Productively managing water quality

Responsible land management is often perceived as being in opposition to the needs of land managers to run at a profit. Recent research in erosion and soil water management has shown that, in fact, most initiatives that reduce contaminant exports from the paddock to streams also help to improve production and profitability. Optimal use of water stored in the soil has also been shown to reduce the risk of landscape salinity due to deep drainage and rising groundwater levels.

Following, are extracts from available information arranged to demonstrate the links between productivity, water quality and salinity risk using soil water research findings.

stream water quality

The water quality in our rivers and creeks tells a story about how well we are managing our land. In the Queensland Murray Darling Basin stream sediment load has been identified by community, industry and environmental groups as a major concern. Land management practices that increase sediment load also generally increase the export rates of other contaminants from paddocks into streams. Thus, stream sediment loads also represent soil loss, nutrient loss and possibly wasted pesticides which all threaten the profitability and sustainability of agricultural enterprises. Another concern with stream water quality is increasing baseflow salinity. This may indicate rising groundwater tables and associated risk of landscape salinity.

ground cover

Soil loss can be minimised if vegetation cover is increased in grazing or cropping lands. Increasing the amount of vegetation cover on the ground not only decreases the loss of soil and other contaminants, but also results in better infiltration and increased soil water storage. Note the two figures below showing research findings that demonstrate that with increased cover there is both a decrease in soil loss and a decrease in runoff (increase in infiltration).

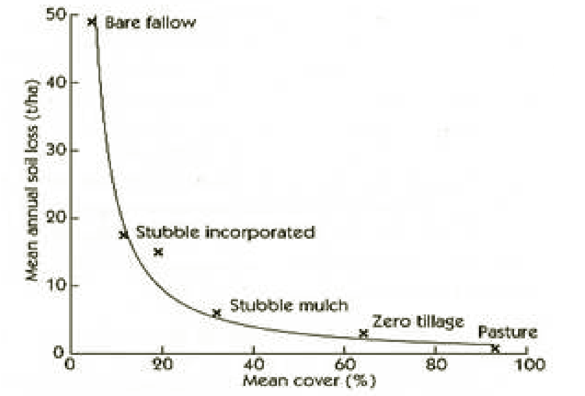

Figure 1: Soil cover and soil loss (Freebain, NR&M)

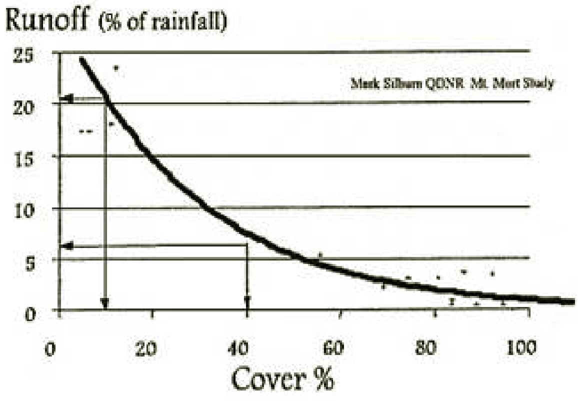

Figure 2: Soil cover and runoff

soil water (adapted from Wockner et al 2004)

The retention of soil, and the increased infiltration achieved by maximising cover, represents increased production potential. To realise this potential it is useful to understand and measure soil water with a view to using what is available for plant growth.

The maximum water available for plant growth is known as the Plant Available Water Capacity (PAWC); it varies with soil type and crop. PAWC is the difference between the upper water storage limit of the soil (DUL) and the lower extraction limit of a crop (CLL) over the depth of rooting. In many seasons, the maximum water storage capacity is not reached due to insufficient rainfall, fallow weeds, run-off and evaporation.

