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Reference evapotranspiration estimation and influence of coffee on real evapotranspiration in humid climatic regions of Kenya

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Rainfed agriculture in Kenya is approximately 98% and highly susceptible to climate variability. Humid climatic regions of Kenya are key to sustainability of agricultural sector. This study focused on influence of coffee on real evapotranspiration in Nyeri and Embu Counties of humid Mount Kenya Region. This is because the economy of Kenya relies mostly on Coffee as the fourth largest export earner. Quality controlled 9-year long dataset was sought from Nyeri and Embu synoptic stations. Site specific soil parameters and coffee coefficient were used in computations of estimates. Penman-Monteith standard equation was used to estimate daily values of reference evapotranspiration. Average daily, monthly ET_0 and annual total estimates were computed. The ET_0 estimates were modelled using 1D Palmer-type soil model to estimate real evapotranspiration using soil parameters for the station at 1 m arable depth. Results showed a very slight variation among the average annual estimates of ET_0 between the two humid regions. For instance, in Nyeri the average annual estimate ET_0 was 1488±52 mm/year while in Embu it was 1488±48 mm/year. Average annual *ET* depicted slightly higher variation with estimates of 813±216 mm/year in Nyeri and 830±166 mm/year in Embu. Average monthly estimates of ET_0 and *ET* were almost the same with estimates of 124±21 mm/month and 68±30 mm/month in Nyeri and 124±23 mm/month and 71±37 mm/month in Embu respectively. Results also indicated that daily average, ET_0, *ET* and *ET* estimates with application of *Kc* varied insignificantly with 4.1±1 mm/day, 2.2±1 mm/day and 2.2±1 mm/day in Nyeri respectively while the estimates were nearly the same in Embu. Coffee coefficient (*Kc)* had slight influence on real evapotranspiration in humid climatic regions under study. This is because the *Kc* values were almost 1 with a range of between 0.9 to 0.95. In addition, the study area receives adequate precipitation hence no soil water stress. Further, the slight differences among the *ET* with and without application of *Kc* were due to the linear function of available soil moisture used in the computation of *ET* from reference evapotranspiration (ET_0). The study is important in investigating the role of 1D Palmer type soil model on ET_0 and coffee coefficient influence on real evapotranspiration in Kenya in these regimes of climate extremes.