Average Monthly and Annual Rainfall Distribution in Puerto Rico[1]

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ABSTRACT

Average annual and monthly rainfall distribution in Puerto Rico are presented in isohyetal charts which indicate that January, February, March, July and December belong to the dry season. The southern coast of Puerto Rico receives the least rainfall compared to that of the southern and northern slopes, north coast, eastern and western interiors, respectively.

INTRODUCTION

Rainfall data is of particular interest to those concerned with the effective use of soil and water (5). The weather is often the controlling factor in problems of preventing excessive soil movement, retaining needed moisture, increasing the intake of surface water, adding needed water by irrigation, and removing excess water by drainage. Moisture, whether too much, too little, or poorly distributed, is one of the major limitations in agricultural production. It is essential to know rainfall distribution patterns at a location for a good water management project. Monthly and annual rainfall amount over a watershed can be computed from isohyetal charts, which are similar to topographic maps. Isohyetal lines indicate equal rainfall (4, 5). Capiel and Calvesbert (1) summarized agricultural water balance of Puerto Rico.

This study presents annual and monthly isohyetal charts (January through December) for Puerto Rico.

MATERIALS AND METHODS

Available rainfall data (3) and publication No. 11-45 of the Weather Bureau, US Department of Commerce (2) were used to calculate the average rainfall corresponding to each weather station identified in table 1. Lines of equal rainfall (isohyets) were interpolated with calculated amounts at weather stations. These isohyets are plotted in figures 1 to 13.

RESULTS AND DISCUSSION

Annual and monthly average rainfall distribution are shown in isohyetal charts 1 to 13. In these graphs, Adjuntas, Gurabo substations; Corozal,

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TABLE 1.—*Weather station index and location (2)*

Station No.[1]	Station Location	County[2]	Index number[3]	Latitude N	Longitude W	Elevation[4]
				° ′	° ′	m
1	Aceituna	Villalba	0040	18 09	66 29	652.5
2[5]	Adjuntas	Ponce	0061	18 11	66 48	450.0
3	Aguirre	Guayama	0147	17 58	66 13	15.0
4	Aibonito	Guayama	0158	18 08	66 16	690.0
5	Arecibo 2ESE	Arecibo	0410	18 28	66 42	4.5
6	Barceloneta 2 NNW	Arecibo	0662	18 29	66 32	22.8
7	Barranquitas	Guayama	0736	18 11	66 19	540.0
8	Bayamón Hato Tejas	San Juan	0842	18 25	66 12	54.0
9	Cabo Rojo	Mayagüez	1123	18 05	67 09	75.0
10	Caguas	Guayama	1300	18 14	66 02	75.0
11	Calero Camp	Aguadilla	1345	18 29	67 07	73.8
12	Canóvanas 2 N	Humacao	1590	18 24	65 05	9.0
13	Caonillas Utuado	Arecibo	1623	18 16	66 39	255.0
14	Caonillas Villalba	Ponce	1634	18 07	66 29	180.0
15	Carite Camp Tunnel	Guayama	1701	18 04	66 06	600.0
16	Carite Plant 1	Guayama	1712	18 03	66 06	288.0
17	Cataño	San Juan	1845	18 25	66 07	6.0
18	Cayey 1 NW	Guayama	1901	18 07	66 09	420.0
19	Central San Francisco	Mayagüez	2316	17 59	68 48	9.0
20	Cidra 3 E	Guayama	2634	18 11	66 08	420.0
21	Coamo Dam	Ponce	2723	18 01	66 23	55.5
22	Coloso	Aguadilla	2801	18 23	67 09	15.0
23	Comerío Falls	Guayama	2823	18 16	66 11	150.0
24[5]	Corozal 4 W	San Juan	2934	18 20	66 22	120.0
25	Dorado 4 W	Arecibo	3409	18 28	66 17	7.5
27	Dos Bocas	Arecibo	3431	18 20	66 40	60.0
28	Ensenada	Mayagüez	3532	17 58	68 55	7.5
29	Fajardo	Humacao	3657	18 20	65 39	12.0
30	Garzas Dam	Ponce	3871	18 08	66 44	745.5
31	Guajataca Dam	Aguadilla	3904	18 24	66 56	196.8
32	Guayabal Reservoir	Ponce	4126	18 06	68 30	81.0
33	Guayama	Guayama	4193	17 59	66 07	58.5
34	Guayanilla	Mayagüez	4211	18 00	66 52	9.0
36[5]	Gurabo	Humacao	4276	18 15	66 00	48.0
37	Humacao 1 SW	Humacao	4613	18 08	65 50	30.0
38	Indiera Baja	Aguadilla	4685	18 11	66 54	840.0
39[6]	Isabela 4 SW	Aguadilla	4702	18 28	67 04	126.0
40	Jájome Alto	Guayama	4867	18 05	66 08	715.5
41	Jayuya	Ponce	4910	18 13	66 35	420.0
43	Juana Díaz Camp	Ponce	5020	18 03	66 30	60.0
44	Juncos 1 E	Humacao	5064	18 14	65 53	81.0
	La Fe	Humacao	5075	18 14	65 46	45.0

