Grower Summary

HNS 193

Nutrient management in Hardy Nursery Stock

(NutrHONS project)

Annual 2017

Disclaimer

While the Agriculture and Horticulture Development Board seeks to ensure that the information contained within this document is accurate at the time of printing, no warranty is given in respect thereof and, to the maximum extent permitted by law the Agriculture and Horticulture Development Board accepts no liability for loss, damage or injury howsoever caused (including that caused by negligence) or suffered directly or indirectly in relation to information and opinions contained in or omitted from this document.

The results and conclusions in this report may be based on an investigation conducted over one year. Therefore, care must be taken with the interpretation of the results.

Use of pesticides

Only officially approved pesticides may be used in the UK. Approvals are normally granted only in relation to individual products and for specified uses. It is an offence to use non-approved products or to use approved products in a manner that does not comply with the statutory conditions of use, except where the crop or situation is the subject of an off-label extension of use.
Before using all pesticides check the approval status and conditions of use.
Read the label before use: use pesticides safely.

Further information

If you would like a copy of the full report, please email the AHDB Horticulture office (hort.info.@ahdb.org.uk), quoting your AHDB Horticulture number, alternatively contact AHDB Horticulture at the address below.

AHDB Horticulture,
AHDB
Stoneleigh Park
Kenilworth
Warwickshire
CV8 2TL

Tel – 0247 669 2051

AHDB Horticulture is a Division of the Agriculture and Horticulture Development Board.

Project title:	Nutrient management in Hardy Nursery Stock (NutrHONS project)
Project number:	HNS 193
Project leader:	D J Adlam, Dove Associates N Bragg, Bulrush Horticulture Ltd
Report:	Annual report, February 2017
Previous report:	Annual report, February 2016
Key staff:	Veronica Monteiro Dias Teresa Maguire Ann McCann
Location of project:	PCS, Gent, Belgium Greenmount Campus, Antrim, N. Ireland Bulrush Horticulture Ltd, N Ireland Coles Nurseries, Leicester
Industry Representative:	Chris Bowman, Osberton Nurseries Dale Swash, Frank P. Matthews
Date project commenced:	01 May 2015
Date project completed	31 December 2017 (Expected)

GROWER SUMMARY

Headline

The trial aims to establish a protocol for collecting and monitoring the nutritional inputs and outputs of container hardy nursery stock growing systems. Several on-nursery hand-held pieces of equipment have been tested across a range of ornamental species and the readings compared to traditional laboratory techniques.

Background

In the second year of the project, a third site, James Coles Nurseries at Leicester, was brought into the trial, which aimed to increase the range of conditions and establish the practicality of growers using the hand held equipment on site. The Coles site proved immensely useful as it showed that some of the equipment, whilst accurate and reliable, was unsuitable for nursery use. We also experienced a supply difficulty with the atLEAF^{+} chlorophyll device which is currently not available. An alternative device, Apogee MC 100, was used on two of the sites. Although expensive, it has proved well suited to the programme.

Summary

The second year of this project has further refined the use of several pieces of hand-held equipment available on the market, to monitor the nutritional status of the crops in comparison to samples sent off for traditional laboratory analysis of substrates, tissue and for leachate samples. The results of the first year clearly indicated that some equipment was limited in its use with nursery stock plants, mainly due to the difficulty of extracting clean tissue sap which could then be used to measure parameters such as nitrate N values. In the second year, equipment used on the nurseries was limited to currently available pieces of equipment easy to use on the nursery.

Year 1 trends between field readings and declining levels of leaf and substrate nutrient levels appear to have been supported by this second year work.

The Apogee MC 100 was introduced into the project to replace the unavailable atLEAF^{+} device. It measures chlorophyll with the near identical wavelength led light sources as the atLEAF^{+} but it is within a closed chamber, avoiding any daylight variations. It also takes a smaller sample size of leaf making readings easier.

Skimmia , which had been very poor in terms of establishment and growth in the first year, were replaced by *Tradescanthia*. The latter is a very fast growing plant and responded well to the various fertiliser additions being used.

Similiarly to the first year, leaching levels of nutrients in the early stages after potting have caused concerns, and investigations of the release rates from CRF fertilisers has been examined. The nitrogen source was changed to Urea to reduce the initial high rate of nitrogen release experienced in year 1.

