

Nitrogen leaching

Cow intensity and urine – a challenge to water quality

GENERAL INFORMATION

Nitrogen is one of the most important major nutrients in the New Zealand farming system. It enters the system either by clover root nodules taking the nitrogen from the air and fixing it in a form the clover can use. It also enters as bought-in feed or as nitrogenous fertiliser. Plants take up the nitrogen returned to the soil in the form of urine, dung and leaf litter. A small proportion of this nitrogen is converted to milk, meat and wool.

There is much more nitrogen in the grass than animals can use, so the excess is returned to the soil mainly as urine. The level of the nitrogen in urine spots can be as high as 1000kg/ha and this is far more than the grass can use. The rate of nitrogen uptake by plants is determined by the depth and vigour of their roots, soil temperature and general soil health. Below a soil temperature of 7°C grass growth slows and nitrogen uptake by the plants reduces significantly.

The nitrogen in urine is found primarily in the ammonium form. This is held by organic and clay particles in the soil. Bacteria in the soil convert the ammonium nitrogen to nitrate-nitrogen which is highly soluble. So, the nitrate-nitrogen that is not captured by plant roots can be lost to the farming system. It is leached whenever the rain is such that water moves through the soil to groundwater. Autumn and winter are the highest risk times for nitrate leaching because of the low temperatures, slow plant uptake and higher rainfall and drainage.

Cultivation of grass paddocks releases nitrogen from soil organic matter and a slow uptake of this nitrogen by the crop can lead to higher leaching losses below the root zone of the crop.

Once in groundwater, nitrate is very difficult to remove. Groundwater moves slowly and may take 40, 50, 60 or even 80 years before it re-enters the waterways. There is evidence from the testing of school wells that the nitrate concentration in groundwater is rising in the region. This is a result of higher stocking rates (and intensive cropping), made possible by increased use of nitrogen based fertilisers and imported feed.

Too much nitrogen in water, when combined with phosphorus, can contribute to nuisance growth of waterweed and algae. This can make water unsuitable for drinking and eventually leads to polluted lakes and rivers.

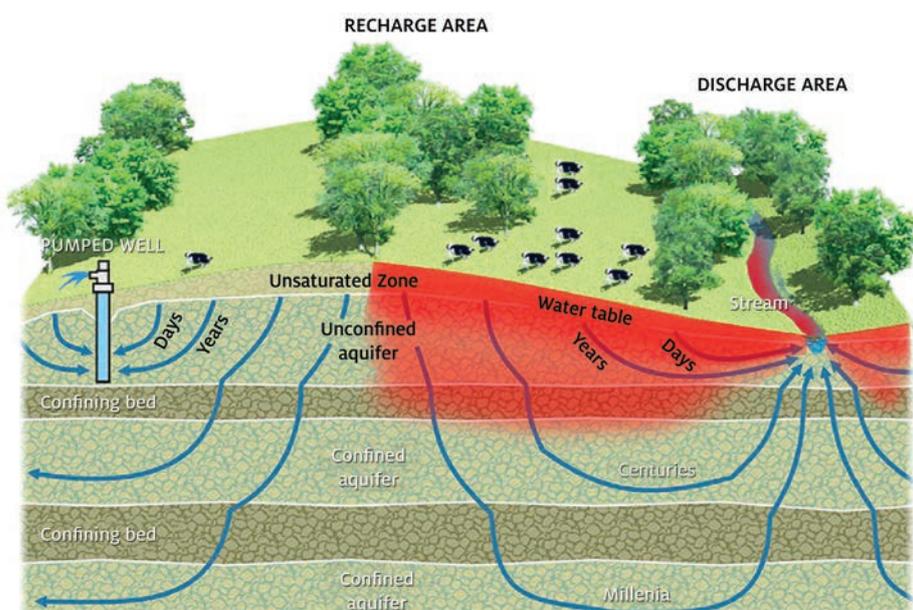


Cow urine contains more nitrogen than pasture can utilise so it is leached to groundwater.

The greater the concentration of cows, the more urine the pasture has to contend with. This calls for management practices that prevent nitrogen leaching into waterways. It demands management practices that take account of the higher leaching of nitrogen to groundwater in the winter months, when soil temperatures are low and soils are more prone to being saturated by rainfall. This requires careful planning around fertiliser and effluent application times and rates, as well as good grazing and soil management.

RECOMMENDED ACTIONS AND BEST MANAGEMENT PRACTICES

- Plan to have effluent storage to enable application of effluent at optimal times.
- Store all effluent from stand-off and feed pad areas over the winter.
- Apply effluent at low rates, over larger areas of the farm.
- Avoid break feeding or mob stocking close to waterways, especially in wet weather.
- Use nitrogen fertiliser only when 10cm soil temperatures at 9am are above 7°C and rising.
- Do not use nitrogen fertilisers when soils are saturated with water.
- Do not use nitrogen in the high leaching risk months of May, June and July.
- Do not use nitrogen fertiliser before heavy rains.
- Fence off wetlands and seeps.
- Use low nitrogen, high energy feed supplements (e.g. maize silage) to balance the high protein content of grass, especially in the spring.
- Stand cows off pasture in winter if soils are prone to pugging.
- Draw up a nutrient management plan to ensure you are using your farm and fertiliser nitrogen as effectively and as efficiently as possible.
- Avoid fallow periods after cultivation.
- Stand off cows in autumn and winter, collect the dung and urine and apply to pastures when soil temperatures allow good pasture growth.



MORE INFORMATION

Contact

- Waikato Regional Council
Freephone 0800 800 401

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