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Crop Monitor

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Spring sowing
With spring planting rapidly approaching we provide a few tips on sowing, seed rates and method.

Thinking about liming?
Following on from the last edition of crop monitor that highlighted soil sampling we examine the importance of a regular liming policy.

What Nitrogen (N) rates should I use?
We look at how you can calculate your nitrogen requirements taking into account higher fertiliser prices this year and the mild winter.

Winter Wheat Disease Strategy
We consider a practical approach to Septoria Tritici control in the light of resistance to strobilurins.

IN THIS ISSUE

Sowing Tips

Tips when sowing your spring cereals: -

Avoid deep cultivation, aiming for a few centimetres below seedling depth. Deep cultivation not only requires more power, but also creates a fluffy seedbed. A firm seedbed will help to maintain seedling depth, but coulters should also be adjusted to suit soil conditions.
If wheeling is visible in the seedbed, consider reducing tyre pressures.

Always check seed rates for accuracy. Inaccuracy can arise from incorrect calibrations or trash/dirt trapped in the seed hopper.
To calculate your seed rate use the following formulae:

$$\text{Seed Rate (kg/ha)} = \frac{\text{Seeds/m}^2 \times \text{TGW}}{100}$$

TGW=Thousand Grain Weight

Aim for between 350-400 seeds /m^2 depending on seedbed and sowing conditions for spring barley crops.

Remember to use the TGW figure for the seed-lot you are sowing. To calculate your TGW count out 250 seeds, weight and multiply by 4 to get thousand-grain weight.

This method of calculating seed rate not only gives a more accurate plant establishment but can save money. For example a seed-lot with a TGW of 40.2g has a sowing rate of 141kg/ha (8.9st/acre) while a seed-lot with a TGW of 45.7 has a sowing rate of 160kg/ha (10.2st/acre), a difference of 20kg/ha and a saving of £6.20/ha, (Seed costed at £310/tonne.

Liming Materials

How do soils become acidic?

Unless steps are taken to correct the pH balance of soils by applying liming materials, there will be a natural reduction in the calcium status of most soils. This results in a natural increase in acidity and in many cases a reduction in soil fertility. Losses occur as a result of:

Leaching

Calcium and magnesium can be carried out of the root zone by the downward movement of soil water.

Cropping

Acids are formed during the decomposition of crop residues and plants remove calcium and magnesium from the soil reserves. Deep tillage may bring acid subsoil into the root zone.

Fertilising

Ammonium nitrate rich fertilisers contribute to soil acidity by nitrification of ammoniacal nitrogen to nitrate.

LOSSES CAN AMOUNT TO 1250KG CALCIUM CARBONATE PER HECTARE/YEAR

Does soil type effect my liming requirements?

Heavy soils particularly clays, although benefiting from regular liming tend to maintain pH levels since they have greater ability to retain calcium/magnesium ions. The addition of lime modifies the characteristics of the clay particles so that they bind together resulting in improved drainage and easier movement of all major ingredients necessary for plant and life development.

Sandy soils have reduced capacity for holding liming materials and as a result of their free draining nature they require more frequent liming at lower dose rates. It is on these soils that troubles from acidity are most common and most acute, but easily remedied.

What are the liming requirements of arable crops?

The replacement of calcium lost from the soil by leaching and crop uptake is essential to maximise production and profits from cereal crops.

The optimum pH for arable crops is outlined in the table below.

Crop	Optimum pH range for Crop Growth
Potatoes	5.5-6.0
Oats	5.5-7.0
Oil Seed Rape	6.0-7.5
Wheat and Maize	6.0-7.5
Peas and Beans	6.0-7.5
Barley	6.5-7.5

If soil pH is lower than the bottom of the indicated range, then crop yields will begin to suffer severely due to the crops' inability to tolerate that level of acidity. It is particularly important to adjust soil pH well in advance for sensitive crops such as barley and peas.

The rate of lime loss needs to be established from regular soil pH testing. Annual lime losses vary considerably throughout Northern Ireland, with a soil test providing the most accurate lime requirements.