TABLE 1.—*Continued*

Station No.[1]	Location	County[2]	Index number[3]	Latitude N	Longitude W	Elevation[4]
45[5]	Lajas	Mayagüez	5097	18 02	67 05	30.0
47	Lares	Aguadilla	5175	18 17	66 53	360.0
48	Manatí	Arecibo	5807	18 26	66 27	75.0
50	Maricao	Aguadilla	5908	18 09	66 59	450.0
51	Maricao Fish Hatchery	Aguadilla	5911	18 10	66 59	450.0
52	Matrullas Dam	Ponce	6017	18 12	66 28	750.0
53	Maunabo 1 SW	Guayama	6050	18 00	65 54	15.0
54[5]	Mayagüez	Mayagüez	6073	18 13	67 08	24.0
57	Mora Camp	Aguadilla	6361	18 28	67 02	123.0
58	Naguabo 6 W	Humacao	6432	18 14	65 44	30.0
59	Paraíso	Humacao	6805	18 18	65 42	45.0
60	Patillas Dam	Guayama	6904	18 02	66 02	72.0
61	Peñuelas Salto Garzas	Mayagüez	6982	18 05	66 44	345.9
62[5]	Ponce 4 E	Ponce	7292	18 01	66 32	12.0
64	Puerto Real	Mayagüez	7492	18 06	67 11	4.5
65	Quebradillas	Aguadilla	7843	18 28	66 56	111.6
66	Ramey Air Force Base	Aguadilla	7898	18 30	67 08	71.1
67	Río Blanco Lower	Humacao	8144	18 15	65 47	39.0
68	Río Blanco Upper	Humacao	8155	18 17	85 47	432.0
71[5]	Río Piedras	San Juan	8301	18 24	66 04	30.0
75	San Germán	Mayagüez	8757	18 05	67 03	114.0
76	San Juan W B City	San Juan	8808	18 28	66 06	14.1
77	San Juan (airport) WB AP 2	San Juan	8812	18 26	66 00	4.5
78	San Lorenzo Espino	Humacao	8817	18 06	66 00	381.0
79	San Sebastián	Aguadilla	8881	18 21	67 01	67.5
80	Santa Isabel 3 NW	Ponce	8940	18 00	66 26	8.4
81	Santa Rita	Mayagüez	8955	18 02	66 52	52.5
82	Toa Baja Constancia	San Juan	9421	18 26	66 15	15.0
83	Toro Negro Plant 2	Ponce	9466	18 10	66 31	675.0
84	Utuado	Arecibo	9608	18 16	66 42	129.0
85	Villalba	Ponce	9774	18 08	66 29	156.0
87	Yabucoa 1 NNE	Humacao	9829	18 04	65 52	30.0
88	Yauco 1 S	Mayagüez	9862	18 01	66 51	7.5

[1] Weather Stations around the island of Puerto Rico are identified by these numbers in rainfall distribution charts (figures 1 to 13).

[2] As of 1950.

[3] Identification numbers are assigned by the Weather Bureau on a state basis and are not reassigned in the future to their stations.

[4] Elevation of weather station above sea level, meters.

[5] These weather stations are located at Agricultural Research Centers of UPR-RUM.

