

Nitrate Leaching from Tillage Lands

Cereal crops have been traditionally sown on some of the better free draining soils in Ireland. These crops have a capacity to take up chemical Nitrogen efficiently and convert it into significant yields of grain and straw nitrate to groundwater if the crop has not used all the applied fertiliser N by crop harvest time. This surplus N is likely to be leached from the soil during periods of higher rainfall in autumn and winter. The challenge in these fields is to ensure the tillage operations achieve maximum returns from applied fertiliser without having any negative impact on water quality.

Nitrate in the soil is both soluble and mobile. In free draining soils, nitrate loss can occur when available nitrate in the soil is greater than crop demand. If soils become saturated or are subjected to heavy rainfall, this nitrate will leach down through

the soil profile. Once nitrate travels below the root system, it has the potential to be lost to groundwater where it can have a negative impact on water quality.

The times of the year at greatest risk of nitrate leaching are the autumn / winter and early spring period.

In autumn and winter many fields may be left fallow prior to sowing spring crops and this coincides with high rainfall levels and rainfall levels are at their highest. Any nitrate remaining in the soil after harvest time or applied during this period is critical to reduce this risk.

TIPS FOR REDUCING NITRATE LEACHING FROM TILLAGE FIELDS

- ▶ **Maximising Nutrient Use Efficiency (NUE) on your farm is the best way to minimise nitrogen losses to waters and also to improve crop profitability.**
- ▶ **Ensure soil pH, Phosphorus and Potassium are at optimum levels. Soils at correct pH, P and K status will result in a higher nutrient uptake by the crop thereby reducing the risk of loss.**
- ▶ **Nitrate leaching risk can be reduced by matching fertiliser application to the crop demand. Adjusting the timing and rate of application to match crop requirements, will ensure best return on money invested as well as reduced losses through leaching. There may be opportunities to reduce Nitrogen rates without impacting the yield of the crop**
- ▶ **Ensure soil temperatures are consistently at 6 degrees or above before applying chemical Nitrogen. Low soil temperatures that do not support crop growth will increase risk of leaching to groundwater. Avoid application when rain is forecast within 48 hours or on wet or waterlogged soils.**
- ▶ **To ensure efficient and accurate application of fertiliser, calibrate fertiliser spreaders and use GPS equipment where available.**

High Risk Factors

1. Early N application should be delayed until the crop is actively growing. Chemical N in the nitrate form spread before the crop needs it may not be retained by the soil and is at greater risk of leaching to groundwater.
2. If using high nitrogen organic manures, apply in the spring to coincide with increasing crop growth rates. Adjust subsequent chemical N application downwards to take account of nutrients applied in these organic manures. Avoid using high N organic manures in the autumn.
3. Ensure fields are not left bare over the autumn and winter period. In the absence of a catch crop, encourage natural regeneration of the stubble to assist in the uptake of soil nitrate.
4. Alleviation of soil compaction through good headland management and improved soil structure all help in ensuring maximum efficiency of fertiliser applied.
5. Observe an uncultivated margin of 2m along all surface water drains and watercourses to help prevent sediment and nutrient loss.



Catch Crops

1. Catch or cover crops can take up significant amounts of nitrogen over the autumn period and thereby reduce the risk of nitrate leaching.
2. Sowing date is critical. To be most effective, crops need to be sown as early as possible post-harvest to ensure good growth is achieved. Delays in sowing date can impact on growth and reduce their potential to trap soil nitrate.
3. There are many different crop types and mixtures to choose from, including natural regeneration. Care needs to be taken in choosing a catch crop mix for your system that will not impact on subsequent crop rotation (Speak with your advisor).

Summary

There is a high risk of nitrate leaching from free draining tillage fields in the autumn/winter and early spring period of the year due to low crop growth rates and high rainfall levels.

Farmers can help reduce these losses by carefully managing fertiliser applications and targeted establishment of catch or cover crops.

Improved utilisation of chemical nitrogen by tillage crops will improve the financial return to the farmer but also reduce the risk to water quality.

For more information please visit www.teagasc.ie/water-quality