sp., *Neoscortechinia forbesii*, *Campnosperma brevipetiolata* and *Amoora* sp. in association with smaller trees such as; *Astronidium* sp. and *Gironniera celtidifolia*. Local variations are described below

A Primary forest containing all main species with *Guoia* sp. very common and occasionally dominant

B Canopy dominated by *Guoia* sp. and *Astronidium* sp., other large trees mainly absent

C A mixed forest with *Guoia* sp. present but not dominant

D A mixed forest with *Guoia* sp. present but not dominant and *Astronidium* sp. absent

E Primary forest with occasional young secondary undergrowth species. *Campnosperma brevipetiolata* and *Terminalia brassii* common in upper storey, whilst *Gynotroches axillaris* is locally dominant in the shrub layer

F Primary forest dominated by *Campnosperma brevipetiolata* and *Gynotroches axillaris* with occasional individuals of *Terminalia brassii*

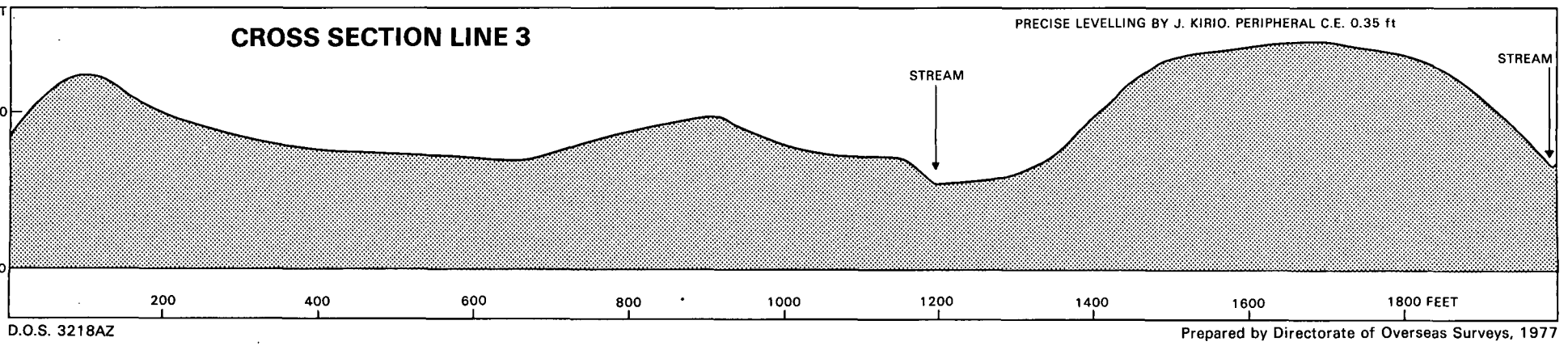
G *Barringtonia asiatica* dominant in tree and shrub layers. Other commonly occurring trees include *Terminalia brassii* and *Campnosperma brevipetiolata*

H Mixed primary and old secondary forest. No species dominant. *Guoia* sp. relatively uncommon. *Myristica* sp. and *Horsfieldia* sp. locally abundant

