

LAND SUITABILITY MAP

ARABICA COFFEE

LAND RESOURCES EVALUATION AND SUITABILITY
ASSESSMENT OF STRATEGIC PRODUCTION AREAS

PROVINCE OF AGUSAN DEL NORTE



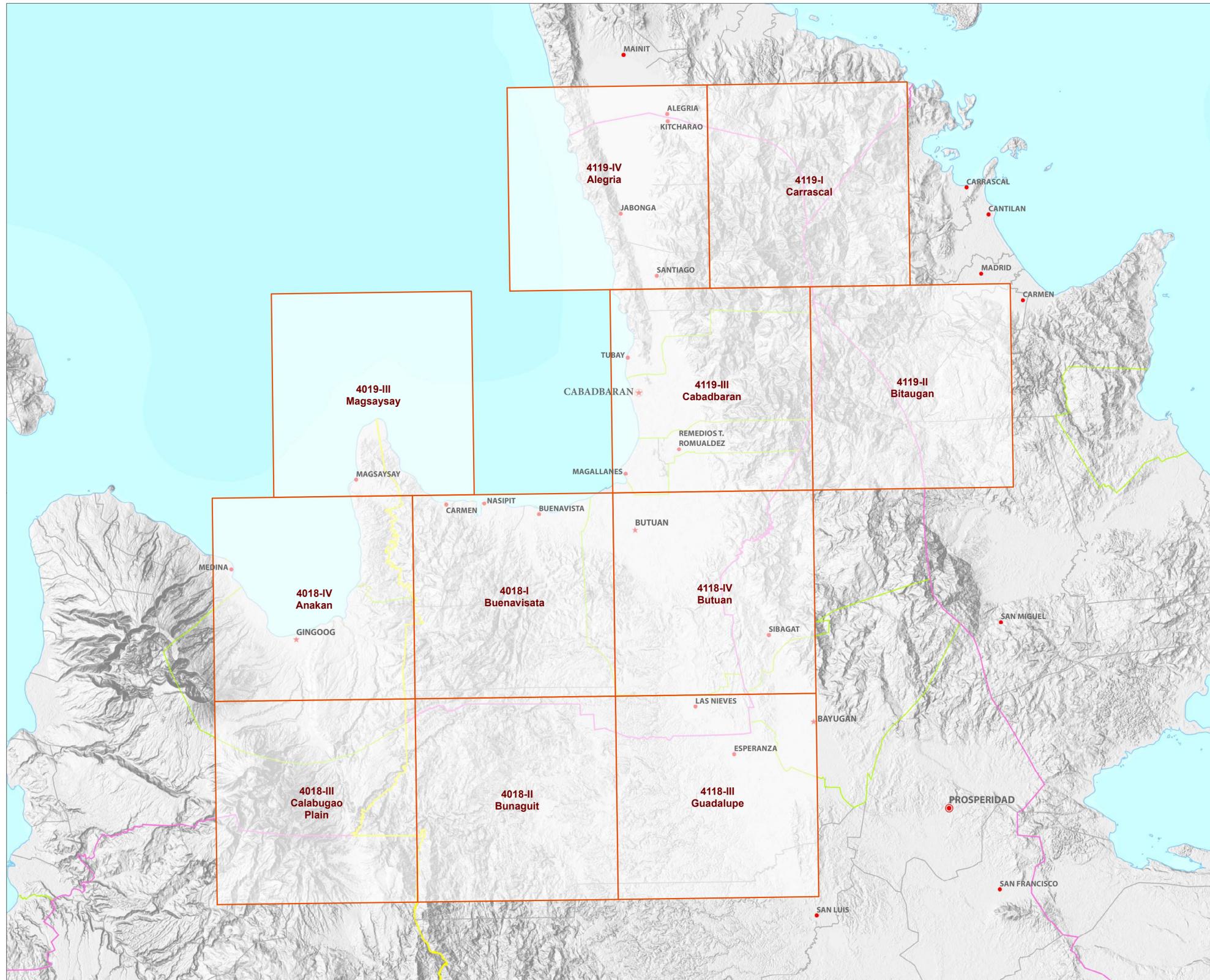
REPUBLIC OF THE PHILIPPINES
DEPARTMENT OF AGRICULTURE
BUREAU OF SOILS AND WATER MANAGEMENT

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LAND RESOURCES EVALUATION AND SUITABILITY ASSESSMENT OF STRATEGIC PRODUCTION AREAS

PROVINCE OF AGUSAN DEL NORTE



LEGEND

Places

- ★ Capital City
- ★ City
- Capital Town
- Town

Administrative Boundary

- Regional
- Provincial
- City
- Municipal

Map Index

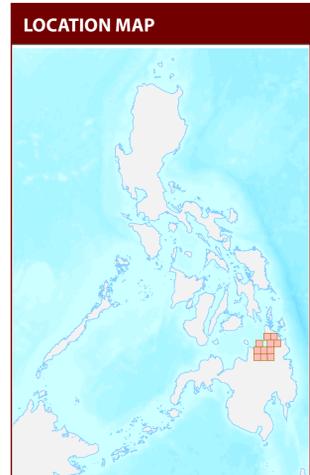
- Index grid

Topographic Relief

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MISCELLANEOUS INFORMATION

Land suitability information produced by the Bureau of Soils and Water Management (BSWM) through the Land Resources Evaluation and Suitability Assessment of Strategic Production Areas for Major Commodities Project duly supported by the Philippine Council on Agriculture and Fisheries (PCAF) and funded by the Bureau of Agricultural Research (BAR).

Map produced by the Geomatics and Soil Information Technology Division, Bureau of Soils and Water Management (BSWM).

