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ILOILO PROVINCE

REPUBLIC OF THE PHILIPPINES
DEPARTMENT OF AGRICULTURE AND NATURAL RESOURCES
M A N I L A

SOIL REPORT 9

SOIL SURVEY OF ILOILO PROVINCE

BY

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SOIL SURVEY OF ILOILO PROVINCE, PHILIPPINES

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INTRODUCTION

The Philippines is still primarily an agricultural country. For many years to come the income of the government and the well-being of the people will continue to depend, as they depended in the past, on the productiveness of our soils. It is true that there is an oversufficiency of agricultural lands available at present. But if we exploit our soils the way we did in the past, and continue to do so, without system, without science, without regards to the welfare of the people who will use the same soils after us, there will be a serious problem for the generations to come. In view of this, we must systematize the use of our soils. We must know how much we have, how it should be used, and when it should be used. Such information can be gathered in a soil survey.

"The objects in soil surveying are (1) to determine the morphology of soils, (2) to classify them according to their characteristics, (3) to show their distribution on maps, and (4) to describe their characteristics, particularly in reference to the growth of various crops, grasses and trees. The ultimate purpose is to provide accurate soil maps, necessary for the classification interpretation and, extension of data regarding agricultural production, the classification of rural lands, and for the factual basis in the development of sound programs of land use, whether planned by public or private agencies, or by individuals."*

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*Soil Survey Manual, by Charles E. Kellogg.

DESCRIPTION OF THE AREA

Iloilo Province, shaped like a distorted triangle, with an area of approximately half a million hectares, is sprawled along the east-southeastern coast of the Island of Panay, with the apex of the triangle pointed towards the center of the Island (fig. 1). Parts of the province are a cluster of islets northeast of the mainland, and Guimaras Island to the southeast. Guimaras Island is close enough to the mainland to act as a natural breakwater for the part of Iloilo, the capital of the province. Iloilo City is 290 airline miles from Manila.

The province is adjacent to Capiz Province in the north and towards the west it is bounded by Antique Province. To the east is the Visayan Sea and towards the south is the Gulf of Panay.

Relief. -- The relief of the province varies from level plains to rolling lands and hills to mountain peaks and ranges with long and narrow meandering streams (fig. 2). The level areas are not extensive and are found mostly in the southeastern part as broad level bottoms along the rivers. In the west in an approximately north-south trend, are the western Cordilleras with a number of prominent peaks, of which Mt. Baloy (1,728 meters), Mt. Inaman (1,350 meters), and Mt. Igdalig (1,288 meters), are among the highest. The mountain range is wide towards its northern end and narrows southward. The southern end forms a hilly promontory at Naso Point. The greater part of the northeastern section of the province is a belt of hills and rolling lands. The hills vary from 90 to 180 meters high.

Guimaras Island is separated from the mainland by the Iloilo

Strait which is three miles in width. Its relief is rolling to hilly. Limestone hills rise abruptly from the shore along the western coast forming indentions and bedlands bordering small areas of coastal plains. The interior of the island is a plateau criscrossed by creeks and ravines. The eastern coast is dotted with small areas of rolling and hilly lands.

The soil cover of the province is given in Table 1.

Table 1. --- The approximate areas of the actual soil cover of Iloilo Province as of February 31, 1937.[a]

Kind	Area in has.	Percentage
Commercial forest	20,780.00	3.93
Non-commercial forest	33,520.00	6.35
Open land	191,060.00	36.15
Cultivated land	269,630.00	51.03
Swamps and salt marshes	13,410.00	2.54
T o t a l	528,400.00	100.00

[a] Data from records of the Bureau of Forestry, 1939.

Drainage. -- The province drains to the east and south. All rivers drain into the sea.

Most of the rivers in the mainland have their headwaters at the western and northern area. The most important rivers are the Jalaud and the Jaro with their tributaries.

In Guimaras Island there are numerous small rivers, some navigable to a limited extent by small native bancas, flowing from the interior of the island outward to the sea.

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Vegetation. -- Three main types of vegetation-forests, grasses, and halophytic plants-are found in Iloilo Province. The forests, both primary and secondary, are found mainly on the limited extent in the western part of the province around Mts. Tagaytay, Igdalig, and Llorente. These forests are not extensive. The more important forest trees in the province are as follows:

Scientific Name	Common Name
Nauclea orinetalis	Tiga
Alstonia macrophylla	Batino
Dracontomelum dao	Dao
Anisoptera thurifera	Palosapia
Tarrieta javanica	Lumbayan
Dipterocarpus grandiflorus	Apitong
Xylocarpus granatum	Tabigue
Azadirachta integrifolia	Maranggo
Terminalia calamansanai	Kalumpit

Grasses cover extensive areas on the Cordillera foothills, the western uplands, and Guimaras Island. Grass areas, mostly cogonales are also found in the hilly regions of the towns of Balasan, Sara, San Dionisio, Passi, and in the mountainous areas of Calinog, Maasin, Tubungan, and San Joaquin. These grassy areas are extensive and are good grazing lands.

Mangrove and nipa swamps are found only in limited areas. Vegetation in the mangrove swamps includes several kinds of halophytic plants, like nipa palms, bangkal, bakawan, langaray, api-api, and dungon-late, the last five of which are good sources of firewood. The plants form close dense overhead canopy and little undergrowth.

The sap that exudes from tapped nipa inflorescence is utilized for the manufacture of alcohol or vinegar. Nipa leaves are used as thatching material for houses.

Organization and population. -- Long before the coming of the Spaniards, according to local folklore, a number of datus from Borneo, with their followers and slaves, come to Panay Island and first landed at a place near Sinogbuhan, near the present site of the town of Miag-ao. These immigrants found the place inhabited by negritoes from whom they succeeded in buying the island, which was then divided into three sections called "sakop", namely, Hantik, Aklan, and Irong-irong. Later, Irong-irong became Iloilo Province. The original "sakop" of Irong-irong was placed under the rule of a datu named Paiburong, who founded the first Malayan settlement in Iloilo.

The Spaniards came to Iloilo in 1569 and established themselves in the town of Ogton, then the largest settlement. During the time of Governor Ronquillo (1850-1853) the villa of Arevalo was founded. This villa became the seat of the Alcaldia, the jurisdiction of which included the whole of Panay and a great part of Negros Island. In 1688 Iloilo became the capital of the province.

During the eighteenth century Iloilo Province lost a great part of its territory as a result of the creation of Capiz Province in 1716 and Antique Province in 1798.

The nineteenth century was a period of prosperity in the history of the province. Culturally and economically there was great progress. But this progress was interrupted at the close of the century when,

as a result of the Philippine rebellion against Spain, the Spaniards evacuated the province in 1898. It was not until April 11, 1901 that a civil government under the United States was established.

In the four decades of American rule, the economic social and political features of the province progressed in an accelerated tempo. Schools were established, the science of government the taught of the people, and agricultural activities were expanded. But on December 8, 1941, this situation was once again disrupted because of the outbreak of the war in the Pacific. The province was occupied by the Japanese in April, 1942 to its liberation by the Americans on March 18, 1945.

The population of the province has increased steadily. In 1818 the population was 176,901; in 1870 it was 348.37; in 1905, 410,315; in 1918, 502,949; and in 1939, 744,022. According to the census of 1939 Iloilo City, which was declared a chartered city in 1938, has a population of 90,480. The comparatively rapid development of the city is attributed to the opening of its port to foreign trade in 1855.

Transportation. -- The province is ramified by a network of national, provincial, and municipal roads, making all the municipalities and big barrios accessible from the capital. Interprovincial roads connect Iloilo City with San Jose de Buenavista, the capital of Antique Province and with Capiz, the Capital of Capiz Province.

A railway line connects Iloilo and Capiz Provinces. It passes through the municipalities of Pavia, Sta. Barbara, Pototan, Dueñas, and Passi.

The port of Iloilo is navigable to ocean-going streamers, and ships from foreign countries call at this port to load merchandise

mostly agricultural products, like sugar, abaca, tobacco, corn and copra. Interisland boats also call at Iloilo on their trips between Manila and the many ports in the Visayan Island and Mindanao.

The Far Eastern Air Transport Incorporated and the Philippines Airline Incorporated maintain air transportation facilities in Iloilo City linking it with Manila and with the other airports of the country.

Water supply. -- Iloilo is one of the few provinces in the country where potable water is scanty. Water from mountain springs and artesian wells is either too low in mineral content or has appreciable iron content or too high in salts 1500 p.p.m. Potable water for the towns of Cabatuan, Jaro, Maasin, Molo, Pavia, Manduriao, La Paz, and Iloilo City is supplied by the Metropolitan Water District Co. from the town of Maasin. This water comes from the Tigon River, a tributary of the Jaro River, and is distributed to the different towns after proper clarification and disinfection. The towns of Sara, Barotac Viejo, Passi, San Dionisio, San Joaquin, Dingle, and Pototan have their own municipal water works. People in other towns depend on surface wells, streams, and springs for their supply of household water.

Other cultural features. -- There are thirty five municipalities and one chartered city in the province. Public schools of elementary grades are found in all the towns and in many barrios. Collegiate schools, academic and vocational schools, both publicly and privately owned, are found in the city. In some towns there are regional high schools.

There are three hospitals in the city. A leprosarium is found at Sta. Barbara. A public dispensary run by the Bureau of Health is

available in every town.

Most of the people in the province profess the Roman Catholic Religion. A Roman Catholic church is found in every town. The Protestant and Aglipayan churches have some followers too.

Industries. -- The industries of the province, other than farming which is the main pursuit of the people, other than farming, fishing, weaving, pottery making, salt making and cattle raising.

Fishing is mostly done along the southeastern and northeastern coast of the province. At Estancia is located the government fishing station and cannery. The vicinity of Gigantes Islands also abounds is fish. Crustaceans are plentiful in the hydrosol areas.

The province has long been famous for its piña cloth and patadiong. Weaving is a home industry and is mostly done by women on home-made looms. Because of the relatively high cost of production, piña cloth and patadiong can no longer compete with factory-made textiles. Peña is made from fibers of the pineapple leaves, and patadiong, from imported cotton yarns.

The making of pottery is a minor industry and is mostly done at Pavia, San Miguel, Sta. Barbara, Estancia, Pototan, and Lambunao.

Salt is made along the coast by solar evaporation of sea water, principally in Carles, Iloilo City, Leganes, and Miag-ao.

Cattle raising is very limited and is confined to San Joaquin, Passi, and Sara.

Iloilo City is the principal market and industrial hub of the province.

CLIMATE

Climate is the sum of several factors, namely, rainfall, temperature, intensity of sunshine, wind velocity and direction, and humidity.

Iloilo Province is divided into three regions of different types of rainfall (fig. 3).

First type: In this region there are two pronounced seasons, dry from December to June, and wet from June to December. The rainy season starts in May and continues with increasing precipitation to October. The rains begin to subside in November. February and March are practically rainless months.

Third type: In this region there is no very pronounced maximum rainfall period, with the dry season lasting only from one to three months. The total amount of rainfall in this type is not as much as that in the first type.

Fourth type: In this region there is no pronounced rainy period and no dry season. Under this type October has the greatest amount of precipitation, while March has the least.

In Table 2 are shown the average monthly and annual rainfall, and the number of rainy days for the different months of the year, from the different weather stations in the province. Each of these stations represents a distinct type of rainfall.

Locality variations in temperature throughout the province are inappreciable except where there are great differences in elevation. Table 3 which shows the monthly and annual temperatures for the City of Iloilo indicates that seasonal temperature variations in this

region are not much.

The northern part of the province, north of latitude 11°, is frequently visited by destructive typhoons. The region south of this latitude is seldom hit by typhoons.

Northeast winds prevail in the province from November to May. The rest of the year the winds come from the southwest.

Table 2. -- Showing the average monthly and annual rainfall for the different weather stations in Iloilo Province from 1903-1918[a].

Month	Rainfall in the first type of climate Iloilo City		Rainfall in the third type of climate		Rainfall in the fourth type of climate	
	Rainfall	Rainy days	Lucena	Hda. Lanhagan	January	Bitaogan
	mm.		mm.	mm.	mm.	mm.
January	56.6	9	55.8	124.9	119.1	153.9
February	46.1	7	55.1	42.9	55.9	84.1
March	28.6	5	46.9	49.0	66.0	66.0
April	36.7	6	49.0	156.9	87.1	55.1
May	146.0	12	143.0	198.1	182.8	203.9
June	262.3	18	217.9	198.1	202.9	230.1
July	380.6	20	296.9	248.9	265.9	250.9
August	347.0	19	270.0	187.9	219.9	228.1
September	317.8	20	208.0	215.9	230.1	251.9
October	272.2	18	255.0	303.0	262.9	309.1
November	188.6	14	213.1	278.8	239.9	252.9
December	127.6	14	98.0	208.0	124.9	222.0
Annual	2,210.1	162.0	1,908.7	2,112.4	2,057.4	2,308.0

[a] CORONAS, Rev. Jose, S. J. The Climate and Weather of the Philippines, 1903-1918. Bureau of Printing (1920) 291-630. Census of the Philippines; 1918, Manila.

Table 3. -- Showing the average of monthly and annual temperature for Iloilo City[a].

Month	Maximum Temperature	Average Temperature	Minimum Temperature
	°C.	°C.	°C.
January	29.8	25.6	22.6
February	30.3	25.8	22.5
March	31.6	26.8	23.1
April	32.7	27.8	24.1
May	32.5	27.8	24.4
June	31.3	27.3	24.1
July	30.0	26.8	23.0
August	30.1	26.8	23.9
September	30.1	26.6	23.7
October	30.7	26.6	23.7
November	30.7	26.6	23.7
December	30.0	26.0	23.2
Monthly average	30.8	26.7	23.6

[a] CORONA, Rev. Jose S. J. The Climate and Weather of the Philippines, 1903 to 1918. Census of the Philippines, 1918. Bureau of Printing 1 (1920) 291-630.

