REPUBLIC OF THE PHILIPPINES
DEPARTMENT OF AGRICULTURE AND NATURAL RESOURCES
BUREAU OF SOILS
MANILA

SOIL SURVEY OF MINDORO PROVINCE

BY

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SOIL SURVEY DIVISION
MANILA
1961

SOIL SURVEY REPORT OF MINDORO PROVINCE PHILIPPINES

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INTRODUCTION

In order to achieve a higher level of agricultural production, the fertility of the soil must be built up and maintained because it is the natural fertility of the soil from which the plants and animals, our source of raw materials and food, depend for production.

A soil classification and erosion survey is undertaken to furnish information to serve as an effective guide for the people, paticularly the farmers, for the formulation of sound programs of land-use and soil management practices. Hence, the soil classification and erosion surveys of Oriental Mindoro were simultaneously conducted on April 17 to July 14, 1961, inclusive, by Messrs. Baldomero C. Dagdag and Luis R. Benales and those of Occidental Mindoro on November 27, 1961 to July 9, 1962, inclusive, by Messrs. Baldomero C. Dagdag and Herminio A. Alcanites, all of the Bureau of Soils under the directorship of Dr. Ricardo T. Marfori and during the incumbency of Honurable Cesar Portich as Secretary of Agriculture and Natural Resources.

SUMMARY

Mindoro Island lies approximately 25 kilometers south off the coast of Batangas south of Manila. It has an aggregate area of 1,024.457 hectares. Mindoro is the seventh largest island in the Philippine Archepelago. Mindoro Island is divided into two provinces, Oriental Mindoro and Occidental Mindoro. Calapan and Mamburao are their respective capitals. It is in these island provinces where "tamarao" (Bubalus mindorensis Heude) abounds.

The east and west coast of the mainland extending several kilometers inland are level. The interim portion are level to undulating and rolling to hilly, reaching up to about 200 feet above sea level. The highest mountains are Mount Halcon and Mount Baco.

Drainage in general is adequate. Many rivers and creeks crisscross the province. Water supply is adequate. Shallow drilled wells and hand pumps are available in some towns.

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The vegetation in the upland and mountainous areas of Mindoro is generally of primary forest. Secondary forest is the result of careless and wastefull lumbering and kaingin clearings.. Patches of open cogor lands are in the interior upland areas. The coastal plains are extensively cultivated to crops. At mouths of rivers nipa palms are found. The small dependent islands of Mindoro are grown to coconuts and some other fruit trees.

Merril and Lt. Col. E, A. Merns identified the rocks in Mount Halcon as andesite. On the northern side of the island some metamorphic rocks, schists and some auriferous veins are found - a continuation of this formation is found in Lubang Islands. On the southern point of the mainland, near Bulalacao, deposites of coal, about the grade of East Batan Coal - of middle tertiary age-like the coal throughout the archipelago, have long been known.

Mindoro Island was formerly called "Mait" by the early Chinese traders. The history of Mindoro dates back to pre-Spanish times. The villages of Mindoro were administered under the Barangay system of government long before the coming of the Spaniards. In 1591, when a part of the Philippines was divided into provinces, Mindoro was among the dozen organized provinces that include Calilaya, Lubang, Batangas, the Calamianes Group and Marinduque.

Mindoro became a part of Batangas Province when the latter was made into a separate province known as Bonbon. At the beginning of the seventeenth century, the island was separated from Batangas and organized into a "Corrigimento" with Puerto Galera as its capital and under the jurisdiction of Marinduque a regular province by then.

When the Americans occupied Mindoro in 1889, they set up a military government in the island until the inauguration of civil government on July 4, 1901.

On November 15, 1950, Mindoro was divided into two provinces the Oriental Mindoro and Occidental Mindoro. Thirteen municipalities were placed under Oriental Mindoro and eight municipalities under Occidental Mindoro.

In 1948, Mindoro had a total population of 168,000. In 1958, 317,000 people were recorded for both provinces. In 1960 the population of Oriental Mindoro was 228,998, while that of Occidental Mindoro was 84,316. The first inhabitants of Mindoro were the Mangyans which were later dominated by the Christians. The present inhabitants are Tagalogs, Ilocanos, Visayans and some foreigners. They belong to the Roman Catholics, Protestants, Church of Christ and some other minor religious seets.

There are two big land transportation companies operating in Oriental Mindoro. Other minor conveyances, jeepney and pick up, are plying between adjacent municipalities and barriors in the interior agricultural section of the province. Occidental Mindoro have but few jeepneys used for transporting people; other municipalities have none at all. Three inter-island vessels ply regularly between Manila and Calapan and other ports of Mindoro weekly. The Philippine Airlines (PAL) maintains a schedule of trips from Manila to Mamburao, San Jose and Calapan. Majority of the towns has a public market and a market day is held once a week which on such date people from distant barrio sell their products and buy their needs. The first schools established in Mindoro were generally in the convent of Parish Churches were religion, Spanish, reading, writing, arithmetic and music were taught. Present available record at the Division Office of the Superintendent of Schools for Oriental Mindoro show that a total of 33,075 pupils (elementary and secondary) and 1,012 teachers. There are two public schools namely, Oriental Mindoro High in Calapan and Mindoro National Agricultural School, in Alcate, Victoria with enrollments of 935 and 24 students respectively. The total enrollment in all public and private schools and colleges (pupilsand students) is 42,329 which is 18.6 percent of the population of the province. There are also vocational schools.

The Provincial Offices of the different Bureaus under the Department of Agriculture and Natural Resources, (DANR) are located in Calapan maintaining public services.

The Bureau of Health maintains puericultural centers and rural health units in some municipalities and barrios. Humanitarian work is rendered by the Philippine National Red Cross (PNRC) local chapter and Department of Social Welfare.

Radio and Telegraphic Communication is being operated by the Bureau of Telecommunication in Calapan and in other principal towns in Mindoro.

The chief industry of the people is agriculture. The most important products are rice, copra, banana, fruits, vegetables and root crops. Other industries are fishing, livestock raising and lumbering. Minor industries such as making shingles from nipa leaves, alcohol from nipa sap, making hollow blocks, basket making from bamboo and rattan, mat and sack weaving; quarrying marble, and salt making are also found.

Oriental Mindoro falls under the fourth type of climate which is characterized by no pronounced maximum rainfall with no dry season. Its rains occur during the northeast monsoons.

Occidental Mindoro falls under the first type of climate which is characterized by two pronounced seasons; dry from November to April and wet during the rest of the year.

Agricultural practices do not differ from other provinces using the native implement and the carabao or cattle as sources of power. The kaingin system of agriculture still prevails.

The livestock industry is being maintained by some cattle ranchers. They help improved the quality of the native animals by crossing them with pure breeds. A quite good number of these animals are exported.

Water control on the land as applied in Oriental Mindoro is concerned primarily with the communal and government irrigation system.

The farm operators are grouped under four classes such as owners part owners, managers and tennants.

Crop sharing is commonly observed on short season annual crops such as rice, corn, legumes and root crops. Two-thirds of the produce are given to the tenant who owns the work-animals, and one-third goes to the landlord.

The soils of Mindoro Provinces are grouped into soils of the plains, valleys and undulating areas; soils of the upland, hills and mountains; and, miscellaneous land types. The total area covered by each of these groups is 192,095.10 hectares for the first group, 251,824.70 hectares for the second group and 569,573.40 for the last group. Unsurveyed area consists of 435,30 hectares while bodies of water occupy 10,528.50 hectares. The total aggregate area of both provinces is 1,024.457 hectares; 587,985 hectares for Occidental Mindoro and 436,472 hectares of Oriental Mindoro.

The soils of the plains, valleys and undulating areas are made up of 17 soil types which developed from young alluvial fans washed down from the surrounding elevated areas. The relief is generally level, nearly level to undulating. They are usually found along the courses of rivers and creeks. These soils constitute the most productive area in Mindoro Provinces.

The soils of the uplands, hills and mountains are those that developed in place from various weathered rocks such as shale, sandstone, basalt and andesites. The general topography is rolling to hilly and mountainous. These are made up to soil types, a soil phase and a complex.

The third group is composed of the beach sand, hydrosol, riverwash and rough mountainous land. Of these areas, the hydrosol is the most important. It can be converted into fishpond like those found in Calapan, Naujan, Baco and Puerto Galera, Oriental Mindoro and in San Jose, Sablayan, Mamburao and Lubang Islands, Occidental Mindoro.

The productivity ratings indicate the comparative capacity of the soils to produce crops under a specified system of management relative to the national standards. These ratings, however, should not be construed as the sole basis for evaluating the potentials of the soils of Mindoro Provinces because most of the farms have been under cultivation for so manyyears without proper management so much so that soil fertility is almost exhausted.

The textural classes of the soils of Mindoro Provinces were determined through the Bouyoucos Method of Mechanical Analysis and the feel method. The feel method is usually done in the field but the results sometimes vary with the laboratory results. Thus, the field determination should be checked against the laboratory results for accuracy.

The soils are grouped into land capability classes or sub-classes based on their chemical and physical properties. The different land capability classes are A, B, C, D, M, N, X and Y.

The soil erosion survey was conducted simultaneously with the soil classification of the provinces. The degree of soil erosion, the factors affecting soil erosion and the erosion control measures are discussed in the report.

I. RECONNAISSANCE SOIL SURVEY OF OCCIDENTAL MINDORO AND ORIENTAL MINDORO

DESCRIPTION OF THE AREA

Location and extent. ---- The mainland of Mindoro lies approximately 25 kilometers south off the coast of Batangas Province; between 120° 15' and 121° 40' E longitude and between 12° 10' and 13° 35' N latitude. It is bounded on the north by Verde Island and Verde Island Passage; on the east by Maestre de Campo Island and Tablas Strait; on the south by Semirara Islands and Cuyo Islands; and on the west by Mindoro Strait. Rugged mountain chain extends from north to south in the mainland which serves as the provincial boundary between eastern or Oriental Mindoro and western of Occidental Mindoro. The provincial capitals are Calapan and Mamburao, respectively. Occidental Mindoro includes two groups of smaller islands. One group, consisting of Lubang Golo, Cabra and Ambil Islands and collectively known as Lubang Islands, is located northwest of the mainland. It is about 67 nautical miles from Manila and 40 kilometers west of Cape Santiago, Batangas. The other group, Ilin and Ambulong Islands, is situated on the southern part of the mainland. The two provinces of Mindoro make up the seventh largest island in the Philippines Group. The aggregate land area of these two provinces is 1,024,457 hectares. It is in this province where "Tamaraw" abounds --- no other place in the world can it be found. It is a fierce animal that attacks on sight and can be stopped only by a well placed shot. But it will run away from any strange sound. So, the natives make as much noise as possible in going through the forest to scare away this animal.

The "tamaraw" (Bubalus mindorensis Heude) looks like the carabao, but it is smaller and the horms are shorter and straight.

Relief and drainage. --- The east and west coast of the mainland, are level. These level areas which extend several kilometers hinterland are devoted mostly to agriculture. The interior portion of the mainland which covered by primary and secondary forests with some cleared patches or kaingin clearings varies in relief from level to undulating and rolling to highly that reaches up to about 200 feet above sea level. Two precipitous ranges, Mt. Halcon (2586 M) and Mt. Baco (2487 M), traverse the mainland from north to south forming deep-sided valleys. The western side of the mainland abounds in boulders and is greatly dissected; while the eastern side is extremely rugged with steep slopes abruptly rising from the lowland.

Some portion of the province are flooded during heavy downpour due to the swelling of streams and rivers. However, except on coastal bottom lands, water subsides readily due to good drainage. The rivers in the steep-sided and winding mountain flow swiftly.

Numerous rivers crisscross the island. The most important of which are Baco, Baruyan, Subaang and Abra de Ilog on the north; Silanay, Mag-asawang Tubig, Lumang-bayan, Pola, Macanlig, Bongabon on the east; Bulalacao and Caguray on the south; and Magsanga, Lumintao, Mongpong, Amnay and Mamburao on the west. Some of these rivers have waterfalls that can be harnessed for hydro-electric power. Others are navigable by motor boat which transport the agricultural products. Fordable streams dry up during dry season and swell during rainy season.

Water supply. --- At Calapan, Oriental Mindoro, the water system is managed by the National Waterworks and Sewerage Authority. The water from this system is slightly brackish, and so water from gravity pumps is preferred by the inhabitants. In towns not served for drinking and washing purposes. Some people buy their drinking water by the kerosene can. The municipality of Bulalacao has the best water supply.

Vegetation. --- The coastal areas, river, valleys and plains are planted to rice, coconut, abaca, sugar cane, tobacco and corn. Large areas of mangroves and nipa palms are found around Naujan Lake and at river mouths. Buri and knong palms about in Oriental Mindoro.

The rugged hinterlands are covered with moss, ferns, grasses, bamboo and trees. In the more gentle slopes, grasses, brush, and secondary forest are found, while in the steeper slopes are thickets of bamboo.

The mountain ranges are covered with the first group of timber and rattan. Patches of cleared areas or kaingin clearings are found in some of the small islands. The islands of Lubang, Ilin and Ambulong, have similar vegetation as those of the mainland --- wooded hills, fruit trees and mangroves and cultivated crops.

Geology. --- Mt. Halcon is underlain by andesite rocks as identified by Merril and Lt. Col. E. A. Merns. On the northern side of the islands some meramorphic rocks :schists, and some auriferous veins - a continuation of those found inLubang Islands - are the underlying materials.

In northern Mindoro, Andal and Caagusan noted the following:

"The rugged mountain ranges in Northern Mindoro are underlain by Upper Paleozoic and mesozoic metamorphic rocks. These rocks compose the backbone of a broad west-southwest-plunging anticline, the major structure in the area. The core of the fold is occupied by gneissic meta-quartz diorite and its border facies while the limbs are made up of Upper Paleozoic metasedimentary rocks consisting of quartzo-feldspathic schist, phyllite, slate and marble."

"The Upper Paleozoic (?) metasedimentary rocks are intruded by the meta-quartz diorite and early triassic (?) spilitic basalt. Undomformable overlying these rocks are Mesozoic sedimentary rocks the oldest of which are Triassic metaconglomerate and semischist. Cretaceous (?) spilitic basalt flows overlic these rocks in the southwestern portion of the area. In the western flanks of the Abra de Ilog valley and in Puerto Galera Cretaceous to early Tertiary serpentinites are thrusted into the Jurassic and older rocks. Upper Miocene to Pliocene rocks undomformably overlie the older rocks in the towns of Puerto Galera and San Teodoro."

"An intercalation of thin marble beds and phyllite immediately below the massive marbles and the intrussive spilitic basalt had been replaced by iron ores. The high grade ore bodies are found at the nose of the plunging anticline while the relatively lower grade massive ores are composed of magnetite and hematite and may contain appreciable amount of sulfides in certain places. Pyrite and chalcopyrite are present as coarse disseminated grains and occasional pockets in the ore. The low grade ores occur as pockets and veinlets of magnetic and hematite in spilitic basalt and as granular concentrations in the phyllites. Amphiboles and pyroxene are admixed with the iron oxides in the ores replacing the phyllites. In some places, the relict schistosity is discernible in this type of ore."

On the southern end of the mainland, particularly near Bulalacao, deposits of coal, about the grade of East Batan coal, have long been known. These are of middle tertiary age, like the coal throughout the archipelago,

In 1913, Dalburg had noted some tertiary shales in the foothills and limestone cliffs, probably Malumbang (Pliocene along the coast) in southern Mindoro near San Jose Sugar Estate.

In 1921, Moldy and Kryshtaforish while exploring in southern Mindoro found several teeth species of shark, presumably Miocene marine conglomerate.

Lubang Island is traversed from east to west by a belt of granite intrusion exposed at the narrow isthmus of Looc, extending from coast to coast between Looc and Tabahin Bays and from the town of Looc to about 2 kilometers south. Micarcon schists flank both south and north boundaries of the granite. Northward along the western coast, schist alternating with gneiss can be traced to Quebrada Point, and from here a formation of slate can be observed. This formation grades from schistose to compact clay slate around Diable Point. An old fragment of weathered sandstone was found at the mouth of a stream between Quebrada and Diable Points, but the original formation was not identical to those found in the coast.

Organization and population. --- Mindoro Island was formerly called "Mait" (derived from the Spanish phrase "Mina de Oro" or gold mine) by the early Chinese traders. They believed that large deposits of gold existed in Oriental Mindoro. The history of the province dates back to pre-Spanish times. Evidences of Hindu or Indian culture had been found in the Island of Mindoro as recorded in an unpublished manuscript entitled "A Brief History of Mindoro" by Conrado R. Nicasio. The pagans of southern Mindoro, regarded as Indonesians, immigrated into the Philippines even earlier than the Malays.

Before the coming of the Spaniards, the villages of Mindoro were administered through the barangay system of government. In 1591, when a part of the Philippines was divided into provinces, Mindoro was among the dozen organized provinces that include Calilaya, Lubang, Batangas, the Calamianes Group and Marinduque.

Later, Mindoro became a part of Batangas Province when the latter was made into a seperate province which was known as Bonbon. At the beginning of the seventeenth century, the island of Mindoro was organized into a "Corrigemento", with Puerto Galera as its capital and came under the juridiction of Marinduque which was already a regular province by then. In the years preceding the revolution, the the executive power of the province was vested in a "politicamilitar" governor.

In June 1902, during the American Military Government, the province was still a part of Marinduque, but by virtue of the act of the Philippine Commission of September 14, 1905, Mindoro, together with Lubang, became a special province. In 1921, it became one of the regular provinces of the archipelago.