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LAND SUITABILITY MAP FOR ARABICA COFFEE

LAND RESOURCES EVALUATION AND SUITABILITY ASSESSMENT OF STRATEGIC PRODUCTION AREAS AGUSAN DEL NORTE, REGION XIII

EXTENT OF SUITABILITY FOR ARABICA COFFEE PRODUCTION BY MUNICIPALITY

MUNICIPALITY	EXISTING COFFEE (Ha)			TOTAL EXISTING AREA (Ha)	EXPANSION AREA (Ha)						CONFLICT RESOLUTION AREA (Ha)						TOTAL POTENTIAL EXPANSION AREA (Ha)	
	S1	S2	S3		Coconut		Shrubland, unmanaged*		Grassland, unmanaged*		Corn		Paddy rice, non-irrigated		Other crops			
					S1	S2	S1	S2	S1	S2	S1	S2	S1	S2	S1	S2		
BUENAVISTA	-	-	-	-	-	103	-	130	-	80	-	-	-	-	-	-	-	312
BUTUAN CITY	-	-	-	-	-	2	-	4	-	-	-	-	-	-	-	-	-	6
CARMEN	-	-	-	-	-	2	-	-	-	-	-	-	-	-	-	-	-	2
CITY OF CABADBARAN	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
JABONGA	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
KITCHARAO	-	-	-	-	-	29	-	1	-	-	-	-	-	-	-	-	-	30
LAS NIEVES	-	-	1	-	-	48	-	-	-	-	-	-	-	-	-	-	-	48
MAGALLANES	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
NASIPIT	-	-	-	-	-	17	-	-	-	-	-	-	-	-	-	-	-	17
REMEDIOS T. ROMUALDEZ	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
SANTIAGO	-	-	-	-	-	-	-	-	4	-	-	-	-	-	-	-	-	4
TUBAY	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
TOTAL	-	-	-	1	-	199	-	134	-	84	-	-	-	-	-	-	-	417

Note: Delivery of arabica coffee planting materials must be started on the onset of rainy season.
*establishment of shade trees prior to planting of arabica coffee.

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 ARABICA COFFEE 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
Coffee (Arabica)	S1	<8	>100	CL, SiCL, SCL, SC, SIC, C, HC	WD, MWD	5.6 - 7.2	high	none-slight	none-slight	none-few	1000-2000	2001-4500	I, III, IV
	S2	8 - 30	30 - 100	FSL, L, SiL	SPD, PD	5.1 - 5.5 7.3 - 7.8	medium	moderate	moderate	common	500-1000 2000-2500	1000-2000	I, II
	S3	>30	<30	S, LS, CSL, SL	VPD, ED	<5.0 - > 7.9	low	severe	severe	many	<500 >2500	<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
E12 - 500 - 1000m or 2000 - 2500m
E13 - < 500m or > 2500m

SOIL DRAINAGE
D2 - Somewhat poorly drained to poorly drained
D3 - Very poorly drained or excessively drained

SOIL DEPTH
Sh2 - Shallow to moderately deep (30 - 100cm)
Sh3 - Very shallow (< 30cm)

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	LIMITATION	CODE	LIMITATION	CODE	LIMITATION	CODE	LIMITATION	CODE	LIMITATION	CODE	LIMITATION	CODE	LIMITATION	CODE	LIMITATION
1	E12-E2-Rc3	11	T2-E3-Rc2	21	T2-E13	31	T2-Sh2-Rc2	41	T3-E12-E3-Sh2-Rc3	51	T3-E3	61	T3-E3	71	T3-E3
2	E13	12	T2-E3-Rc3	22	T2-E13-E2	32	T3	42	T3-E12-E3-Sh3-Rc2	52	T3-E3-Rc3	62	T3-E3-Rc3	72	T3-E3-Rc3
3	E13-F2-D2	13	T2-F3-Sh2-Rc2	23	T2-E13-E2-Sh2-Rc2	33	T3-E3	43	T3-E12-E3-Sh3-Rc3	53	T3-E3-Sh3-Rc3	63	T3-E3-Sh3-Rc3	73	T3-E3-Sh3-Rc3
4	E13-F2-Tc	14	T2-E12	24	T2-E13-E3	34	T3-E3-Rc2	44	T3-E3	54	T3-E12	64	T3-E12	74	T3-E12
5	E13-F3-D2	15	T2-E12-E3-Rc2	25	T2-E13-E3-Rc3	35	T3-E3-Sh2-Rc3	45	T3-E3-E3	55	T3-E12-E3-Rc3	65	T3-E12-E3-Rc3	75	T3-E12-E3-Rc3
6	E13-Sh2	16	T2-E12-E3-Rc3	26	T2-E13-E3-Sh2-Rc2	36	T3-E3-Sh3-Rc2	46	T3-E12-E3-Sh2-Rc3	56	T3-E12-E3-Sh3-Rc3	66	T3-E12-E3-Sh3-Rc3	76	T3-E12-E3-Sh3-Rc3
7	E13-Sh2-Rc2	17	T2-E12-E3-Sh2-Rc2	27	T2-E13-E3-Sh2-Rc3	37	T3-E3-Sh3-Rc3	47	T3-E12-E3-Sh3-Rc2	57	T3-E13	67	T3-E13	77	T3-E13
8	Sh2-Rc2	18	T2-E12-E3-Sh2-Rc3	28	T2-E13-F2-D2	38	T3-E12	48	T3-E12-E3-Sh3-Rc3	58	T3-E13-E3	68	T3-E13-E3	78	T3-E13-E3
9	T2	19	T2-E12-Rc2	29	T2-E13-F3-D2	39	T3-E12-E3	49	T3-E13-F3-D2	59	T3-E13-E3-Sh3-Rc3	69	T3-E13-E3-Sh3-Rc3	79	T3-E13-E3-Sh3-Rc3
10	T2-E3	20	T2-E12-Sh2-Rc2	30	T2-Rc2	40	T3-E12-E3-Rc2	50	T3	60	T3-E13	70	T3-E13	80	T3-E13

CODE	LANDUSE
4	Corn
81	Coffee
82	Cacao
116	Coconut
126	Grassland
130	Bare areas, unmanaged
134	Shrubs, unmanaged

CLIMATE TYPE

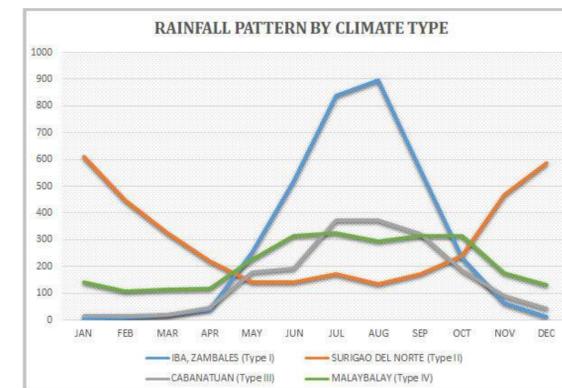
TYPE I : Two pronounced season, dry from November to April and wet during the rest of the year. Maximum rain period is from June to September

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.

