

from the Island, because it is one of the bases of any people's progress that its land-owners should live in their own country, and contrive to spend their income therein, thus furthering Commerce, Industry and even Agriculture itself. As regards Puerto-Rico, nearly every owner of the best land lives away from the Island, and lays the rent of his plantation out, in maintaining the ostentatiousness of his home in a foreign country, thereby depriving this people of those elements of progress.

The monthly remittance of those funds to Europe occasions the rise of exchange and the unbalanced state of the money-market; and our towns and villages stagnate in sad inertness, while the soundest rents of the country go to improve the building up of European paltry villages, where our wealthy land proprietors settle, owing to the cheapness of the living, and the better quality of the climate. Every one is free to spend his rents where it may best suit his taste and his liking; but we, called upon to watch over the progress of our Island, must endeavor to save our towns from being considered as temporary stations, wherein to raise a fortune, whose rent shall be enjoyed in foreign countries.

Caetano Coll y Toste.  
Secretary of Finance.

## I.

## THE SOIL OF PUERTO RICO.

Puerto Rico is a stratified Island, made up of ancient eruptive rocks, together with sedimentary deposits from different ages, from the silicious to the calcareous, conchiferous and madreporous soils of recent epochs.

The Island has a central ridge of mountains, extending from east to west, where, in the central and western regions, great masses of *diorite* and *serpentine* are prevalent; and of *granite*, especially *syenite*, at the eastern region.

The morphology of the Island is derived from sedimentary deposits from diverse ages, *lime-stone* predominating on the mountain ramifications and on their collateral sloping hill-ranges. In some places this stone is compact and myielding, in other rough and porous.

The plains on the heights and at some coast localities are full of compact *marls*, called, in the country, *clay-grounds* (*terreno-barrosos*), overstrewn at intervals with sandy deposits, worn off from the adjacent rocks along with some vegetable earth. These *marls*, bearing a great deal of oxyd of iron, and alternatively assuming the red and yellow appearances of this mineral, constitute the so-called *red-clay* and *yellow-clay* lands, sometimes intermixed with large *sand-banks*.

The extensive meadows irrigated by the rivers that descend from the central ridge of mountains are overlaid with modern *alluvial* soils, made up of the erosions from the sandy and limy peaks of the neighboring mountains, together with abundant vegetable earth, argil and bowlders, all having been swept along by the waters.

At some mountain-slopes mineral veins are found amidst compact *lime-stone*, and several rivers and creeks sweep away gold-bearing sands.

The configuration of the Island is completed by the fossil conglomerates of various forms and dimensions, particularly on beaches where the *detritus* of shells and corals forms large deposits, whose aggregation is in continual genesis; this being the origin of the most recent conchiferous and madreporous lands.

Such is the geological constitution of the Island of Puerto Rico.

## II.

## CLASSIFICATION OF THE LANDS.

We have said that Puerto Rico is a stratified Island, and it is because sedimentary rocks predominate in it; above all, those that are sandy, clayey and calcareous, which, as they appear mingled, but rarely are found in a form perfectly characteristic and pure.

The soil of the Island, then, is composed of several kinds of land, which the husbandman may and should study, not only to be able to classify those lands, but also that he may find the convenient means of modifying and fertilizing such as should be sterile.

Nature itself increases and repairs unceasingly the dominion of Tillage, by introducing in ploughlands new elements, often drawn from the uncultivated rocks that form the neighboring prominences.

In this continuous process of decomposition and trituration of the rocks, the several *silicates* give rise to the *sandy* lands; *feldspars* and *schists* to the *clayey* lands; and *carbonates of lime* to the *calcareous* detriti.

Flowing waters either mix up or separate, according to circumstances, these three elements.

As regards *mold*, it owes its origin to vegetable and animal detritus, and is a very important ingredient of fertile lands. Sometimes it is found at the very same place where it has been formed; but as a general rule it becomes heaped up in the valleys, because, being lighter than water, it allows itself to be easily carried off by floods. The plentifulness of this material in an extent of ground is revealed by the blackish color and the *looseness* of the soil.

