

LAND SUITABILITY MAP

CACAO

LAND RESOURCES EVALUATION AND SUITABILITY ASSESSMENT OF STRATEGIC PRODUCTION AREAS

MOUNTAIN PROVINCE



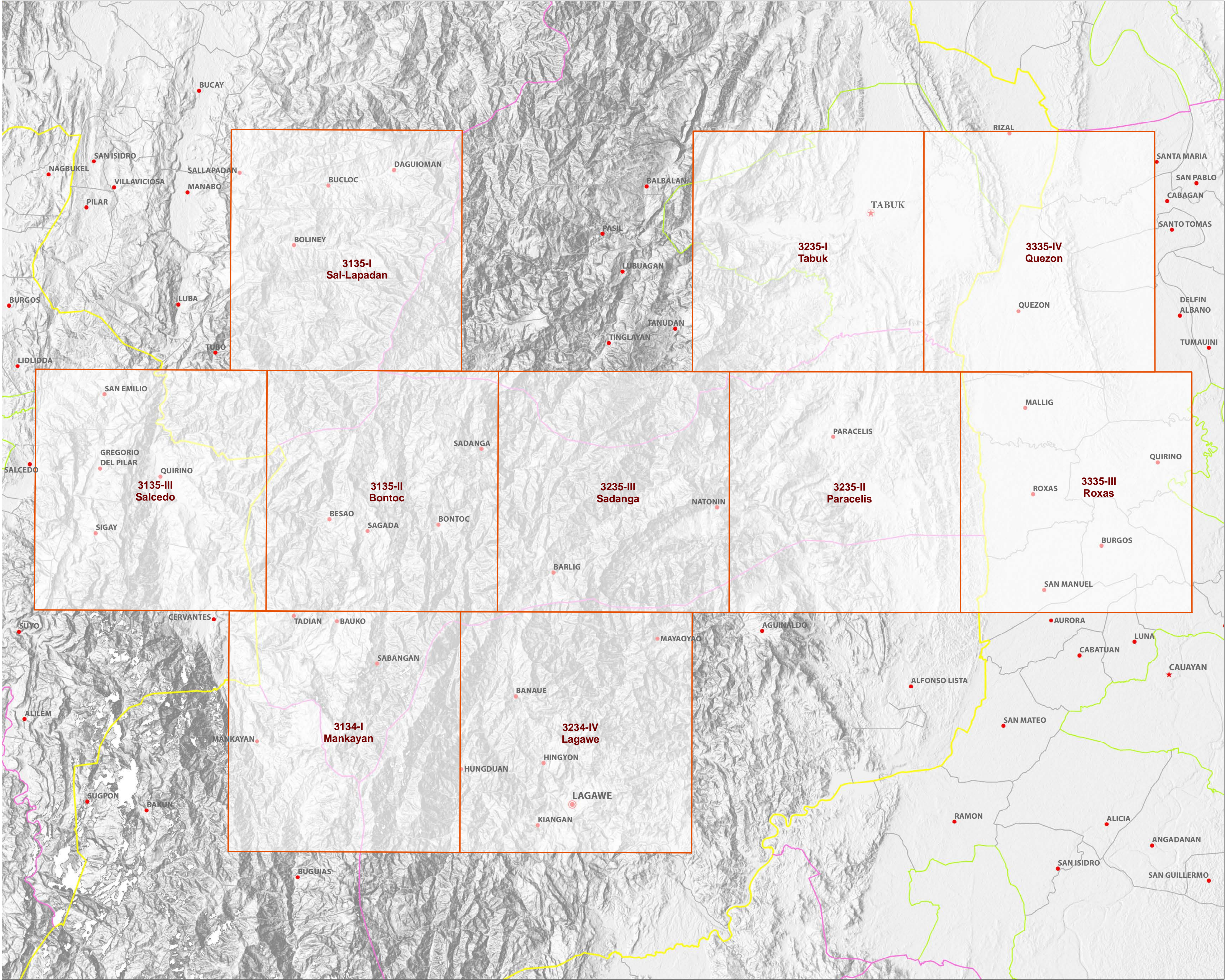
REPUBLIC OF THE PHILIPPINES
DEPARTMENT OF AGRICULTURE
BUREAU OF SOILS AND WATER MANAGEMENT

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MAP INDEX

LAND RESOURCES EVALUATION AND SUITABILITY ASSESSMENT OF STRATEGIC PRODUCTION AREAS

MOUNTAIN PROVINCE



LEGEND

Places

★ Capital City

★ City

● Capital Town

● Town

Administrative Boundary

Regional

Provincial

City

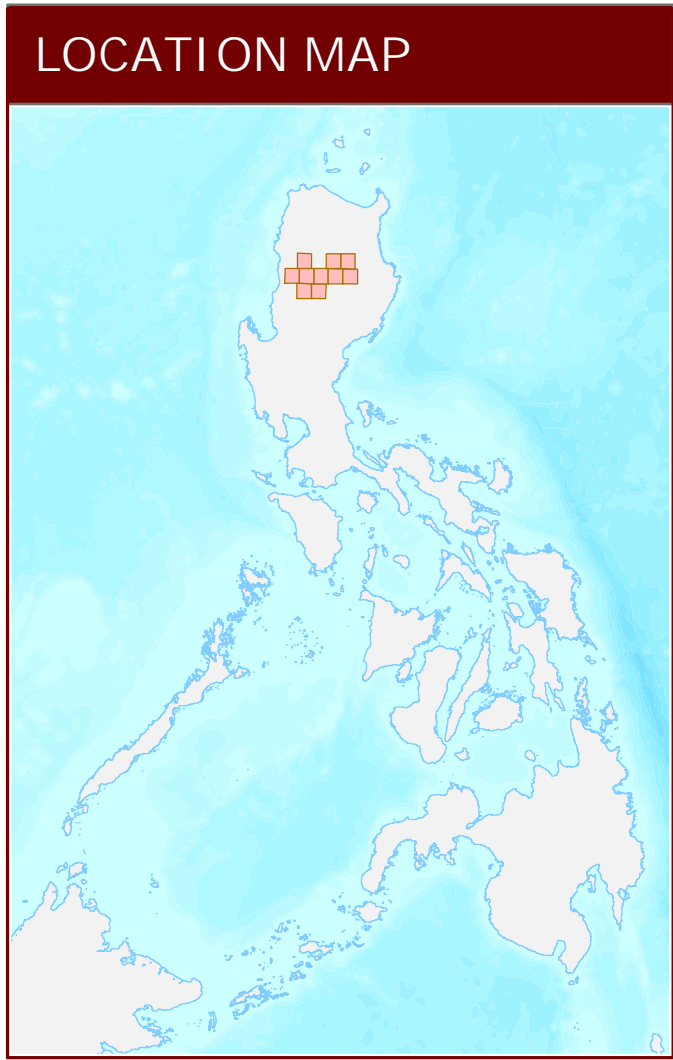
Municipal

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Bathymetry



LAND SUITABILITY MAP FOR CACAO

LAND RESOURCES EVALUATION AND SUITABILITY ASSESSMENT OF STRATEGIC PRODUCTION AREAS MOUNTAIN PROVINCE, CAR

EXTENT OF SUITABILITY FOR CACAO PRODUCTION BY MUNICIPALITY

MUNICIPALITY	EXISTING CACAO (Ha)			TOTAL EXISTING AREA (Ha)	EXPANSION AREA (Ha)						CONFLICT RESOLUTION (Ha)						TOTAL POTENTIAL EXPANSION AREA (Ha)
					Coconut		Shrubland, unmanaged*		Grassland, unmanaged*		Corn		Rice paddy, non-irrigated		Other crops		
	S1	S2	S3		S1	S2	S1	S2	S1	S2	S1	S2	S1	S2	S1	S2	
BARLIG	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BAUKO	-	-	-	-	-	-	-	39	-	74	-	212	-	1	-	-	325
BESAO	-	-	-	-	-	-	-	-	-	22	-	11	-	-	-	-	33
BONTOC	-	-	-	-	-	-	-	12	-	13	-	43	-	-	-	-	68
NATONIN	-	-	-	-	-	-	411	192	59	6	139	279	7	-	-	-	1,093
PARACELIS	4	-	11	15	385	286	3,284	53	4,235	78	6,097	99	2,050	49	-	-	16,617
SABANGAN	-	-	-	-	-	-	-	10	-	23	-	25	-	-	-	-	58
SADANGA	-	-	-	-	-	-	-	-	-	3	-	21	-	3	-	-	27
SAGADA	-	-	-	-	-	-	-	1	-	1	-	119	-	-	-	-	120
TADIAN	-	-	13	13	-	-	-	7	-	18	-	101	-	13	-	-	139
TOTAL	4	-	24	28	385	286	3,695	314	4,295	238	6,237	909	2,057	66	-	-	18,480

*establishment of shade trees prior to planting of cacao.

SUITABILITY CLASSES:

Highly Suitable (S1) Land having no significant limitation to sustained application of a given use, or only minor limitations that will not significantly reduce productivity or benefits and will not raise inputs above an acceptable level.	Marginally Suitable (S3) Land having limitations which in aggregate are severe for sustained application of a given use and will so reduce productivity or benefits, or increase required inputs, that this expenditure will be only marginally justified.
Moderately Suitable (S2) Land having limitation which in aggregate are moderately severe for sustained application of a given use; the limitation will reduce productivity or benefits and increase required inputs to the extent that the overall advantage to be gained from the use, although still attractive, will be appreciably inferior to that expected on class S1 land.	Not Suitable / Not Relevant Land having limitations which may be surmountable in time but which cannot be corrected with existing knowledge at currently acceptable cost; the limitations are so severe as to preclude successful sustained use of the land in the given manner. Existing forest, shrubland greater than 18% slope, irrigated paddy rice and miscellaneous land types such as built up areas, roads, etc are considered as not relevant.

