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SOIL SURVEY OF NUEVA ECIJA PROVINCE PHILIPPINES

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Description of the Area.- The Province of Nueva Ecija is situated in the eastern part of the Central Plain of Luzon. It is bounded on the north by Pangasinan and Nueva Vizcaya Provinces, on the east by Tayabas Province, on the south by Bulacan and Pampanga Provinces, and on the west by Tarlac Province.

The topographic features of the province are the low-lying alluvial plains in the western, central, and southwestern parts, and the rolling uplands and mountains in the northern, eastern, and southeastern parts. The mountainous northern portion is a part of the "Central Knot" of Luzon, or Caraballo Sur Mountains, while the mountainous eastern and southeastern portions are a part of the Sierra Madre Range.

One of the lowest areas in the province is the swampy area in the sourthern part of Cabiao, which is a portion of the Candaba Swamp of Pampanga Province. The elevation of that area is about 12 meters above sea level. In the barrio of Papaya of the municipality of San Antoni the elevation is also about 12 meters above sea level. The region comprising the towns of Gapan, Jaen, San Isidro, Zaragosa, and Licab has an elevation of about 18 meters above sea level. Cabanatuan has an elevation of about 27 meters, Muñoz about 61 meters, and San Jose about 104 meters above sea level. The pass to the Cagayan Valley at the boundary of Nueva Ecija and Nueva Vizcaya is approximately 884 meters above sea level. On the Sierra Madre Range in the eastern part of the province is a mountain peak which is 1,812 meters above sea level.

There are several rivers in the province of which the Pampanga (or Rio Grande de Pampanga), the Peñaranda, the Talavera, and the Chico Pampanga Rivers are the principal ones. The three rivers join the Pampanga River and constitute its principal tributaries. The Sabani Valley, which is located south of Boñagon, is an important Valley; it has extensive rolling lands with good pasturage.

The rolling uplands of the Carranglan-Pantabangan and Boñgabon areas are the head waters of the Pampanga River. These areas are thoroughly deforested and covered

mostly with cogon which is burned out almost every year.

Geologically, the plain of the province consists of recent alluvial deposits of various materials. The depths of these deposits vary in many places according to the elevation of the area. The absence of gravel, cobblestones, and pebbles in the substratum shows that these deposits were made by slow-moving streams. The mountains in the northern part consist of Tertiary undifferentiated rocks, while those on the eastern sides consist of Tertiary and later effusive rocks of rhyolites, dacites, and basalts. The foothills on the western flank of the Sierra Madre Range consist of narrow strips of volcanic tuff material, sandstone, shales, and limestones.

DRAINAGE AND IRRIGATION

The drainage system of the province consists of several rivers which flow throughout the region from the highlands down to the Pampanga River and the Chico Pampanga River. The Pampanga River is the largest in the province. The headwaters of this river are in the highlands of Carranglan, Pantabangan, Rizal, Boñgabon, and Laur. From these highlands the river meaders its way down to Cabanatuan, Sta. Rosa, Jaen, San Isidro, San Antonio, and Cabiao; passes through Pampanga Province and then empties into Manila Bay. On both sides of this river are located several tributaries.

The rice fields at Boñgabon and Laur are partially irrigated and hence they depend mostly upon the rain for their water supply.

The headwaters of the Peñaranda River are in the highlands and mountains of Papaya and Peñaranda. This river joins the Pampanga River at San Isidro. The Peñaranda Irrigation System, which gets its water from the Peñaranda River, irrigates the rice fields in Gapan, San Isidro, and Cabiao and also those in San Miguel, Bulacan Province.

The head waters of the Talavera River are in the uplands and mountains of Carranglan, San Jose, and Lupao. The Talavera River meanders down to San Jose, Talavera, Sto. Domingo, Quezon, Aliaga, Zaragosa, and then joins the Chico Pampanga River. Several thousand hectares of rice land in San Jose, Muñoz, Talavera, and Sto. Domingo are irrigated by the Talavera Irrigation System. Between

Zaragosa and Aliaga is a small lake formed by the Talavera River. The lowlands along the boundary of Tarlac and Nueva Ecija are always flooded during the rainy season.