SOIL SURVEY OF ILOILO PROVINCE

AGRICULTURE

Agriculture, the principal occupation of the people throughout the province, began long before the coming of the Spaniards. In 1939 the total area planted to crops was 190,623.68 hectares with a produce valued at 8,375,115 pesos. The principal crops are rice, corn, coconut, sugar cane, mungo, sweet potato, tobacco, beans, and peanuts. Table 4 gives the hectareages of the principal crops in Iloilo with their corresponding production and value of produce in 1939.

Table 4. -- Area and value of produce of the ten leading crops of Iloilo Province.[1]

Crops	Area Hectares	Production	Value Pesos	Remarks
1. Palay	124,785.27	a 2,398,428	6,445.359	Total of first, second & upland crops.
2. Corn	23,193.09	a 152,384	345,990	Total of first, second & third crops.
3. Coconut	16,395.73	b 19,280,510	802,687	
4. Sugar cane	9,693.85	c 361,885	d 31,234	Excluding basis 8,161 liter, canes 2,276,788 units.
5. Mungo	7,247.70	e 1,128,530	157,389	
6. Sweet potatoes	2,809.80	e 3,407,415	115,000	
7. Tobacco	1,875.32	e 1,102,654	253,264	
8. Cassava	1,054.31	e 1,530,192	43,607	
9. Beans	916.49	e 228,241	29,581	
10. Peanuts	470.08	e 170,000	15,674	
Total for ten crops	188,437.64		8,219,785	

[1]Data from the Census of the Philippines, 1939. a, cavans; nuts; panucha; total value; kilogram.

Rice is extensively grown throughout the province. The level lands are planted to lowland rice, and the rolling and hilly lands to upland rice. The more common varieties of rice found in the province are Raminad Stains 1 and 3, Elon-elon, Flon-ram, Ramelon, Khao Bai Shri, Dumali, Kinastila IV, and Kanaldit. In 1939, 118,402.10 hectares, or 72.34 per cent of the cultivated lands were planted to rice. This area produced 2,285.487 cavans of palay valued at 6,158,775 pesos. In places where there is sufficient water for irrigation, two crops of rice are grown in a years. Of the area devoted to rice

cultivation, only 17,848.15 hectares are artificially irrigated.

Corn is planted in rotation with other crops, like tobacco, upland rice, beans, and other legumes. The hectarage of the different crops of corn, with their corresponding production of root crops of corn, with their corresponding production and market value for the year 1939, are given in Table 5. The common local varieties are white flint, dent, and glutinous corn.

Table 5. -- Showing the area, yield and value of corn planted in 1939.[a]

Croppings	Area in hectares	Production in Cavans	Total Value of Produce
First Crop	16,949.08	115,213	257,474.00
Second Crop	5,365.22	31,025	71,515.00
Third Crop	348.87	2,226	4,776.00
Green corn Crop	530.00	5,556	12,225.00
Total	23,193.17	154,020	345,990.00

[a] Census of the Philippines, 1939.

The area planted to coconut trees in 1939 was 16,393.73 hectares, or 10.03 per cent of the total cultivated area in the province. The production for the same year was 19,288.510 nuts valued at 802,687 pesos. Most of the coconut trees are planted along the coastal plains, the hilly areas, and along river banks. Of the 2,064.835 coconut trees in the province 1,099,010 are bearing; 875 are non-bearing. Ninety thousand twenty three are being tapped for tuba with a total yield of 12,178,801 liters of juice valued at 577,137 pesos.

In 1939 the production figures from 9,693.85 hectares planted to sugar cane are as follows:

	Pesos
276,778 stalks, cane for chewing	15,107.00
361,385 pieces, panocha	15,422.00
8,161 liters, basi	705.00
T o t a l	31,234.00

Centrifugal sugar:

Centrals	Piculs
Sara-Ajuy, 1941-1942	108,725.52
Santos-Lopez, 1940-1941	220,209.36
Janiuay, 1940-1941	111,435.49

As a result of the war all the sugar centrals were destroyed and the bigger plantations were either neglected or abandoned. It will take sometime to rehabilitate the sugar industry of the province.

The principal root crops of the province are sweet potato, cassava, gabi, tugui, arrowroot, ginger, sincamas, potato, and radish. These crops are not raised on an extensive scale. Only 4,534.33 hectares, or 2.77 per cent of the cultivated area in the province, are devoted to their culture.

Leguminous crops are usually grown in rotation with the principal crops, or as catch crops. Among the legumes grown in the province are munco, sitao, patani, cowpea, soybeans, bataо, and peanuts. An aggregate area of 8,658.20 hectares are planted to leguminous crops in 1939.

Tobacco is a minor crop compared to rice. Only 1,873.32 hectares are devoted to its cultivation throughout the province. In 1939, 1,102.654 kilos of cured tobacco leaves were produced valued at 233,264 pesos.

The fiber crops grown in the province are abaca, maguey, kapok, cotton, and ramie. The abaca industry has been declining steadily since 1918. For that year 3,648,892 kilos of abaca fibers were produced as compared to the 1939 production of 121,0116 kilos. The total area covered by fiber crops excepting kapok, according to the 1939 census, was 411.85 hectares which produced 139,258 kilos of fibers valued at 19,893 pesos.

The raising of vegetables is mostly done in home gardens and is practiced throughout the province. The province has a liberal supply of vegetables all the year round.

The important fruit trees found in the province are bananas, mungo, jackfruit, papaya, orange, siniguelas, santol, pummelo, atis, and breadfruit. Table 6 show the number of bearing trees, production and value of fruits of the province in 1939. In certain localities coffee and cacao are raised on a small scale.

Table 6. -- Showing the number of bearing trees, production and value of fruits of Iloilo Province in 1939.[a]

Kinds of Fruit Trees	Bearing	Production	Values
	Hills	Bunch	Pesos
1. Banana	1,098,021	2,167,985	535,340.00
	Trees	Fruits	
2. Mangoes	40,223	11,201,274	224,854.00
3. Jackfruit	91,739	992,448	180,745.00
4. Papaya	92,957	2,556,035	68,933.00
5. Oranges	21,756	793,749	16,893.00
6. Siniguelas	21,917	12,045,212	16,642.00
7. Santol	9,803	5,418,099	11,806.00
8. Pummelo	9,032	579,025	11,586.00
9. Atis	19,448	470,104	6,224.00
10. Breadfruit	5,610	402,675	5,888.00

[a] Census of the Philippines, 1939.

AGRICULTURAL PRACTICES

Antiquated agricultural methods, prevalent in most places in the Philippines, are generally followed in this province. The wooden plow and the carabao are still the principal tools of the farmer. Farming with machinery is practically unknown. Except in the large sugar cane plantations the use of fertilizers and amendment is very limited. Green manuring and other soil conserving processes are practiced unconsciously, if at all.

There is, however, a growing awareness on the part of the people that the present methods of raising crops can be improved. In the sugar cane haciendas, where the landlords have capital to invest in their farms, the use of fertilizers has been tried and found to increase the yields of the land. Fertilizer has been applied to sugar cane lands at the rate of 400 to 500 kilos per hectare in two applications. The first dressing is made when the cane plants are a month old or so, and the second during August or September.

The old agricultural practice of terracing rice fields to impound the water incidentally solve the problem of soil erosion in the regions where rice is grown. In other areas no effort is made to solve this problem because the farmers are not even cognizant of its importance. A program of soil conservation must be worked out for this province, especially because clean culture is practiced in the raising of most crops.

Only a very small fraction of the cultivated area is irrigated by established irrigation projects. The Aganan River and Sta. Barbara

Irrigation System supply water to 9,725 hectares which is only 10.54 per cent of the area planted to lowland rice. Most of the farmlands in the province are irrigated by rain water or by temporarily damming up rivers during the dry season to divert their water to irrigation canals. Diversified cropping, catch-cropping, and inter-cropping are practiced in the province but without definite program, objectives, or system.

LIVESTOCK AND LIVESTOCK PRODUCT

According to the Census of the Philippines in 1939, the different kinds of livestock found in the province are carabaos, buffaloes, cattle, horses, goats, sheeps, hogs, chickens, ducks, geese, turkeys, guinea fowls, rabbits, and pigeons. Table 7 and 8 give the livestock population in 1939 with their corresponding market value. The raising of livestock is only a secondary pursuit of the people. There are no dairy farms in the province. Fowls are raised on farms and in backyards but not on a commercial scale. Attempts were made the past to introduce foreign stock of cattle and chicken for the raising of dairy and poultry products, but these attempts had not succeeded.

Table 7. -- Showing the kinds, number, and value of livestock in Iloilo Province in 1939.

Livestock	Number	Value
Carabao	178,530	5,166,540.00
Buffaloes	33	1,215.00
Cattle	69,221	1,184,546.00
Horses	2,884	63,635.00
Sheep	1,258	3,498.00
Goats	11,921	21,630.00
Hogs	109,010	656,832.00
T o t a l	372,857	7,097,896.00

Table 8. -- Showing the kinds, number, and value of poultry in Iloilo Province in 1939.

Poultry	Number	Value
Chicken	1,212,219	351,261.00
Geese	1,606	1,999.00
Turkeys	1,209	3,275.00
Guinea fowls	1,446	898.00
Pigeons	7,432	1,408.00
Ducks	4,885	9,587.00
T o t a l	1,228,797	486,428.00

LAND-USE CHANGES

Iloilo has a total farm area of 250,042.60 hectares classified as follows; cultivated land, 163,468.93 hectares; idle land, 28,357.76 hectares; pasture land, 33,756.59 hectares; forest land, 11,885.74 hectares; and other lands, 12,573.58 hectares.

By cultivated land is meant land planted to crops. An idle land is one suitable for growing crops but was not cultivated in 1939. Pasture land is land used exclusively for pasture in 1939. Forest lands are the forest areas within the farms. Other lands include house lots and wastelands.

According to the Philippine Census of 1939, there were 66,915 farms in the province, 13.64 per cent of the number are less than hectare in size; 75.92 per cent, less than five but more than one hectare; 1.87 per cent, less than ten but more than one hectare; 7.87 per cent less than ten but more than five hectares; 1.8 per cent, less than twenty but more than ten hectares; and 0.77 per cent, over 20 hectares.

This classification is based on the total area of the cultivated lands.

FARM TENURE

Farmers, or farm operators, are classified into four groups, namely, owners, part-owners, managers, and tenants. The tenant group is further subdivided into share tenants, sharecrop tenants, and cash tenants.

In 1939 there were 66,915 farmers in the province. Thirty eight and three-tenths per cent of this number owned their farms; 14.21 per cent were part-owners of the land they tilled; 44.80 per cent were share tenants; 0.56 per cent, share-crop tenants; 2.04 per cent, cash tenants; and 0.09 per cent, farm managers.

Of the total farm area in the province, 45.34 per cent of the land is farmed by owners; 13.47 per cent, by part-owners; 33.70 per cent, by share tenants; 0.62 per cent, by share-crop tenants; 2.43 per cent, by cash tenants; and 4.46 per cent through farm managers.

The average size of a tenant's holding in this province is 3.7 hectares, which yield the tenant and annual income of one hundred to one hundred thirty five pesos before the war.

Without a supplementary source of income the tenant can hardly live within his earnings. This situation has given rise to the tenancy problem which now dominates the Philippine agricultural economy.

FARM INVESTMENTS

According to the census of 1939 Iloilo Province had the following farm equipments valued at 879,610 pesos:

	Pieces
Plows	79,555
Harrows	62,336
Carts	4,048
Work Animals	110,885
Sleds	44,577

TYPES OF FARMS

Table 9, taken from the 1939 Philippine Census, give the number of farms in Iloilo classified according to type. In this classification twelve farm types are defined as follows:

1. Palay farms - those where 50 per cent or more of the cultivated area is planted to lowland and/or upland rice.

2. Corn farms - those where 50 per cent or more of the cultivated area is planted to corn.

3. Abaca farms - those where 50 per cent or more of the cultivated area is planted to abaca.

4. Sugar cane farms - those where 50 per cent or more of the cultivated area is planted to sugar cane.

5. Coconut farms - those where 50 per cent or more of the cultivated area is planted to coconut.

6. Fruit farms - those where 50 per cent or more of the cultivated area is planted to fruit trees.

7. Tobacco farms - those where 50 per cent or more of the cultivated area is planted to tobacco.

8. Palay-tobacco farms - those on which at least 25 per cent or more planted to tobacco.

9. Vegetable farms - those where more than 50 per cent of the cultivated area is planted to vegetables.

10. Livestock farms - those not less than ten hectares in area and having more than ten head of cattle, horses, goats, or sheep, and with less than 20 per cent of the total farm area planted to crops.

11. Poultry farms - those having more than 300 chickens or

200 ducks and with less than two hectares of cultivated land.

12. Other farms - those not falling under any of the above categories.

Table 9. -- Number of farms by type in Iloilo Province, 1939.[a]

Number	Type of Farm	Farms	Percentage
1	Palay	54,602	81.60
2	Corn	3,881	5.80
3	Abaca	18	0.03
4	Sugar cane	555	0.83
5	Coconut	3,448	5.15
6	Fruit	176	0.26
7	Tobacco	219	0.33
8	Palay Tobacco	140	0.20
9	Vegetable	176	0.25
10	Livestock	61	0.09
11	Poultry	1	0.002
12	Other	3,638	5.44
T o t a l		69,915	100.00

[a]Data from the Census of the Philippines (1939)

SOIL SURVEY METHODS AND DEFINITIONS

Soil survey is an institution devoted to the study of the soil in its habitat. It consists of (1) the determination of the morphological characteristics of soils, (2) the grouping and classification of soils into units according to their characteristics, (3) their delineation on maps, and (4) the description of their characteristics in relation to agriculture and other activities of men. The soil, their landscapes and underlying formation, are examined in as many sites as possible. Boring with the soil auger are made, test pits are dug, and exposures, such as road and railroad cuts are studied. An excavation or road cut exposes a series of layers called collectively the soil profile. The horizons of the profile as well as the parent material beneath are studied in detail and the color structure, porosity, consistency, texture, and content of organic matter, roots, gravel and stones are noted. The reaction of the soil and its lime and salt contents are determined. The drainage, both external, and other features such as the relief of the land and climate, as well as the natural and artificial features, are taken into consideration, and the relationship of the soil and the vegetation and other environmental features is studied.

