UNITED STATES
DEPARTMENT OF AGRICULTURE
CIRCULAR No. 519

Washington, D. C. Issued March 1939

THE TOBACCO INDUSTRY IN PUERTO RICO

By

CHARLES E. GAGE

Senior Marketing Specialist
Bureau of Agricultural Economics

For sale by the Superintendent of Documents, Washington, D. C. - - - - Price 10 cents

CIRCULAR No. 519 MARCH 1939
UNITED STATES DEPARTMENT OF AGRICULTURE
WASHINGTON, D. C.

THE TOBACCO INDUSTRY IN PUERTO RICO

By CHARLES E. GAGE, *senior marketing specialist, Bureau of Agricultural Economics* [1]

CONTENTS

INTRODUCTION

The island of Puerto Rico lies in the Tropics and is the easternmost and smallest of the group of islands known as the Greater Antilles. It is located 1,399 miles southeast of New York and 480 miles southeast of Cuba (fig. 1). It has the distinction of being the only soil now under the American flag that was visited by Columbus, the explorer having landed at Aguadilla in 1493. The island was colonized by the Spanish and remained under Spanish rule until the American occupation in 1898. The population, customs, and prevailing language are Spanish. It has its own legislature functioning under what is in effect a constitution provided by Congress—the organic act passed by Congress and approved by the President on March 2, 1917, by which the present form of civil government was established. This act also conferred American citizenship upon all inhabitants who did not specifically decline it, and under it the President appoints the Governor.

[1] The author is indebted to J. A. B. Nolla, director of the Agricultural Experiment Station, Río Piedras, and Theodor Juhl, assistant field officer, Agricultural Adjustment Administration, San Juan, for cooperation and assistance, without which this study could not have been made; to R. W. Gray, senior meteorologist, Weather Bureau, San Juan; A. Rodríguez Geigel, director of extension, S. L. Descartes and F. Joglar Rodríguez of the University of Puerto Rico, Río Piedras; G. N. Wolcott, entomologist, Puerto Rico Experiment Station, Río Piedras; A. K. Lobeck of Columbia University for reviewing and correcting the section on physiography; R. C. Roberts, Bureau of Chemistry and Soils, and W. H. White, Bureau of Entomology and Plant Quarantine, U. S. Department of Agriculture; Hubert A. Kramer, formerly marketing specialist, Bureau of Agricultural Economics, U. S. Department of Agriculture; Dudley Smith, assistant director, Association of Sugar Producers of Puerto Rico; and to numerous members of the tobacco trade on the island. Credit is due Alice Wolfe and Sara Grace Smith for their aid in the preparation of tables and text.

Facts not generally realized in the continental United States are that this island possession is one of the most densely populated places in the world and is given over largely to the production of crops and small manufactures for export and that, because of its dense population and specialized agriculture, Puerto Rico occupies a position of unusual importance in the exterior trade of the States. The general cash-crop nature of Puerto Rican agriculture is closely related to the fact that of a total population in 1935 of 1,723,534, or about 502 per square mile, 1,211,514, or 350 per square mile, were classed as rural. The vast majority of this rural population is not only landless but

BAE 34160

FIGURE 1.—Map of the Caribbean area, showing geographical position of Puerto Rico.

without even the status of tenants, living by such day labor as is available on farms or public works.

In relation to conditions on other islands in the American Tropics the standard of living in Puerto Rico is considered high (*11*) [2] and yet large numbers of the people subsist on an income too low for the maintenance of life in other than a tropical climate. Owing to the very low purchasing power of the mass of the people the most profitable outlet for farm production is not food or feed crops for home consumption, much as they may be needed, but the specialized crops for which the tropical climate is especially adapted and for which the greatest effective demand is outside of the island.

The dependence of Puerto Rico on outside sources for articles of food is pointedly illustrated by its imports of a few of the commoner items of diet. For example, the Annual Book on Statistics [3] shows that during the year ended June 30, 1937, there were shipped from the States to Puerto Rico 225,311,540 pounds of rice (not including

[2] Italic numbers in parentheses refer to Literature Cited, p. 52.

[3] PUERTO RICO DEPARTMENT OF AGRICULTURE AND COMMERCE. ANNUAL BOOKS ON STATISTICS, 1935–36, AND 1936–37. 1936–37. [Mimeographed.] See book for fiscal year 1937.

broken rice, screenings, etc.) having a value of $7,791,144; 30,809,999 pounds of dried beans, value $1,633,475; and 48,436,852 pounds of potatoes, value $648,266. One need not search far, therefore, for an explanation not only of some of the economic ills discussed in the Chardon Report [4] but of the fact that among Latin American countries this island, in 1936, ranked first and second, respectively, in purchases from and sales to continental United States; and sixth and seventh, respectively, among all the countries of the world. In 1937 its ranking was lower: fourth among all Latin American countries; and among all countries of the world, twelfth in purchases from and eleventh in sales to the continental United States.

PHYSIOGRAPHY

Puerto Rico is approximately 35 miles wide and 110 miles long, the long axis being from east to west. It is almost rectangular in shape and has regular coast lines. A coastal plain extends around most of the island, being widest in the north central to northeast. The interior is a complex mountain mass, the character of which has been profoundly affected by the fact that the trade winds, which blow almost constantly from the northeast and east, discharge heavy precipitation against northern and eastern exposures, resulting in a process of erosion which has largely determined the present topography. The backbone of the mountain system is the Cordillera Central, a ridge extending roughly east and west, which in most of its extent exceeds 2,500 feet in elevation. The southern slope of the ridge descends abruptly to the southern coastal plain. Approximately two-thirds of the island lies north of this ridge, and in this area the original mountain mass has been reduced to an uneven peneplain later dissected into steeply ridge-like mountains that show as mountain spurs extending northward from the Cordillera Central, with many intervening northward-flowing streams (fig. 2).

All of the peaks and mountains, some of which rise to an elevation of about 4,000 feet, are mountains of erosion, the initial form having been obliterated by dissection. In a few places, rather extensive valleys and lowlands occur such as those in which Caguas and Cayey are located. In much of the deep interior, however, the intervening valleys are V-shaped, frequently of such steep gradient that no silting has occurred. Nearer the north coastal plain, valley floors assume the shape of alluvial fans, narrow at first but widening out until they merge into the coastal plain itself. In such valleys, the floor is flat and the hillsides rise abruptly. Mature valleys, broad and with gently rising lower slopes like those shown in figures 3 and 4, are not common. The island as a whole presents an aspect of ruggedness and great beauty.

Hillsides are extraordinarily steep, many of them having slopes of 30° to 45°. As valleys of cultivable proportions occupy only a relatively small percentage of the land area in the interior of the island, agriculture there is mostly of a hillside type. These are the conditions under which practically all the tobacco is produced.

A comprehensive soil survey of the island has been completed.[5]

[4] Chardon, Carlos E., Ramos, R. Menendez, and Garcia, R. Fernandez. report of the puerto rico policy commission. (chardon report.) 146 pp. 1934. [Mimeographed.]

[5] Roberts, R. C. soil survey of puerto rico (in preparation). See also description of soils under Types (p. 15), notes for which were furnished by Roberts, Bureau of Chemistry and Soils, U. S. Department of Agriculture.

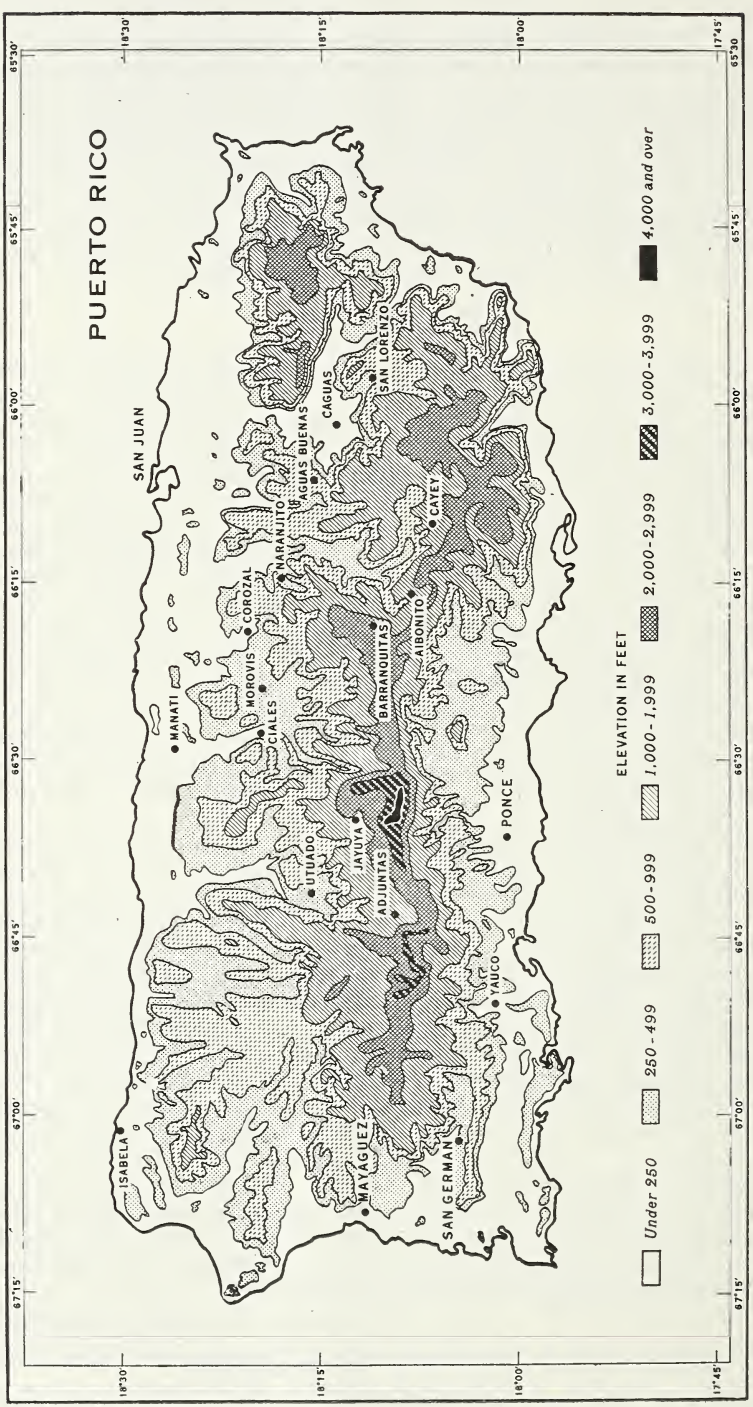


FIGURE 2.—Topographic map of Puerto Rico, generalized from contour map prepared by the Forest Service.

Soils, geological history, and economic geography have been discussed by McCord, Serrallés, and Picó (*5*, *9*) and physiography has been treated exhaustively by Lobeck (*2*). The geological map contained in Bulletin 41 of the Agricultural Experiment Station of Puerto Rico (*5*) shows parent rock of such diverse character as limestone, shale, volcanic ash, granitic formations, and conglomerate. Some of the limestones, especially of the Tertiary period, appear to be very soft and subject to rapid weathering not only by ground water but by atmospheric conditions. The exposed limestone of the so-called "haystack hills" in the north and northwestern coastal plain from a short distance (fig. 5) frequently looks like chalk. The sides of some of these hills are deeply marked by pits and holes, showing the unusual susceptibility to weathering. Outcrops of Cretaceous limestone, which are usually very hard, do not appear to be common. Most of the exposed rock of whatever formation has an appearance of extreme weathering, an important effect of which is the tendency to rejuvenate soils on the gentler mountain slopes. Actual disintegration, however, is less rapid than might be expected, as pointed out by Berkey, quoted by Lobeck (*2*), because of the low temperature variation, the clinging character of vegetation, and the low content of quartz and similar inert materials. To the permeability of the clay soils and the absence of quartz grains is also attributed the absence of gulleying, which in view of the steepness of the hillside fields and lack of cover crops, is remarkable.

The processes of weathering and erosion and the influences that modify the character of the derived soils have taken place at a much faster pace in the northern two-thirds of the island than to the south, because of the heavier precipitation. In the more arid section, embraced by the south coastal plain and the southern slope of the Cordillera Central where there is less intensive cropping and less active leaching, the soil retains more of its natural fertility. Heavy yields of sugarcane are obtained where irrigation is available, but otherwise the section is arid and in appearance suggests our own Southwest.

CLIMATE

Puerto Rico has a tropical marine climate, modified by the land area and topography of the island. The modifying effects of land and topography are much less pronounced on the immediate coast, as at San Juan, Mayagüez, Ensenada, and Ponce, than in the interior. The coastal areas, therefore, have a climate that is more nearly tropical marine.

A tropical marine climate is characterized by slight daily and annual ranges of temperature and relative humidity. At San Juan the mean daily range of temperature is only 10.5°F, and the annual range of mean temperature (between the warmest and the coolest months) is only 5.7° F. The range of relative humidity in the coastal areas is likewise slight, since relative humidity varies directly with the temperature where a comparatively uniform atmospheric moisture condition obtains.

In the interior, day temperatures are higher and night temperatures lower than on the coasts, with a consequent greater daily range. Of course, temperatures in the interior are influenced by elevation. The effect of elevation and land surface upon minimum (night) temperatures is shown in the case of Aibonito, for example. A temperature

BAE 33561–D

FIGURE 3.—A view of the La Plata Valley near Cayey. An important district in which shade tobacco was formerly produced. (See fig. 4.)

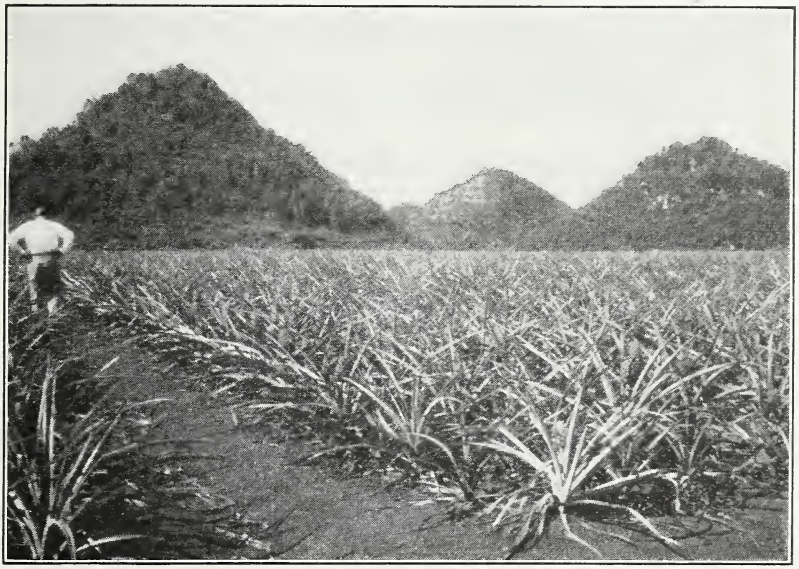
BAE 33700

FIGURE 4.—A different view of the area shown in figure 3, as it appeared in the 1920's when shade-grown wrapper tobacco was being produced.

of 40° F. has been recorded at that place, while the lowest temperature on record for San Juan is 62°.

The range between the average annual minimum and average annual maximum temperatures at cooperative Weather Bureau stations varies from about 13° to about 25° F. Highest average maximum and minimum temperatures are reached in the south, southwest, and west—from Ponce around to Mayagüez. Lowest average maximum and minimum temperatures are reached at Aibonito, in the mountainous interior, and Maricao in the less mountainous western portion.

Relative-humidity data are available for San Juan only. But it can be said that the daily and annual range of relative humidity in



BAE 32422

FIGURE 5.—"Haystack hills" bordering the north coastal plain, with pineapple field in foreground.

the interior is considerably greater than on the coasts. In the valleys, where fogs occur frequently, the relative humidity is undoubtedly often 100 percent during the early morning hours. During the day, the relative humidity in the valleys falls rapidly as the temperature increases, and reaches a lower percentage than in the coastal areas.

Hurricanes are an important feature of the climate, and may occur during the months from June to November. The months of greatest frequency are August and September. Storms that occur during these months usually originate farther east and attain greater intensity and destructiveness than those of earlier or later months. Hurricanes are important more for their great destructiveness than for their frequency. Probably their most disastrous effects have been visited upon the coffee industry, which was virtually destroyed by windstorms in 1899 and again in 1928. In numerous other years hurricanes have brought severe damage to coffee plantations and citrus groves, notably in 1932. Buildings and field crops likewise

TABLE 1.—*Average precipitation, by months, at Weather Bureau stations in Puerto Rico, for specified number of years*

Station	Elevation	Length of record	January	February	March	April	May	June	July	August	September	October	November	December	Annual
Coastal:	*Feet*	*Years*	*Inches*	*Inches*	*Inches*	*Inches*	*Inches*	*Inches*	*Inches*	*Inches*	*Inches*	*Inches*	*Inches*	*Inches*	*Inches*
Aguirre	20	37	1.47	1.61	1.37	1.84	4.24	4.76	4.31	4.84	6.11	5.95	4.22	1.93	42.65
Arecibo	75	33	5.23	3.68	3.88	3.82	5.86	3.55	4.73	4.53	5.09	4.57	7.83	5.85	58.62
Barceloneta	20	21	5.66	4.10	3.56	3.49	5.59	3.39	5.48	4.84	5.61	4.93	7.75	5.71	60.11
Cabo Rojo	250	28	2.35	2.94	4.02	4.87	6.10	4.24	6.66	8.04	9.11	8.46	5.34	2.85	64.98
Camp Calero	75	7	2.37	2.77	5.01	2.96	10.27	7.06	5.17	5.95	7.87	6.53	3.72	3.13	62.81
Camuy	70	21	3.85	2.88	3.20	3.15	4.46	2.70	3.52	4.16	4.73	4.56	6.09	4.76	48.06
Central "San Francisco"	----------	9	1.20	1.68	1.32	2.04	5.59	2.23	1.99	3.80	5.05	3.78	2.80	.89	32.37
Coloso	35	37	2.17	2.33	3.30	4.87	10.48	11.84	9.50	10.14	10.35	8.23	6.06	2.55	81.82
Dorado	25	28	5.30	3.83	3.55	4.32	5.94	4.63	6.29	5.84	6.51	5.16	8.37	6.20	65.94
Ensenada	50	34	.85	1.49	1.44	1.86	3.39	2.16	1.60	2.95	4.34	3.98	3.69	1.20	28.95
Fajardo	30	37	3.59	3.02	3.00	3.83	6.06	5.26	5.74	5.93	7.71	8.26	8.45	4.79	65.64
Guayama	25	25	2.28	2.24	1.93	2.00	5.48	5.53	5.24	5.29	7.02	6.76	5.20	2.86	51.83
Humacao	100	37	4.34	3.45	3.55	4.52	8.93	8.91	8.24	8.49	10.08	9.65	8.96	5.08	84.20
Isabela	275	37	3.42	2.86	2.90	3.42	6.12	4.62	3.93	4.98	5.51	5.43	7.12	4.67	54.98
Josefa	25	34	1.83	1.97	1.80	1.92	4.70	5.32	5.00	4.82	6.92	7.18	5.21	2.34	49.01
Mayagüez	80	37	1.98	2.28	3.94	5.30	8.24	8.84	10.75	11.22	11.15	9.69	6.00	2.63	82.02
Mora Camp	----------	8	3.00	3.30	3.30	2.88	8.96	6.93	4.92	5.77	8.25	6.43	6.76	4.49	64.99
Mona Island	175	18	1.41	2.41	2.85	3.13	4.73	3.99	3.88	3.51	5.33	4.78	4.44	2.68	43.14
Quebradillas	----------	12	3.53	2.63	3.24	3.63	6.93	3.88	4.23	4.55	5.74	5.48	7.00	5.12	55.96
San Juan	57	37	4.20	2.77	2.97	4.12	5.69	5.37	5.78	5.98	6.46	5.56	6.96	5.33	61.19
Santa Isabel	25	35	1.09	1.13	1.05	1.49	4.09	2.96	2.67	3.73	4.61	5.30	3.88	1.77	33.77
Vieques Island (Playa Grande)	50	8	2.42	1.96	2.10	1.56	6.79	4.44	3.41	5.36	6.15	6.04	6.55	2.64	49.42
Vieques Sugar Co. (Resolución)	50	8	2.18	2.42	2.06	1.56	6.53	4.60	3.66	5.32	7.25	6.77	6.28	2.53	51.16
Yabucoa	100	31	4.07	3.96	3.22	3.98	8.09	7.55	7.58	7.86	10.09	9.46	9.30	5.23	80.39
Yauco (Guayanilla)	----------	9	1.16	1.85	1.53	1.54	6.63	2.34	1.92	5.37	6.37	4.62	3.41	1.05	37.79
Average	77	----------	2.84	2.62	2.80	3.12	6.40	5.08	5.05	5.73	6.94	6.30	6.06	3.53	56.47
Coastal plains and foothills:															
Bayamón	75	37	4.77	3.40	3.81	4.66	7.50	7.03	8.05	8.30	7.96	6.58	7.42	6.24	75.72
Bayaney	1,050	6	3.77	4.39	5.68	5.32	11.43	8.00	6.94	7.84	10.16	8.35	7.28	6.12	85.28
Canóvanas	30	46	5.64	3.31	3.84	4.78	6.95	6.82	9.09	8.05	7.46	7.01	8.77	7.22	78.94
Cepero	100	24	4.95	3.65	3.65	5.13	7.25	6.11	7.72	7.28	8.02	7.15	8.03	6.03	74.97
Coamo	350	8	3.43	1.48	1.77	3.80	4.26	5.60	3.60	5.97	5.26	6.81	6.43	4.04	52.45
Fe, La	----------	11	6.30	4.08	4.88	5.17	12.74	11.04	10.07	11.16	13.47	15.31	13.58	6.75	114.55
Guajataca Dam	----------	14	3.34	3.93	4.52	5.81	9.05	8.92	5.52	7.82	10.02	8.57	6.40	5.02	78.92
Manatí	60	35	4.92	4.15	4.44	4.71	5.81	4.14	5.67	5.15	6.39	5.50	8.04	6.67	65.59
Maunabo	50	37	4.58	3.34	3.34	3.29	6.75	8.23	7.19	7.39	9.40	9.86	8.29	5.27	76.93
Paraíso	----------	11	5.33	4.26	4.66	5.52	10.49	7.57	7.58	7.64	11.33	11.71	10.43	4.76	91.28
Patillas Dam	200	25	3.47	3.13	2.62	2.50	6.20	6.44	6.80	6.29	7.52	7.79	6.62	4.03	63.41
Peñuelas	500	21	1.40	2.49	2.14	4.28	6.21	4.87	4.61	6.79	7.79	7.83	5.64	1.95	56.00
Ponce	80	35	1.08	1.25	1.31	1.90	3.58	3.57	2.62	4.18	5.11	5.77	3.82	1.14	35.33
Potala	50	25	.77	1.47	1.06	1.97	3.73	2.73	2.42	4.07	5.26	4.82	3.48	1.09	32.87