THE ULTIMATE OBJECTIVE IS TO MAINTAIN THE SOIL AT PH 7 FOR ARABLE CROPS

How do you grade the quality of your liming material?
The effectiveness of a liming material is dependent upon its neutralising value, the fineness of grinding and the relative hardness of the parent rock.

1. Neutralising Value (NV)
   The neutralising value of a liming material is expressed in terms of the percentage of calcium oxide equivalent. Thus, 100 kg of a liming material with a neutralising value (NV) of 52% will have the same neutralising value as 52 kg of pure calcium oxide (CaO).
   THE HIGHER THE NV THE LOWER THE RATE OF LIME REQUIRED

2. Fineness (%<150μ)
   For maximum effectiveness, the harder and less porous the parent rock, the finer the liming material must be ground. Where lime is applied to an acid soil, there is a well-proven relationship between the fineness of grinding and the crop yield response.
   THE COARSER THE LIME, THE HIGHER THE APPLICATION RATE

   The qualities of various liming products are outlined in the table below.

Liming Material	Neutralizing Value (NV)	Fineness (%)
Ground Chalk	54	100
Ground Limestone	54	>40
Mg Screened Limestone:>15% MgO	58	>20
Screened Limestone	58	>20
Coarse Screened Lime	35	<20

How much lime is required?
Recommendations for lime application assume that the lime has a NV of 54 and a fineness of 40%.

To calculate the amount of lime required based on its NV:

$$\textit{(Ground limestone recommendation)} \times \frac{54}{\textit{NV of purchased lime}}$$

For example if the NV of your lime is only 35 and the recommended application rate was 3.0t/ha then

3.0 X (54/35) = 4.6t/ha

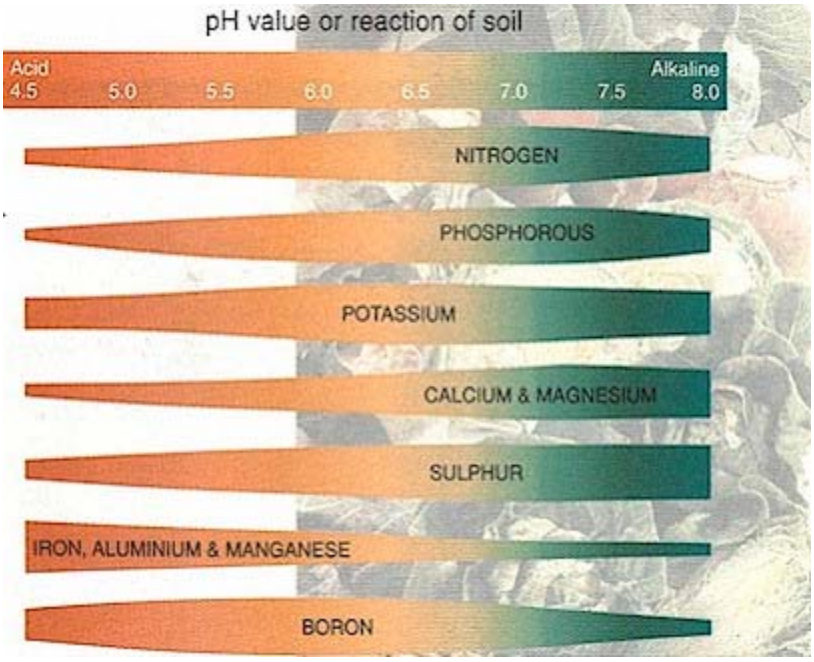
(An extra 1.6t/ha to have the same effect.)

If fineness is 30% apply 22% more liming material than recommended
If fineness is 20% apply 44% more liming material than recommended.
If fineness is 10% apply 66% more liming material than recommended.

Using poor quality lime may be cheaper but an application rate of 7.8t/ha of coarse screened limestone (NV of 35 and fineness of 20%) is required to produce the same liming effect as 3.0t/ha of ground limestone (NV 54 and fineness 40%).

When should lime be applied?
Liming may be carried out at any time when ground conditions are suitable. It is important to allow sufficient time for the soil to adjust to the correct pH before sowing. This can take several weeks, depending on the quality of lime used. It is particularly important to adjust soil pH well in advance of sensitive crops such as barley and peas. Spreading should be even, accurate, and cause little disruption to the soil structure.