AGRONOMIC REQUIREMENT OF CACAO PRODUCTION

LAND UTILIZATION TYPE	SUITABILITY RATING	SLOPE (%)	SOIL DEPTH (cm)	SOIL TEXTURE	SOIL DRAINAGE	SOIL REACTION (pH)	INHERENT FERTILITY	FLOODING CLASS	EROSION CLASS	ROCK OUTCROPS	ELEVATION (masl)	ANNUAL RAINFALL (mm)	CLIMATIC TYPE
Cacao	S1	<8	>100	CL, SiCL, SCL, SC, SiC, C, HC	WD,MWD	5.6 -7.2	high	none-slight	none-slight	none-few	<1000	2001-4500	I, III, IV
	S2	8 - 30	50 - 100	FSL, L, SiL	SPD,PD	5.1 - 5.5 7.3 - 7.8	medium	moderate	moderate	common	1000-1500	1000-2000	I, II
	S3	>30	<50	S, LS, CSL, SL	VPD,ED	<5.0 - > 7.9	low	severe	severe	many	>1500	<1000 >4500	

SLOPE (%) 0 - 3 - level to gently sloping 3 - 8 - gently sloping to undulating 8 - 18 - undulating to rolling 18 - 30 - rolling to moderately steep 30 - 50 - steep > 50 - very steep	SOIL DRAINAGE ED - excessively drained WD - well drained MWD - moderately well drained SPD - somewhat poorly drained PD - poorly drained VPD - very poorly drained	SOIL REACTION (pH) < 4.5 - extremely acid 4.5 - 5.0 - very strongly acid 5.1 - 5.5 - strongly acid 5.6 - 6.0 - medium acid 6.1 - 6.5 - slightly acid 6.6 - 7.2 - neutral 7.3 - 7.8 - mildly alkaline 7.9 - 8.4 - moderately alkaline > 8.5 - strongly alkaline	SOIL TEXTURE Coarse S - sand LS - loamy sand CSL - coarse sandy loam SL - sandy loam Medium FSL - fine sandy loam L - loam SiL - silt loam CL - clay loam SiCL - silty clay loam SCL - sandy clay loam Fine SC - sandy clay SiC - silty clay C - clay HC - heavy clay
SOIL DEPTH (cm) 0 - 30 - very shallow 30 - 50 - shallow 50 - 100 - moderately deep > 100 - deep to very deep	SURFACE IMPEDIMENT ROCK OUTCROPS < 10% - none - few 10 - 30% - common > 30% - many		

LAND LIMITATIONS DESCRIPTION AND COMBINATIONS

ELEVATION EI2 - 1000m - 1500m EI3 - > 1500m	SOIL DRAINAGE D2 - Somewhat poorly drained to poorly drained D3 - Very poorly drained or excessively drained	SOIL DEPTH Sh2 - Moderately deep (50 - 100cm) Sh3 - Very shallow to shallow (< 50cm)	SOIL EROSION E2 - Moderate erosion E3 - Severe erosion
SLOPE/TOPOGRAPHY T2 - Undulating to moderately steep T3 - Steep to very steep	SOIL TEXTURE Tc - Coarse texture	ROCK OUTCROPS Rc2 - Common Rc3 - Many	FLOODING F2 - Moderate seasonal flooding F3 - Severe seasonal flooding

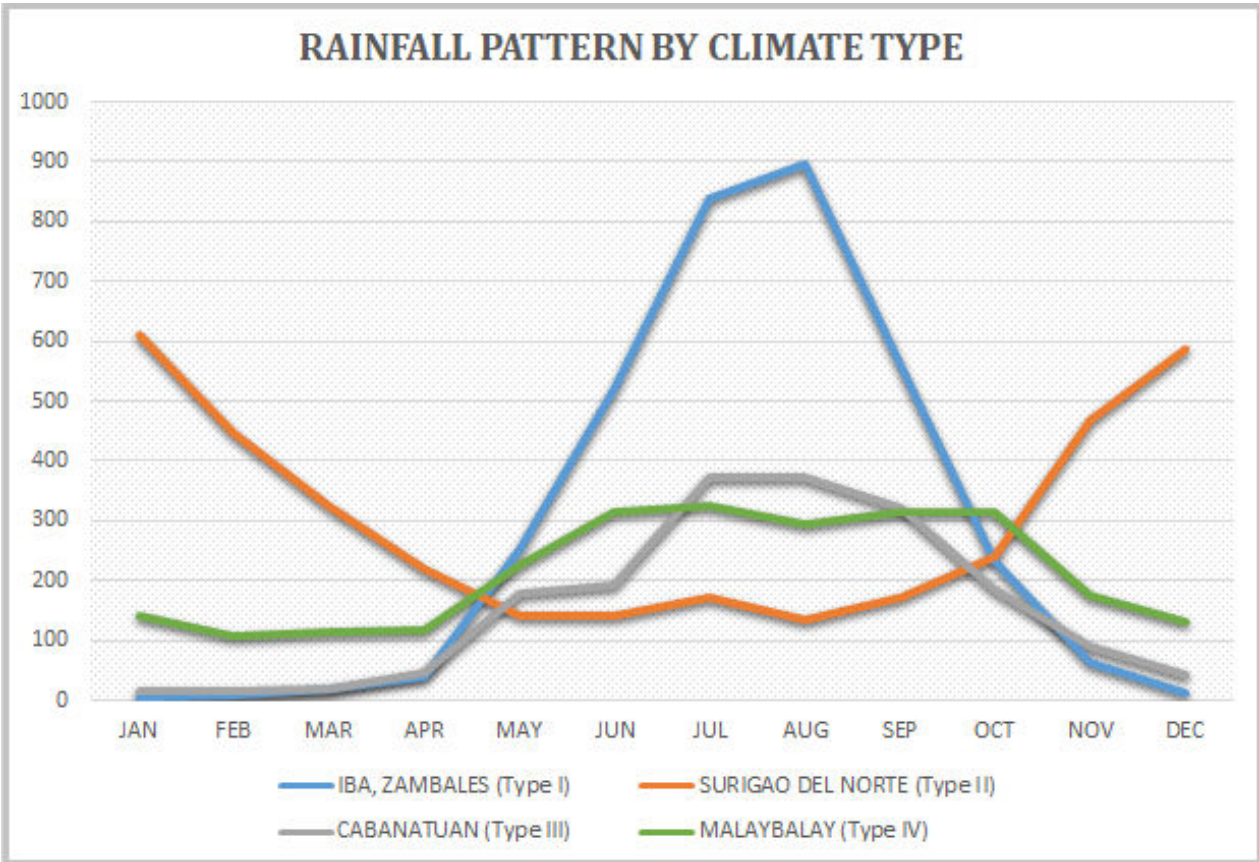
CODE	LAND LIMITATION	CODE	LAND LIMITATION	CODE	LAND LIMITATION	CODE	LAND LIMITATION	CODE	LAND LIMITATION
1	EI2	11	EI3-Sh2-Rc2	21	T2-EI2-E3-Sh2-Rc2	31	T3-E3-Rc2	41	T3-EI2-E3-Sh3-Rc3
2	EI2-E3-Rc3	12	EI3-Sh2-Rc3	22	T2-EI2-E3-Sh2-Rc3	32	T3-E3-Rc3	42	T3-EI3
3	EI2-E3-Sh2-Rc3	13	Sh2	23	T2-EI3	33	T3-E3-Sh3-Rc2	43	T3-EI3-E3
4	EI2-Rc2	14	T2	24	T2-EI3-E3	34	T3-E3-Sh3-Rc2	44	T3-EI3-E3-Rc2
5	EI2-Sh2-Rc2	15	T2-E3	25	T2-EI3-E3-Rc2	35	T3-EI2	45	T3-EI3-E3-Rc3
6	EI2-Sh2-Rc3	16	T2-E3-Rc2	26	T2-EI3-E3-Rc3	36	T3-EI2-E3	46	T3-EI3-E3-Sh2-Rc3
7	EI3	17	T2-EI2	27	T2-EI3-E3-Sh2-Rc2	37	T3-EI2-E3-Rc2	47	T3-EI3-E3-Sh3-Rc2
8	EI3-E3-Rc3	18	T2-EI2-E3	28	T2-EI3-E3-Sh2-Rc3	38	T3-EI2-E3-Rc3	48	T3-EI3-E3-Sh3-Rc3
9	EI3-E3-Sh2-Rc3	19	T2-EI2-E3-Rc2	29	T3	39	T3-EI2-E3-Sh2-Rc3		
10	EI3-Rc2	20	T2-EI2-E3-Rc3	30	T3-E3	40	T3-EI2-E3-Sh3-Rc2		

CODE	LAND USE
2	Rice paddy, non-irrigated
4	Corn
81	Coffee
82	Cacao
116	Coconut
126	Grassland
134	Shrubland, unmanaged

