

Monitoring soil temp to optimise spring fertiliser application

To make best use of nutrients on farm and reduce harmful emissions, fertilisers need to be better targeted to improve crop uptake, reduce waste, and improve profits. A range of benefits come from using soil temperature sensors to gather data on your farm. Measuring soil temperature using a sensor is the most accurate way of deciding when to apply spring nitrogen. As a guide, the optimum time for the first fertiliser application is when the soil temperature at 10cm deep reaches 4- 5°C for at least four-days.

It is widely recognised that significant opportunities exist for emissions abatement and environmental protection through improved utilisation of fertilisers in Scottish agriculture. Research shows that a significant proportion of the nitrogen applied as synthetic or organic fertiliser is wasted through leaching, denitrification and volatilisation.



A report by N. Lampkin et al. (2019) states that almost 50% of Scottish nitrogen applications taking place during 2017 (equivalent to an average of 92kg of nitrogen per hectare) were not taken up by the target crop and as a result were lost to the environment. In addition to contributing to greenhouse gasses, there is the serious issue of nitrate losses to watercourses; elevated nitrate levels contribute to eutrophication of waterbodies and pose a risk to human health.

T Sum 200. Using T-sum 200 (when cumulative positive air temperatures from 1st January reach 200) to assess the right time to apply nitrogen is a useful guide but it is more accurate to measure soil temp at root depth on your own farm. The T-sum can be out of sync with what is happening in the soil, especially with mild winters. It is important to recognise each season varies so regular soil temp monitoring is important.

The focus should be on getting nitrogen into the soil at the time when crop roots are able to respond. If the application is too early, there's a risk of run off or leaching, and if it's too late, the opportunity to optimise crop growth is lost. Therefore, nitrogen should be first applied when crop growth starts, and ground conditions allow spreading without soil damage – best determined by soil temperature.

The addition of a very small number of soil temp sensors across the major farm soil types or in different aspects (especially South and South West compared with North and North East laying fields) can further refine decision making.

Why is soil temperature important?

Temperature affects several processes in soil and soil ecosystem, namely:

- It directly affects plant growth and seed germination.
- Soil temp influences aeration, soil moisture content, and the availability of plant nutrients.
- Vegetative cover. A bare soil quickly absorbs heat, becomes hot during the summer, and becomes cold during winter.
- Organisms within the soil thrive at different temperatures.
- Understanding and monitoring soil temp allows you to quantify early and late seasons.