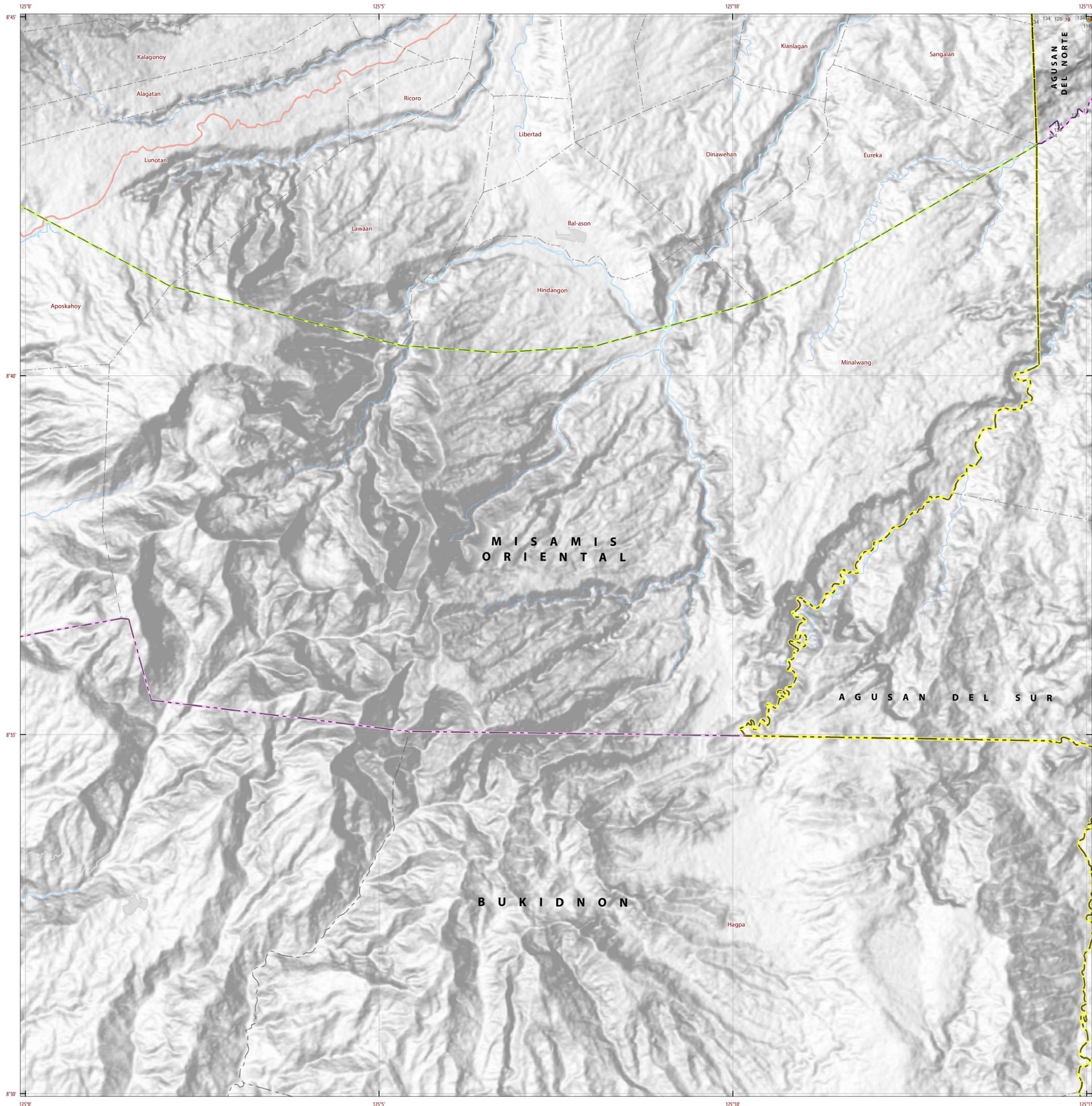
TYPE III : No very pronounced maximum rain period, with a dry season lasting only from one to three months, either during the period from December to February or from March to May. This type resembles Type I since it has a short dry season.

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 Agusan Del Norte is classified as climatic Type IV and North Eastern part is climatic Type II.

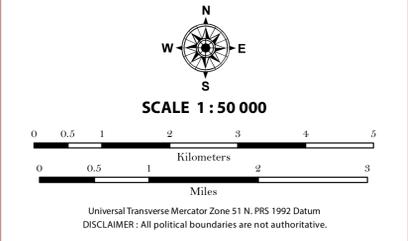


Source: PAGASA 2018, *Climatological Normals (Rainfall)*, Philippine Atmospheric, Geophysical and Astronomical Services Administration (PAGASA), accessed 27 July 2018, <<https://www1.pagasa.dost.gov.ph/index.php/climate/climatological-normals>>.



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LAND RESOURCES EVALUATION AND SUITABILITY ASSESSMENT OF STRATEGIC PRODUCTION AREAS



LEGEND

SUITABILITY CLASSES

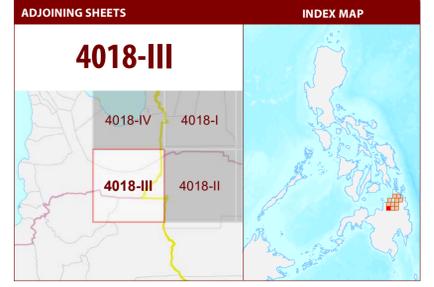
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- S3 Marginally Suitable** - Land having limitations which in aggregate are severe for sustained application of a given use and will so reduce productivity or benefits, or increase required inputs, that this expenditure will be only marginally justified.
- Not Suitable/ Not Relevant**

OTHER SIGNS

- NGP Areas
- Cacao
- Land limitation
- Land use

CONVENTIONAL SIGNS

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



MISCELLANEOUS INFORMATION

SOURCES OF INFORMATION: 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 (FAO, 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 Major Commodities Project implemented by BSWM (2017).