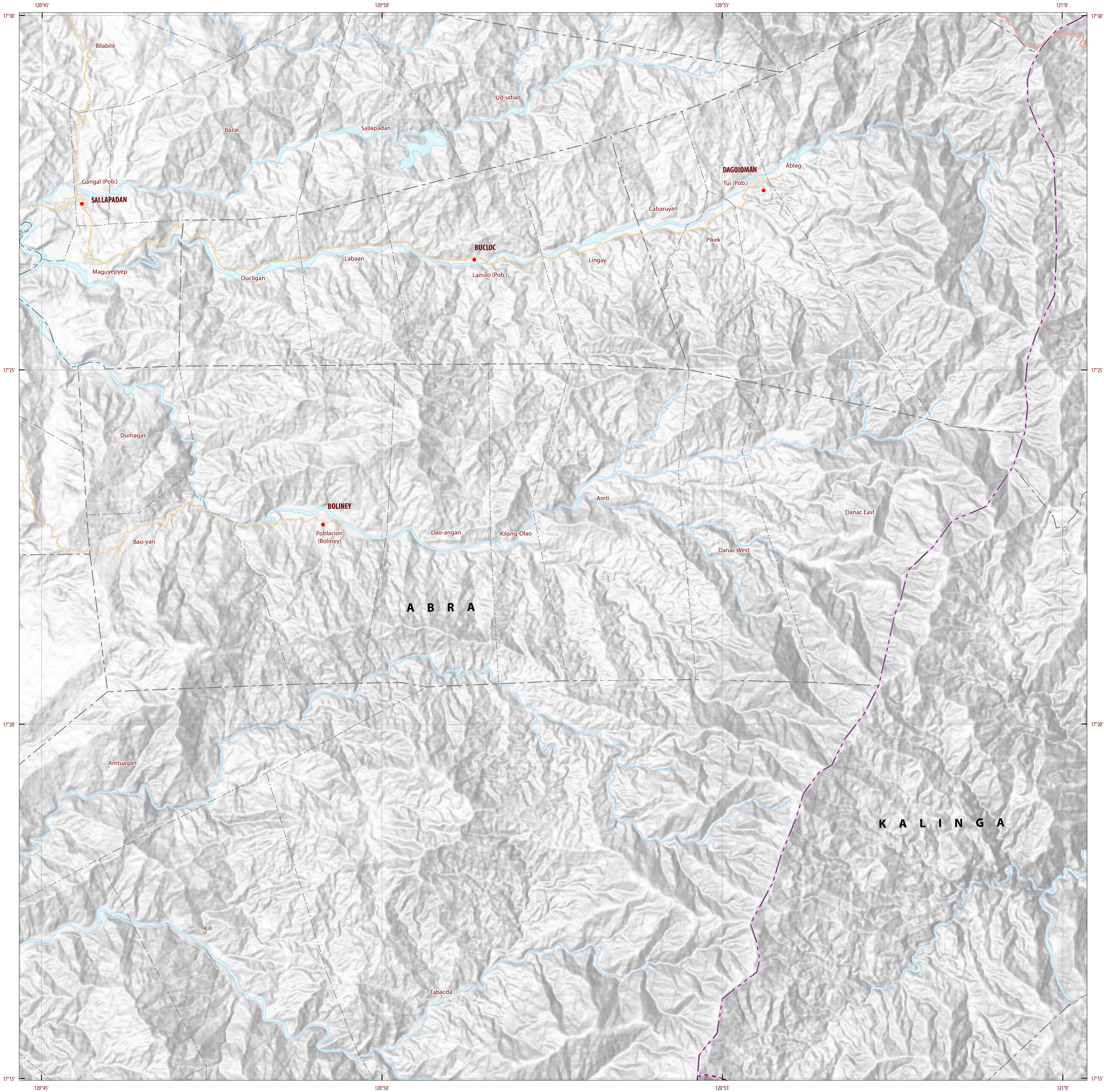
CLIMATE TYPE




TYPE I : Two pronounced season, dry from November to April and wet during the rest of the year. Maximum rain period is from June to September	TYPE II : No dry season with a very pronounced maximum rain period from December to February. There is not a single dry month. Maximum monthly rainfall occurs during the period from March to May.
TYPE III : No very pronounced maximum rain period, with a dry season lasting only from one to three months, either during the period from December to February or from March to May. This type resembles Type I since it has a short dry season.	TYPE IV : Rainfall is more or less evenly distributed throughout the year. This type resembles Type II since it has no dry season.

Western part of Mountain Province belongs to Type I climate classification and the rest on Eastern part belongs to Type III.



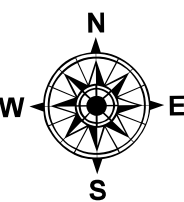
Source: PAGASA 2018, *Climatological Normals (Rainfall)*, Philippine Atmospheric, Geophysical and Astronomical Services Administration (PAGASA), accessed 27 July 2018, <<https://www1.pagasa.dost.gov.ph/index.php/climate/climatological-normals>>.





LAND SUITABILITY MAP
CACAO

LAND RESOURCES EVALUATION AND SUITABILITY
ASSESSMENT OF STRATEGIC PRODUCTION AREAS



SCALE 1 : 50 000

00.512345

Kilometers

00.5123

Miles

Universal Transverse Mercator Zone 51 N, PRS 1992 Datum
DISCLAIMER : All political boundaries are not authoritative.

LEGEND

SUITABILITY CLASSES

S1

Highly Suitable

- Land having no significant limitations to sustained application of a given use, or only minor limitations that will not significantly reduce productivity or benefits and will not raise inputs above an acceptable level.

S2

Moderately Suitable

- Land having limitations which in aggregate are moderately severe for sustained application of a given use; the limitations will reduce productivity or benefits and increase required inputs to the extent that the overall advantage to be gained from the use, although still attractive, will be appreciably inferior to that expected on class S1 land.


S3


Marginally Suitable


- Land having limitations which in aggregate are severe for sustained application of a given use and will so reduce productivity or benefits, or increase required inputs, that this expenditure will be only marginally justified.

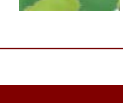
Not Suitable/ Not Relevant

OTHER SIGNS

 NGP Areas

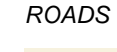
 Cacao


 Land limitation

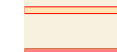
 Land use


CONVENTIONAL SIGNS


ROADS

 Expressway

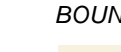
 Trunk line


 Primary


 Secondary


 Tertiary


BOUNDARY

 Region

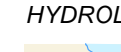
 Province


 District

 Municipality


 Barangay


HYDROLOGY

 Sea / Shoreline


 Lakes / Rivers


PLACES


 Capital City / City

 Capital Town / Town

LAND USE

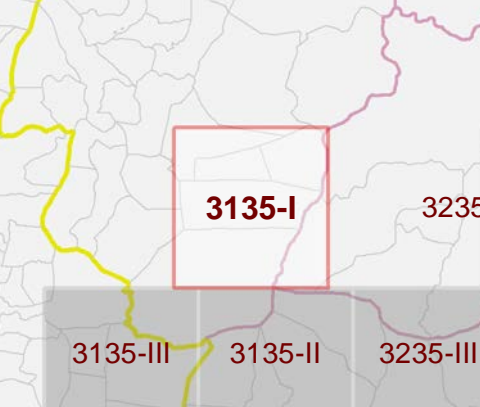
 Built-up

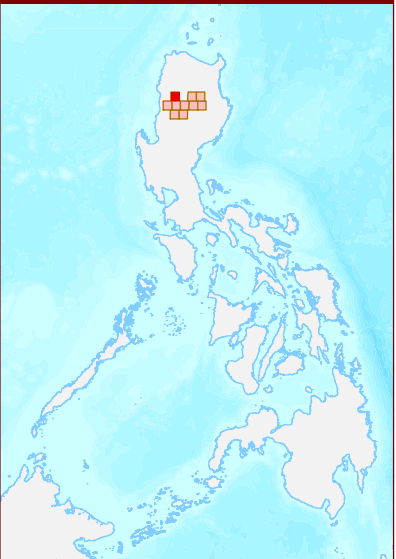
 Fishpond

 Mangrove

ADJOINING SHEETS

3135-I






MISCELLANEOUS INFORMATION

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Project Leader : BERNARDO B. PASCUA
GIS and Cartography : IRVIN K. SAMALCA

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Collaborating Agencies : Philippine Council on Agriculture and Fisheries (PCAF)
: Department of Agriculture Regional Field Office of CAR, Region II, IV-A, IV-B, VI, VII, VIII, IX, X, XI, XII and CARAGA(XIII)
: Local Government Unit (LGU) of covered provinces and municipalities

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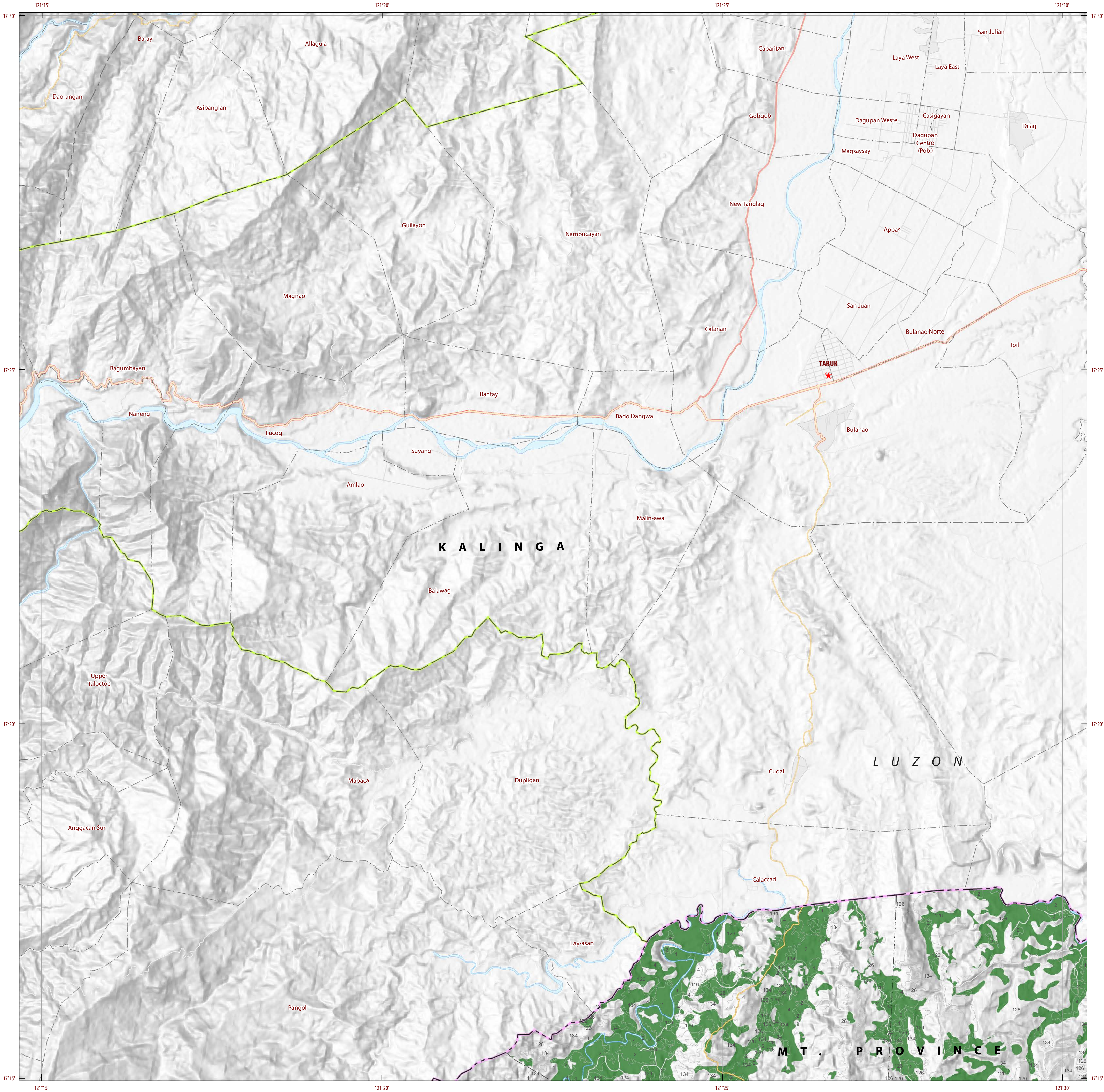
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MOUNTAIN PROVINCE

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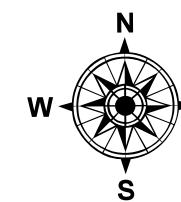
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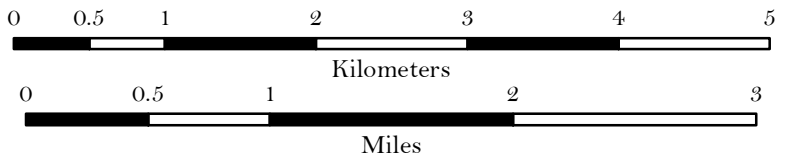


LAND SUITABILITY MAP
CACAO

LAND RESOURCES EVALUATION AND SUITABILITY
ASSESSMENT OF STRATEGIC PRODUCTION AREAS



SCALE 1 : 50 000



Universal Transverse Mercator Zone 51 N, PRS 1992 Datum
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LEGEND

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- S2 Moderately Suitable** - Land having limitations which in aggregate are moderately severe for sustained application of a given use; the limitations will reduce productivity or benefits and increase required inputs to the extent that the overall advantage to be gained from the use, although still attractive, will be appreciably inferior to that expected on class S1 land.
- S3 Marginally Suitable** - Land having limitations which in aggregate are severe for sustained application of a given use and will so reduce productivity or benefits, or increase required inputs, that this expenditure will be only marginally justified.

