

Cover crops: a proven tool to reduce nitrate leaching



Ciaran Hickey and Jonathan Leech say cover crops help improve soil structure.

ACRES and new Water EIP scheme are helping farmers fund the costs of planting cover crops, which can deliver a significant decrease in groundwater nitrate concentrations

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Nitrate leaching is most likely to occur in intensive spring sown tillage farms where land is left fallow over the winter. This can be mitigated by planting rapidly growing cover crops after harvest. These leafy crops are hungry for any nitrate present in the soil and 'give back' the nitrogen when ploughed under in the spring.

Experiments carried out at Teagasc Oak Park on light sandy soil, found that there was a significant decrease in groundwater nitrate concentrations under a mustard cover crop, compared to no cover crop. Nitrogen uptake by mustard was significantly higher than from naturally regenerated plant cover in all three years of the experiment.

However, results from this experiment also showed that nitrogen uptake by naturally regenerated growth was almost as high as uptake rates found for some other popular cover crops.

Nitrogen surplus

Nitrogen balance, (per hectare farmed), is used in the Teagasc National Farm Survey (NFS) Sustainability Report as an indicator of the potential magnitude of nitrogen

surplus on farms.

This indicates the risk of nutrient losses to water bodies, all other things being equal. It is calculated on the basis of nitrogen inputs, minus nitrogen outputs, on a per hectare basis.

Nitrogen surplus on tillage farms is low when compared to other enterprises, and it varies from year to year. Nitrogen surpluses are affected by a range of factors some of which are within, and some (such as weather) which are outside, the farmer's control.

Higher nitrogen surpluses tend to be associated with adverse annual weather/growing conditions. Large nitrogen surpluses of 62.0kg were recorded in 2018 when drought reduced crop yields. In the high yielding year of 2022, a surplus of 40.5 kg/ha was recorded in the NFS Sustainability Report.

Importance of sowing date

Sowing date of cover crops is crucial. The more crop cover there is, and the more vigorous the growth, the more nitrate will be taken up. Good establishment, helped by early sowing, is essential to achieve the large biomass production which will max-

imise the benefit of the cover crop.

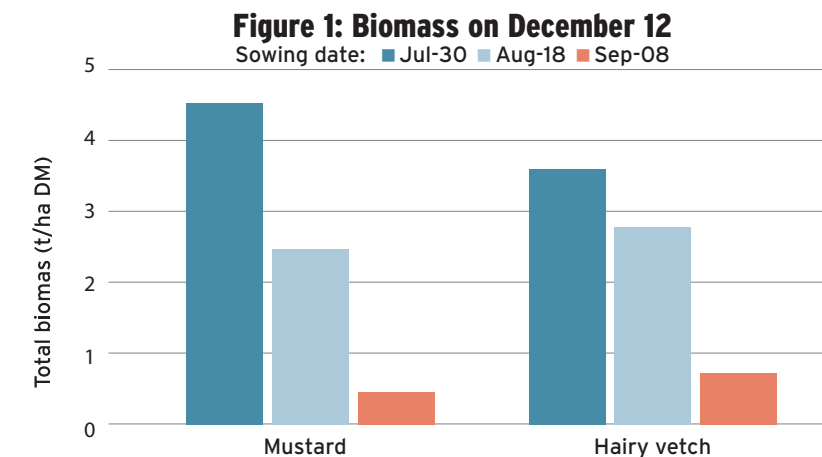
An experiment in Teagasc Oak Park examined biomass production from three sowing dates: Early – 30 July, Target – 18 August and Delayed – 8 September. Two cover crops were used: mustard, which is a fast growing non-legume, and hairy vetch a winter hardy legume.

The results (Figure 1) showed that there was a linear reduction in the amount of biomass produced as sowing date was delayed. The mustard lost 2tDM/ha for each three-week delay in sowing.

A key point from the experiment is that there were virtually no weeds produced on the 30 July sowing date; but between 40 and 60% of the biomass after the 8 September sowing was actually weeds. The later sowing date clearly reduced competition from the cover crop.

Cover crop species

Carefully select cover crop species that suit your rotation. Growers of beans and peas should avoid legumes in their cover crop mixtures. Oilseed rape growers should avoid brassicas. Recent instances of clubroot in oil-



seed rape have been linked to the use of brassica cover crops.

Phacelia is a popular option as it is from a different family to other crops grown in tillage rotations.

It is important not to overestimate the nitrogen benefit of cover crops to following crops. Teagasc research has shown that the nitrogen benefit of non-leguminous winter covers is small and that only legumes have the potential to supply significant amounts of nitrogen to

succeeding crops. And this can be very variable.

Cover crops also provide other benefits including improved soil structure, reduced compaction, increased water infiltration and reduced risk of soil loss in periods of heavy rainfall.

Soil compaction is very common this year following the wet conditions this spring. Deep rooting cover crops can play a role in alleviating some of these problems.

Farmer case study: Jonathan Leech Agri Ltd, Clonroche, Co Wexford

‘Cover crops are a key part of the cultivation system’

Jonathan Leech of J Leech Agri Ltd., is farming in Tomfarney, Clonroche Co Wexford. He's a tillage farmer, but also a contractor and a machinery dealer,

Jonathan's rotation includes spring malting barley, winter oilseed rape, winter wheat, spring beans and oats. "I rarely grow winter barley, as the yield gap between good crops of spring barley and winter barley does not justify the extra cost on this farm," says Jonathan.

