

Estimation of evapotranspiration rate by different methods for paddy crop in South Kodagu, Central Western Ghats

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■ **Abstract** : The evapotranspiration process consists in conversion of water to vapour from liquid phase. The source of energy for this process is the radiation received from the sun. Solar radiation reaches the outer surface of the earth's atmosphere measured perpendicularly to the beam. Eight evapotranspiration estimation methods viz., Penman, Penman-Monteith, Pan Evaporation, Kimberly-Penman, Priestley-Taylor, Hargreaves, Samani-Hargreaves and Blaney-Criddle were tested with meteorological data of year 2009, Agricultural Research Station, Ponnampet, South Kodagu. The evapotranspiration estimates by all methods shows the same trend throughout the year. Samani-Hargreaves gave the highest estimates followed by the Priestley-Taylor and Hargreaves methods. The lowest estimates were by Penman-Monteith and followed by the Blaney-Criddle and Pan methods. The Penman-Monteith, Blaney-Criddle and Pan methods estimate lower values of evapotranspiration with no significant difference among them. Penman method, though is different from the three methods, estimates reference evapotranspiration close to these three methods. The Penman-Monteith, Blaney-Criddle and Pan are the best methods to estimate evapotranspiration in the study area. The Penman method can be used to get somewhat reasonable estimates though it overestimates the evapotranspiration a little.

■ **Key words** : Evapotranspiration, Solar radiation, Energy, Penman –Monteith and Pan method

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Crops need water in particular quantities for their optimum growth. Excessive or deficit amounts of water could retard crop growth and ultimately lower the crop yields. Conditions influencing the rate of water use by crops include the type of the crop, stage of its growth, climatic parameters like temperature, wind velocity, humidity etc., available water supply and soil characteristics (Murthy, 2001). The evapotranspiration process consists in conversion of water to vapour from liquid phase. The source of energy for this process is the radiation received from the sun. Solar radiation reaches the outer surface of the earth's atmosphere measured perpendicularly to the beam. Estimates of rice crop evapotranspiration are important in irrigation planning, irrigation scheduling, and overall crop and irrigation system management in large scale paddy producing areas. (Lee *et al.*, 2004) defined the reference evapotranspiration (ET_r) as the rate of evapotranspiration from a hypothetical crop with an assumed crop height (12 cm) and a fixed canopy resistance which would closely resemble evapotranspiration from an

extensive surface of green grass cover of uniform height, actively growing, completely shading the ground and not short of water. Evapotranspiration can be obtained by many estimation methods. Some of these methods need many weather parameters as inputs while others need fewer. Numerous methods have been developed for evapotranspiration estimation out of which some techniques have been developed partly in response to the availability of data. Factors such as data availability, the intended use, and the time scale required by the problem must be considered when choosing the evapotranspiration calculation technique (Allen *et al.*, 1998).

The Penman equation or the later Penman-Monteith equation requires numerous meteorological data parameters and is also complicated. The Penman equations were also limited by the lack of availability of net radiation or solar radiation data. The Penman method requires a variety of climatological data, such as maximum and minimum air temperatures, relative humidity, solar radiation, and wind