

How does Horticulture fit into the amended Table 14.2?

INTRODUCTION

The Lake Horowhenua target catchment contains significant areas of class 1 and 2 soils, which are ideal for commercial production of vegetables including asparagus, brassicas, leafy green salad varieties, leeks and potatoes. As commercial vegetable growing is classed as an intensive land use in the Horizons Region, existing growers that fall into this category will require resource (land use) consent and must meet Table 14.2 cumulative N leaching maximums in target catchments. Likewise all new growers across the Region will require resource consent.

Hort NZ currently estimates that there are approximately 60 growers in the Horowhenua, with 80% of those operating on a land area greater than 4ha. The exact number of those farms that operate on land greater than 4 ha and reside in target catchments, we are still unsure of.

DISCUSSION

The table below shows the original and revised Overseer cumulative N leaching maximums in Table 14.2 in The One Plan.

Table 1: Original and revised (OVERSEER® v 6.2.3 using v5.2.6 defaults) cumulative N leaching maximums (Hanly *et al.*, 2018).

	LUC I	LUC II	LUC III	LUC IV	LUC V	LUC VI	LUC VII	LUC VIII
Original	30	27	24	18	16	15	8	2
Revised (v 6.2.3)	49.8	44.4	35.7	26.2	22.7	21.6	10.6	3.3*
Increase	66.0%	64.4%	48.8%	45.6%	41.9%	44.0%	32.5%	65.0%

*Native trees (pines are 2.7 kg N/ha loss to water)

Table 1 shows that soils under LUC I and LUC II will have to meet between 27-30 kg N/ha cumulative N leaching maximums under current version of the One Plan (using version 5.2.6 of Overseer) and will have to meet between 44-50 kg N/ha cumulative N leaching maximums under version 6.2.3 of Overseer and the revision of Table 14.2. As mentioned above, the majority of commercial vegetable growing operations are on LUC I and II soils, these limits would apply to those farms that fit the criteria to get an intensive land use consent.

Stuart Ford's Report

Horizons Regional Council procured a report from The Agribusiness Group in which the report described three types of rotations and the financial impact that identified mitigations would have on those rotations, including the estimated N loss from these systems once the mitigations had been applied using Overseer. Table 2 shows the three types of rotations and the N loss estimates before and after different mitigation options had been applied which included:

- Rotation 1 – Cash Cropping: Horticultural cropping is secondary to the primary purpose which is grazing of the land. Cropping is a relatively short term operation and is often for specialist crops like seed potatoes.
- Rotation 2 – Intensive Vegetable Production: These properties are generally of a greater scale than Market Garden. They generally have several years of a break crop such as pasture in the rotation. They use advanced farming systems to achieve the scale of production. They have a broad mix of crops.
- Rotation 3 – Market Garden: These farms represent the intensive market garden systems which have many crops in the same field with up to three crops a year in a continuous rotation.

Surveys were completed by 19 of the horticultural farmers in the Horizons region which detailed physical inputs and outputs of the farming systems as well as information around growing practice parameters that were of particular interest to the study. Base models of the vegetable grower systems and mitigation options to be modelled were created from information that was gained from the surveys. This information was used to create the above rotations. The N loss for each rotation was modelled using Overseer 6.1 in which when the exact crop was not available a crop with very similar crop was substituted.

Table 2: N leaching results (kg N / ha / annum)

	Status Quo	M 1	M2 10%	M2 20%	M2 30%	M 3
Rotation 1	23	22	23	21	21	22
Rotation 2	69	66	67	66	63	66
Rotation 3	61	64	59	57	52	58

The three mitigation options that were applied and modelled were:

- Mitigation 1 – Limiting N application to any one application of N to 80 kg N/ha per month.
- Mitigation 2 – Altering the amount of N applied to the crop in 10% deductions from 0 to a 30% reduction in the amount of N applied.
- Mitigation 3 – The use of cover crops.

The results from the financial modelling indicated that the major impact would include a deterioration of the financial performance of each of the rotations as a result if the restriction on the amount of N used. This would make these farms financially unviable. The Overseer analysis indicate that there is very little that can be done in terms of the currently available mitigation techniques that will substantially lower the amount of N leaching in the three models used.

The conclusion from Stuart was that the only way for growers to meet Table 14.2 requirements would be to buy additional non-productive land that would not be farmed intensively and balance the whole of farm N leaching, to meet the N limit requirements.