All plants were potted in week 19 and whilst the initial leaf tissue N% levels were quite good at or near potting, the N% figure levels dropped for subjects after the beginning of June and in many cases resulted in N% tissue levels being below the 'book' values expected for such plants. The N% in tissue from June to October clearly shows the ever decreasing level of N in tissue. This may reflect the initial release of fertiliser from the CRF granules ahead of the plants establishing an active root system, which is supported by the initial high levels of nutrients in the leachate. The result of the leaching in the early stages after potting meant that optimal levels of available N for tissues were not reached later in the crop.

Chlorophyll measurements

The chlorophyll meters have produced a degree of similarity between the N tissue content and the chlorophyll reading. In the case of the *Tradescanthia*, the plant leaf colour does naturally turn browner as it matures which late in the season gives a less accurate reading for N levels. It can however be demonstrated that for *Tradescanthia* there is a relationship between tissue N and the atLEAF^{+} for the major part of the growing season, see Figure 1.

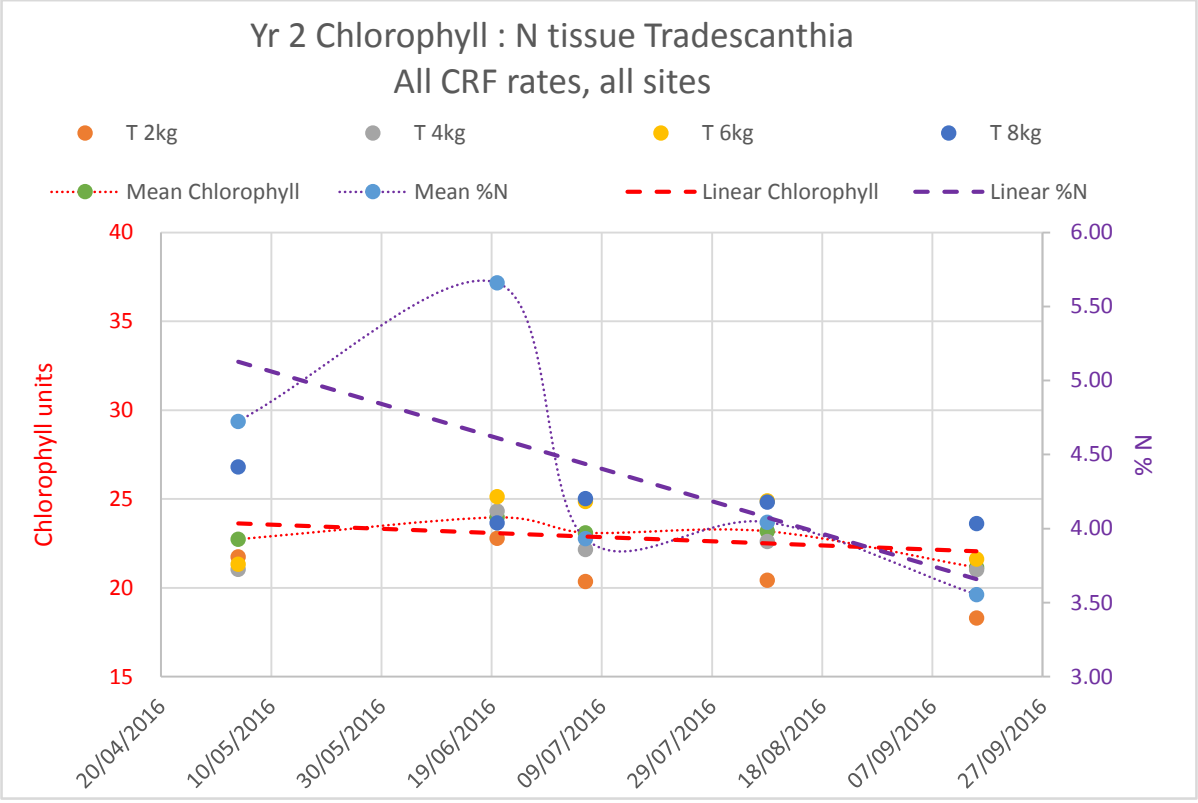

Figure 1 shows tissue v chlorophyll comparison for *Tradescanthia* across all 3 sites

The scale-like foliage of the *Chamaecyparis* makes leaf chlorophyll readings difficult to achieve. As the atLEAF+ device has an open gate for reading it is possible to slide the tissue through, holding down the “Read” button and obtain an average indication of chlorophyll level. This is not a reliable method for reading and it was found that when using the Apogee MC 100 in its place with a closed chamber, it was difficult to ensure a uniform foliage thickness and avoid gaps through the scales.