When Mindoro was divided into two provinces, namely, Oriental and Occidental Mindoro, on November 15, 1950, 13 municipalities were placed under the former and 8 municipalities under the latter.

In 1948, Mindoro had a total population of 168,000. Of this number, 124,556 belonged to Oriental Mindoro and 43,149 to Occidental Mindoro. In 1960, the estimated population of Oriental Mindoro was 228,998 and that of Occidental Mindoro was 84,316.

The original inhabitants of Mindoro Provinces are the Mangyans. The influx of Christians settlers drove them to the mountains. Today the people of the province are mostly Tagalogs although there are also a big number of Ilocano and Visayan immigrants as well as a few foreigners. The majority of the people are Roman Catholics. Protestants and member of the Church of Christ are also found.

Transportation and market. --- Travel between the towns and barriors in Occidental Mindoro is mainly by bancas along the coast and by foot or horseback in the interior of the province. Land transportation facilities are not of much use because of lack of bridges across streams and poor condition of the roads. While motor vehicles are in use in some ot the towns, such places are not accessible except by foot during the rainy season.

Transportation between Occidental and Oriental Mindoro is by boat. No road connects the two provinces. In the latter province most towns are accessible to motor vehicles throughout the year. The southern towns of Roxas, Mansalay, and Bulalacao can be reached by motor vihicles during the dry season only. The road to Bulalacao, the southernmost town, is under construction at the time of the survey.

There are two land transportation companies operating in Oriental Mindoro. They are the Mindoro Transportation Company (MITRANCO) and Bongabon Transportation Company. Daily trips are made to the different towns. Small private transportation facilities (jeepneys and pick-ups) serve the outlying barrios into the agricultural sections of the province.

Along the irregular coast line of Mindoro are many good harbors, among which are a number of ports of call of interisland vessels. Weekly, boats from Manila call at these ports to load passengers and cargo for Manila and on way ports. Ferry boats maintain three times daily service between Batangas and Calapan, and once daily between Batangas and Puerto Galera.

The Philippine Air Lines (PAL) maintains regular flights between Manila and the towns of Calapan, Oriental Mindoro; San Jose and Mamburao, both of Occidental Mindoro.

Almost all towns have a public market where people sell their products and buy their provisions during market days.

Cultural development and improvement. --- The first mass education of the children in the island provices was initiated by the religious authorities. Classes were usually held in the parish church - where religion, Spanish, reading, writing, arithmetic and music were taught. Later, public scholls were built in every town. A school, specifically devoted to educate the Mangyana, is located at Saklang, San Teodoro. Likewise, a Mangyan adult Education Center exists in Puerto Galera.

The Bureau of Public Schools maintains two public high schools in Oriental Mindoro, namely, Oriental Mindoro High School in Calapan and Mindoro National Agricultural School (MINAS) in Alcate, Victoria.

Asides from these public schools there are six private primary and intermediate schools, fifteen private high schools and two private colleges. The high schools are located in the municipalities of Bansud, Bongabon, Calapan, Naujan, Pinamalayah, Pola Roxas, San Teodoro and Victoria.

There are also seven vocational schools in the municipalities of Calapan, Naujan, Pinamalayah, and Roxas.

The Divine Ward Missionaries (S.V.D.) have contributed much towards the educational growth in the island provinces.

The provincial offices of the different Bureau under the Department of Agriculture and Natural Resources are located in Calapan Oriental Mindoro and in San Jose and Mamburao, Occidental Mindoro. Sub-offices are located in other municipalities. The objective is to encourage and assists farmers to produce more rice and corn per hectare.

The personnel of the different bureaus under the Department of Agriculture is cooperation with the ACCFA, now ACA and the College of Agriculture personnel help the farmers in the production of crops by way of extending them technical assistance on the control of pest and diseases, procurement of planting materials, chemicals, fertilizers and storage and marketing of their farm products.

The Philippine National Bank (PNB) and the Development Bank of the Philippines (DBP) give out loams to farmers to finance their rice and corn crops.

Health. --- The health of the people is looked after through the mariculture centers and rural health units organized in some municipalities and barrios. Humanitarian activities are rendered by the Philippine National Red Cross (PNRC) and the Social Welfare Administration (SWA)

Communication. --- Radio and telegraphic facilities are available through the Bureau of Telecommunications in Calapan, Oriental Mindoro connecting other towns and province. Mail service within the province is made daily. While airmail service between Manila and Calapan, Mamburao, of San Jose is scheduled two times a week.

Industries. --- Farming is the chief industry of the people in both provinces. It has been the major and oldest industry of the people long before the Spanairds land on the shores of Mindoro, It is expected to hold the premier position for a long time to come. The most important crops, are rice, coconut, tobacco, corn and sugar cane. Fruits and vegetables are also grown.

At Mindoro Sugar Mill, Occidental Mindoro, there are 2,500 hectares of sugar can land of which 700 hectares are planted with a yield of 102,000 piculs of sugar. The operation of the sugar mill is, however, often hampered due to change of ownership and new management.

High quality copra is produced in Mindoro using the PHILCOA improved drier instead of the native tapahan. The "PHILCOA de VAPOR" copra drier can dry the meat of 2000 nuts at 9 to 90 percent moisture content in 16 to 18 hours.

Salt making is an extensive industry in San Jose, Occidental Mindoro. Tabacalera and Company owns 900 hectares of which 300 hectares are utilized as salt beds.

Lumbering is another important industry in Mindoro. Table 1 shows the different sawmills operating in Oriental Mindoro for the fiscal year 1960-61. According to the Bureau of Forestry, Calapan, Oriental Mindoro, log exported for the years 1956 to 1960 amounted to 12,208,731 board feet and the lumber exported from 1956 to 1959 totaled 1,100,983 board feet.

Table 1. ---The location, capacity and investment of the different lumber mills in Oriental Mindoro 1960. 1/

Mills	Location	Capita Invested	Daily capacity	Leased area in hectares
[illegible] Lumber Co. Inc.	Bagto, Naujan	₱20,000.00	15,000 bd. ft.	5,700
[illegible] Lumber & Dev. Co., Inc.	Poblacion, San Teodoro	40,000.00	4,000.bd. ft	4,620
[illegible] National Agricultural Sch. Sawmill	Alcate, Naujan	No record government owned	2,000 bd.	School

In San Jose, Occidental Mindoro, the Bureau of Forestry has listed 21 ordinary timber licenses which were allowed to cut 28,240 cubic meter of timber in an area of 37,075 hectares and 39 ordinary minor forest product licenses which realized an income of ₱1,048.35.

Fishing is another important and lucrative industry in Mindoro. The most important fishing area is Lake Naujan where Simbad, Banglis or Sabalo (big bangos), considered the best anywhere, are caught. Other species caught are Managat, Alamang and Banak (mullet). Large quantities of mullets are caught during the months of October and November, their spawning seasone, that is, when they go down the Naujan River from Lake Naujan to lay their eggs in the sea. The fish, especially the eggs which are considered a delicacy in Mindoro and Batangas, are preserved.

Fishponds are also maintained in the mainland of Mindoro. Likewise, there are large areas in both Mindoro Provinces which can be converted into fishponds.

1/ Data taken from the Office of the District Forester, Calapan, Oriental Mindoro Province.

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Livestock raising is a developing industry as shown by 230 pasture permits and leases covering 93,223 hectares for the year 1960-1961 in Occidental Mindoro.

Other industries. --- Other sources in income of the people are making of nipa shingles used for roofing purposes, weaving of rattan and bamboo, hollow block manufacture, and marble quarrying.

Hollow block manufacture, if properly developed may become a major source of income since hollow blocks are in great demand anywhere.

CLIMATE

Oriental Mindoro falls under the fourth type of climate characterized by a more or less even distribution of rainfall throughout the year.

Table 2 shows the monthly average annual rainfall; number of rainy days; mean, mean maximum and mean minimum temperature; relative humidity; and cloudiness in both provinces. As can be seen in table, precipitation is greatest in the month of November while the most number of rainy days occur in the month of December. Relative humidity ranges from 79 percent in March to 87 percent in August and September. Cloudiness ranges from 6 in February to 9 in August and September. The mean annual temperature is 26.8°C.

Occidental Mindoro, on the other hand, falls under the first type of climate chraterized by two pronounced seasons, dry form November to April and wet during the rest of the year.

The greatest precipitation occurs in August with 24.65 inches of rainfall.

Table 4 — Monthly average and annual rainfall; no. of rainy days; mean, maximum and mean minimum temperature; relative humidity; and, cloudiness in Mindoro Provinces.

Month	Rainfall in inches 1/		No. of Rainy Days 1/		Temperature °C 2/			Relative Humidity 2/ (%)	Cloudiness 2/ (0-10)
	Tilik, Lubang Is. Occ. Min.	Calapan, Or. Mindoro	Tilik, Lubang Is. Occ. Min.	Calapan, Or. Min.	Mean	Mean Maximum	Mean Minimum		
January	0.52	4.38	3	18	25.5	28.6	22.4	85	7
February	0.30	2.75	2	13	26.1	29.4	22.8	81	6
March	0.21	2.32	1	12	26.8	30.0	23.7	79	7
April	1.14	4.32	2	11	27.2	30.6	23.9	82	7
May	3.82	6.95	7	13	27.3	30.8	23.8	82	8
June	12.74	8,47	16	16	27.6	31.3	23.8	85	8
July	15.26	9.40	18	18	27.4	31.5	23.4	82	8
August	24.65	8.77	15	15	26.9	30.4	23.4	87	9
September	18.57	7.60	16	16	26.5	29.7	23.3	87	9
October	10.82	10.94	20	20	27.0	30.4	23.5	85	8
November	3.01	11.39	21	21	26.8	30.1	23.6	82	7
December	2.14	7.82	22	22	26.0	28.7	23.3	86	8
Annual	93.18	85.11	125	195	26.8	30.0	23.4	84	8

1/ Weather Bureau, "Monthly Average Rainfall and Rainy Days in the Philippines." (Manila: Weather Bureau, 1962). (Mimeographed)

2/ Weather Bureau, Annual Climatological Review, 1956. (Manila: Weather Bureau, n.d.). p.110. (For Oriental Mindoro only).

AGRICULTURE

Generally, Mindoro Province have a rugged terrain. Raising of food crops is confined to the lowlands which are mostly found along the coasts and river banks. Rice, which is the staple food of the people, is extensively grown. However, since rough rice is exported to the neighboring provinces the supply is depleted before the next harvest and importation for clean rice is resorted to.

Crops

From the 1960 agricultural census the leading economic crops of Occidental Mindoro are as follows:

Crop	Area-Ha.	Production	Value
Palay (Lowland & Upland)	21,581.2	517,356 cavans	₱3,937,555
Tobacco, Native	162.0	124,392 kg.)	523,429
Virginia & other var.	196.3	141,204 kg.)	
Coconut	2,827.1	6,814,994 nuts	495,877
Corn	2,330.3	22,276 cavans	161,766
Camote	135.7	299,843 kg.	46,924
Eggplant	31.5	248,117 kg.	37,041
Mongo	94.7	55,819 kg.	34,115
Cassava	51.1	157,598 kg.	17,872

In Oriental Mindoro, the leading economic crops according to the same census are as follows:

Crop	Area-Ha.	Production	Value
Palay (Lowland & Upland	45,957.0	1,221,077 cavans	₱10,072,770
Coconut	19,897.9	46,163,510 nuts	3,341,693
Corn	8,829.7	138,861 cavans	1,085,647
Mongo	403.7	266,414 kg.	194,973
Camote	319.6	1,307,892 kg.	104,269
Gabi	66.9	272,217 kg.	77,567
Tobacco, Native	31.7	19,315 kg.	53,455
Virginia	18.3	18,222 kg.	
Abacca	156.5	59,645 kg.	48,252
Eggplant	51.5	147,441 kg.	27,235

Palay. --- Based on the value of production, palay, is the leading crop in both Mindoro Provinces. Lowland rice is planted twice a year and upland rice, once a year. The planting season for lowland rice in Oriental Mindoro starts from June to July. For upland rice, it is from April to May. In Occidental Mindoro, lowland rice is planted from July to August. The varities planted are Intan, Tjeromas, Thailand, Peta, BE-3, BPI and Camuros, a native variety.

Coconut. --- Coconut ranks second to palay in Oriental Mindoro while it ranks third in Occidental Mindoro. In 1960, the total area planted to this crop in Oriental Mindoro is 19,897.9 hectares with a total production of 46,163,510 nuts valued at ₱3,341,693. Aside from this, 1,035,431 liters of tubavalued at ₱147,338 were realized. In Occidental Mindoro, the total area planted is 2,827.1 hectares with a total production of 6,84,994 nuts valued at ₱495,877 and 30,740 liters of tuba valued at ₱3,495,877.

Tobacco. --- Tobacco occupies second place in Occidental Mindoro. It is planted to 358,3 hectares producing 265,596 kg. valued at ₱523,429. In Oriental Mindoro, it ranks seventh. The total area planted is 50 hectares with a total production of 37,537 kilograms valued at ₱53,455. Native, Virginia and other varieties are grown in both provinces.

Corm. --- Corn is grown three times a year. In 1060, the total area planted to this crop in Occidental Mindoro is 2,330.3 hectares which produced 22,276 cavans of shelled corn at 57 kilos a cavan, valued at ₱161,766.00. In Oriental Mindoro, the area occupied by corn is 8,829.7 hectares with a total production of 138,861 cavans of shelled corn at 57 kilos a cavan valued at ₱1,085,647.

Sugar cane. --- Sugar cane is grown in Oriental Mindoro only. The area planted is 17.3 hectares. It is mostly raised for chewing purposes. Some canes are processed into muscovado sugar and panocha. for local consumption and others are used for basi manufacture. It is mostly found in Mansalay, Oriental Mindoro,

Root crops. --- The most important root crops grown in both provinces are camote, gabi, and cassava. Ubi is also grown in Oriental Mindoro.

Legumes. --- Mongo and peanut are the most important legumes crops grown in both provinces. Sitao or string beans is also grown extensively in Occidental Mindoro.

Vegetables. ---The leading vegetable grown in Occidental Mindoro is eggplant followed in the descending order of importance by squash, garlic, tomato, patoal and okra. While in Oriental Mindoro, garlic gave the most substantial income of ₱50,210. in 1060, followed by egg-plant, green corn, tomato and squash.

Fruit trees and other cultivated fruits. --- Among the fruit trees grown in both provinces, banana gave the most substantial income. In Oriental Mindoro alone, banana occupied 6,508.3 hectares which produced 39,127,900 kilograms valued at ₱3,007,036. In Occidental Mindoro, it occupied 1,080.3 hectares with a total production of 5,293,824 kg. worth ₱552,848. Other fruit trees grown which gave sizeable income to the provinces are coffee, cacao, mango, jackfruit, calamansi, avocado, pineapple and papaya.

In Occidental Mindoro, the leading fruit trees and other cultivated fruit according to the 1960 agricultural census are as follows:

Fruit trees & other cultivated fruits	Area-Ha.	Total No. trees/hills	No. of bearing trees/ hills	Production (kg)	Value
Banana	1,080.3	440,254 h.	-	5,293,824	₱552,848
Coffee,				(2,248	18,496
Arabica	31.9	25,601 tr.	1,029 tr.	(4,219	
other variety	71.8	46,397 tr.	1,376 tr.	91,341	12,149
Jackfruit	94.4	9,119 tr.	1,696 tr.	56,262	11,665
Mango	226.5	12,558 tr.	1,921 tr.	67,881	8,827
Papaya	13.4	8,398 tr.	2,272 tr.	21,105	3,799
Pineapple	8.4	6,982 h.	3,132 h.	12,361	3,016
Cashew	87.4	10,858 tr.	1,797 tr.	13,441	2,689
Mandarin	56.2	10,920 tr.	1,679 tr.	13,018	1,562
Avocado	30.1	1,000 tr.	93 tr.	5,690	1,423
Siniguelas	5.7	741 tr.	276 tr.	70,490	1,049
Sugar apple	11.3	2,908 tr.	275 tr.		

In Oriental Mindoro, the following are the leading fruit trees and other cultivated fruits according to the 1960 agricultural census.

Fruit trees & other cultivated fruit	Area-Ha.	Total No. trees/hill	No. of bearing trees/ hills	Production (kg.)	Value
Banana	6,508.3	2,842,009 h.	-	39,127,900	₱3,007.036
Coffee, Arabica	316.7	217,012 tr.	57,885 tr.	48,822)	
other variety	833.7	551,747 tr.	142,709 tr.	74,264)	279,020
Cacao	169.9	97,958 tr.	29,468 tr.	59,973	174,098
Mango	771.8	4,651 tr	2,891 tr.	280,998	87,360
Kalamansi	55.6	26,290 tr.	13,181 tr.	301,588	81,429
Avocado	18.6	3,169 tr.	1,756 tr.	97,556	17,565
Pineapple	22.7	120,724 h.	70,208 h,	97,651	14,458
Jackfruit	33.6	4,500 tr.	2,066 tr.	99,442	9,491
Star apple	13.3	1,623 tr	1,317 tr.	60,200	7,224
Orange (dalandan)	103.5	13,768 tr.	1,067 tr.	22,710	6,359
Papaya	10.3	7,003 tr.	2,500 tr.	52,576	5,258
Chiquelas	2.4	390 tr.	331 tr.	14,869	4,113

Other crops. --- Additional income for both provinces came from bamboo. In Occidental Mindoro bamboo yielded 38,376 poles worth ₱20,723.00 while in Oriental Mindoro, the same crop yielded 58,201 poles valued at ₱45,979.00. Nipa also gave some ₱7,105.00 income to the latter province.