Not Suitable/ Not Relevant

OTHER SIGNS

- NGP Areas
- Cacao
- Land limitation
- Land use

CONVENTIONAL SIGNS

ROADS	BOUNDARY	HYDROLOGY
Expressway	Region	Sea / Shoreline
Trunk line	Province	Lakes / Rivers
Primary	District	
Secondary	Municipality	PLACES
Tertiary	Barangay	Capital City / City
		Capital Town / Town

LAND USE

- Built-up
- Fishpond
- Mangrove

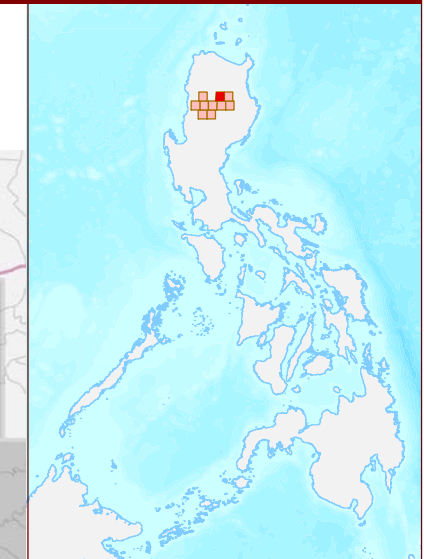
ADJOINING SHEETS

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MISCELLANEOUS INFORMATION

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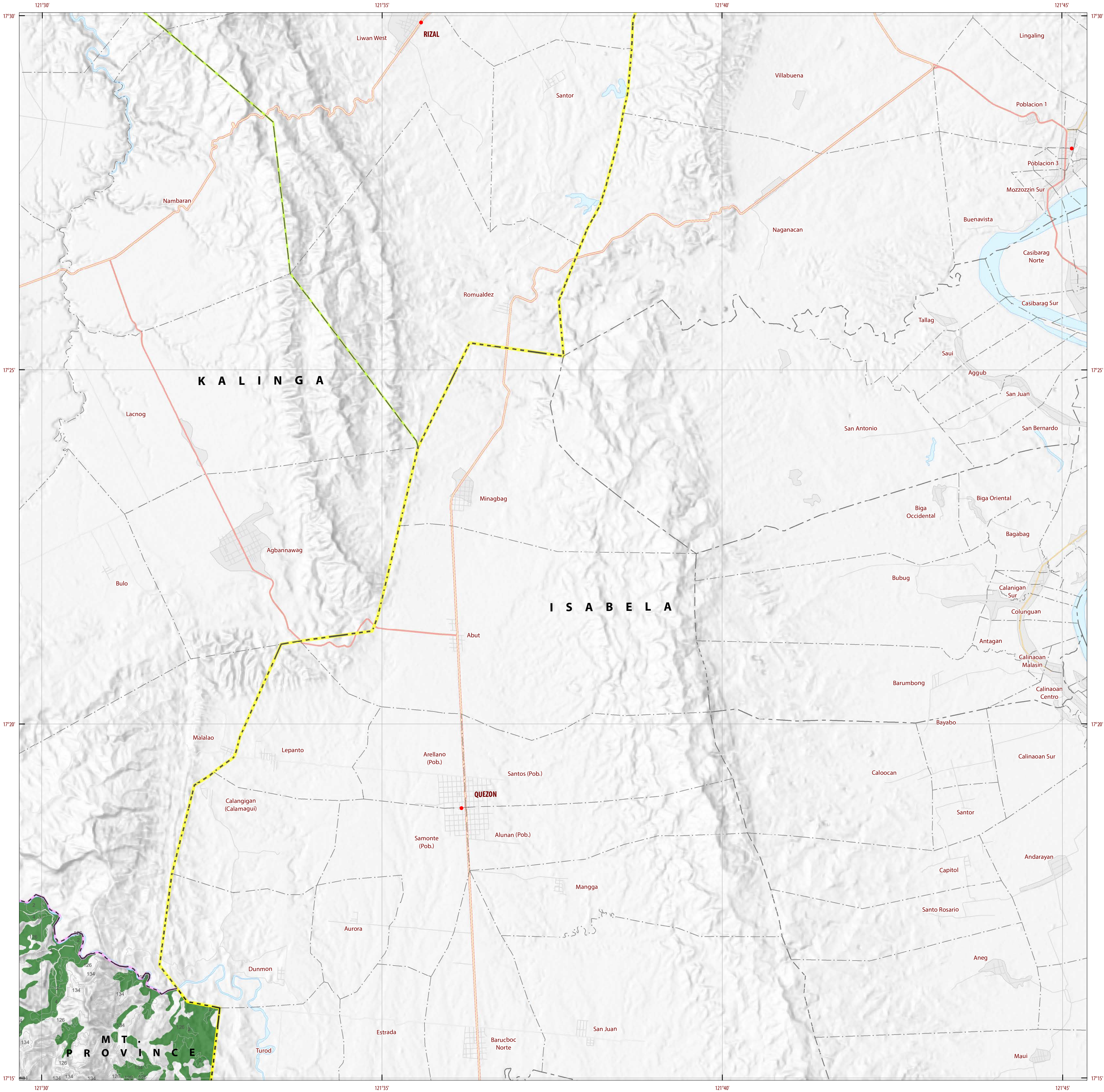
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MOUNTAIN PROVINCE

Sheet 2 of 10

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CACAO

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SCALE 1 : 50 000

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LEGEND

SUITABILITY CLASSES

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S3

Marginally Suitable

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Not Suitable/ Not Relevant

OTHER SIGNS

NGP Areas

Cacao

Land limitation

Land use

CONVENTIONAL SIGNS

ROADS

Expressway

Trunk line

Primary

Secondary

Tertiary

BOUNDARY

Region

Province

District

Municipality

Barangay

HYDROLOGY

Sea / Shoreline

Lakes / Rivers

PLACES

Capital City / City

Capital Town / Town

LAND USE

Built-up

Fishpond

Mangrove

ADJOINING SHEETS

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3235-I

3335-IV

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MISCELLANEOUS INFORMATION

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Project Leader

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GIS and Cartography

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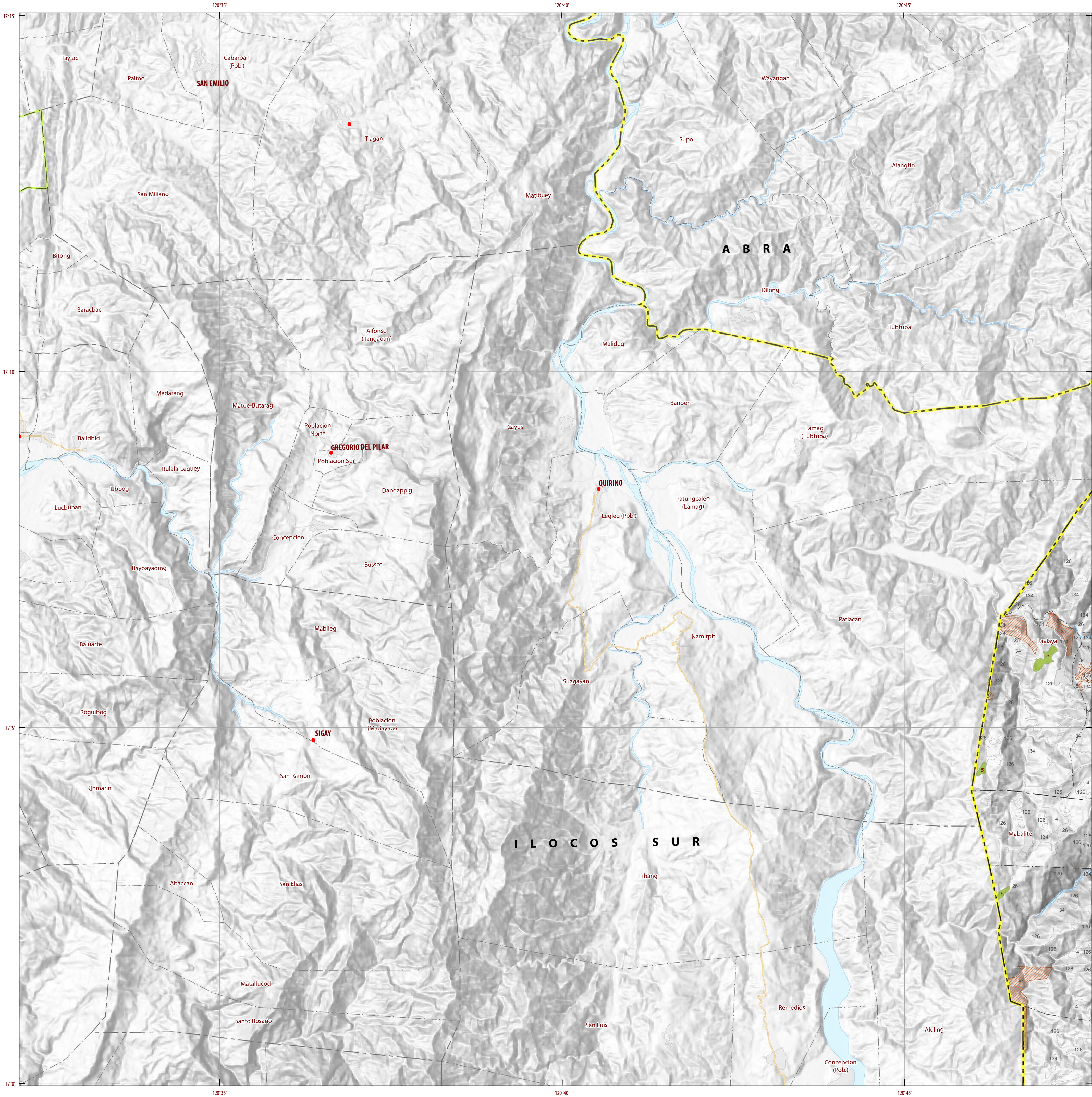
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MOUNTAIN PROVINCE

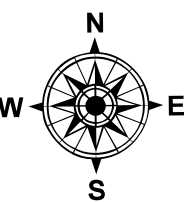
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LAND SUITABILITY MAP
CACAO

LAND RESOURCES EVALUATION AND SUITABILITY
ASSESSMENT OF STRATEGIC PRODUCTION AREAS



SCALE 1 : 50 000

0 0.5 1 2 3 4 5
Kilometers

0 0.5 1 2 3
Miles

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LEGEND

SUITABILITY CLASSES

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S3 Marginally Suitable - Land having limitations which in aggregate are severe for sustained application of a given use and will so reduce productivity or benefits, or increase required inputs, that this expenditure will be only marginally justified.