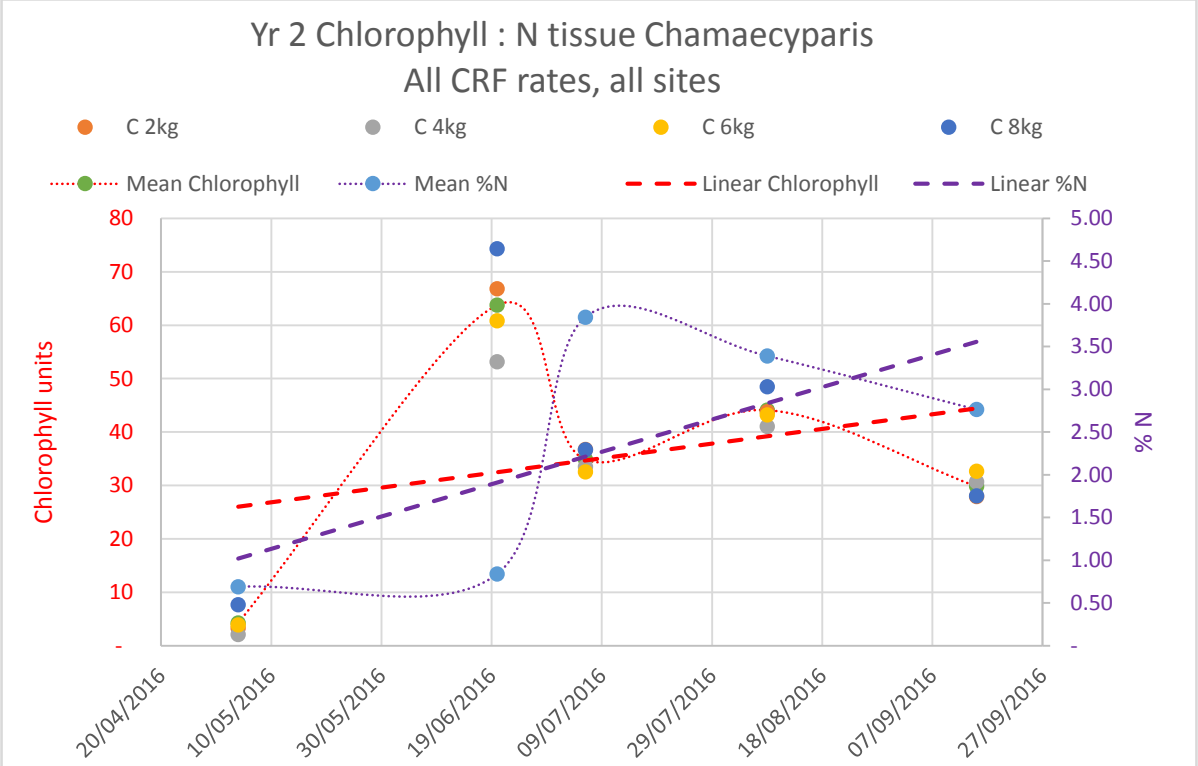

Figure 2 shows tissue v chlorophyll comparison for *Chamaecyparis* across all 3 sites

The Apogee MC 100 device was particularly effective at identifying chlorophyll colour changes before they were identified by the eye, see Figure 3.