Livestock and Poultry Industry

Livestock raising in Mindoro Provinces is promising. Some farmers maintain cattle ranches in the provinces. The Bureau of Animal Industry helps in the improvement of the native stocks through the public breeding stations using imported breeds.

The most important animals raised are carabao, cattle and horse. Carabao and cattle are used as work animals while horse provide power for transportation.

Hogs and checkens are a rised mostly to supplement the income of the household and for home consumption.

The number and value of livestock and poultry in both provinces according to 1960 census figures are as follows:

Livestock & Poultry	Occidental Mindoro			Oriental Mindoro		
	Household Reporting	Number	Value	Household Reporting	Number	Value
Carabaos	8,004	19,824	₱3,786,639	21,779	43,100	10,098,821
Cattle	2,475	19,693	2,401,888	5,270	15,406	2,536,245
Hogs	9,123	24,561	983,269	26,286	58,535	2,927,187
Horses	1,370	3,369	315,095	1,220	2,007	293,195
Goats	380	2, 061	18,951	3,309	13,908	116,300
Sheep	5	271	5,635	7	15	240
Chicken	10,449	160,935	208,901	31,488	442,320	706,889
Ducks	587	3,116	4,948	2,441	20,497	30,657
Turkeys	33	156	637	169	537	2,333
Pigeons	80	529	472	36	96	1,008
Geese	38	135	394	108	969	1,514

Farm Tenure

Farm tenure refers to the manner in which a farm is held by its operator. In farm tenure classification, the Bureau of the Census and Statistics during the 1960 census year classified farmoperators into five categories; namely, (1) full owners, (2) part owners, (3) tenants, (4) farm managers, and (5) farm operators under other conditions. Tenants are further classified as (a) cash tenants, (b) fixed-amount-of produce tenants, (c) share-of-produce tenants, (d) cash and fixed-amount-of produce tenants, (e) cash and share-of-produce tenants, and (f) rent-free tenants.

The total number and area of these farms by tenure of farm operators according to 1960 census figures in both provinces are as follows:

Tenure of farm operator	Occidental Mindoro		Oriental Mindoro	
	Total No. of farms	Total area of farms-ha	Total No. of farms	Total area of farms-ha
Full owner	3,755	34,241.2	9,451	54,569.2
Part owner	753	4,272.0	2,063	9,880.4
Tenant:				
Cash tenant	4	29.5	42	238.4
Fixed-amount-of-produce tenant	147	473.5	121	382.6
Share-of-produce tenant	2,940	8,751.8	10,587	30,127.6
Cash-&-fixed-amount-of-produce tenant	-	-	10	53.0
Cash-&-share-of-produce tena t	13	38.0	21	134,0
Rent free tenant	175	512.4	370	878,8
Other tenants	377	1,194.5	150	696,6
Manager	41	13,781.9	28	5,074,1
Other forms of tenure	67	5,575.8	210	924,5
Total	8,273	68,870.6	23,053	102,959,2

Types of Farms

The Bureau of the Census and Statistics during the 1960 census year classified farms into 14 types, 10 of which are grouped as crop farms. The 10 crop farms classifide which were based on the first 10 major crops in the country are as follows: (1) palay farm, (2) corn farm, (3) sugar cane farm, (4) abaca farm, (5) tobacco farm, (6) vegetable farm, (7) root crop farm, (8) coconut farm, (9) fruit farm and (10) coffee farm. The relationship between the physical area planted to a particular crop, on one hand, and the cultivated land in the farm, on the other, is taken into primary consideration. A crop farm is typed according to the particular crop which occupies 50 percent or more of the cultivated part of the a farm.

The four other types of farms are: (11) hog farms with 20 or more hogs regardless of area; (12) Livestock farms which satisfy any of these conditions, namely, (a) the area is 10 hectares or more with at least 10 heads of any specific kind of livestock and the cultivated area is less than 20 percent of the total area of the farm, or (b) the area is

less than 10 hectares provided there are more than 10 heads of any specific kind of livestock (except hogs) and the cultivated area of the farm is less than 20 percent of the total area of the farm; (13) poultry farms are farms which do not quality as crop farms and satisfy any of these conditions, namely, (a) there are more than 300 chickens regardless of area, (b) there are more than 100 laying chickens or ducks regardless of area, (c) there are more than 200 other specific kinds of poultry other than chickens; and (14) other farms which are those that could not be classified under any of the aforementioned thirteen types of farms, grouped as follows; (a) farm planted to palay, corn, coconut, abaca, tobacco, and/or sugar cane without any of them occupying 50 percentor more of the cultivated land, or (b) farms planted to other miscellaneous crops such as cotton, cacao, kapok, ramie, bamboo, etc., even if one of them occupied 50 percent or more of the cultivated land.

The total number of farms and their corresponding areas by type of farm in Mindoro provinces according to census figures of 1960 are as follows:

Types of farm	Occidental Mindoro		Oriental Mindoro	
	Total No. of farms	Total area of farms-ha	Total No. of farms	Total area of farms-ha.
Palay	6,995	35,587.4	16,987	60,795.7
Corm	276	1,033.5	549	1,708.6
Sugar cane	-	-	-	-
Abacca	-	-	6	40.5
Tobacco	16	28.7	7	70.5
Vegetable	1	15.0	21	2
Root crop	49	157.5	21	35.4
Coconut	273	4591.7	3,928	23,071.0
Fruit	205	1,244.3	744	3,638.5
Coffee	-	-	134	738.4
Hog	4	14.8	9	99.6
Livestock	157	24,102.2	48	7,505.1
Poultry	47	197.9	39	103.2
Others	250	1,897.6	580	5,150.7
Total	8,273	68,870.6	23,053	102,959.2

The total No. of farms and their corresponding areas by sized of farm in both provinces according to 1960 census figure are as follows:

Size of farm Ha.	Occidental Mindoro		Oriental Mindoro	
	Total No. of farms	Total area of farms-Ha.	Total No. of farms	Total area of farms-Ha.
Under 0.2		4.9	31	3.1
0.2 & under 0.5	49	2.1	66	21.5
0.5 & " 1.0	7	59.4	462	275.2
1.0 & " 2.0	91	1,612.4	5,304	6,448.5
2.0 & " 3.0	1,366	3,823.9	5,369	11,482.1
3.0 & " 4.0	1,821	4,239.2	3,478	10,000.8
4.0 & " 5.0	1,370	3,061.9	2,359	9,681.5
5.0 & " 10.0	750	10,635.9	4,311	28,650.5
10.0 & " 15.0	1,641	8,862.6	1,158	12,927.7
15.0 & " 20.0	831	1,564.2	203	3,374.4
20.0 & " 25.0	96	1,879.4	138	3,064.8
25.0 & " 50.0	87	2,701.8	102	3,433.5
50.0 & " 100.0	79	2,384.7	44	2,921.1
100.0 & " 200.0	33	2,763.2	16	2,039.0
200.0 & over	20	25,275.0	12	7,827.5
Total	8,273	68,870.6	23,053	102,959.2

Farm Investment

The number of selected farm equivalent which corresponds of the farm investment in Mindoro province according to the 1960 are as follows:

Equipment	Occ. Mindoro	Or. Mindoro
	NUMBER	
Plows	8,417	21,834
Harrows	6,871	17,096
Tractors	19	38
Harvesting machine	4	2
Threshers	13	18
Carts	597	4,521
Motor vehicles	21	22
Sprayers	118	369
Incubators	2	9
Sugar cane crushers	-	3
Abaca stripping machine	-	4

SOIL SURVEY METHODS AND DEFINITIONS

Soil surveying 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 man.

Soils, their landscapes and underlying formation, are examined in as many sites as possible. Borings with the soil auger are made, test pits are dug, and exposure such as road and railroad cuts are studied. An excavation or road cut exposes a series of layers collectively called the soil profile. The horizons of the profile, as well as the parent material beneath, are studied indetailed and the color, structure, poresity, consistency, texture, and the presence of organic matter, roots, gravel and stones are noted. The reaction of the soil and its content of lime and salts are determined either in the field or in the laboratory. The drainage, both external and internal, and other features such as the relief of the land, climate, natural and artificial feature are taken into consideration, and the relationship of the soil and the vegetation and other environmental features are studied.

On the bases 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 of there mapping units are in such intimate or mixed pattern that they cannot be clearly shown or a small-scale map, they are mapped or grouped into a (4) soil complex. Areas of land that have no true soils, such as river beds, coastal beaches, or bare mountain sides are called (5) miscellaneous land types. Areas that are inaccessible like mountains 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 similar parent material. It comprises of soils whcih have essentially the same general color, structure, consistency, range of relief, naturaldrainage condion and other important enternal and external characteristics. In the estanlishement of a series, a geographic name is selected, taken usually from the locality where the soil was first identified. For example, the Tilik Series was first found and classified in the vicinity of Tilik, Lubang Island.

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A soil series has one or more soil types, defined according to the texture of the upper part of the soil, or the surface soils. The class name such as sand, loamy sand, sandy loamy silty clay loam, clay loam or clay is added to the series name to give the complete name of the soil. For example, Tilik silt loam is a soil type within the Tilik 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, deffering from the soil type in some minor features, generally external, that may be of special practical significance. Differences in relief, stoniness, and extent or degrees of erosion are shown as phase. A minor difference in relief may cause a change in the 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 differ in fertilizer requirement and cultural management from the real soil type. A phase of a type due mainly to degree of erosion, degree of slope and amount of gravel and stone in the surface is usually segragated on the map if the area can be delineated.

A soil complex is a soil association composed of such intimate mixture of series, types, or phase that cannot be indicated seperately on a small-scale map. This is mapped as a unit and its called a soil complex. If, in an area, there are several series such as Banto, Malalag and Luisiana that are mixed together, the complex must bear the names of the dominant series, as Banto-Malalag complex. If there is only one dominant constituent, the complex bears the name of that series, as Banto-Malalag complex as the case may be.

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

The soil survey party, composed of two or three technical men, maps the area and delineated the various soil types, phases, complexes and miscellaneous land types.

All natural and cultural features found in the area are indicated on the soil map, such as trails, railroads, bridges, telephone and telegraph lines; barrios, towns, and cities; rivers and lakes; prominent mountains, and many others.

SOILS OF MINDORO PROVINCES

The soils of Mindoro Provinces are classified as follows:

Soils & Miscellaneous Land Type	Number
A. Soils of the plains, valleys and undulating areas:	
1. Bantog clay	228
2. Buguey loamy sand	572
3. Calumpang clayloam	52
4. Calumpang silty clay loam	569
5. Mogpog clay loam	506
6. Quingua clay	385
7. Quingua clay loam	109
8. Quingua loam	413
9. Quingua sandy loam	412
10. Quingua silt loam	5
11. Quingua silty clay	899
12. San Manuel clay loam	236
13. San Manuel loam	190
14. San Manuel loamy sand	370
15. San Manuel sandy loam	96
16. San Manuel silt loam	82
17. Umingan loam	322
B. Soils of the uplands, hills & mountains:	
1. Alaminos clay loam	407
2. Alaminos silty clay loam	699
3. Alimodian silt loam	127
4. Banto clay loam	507
5. Banto-Malalag complex	865
6. Bolonao clay	153
7. Bolinao clay loam	108
8. Bolinao silty clay loam	679
9. Bulaoen clay loam	276
10. Lugo clay	156
11. Luisiana clay	239
12. Luisiana clay loam	140
13. Magsaysay silty clay	861
14. Maranlig clay	601
15. Maranlig gravelly sandy clay loam	829
16. Maranlig loam	818
17. San Fabian clay loam	102
18. Tagaytay sandy loam	36
19. Tilik silt loam	859
20. Tilik silt loam, gravelly phase	860

C. Miscellaneous land types:

1.	Beach sand	118
2.	Hydrosol	1
3.	Riverwash	152
4.	Rough mountainous land	202

Table 3 1 meter shows the area and proportionate extent of each soil type, soil complex and miscellaneous land type in Mindoro Provinces.

Table 3. --- rea and proportionate extent of each soil mapping unit in Mindoro Provinces:

Soil Mapping Number	Soil Mapping Unit	Area (Ha.)	Percent
228	Bantog clay	2,216.50	0.22
572	Buguey loamy sand	4,631.10	0.45
52	Calimpang clay loam	5,383.10	0.52
569	Calumpang silty clay loam	3,522.70	0.45
506	Mogpog clay loam	1,306.10	0.13
385	Quingua clay	6,456.70	0.63
109	Quingua clay loam	38,433.30	3.75
413	Quingua loam	2,615.30	0.26
412	Quingua sandy loam	3,483.10	0.34
5	Quingua silt loam	9,222.40	0.90
899	Quingua silty clay	4,947.60	0.48
236	San Manuel clay loam	10,924.40	1.07
190	San Manuel loam	13,655.50	1.33
370	San Manuel loamy sand	1,147.80	0.11
96	San Manuel sandy loam	23,234.10	2.27
82	San Manuel silt loam	53,434.60	5.22
322	Umingan loam	7,480.80	0.73
407	Alaminos clay loam	2,849.80	0.28
699	Alaminos silty clay loam	21,096.70	2.06
127	Alimodian silt loam	3,245.60	0.32
507	Banto clay loam	24,856.90	2.43
153	Bolinao clay	13,823.80	1.35
108	Bolinao clay loam	10,409,80	1.02
679	Bolinao silty clay loam	9,143.20	0.89
276	Bulaoen clay loam	8,984.90	0.88
156	Lugo clay	1,029.10	0.10
239	Luisiana clay	21,057.10	2.06
140	Luisiana clay loam	24,421.60	2.38

Soil Mapping Number	Soil Mapping Unit	Area (Ha.)	Percent
861	Magsaysay silty loam	12,032.60	1.17
501	Maranlig clay	1,583.20	0.15
829	Maranlig gravelly clay loam	65,150.70	6.36
818	Maranlig loam	474.90	0.05
102	San Fabian clay loam	4,156.00	0.41
36	Tagaytay sandy loam	14,130.40	1.38
859	Tilil silt loam	3,126.90	0.30
860	Tilik silt loam gravelly phase	7,124.60	0.69
865	Banto-Malalag complex	3,126.90	0.31
118	Beach sand	12,428.40	0.21
1	Hydrosol	4,710.10	0.46
152	Riverwash	4,749.70	0.46
202	Rough Mountainous land	547,685.20	53.46
	Unserveyed area	435,30	0.04
	Bodies of water	10,528.50	1.03
	T o t a l	1,024,457.00	100.00

Soils of the Plains, Valleys & Undulating Areas

The soils of the plains, valleys and undulating areas are developed from young alluvial fans washed down from the surrounding elevated areas. Their color ranges from light brown to dark brown, light reddish brown, reddish brown to dark brown and graysih brown to clay. Relief is generally level, nearly level to undulating. External drainage is good while internal drainage is poor the fair. They are usually found along the courses of rivers and creeks. These soils constitute the most production area in Mindoro Provinces.

Bantog Series

The soils of the series are developed from water-laid sidements from surrounding uplands. External drainage is poor to fair while internal drainage is very poor owing to their fine-textured subsoils. The latter condition makes them fit for lowland rice culture. Relief is generally level. Bantog clay is the only clay type mapped under the series.

Bantog clay (228). --- The surface soil is brown to dark brown clay; sticky and plastic when wet; hard and compact when dry; medium granular in structure; with reddish brown streaks. It is 30 centimeters deep.

The subsoil is light to grayish brown to brown clay; sticky and plastic when wet; hard and compact when dry; moderately medium granular to granular structure. The upper boundary is 30 centimeters while the lower boundary is 90 centimeters from the surface.

The subtratum is grayish brown clay; with dark brown mottlings; moderately medium granular in structure; slightly compact and crumbly when dry; sticky and plastic when wet.

The soil type is found in barrio Magsikap, formerly San Jose now Rizal, Occidental Mindoro. It has an approximate area of 2,216 hectares.

The main crop grown is lowland rice. Varieteis planted are gund, BE-3, Compol and Los Baños. The yield ranges from 40 to 50 cavans of palay per hectares.

Buguey Series

Buguey series, first identified during the reconnaissance soil classification of Cagayan Province, consists of soils developed from recent coastal deposits. The soils are friable and structureless. Root penetration is easy. The relief is generally level. External and internal drainage are good to excessive. Buguey loamy sand is the only soil type mapped under the series.

Buguey loamy sand (572). --- The surface soil is brownish gray to dark gray brown loamy sand; loose and structureless. The boundary between layers is not distinct. Root penetrates this layer with ease. The average depth is 20 centimeters.

The subsoil is brown to dark brown sand, loose and structureless. Few marine sheel are present in some places. The upper boundary is 20 centimeters while the lower boundary is 150 centimeters from the surface.

The substratum is similar to the subsoil.

The soil type occupies the slightly elevated areas along the coast of Calapan, Naujan, Gloria, Bansud and Bongabong. It covers and approximate area of 4,631 hectares.

The main crop is cocomut. Vegetable and root crops are grown in some areas. Uncultivated areas are covered with different species of shrubs.

Calumpang Series

Calumpang soils are derived from recent alluvial deposits. The relief is level to slightly undualting. External and internal drainage are poor. Two soil types under the series are mapped in Mindoro Provinces.

Calumpang clay loam (52).--- The surface soil is light gray clay loam; highly plastic and slightly sticky when wet; hard and compact when dray. It is 10 centimeters deep.

The subsoil is dark gray to very dark brown clay loam; sticky when wet, brittle when dry; with blocky structure. The upper boundary is 10 centimeters while the lower boundary is 40 centimeters from the surface.