CLIMATE

The climate of Nueva Ecija Province belongs to the first type of climate in the Philippines which includes those of Manila and Vigan, Ilocos Sur. This type of climate has two pronounced seasons, the dry and the wet seasons. In Nueva Ecija the wet, or rainy season lasts from May to November, with the maximum rainfall occuring during the month of July. Table 1 shows the average monthly rainfall and temperature at San Isidro and the average rainfall at five other weather stations in Nueva Ecija Province. According to this record the mean annual rainfall in the province is 1,898,5 millimeters.

The minimum monthly temperature during a ten-year period (1924-1933) was 19.2°C. in January, and the maximum monthly temperature was 36.2°C in April.

Nueva Ecija lies in the zone of very frequent typhoons. However, the mountain ranges in the northern, eastern, and southeastern parts of the province afford a natural protection against destructive typhoons coming from these directions.

AGRICULTURAL STATISTICS

The most important industry in the province is agriculture. The province has a total area of approximately 541,706 hectares, about one-half of which is under cultivation. In the area classified as open land a large portion may still be utilized as grazing land. Table 2 shows the classification of the soil cover of Nueva Ecija Province.

Because of the wide level area, numerous streams, and the favorable climate of the province, rice growing is the leading agricultural pursuit of the people. According to the 1938 statistics, of the total cultivated area of the province which was 248,480 hectares, 90.86 per cent, or 325,760 hectares, were devoted to the cultivation of rice. Of the total value of produce for 1938

Table 1. Average Monthly rainfall and temperature at San Isidro and average monthly rainfall at five other weather stations in Nueva Ecija Province.

Month	San Isidro			Boñgabon Stock Farm	Muñoz Agricultural School	Nueva Ecija Sugar Mills	San Felipe Aliaga	Quezon
	Rainfall	Temperature		Rainfall	Rainfall	Rainfall	Rainfall	Rainfall
	1902 to 1933	1924 to 1933		1929 to 1937	1918 to 1937	1927 to 1937	1928 to 1933	1928 to 1933
	mm.	°C. Maximum	°C. Minimum	mm.	mm.	mm.	mm.	mm.
January	11.6	31.6	19.2	9.8	3.3	8.3	5.2	6.2
February	7.2	33.0	19.96	10.0	7.3	9.7	0.0	1.0
March	16.4	34.6	21.1	11.4	19.3	35.3	7.8	12.4
April	42.7	36.2	23.0	35.1	28.6	49.9	52.0	47.5
May	186.6	35.3	24.0	238.8	206.7	183.6	228.6	193.2
June	235.6	32.4	24.0	193.1	232.2	195.8	189.0	246.5
July	390.6	31.3	23.7	433.1	409.3	346.5	345.2	367.3
August	362.4	31.0	23.8	399.3	398.9	321.3	378.1	378.7
September	297.9	31.8	23.8	365.0	274.4	301.9	308.3	368.2
October	189.3	31.6	23.2	200.2	192.7	153.8	217.4	140.7
November	102.6	31.5	21.7	151.2	86.7	98.1	103.2	87.4
December	57.2	31.5	20.1	58.8	28.6	45.9	34.2	29.1
	1,900.1	--	--	2,105.8	1,886.0	1,750.1	1,869.0	1,878.2

[redacted]

Table 3. Area planted and value of production of seven leading crops of Nueva Ecija Province in 1936, 1937, and 1938.

Crop	1936		1937		1938	
	Area planted	Value	Area planted	Value	Area planted	Value
	Hectares	Pesos	Hectares	Pesos	Hectares	Pesos
Palay	229,750	20,720,550	237,080	21,036,460	225,760	21,718,950
Corn	5,120	93,100	8,030	200,890	10,660	187,080
Sugar cane	3,140	581,410	3,200	499,560	3,260	670,080
Banana	2,696	269,470	2,686	268,600	2,688	289,120
Tobacco	1,690	67,630	1,680	81,180	1,785	81,680
Mango	846	199,430	846	199,560	847	232,780
Sweet potato	380	7,830	547	10,630	634	12,240
Total for all crops ----	246,204	22,147,210	256,829	22,520,500	248,480	23,436,210

Rice. - Rice is the staple crop of the province. It is grown in all towns of Nueva Ecija which is the premier rice-producing province of the Islands. The area planted to rice, the production, and the average yield per hectare of the ten leading rice-producing provinces of the whole Philippines are shown in Table 4. In 1938, Nueva Ecija gave the highest average yield of palay per hectare, which was 39.43 cavans, while the average for the whole Philippines was 27.38 cavans. In the same year, of the total area planted to rice in the Philippines, 11.81 per cent was in Nueva Ecija, which gave 17 per cent of the total rice production of the country.

