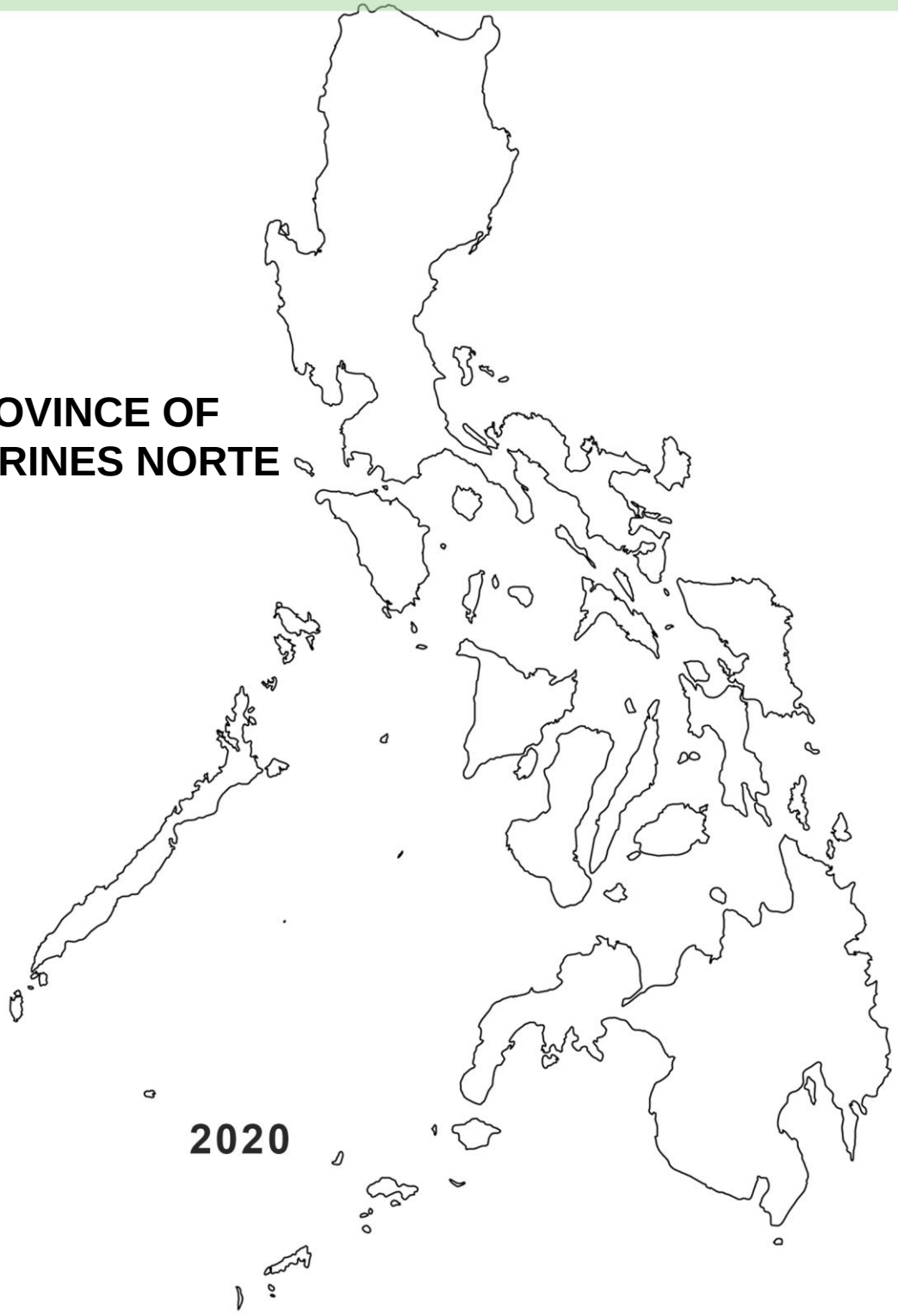
DEPARTMENT OF AGRICULTURE
Bureau of Soils and Water Management

Agricultural Land Management and Evaluation Division

National Mapping, Characterization and Development of Spatial Database for the Coastal Areas Affected by Salinity



PROVINCE OF CAMARINES NORTE

2020

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RATIONALE

Salinity is long time known as one of the problem soils. It directly affects the agriculture and fishery sector in terms of productivity and income. Seriously salt-affected soils result to a total crop failure. The reasons for salinity are 1) increasing trend in sea level rise, 2) over pumping of the aquifers, and 3) seepage along the river — that is, when seawater moves upstream into the river during periods of high tide and low river flow.

The Bureau of Soils and Water Management (BSWM) have initiated several studies regarding soil salinity, but a nationwide information system has never been developed for areas affected by salinity. A baseline information on salinity will be a significant input in infrastructure planning in agriculture and fishery, risk management — particularly disaster risk management and climate change adaptation, — and policy recommendations.

Based on BSWM Reconnaissance Survey in 1988, forty five (45) provinces are identified affected by salinity. They represent more than half of the country's provinces. However, the extent of this condition to Philippine soils is not yet established and thus the subject of this project.

This project generally aims to develop a national information system for the coastal areas affected by salinity. Specifically, it aims to:

1. describe the soil physico-chemical characteristics;

2. generate salinity maps;

3. develop spatial database on salinity for the coastal areas;

4. undertake suitability evaluation for agriculture and fisheries and prepare scenarios as input to policy.

CAMARINES NORTE

I. SOIL/LAND PHYSICAL CHARACTERISTICS

A. General Description of Saline Affected Area

Camarines Norte is a province in the Bicol region that covers a total area of 2,320.07 square kilometres occupying the northwestern coast of the Bicol Peninsula in the southeastern section of Luzon. It is bounded on the northeast by the Philippine Sea, east by the San Miguel Bay, west by the Lamon Bay, southwest by Quezon province, and southeast by Camarines Sur.

There are nine (9) coastal municipalities in Camarines Norte that are susceptible to soil salinity, hence the sites for sampling shown in Table 1.1.