I Old secondary forest with relatively few large trees

J Mixed primary forest with *Amoora* sp. common

CROSS SECTION LINE 3



PRECISE LEVELLING BY J. KIRIO. PERIPHERAL C.E. 0.35 ft

D.O.S. 3218AZ

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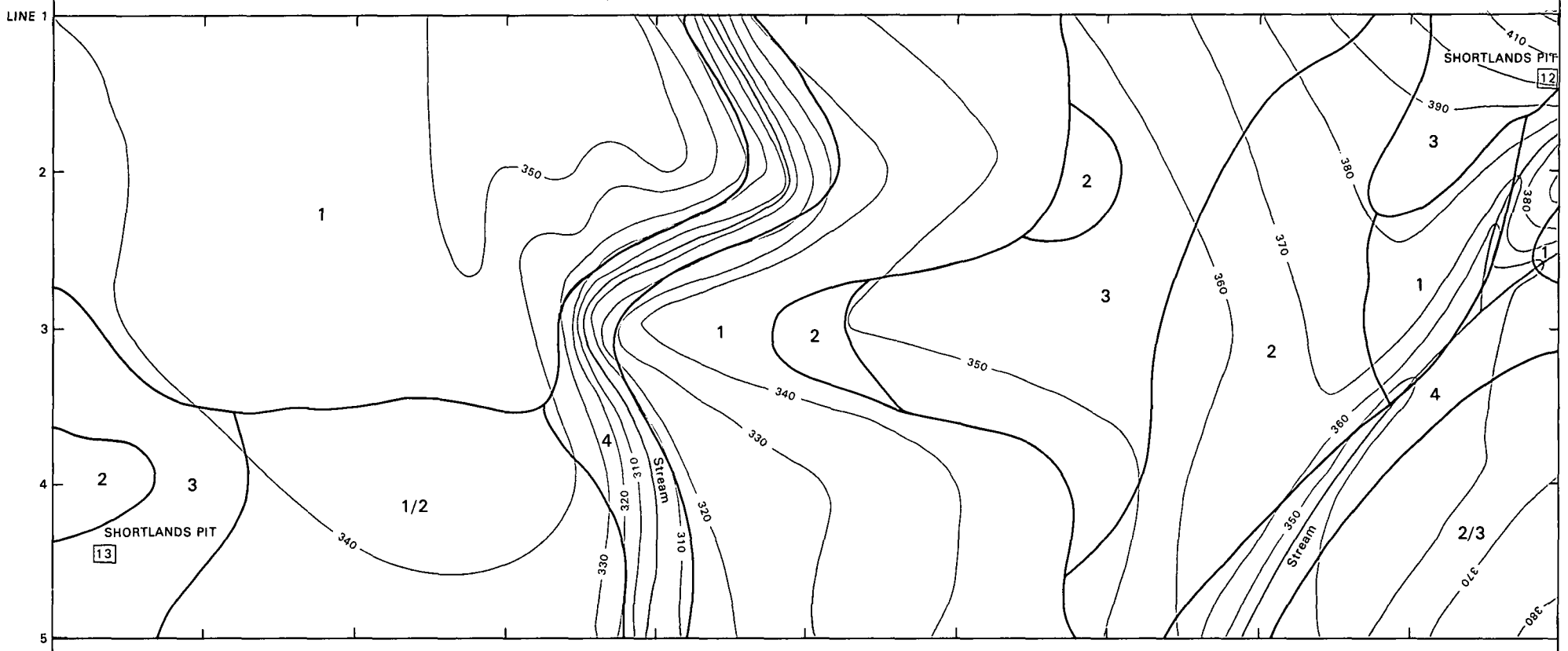
SAMPLE AREA CA ALU

SOIL



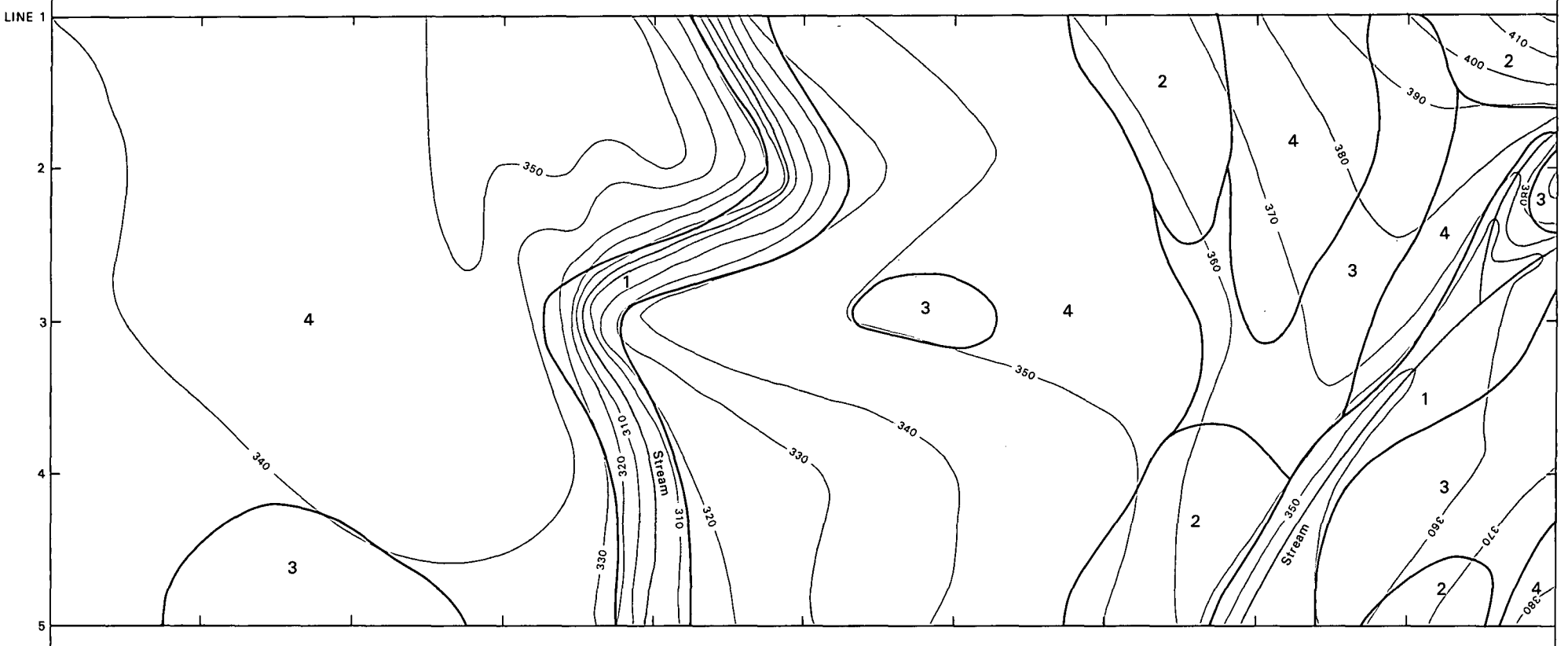
1 Moderately deep to deep, imperfectly drained brownish loams or clays overlying yellowish brown to yellow, mottled clay and clay loam subsoils (Aquic Tropudalfs)