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 GIS and Cartography : IRWIN K. SAMALCA

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 : Local Government Unit (LGU) of covered provinces and municipalities

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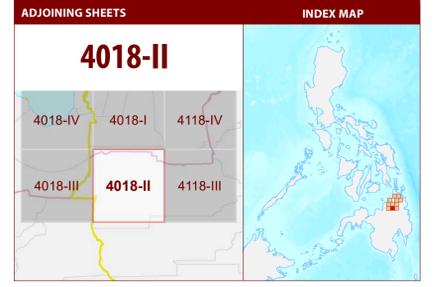
SCALE 1 : 50 000

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

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- 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 | PLACES |
| Secondary | Municipality | Capital City / City |
| Tertiary | Barangay | Capital Town / Town |
- LAND USE**
- Built-up
 - Fishpond
 - Mangrove



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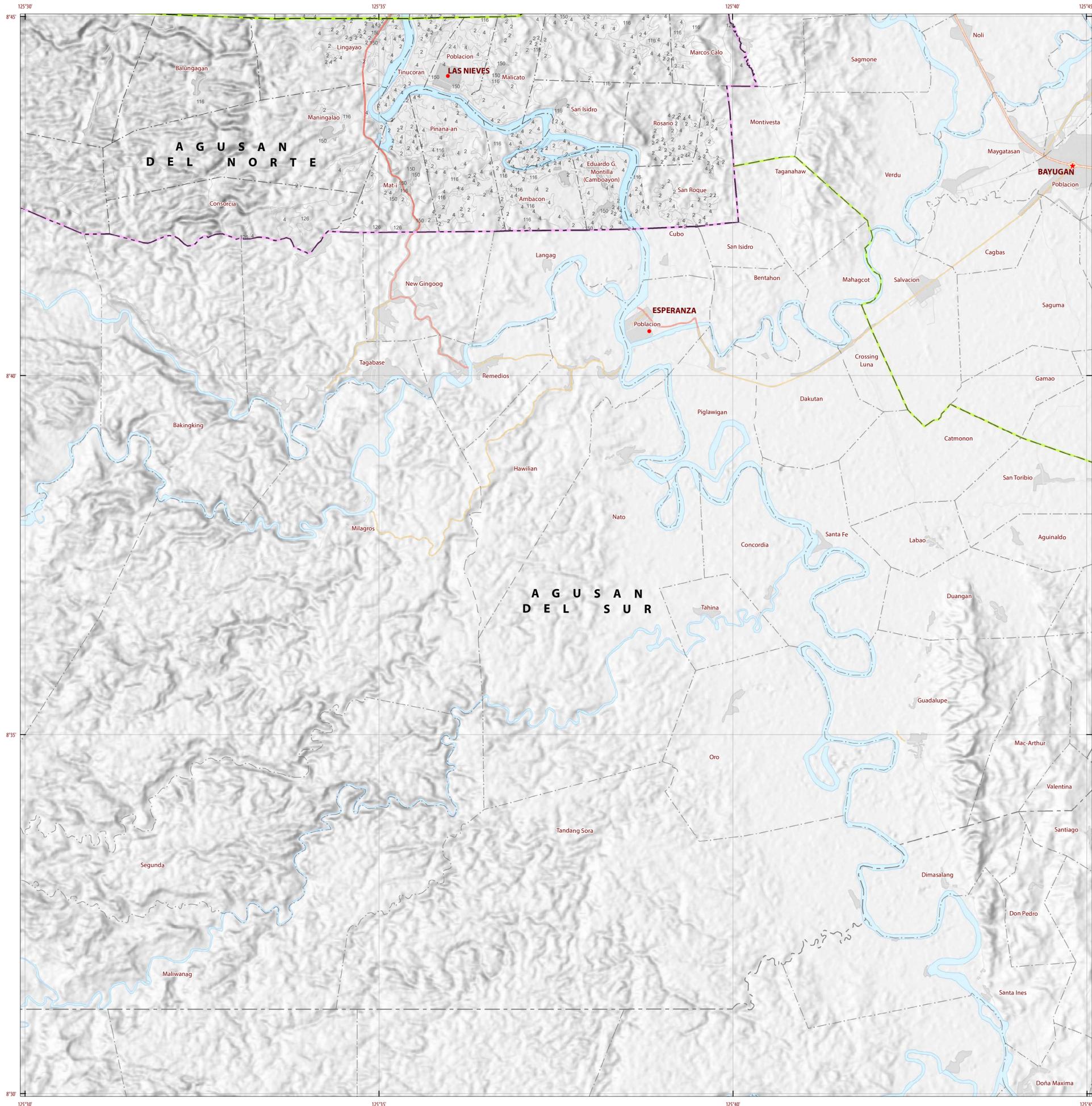
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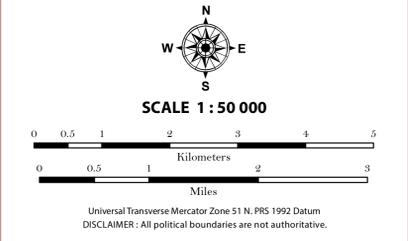
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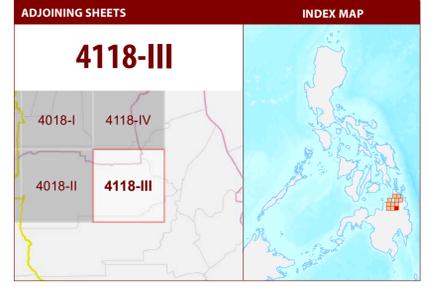
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OTHER SIGNS	
	NGP Areas
	Cacao
	Land limitation
	Land use