On the basis of both external and internal characteristics, the soils are grouped into classification units, of which the three principal ones are (1) soil series, (2) soil type, and (3) soil phase. When two or more these units are in intimate or mixed pattern such that they cannot be clearly shown into a (4) soil complex. Areas of land that have no true soil, such as river beds, coastal

beaches, or bare rocky mountain side are called (5) miscellaneous land types. Areas that are inaccessible lime mountain and great forest areas whose classification is of no agricultural importance for the present are classified as (6) undifferentiated soils.

A series is a group of soils that have the same genetic horizons, similar important morphological characteristics, and having similar parent material. It comprises soils having essentially the same general color, structure, consistency, range of relief, natural drainage condition and other important internal and external characteristics, in the establishment of a series a geographic name is selected, taken usually from the locality of localities where the soil was first identified. For example, the Culis series was first found and classified in the vicinity of Culis, barrio in the town of Hermosa, Bataan Province.

A soil series has one or more soil type, defined according to the texture of the upper part of the soil, or the surface soil. The class name such as sand, loamy sand, sandy loam, silty clay loam, clay, is added to the series name to give a complete name to the soil. For example Culis loam is a soil type within the Culis series. The soil type, therefore, has the same general characteristics as the soil series except for the texture of the surface soil. The soil type is the principal mapping unit. Because of its certain specific characteristics it is usually the unit to which agronomic data are definitely related.

A phase of a soil type is a variation within the type, differing from the soil type only in some minor features, generally

external, that may be of special practical significance. Differences in relief, stoniness, and extent or degree of erosion are shown as phases. A minor difference in relief may cause a change in agricultural operation or change in the kind of machinery to be used. The phase of a type with a slight degree of accelerated erosion may present different fertilizer requirements and other cultural management problems from the real soil type. A phase of a type due mainly to degree of erosion, degree of slope and amount of gravel and stones in the surface soil is usually segregated on the map if the area can be delineated.

A soil complex is a soil association composed of such intimate mixtures of series, type, or phases that cannot be indicated separately on a small-scale map. This is mapped as a unit and called a soil complex. If there are several series in an area, as Sara, Sta. Rita, Alimodian, and others, that are mixed together, the two dominant series bear the name of the complex, as Sara-Sta. Rita complex, or Sara-Alimodian complex, as the case may be. If there is only one dominant constituent in a series, that series or type bears the name of the complex, as Sara complex, or Alimodian complex.

Surface soil and subsoil samples for chemical and physical analysis are collected from each soil type or phase, the number of samples being determined by the importance and extent of such soil type or phase. Profile samples are also obtained for further morphological studies of important soil types.

All natural and artificial features found in an area, as trails, roads, railroads, bridges, telephone and telegraph lines; barrios,

towns and cities; rivers and lakes; prominent mountains and others, are indicated on the soil map.

SOILS OF ILOILO PROVINCE

The soils of Iloilo Province are classified into three general land types based on their relief, namely; (1) soils of the swamps and marshes, (2) soils of the plains, and (3) soils of the hills and mountains. The soils under each of the three groups are further classified into soil series and soil types based on the genetic and morphological characteristics of the profile. The soil types are as follows:

1. Soils of the swamps and marshes
   (a) Hydrosol
2. Soils of the plains
   (a) Sta. Rita clay
   (b) Sta. Rita clay loam
   (c) Bantog clay loam
   (d) Sara silt loam
   (e) Sara sandy loam
   (f) Umingan fine sandy loam
   (g) Beach sand
3. Soils of the hills and mountains
   (a) Guimaras gravelly loam
   (b) Faraon clay
   (c) Barotac clay loam
   (d) Barotac loam
   (e) Barotac loam, rolling phase
   (f) Alimodian clay loam
   (g) Alimodian silt loam
   (h) Alimodian-Barotac complex
   (i) Luisiana loam
   (j) Alimodian soils, undifferentiated
   (k) San Rafael loam

Table 13 shows the area, proportionate extent, and present use of the types, phases, and miscellaneous land types herein described. The location and distribution of these types and phases

are shown in the accompanying soil map.

Hydrosol (1). -- The areas along the coast from the northeastern to the southern end of the province which are under water almost throughout the year are hydrosols. The areas mapped are at Bacay Point at Dumangas, Banate Bay, Ajuy Bay, Bancal Bay at the northeastern part, and in Guimaras Island at the Poblacion of Buenavista and Jordan.

These hydrosols are generally characterized by a backish aqueous horizon or surface water ranging in depth from 5 centimeters to 100 centimeters. This horizon is the most important medium for the growth of algae and other aquatic plants which are the food of bangus fish. This layer corresponds to the "A" horizon of the normal soil profile. The subaqueous horizon equivalent to horizon "A" in the soil profile, is slimy, light brown to gray clay with plenty of undecomposed organic debris. The depth ranges from 20 to 60 centimeters. This subaqueous layer is underlain by the basal horizon or "B" horizon of gray slimy clay with a depth of from 20 to 60 to more than 150 centimeters. The mangrove lands and nipa swamps and fishponds fall under this type of soil.

The hydrosol has an area of 8,298 hectares or 1.57 per cent of the total area of the province. It has no agricultural value except for the dense growth of halophytic trees like api-api, bakauan, and daluru which are good sources of firewood and housing materials.

The fishponds are used specifically for the culture and production of bangus (milkfish). There are several of these fishponds in the towns of Dumangas, Ajuy, and Balasan. At present this industry

is in the process of rehabilitation.

STA. RITA SERIES

The Sta. Rita series is the most important soil of Iloilo Province. Its extensive area occupies the level lands from Tigbauan at the west to San Miguel, Janiuay, and Pototan at the north, and Barotac Nuevo and Dumangas at the east. The series has developed from the recent alluvial deposit of fine soil material from the surrounding uplands. Drainage is generally poor because of its topography and the heaviness and compactness of the surface soil and subsoil. However, most of the big rivers, like Iloilo, Aganan, Jaro, and Jalaud Rivers naturally drain this area.

Sta. Rita clay (120). -- A typical profile of the Sta. Rita series is shown by the Sta. Rita clay as follows:

Sta. Rita clay

Depth of soil cm.	Characteristics
0 to 20	Surface soil, black to dark brown with moderate coarse granular structure; highly plastic and soft when wet; shrinks and cracks and becomes very hard when dry. With proper amount of moisture, it is slightly crumbly. There are no stones, gravels, pebbles, or cobblestones present, and is fairly rich in organic matter content. The surface soil ranges in depth from 20 to 25 centimeters. This layer is separated by a diffused and smooth boundary from the subsoil.
20 to 70	Subsoil, also clayey, hard when dry, but soft and plastic when wet, black to dark brown, but lighter in color than the surface soil. It is also moderately coarse granular structure. There are no stones or gravels. This layer is poor in organic matter. It ranges from 40 to 50 centimeters in thickness and is separated from the next layer by a clear and smooth boundary.

70 to 97	Brown to light silty clay that is slightly compact with good medium granular structure. There is a uniform deposition of silty clay soil in this layer.
97 to 150	Substratum, light brown silt loam, soft and friable and a good fine granular structure with no stones or pebbles in it.

The Sta. Rita clay type is the largest in this series. It has an area of 54,753.18 hectares equivalent to 10.36 per cent of the whole area of the province. This area includes almost all the level regions southeast of Tigbauan, San Miguel, Cabatuan, Janiuay, Pototan, and Barotac Nuevo to Zarraga Point. In elevation it ranges from a few feet above sea level to 100 feet at the northern boundaries. This gradient is deal for irrigation projects.

The surface soil of this type ranges in depth from 20 to 25 centimeters. The color is characteristically dark or black when moist, and lighter when dry. When wet, it is soft, plastic and sticky, and when dry, it is hard and forms cracks.

Rice is the principal crop raised on this soil type. Raminad, Elon-elon, Arabon, and Seraup Kechil 36 are the important lowland varieties grown. Yields obtained in irrigated areas are higher than in the unirrigated areas. Raminad or Elon-elon gives as much as from 80 to 100 cavans of palay, and Seraup Kechil 36 yields as high as 105 cavans per hectare in exceptionaly fertile areas. Part of this soil type is irrigated by the Aganan River and Sta. Barbara Irrigation Systems. The yearly irrigation fee is six pesos per hectare. Fertilization will increase profitably the yield. Experiments on the quality, quantity and brand of fertilizer to be used

should be conducted to increase the yield of rice.

The rice crop is rotated with corn, mungo, or other legumes. The planting of mungo is extensively practiced in this area. The rate of seeding is 8 to 12 gantas per hectare and the average production is 5 to 10 cavans per hectare. Mungo is broadcast 2 or 3 days before harvest time.

Sta. Rita clay loam (119). -- The slightly undulating to almost level areas of the northeastern half of Dumangas, a greater part of Barotac Nuevo, Banate, Barotac Viejo and the coastal areas of Ajuy around the barrio of Culasi with an aggregate area of 17,570.90 hectares, belong to the Sta. Rita clay loam type. This area has fair to good external and internal drainage without any danger of excessive run-off. The surface soil ranging in depth from 20 to 25 centimeters is brown to dark brown clay loam, friable and medium granular at optimum moisture content. The subsoil and substratum have the same properties as the Sta. Rita clay.

Corn and sugar cane are the principal crops grown. The Santos-Lopez Central is located on this soil type. The Alunan and P.O.J. 2878 varieties of sugar cane are grown, yielding from 70 to 80 piculs of sugar per hectare when fertilizers are used. Unfertilized areas yield only about half of the yield of those that are fertilized. Lowland rice is also grown on this soil type but the area planted is not so extensive as that planted to sugar cane. Lowland rice grown on this type depends solely on rainfall for water.

The white variety of corn is commonly grown, yielding an average of 12 cavans per hectare. Coconuts are also grown and there

are more of this tree on this type than on the Sta. Rita clay.

BANTOG SERIES

Bantog clay loam (1e). -- This type is one of the best soil type for rice in Bulacan Province. As found in Iloilo Province it occupies the valley traversed by the Calinog-Passi road from kilometer-post 61 to kilometer-post 70. Despite its elevation being 150 feet above sea level, and its nearness to the rivers this type has poor to fair internal drainage. The profile characteristics of this type are as follows:

Depth of soil cm.	Characteristics
0 to 30	Surface soil, brown to dark brown, with brownish red streaks, clay loam to heavy clay loam with depth ranging from 20 to 30 centimeters; good medium granular structure and soft slightly plastic but does not become hard when dry; fairly rich in organic matter; absence of stones or gravels; has a diffused and smooth boundary between surface and subsoil.
30 to 95	Subsoil, light yellowish-brown clay, moderate, medium columnar to granular structure, hard or compact when dry and slightly plastic and sticky when wet. It is poor in organic matter.
95 to 150	Substratum, grayish clay with brown mottlings, moderate medium granular and slightly crumbly when dry and slightly plastic when wet. No gravels or concretions in this layer. The boundary between horizon "B" and horizon "C" is gradual and smooth.

This type with an area of 1,428.34 hectares is suitable to lowland rice production. Due to the insufficiency of rain, water becomes a limiting factor. The Jalaud River can irrigate efficiency this soil type and other adjacent areas. The yield ranges from 30 to 40 cavans

per hectares. A secondary crop like mungo, tobacco and corn is planted in areas having favorable drainage after the harvest of rice. The yields of these secondary crops are likewise low. The seedbed method of preparing the rice seedlings is usually practiced as is done in the Sta. Rita series.

SARA SERIES

This series is named after the town of Sara where the major soil body is identified and mapped. It covers all the level to gently rolling alluvial plains of the towns of Sara, Ajuy, Balasan, and Carles and also the northeastern tip of Guimaras Island, the elevation of which ranges from a few feet to 250 feet.

The distinguishing characteristics of this series are as follows: Surface soil loose to nearly compact, brown to brownish gray structureless silt loam to sandy loam; a subsoil of mottled brown or grayish brown compact usually gritty silt loam and a substratum of compact sandy material. Drainage conditions are fair in level areas and good in gently rolling areas.

There are only two soil types in this series, namely, Sara silt loam and Sara sandy loam.

Sara silt loam (124). -- A typical profile of Sara silt loam is as follows:

Depth of soil cm.	Characteristics
0 to 15	Surface soil, silt loam to fine sandy loam, dark brown to reddish brown when wet, grayish brown when dry, excellent fine granular structure and moderately friable. Soils in the ricefield are soft and slightly friable.

	Very poor in organic matter. Plenty of concretions and gravels. The boundary between the surface and subsoil is clear and smooth.
30 to 80	Silt loam, brown to gray with red streaks. Structure is good and fine granular. When wet it is slightly friable. Some concretions present and slightly compact.
80 to 150	Grayish brown to reddish brown silt loam, moderate medium granular, friable but slightly compact. There are some concretions present but no stones, gravels or boulders.

This soil type has a total area of 4,647.79 hectares and covers parts of Estancia, Balasan, and Carlos. Early maturing varieties of rice cannot be recommemded for this area owing to the insufficiency of October and December rains. Also the structure and texture of the soil cannot retain much of the moisture to meet the plant requirements. Low yield of rice in this type is attributed to the very poor soil and insufficient water supply.

To bring about good yields of lowland rice, this soil has to be fertilized heavily with complete fertilizers, and irrigation system should be constructed. There are no big rivers around this area that can be dammed for irrigation purpose to supplement the rainfall.

Sara sandy loam (123). - This soil type occurs on the flat or level to the gently rolling areas found at Ajuy, Sara, a part of Balasan and Carlos and on the northeastern portion of Buenavista in Guimaras Island. The maximum elevation of this area is 260 feet. This type covers an area of 17,888 .31 hectares. The surface soil is loose and structureless and average only 15 centimeters deep. When dry the soil is gray but becomes dark brown to grayish brown when wet.

At optimum moisture the soil is easily cultivated to good tilth.

