

How much nitrogen does asparagus need?

Collaborative research towards best practice nitrogen management in asparagus cropping

Why: To collaborate with growers across the growing regions, in order to collect data upon which we can build an understanding of nitrogen pools and dynamics, and together determine what best practice should be.

Where: On four properties in Hawke's Bay, Manawatu, Horowhenua and Canterbury.

Who: Dan Bloomer (LandWISE), John Evans (Canterbury), Braam Paans (LandWISE summer intern), Bruce Searle (Plant & Food Research), Iain Trotter (grower, Hawke's Bay), Sam Rainey (grower, Manawatu), Cam Lewis (grower, Horowhenua) and John Cunliffe (grower, Canterbury).

What:

- Current nitrogen fertiliser recommendations are not specific to New Zealand.
- There has been limited field work in New Zealand, meaning fertiliser recommendations and practice vary widely.
- While sufficient nitrogen fertiliser to grow healthy asparagus ferns should be applied during the establishing years, once established any applications should be based on replacing the nutrients removed during harvest.
- International research shows 75 kg N/ha could support a crop for three years without a detectable change in fern nitrogen concentration.

Read more: *Best practice nitrogen management in asparagus cropping:* ourlandandwater.nz/RPF2022

A project to develop a best practice guide for the use of nitrogen in asparagus crops in New Zealand was hampered by one of the worst seasons on record, but having uncovered a wide variety of grower practices research will continue.

When LandWISE manager Dan Bloomer initiated a project to analyse how New Zealand asparagus growers use nitrogen and to come up with a good practice guide for the industry, he did not anticipate a season so difficult that some growers left their crops unharvested and were unable to contribute to the research.

“We were starting to do the research, but with the Covid-19 lockdown, growers not being able to get staff and no way of exporting asparagus out of New Zealand because there were no aeroplanes, the whole thing became very difficult,” he says.

Despite the difficulties, some insights were gained.

“We brought together some good information, so we now know the range of different practices that growers are using, and we got some good trials established comparing different nitrogen fertiliser rates. As we look at the current season's yields, we'll get the results we need to get full value out of the work we started.”

The project had its origins in work that Dan and his colleagues at LandWISE did with vegetable growers in Levin, following concerns they were losing nitrogen to Lake Horowhenua. They produced a reasonably simple nutrient budget template that worked for most crops, but when Dan heard asparagus growers were interested in using it too, he realised its shortcomings for their crop because there were no reliable data or guidelines available.



Asparagus spears emerging in spring



Taking pre-season soil samples to full root depth to identify amount and location of nitrates

Anecdotaly, asparagus has been considered a low-nitrogen crop but grower practices are not always reflecting this.

After some discussion with the New Zealand Asparagus Council, Dan successfully sought funding via the Rural Professionals Fund from the Our Land and Water National Science Challenge and the project started.

Research hampered by “the worst season”

The research team first reviewed the already published research and surveyed growers nationally to get a picture of how they used nitrogen, discovering widely varying practices and indicating no agreed industry best practice.

“Different growers have completely and utterly different ways of dealing with nitrogen from, ‘I don’t put any nitrogen on my asparagus, I save it up and put it on my broccoli’, through to putting it on ‘because Dad did’, so there isn’t an industry standard practice,” says Dan.

Anecdotaly, asparagus has been considered a low-nitrogen crop but grower practices are not always reflecting this. A 2019 survey of grower practices in Waikato suggested an extremely wide range

of application rates and that typical applications exceeded crop exports, but there has been minimal in-field validation.

To address this, with growers’ cooperation, the researchers designed a research plan to address key gaps in their knowledge:

- How much nitrogen is cycling in the system?
- How much is exported?
- How much is typically added?
- What is the maximum biomass and how much nitrogen does it contain?
- How does the nitrogen content in the root zone vary throughout the season?

A matrix of data collection points across space and time was developed, representing different regions, soil types, varieties and ages.