CONVENTIONAL SIGNS		
ROADS	BOUNDARY	HYDROLOGY
		PLACES
LAND USE		



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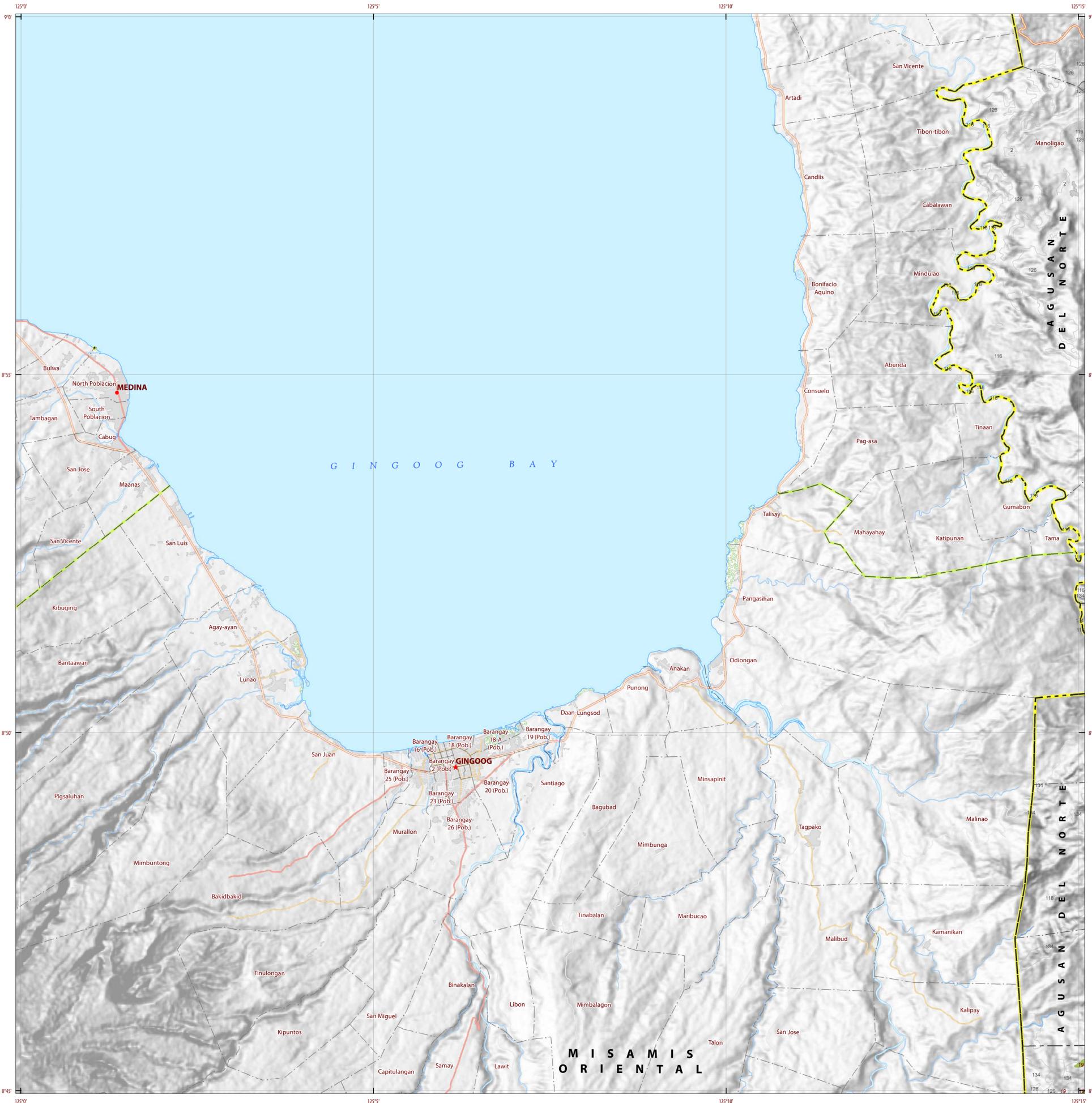
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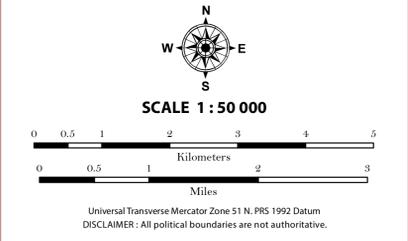
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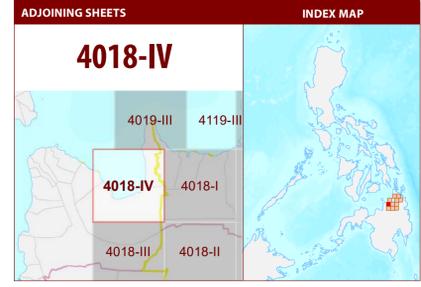
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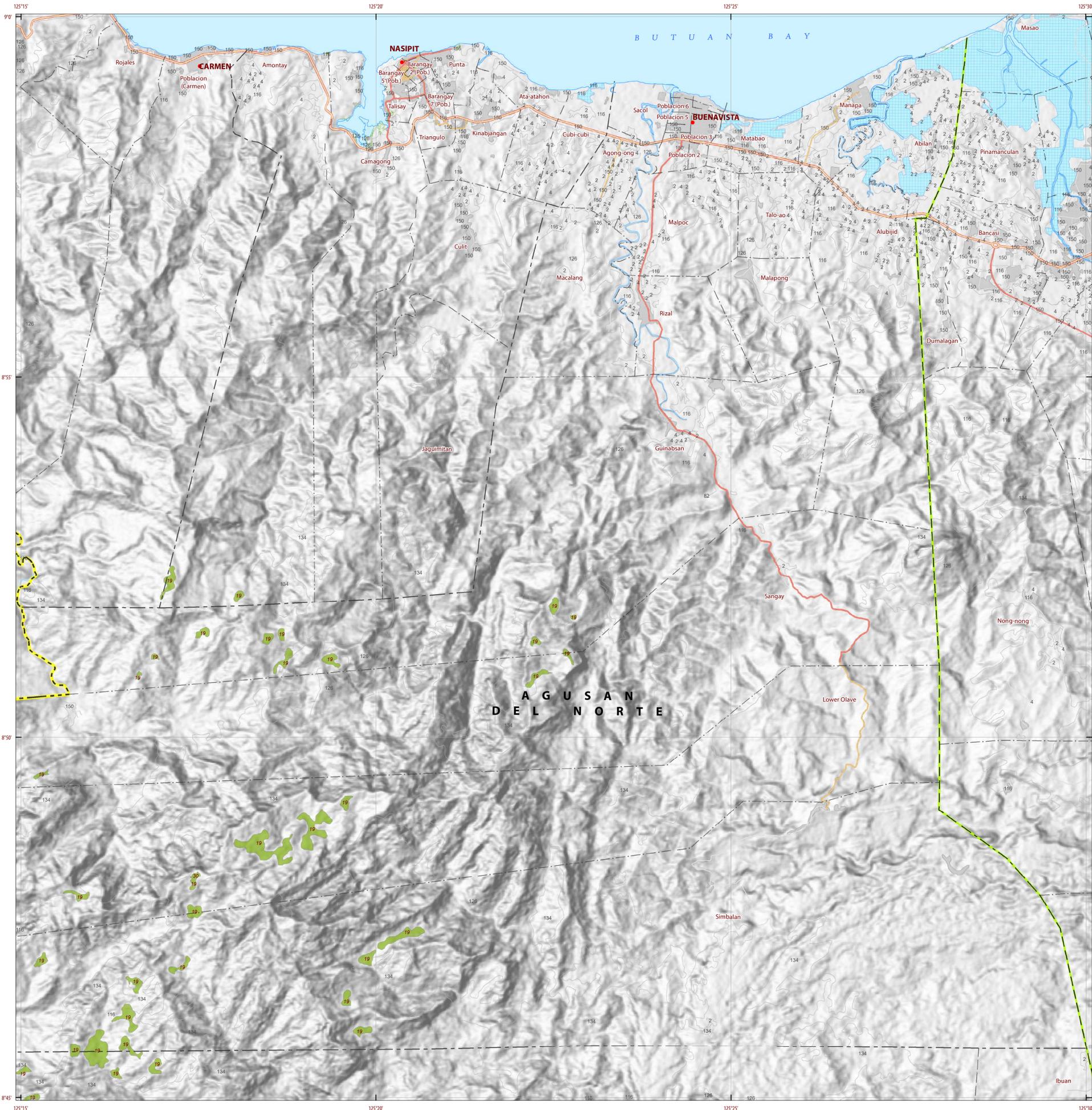
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LAND SUITABILITY MAP ARABICA COFFEE