Not Suitable/ Not Relevant

OTHER SIGNS

NGP Areas

Cacao

Land limitation

Land use

CONVENTIONAL SIGNS

ROADS

Expressway

Trunk line

Primary

Secondary

Tertiary

BOUNDARY

Region

Province

District

Municipality

Barangay

HYDROLOGY

Sea / Shoreline

Lakes / Rivers

PLACES

Capital City / City

Capital Town / Town

LAND USE

Built-up

Fishpond

Mangrove

ADJOINING SHEETS

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INDEX MAP

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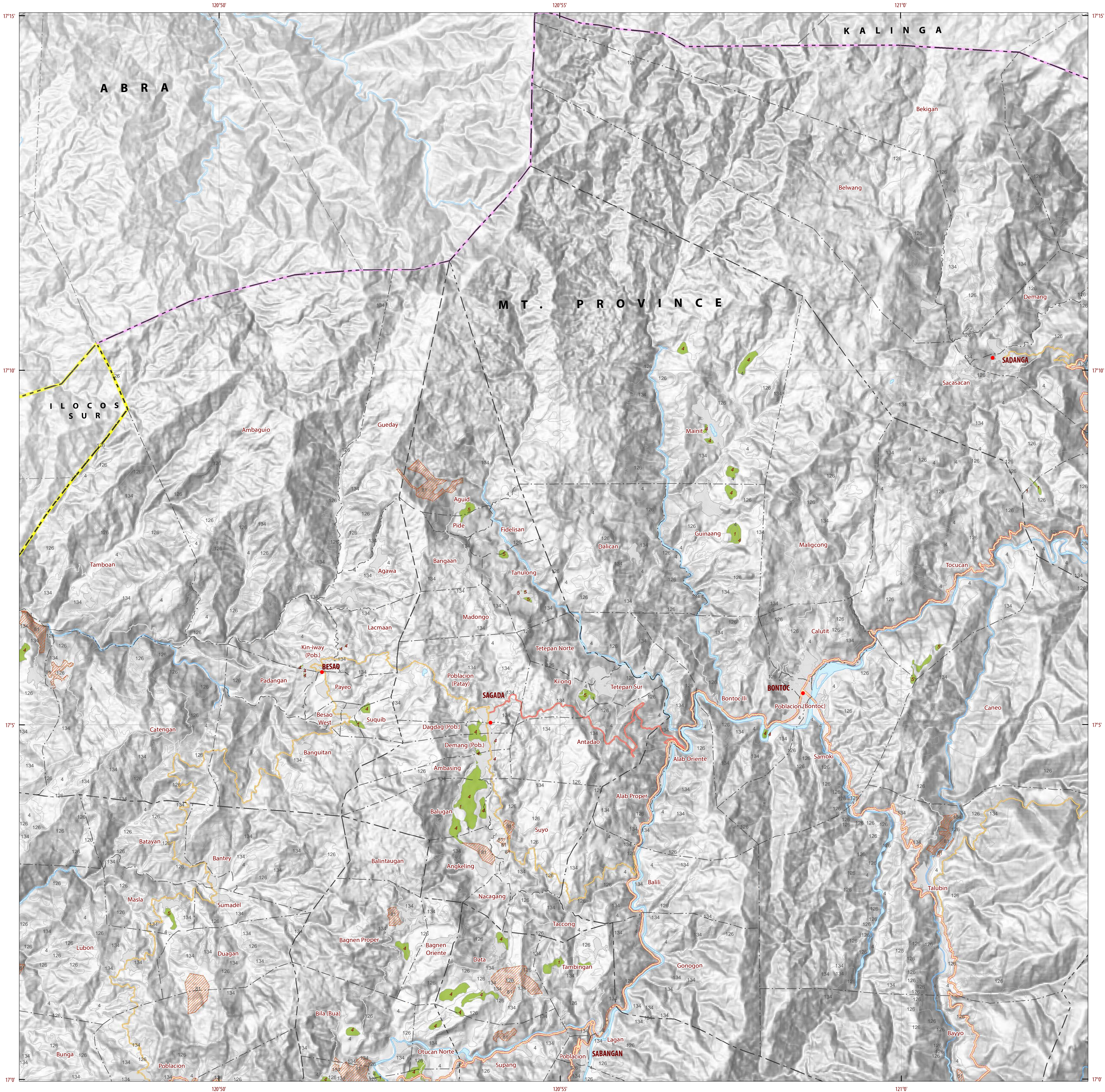
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MOUNTAIN PROVINCE

Sheet 4 of 10

Sheet No. 3135-III



LAND SUITABILITY MAP
CACAO

LAND RESOURCES EVALUATION AND SUITABILITY
ASSESSMENT OF STRATEGIC PRODUCTION AREAS

SCALE 1 : 50 000

Universal Transverse Mercator Zone 51 N, PRS 1992 Datum
DISCLAIMER: All political boundaries are not authoritative.

LEGEND

SUITABILITY CLASSES

S1

Highly Suitable - Land having no significant limitations to sustained application of a given use, or only minor limitations that will not significantly reduce productivity or benefits and will not raise inputs above an acceptable level.

S2

Moderately Suitable - Land having limitations which in aggregate are moderately severe for sustained application of a given use; the limitations will reduce productivity or benefits and increase required inputs to the extent that the overall advantage to be gained from the use, although still attractive, will be appreciably inferior to that expected on class S1 land.

S3

Marginally Suitable - Land having limitations which in aggregate are severe for sustained application of a given use and will so reduce productivity or benefits, or increase required inputs, that this expenditure will be only marginally justified.

Not Suitable/ Not Relevant

OTHER SIGNS

NGP Areas

Cacao

Land limitation

Land use

CONVENTIONAL SIGNS

ROADS

Expressway

Trunk line

Primary

Secondary

Tertiary

BOUNDARY

Region

Province

District

Municipality

Barangay

HYDROLOGY

Sea / Shoreline

Lakes / Rivers

PLACES

Capital City / City

Capital Town / Town

LAND USE

Built-up

Fishpond

Mangrove

ADJOINING SHEETS

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3134-I 3234-IV

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Topographic information taken from NAMRIA Topographic Map at 1:50,000 scale. Land resources information from the Agricultural Land Management and Evaluation Division (ALMED), Soils Survey Division (SSD) and Laboratory Services Division (LSD) of BSWM. Rice areas obtained from the Land Use System (PAO, 2015) and Philippine Rice Information System (PRISM) (IRRI, 2015). Data analysis and compilation through the Land Resources Evaluation and Suitability Assessment of Strategic Production Areas for Coffee and Cacao Project implemented by BSWM (2017).

Project Leader

: BERNARDO B. PASCUA

GIS and Cartography

: IRVIN K. SAMALCA

Funding Agency

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Collaborating Agencies

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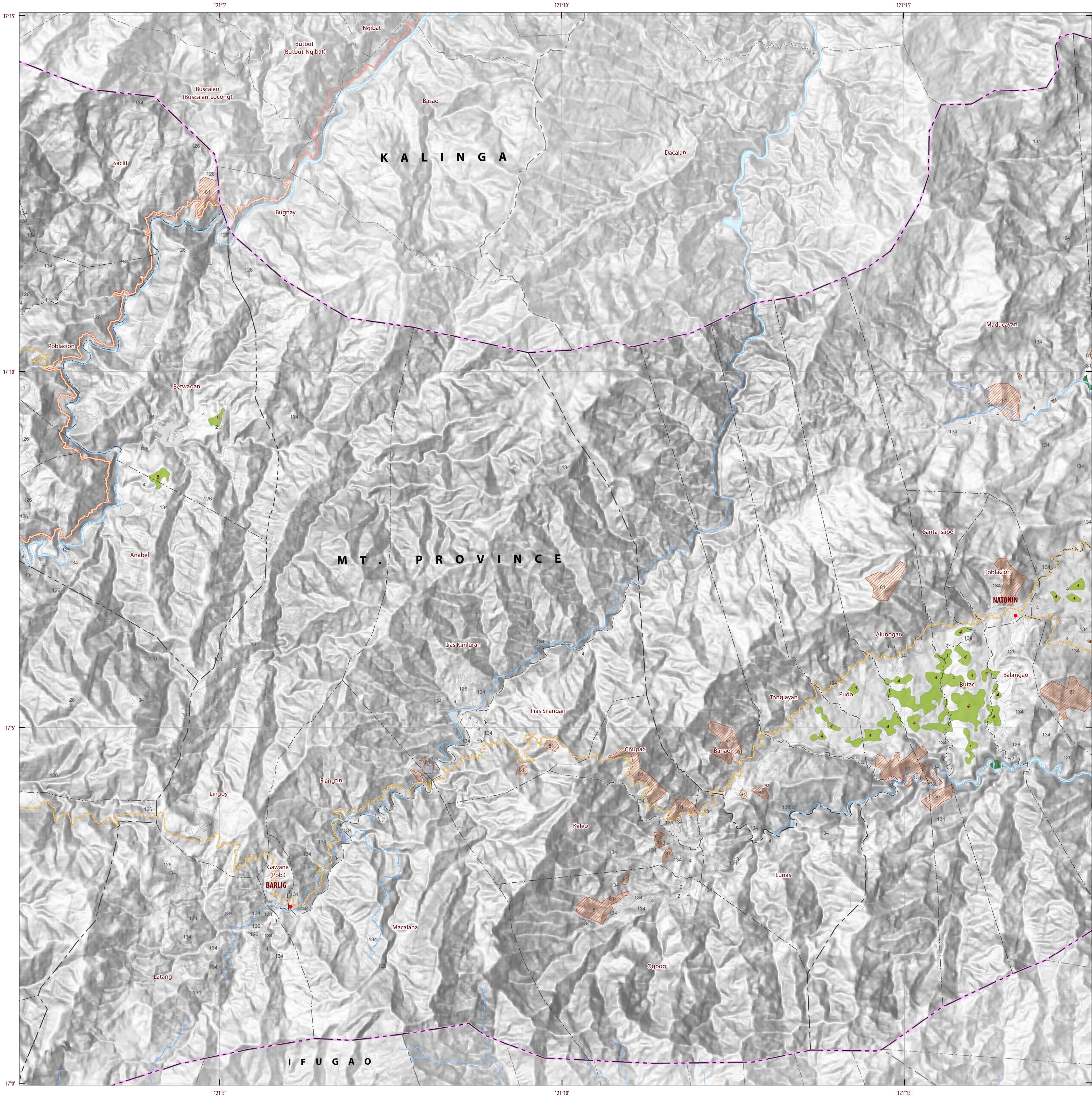
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BUREAU OF SOILS AND WATER MANAGEMENT