Table 1.1. Coastal Areas and Municipalities in Camarines Norte

No.	Municipality	No. of Barangay	No. of Sampling Sites	No. of Soil Samples Collected
1	Basud	29	7	21
2	Capalonga	22	10	30
3	Daet	25	6	18
4	Jose Panganiban	27	5	15
5	Labo	52	2	6
6	Mercedes	26	5	15
7	Paracale	27	10	30
8	Santa Elena	19	6	18
9	Talisay	15	3	9
10	Vinzons	19	5	15
	TOTAL	**261**	**59**	**177**

B. Land Management Unit (LMU)

Land Management Unit is a recurring pattern of land which possesses similar physical characteristics such as soil type associated with relatively uniform land use or vegetation cover and parent material. The land management unit is the basis for integration of various resource information in suitability rating for different crops wherein each suitability class can be fitted with specific sets of management requirements and input. It is the building block of the pedo - ecological zone, which represents a broader landscape grouping such as lowland, upland, hillyland and highland.

Table 1.2. Land Management Units of Sampling Sites

LMU	Description	
01- Active Tidal Flats (Fishpond)	It comprises the low-lying areas along the coastal landscape. It is submerged or under water and often affected by high tide. This unit is formerly mangrove areas and former old tidal flat converted to fishponds formed from materials deposited by the rivers and ocean waters and occur on flat coastal areas	
02- Active Tidal Flats (Mangrove/ Nipa)	Comprise the coastal, active tidal flat estuarine plain subject to constraint tidal inundations. These are moderately deep to deep, very poorly drained, fine loamy to clayey textures saturated by saline water.	
08 - Beach, Ridges and Swales	Elongated ridges of sandy materials formed by the action of waves affected by tidal flooding, characterized by medium to coarse textured soils, shallow and well drained.	
09 - Broad Alluvial Plains	Generally flat low relief. The soil are very deep clay or heavy clay, moderately well drained to poorly drained, highly fertile and adaptable to wide range of crops dominated by paddy rice irrigated and non-irrigated.	
10 – Former Tidal Flats	Formed on level to gently sloping landscape between the tidal flats and alluvial plains near the coastal shore. The soil is deep to very deep, medium textured, well drained and very low fertility.	
16 – Infilled/ Localized Valleys	Found in the low laying narrow strip collu-alluvial valleys along the minor river or creeks developed by depositional processes in between hills or mountain with an outlet transitional or connected to alluvial fan.	
19 – Narrow Alluvial Plains	Mapped in minor alluvial plain situated in a small strip of long and narrow alluvial landscape with less than 500 meters in width. The soils are generally deep; slightly stony, heavy or clayey textured and well drained.	
180- Miscellaneous/Built –up Areas	Built-up areas are those that are occupied by settlement or residential, institutional (schools, chapels, church and cemeteries, etc.) infrastructure (road, bridges) and other similar structures.	

C. Flooding

Flooding in the low lying areas of the province is commonly caused by accumulation of rain water and over flowing of rivers due to excessive run-off of its watershed. It is usually accompanied with typhoons which severely damage plants and animals. Table 1.3 below shows the flooding classes, depth, frequency and the causes of flooding in Camarines Norte, while Table 1.4 shows the area distribution of flooding by municipality by flooding class.

Table 1.3 Flooding Classes, Depth, Duration, Frequency and Main Causes of Flooding in Camarines Norte (BSWM, 1993)

FLOODING SYMBOL	CLASSES	DESCRIPTION	FREQUENCY/ OCCURRENCE	CAUSES/ ORIGIN
F0	None	No flooding		
F1	Slight	Slight seasonal flooding normally characterized by flooding depth of less than 0.5 meters after heavy rains; flood water recede from 12 hours to one day	Flooding occurs once a year mainly during the months of October to December	Overflow of creeks, rivers flash floods and surface run-off from higher surrounding areas
F2	Moderate	With flooding depth of 0.5 - 1 meter for a duration of 2-5 days to maximum of 7 days	Occurrence of flood is once or twice a year particularly during the months of October to December	River bank overflows accumulation of rainwater and due to surface runoff from the adjoining elevated areas
F3	Severe	Severe seasonal flooding with a depth of 0.5 meter oftentimes reaching up to 1 - 1.5 meters in depth lasting for 7up to 30 days	Occurs during typhoon months particularly within the months of October to December	Accumulation of rainwater lack of adequate drainage outlets
F4	Tidal Flooding	Characterized by a flooding depth of 0.5 – 1 meter submerged (active tidal flats, swales and mangroves)	Daily affected by tidal flooding and becomes severe during typhoon months	Tidal flood water from the sea and main rivers

Table 1.4 Area Distribution by Flooding Class

Municipality	FLOODING AREAS (Has)				Total (Has)
	Severe	Moderate	Slight	Tidal Flooding	
Basud	-	-	603.94	31.39	635.33
Capalonga	-	-	167.94	2,050.83	2,218.77
Daet	-	-	2,080.95	453.33	2,534.28
Jose Panganiban	-	-	-	1,555.78	1,555.78
Labo	-	1,120.96	552.62	-	1,673.58
Mercedes	-	-	93.79	990.59	1,084.38
Paracale	-	111.23	195.72	1,524.13	1,831.08
San Lorenzo Ruiz	-	-	-	-	-
San Vicente	-	-	-	-	-
Santa Elena	769.16	-	1,255.71	2,651.64	4,676.51
Talisay	-	-	1,221.31	106.43	1,327.74
Vinzons	376.71	1,474.02	777.10	667.40	3,295.23
TOTAL (Has)	**1,145.87**	**2,706.21**	**6,949.08**	**10,031.52**	**20,832.68**

Source: Soil and Land Resource Evaluation Project, Bureau of Soils and Water Management, Municipal Land Information Maps, Land Management Sector, Region V