The low and level areas of this type are planted to lowland rice with an average yield of 8 to 10 cavans per hectare. Like Sara silt loam this type of soil is poor. The moisture supply depends on natural irrigation. Noxious grasses grow very luxuriantly after the rice crop. Aside from lowland rice sugar cane is also extensively cultivated on this type. The canes are milled at the Sara-Ajuy Central. An average yield of 40 to 50 piculs per hectare is obtained from fertilized fields using Sara-Ajuy mixture. At the time of survey, several hectares were devoted to sugar cane for seed purposes and for muscovado-sugar production.

Other crops grown on this soil type, especially in well drained areas, are corn, fruit trees, coconut, tobacco and vegetables.

UMINGAN SERIES

Umingan fine sandy loam (122).---The Umignan series was first established and classified during the soil survey of Nueva Ecija Province. As found in Iloilo Province the Umingan Fine sandy loam occurs along the banks of Sibalom, Anganan, Jaro, Zarraga, Jalaud, and Ulian River. This type is considered fertile because of the yearly overflow of these rivers.

A typical of the Umingan fine sandy loam is as follows:

Depth of soil cm.	Characteristics
0 to 25	Surface soil, fine sandy loam, brown to dark brown, strongly friable, loosed and structureless, fair in organic matter content. Soil boundary is clear and smooth.
25 to 60	Subsoil, light brown to brown silt loam, strongly friable with an excellent medium granular structure fair in organic matter content with deep root penetration and an abrupt and smooth boundary.
60 to 100	Loam to silt loam, with some gravels, strongly loose and moderately friable with coarse single grain structure. Soil boundary is clear and smooth.
100 below	Gravelly silt loam slightly compact, and coarse single grain. Gravels are rounded.

This type covers an area of 19,316.65 hectares. The surface soil ranges in depth from 25 to 40 centimeters and consists of fine sandy loam to silt loam. Soils bear the upland areas are much heavier in texture than those near the banks of the rivers. In general the soil is loose and very friable. It can be plowed any time of the year without danger of pudding.

This soil is good for general or diversified farming. Crops such as tobacco, corn, sugar cane, vegetables, fruit trees, camote, cassava, peanuts and other root and bulded crops are raised profitably. Corn yields as high as 15 to 20 cavans per hectare. Crops such as tobacco, sugar cane, vegetables, camote and bulded crops have a good stand. The yields of these crops can be appreciably increased through the application of commercial fertilizers, such as ammophos and nitrophoska.

The frequency of floods during and after heavy rains is the only crop hazard of the area. The damage on standing crops can, however, be minimized by the application of water control measures such as diking and adjusting the cropping seasons.

Beach sand (118). -- This is found as a narrow strip of sand along the seashore from Arevalo to Dumangas and the portion of the profile to a depth of 150 centimeters consists of coarse to fine structureless, dark gray to brown sand. Organic matter content is poor. Drainage is good to excessive. The soil textural class and consistency very directly with distance from the shore, coarse and loose near the shore and fine and slightly compact inland.

Coconuts, are however, grown profitably on this type for the production of tuba and copra. Other fruit trees, such as sineguelas, sugar apple (atis), banana, breadfruit, sour apples, and other fruit trees, are also grown profitably. This type has an area of 4,650.22 hectares.

GUIMARAS SERIES

Guimaras series as found and classified on Guimaras Island is strongly rolling to hilly in topography. The slope along the cultivated areas varies from 40 to 60 per cent. A great part of the area is uncultivated and is either covered by second growth forest or by cogon grass. The cultivated areas are mostly planted to coconuts.

Guimaras series is characterized by brown to grayish brown gravelly sandy surface soils, underlain by a light brown fine sand, slightly compact and structureless. There are abundant concretion and gravels in the subsoil to an amount ranging from 60 to 75 per cent.

The substratum is dark brown fine sand. Parent soil material is derived from dioritic and basaltic rocks. These are the distinguising characteristics of this series as compared to the Sara series.

Guimaras gravelly loam (134). -- The typical profile of Guimaras gravelly loam is as follows:

Depth of soil cm.	Characteristics
0 to 20	Surface and brown soil to grayish brown fine sandy to gravelly loam, structureless, strongly friable when wet, concretions and gravels present; deep root penetration and fairly rich in organic matter. Soil boundary is gradual and smooth.
20 to 80	Subsoil, light brown to fine sand, slightly compact, and structureless, concretions and gravels are abundant on this layer. Boundary is abrupt and smooth.
80 to 150	Substratum, dark brown fine sand, structureless, slightly compact but not as much as in the subsoil. Gravels here are not as plentiful as in the upper layer.

The soil at the upper areas of the hills as well as those of the plateaus are fine sandy loam, while those at the slopes are sandy and gravelly loam. Likewise, the soils under the second-growth forest are dark brown while those in the grass lands are black. The surface soil ranges in depth from 20 to 25 centimeters. It can be easily plowed as the soil is light and friable. External drainage is excessive owing to the high grade, of slope. Internal drainage is excessive to fair. This type has an area of 36,990.83 hectares.

The principal crop grown in this type is coconut. The trees grow well, and a majority of them are in the fruiting stage.

Fruit trees such as jackfruit, breadfruit, bananas, citrus, mangoes, caimito, chico and many others will do well on this type of soil.

Lowland rice is grown in the coastal and narrow valley areas and upland rice in kaingined and slopy areas. Production on these areas is low. The use of fertilizers brings better result on the lowland rice.

FARAON SERIES

The soil of this series is developed from the weathering of the soft and porous coralline limestone. The limestone rocks are usually grayish, but upon weathering, especially under forest conditions, they become orange to dark yellowish gray. The topography of the series is usually hilly and strongly rolling. Elevation in most cases reaches up to 250 feet.

This series covers the limestone areas of the western coast of Guimaras Island; at Barrio Bitaogan, bordering the Iloilo-Capiz boundary and near Barrio Ma-asin, Passi and the hilly patches south-east of Passi proper, and a narrow rectangular area north of Barotac Nuevo proper.

Due to relief, the external drainage is very good to excessive but the internal drainage is poor to fair. Erosion in these areas, especially in the open lands, is becoming porous. In certain areas the subsoil and sometimes the bedrocks are already exposed.

Native vegetation in this type consists of forest trees, such as molave, ipil-ipil, and other hardwoods. Ipil-ipil is likewise

abundant on the slopes of the hills.

Faraon clay (132). -- A typical profile of the Faraon series as shown by the Faraon clay is as follows:

Depth of soil cm.	Characteristics
0 to 30	Surface soil, black clay, medium granular structure, soft and very strongly plastic when wet, slightly hard and brittle when dry. Fair in organic matter; at times limestone rocks are found on the surface. An abrupt and smooth boundary separates surface and subsoil layers.
30 to 45	Subsoil, dark yellowish gray clay, like the surface soil also strongly plastic when wet but hard when dry with a moderate fine granular structure; also mixed in this layer are partially weathered limestone rocks. The horizon is separated by a clear and smooth boundary.
45 to 60	Yellowish gray highly weathered limestone rocks, soft and weak coarse granular.
60 to 150	Grayish to white porous limestone rocks, soft and easily broken.

The surface soil ranging in depth from 20 to 30 centimeters is black heavy clay loam to clay. It is highly plastic and sticky when wet and brittle and hard when dry. In cultivated and eroded state, it is granular. Color grades from black to yellowish brown. Limestone outcrops are sometimes so abundant that they hinder agricultural operations. The subsoil is usually absent, a characteristic of soils developing from limestone bedrock. This soil type covers an area of 11,721.49 hectares.

The most important crop grown on this type is coconut. Coconut trees thrive well, but the trees are abandoned for the present because of the low price of copra. Next in importance is

is corn. The area planted to corn is limited owing to the limestone outcrops that hinder the agricultural operation. Usually the land is simply cleared or kaingined and planted to corn. In highly eroded land, seeds are planted in rock crevices where there are ample soils left. In most cases the slope of the land where corn is planted has a grade of as high as 100 per cent.

mangoes, bananas, and other orchard products soil in Iloilo City partly come from this soil area. Fruits produced in this kind of soil are rather large and good in quality. Ipil-ipil, "sibuko" and other trees growing on this type are sources of firewood for Iloilo City residents.

The limestone rocks are also used in the manufacture of industrial and agricultural lime. Lime factories are found at Buenavista, Guimaras Island, and their product is sold to the sugar cane planters of Iloilo and Negros. The rocks along the shores of the Island are quarried and are used for building breakwaters, wharves, and as pavement for roads.

BAROTAC SERIES

The soils of the hilly and mountainous areas north of Barotac Viejo to the southern part of Ajuy are classified under the Barotac series. Soils under this series are also found at Concepcion and at Estancia. The topography is very irregular and the slopes are steep. Elevation along the highway reaches up to 250 feet above sea level. The soil of this series has been developed from basaltic rocks. These

rocks, however, are ovelaid on shales. Drainage condition is excessive externally and fair internally. The greater portion of this series is covered by second growth forest, and the remaining portion, by cogon. Soils in the forest areas are dark brown, while those in the cogonal areas are black or nearly so. Kaingined areas on the mountain slopes are usually abandoned after two years of planting corn, upland rice, camote and other root crops. These areas are converted to second growth forest. In the cogonal areas binayuyu trees are found growing sparsely.

This series differs from the Annam and other reddish brown soils by the presence of stones and gravels in all horizons, and boulder and cobblestone outcrops on the surface soil.

There are three soil types identified under this series namely; Barotac loam; Barotac loam, rolling phase; and Barotac clay loam.

Barotac loam (129). -- A typical profile of the Barotac series as shown by Barotac loam type is as follows:

Depth of soil cm.	Characteristics
0 to 30	Surface soil, brown to light reddish brown loam, moderate and medium granular structure and moderately friable in consistency. Gravels and stones are oftentimes present in this horizon. There is deep root penetration and the soil is fairly rich in organic matter. The boundary separating this layer from the subsoil is diffused and smooth.
30 to 70	Subsoil, dark brown clay loam, slightly crumbly, slightly compact, with gravels and some stones. Structure is coarse granular. Boundary is diffused and smooth.

70 to 110	Dark brown clay loam, moderately hard and brittle, compact with gravels and stone. Boundary is diffused.
110 to 150	Substratum, light gray to grayish brown clay loam, moderately hard, brittle, and slightly compact, and also stony and gravelly.

Barotac loam is the largest soil type under this series, covering about 26,753.11 hectares. The area is found north of Barotac Viejo and south of Ajuy. The topography is roughly hilly to mountainous. Small pockets and valleys are found in the interior regions and they are utilized for lowland rice culture. External regions and they are utilized for lowland rice culture. External drainage is excellent to excessive, but internal drainage is fair to good.

The surface soil ranges from 20 to 30 centimeters deep. It is shallow along the slopes and rather deep at the foot slopes. The plowed land of this type is brown to dark brown, whereas those in the cogonal areas are black. Another distinguishing characteristics of this type is the presence of stones on the surface and in the subsurface layer. Sometimes plowing becomes impractical owing to the presence of a considerable amount of stones and boulders on the surface. Soils in the kaingined areas are planted to either corn or palay.

Barotac loam, rolling phase (130). -- This type is found along the highway approaching Ajuy, and also between Sara and Concepcion. The area is 2,970.05 hectares only covers the lower regions of the Barotac loam. The land is moderate rolling and partly hilly and is more tillable than the Barotac loam. The surface soil is dark brown, ranging in depth from 30 to 35 centimeters. Gravels and stones are

also found but not as much as in the Barotac loam type.

Lowland rice is the principal crop grown. Dikes are constructed to retain the water in the paddies. The rice crop independent on rainfall and upland streams for its moisture supply. Dry seedbed method is generally practiced. The seeds are usually sown or broadcast after the first rains in May. The seedlings are transplanted to prepared rice paddies when they are about 45 days old. Early maturing rice varieties are grown here. Minor crops like coconut and some bananas are grown also. The grassy area of this soil type is utilized for pasture.

Barotac clay loam (131). -- Unlike the Barotac loam which is mountainous, Barotac clay loam is hilly. More areas are cultivated in this soil type than in other types of the series. This type has an area of about 4,647.79 hectares. The slopes of the hills are extensive and smooth. Some stones and boulders are found on the surface but these are not as plentiful as to hinder farm operation. The surface soil is rather shallow ranging from 15 to 20 centimeters. Due to erosion, the subsoil along the slopes is already exposed. The surface soil is dark brown while the subsoil is light brown.

Corn and upland rice are the principal crops grown on this soil type. Corn gives a production of 10 cavans per hectares. Upland rice varieties like Candidit, Kutsian, and Lubang are grown and the yield is about 15 cavans per hectares of palay. Coconuts are also grown for tuba production.

ALIMODIAN SERIES

Alimodian is the largest of all the soil series identified in the province. It includes all areas directly north and south of the

Sta. Rita series to the provincial boundaries, and covers almost the whole of the towns of San Joaquin, Miag-ao, Igbaras, Guimbal, Tubungan, Leon, Alimodian, Maasin, Lambunao, Calinog, Passi, Dueñas, Dingle, Anilao, and Banate. A large portion of Tigbauan, San Miguel, Cabatuan, and Janiuay, and the rolling and hilly areas of Sta. Barbara and Pototan, belong to this series.

This upland soil with a relief ranging from undulating, slightly rolling to hilly and mountainous and flat upland is traversed by several creeks and rivers. Its elevation ranges from 100 to 1,700 meters above sea level. The external drainage is fair.

The soils of this series have developed from the weathering of soft and porous sedimentary rocks, like shale and sandstones. In some areas igneous rocks are found in the bedrock but these rocks have little influence on the mode of formation of this series.

Native vegetation in the interior and mountainous parts of this series consists of primary forest while second growth forest, cogonal, and bamboo groves occupy the hilly areas. Commercial timbers, however, are quite insufficient to warrant commercial lumbering. The bamboos used in the reconstruction of houses in most towns of the province come from this region. They are transported to the city and towns by trucks and by water.

There are four soil types identified under this series, namely; Alimodian clay loam, Alimodian silt loam, Alimodian-Barotac complex, and Alimodian soils, undifferentiated.

