Opportunities to reduce dryland salting in South Eastern Australia

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It is generally accepted that the increase in mean annual recharge to the groundwater (MAR) following the replacement of native vegetation by agricultural species is the principal cause of salting of soil and water resources in dryland areas. This increase in MAR has been attributed to a range of factors that influence the hydrological balance. In particular, agricultural plants have shallower roots, shorter growing seasons and a lower leaf area than the native vegetation they replaced. In addition, agricultural plants are often annuals whereas native vegetation generally contains a perennial component.

It is reasonable to expect that farm management can be modified to reduce MAR to an acceptable level as MAR is often small relative to annual rainfall and the potential evapotranspiration of agricultural plants (1). Determination of the most cost effective means for reducing MAR involves identifying the relative contributions to MAR and farm income of each of the factors that have modified the hydrological balance (2). A large degree of field heterogeneity and difficulties of measurement means that it has not been possible to determine effects of modified farm management on MAR from measurements taken in the field. We estimated MAR by simulating daily water balance under historical rainfall and evaporation regimes using a computer model. The model was constructed to represent the conditions of a four-year farming rotation involving wheat, fallow and pasture on the sloping red duplex soils of north central Victoria. The effects of length of fallow, pasture type and seeding date were investigated (Table 1).

Table 1 Estimated MAR (mm) for three farming systems

Farming system	Seeding date (weeks from January 1) 18	23	28
WWAAw	12.8	18.7	25.5
WWAAa	3.3	6.6	10.5
WWLLa	0.9	1.8	3.1

W = Wheat; A = Annual pasture; L = Lucerne;
w = Winter fallow; a = Autumn fallow

Changing from winter to autumn fallowing reduced MAR by 12.1 mm for seeding date in Week 23. Changing from an annual pasture to lucerne reduced MAR by a further 4.8 mm. Bringing the date of seeding forward from Week 23, which is the optimal date in this area, to Week 18 reduced MAR by 5.9 mm.

Both the reduction in the length of time that land lies fallow and the use of lucerne are financially attractive options in north central Victoria at present and both are being promoted locally to reduce dryland salting. Bringing the date of seeding forward, which would achieve a modest reduction in MAR is not considered a viable proposition as it is likely to involve major disruptions to management and may lead to reduced yields.

1. Cooke, J.W. and Willatt, S.T. 1983. Proc. R. Soc. Vict. 95, 117-21.

2. Dumsday, A.G., Oram, D.A. and Lumley, S.E. 1983. Proc. R. Soc. Vict. 95, 139-45.