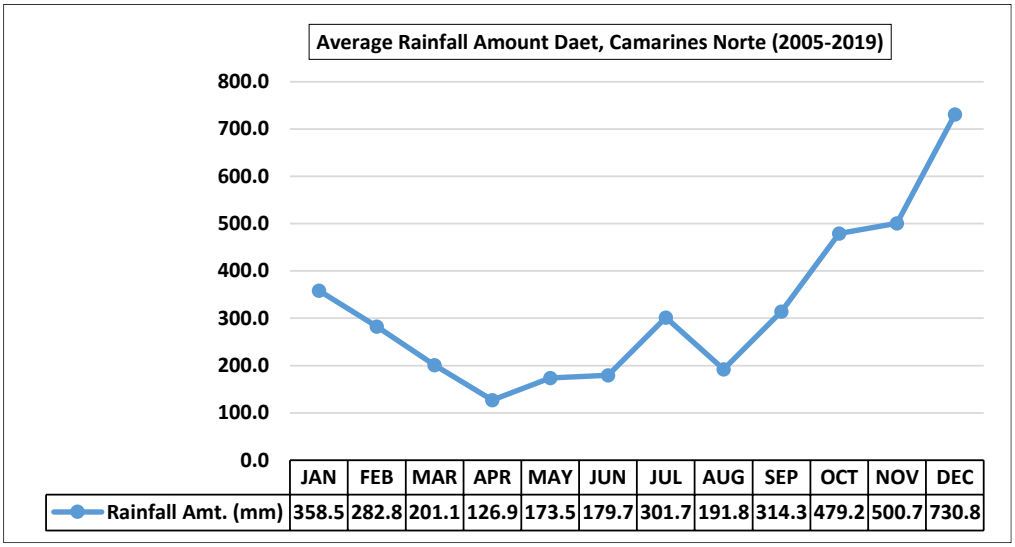
D. Elevation

The elevation of a geographic location is the height above sea level (meters above sea level). Since the coastal areas are in the lowland pedo-ecological zone, soil sampling points are taken from elevations ranging from 0-5masl and 5-10masl.

E. Agro-Climate

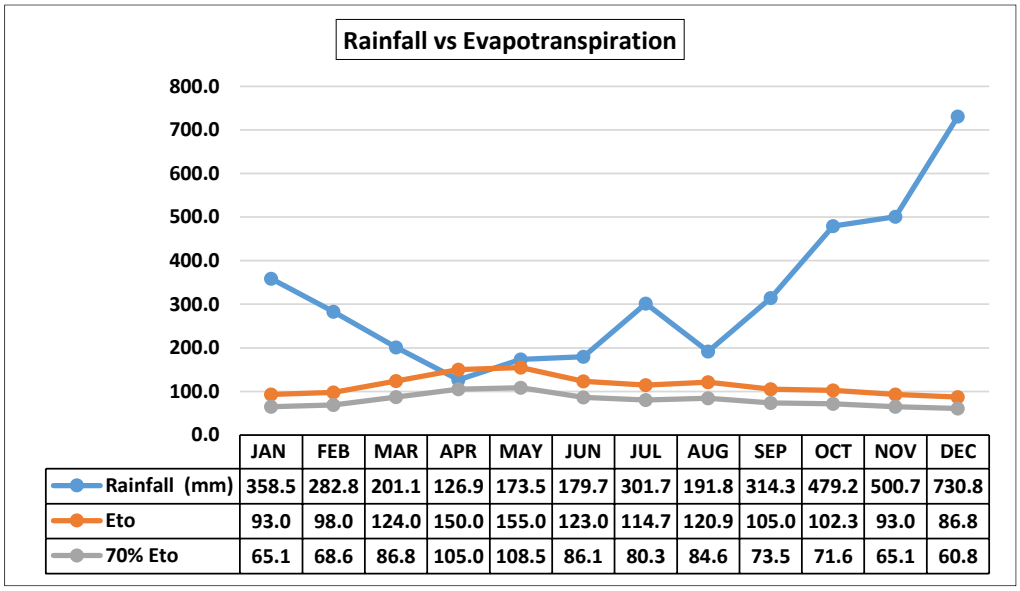
According to the Modified Corona's Classification of Climate, Camarines Norte is in Type II Climate. It is characterized with no dry season and with a very pronounced maximum rain period that occurs from October to January, as shown in Figure 1.1 Average Monthly Amount of Rainfall recorded from 2005 to 2019, from PAGASA Agromet station in Daet, Camarines Norte.

Figure 1.1 Average Monthly Amount of Rainfall



	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
Rainfall Amt. (mm)	358.5	282.8	201.1	126.9	173.5	179.7	301.7	191.8	314.3	479.2	500.7	730.8

Figure 1.2 Comparison of the Average Rainfall and Evapotranspiration



	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
Rainfall (mm)	358.5	282.8	201.1	126.9	173.5	179.7	301.7	191.8	314.3	479.2	500.7	730.8
Eto	93.0	98.0	124.0	150.0	155.0	123.0	114.7	120.9	105.0	102.3	93.0	86.8
70% Eto	65.1	68.6	86.8	105.0	108.5	86.1	80.3	84.6	73.5	71.6	65.1	60.8

Evapotranspiration (Eto) is the sum of water transpired by the leaves of the crop and evaporation from the surrounding soil when water is not limited. Ideally, rainfall is considered to be sufficient if its amount is equal or higher than the potential evapotranspiration. In Figure 1.2 comparison of rainfall and evapotranspiration in Camarines Norte, the average rainfall is higher than the potential evapotranspiration all throughout the year except for the month of April. This means that soil moisture is sufficient to support crop cultivation every month except April.

F. Land Use/Vegetation

Land use involves the management and modification of natural environment. It also has been defined as "the total arrangements, activities, and inputs that people undertake in a certain land cover type." Land use and vegetation plays an important role in the identification of areas affected by salinity. It provides primarily indicative information on the physical and socio-economic activities prevailing in the area. On the other hand, salinity reduces the kinds of crops that can be grown for economic purposes due to chemical reactions between salt water and soil clay particles.

The common land use/vegetation in Camarines Norte sampling sites are presented in Table 1.5. Some indicators of salinity per municipality are also indicated in this table.

