

2.3 Salinity due to irrigation with saline water and irrigating with shallow groundwater

To avoid salt build up in the soil in irrigated areas, the volume of irrigation water applied must be greater than the plant water requirement where rainfall leaching is insufficient for the salinity level of the irrigation water applied. This excess water is called the 'leaching fraction' and is essential to ensure that salt applied through irrigation water and rainfall is flushed through the soil profile. The leaching fraction is dependent upon:

- The salinity of the water being applied (the greater the salinity the greater the required leaching fraction);
- The soil type (the lower the soil permeability, the greater the required leaching fraction); and
- The pasture type (some pastures are more salt tolerant than others).

However, if the irrigation water is essentially fresh (such as the MID channel water) any irrigation applied over and above the plant water requirement has the potential to cause excessive recharge.

Until very recently, the build up of salt in the root zone caused by under-irrigation within the Macalister Irrigation District was not an issue due to the prevalence of flood irrigation with fresh river or channel water. Flood irrigation with fresh river or channel water always results in the required leaching fraction being exceeded. However, more recently, the issue of under-irrigation with saline water and the consequent build up of salt in surface soils has become more of a concern in the MID due to two major factors:

- Increasing use of more efficient spray irrigation to replace flood irrigation; and
- Increased use of groundwater (which usually has a higher salinity than channel or river water) for irrigation.

There is now an uncalibrated technique devised especially for the Macalister Irrigation District to determine the expected pasture yield decline for a given irrigation application rate, soil type and water salinity (Sinclair Knight Merz, 2003a). However, the technique is theoretical and confidence in the results could be improved through calibration against actual field measurements.

There is also the potential for further salt build up in soils through the "recycling" effect of using shallow groundwater as an irrigation supply. Shallow groundwater applied as irrigation water can leach through the soil zone and back to the water table to be pumped out again as irrigation water. This continuous cycling of water can concentrate salt in the groundwater and soil as fresh water is extracted through the evapotranspiration process. This process can potentially affect both the land and groundwater assets. Although there are no documented examples in the Macalister Irrigation District, anecdotal evidence suggests that this process may already be occurring in some areas. The area of greatest potential for this process to occur is in the Nambrok area where a large cluster of private irrigation bores (70 to 80) are pumping from the shallow alluvial aquifer connected to the water table. This area is covered by the "Denison Water Supply Protection Area" and the management of groundwater pumping is being addressed through the Denison Groundwater Management Plan (currently in draft form).