The substratum is mottled grayish brown to yellowish brown clay loam to clay; sticky and plastic when wet; [illegible] gritty. The depth ranges from 40 to 150 centimeters from the surface.

The soil type is mapped in the municipality of Naujan with an approximate area of 5,383 hectares.

The principal crop grwon is rice, both lowland and upland. Varieties planted are Camuros and Pinili which yeild from 20 to 40 cavans per hectares. Coconut and banana are also grown on the slightly elevated portions.

Calumpang silty clay loam (569). --- This soil type has similar profile characteristics as that of Calumpang clay loam except for the texture of the surface soil.

It is mapped just south of the poblacion of Calapan, Oriental Mindoro. The aggregate area occupied is about 3,522 hectares.

The principal crop is lowland rice. Varieties planted are Pinili and Pinursigue which yield from 25 to 50 cavans per hectare. Coconut, banana and corn are planted on slightly elevated portions.

Mogpog Series

Soils of the series are derived from recent alluvial deposits. The relief is level to nearly level with some portions on depression which remain waterlogged after a continuos heavy rain. Lowland rice, coconut and banana are grown. Only one soil type, Mogpog clay loam, is mapped under the series.

Mogpog clay loam (506).--- The clay loam surface soil is brown to reddish brown, fine granular structure, with reddish mottlings. It is slightly sticky and plastic when wet; friable when dry. Root penetration is fair. The average depth is 25 centimeters. The boundary is smooth and diffuse. The subsoil is clay loam, brown to yellowish brown, slightly compact to compact with reddish brown splotches. The dpth is 105 centimeters from the surface. Boundary with substratum is smooth and diffuse.

The substratum is sandy clay loam, yellowish brown, with pale rust-like streaks. Concretions that produce a black powdery mass are present.

The soil type is mapped in SanTeodoro and along the principal highway between this municipality and Puerto Galera. The total area occupied by the soil type is 1,306 hectares.

The principal crop grown is lowland rice. Banana and coconut are planted on the slightly elevated portions. The lowland rice is solely dependent upon the rain but gives a satisfactory yeild of 40 to 50 cavans per hectare.

Quingua Series

The soil series is derived from recent alluvial deposits. The relief is level to slightly undulating. The undulating portions are covered with brubs or grass while the cultivated area is planted to rice, coconut, banana and root crops. External and internal drainage is fair to good. The soil types mapped under the series are Quingua clay, clay loam, loam, sandy loam, silt loam, and silty clay.

Quingua clay (385). --- The clay surface is light brown to brown, loose, friable and structureless. External and internal drainage is fair to good. Root penetration is easy. The average thickness is about 30 centimeters.

Other profile characteristics are similar to that of Quingua silt loam discussed elsewhere in this report.

The soil type is found in Barriors La Cueva, Progreso, Tarlac, San Jose Oriental Mindoro. It occupies a total area of 6,456 hectares.

The principal crops grown are lowland and upland rice. The varieties planted are Inapostol, Tenador, Inaday, Elon-elow Tjeremas, Pinursigue, and Pinili. The average yeild ranges from 25 to 50 cavans per hectares.

Quingua clay loam (109). --- The profile characteristics of this soil type, except the texture of sufface soil, are similar to thatof Quingua silt loam discussed elsewhere in this report.

The soil type is found in the different barrios in the municipalities of Victoria, Pinamalayan, Gloria, Bansud, Bongabong, Roxas, Oriental Mindoro and in Calintaan, Rizal, Sablayan and Mamburao, Occidental Mindoro. It covers a total area of 38,433 hectares.

It is the second most extensive cropland in Mindoro Provinces. The principal crop grown is rice, both lowland and upland. The different varieties planted are Mapintol, Senador, Inaday, Elon-elon, Tjeromas, Pinursique and Pinili which yield from 25 ot 50 cavans per hectares.

Quingua loam (413).--- The profile characteristics of this soil type, except for the texture of the surface soil, are similar of the other soil types under the series.

The soil type is mapped in the sitio of Pasugue (Penal Colony Reservation) and Barrio Ligaya, Sablayan. The total area covered is 2,615 hectares.

The area covered by the soil types in Pasugue is cultivated to different crops such as upland rice, root crops, vegetables and some fruit trees.

Quingua sandy loam (412).--- The profile characteristics of the soil type except for the texture of the surface soil are similar to that of Quingua silt loam discussed elsewhere in the report.

The soil type covers the level areas within the Mindoro Sugar Central in San Jose, Occidental Mindoro with an aggregate area of 3,483 hectares.

The principal crops grown is sugar cane. The varieties planted are POJ-1933,3016, and Java 2878. The average yield is 145 piculs per hectares. Lowland rice is also planted. The varieties used are Ramined and BE-3 which yield and average of 65 cavans per hectares.

Quingua silt loam (5).--- The surface soil is silt loam, light brown, yellowish brown to brown, loose and structureless. Root penetration is easy. External and internal drainage is fair to good. The average depth is 30 centimeters.

The subsoil is silty clay loam, dark brown, light brown to reddish brown, loose and friable to slightly compact. The depth ranges from 30 to 100 centimeters from the surface.

The substratum is silt loam to silty clay loam, brown, brownish yellowish to reddish brown, loose and slightly friable.

The soil type is found in Barrios Cabanabahan, San Jose, Bamos, Calintaan, Kabungahan, Lumonan, Buenavista, Inaplam Sta. Cruz; Tayamaan, Mamburao; Tobago, Abra de Ilog and Talaotao, Golo Island. It has a total area of approximately 9222 hectares.

The principal crops grown, is rice, Coconut, citrus, tobacco, and vegetables are grown to some extent.

Quingua silty clay (899), --- Except for the silty clay surface soil other characteristics of this soil type are similar to those of the other soil types under the series.

The soi type is mapped at Mabig, Lubang Island and at Sibalat, Bagaas, Lumlum, and Olayan, Magsaysay, Occidental Mindoro. The area covered is approximately 4,947 hectares.

The area at Lubang Island is planted to rice. The varieties used are Tinambo, Pinili and Balintawak. The average yield is 30 cavans per hectares. The low yield may be attributed to poor soil management and the rice varieties planted.

The area at San Jose, Occidental Mindoro is suitable for lowland rice varieties such as Inapostol, Senador, Inaday, Elon-elon, Theremas, Pinursigue and Pinili which yield from 25 to 50 cavans per hectares.

San Manuel Series

San Manuel soils are of recent alluvial deposits. They are usually found along courses of rivers and streams. The topography is level to nearly level. Drainage condition is fair to good.

The native vegetation consists predominantly of grasses, talahib and bamboo along the banks of creeks of rivers. The soils of the series are exceptionally fertile and are cultivated to varios crops. There are five soil types identified under this series, namely, San Manuel clay loam, San Manuel loam, San Manuel loamy sand, San Manuel sandy loam, and SanManuel silt loam.

San Manuel clay loam (236). --- The clay loam surface soil is 25 to 30 centimeters deep. It has a coarse granular structure and friable. The soils is well drained.

The soil type is mapped in the municipalities of Abra de Ilog, Occidental Mindoro; Pola, Socroo, Pinamalayan, Gloria, Roxas and Mansalay, Oriental Mindor. It occupies a total area of about 16,924 hectarees.

The principal crop grown is rice. Both upland and lowland rice are planted. The yield as 25 and 40 cavans per hectares, respectively. Corn is also grown. The produce is 27 cavans of shelled corn per hectare. Coconut thrives well in the soil type, too.

San Manuel loam (190).--- The profile characteristics of the soil type, except for the texture of the surface soil, are similar to those of San Manuel silt loam discussed elsewhere in this report.

The soil type is mapped in Baco, Naujan, Bansad, Gloria, Oriental Mindoro and in Rizal, Looc and Lubang Islands, Occidental Mindoro. The total area covered is about 13,655 hectares.

The crops grown are upland and lowland rice, corn, coconut, and some root crops. The varieties of rice planted are Pinursigue, Pinili, and Binangcoro. The yield is 25 cavans of palay per hectares. Coconut yield 3,000 nuts per hectares per harvest.

San Manuel loamy sand (370).--- The profile characteristics, except for the texture of the surface soil, are similar to those of the other soil types under the series.

This soil type is mapped in Bos. Bubog, Busugao, Curantan and San Agustin, San Jose; Payompon, Dapi, and Tayamaan, Mamburao; and Wawa, Abra de Ilog. The area covered is about 1,147 hectares.

The crops planted are coconut and some fruit trees. The coconut yield approximately 2,800 nuts per hectares per harvest. Part of the soil type is idle.

San Manuel sandy loam (96).--- The profile characteristics of this soil type, except for the texture of the surface soil, are similar to those of San Manuel silt loam discussed elsewhere in this report.

The soil type is mapped in the municipalities of Naujan, Pola, Pinamalayan, Bongabong, Bansud, Bulalacao and Roxas, Oriental Mindoro and in Abra de Ilog, Mamburao, Sta. Cruz, Sablayan and San Jose; Occidental Mindoro. The total area coverd is about 23,234 hectares.

The principal crops grown are upland rice and coconut. The variety of rice planted is Pinursique which yeild 25 cavans per hectares. Some root crops and vegetables are also grown.

San Manuel silt loam (82).--- The silt loam surface soil is pale brown to brown, coarse granular in structure, brittle when dry and slightly plastic when moist. The averqge depth is 35 centimeters. The boundary with the underlying layer is wavy and gradual.

The upper subsoil is silt loam, brown to brownish gray with yellowish brown mottlings; friable and fine to medium granular structure. The lower boundary is 75 centimeters from the surface. It has a wavy and clear boundary with the underlying layer. Roots penetrate this layer with ease. The lower subsoil is fine sandy loam, yellowish brown, slightly compact and gritty.

The substratum is fine sandy loam to fine sand, light reddish brown. Depth varies from 100 to 150 centimeters from the surface.

This soil type occupies the level areas in the municipalities of Baco, Calapan, Naujan, Mansalay, Bongabong, and Roxas, Oriental Mindoro and in San Jose, Sablayan, Mamburao, Paluan, Lubang and Looc, Occidental Mindoro. The total area covered is approximately 53,434 hectares. The soil type is the most extensive agricultural area and one of the most productive soils in Mindoro Provices. Althogh some areas occur on depressions water does not remain long due to its good drainage and permeability.

The soil type is mostly utilized for upland and lowland rice production. A big portion fo this soil type in Oriental Mindoro has no paddies or dikes to control water. The varieties of rice planted are Balibad, Pinili, Camuros, Pinursigue and Pola. The last one is a glutinous variety. The yield varies from 25 to 40 cavans per hectare.

The area occupied by the "Minas" Agricultural School at Victoria belong to this soil type. Clearing on the reservation is going on at the times of the survey.

Umingan Series

The soils of the series are of recent alluvial deposits. They occur on level to slightly undulating topography usually near river banks. Both external and internal drainage is good. The series has a distinct layer of stones and gravels accumulation about 10 to 15 cm. thick in its profile. This account for the good internal drainage condition. Umingan loam is the only soil type mapped in Mindoro Povinces under the series.

Umingan loam (322).--- The loam surface is soil brown to yellowish brown, loose, friable and fine granular in structure. Depth is about 40 centimeters. Boundary with underlying layer is clear and smooth.

The upper subsoil is silt loam, light brown to brown, loose, friable, and fine granualr in structure.

The lower subsoil is fine sand, light brown to ash brown and loose. Layer of gravels, pebbles, and stone underlie this layer and is about 130 centimeters at its lower limit from the surface.

The substratum is brown, light brown to grayish brown, loose and structureless sand.

This soil type is found along the Mongpong and Pandan Rivers. Sablayan and Lumintao Rivers and in a limited area along the Caguray River; Magsaysay, Occidental Mindoro Povince. The total area is about 7,480 hectares.

The area along Caguray River is devoted to rice. The yield ranges from 20 to 25 cavans per hectare. Vegetables are also grown. The rest are either idle, partly used as pasture land, or occupied by cogon. The latter area can be planted to coconut, fruit trees and other seasonal crops.

The Soils of the Upland, Hills and Mountains

The soils of the upland, hills and mountain are generally those soils developed in place from various weathered rocks such as shale, sandstone, basalt and andesites. The general topography is rolling to hilly and mountainous. The external drainage is good to excessive.

The color of the surface soils ranges from light to reddish brown while the texture varies from gravelly sandy clay loam, sandy loam to clay.

The native vegetation consists of grass, second growth forest and primary forest. Patches of kaingin clearings are also found.

The soil series that composed these soils are the Alaminos, Alimodian, Banto, Bolinao, Bulacan, Lugo, Luisiana, Magsaysay, Maranlig, San Fabian, Tagaytay and Tilik series.

Alaminos Series

Alaminos series are residual soils of volcanic rocks. The surface soils are reddish brown to brick red friable loam to clay loam. The relief is slightly rolling to hilly and mountainous. Drainage is good to excessive.

In places where erosion is serious, rock outcrops as well as highly weathered rocks are found on the surface. Boulders of basalt, diorite, andsite, conglomerates and serpentine rocks present in this series.

The mountainous and hilly regions are either covered with shrubs or secondary forest. The rolling areas are under grass.

Alaminos clay loam (407).--- The clay loam surface soil is reddish brown to brick red in color. It has columnar structure, perous, sticky when wet and friable when dry. Iron concretions are present. Depth is 35 centimeters.

The subsoil is similar to the surface soil in color and in texture. When dry is it cloddy to coarse granular in structure. The upper boundary is 35 centimeters and the lower limit is 70 centimeters from the surface.

The subtratum has similar physical characteristics as the surface soil. The amount of gravel and iron concretions increases with depth. Sometimes, limestone, basalts and conglomerates are present.

This soil type occupies the lower slopes of San Teodoro extending toward Baco municipality. It has an aggregate area of 2,849 hectares.

The principal crops grown are coconuts, bananas, and root crops.

Alaminos silty clay loam (699).--- The soil type has similar profile characteristics as Alaminos clay loam except for the texture of the surface soil.

Alaminos silty clay loam occurs on the rolling to hilly areas of Sta. Cruz, Mamburao and Paluan municipalities, Occidental Mindoro. It comprises an aggregate area of 21,096 hectares. The area is presently covered by grasses, cogon and second growth forest. A portion of the [illegible] soil type under grasses is utilized as pasture. A few patches of kaingin clearings also exist.

Alimodian Series

The soils of Alimodian series are developed from the weathered products of shales and sandstones. Fragments of sandstone rocks are found on the surface. The relief ranges from strongly rolling to hilly. Drainage is good to excessive. The soils are under secondary to primary forest, grass and patches of kaingin clearings.

Alimodian silt loam (127). --- The silt loam surface soils is brown to reddish brown, loose, strong medium granular structure, slightly fraible when mosit, brittle when dry with organic matter content and easy root penetration. Shale and sandstone gravels are present on the surface. Boundary with the underlying layer is clear and smooth. Depth is 25 centimeters.

The subsoil is clay loam light brown slightly brittle, moderately compact, poor organic matter content. Boundary with substratum is clear and smooth. The lower limit is 60 centimeters from the surface.

The substratum is high weathered sandstone, gray to grayish brown, weak platystructure and slightly compact. Shale and sandstone are stratified in some places. The soil occupies the whole island of Ambil. It covers an agrregate area of 3,245 hectares. The area is non-agricultural. However, portion below the slopes are planted to cononut and some fruit trees. The steep slpes do not warrant the planting of seasonal crops. The presence of stones and gravels in some places is another undesirable features of the soil type. The area is presently utilized as pasture for cattle which it may be best kept under forest because of its relief.

Bantog Series

Banto soils are developed from igneous rocks, primarily andesite and basalt. The relief is rolling to hilly. External drainage is good to excessive while enternal drainage is fair.

The area occupied by Banto soils are primarily under secondary and primary forest. A portion though is used as pasture and a few patches are occupied by upland rice as well as some fruit trees.

Banto clay loam (507). --- The clay loam surface soil is reddish brown to almost red, friable compact with fine granular structure, sticky and plastic when wet. Black concretions are present. Root penetration is easy. Depth is 30 centimeters.

The subsoil is clay, pale to dark red, granular structure, with soft concretions, slightly fraible when dry and sticky and plastic when wet. Depth is 105 centimeters from the surface.

The substratum is clay, reddish brown to almost red, with block specks. It is hard and compact when dry, sticky and plastic when wet. The lower portions has yellowish brown mottlings.

This soil type is mapped in the rolling to hilly areas at Sta. Cruz, Sablayan and Galintaan. It covers an approximate area of 24,856 hectares. The area is subject to severe erosion because of the kaingin system of farming. Upland rice, corn, banana and root crops are grown in the area.

Bolinao Series

Bolinao series are primary soils developed from coralline limestone. They are differentiated from other series of limestone origin by their dark brown to red surface soils. The relief is rolling to hilly with some level areas. External drainage is good to excessive while internal drainage is fair. The soils are under grass, secondary and primary forest and crops.

Bolinao clay (153).---The profile characteristics of the soil type except for the texture of the surface soil are similar to those of Bolinao clay loam discussed elsewhere in this report.

This soil type occupies the southern tip of the island of Mindoro Provinces, specially in the municipalities of Bulalacao, Oriental Mindoro and Magsaysay, Occidental Mindoro.

Angular and rounded limestone gravels abound on the surface. On the eroded portion, limestone boulders outcrops interfere with tillage operation.

Part of the soil type, however, is planted to coconuts. The rest of the area is either under secondary or primary forest.