Table 1.5 Land Use/Vegetation in Camarines Norte Sampling Sites.

Municipality	Land Use/Vegetation	Some indicators of Salinity
1. Basud	Paddy Rice and Queen Pineapple	Sedges Weeds and Bear Grasses
2. Capalonga	Paddy Rice and Nipa	Sedges Weeds, Bear Grasses, Yellowish Leaves, Stunted Growth, Nipa and Empty Panicle
3. Daet	Paddy Rice, Coconut, Corn and Cassava	White crust in field surface, Aster Weeds, Beard Grasses, Wilting Plant, Yellowish Leaves, Stunted Growth and Empty Panicle
4. Jose Panganiban	Paddy Rice	Sedges Weeds, Bear Grasses, Yellowish Leaves, Stunted Growth and Empty Panicle
5. Mercedes	Paddy Rice, Nipa and String Beans	Aster Weeds, Sedges Weeds, Bear Grasses, Wilting Plant, Yellowish Leaves, Stunted Growth, Nipa and Empty Panicle
6. Paracale	Paddy Rice and Watermelon	Aster Weeds, Sedges Weeds, Beard Grasses, Wilting Plant and Yellowish Leaves
7. Santa Elena	Paddy Rice, Coconut and Fishpond	Sedges Weeds, Yellowish Leaves, Stunted Growth and Empty Panicle
8. Talisay	Paddy Rice and Watermelon	Wilting Plant, Yellowish Leaves and Empty Panicle
9. Vinzons	Paddy Rice, Corn, Squash, String Beans, Bitter Gourd and Watermelon	

Figure 1.3 Auger Boring and Soil Sampling

II. CROP PRODUCTION ON SALINE AFFECTED AREAS

A. Key Informant Profile

Based on the 104 farmer respondents with 1:4 female-male ratio, the average age of farmers is 54. The eldest and youngest is 85 and 22 years old. Most of the farmer respondents are tenants (73%), and only 27% are owners of their farm. The average farm size is 1.5 hectares per farmer and their average farming experience is 29 years.

B. Farm Production

The two major crops in Camarines Norte that contribute to agricultural productivity are coconut and rice. Table 2.1 shows the area distribution of different crops in the Municipality of Daet, the capital of Camarines Norte.

Table 2.1 Area Distribution per Hectare of Different Crops per Municipality

Municipality	Land Area (Hectares)	Area Planted (Hectares)			
		Irrigated Rice	Rainfed Rice	Upland Rice	Coconut
Basud	26,028.00	596.55	410.06		7,964.00
Daet	4,600.00	1,069.93	169.46		1,731.40
Jose Panganiban	21,440.00	904.25	300.28		
Sta Elena	18,353.48	612.35	327.05	36.5	229,216.00

Figure 2.1 Key Informant Interviews

Figure 2.2 Courtesy Visit per Municipal LGUs

C. Farm Input

The study is limited to the coastal communities of the province, therefore, the information on farm inputs are mainly based on the key informant interviews. Farmer respondents usually use commercially available rice seed varieties as shown in Table 2.2.

Table 2.2 Rice Seed Varieties

Seed Variety	Description
NSIC RC252H	Mestiso 33 , Hybrid
NSIC RC222	Tubigan 18, Inbred
NSIC RC 152	Tubigan 10, Inbred
NSIC RC 110	Tubigan 1, Inbred
NSIC RC 216	Tubigan 17, Inbred
PSB RC 10	Pagsanjan, Inbred

For fertilizers, they use inorganic fertilizers like urea (46-0-0), complete (14-14-14), ammonium phosphate (16-20-0) and magnum. They also use chemical herbicides 2,4-D, and insecticides like cymbus, furadan, and karate.

D. Source of Irrigation

The province of Camarines Norte has a potential area for irrigation development about 16,889 hectares. The National Irrigation System servicing to about 2,903 hectares to the municipalities of Basud, Labo, Mercedes, Talisay and Vinzons. Some irrigation facilities were established by other government agencies and private sector. Total irrigated area accounted to about 43.24% of the potential irrigable areas and 56.76% are the remaining areas to be developed.

Figure 2.3 Daet- Talisay Dam

Table 2.3 Source of Irrigation for Paddy Rice

Source of Irrigation	Percent (%)
NIA	36
STW	12
Creek	9
Rainfed	43

E. Period of Salinity Occurrence and Practices to Address Salinity

Only 37% of the farmer respondents said that salinity affects their rice farms during heavy rainfall. They still want to plant rice and do not consider to adopt other suitable crops considering salinity. Most of the farmer-respondents' practices to address salinity are the following: 1) proper timing in planting, 2) no application of fertilizer, and 3) flushing saline water with fresh water.

Figure 2.4 Air Drying, Pulverizing and Packaging of Soil Samples

III. SOIL CHEMICAL CHARACTERISTICS

Soil samples are brought to the BSWM Laboratory Services Division for the soil salinity/alkalinity test which includes pH (1:1) at 25^0C, Electrical Conductivity (EC) at 25^0C, Calcium (Ca), Magnesium (Mg), Sodium (Na), Potassium (K), Sum of Cations, Carbonate (CO_3), Bicarbonate (HCO_3), Chloride (Cl), Sulfate (SO_4), Sum of Anions, and Sodium Adsorption Ratio (SAR).

The EC test results are classified according to its salinity class and then used to map salinity in the coastal area. Other laboratory test results are gathered as input to the Saline-Affected Areas Database Information System (SADIS v1.1). This spatial database can be used as reference for future research studies on salinity.

A. Salinity Classification

The laboratory results for salinity testing, specifically the EC readings, are classified using Table 3.1 below, based on the BSWM/FAO Salinity Project in 1999. This salinity classification is rice-based and applicable to Philippine setting.