Alimodian clay loam (126). -- This type is the most typical of the Alimodian series. The profile characteristics are as follows:

Depth of soil cm.	Characteristics
0 to 30	Surface soil, brown to reddish brown clay loam, good medium granular structure, slightly friable when moist hard and brittle when dry, fair in organic matter content allowing deep root penetration; sometimes with rounded gravels and stones on the surface. It has a clear and smooth boundary toward the subsoil.
30 to 60	Subsoil, clay loam, light brittle, weak medium columnar structure, hard and slightly compact, with clear and smooth boundary to the substratum.
60 to 150	Substratum, gray to grayish brown highly weathered shale and sometimes weathered sandstone, weak coarse platy, and slightly compact.

The Alimodian clay loam covers nearly 183,304.13 hectares. This is the largest soil type classified in the province. It covers all the rolling to hilly and mountainous areas from San Joaquin to Tigbauan at the south to as far north as the northern boundary of Iloilo-Capiz and the municipality of Barotac Viejo at the east. External drainage is excessive; internal drainage is fair to good. A large part of this series is cultivated. The uncultivated part is covered with forest trees and cogon grass.

The surface soil of this type varies in depth from 20 to 30 centimeters. The soil is deep on the grasslands; forest lands and on foot slopes, and very thin in cultivated slopy areas. This is the reason why the color of the surface soil ranges from yellowish brown to dark brown. The light colored soils represent the eroded

areas of the type. There are few stones on the surface, and they do not interfere with the farm operation oftentimes called the corn belt of Iloilo Province because of its extensive planting of corn. The yield of corn ranges from 15 to 20 cavans per hectares. It is grown two to three times a year in some places, like Passi, Leon, Janiuay, and Lambunao, where climatic conditions permit. If only one crop is raised, it is rotated with crops like upland rice, mungo or other legumes or root crops. Upland rice is next to corn in hectares, and is either drilled or broadcast during May or early in June.

The minor crops of the soil type are coconuts, bananas, water melons, cantaloupes, mangoes, peanuts, camotes, cassava, and other fruit trees. Water melons and cantaloupes are grown extensively at Leon and Alimodian.

Alimodian silt loam (127) -- This type is found in three places namely, one just south of the town of Janiuay, another south of Cabatuan, and the third between the towns of San Miguel and Tigbauan. It has a very gently rolling topography. The elevetion of this type ranges from 170 feet at Napnapan to 180 feet at Barrio Cordova, Tigbauan. The external drainage is good and the internal drainage is fair. This type has an area of 5,463.98 hectares.

The surface soil is grayish brown, light brown to yellowish brown silt loam, and is very friable and granular. It has an average depth of 30 centimeters. Its organic matter content is very low to continuous cropping and leaching.

Lowland rice is the principal crop grown on this soil type, the yields ranging from 12 to 35 cavans per hectares. On some farms, where irrigation and fertilization with amophos or ammonium sulfate

are practiced, the yields of Seraup Kechil and Raminad varieties are greater. Medium late varieties, like Pinili and Arabon, are grown on unirrigated areas with rather low yields.

Sugar cane is grown and manufactured into sugar. The cane fields are not fertilized. Badila and La Carlota varieties of canes are commonly planted and the yields average 27 piculs per hectare. The low yield is due to the crude methods of farming. The other crops such as corn, tobacco, and vegetables are raised semi-commercially. Production is quite low but can be improved only by better farm practices like irrigation, fertilization, and rotation with leguminous crops.

Few coconut trees are also found along the barrio roads and creeks. There are buri palms around Barrio Napnapan, Tigbauan, Kamanchile trees are very common on this type. Shy bearing mango trees and other fruit trees are grown in backyards and along the roads and banks of creeks.

Alimodian-Barotac complex (125). - This type is found at the north-eastern part of Passi, extending into Capiz Province, and has an area of 8,572.74 hectares. The soils complex is the association of the Alimodian and Barotac series, the former being dominant. The soil development from weathered shales, sandstones, and basalt. Its dominant texture is loam. It is brown to dark brown, friable and is easily tilled. The topography is very hilly to mountainous. The external drainage is excessive while the internal drainage is fair. Some areas in this complex are stony but the stones are not big enough to hinder tillage operation.

This region is not extensively cultivated. Only small areas on the slopes are devoted to upland rice and corn production. The greater part

of this complex is cogon grassland with some binayuyu trees growing here and there. Patches of second growth forest are found especially in between steep slopes of the hills.

Alimodian soils, undifferentiated (135).--This type of soil approximately 45,366.92 hectares is found at the western border of the province along the Iloilo-Antique boundary. Being mountainous the terrain is very rough, steep, and stony. The prominent mountains of the province, such as Mt. Baloy (1,728 meters), Mt. Inaman (1,350 meters), Mt. Igdalig (1,288 meters), (Mt. Inaman) are within this area. The vegetation is mostly second growth forest. There is also timber of the first group but no commercial logging is done because of the difficulty of transportation. Portion of the land are kaingin for upland rice, corn, and camote. Such practice on soils of loose and soft structure is very conducive to accelerated soil erosion. Reforestation work should be done in this area especially within the Iloilo watershed zone to minimize the frequency of floods and to maintain and enlarge the natural water reservoir of the province.

LUISIANA SERIES

The Luisiana series is similar to the Antipolo ans Alaminos series and other reddish-brown to red soils that have developed from volcanic basaltic rock materials. The weathering of the parent materials has gone so deepthat the thickness of the resulting soil is from 3 meters to an indefinite depth. This series has an elevation of from 480 to 550 feet above sea level, and occupies the hilly and rolling areas between Passi and Sara. The external drainage is good to excessive

depending upon the vegetation and slope of the area, and the internal drainage is good.

The distinguishing characteristics of this series in relation to the Antipolo and Alaminos series are its deep soil excellent friability and granulation, absence of gravel, pebbles, or boulders in the profile and the presence of all shades of red color in the soil substratum. A yellowish red streak is produced on the lower portion of the profile when a fresh cut is made with a spade or a geologist's hammer.

Luisiana loam (128) . -- A typical profile description of this series is shown by the Luisiana loam, the only type under this series found in this province.

Depth of soil cm.	Characteristics
0 to 20	Surface soil, loam, dark brown to reddish brown strongly loose and friable and fine granular. No stones or boulders present.
20 to 60	Subsoil, yellowish brown to yellowish red speckled with a cloudly red, silt loam, fine granular, slightly friable to slightly compact. Separating this horizon from the lower layer is a diffused and smooth boundary.
60 to 150	Substratum, yellowish red to almost red, speckled with a cloudy deep red, silt loam; fine granular and slightly friable to slightly compact. No stone or boulders, no indication of parent material. This layer usually extend deeper than 150 centimeters.

This type is found along the highway between Passi and Sara, in the vicinity of San Rafael. The land is rolling to hilly and is well drained both externally and internally. The surface soil ranges in depth

from 15 to 20 centimeters. It is deep in the lower part of the slopes and in the valleys, and shallow about the peaks of hills and upper slopes. In color it is dark brown in the grasslands, but reddish brown in the open cultivated fields. The light and friable consistence of the soil makes tillage operation very easy. There are no stones or boulders to obstruct any farm operations. This type has an area of about 4,602.44 hectares.

Upland crops planted in this area are rice, corn, tobacco, and fruit trees, such as caimito, jackfruit, citrus, and papaya. Root crops, such as cassava, and camote, are also planted. The yield of upland rice is very low, ranging from 5 to 10 cavans to the hectares. Lowland rice is also cultivated on this type in narrow valleys and small pockets. The supply of water is dependent upon rain and see page from upland and areas. The yield ranges from 25 to 60 cavans to the hectare with the Pinili variety.

The soil type must be guarded against the danger of accelerated soil erosion. If the land is sloping or rolling, accelerated soil erosion easily starts especially when the land is cleared or planted to clean cultured crops. To avoid its occurence conservation measures such as contour farming, strip cropping, and cover cropping should be practiced. Land with slopes not suited for clean-cultivated crops should be either be planted to permanet crops like coconuts, fruit trees, coffee, and cacao, with suitable cover crops, or be refcrested.

SAN RAFAEL SERIES

Like the Alimodian and Barotac series the San Rafael series is hilly and mountainous. Its elevation ranges from 500 to 2,000 feet above sea level. External drainage is excessive while the internal drainage is fair. A great part of this series is covered with second growth forest.

The soil consists of dark gray to black shallow surface soil underlain by reddish brown gravelly sand. The substratum consists of light gray to almost white porous and structureless coarse sand and quartz gravels.

Accelerated erosion has gained headway in this series especially in uncultivated areas. The surface soil is oftentimes absent. In some cases the subsoil is also eroded. Generally this series is not important agriculturally.

San Rafael loam (133).-- The typical profile of this type is as follows:

Depth of soil cm.	Characteristics
0 to 12	Surface soil dark brown to almost black loam, granular structure and strongly crumbly when dry and soft when wet. It affords deep root penetration, No stones, pebbles, or cobble stones. The boundary is diffused and smooth.
12 to 30	Subsoil brown loam, excellent medium granular structure soft, strongly friable, and very strongly crumbly. Boundary is diffused and smooth.
30 to 150	Substratum, gray to reddish brown, sandy and gravelly, soft and structureless; weathered andesites may be found as an intrusive material in weathered diorite mass.

The distinguishing characteristics of this soil type are dark gray to black and shallow surface soil, ranging in depth from 10 to 20 centimeters and brown shallow subsoil underlain with a reddish brown sand and gravelly weathered diorite material, and structureless coarse sand quartz gravels.

The condition of drainage is generally good to excessive. During the rainy season soil erosion is very active on cultivated areas.

This type has an area of 56,453.59 hectares. The native vegetation consists mainly of cogon, talahib, and second growth forest. Patches of cleared and kaingin areas are found here and there on the slopes planted to corn, camote, and upland rice.

The area under this soil type could profitably be utilized for cattle farming because of its extensive grass area and live streams. However, some portions of the area and must be reforested to conserve the water supply, protect and improve the soil, and increase our first class timberlands.

Table 13. -- Showing the soil types, area, and their present use use in Iloilo Province.[a]

Soil types	Area in hectares	Percent	Present use
Hydrosol	8,298.00	1.57	Api-api, bakauan, daluru, nipa palm, & other halophytic plants.
Beach sand	4,650.22		Coconut & other sea-shores vegetation.
Sta. Rita clay loam	17,570.90	3.33	Sugar cane, corn, coconut, lowland rice, camote, vegetables, & tobacco, bamboos, & fruit trees along creek banks.
Sta. Rita clay	54,753.18	10.36	Lowland rice, mungo, co corn, vegetables, & fruit trees.
Bantog clay loam	1,428,34	0.27	Lowland rice, corn, tobacco, mungo, & coconuts
Umingan fine sandy loam	19,316.65	3.66	Tobacco, corn, sugar cane, coconut, vegetables, kamanchile, cogon, & bamboos.
Sara sandy loam	17,888.31	3.39	Lowland rice, corn, sugar cane, coconut and tobacco.
Sara silt loam	4,647.79	0.88	Lowland rice, upland rice coconut & fruit trees.
Alimodian-Barotac complex	8,592.74	1.63	Upland rice, corn, camote, & cassava, cogon, binayuyu, & second growth forest.
Alimodian clay loam	183,304.13	34.69	Corn, upland rice, coconut, fruit trees, banana, watermelon, cantaloupes, cogon & forest trees.

Alimodian silt loam	5,463.98	1.03	Sugar cane, lowland rice, fruit trees, and bamboos.
Luisiana loam	4,602.44	0.87	Rice, corn, tobacco, fruit trees, cassava, & camote.
Barotac loam	26,753.11	5.06	Upland rice, corn, camote, cassava, banana, & fruit trees, good for grasing.
Barotac loam, lowland phase	2,970.05	0.56	Lowland rice, coconut, banana, & fruit trees.
Barotac clay loam	4,647.79	0.88	Coconut, corn, upland rice & fruit trees.
Faraon clay	11,721.49	2.22	Coconut, corn, upland rice, fruit trees & forest trees.
San Rafael Loam	56,453.59	10.68	Mostly not cultivated under second growth forest, cogon, talahib & binayuyu.
Guimaras gravelly loam	36,990.83	7.00	Lowland rice, & upland rice coconuts. corn, fruit trees cogon, talahib, & second growth forest.
Alimodian soils, undifferentiated	45,366.92	8.59	Upland rice, corn, [illegible] & forest trees.
Area of unclassified islets	12,979.54	2.45	Coconuts, camote, [illegible] & forest trees.
Total	528,400.00	100.00	

[a] Area obtained with the use of a planimeter. No dedection was made for areas occupied by roads, buildings and rivers. Data on total area abtained from a report of the Bureau of Forestry as of June 20, 1939.

MORPHOLOGY AND GENESIS OF SOILS

Generally the soil is a mixture of mineral and organic matter in which plants grow. Under the modern concept of soil, however, it is defined as a natural body on the earth's surface characterized by layers or horizons resulting from the modification of parent material by physical, chemical and biological forces under the influence of certain conditions during various periods of time. From this new concept the different major factors that participate in the formation of the soils are (1) the physical and mineralogical composition of the parent material, (2) the climate acting upon the soil material, (3) the plant and animal life in and on the soil, (4) the topography of the land and (5) the length of time the forces of development have acted on the soil material.

The parent maretial of the soil is the unconsolidated mass from which the soil develops. This material consists of partially or wholly weathered rocks when weathering factors and act upon the various kinds of rocks. These materials may develop in place into a soil, or they may be transported to other areas by various agencies like water and gravity and later developed into a soil.

In Iloilo Province, basaltic rocks are found as outcrops between the towns of Banate and Barotac Viejo. They are dark brown rocks and soils with usually red loam or clay developing from them. Diorite rocks produce coarse gray sand upon weathering. The parent materials of Barotac and Luisiana series have developed from the weathering of these rocks.

Shales are consolidated silt or clay that have hardened into a compact insoluble rock because of temparature or pressure or both.

They appear as the yellowish brown to gray plates in horizontal layers. The soils developing from the weathering of such rock materials are usually dark brown to reddish brown clay loam to clay. These are the soils of the Alimodian and Barotac series.