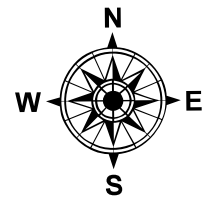
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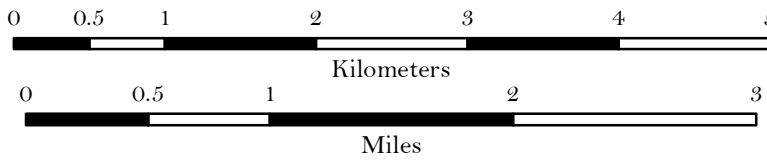


LAND SUITABILITY MAP CACAO

LAND RESOURCES EVALUATION AND SUITABILITY ASSESSMENT OF STRATEGIC PRODUCTION AREAS



SCALE 1 : 50 000



Universal Transverse Mercator Zone 51 N, PRS 1992 Datum
DISCLAIMER : All political boundaries are not authoritative.

LEGEND

SUITABILITY CLASSES

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Not Suitable/ Not Relevant

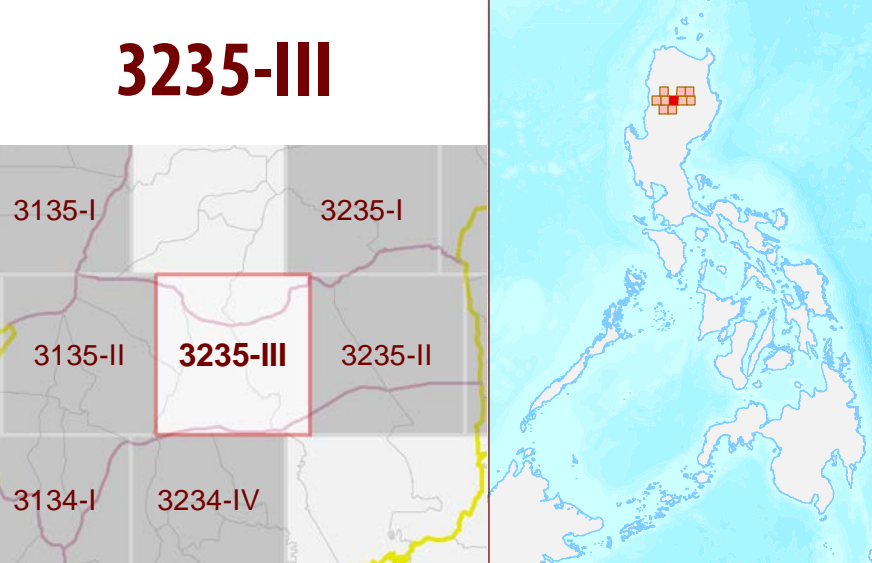
OTHER SIGNS

- NGP Areas
- Cacao
- Land limitation
- Land use

CONVENTIONAL SIGNS

- ROADS**
 - Expressway
 - Trunk line
 - Primary
 - Secondary
 - Tertiary
- BOUNDARY**
 - Region
 - Province
 - District
 - Municipality
 - Barangay
- HYDROLOGY**
 - Sea / Shoreline
 - Lakes / Rivers
- PLACES**
 - Capital City / City
 - Capital Town / Town
- LAND USE**
 - Built-up
 - Fishpond
 - Mangrove

ADJOINING SHEETS



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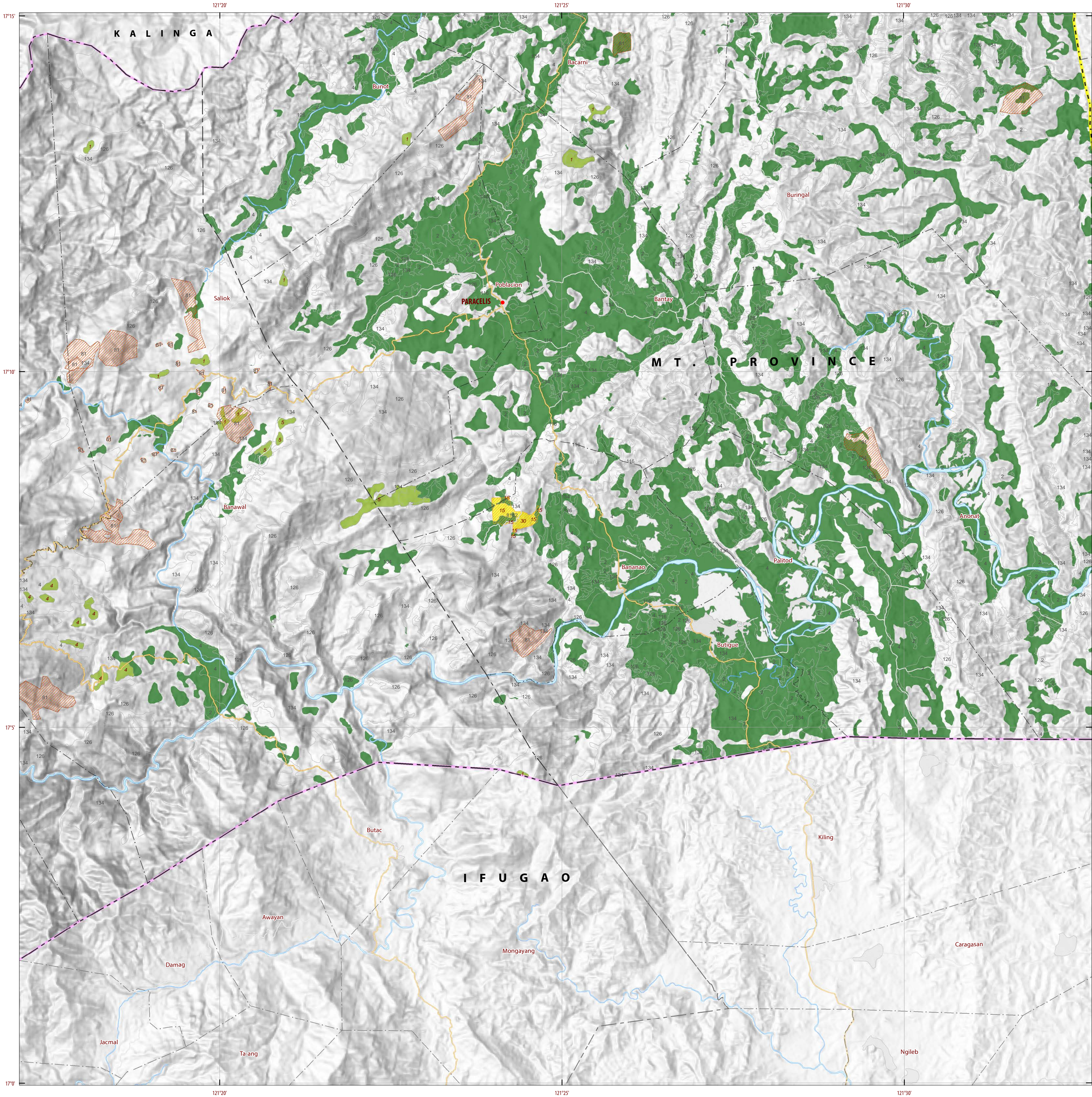
Project Leader : BERNARDO B. PASCUA
GIS and Cartography : IRVIN K. SAMALCA

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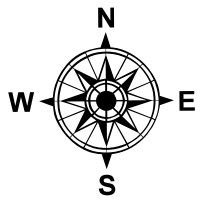
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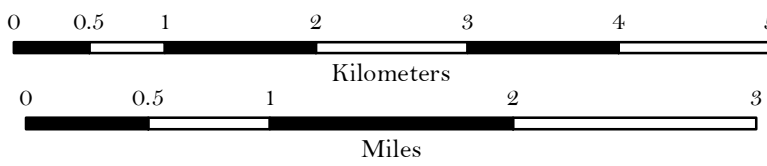


LAND SUITABILITY MAP CACAO

LAND RESOURCES EVALUATION AND SUITABILITY ASSESSMENT OF STRATEGIC PRODUCTION AREAS



SCALE 1 : 50 000



Universal Transverse Mercator Zone 51 N, PRS 1992 Datum
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Not Suitable/ Not Relevant