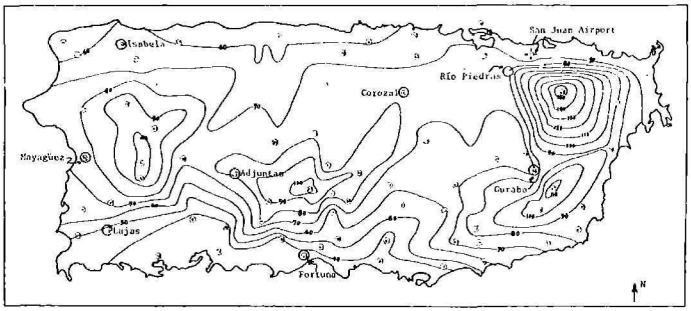

FIG. 1.—Annual isohyetal chart of Puerto Rico. Each value of the contour indicates average rainfall amount in inches which should be multiplied by 2.54 to convert into centimeters. Circled numbers refer to weather stations, which are identified in table 1.

(2) Adjuntas Substation
(45) Lajas Substation
(24) Corozal Substation
(54) UPR-RUM Mayagüez
(36) Gurabo Substation
(62) Fortuna Substation
(39) Isabela Substation
(71) Agric. Exp. Station, Río Piedras
(77) San Juan Airport
(1) Weather stations

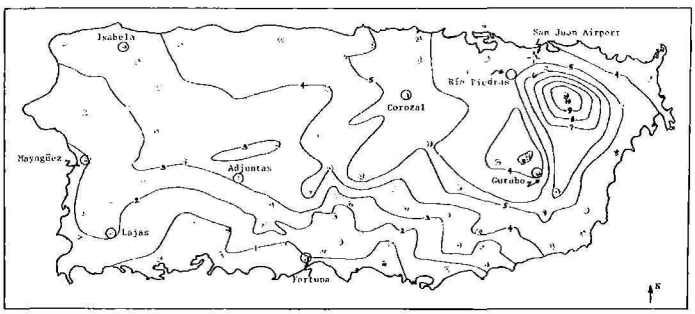

FIG. 2.—Monthly isohyetal chart (inches) of Puerto Rico for January.

Fortuna and Isabela, Lajas, Mayagüez, Río Piedras Agricultural Research and Development Centers, and San Juan Airport are identified by circled numbers 2, 36, 24, 62, 39, 45, 54, 71 and 77, respectively. Contour values in all graphs are in inches.

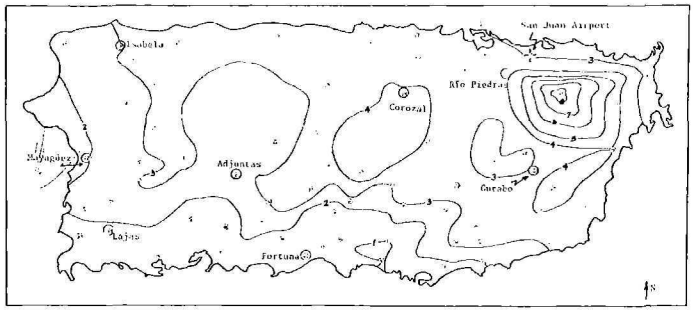

FIG. 3.—Monthly isohyetal chart (inches) of Puerto Rico for February.

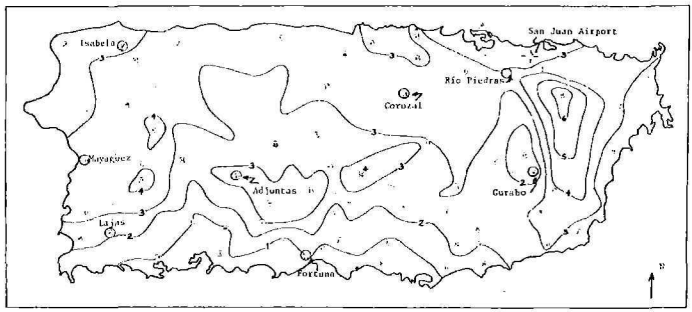

FIG. 4.—Monthly isohyetal chart (inches) of Puerto Rico for March.

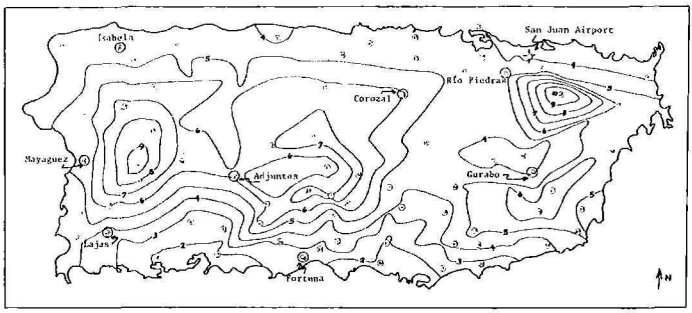

FIG. 5.—Monthly isohyetal chart (inches) of Puerto Rico for April.