*Silex* is one of the inorganic elements most generally distributed, largely derived from the disaggregation of quartz rocks. When it is found in a pulverized state, it constitutes the principal part of *sandy soils*. These sands become easily heated and are very permeable to air and water. Hence these soils are almost always dry and parched, and want manuring and irrigation. These same lands may serve to modify soils that are too compact, and make them better for cultivation.

*Argil* is an earth formed of *silex* with a large admixture of *alumina*, it being not uncommon that it should contain *magnesia* and several other substances. One of the most remarkable properties of argil is the faculty of retaining ammoniacal gases among its particles, which increases its fertility.

*Limestone* has a noxious effect on plants, if it absolutely predominates in a soil: such is the case with all mineral elements, when in the solid state. Applied to sandy soils, it gives them consistency. Mixed with argillous earths, it causes them to lose their impermeability, so unfavorable to vegetation. Limestone combined with sand and argil yields admirable results as to tillage. It suffices to add a small quantity of limestone to the earths which do not contain it, to augment their returns considerably.

*Marl* is limestone mingled with argil and sand in variable quantities. To sandy soils the argillous marls should be applied; to argillous earths, sandy marls, in order to obtain good mechanical results.

## III.

## ASSORTMENT OF THE LANDS OF THE ISLAND

The soils at Puerto Rico are, as a general thing, formed of *silex*, *alumina*, *lime-stone* and *mold*.

Leaving out other secondary substances, and proceeding from this scientific stand-point, we may classify the principal soils of the Island into *humiferous*, *argillous*, *calcareous* and *sandy*, according as the said elements predominate in them.

The combination of the three mentioned substances with *humus* (*mold*), in due proportions, is what produces an earth of superior quality; whilst each one of them is by itself completely sterile.

Secondary divisions may be formed, of *argillous-sandy*, *argillous-limy*, and so forth, according to what may be the prevailing element.

*Silicious* earths are largely composed of bowlders, gravel and sand. Sometimes they have in them some lime, argil or mold; but siliceous matter is the dominant one. As they do not hold water and are very permeable to the air, they are liable to become droughty, easily even down to the roots of the plants, thus causing them to die. They contain with difficulty soluble substances, so necessary for the nutrition of vegetables, because, letting the water, which holds those in solution, pass through them, they are left again dry and exhausted. Most of the silicious earths in the Island are found at the sea-shore, at the bottom lands near some rivers, and at localities subject to alluvial deposits from rain.

*Argillous* lands are all those wherein argil predominates. They are usually termed strong, fat and clayey grounds. These soils are commonly found tinged with iron, and of diverse hues, from red and white to gray. Argillous lands are highly valued for cultivation. Strong or fat ones oppose a certain resistance to the plough, and are the most inferior in their class, on account of their tenaciousness and impermeableness. This defect is made up for by admixing them with sand, lime, or other porous mineral substances. Good argillous soils always contain some sand as well as some lime, which enable them to drain the water slowly.

*Calcareous* lands are those wherein limestone predominates. Usually they are bare and sterile. Hills and hillocks of this kind abound in the Island.

*Humiferous* lands are those in which there is an abundance of *humus*, or *mold*, and is constituted by organic matter in a more or less advanced state of decay. Such lands are formed at some sites in the woods and mountains, of the leaves of plants and other waste matter that falls and is rotten, and in rivers, where these flow gently, and the said material is there deposited by the retarded waters. They are easily distinguished by their blackish color, their state of looseness, and avidity for water. These soils, if they contain no sand nor argil, are unproductive, since the organic matter is not then readily decomposed, and, from its being too pure is of no avail for vegetation. Besides, they become soon dried up because of their great porosity, their black color, which absorbs heat most; and hence, plants in it have not all the moisture that would be suitable for them. Generally, these lands are acid in their early formation, and the most convenient manure for them is quicklime and other alkaline substances that may saturate and neutralize the acids, turning them into being moldy and sweet. Mold added to earths of other kinds produces admirable effects as to tillage.