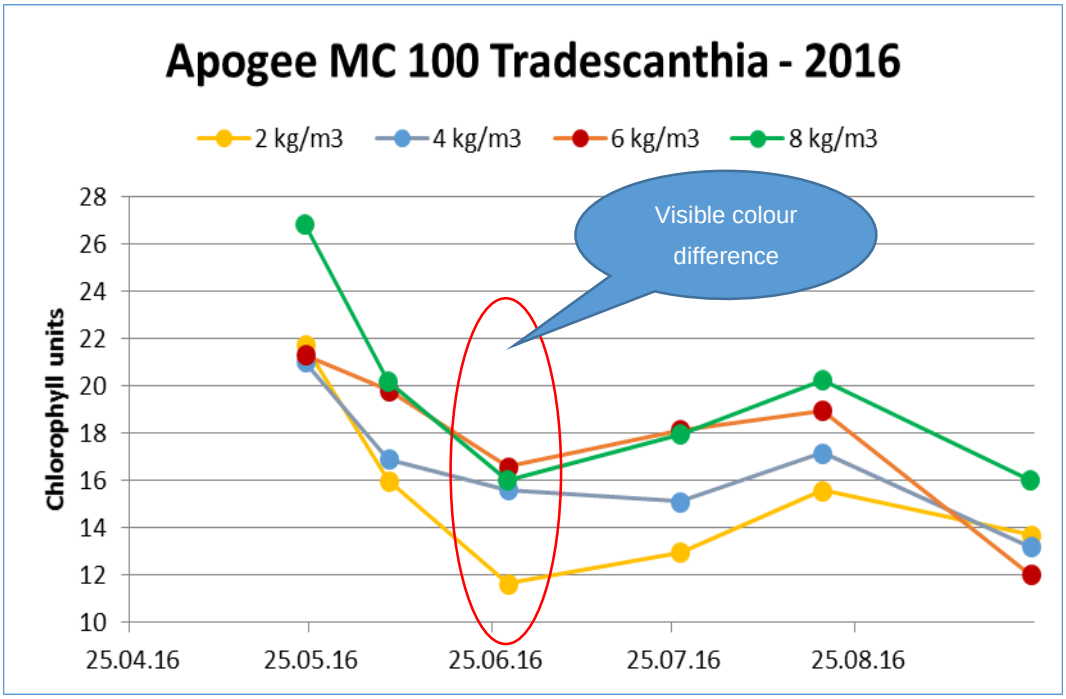

Figure 3 shows chlorophyll colour changes for *Tradescanthia* across all CRF (osmocote) rates

The Green Index system is a low-cost chlorophyll meter using the camera of an iPhone. It has continued to show promising results in the second year. At all three sites it gave a chlorophyll value that reflected the N level in the tissue reasonably well. As with other chlorophyll measuring equipment (such as the Apogee MC 100 and atLEAF^{+}) it was subject to variations in leaf shape and texture and again was not as accurate as the leaf colour changed in the autumn. Overall as a guide to plant nutrient status the Green Index was easy to use and cost effective, but note that the system did not detect the early colour changes in leaves, unlike the Apogee MC 100.

Substrate conductivity equipment

Considering that the Procheck is sensing the electrical conductivity of the substrate, rather than any direct plant response, the values for EC recorded in the substrate did have a very similar trend to the N% recorded in the leaf tissue, at least for the *Tradescanthia*, (Figure 4). During the season *Buddleja* showed a more erratic pattern due to the EC rise in the substrate at the time of trimming (Figure 5).