Río Piedras	75	34	4.70	3.12	3.61	4.69	6.77	6.16	7.57	7.75	8.23	6.66	7.14	6.33	72.73
Sábana Grande	375	23	1.43	2.53	3.14	4.28	6.06	3.25	4.55	6.08	7.73	8.72	7.57	2.81	58.15
San Cristobal		11	5.07	3.76	3.85	4.34	11.87	8.48	8.64	7.89	11.40	10.33	10.47	6.30	92.40
San Germán	350	37	2.05	2.90	3.72	6.04	6.23	4.24	5.88	7.59	8.44	9.29	6.92	3.55	66.85
Santa Rita	175	27	.91	1.69	1.10	1.98	3.45	1.94	2.05	3.81	4.28	4.62	3.77	.96	30.56
Toa Alta (Mucarabones)	75	10	7.36	4.81	5.10	4.17	9.71	6.50	10.48	10.03	9.82	7.85	9.08	7.45	92.36
Toa Baja (Central Constancia)	50	12	5.57	3.69	4.37	3.56	7.14	4.60	8.08	6.32	6.73	5.33	6.82	5.38	67.59
Average	214		3.85	3.18	3.46	4.19	7.29	6.01	6.43	7.02	8.18	7.90	7.43	4.72	69.66
Interior:															
Adjuntas	1,700	18	3.78	1.98	4.90	4.04	10.60	6.62	6.74	10.74	14.44	11.00	7.60	4.54	86.98
Aibonito	2,000	27	3.80	3.21	3.50	3.89	5.83	4.10	5.07	5.89	6.59	7.57	6.57	4.49	60.51
Barranquitas															
Caguas	250	37	3.80	2.48	2.92	3.86	5.60	6.09	6.72	6.56	7.35	6.89	6.30	4.84	63.41
Carite Camp	2,100	25	4.75	4.38	4.44	4.44	7.73	7.72	9.00	7.97	9.31	9.34	7.64	4.85	81.57
Cayey	1,350	37	3.24	2.72	2.91	3.57	5.04	5.44	5.98	6.58	6.85	5.96	5.98	4.01	58.28
Cidra	1,400	26	6.22	3.78	4.13	4.97	7.75	6.92	7.86	9.09	7.92	5.92	6.52	6.46	77.54
Coamo Dam		6	1.46	1.81	.89	1.70	5.92	3.09	1.74	4.62	6.79	3.12	2.75	2.08	35.97
Comerío Falls	500	29	6.06	4.34	4.63	5.37	6.39	4.48	7.07	8.04	8.06	6.49	8.03	7.04	76.00
Corozal	400	35	5.30	4.23	4.52	6.05	7.63	5.23	7.25	7.76	7.87	7.28	8.64	7.35	79.11
Dos Bocas															
Fronton (La Isolina)	1,400	25	5.42	4.00	6.27	6.79	12.35	5.76	6.40	8.31	11.23	9.07	9.67	6.88	92.15
Garzas															
Guineo Reservoir	3,000	7	4.49	6.08	6.03	6.61	15.98	7.87	6.33	11.83	16.35	13.84	8.28	4.96	108.65
Jájome Alto	2,350	22	4.86	4.32	4.73	4.49	7.77	7.89	8.62	8.05	10.50	7.73	7.09	5.19	81.24
Jayuya	1,500	15	4.65	3.13	3.81	4.47	5.87	4.92	6.80	8.41	9.42	10.25	7.11	4.68	73.52
Juana Díaz Camp	200	37	1.20	1.73	1.99	3.06	4.91	4.44	3.52	5.83	7.29	8.10	4.71	1.72	48.50
Juncos	250	22	3.23	2.55	2.85	3.38	5.61	6.12	7.05	7.11	7.86	7.75	7.17	3.24	63.92
La Mina (El Yunque)															
Lares	1,200	31	3.11	3.64	4.52	8.55	12.39	9.43	8.13	9.71	11.94	12.03	8.31	4.74	96.50
Maricao	1,500	25	2.19	3.45	5.22	8.34	11.77	8.23	11.69	14.39	16.12	15.36	8.82	3.65	109.23
Matrullas Dam	2,700	5	5.19	2.47	7.48	4.22	12.76	4.33	5.38	6.18	11.34	10.46	7.12	6.05	82.98
Morovis	700	9	5.25	3.38	6.38	5.74	8.35	5.63	6.46	11.06	8.61	10.01	8.62	7.70	87.19
Orocovis	2,000	18	5.86	4.27	5.54	4.91	9.66	3.79	5.92	5.82	10.67	8.49	8.32	7.67	80.92
Río Blanco	1,800	10	11.18	8.63	8.85	9.08	14.46	13.87	12.39	12.60	14.78	12.31	15.09	13.03	146.27
San Lorenzo (Valdés farm)	200	11	3.57	2.73	3.16	3.63	8.20	7.57	6.30	7.70	10.81	8.36	8.43	4.82	75.28
San Lorenzo (town residence)	200	23	3.90	2.77	3.78	4.53	8.10	10.57	8.88	8.26	10.00	8.36	7.88	4.68	81.71
San Sebastián	350	21	2.93	2.49	4.33	7.40	13.74	11.99	9.09	10.84	12.87	11.38	8.40	3.82	99.28
Toro Negro Reservoir	2,275	25	4.04	5.06	4.94	7.72	11.02	6.67	6.93	8.47	13.26	13.73	9.72	4.61	96.17
Utuado	1,500	16	3.74	1.76	3.62	6.50	7.77	7.59	5.95	7.69	12.23	10.54	7.54	3.77	78.70
Average	1,313		4.35	3.52	4.47	5.28	8.97	6.78	7.05	8.44	10.40	9.28	7.78	5.26	81.58
Average for Puerto Rico			3.68	3.11	3.60	4.21	7.59	5.97	6.18	7.09	8.55	7.84	7.08	4.50	69.40

Compiled from official records of the U. S. Department of Agriculture, Weather Bureau, San Juan, P. R.

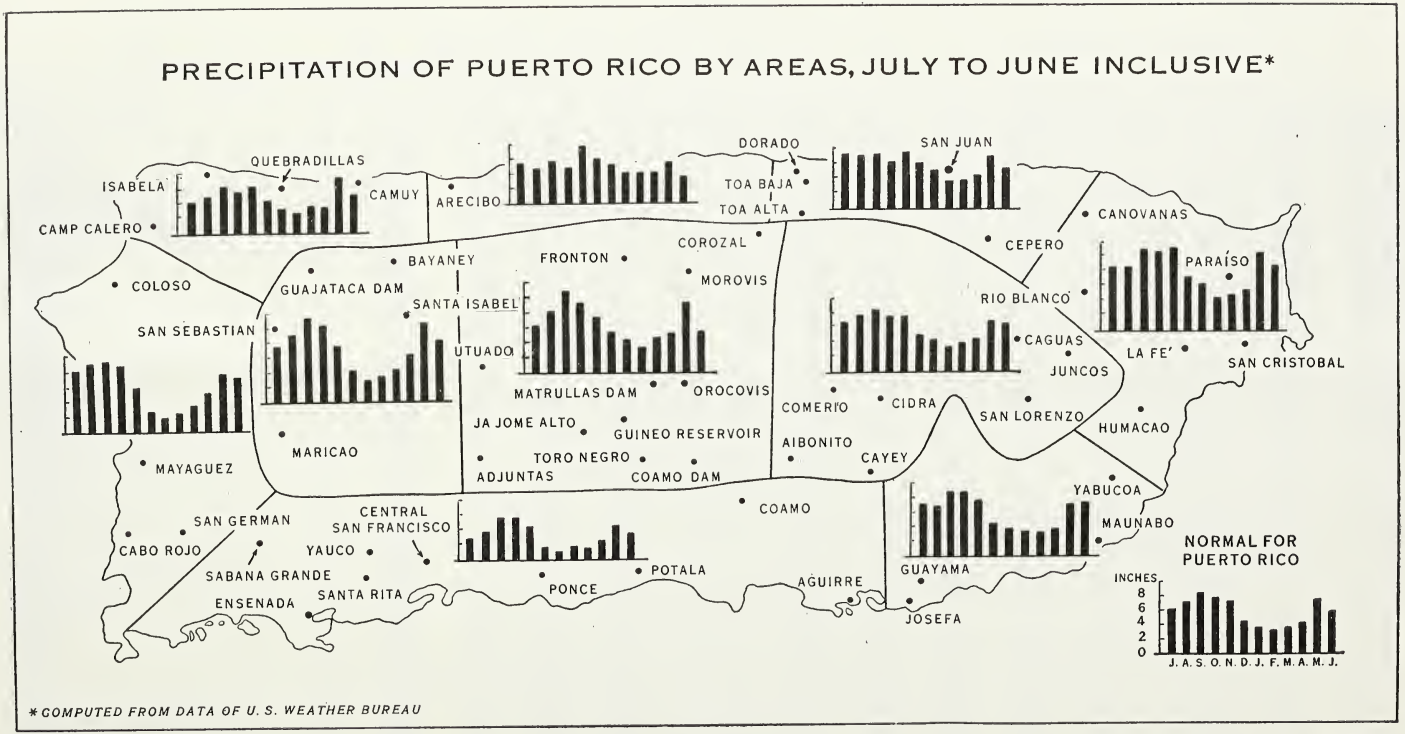


FIGURE 6.—Distribution of rainfall by months for different sections of Puerto Rico. The months are arranged from July to June, inclusive.

feel the effects of these destructive winds, but in general the damage is of less enduring consequence than where bearing trees are destroyed. The so-called average frequency of destructive storms in Puerto Rico, during approximately 30 years, is misleading. The United States Weather Bureau says that the north coast has been visited by major catastrophes three times in a 5-year period.

The fact that trade winds in Puerto Rico blow mainly from the northeast and east, and discharge their moisture against the northern and eastern exposures of land features is reflected in table 1, which shows average precipitation at 72 stations. The average annual precipitation ranges from 28.95 inches in Ensenada, on the southwest coast protected by the great wall of the Cordillera Central, to 146.27 inches at Río Blanco, near the eastern tip of the island.

The distribution of rainfall in relation to time divides the year into a rainy season and a so-called dry season, the latter varying somewhat for different districts, but in general embracing the months from December to April, inclusive (fig. 6).

During most of the year precipitation in the interior is usually in the form of frequent showers and downpours of short duration, although in November prolonged rains seem to be the rule and they occur occasionally in the summer.

The average number of days with 0.01 inch or more of precipitation ranges from 64 to 91 per annum at Ensenada and Ponce, respectively, on the south coast, to 296 at Guineo Reservoir. The average for 30 observation stations is approximately 169 days.

PRODUCTION OF TOBACCO

Tobacco is now Puerto Rico's second ranking crop, whether measured by the value of production or of exports. It is exceeded only by sugarcane. Its economic importance extends beyond the cash income to producers because of the large number of people employed in its manipulation, which work is somewhat seasonal. From the time the grower delivers his crop until it is finally exported or manufactured the tobacco goes through from 10 to 20 operations, one bundle or hand at a time—in some operations, one leaf at a time.

The production of tobacco during the Spanish regime was on a much smaller scale than it is today, and was rather closely associated with the industry in Cuba. Both islands were Spanish possessions and trade was fostered between them and with the mother country, although a customs duty was applied to tobacco from Cuba and Puerto Rico entering Spain.

The outlet for Puerto Rican tobacco before the American occupation in 1898 was therefore confined mostly to domestic consumption and exports of unmanufactured tobacco mainly to Cuba and Spain, with smaller quantities to other European countries, like France and Germany. Exports of tobacco and tobacco products to the United States encountered the usual import duties and were very small in volume.

The cigar industry in Cuba formerly provided a market for a considerable part of the Puerto Rican tobacco. Although the door to this market was practically closed as a result of the Spanish-American War, the American market was opened. Prior to the American occupation, it required practically all of the income from tobacco sold

in exterior markets to pay for the tobacco manufactures Puerto Rico bought. A marked expansion of the production, manufacture, and export of tobacco was made possible by the removal of import duties on Puerto Rican tobacco and cigars coming into the United States, although several years elapsed before that expansion became really significant. (See discussion and statistics of exports, pp. 37–39.)

Table 2 shows the acreage, production, and farm price of tobacco during recent years.

TABLE 2.—*Acreage, production, yield per acre, and farm price of tobacco in Puerto Rico, 1921–37*

Crop year [1]	Acreage	Production	Yield per acre	Farm price per pound	Crop year [1]	Acreage	Production	Yield per acre	Farm price per pound
	Acres	*1,000 pounds*	*Pounds*	*Cents*		*Acres*	*1,000 pounds*	*Pounds*	*Cents*
1921	40,000	25,000	625	21.9	1930	43,312	32,500	750	28.0
1922	35,000	22,500	643	24.8	1931	50,000	37,300	746	20.0
1923	41,500	26,000	627	29.7	1932	10,079	6,000	595	15.0
1924	40,000	25,000	625	20.5	1933	25,300	16,783	663	15.0
1925	34,023	23,000	676	31.1	1934	45,500	25,000	549	17.0
1926	58,000	36,000	621	39.2	1935	38,000	22,500	592	20.0
1927	81,900	50,000	611	22.0	1936	43,809	26,000	593	12.0
1928	40,345	27,000	669	25.0	1937	50,000	34,983	700	14.0
1929	39,075	28,000	717	23.0					

[1] The usual crop year is from September to August and is designated by the calendar year in which the crop is harvested. For example, the crop year 1921 is from September 1920 to August 1921.

Compiled from Annual Books on Statistics, Department of Agriculture and Commerce, Government of Puerto Rico, fiscal years, 1935–36 and 1936–37.

In connection with table 2 it should be pointed out that up to this time Puerto Rico has had no crop-reporting organization and that so far as is known to the author the figures given were not obtained through official channels or by methods to insure reasonable accuracy. This point is important because the production figures do not satisfactorily account for the volume of tobacco exported and used locally in manufacture. This is shown by the analysis in table 3.

TABLE 3.—*Apparent deficiencies in estimates of tobacco production*

	Reported weight	Farm-sales weight equivalent
	Million pounds	*Million pounds*
(1) Requirements for export and manufacture 1926–35:		
Exports	231.1	[1] 338.6
Cigars manufactured, 1,617 million, requiring		46.3
Cigarettes manufactured, 2,094 million, requiring		7.4
Chewing tobacco, minimum estimate		9.4
Total requirements		401.7
(2) Production reported in table 2, 1925–34		281.6
Imports, 1926–35	34.3	40.1
Total production and imports		321.7
(3) Deficiency of tobacco reported as produced and imported for purposes shown under (1)		80.0
Apparent average annual deficiency		8.0

[1] United States only.

From table 3 it would appear that the production figures are understated, and that the average annual error may be as much as 8 million pounds. On the other hand there appears to be some possibility that production as reported is based on fermented weights. If this is true the effect would be to reduce the indicated average annual error to about 5 million pounds. The base acreages reported to the Agricultural Adjustment Administration (table 4) indicate that the acreage figures in table 2 are too low for the years previous to the crop year 1934. Acreage and production figures for that and the succeeding year are based on reports obtained by the Agricultural Adjustment Administration and are undoubtedly much more accurate. Actual statistics are not available for computing the quantity of leaf required in manufacturing operations but information obtained on the island indicates that 24½ pounds of unstemmed dry-weight tobacco is used

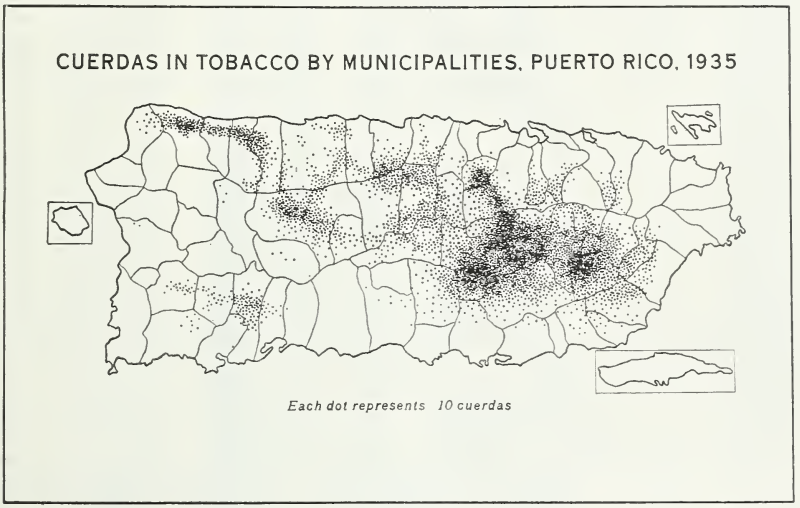


FIGURE 7.—Relative density of tobacco production in various parts of Puerto Rico. The area of greatest density lies in the district including Caguas, San Lorenzo, Cayey, Comerío, and Aibonito as shown in the rainfall map (fig. 6). (NOTE.—1 cuerda equals 0.9712 acre. A municipality is a geographical division corresponding roughly to a county in the United States.) (Adapted from map prepared by Division of Agricultural Economics, Puerto Rico Experiment Station. Data from the 1935 census, Puerto Rico Agriculture.)

per thousand cigars. Requirements for manufacture of roll chewing tobacco are almost certainly understated.