Bolinao clay loam (108). --- The clay loam surface soil is brown to reddish brown, compact and hard when dry, plastic and sticky when wet. Root penetrates this layer with ease. Organic matter content is poor. Boundary with underlying layer is clear and smooth.

The depth is 35 centimeters.

The subsoil is clay, strong brown to reddish brown, fine to coarse granular structure, compact when dry, highly sticky and plastic when wet. Limestone gravels are present in the lower portion. Boundary with underlying layer is clear and smooth. Depth is 80 centimeters from the surface. The upper substratum is reddish brown weathered limestone rocks while the lower layer is reddish brown hard limestone rocks.

This soil type is mapped in Barrio Teresa; Ilin and Ambulong Islands; the whole of Cabra Island and a small portion included in San Manuel loam in Lubang Island northwest of Port Tilik, Occidental Mindoro.

It covers an aggragate area of 10,409 hectares.

The principal crop is grown upland rice. Corn and vegetables are also planted, especially in Cabra Island. Coconuts are planted on the higher slopes. The varieties of rice planted are Vinisaya, Lanuyo and Balintawak with an average yield of 15 to 20 cavans per hectare.

Bolinao silty clay loam (679).--- The profile characteristics of the soil map are similar to those of Bolinao clay loam except for the texture of the surface soil.

The soil type occupies the western half of Lubang Island. It covers a total area of approximately 9,143 hectares.

The principal crop planted is upland rice, corn, vegetable and coconuts are also planted.

Bulaoen Series

Bulaoen soils are primary soils developed from igneous rocks. The relief is flar upland to undualting and rolling with outcrops of gabbro rocks and boulders on the surface. External drainage is good to excessive while internal drainage is fair. The uncultivated portion is under secondary forest while cultivated parts are planted to coconuts, banana, other fruit trees and upland rice. There is only one soil type under the sereis mapped in Oriental Mindoro.

Bulaoen clay loam (276).--- The surface soil is clay loam, brown to grayish brown, slightly friable and fine granular in structure. Depth is 25 centimeters. Boundary with the underlying layer is smooth.

The subsoil is clay loam, brwon to reddish brown with plenty of gravels and iron concretions. Boulders are embedded in some places. The depth is 45 centimeters from the surface.

The substratum is clay loam, brown to strong brown to reddish brown, massive and friable. It is sticky when wet. Gabbro rocks are present.

The soil type is mapped on the undulating and rolling areas on the eastern part of Calapan and on the rolling portion at Naujan and Pola, Oriental Mindoro. It covers a total area of approximately 8,984 hectares.

The hilly portion at Calapan, Oriental Mindoro is planted to coconuts, some bananas and second growth forest. Coconuts yield and avarage of 3,000 nuts per hectares. While a limited area of flat upland (plateau) within the soil type is planted to upland rice and corn.

Lugo Series

Lugo soils are residual soils from calcareous shales. The relief is slightly rolling to rolling. Drainga is good externally but poor internally. Limestone rocks are occasionally present.

There is only one soil type mapped under the series is Mindoro Provice.

Lugo clay (156).--- The clay surface soil is dark gray to black, medium to fine granular structure, sticky and very plastic when wet, slightly friable when almost dry, fairly rich in organic matter. Limestone rock outcrpos are present. Depth is 15 centimeters. Boundary of subsoil is smooth and diffuse.

The clay subsoil, dark brown to yellowish brown, strong coarse granular structure; slightly friable when dry, very plastic when wet. Boundary with underlying layer is smoooth and abrupt.

The substratum is silty clay, brownish gray, weak coarse granular structure, gritty, sticky when wet. Limy consolid ated shales are present.

The soi type is found on the northwestern tip of Oriental Mindoro Province within the municipality of Puerto Galera with a total area of 1,029 hectares.

The principal crops grown is coconut which yield 2,800 nuts per hectare. Banana, coffee and some fruit trees are also grown.

Luisina Series

Luisiana soils are developed from basaltic rock materials. The topography is rolling to hilly and mountainous. External drainage is good to excessive while internal drainage is good. The vegetation consists of grass, secondary and primary forests and some crops.

Luisiana clay (239).--- The profile characteristics of the soil type are similar to those of Luisiana clay loam discussed below.

The soil type is mapped is the hilly areas of Palauan with a total area of 21,057 hectares.

A part of the soil type is devoted to pasture. Others are under kaingin clearings while the rest is under forest.

Luisiana clay loam (140).--- The clay loam surface soil is brown to reddish brown, very friable when dry, sticky when wet, prismatic to columnar to coarse granular is structure. Depth is 25 centimeters.

The subsoil is clay, yellowish brown to light reddish brown, friable and mellow, columanar in structure, with reddish purple streaks and light gray or yellow splotches. The upper and lower boundaries are smooth and obscure. Depth is 70 centimeters from the surface.

The substratum is clay, very friable with light gray to yellowish gray to yellow splotches.

The soil type comaprises the strips occupying the lower slopes of the rough mountainous land within the municipalities of Baco, Naujan, Victoria, Pola and Socorro, Oriental Mindoro. The total area is about 24,421 hectares.

Coconut isthe principal crop grown. Upland rice. banana and other fruit trees are also grown.

Magsaysay Series

Magsaysay series is a new series identified in Barrio Magsaysay, San Jose, now Magsaysay town, Occidental Mindoro. It is a residual soil, developed from the weathering of sandstone. The topography is slightly sloping to rolling. Drainage is good to excessive, exceedingly good internally. Only the silty clay type is mapped under the series which represents the profile characteristics of the series.

Magsaysay silty clay (861).--- The surface soil is silty clay light brown, to light reddish brown, fine granular structure and friable. In undisturbed condition the soil is brown and almost compact. In some places, fine to coarse whitish gravels are present. Depth is 20 centimeters.

The subsoil is sandy clay loam, light grayish brown, frable when dry, slightly sticky when wet with reddish brown splotches. Few gravel and concretions are present. Root penetration is easy. The boundary with theunderlying layer is gradual. The upper boundary is 20 centimeters while the lower boundary is 80 centimeters from the surface.

The substratum is sandy clay, light gray, slightly sticky and gritty. Highly weathered sandstone is present.

Maranlig Series

Maranlig soils are primary soils derived from basalt and andesite. The relief is rolling to hilly with some level to undulating portions.

Drainage is good to excessive externally and fair internally.

The series covers the extensive rolling to hilly areas under secondary forest, some portions under parang and grass and cultivated areas. The cultivated portions are planted to coconut, upland rice, corn, bananas and root crops.

There are three soil types mapped under the series.

Maranlig clay (501).--- The surface soil is clay, brown to dark reddish brown, slightly friable and compact when dry, sticky and plastic when wet, fine granular structure. Root penetration is easy. Depth is 25 centimeters. Boundary with subsoil is smooth and abrupt.

The subsoil is clay, dark brown to reddish brown, hard and compact when dry, very sticky and plastic when wet. Gravels and stones of various sizes and shapes are well distributed in this layer. The upper boundary is at 25 centimeters while lower boundary is at 90 centimeters from the surface.

The substratum is clay, reddish brown, sticky and plastic when wet, hard and compact when dry. Gravels and stones of various sizes and shapes at varying degrees of weathering are present.

This soil type is found in Papandayan, Pinamalayan, Oriental Mindoro which occupies a total area of approximately 1,583 hectares.

The principal crops is coconut which yields and average of 3,000 nuts per hectares. Banana with an average yield of 750 bunches per hectares and some root crops are also planted.

Maranlig gravelly sandy clay loam (829).--- The profile characteristic of this soil type are similar to those of the Maranlig clay discussed elsewhere in this report except from the texture of the surface soil.

This soil type is found as a strip along the lower slopes of the mountainous land extending from north to south in Pinamalayan, Gloria, Bansud, Bongabong, Roxas, and Mansalay, Oriental Mindoro and in Calintaan, Rizal and San Jose Occidental Mindoro. The area occupied is extensive covering approximately 65,150 hectares.

There is not much cultivation on this soil type. Only small patches of coconut fields, upland rice and root crops afe found. The rest of the area is devoted to pasture.

Maranlig loam (818).--- The profile characteristics of this soil type is similar to those of Maranlig clay discussed elsewhere in this repoft except for the texture of the surface soil.

This soil type is found in the level to undulating area in Barrio Formon, Bongabong, Oriental Mindoro. The area is very limited about 474 hectares only.

The principal crop grown is upland rice which yields from 20 to 30 cavans of palay to the hectares. Other crops grown are corn, coconut, banana, sweet potato and to other root crops. Banana gave some 400 to 750 bunches per hectares.

San Fabian Series

San Fabian soils are residual soil of volcanic tuff. The relief is rolling to hilly with some level areas. The external drainage is good to excessive but internal drainage is poor to fair.

A large portion of the area is under sedondary forest. The rest is under grass with some portions deveted to kaingin farming where upland rice, root crops and some fruit trees are grown.

Only one soil type is mapped in Mindoro Provinces under the series.

San Fabian clay loam (102).--- The clay loam surface soil is dark brown to dark gray, nutty to cloddy structure, slightly friable when dry and plastic when wet. Gravels are present. The depthis 25 centimeters.

The subsoil is clay loam, grayish brown, granular to nutty structure slightly compact to compact. Depth is 40 centimeters from the surface.

The substratum is clay loam to clay, pale gray to yellowish gray, sticky and plastic when wet and hard and compact when dry. Some gravels are present.

The soil type is found in the rolling hills at Clotic, Tibang, Lavbanan and Matabang, Abra de Ilog, Occidental Mindoro, It occupies and approximately te area of 4,156 hectares.

The soil type is not suited for agricultural purpose. Some portions, though, are under kaingin farming and are planted to uplamdrice and root crops.

Tagaytay Series

Tagaytay soils are developed from volcanic rocks. The relief is generally rolling to hilly. External drainage is good to excessive while internal drainage is fair to good.

The series as mapped in Mindoro Provinces is under grass, second growth forest and some patches of kaingin clearings. Only one soil type is found in the provinces.

Tagaytay sandy loam (36). ---- The surface soil is sandy loam, dark brown to nearly black, fraible and granular. Root penetrations is easy, The depth is 25 centimeters.

The subsoil is clay loam to clay, dark brown to very dark brown, slightly friable to almost compact. The organic matter content is poor. The upper boundary is 25 centimeters while the lower boundary is 50 centimeters from the surface.

The substratum is light yellowish brown to light grayish brown partly weathered tuffaceous rock extending to a considerable depth.

The soil type covers the gently rolling to hilly areas of Bulalacao and the small islands of Tambaron, Maasin and Buyayao, Oriental Mindoro. It has a total area of approximately 14,130 hectares.

The soil type is at present utilized as pasture for cattle. Some patches are devoted to kaingin farming and are planted to upland rice, root crps and some fruit trees.

Tilik Series

Tilik series is a new soil series identified during the reconnaissance soil survey of Mindoro Provinces. It is a primary soil developed from the weathering of metamorphic rocks underlain by weathered shale rock. The relief is rolling to hilly and mountainous. External drainage is excessive while internal drainage is fair to good. The vegetation consists of forest and cultivated crops like upland rice. coconut, citrus, banana, coffee and other fruit trees.

The series occupies almost one-half of Lubang Island, cutting the island in the center from the North of Port Tilik, where the series got its name, to the south and extending to Golo Island. The total area covered is approximately 10,251 hectares.

A soil type is a phase under the series are mapped in Mindoro Provinces. They are Tilik silt loam and Tilik silt loam, gravelly phase.

Tilik silt loam (859).--- A typical profile description of the series is given below.

Depth (cm.)	Characteristics
0 - 25	Surface soil, silt loam, light brown to reddish brown, granular in structure, slightly friable when dry and slightly plastic and sticky when wet. Gravels are present. Root penetraits this layer with case. External drainage is good to excessive while internal drinage is fair. Depth is 25 centimeters.
25 - 80	Subsoil, clay loam, reddish brown to brown, sticky, slightly compact with highly weathered metamorphic and shale rocks. Gravels are present in some places. The upper boundary is 25 centimeters while the lower boundary is 80 centimeters from the surface.
80 - 150	Substratum, light yellowish brown to light reddish brown, highly weathered metamorphic and shale rocks. It is slightly friable.

The soil type occurs in the central eastern part of Lubang Islands. The relief is slightly rolling to hilly. The total area occupied is approximately 3,126 hectares.

A greater portion of the area is under secondary and primary forest. The area along the lower slopes is under grass and some patches of cultivated upland rice, bananas, coconuts and other fruit trees.

Tilik silt loam, gravelly phase (860).--- The soil phase has the same profile characteristics as Tilik silt loam except for the presence of large amount of gravels on the surface.

The soil phase is located at the southern section of Lubang Island except the lowlands. The area occupied is approximately 7,124 hectares.

The vegetation of the soil phase consits of grass, primary and secondary forests and some crops such as upland rice, bananas, coconuts, and fruit trees planted in kaingin clearings.

Banto-Malalag Complex

Banto-Malalag complex (865).--- This soil complex is an association of Banto clay loam and Malalag clay loam. These two soils are mixed in intricate pattern that they cannot be indicated separately on a small-scale map. This soil complex has a rolling to hilly and mountainous relief. It is mapped at the mountains of Puerto Galera extending westward to Sitio Cabasingan, Abra de Ilog, Occidental Mindoro, and southeastward occupying part of the municipality of San Teodoro. The total area occupied is approximately 3,126 hectares.

The principal vegetation is secondary forest. Areas along the provincial highway are planted to coconuts and bananas.

Miscellaneous Land Types

Strickly speaking, soils under this classification are not true soils in the sense that they are not products of weathering and they do not exhibit profile development. Areas where relief, drainage, accessibility, and others, are not favorable for agriculture are also included under miscellaneous land types. In Mindoro Provinces the following constitue the miscellaneous land types; beach sand, hydrosol, riverwash and rough mountainous land. The total area occupied by these types is approximately 569,573 hectares.

Beach sand (118).--- This land type occupies the low level areas along the coast of the provinces. The sand consists of quartz, limestone and finely triturated marine shells which accumulate on the beach through wave action. Beach sand is well drained. Crops are grown on this type to a certain extent. Coconuts are usually planted. Depending upon the coarseness of the sand and the availability of irrigation water, this land type can be grown to vegetables and some fruit trees. Beach sand occupies an approximate area of 12,428 hectares.

Hydrosol (1).--- Salt marshes along the coastal regions in Mindoro Provinces are classified as hydrosol. Such areas are usually flat and are under water most of the time. The total area occupied is approximately 4,710 hectares. The vegetation is made up of mangroves, nipa, palms, bakauan, and pagat-pat.

Hydrosol areas are converted into fish ponds are found in Calapan, Naujan, Baco, and Puerto Galera, all of Oriental Mindoro and in San Jose, Sablayan, Mamburao and Lubang Islands, all of Occidental Mindoro.

Riverwash (152).--- This land type is brought about when a river or streams changes its course or when it runs dry. The resultant barren strip, which is usually covered with sand, gravels and stones, is classified as riverwash. Banks of live streams which are covered with stones, gravels and boulders are also considered riverwash. This land type covers an aggregate area of about 4,749 hectares.

Rough Mountainous land (202).--- The mountain ranges which centrally run along the length of the provinces are classified as rough mountainous land. A large part of this land type is not suitable for agriculture because of its very steep slopes. Small patches of relatively level areas are found throughout this land type, though, which may be properly cultivated and planted to crops. Numerous kaingin clearings exist at the time of the survey. This kind of cultivation of farming has contributed much to soi erosion problems in the provinces. Runoff became very excessive which caused destruction in the lowlands not only of homes, crops and livestocks but also of arable lands burying them under rocks and sand.

Rough mountainous land should be utilized solely for forest. Areas cleared should be reforested and the kaingin system of farming must be stopped by all means. Lumber concessioners in the area should be remainded to practice selective logging and reforestation.

Once this area is reforested, soil erosion and excessive runoff will be minimized; streams which supply water as well as drain the areas in the lowlands, may flow continously.

This land type covers an approximate area of 547,685 hectares equivalent to 53.46% of the combined area of Mindoro Provinces.