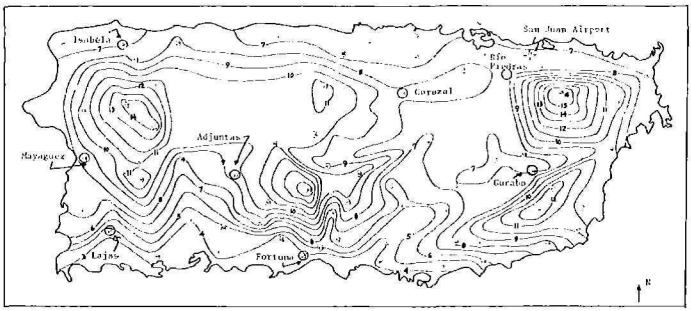

FIG. 6.—Monthly isohyetal chart (inches) of Puerto Rico for May.

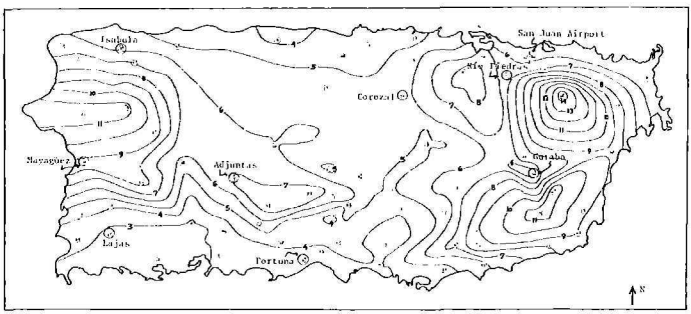

FIG. 7.—Monthly isohyetal chart (inches) of Puerto Rico for June.

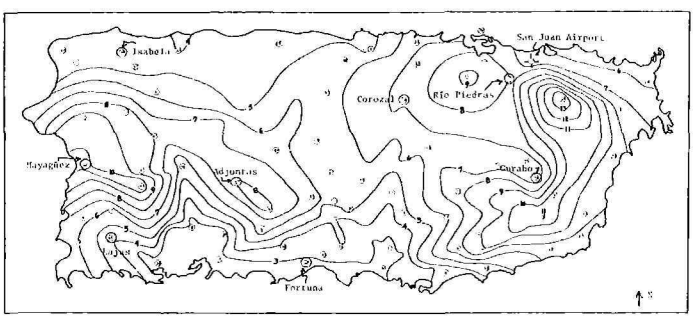

FIG. 8.—Monthly isohyetal chart (inches) of Puerto Rico for July.

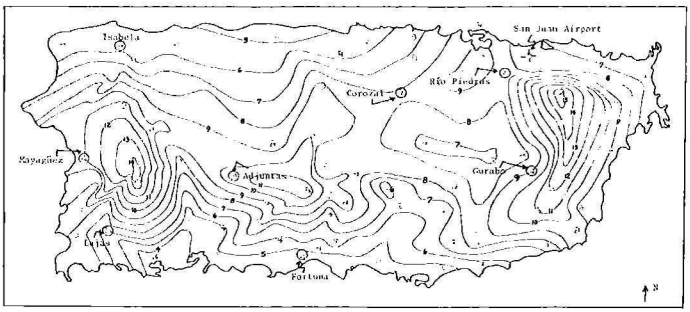

FIG. 9.—Monthly isohyetal chart (inches) of Puerto Rico for August.

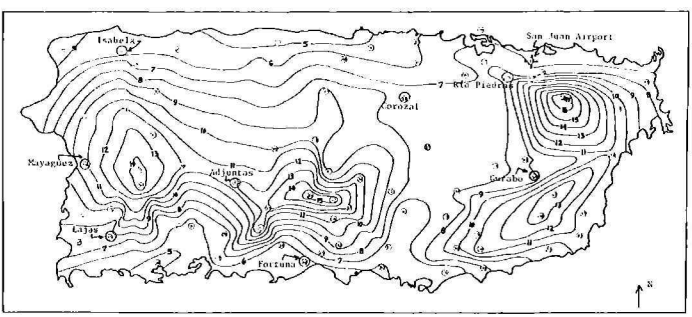

FIG. 10.—Monthly isohyetal chart (inches) of Puerto Rico for September.