Figure 7 shows the relative density of tobacco production in various portions of the island.

Table 4, prepared from data supplied by the Agricultural Adjustment Administration at San Juan, and showing the number of tobacco contracts entered into with the tobacco growers, the number of farms, and the acreage in tobacco, is based on contracts with more than 90 percent of the growers. The acreage statistics shown relate not only to the years covered by production and soil-conservation contracts, but to the acreage base period. The principal producing areas are also shown in the map on page 16.

TABLE 4.—*Tobacco acreage, by types, under Agricultural Adjustment Administration contracts, in municipalities of Puerto Rico, 1929, 1930, and 1932–35* [1]

Type of tobacco and municipality	Method of harvesting [2]	Acreage planted in base period [3]				Base acreage	Acreage planted under contract, year beginning September—		Production, 1934
		Year beginning September—							
		1929	1930	1932	1933		1934	1935	
Filler: [4]		*Acres*	*Acres*	*Acres*	*Acres*	*Acres*	*Acres*	*Acres*	*Pounds*
Adjuntas	Sc	135	109	23	14	77.6	35	29	18,733
Aguas Buenas	Pr	2,211	2,505	1,103	2,201	2,151.9	1,301	1,523	1,094,102
Aibonito	do	4,345	4,794	2,149	3,803	3,865.7	2,299	2,637	1,948,650
Arecibo [5]	Sc	1,509	1,414	1,143	1,353	1,316.3	299	673	165,558
Barceloneta [5]	do	821	743	475	692	694.1	353	392	234,448
Barranquitas	Pr	3,028	2,755	1,528	2,820	2,499.3	1,643	1,843	1,152,218
Bayamón	Pr-Sc	1,104	1,157	406	742	921.2	526	658	296,825
Caguas	Pr	4,534	4,619	3,641	4,407	4,435.8	2,564	3,153	2,205,781
Carolina	Sc	433	362	264	356	362.1	177	245	88,705
Cayey	Pr-Sc	6,173	6,594	1,786	4,722	4,582.7	2,423	2,846	1,952,853
Ciales	Sc	1,743	1,454	1,032	1,659	1,476.1	819	867	646,257
Cidra	Pr	4,279	4,435	2,147	3,833	3,847.6	2,375	2,757	2,093,639
Coamo [5]	Pr-Sc	1,080	193	923	926	1,024.3	545	665	422,817
Comerío	Pr	613	4,798	2,492	3,878	4,031.0	2,044	2,895	1,395,427
Corozal	Sc	1,453	1,175	623	896	1,046.7	512	662	289,942
Dorado	do	50	46	2	12	40.8	4	26	1,745
Guayama [5]	do	145	180	130	132	137.1	94	100	65,490
Guaynabo	Pr	928	851	573	770	793.6	375	556	288,572
Gurabo	Pr-Sc	159	1,088	766	902	993.0	608	570	291,499
Humacao	Sc	338	349	294	320	332.3	166	217	112,683
Jayuya	do	911	1,014	368	767	822.1	431	458	199,060
Juncos	do	1,419	1,415	1,228	1,412	1,405.3	660	811	376,564
Las Piedras	do	1,259	1,229	1,038	1,204	1,204.3	639	803	329,623
Manatí	do	1,476	1,167	862	1,408	1,232.4	643	712	466,780
Maunabo	do	86	84	69	65	77.2	11	44	6,420
Morovis	do	1,926	1,543	1,236	1,734	1,615.8	820	1,006	675,575
Naguabo [5]	do	96	86	77	116	97.4	47	52	24,196
Narinjito	Pr-Sc	2,006	1,859	716	1,427	1,582.3	852	1,050	588,848
Orocovis	do	1,253	1,265	708	1,285	1,159.6	690	824	494,347
Río Piedras	Pr	638	585	498	563	258.7	298	406	204,971
San Lorenzo	Pr-Sc	5,598	5,737	5,003	4,920	5,425.0	2,956	3,540	2,191,123
Toa Alta / Toa Baja	Sc	592	476	148	639	509.6	275	363	155,227
Trujillo Alto	do	87	90	62	63	76.7	25	50	17,386
Utuado	do	3,501	3,484	1,552	3,976	3,432.8	1,718	2,263	1,040,645
Vega Alta	do	184	149	83	149	163.1	82	94	47,031
Vega Baja	do	502	421	316	397	430.5	215	226	109,931
Yabucoa [5]	do	1,517	1,446	1,195	1,507	1,446.0	592	952	348,521
Total		58,132	61,671	36,659	56,070	55,568.0	30,116	36,968	22,042,192
Percentage filler		*Percent* 86.9	*Percent* 87.7	*Percent* 82.4	*Percent* 88.6	*Percent* 87.1	*Percent* 94.3	*Percent* 91.8	*Percent* 95.2
Chewing:		*Acres*	*Acres*	*Acres*	*Acres*	*Acres*	*Acres*	*Acres*	*Pounds*
Aguadilla	Sc	481	486	473	337	454.6	84	154	55,364
Cabo Rojo	do	8	8	8	8	8.1		1	
Camuy	do	806	798	780	895	841.5	84	267	44,943
Guánica / Guáyanilla	do	567	522	461	343	482.6	80	161	33,848
Hatillo	do	739	755	763	788	775.0	79	318	43,029
Isabela	do	2,023	2,017	1,901	1,808	1,972.5	628	723	375,765
Juana Díaz	do	179	174	100	75	141.3	52	68	29,570
Lajas	do	266	244	226	193	236.2	25	76	118,002
Loíza	do	236	179	130	176	183.1	66	118	33,605
Moca	do	5	10	11	6	8.8	1	2	280
Patillas	do	301	313	218	233	259.0	67	147	37,577
Quebradillas	do	473	537	539	546	545.4	133	197	71,425
Río Grande	do	18				5.1		4	
Sábana Grande	do	404	432	346	334	383.2	72	167	42,111
Salinas	do	166	156	140	159	160.3	85	102	61,092
San Germán	do	472	475	427	383	451.9	57	176	21,224
Yauco	do	1,598	1,514	1,327	900	1,338.0	316	622	136,056
Total		8,742	8,620	7,850	71,184	8,246.6	1,829	3,303	1,103,891
Percentage chewing		*Percent* 13.1	*Percent* 12.3	*Percent* 17.6	*Percent* 11.4	*Percent* 12.9	*Percent* 5.7	*Percent* 8.2	*Percent* 4.8
Grand total		*Acres* 66,874	*Acres* 70,291	*Acres* 44,509	*Acres* 63,254	*Acres* 63,814.6	*Acres* 31,945	*Acres* 40,271	*Pounds* 23,146,083

[1] Statistics shown represent farms under contract under Agricultural Adjustment Administration. In 1935 approximately 90 percent of all tobacco acreage was under contract.

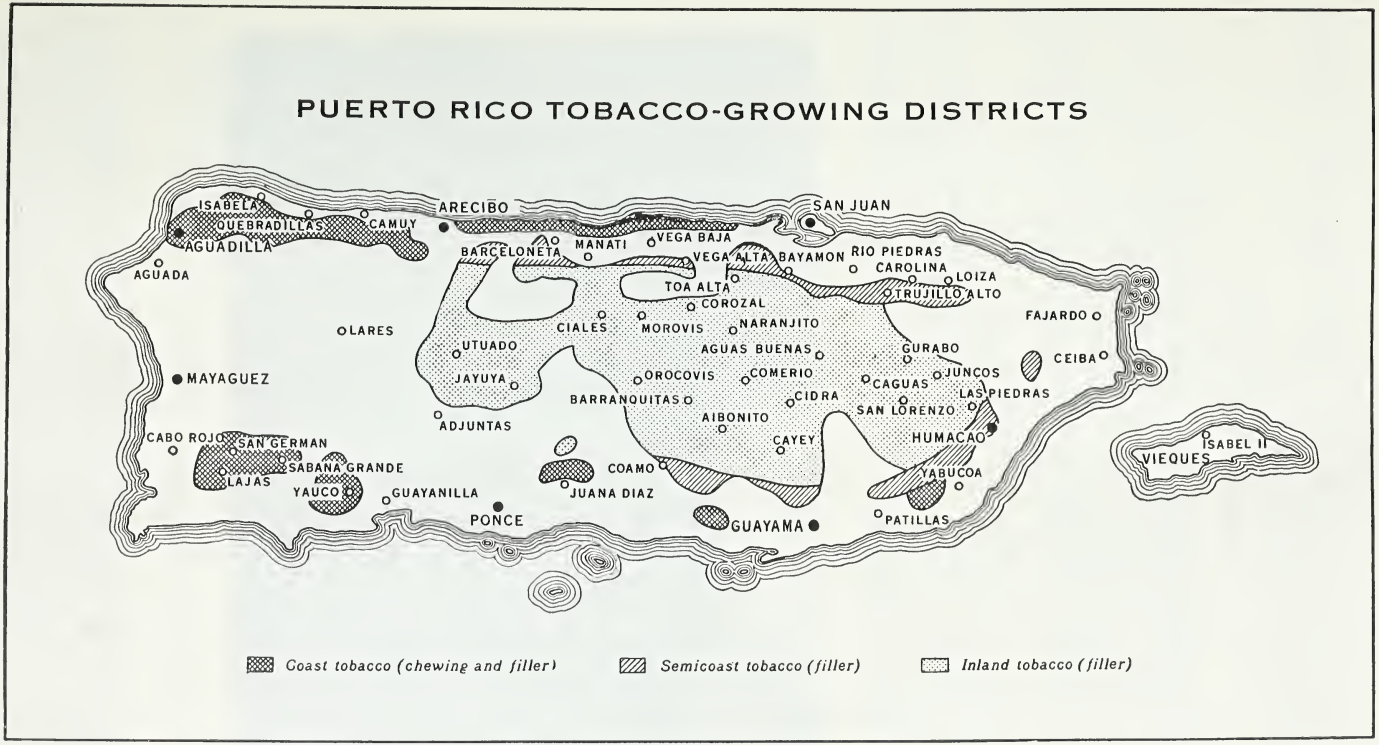
[2] Sc is used to indicate stalk-cut; Pr to indicate primed.

[3] The figures represent planted acreages approved for establishing base acreages for contracts.

[4] Includes the semicoastal tobacco.

[5] Includes a small quantity of chewing tobacco (coastal).

Compiled from reports of the Agricultural Adjustment Administration.



BAE 32388

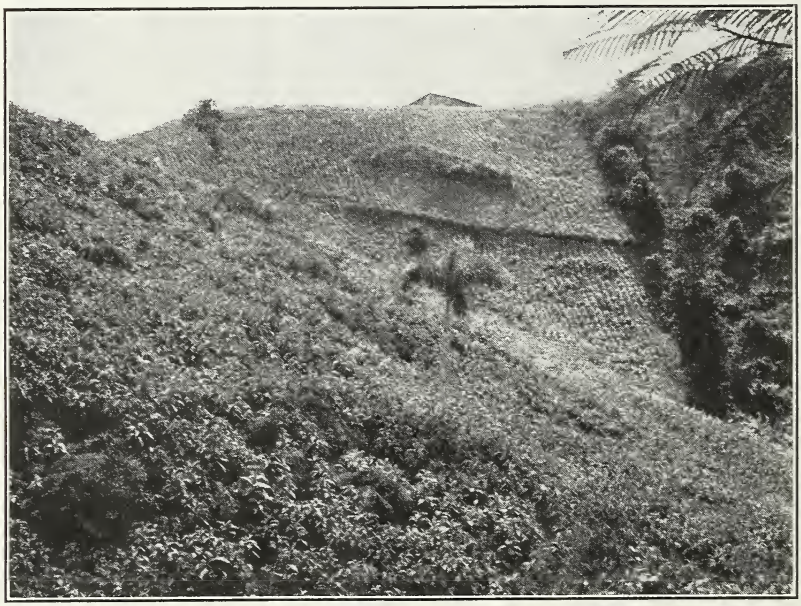
FIGURE 8.—Areas in which different types of Puerto Rican tobacco are produced are shown without reference to density of production. Inland or filler type is produced in the mountainous interior, including some lowland area such as that around Caguas. (See topographic map, fig. 2.)

TYPES

Tobacco produced in Puerto Rico falls into three general classifications, related to topographic and climatic factors. The producing districts and types are shown in figure 8.

FILLER OR INTERIOR TYPE

The filler or interior type is the tobacco for which the island is chiefly known and represents probably 95 percent of the total production. It is grown in the valleys and on the hillsides of the interior (fig. 9). Although it is all used for the manufacture of cigars and Puerto Rican cigarettes, the conditions of soil, slope, elevation, and exposure, together with differences in cultural and curing practices, bring about variations which distinguish the tobacco from different interior sections, and these variations are reflected in prices paid. All of it is classified as cigar filler, type 46, although some select leaves are used for binder purposes. The so-called standard varieties are Virginia No. 9 and Utuado X. In the manufacture of cigars, Puerto Rican tobacco is generally blended with other filler types, mainly those produced in the States. To some extent it is used straight or blended with Cuban filler in the better grades of cigars.



BAE 33561—C

FIGURE 9.—Typical field of filler tobacco in district between Aibonito and Cayey.

The most extensive soils used for the production of tobacco in the filler district are those of the uplands derived from tuffaceous rock, which includes most of the center of the district, and those derived from granitic rock, which includes the eastern and western parts of the district. Of the soils developed from the weathering of tuffaceous rock, those of the Múcara series predominate. They are brown,

fairly granular, friable, neutral or slightly acid, well drained, and fairly heavy in texture. These soils are shallow, the depth depending on the slope—the steeper the slope the shallower the soils. In many fields only 3 or 4 inches of soil covers the parent rock. The Múcara soils are fairly high in bases such as calcium and magnesium, and generally fertile. Crop yields depend mostly upon the slope, the extent of sheet erosion, and the length of continuous cultivation without the use of fertilizer.

The soils derived from granite that are used extensively for tobacco are the Utuado, Las Piedras, and Cayauga series. These soils are gray, friable, very well drained, acid, and sandy. They are much deeper than the Múcara soils but have a lower content of bases and generally a small quantity of organic matter. On comparable slopes the Múcara soils will out-yield the soils derived from granite.

COASTAL

A very short, heavy-bodied type of tobacco, produced on the coastal plain around the northwestern and southwestern parts of the island is called coastal (fig. 10). A small quantity is grown along the north coast. Owing in part to lack of seed selection and to faulty cultural practices the varieties have degenerated greatly and are

BAE 33556–C

FIGURE 10.—Field of coastal chewing tobacco near Yauco, in southwestern part of the island.

often mixed in the field. These factors, together with climatic and soil differences, effect of salt air from the ocean, and deficient rainfall, render the first crop coarse and unsuitable for cigar-filler purposes, but it is suitable for the manufacture of roll chewing tobacco. The second crop is thinner and is sold as scrap for cigars and cigarettes.

The most extensive soils used for tobacco in the coastal district are the Bayamón and related soils on the north coast derived from Tertiary limestone, and the Fraternidad and related soils on the south coast derived from material washed from the tuffaceous and limestone hills.

The Bayamón soils are nearly level, red, friable, faintly granular, strongly acid, and low in bases and organic matter. They are very permeable and well drained although they may have more than 90 percent clay in the surface soil.

Fraternidad soils occur on level or gently sloping relief and are brown, granular, alkaline, fairly well drained, and heavy in texture. These soils are high in bases and generally fairly high in organic matter.

SEMICOASTAL

Semicoastal tobacco is produced in the lower valleys adjacent to the coastal plain. The soils are intermediate between the coastal and interior types, and the influence on the tobacco of the salt ocean air is modified by proximity of hill conditions. The tobacco is intermediate between the coastal chewing type and the interior smoking type, but the trade as a rule treats it as a filler type.

The soils in the semicoastal tobacco district that are used extensively for tobacco growing are similar to the Fraternidad soils described next under coastal, but are more shallow. On the other hand, they are much deeper than the Múcara soils of the interior and are more productive, provided they receive as much precipitation.

SHADE-GROWN WRAPPER

Shade-grown wrapper tobacco was produced in former years by a subsidiary of one of the large manufacturers in the States. This subsidiary company, organized in 1902, acquired large tracts of valley and hillside land along the La Plata Valley at Aibonito, Cayey, and Comerío and in the lowlands around Caguas, Gurabo, and Juncos. It was organized to produce both filler and wrapper types. During the early 1920's it had as much as 3,500 acres of tobacco under shade, partly in the La Plata Valley, but extensively on gentle to steep mountain sides. (See fig. 4.) Because of competition of other wrapper types, and other difficulties, the production of shade tobacco was abandoned in 1927. The fertile land of La Plata Valley between Cayey and Aibonito was sold to the Federal Government and is now being developed for rural rehabilitation purposes, including some production of filler tobacco.

Experiments and variety tests looking to the reestablishment of the shade-tobacco industry were inaugurated by J. A. B. Nolla, then deputy commissioner of agriculture and in charge of the Tobacco Institute, now director of the Agricultural Experiment Station, Río Piedras. (See p. 50.)

PREPARATION OF SOIL AND PLANTING

First plowing of the land for planting is usually done in June and July. No vines or stalks are plowed under, which is one of the reasons the soil is lacking in humus. Puerto Ricans are said to exercise exceptional care in the preparation of soil and culture of the crops, and the

presence on the ground of litter like stalks and vines seems to mean carelessness to them. It may be noted, however, that the Extension Service has initiated an educational program, especially in the coastal district, in seed selection, the use of green manures, etc.

Preparation of the soil for planting is careful and thorough on bottom lands and the gentler slopes, but many fields are planted on hillsides so steep that only hand methods are possible and then the preparation of the soil is necessarily less thorough. Plants are set in rows from 32 to 48 inches apart, and the spacing in the row is usually 14 to 18 inches, varying according to the exposure of the particular field to the sun. This location of fields also influences the time of planting, those with southern exposure being planted earlier in the season than those with northern exposure. Commercial fertilizers are used, usually 6–7–8, or 6–8–10 applied at the rate of 500 to 600 pounds per acre, but until recently no fertilizer tests have been conducted to determine scientifically the kinds or quantities needed for best results. Cultivation is clean and thorough.

The planting season varies considerably in the different sections, extending in the most important districts from October through January, although in a few areas planting may occur as early as September, and in others as late as March. When a farmer wishes to plant more tobacco than he has barn room to cure at one time, he may make two plantings with an interval of a month or more. Seedbeds are not sterilized.

FACTORS AFFECTING YIELD PER ACRE

The average yield per acre of tobacco is strikingly low, particularly in view of the fact that, contrary to the universal practice in the States, some second-crop and even third-crop tobacco is harvested. Aside from the effects of diseases and insect pests, discussed elsewhere, the low yield is mainly due to the relatively small size of the leaves, the bulk of which run from 10 to 14 inches in length for the better grades, and 6 to 10 inches for the boliches or lugs. Much of the tobacco is topped, with only 14 or 16 leaves remaining. In the case of stalk-cut tobacco when the whole plant must reach full maturity before harvesting, two or three of the bottom leaves dry up and are lost. Offsetting this, the remaining leaves acquire good body and are rather heavy. In the case of primed tobacco, all leaves may be harvested but they are thin and light in weight.

