Appendix A. 1.

POTENTIAL EVAPOTRANSPIRATION ESTIMATES FOR WEST PAKISTAN

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Free-water evaporation was computed from meteorological factors using the method described in Weather Bureau Research Paper No. 38, "Evaporation from Pans and Lakes". Two computations were made based on different methods of converting percent sunshine (estimated from cloud cover) to solar radiation. These values are shown under Methods 1 and 2 of attached tabulation. Radiation for Method 1 is based on a relation developed by Hamon, Weiss, and Wilson (see Legend for specific reference). In Method 2 Brunt's equation $R_c = R_A (0.18 + 0.55 \frac{n}{N})$ was used. This equation is used by Penman for England and some other parts of the world. Our studies would indicate that potential evapotranspiration is not much different than free-water evaporation. Some investigators feel that potential evapotranspiration is much less; for example, Penman uses an annual coefficient of 0.75 for England and something higher than this in lower latitudes. The determination of Penman's coefficient was based on evaporation values which he now admits were too high. Annual free-water evaporation is probably, at most, 10 percent greater than the potential evapotranspiration. Using the same meteorological data, potential evapotranspiration, as computed by the original Penman approach, is shown under Method 3. This approach involves the computation of free-water evaporation and application of coefficients (May-August, 0.8; Nov.-Feb., 0.6; remaining months, 0.7) for reduction to potential evapotranspiration. Penman has published a revised free-water evaporation equation, but has not presented revised coefficients. In these Penman computations, radiation was computed in the same manner as described in Method 2.

Potential evapotranspiration values based on Thornthwaite's approach as made by Ahmad are listed as Method 4. Free-water evaporation computed by Rohwer's equation (Raman) are shown under Method 5. The values shown under "Recommended" take into account all known factors, including the possibility that potential evapotranspiration may be as much as 10 percent less than free-water evaporation. The most important factor in the evaporation process is solar radiation. In our computations it was necessary to derive estimates of solar radiation from cloud cover observations. We believe that more reliable estimates of potential evapotranspiration could be made if observed solar radiation data were available. In a recent report by the Pakistan Meteorological Service (March 1960), it was indicated that radi-