Table 4.- Area planted, production, and yield per hectare of ten leading rice-producing provinces and of the whole Philippines in 1938.

Province	Area planted	Production	Average yield per hectare
	Ha.	Cavans	Ha.
Nueva Ecija	225,760	8,901,210	39.43
Pangasinan	203,210	6,398,250	31.48
Iloilo	112,020	2,794,790	24.95
Lanao	90,780	2,532,650	28.12
Bulacan	67,980	2,454,360	36.10
Tarlac	78,300	2,403,350	30.69
Capiz	63,980	1,684,850	26.33
Ilocos Norte	63,090	1,581,170	25.06
Pampanga	47,760	1,482,250	31.03
Cotabato	38 ,730	1,196,930	30.90
Total for Philippines	912,050	52,345,210	27.38

According to cultural requirements of habitat there are two groups of rice varieties grown in this province, the lowland and the upland varieties. Among the lowland varieties is a subgroup of species called palagad which is well adapted for dry season planting in places where irrigation facilities are available.

In the 1939-1940 planting season the standard varieties of lowland rice planted in Nueva Ecija, arranged in the order of their hectarage, were Macan Bino, Ramai, Elon-elon, Khao Bai Sri, Apostol, Macan Sta. Mesa, Señora

II, Ramelon Str. 2, Inachupal, Quezon rice (Raminad Str. 3), and Raminad Str. 4. The average yield per hectare of these varieties varied from 40 cavans with Apostol to 75 cavans with Quezon rice.

Besides these standard varieties there were other lowland rice species planted on a commercial scale. The most important among them were Macan Tago, Macan China, Macan Lamio, and Macan Aga.

The standard palagad varieties planted in the 1939-1940 season were Pinursigue and Guinangang. The yield of these varieties varied from 35 to 52 cavans per hectare.

The lowland varieties of rice are planted in relatively low paddy lands which are either irrigated from a canal or are rain-fed.

Among the upland varieties are Kinastila, Inantipolo, Inintiw, Piniling Baybay, Sinampiro, Kinampupoy, Kinandang Puti, Binicol, and Dumali. These varieties are planted in the rolling and upland areas of the province and are dependent on rainfall for their water supply. The cultivation of upland rice in Nueva Ecija is more or less extensive in the municipalities of Carranglan, Pantabangan, Rizal, Boñgabon, Laur, Papaya, Peñaranda, Cuyapo, and Lupao. As a rule, upland rice gives a lower yield per hectare than lowland rice.

The application of commercial fertilizer in rice land is a recent practice by a few farmers. In the Central Luzon Agricultural School at Muñoz, ammonium sulfate was tried at the rate of 300 kilograms per hectare on Maligaya clay loam. The yield of rice was increased from 15 to 20 cavans per hectare over the control. Fertilizer experiments with rice in the different rice-producing province are being undertaken by the Division of Soil Survey. The results of the experiments thus far are encouraging.

The harvesting of rice is still done by hand, but the bulk of commercial palay is the province is generally threshed by machine.

The bulk of the rice produce in the province is marketed in Manila. The National Rice and Corn Corporation, which buys and sells rice and corn at nominal

prices, helps to stabilize the prices of these commodities.

Corn.- Corn is the second important crop of the province in point of hectarage. In 1938 the area cultivated with this crop was 10,660 hectares and the total amount of produce was 187,080 pesos. About 102,230 cavans of shelled corn were produced. The average yield per hectare was only 9.59 cavans of shelled corn, while the average for the whole Philippines was 12.5 cavans per hectare, and that for Ilocos Norte was 17.79 cavans per hectare, the highest average yield in the Islands during the year.