The small size of leaves and consequent low yield may be explained in part by the depleted condition of the soil. Most of the tobacco is grown on hillsides, some of them excessively steep; consequently, the soils are exceedingly shallow and neither the size of the leaf nor the yield per acre is as large as on the deeper soils of the valleys and gentler hillsides. The finer particles of soil have been washed out, leaving a coarse granular soil deficient in humus and natural fertility. Crop rotation and the production of soil-building crops do not seem to be generally practiced, although the Extension Service is teaching seed selection, the use of green manures, and contour planting to avoid soil erosion. Corn and beans are frequently planted after tobacco, not as a planned rotation but because tenants are allowed to do this and get the benefit of such fertilizer as remains in the ground. A more general rule is to allow the land to remain idle.

Then, in the opinion of Dr. Nolla, the varieties in use have become somewhat off-type, probably because of improper selection. With that in mind, a part of the scientific work on tobacco, referred to elsewhere, is devoted to the introduction or development of new and better yielding varieties. Seed has been brought in from South American countries, notably Colombia and Venezuela. Hybridization work is being conducted at the Insular Experiment Station at Río Piedras.

Smallness of leaf is not entirely due to the enumerated conditions. Whereas growers would prefer varieties having large leaves and consequent heavier yields, the buyers prefer shorter leaves because they are easier to handle and involve smaller losses in stemming.

DISEASES AND INSECT PESTS

DISEASES

Tobacco in Puerto Rico is subject to several diseases of great economic importance. The more important are discussed briefly here.

MOSAIC

The mosaic disease is the most serious and affects both the yield and the quality. The intensive cultivation to which the crop is subjected, including continuous suckering, has brought a widespread distribution of the disease. In sections where only one crop of tobacco is harvested, mosaic is usually the result only of primary infections. In districts where two crops are harvested, irrespective of the method of harvesting, a general distribution results from secondary infections. The farmers do not seem to be much concerned about the seriousness of this disease because they usually get a crop anyway.

Methods of control of mosaic have been mainly of an eradicatory nature but during the last decade efforts have been made to reduce the incidence through preventive methods. The most important is the breeding of mosaic-resistant strains, in which much progress has been made. The first tobacco resistant to the mosaic disease was discovered in the Cauca Valley of Colombia, South America (*6*, *7*, *8*).

A large number of resistant strains, many of them considered to be far superior to existing tobacco varieties in Puerto Rico, are being tested at the Tobacco Institute for yield and quality, and as sources of cigar filler, cigar wrapper, cigar binder, and cigarette leaf.

As a further preventive measure careful cleaning of seed is advocated to minimize the danger from primary infections in the seedbed.

DAMPING-OFF OF SEEDLINGS

The damping-off of seedlings is very important, especially during seasons of heavy rainfall. Seedbeds are prepared on a rather extensive scale and usually on hillsides. Great damage is caused by seedbed diseases. Seedbeds are usually very long and have no protection on the edges. There is much washing on these beds and the drainage water may carry the inoculum from bed to bed, especially when the primary infections occur at the higher points on a seedbed. A focus of infection may soon extend over a large area.

The damping-off of seedlings in Puerto Rico is caused by the pathogens *Pythium debaryanum* and *Phytophthora parasitica*. The disease becomes more serious when the latter is involved because it also produces a black shank on the transplants.

Control is usually accomplished by rotation of seedbed sites and by treatment of the seedlings in the seedbed as soon as small infections are detected. It has now become a practice to apply formaldehyde, of the concentration 1–30, in spots where rotting of the seedlings is evident. The rest of the seedbed is soaked with Bordeaux mixture (3–3–50).

Another precaution is to discard any seedlings that may exhibit symptoms of the disease along the stem, for, if transplanted, they quickly develop black shank.

BLACK SHANK DISEASE

The black shank disease, which is characterized by necrotic lesions along the base of the stem and roots and by wilting of the plants, is important only in low, wet areas and in the case of wrapper tobacco grown in the shade. The ordinary cigar-filler tobacco of Puerto Rico is rather resistant to this disease but when the same tobacco is grown under shade the disease becomes an economic menace as it may kill a large percentage of the plants.

Breeding work is now being conducted to develop strains of cigar-filler and cigar-wrapper tobacco that will be resistant to the disease. A number of strains have been developed that are very promising; they are undergoing final tests in the field.

LEAF-SPOT DISEASES

Of the leaf-spot diseases of tobacco in Puerto Rico perhaps the most important is the frogeye caused by *Cercospora nicotianae*. No apparent immunity has been observed in existing strains or varieties. No eradicatory measures have been developed as yet.

Several leaf spots of perhaps another origin are common in the tobacco crop but these have not been studied extensively. Several causes have been attributed to various leaf spots such as *Alternaria* sp. and *Phyllosticta* sp.

Diseases of tobacco that occur in the process of curing in the barn have not been very well studied. It is considered that at least the molds are of economic importance.

INSECTS INJURIOUS TO TOBACCO IN PUERTO RICO

THE MOLE CRICKET

One of the most serious insect pests is the mole cricket or changa (*Scapteriscus vicinus* Scudder). Accidentally introduced from South America many years ago, it now occurs in all parts of the island. Its chief damage is confined to sandy lands. The changa burrows just beneath the surface of the soil, eating into the stems of tobacco or other crops, and killing the plants. If the grower is to have an even stand of plants, he must surround each plant with a ring of a mixture of paris green and flour, to protect it against these pests. Biologic control of the changa is a possibility, for a specific parasite (*Larra americana* Saussure) exists in tropical South America. In May 1938 it was demonstrated that these parasites can be brought alive to Puerto Rico.

THE FLEA BEETLE

Three species of flea beetles (*Epitrix parvula* F., *E. cucumeris* Harris, and *Systena basalis* J. Duval) feed on the leaves of tobacco, riddling them with small holes. Elimination of alternate hosts around tobacco fields would do much to limit the numbers of these beetles, but most growers rely on dusting the seedbeds and the transplanted plants with paris green or other arsenical mixtures.

OTHER INSECTS

Several species of cutworms, the most abundant of which is *Feltia annexa* Treit., feed on tobacco leaves, usually in the period immediately after the transplanting. Control is by hand picking, or by dusting with paris green.

The pega-pega or leaf folder (*Psara periusalis* Walker) often attacks young tobacco leaves.

A looper caterpillar (*Phytometra oo* Cramer) is most likely to occur on shade-grown tobacco. Its injury persists even after the tobacco is harvested and hung up to dry.

The tobacco hornworm (*Protoparce sexta* var. *jamaicensis* Butler) occurs mostly on nearly mature plants, and, because of its size, can cause great damage in a very short period. It continues to feed on unpoisoned tobacco after it is hung up in the drying sheds.

During periods of dry weather a leaf miner (*Phthorimaea operculella* Zeller) often causes serious damage—the more serious because dusting with poison will not control it. Hand pinching of each caterpillar inside its mine appears to be the only effective control, if the weather does not change and if rain does not rot the tunnels.

Tobacco in storage is attacked by a small beetle (*Lasioderma serricorne* F.) which feeds on a great variety of other stored products, like cottonseed meal, the interior of camandula seeds, and book bindings. Control is by clean-up methods and fumigation with hydrocyanic acid or carbon disulphide gas.

HARVESTING AND CURING

Most of the harvesting occurs in January, February, and March. Methods of harvesting vary in different sections. In the important areas around Caguas, Cayey, Aibonito, and Comerío the tobacco is primed, tied to sticks, and suspended in tiers, as in the flue-cured districts in the States. The practice of priming appears to have been adopted from the introduction of shade tobacco in this area, priming being customary in the harvesting of this type. In some other districts, such as Utuado and Ciales, the tobacco is stalk-cut; but in the States there is no counterpart for the Puerto Rican method of suspending the stalks in the curing barn. Because of the small size of the stalks they can neither be speared as in Maryland or Wisconsin nor split as in Kentucky or Tennessee; at least they are not. They are tied one above another to cords suspended from the rafters of the curing barn, or the plants are tied with strips of palm leaves to strong sticks laid across tier poles, four to six plants to the stick. In some districts both methods are followed. Barns built for stalk curing are not suitable for housing primed tobacco.

A common fault in curing is to hang the tobacco too compactly in the barns, so the annual loss from house burn is considerable, particularly in rainy seasons. Frequently the barns are rather poorly constructed (fig. 11). As a rule the side walls are covered with palm or cane leaves, and while this construction permits good circulation of air during dry weather, it gives insufficient protection during wet weather. Charcoal fires are used in humid weather to avoid house burn, but many of the small farmers cannot afford this rather expensive practice. Furthermore, charcoal fires are of but little value in the poorly built barns used by many of the smaller growers. A better type of barn for curing primed tobacco is shown in figure 12. The improvement of curing barns is being promoted by the agricultural experiment station.

Under normal atmospheric conditions the curing period is from 35 to 40 days (*10*).

When stalk-cut tobacco is taken down it is put in square or round piles, stalk and all, and left for 40 to 48 hours. When removing the tobacco from the stalk it is roughly classified as to length and quality, and tied in hands of 40 to 60 leaves. For delivery, the farmer puts his tobacco up in fardos or rolls. Strips of burlap 30 to 40 inches wide and about 12 feet long are stretched out on the floor or ground. The tobacco, having been tied in hands with string or strips of palm leaves, is arranged several inches deep on the burlap, butts out, and the whole thing is rolled up and tied. A fardo of tobacco weighs from 100 to 150 pounds.

MARKETING AND COMMERCE

As a first step in marketing, the Puerto Rican grower delivers his cured tobacco to one of the agencies discussed on pages 28–32, by whom it is classified into grades and fermented—an almost invariable prelude to actual sale.

CLASSIFICATION INTO GRADES

There are no official standard grades in Puerto Rico, but grades and grade terminology have been fairly well established by custom. Absence of established, official grade specifications and an official arbiter to render unbiased decisions on questions pertaining to grade is an apparent weakness in the marketing system.

Some variation exists between the grade names used in stalk-cut and primed tobacco, as shown below:

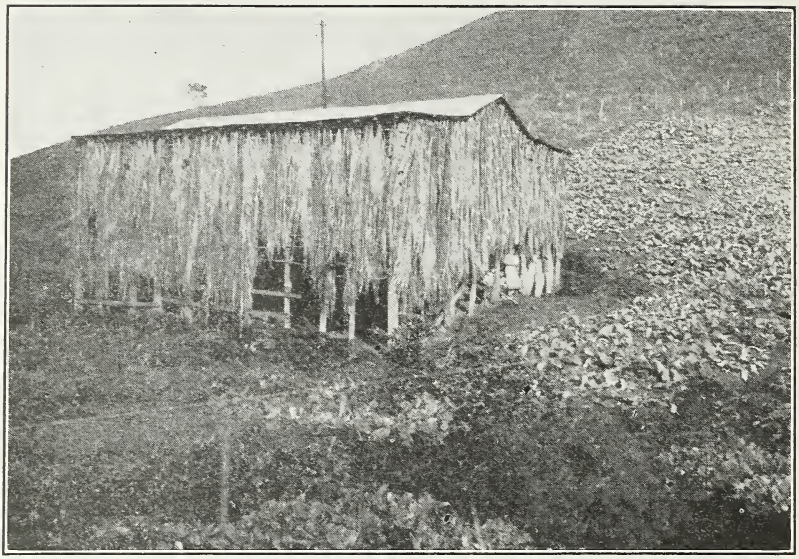
COMPARISON OF GRADE CLASSIFICATIONS COMMONLY USED IN STALK-CUT AND PRIMED TOBACCO

Stalk-cut:

- Manojo 1 and 2 (heavy leaf): First and second qualities. Includes about 50 percent of the plant.
- Tripas (thin leaf): Short inferior leaves which can be stripped (stemmed); sometimes called Manojo 3; about 30 percent of plant.
- Boliches: Low-grade leaf, lugs, and second cuttings, and all inferior leaves that cannot be stripped; about 20 percent.

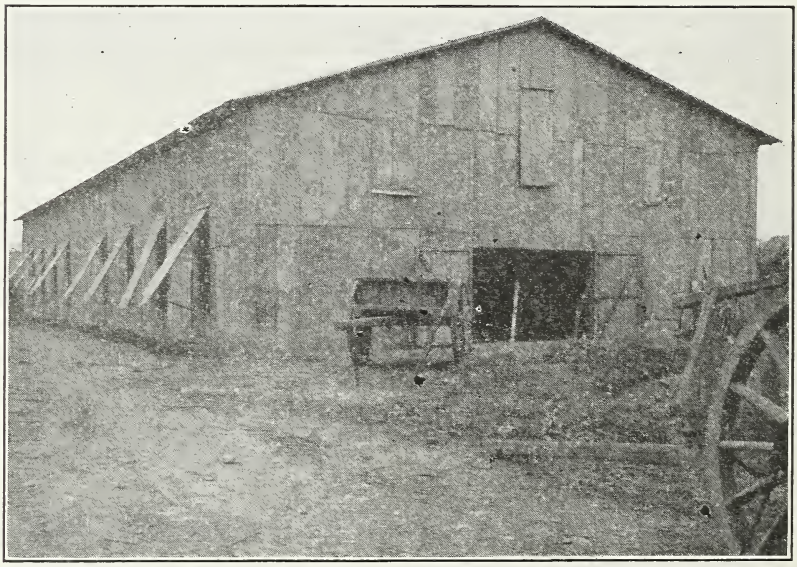
Primed:

- Médios (middles): Superiores or Finos Inferiores.
- Coronas (tops): Superiores; Inferiores.
- Pié (foot): Superiores; Inferiores; Boliches (from second cutting).



BAE 33559-C

FIGURE 11.—Tobacco barn near Naranjito with palm-leaf sides and in bad repair.



BAE 33559-D

FIGURE 12.—Curing barn of the ventilator type near Caguas. This kind of barn is commonly used by the better growers, though they are usually of all-wood construction. This barn is covered with corrugated iron.

Other terms in common use are "rezagos" or throw-outs from different grades; "sentidos" or leaves injured or showing injury from wet stems because taken down too early during curing; "picadura" or scrap tobacco.

A more complete statement of the grades in use is contained in Extension Bulletin 4 (*10*), from which classifications No. 1 and No. 2, following, are quoted. (See also Stocks of Unmanufactured Tobacco, p. 41).

GRADE CLASSIFICATIONS OF PUERTO RICAN TOBACCO

1. Primed

Group	General characteristics
Deshojado—Pie Inferior (primed—lower foot leaves).	The first leaves found above the ground, which are torn and damaged.
Deshojado—Pie Superior (primed—upper foot leaves).	The leaves above those in contact with the ground, but which are rather healthy and of medium quality.
Deshojado—Pie Amarillo (primed—yellow foot leaves).	All the first leaves of the plant which are near the ground and are of a yellow color.
Deshojado—Medio Inferior (primed—lower middle leaves).	Leaves above the upper foot leaves and which are sound and live.
Deshojado—Medio Superior (primed—upper middle leaves).	Those which grow above the lower middle leaves or in the middle of the plant. They are healthy, long, of good quality, clean, of good body or strength, and are used for wrappers and good fillers.
Deshojado—Medio Amarillo (primed—yellow middle leaves).	Leaves from the middle of the plant, which are as the name indicates.
Deshojado—Corona Inferior (primed—lower top leaves).	Leaves from the upper part of the plant, which are very thick and short, but which can be stripped.
Deshojado—Corona Superior (primed—upper top leaves).	Leaves from the upper part of the plant, but of larger size; soft and elastic; very good for filler.
Boliche	Leaves that are broken, of poor quality, difficult to stem, but not wet or rotten.
Sentido	Leaves having the midrib soft or moist, with spots on the surfaces of the leaves, with excessive moisture, but which are not moldy or rotten.
Salcochado (house burnt)	Leaves that have been house burnt and are of a rather dark color.
Mohoso (moldy)	Leaves with typical spots of mold and with a rather bad odor.

2. Stalk-cut

Boliche	Same as primed tobacco, but it has more thickness or body and is in good demand with the buyers.
Sentido	Same as primed tobacco.
Mohoso	Do.
Salcochado	Do.
Manojo de Mata Núm. 1 (stalk-cut No. 1).	Clean, healthy leaves, of good thickness or body and quality, and suitable for filler.

GRADE CLASSIFICATIONS OF PUERTO RICAN TOBACCO—Continued

2. Stalk-cut—Continued

Group	General characteristics
Manojo de Mata Núm. 2 (stalk-cut No. 2).	Leaves of the average size of No. 1, not very clean or sound, but of good body and quality.
Manojo de Mata Núm. 3 (stalk-cut No. 3).	Leaves of inferior size and quality to No. 2, but of fair size for stemming. The farmers often call Manojo No. 3, tripas.
Boliche—segundos (Boliche—seconds)	This tobacco is much like the boliche of primed tobacco (deshojado), but it presents difficulties in fermentation.
Tripas—segundos (Filler—seconds)	Leaves of good quality, fairly sound, of fair size, good body, clean, and easy to stem.

FERMENTATION

Tobacco is delivered to warehouses where it is classified and made into estibas or bulks of 50 to 60 quintals, depending on the type and moisture content of the tobacco, a quintal being 100 pounds. (The actual equivalent of a Spanish quintal is 101.43 pounds, but as the Spanish system of weights and measures is no longer used in Puerto Rico, the term "quintal" is used to represent a hundredweight.) Numerous strings stretched lengthwise in the bulk with tags on the outside preserve the identity of the tobacco of different farmers.

Attached to each bulk is a card for recording the daily temperature. Temperature is ascertained by inserting a thermometer through a tube to the center of the bulk. In a new bulk of primed tobacco the temperature rises to about 126° F. in 4 to 5 days. The bulk is then torn down and rebuilt with the hot tobacco on the outside and the colder, outer bundles moved inward. The top and bottom layers go to the center. Aside from this, tobacco at the top goes to the bottom and vice versa. Heating then takes place somewhat more slowly, possibly 6 days being required. The second cambio or change is made preferably at a slightly higher temperature, but will be made at a lower degree if the temperature becomes stationary for 2 or 3 days. As many as four or five changes may be made, each requiring a little longer period until the temperature becomes stationary at 118° to 122°, or until it will not rise any higher than approximately 120°. When this stage has been reached two or more small bulks are combined into one large one and further changed until the lot ceases to heat. Figure 13 shows bulks of tobacco during fermentation.

Stalk-cut tobacco, having more body and more gum, requires more changes and is allowed to reach higher temperatures. On the first fermentation it reaches 130° to 134° F. Later, the temperature reaches 138°. There is no set rule as to the number of fermentations or the temperature, the practice varying with the nature of the particular lot of tobacco. Some bulks require considerably more fermentation than others. Much tobacco is delivered with a pronounced greenish cast, and nearly all new tobacco lacks uniformity of color. One of the objects and results of repeated fermentation is to eliminate the greenish cast and achieve greater uniformity of color.

METHOD OF PACKING

The method of packing Puerto Rican tobacco for shipment has varied from time to time. Formerly, most of it was stripped and shipped in barrels of 120 to 130 pounds net, but this method of packing is being abandoned. Some years ago one large company, which produced both filler and shade-grown wrapper types, adopted the practice of shipping considerable quantities of unstripped tobacco. All unstripped filler grades were packed in bales 36 inches long by approximately 16 inches high and 18 inches wide, with palm leaf inside and burlap on the outside. All wrapper tobacco was packed in the Cuban style. That is, four small hands of tobacco were tied together forming a cigar-shaped bundle called a manojo. From 48 to 72 manojos were combined to make one bale (tercio) with a net

BAE 33765

FIGURE 13.—Bulks of tobacco during fermentation. The cards attached to the bulks contain a record of the daily temperature and of the dates on which the bulks were torn down and rebuilt. In the foreground are heavy cloths on which new bulks will be built.

weight of from 100 to 140 pounds, according to the length and number of the manojos. This bale was only very slightly pressed and the wrapping consisted entirely of palm leaves, with sometimes a piece of burlap on the outside for protection. This method was considered very good to preserve the tobacco, but had the disadvantage of causing a relatively high percentage of breakage in handling the bales because of the loose packing, and the method was rather expensive. Later a change was made to the regular Sumatra-style bale, a flat bale about 32 by 32 by 10 inches. The bale has paraffined paper inside and a grass matting outside and weighs from 120 to 130 pounds net.

