7. CONCLUSION

An estimated 72% of acid soils on the Northern Tablelands of NSW were acidic with a soil pH_{Ca} of 5.5 or less. Of these 27% were strongly acid. Only 6% of soils in the region were in the optimal range for plant growth. These estimates were determined from a soil pH map produced from published data and data generated by this project. Although unbiased and representative of the area, the results do not differentiate between different land-management areas. More soil survey work is needed in order to produce higher-definition maps of surface and subsurface soil pH_{Ca}.

A paired-sites study found that accelerated soil acidification from pasture management, as measured by soil pH_{Ca}, was not significant on the Northern Tablelands. For soils from the region, soil pH_{Ca} was the more robust measurement for soils from the area as compared with soil pH_{W}, which was affected by salts from phosphatic fertilizer applications in paddock areas. Soils under grazed, fertilized, improved pasture paddocks had higher concentrations of phosphorus, total N and nitrate-N compared with those of the native pasture, reserve areas. Nitrate-N at depth was negligible and differences between paddock and reserve soils were not observed.

A single sampling time was insufficient to assess nitrate leaching, and a study involving repeated measurements over time was designed to assess the short-term and seasonal changes in the soil chemical properties of managed pastures. Drought had an effect on this study with a lower rainfall than the long-term average in spring and summer and higher than average falls during autumn. Nitrate-N concentrations were found to increase with an increase in rainfall and were utilized by actively-growing pasture plants. Some nitrate movement down the profile was detected following rainfall at a time when pasture growth had slowed, but the scale of this leaching could not be conclusively determined. Drought conditions and suppressed plant activity could result in a pool of nitrate remaining fairly static. With a change in rainfall pattern, nitrate leaching with acidifying effects might occur. Soil sampling the same sites at a time when the weather is similar to long-term predictions could produce a different result.

Pasture management and climate influenced nitrification as observed from incubating soils under controlled conditions. Nitrification of soil from a fertilized, pastured paddock proceeded with warmer temperatures under moist and wet conditions, but was negligible for cold temperatures. In native pasture reserve soils, nitrification was negligible even under warm, moist conditions and this was indicative of low activity by microbial nitrifying bacteria. Higher nitrification in soils under improved pasture paddocks results from increased microbial activity with higher fertility in this area from fertilizer amendments and pasture management using legumes.

In early autumn, paddock pastures in the Northern Tableland, undergo senescence and death to produce plant organic-N, which is subsequently mineralized and nitrified. Plants do not take up nitrate-N at this stage and so the pool of nitrate-N increases. During winter, nitrification of ammonium to nitrate is very slow and the dormant plants do not take up nitrate. With this slowing of nitrate cycling, the pool of nitrate-N remains static. During spring and summer with warmer temperatures and rainfall, pasture plants start actively growing again and take up the pooled nitrate-N before it is leached. For soils from the reserve areas, a similar process would ensue except that the pool of nitrate would not increase to the extent that it would under the improved paddock pastures. In southern NSW dry conditions during summer leads to an accumulation of nitrate at a time when plants are not taking up nitrate. An increase in the nitrate pool results and this is leached during autumn and winter rainfall before plants are able to take up the nitrate with spring growth.

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