Does soil pH affect fertiliser efficiency?
A reduction in soil pH levels creates 'stale' soils, places plants under stress and reduces their ability to make effective use of the nutrients and organic matter available to them. The availability of plant nutrients is affected by the pH of soil. The diagram below shows the scale of reduction in availability of the major plant nutrients. The major plant nutrients nitrogen (N), phosphorus (P) and potash (K), as well as calcium and magnesium, show a marked reduction in availability in acid conditions.



Ref: Agricultural Lime Association

Nitrogen Rates Winter and Spring Cereals 2004

In the last edition of Crop Monitor we highlighted the benefit of regular soil testing in calculating phosphorus and potash requirements for your cereals. This article aims to assist you in calculating nitrogen requirements for your cereals this season.

When calculating fertiliser rates it is important to establish three main factors.

1. How much nutrient will the soil supply
2. How much nutrients will organic manures supply
3. How much fertiliser will the crop require

Soil Nitrogen Supply
Nitrogen (N) recommendations are normally based on estimating how much nitrogen is available in the soil after leaching following the winter period. If leaching has been low, then the soil nitrogen supply (SNS) for crops may be higher than average and less fertiliser N will be needed.
Factors to consider when finalising your fertiliser requirements this year

- **Lower winter rainfall**
  Rainfall for December to February has been 87% of the average, indicating that SNS will be higher than normal.

- **Higher fertiliser N value from organic manures**

  Fields with organic manures applied pre-sowing will have higher SNS this season than normal. Again this is due to the lower than average rainfall (87% of the average). To help estimate the fertiliser N value from an organic manure application, contact your local Crops Development Advisor.

- **Higher Fertiliser costs**

  Most farmers this season have or will be paying over 47p/kg N. If 2004 grain prices are £100/t, the breakeven ratio is 4.7 (i.e. you need 4.7 kg grain to cover the cost of 1kg of fertiliser N). Crop recommendations are based on a breakeven ratio of 3 so as the breakeven ratio increases to 4.0 and above you should consider reducing fertiliser N rates. The economic response from each additional unit of nitrogen will decreases when applying optimum fertiliser rates. Based on this scenario it may be worth considering reducing fertiliser N by 15-20kg/ha, but this should be considered on an individual farm basis and its crop management practices.

- **Higher Establishment Rates**

  The combination of good drilling conditions, good emergence and mild winter has resulted in winter cereals having high shoot numbers. The recent cold spell could help reduce tillers although it is unlikely to have much effect on the most advanced crops. This means that growers will need to adjust both nitrogen and plant growth regulator (PGR) management plans to help reduce the lodging risk as well as maximise yield.

Calculating fertiliser N rates

Table 1 below can help you estimate your SNS based on your soil type and previous crop. Once you have decided on your index, use the relevant crop Table (Tables 2-5) to calculate your fertiliser N application rate.

Table1: Soil Nitrogen Supply (SNS) for high rainfall areas

	SNS INDEX			
SOIL TYPE	0	1	2	3
Light sands or shallow soils over sandstone	Cereals, Potatoes Peas, Beans, Oilseed rape, Low/medium/ high N veg, forage crops, Rotational setaside	Sugar Beet		
Medium soils or shallow soils (not over sandstone)		Cereals, Sugar beet, Potatoes Peas, Beans, Oilseed rape, Low/medium N veg, Forage Crops	High N veg, Rotational setaside	
Deep clay soils		Cereals, sugar beet, Low/ medium N veg, Forage Crops	Potatoes, Peas, Beans, Oilseed rape, High N veg, rotational setaside	
Deep fertile silty soils		Cereals, sugar beet low N veg Forage crops	Medium N veg	Peas, beans, Oilseed rape, Potatoes, High N veg, Rotational set-aside

Ref: DEFRA Fertiliser Recommendations (RB209) 7th edition.

With knowledge of your soil type and SNS index from Table 1, calculate the total amount of fertiliser nitrogen required using either Table 2,3,4,or 5 depending on your crop.