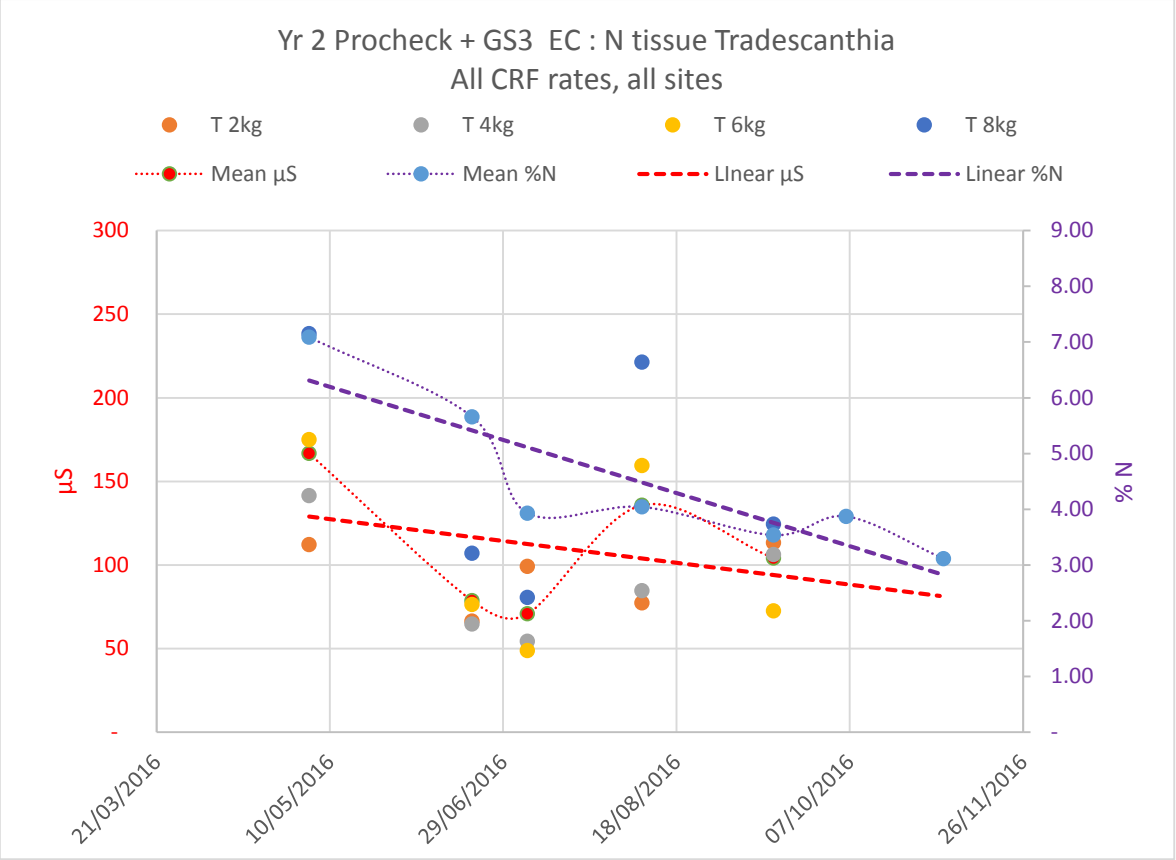

Figure 4 shows EC v N levels for *Tradescanthia* across all 3 sites

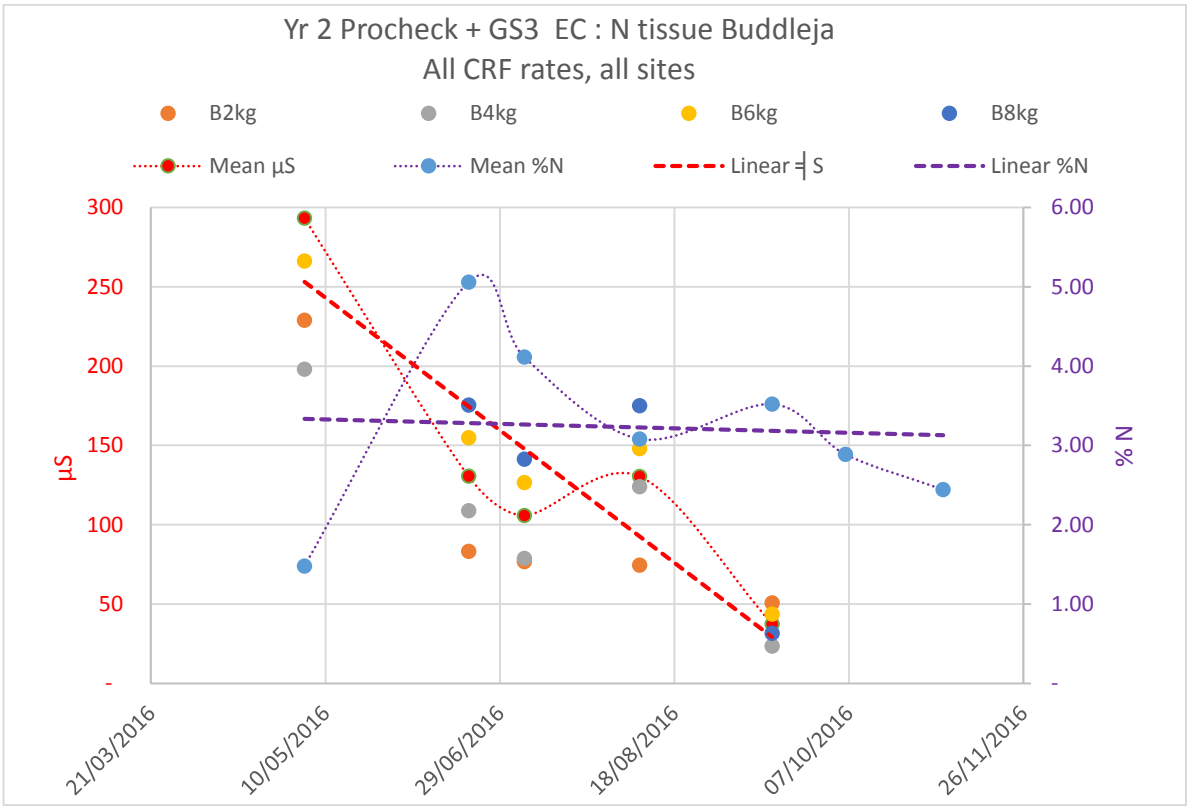

Figure 5 shows EC v N levels for *Buddleja* across all 3 sites

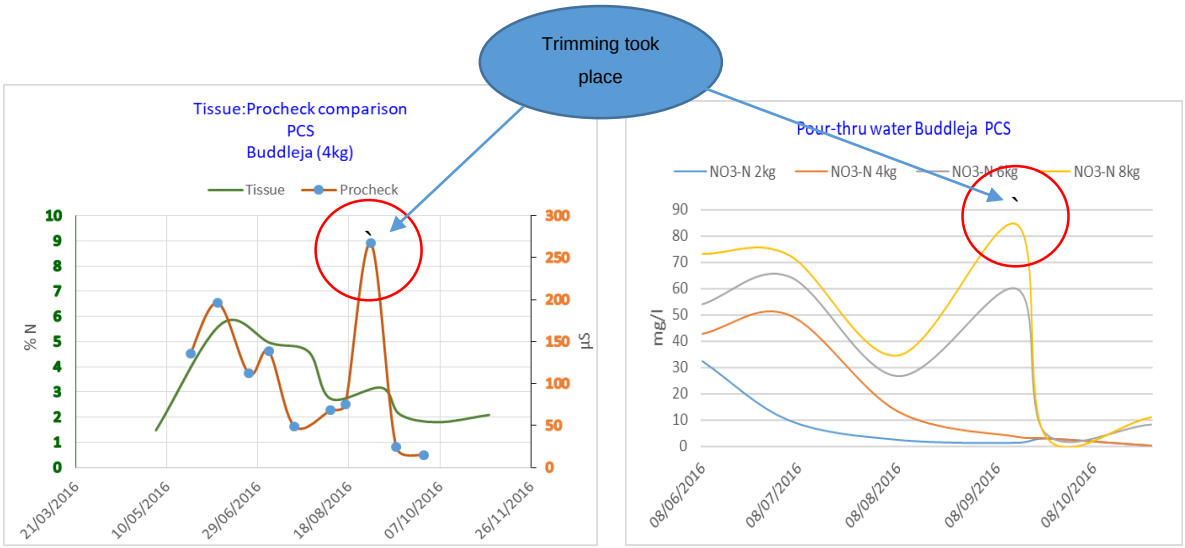

Figure 6 shows EC v N levels and leaching levels for *Buddleja* when trimmed

Financial Benefits

Investment in monitoring equipment will be needed, but this may only be in the order of £2,000-£3,000 to make the monitoring possible. Taking the value of crops being monitored, the capital expenditure is quite low. The effect on a grower's sales when they have a nutrition problem can be very high. We asked a group of seven nursery stock growers what the crop losses were from nutritional problems. No one was able to quantify these losses.

For many Growers there can be losses of plants through production of between 5-10% due to disease, pest or nutritional effects. If it is accepted that on average the return per ha for HNS is £750,000, then a loss of 7.5% would equate to £56,000. If we then assumed that nutritional losses or under performance due to inadequate nutrition is 2-3% then this would equate to £19,000.

The new atLEAF+ chlorophyll meter priced at £350.00 or the Procheck EC meter at £750.00 both have the ability to ensure marketing targets of crops valued at tens of thousands of pounds are met. One grower comment was that equipment such as the Apogee MC100 at over £2,000 was of value if it could advise of nutrients lacking in the crop and saved it.