Table 3.1 Salinity Classification (Crop-based, Rice)

Electrical Conductivity *(mS/cm)*	Soil Salinity Class	Hazard for Crop Growth	Plant Response
0 - 2	Non Saline	Very low	Negligible
2.1 - 4	Slightly Saline	Low	Restricted yield of sensitive crops
4.1 - 8	Moderately Saline	Moderate	Restricted yield of many crops
8.1 - 16	Severely Saline	High	Only a few tolerant crops yield satisfactorily
>16	Very Severely Saline	Very high	Only a few tolerant forage grow satisfactorily

Table 3.2 shows the laboratory EC test results of soil samples per municipality. Each EC readings are further classified using Table 3.1 above. In the Municipalities of Basud and Paracale there are very severely saline soil (Barangays Pinagwarasan and Mampungo). These areas have very high hazard for crop growth and only a few tolerant forage can grow satisfactorily. Severely saline soils are in Barangays Awitan and San Isidro of Daet and in Barangay Larap of Paracale. These areas are also hazard for crop growth, although only very few plants have root system that can reach this depth. Moderately saline soils are in some Barangays of Daet and Jose Panganiban. These are moderately hazard for crop growth that will result to restricted yield of many crops. Generally, most of the soil samples are non saline.

Table 3.2 Electrical Conductivity (EC) of Soil Samples at Different Depths

AUGER REF	BARANGAY	MUNICIPALITY	EC (mS/cm) @0 -30cm	EC (mS/cm) @30 -60cm	EC (mS/cm) @60 -90cm
AB24	Calangcawan Sur	Vinzons	1.205	0.483	0.144
AB25	Calangcawan Sur	Vinzons	0.171	0.095	0.056
AB26	Guinacuitan	Vinzons	0.111	0.075	0.079
AB27	Fundado	Labo	0.412	0.130	0.133
AB28	Bagacay	Labo	0.099	0.048	0.045
AB7	Angas	Basud	0.145	0.042	0.054
AB9	Mocong	Basud	0.094	0.075	0.062
AB10	Bagtas	Basud	0.192	0.064	0.063
AB11	Bagtas	Basud	0.233	0.169	0.560
AB17	San Isidro	Daet	0.147	0.166	0.165
AB19	Borabod	Daet	0.323	0.148	0.124
AB21	San Jose	Talisay	0.431	0.196	0.153
AB22	Binanuan	Talisay	0.162	0.116	0.080
AB23	San Francisco	Talisay	0.124	0.116	0.126
AB20	Awitan	Daet	9.31	8.46	14.53
AB18	San Isidro	Daet	7.15	10.78	12.99
AB15	San Isidro	Daet	0.608	0.572	0.405
AB16	San Isidro	Daet	0.263	0.259	0.158
AB6	Mangcamagong	Basud	0.668	0.544	0.276
AB8	Pinagwarasan	Basud	0.543	70.02	67.02
AB37	Gumaos	Paracale	0.468	0.463	1.92
AB34	Casalugan	Paracale	0.367	0.234	0.309
AB35	Tawig	Paracale	0.253	0.294	0.201
AB36	Pinagbirayan Malaki	Paracale	0.130	0.218	0.154
AB33	Calaburnay	Paracale	0.167	0.277	0.17
AB31	Tabas	Paracale	0.318	0.137	213
AB32	Agit-it	Paracale	0.593	0.222	0.295
AB30	Manlucugan	Vinzons	0.302	1.282	0.186
AB29	Mampungo	Paracale	0.632	1.892	18.71
AB12	Cayucyucan	Mercedes	0.14	0.092	0.216
AB14	Manguisoc	Mercedes	0.117	0.121	0.14
AB13	Takad	Basud	0.255	0.074	0.119
AB5	Matoogtoog	Mercedes	0.313	0.149	0.094
AB4	Pambuhan	Mercedes	0.107	0.073	0.076
AB43	Santa Cruz	Jose Panganiban	0.19	0.247	7.326
AB39	San Jose	Jose Panganiban	1.612	2.012	1.845
AB42	Santa Cruz	Jose Panganiban	0.391	0.186	0.17
AB40	Larap	Jose Panganiban	7.503	9.207	10.4
AB38	Santa Rosa	Jose Panganiban	1.209	0.412	0.503
AB57	Basiad	Sta Elena	0.439	0.275	0.234
AB58	Basiad	Sta Elena	0.244	0.222	0.164
AB56	San Vicente	Sta Elena	0.309	0.221	0.178
AB55	Sta Elena	Sta Elena	0.234	0.156	0.141
AB54	San Lorenzo	Sta Elena	0.197	0.178	0.164

AUGER REF	BARANGAY	MUNICIPALITY	EC (mS/cm) @0 -30cm	EC (mS/cm) @30 -60cm	EC (mS/cm) @60 -90cm
AB53	Del Pilar	Capalonga	0.141	0.148	0.136
AB52	Del Pilar	Capalonga	6.911	4.244	2.87
AB44	Catioan	Capalonga	0.124	0.069	0.07
AB45	Poblacion	Capalonga	0.42	0.196	0.359
AB46	Lubang	Capalonga	0.103	0.085	0.084
AB44A	Catagwan	Capalonga	0.825	0.114	0.125
AB47	Itok	Capalonga	0.103	0.073	0.061
AB48	Itok	Capalonga	0.13	0.069	0.078
AB51	Calabaca	Capalonga	0.165	0.111	0.097
AB50	Calabaca	Capalonga	0.434	0.563	9.249
AB55A	Pulong Guit Git	Sta Elena	4.635	4.926	10.04
AB37A	Gumaus	Paracale	1.033	1.06	0.323
AB30A	Aguit-it	Vinzons	0.74	0.202	0.328
AB26A	Mangcayo	Vinzons	0.155	0.111	0.09
AB16A	Del Rosario	Mercedes	0.243	0.279	0.685

Soil Salinity Maps for three different depths (0-30cm, 30-60cm, and 60-90cm) are delineated using the corresponding coordinates of the sampling sites and the EC readings. These maps interpret the land area per municipality at different degrees of salinity, as shown in Tables 3.3 – 3.5.