Coralline limestones are formed through the constant secretion of lime by minute marine called corals. Coralline limestone are rough rocks with many sharp and irregular edges. Limestone rocks may also be formed by the compacting of limy sediments derived from chemical precipitates of lime in sea water or from fragments of shells. Rocks that have developed in this way are hard, smooth, and massive. Coralline limestones are the dominant from of rocks found in Iloilo. The northwestern coastal shore of Guimaras Island is made up of this rock. The hills north of Barotac Nuevo and those northeast and southeast of Passi and near it are also coralline rocks. Under humid climate soils that have developed out of such parent materials are generally black clay and are classified under the Faraon series. The black coloration may be due to high intensity of humus pigmentation.

Metamorphic rock is either an igneous or a sedimentary rock the physical properties of which have been altered by pressure or temperature or by both. The hard and platy rocks found in the mountain ridges along the Antique-Iloilo boundary are a class of metamorphic rock called slate.

The alluvial soils of Iloilo Province have developed from the sediments mainly derived by erosion from the brown to reddish brown and black upland of the Alimodian and Luisiana series surrounding the Iloilo plain. These alluvial deposits of all grades and forms are the result of two major mobile processes, namely, degradation and

aggradation. Due to the variation in the stages of development and the degree of exposure to the factors of soil forming processes as manifested by their respective profiles, the soils of the plains are divided into various soil types, namely coastal beach sand; Umingan series; and the Sta. Rita, the Bantog, and the Sara series. Based on the physical, chemical and biological factors that influence the development of these soils, they could also be differentiated from one another by their fertility or productive capacity. Thus among the different series mapped in this plain, the Sta. Rita soils are the most fertile, followed by the Umignan and the Bantog soils, then the Sara soils, and so on to the coastal beach sand, which is the least fertile.

Based on the origin, degree of profile development and topography, the different soil series of Iloilo as described in this report may be classified into the following profile groups.

1. Soils of the swamps and marshes
   - (a) Hydrosol — 8,298.0
2. Soils of the plains
   - (a) Profile group I
     - (1) Beach sand — 4,650.22
   - (b) Profile group II
     - (1) Umingan fine sandy loam - 19,316.65
   - (c) Profile group III
     - (1) Sta. Rita clay - 54,753.18
     - (2) Bantog clay loam 1,428.34
     - (3) Sara silt loam - 4,647.79
3. Soils of the hills and mountains
   - (a) Profile group VII
     - (1) Guimaras gravelly loam
     - (2) Barotac clay loam
     - (3) San Rafael loam
   - (b) Profile group VIII
     - (1) Alimodian clay loam
   - (c) Profile group IX
     - (1) Faraon clay

Profile group I as exemplified by coastal beach sand shows soils of recent alluvial formation with a very young and undeveloped profile. The profile of coastal beach sand is composed of layers of fine coarse structureless sand.

The soils under profile groupII are young alluvial fans, plains or other secondary deposits having slightly developed profiles, underlain by unconsolidated materials. There are profiles, with slightly compact subsoil horizons. The Umingan sandy loam, which has a slightly developed profile underlain by unconsolidated materials, belongs to this profile group. This soil is relatively more developed than the soil profile of the coastal beach sand.

Profile group III consists of soils on older alluvial fans, alluvial plains and terraces having moderately developed profiles (moderately dense subsoils) underlain by unconsolidated materials. These are generally deep soils, and they are underlain by clay pan or hard pan, but the subsoils are moderately dense. The Sta. Rita, the Sara and the Bantog series fall under profile group III. They consist of soils of older alluvial plains having a moderately dense subsoils and underlain by unconsolidated materials. With the exception of the Bantog series, which was first identified in Bulacan Province, the Sta. Rita soil is different from the Bigaa soil in that the surface soil of the former is dark gray to black, while that of the latter is dark brown to brown. Moreover, in the Bigaa soils black iron concretions are in the substratum whereas in the Sta. Rita soils these are absent. The Sta. Rita series is also different from the San Fernando series of Pampanga Province in the texture and arrangement of the profile horizons.

Profile group VII to which the Guimaras, The Barotac, the Luisiana, and the San Rafael series belong, consists of soils of upland areas developed from hard igneous rock, and occupies a rolling to steep topography. They are all primary soils the bedrocks of which are either basalt or diorites. The basaltic rocks of the Barotac series are overlain by shales.

The Luisiana series is a dark red soil which was first identified in Laguna Province. Of the four soil series in this group the Luisiana series is the oldest and most weathered as shown by the deep profile development.

The Alimodian series is classified under profile group VIII, or soils of upland areas developed from consolidated sedimentary rocks. Shale is the most dominant rock present in this series although some sandstones and slates are also present.

Profile group IX consists of soils of upland areas developed on sift consolidated rock materials like limestone and sandstone. The Faraon series belongs to this group. This series differs from either the Sibul or the Binangonan series in the structural characteristics of the bedfock. The limestone rock of the Faraon series is porous gray to yellowish gray, while that of the Binangonan or the Sibul series is more or less massive in character. Rock outcrops which are seldom present have round edges in the Binangonan or the Sibul series, and sharp edges in the Faraon series.

PRODUCTIVITY RATING OF THE SOILS OF ILOILO

The productivity rating of the soil is one of the latest contributions to the soil survey reports in that it supplements the soil type description. The calculations made during and after the field operation aim at the assesment of each soil type and phase by designating an index number to represent its productivity compared with the standard productivity of 100. The primary aim is to show specifically the comparative productiveness of the individual soil type. The rating are obtained either by inductive method. The inductive method weight the profile characteristics in relation to the effect upon the production of crops in mind. Conditions and properties, such as imperfect drainage, content of organic matter, and the texture of the surface soils, are considered by the rater in terms of their effects on the productivity in question. In the deductive process, rating are assigned to the yields that are considered representative of the specified crop planted on a particular soil.

An interesting method of rating the soil was devised by Storie, of the University of California at Berkeley. This method is by induction employing three general factors which are almost likely to influence the soil productivity under the most profitable crops of area. The first factor, called "A" consists of the soil profile and its general characteristics; the second factor, "B" consists of the texture of the surface soil, and the third factor, called "C", of miscellaneous conditions, such as chemical properties, drainage, and other things. These three factors are expressed in percentages which multiplied together, give final rating. The disadvantage of this

system is that one of the factors can make the rating low even if the other two are each rated 100 per cent.

So far, a well-defined quantitative method of rating the productivity of the soil types and phases, based on the calculation of their characteristics and properties, is not available. For this reason standard yields are obtained by arbitrary selection on the basis of informative relative to the average yield of the different crops on the different soils of the province where practices do not include the addition of commercial fertilizer or amendment. Such information is gathered directly from farmers, from sensus reports, bulletins, and reports of the Provincial Agricultural Supervision. This method can only be applied in a well-settled country where lorg term yield acreages can be ascertained, and where customary agricultural practices are well established.

The productivity ratings of the soil types of the province is shown in Table 14. As far as can be ascertained, the ratings of weight leading crops are clearly shown. For rice the Sta. Rita clay is the best soil, followed by the Bantog clay and the Luisiana loam. For corn the Umingan silt loam and the Alimodian clay loam are the best. The Faraon clay is the best soil of the province for coconut, while the Sta. Rita clay is the best soil for sugar cane. These ratings are under Iloilo conditions with the normal way of farming practices.

Table 14. -- Productivity Ratings of the soils in Iloilo

Soil Types[a]	Crop Productivity Index for [b]							
	Lowland palay 100-60 cavans per ha.	Corn 100-17 cavans per hectare	Coconut 100-3750 nuts per hectare	Sugar cane 100-80 piculs per ha.	Mungo 100-7 cavans per hectare	Sweet 100-8 tons per hectare	Tobacco 100-1478 kilogram per hectare	Cassava 100-15 tons per hectare
1. Sta. Rita clay	130	50	35	75	115	10	60	30
2. Sta. Rita clay loam	35	70	40	110	60	85	70	60
3. Bantog clay loam	65	80	-	85	-	10	-	-
4. Sara silt loam	40	60	-	50	-	15	-	-
5. Sara sandy loam	20	40	40	65	100	40	30	40
6. Umingan fine sdy. loam	-	115	85	95	80	75	80	75
7. Coastal beach sand	-	-	90	(c)	(c)	-	-	-
8. Guimaras gravelly loam	20	25	75	-	-	10	-	40
9. Faraon clay	-	-	80	(c)	-	-	-	-
10. Barotac clay loam	25	60	60	-	-	10	-	35
11. Barotac loam	35	65	40	85	85	15	60	45
12. Barotac loam, rolling phase	40	50	-	-	25	-	-	-
13. Alimodian clay loam	40	115	70	85	60	15	70	40
14. Alimodian silt loam	60	40	75	35	80	10	80	70
15. Alimodian-Barotac complex	-	-	-	-	-	-	-	-
16. Luisiana loam	65	50	-	85	-	25	40	40
17. San Rafael loam	-	40	-	-	-	40	(e)	(e)

[a] Soils are listed in the approximate order of their general productivity under current practices and their relative physical suitability for growing crops.

[b] The soils of Iloilo Province are given indexes that give the approximate average production of each crop in per cent as the standard of reference. The standard represents the approximately yield without the use of fertilizer or amendments on the extensive and better soil types of the regions of the Phil. Is., in the crop is most widely grown. [c] Mostly coconut. [d] Not extensively cultivated grassland. [e] Largely grassland.

WATER CONTROL ON LAND

The erosion or the surface run-off in this region is of three types, namely, sheet erosion, or the uniforn removal of surface soil over a wide area; rill erosion, or tiny gullies irregularly dispersed on newly planted areas; and gully erosion, or soil removal by water concentrated along one line forming canals,rivulets, and the like.

Sheet and rill erosion are very common on the Alimodian and the Faraon series. The variations in the intensity of the soil colors in these two series (dark brown or black to yellowish brown) are the result of cultivation and of sheet and rill erosions. The decreasing yields of crops, the extensiveness of submarginal lands, and the exposure of the subsoil are evidences of accelerated sheet and rill erosions.

Gully erosion, although not so serious on areas covered by the San Rafael series, deserves the prompt attention of our farmers. Erosion of this type may appear too insignificant as the beginning, but under favorable climatic and soil conditions it will eventually form deep ditches and ravines. Soil losses in the uplands of Iloilo due to the above factors are not so severe as to cause great havoc to our agriculture. Nevertheless, the fact remains that annual soil losses due to sheet and rill erosions are cumulatively increasing in magnitude; the productivity of our good soils in the rolling lands are running low; and the hectareage of our submarginal lands and abandones agricultural lands is relatively increasing annualy.

The following remedial measures for the control of soil erosion are suggested;

All lands having topography, soil and climate favorable to but not yet affected by soil erosion, must follow a well-planned cropping

system-that the land must not be left bare during a certain period of the year in which heavy precipitation is a certain period of the year in which heavy precipitation is expected. Thus crop rotation, or the growing of different crops on a piece of land is practiced. Cropping must also be adjusted that each crop in the rotation will suit the climatic conditions or vice versa. All plowings and furrows and planting must follow the contour.

On rolling, sloping, hilly and mountainous agricultural areas where gullying has started, cover cropping and tracing must be done. In some areas under the Alimodian series, the farmers have saved the erodible portion of their soil by putting up dikes of stones across the slope (Plate 4, fig. 1). In some sections under the Guimaras series, terraces are constructed to check surface runoff. But for advanced gullying obstructions of any matreials are put in the deep ditches. This will effect the silting of the runoff water. This accumulated soil materials or deposit should be seeded to non-erosive crops or to any good soil binder crops. Soil-saving dams, although too expensive help in saving our soils from being washed to the sea. Under Iloilo conditions, terracing is the most effective method for the control of soil erosion for the present time.

Sheet erosion or the removal of the surface or thin soil layers with each heavy rain is the type that causes most of our soils to lose their fertility. This could be controlled by using a cropping system whereby a crop is grown on the land most of the time or at least during the seasons when the greatest erosion is likely to occur. Small grain crops hold the soil better than corn or other cultivated crops. On steeply sloping lands permanent grass pastures or meadows should be used.

In less sloping ground, contour farming, strip cropping, and crop rotation will not only control soil erosion but also conserve soil fertility. Terracing is also very effective.

Other areas subject to soil erosion, and hilly and mountainous lands which could not be utilized for grazing and for crops because of topography, should be reforested. It will not only conserve the soil but will also conserve the moisture supply of the province.

Moisture supply necessary for the growth of all crops entirely controlled by climate, and fluctuates invariably in the soil and with different crops. Thus we have irrigation and drainage. We irrigate the soil when moisture is lacking to attain normal plant growth and drain the soil when moisture is excessive. The general relief of the province shows that all the big rivers are potential sources of irrigation water . The lay of the land shows that most of the important crops, like rice, sugar cane, corn, vegetables and fruit trees, could be irrigated and thus reduce crop failures due to drouht or lack of moisture. With this objective the Bureau of Public Works constructed the Aganan River and the Sta. Barbara Irrigation System with dams at Barrio San Antonio, San Miguel, and Miraga, Sta. Barbara, to divert the flow of the Aganan River and Jaro River, respectively. The Aganan River Irrigation System irrigates the riceland areas of portions of San Miguel, Pavia, Oton, and Iloilo City, covering an area of 5,044 hectares. The Sta. Barbara Irrigation System irrigates parts of Sta. Barbara, Pavia, Leganes and the districts of La Paz and Jaro, Iloilo City, covering an area of 4,681.

Due to the frequency of runoff in the watersheds of the systems after heavy rains, silting in the irrigation dams, canals, laterals, and sublaterals affect the efficiency of the systems. Aside from the high

cost of maintenance of the systems, the removal of silt deposits is a big problem. The farmer's main objection against the systems is that sufficient water could not be supplied by such systems during droughty days. Another complaint is that irrigation water is too turbid, and silty materials are deposited on their farms. Although these systems irrigate areas too big for their capacity, they have saved rice crops from drought. Because irrigation is indespensable to light textured soils planted to lowland rice, such as areas under the Sta. Rita clay and clay loam, the Sara sandy loam, and other soils, the construction of several irrigation system to irrigate them deserves due consideration.