LAND RESOURCES EVALUATION AND SUITABILITY ASSESSMENT OF STRATEGIC PRODUCTION AREAS



SCALE 1 : 50 000

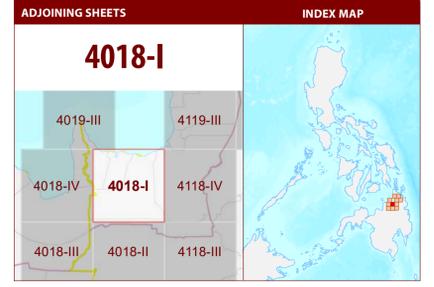


Universal Transverse Mercator Zone 51 N, PRS 1992 Datum
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LEGEND

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



MISCELLANEOUS INFORMATION

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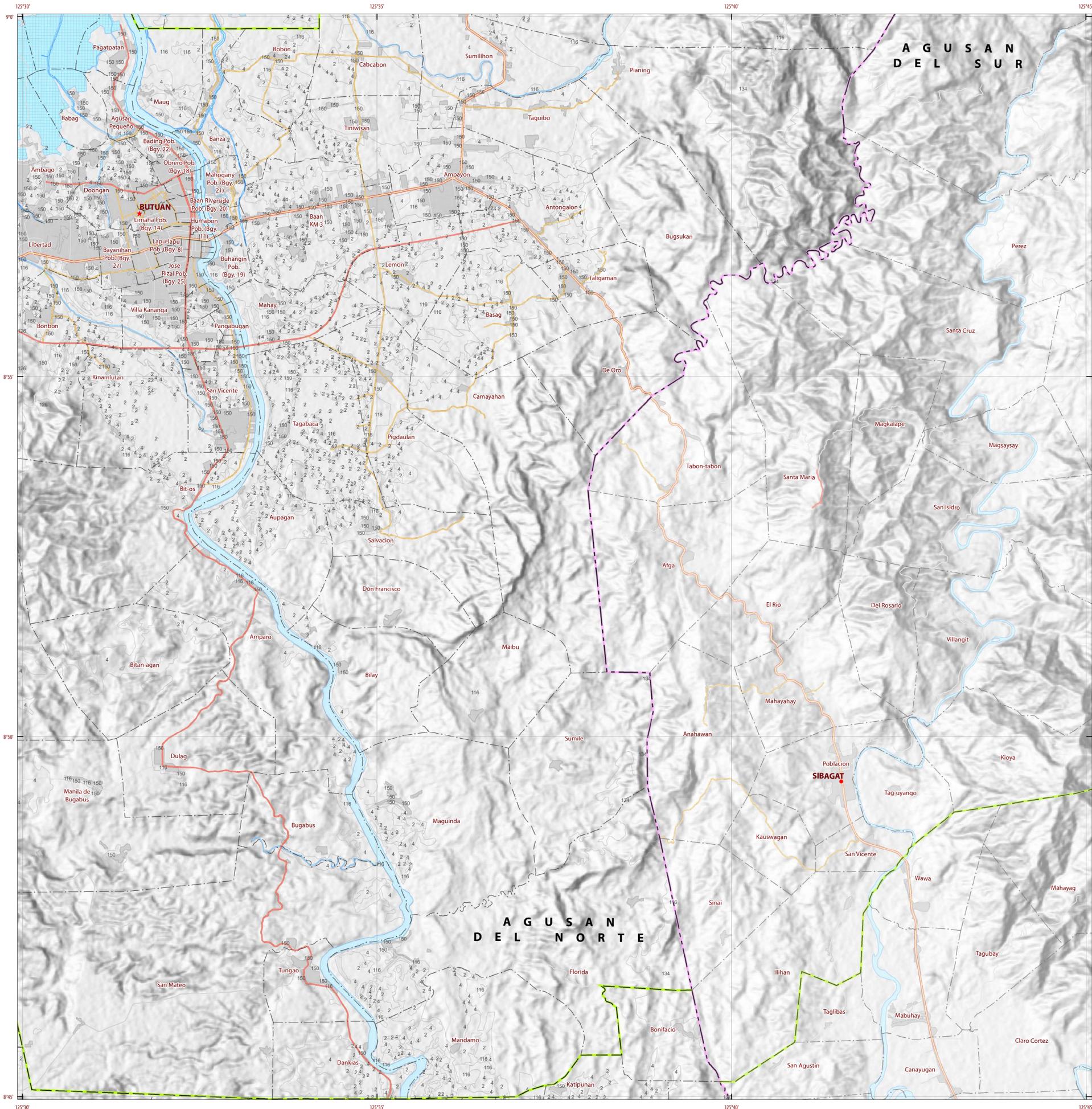
Project Leader : BERNARDO B. PASCUA
GIS and Cartography : IRWIN K. SAMALCA

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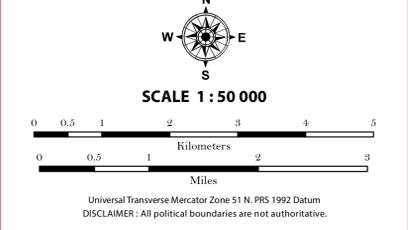
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LAND SUITABILITY MAP ARABICA COFFEE