Table 4.— Key to the soils of Mindoro Provinces:

Soil type, soil complex or miscellaneous land type	Parent Material or parent rock	General Relief	Drainage		Present Use/Veg
			External	Internal	
Bantog clay	Alluvial deposits	Level	Poor to fair	Poor	Lowland rice
Buguey loamy sand			Good to excessive	Good to excessive	Coconut, vegeta crops; shrubs.
Calumpang clay loam		Level to slightly undulating	Poor	Poor	Rice, coconut,
Calumpang silty clay loam		Level to nearly level			Lowland rice, c na & corn.
Mogpog clay loam					Lowland rice, c banana.
Quingua clay		Level to slightly undulating	Fair to good	Fair to good	Rice
Quingua clay loam					Lowland and upl
Quingua loam					Upland rice, ro vegetables; fru
Quingua sandy loam					Sugar cane, lowl
Quingua silt loam					Rice, coconuts cco, & vegetabl
Quingua silty clay					Rice.
San Manuel clay loam					Lowland & Up la & coconuts.
San Manuel loam					Lowland & Uplan coconut, root c

Soil type, soil complex or miscellaneous land type	Parent Material or parent rock	General relief	Drainage		Present Use/Vege
			External	Internal	
San Manuel loamy sand	Volcanic rocks	Level to nearly level			Coconut, & fru
San Manuel sandy loam					Upland rice, crops & vegeta
San Manuel silt loam					Lowland & upla
Umingan loam		Level to slightly undulating	Good	Good	Rice, vegetabl pasture; Idle.
Alaminos clay loam		Slightly rolling to hilly & mountainous	Good to excessive	Good to excessive	Coconut, banan
Alaminos silty clay loam					Grasses, cogon growth forest.
Alaminos silt loam	Shale & sandstone	Strongly rolling to hilly			Coconut, fruit ches.
Banto clay loam	Igneous rocks	Rolling to hilly		Fair	Upland rice, c root crops.
Bolinao clay	Corralline limestone	Rolling to hilly with some level areas.			Coconut, prima forest.
Bolianao clay loam Bolinao silty clay loam					Upland rice, c & coconuts.
Bulaoen clay loam	Igneous rocks	Flat upland to undulating & rolling			Upland rice, c banana; second
Lugo clay	Calcareous shale				
		Slightly rolling to rolling	Good	Poor	Coconut, banan trees.
Luisiana clay	Igneous rocks	Rolling to hilly & mountainous		Good	Pasture, fore
Luisiana clay loam					Coconut, upla & fruit tree

Soil Mapping Number	Soil type, soil complex or miscelaneous land type	Parent Material or parent rock	General relief	Drainage		Present Use/Vegetation
				External	Internal	
861	Magsaysay silty clay	Sandstone	Slightly sloping to rolling			Upland rice, fruit trees, root crops; grasses, cogon; primary & secondary forest.
501	Maranlig clay	Basalt and andesite	Rolling to hilly with some level to undulating	Good to excessive	Fair	Coconut, banana, root crops.
829	Maranlig gravelly sandy clay loam					Coconut, upland rice, root crops; pasture.
818	Maranlig loam					Upland rice, corn, coconut, sweet potato, root crops.
102	San Fabian clay loam	Volcanic tuff	Rolling to hilly with some level areas.		Poor to Fair	Upland rice, root crops, fruit trees; secondary forest; grass.
36	Tagaytay sandy loam	Volcanic rocks	Rolling to hilly		Good	Upland rice, root crops; fruit trees; secondary forest grass.
859	Tilik silt loam	Metamorphic rocks	Rolling to hilly & mountainous	Excessive		Upland rice, banana, coconut fruit trees; primary &secondary forest; grasses
860	Tilik silt loam, gravelly phase					
865	Banto-Malalag complex	Mixture of igneous, metamorphic & shale rocks.		Good to excessive		Coconut & banana; secondary forest.
118	Beach sand	—	Level	—	—	Coconut
1	Hydrosol					Mangroves; nipa palms, bakauan & pagatpat.
152	Riverwash		—			—
202	Rough mountainous land		Mountainous			Kaingin; primary & secondary forest; cogon.

Land-use Changes

Land-use changes in the provinces are brought about primarily by the economic needs of the people. Some parts of the idle land, forest and grass land are utilized for the cultivation of crops to meet the increasing demand of the over-increasing populace for food. Portions of the swampy areas are converted into fishponds. Pasture lands are maintained and/or increased.

Water Control on the Land

Water controlon the land as applied inMindoro Provinces refers primarily to the proper use and control of irrigated water and control of run-off and soil erosion. Since Oriental Mindoro falls under the fourth type of climate where there is a more or less even distribution of rainfall throughout the year, water control is not much of a problem. However, in Occidental Mindoro, water control is necessary especially during the dry season. There are times when dry spells occur.

Communal irrigation system supply the needed water in some farms while irrigation water in other farms is supplied by the government-owned Pinamalayan-Pola irrigation system.

With the availability of irrigation water, rice can be planted twice a year. Secondary crops like corn, sweet potato and cassava are likewise grown extensively.

Productivity Ratings of Mindoro Soils

Productivity refers the ability of the soil to produce a crop or a sequence of crops under a specified system of management. It represents the combined effects on crop yield of the many soil characteristics, such as depth and textureof the surface and subsoil, nature of the parent material, fertility, reaction, relief, drainage, and so forth.

The productivity ratings of the soil types of Mindoro Provinces were obtained by the deductive method. Data on crop yields over a long period of cropping are considered excellent sources of information on the suitability of a certain soil type for a certain crop. Very few farmers, if any, keep such records. Even government agencies on agriculture have an adequate statistics. The average yields of the different crops are therefore, obtained through direct inquires fromfarmers. Rice and corn action team personnel, supplemented by census data and other agricultural bulletins andreports. These figures are based on local farm practices without the application of fertilizers or soil amendments.

Table 5 shows the productivity ratings of the soils of Mindoro Provinces. The soil productivity rating of index for a given crop is expressed in terms of a standard index of 100. Thus a productivity rating of 75 for a certain crop means that the soil is about three-fourths as productive as the national standard or in terms of production the soil can produce 45 cavans of palay of lowland rice per hectares as compared to the national standard of 60 cavans per hectares.

Table 5. --- Productivity ratings of some of the soils of Mindoro Provinces

Soil Type	CROP PRODUCTIVITY Index for 1/ Lowland Rice 100 = 60 Cavans/ha.	Upland Rice 100 = 20 Cavans/ha.	Corn 100 = 17 Cavans/ha.	Coconut 100 = 3,750 Nuts/ha.	Banana 100 = 900 Bunches/ha.	Sweet potato 100 = 8 Tons/ha.	Peanuts 100 = 2 Tons/ha.	Mungo 100 = 7	Sugar Cane 100 = 80 Piculs/ha.
Bantog clay	80	-	-	-	-	-	-	-	-
Buguey loamy sand	-	-	-	100	-	-	-	-	-
Calumpang clay loam	85	150	120	80	75	-	-	-	-
Calumpang silty clay loam	85	200	-	-	70	-	-	-	-
Mogpog clay loam	85	150	150	-	80	80	-	-	-
Quingua clay	80	-	-	-	-	-	-	-	-
Quingua clay loam	80	125	180	80	80	-	80	85	-
Quingua loam	120	120	100	-	80	70	80	80	-
Quingua sandy loam	120	-	-	-	-	-	-	-	180
Quingua silt loam	85	75	115	80	70	65	70	75	-
San Manuel clay loam	65	125	150	-	70	-	-	-	-
San Manuel loam	60	125	150	80	-	60	80	90	-
San Manuel loamy sand	-	-	-	80	-	-	-	-	-
San Manuel sandy loam	60	120	150	90	80	70	100	80	-
San Manuel silt loam	80	150	180	-	85	70	70	80	-
Umingan loam	-	125	-	-	-	-	-	-	-
Alaminos clay loam	-	70	-	70	75	-	-	-	-
Alimodian silt loam	-	75	80	80	-	-	-	-	-
Bolinao clay loam	-	70	75	100	70	-	-	-	-
Bulacen clay loam	-	100	140	80	70	65	-	-	-
Lugo clay	-	-	-	80	90	-	-	-	-
Luisiana clay loam	-	80	-	-	80	70	-	-	-
Maranlig clay	80	130	75	-	70	-	-	-	-
Maranlig gravelly sdy clay loam	-	60	150	-	75	65	45	-	-
Maranlig loam	-	150	80	80	70	50	95	80	55
Tilik silt loam	-	70	-		75	65	45	-	-

1/ Indexes give the approximate average production of each crop in percent as the standard of reference. The standard represents the approximate yield obtained without the use of fertilizers or amendments from the extensive and better soil types of the region in the Philippines in which the crop is most widely grown.

TEXRURAL CLASSES OF THE SOILS OF MINDORO PROVINCES

Field Determination of Soil Textural Class

The determination of the soil textural class is made in the field mainly by feeling the soil with the fingers. While this requires skill and experience, accuracy can be had if the field scientist frequently checks his field textural classification against laboratory results.

Hereunder are definitions and description of the basic soil textural classes in terms of field determination.

Sand. -- Sand is loose and single-grained. The individual grains can readily be seen or felt. Squeezed in the hand when dry, individual particles will fall apart when the pressure is released. Squeezed when moist, the particles will form a cast, but will crumble when touched.

Sandy loam. --- Sandy loam contains much sand with enough silt and clay to make it somewhat, coherent. The individual sand grains can be readily seen and felt. Squeezed when dry, the soil particles will form a cast which readily fall apart, but it squeezed when moist, a cast dan be formed which will bear careful handling without breaking.

Loam. --- Loam consists of relatively even mixture of different grades of sand, silt, and clay. It is mellow with a somewhat gritty feel, yet fairly smooth and slightly plastic. Squeezed when dry, the soil particles will form a cast that will bear careful handling, while the cast formed by squeezed the moist soil can be handled quite freely without breaking.

Silt loam.--- Silt loam contains a moderate amount of the fine grades of sand and only a small amount of clay, over half of the particles being of the soil seperate called "silt". When dry it may appear cloddy by the lumps can be readily broken, and when pulverized it feels soft and floury. When wet the soil readily runs together and puddles. Either dry or moist, the soil particles will form into a cast which can be freely handled without breaking. When moistened and squeezed between fingers, it will not "ribbon" but will give a broken appearance.

Clay loam.--- Clay loam is a fine-textured soil which usually breaks into clods or lumps that are hard when dry. When the moist soil is pinched between the thumb and fingers, it will from a thin "ribbon" which breaks readily, barely sustaining its own weight. The moist soil is plastic and can be formed into a cast that will bear much handling. When kneaded in the hand it does not crumble readily but tends to form into a heavy compact mass.

Clay.--- Clay is a fine-textured soil that usually forms very hard lumps or clods when dry, and is quite plastic and usually sticky when wet. When the moist soil is pinched between the thumb and fingers, it will form into a long, flexible "ribbon". Some fine clays very high in colloids are friable and lack plasticity under all conditions of moisture.

The above definitions are descriptive only. One could be made in these or similar terms that would apply adequately to all soils. The dependable definitions, the standards, are those developed from mechanical analyses.

MECHANICAL ANALYSIS

Accuracy in the determination of textural classes of soils deleneated during the soil survey is attained through mechanical analysis. Generally, field classifications coincide with the results of the mechanical analysis. However, there are instances when field classification and laboratory classification vary. Some soils exhebit clayey textures in the field. They are sticky and plastic when wet, hard or brittle when dry, but actually when analyzed their clay contents are low. Under these circumstances, the field classifications are maintained except which their clay contents are so low that their final textural classifications are those established by the laboratory.

The soils separates are sand, silt, and clay. Sand includes particles from 2.0 millimeters to 0.05 millimeters in diameter; silt from 0.05 to o.002 millimeters; and clay, particles smaller than 0.002 millimeters in diameter.[1] Particles larger than 2.0 millimeters such as gravels, pebbles, and cobbles are considered coarse skeleton. Class names such as sand, silt, silt loam, clay loam, clay, sandy loam, etc., are determined by the proportionate amount of the different separates present in the soil. A soil with an analysis of 30 percent or more of clay fraction in considered a clay soil. Lately, however, this percentage was changed to 40, so that all soils containing 40 percent or more of clay are classified as clay soils.

The modified Bouyoucos method was employed in the mechanical analysis wherein the conventional jar, hydrometer, and thermometer were used. Analysis was made without removing the organic matter from the soil.

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[1] Previous to 1938, the United States Department of Agriculture used the 0.05 to 0.005 millimeters for the size of silt and smaller than 0.005 millimeter for clay.

Table ___ . --- Mechanical analysis of some surface soils of Mindoro Provinces.

Soil Mapping Number	Soil Mapping Unit	Sand (2.0-0.05mm.) Percent	Silt (0.05-0.002 mm.) Percent	Clay (below 0.002 mm.) Percent
228	Bantog clay	12.40	37.80	49.80
572	Buguey loamy sand	84.80	8.00	7.20
52	Calumpang clay loam	43.20	24.00	32.80
569	Calumpang silty clay loam	7.20	58.20	34.60
506	Mogpog clay loam	28.80	37.00	34.20
385	Quingua clay	11.20	36.60	52.20
109	Quingua clay loam	22.40	43.80	33.80
413	Quingua loam	38.40	39.00	22.60
412	Quingua sandy loam	58.80	23.00	19.20
5	Quingua silt loam	28.40	54.40	17.20
236	San Manuel clay loam	31.20	39.60	29.20
190	San Manuel loam	44.00	38.40	17.60
370	San Manuel loamy sand	84.40	8.80	6.60
96	San Manuel sandy loam	64.80	28.40	9.80
82	San Manuel silt loam	24.20	62.00	13.80
322	Umingan loam	44.80	31.60	23.60
407	Alaminos clay loam	44.80	25.00	30.20
699	Alaminos silty clay loam	18.80	44.40	36.80
127	Alimodian silt loam	29.20	50.00	20.80
507	Banto clay loam	21.40	41.40	37.20
153	Bolinao clay	25.80	28.60	45.60
108	Bolinao clay loam	36.80	23.60	39.60
276	Bulaoen clay loam	27.20	41.20	31.60
156	Lugo clay	14.40	42.40	43.20
239	Luisiana clay	9.20	35.20	55.60
140	Luisiana clay loam	42.20	27.00	30.80
861	Magsaysay silty clay	19.80	40.00	40.20
501	Maranlig clay	31.20	23.40	45.40
829	Maranlig gravely sandy clay loam	53.80	20.00	26.20
818	Maranlig loam	49.80	30.80	19.40
859	Tilik silt loam	20.00	56.40	23.60
860	Tilik silt loam, eroded phase.	24.40	54.00	21.60

LAND CAPABILITY CLASSIFICATION AND CONSERVATION GUIDE

FOR THE SOILS OF MINDORO PROVINCES

Land capability classification is a scheme of grouping soil type together for their proper utilization. Utilization, from the standpoint of agricutural as well as economic capabilities, implies any of or a combination of four general purposes, namely:

(1) cropland, (2) pasture land, (3) forest land, (4) land for wildlife or recreation. For cropping purposes the crop or set of crops are usually specified and the corresponding necessary soil management practices together with the supporting soil conservation measures are given.

The three major factors to consider in land capability classification are (1) the soil type, (2) the slope of the land, and (3) the degree of erosion. In the consideration of a given soil type, its physical and chemical properties, both of which consist of inherent and acquired characteristics, are fully evaluated in the field and in the laboratory. Land capability classes are further subdivided into subclasses by taking into account different soil problems. In the Philippines, the three major problems on soil are (e) erosion and runoff, (b) wetness and drainage, and (c) root zone and tillage limitations, such as shallowness, stoniness, droughtiness, and salinity. The subclasses are indicated by "e" for erosion and runoff; by "w" for wetness and drainage; and by "s" for root zone and tillage limitations.

The different land capability classes are as follows:

Class A --- Very good land; can be cultivated safely; requires only simple but good farm management practices.

Class B --- Good land can be cultivated safely; requires easy applied conservation practices.

Class C --- Moderately good land; must be cultivated with caution; requires carefull management and intensive conservation practices.

Class D --- Fairly good land, must be cultivated with extra caution; requires careful management and complex conservation practices. This land is good for limited cultivation only and best suited for permanent crops.

Class L --- Level to nearly level land; too stony or very wet for cultivation. Suited to pasture or forest with good soil management.

Class M --- Steep, very severely to excessive eroded or shallow for cultivation. Suited to pasture or forest with careful management.

Class N --- Very steep, excessive eroded, shallow, rough or dry for cultivation. Suited to pasture with very careful management and definite restrictions. Best suited to forest with very careful management.

Class X --- Level land, wet most of the time, cannot be economically drained. Suited for farm ponds or for recreation.

Class Y --- Very hilly or mountainous; barren and rugged; should be reserved for recreation and wildlife.

Table 7. --- Land Capability classification of each soil mapping unit in Mindoro Provinces.

Soil Mapping Number	Soil Mapping Unit	Possible soil [1] Unit (Slope-Erosion Class)	Land Capability Class/Subclass
385	Quingua clay		
109	Quingua clay loam		
413	Quingua loam		
412	Quingua sandy loam		
5	Quingua silt loam		
236	San Manuel clay loam	a - 0	A
190	San Manuel loam		
370	San Manuel loamy sand		
96	San Manuel sandy loam		
82	San Manuel silt loam		
108	Bolinao clay loam	b - 1	Be
818	Maranlig loam		
228	Bantog clay		
52	Calumpang clay loam	a - 0	Bw
569	Calumpang silty clay loam		
506	Mogpog clay loam		
572	Buguey loamy sand	a - 0	Bs
322	Umingan loam		
102	San Fabian clay loam		
407	Alaminos clay loam	b - 1	Ce
699	Alaminos silty clay loam		

[1] The slope-erosion units are possible conditions that may exist in each soil type. Any other unit with a slope or an erosion greater than the ones specified in the table will accordingly be classified under lower capability class.

Soil Mapping Number	Soil Mapping Unit	Possible soil Unit (Slope-Erosion Class)	Land Capability Class/Subclass
127	Alimodian silt loam	d - 2	M
507	Banto clay loam		
865	Banto-Malalag complex		
276	Bulaoen clay loam		
156	Lugo clay		
239	Luisiana clay		
140	Luisiana clay loam		
861	Magsaysay silty clay		
501	Maranlig clay		
829	Maranlig gravelly sandy clay loam		
36	Tagaytay sandy loam		
859	Tilik silt loam		
860	Tilik silt loam, gravelly phase		
1	Hydrosol	-	X
118	Beach sand	-	Ds
152	Riverwash	-	Y
202	Rough mountainous land	-	N

Land Capability Class A

Very good land. Can be cultivated safely. Requires only simple but good farm management practices.

Quingua clay	San Manuel clay loam
Quingua clay loam	San Manuel loam
Quingua loam	San Manuel loamy sand
Quingua sandy loam	San Manuel sandy loam
Quingua silt loam	San Manuel silt loam

Class A is level to nearly level land. The soil is deep, fertile or well supplied with plant nutrient elements, well drained, and easy to cultivate.

