Research Note

NORMAL MONTHLY CLASS A PAN EVAPORATION FOR AGRICULTURAL EXPERIMENT SUBSTATIONS IN PUERTO RICO[1]

Evaporation is the quantity of water evaporated from free water surfaces, and from land surfaces, but excluding transpiration.[2] By subtracting infiltration, evaporation and transpiration from precipitation, it may be possible to estimate average runoff in the absence of runoff records. Evaporation from lakes, reservoirs, and other open water surfaces can be computed on the basis of pan evaporation data or by means of formulas. The standard U. S. Weather Bureau Class A evaporation pan is widely used throughout the world to measure daily evaporation. The class A pan is 25 cm deep and 133.3 cm in diameter. The U. S. Weather Bureau[3] publishes pan evaporation data in its monthly publication Climatological Data. Pan evaporation coefficients are used to convert raw data into evaporation from water surfaces, depending upon the size and type of pan and on differences between the pan and the free-water body in temperature, humidity, and wind. Pan evaporation has been found to be a good index to evapotranspiration.[4] In fact, many evapotranspiration models were evolved from pan evaporation equations.

The objective of this study was to evaluate distribution of Class A pan evaporation at several locations in Puerto Rico. The Class A pan was used to measure daily evaporation at Adjuntas, Corozal, Fortuna, Gurabo, Isabela, Lajas and Río Piedras Agricultural Experiment Substations in Puerto Rico. The location of the weather stations has been identified by Ravalo, et al.[5] Daily evaporation during the month was totaled to obtain monthly evaporation. The average of several years' records gave normal monthly evaporation.

Table 1 indicates distribution of normal monthly evaporation (E, in cm) at all locations for January through December. Maximum E was in July at Adjuntas, Corozal, Fortuna, Gurabo and Lajas, respectively. At Isabela, maximum E was in April. Evaporation was minimal in December at Adjuntas, Corozal, Gurabo, Isabela, Lajas, and Río Piedras. At Fortuna it was minimal in November. During the year evaporation range (cm) was 8 to 15 at Adjuntas, 7.5 to 15.1 at Corozal, 12.5 to 22.5 at Fortuna, 9.5 to 16.2 at Gurabo, 12.5 to 17.5 at Isabela, 10.1 to 19.9 at Lajas and 11.0 to 18.0 at Río Piedras. This finding implies that in Puerto Rico evaporation minima varied from 7.5 to 12.5 cm, and evaporation maxima varied from 15 to 22.5 cm. The annual range was 7.5 to 22.5 cm, equivalent to 2.5 to 7.5 mm per day.

Figure 1 shows average monthly evaporation (E cm) in mountain, humid-coastal

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[2]Butler, S. S., 1981. Engineering Hydrology. Prentice-Hall, Inc., Englewood Cliffs, N. J., Chapter 10.

[3]Climatological Data Annual Summary—Puerto Rico and Virgin Islands, 1985. U. S. National Climatic Data Center, Asheville, N.C., Vol. 31 No. 13.

[4]Jensen, M. E., 1980. Design and Operation of Farm Irrigation Systems. American Society of Agricultural Engineers, St. Joseph, MI, monograph No. 3, Chapter 6.

[5]Ravalo, E. J., M. R. Goyal and C. R. Almodóvar, 1986. Average monthly and annual rainfall distribution in Puerto Rico. *J. Agric. Univ. P. R.*, 70 (4): 267-75.

TABLE 1.—*Mean monthly class A pan evaporation for Agricultural Experiment Substations in Puerto Rico*

Month	Class A pan evaporation, mm/month						
	Agricultural Experiment Station						
	Adjuntas	Corozal	Fortuna	Gurabo	Isabela	Lajas	Río Piedras
Record years	1967-80	1964-80	1964-80	1961-80	1963-80	1949-80	1963-65 1972-80
January	85	84	150	98	117	120	112
February	90	92	155	110	124	140	118
March	101	116	188	138	170	173	156
April	126	126	212	150	175	180	168
May	137	140	201	152	162	194	169
June	142	150	203	156	158	199	170
July	145	151	225	162	166	194	180
August	130	134	201	152	162	176	167
September	113	114	172	138	140	151	140
October	110	112	152	121	128	134	130
November	83	85	125	96	126	110	114
December	80	75	137	95	125	101	110
Total	1342	1379	2121	1568	1753	1872	1734

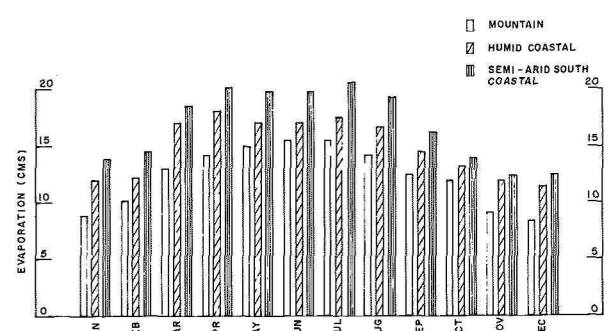

Fig. 1 AVERAGE MONTLY EVAPORATION (CMS)

(north) and semiarid south coastal areas of Puerto Rico. Throughout the year, the south coast showed highest E, and mountain regions showed lowest E. These findings are confirmed by similar patterns of rainfall and temperature in these areas.[5] Thus, in Puerto Rico from January through December, pan evaporation E varies from 2.5 to 7.5 mm per day.

Megh R. Goyal
Eliodoro J. Ravalo
Department of Agricultural Engineering
Eladio A. González
Department of Agronomy and Soils