LAND RESOURCES EVALUATION AND SUITABILITY ASSESSMENT OF STRATEGIC PRODUCTION AREAS



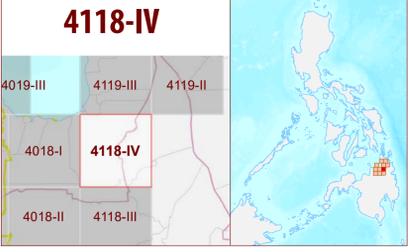
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- Not Suitable/ Not Relevant**
- OTHER SIGNS**
- NGP Areas
 - Cacao
 - Land limitation
 - Land use

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



MISCELLANEOUS INFORMATION

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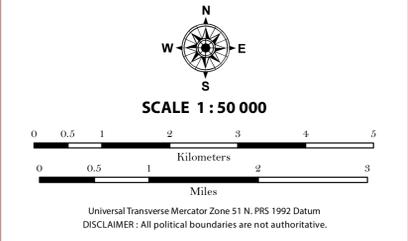
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LAND SUITABILITY MAP ARABICA COFFEE

LAND RESOURCES EVALUATION AND SUITABILITY ASSESSMENT OF STRATEGIC PRODUCTION AREAS



LEGEND

SUITABILITY CLASSES

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Not Suitable/ Not Relevant

OTHER SIGNS

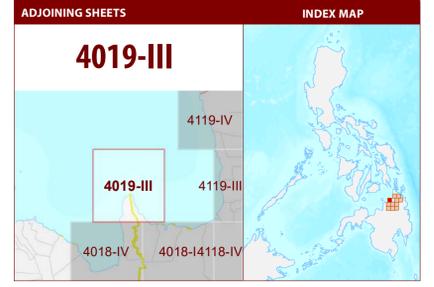
- NGP Areas
- Cacao
- Land limitation
- Land use

CONVENTIONAL SIGNS

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

LAND USE

- Built-up
- Fishpond
- Mangrove



MISCELLANEOUS INFORMATION

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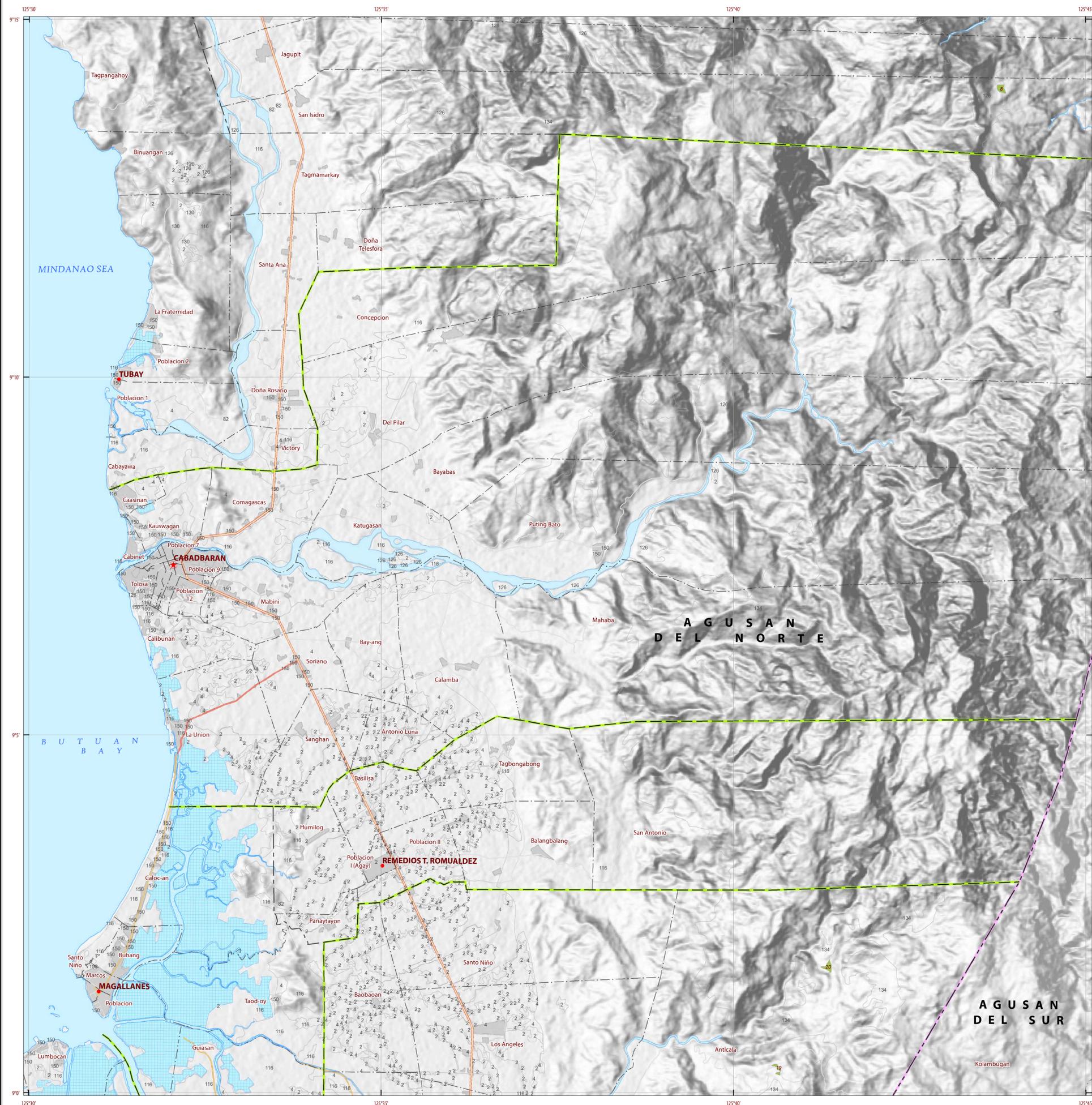
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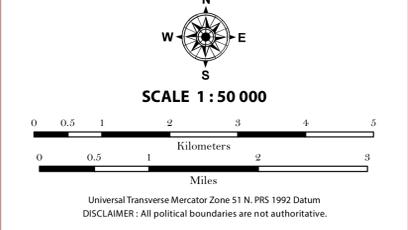
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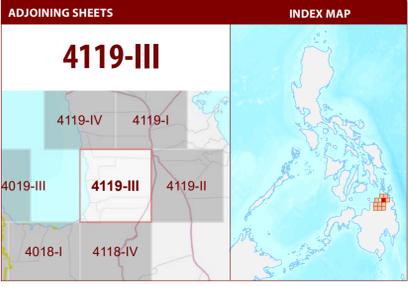
LAND SUITABILITY MAP ARABICA COFFEE