2 Moderately shallow to deep, moderately well drained, brown to dark yellowish brown loams and clays locally overlying mottled strong brown clays (Tropudalfs)

3 Moderately shallow to deep, well drained clays and loams, commonly with dark brown, locally strong brown top soils, overlying dark brown and dark yellowish brown subsoils (Tropudalfs/Eutropepts)

4 *Lithosols, less than 25 cm deep overlying limestone, along river banks and on slopes of gorges* (Lithic Rendolls)

SOIL DEPTH



0 100 200 300 400 ft

Contour interval 10 ft

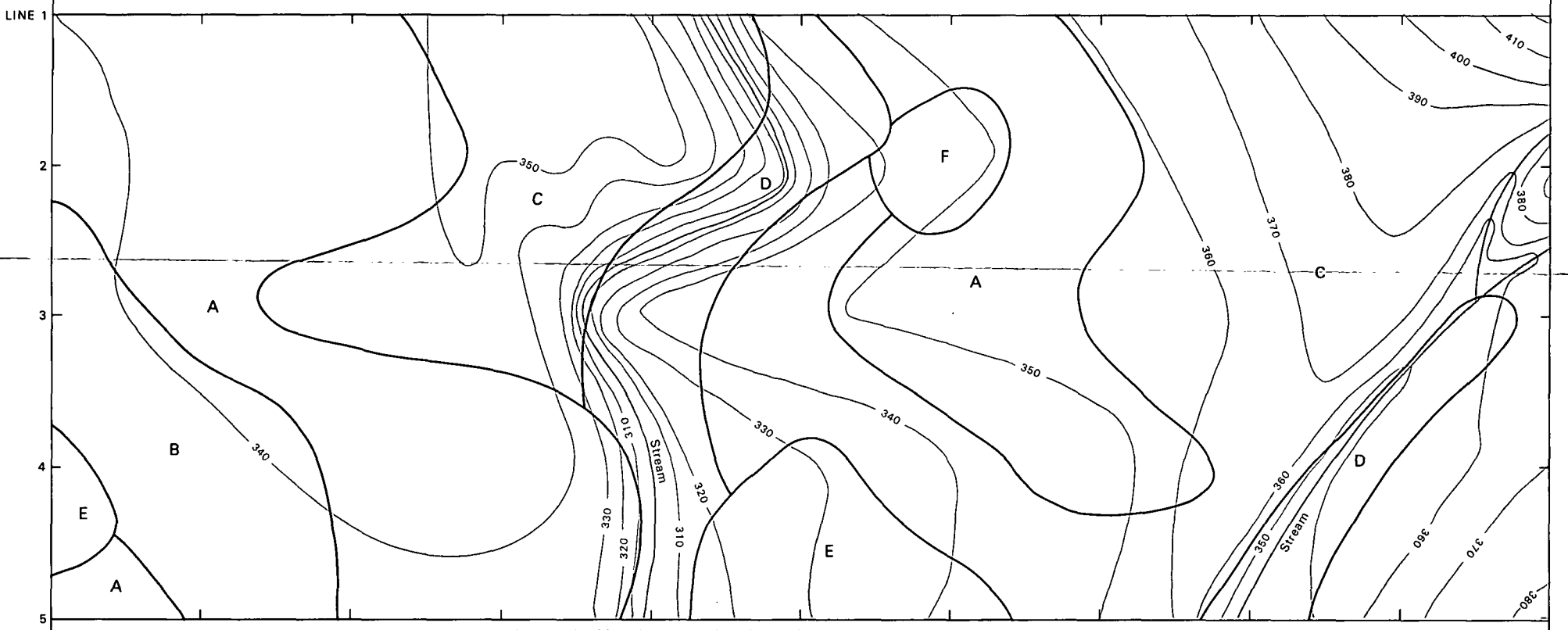
1 *Very shallow (<4") with many surface limestone boulders*