Table 3.3 Coastal Land Area (in hectares) per Municipality at Different Degrees of Salinity (0-30 cm depth)

Coastal Municipality	Non Saline	Slightly Saline	Moderately Saline	Severely Saline	Very Severely Saline
BASUD	3,561.46	469.68	174.44		
DAET	2,620.13	419.80	418.92	27.50	
JOSE PANGANIBAN	333.81				
LABO	3,354.41				
MERCEDES	2,716.92	220.02			
PARACALE	5,118.52				
SAN LORENZO RUIZ	0.22				
SAN VICENTE	17.23				
TALISAY	2,543.69	138.32	109.72	23.01	
VINZONS	6,927.43				
TOTAL	**27,193.81**	**1,247.82**	**703.08**	**50.51**	

Table 3.3 shows the coastal land area (in hectares) affected by salinity for 0-30cm depth. Severely saline is 50.51 hectares, in Daet and Talisay. These areas have high hazard to crop growth and only a few tolerant crops yield satisfactorily. Moderately saline is 703.82 hectares, also in Daet, Talisay and Basud. These areas have restricted yield on many crops. Slightly saline area is 1,247.82 hectares and these have low hazard to crop growth. Generally, the coastal land area is non saline.

Table 3.4 Coastal Land Area (in hectares) per Municipality at Different Degrees of Salinity (30-60 cm depth)

Coastal Municipality	Non Saline	Slightly Saline	Moderately Saline	Severely Saline	Very Severely Saline
BASUD	3,486.73	511.06	207.79		
DAET	2,526.75	420.13	381.12	158.36	
JOSE PANGANIBAN	333.81				
LABO	3,354.41				
MERCEDES	2,190.62	746.32			
PARACALE	5,118.52				
SAN LORENZO RUIZ	0.22				
SAN VICENTE	17.23				
TALISAY	2,546.28	139.11	116.95	12.39	
VINZONS	6,927.43				
TOTAL	**26,501.99**	**1,816.62**	**705.86**	**170.75**	

On Table 3.4 at 30-60cm depth, the land area affected by salinity is a little higher than at 0-30cm depth. Severely saline is 170.75 hectares, in Daet and Talisay. Moderately saline is 705.86 hectares, also in Daet, Talisay and Basud. These areas have high to moderate hazard to crop growth and only a few tolerant crops yield satisfactorily.

Table 3.5 shows the largest area affected by salinity. Severely saline and a increased to 470.22 hectares, while the moderately saline area is 574.41 hectares. Although only very few plants have root system that can reach this depth, there are chances that during dry months, salts will accumulate at the surface of the soil and thus, can be moderately to highly hazardous to crop growth.

Table 3.5 Coastal Land Area (in hectares) per Municipality at Different Degrees of Salinity (60-90 cm depth)

Coastal Municipality	Non Saline	Slightly Saline	Moderately Saline	Severely Saline	Very Severely Saline
BASUD	3,497.31	530.45	177.81		
DAET	1,960.38	888.84	267.67	369.46	
JOSE PANGANIBAN	333.81				
LABO	3,354.41				
MERCEDES	1,350.02	1,561.91	25.01		
PARACALE	5,118.52				
SAN LORENZO RUIZ	0.22				
SAN VICENTE	16.82	0.40			
TALISAY	2,434.64	175.42	103.92	100.76	
VINZONS	6,927.43				
TOTAL	**24,993.57**	**3,157.02**	**574.41**	**470.22**	

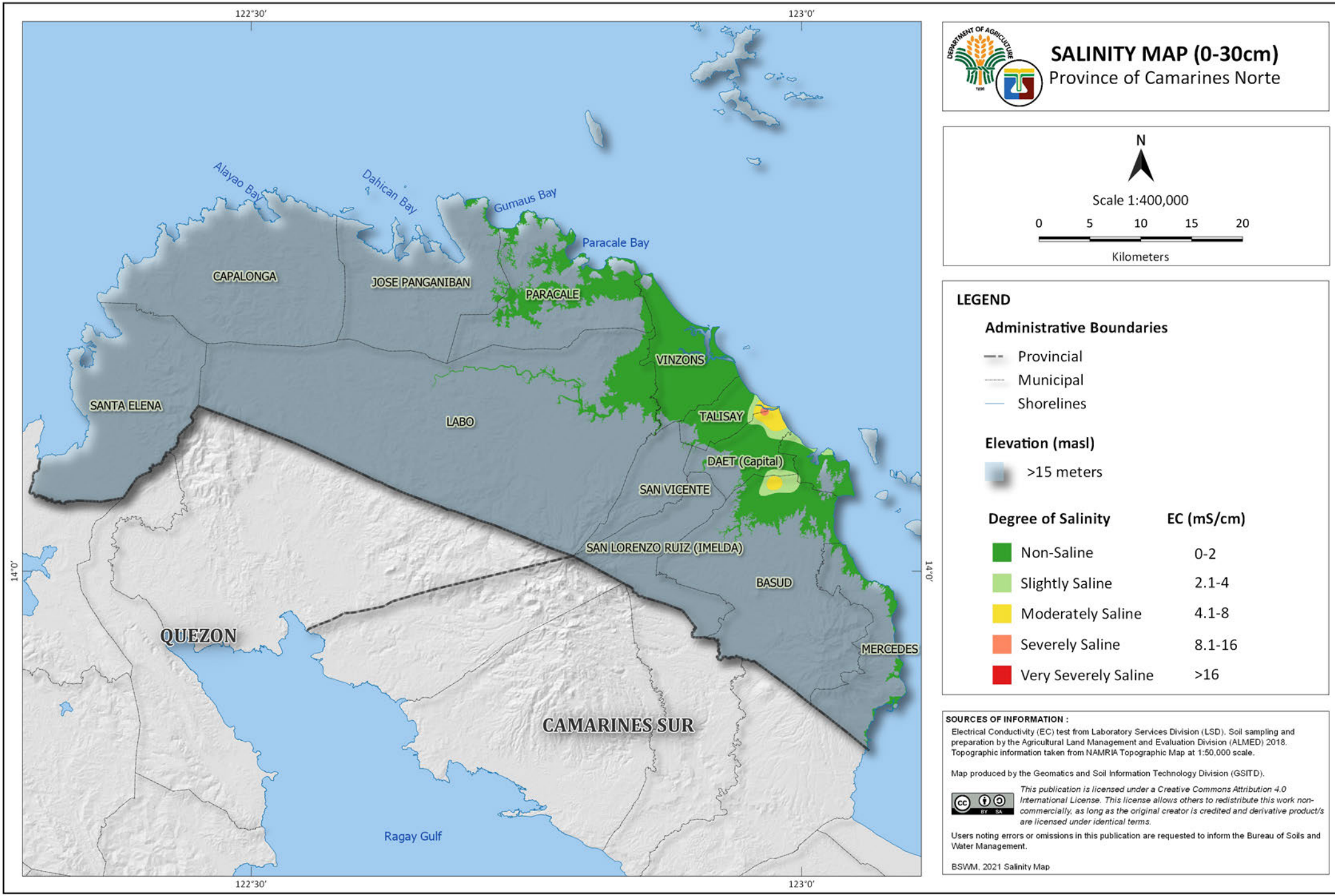
Table 3.6 Distribution of Coastal Land Area at Different Degrees of Salinity, Camarines Norte Province