LAND RESOURCES EVALUATION AND SUITABILITY ASSESSMENT OF STRATEGIC PRODUCTION AREAS



- LEGEND**
- SUITABILITY CLASSES**
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 - 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 | PLACES |
| Secondary | Municipality | ★ Capital City / City |
| Tertiary | Barangay | ● Capital Town / Town |
- LAND USE**
- Built-up
 - Fishpond
 - Mangrove



MISCELLANEOUS INFORMATION

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LAND SUITABILITY MAP ARABICA COFFEE

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

LAND USE

- Built-up
- Fishpond
- Mangrove

ADJOINING SHEETS

4119-IV

4119-I, 4119-II, 4119-III, 4019-III

INDEX MAP

MISCELLANEOUS INFORMATION

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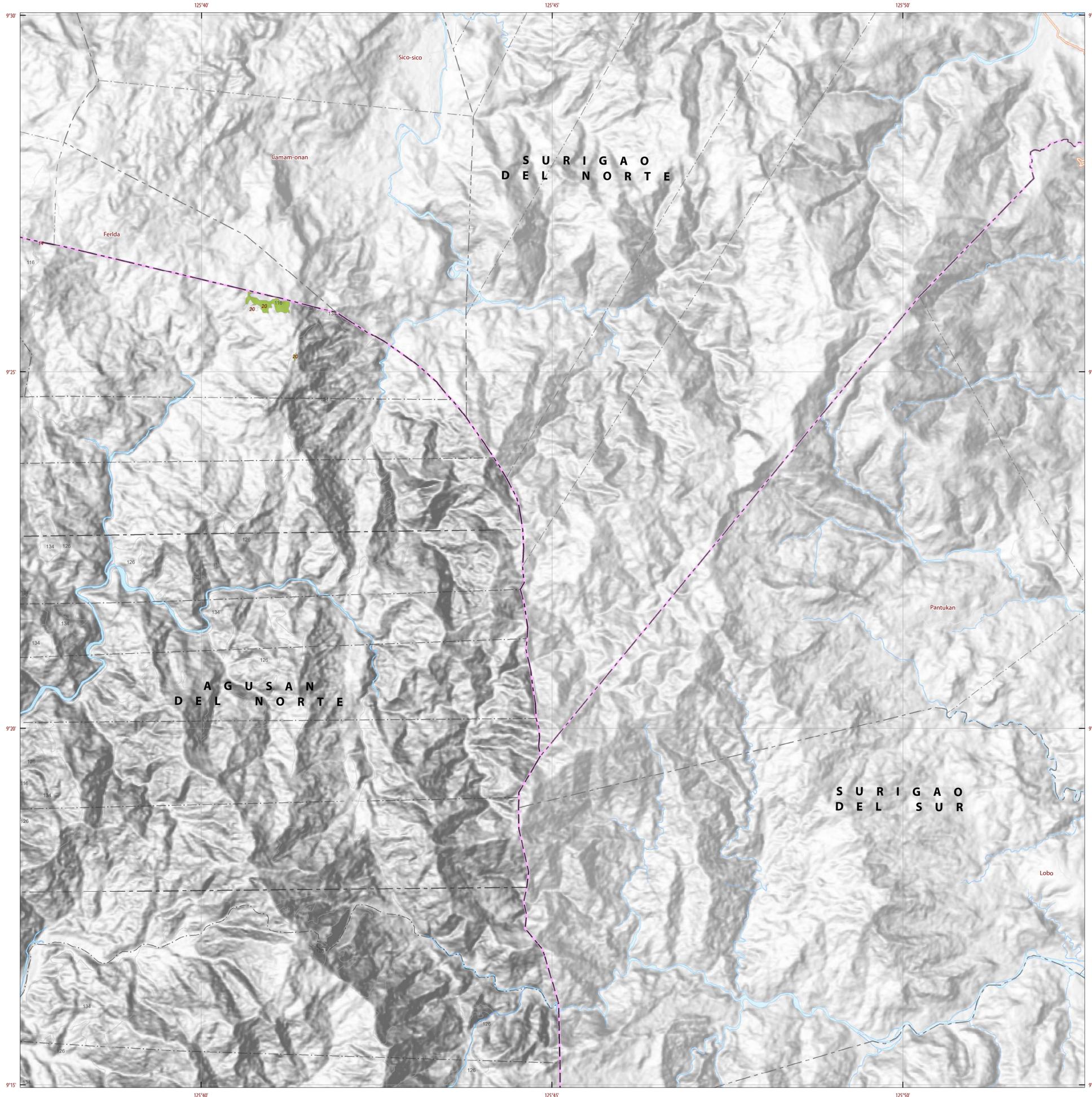
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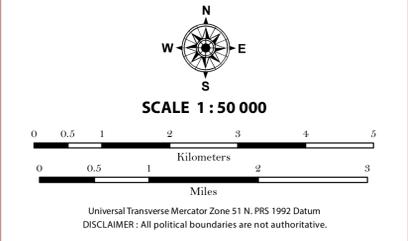
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PROVINCE OF AGUSAN DEL NORTE Sheet 10 of 11 Sheet No. 4119-IV



LAND SUITABILITY MAP ARABICA COFFEE

LAND RESOURCES EVALUATION AND SUITABILITY ASSESSMENT OF STRATEGIC PRODUCTION AREAS



LEGEND

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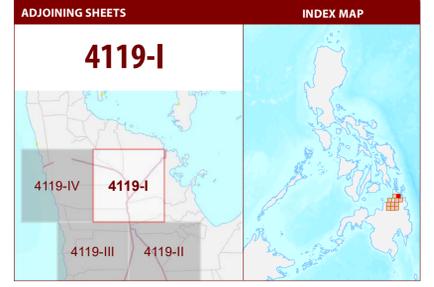
Not Suitable/ Not Relevant

OTHER SIGNS

- NGP Areas
- Cacao
- Land limitation
- Land use

CONVENTIONAL SIGNS

ROADS	BOUNDARY	HYDROLOGY
Expressway	Region	Sea / Shoreline
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Primary	District	PLACES
Secondary	Municipality	★ Capital City / City
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LAND USE		
Built-up	Fishpond	Mangrove



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