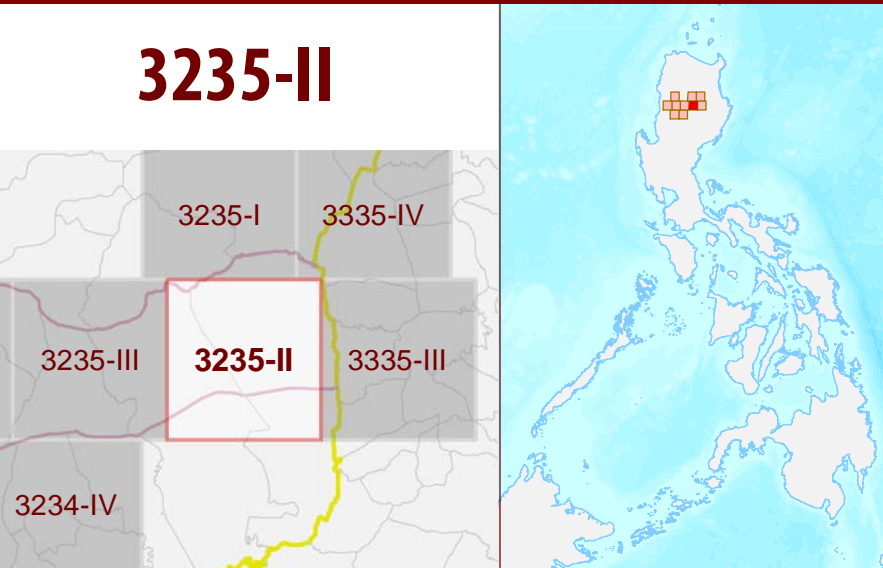
OTHER SIGNS

- NGP Areas
- Cacao
- Land limitation
- Land use

CONVENTIONAL SIGNS

- ROADS**
 - Expressway
 - Trunk line
 - Primary
 - Secondary
 - Tertiary
- BOUNDARY**
 - Region
 - Province
 - District
 - Municipality
 - Barangay
- HYDROLOGY**
 - Sea / Shoreline
 - Lakes / Rivers
- PLACES**
 - Capital City / City
 - Capital Town / Town
- LAND USE**
 - Built-up
 - Fishpond
 - Mangrove

ADJOINING SHEETS



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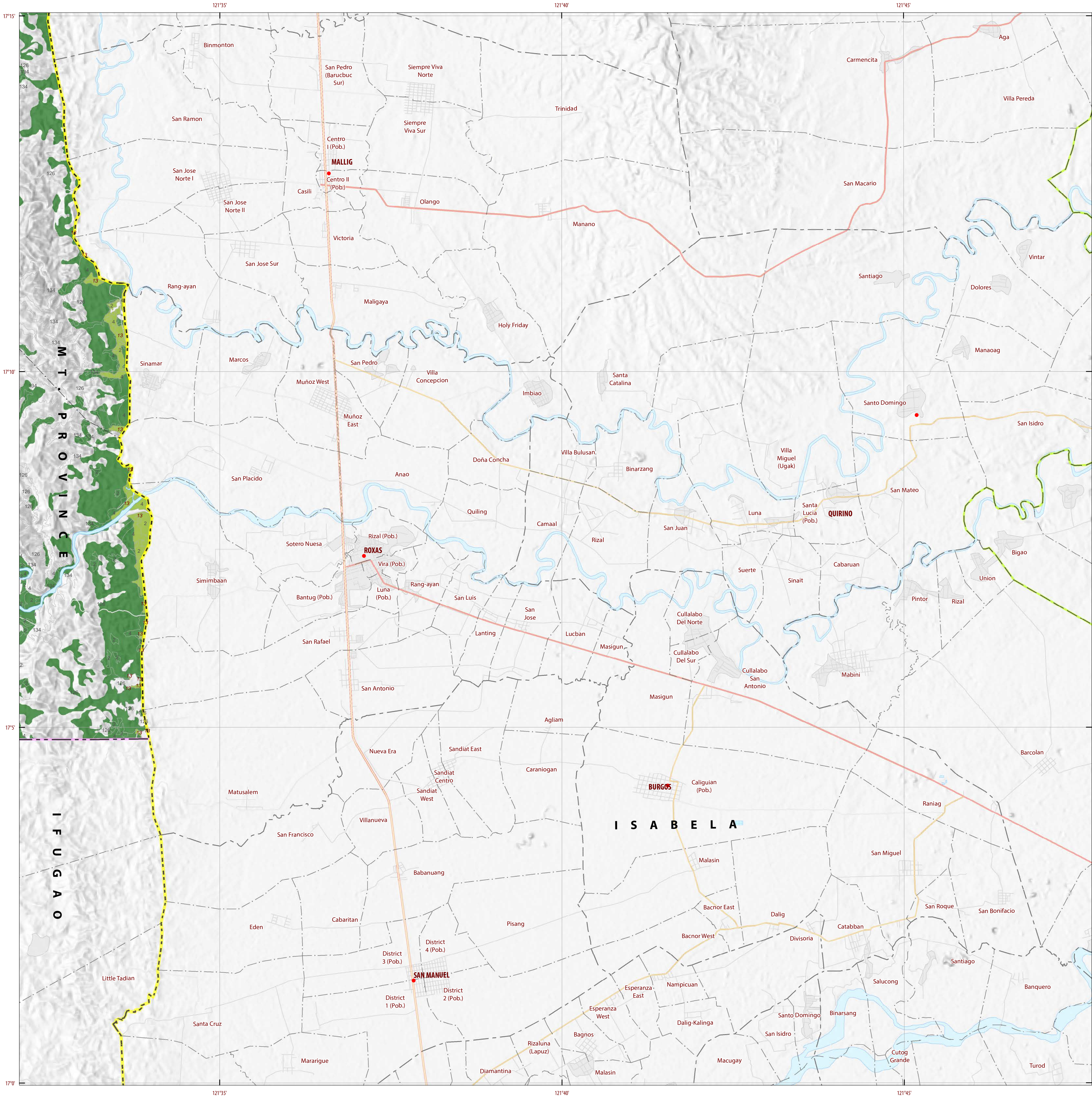
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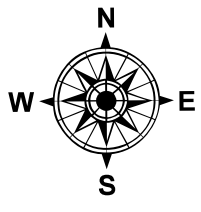
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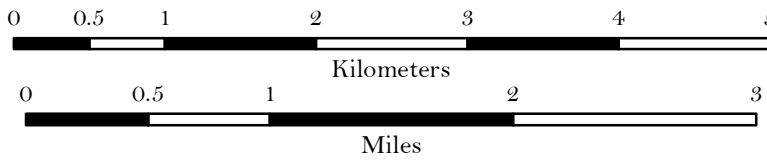


LAND SUITABILITY MAP CACAO

LAND RESOURCES EVALUATION AND SUITABILITY ASSESSMENT OF STRATEGIC PRODUCTION AREAS



SCALE 1 : 50 000



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Not Suitable/ Not Relevant

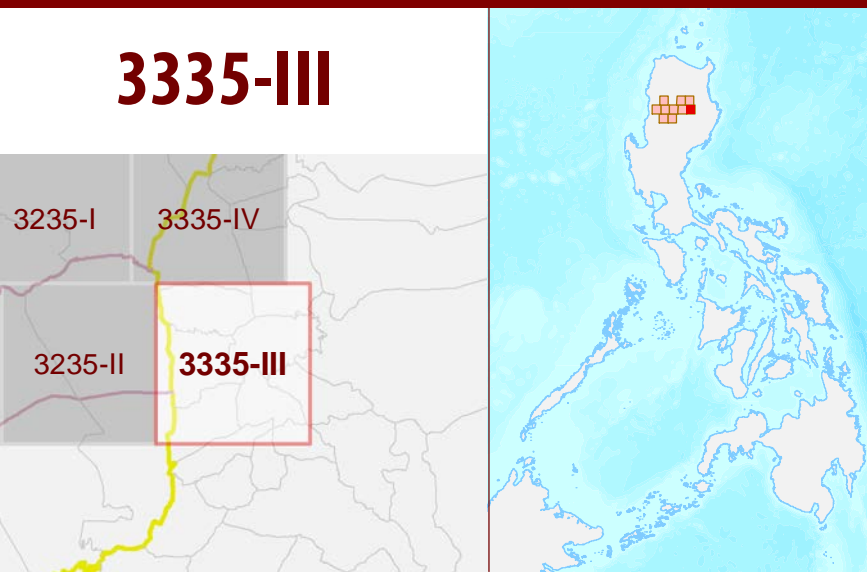
OTHER SIGNS

- NGP Areas
- Cacao
- Land limitation
- Land use

CONVENTIONAL SIGNS

- ROADS**
 - Expressway
 - Trunk line
 - Primary
 - Secondary
 - Tertiary
- BOUNDARY**
 - Region
 - Province
 - District
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 - Barangay
- HYDROLOGY**
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 - Fishpond
 - Mangrove

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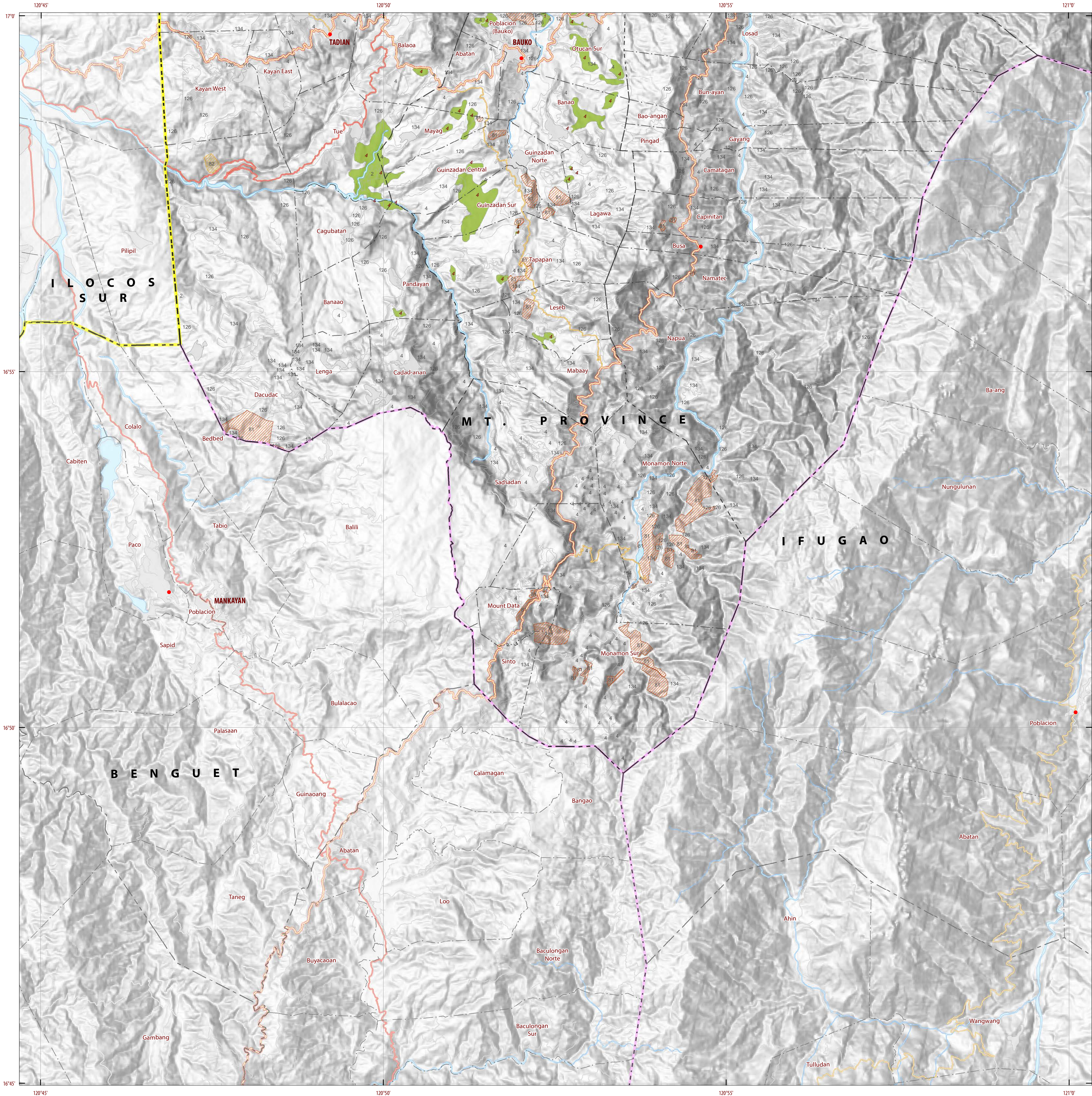
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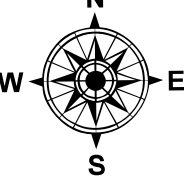
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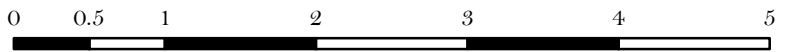