Erosion is not much of a problem. The land is rarely flooded.

This class is suited for intensive cultivation and all crops common in the area can be grown. Since soils under this class have good permeability, if lowland rice is to be grown, puddling the soil is usually necessary to minimize seepage.

Good farm management practices are required specially the judicios application of agricultural lime and fertilizers and the observance of crops rotation which should include a legumes of soil= improving crop in the sequence for sustained production. In consonance with lime and fertilizer application, greater benefits could be derived thereof if green manuring or the plowing under of young green plants, preferably leguminous crops, and the application of farm manure or compost are observed regularly.

Land Capability Class B, Subclass Be

Nearly level to gently sloping, slightly to moderately eroded. Erosoin is the main problem. Observe erosion control measure and easily applied conservation practices.

Bolinao clay
Bolinao clay loam
Maranlig loam

Subclass Be is nearly level to gently sloping land and is slightly to moderately eroded. It is deep with rather heavy subsoil.

The slope, which in any place is not more than 8 percent, makes the soil susceptible to moderate erosion.

Crops adapted to the area grown on soils of this subclass respond to good management. However, erosion control measures such as contour plowing, terracing, and strip cropping should be practices. Excess water on the area and runoff from the adjoining uplands must be channeled into grasses waterways or diversion ditches.

In addition to erosion control measures the proper kind and quantity of fertilizer and lime should be applied. Crop rotation should be observed wherein a legume is included in the sequence at least once in every three of four years for soil building purposes. For all legumes, the soil should be well supplied with lime and a phosphate-carrying fertilizer, if the soil does not contain the right kind of bacteria it should be inoculated accordingly. The use of farm manure or compost is recommended.

Land Capability Class B, Subclass Bs

Nearly level, Low fertility, shallowness, droughtiness, slight alkalinity or salinity is/are the problems. Adepth special soil management practices and observe easily applied conservation practices.

Buguey loamy sand
Umingan loam

Subclass Bs is nearly level land with sandy loam or light textured subsoil.

This subclass is potentially good land but the soil is inherently low in fertility and its porous subsoil allows water to percolate rapidly thus makeng it somewhat droughty. Moreover, fetility loss through leaching is relatively high.

Fruit trees, vegetable, and other truck and special crops are best adapted to this land.

Special soil management practices and the observation of easily applied conservation practices are necessary. To enbance and maintain productivity the plant nutrient and organic matter contents of the soil should be always at their highest possible level. Their means using a system of crop rotation which must include a legume at least once in every three or four years, the addition of farm manure or compost, and the application of mineral fertilizers. Increasing the organic matter content of the soil increase its waterholding capacity and improves its tilth and fertility. Supplemental irrigation may be needed during the dry season for best growth of all crops.

Land Capability Class B, Subclass Bw

Nearly level, occurs in depressions. Occasional overflow is the problem. Require protention from overflow. Observe easily applied conservation practices.

Bantog clay
Calumpang clay loam
Calumpang silty clay loam
Mogpog clay loam

Subclass Bw land is nearly level and occurs in depressions near large streams or on low bottom lands. Included under this subclass are wet lands that can be easily drained and those with a high water table. The soil is deep; the subsoil is heavy.

Poor external and internal drainage require some means to drain the excess water. Furthermore the area is subjected to occasional overflow.

Protection from occasional overflow of nearly streams maybe needed. Diversified ditches should be constructed for runoff coming from adjoining uplands.

When drained and cultivated , lime and the right kind and quantity of fertilizer should be applied. The planting of soil-improving crops and the use of farm manure and compost must be observed.

Land Capability Class C, Subclass Ce

Moderately sloping, moderately to severely eroded. Erosion are fertility are the main problems. Observed erosion control measures, careful management and intensive conservation practices.

San Fabian clay loam
Alaminos clay loam
Alaminos silty clay loam

Subclass Ce land is moderately sloping and is moderately to severely eroded. Its effective depth may extend to 90 centimeters or more.

The slope which ranges from 8 to 15 percent accelaration erosion. In turn erosion depleted fertility.

Primarily, for this subclass, a good cropping system should be planted. The crops grown and tillage methods effect soil condition, and consequently runoff and soil erosion. Different combinations of erosion-prevention and water-control practices should be chosen with the crops to be grown. In general, crops common in the area as well as fruit trees could be cultivated. Close-growing crops with a legumes in the rotation should be supported by practices that control runoff and minimize erosion the most important of which are contour tillage, strip cropping, cover cropping, grassed waterways, and terracing. In addition, lime and fertilizer according to needs, should be applied; compost and farm manure should be incorporated into the soil; and green manuring must be observed regularly.

Land Capability Class D, Subclass Ds

Nearly level to gently sloping, slightly eroded. Very low fertility, very rapid permeability and low moisture holding capacity, strongly alkaline or high salt content, formation of dunes is/are the problems. Adopt special soil management practices and observe complex conservation practices if land is to be cultivated.

Beach sand

Subclass Ds is nearly level to gently sloping land and is slightly eroded. The surface soil is shallow with sandy to loamy texture; the subsoil is highly permeable.

Relatively, subclass Ds land may be less sloping than subclass Cs land, but for root zone and tillage limitations, the former has more acute problems than the latter. Thus, Ds land is comparatively of lower fertility, or has a more rapid permeabilty and lower moisture holding capacity, or has a higher salt content than Cs land. Moreover, the formation of dunes through wind action is more likely to happen on land under subclass Ds.

If plants to clean culture crops soils under this subclass require intensive conservation measures. This subclass may be devoted to vegetable or to truch farming and to root crops provided water supply is adequeate and additional measures are taken of increase the water holding capacity of the soil.

Increasing the organic matter content of the soil by the application of compost and farm manure and the observance of green manuring are necessary. Other vegetative soil conservation measures to be instituted in conjunction with clean culture cultivation are contour and buffer strip cropping, cover cropping and mulching. Where sand dunes are likely to form vegetative and mechanical means to stabilize the shifting sand must be adopted.

It is not likely that soils under this subclass will need anylime but should it be deemed necessary, lime may be added only after the soil is analyzed. Commercial fertilizers needed would be more of nitgrogenous fertilizer for leafy vegetables and ammonium phosphate or complete fertilizers, as soil analysis may show, for the fruiting vegetables.

Steep, very severely to xexcessively eroded, or shallow for cultivation. Suited to pasture or forest with careful management.

Alimodian silt loam
Banto clay loam
Banto-Malalag complex
Bulaoen clay loam
Lugo clay
Luisiana clay
Luisiana clay loam
Magsaysay silty clay
Maranlig clay
Maranlig gravelly sandy clay loam
Tagaytay sandy loam
Tilik silt loam
Tilik silt loam, gravelly phase

Class M is steep and is very severely to excessive eroded, or shallow land. Stones or gravels may be present.

The slope, which ranges from 25 to 40 percent, and the generally shallow soil make this land unfit for seasonal cultivation. Where climatic conditions are favorable orchards of citrus, coffee, etc., may be developed provided the trees are planted along the contour., and a good cover is raised to prevent soil erosiom.

Land under this capability class is best suited to pasture or forest. When devoted to pasture careful management should be observed. To grow legumes or grass for grazing, the soil should be well prepared. Lime and fertilizers, as needed, should be applied to give the young legumes or grass a good start. Newly developed pastures should not be grezed heavily; the use of those already established should be controlled and rotated. Stock pons should be constructed wherever possible. Diversion around the heads of active gullies should be installed. Gullies that are about to developed should be smoothened and sodded.

For forest purposes, trees shouldbe protected from fires; kaingin cultivation must be prevented; bare spaces should be planted to trees like ipil-ipil.

Land Capability Class N

Very steep, excessively eroded, shallow, rough or dry for cultivation. Suited to pasture with very careful management and definite restrictions. Best suited to forest with very careful management and restrictions.

Rough Mountainous Land

Class N is very steep and is excessively eroded land. The soil is very shallow and dry; the land is rugged and broken by many large gullies.

The slope, which is 40 percent or over, and excessive erosion make this land not suitable for cultivation.

Land under this capability class could be utilized for pasture provided very careful management is observed and definite restrictions imposed. Where grasses grow, grazing must be controlled or restrictionsto a few heads of animals per hectares and grazing areas rotated regularly. The pasture will need liberal application of fertilizers and lime; reseeding, is necessary.

Class M is steep and is very severely to excessive eroded, or shallow land. Stones or gravels may be present.

The slope, which ranges from 25 to 40 percent, and the generally shallow soil make this land unfit for seasonal cultivation. Where climatic conditions are favorable orchards of citrus, coffee, etc., may be developed provided the trees are planted along the contour, and a good cover is raised to prevent soil erosion.

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The slope, which is 40 percent or over, and excessive erosion provided make this land not suitable for cultivation.

Land under this capability class could be utilized for pasture provided very careful management is observed and definite restriction imposed. Where grasses grow, grazing must be controlled or restrictions to a few heads or animals per hectares and grazing areas rotated regularly. The pasture will need liberal application of fertilizers and lime; reseeding, is necessary.

This land is best suited to forest. However, very careful management and restrictions must be observed. The established of permanent vegetation; like ipil-ipil, is recommended especially in gullied places. Kaingin farming must be stooped by all means.

Land Capability Class X

b Level land, wet most of the time and cannot be oconomically drained. Can be used for farm ponds or for recreation.

Hydrosol

Class X is level or slightly depressed land and because of its location and elevation sea water or fresh water finds passage into the area. In some places the water my flow or drain back to its source with the receeding tide while in other places the water stagnates. Land along the shore or very near the sea and the mouths of rivers and creeks which are accessible to sea water are usually covered by mangroves or nipa palms. Inland areas occupied by fresh water, on the other hand, are covered by grasses. In general, land covered by sea or fresh water part or most of the time is known as a hydrosol area.

This land is suitable for salt beds, fish ponds, farm ponds, or recreation as the case maybe.

In the construction of fish ponds or salt beds the trees and palms are cut except a strip along the shore line wide enough to protect the site from the scouring action of waves. For fish ponds the suite should be dug no less than a meter deep. Afterwards, the water should be fertilizer to produce a good growth of algae, the food for most fish.

Land Capability Class Y

Very hilly or mountainous, barren and rugged. Should be reserved for recreation and wildlife.

Riverwash

Class Y is extremely arid or very steep, rough and stony land with thin or no soil cover at all. It includes such areas as rocky-foot-hills, rough mountainous lands; large areas dotted with rock outcrops or strewn with boulders; and extremely eroded places with exposed substrata.

Land under this capability class is recommended for wildlife and recreation. By all means, existing forest should be preserved; as much as possible, where non-existent permanent forest vegetation should be established.

II. SOIL EROSION SURVEY

The reconnaissance soil erosion survey of Mindoro Provinces was conducted simultaneously with the soil classification survey of the provinces to (1) get a picture of the different degrees and extent of soil erosion in the provinces; (2) present the different factors that couse soil erosion; (3) show the effects of soil erosion to agriculture and the country's economic stability; and (4) to suggest possible remedial measures to control or check soil erosion.

SOIL EROSION DEFINED

Soil erosion is defined as the process of soil detach ent and tranportation by either wind or water. There are two kinds of erosion; namely, normal or geologic and accelerated erosion.

Normal or geologic erosion. --- Normal or geologic erosion takes place in a natural or undisturbed condition under the canopy of forest, grass, ground litter, and in underground network of binding roots. Geologic erosion is a slow process; the removal of the soil by either water or wind is balanced by the formation of soil from the parent material underneath. This kind or erosion is beneficial in the sense that there is a constant renewal of the fertility of the soil.

Accelerated erosion.--- Accelerated erosion is the process brought about by man's activities on the land, thereby disturbing the equilibrium between soil building and soil removal. This kind of erosion is destructive as it removes soil particles very much faster than the formation of soils from the material underneath. The loss of the surface soil which contains most of the fertility means also the decline in crop yields. Soil erosion in the Philippines is caused mainly bywater. The different kinds of accelerated soil erosion are: sheet, rill, gully, and streams bank erosion.

Sheet erosion.--- This is the washing away in a more or less uniform depth, of the upper part of the soil in the croplands. It occurs when farmers cultivate their sloping lands without employing any means of controlling the flow of the surface water or runoff. At the beginning, this kind of erosion is slow and its not noticeable, but it is treacherously destructive.

Rill erosion.--- This kind of erosion is the washing off of the soil by the formation of tiny incisions of a few inches depth and width which run down the slopes of an unprotected cultivation land. This is attributed to the method of planning and aranging the furrows along the slope of the land. Such rills may be erased by ordinary plowing. This type of erosion marks the biginning of the formation of more serious kinds of erosion.

Gully erosion.--- This erosion occurs on paths of concentrated flow down a slope and is the cutting of deep narrow strips or gullies on the face thereof. Gullies occur both on alluvial plains as well as on uplands. On a plain where drainage outlets are not protected, the edges of the plain are gradually eroded which consequently form into vertical cuts. These gullies, if not checked gradually destroyed the plain. On uplands, gullying occurs mostly on slopes where runoff continually drain. This happens when farmers plow their fields up and down slopes. Some gullies are small, but others are so big that farm animals cannot cross. Gullies grow bigger each year.

Stream bank erosion.--- This kind of erosion occurs along the banks of streams and river. It is very destructive particularly on such lands where the substrata are of coarse or medium-textured soils. The flowing water undermines the lower part of the river or stream bank particularly along its outer curve thus causing the upper part to fall by its own weight.

FACTORS AFFECTING SOIL EROSION

Soil erosion occurs when water runs over the surface of a sloping land. This water running over the surface is called runoff. The rate of soil erosion will depend upon the speed of surface runoff. The volume of runoff as well as its speed depend upon the soil, slope, vegetation, and intensity of rainfall in the area.

Soil

The soil possesses certain physical characteristics which influence its erodibility. Under similar conditions of climate, relief and vegetative cover, there are marked differences in the erodibility of different soils. In some cases sandy loam soils are more susceptible to erosion than clay loam soils.

Porosity and permeability are important factors in the formations of runoff. The higher the absorbing quality of the soil or infiltration of water into the soil the less runoff will be formed. Different soils types differ in porosity and permeability. Also soils rich in organic matter are porous and will absorb more water readily than those poor in it.

Slope

Slope has a great influence on erosion. Runoff flows faster on a steeper slope than on one with lesser grade. Taking other erosion factors equal, soil loss is greatest where runoff is fastest. Furthermore, on farm lands with the same grades of slopes, one with a longer slope will erode more than one with a shorter slope. This is so because as runoff acquires momentum its cutting power as well as the soil carrying capacity is increased considerably. A slope unprotected by vegetation or some mechanical devices to decrease the velocity of runoff suffers heavilty during a heavy rainfall.

Vegetation

The density of the vegetative cover of an area contributes a great deal to its resistance of erosion. In the heavily wooded portions of our forest the rate of soils loss is balanced by the formation of soil underneath. On cultivated farms the crops offer very little protection for the soil. Crops that can cover the ground well will give some protection for the soil but clean tilled row crops are conductive to erosion. Land on slopes exposed or bare of vegetative cover suffers heavy soil losses.

In the open areas where cogon predominated very little erosion takes place. The thick growth of cogon is quite adequate protection of the land. Even on steep slopes the grass cover if preserved and improved will give good protection.

Intensity of Rainfall

Rainfall intensity is a factor in erosion. A region with rainfall distributed throughout the year will have less soil erosion than another area where the same amount of rain occurs but only within a period of six months. In the latter area the intensity of rainfall is much bigger and hence the amount of runoff is correspondingly greater. In the former case, the intensity of rainfall is less giving more time for the water to infiltrate into the soil, hence, less runoff.

How much of the rain that falls run off the surface is shown by investigations conducted by the United States Department of Agriculture. At the Yazoo River Watershed, 27 inches of rain caused a disastrous flood, where 62 percent of the rain water immediately run off cultivated fields and carried soil at the rate of 34 tons per acre. Runoff from plots on barren abandoned fields was 54 percent of the to tal rainfall.

Surface runoff during the most intence rains increased from 75 to 95 percent of the total precipitation. On undisturbed oak forest only 0.5 percent of the 27 inches of rain ran off the experimental plot while soil removed was only 75 pounds per acre.

FACTORS PROMOTING SOIL EROSION

System of farming lands.--- In the province, most of the farm lands are rolling and hilly. These are planted to upland rice, corn, and those tobacco which are erosion promoting crops. No means of protectiom is employed in farming these sloping lands. Erosion is aggr vated by the common farm practice of plowing up and down hill and laying the furrows along the slopes.

Crop rotation in the provinces is seldom practiced. Rice, tobacco and corn are planted from year to year. Sometimes the field is followed after the rice crop. A good rotation of crops which includes a soil building legumes helps conserve the soil.

The pasture lands are over grazed. As a result, hillsides have very scant grass cover and erosion is very much in evidence.

Kaingin.--- This is another factor contributing to the destruction of soil and forest. Very often kaingin clearings are made on steep slopes. The trees and other vegetation are burned, leaving the area cleared and entirely bare. When it rains runoff rushes downhill and genrates quite a tremendous cutting power that detaches and carries a great of deal surface soil. Rills and sometimes gullies often result after one heavy rain.

SOIL EROSION SURVEY METHODS

The primary purpose of the soil erosion survey is to determine the degree of erosion in the different soils of the provinces, that is, the extent to which removal of the surface or subsoil has progressed as well as the amount of gullying with special reference of its effect on the cultivation of the land.