Salinity Class	Soil Depth (cm)					
	0-30		30-60		60-90	
	hectares	%	hectares	%	hectares	%
Non saline	27,193.81	93.14	26,501.99	90.78	24,993.57	85.61
Slightly saline	1,247.82	4.27	1,816.62	6.22	3,157.02	10.81
Moderately saline	703.08	2.41	705.86	2.42	574.41	1.97
Severely saline	50.51	0.17	170.75	0.58	470.22	1.61
Very Severely saline						
TOTAL	**29,195.22**	**100**	**29,195.22**	**100**	**29,195.22**	**100**

Table 3.6 summarizes the total coastal land area of Camarines Norte per degree of salinity. At 60-90 cm soil depth, only 1.61% of the coastal land area is severely saline and at the soil depths 0-30 and 30-60 cm, 2.42% is moderately saline. Generally, the coastal land area is non saline.

B. Output Maps

The following are the output maps of the project: the Soil Salinity Maps of the Province of Camarines Norte at 0-30cm depth; 30-60cm depth; and 60-90cm depth.



SALINITY MAP (0-30cm)

Province of Camarines Norte

N

Scale 1:400,000

0 5 10 15 20

Kilometers

LEGEND

Administrative Boundaries

- Provincial
- Municipal
- Shorelines

Elevation (masl)

- >15 meters

Degree of Salinity	EC (mS/cm)
Non-Saline	0-2
Slightly Saline	2.1-4
Moderately Saline	4.1-8
Severely Saline	8.1-16
Very Severely Saline	>16

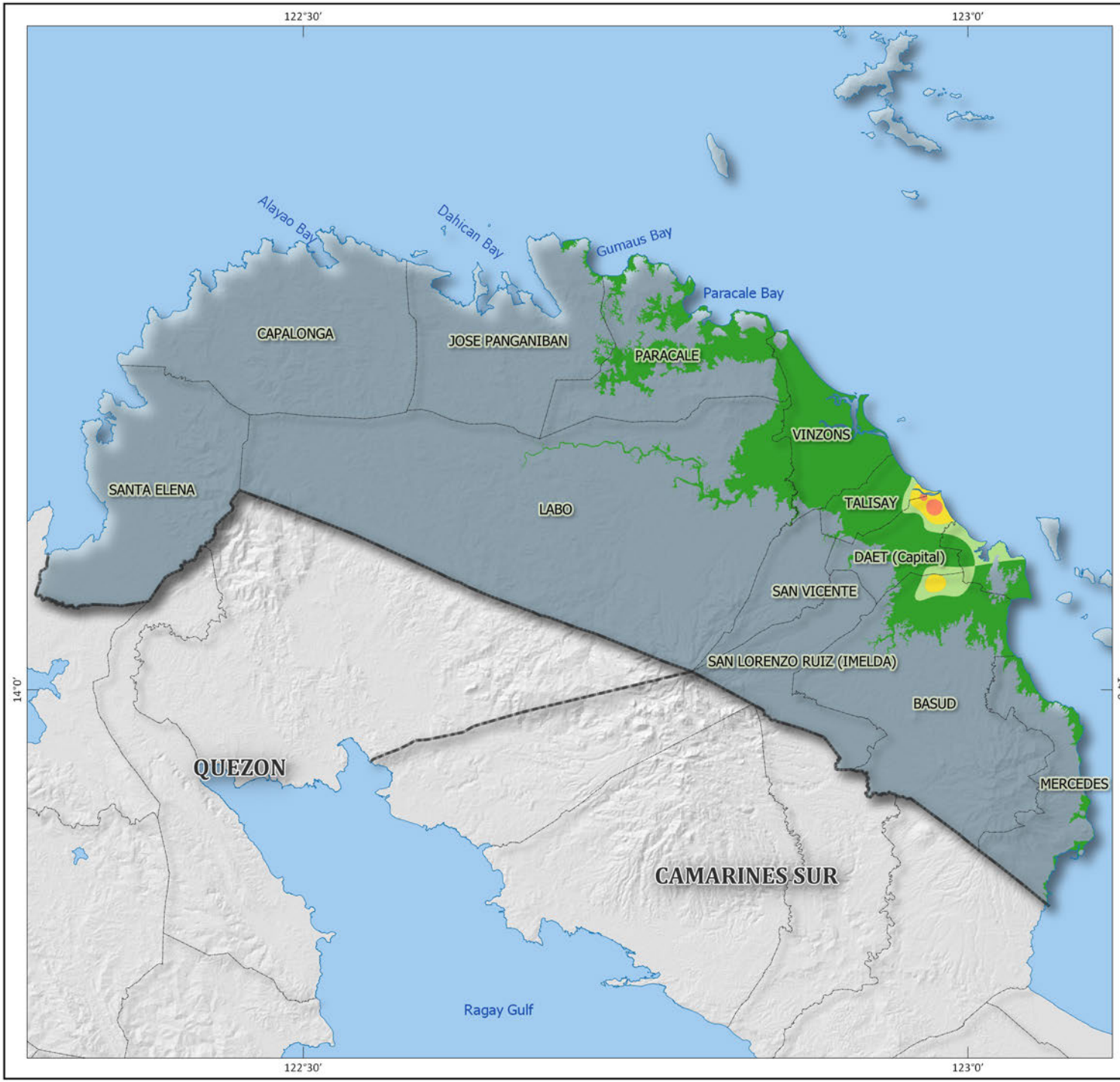
SOURCES OF INFORMATION :