The varieties of corn extensively grown in the province are the yellow flint and the white flint; sweet corn is also grown but to a very limited extent. The flint varieties are harvested mature and sold partly for human consumption and partly as food for chickens, horses, and hogs, while sweet corn is harvested green and sold locally or in Manila markets. The corn-producing towns are Cabiao, San Antonio, San Isidro, Jaen, San Leonardo, Muñoz, Talavera, Cabanatuan, Sto. Domingo, Laur, Boñgabon, Rizal, Pantabangan, Carranglan, Lupao, and Cuyapo. San Antonio, San Isidro, and Jaen produce the best corn in Nueva Ecija. These towns are along the Pampanga River, and the soils belong to the Quingua series.

Sugar cane.- The area planted to this crop in 1938 was 3,260 hectares. The total value of produce amounted to 670,080 pesos. The growing of sugar cane in this province was curtailed by the limitation of sugar production in the Philippines which resulted in the assignment of quota for each sugar central. The sugar central at Cabiao, the only one in the province, was dismented in 1938, and its quota of centrifugal sugar was sold to other sugar central. As a result, most of the sugar cane planted at present in the province is converted into panocha and muscovado sugar, manufactured by the old open-kettle system. A part of the sugar cane crop is converted into basi, a native wine made from sugar cane juice. The sugar cane varieties grown in this province are mostly P.O.J. 2878, and to a limited extent Luzon White and Pampanga Purple.

Banana.- The banana, a common fruit in the Philippines, ranks as the fourth crop in hectarage in Nueva Ecija. In 1938, the area planted to this crop was 2,688 hectares, with a total produce valued at 289,120 pesos. The most common varieties grown in this province are saba, latundan, ternate, buñgulan, lakatan, and moradol. The towns where bananas are grown extensively are San Antonio, San Isidro, Jaen, San Leonardo, Sta. Rosa, Cabanatuan, Talavera, Sto. Domingo, Muñoz, San Jose, Quimba, Boñgabon, Laur, and Rizal.

A part of the banana produce is consumed locally in the different town and a part is marketed at Cabanatuan. In 1938, the yield of banana in this province was 401 bunches per hectare, while the average yield per unit area for the whole Philippines was 519 bunches. According to the 1938 statistics Nueva Ecija has the lowest yield of bananas per hectare. Batangas province had the highest yield of this crop with 635 bunches per hectare.

Tobacco.- Another important minor crop grown in the province is tobacco. In 1938 the area cultivated with it was 1,785 hectares, with a production valued at 81,680 pesos. The most common variety grown was Batak. The Virginia and the Adcock varieties were slow grown to some extent. The yield of tobacco in this province was quite low, the average being 6.51 quintals per hectare, while the average for the whole Philippines was 10.45 quintals per hectare, and the highest was 14.12 quintals which was the average yield in Isabela province.

The problem of increasing the yield of tobacco involves many factors. Seed selection, proper soil, proper tillage, right time of planting, harvesting, and curing are the most important. Stabilization of price is another problem which confronts tobacco farmers.

Fruit trees.- The fruit trees of the province are principally mango, pomelo, mandarin, and other citrus plants, papaya, guayabano or soursop. anonas or bullock's heart, atis or sugar apple, chico, and lanzones. In 1938, the total area planted to these crops was 1,279 hectares and the total produce was valued at 282,520 pesos.

Mango is the most important fruit trees. In 1938 the total area planted to mango alone was 847 hectares

and the value of produce was 232,780 pesos.

Root crop.- The root crops of the province are sweet potato, or camote, cassava, gabi, tugi, and ubi, Irish potato. In 1938 the total area planted to these crops was 1,100 hectares and the total value of produce was 47,220 pesos.

In hectarage sweet potato is the most important root crop. In 1938 the total area planted to it was 634 hectares with a production valued at 12,240 pesos. Sweet potato is grown mostly on light soils of the Quingua series. In the upland and rolling lands with Annam soils sweet potato is grown for the immediate needs of the farmers. At San Isidro, Jaen, and San Leonardo sweet potato is grown for human consumption and as animal feed also.