2 Moderately shallow to moderately deep (10"-20") with common limestone fragments and a few volcanic rocks

3 Moderately deep to deep (20"-36") with few limestone and volcanic rock fragments

4 Deep (>36") with surface stones rare

VEGETATION



Lowland forest with small patches of secondary growth on steep-sided gorges, in old gardens and cyclone damaged areas. Main canopy species are *Pometia pinnata* and *Vitex cofassus*, in association with *Horsfieldia irya, Dysoxylum* sp. and *Boerlagiodendron tetrandrum*. Variations are described below

A Old, presumed primary forest consisting of an association of *Pometia pinnata* and *Vitex cofassus* forming the canopy, with *Horsfieldia irya, Dysoxylum* sp. and *Boerlagiodendron tetrandrum* common

B As unit 1 but with *Horsfieldia irya* absent

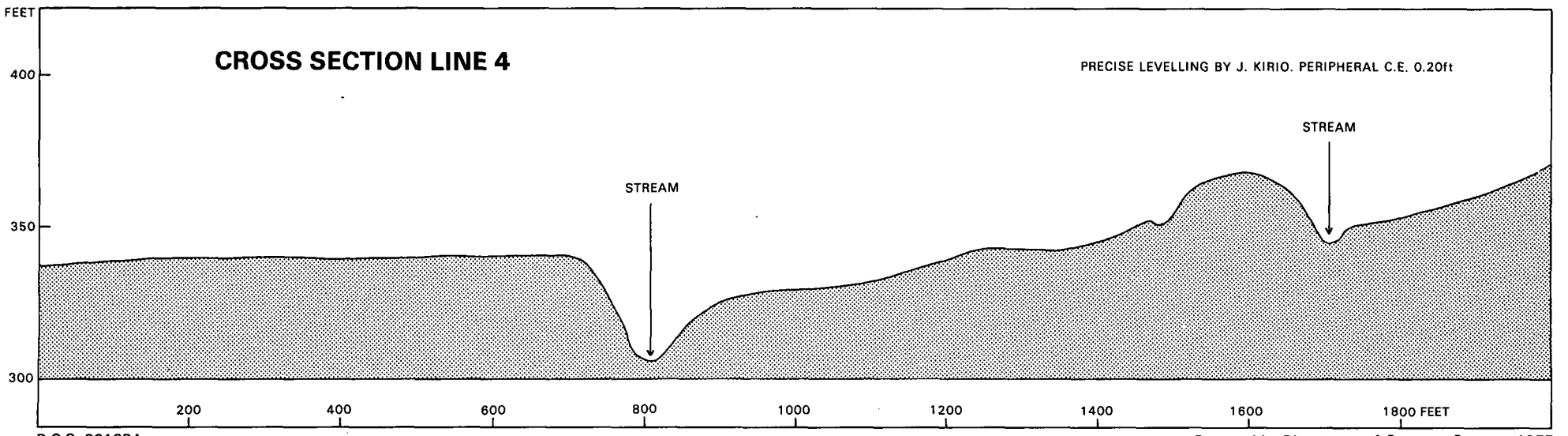
C As unit 1 but with *Boerlagiodendron tetrandrum* absent

D Forest with a relatively open tree canopy and occasional *Vitex cofassus* emergents containing some secondary growth on gorge slopes

E Secondary growth, 20-30 years old. Large individuals of *Pometia pinnata* and *Vitex cofassus* are rare. *Horsfieldia irya* and *Dysoxylum* sp. are common whilst *Macaranga* sp. and *Metroxylon salomonense* are also present

F Site of 20-25 years old abandoned garden containing isolated coconuts surrounded by secondary regrowth