At present, approximately 80 percent of all stripped tobacco is shipped in bales approximately 34 inches long by 28 inches wide by

30 inches high, and weighing about 150 pounds net (fig. 14). Most of the stripped tobacco goes to six large companies. Only the small lots that go to the jobbers for retail purposes or sales in small lots are packed in barrels. Burlap is used on the outside of the bales. The inside is lined with heavy paraffined paper or yagua, the lower or sheath-forming part of the leaf of the royal palm.

MARKETING CHANNELS

An understanding of the marketing methods requires an explanation of the functions of the various agencies through whose hands the tobacco passes after leaving the curing barn. These are: (1) Refaccionistas, (2) local dealers, and (3) brokers, leaf dealers, and manu-

BAE 33579-A

FIGURE 14.—Bales of Puerto Rican tobacco in storage in Manatí for later shipment. Bales weigh approximately 150 pounds.

facturers. In addition, there is a large growers' cooperative association which is discussed later.

REFACCIONISTAS

The production, fermentation, and marketing of tobacco are closely tied up with the functions of those important personages known as refaccionistas. The nearest counterpart in the States to the refaccionista is the time merchant of the South. The refaccionista supplies production credit, exercises a certain degree of supervision over the spending of the money and the production of the tobacco, takes delivery of the cured tobacco, and puts it through the long fermentation process.

Often the refaccionista is a landowner who produces some tobacco himself. Usually he is a merchant dealing in food, feed, and fertiliz-

ers, and most of his financing is in the form of credit for articles in which he deals. If not a merchant, the refaccionista, as a rule, furnishes credit through local merchants.

The laws of Puerto Rico give the refaccionista a lien on the crop until his claims have been satisfied. To protect their liens, refaccionistas supply money and credit sparingly, to meet only the most pressing needs, and they ride over the farms periodically or send out supervisors to see that the growers are taking proper care of their crops.

The grower delivers his tobacco to the refaccionista who classifies it into grades and issues a receipt showing the number of pounds of each grade. Since the tobacco is in soft order when delivered by the grower, a deduction is made from delivery weights for anticipated losses through drying of excess moisture and fermentation. The customary deduction for such loss in weight is 10 to 12 percent. The tobacco is bulked and fermented by the refaccionista, who ultimately buys it or facilitates its sale to other parties. Following such disposition, settlement is made with the grower, the debits including credit advanced and costs of fermentation.

The refaccionista's relationship to the sale of the tobacco varies. He may buy it from the grower, either as a speculative venture or in fulfillment of a contract entered into between himself and a local dealer. That is to say, before the planting season a leaf dealer from the States may place an order with a local dealer at some interior point in Puerto Rico to refaccion a certain acreage or poundage of tobacco. To accomplish this the leaf dealer supplies the cash at intervals during the planting, growing, and harvesting season. The arrangement is designed to insure that the leaf dealer will get the quantity of tobacco desired. The local dealer in turn makes his own terms with refaccionistas. The production credit in this case is based on the remittances of cash from the leaf dealer. The local dealer may receive a commission, but may derive additional benefits depending on his ability to refaccion the tobacco at costs which will leave him a margin of profit from the prices ultimately paid by the leaf dealer. Similarly, the refaccionista may buy the tobacco from the grower at a price that will enable him to make delivery to the local dealer at a profit. In this case the refaccionista's profits come from interest on the credit advanced, from profits on the merchandise sold under such credit, and from the margin between the price paid to the grower and that received from the dealer.

Not all of the refaccionistas' operations fall within the above category. Many, relying on their own sources of financial backing, refaccion tobacco on a straight production-loan basis, ferment the crop, and make it possible for the buyers to inspect the tobacco. Upon sale they may take a contract from the purchaser for stripping the tobacco, that is, removing the midrib. Virtually all tobacco is stripped before the final stages of fermentation. The work is done mostly by women and girls on a piece-work basis.

The refaccion system is an important part of the tobacco production and marketing set-up. Although it has probably declined in importance in recent years because of the growth of the cooperative marketing movement, refaccionistas continue to exercise great influence over the affairs of growers.

As is to be expected, some refaccionistas, like some time merchants, are unscrupulous, charge excessive rates for fertilizer and other supplies, and in other ways take advantage of the growers. While it is true that the refaccionista finds it necessary to protect himself against many hazards, including partial or total loss of the crop from adverse weather, destruction of cured tobacco by fire, and, perhaps, incompetence of the grower, it is also true that refaccionistas are in a highly strategic position to make exactions of the growers. (See discussion under Possible Marketing Reform, p. 32)

Mention should be made of a small group of buyers known as traficantes. Traficantes are itinerant buyers who go about buying tobacco at the farm, either on their own account or on commission for larger buyers. The quantities bought are small and sometimes represent tobacco produced under refaccion contract which the grower sells clandestinely to get some money quickly. On the other hand—

> this agency furnishes outlet for the product of small farmers who have grown their tobacco without the necessity of obtaining production loans and who find it unprofitable to go to town and wrangle with dealers. * * * Only 5.8 percent of the total tobacco sold was marketed through this agency.[6]

LOCAL DEALERS

There is a clear distinction between local dealers and leaf dealers. The former are located at interior points and play a part as herein described in the early stages of the commerce in tobacco. Leaf dealers are supply merchants, located mostly in New York, who buy and store large quantities of tobacco for later sale to cigar manufacturers who do not have Puerto Rican leaf departments.

To a considerable extent local dealers depend on arrangements with refaccionistas, as described in the preceding section, acting as commissioned intermediaries between leaf dealers and refaccionistas, but frequently they refaccion tobacco direct instead of through others, and they buy tobacco from growers who do not depend on refaccion contracts for their production credit.

Local dealers maintain warehouses in which to receive, classify, and store tobacco, expose it for the inspection of the buyers, strip, and pack it for shipment.

Local dealers, like refaccionistas, receive cured tobacco direct from growers but as a rule it is by direct purchase, whereas in the case of the refaccionista the grower generally retains ownership of the tobacco until it has been fermented and a sale has been made to some outside buyer. Sometimes, on the other hand, local dealers render services to growers similar to those of refaccionistas in that they may actually refaccion crops or may receive unrefaccioned tobacco, ferment it and facilitate its sale to other buyers. Then, it is generally the rule that a grower, if not satisfied with the offers obtained at the warehouse where the tobacco was fermented, may pay the handling costs and carry his tobacco to another dealer for sale. This, of course, presupposes that any refaccionista's lien on the crop is protected.

It will be observed that there are points of similarity between the operations of refaccionistas and local dealers. Both refaccion tobacco

[6] TORRES, R. COLÓN, and DEL TORO, EMILIO, JR. METHODS OF MARKETING. 268 TOBACCO FARMS, PUERTO RICO, 1936–37. (Unpublished study.)

crops, although this is done mostly by the former group. Both maintain facilities for bulking and fermentation. The refaccionistas' fermentation space usually is in additions to their store buildings, whereas the local dealers have warehouses designed and constructed especially for that purpose. The facilities of the dealers, however, include provisions for stripping and packing the tobacco for shipment or storage. Both groups assist in promoting the sale of the tobacco for the grower, but the local dealers also occupy the broader field of intermediaries between the large purchasers, that is, leaf dealers and cigar manufacturers, and the immediate sources of tobacco—the refaccionistas and growers. Local dealers do maintain direct connections with leaf dealers in the States to some extent. Probably a larger percentage of their sales are made to company buyers who, though representing continental interests, are located on the island or come there during the marketing season. A considerable part of this class of business is transacted through brokers.

BROKERS, LEAF DEALERS, AND MANUFACTURERS

Brokers, leaf dealers, and manufacturers, in their relationships to the agencies already discussed, are here treated as a unit. For the practical purpose of analyzing the marketing and commerce in Puerto Rican tobacco, the cigar manufacturer may be considered the consumer, disregarding the small percentage of the tobacco used for cigarettes and chewing. The greatest consumers are the cigar manufacturers in the States.

Very few manufacturers maintain their own leaf departments and buying organizations for buying and storing Puerto Rican tobacco. Even this small group is divided into two classes: (1) Those who have receiving plants at interior points on the island that are equipped to receive tobacco in large quantities and in all stages from unfermented to fermented and stripped and to put it through any necessary classification, fermentation, stripping, and baling process and to store it for later shipment to the States; and (2) other manufacturers who maintain one or more buyers on the island but have no leaf-handling facilities there.

Aside from these, numerous manufacturers in the States use Puerto Rican tobacco but not in sufficient volume to justify them in maintaining buying agencies on the island or even in carrying yearly supplies. These manufacturers buy their supplies as needed from leaf dealers. That is to say, leaf dealers perform for the lesser users of Puerto Rican tobacco services that are analogous to those the larger users obtain from their own leaf departments.

Leaf dealers, who almost without exception are located in New York City, buy and store Puerto Rican tobacco in large quantities. A few have branch receiving and handling houses on the island. Mostly, however, they send representatives to Puerto Rico during the buying season.

Both the dealers and the manufacturers who have buyers but not branch houses on the island make extensive use of the services of brokers. The customary procedure is for the buyers to bargain with the local dealers, refaccionistas, and sometimes individual growers on questions of price for stipulated grades. It is the duty of the broker to make such inspections as are necessary to insure that the grades are

maintained, take delivery of the packed tobacco, arrange for payment, and forward the tobacco to his principal. The broker's functions therefore are those of purchasing and forwarding agent.

COOPERATIVE MARKETING

Cooperative marketing of tobacco has existed for several years. The present organization, the Puerto Rico Tobacco Marketing Association, was formed on August 31, 1934, and supersedes several small associations that had existed in different parts of the island.

The present association receives its financing from governmental sources. Financial statements for the crop year 1935–36 show the Puerto Rico Production Credit Association and the Emergency Crop and Feed Loan Section of the Farm Credit Administration as the sources of crop-lien loans to members; and in addition the association itself made advances from its own funds. The association pledged all the tobacco handled to the Baltimore Bank for Cooperatives on a pignoration loan, the proceeds being used to cover in part the production loans and advances to members and provide for warehouse and general expenses. The fact that membership in the association is prerequisite to the granting of a crop loan by the agencies named is a factor of strength in the present organization. Aside from that, however, it has demonstrated a capacity to handle its affairs in an efficient and businesslike way.

At present, approximately one-third of the tobacco growers are members. Large and well-equipped receiving plants for fermentation, stripping, and packing are maintained at Aibonito, Cayey, Caguas, Ciales, Comerío, Utuado, and San Lorenzo, although that at Aibonito was not operated during the 1936–37 season. Although cooperative marketing at one time encountered considerable opposition from buyers, this opposition is said to have diminished by reason of the advantages buyers find in the ability to buy larger quantities of evenly graded, well-fermented tobacco. During the 1936–37 season the association handled about 32 percent of the total production.

It is claimed that the growth of the association has brought a reduction of the charges made by refaccionistas. An official inspection service, established on the basis of standard grades and efficiently administered, would undoubtedly be advantageous, not only from the standpoint of the members but in dealings with the trade.

POSSIBLE MARKETING REFORM

Some aspects of the marketing system are thrown into sharp relief by consideration of complaints and criticisms expressed by growers. These criticisms may or may not be well founded. In either case they bear on controversial points and deserve consideration.

NEED FOR INSPECTION SERVICE

The complaint is made that the classification of the tobacco is in the hands of men whose interests are not parallel with those of the growers. Such cases are pointed out as when the refaccionista or dealer rehandles the tobacco and buys it himself, expecting to sell later to a larger dealer or manufacturer. Growers claim that the grading, and the weights

running to the different grades, are manipulated to depress the price. It is not intended here to assert or deny that such complaints are justified, but to point out that at least the present system lends itself to such practices and that the growers have no means of protection at their command.

The remedy would seem to be (1) the adoption of standard grades, but only after painstaking analysis and a critical review by the trade, and (2) organization of an inspection service, competently staffed and thoroughly trained. The function of such an organization should be to inspect a grower's tobacco upon delivery and after it has been sorted or classified, and to issue a certificate showing the grades delivered and the number of pounds of each such grade. Actual supervision of the sorting by the inspectors offers possibilities that should be given consideration.

The concept of an official inspection service in tobacco is comparable to that involved in governmental regulation of weights and measures. It implies the exercise by the governing body of the power to establish and define standards, coupled in this case with an agency for affording disinterested and unbiased application of those standards. It assumes that as the interests of buyers and sellers to a certain extent are diametrically opposed and as the sellers are incapable of protecting themselves against improper exactions or practices of buyers, then the interposition of the Government is in the public interest. The possibility of incorrect weights, juggling of grades, or improper exactions by which uneducated and helpless growers may be deprived of the results of their labor should be eradicated.

This view contemplates that the appropriate field for inspection service, made mandatory when sufficiently well organized, is that stage of the marketing process when the grower's tobacco is delivered and classified into grades and a receipt issued. It is precisely then that the grower needs an authoritative and unbiased determination of quality. This does not contemplate the compulsory injection of standard grades into the ordinary commercial transactions in tobacco. It may be assumed that insofar as standard grades fit into trade requirements and facilitate trade practices they will be adopted, but such a development is not essential to the stated purpose of protecting the grower in the marketing of his crop.

BASIS FOR PRICES

A further criticism of growers is that buyers, when inspecting tobacco offered for sale, unduly disparage its quality as a means of beating down the price; that they arrive at an understanding among themselves by which the territory is parcelled out, purchasing percentages agreed upon, and prices determined; that to restrict competition several purchasers may commit their buying to a single broker.

In all probability some truth and some error are to be found in criticisms of this nature. It is readily apparent that a large part of the buying is concentrated in a few hands and that as between a small and possibly cohesive group of strong, alert, well-informed buyers on the one hand, and on the other a large group of small sellers lacking information on market conditions and relative values, all or most of them acting independently of each other, the bargaining advantages will rest with the former group.

Here again the use of inspection service would be found useful. For with standard grades efficiently applied it should become possible to organize a price-reporting service by which growers could be informed of the prevailing prices, on a grade basis. Such a service would be informational only and would be supplemental to the inspection service. With authoritative information on the quality of his tobacco and on the prevailing market price for tobacco of similar grade, the grower would be in position to learn with a fair degree of accuracy the price he should receive and be forewarned against accepting unreasonably low prices.

PRODUCTION CREDIT IN RELATION TO MARKETING

An undoubted weakness in the present marketing set-up, which goes back to the production side, however, is associated with the problem of credit. Tobacco growers, especially those classified as "small," (those having less than 10 cuerdas of cropland) who are not members of the cooperative association have no source of production credit other than the refaccionistas. This touches upon a complex phase of the problem of the production and marketing of tobacco in Puerto Rico.

Phases of the social, educational, and economic status of small farmers and their farm-management problems are discussed in several reports, in particular those by McCord and his coworkers, Descartes, Huyke, Serrallés, and Picó, (*3*, *4*, *5*).[7] From the standpoint of this discussion the important considerations are the low educational status of the small growers, their extremely limited capital and the resulting limitations on their credit facilities and on the capacity of such small growers to defend themselves against unfair practices encountered in the marketing of their tobacco, and finally the high percentage of tobacco growers included within the classification "small."

In a survey of 194 small tobacco farms around Aibonito, Barranquitas, and Comerío, located in the heart of the filler district, it was found that 45 percent of the farm operators were illiterate, that the education of 36 percent was represented by the first to fourth grades, that only 5 percent had received an elementary-school diploma, and only 2 percent a high-school education. This situation probably does not reflect a lack of desire for education so much as it does a lack of educational facilities. Most of the rural schools do not provide classes above the fourth grade. In the extension of facilities emphasis appears to have been placed on increasing the number of such rural or barrio schools rather than on extending the curriculum in those already established.

Probably the number of illiterate farmers will continue to diminish and the number of farmers with from 1 to 4 years of schooling will increase. This represents a certain degree of progress, but it is not enough to make those men alert, aggressive, and progressive farmers.

[7] Also the following studies, quotations from which have been used herein.

DEL TORO, EMILIO, JR. BRIEF FACTS ON TOBACCO FARMING IN PUERTO RICO IN 1935-36 AND 1936-37. Puerto Rico Agr. Expt. Sta., Div. Agr. Econ. Mimeograph Rept. 11, 15 pp., illus. 1938.

DESCARTES, S. L. LOS PROBLEMAS DE LAS PEQUEÑAS FINCAS DE PUERTO RICO. Puerto Rico Agr. Expt. Sta., Div. Agr. Econ. Mimeograph Rept. 6, 25 pp. 1937.

SERRALLÉS, JORGE J., JR., TORRES, R. COLÓN, and JULIÁ, FRANK J. A FARM MANAGEMENT STUDY OF 194 SMALL TOBACCO FARMS IN THREE MUNICIPALITIES OF PUERTO RICO, 1935-36. Puerto Rico Agr. Expt. Sta., Div. Agr. Econ. Mimeograph Rept. 5, 8 pp. 1937.

TORRES, R. COLÓN. FACTS ON THE "ORGANIZATION AND RETURNS ON 194 SMALL TOBACCO FARMS IN PUERTO RICO, 1935-36." Puerto Rico Agr. Expt. Sta., Div. Agr. Econ. Mimeograph Rept. 8, 9 pp. 1937.

The average sales of tobacco from the 194 small tobacco farms studied amounted to only $291. Cash sales of minor crops added slightly to the cash income. The average total cash farm income plus farm privileges was only $396. The total population on the 194 farms was 1,508 persons included in the farmers' families. That is to say, from a total income from the farm which averaged slightly more than a dollar a day plus such wages as might come from working off the farm, it was necessary to meet production costs and maintain a family the average size of which was 7.76 persons. The cash income from the farm averaged 8 cents per person per day. The items of farm purchases other than food, clothes, etc., include fertilizer, feeds, insecticides, twine, and rope. The most important of these is fertilizer, the average cost of which per farm buying was $37. None of the other items averaged higher than $8.

These low-income conditions appear to be characteristic of small farms, and their significance in relation to the problems of the tobacco growers lies in the high percentage of tobacco farms classed as small (table 5).

TABLE 5.—*Acreage and value of small farms and percentage of all farms, specified type, in Puerto Rico, 1935* [1]

Type of farm	Small farms		Land in farms		Cropland		Farm value	
	Total	Percentage of all farms, specified type	Total	Percentage of all farms, specified type	Total	Percentage of all farms, specified type	Total	Percentage of all farms, specified type
	Number	*Percent*	*Cuerdas*	*Percent*	*Cuerdas*	*Percent*	*Dollars*	*Percent*
Sugarcane	3,632	54.8	32,379	4.2	16,339	4.7	2,736,917	3.2
Coffee	5,934	61.6	61,422	15.3	25,131	12.1	3,235,460	12.5
Tobacco	10,428	80.1	101,700	40.3	43,950	41.6	4,611,839	35.9
Minor crops	16,612	88.6	147,077	60.4	58,448	56.6	6,031,999	59.3
Others	3,382	71.1	114,085	44.4	8,534	13.3	8,069,642	40.4
Total	39,988	75.7	456,663	23.9	152,402	18.4	24,685.857	15.8

[1] Small farms are those having less than 10 cuerdas; 1 cuerda is equal to 0.9712 acre.

Compiled from DESCARTES, S. L. See footnote 7. Data were taken from the Puerto Rico Reconstruction Administration Census of Agriculture, 1935.

