

A comparison of six methods for estimating crop evapotranspiration

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Water is a major factor affecting crop production in Australia and there exists considerable variability among different Methods of measuring or estimating crop evapotranspiration (ET). This paper presents an objective comparison of six different Methods which were applied to two wheat cultivars, Banks and Quarrion, for four sowing dates over two growing seasons.

Methods

Crops of wheat (cv. Banks and Quarrion) were sown on four dates in May, June, July and September in two seasons (1984/85 and 1985/86) on a red duplex soil (Dbl. 13) at Werribee, Victoria (37°05'S, 144°40'E). Measurements were made of crop dry matter components, development, daily weather and soil moisture changes. Five soil monolith lysimeters were used (ET_m) to measure the changes and these data were compared with pan evaporation (ET_p), estimates of the energy (ET_e), and aerodynamic (3) (ET_{vp}) components of the Penman-Monteith combination function (2). Two additional forms of ET_{pm} were used one with the Dillely and Shepherd wind function (ET_{ds}) (1) and one with the Thom and Oliver wind function (ET_{to}) (4).

Results

Estimates of ET using each Method are presented in Table 1 for 4 sowing dates for Quarrion grown in 1985. If ET_m is used as a reference, the ranking of agreement among the Methods is: ET_{to}>ET_{ds}>ET_e>ET_{vp}>>ET_p.

Table 1 Comparison of six Methods for estimating ET with ET_m

SD	ET _p	ET _e	ET _{vp}	ET _{ds}	ET _{to}	ET _m
140	618.4	395.5	285.3	738.4	769.0	449.7
171	581.4	350.8	253.7	680.1	618.8	393.2
208	540.8	327.9	224.1	618.9	577.4	349.3
241	935.7	363.7	246.3	705.7	658.5	388.4
β	0.54(0.12)	1.08(0.01)	1.51(0.03)	0.58(0.01)	0.59(0.01)	
r^2	0.12	0.85	0.57	0.86	0.87	

13: slope;() SE of slope; SD sowing date (day of year);
 r^2 Coefficient of determination for each Method versus the lysimeter data (ET_m)

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