Under LUC I and LUC II in the table 14.2 N leaching maximums, these maximums range from 30-27 kg N ha/yr., respectively. In the revised table LUC I and LUC II leaching maximums range from 50 – 44 kg N ha/yr, respectively. Comparing The Agribusiness Group results to both the current and revised maximums and what the report shows, I can conclude the following results:

- Farms that apply to Rotation 1 (Cash Cropping) may be able to meet both the original and revised Table 14.2 without any mitigation. This report shows the farms are leaching 23 kg N/ha/yr as status quo, and can get down to 21 kg N/ha/yr with mitigation.
- The report shows that farms which apply to Rotation 2 (Intensive Vegetable Production) are leaching 69 kg N ha/yr and can reduce to 63 kg N ha/yr with the mitigations used. These will not be able to meet the current or revised N leaching maximums in Table 14.2.

- Rotation 3 (Market Garden) farms are leaching 61 kg N ha/yr and can decrease their N leaching to 52 kg N ha/yr and will not be able to meet the current or revised N leaching maximums in Table 14.2.

Stuarts report, therefore, shows that only cash cropping farms that are leaching within the range as shown above might be able to obtain an intensive farming land use consent.

Root Zone Reality Project

In July 2014, a project was commissioned to establish a network of fluxmeters in commercial cropping farms throughout different regions, with Manawatu being included in this project (The MPI SFF root zone reality project and the HortNZ northern fluxmeter project). The network was being used to measure nutrient concentrations of nitrogen (N) and phosphorus (P) in drainage water.

The design included four monitor regions, three sites per region and 12 fluxmeters per site. The three sites that were used in the Manawatu-Wanganui Region are as follows:

- Site 4 is located near Levin on an intensive vegetable cropping enterprise;
- Site 5 is located near Bulls on a mixed cropping and livestock grazing enterprise
- Site 6 is located near Ohakune on a mixed cropping enterprise.

The table below shows the drainage samples that were collected and the concentration of mineral N losses measured within those drainage samples:

Table 3 – Nitrate concentration losses from drainage samples collected on Manawatu-Wanganui Region sites

	LEVIN	BULLS	OHAKUNE
YR 1	216 kg N/ha	240 kg N/ha	49 kg N/ha
YR 2	129 kg N/ha	75 kg N/ha	16 kg N/ha
YR 3	77 kg N/ha	55 kg N/ha	4 kg N/ha

The fluxmeters only measure the concentration of N in that sample point at that point of time and there are many of variabilities including weather. In particular, the first sample year (Year 1: 1 October 2014 – 30 September 2015) there was a high level of rainfall throughout the region.

Comparing the results from the fluxmeter project and the required N loss figures in Table 14.2. I can conclude the following:

- At site 4, the intensive vegetable cropping property in Levin, this property leached between 216 – 77 kg N/ha over the 3 year period which will not meet the current or revised tables cumulative N leaching maximum requirement.
- At site 5, the mixed cropping and livestock grazing enterprise property in Bulls, this property leached between 240 – 55 kg N/ha over the 3 year period. These results show that the property would not be able to reach the current or revised cumulative N leaching maximums.
- At site 6, the mixed cropping enterprise near Ohakune, this property leached between 49 – 4 kg N/ha/yr over the three year period. This mixed cropping property has the ability to meet the table as shown in years 1 and 2, only leaching 16 and 4 kg N/ha respectively.

CONCLUSION

To compare both The Agribusiness's reports vegetable growing/cropping sites and the Fluxmeter Projects sites that were chosen:

- Site 4 in the Fluxmeter Project in Levin, compares mostly to The Agribusiness Group's definition of Market Garden as it is an intensive market garden system which has up to three crops a year in continuous rotation. This would also be an example of **Commercial vegetable growing** as defined within The One Plan: means using an area of land greater than 4 ha for producing vegetable crops for human consumption. It includes the whole rotational cycle, being the period of time that is required for the full sequence of crops, including any pasture phase in the rotation. Fruit crops, vegetables that are perennial, dry field peas or beans are not included.
- Site 5 (Bulls) and Site 6 (Ohakune) in the Fluxmeter Project align with the Agribusiness Group's definition of cash Cropping within their report, and would also be an example of *cropping* as defined within The One Plan: **Cropping** means using an area of land in excess of 20 ha to grow crops. A "crop" is defined as cereal, coarse grains, oilseed, peanuts, lupins, dry field peas or dry field beans. This definition does not include crops fed to animals or grazed on by animals on the same property.

Both studies have highlighted that for Commercial Vegetable Growers or Market Gardens in the Region reaching N leaching targets, both current and proposed to reflect the latest Overseer version, is not economical and the growers could not meet these current targets. There are, however, options for Cash Cropping farmers that might only have a portion of their farm in crop and can offset their targets by using the rest of their farm (which may be run as a sheep and beef enterprise, for example, or non productive land) that may be able to reach N leaching targets as shown in Rotation 1 in The Agribusiness Group's study and Site 6 in the fluxmeter project.

REFERENCES

Norris M, J. P. (2017). *The MPI SFF root zone reality project (401484) and the HortNZ northern fluxmeter project.*

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