The present depths of the different soil types under cultivation in the province were compared to the depths of the virgin soils or soils with normal profiles. The depths of different soils under normal profiles were established after various determinations over a wide area by boring with the soil auger, studying road cuts, pits, open wells and streams banks.

Variations in the depth of soil as caused by erosion together with the presence of gullies are considered in mapping the different erosion classes. The depth and frequency of occurrence of gullies are noted as these effect the cultivation of the land. The classification of the different degrees of soil erosion used in this survey are as follows:

Erosion Class	Degree of erosion	Description
0	No apparent erosion; no gullies	No apparent erosion; no gullies.
1	Slight erosion	Less than $\frac{1}{4}$ of original surface soil eroded; occasional crossable gullies present.
2	Moderate erosion	From $\frac{1}{4}$ to $\frac{3}{4}$ of original surface soil eroded.
3	Severe erosion	From $\frac{3}{4}$ of original surface soil to $\frac{1}{4}$ of subsoil eroded.
4	Very severe erosion	All of the surface soil to $\frac{3}{4}$ of subsoil eroded.
5	Excessive erosion	All the surface soil and over $\frac{3}{4}$ of subsoil eroded.
W	Normal erosion	Balance between soil erosion and soil formation is maintained.
Q	Erosion, undifferentiated	Erosion conditions change as often as floods occur.

The extent as well as the degree of soil erosion will increase each year unless control measures are instituted and practiced.

SOIL EROSION IN THE DIFFERENT AREAS

The soils of Mindoro Provinces have undergone erosion, normal or geologic and accelerated, at one time or another. The erosion survey of the province was conducted to determine the degree of erosion to which the different soil types have been subjected. However, due to the numerous factors resposible for erosion accurate erosion losses by individual fields cannot be presented but rather the general distribution of such losses.

So much so that one can expect that the same soil type in different areas may have different degrees of erosion, or two different but adjacent soil types may have the same degree of erosion. Likewise, different adjacent soil types may have different degrees of erosion and one soil type in an area may have different degrees of erosion within its boundaries.

The degrees of erosion of which the different soil types of the province have been sunjected are shwon in table 8.

Table 8.--- Erosion classification of each mapping unit in Mindoro Provinces.

Erosion Class	0-No apparent erosion	1-Slight erosion	2-Moderate erosion	3-Severe erosion	W-Nor al erosion	Unclassified
	Bantog clay Buguey loamy sand Calumpang clay loam Calumpang silty clay loam Mogpog clay loam Quingua clay Quingua clay loam Quingua loam Quingua sandy loam Quingua silt loam San Manuel clay loam San Manuel loam San Manuel loamy sand San Manuel sandy loam San Manuel silt loam Umingan loam	Bolinao clay Bolinao clay loam Bulaoen clay loam Luisiana clay Luisiana clay loam Magsaysay silty clay Maranlig gravelly sandy clay loam	Alaminos clay loam Alaminos silt loam Alaminos silty clay loam Banto clay loam Banto-Malalag complex Bulaoen clay loam Lugo clay Luisiana clay Luisiana clay loam Maranlig loam Maranlig gravelly sandy clay loam Tilik silt loam Tilik silt loam, gravelly phase	Banto clay loam Banto-Malalag complex Bulaoen clay loam Luisiana clay Tilik silt loam Tilik silt loam, gravelly phase	Hydrosol Beach sand Riverwash Rough mountainous land	Soguicay Island Aslom Island Sibalat Island Alibatan Island Garza Island

EFFECTS OF SOIL EROSION

Soil erosion has an exhausting influence on agriculture. Freviously, most of us have had so little concern about its adverse effects; it was only recently that we became aware of the fact that erosion if left uncontrolled will eventually deplete our agricultural lands of their productivity thereby affecting the nation's economic stability and prosperity.

Physical Effects

Where erosion exists, the first to suffer is the land which is gradually robbed of its surface soil or furrow slice. This means that not only the inherent fertility of the soil is loss by costly commercial fertilizers added are wasted as well. Much more, if the furrow slice shall be comprised less of the surface soil and more of the subsoil which is usually less fertile, there will be greater difficulty in maintaining a satisfactory physical condition of the soil. Moreover, eroded soil materials, such as sand and gravel, have at times covered entire fields of newly cultivated crops causing so much loss in seeding and interference in subsequent cultivation. The objectives of any shheme of soil management, however good, is therefore seriously interfered with. One appreciable effect of soil erosion is the silting up to reservoirs which reduces their storage capacity and adding greatly to the expense of their upkeep. Gullying and stream bank cutting of agricultural lands seriously impair the productive capacity on the farm and the farmer's income suffers an appreciable loss. Likewise, highways near or parallel to stream or river courses suffer from stream bank cutting and those along the hills and mountains suffer from landslides thereby the means of transportaion is seriously impeded.

Economic and Cultural Effect

The adverse effects of accelerated or man-made soil erosion are much too obvious that they need not be over emphasized. Unfortunately, however, most people take the existence of soil from granted, in the manner that almost overyone always indifferently regards the existence of the air we breathe. Whereas our supply of the latter has never been doubted, the certainly of our enjoying the bounty of the former cannot last forever unless we recognize the imminent dangers of soil erosion.

Soil conditions have much to do to shape the pattern of a nation's existence. While we begin by trying to analyze their effects from an agricultural point of view, we ultimately arrive at their economic and social effects as well. This is so because agricultural economic and social conditions are closely interrelated so much so that it is quite difficult to separate them too sharply. Erodibility being one of many soil conditions, should ever be borne in mind as much as fertility.

We know that food, shelter, and clothing mam's basic needs, all emanate from the soil. Soil lost to us if taken interms of the economic value of production of these basic needs surely would amount to enormous figures. The high cost of living may then be partially understood.

We know that while soil loss mounts, there is no sign that population also declines. The tendency is when population increases, people tend to overwork the soil. Overworking the soil inevitably results in decline of productivity. Soil erosion then commences and if unchecked, the people simply abandom the affected area and move to other places. This may happem once or more than once within a generation. What has started as an agricultural problems also becomes an economic and social problems.

We know that industry, especially the manufacture of consumer goods, is dependent on the supply of various raw materials. By and large, these raw materials are produced from the soil. Industry, therefore, directly and indirectly is affected by soil erosion. In turn when factories shut down or curtail operation, men lose their jobs and another social problems is added.

Soil erosion, therefore, is not the individual farmers problem alone. While it affects his capacity to provide for his family's wants and meet his social obligation, erosion eventually become a community's province's and finally a nations agricultural, economic, and social concern.

METHODS OF EROSION CONTROL

There are two general ways of erosion control in croplands; namely, (1) vegetative measures, and (2) mechanical means. Vegetative measures are simpler and easier to apply, while mechanical means usually require engineering aids, tools, and machenery. The former is usually employed on lands that are nearly level to gently rolling, while the latter is adapted to rolling and undulating land. Sometimes both means are employed simultaneously, or one in support of the other depending upon attendant circumstances.

Vegetative Measures

Control of erosion by vegetative means deals with the use of plants following the normal farm operations and use of ordinary implements and machinery.

Cover cropping.-- Vegetative cover is the first protection against runoff and erosion. Cover crops are usually planted after the harvest of row tilled or seasonal crops. There are also permanent cover crops which are mostly planted in orchards. When planting cover crops mulches of dead stems, leaves, or straw are necessary since cover crops offer protention only after they have attained considerable growth.

Strip cropping.--- This vegetative method of erosion control is the alternate cultivation ofclean tilled crops on one strip and dense close growing crops on the next strip. These alternate strips break up a relatively large sloping field into small narrow bands lying across the slope. They serve to check the momentum of runoff and to filter out the soil particles. The subsequent loss of the speed of runoff allows rain water to seep into the soil rather than readily flow down the slope. Soil and water are thus conserved.

Buffer strip cropping.---Buffer strips are established bands usually on the contour, two or three meters wide, planted to perennial grass or other erosion-resisting vegetation. They are arranged in regular alternation with relatively wider strips of row a tilled crops. Buffer strips are adapted to land with slopes up to eight percent. When the slopes is long, a combination of vegetative and some mechanical means may be necessary. Grasses such as Guinea grass, Napier, Brown-top, Bermuda grass, and ipil-ipil (periodically trimed to about a foot high) are recommended.

Grassed waterways.---Waterways in soils work are either natural or man-made depressions on sloping areas which serve as passageways for water that goes through a farm from adjacent land or accumulating on it due to rain. They are important in any scheme of soil and water conservation. Naturally located depressions serve the purpose best. Man-made canals strategically laid are also necessary from more efficient discharge of runoff. The establishment of a dense vegetative cover all waterways is imperative. Grasses readily adaptable to the area should be used, but whenever practicable those species which form a dense turf are preferable. Inasmuch as waterways are supposed to carry heavy flows during certain periods they should be designed to handle maximum runoff from the heaviest rainfall occuring in the locality once in about eight to ten years. Grassed waterways are essential wherever excess runoff accumulate such as in strip cropped fields.

Mechanical Measures

On steep slopes vegetative measures offer inadequate protection for the soil. Mechanical means of erosion control are therefore essential in conjunction with the vegetative phase.

Contour tillage.--- Contour tillage is plowing and planting on the contour. This is an erosion control measures which is most effective on two to eight percent slopes and less than 100 meters long. Ridges formed by the tillage implements retard the downhill flow of water. These ridges serve adequately when rainfall are intense or heavy. Contouring is not enough protection especially when slopes are not uniform and above eight percent, when the fields are already eroded, or when subsoil are clayey and compact. In these cases excess runoff may break through the ridges thus necessitating the adoption of other mechanical conservation measures like terraceng.

Terracing.---Terraces are mechanical measures of soil conservation and are differentiated into three types; namely, (1) absorptive, (2) bench, and (3) drainage.

Absorptive terrace or ridge type is designed for moisture conservation. It is adapted to gentler slopes and absorptive soils.

Bench terrace is constructed on the contour. It has a steep drop and adapted to steeper slopes.

Drainage terrace of broad channel type is designed to conduct water from a field at low velocity.

As used in this text, terrace may denote a ridge type or a combination of ridge and channel type.

Terraces are built across a slope. They are either level or graded depending upon the purpose for which they are made. Graded terraces land runoff from the field at nonerosive velocities. Level terraces impound most of the water giving it time to soak into the soil. Where the average annual rainfall is less than 30 inches, level terraces are recommended. Dimensions of terraces are also ofoutmost importance. They should be large enough to avoid overtopping. Usually the runoff which may be expected from the heaviest rain occuring on an average of once in 10 years is used as a basis. Their shape is generally based on the farming equipment used.

Terrace construction requires technical skill, financing, and special implements and machinery. Aside from these considerations, one most realize that all slopes and all soils cannot be successfully or economically terraced. Sandy, stony, and shallow soils, fields dotted by humps or mounds, or slopes that change planes and steepness every 30 meters are impractical to build terraces on.

Diversion ditches.--- Diversion ditches or diversion terraces are built to intercept the runoff from drainage areas. They are usually large than field terraces. They are desinged to protect cultivated fields from hillside runoff by providing for a passageway of the water away from the fields to other nearby areas where it is spread or disporsed. Where adjacent slopes generate runoff towards a terraced area, diversion ditches carry the water away from the terrace system, of if towards a gully diversion the water assist in controlling its further enlargement.

Other Aspects of Erosion Control

Whereas erosion depleted the soil of its inherent fertility, low fertility also brings about soil erosion. Infertile soils invariably mean poor vegetation, thus more surface soil is exposed to direct rain and wind action.

Therefore, soils of low fertility when tilled are highly erodible. In this case proper an adequate fertilization can minimze erosion.

The regular application of farm manures and the practice of green manuring increase the soil's organic matter content. Organic matter, asides from enchancing soil fertility, also improves tilth and maintain if not improve soil structure. Stable and favorable soil structure means higher porosity and better permeability. When soils are porous and permeable plant root penetration is improved. All of these faverable physical condition when attained promote the soil's water absorbing and water holding capacities or in other words surface runoff is minimized.

Crop rotation should essentially be a part of every farm program. A well planned scheme of crop rotation, asided from providing a practical means of utilizing green manures and fertilizers, counteracting possible development of toxic substances, and improving crop quality and increasing yields, also minimize or help control erosion. This farm practice keeps the soil in suitable physical condition, helps maintain the supply of organic matter and nitrogen in the soil, provided vegetative cover, and changes the location of the feeding ranges of roots.

The physical effects of liming such as the promotion of soil granulation of fine textured soils and the modification and improving of the structure ofcoarse textured soils thus makeng them lighter to work subsequently contribute much to erosion control.

An efficient system of soil management in support to vegetative and mechanical measures is, indeed, necessary to combat soil erosion. The different practices followed or adopted should form a farm program that as a unit could fit the kind of soil or kinds of soils within a farm so that the end attained is the combined beneficial effects of the many interacting processes involved. Each farmer, therefore, should first appraise the erosion hazards of his farm, then plan a cropping system and supporting conservation practices of reduce or offset the erosion hazards.

GLOSSARY OF COMMON ECONOMIC PLANTS FOUNDS IN MINDORO PROVINCES

Common Name	Scientific Name	Family
Abaca	Musa textilis Nee	Musaceae
Ampalaya	Momordica charantai Linn	Cucurbitaceae
Avocado	Persea americana Mill.	Lauracene
Apitong	Dipterocarpus grandiflorus Blanco	Bipterocarpaceae
Atis or sugar apple	Anona squamosa Linn.	Anonacene
Bakauan	Rhizophora mucrenata Lam.	Rhizophoraceae
Bamboo	Bambusa spinosa Roxb.	Gramineae
Banana	Musa sapientum Linn.	Musaceae
Bangkal	Nauclea Orientalis Linn.	Rubiaceae
Batao	Delichos lablab Linn.	Leguminosae
Binayuyo	Antidesma ghaesembilla Gaertn.	Euphorbiaceae
Betel nut	Areca catechu Linn.	Palmae
Breadfruit	Artocarpus communis Forst.	Moraceae
Buri	Corypha elata Roxb.	Palmae
Cabbage	Brassica oleracea Linn. var. capitata Linn.	Cruciferae
Cacao	Theobroma cacao Linn.	Sterculiaceae
Camote	Ipomoea batatas (Linn.) Poir	Convolvulaceae
Canna	Cana indica Linn.	Cannaceae
Caimito	Chrysophyllum cainito Linn.	Sapotacene
Cassava	Manihot esculenta Crantz.	Euphorbiaceae
Chico	Achras sapeta Linn.	Sapotaceae
Coconut	Cocos nucifera Linn.	Palmae
Coffee (Arabica)	Coffea arabica Linn.	Rubiaceae
Cogon	Imperata cylindrica (Linn.) Beauv.	Gramineae
Corn	Zea mays Linn.	Gramineae
Cowpea	Vigna sinensis (Linn.) Savi.	Leguminosae
Eggplant	Solanum melongena Linn.	Solanaceae
Gabi	Colocasian esculenta (Linn.) Schoot and Endl.	Araceae
Garlic	Allium sativum Linn.	Liliaceae
Guayabano	Anona muricata Linn.	Anonaceae
Ginger	Zingiber officinale Rosc.	Zingiberaceae
Guava	Psidium guajava Linn.	Myrtaceae
Ipil-ipil	Leacaena glauca (Linn.) Benth.	Leguminosae
Jackfruit	Artocarpus heterophyllus Lam.	Moracene
Kadios	Cajanus cajan (Linn.) Millsp.	Leguminosae
Kalamansi	Citrus microcarpa Bunge	Rutaceae
Kapok	Ceiba pentandra (Linn.) Gaertn.	Bombacaceae

Madre cacao	Gliricidia sepium (Jack) Steud	Leguminosae
Lanzones	Lansium domesticuk Correa	Meliaceae
Malunggay	Moringa oleifera Lam	Moringaceae
Molave	Vitex parviflora Juss	Verbenaceae
Mungo	Phaseolys aureaus Roxb	Leguminosae
Mango	Mangifera indica Linn	Leguminosae
Narra	Pterocarpus indicus Wild	Anarcardiaceae
Nipa	Nypafruticans Wurmb	Leguminosae
Onion	Allium cepa Linn	Palmae
Oranges	Citrus aurantium Linn	Liliaceae
Papaya	Carica papaya Linn	Rutaceae
Patani	Phaseolys lunatus Linn	Caricaceae
Patola	Luffa cylindrica (Linn.) M. Roem	Leguminosae
Peanut	Arachis hypogeea ,Linn	Cucurbitaceae
Pechay	Brassica chinensis Linn	Leguminosae
Potato	Solanum tuberosum Linn	Cruciferae
Radish	Raphanus sativus Linn	Solanceae
Rattan	Calamus spp.	Palmae
Rice	Oryza sativa Linn	Gramineae
Santol	Sandoricum koetjape (Burm.) Merr.	Cruciferae
Sitao	Vigna sesquipedalis Fruw.	Meliaceae
Sineguelas	Spondias purpurea Linn.	Leguminosae
Soybean	Glycine max (Linn.) Merr.	Anacardiaceae
Squash	Cucurbita maxima Duchesne	Leguminosae
Sugar can	Saccharum officinarum Linn	Cucurbitaceae
Talahib	Saccharum spotaneum Linn	Gramineae
Tamarind	Tamarindus indica Linn	Gramineae
Tambo	Phragmites vulgaris (Lam.) Trin	Leguminosae
Tobacco	Nicotiana tabacum Linn	Gramineae
Tomato	Lycopersicum esculentum Mill.	Solanaceae
Tungue	Diocorea esculenta (Lour.) Burkill	Solanaceae
Ubi	Dioscorea alata Linn	Dioscoreaceae
		Dioscoreaceae

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