In 1938 the average yield of sweet potato per hectare in this province was 2,178 kilos, while the average yield for the Philippines was 2,602 kilos, and that for Pampanga, was 4,272 kilos which was the highest for that year.

Vegetables.- The most important vegetables of the province are eggplant, beans, tomato, mungo, raddish, and cabbage. In 1938, the area planted to those truck crops was 1,002 hectares with a production valued at 80,460 pesos. These truck crops are grown principally on the light soils of the Guingua series along the Pampanga River. Vegetables raised in these areas find already market at Cabanatuan.

The growing of the Bermuda onion is becoming an established industry of the province, especially in areas with light soils. At the time of the survey large areas were planted to onions in Muñoz, San Jose, Rizal, Boñgabon, and Laur, especially in the Sabani Estate where considerable profit was obtained from the crop.

The vegetables of lesser importance grown in the province include mustard, pechai, pigeon pea, upo, squash, pepper, and ampalaya.

Other minor crops. - The other minor crops of the province are coconut, peanut, kapok, castor oil bean,

pineapple, lumbang, coffee, cacao, cotton, forage grass, and pilli nut. The total area planted to these crops in 1938 amounted to 946 hectares and the value of produce was 79,100 pesos.

Livestock.- In 1938 the livestock population of the province consisted of 136,094 carabaos, 22,013 head of cattle, 17,053 horses, 107,055 hogs, 43,061 goats, and 5,460 sheep. In 1937, when the livestock population was slightly less than that of 1938, the estimated value of the livestock was 5,791 pesos. There is no available data on poultry population, but in 1938, 804,690 chickens and 7,892,335 chicken eggs from Nueva Ecija were received at the Manila public markets.

The Bureau of Animal Industry has a stock farm at Boñgabon and maintains several thousand head of cattle, such as carabaos, horses, goats, sheep, and hogs. Its object is to improve the breeds of livestock in this region by introducing imported purebred, particularly dairy cattle, and by cross-breeding these superior breeds with the native stock.

SOILS AND CROPS

Like the soils of Pangasinan Province, the soils of Nueva Ecija represent a wide range on the age or stages of development from young soils which had developed from recently deposited materials and soils of highly eroded rolling uplands to old or mature soils of the mountains and forested areas. Most of the younger soils are located in the plain or valley floor, while the older ones are in the higher terraces and upland means, benches or mountain areas.

The most important group of soils is that found in the alluvial plain representing the young of immature stages of development. The soil from the surfaces down to the substratum consists of recent alluvial deposits from the upland region of the province.

The inherent properties of the parent rock material can be readily traced in these young soils. In due time, however, these soils will reach a mature stage of development and the properties of such soils will be those which are the results of the influence of climate, vegetation, topography, and age. The most common geological materials from which the mature soils in these regions have developed are basalts, andesites, shale, limestone, ryholites and dacites. These materials are all found in the mountains, hills, and uplands of the province.

The area, percentage, and location of, and the principal crops grown in each soil type classified and mapped in the province are shown in Table 5. In the following pages the soils of Nueva Ecija Province are described in detail; their agricultural relationships are discussed and their location and distribution are shown in the accompanying soil map.

LAND USES AND AGRICULTURAL METHODS

As influenced by the topography of the region, the agricultural lands of the province may be roughly classified into (1) alluvial plains in the western, central, and southwestern parts, and (2) rolling uplands and mountainous areas in the northern, eastern, and southeastern parts. The greater portion of the agricultural lands in the alluvial plains is terraced for the cultivation of rice. In these areas accelerated soil erosion is practically negligible. It is in the cultivated rolling uplands and mountain sides where soil erosion is a serious problem.

With the right species of pasture grasses and proper range management, the rolling uplands may be converted into ideal pasture grounds. The steep mountain sides may either be planted to fruit trees with permanent soil cover or reforested. The planting of ipil-ipil trees on steep slopes will not only reduce erosion to the minimum but will also provide a good source of firewood.

In the intensively cultivated soils of the alluvial plains the main problem is to increase or maintain the fertility. The maintenance of soil fertility requires that the plant-nutrient elements removed by crops be returned to the soil in forms that may readily be available again to plants.