CROSS SECTION LINE 4



PRECISE LEVELLING BY J. KIRIO. PERIPHERAL C.E. 0.20ft

D.O.S. 3218BA

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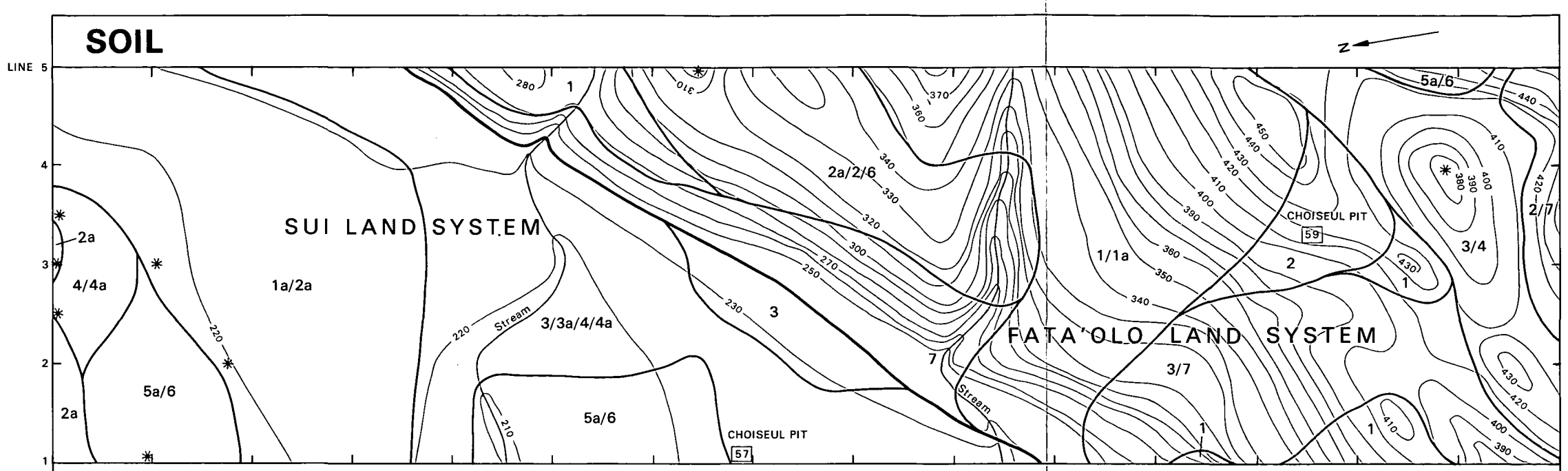
SAMPLE AREA CB MONO

SAMPLE AREA CC CHIROVANGA

SOIL



1 Deep, yellowish red or red clay with deep dark topsoil and locally changing to strong brown or yellowish brown clay above weathering rock (Haplorthox, Tropohumults)

2 Deep, strong brown clay beneath deep dark topsoil (Tropohumults, Argiudolls)

3 Moderately deep to deep, brownish to dark brown loams grading to clays with depth and locally with sandy or gravelly deep subsoil (Eutropepts, Tropudalfs)

4 As 3 but probably with mollic epipedon (Argiudolls, Hapludolls)

5 Deep, yellowish brown clay beneath deep, dark mollic epipedon and locally overlying dark to light soft weathering rock (Argiudolls, Hapludolls)

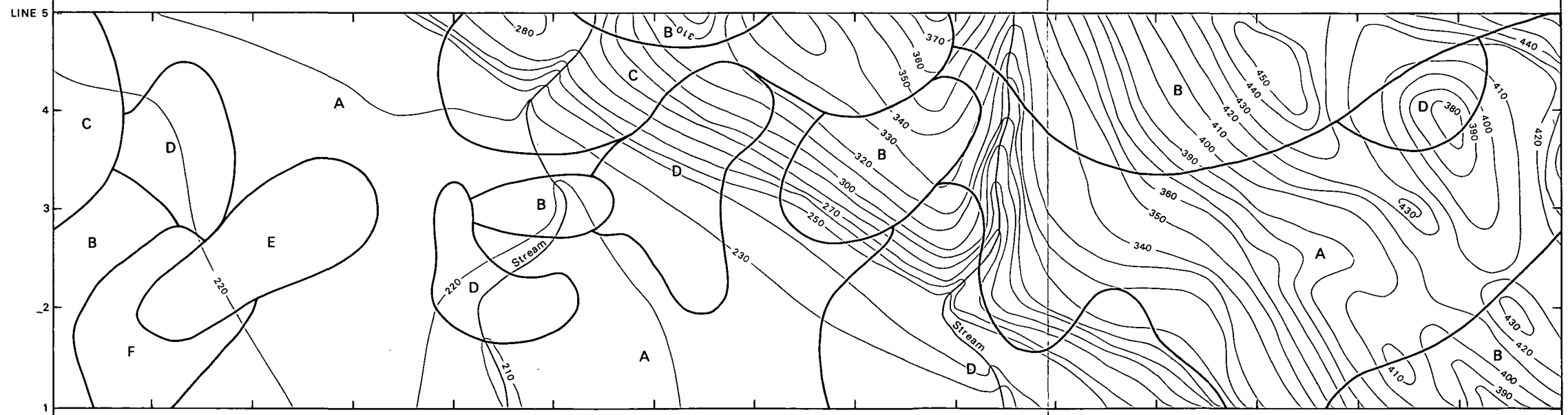
6 As 5 but probably without mollic epipedon (Tropudalfs, Eutropepts)

