

Memorandum

Date: 8 October 2017

Subject: Water quality effects of N input limit suitable for growing a range of vegetables

From: Michelle Sands

Company: Horticulture New Zealand

Introduction

1. During Hearing Topic 14 – Waste and Discharges to Land, Astra Foster of Horticulture NZ was asked for further information on the water quality effects of the proposal made by Horticulture NZ which would require nitrogen inputs not to exceed the reasonable nitrogen requirements of the crops being grown, rather than setting a total cumulative nitrogen (N) loading rate of no greater than 200kg N/hectare/year.
2. In our view requiring growers not to exceed the reasonable nitrogen requirements of the crops being grown is likely to result in a better water quality outcome than setting a 200kg N/hectare/year input limit.

Crop fertiliser requirements

3. Crops are grown in rotations to avoid the build-up of soil borne diseases. The nitrogen requirements of crops differ and the amount of fertiliser required depends on the crop and the soil nitrogen at the time of planting. The soil nitrogen is related to the nitrogen left behind by the proceeding crop, and is attributed to both crop residue and the fertiliser applied which was not taken-up by the proceeding crop.
4. We have spoken to growers in Marlborough and most currently grow rotations that use less than 200kg/ha/yr. However, in our view it is important to maintain the versatility of soils to grow a range of crops.
5. Below are three examples of the theoretical nitrogen requirements of different vegetable crops, (Reid,J.2018). Of the three examples below, potatoes have the greatest required fertiliser (greater than 200kg/ha/yr), and are predicted to remove the greatest amount of nitrogen and therefore would theoretically have the lowest leaching risk.

- a. To yield 10 t/ha of onions, and assuming soil available nitrogen was 20kg/ha at the time of planting, then 140kg/ha of nitrogen fertiliser is recommended, if the removed yield was 8t/ha dry, then 120kg/ha would be removed with the crop, leaving 20kg/ha in the soil.
 - b. To yield 87t/ha of russet burbank potatoes, and assuming soil mineral nitrogen to 60cm of 50 kg/ha at the time of planting, 225 kg/ha of nitrogen fertiliser is recommended, and 237 t/ha of nitrogen could be expected to be removed with the tubers, leaving no additional nitrogen in the soil
 - c. To yield 40t/ha of butternut squash (water stressed), and assuming available nitrogen of 60 kg/ha the recommended nitrogen fertiliser to grow the crop is 150kg/ha, and if only the marketable yield of 28t/ha was removed, 103 t/ha of nitrogen would be expected to be removed with the crop, leaving approximately 50kg/ha in the soil.
6. The values provided above are theoretical nitrogen requirements, plants uptake nitrogen and water as the grow, with the rate of growth is dependent on nutrients, temperature and light.
 7. Leaching can occur due to rain or excessive irrigation, causing nitrogen to be washed into the deeper soils, which might be beyond the roots of shallow rooted crops such as onions. In heavy rain or in free-draining soils nitrogen may be washed into the groundwater before it can be taken up by the plants.
 8. Excess leaching can also occur if conditions are too dry to enable the crop to grow and take up the fertiliser, creating a risk if subsequent rain occurs. For this reason, reliable irrigation is an important tool in managing leaching risk.
 9. If nitrogen is lost to leaching before it can be taken up by the plant, the nutrients need to be replaced in order for the crop yield to be achieved, and therefore for outdoor growing the amount of fertiliser used is always likely to be somewhat more than theoretically required.
 10. The risk of leaching nitrogen is minimized by fertilising at the time of planting and during the growth phase through side-dressing. Other methods such as fertigation where fertiliser is applied with water several times during crop growth, or controlled-release fertiliser products are also good methods of reducing the risk of leaching.

Summary

11. It is the relationship between the yield of the crop and the fertiliser input that is important in determining the risk of leaching rather than the input of nitrogen fertiliser alone.
12. In our view a rule that requires nitrogen inputs not to exceed the reasonable nitrogen requirements of the crops being grown, provides better direction for managing the water quality risks associated with growing crops compared with setting a maximum nitrogen limit of 200kg/ha.

13. The HortNZ code of practice for nutrient management sets out how growers should implement good management practice to reduce the risk of leaching.
(<http://hortnz.co.nz/our-work/natural-resources/code-of-practice-for-nutrient-management/>
Z code of practice)

Reference

Reid, J, Morton J, 2018 Nutrient Management for vegetable crops in NZ. DRAFT, Plant and Food and Morton Ag.