According to the crop statistics of the province, about 90 per cent of the cultivated area is under rice cultivation. Since the produce is in the form of grain, the greater portion of which is shipped out of the province, it is evident that the plant nutrients contained in the grain are not returned to the soil. Because rice has been grown in this province for at least two centuries without the application of fertilizer or the introduction of any soil amendment, it is to be expected that the soils now have rather low contents of the principal nutrient elements. For example, the

results of the chemical analysis show that, in general, the cultivated soils of the province are quite low in phosphorus content. The insufficiency of soil phosphorus has been confirmed by the good response to phosphatic fertilizers in the several rice fertilizer experiments conducted on important soil types of the province.

Green manuring with legumes, such as soybean, cowpea, mungo and various species of Crotolaria and Tephrosia, may be practiced, especially in the intensively cultivated rice lands of the province. Such green manures will help maintain the fertility as well as improve the physical and biological condition of the soil.

ANALYSES OF NUEVA ECIJA SOILS

The study of soils in the field is not considered complete without the laboratory examination of the soil samples collected. Samples of the different soil types classified are brought to the laboratory for mechanical and chemical analyses. The laboratory analyses are correlated with the field data in order to obtain a more comprehensive knowledge of the soils under study.

Mechanical analysis. - Mechanical analysis is made on the surface soils of the different soil types mapped for the purpose of checking up the field classification which is done by the "feel method." In most cases the field classification agrees with the mechanical analysis. In a few cases, however, the field classification is texture in the field. This group of soils has celluloidal properties different from those of the other groups of soils, such as the dark-gray and the dark-brown soils. The clay content of the red soils is high, but in the field these soils are friable, mellow, and easy to cultivate. Under this condition the field classification is maintained, unless the clay content is so high that the textural class is made to conform with that obtained by the mechanical analysis.

The hydrometer method of mechanical analysis devised by Bouyoucos was used. The results of the mechanical analysis are shown in Table 6.

Chemical analysis. - In the proper identification and classification of soils, that is, in tracing the

genetic relationship of soils and rock materials, and in studying the processes of soil formation, chemical analysis of the soil is necessary. For this purpose, samples of the different soil horizons of the different soil series established in the field survey are brought to the laboratory for study.

As far as farmers are concerned, the primary object of chemical analysis is to determine the potential of soils. Result of analysis will reveal the deficiencies, if any, in regard to the plant-nutrient elements in the soil, and thereby simplify the trial-and-error method of field experiments for determining the fertilizer requirement of soils. Chemical analysis helps also in determining natural crop adaptability of a soil type.

Samples of surface soils representing the different major soil types identified and mapped in the field survey are analyzed for their total contents of the principal plant-nutrient elements which are often found deficient in agricultural soils. These elements are nitrogen, phosphorus, and potassium. Organic carbon, calcium, magnesium, and soil reaction are also determined. Organic carbon and a measure of the organic matter content which affects such important soil characteristics as structure, moisture holding capacity, and beneficial microbiological population of the soil. Calcium and magnesium, besides being essential plant nutrients, affect soil consistency. When the ratio of calcium to magnesium is low, or when the magnesium content is more than one half of the calcium content, the soil is usually plastic and sticky.

Soil reaction or pH value is a very important limiting factor for plant growth. Different plants have different optimum soil-reaction requirements and tolerance limits. While studies along this line are still under way in the Division of Soil Survey, it might be of interest to present here some data obtained by foreign workers to show the relationship between soil reaction and plant growth. Selected data are shown in Table 7.

The nitrogen, phosphoric anhydride, potash, lime, and magnesia contents of the soil samples were determined according to the "Methods of Anaysis" (1935 edition) of the Association of Official Agricultural Chemists of Official Agricultural Chemist of the United States. The

determination of organic carbon was in accordance with the Parr method. The hydrogen-ion concentration, or pH value, was determined by the electro-metric method, using the antimony electrode. The results of the analysis, calculated on the dry basis, are presented as averages for the different soil types in Table 8.