However, although the project intended to work with growers by separately harvesting trial plots and recording yields, the terrible season growers experienced meant the research had limited grower input.

“Growers had very little extra brain space to focus in on what we were doing and prioritised the business-critical stuff like, ‘I can’t get any staff, there’re no backpackers or RSEs, what the hell am I going to do?’”

Some growers pulled the plug on the season all together and did not harvest. As a result, there was no research conducted in Waikato. But four collaborating growers in Hawke’s Bay, Manawatu, Horowhenua and Canterbury did take part so that data could be collected, albeit incomplete.

What is best practice?

Although the season’s issues limited data collection, the international literature review suggested the best time to apply nitrogen is after harvest and before the fern is allowed to grow. This will minimise leaching risk, especially on shallow or low water-holding soil types.

Once the crop is established and plants have reached their full size, it appears to need minimal additional nitrogen.

There is not a lot of nitrogen in the exported asparagus spears, which are all that need to be replaced. After harvest the ferns are left to grow, initially taking up soil nitrogen. As they grow and die down at the end of autumn, they transfer reserves back into the roots, and that drives production the following spring (see Figure 1).

“Whether asparagus growers are producing as much as they could if nitrogen was added wasn’t really known.”

“When you put nitrogen on you want to put it on at the start of fern growth because that’s when it’ll get sucked into the plant and be turned into big new storage roots for next season.”

Next steps

“Whether asparagus growers are producing as much as they could if nitrogen was added wasn’t really known,” says Dan. That should be addressed with some additional work to be undertaken this spring.

“Our trials compared each growers’ usual practice versus ‘something else’. When we get their current season’s yield data, we’ll see if that extra nitrogen actually gives you extra yield down the track.”

Tony Benny for the Our Land and Water National Science Challenge

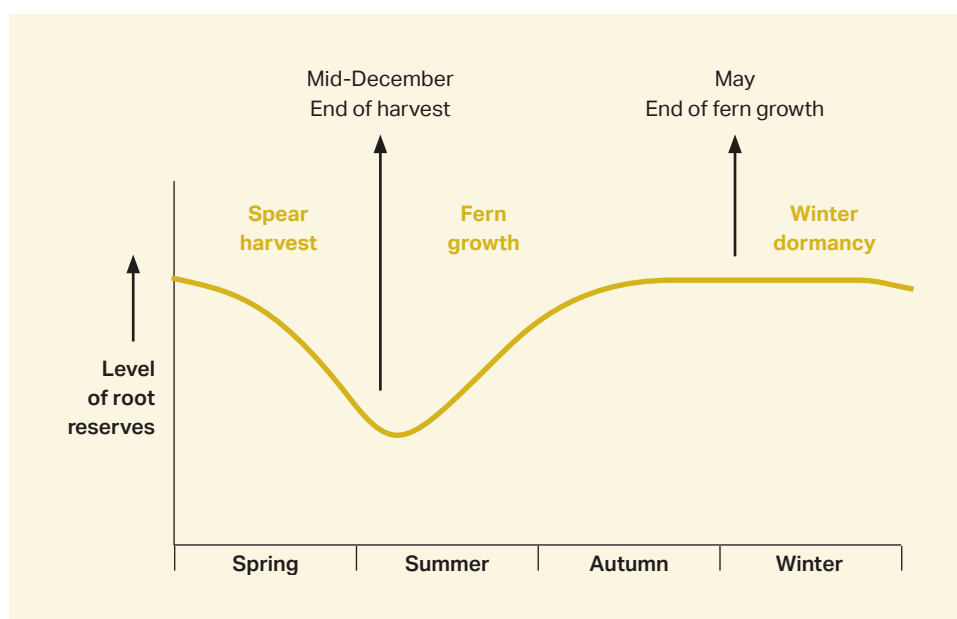


Figure 1: The depletion and rejuvenation of root carbohydrate reserves in asparagus through one annual cycle. Source. Brash, D, et al. (2005). Asparagus Manual