It follows that 80 percent of the tobacco growers operate farms of such small size, have such limited resources for credit purposes, and such a low educational and social status that they cannot be considered good credit risks. Thus the agencies available to larger growers for production credit are in large measure closed to the small tobacco farmers so that practically their only recourse is to the refaccionistas. This situation is set forth more fully by Descartes, a portion of whose analysis reads as follows:

Small farmers need production credit. It could not be expected to be otherwise for farmers whose cash income ranges from $0.37 to $0.66 a day. On the island, production credit is advanced only for the production of sugarcane, tobacco, coffee, and citrus fruits. Occasionally some loans are made to large livestock and dairy farms. Minor crops are considered too risky an enterprise to merit production credit. Small farms in Puerto Rico, if they produce tobacco or coffee, can apply for production credit to three sources: The Production Credit Association, the Emergency Crop and Feed Loan Office, and private lenders. The latter group is composed mostly of wholesale merchants who advance the producers the materials needed for their crop and some cash, and

insist at the end of the growing season that the crop be sold to them. The Cooperative Production Credit Association and the Emergency Crop and Feed Loan Office finance a relatively small number of growers. * * *

One of the chief obstacles to the efficient operation of the Production Credit Association is the small amount of the loans. Legal costs, necessary inspection of the borrower's planting, and accounting expenses are very high when the size of loan is small. For this reason, and to lower expenses, the Production Credit Association reduced considerably the number of loans granted in the years 1935–36 and 1936–37 compared with the year 1934–35, as shown in the following figures:

Production Credit Association's loans on tobacco, Puerto Rico, 1934–36

Year beginning July—	Loans, number	Amount of loans	
		Total	Average
1934	1,338	$389,839	$291
1935	70	130,363	1,862
1936	39	15,879	407

[AUTHOR'S NOTE.—Figures for sugarcane and coffee omitted.]

Applicants for loans to the Production Credit Association which were considered risky, or applicants for small amounts were referred to the Emergency Crop and Feed Loan Office. This latter agency loaned to a much larger number of small farmers than the Production Credit Association, mostly to tobacco growers.

Emergency crop and feed loans, Puerto Rico, year beginning July 1936

Crop	Loans, number	Amount of loans	
		Total	Average
Sugarcane	46	$7,965	$173
Coffee	296	55,790	189
Tobacco	2,687	400,595	149

The Emergency Crop and Feed Loan Office, as its name indicates, is an agency created to lend to farmers in distress affected by the drought in the States. Fortunately, it was extended to Puerto Rico and advanced funds to a large number of small farmers who could not borrow from the Production Credit Association. This situation needs to be emphasized because when this emergency office ceases doing business in Puerto Rico, practically all the small farmers now borrowing from it must have to start again borrowing from merchants, buyers of their crops.* * *

It is the experience of the Production Credit Association and the Emergency Crop and Feed Loan Office that to be sure of recovering their loans, it is necessary first, to inspect the borrower's plantings periodically to make sure that the funds advanced are being used to grow the crop financed and second, that they control the agency through which the borrower sells his crop. For this reason, it is a prerequisite that to be granted a loan, the farmer must sign a marketing agreement with the coffee or tobacco cooperative.

This quotation makes it clear that the refaccionistas are in an entrenched position. Large numbers of growers are already dependent on them for production credit, and additional small growers will be made dependent upon them if and when the Emergency Crop and Feed Loan Office ceases to function. Refaccionistas are thus able to require such growers to deliver the tobacco to them, and by long custom the other branches of the trade look to and depend upon them as intermediaries.

The problem posed by the foregoing discussion is to develop a form of production credit available to small growers who are not members of the cooperative marketing association. Upon its solution depends in part the achievement of substantial marketing reform and improvement in the status of large numbers of tobacco growers.

BROADER ASPECTS

Some of the fundamental weaknesses in the tobacco-marketing system have now been considered, but the problem has its broader aspects. It involves the question of whether means can be devised for bringing the seller and the ultimate buyer closer together, with or without the services of the refaccionista, in the fermentation and sale of the tobacco. It is a problem that should receive close study not only by agricultural leaders, but by responsible leaders in the trade. Questions of permanence of supply and the maintenance or improvement of quality of tobacco for manufacturing are inseparably associated with the welfare of producers.

Solution of the problem calls for a painstaking survey to learn the facts with respect to the spread between prices paid by manufacturers and dealers and those actually received by growers, the charges or deductions made by the different agencies through whose hands the tobacco passes, and associated conditions. Coupled with a concrete knowledge of the facts there are needed breadth of vision and constructive thinking from every angle, recognition of the needs of producers and consumers alike, and a spirit of understanding and cooperation among those who live by the production, distribution, and manufacture of the crop.

EXPORTS AND IMPORTS OF UNMANUFACTURED TOBACCO

EXPORTS

The movement of tobacco from Puerto Rico to the mainland usually begins in the fall and most of it occurs during October, November, and December. It is comprised of tobacco planted the previous fall and winter. In the following tables, therefore, exports are given on a fiscal-year basis [8] and may be compared with production statistics of the preceding or slightly overlapping crop year. Thus, shipments in the year 1927 were made during the 12 months beginning July 1927. They were mainly from tobacco produced in the crop year 1927, that is, the 12 months from September 1926 to August 1927 (see footnote, table 2).

Exportation of leaf tobacco, including shipments to the States, has increased markedly since American occupation of the island (table 6). Measured in equivalent farm-sales weight, the peak movement occurred during the fiscal year beginning July 1, 1926, when the total exports represented a reported weight of 30,782,000 pounds. All but 52,000 pounds of this was shipped to the States and the farm-sales-weight equivalent of these shipments (table 7) was 43,423,000 pounds. Shipments declined during the succeeding 6 years, but since then have

[8] It should be noted that the year is indicated in the tables which follow as "Year beginning July," and that it corresponds to the year marking the close of the fiscal year in the Puerto Rican Annual Books on Statistics. For example, the year beginning July 1936 as shown herein is the fiscal year 1937 as shown in the Puerto Rican reports.

been on an increasing scale. Recent increases in the movement of unmanufactured tobacco to the States have been coincident with sharp decreases in the corresponding movement of cigars, discussed under Cigars.

Table 6 shows the total exports and value of unmanufactured tobacco for the years 1900 to 1936, separated as to shipments to continental United States and to foreign countries.

TABLE 6.—*Quantity and value of exports of unmanufactured tobacco from Puerto Rico to continental United States and foreign countries, 1900–1936*

Year beginning July—	To United States		To foreign countries		Total		Average value per pound
	Quantity	Value	Quantity	Value	Quantity	Value	
	1,000 pounds	*1,000 dollars*	*1,000 pounds*	*1,000 dollars*	*1,000 pounds*	*1,000 dollars*	*Cents*
1900	557	121	4,433	255	4,990	376	7.5
1901	666	112	1,387	101	2,053	213	10.4
1902	770	135	1,482	69	2,252	204	9.1
1903	2,386	261	719	25	3,105	286	9.2
1904	2,196	422	317	16	2,513	438	17.4
1905	1,397	477	47	4	1,444	481	33.3
1906	3,681	1,157	664	75	4,345	1,232	28.4
1907	4,979	1,678	3,423	318	8,402	1,996	23.8
1908	3,868	1,202	671	48	4,539	1,250	27.5
1909	4,120	1,255	56	3	4,176	1,258	30.1
1910	4,362	1,547	88	8	4,450	1,555	34.9
1911	5,457	2,320	----	----	5,457	2,320	42.5
1912	8,150	3,148	387	40	8,537	3,188	37.3
1913	7,534	3,104	2,936	245	10,470	3,349	32.0
1914	9,052	3,187	233	17	9,285	3,204	34.5
1915	8,021	3,026	64	7	8,085	3,033	37.5
1916	9,256	3,829	153	22	9,409	3,851	40.9
1917	17,114	8,968	82	14	17,196	8,982	52.2
1918	15,664	8,111	2,196	310	17,860	8,421	47.2
1919	20,173	13,318	334	98	20,507	13,416	65.4
1920	14,564	13,552	104	16	14,668	13,568	92.5
1921	22,370	8,994	83	9	22,453	9,003	40.1
1922	19,574	9,459	15	3	19,589	9,462	48.3
1923	23,298	13,170	111	21	23,409	13,191	56.4
1924	22,721	9,838	236	32	22,957	9,870	43.0
1925	24,521	13,945	----	----	24,521	13,945	56.9
1926	30,730	20,580	52	7	30,782	20,587	66.9
1927	29,807	17,062	128	13	29,935	17,075	57.0
1928	27,410	12,881	28	4	27,438	12,885	47.0
1929	26,014	11,914	24	3	26,038	11,917	45.8
1930	25,180	13,165	12	2	25,192	13,167	52.3
1931	17,035	6,714	66	1	17,101	6,715	39.3
1932	12,928	4,403	3	1	12,931	4,404	34.1
1933	18,846	6,329	24	4	18,870	6,333	33.6
1934	19,974	7,146	11	1	19,985	7,147	35.8
1935	23,157	9,254	105	1	23,262	9,255	39.8
1936	23,581	9,135	----	----	23,581	9,135	38.7

Compiled, 1900–1919 from Monthly Summaries of Foreign Commerce of the United States and annual reports of the Governor of Puerto Rico; 1920–36 from Annual Books on Statistics, Department of Agriculture and Commerce, Government of Puerto Rico, fiscal years, 1935–36 and 1936–37.

A minor qualification is made with reference to these figures on exports to the United States. In former years some tobacco was sent from Cuba to Puerto Rico to be stemmed and transshipped to the States, and is included in the figures shown. The volume of this business was apparently not large.

Several important points are to be noted in connection with table 6. It may be seen, for example, that exports to foreign countries are insignificant in volume. If any substantial demand for Puerto Rican tobacco had been developed in foreign countries while the island was under Spanish rule, there is no reason to assume that that demand would have been completely destroyed by the American occupation. On

the other hand, by coming under the American flag the American market was opened to Puerto Rican tobacco with all import duties removed. This may have made the States the most profitable outlet with the effect of stopping such trade as existed with foreign countries. At least this would explain the apparent cessation of exports to Spain where, even under Spanish rule, a tariff existed against tobacco from Puerto Rico and Cuba.

The statistics make clear the steady gains made by Puerto Rican tobacco in the American market. Shipments to the States increased from an average of 2 to 4 million pounds per annum at the turn of the century to a peak movement of nearly 31 million pounds in the year 1926. Generally in periods of depression there has been some decrease in outshipments. This was true during the recent depression when shipments to the mainland (1932) declined to a low of 12,928,000 pounds, export weight.

It is necessary to emphasize that in this discussion export weights are quoted, and that these vary materially from the corresponding farm-sales weights. For the earlier years given in table 6 information is not available on which to convert the weights to a farm-sales basis. Beginning with the year 1923, statistics of shipments to the States show a separation as to the form of the tobacco, that is, Unstemmed, Stemmed, and Stems, trimmings, and scrap. Inquiry has developed the fact that most of the tobacco exported under the latter classification consists of trimmings and scrap, very little of stems. It is possible, therefore, to convert these weights back to an approximate farm-sales-weight basis which is done in table 7.

TABLE 7.—*Exports of unmanufactured tobacco from Puerto Rico to continental United States, classified as to form and the farm-sales-weight equivalents, 1923–36*

Year beginning July—	Leaf				Stems, trimmings, and scrap		Total		Farm-sales-weight-equivalent
	Unstemmed		Stemmed						
	1,000 pounds	*Percent*	*1,000 pounds*	*Percent*	*1,000 pounds*	*Percent*	*1,000 pounds*	*Percent*	*1,000 pounds*
1923	992	4.2	18,842	80.9	3,464	14.9	23,298	100.0	34,436
1924	4,718	20.8	13,048	57.4	4,955	21.8	22,721	100.0	32,376
1925	4,178	17.0	16,335	66.6	4,008	16.4	24,521	100.0	35,235
1926	7,515	24.4	18,460	60.1	4,755	15.5	30,730	100.0	43,423
1927	6,591	22.1	20,063	67.3	3,153	10.6	29,807	100.0	42,344
1928	1,704	6.2	17,610	64.3	8,096	29.5	27,410	100.0	40,340
1929	2,508	9.7	16,420	63.1	7,086	27.2	26,014	100.0	37,999
1930	351	1.4	19,567	77.7	5,262	20.9	25,180	100.0	37,450
1931	99	.6	11,864	69.6	5,072	29.8	17,035	100.0	25,381
1932	1	(1)	9,038	69.9	3,889	30.1	12,928	100.0	19,285
1933	48	.3	14,039	74.5	4,759	25.2	18,846	100.0	28,098
1934	122	.6	16,523	82.7	3,329	16.7	19,974	100.0	29,758
1935	83	.4	18,533	80.0	4,541	19.6	23,157	100.0	34,517
1936	80	.3	18,885	80.1	4,616	19.6	23,581	100.0	35,151

[1] Less than 0.05 percent.

Compiled from Monthly Summaries of Foreign Commerce of the United States and annual reports of the Governor of Puerto Rico.

It is noticeable, in table 7, that practices have varied with respect to the form in which tobacco is exported. In 1923 only 4.2 percent of exports was unstemmed. In 3 years the percentage had changed to 24.4 percent, since which time it has dwindled to less than 1 percent. These variations in the percentages of stemmed and unstemmed

have impaired the value of the statistics for purposes of comparison. Similarly, export values per pound are to some extent obscured when based on computations of reported weights and reported total values.

IMPORTS AND IN-SHIPMENTS

Statistics on the volume of tobacco shipped from the States to Puerto Rico extending back to 1922 and separated as to the principal types back to 1928, are shown in table 8. The weights represent storage or export order. Their conversion to equivalent farm-sales weights is not practicable for there is no means of determining the quantities of stemmed and unstemmed tobacco involved. It would be reasonable to assume that the figures as presented are from 15 to 20 percent lower than the farm-sales weights.

Among the types shown, cigar tobacco predominates. Shipments of cigar tobacco to Puerto Rico reached a total of 4 million pounds in 1930, coinciding with the crop harvested in 1931, the second largest crop shown in table 2. Material decreases in the manufacture of cigars occurred at about the same time (table 10), the effects of which may be discerned in the break in prices paid to growers and the ensuing drastic curtailment of acreage, production, imports, and exports.

Appreciable quantities of tobacco other than of cigar types are shipped from the mainland to Puerto Rico. The uses made of these noncigar types are uncertain. Some of them may be used with coastal types in the manufacture of roll chewing tobacco, and some are probably used in cigarettes. This is probably true as to flue-cured, but the author has also observed supplies of dark air-cured tobacco in factories that manufacture cheaper grades of cigars.

TABLE 8.—*Imports of unmanufactured tobacco into Puerto Rico from the United States, by types, 1922–36*

Year beginning July—	Bright flue-cured	Burley	One Sucker	Green River	Cigar leaf	Other leaf	Stems, trimmings, and scrap	Total
	Pounds	*Pounds*	*Pounds*	*Pounds*	*Pounds*	*Pounds*	*Pounds*	*Pounds*
1922								3,054,489
1923								2,794,327
1924								2,946,507
1925								3,613,208
1926								4,260,911
1927								2,827,074
1928					1,023,551	2,046,001		3,069,552
1929	[1] 95,122			212,391	3,383,393	759,832		4,450,738
1930	336,859			243,689	4,057,362	404,956		5,042,866
1931	93,075	283,797			1,900,149	331,452		2,608,473
1932	38,255	290,347			1,027,970	275,528		1,632,100
1933	10,905	217,485	161,767		923,414	109,387		1,422,958
1934	4,494	65,885	318,399		1,159,898	38,179	3,014	1,589,869
1935	59,861	126,377	326,915		1,041,258	138,095	270,703	1,963,209
1936	7,252	185,039	133,116		1,268,965	426,122	117,420	2,137,914

[1] Beginning Jan. 1, 1930.

Compiled from Monthly Summaries of Foreign Commerce of the United States.

STOCKS OF UNMANUFACTURED TOBACCO

The record of stocks of Puerto Rican tobacco held by dealers and manufacturers in continental United States begins with the year 1912. From that year until 1917 stocks were reported semiannually. Since 1917 they have been reported quarterly.

Detailed information on tobacco inventories, used in conjunction with statistics of production, afford a basis for measuring the annual disappearance (*1*, pp. 2–5). In the case of Puerto Rican tobacco, however, stocks figures published before January 1, 1936, related to tobacco in the States only, omitting the indeterminate quantities held on the island. The seventy-fourth Congress, by an act approved August 27, 1935, brought dealers and manufacturers within the scope of the law requiring the submission of stocks reports.

This law requires that the quantity of unstemmed and stemmed leaf tobacco be reported by groups of grades. The groups applicable to type 46 are generally comparable with the groups applicable to the filler types in the United States. The Spanish grades falling within each of the groups are shown below. Stocks of unmanufactured tobacco of type 46 are shown in table 9, both as reported and converted to farm-sales-weight equivalents.

UNSTEMMED (EN RAMA)

Group	Grade
C	Superior—including Pié Limpio y Superior, Médios y Coronas, Manojo 1, 2, y 3, Tripa Superior
X	Inferior—including Pie Inferior, Rezago Superior, Tripa Inferior, Corona Corta
Y	Defectuoso—including Boliche, Sentido, Amarillo, Blanco, Cacho Duro, Picado, Salchochado, Segunda (second) Cosecha, Rabia, Pié Sucio, Pinto
S	Hojas Sueltas Inferior y Picadura de Estivas y Almacen
N	Tabaco Averiado y Mohoso (musty)

STEMMED (DESPALILLADO)

C	Superior—including Tripa Primera, Tripa Segunda, y Tripa Tercera, Rezago Superior
X	Inferior—including Tripa Pajiza Superior, 1, 2, y 3, Rezago Pajizo, Superior, Rezago Inferior
Y	Defectuoso—including Sentido, Cacho Duro, Amarillo, Manchado, Blanco, Salchochado, Pinto, y otras clases de Tripa defectuoso no mencionado en este pliego
S	Pedazos y Picadura de Despalillado
N	Tripa Averiada y Mohoso (musty) y Picadura Danada

TABLE 9.—*Stocks of Puerto Rican unmanufactured tobacco, type 46, combining unstemmed and stemmed, owned by dealers and manufacturers in the United States, semiannually 1912–16, quarterly 1917–37* [1]

Year	Jan. 1		Apr. 1		July 1		Oct. 1	
	Reported weight	Farm-sales-weight equivalent	Reported weight	Farm-sales-weight equivalent	Reported weight	Farm-sales-weight equivalent	Reported weight	Farm-sales-weight equivalent
	1,000 pounds	*1,000 pounds*	*1,000 pounds*	*1,000 pounds*	*1,000 pounds*	*1,000 pounds*	*1,000 pounds*	*1,000 pounds*
1912							2,942	3,680
1913			3,815	4,798			4,129	5,211
1914			4,384	5,569			4,874	6,017
1915			6,935	8,557			5,888	7,261
1916			4,684	5,863			4,781	6,049
1917	4,567	5,907	3,494	4,626	2,480	3,303	4,843	6,262
1918	7,307	9,510	7,297	9,649	6,432	8,552	7,668	10,132
1919	10,023	13,022	9,137	11,992	8,119	10,584	11,115	14,399
1920	10,833	14,238	8,874	11,652	7,420	9,844	8,746	11,873
1921	9,541	13,318	9,116	13,006	7,865	11,065	7,698	10,730
1922	9,407	12,910	9,499	13,236	8,858	12,325	10,873	14,564
1923	11,330	15,513	9,446	13,005	6,519	8,912	9,547	12,937
1924	11,673	16,317	11,116	15,851	8,773	12,690	9,220	12,870
1925	10,456	14,596	10,130	14,485	8,350	12,174	8,074	11,615
1926	11,279	15,408	10,194	14,355	7,651	10,783	10,719	14,901
1927	18,577	25,321	17,640	24,513	13,746	19,186	16,588	23,173
1928	21,426	30,092	23,646	33,381	21,172	30,212	20,067	28,663
1929	22,229	31,206	26,128	36,520	25,142	35,700	25,270	35,499
1930	29,039	40,632	28,442	40,262	24,734	34,859	23,510	33,568
1931	27,284	39,264	27,932	40,645	24,940	36,151	23,546	34,201
1932	26,415	38,691	25,647	37,556	23,470	33,645	20,336	29,730
1933	19,668	28,800	19,318	28,420	18,732	27,798	17,831	26,003
1934	20,487	30,188	21,162	31,211	19,490	28,663	18,502	27,217
1935	20,929	30,801	23,130	34,091	20,677	30,414	19,691	29,023
1936	26,654	38,356	24,870	36,722	21,916	32,157	19,680	28,891
1937	23,880	34,495	25,845	37,965	24,436	36,032	22,045	32,398