## IV.

## ANALYSIS OF THE LANDS:

For the most exact knowledge of the composition of any lands, a physical and chemical analysis would be necessary, studying their hygrometrical and

hygroscopic properties, their tenaciousness, their conductivity, their acidity or alkalinity, and even their coloring, for white color reflects calorific rays, and black absorbs them, and so forth; but regarding the practical and useful end which we are after, we can give out a simple method that may serve for husbandmen to analyze their tillable lands, so as to ascertain, under general headings, their chief components, and modify and manure them according to what they may require.

The elements which principally constitute tillable grounds are four: *silex* in sands, *alumina* in argils, *lime* in calcareous lands, and *humus* in molds.

First-rate lands contain generally argil, sand, lime and mold; those lands wherein sand, argil or lime prevail are second-rate, and third-rate those which lack mold.

To analyze those components, first a definite quantity of earth is weighed: then it is put into a vessel holding water, and is stirred up. Mold comes up to the surface and may be scummed and weighed. The liquid is again stirred, and the sand, being heavier, is deposited at the bottom of the vessel, whence it may also be collected and weighed. Then the lime is separated from the argil by pouring hydrochloric (muratic) acid into the liquid, until no effervescence should be produced: then the liquid is drawn off and the argil, after having let some time elapse, for it to be deposited at the bottom of the vessel, may be collected therefrom and weighed.

The difference between the original weight and that which may have resulted from the mold, the sand and the argil, will evince that of the lime which the examined earth contained.

This analysis renders the means easy for the tiller, of ascertaining why a certain land proves unfruitful, he being able to draw from the subsoil or from other near sources what elements he may need for improving it and making it fertile.

## V.

THE GENERAL ORDERS N<sup>o</sup> 6:

Now, then, the topographical conditions of the country being given, tillage grounds are first, second and third rate, for each culture.

In Puerto Rico, an island so fruitful, not all the lands are cultivated: some, because of negligence of their owners; others, by want of roads to convey fruits to ports, and others, through the hinderances of the former system of contribution, and for want of due protection of agricultural banks.

The General Orders n<sup>o</sup> 6, of this year, which we transcribe, will serve as a stimulus for tardy land-owners; the latter will speedily set to tilling their lands, or else will sell them. He who owns a fertile farm will see his virtuous labor rewarded, without having the Fisc extorting from him five per cent of his net products, and the Municipality seven, twelve or fifteen per cent besides, indeterminately, according to the caprice of the Municipal Corporations.

Here are the General Orders n<sup>o</sup> 6 of this year:

## HEADQUARTERS DEPARTMENT OF PORTO RICO.

GENERAL ORDERS N<sup>o</sup> 6. SAN JUAN, JANUARY 19, 1899.

In order to remedy the evils due to unjust apporportionments, the following are the orders concerning the taxation of lands on this Island; any variation from this order, or excess in taxation under it, will, upon being reported to these headquarters result in the punishment of the offending parties:

1.—The assessment of taxes upon lands will hereafter be made in accordance with the various cultivations existing in the Island and the quality of the land tax d.

2.—In accordance with the various cultivations, there will be taxes on cane lands, coffee lands, tobacco lands, pasture lands, minor produce lands, and forest lands.

3.—In accordance with the quality of the land there will be taxes of the 1st, 2nd and 3rd classes: the 1st class comprising the best lands, the 2nd class the next best, and the 3rd class the poorest.

4.—On all lands of the 1st class there will be a tax of 1 peso per cuerda; on all lands of the 2nd class a tax of 0.50 peso per cuerda; on all lands of the 3rd class, a tax of 0.25 peso per cuerda.

5.—Each municipal corporation will appoint a classifying commission which will select sub-commissions in the different districts of each township, these sub-commissions to report to the classifying commissions on the class of lands in their respective districts.

6.—These commissions will be guided by the following instructions:

(a) 1st class cane lands are plains and valleys and other alluvial lands lying near settled communities, highways, railroads, and seaports, and the lands of drained lagoons and mangrove marshes;

(a') 2nd class cane lands are the highland plains, generally surcharged with oxides of iron and known in the country as clayish lands;

(b) 1st class coffee lands are valley-lands and hills abounding in organic detritus.

(b') 2nd class coffee lands are highlands having a calcareous or limy formation;

(c) 1st class tobacco lands are valley lands watered by rivers;