Letters to the Editor

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A COMPARISON OF PICHE AND MESH COVERED STANDARD U.S.A. PAN EVAPORIMETERS

1. The Piche evaporimeter is a very simple and inexpensive instrument used for measuring evaporation. Its records though not hampered by precipitation, are very different from those of the standard U.S.A. pan due to a number of physical factors. Its readings depend on the type of the filter paper used, the area exposed and the pressure of the clip on the disc. The disc sometimes dries around the edges in dry regions and so the evaporating surface is not always of the same area. Also because of the manner of mounting it in contact with the open end of the glass tube it is difficult to standardise the effectiveness of the evaporating surface. The readings are also seriously affected by the deposition of dust or sand on the porous disc. The Piche tube placed inside the Stevenson screen, responds to vapour pressure deficit and variations in wind speed, but not to variations in solar and sky energy which play an important role in controlling evaporation.

2. A considerable amount of Piche evaporimeter data from a fairly close network of stations in India is now available. The object of this study was to find out if it was possible to develop a suitable corrective procedure by which it would be possible to convert fairly accurately the Piche evaporation data to the standard U.S.A. pan readings. Comparative observations of Piche evaporimeter placed inside a Stevenson screen and the standard U.S.A. pan covered with a mesh of specific design, from December 1955 to November 1960 collected at the Central Agricultural Meteorological Observatory Poona, have been made use of in the present study.

3. A study of dot diagrams of Piche *versus* mesh-covered daily values yearwise for each of the months indicated that no linear relation exists between two sets of evaporation values and so the idea of correlation study was given up.

4. To see if within some tolerance limits, it was possible to find correction factors on a seasonal basis, the ratios of evaporation values from mesh-covered to Piche during the different seasons were examined. Daily ratios as well as ratios for weekly accumulated evaporation and total evaporation during a season were computed, omitting weeks with 3 or more rainy days and after applying necessary corrections for rainfall for weeks with 1 or 2 rainy days. It was seen that the ratios fluctuate widely from year to year during a particular season and it was not possible to suggest a single correction factor representative for a season.

The coefficients of variability of the ratios computed for the different seasons have also led to the same inference. These coefficients are of the order of 15 to 20 %.

5. The weekly ratios of evaporation values from mesh-covered to Piche were then examined with respect to the different relevant meteorological factors. For this the ratios were grouped and examined under broad classes with specified ranges of each of the meteorological factors. The meteorological factors considered were maximum temperature, wind speed and humidity.

5.1. *Maximum Temperature*—The maximum temperatures recorded inside the Stevenson screen were divided in four equal groups of 5° C each. The ratios are widely scattered in each of the groups and no systematisation is possible with regard to maximum temperature.

5.2. *Wind speed*—The wind speeds were the average speeds at a height of about 2 m above the ground divided into 7 groups each of range 2 kmph. There is a very weak suggestion that the ratio increases with wind speed; but the higher values are scattered so much so that no systematisation with regard to wind speed is possible.

5.3. *Relative Humidity*—The humidity considered was the mean of the relative humidities at the maximum and minimum epochs recorded inside the Stevenson screen and these have been divided into 6 groups, each of range 10 per cent. The ratios are widely scattered in each of the groups and hence no systematisation is possible with relation to humidity as well.

The coefficients of variability of the ratios computed for each group of the meteorological factors has also led to the same inference. The coefficients are of the order of 15 to 25 per cent and with such high variabilities it is not possible to suggest a single ratio that could be used as a reliable correction factor even if the ratio values are sub-grouped under the various ranges of maximum temperature, wind speed and relative humidity, taking these factors severally.

6. A final attempt was made to see if any suitable curvilinear relation could be established between the evaporation ratios and the relevant meteorological factors taken jointly. This aspect was examined in the the following two ways.

6.1. A particular element say maximum temperature, was kept at a particular range and the ratio values for this range were plotted with respect to the other two meteorological elements, *viz.*, wind speed and relative humidity, in the form of a scatter diagram. Diagrams were prepared for various combinations. No isopleths in the form of a family of smooth curves in any of the scatter diagrams could be drawn, suggesting thereby the absence of any organized relation between the ratios and the weather factors even taken jointly.

6.2. An alternative attempt was made by sub-grouping and averaging the observations in the manner suggested by Ezekiel and Fox (1951). The ratios were recast with respect to wind speed and saturation vapour pressure deficit. The available 198 ratio values were first classified according to wind speed and then sub-classified according to saturation vapour pressure deficit and the averages of ratios and the meteorological factors in each group were determined. 7 groups each way gave a 49-group classification—but with some of the cells vacant. In all 39 values of the ratio averages were available and these values were plotted corresponding to average values of wind speed and saturation vapour pressure deficit—in the form of a scatter diagram. The ratio values in the diagram were irregularly distributed and no isopleths in the form of a family of smooth curves could be drawn, indicating once again the absence of any organized relation of the evaporation ratios with these two meteorological factors taken jointly.

7. The above study has shown that the ratios of evaporation values from mesh-covered standard U.S.A. pan to Piche vary erratically within very wide limits. It has not been possible to suggest a single correction factor representative for a season. Also no relation linear or curvilinear, could be established between the ratios and the relevant meteorological factors like temperature, wind speed and humidity, taken severally or jointly. It thus appears that if the mesh-covered U.S.A. pan is taken as a standard, the evaporation readings from Piche evaporimeter are so erratic that it is not possible to

determine a suitable correction by which they could be converted to mesh-covered pan readings.

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REFERENCES

Ezekiel, M. and Fox, K. A.	1951	*Methods of Correlation and Regression Analysis*, pp. 348-377.
Robertson, G. W.	1955	The standardisation of the measurement of evaporation as a climatic factor, W.M.O. Tech. Note, 11.
—	1961	Guide to Meteorological instruments and observing Practices, W.M.O., No.8, T.P. 3.