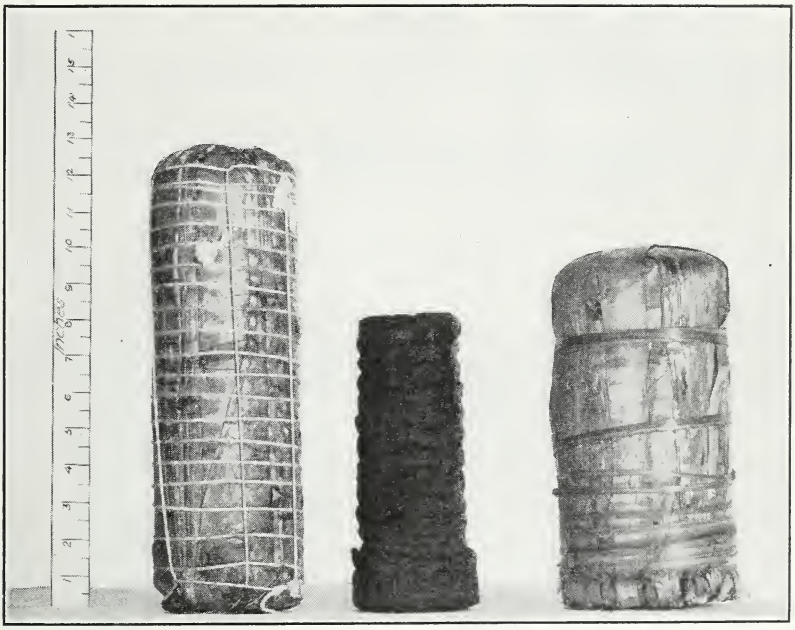
[1] Stocks in Puerto Rico were reported for the first time as of Jan. 1, 1936. The following figures show the continental and insular stocks for each quarter of 1936 and 1937:

Year	Jan. 1		Apr. 1		July 1		Oct. 1	
	Reported weight	Farm-sales-weight equivalent	Reported weight	Farm-sales-weight equivalent	Reported weight	Farm-sales-weight equivalent	Reported weight	Farm-sales-weight equivalent
1936	*1,000 pounds*	*1,000 pounds*	*1,000 pounds*	*1,000 pounds*	*1,000 pounds*	*1,000 pounds*	*1,000 pounds*	*1,000 pounds*
United States	26,654	38,356	24,870	36,722	21,916	32,157	19,680	28,891
Puerto Rico	8,746	11,894	16,029	19,739	25,627	30,469	24,870	30,445
Total	35,400	50,160	40,899	56,461	47,543	62,626	44,550	59,336
1937								
United States	23,880	34,495	25,845	37,965	24,436	36,032	22,045	32,398
Puerto Rico	13,017	16,730	13,670	17,188	31,374	37,511	23,809	29,381
Total	36,897	51,225	39,515	55,153	55,810	73,543	45,854	61,779

Compiled from U. S. Department of Agriculture Circular 435.

TOBACCO MANUFACTURES AND CONSUMPTION

Three forms of tobacco products are manufactured—cigars, cigarettes, and chewing tobacco. Statistics are available for cigars and cigarettes, but not for chewing. The chewing tobacco is in the form of "roll," made in the homes or in very small factory units, where women workers twist the tobacco into rope form which is then put up in rolls (fig. 15). Storekeepers buy this tobacco by the roll and retail it in small quantities, the customary price having been reported as 1 cent per inch. The lack of statistics is significant mainly in connection with attempts to measure the changes and volume of tobacco consumption per capita. As an industrial proposition, greater significance attaches to the manufacture of cigars and cigarettes, for pipe smoking does not appear to be common.



BAE 33737

FIGURE 15.—Roll chewing tobacco. The rolls are formed by looping the rope of tobacco back and forth to make a core, after which several layers are wound as shown in the partially consumed center roll. Banana leaves are used for wrapping.

CIGARS

For a long period the tobacco industry appears to have been centered around the manufacture of cigars, partly for consumption on the island but mainly for export. During the 31 years for which statistics are available and during which the output has fluctuated from as high as 323 million to as low as 81 million cigars per annum, the ratio of cigars exported to cigars consumed domestically has remained approximately 2 to 1 (table 10).

Tables 10, 11, and 12 show the numbers of cigars manufactured and withdrawn for consumption or export, and cigars imported.

TABLE 10.—*Cigars manufactured in Puerto Rico and withdrawn for consumption and export, 1906–36*

Year beginning July—	Withdrawn for consumption	Withdrawn for export	Total output	Year beginning July—	Withdrawn for consumption	Withdrawn for export	Total output
	Thousands	*Thousands*	*Thousands*		*Thousands*	*Thousands*	*Thousands*
1906	74,698	132,670	207,368	1922	75,018	184,626	259,644
1907	76,984	103,782	180,766	1923	75,929	162,332	238,261
1908	84,933	140,302	225,235	1924	70,019	196,560	266,579
1909	92,700	151,725	244,425	1925	108,577	214,546	323,123
1910	101,065	174,743	275,808	1926	68,647	160,805	229,452
1911	111,682	169,766	281,448	1927	63,393	147,354	210,747
1912	119,038	165,769	284,807	1928	61,330	158,781	220,111
1913	112,712	150,364	263,076	1929	55,453	145,798	201,251
1914	101,423	174,275	275,698	1930	48,494	171,458	219,952
1915	109,130	159,249	268,379	1931	43,524	122,455	165,979
1916	107,889	210,399	318,288	1932	36,547	63,039	99,586
1917	106,647	181,779	288,426	1933	32,003	65,278	97,281
1918	94,335	149,125	243,460	1934	28,530	63,193	91,723
1919	98,024	223,316	321,340	1935	28,881	52,368	81,249
1920	105,728	152,324	258,052	1936	50,047	51,237	101,284
1921	77,513	140,504	218,017				

Compiled from Annual Books on Statistics, Department of Agriculture and Commerce, Government of Puerto Rico, fiscal years, 1935–36 and 1936–37.

TABLE 11.—*Quantity and value of exports of cigars from Puerto Rico to continental United States and foreign countries, 1900–1936*

Year beginning July—	To United States		To foreign countries		Total		Average value per thousand
	Quantity	Value	Quantity	Value	Quantity	Value	
	Thousands	*Dollars*	*Thousands*	*Dollars*	*Thousands*	*Dollars*	*Dollars*
1900	11,013	296,021	818	10,094	11,831	306,115	25.87
1901	70,053	1,543,253	625	5,982	70,678	1,549,235	21.92
1902	67,243	1,746,483	721	7,332	67,964	1,753,815	25.81
1903	59,185	1,454,784	486	5,837	59,671	1,460,621	24.48
1904	87,569	2,146,846	392	5,205	87,961	2,152,051	24.47
1905	113,223	3,069,576	356	4,650	113,579	3,074,226	27.07
1906	128,826	4,235,225	384	6,185	129,210	4,241,410	32.83
1907	105,917	3,407,747	358	6,393	106,275	3,414,140	32.13
1908	141,537	4,375,657	(1)	8,236	(1)	4,383,893	(1)
1909	149,469	4,473,123	(1)	14,907	(1)	4,488,030	(1)
1910	174,246	5,349,626	(1)	5,597	(1)	5,355,223	(1)
1911	169,484	5,077,976	288	8,735	169,772	5,086,711	29.96
1912	165,524	5,800,162	44	524	165,568	5,800,686	35.04
1913	161,093	5,592,803	928	4,473	162,021	5,597,276	34.55
1914	169,562	6,006,680	502	9,442	170,064	6,016,122	35.38
1915	156,996	5,528,496	178	3,039	157,174	5,531,535	35.19
1916	204,863	7,834,983	445	8,027	205,308	7,843,010	38.20
1917	179,038	7,131,535	150	3,158	179,188	7,134,693	39.82
1918	149,335	6,647,621	463	9,901	149,798	6,657,522	44.44
1919	226,776	11,607,445	251	6,552	227,027	11,613,997	51.16
1920	152,066	8,101,628	32	1,973	152,098	8,103,601	53.28
1921	140,457	6,277,832	47	1,222	140,504	6,279,054	44.69
1922	192,069	6,910,735	35	775	192,104	6,911,510	35.98
1923	175,251	5,458,880	38	1,239	175,289	5,460,119	31.15
1924	196,553	7,105,313	7	195	196,560	7,105,508	36.15
1925	214,546	7,196,365			214,546	7,196,365	33.54
1926	160,804	4,227,576			160,804	4,227,576	26.29
1927	144,378	3,625,561			144,378	3,625,561	25.11
1928	158,636	3,847,797			158,636	3,847,797	24.26
1929	145,566	3,408,721			145,566	3,408,721	23.42
1930	166,986	3,899,556			166,986	3,899,556	23.35
1931	122,455	2,403,532			122,455	2,403,532	19.63
1932	63,044	1,284,289			63,044	1,284,289	20.37
1933	64,992	1,463,911			64,992	1,463,911	22.52
1934	61,227	1,322,886	47	1,418	61,274	1,324,304	21.61
1935	53,297	1,095,203	68	1,767	53,365	1,096,970	20.56
1936	50,339	951,809	70	1,866	50,409	953,675	18.92

[1] Data not available.

Compiled, 1900–1919, from Monthly Summaries of Foreign Commerce of the United States and annual reports of the Governor of Puerto Rico; 1920–36, from Annual Books on Statistics, Department of Agriculture and Commerce, Government of Puerto Rico, fiscal years, 1935–36 and 1936–37.

TABLE 12.—*Quantity and value of imports of cigars into Puerto Rico from the United States, 1900–1936*

Year beginning July—	Quantity	Value	Average value per thousand	Year beginning July—	Quantity	Value	Average value per thousand
	Thousands	*Dollars*	*Dollars*		*Thousands*	*Dollars*	*Dollars*
1900	(1)	(1)		1919	(1)	(1)	
1901	39	1,280	32.82	1920	(1)	(1)	
1902	13	315	24.23	1921	(1)	(1)	
1903	55	1,456	26.47	1922	16	422	26.38
1904	24	367	15.29	1923	(1)	(1)	
1905	37	675	18.24	1924	2,270	3,941	17.36
1906	35	1,456	41.60	1925	96	6,274	65.35
1907	108	1,682	15.57	1926	132	10,077	76.34
1908	860	26,647	30.98	1927	554	28,748	51.89
1909	22	350	15.91	1928	267	13,705	51.33
1910	39	575	14.74	1929	133	8,734	65.67
1911	28	341	12.18	1930	58	1,903	32.81
1912	247	6,606	26.74	1931	33	862	26.12
1913	20	224	11.20	1932	185	7,738	41.83
1914	(1)	(1)		1933	88	2,830	32.16
1915	(1)	(1)		1934	167	5,567	33.34
1916	(1)	(1)		1935	150	4,369	29.13
1917	(1)	(1)		1936	102	2,763	27.09
1918	(1)	(1)					

[1] Reported in value only of all manufactured tobacco.

Compiled, 1900–1927, from Monthly Summaries of Foreign Commerce of the United States and annual reports of the Governor of Puerto Rico; 1928–36, from Annual Books on Statistics, Department of Agriculture and Commerce, Government of Puerto Rico, fiscal years, 1935–36 and 1936–37.

The manufacture of cigars for domestic consumption increased rapidly from 1906 to 1912, since which time the trend has been strongly though irregularly downward (table 10). Manufactures for export did not reach their peak until the year 1919. The decrease in domestic consumption of cigars can be interpreted only as a corollary to the increase in cigarette consumption; and as the Puerto Rican cigarettes are being rapidly replaced by those shipped in from the States, the implication is clear that Puerto Rican tobacco has lost a large part of its domestic market.

The decline in cigars manufactured for export appears to be more significant in a broad economic sense than in relation to the producers only, although it is not without significance to them. The manufacture of cigars for consumption in the States has necessitated the shipment of tobacco from the States to Puerto Rico, especially since the discontinuance of wrapper production on the island. So long as the shipping costs on leaf tobacco from the States to Puerto Rico, and back again in the manufactured form, were fully offset by lower manufacturing costs on the island, this procedure was economical. Apparently this margin in manufacturing costs disappeared and it then became more profitable to ship tobacco to the mainland for blending with other types and manufacture into cigars. The immediate loss to the island, therefore, was in employment for labor in cigar factories, a loss which is likewise taking place in cigarette factories.

From the broader viewpoint of possible increases in the consumption of Puerto Rican tobacco in the States, the transference of the cigar industry may prove advantageous to the growers. It seems reasonable to hold that manufacturers on the mainland are more closely in touch with the likes and dislikes of American smokers, have wider facilities for achieving tempting blends, and are better organized

to promote the sale of brands containing Puerto Rican filler. If this works toward a wider acceptance of such cigars than could be accomplished by manufacturers located on the island, a net gain to the growers would be the logical result.

With respect to the cigars manufactured for shipment to the States, the shift from class B or better, to class A cigars, has been rapid and has exerted a depressing influence on prices paid to growers. During the year 1918, the first for which statistics are available, of tax-paid withdrawals in the States of large cigars shipped in from Puerto Rico slightly less than 25 percent were of class A—that is, manufactured to sell at not more than 5 cents each. By 1924 class A cigars had increased to nearly 66 percent; by 1929 to 87 percent; and during 1936 the percentage was around 95 or 96 percent.

The shift to class A has taken place more rapidly in Puerto Rican cigars than in those manufactured in the States. However, the shift has been rapid in the States and has affected Puerto Rican tobacco along with other types used in manufacturing cigars.

During the boom times following the World War and into the late 1920's, tobacco from the island was used to a large extent in class B cigars made to retail at more than 5, but not more than 8 cents, and class C cigars which sold for more than 8 but not more than 15 cents. With class A goods, retailing at not more than 5 cents, occupying a larger and larger percentage of total manufactures, the purchases of Puerto Rican tobacco today are predicated upon its use in brands selling at 5 cents or two for 5. The tendency of this, like the corresponding tendency in Puerto Rico, is to depress the level of prices paid to growers.

Puerto Rican tobacco is still used in cigars of classes B and C, to some extent straight but more generally blended with Cuban, but the percentage of Puerto Rican filler to the total filler in these classes appears to be decreasing.

Table 13 shows the tax-paid withdrawals in the States of cigars from Puerto Rico according to classes.

TABLE 13.—*Tax-paid withdrawals of cigars from Puerto Rico in the United States, 1918–36*

Year beginning July—	Large cigars						Small cigars
	Class A	Class B	Class C	Class D	Class E	Total	
	Thousands	*Thousands*	*Thousands*	*Thousands*	*Thousands*	*Thousands*	*Thousands*
1918	30,066	39,042	52,239	5	----------	121,352	5,550
1919	60,035	54,037	109,726	3,081	----------	226,879	13,000
1920	58,134	7,410	76,477	4,341	425	146,787	6,460
1921	51,533	7,583	63,887	1,506	13	124,522	12,409
1922	100,904	15,020	52,489	159	7	168,579	16,952
1923	91,411	13,176	35,432	117	1	140,137	17,000
1924	122,560	15,681	48,224	86	----------	186,551	13,000
1925	141,810	11,483	50,355	101	3	203,752	11,495
1926	109,508	8,826	30,108	28	----------	148,470	10,198
1927	116,209	4,033	20,346	50	9	140,647	6,960
1928	119,967	7,020	20,222	25	20	147,254	9,287
1929	122,503	3,876	14,223	49	33	140,684	8,000
1930	148,243	3,022	8,931	50	4	160,250	7,050
1931	92,467	828	4,592	20	----------	97,907	4,750
1932	58,709	1,046	1,035	1	----------	60,791	4,404
1933	57,565	2,781	956	2	----------	61,304	2,820
1934	56,504	2,006	664	1	----------	59,175	2,840
1935	49,343	1,369	597	2	----------	51,311	1,872
1936	45,645	1,259	656	1	----------	47,561	1,830

Compiled from reports of the Commissioner of Internal Revenue.

CIGARETTES

The cigarette industry, as far back as statistics for analysis are available, has been of secondary importance. The reasons for this lie partly in the fact that there is practically no export demand for cigarettes manufactured from the types of tobacco produced on the island, and partly no doubt in the inability of a large section of the rural population to buy cigarettes or other manufactured tobacco products.

Puerto Rican cigarettes are manufactured mostly from native tobacco and for domestic consumption. The peak of manufactures

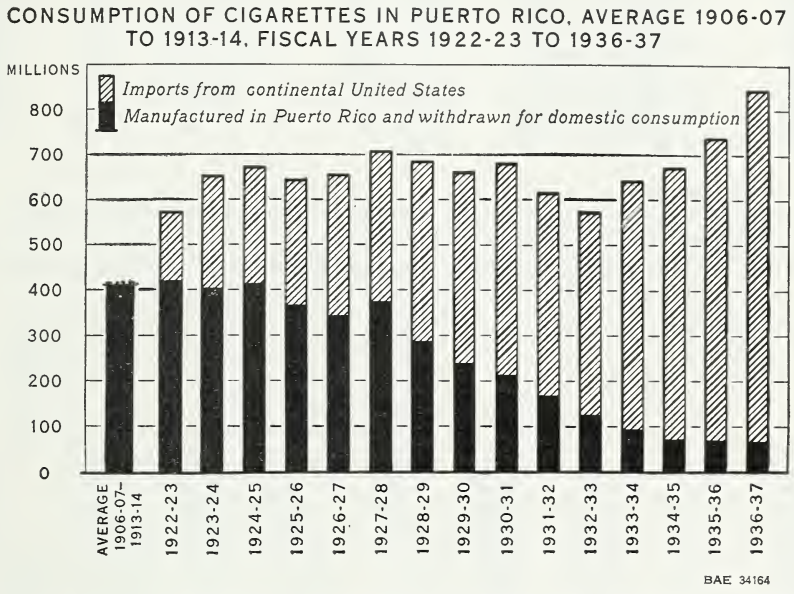


FIGURE 16.—Consumption of cigarettes in Puerto Rico divided as to those manufactured on the island and those shipped in from the States, average for the fiscal years 1907–14 and fiscal years 1923 to 1937, inclusive. (See table 17.)

was reached in 1919 with a total of 581,549,000 cigarettes (table 14). But Puerto Ricans are changing more and more to blended cigarettes shipped in from the States, so that during 1936 the total cigarettes manufactured on the island amounted to only 72,151,000—a decrease of nearly 88 percent. The losses involved in this transition apply not only to the manufacturing side of the industry but to the growers who find their outlet for tobacco noticeably contracted. Tables 14, 15, and 16 show the numbers of cigarettes manufactured and withdrawn for consumption or export, and cigarettes imported. Table 17 and figure 16 show the decreasing rate of cigarette manufactures in Puerto Rico and the increasing rate of cigarette imports.

