Leaflet 8

# Soil acidity has an effect beyond the paddock

Soil acidity is a serious soil degradation process, estimated to affect half of all agricultural land in NSW. This is eight to nine times the area affected by dryland salinity. Through its effect on plant growth, soil acidity contributes to rising water tables and associated dryland salinity.

The direct agricultural effects of soil acidity are widely recognised and documented. These include a reduction in crop and pasture yield and restrictions on what plant species can be grown. In addition to these on-farm effects soil acidity has serious downstream consequences for landholders, townships and local government. These downstream, or off-site, effects of soil acidity are difficult to quantify due to the complex interaction of many degradation factors. It is possible to explain their nature but difficult to be precise about their magnitude.

## OFF-SITE EFFECTS OF SOIL ACIDITY

Effective management of the water cycle is critical to managing many of the off-site effects of soil acidification. Rainfall may:

- Evaporate from the soil or plant surface
- Run off as surface water
- Infiltrate into the soil and be used by the plant
- Infiltrate into the soil and drain below the root zone of the plant into the ground water system.

A certain amount of surface run-off and deep drainage is natural and desirable. However, when excessive amounts of either occur there is the risk of:

- Loss of organic matter and associated nutrients from surface soil erosion
- Nitrate leaching which promotes soil acidity
- Rising water tables and potential for salinity

These processes can cause off-site, or downstream, effects by reducing water quality in the whole catchment. For instance, an increase in surface run-off increases the risk of soil erosion and associated turbidity, phosphorus contamination and algal problems in waterways. Increased deep drainage below the root zone can result in higher water tables, nitrate contamination of groundwater, waterlogging and possible dryland salinity.

A key strategy in minimising these off-site effects is to encourage plants to use more of the rain where it falls. Soil acidity compromises this basic strategy by reducing plant vigour and root growth and hence their ability to effectively use this water.

*Figure 1 Acid soil conditions have restricted the root growth of these sub clover plants. No acidity on left, highly acid conditions on right.*

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## MANAGING SOIL ACIDITY TO REDUCE OFF-SITE EFFECTS

The management of soil acidity to reduce its off-site effects requires either the correction of acidity with lime, the use of acid tolerant plants or a combination of both. With each option it is important to manage the pasture or crop so that it grows vigorously and uses as much water as possible. For example, lucerne is one of the most desirable species to minimise deep drainage and reduce the threat of salinity. However, lucerne grows poorly in acid soil conditions. Soil acidity must be corrected before lucerne can be grown successfully. Phalaris, another important pasture species, is also a more efficient water user when soil acidity is managed. In southern NSW, research on a phalaris based pasture showed that liming to manage soil acidity halved the amount of water lost in deep drainage.

However, in many of the higher rainfall, permanent pasture areas it is often uneconomic for individual landholders to undertake a liming program. This is particularly true where acidity has extended deep into the soil profile. In these cases the only option available to landholders is plant tolerance. It must be recognised, however, that in these situations acid soil conditions will continue to worsen.

## FUTURE IMPLICATIONS

Soil acidity can produce a range of landscape changes with major agricultural and environmental consequences. Managing soil acidity is necessary to sustain agricultural production and catchment health. In cropping systems it has been financially attractive to use lime to improve crop yields and allow the continued use of acid sensitive crop species. However, in grazing enterprises the low rate of return has made it less attractive to use lime. Consequently, soil acidification continues in these systems with adverse environmental effects. There needs to be greater consideration of the off-site impacts of soil acidity if we are to fully recognise the cost of land degradation issues to the whole community and implement remedial actions.



## FURTHER READING

Cregan P. and Scott B., 1998, 'Soil Acidification – An Agricultural and Environmental Problem,' *Agriculture and Environmental Imperative,* pp 98-128, Edited by Jim Pratley and Alistar Robertson, CSIRO, Collingwood.

Scott B.J., Ridley A.M. and Conyers M. K. 2000, 'Management of Soil Acidity in Long Term Pastures of South Eastern Australia – A Review,' *Australian Journal of Experimental Agriculture,* **40:** 1173 – 1198.

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MASTER – *Managing Acid Soils Through Efficient Rotations* handout series.

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