

NDICEA - A digital tool to model nutrient balances across a crop rotation

Problem

There is often an assumption that organically managed farms must maintain a neutral or positive nutrient balance. However, this is not always the case. Consequently, knowing the best way to address a negative nutrient balance can be a challenge.

Solution

NDICEA allows farmers to model crop rotations at a field scale under a given management regime and observe the nutrient balance over their course.

Outcome

Using NDICEA, farmers can identify where problems with nutrient loss/imbalance occur in their rotation. They can experiment with changes in rotation or management to find the most effective strategies to address nutrient imbalances and nutrient losses due to leaching.

Applicability box

Theme

Nutrient management

Geographical coverage

Global

Application time

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Required time

1-3 hours per field

Period of impact

Ongoing

Equipment

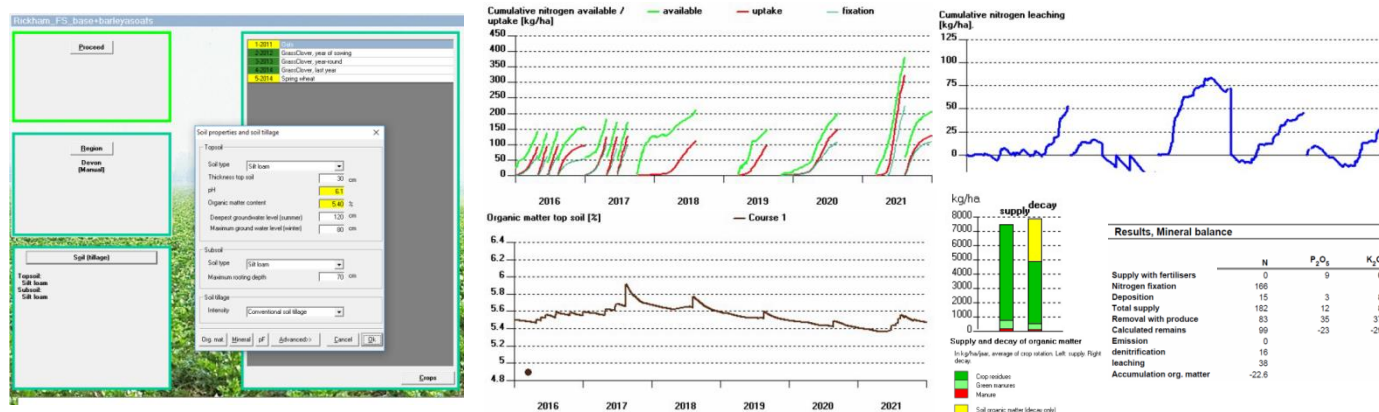
Computer; NDICEA tool (free download); basic soil, crop and management data

Best in

Arable and mixed arable crops

Practical recommendation

- NDICEA is a freely available, computer-based nutrient budgeting tool developed by the Louis Bolk Institute in the Netherlands. It takes data on the crop rotation for an individual field rotation, alongside data on climate, soil properties and management practices (e.g. seed rates, fertiliser application, cultivation regimes etc.) to map changes in soil nutrients over the course of the rotation.
- Application of the tool on seven organic farms found that, of eight fields modelled, seven had negative organic nitrogen balances and five had negative phosphate and potassium balances. The only farm with positive levels for both minerals achieved this through applications of either compost (35 t per ha) or chicken manure (10 to 17 t per ha) for six (out of eight) years of the rotation.
- In all cases, many of the nutrients added to the fields were lost through leaching or harvest of the high fertility ley before being available to the commercial crop. This was especially the case where the ley was broken in autumn, leaving the soil susceptible to leaching and denitrification over winter. Breaking the ley in spring makes the nutrients available for the next crop rather than being lost by leaching or denitrification. This is true even for autumn cropping.
- The biggest improvements to nutrient balance resulted from changing tillage practices to a reduced-till or, ideally, no-till system. For several cases, this change alone was enough to result in positive nutrient and organic nitrogen balances. Leaving the straw behind had very little impact on nutrient balances but did increase organic matter. Increasing the yield of the grass-clover ley can also significantly improve organic nitrogen balances plus soil nutrient retention.
- Using digestate from anaerobic digestion could present an alternative to rock phosphate. In addition to supplying phosphate, digestate can add nitrates, potassium and organic matter to the soil.



Left: Users enter data on their crop rotation and management practices as well as abiotic factors such as soil type, pH and climate. **Right:** The programme provides the results in a number of graphs and tables showing the progression of soil nutrients and organic nitrogen over the course of the rotation.

Practical testing and sharing of the results

If this tool seems to be suitable for your farm, we recommend that you test it under your own farm conditions.

Use the comment section on the [Farmknowledge platform](#) to share your experiences with other farmers, advisors and scientists! If you have any questions concerning the method, please contact the author of the practice abstract by e-mail.



Further information

Further readings

- A short blog article on the application of NDICEA on seven organic farms is available at [Agricology.co.uk](#).

Weblinks

- NDICEA can be downloaded for free from www.ndicea.nl or via Farmknowledge.org.
- Further tips on managing soil nutrients can be found at Farmknowledge.org.

About this practice abstract and OK-Net Arable

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among farmers, farm advisers and scientists with the aim to increase productivity and quality in organic arable cropping all over Europe.

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