The farm is on 'Clonroche series soil' which is defined as Brown Earth. These are well drained soils, predominantly derived from the underlying shale rock. The profile contains appreciable quantities of small shale fragments which enhance the internal drainage of the soil.

These soils are particularly suitable for tillage. The challenge now is for any nutrients remaining after harvest to be captured using a catch crop.

"I have been using Non Inversion



Neilus Nunan, Ciaran Hickey and Jonathan Leech examine cover crop seed.

Tillage cultivation or Min Till for the last seven years and see benefits in improved soil structure and soil biology," says Jonathan. "Cover crops are also a key part of the cultivation system."

"They provide a roof over the soil in the winter. They stop the rainfall compacting the soil as well as keeping live roots in the soil and drainage pores open. This in turn helps soil drainage, which improves trafficability and makes cultivation easier."

The very important added bonus is that these living plant roots are taking up nutrients which otherwise would be available to be leached out of Jonathan's free

draining Brown Earth.

"The only downside is the cost to establish and manage the cover crops and this is where schemes such as ACRES and the new Water EIP are so important," says Jonathan.





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With the help of Teagasc ASSAP advisor, Neilus Nunan, Jonathan is currently joining the new Water EIP which will pay €100/ac up to a max of 50ac; this payment will help to fund cover crops on the farm.

New Water EIP Q&A:

Q: What is it?

A: New €60m Water EIP (European Innovation Programme) designed to target the most vulnerable areas for water quality across the country with specific measures that will have maximum impact in improving water quality.

Q: Who is operating it?

A: LAWPRO (Local Authority Water Programme), Teagasc and Dairy Industry Ireland, in collaboration.

Q: Why is it needed?

A: Water quality needs to improve locally, regionally and nationally.

Q: What is the main objective?

A: To help farmers implement appropriate measures to address and improve water quality issues in vulnerable areas for water quality. Putting the "right measure in the right place" is a key part of the programme.

Q: How does it work?

A: Specialised Water Quality Advisors (from ASSAP/Teagasc & the Dairy Co-ops) approach farmers in the most vulnerable areas for water quality with a view to assessment and voluntary participation in the programme.

Q: Is there guaranteed access?

A: No, there is a rigorous selection process similar to many other schemes. It is not until this process is carried out, that approval and subsequent participation in the EIP can be granted.

Q: Are there payments?

A: Yes, there are 41 different measures in the EIP with varying rates of payment for each.

Q: When did the scheme start?

A: It was announced in March and has opened for applications in recent months.

Q: What is the scheme's relevance to Tillage?

A: Use of Cover/Catch Crops are a key measure in the EIP to address the high nitrates problem, in areas such as the south-east, in particular. There are also pesticide measures to deal with specific issues.

** Jonathan has put himself forward for selection in the EIP and hopes to implement the Catch/Cover Crops measure on up to 20ha of his farm, if selected.*

Cover crop benefits

- Carbon capture.
- Crop biomass production.
- Overwinter green cover retains more soil C over the winter.
- N captured over winter.
- Captures 1.3t CO₂/ha.
- Reduce N leaching.
- N uptakes 10 to 65kgN/ha.
- Reduced N losses over winter

- 20% of N available to following crop.

Scan these QR codes to watch videos on cover crop sowing in Wexford



Weed Watch 2024: Herbicide resistance testing

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Teagasc has launched a 'Weed Watch-2024' campaign with the *Irish Farmers Journal* to combat the increasing threat of herbicide resistance.

Resistance tests on suspected populations of ANY grass and/or broad-leaved weeds are encouraged.

If you have large uncontrolled populations or you suspect resistance with Black-grass, Italian ryegrass, Wild oats, Bromes, Meadow grass, Canary grass, Chickweed, Poppy, Speedwell or Corn marigold, it might be worth getting weed seed samples tested now.

This invaluable service from Oak Park is for free for a limited time, as a part of the DAFM-funded EVOLVE research project.

Testing protocol

To obtain comprehensive results from testing, it is important to col-

lect and submit quality samples of your target weed(s). Follow these steps:

- For grass-weeds, collect ripe seeds when they easily fall-off the seed head when brushed, stroked, or shaken vigorously into a paper envelope.
- For broad-leaved weeds, collect ripe seed heads or capsules or seeds directly into a paper envelope.
- Sample sufficient seed quantities.
- Fill-out the herbicide resistance testing form.
- Send paper bags of dry seeds along with completed form to Vijaya Bhaskar, Teagasc Crops Research Centre, Oak Park, Carlow.
- The resistance testing form and seed collection instruction is available on the linked flyer. Your advisor will have all the details too.

Act now

The window before harvest is an opportunity for growers and industry to gain unique information on what herbicides will work on your populations by conducting resistance tests. This information is crucial for developing future rotational plans.

Table 1: Confirmed herbicide-resistant grass and broadleaf weeds in Ireland

ACCase herbicides (Axial, Falcon, Stratos, Centurion)	Broad-spectrum ALS herbicides (Pacifica, Broadway)	Broad-spectrum ALS herbicides (Ally Max, Cameo Max)	Auxin mimics (2,4-D)
Wild oats Blackgrass Italian ryegrass	Blackgrass Italian ryegrass Annual meadow grass Rough-stalked meadow grass Chickweed Poppy Corn marigold Speedwell	Chickweed Poppy Corn marigold Speedwell	Poppy Chickweed