TABLE 14.—*Cigarettes manufactured in Puerto Rico and withdrawn for consumption and export, 1906–36*

Year beginning July—	Withdrawn for consumption	Withdrawn for export	Total output	Year beginning July—	Withdrawn for consumption	Withdrawn for export	Total output
	Thousands	*Thousands*	*Thousands*		*Thousands*	*Thousands*	*Thousands*
1906	347, 722	10, 460	358, 182	1922	417, 307	2, 996	420, 303
1907	354, 408	11, 232	365, 640	1923	401, 134	7, 734	408, 868
1908	365, 526	11, 244	376, 770	1924	410, 102	14, 006	424, 108
1909	393, 844	13, 142	406, 986	1925	365, 260	10, 262	375, 522
1910	459, 710	11, 760	471, 470	1926	341, 857	12, 597	354, 454
1911	532, 431	11, 293	543, 724	1927	373, 458	16, 786	390, 244
1912	464, 861	8, 908	473, 769	1928	286, 632	17, 755	304, 387
1913	376, 695	6, 195	382, 890	1929	239, 324	21, 072	260, 396
1914	339, 080	12, 021	351, 101	1930	211, 686	20, 015	231, 701
1915	308, 026	11, 785	319, 811	1931	166, 510	9, 402	175, 912
1916	(1)	9, 571	(1)	1932	122, 248	4, 978	127, 226
1917	340, 077	6, 440	346, 517	1933	91, 339	6, 788	98, 127
1918	426, 582	20, 112	446, 694	1934	70, 638	6, 366	77, 004
1919	576, 425	5, 124	581, 549	1935	69, 526	4, 784	74, 310
1920	411, 717	5, 738	417, 455	1936	66, 404	5, 747	72, 151
1921	434, 653	2, 056	436, 709				

[1] Data not available.

Compiled from Annual Books on Statistics, Department of Agriculture and Commerce, Government of Puerto Rico, fiscal years, 1935-36 and 1936-37.

TABLE 15.—*Quantity and value of exports of cigarettes from Puerto Rico to continental United States and foreign countries, 1900–1936*

Year beginning July—	To United States		To foreign countries		Total		Average value per thousand
	Quantity	Value	Quantity	Value	Quantity	Value	
	Thousands	*Dollars*	*Thousands*	*Dollars*	*Thousands*	*Dollars*	*Dollars*
1900	599	880	1, 243	1, 869	1, 842	2, 749	1. 49
1901	10, 908	27, 695	427	1, 818	11, 335	29, 513	2. 60
1902	4, 176	8, 828	282	584	4, 458	9, 412	2. 11
1903	2, 725	5, 465	205	339	2, 930	5, 804	1. 98
1904	3, 808	8, 684	486	676	4, 294	9, 360	2. 18
1905	3, 809	11, 362	187	345	3, 996	11, 707	2. 93
1906	9, 040	21, 855	(1)	(1)	(1)	(1)	(1)
1907	12, 254	29, 159	(1)	(1)	(1)	(1)	(1)
1908	11, 260	29, 452	(1)	(1)	(1)	(1)	(1)
1909	11, 903	24, 757	(1)	(1)	(1)	(1)	(1)
1910	11, 544	33, 521	(1)	(1)	(1)	(1)	(1)
1911	11, 297	32, 089	26	82	11, 323	32, 171	2. 84
1912	8, 382	23, 323	15	21	8, 397	23, 344	2. 78
1913	5, 449	16, 026	20	198	5, 469	16, 224	2. 97
1914	7, 810	19, 691	5, 464	6, 311	13, 274	26, 002	1. 96
1915	7, 238	17, 278	4, 614	5, 890	11, 852	23, 168	1. 95
1916	7, 625	24, 867	3, 241	5, 165	10, 866	30, 032	2. 76
1917	4, 255	16, 656	2, 030	9, 076	6, 285	25, 732	4. 09
1918	18, 139	108, 942	751	1, 631	18, 890	110, 573	5. 85
1919	7, 541	75, 942	1, 976	7, 676	9, 517	83, 618	8. 79
1920	776	5, 489	4, 962	13, 109	5, 738	18, 598	3. 24
1921	1, 396	34, 155	660	2, 300	2, 056	36, 455	17. 73
1922	888	9, 281	2, 976	8, 679	3, 864	17, 960	4. 65
1923	3, 710	38, 294	4, 024	11, 057	7, 734	49, 351	6. 38
1924	9, 380	95, 732	4, 626	12, 916	14, 006	108, 648	7. 76
1925	3, 820	35, 527	6, 442	19, 390	10, 262	54, 917	5. 35
1926	5, 250	52, 209	7, 347	23, 432	12, 597	75, 641	6. 00
1927	5, 377	44, 596	11, 409	33, 220	16, 786	77, 816	4. 64
1928	5, 186	44, 180	12, 569	35, 814	17, 755	79, 994	4. 51
1929	6, 027	44, 621	15, 045	35, 833	21, 072	80, 454	3. 82
1930	20, 122	99, 524	10, 272	28, 010	30, 394	127, 534	4. 20
1931	7, 779	39, 272	10, 688	28, 571	18, 467	67, 843	3. 67
1932	2, 972	15, 932	10, 566	27, 103	13, 538	43, 035	3. 18
1933	5, 102	26, 624	15, 829	36, 274	20, 931	62, 898	3. 00
1934	3, 719	17, 582	6, 382	15, 295	10, 101	32, 877	3. 25
1935	3, 760	18, 377	5	105	3, 765	18, 482	4. 91
1936	5, 002	23, 867			5, 002	23, 867	4. 77

[1] Data not available.

Compiled, 1900–1919, from Monthly Summaries of Foreign Commerce of the United States and annual reports of the Governor of Puerto Rico; 1920–36, from Annual Books on Statistics, Department of Agriculture and Commerce, Government of Puerto Rico, fiscal years, 1935-36 and 1936-37.

TABLE 16.—*Quantity and value of imports of cigarettes into Puerto Rico from the United States, 1900–1936*

Year beginning July—	Quantity	Value	Average value per thousand	Year beginning July—	Quantity	Value	Average value per thousand
	Thousands	*Dollars*	*Dollars*		*Thousands*	*Dollars*	*Dollars*
1900	(1)	(1)		1919	(1)	(1)	
1901	35	61	1.74	1920	(1)	(1)	
1902	206	496	2.41	1921	(1)	(1)	
1903	90	408	4.53	1922	152,957	411,023	2.69
1904	229	490	2.14	1923	249,201	553,657	2.22
1905	20	88	4.40	1924	257,230	562,511	2.19
1906	26	225	8.65	1925	275,971	928,232	3.36
1907	115	833	7.24	1926	311,249	1,157,384	3.72
1908	196	1,321	6.74	1927	332,496	1,497,023	4.50
1909	601	2,401	4.00	1928	398,789	2,044,283	5.13
1910	608	3,948	6.49	1929	421,353	2,182,312	5.18
1911	870	6,841	7.86	1930	468,234	2,199,182	4.70
1912	1,709	12,471	7.30	1931	445,600	2,291,012	5.14
1913	1,368	10,902	7.97	1932	448,982	2,163,315	4.82
1914	(1)	(1)		1933	549,113	2,379,481	4.33
1915	(1)	(1)		1934	599,083	2,346,958	3.92
1916	(1)	(1)		1935	666,818	2,997,074	4.49
1917	(1)	(1)		1936	777,519	3,399,893	4.37
1918	(1)	(1)					

[1] Reported in value only of all manufactured tobacco.

Compiled, 1900–1922, from Monthly Summaries of Foreign Commerce of the United States and annual reports of the Governor of Puerto Rico; 1923–36, from Annual Books on Statistics, Department of Agriculture and Commerce, Government of Puerto Rico, fiscal years, 1935–36 and 1936–37.

TABLE 17.—*Consumption of cigarettes in Puerto Rico as measured by withdrawals of those manufactured on the island and imports from continental United States, average 1906–13, annual 1922–36*

Year beginning July—	Manufactured in Puerto Rico and withdrawn for domestic consumption		Imported from United States		Total	
	Millions	*Percent*	*Millions*	*Percent*	*Millions*	*Percent*
Average 1906–13[1]	411.9	99.8	0.7	0.2	412.6	100.0
1922	417.3	73.2	153.0	26.8	570.3	100.0
1923	401.1	61.7	249.2	38.3	650.3	100.0
1924	410.1	61.5	257.2	38.5	667.3	100.0
1925	365.3	57.0	276.0	43.0	641.3	100.0
1926	341.9	52.4	311.2	47.6	653.1	100.0
1927	373.5	52.9	332.5	47.1	706.0	100.0
1928	286.6	41.8	398.8	58.2	685.4	100.0
1929	239.3	36.2	421.4	63.8	660.7	100.0
1930	211.7	31.1	468.2	68.9	679.9	100.0
1931	166.5	27.2	445.6	72.8	612.1	100.0
1932	122.2	21.4	449.0	78.6	571.2	100.0
1933	91.3	14.3	549.1	85.7	640.4	100.0
1934	70.6	10.5	599.1	89.5	669.7	100.0
1935	69.5	9.4	666.8	90.6	736.3	100.0
1936	66.4	7.9	777.5	92.1	843.9	100.0

[1] Statistics on imports from the United States not available for the period 1914–21.

Compiled from Annual Books on Statistics, Department of Agriculture and Commerce, Government of Puerto Rico, fiscal years, 1935–36 and 1936–37.

RESEARCH IN TOBACCO

NEED FOR RESEARCH

Developments in the tobacco industry in recent years have pointed to the need for a broad program of research looking especially to improvement in cultural practices and the development of new or improved varieties. Prominent among these developments are: The disappearance of shade-grown wrapper production; the virtual extinction of the cigarette industry, resulting from a shift in consumer

demand from cigarettes made of Puerto Rican tobacco to blended cigarettes shipped in from the States; the transference of a major part of the cigar-manufacturing business from the island to the mainland; and the change in the use of Puerto Rican tobacco from class B or better cigars to class A cigars. These developments have had repercussions on prices paid to growers, total outlet for their tobacco, the field of employment for factory workers, and revenue to the Insular Government, and have served not only to create a fear for the future of the tobacco industry but to focus attention on the need for research along lines that will improve the situation.

Activities of the experiment station and extension service of the University of Puerto Rico at Río Piedras have already been mentioned. It should be noted also that the Division of Agricultural

BAE 33450

FIGURE 17.—Experiment in producing wrapper tobacco under shade. Experiment farm of the Tobacco Institute of Puerto Rico at Caguas. (Courtesy of J. A. B. Nolla, director of the Puerto Rico Experiment Station, Río Piedras, P. R.)

Economics of the university is concerned with studies pertaining to many of the problems of tobacco growers and other groups of farmers. The published results of several of these studies are mentioned herein.

In further recognition of the need for a broad program of research on tobacco, the legislature on July 22, 1935, passed Joint Resolution No. 15 directing the establishment of the Tobacco Institute as a separate Government agency, and providing funds for its support. This legislation with subsequent amendments has made possible the erection of a central research laboratory and the purchase of experimental farms.

PLAN OF TOBACCO INSTITUTE

The following statement, prepared by J. A. B. Nolla, then deputy commissioner of agriculture and commerce, and director of the

Tobacco Institute, sets forth the scope of the institute's research program. Figures 17 and 18 illustrate some of the work.

1. *Hybridization studies.*—a. Studies on the development of strains of cigar-filler and cigar shade-tobacco resistant to the mosaic disease and to the black shank or fungus wilt disease (*Phytophthora parasitica var. nicotiana*).

The work on these two projects was initiated about 9 years ago, and will be taken up at this point by the Tobacco Institute. The development of a satisfactory cigar-wrapper tobacco will be of great help in the development of the tobacco districts where we only grow now cigar-filler types.

b. Development of improved types of cigar-filler tobaccos, irrespective of their resistance to diseases, with the hope of increasing the materials now available for the improvement of the disease-resistant types and varieties.

c. Development of disease-resistant strains which may be satisfactory as flue-cured types.

BAE 33449

FIGURE 18.—Plot of filler tobacco in the fertilizer experiments conducted by the Tobacco Institute of Puerto Rico at Caguas. (Courtesy of J. A. B. Nolla, director of the Puerto Rico Experiment Station, Río Piedras, P. R.)

This work will involve testing of a large number of strains developed under (a). From that point on, the selected few strains will be subjected to rigorous tests for adaptation to climatic and soil conditions.

2. *Fertilizers and green manures.*—The institute will endeavor to carry out an intensive program of investigation on commercial fertilizers, green manures, and their adaptation to our various soil conditions. It is hoped that, with a better knowledge of the fertilizer requirement of our soils, a better quality of cigar-filler tobacco may be grown on the island.

3. *Curing and fermentation.*—The studies will be made to elucidate the rather vague problems in connection with tobacco curing and fermentation.

4. *Agronomic factors.*—The investigation of all other agronomic factors concerned with tobacco culture will receive due consideration.

5. *Service to farmers.*—The Tobacco Institute, with the various field stations, will endeavor to raise enough seed of the predominant and most adapted varieties for the special districts. This seed we hope to distribute, free of charge, to the farmers. In this connection, during the past year we have raised enough tobacco to produce about 500 pounds of seed which will be distributed for the coming crop. Eventually, the institute might raise the larger part of the seed requirements for the growers of the island. In this way we hope to bring about uniformity and standardization of the tobacco crop.

At the present time the institute has enough laboratory facilities to start work in plant pathology, genetics, and chemistry. A very modern greenhouse forms an essential part of the laboratory. In addition to this, it is hoped that in the next year three experimental field stations will be organized in various districts, representing distinct and diverse soil and climatic conditions.

SUMMARY

Puerto Rico is a tropical island of rugged topography, densely populated, and adapted to the production of cash crops. Tobacco is the second ranking crop in value of production and exports.

Tobacco produced is of a cigar-filler type, although small quantities are used in the manufacture of cigarettes and roll chewing tobacco. The sections producing it and the tobacco grown therein are classed as coastal, semicoastal, and interior. Tobacco from the semicoastal and interior districts is classed as cigar filler, while that from the coastal district is a chewing type, only a small percentage of it—mostly boliches—being useable for smoking purposes.

Production of tobacco and manufacture of cigars were greatly stimulated by the removal of American tariff barriers, following the war of 1898. The States became the most important outlet for manufactured and unmanufactured tobacco grown on the island. The trend in recent years has been toward a moderate increase in the shipments of unmanufactured tobacco to the States, accompanied by decreased shipments of cigars. The manufacture of cigarettes for domestic consumption has almost disappeared as a result of the competition of blended cigarettes from the mainland.

Shade-grown cigar-wrapper tobacco was grown rather extensively for a considerable number of years but this enterprise was abandoned in 1927. Experimental work has been inaugurated by the Tobacco Institute looking to a possible renewal of the shade tobacco industry and the improvement of other types.

Methods of marketing tobacco are closely related to available sources of production credit. For growers who are not members of the cooperative marketing association, credit is obtainable only from refaccionistas, who thus gain a large measure of control over the growers' tobacco. This places in the hands of refaccionistas undue opportunities for unfair practices. The marketing system might be improved with advantage to the growers by developing additional sources of production credit, establishing standard grades for Puerto Rican tobacco, and inaugurating official inspection services for the protection of growers.

The cooperative association performs a useful service. It should be strengthened and enlarged.

LITERATURE CITED

(1) Gage, Charles E.
1933. American tobacco types, uses and markets. U. S. Dept. Agr. Cir. 249, 88 pp., illus.

(2) Lobeck, A. K.
1922. The physiography of Porto Rico. In New York Academy of Sciences, Scientific Survey of Porto Rico and the Virgin Islands, v. 1, pt. 4, pp. 301–384, illus.

(3) McCord, J. E., and Descartes, S. L.
1935. A FARM MANAGEMENT STUDY OF SMALL FARMS IN THREE AREAS OF PUERTO RICO. Puerto Rico Agr. Expt. Sta., Div. Agr. Econ. Bull. 40, 36 pp., illus.
(4) ——— Descartes, S. L., and Huyke, R.
1936. A FARM MANAGEMENT STUDY OF SMALL FARMS IN TWO AREAS OF PUERTO RICO. PART I. CAROLINA-TRUJILLO ALTO. PART II. ISABELA. Puerto Rico Agr. Expt. Sta., Div. Agr. Econ. Bull. 43, 64 pp., illus.
(5) ——— Serrallés, Jorge J., Jr., and Picó, Rafael.
1935. TYPES OF FARMING IN PUERTO RICO. Puerto Rico Agr. Expt. Sta., Div. Agr. Econ. Bull. 41, 54 pp., illus.
(6) Nolla, J. A. B.
1935. STUDIES ON DISEASE RESISTANCE. I. A TOBACCO RESISTANT TO ORDINARY TOBACCO MOSAIC. Puerto Rico Univ. Jour. Agr. 19 (1): 29–49.
(7) ———
1938. INHERITANCE IN NICOTIANA. III. A STUDY OF THE CHARACTER FOR MOSAIC RESISTANCE IN NICOTIANA TABACUM L. Jour. Heredity 29: 42–48, illus.
(8) ——— and Roque, A.
1933. A VARIETY OF TOBACCO RESISTANT TO ORDINARY TOBACCO MOSAIC. Puerto Rico Jour. Dept. Agr. 17: 301–303.
(9) Picó, Rafael.
1937. STUDIES IN THE ECONOMIC GEOGRAPHY OF PUERTO RICO. Puerto Rico Univ. Bull. Ser. 8, No. 1, 84 pp., illus.
(10) Rodríguez, F. Joglar.
1935. CULTIVO DEL TOBACO. Puerto Rico Univ. Col. Agr. Serv. Ext. Agr. Bol. Ext. 4, 30 pp., illus.
(11) Smith, Dudley.
1937. SOME MARKS OF PROGRESS IN PUERTO RICO RESULTING FROM INCREASED TRADE. 32 pp., illus. Washington, D. C.

ORGANIZATION OF THE UNITED STATES DEPARTMENT OF AGRICULTURE WHEN THIS PUBLICATION WAS LAST PRINTED

Secretary of Agriculture	HENRY A. WALLACE.
Under Secretary	M. L. WILSON.
Assistant Secretary	HARRY L. BROWN.
Coordinator of Land Use Planning and Director of Information.	M. S. EISENHOWER.
Director of Extension Work	C. W. WARBURTON.
Director of Finance	W. A. JUMP.
Director of Personnel	ROY F. HENDRICKSON.
Director of Research	JAMES T. JARDINE.
Solicitor	MASTIN G. WHITE.
Agricultural Adjustment Administration	H. R. TOLLEY, *Administrator.*
Bureau of Agricultural Economics	A. G. BLACK, *Chief.*
Bureau of Agricultural Engineering	S. H. MCCRORY, *Chief.*
Bureau of Animal Industry	JOHN R. MOHLER, *Chief.*
Bureau of Biological Survey	IRA N. GABRIELSON, *Chief.*
Bureau of Chemistry and Soils	HENRY G. KNIGHT, *Chief.*
Commodity Exchange Administration	J. W. T. DUVEL, *Chief.*
Bureau of Dairy Industry	O. E. REED, *Chief.*
Bureau of Entomology and Plant Quarantine	LEE A. STRONG, *Chief.*
Office of Experiment Stations	JAMES T. JARDINE, *Chief.*
Farm Security Administration	W. W. ALEXANDER, *Administrator.*
Food and Drug Administration	WALTER G. CAMPBELL, *Chief.*
Forest Service	FERDINAND A. SILCOX, *Chief.*
Bureau of Home Economics	LOUISE STANLEY, *Chief.*
Library	CLARIBEL R. BARNETT, *Librarian.*
Bureau of Plant Industry	E. C. AUCHTER, CHIEF.
Bureau of Public Roads	THOMAS H. MACDONALD, *Chief.*
Soil Conservation Service	H. H. BENNETT, *Chief.*
Weather Bureau	F. W. REICHELDERFER, *Chief.*

This circular is a contribution from

Bureau of Agricultural Economics	A. G. BLACK, *Chief.*

U. S. GOVERNMENT PRINTING OFFICE: 1939