Queensland Murray Darling Committee

Funded by:
action Salinity & Water AUSTRALIA
Natural Heritage Trust
Australian Government Department of Agriculture, Fisheries and Forestry National Landcare Programme
Queensland Government

In these cases, the actual water present is described in terms of the PAWC, that is, how full is the bucket. However, in other cases it is possible that even after the bucket is full, more rain falls which infiltrates but is not used by crops or pastures. This is likely to result in deep drainage, being drainage below the crop or pasture root zone. In native vegetation areas most of this deep drainage was used by deeper rooted trees.

salinity risk

In agricultural areas where broad scale clearing has occurred, deep drainage is likely to result in recharge of shallow groundwater aquifers. This in turn represents a risk to production as the resulting rising groundwater is likely to contain salt concentrations above crop or pasture tolerance levels.

Deep drainage (from NR&M fact sheet figures rounded):
- 1mm under native vegetation
- 10mm under dryland cropping
- 100mm or more under irrigation

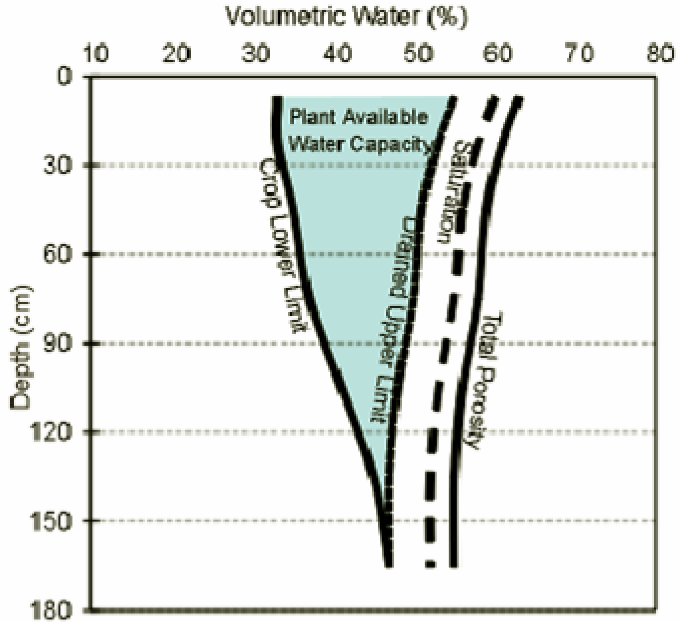

Figure 3: Water distribution in soil profile

The deep drainage risk is greatest when irrigation water is applied inefficiently and, or, when winter crop rotations result in fallow paddocks during maximum recharge periods. Risk can be minimised by ensuring all or most of the water stored in the soil is used by plants. This can be achieved through initiatives such as: increased water use efficiency, opportunity cropping, and native vegetation management.

managing productivity, water quality, soil water and salinity

QMDC is working with landholders and other agencies to facilitate optimal production, and minimum environmental and production risk. This is achieved through access to training and information and through support for changed land management practices with production and environmental benefits.

references

- CSIRO, 2005, Salinity Information page of CSIRO Land and Water accessed February 2006 at http://www.clw.csiro.au/priorities/salinity/index.html
- Freebairn D.M. and Wockner G.H, 1983, Soil erosion research provides management answers, Qld Agricultural Journal, 109: 227-234.
- NR&M Factsheets, Qld Dept of Natural Resources and Mines factsheets accessed February 2006 at http://www.nrm.qld.gov.au/factsheets/index.php
- Western Farming Systems 2005, Action learning Tools accessed online February 2005,
- http://www.apsru.gov.au/apsru/Projects/WFS/ActionLearning/ActLearnToolIndex.htm
- Wockner G, Dalgliesh NP, Dang Y, Price L and Voller J, 2004, MEASURING AND MANAGING SOIL WATER TRAINING MANUAL, Queensland Department of Natural Resources, and Mines, Toowoomba.

FSWAT02 Produced by: Paul Webb, February 2006
For further information, contact QMDC on (07) 4637 6201 or visit www.qmdc.org.au