22. WATER AND SALT MOVEMENT IN THE TRANSITIONAL MALLEE ENVIRONMENT

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North west of Griffith a transition zone occurs from the alluvial plain soils of the south to the typically undulating mallee soils to the north. The soils of this zone are characterised by fine to intermediate textures and a relatively high content of carbonates. A typical profile shows a few centimetres of surface loam overlying calcareous light to medium clay to about 2 m. At this depth gypsum is frequently high and a change to grey clays of low permeability usually occurs.

A type of gilgai formation is common in this landscape,but it differs from the regular puff-shelf formations of the alluvial plains. The raised puff is calcareous to the surface, but does not consist of self mulching clays. The shelf component has a profile as broadly described above.

The soil profiles to 3 m are salty. The EC (1:5) of unirrigated sites varied from 1.4 - 7.0 mS cm^{-1}, with most values around 2.5 mS cm^{-1}. The top of the profile is much less salty than the deeper layers. There is no obvious difference in salinity distribution between puff and shelf profiles.

Development for flood irrigation results in three different potential hazards to the environment. Firstly, downward percolation and raising of regional watertables; secondly, lateral movement through superficial layers to adjacent land, and, thirdly, patchy salting. The latter two are causing most concern and results of some investigations are discussed.

Lateral groundwater flow

The lateral movement through the superficial 2 m of soil is governed by the gradient and the horizontal hydraulic conductivity. Along many supply channels there is severe salting caused by seepage. Where this salting extends for between 10 - 100 m, the hydraulic conductivity in 2 m holes was measured at 110 - 450 mm day^{-1}, with a geometric mean of 210 mm day^{-1}.

Adjacent to a rice field where some groundwater flow extended to 5 m distance, the hydraulic conductivity in the 0.3 - 1.1 m layer was measured at 440 mm day^{-1}. The layer between 1 and 2 m was less permeable, about 40 mm day^{-1}.

Salting

Observations indicated that water may move preferentially down under the shelf soils and up through the puff soils. Downward movement is mostly through cracks and upward movement through pores. Patchy salting may be the result.

Infiltration rings inserted to 15 cm depth gave the following results for continuous periods of between 2 and 3 weeks.

	Infiltration (mm day^{-1}) Puff	Shelf
Surface	> 300	Variable, 10 - 12
In pit at 50 cm depth	2 - 6	20 - 120

During the tests the soil under the puffs dispersed explaining the low infiltration rates. This did not occur with the shelf soils, in which the restriction for downward flow is at or near the surface.

Salinity profiles were determined by duplicate sampling at six sites of a rice field, before and after the period of ponding. The averages are as follows:

Depth (cm)	EC 1:5 SUSPENSION (mS/cm)		EC (mS/cm) groundwater during ponding
	Before Rice	2 Months After Rice	
Surface	0.8*	1.2*	-
25	0.5	0.6	-
50	0.8	0.7	-
100	2.0*	2.4*	17.0
200	3.2	4.2	35.5
300	2.3	3.7	38.8

*Variable result

The surface soil salinity appears to have increased slightly but otherwise there was little change, either in total salt or in its distribution.

In the transitional mallee zone most salting occurs on unirrigated reserves and land adjacent to channels. There appears to be a relationship with soil permeability, the heavier textured soils being affected least.