Moisture relations, groundwater recharge and dryland salinity

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Increased groundwater infiltration associated with the loss of the indigenous summer-active vegetation from catchment uplands is recognised as the main factor contributing to problems of dryland salinity in southern Australia. Salinity is estimated to directly affect 10,000 ha of land in N.S.W. and salinisation of surface and sub-surface waters is feared to have a much greater future impact. The potential of improved cultivars to reduce groundwater recharge at Wagga Wagga is examined in this paper using a simple monthly moisture balance (1).

Methods

Monthly rainfall totals for the Soil Conservation Research Service Centre (1948-1987), and monthly evaporation averages were evaluated for assumed soil water holding capacities of 20 mm, 40 mm, 100 mm and 150 mm (representing shallow skeletal to deep loam soil types). The percentage occurrence, and median calculated values for profile overflow events were calculated for each month.

Results and discussion

The soil water store controls the occurrence and median value of surpluses in autumn when evaporation rates are falling, but has little impact in spring when evaporation is increasing rapidly (Table 1). Low evaporation in winter limits the scope to increase water expenditure by vegetation. By spring, water has already moved beyond the reach of plant roots towards catchment discharge points. Use of summer active plants in pastures would increase the potential to transpire summer and early autumn rainfall. This would give a drier soil profile in autumn and thus delay the time when surpluses occur, and their magnitude. It would also increase pasture productivity at a time of low forage production by cool season plants.

Table 1. Monthly occurrence and median calculated values of calculated soil profile overflow events at Wagga Wagga.

Profile capacity	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Year
						% occurrence							
20 mm	0	0	3	10	33	53	70	75	28	20	0	0	95
40 mm	0	0	3	5	25	35	60	68	25	20	0	0	88
100 mm	0	0	0	3	8	13	30	45	18	13	0	0	55
150 mm	0	0	0	0	0	5	18	23	13	8	0	0	30
						Median calculated surpluses (mm)							
20 mm	0	0	64	34	39	27	34	22	23	26	0	0	96
40 mm	0	0	44	55	34	29	37	20	25	16	0	0	80
100 mm	0	0	0	15	31	42	36	15	29	9	0	0	50
150 mm	0	0	0	0	0	44	24	9	48	31	0	0	43
Av. evap.	244	254	165	99	54	33	32	48	72	113	166	229	1509
Av. rfall.	30	27	25	34	48	39	57	53	47	50	38	38	547

1. Edwards, K., and Johnston, W.H. (1978). Aust. J. Agric. Res. 29, 851-862.