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Estimation of Reference Evapotranspiration: Need for Generalized Models

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Evapotranspiration as one of the most important components of the hydrological cycle has a vital importance for irrigation planning and management, as well as for hydrological and climatological studies. Installed reference evapotranspiration (ET_0) networks are not available in most of the regions throughout the world due to their high installation and maintenance costs. As a consequence, improper weather data is systematically used for ET_0 calculations from non-ideal sites. For the purpose of estimating ET_0in various climatic regimes, some empirical and/or physically based equations have been developed during the past decades [1].

During the last decade, artificial neural networks (ANN) were applied for estimating ET_0 and compared with empirical methods [2]. The ET_0modeling initiated after year 2000 when Kumar et al. [3] developed ANN models using lysimeter evapotranspiration data for Davis. The ANN results were found to be better than the FAO-56 PM method. After this study, several studies indicated that the ANN models performed better than the respective empirical models in various climatic conditions. However, these ANN models generally have the limitation of regional validity since they are applicable to those locations for which data were used in model development [4].

Recently, the generalized ANN models were successfully developed by using pooled data of four different meteorological stations having distinction in spatial and altitudinal characteristics and tested with the data from Lodi, Fresno, Gwalior, Indore, Hoshangabad, and Pendra stations which were not used in the development of the generalized ANN models [4]. Comparison with corresponding conventional ET_0methods (e.g., FAO-24 RAD, FAO-24 BC) indicated that the generalized ANN models performed better than the other methods for estimating ET_0. Related literature reveals that future researches need in generalized ANN models which can be achieved by incorporating data from several distinct locations representing different locations in model development.

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