With the exception of Quingua fine sandy loam, which had pH value of 7.04, all the Nueva Ecija soil types were slightly acidic in reaction, the pH values of most of them being between 6 and 7. Only two soil types had reaction values below pH 6. Annam clay loam had a pH value of 5.57 and Annam sandy clay loam had 5.76. The organic carbon contents of the surface in Nueva Ecija were generally low, ranging between 0.79 and 2.42 per cent. On the other hand the total nitrogen contents were fairly high or normal; only one type, the Prensa silt loam, had a nitrogen content below 0.10 per cent.

The phosphoric acid and the potash contents of most of the Nueva Ecija types were quite low, indicating a need for phosphatic and potassic fertilizer treatments for at least some of them. In general, the lime and magnesia contents of these soils seemed normal, except those of the soils of the Annam series which had fairly low calcium-magnesium ratios.

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Table 6. Mechanical analysis of the surface soil of the important soil types in Nueva Ecija Province.

Type No.	Soil Type	Sand 2.0-0.05 mm.	Silt 0.05-0.005 mm.	Clay 0.005-0.000 mm.	Total colloid
		Per Cent	Per Cent	Per Cent	Per Cent
4	Quingua fine sandy loam	42.2	35.0	22.8	32.8
5	Quingua silt loam	26.4	40.4	33.2	45.2
109	Quingua clay loam	22.6	34.8	42.6	55.9
16	Bantog clay loam	26.7	24.2	49.1	58.9
66	Prensa silt loam	48.0	19.7	32.3	36.7
111	Prensa sandy loam	51.5	23.3	25.2	31.8
90	Zaragosa clay	16.8	32.0	51.2	63.2
98	Annam clay loam	25.4	31.0	43.6	57.6
112	Annam loam, gravelly phase	48.6	23.6	27.8	35.6
113	Annam sandy clay loam	39.5	28.6	31.9	41.8
99	Umingan silt loam	36.8	33.8	29.4	41.7
100	Umingan sandy loam	44.8	32.2	23.0	35.0
114	Umingan loam, deep phase	35.0	38.7	26.3	50.9
102	San Fabian clay loam	29.4	26.3	44.3	51.8
116	Maligaya silt loam	38.7	34.7	26.6	37.3
117	Maligaya clay loam	44.9	24.9	30.2	37.7

Table 8. - Average chemical analysis of the surface soil of the different soil types in Nueva Ecija Province.

Type No.	Soil type	pH value	Organic carbon	Nitrogen (N)	Phosphoric acid (P_2O_5)	Potash	Lime (CaO)	Magnesia (MgO)
			%	%	%	%	%	%
4	Quingua fine sandy loam	7.04	1.55	0.17	0.42	0.40	3.38	1.07
5	Quingua silt loam	6.66	1.37	0.12	0.18	0.17	3.37	1.52
109	Quingua clay loam	6.68	1.82	0.16	0.17	0.15	2.38	1.08
16	Bantog clay loam	6.32	1.94	0.18	0.16	0.16	2.43	1.05
66	Prensa silt loam	6.36	0.79	0.08	0.09	0.09	1.31	0.60
111	Prensa sandy loam	6.41	0.82	0.10	0.11	0.11	1.90	0.49
90	Zaragosa clay	6.67	1.87	0.17	0.11	0.08	2.94	1.39
98	Annam clay loam	5.57	2.42	0.19	0.20	0.08	1.45	1.51
112	Annam loam, gravelly phase	6.08	1.76	0.14	0.12	0.09	0.79	0.62
113	Annam sandy clay loam	5.76	1.61	0.14	0.13	0.08	0.97	0.60
99	Umingan silt loam	6.36	1.92	0.14	0.14	0.10	3.35	1.58
100	Umingan sandy loam	6.37	1.90	0.17	0.21	0.10	4.00	1.63
114	Umingan loam, deep phase	6.28	2.02	0.17	0.21	0.14	2.54	1.09
102	San Fabian clay loam	6.48	1.78	0.11	0.07	0.13	3.74	1.42
116	Maligaya silt loam	6.48	1.22	0.12	0.17	0.35	3.53	1.03
117	Maligaya clay loam	6.64	1.62	0.13	0.19	0.10	3.67	1.46