7 Moderately shallow to deep, brown to dark brown clay with mollic epipedon and with limestone parent rock (Rendolls)

a This suffix denotes Aquic Subgroups with subsoil mottling and gleying due to imperfect drainage

✳ Approximate sink hole location

FOREST & LAND USE



A Lowland forest with *Vitex cofassus* and *Pometia pinnata* common in the canopy. Small trees include *Caryota rumphiana*, *Celtis philippinensis* and *Zizyphus angustifolius*

B Lowland forest similar to group A but with *Celtis latifolia* occurring in the canopy

C Lowland forest similar to group A but with *Zizyphus angustifolius* absent and replaced by *Kleinhovia hospita* in the lower storey

D Lowland forest similar to group A but with *Ficus polyantha/F. hombroniana* common

E Garden containing a wide range of subsistence crops

F Garden regrowth with no large trees; low regrowth dominated by *Melochia umbellata*, *Macaranga urophylla* and *Dendrocnide* sp.

0 200 400 600 ft

Contour interval 10ft

D.O.S. 3218BB

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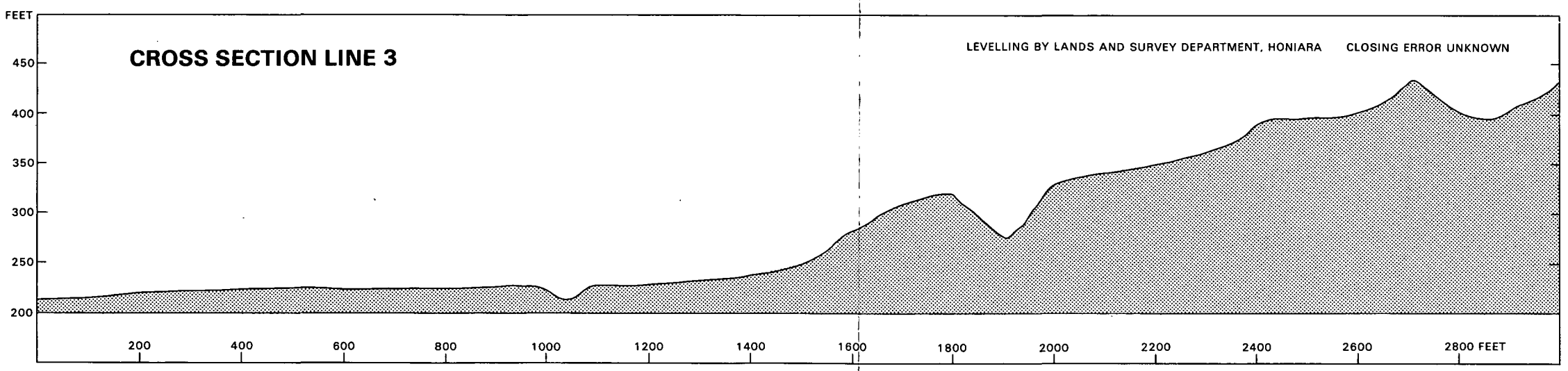
CROSS SECTION LINE 3

LEVELLING BY LANDS AND SURVEY DEPARTMENT, HONIARA CLOSING ERROR UNKNOWN



Publications of the

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BAWDEN M G and LANGDALE-BROWN I	1961	An aerial photographic reconnaissance of the present and possible land use in the Bamenda Area, Southern Cameroons.*
BAWDEN M G and STOBBS A R	1963	The land resources of Eastern Bechuanaland.
LANGDALE-BROWN I and SPOONER R J	1963	The land use prospects of Northern Bechuanaland.*
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