Electrical Conductivity (EC) test from Laboratory Services Division (LSD). Soil sampling and preparation by the Agricultural Land Management and Evaluation Division (ALMED) 2018. Topographic information taken from NAMRIA Topographic Map at 1:50,000 scale.

Map produced by the Geomatics and Soil Information Technology Division (GSITD).

Users noting errors or omissions in this publication are requested to inform the Bureau of Soils and Water Management.

BSWM, 2021 Salinity Map



SALINITY MAP (30-60cm)

Province of Camarines Norte

N

Scale 1:400,000

0 5 10 15 20

Kilometers

LEGEND

Administrative Boundaries

- Provincial
- Municipal
- Shorelines

Elevation (masl)

- >15 meters

Degree of Salinity	EC (mS/cm)
Non-Saline	0-2
Slightly Saline	2.1-4
Moderately Saline	4.1-8
Severely Saline	8.1-16
Very Severely Saline	>16

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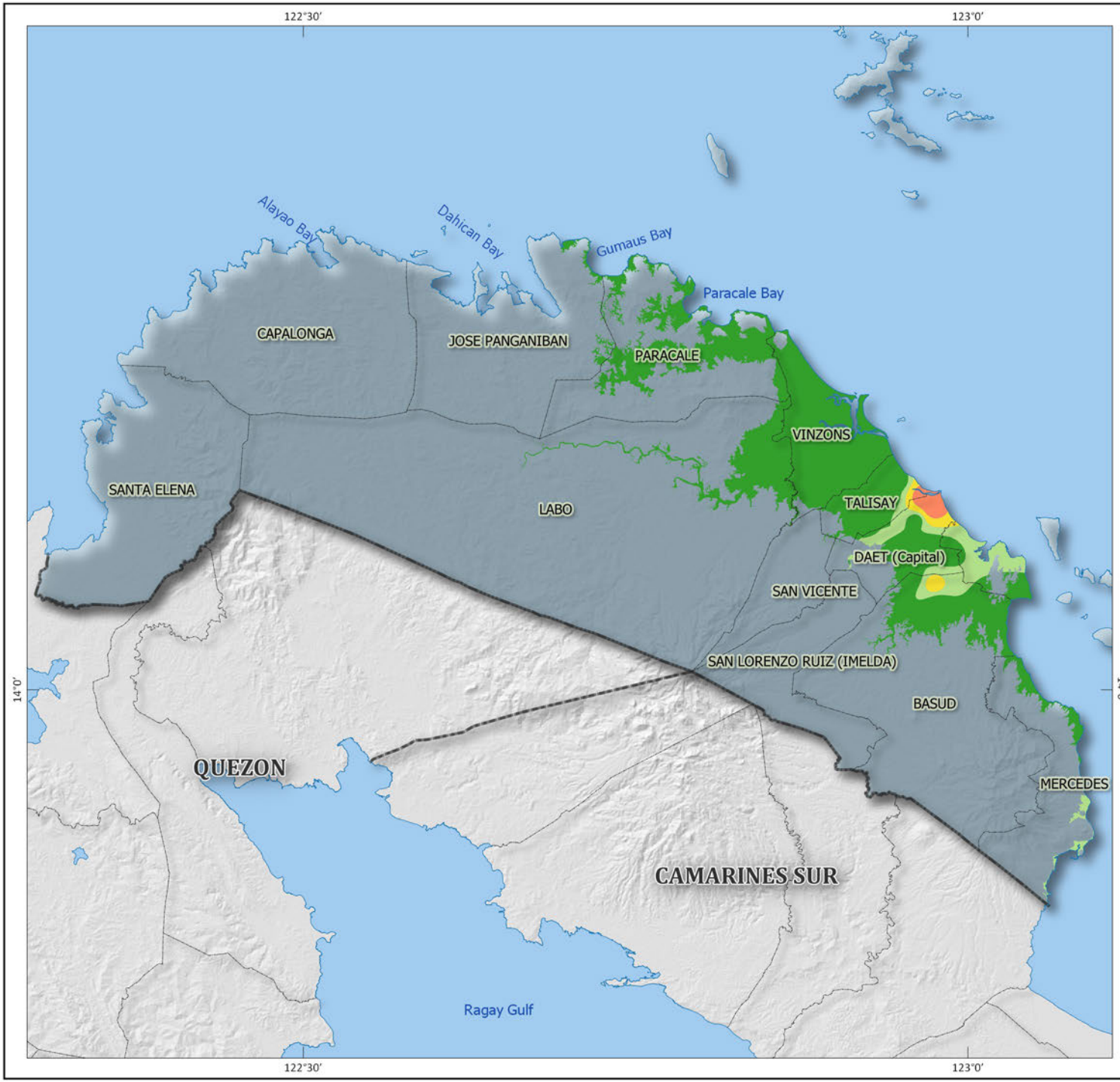
BSWM, 2021 Salinity Map



SALINITY MAP (60-90cm)

Province of Camarines Norte

N

Scale 1:400,000

0 5 10 15 20

Kilometers

LEGEND

Administrative Boundaries

- Provincial
- Municipal
- Shorelines

Elevation (masl)

- >15 meters

Degree of Salinity	EC (mS/cm)
Non-Saline	0-2
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BSWM, 2021 Salinity Map

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