In as much as the whole Iloilo Province is systematically dissected by rivers, atreams, rivulets and creeks, the natural drainage of this region is fair to good, Soil investigation done during the survey show that all the soils of the province with the exception of the hydrosol, coastal beach sand, and areas under the Sta. Rita clay and the other lowland rice areas, have fair to good or excessive external drainage. So that from the standpoint of general farming, except lowland farming, artificial drainage, is not necessary. Conversely, most farmers desires to conserve all the moisture available in the soil to insure better crops.

Thus we always encounter the problem of the conservations of moisture in our soil. The following ways may be suggested of moisture in our soil, for increasing the capacity of our soil to retain moisture. Moisture retentivity of the soil is dependent on texture, structure, amount of organic matter, depth of the soil or solum, amount of soil colloids

present, vegetation and elevation. Generally, moisture conservation could be attained in the soil by the addition of organic matter good tillage, eradication of weeds, fertilizer application, and mulching. These practices will not only increase its productive capacity.

CHEMICAL CHARACTERISTICS OF THE SOILS OF ILOILO PROVINCE

General consideration. -- The capacity of the soils to sustain vegetative life depends to a very great extent on the content of such soils of sulubble chemical substances needed by plants. The fertility of soils varies in all degrees, because their content of available plant nutrients differs in all degrees. Soils that are adequately supplied with nutrients needed by growing plants generally are found to be more fertile than soils not so sufficiently endowed. It is important, therefore, that information concerning the chemical composition of soils, particularly that portion soluble in soil water and commonly known to affect plant growth, is of practical importance to producers of plant and plant products and to persons engaged in soil research or educational work.

To thrive normally a growing plant, like any other growing thing, must be supplied with sufficient amount of food. A plant growing in the soil will have to nourish itself from the soil. If the soil is not possessed of the things that the plant needs, the plant will have to go along without the deficient nutrients, if it can, but if the deficiency is great enough, the plant dies. It is now knownjust that most plants need to grow normally, and how much they need. Awise planter should know the requirements of his plants and the capabilities of his soil. Whatever nutrients are lacking for the proper growth of his plants must be

supplied in correct amounts and whatever is over abundant must be conserved, or if such overabundance is deleterious to the plants, it must be corrected.

In discussing soil plant relationship, it must be emphasized, however, that the successful production of plant products is not solely dependent on the soil. There are several factors of plant growth, which may be classified into three main divisions, namely, (1) climatic factors, (2) soil factors, and (3) factors inherent in the plant itself.

Climatic factors include all forces that exert pressure on the plant, involving water, temperature and energy exchange brought about by changes in the atmospheric conditions.

Soil factors, generally divided into three groups, namely, chemical, physical, and biological factors, affect the plant because it is anchored in the soil and drives most of its nourishment from the soil.

The factors inherent in the plant itself include such forces as the individual capacities of a plant to grow, its ability to weather unfavorable conditions, and to grow only to a defineite size, then stop growing, etc.

It can be seen from the preceding paragraph that for a plant to grow succesfuly all the factors relative to its growth must so coordinately act that the net result of such action is most favorable to the plant; in other words, the soil must be just right, the climate just right, and the plant just right. Because the climate is generally beyond

man's control, and the plant, we usually take it is , it is only the soil that we can easily adjust. This adjustment of the soil to suit best the plants we wish to grown involves the whole field of edaphology, and the chemical analysis and adjustment of soils is just one branch of this large field of work.

Plants require in more or less large quantities the following elements: Hydrogen, carbon, oxygen, calcium, magnesium, phosphorous, potassium, nitrogen, sulfur, and iron. And in lesser quantities plants also need boron, manganese, zinc, and copper. Excepting hydrogen, oxygen, carbon, and at times nitrogen, all of those elements are obtained by the plants from the soil or its solution.

Nitrogen.-- Nitrogen is a nutrient element required by all plants. It is found chiefly in the organic matter of the soil. The nitrogen of the organic matter in the soil, through the action of soil micro-organism, is converted into ammonia, then to nitrate and finally to nitrate by the process known as nitrification. To have an adequate supply of nitrogen for the plants, the soil must have sufficient nitrogen carrying organic matter, must be moist, warm, aerated and possessed of the proper soil micro-organisms. Soils low in organic matter are generally low in available nitrogen. Productive soils are usually rich in organic matter convertible into substances utilizable by plants. A deficiency of nirogen can be corrected by the application of nitrogen-bearing fertilizers, like compounds of ammonia or nitrate compounds, organic matter in the form of manures has been used successfuly for ages to make up for nitrogen deficiency.

Because nitrates are easily soluble in water, they are easily lost from the soil, especially well-drained soils, through leaching.

The nitrate content of the soil is likely to fluctuate from season to season, depending on the amount made available by the soil organisms and the amount lost due to leaching. A periodic test for nitrates in the soil must be made so that corrections may be applied whenever necessary.

The soils of Iloilo Province, as can be seen in Table 14, nearly like all other soils of the Philippines analyzed in the Division os Soil Survey to date, are quite low in nitrogen content in the form of both nitrate and ammonia. This, of course, suggests the necessity of applying nitrogen-carrying fertilizers to correct the dificiency. For most plants to grow well a minimum of lo p.pm. for nitrates and 10 p.pm. for ammonia must be maintained at all times during the growing period of the plant.

To build up the depleted nitrogen content of the soils of this region, a revision of farming practices will help. Crop rotation, especially the planting of leguminous plants after harvesting non leguminous crops, green manuring, application of stable manures and other nitrogen bearing fertilizers, will tend to increase the organic matter in the soil and ultimately, as we have seen, the nitrogen content.

Phosphorous.-- Phosphorous, like nitrogen, is needed by plants in more or less large amounts. It is made soluble in the soil and available to plants by the decay of organic matter phosphorous and ability of the soil to maintain this supply are two main considerations with respect to available phosphorous. Many agricultural soils are low in their content of available phosphorous, not only because most plants are heavy phosphorous feeder, but also because very often the phosphorous

content of the soil is "fixed" or in an unavailable form. While this nutrient element is indespensable to growing plants too much of it in the soil may be the cause of injury to plants. The three chief effect of phosphorous on plants are (1) stimulating root growth, (2) hastening the maturity of crops, and (3) improving the quality of seeds especially grains.

The soils of Iloilo Province as shown in Table 14, contain a very limited amount of available phosphorous. Not even one of the samples examined and analyzed showed sufficient of this nutrient element for even the lightiest-phosporous-feeder plant. For most field crops a test of less than 1 p.p.m. is an indication of insufficiency, and fertilization with phosphatic fertilizers is in order. To maintain a normal phosphorous level in the soil there must be at least 1 to 21/2 p.p.m. of available phosphorous throughout the growing and maturing periods of the plant.

Phosphorous can be applied to the soil in two forms, namely, as organic fertilizers like guano, which also contain nitrogen in varying amounts, or as inorganic fertilizers like superphosphates or rock phosphate. In using phosphatic fertilizers it must be remembered that soils revert or make insoluble some of the phosphorous applied to them, and some soils have this power in greater magnitude than others. In case of certain soils, therefore, the application of 100 kilos of superphosphate per hectare may cause a difference in test results between fertilized and unfertilized soils; but in the other cases, 400 or 500 kilos or more of superphosphate may be required to show much difference in test results. In other words, the reverting or obsorbing power of a soil for phosphorous must be satisfied before a considerable amount of phosphorous will be found in the soil extract.

Potassium.-- Potassium belong to the list of major plant nutrient elements, because like the others in the list, it is needed by plants in considerable quantities. It occurs both in the organic and in the mineral matter of soils and becomes available to plants by solution in the soil water. Most soils, except mucks and peats, of which we have very limited examples in the Philippines, contain relatively large amounts of total potassium, but the amount available to plants in any one soil may be low, especially in sandy soils. A deficiency of potassium in the soil does not readily become apparent until it becomes more or less critical. Then it is indicated by a stunted growth of the plants with the leaves becoming or brown toward the centers. In extreme cases the leaves fall off from the plants. A large portion of small shrunken, misshaped pods and seeds of legumes or of other fruits, flowers, tubers, and roots may indicate potassium deficiency in the soil. Care must be taken, however, to avoid confusing these symptoms with those caused by diseases or insect infestations.

The soils of Iloilo Province except the Luisiana loam and the coastal beach sand, gave low test for available potassium. These two exceptions gave tests of medium sufficiency. For most crops 5 to 10 p.p.m. of potassium is needed for good growth. As mentioned above the effect of this defficiency is perhaps not apparent because it is not yet at the critical stage, but it is better to correct this condition now, only to get immediate improvement in the yields of those soils but also to avoid creating a critical situation which may be difficult to remedy later.

The common carriers for potassium sulfate and potassium chloride.

Calcium.-- Calcium performs many important functions in the soil relative to the growth of plants, and the physical structure and the physiological condition of the soil. The soils well supplied with calcium are known to be less easily puddled than those not so well supplied with it. In some forms calcium is often used to correct soil acidity when it becomes unfavorable to plant growth. This nutrient element is commonly found in relatively large amounts in soil and soil extracts. Soils are seldom deficient in calcium as a plant nutrient, but a low productivity, especially for crops that need a good supply of this element. Leguminous crops and most garden plants require a liberal supply of calcium from the soil, but grains and grasses generally require less. Excessive amounts of calcium in the soil is injurious to plants especially for crops that require acidic soil condition for normal growth.

The soils of Iloilo Province, except for five soil types, namely, Barotac clay loam, Barotac loam, Alimodian silt loam, and Sara silt loam, may be considered normal with respect to available calcium. In the case of Sara sandy loam and Sara silt loam, the deficiency is apparently reflected already in the acidity of the soil (refer to pH value) and therefore seems to need correction by liming processes. In the other soil types mentioned the calcium deficiency does not seem to be serious yet because the corresponding pH values for such soil types are not yet very low, and if these soils are planted to rice the soi acidity would still be within the preference pH range of rice. But even then, the application of lime to

to bring the test figure to at least 40 p.p.m. of available calcium is necessary through out the growing and maturing periods of the plants.

Soil reaction.-- Soil reaction, generally expressed in terms of pH values, denotes the degree of acidity or alkalinity of the soil. A pH value of 7 means that the soil is neutral-neither acid nor alkaline. PH values lower than 7 means that the soil is acidic, and pH values higher than 7 means that the soil is alkaline or basic in reaction. Cultivated plants have soil reaction preferences some requiring an acid soil, some a neutral soil, and some preferring the alkaline condition. Rice, for instance, thrives best in a pH range of 4.8 to 6.9.

Two alternatives are open when the pH value of a soil does not fall within the pH range preferred by a plant. The pH range of the soil can b be adjusted to suit the plant, or the plant. The pH range of the soil can be adjusted to suit the plant adopted to suit the pH value of the soil chosen. It is generally easier to choose the latter course but if an adjustment of the pH is necessary, liming is gerally resorted to, to shift the pH towards the alkaline side, and where the demand is to shift the pH towards the acid side, sulfur is generally used to accomplish the objective.

The soils of Iloilo Province range in pH from 4.0 to 6.5. The Sara sandy loam and the Sara silt loam are too acidic for most field crops except legumes and grasses which have high tolerance for acid soils. So with regards to these two types, it is advisable to lime the soils,

Table 15.-- Chemical analysis of available plant nutrient elements of the soils of Iloilo Province.

SOIL TYPES	PH	Nitrate (NO 5) p.p.m.	Nitrate (NO 5) Kilo per hec. per 15 cms.	Ammonia (NH3) p.p.m.	Ammonia (NH3) Kilo per hec. per 15 cms	Phosphorous (P) p.p.m.	Phosphorous (P) Kilo per hec. per 15 cms.	Potassium (K) p.p.m.	Potassium (K) Kilo per hec. per 15 cms.	Calcium (Ca) p.p.m.	Calcium (Ca) Kilo per hec. per 15 cms.
Sta. Rita clay	6.5	2	18	3.0	27	0.5	4.3	Low	27	90	810
Sta. Rita clay loam	6.0	10	90	3.0	27	1.0	9.0	Low	27	70	640
Barotac clay loam	5.5	3	27	4.0	36	a0.5	a4	4	36	20	180
Barotac loam rolling phase	5.5	a2	a18	8.0	27	a0.5	4	4	36	20	180
Umingan fine sandy loam	6.0	10	90	6.0	54	0.5	4.5	Low	a27	80	720
Alimodian clay loam	6.0	5	45	5.0	45	a0.5	a4.5	Low	a27	100	900
Alimodian silt loam	5.0	2	18	3.0	27	0.5	4.5	Low	a27	30	270
Bantog clay loam	5.0	a2	a18	6.0	54	a0.5	a4.5	4	30	40	360
Faraon clay loam	6.5	12	108	5.0	45	0.5	4.5	Low	a27	175	1,580
Sara sandy loam	4.0	a2	a18	5.0	45	a0.5	a4.5	Low	a27	30	270
Sara silt loam	4.5	a2	a18	8.0	72	a4.5	a4.5	Low	a27	20	180
San Rafael loam	5.5	a2	a18	6.0	54	a0.5	a4.5	Low	a27	70	640
Guimaras clay loam	5.0	a2	a18	7.0	63	a0.5	a4.5	Low	a27	40	360
Luisiana loam	5.5	25	225	9.0	81	0.5	4.5	11	99	50	450
Coastal beach sand	6.0	a2	a18	5.0	45	0.5	4.5	15	135	100	900

a Less than.

especially if rice is the main crop in the region. All the other soil types are moderately acid and do not seem to need any treatment for pH correction if the soils are planted to rice.

Magnesium and sulfur. - These two elements even when deficient in soils do not present separate problems because both of them are taken care of more or less incidentally when the other major plant nutrients are applied to the soil as amendments. For instance, most limes contain considerable magnesium carbonate. Judicious liming, therefore, often takes care of possible deficiencies in this element.