LAND SUITABILITY MAP
CACAO

LAND RESOURCES EVALUATION AND SUITABILITY
ASSESSMENT OF STRATEGIC PRODUCTION AREAS



SCALE 1 : 50 000



Universal Transverse Mercator Zone 51 N, PRS 1992 Datum
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LEGEND

SUITABILITY CLASSES

S1

Highly Suitable

Land having no significant limitations to sustained application of a given use, or only minor limitations that will not significantly reduce productivity or benefits and will not raise inputs above an acceptable level.

S2

Moderately Suitable

Land having limitations which in aggregate are moderately severe for sustained application of a given use; the limitations will reduce productivity or benefits and increase required inputs to the extent that the overall advantage to be gained from the use, although still attractive, will be appreciably inferior to that expected on class S1 land.

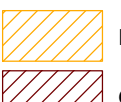
S3


Marginally Suitable


Land having limitations which in aggregate are severe for sustained application of a given use and will so reduce productivity or benefits, or increase required inputs, that this expenditure will be only marginally justified.

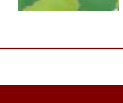
Not Suitable/ Not Relevant

OTHER SIGNS

 NGP Areas

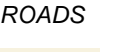
 Cacao


 Land limitation

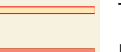
 Land use


CONVENTIONAL SIGNS


ROADS

 Expressway


 Trunk line


 Primary


 Secondary


 Tertiary

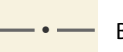
BOUNDARY

 Region


 Province


 District

 Municipality


 Barangay


HYDROLOGY

 Sea / Shoreline


 Lakes / Rivers


PLACES


 Capital City / City

 Capital Town / Town

LAND USE

 Built-up

 Fishpond

 Mangrove

ADJOINING SHEETS

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MISCELLANEOUS INFORMATION

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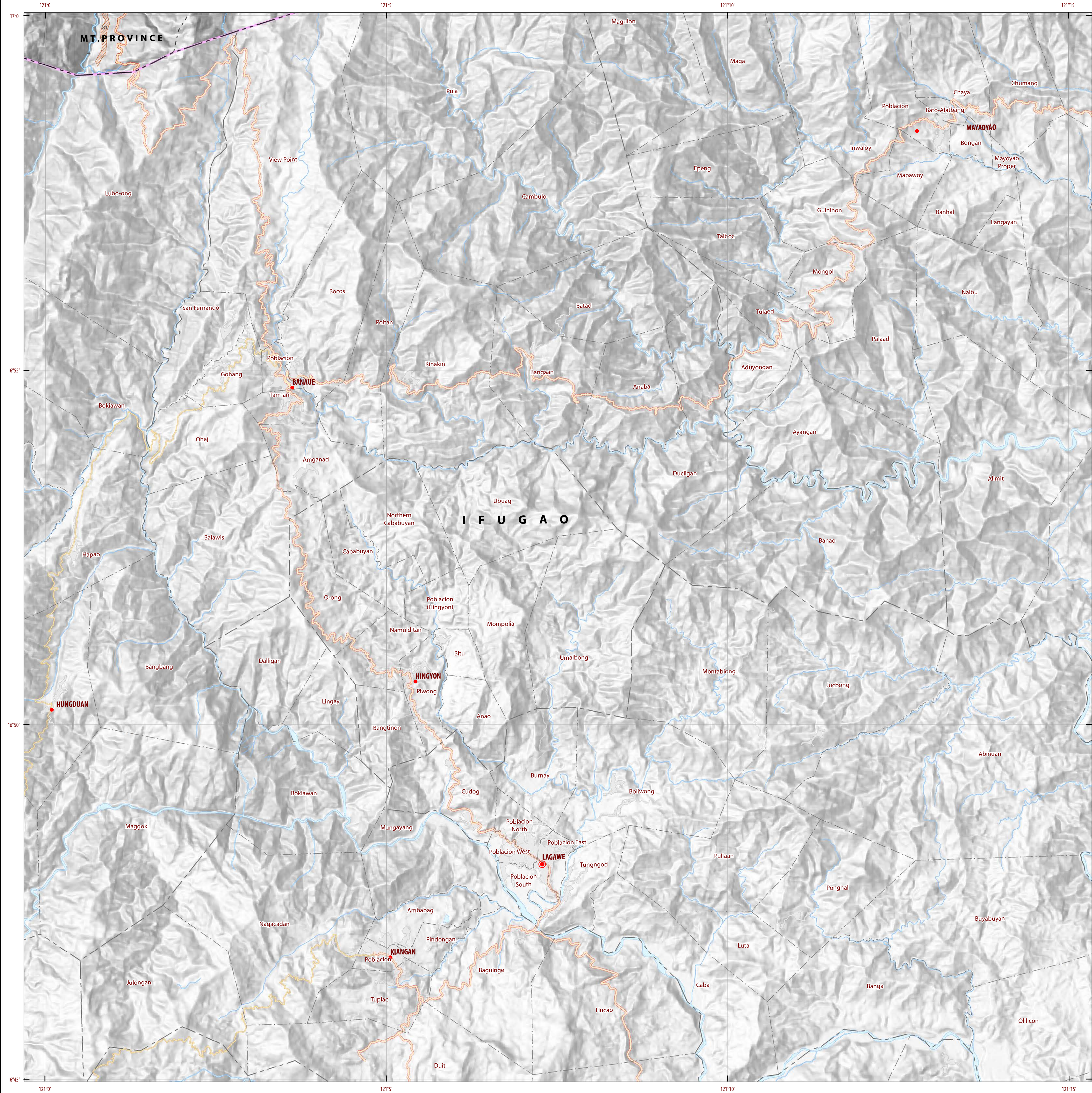
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MOUNTAIN PROVINCE

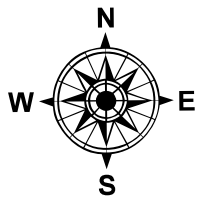
Sheet 9 of 10

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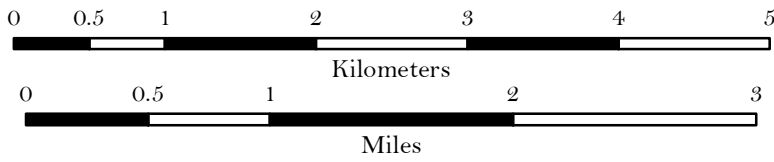


LAND SUITABILITY MAP CACAO

LAND RESOURCES EVALUATION AND SUITABILITY ASSESSMENT OF STRATEGIC PRODUCTION AREAS



SCALE 1 : 50 000



Universal Transverse Mercator Zone 51 N, PRS 1992 Datum
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LEGEND

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Not Suitable/ Not Relevant

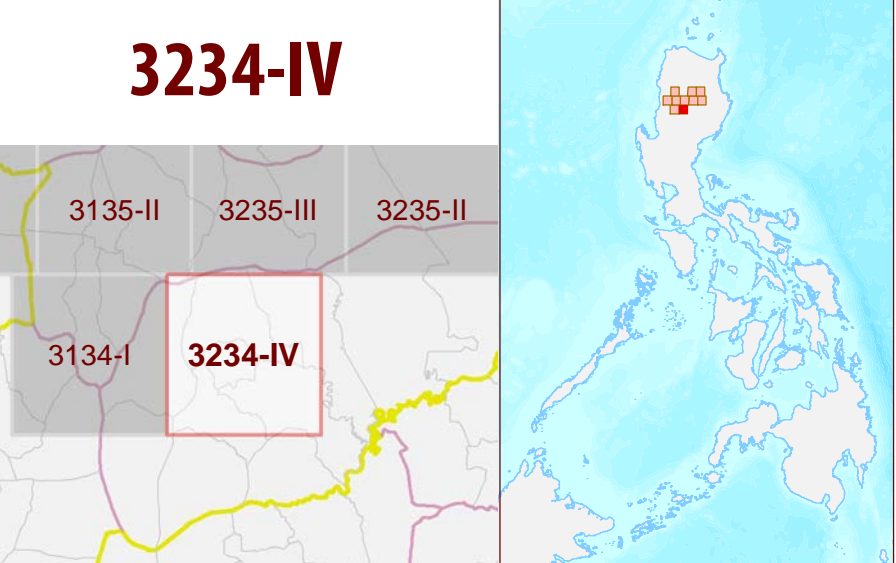
OTHER SIGNS

- NGP Areas
- Cacao
- Land limitation
- Land use

CONVENTIONAL SIGNS

- ROADS**
 - Expressway
 - Trunk line
 - Primary
 - Secondary
 - Tertiary
- BOUNDARY**
 - Region
 - Province
 - District
 - Municipality
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 - Mangrove

ADJOINING SHEETS



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