Water use and capillary contribution to irrigated wheat at Griffith, N.S.W.

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Efforts to improve the efficiency of irrigation water use are highly dependent on accurate estimates of crop water use. These estimates are needed not only to ensure that amounts of water applied match crop water requirements but also that applications are timely for optimum crop productivity. Improved efficiency will also reduce accessions to groundwater's. Most irrigation scheduling systems pay scant regard to the contribution that water-tables may make to crop water use. Maximum efficiency will only be possible when this contribution is accounted for. The aims of this experiment were to accurately measure water use by wheat, to test methods for estimating crop evaporation and to measure the capillary contribution from a shallow water-table on two soil types.

Methods

Water use was measured with two weighing lysimeters. One lysimeter (L1) contained Hanwood loam soil while the second (L2) contained Mundiwa clay loam. The pressure head for water-tables was maintained 1 m below the soil surface using a Mariotte tube arrangement. Wheat (cv. Yecora) was sown in and round the lysimeters on 30 May 1986. Rows were 160 mm apart, 200 plants m_I were established, while total fertilizer additions were 160 kg N ha (in 3 applications) and 32 kg P ha . Irrigation water was supplied with set line sprays to maintain the crop in a well watered condition. Leaf growth leaf area development, and root development were followed non-destructively through the season. The crop was harvested on 28 Nov. 1986 and yield and its components measured.

Results and discussion

The crop developed high LAW (>10) with a closed canopy occurring about 70 days from sowing. The seasonal water balance indicates a very similar total water use but with quite different contributions from the water-table.

Evaporation	589	612
Rain (mm)	286	298
Irrigation (mm)	246	242
Capillary rise (mm)	126	72
Soil Storage (mm)	+34	+33
Drainage (mm)	103	33
Yield (t/ha)	7.74	8.47
Harvest Index	0.37	0.40

Daily rates of crop evaporation ranged from 2 to 4 mm in the first 60 days of crop growth to 7 mm in the later stages with a peak rate of 14 mm during a single day (5 Nov. 1986) of high evaporative demand. Root length in the two layers closest to the water-table (750 and 900 mm depth) were very similar between L1 and L2 indicating that the higher capillary contribution was due to the more rapid hydraulic conducting properties of the Hanwood loam soil in Ll. Hourly and daily values of crop evaporation will be used to test methods of estimating crop water use currently being used in irrigation scheduling services in the irrigation area.