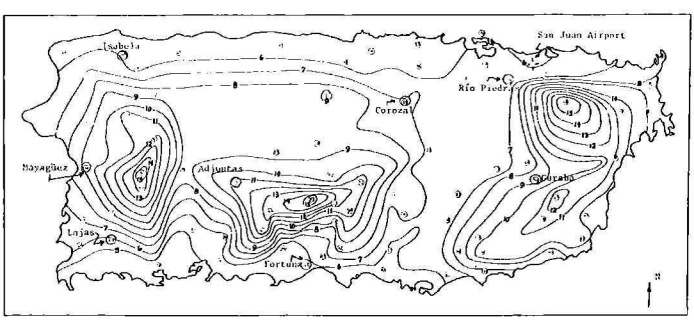

FIG. 11.—Monthly isohyetal chart (inches) of Puerto Rico for October.

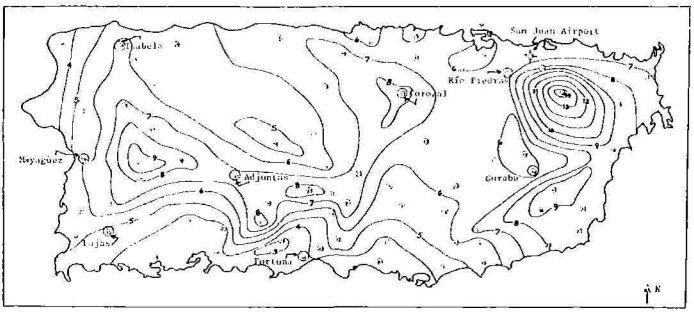

FIG. 12.—Monthly isohyetal chart (inches) of Puerto Rico for November.

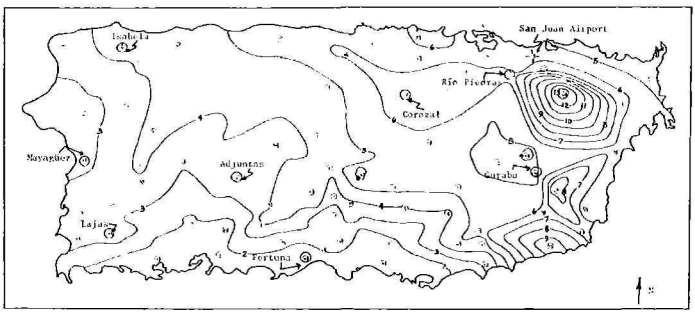

FIG. 13.—Monthly isohyetal chart (inches) of Puerto Rico for December.

Figure 1 indicates that the south coast of Puerto Rico receives annual average rainfall of less than 102 cm compared to that of 102 to 178 cm in the southern slopes; 178 to 254 in the western interior; 178 to 382 in the eastern interior; 152 to 178 in the northern slopes; and less than 165 cm in the north coast of Puerto Rico, respectively. Figures 2 to 4 reveal that the south coast receives 2.5 to 5.0 cm of rainfall during January/February or March compared to 25 cm in the El Yunque rain forest. April to November are wetter months as shown in figures 5 to 12 than December through March (figures 13, 2, 3, 4) respectively. It is not unusual to have from 1 to 2 tropical storms from August to November.

Average depth of rainfall for any given location can be interpolated or extrapolated from figures 1 to 13. The following example shows how to calculate average annual rainfall at the Lajas Agricultural Research and Development Center (Weather Station #45).

Example: The Lajas Research Center is located between isohyets 40 and 50 (fig. 1): Assume a least distance of X_1 between contour 50 and the weather station; and a least distance of X_2 between contour 40 and the weather station. Then, average depth of rainfall (inches) at the weather station = $(50\ X_1 + 40\ X_2)/(X_1 + X_2)$.

RESUMEN

Se prepararon cartas isopluviales para ilustrar la distribución media de precipitación anual y mensual en Puerto Rico. Las cartas indican que enero, febrero, marzo, julio y diciembre pertenecen a la estación seca. La costa sur de Puerto Rico recibe menos precipitación comparada con la de las vertientes sur y norte, la costa norte y los interiores este y oeste, respectivamente.

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