The table below shows the cost of nutrients added to and leached from the 6 pots contained in the Pour-thru units at PCS on *Viburnum*. The unit price of nitrogen was costed at £600/tonne. Note that the value of any mineralised N from the substrate would be included in the leachate data but no value is available for that part of the analysis results.

Kgs CRF/m³	2kg/m³	4kg/m³	6kg/m³	8kg/m³
Cost of N added(CRF + PG mix + Urea)	£0.01238	£0.01707	£0.02535	£0.02812
Cost of N in leachate	£0.00700	£0.01200	£0.02000	£0.02400

Table showing nutrient costings

Using the monitoring equipment that detects nutrient content prior to visual detection enables a greater reactive approach to crop nutrition that has both environmental and financial gains.

Action Points

If growers are going to monitor crops on nurseries then:

a) Dedicate a person and give them the skills for accurate sampling across the selected subjects,

b) Use selected marker crops on the nursery, potted into a substrate used widely across the nursery for sampling,

c) During the first few years of monitoring, laboratory analysis will be needed to establish the benchmark of nutritional values for specific crops,

d) Be prepared to liquid feed a crop with CRF added to maintain targeted growth.

e) Be aware that some husbandry work can affect substrate EC levels and nutrient uptake.

f) Clearly label tissue samples so that accurate identification can be made even if they don't come back from the laboratory in same order as sent.

g) More frequent sampling (e.g fortnightly, or weekly intervals) is necessary in the first year, so that trends can be developed even if tissue samples get lost or damaged.