Considerable sulfur is added to the soils in crop residues, green manures, and farm manures. Besides, rain frings to the soil a large quantity of this element from the atmosphere in addition to the amount directly absorbed from the air by the soil. Routine fertility practices automatically take care of this element. Ammonium sulfate and potassium sulfate, for instance, carry with them sulfur to the soil.

The trace elements. - Although it is now admitted that no fertility diagnosis is complete without considering trace elements, the lack of laboratory facilities at the present time prevented the test of the soils of Iloilo Province for these elements. It must be remembered, however, that a deficiency in one trace element will cause just as much difficulty in soil management as a deficiency of, for instance nitrogen. A nutrient ration can be just as seriously unbalanced because of the lack of a mere trace of zinc or boron as from a deficiency of potash to the extent of many pounds.

SUMMARY

Iloilo is in the Visayan group. Iloilo, the capital of the province and one of the chartered cities of the Philippines, is 290 miles south of Manila. The province, with an area of 528,400 hectares, had a population of 834,502 in 1938.

Regions along the border of Antique and Capiz Province are hilly to mountanous and their bed rocks consist of shale, slate, basalt, diorite, and quartzite. The large level area about Iloilo City, is of recent alluvial deposit of unconsolidated silt and clay.

In general the whole province is well-drained. Some of the big rivers are damed either for irrigation purposes or for domestic water supply. Destructive floods oftentimes occur on the lower plains whenever there is heavy rain over the water shed of these rivers.

Guimaras is generally a rolling to hilly country which is well drained. The western hills are of limestone formation, whereas the other parts are bed rocks of igneous origin.

The Iloilo Metropolitan Water District supplies the City as well as the towns along the main pipe line between the City and the town of Maasin, with potable water. A few other towns have their own water systems while the others just depend upon rain water or water from rivers or springs.

T The greater part of the province is devoted mostly to the cultivation of rice, sugar cane, coconut, corn, tobacco, vegetables, and some fruit trees. The uncultivated hills and mountains are mostly open grasslands dotted here and there with small (are mostly open grasslands) patches of second-growth forest.

The whole Island of Panay was purchased by a number of Bornean datus from the native chieftain. These datus designated Datu Paiburong as ruler of one of the three geographical divisions of the Island called Ironirong, which later was called Iloilo. The Spaniards occupied the province up to the revolution of 1898, which marked the end of the Spanish rule. The American occupation followed with the establishment of a Civil form of government on April 11, 1901. Upon the outbreak of Pacific War, Iloilo was occupied by the Japanese Forces in 1942 and this occupation lasted until liberation in 1945, when the former Commonwealth form of government was resorted.

Before the war Iloilo had a good system of land, sea and air means of transportation. After the war some of the roads were closed and highways are now poorly maintained. Airways travel, however, is much better than it was before.

The port of Iloilo, an active port before, is open to foreign trade. With the disruption in economy and industries as a result of the war, both local and foreign trading have been practically nil.

Farming is the principal industry of the people. Sugar manufacturing was an important industry before World War II. After the war the industry was paralized as a result of the destraction of the sugar centrals during the period of enemy occupation. Copra making also has stopped because of the low level prices fixed by the importers. Fishing, weaving, pot and salt making are the other important industries of the people.

Iloilo Province is under three types of rainfall. Generally rainfall begins in the latter part of May and ends in November.

It is followed by a relatively dry period up to the early part of May. Typhoons are not very frequent at the southern half of the Province, but are very destructive at the northern portion.

The soil of the province was classified under three general land types based on their relief, namely soils of the swamps and marshes, soils of the plains, and soils of the hills and mountains. There is only one soil type under the first land type, even soil types under the second land type, and eleven under the third land type. The distribution of the soil type is indicated in the map of the province.

The hydrosol type is used for fishing prounds. The soils of the Sta. Rita series are the most important agriculturally as they are devoted entirely to rice - the most important crop at present. The Sara soils were formaly devoted to sugar cane but this crop was partly replaced by rice and corn to comply with the sugar limitation requirements.

Among the soils of the hills and mountains the Alimodian sereis is the most important. It is planted mostly to corn and rotated with tobacco and upland rice. It is the largest soil series in the province. The Barotac and the San Rafael soils are not well cultivated because the topography is rather rough and the soils are relatively poor.

In general the soils of Iloilo Province are low in their content of nitrogen, phosphorous, and potassium. This deficiency suggests the necessity of the application of these elements in the form of fertilizers to obtain immediate improvement of the soils.

A revision of exhaustive farming practices to conserve and if possible to build up the soil fertility in this area should be initiated.

Of the total farm area of the province only 65.38 per cent is actually cultivated. About 75.92 per cent of the total number of farms has an average of 3.74 hectares. The largest percentage of the farms constitutes share tenents. About half of the cultivated farm areas are operated by the owners themselves.

GLOSSARY OF COMMON ECONOMIC PLANTS FOUND IN ILOILO PROVINCE

Common Name	Scientific Name	Family Name
Abaca	Musa textilis Nee	Musaceae
Agingai	Rottboellia exaltata Linn.	Gramineae
Agoho	Casuarina equisetifolia Linn.	Casuarianaceae
Ampalaya	Mamordica charantia Linn.	Cucurbitaceae
Api-api	Avicennia officinalis Linn.	Verbenaceae
Apitong	Dipterocarpus grandiflorus Blco.	Dipterocarpaceae
Arrowroot	Maranta arundinaceae Linn.	Marantaceae
Atis	Anona squamosa Linn.	Anonaceae
Bakauan	Rhizophora mucronata Linn.	Rhizophoraceae
Balangot	Typha capensis Rohrb.	Typhaceae
Bamboo	Bambusa spinosa Roxb.	Gramineae
Banana	Musa sapientum Linn.	Musaceae
Bangkal	Nauclea orientalis Linn.	Rubieaceae
Batao	Dolichos lablab Linn.	Leguminouseae
Batino	Alstonia macrophylla Wall.	Apocynaceae
Bermuda grass	Cynodon dactylon (Linn.) pers.	Gramineae
Binayuyo	Antidesma ghaesembilla Gaertn.	Euphorbiaceae
Breadfruit	Artocarpus communis Forst.	Moraceae
Buri	Corypha elata Roxb.	Palmae
Cabbage	Brassica oleracea Linn.	Cruciferae
Cacao	Theobroma cacao Linn.	Sterculiaceae
Cadios	Cajanus cajan (Linn.) Millsp.	Leguminousae
Caimito	Chrysophyllus cainito Linn.	Sapotaceae
Cantaloupe	Cucumis melo Linn.	Cucurbitaceae
Cashew	Anacardium occidentale Linn.	Anacardiaceae
Cassava	Manihot esculenta Crantz	Euphorbiaceae
Cauliflower	Brassica oleracea var. botrustis Linn.	Cruciferae
Chico	Achras sapota Linn.	Palmae
Coconut	Cocos nucifera Linn.	Palmae
Coffee	Coffea arabica Linn.	Rubiaceae

Common Name	Scientific Name	Family Name
Cogon	Imperata cylindrica (Linn.) Beauv.	Gramineae
Corn	Zea mays Linn.	Gramineae
Cotton	Gossypium hirsutum Linn.	Malvaceae
Cowpeas	Vigna sinesis (Linn.) Savi	Leguminosae
Cucumber	Cucumis sativus Linn.	Cucurbitaceae
Dao	Dracontomelum dao (Blanco) Merr. & Rolfe	Anacardiaceae
Derris	Derris elliptica (Rox.) Benth.	Leguminosae
Dalurung Lalaki	Sonneratia caseolaris (Linn.) Engl.	Cryteroniaceae
Duhat	Eugenia cumini (Linn.) Druce	Myrtaceae
Dungon-late	Heritiera littoralis Dryand	Sterculiaceae
Eggplant	Solanum melongena Linn.	Solanaceae
Gabi	Colocasia esculentum (Linn.) Schott	Araceae
Garlic	Allium sativa Linn.	Liliaceae
Ginger	Zingiber officinale Rosc.	Zingiberaceae
Ipil	Instia biyuga (Colebr.) O. Kuntze	Leguminosae
Ipil-ipil	Leucaena glauca (Linn.) Benth	Leguminesae
Kalumpit	Terminalia edulis Blanco	Combretaceae
Kamachile	Pithecolobium dulce (Roxb.) Benth.	Leguminosae
Kapok	Ceiba pentandra (Linn.) Gaertn.	Bombacaceae
Kondol	Benincasa hispida (Thum.) Cogn.	Cucurbitaceae
Langarai	Bruguiera parviflora (Roxb.) W. & A. Prodr.	Rhizophoraceae
Lettuce	Lactuca sativa Linn.	Sterculiaceae
Lumbayan	Tarrietia javanica Blume	Sterculiaceae
Maguey	Agave cantal Roxb.	Amaryllidaceae
Mandarin	Citrus nobilis Lour.	Rutaceae
Mangoes	Mangifera indica Linn.	Anacardiaceae
Maranggo	Azadirachta integrifolia Merr.	Meliaceae
Molace	Vitex parviflora Juss	Verbenaceae
Mungo	Phaseolus aureus Roxb.	Leguminosae
Nangka	Artocarpus heterophyllus Lam.	Moraceae
Nipa	Nypa fructicans Wurmb	Palmae
Onion	Allium cepa Linn.	Liliaceae

Common Name	Scientific Name	Family Name
Orange	Citrus sinensis Osbeck	Rutaceae
Palosapis	Anisoptera thurifera (Blanco) Blume.	Dipterocarpaceae
Pandan	Pandanus tectorius Sol.	Pandanaceae
Papaya	Carica papaya Linn.	Caricaceae
Patani	Phaseolus lunatus Linn.	Leguminosae
Patola	Luffa culindrica (Linn.) M. Roem.	Cucurbitaceae
Peanut	Arachis hypogaea Linn.	Leguminosae
Pechay	Brassica chinensis Linn.	Cruciferae
Pineapple	Ananas comosus (Linn.) Merr.	Bromeliaceae
Potato	Solanum tubersum Linn.	Solanaceae
Pummelo	Citrus maxima (Run.) Merr.	Rutaceae
Pumpkin	Cucurbita pepo Linn.	Cucurbitaceae
Radish	Raphanus satimus Linn.	Cruciferae
Ramie	Boehmeria givea (Linn.) Gandich.	Urticaceae
Rice	Oryza sativa Linn.	Gramineae
Satol	Sandoricum koetjape (Burn. F.) Merr.	Meliaceae
Sincamas	Pachyrrhizuz (Linn.) Urh.	Leguminosae
Sitao	Vigna sesquipedalis Fruw.	Leguminosae
Soybean	Glycine max (Linn.) Merr.	Leguminosae
Squash	Cucubita maxima Duchesne	Cucurbitaceae
Sugar cane	Saccharum officinarum Linn.	Gramineae
Sweet potato	Ipomoea batatas (Linn.) poir.	Convolvulaceae
Tabigi	Xylocarpus granatum Koening	Meliaceae
Talahib	Saccharum spontaneum	Gramineae
Tiga	Tristania decorticata Merr.	Myrtaceae
Tobacco	Nicotiana tabacum Linn.	Solanaceae
Tomatoes	Lycopersicum esculentum Mill.	Solanaceae
Tugui	Dioscorea esculenta (Lour.) Burkill	Dioscoreaceae
Ubi	Dioscorea alata Linn.	Dioscoreaceae
Upo	Lagenaria leucantha (Duch.) Rusby	Cucurbitaceae
Watermelon	Citrullus vulgaris Schard.	Cucurbitaceae

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ILLUSTRATIONS

PLATE 1

FIG. 1. A view of the landscape of the Sta. Rita clay. Rice being plowed preparatory to transplanting lowland rice.

Profile of Sta. Rita clay. Roots of grasses penetrate down to the subsoil. Profile is about three meters deep.

PLATE 2

FIG. 1. Landscape of Luisiana loam showing the rolling and hilly configurations of the land. Cogon grown is the dominant vegetative cover of the area.

2. Profile of Luisiana loam taken at San Rafael, Barotac Viejo. The soil is very deep and has a characteristically dark-red coloration.

PLATE 3

FIG. 1. Landscape of San Rafael loam. The hills and mountains, characteristic of the type, are covered by cogon grass with sporadic patches of second-growth forest.

2. Some areas of Barotac loam are cleared for Kaingin and planted to corn.

PLATE 4

FIG. 1. Dikes of stones are built by some farmers on Alimodian soils to check soil erosion.

2. Faraon clay soils cleared for planting corn. Note the steep slopes and the lime rocks on the ground surface.

PLATE 5

FIG 1. Tobacco fields on Umingan fine sandy loam. Light-colored areas at the backround are eroded soils belonging to the Alimodian series.

2. Sara sandy loam is a gently undulating area where sugar cane, lowland rice, and coconut are grown. Figure shows three-weck lowland rice seedlings grown by the dry method.

PLATE 6

FIG. 1. General topography of Barotac series. Second-growth forest and cogon grass are the principal vegetative cover of the area.

2. Profile of Barotac loam taken along the highway between Barotac Viejo and Ajuy.

PLATE 7

FIG. 1. Pottery is another industry of the people at San Miguel. The puddled earthen clay is shaped into pots. After they are dried in the sun, they are baked by burning in a stock of rice straw.

2. Weaving of patadiong is an important industry of women at Miag-ao. The imported cotton yarns are woven in homemade loams.

PLATE 8

FIG. 1. Scene at Estancia with fishing boats at the shore.

2. Fishing is the industry of the people living in towns near the sea like Estancia. The sea about Estancia is one of the best fishing ground in the Philippines. Different kinds of fish are caught in abundance and preserved by drying under the sun.

TEXT FIGURES

FIG. 1. Outline map of the Republic of the Philippines showing Iloilo Province.

2. Sketch map of Iloilo Province showing general topography and natural drainage system.

3. Sketch map showing the types of rainfall in Iloilo Province.

4. Graph of the third type of climate of the Philippines.

5. Graph of the first type of climate of the Philippines.

6. Graph of the fourth type of climate of the Philippines.

MAP -- Soil Survey Map of Iloilo Province (In pocket).

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(As of October, 1947)

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Secretary of Agriculture and Natural Resources

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