Table 2: Winter Wheat Nitrogen Recommendations (kg/ha)

	SNS Index			
	0	**1**	**2**	**3**
Light sand soils	160	130	100	70
Shallow soils over chalk		240	200	160
Medium and deep clay soils, shallow soils over rock		220	180	150
Deep fertile silty soils		180	150	120
Organic soils				120

Table 3: Winter Barley Nitrogen Recommendations (kg/ha)

	SNS Index			
	0	**1**	**2**	**3**
Light sand soils	160	130	100	70
Shallow soils over chalk		200	160	130
Medium and deep clay soils, shallow soils over rock		180	150	120
Deep fertile silty soils		150	120	80
Organic soils				120

Table 4: Winter Oat Nitrogen Recommendations (kg/ha)

	SNS Index			
	0	**1**	**2**	**3**
Light sand soils	120	80	50	0-40
All other mineral soils		130	100	70
Organic soils				70

Table 5: Spring Barley (Feed) Nitrogen Recommendations (kg/ha)

	SNS Index			
	0	**1**	**2**	**3**
Light sand soils	125	90	60	40
Other Mineral Soils		150	120	80
Organic soils				80
Peaty Soils				

Fertiliser N timing

Final decisions on main N top dressing rates for winter sown crops should not be made until the end of March or even later when the full winters rainfall will be known, and early crop growth and development can be assessed.

1. **Winter Wheat N timing**

Less than 120kg/ha N

Apply the whole recommendation as a single dressing by early stem extension, but not before early April.

Over 120 kg/ha N
Half should be applied at the start of stem elongation, and half at least 2 weeks later (not after early May).

IF TILLER NUMBERS ARE LOW (LESS THAN 1000-1200 SHOOTS/M^2) APPLY 40KG/ DURING LATE TILLERING OR AS SOON AS POSSIBLE.

2. Winter Barley and Oat N timing

Less than 100kg/ha N
Apply this as a single dressing by early stem extension (GS30-33)

More than 100kg/ha N
Split the dressing with 40kg/ha as soon as possible (during tillering) and the rest by early stem extension (GS30-33).

3. **Spring Barley**

Less than 70 kg/ha N
Apply this as a single dressing in the seedbed

More than 70 kg/ha N
Split the dressing with 40kg/ha in the seedbed and the rest by early stem extension (GS 30-33).

Calculating Nitrogen Fertiliser Rates
The content of each nutrient in a fertiliser is given as a percentage. Therefore 100kg of a 20:10:10(two 50kg bags) NPK compound fertiliser will contain 20kg of nitrogen, 10kg of phosphate and 10kg of potash.
The amount of fertiliser product to apply per hectare is calculated as follows:

$$\text{Rate of fertiliser product (kg/ha)} = \frac{\text{Nutrient application rate (kg/ha)} \times 100}{\text{Percentage nutrient in fertiliser}}$$

(Convert kg/ha to units/acre multiply by 0.8)

For example: A field with a mineral soil that was in cereal last year and is destined for spring barley has a SNS of 1. From table 5 the crop requires 150 kg/ha N. Based on using Calcium Ammonium Nitrate (CAN) (27.5%N) the rate of fertiliser can be calculated as follows:

$$\text{Rate of fertiliser (kg/ha)} = \frac{150 \times 100}{27.5} = 545\text{kg/ha of CAN}$$

Winter Wheat Disease Management Decisions for 2004

Due to the development of strobilurin resistance in *Septoria tritici*, during 2002/03, FRAG-UK (the Fungicide Resistance Action Group UK) has issued guidelines for 2004. Our advice is based on these.

- Never apply more than two foliar applications of strobilurin fungicides to a cereal crop (this has been a legal requirement since the 2003 season).

- Where strobilurins are used, do so only in mixtures and always apply with a robust dose of a triazole effective against Septoria. The addition of chlorothalonil to the two-way mixture is particularly effective at the stem extension to first node and at flag leaf emergence growth stages.

- Where possible, use strobilurins as protectant fungicides and not when disease is well established

Why is fungicide resistance important?
Fungicide resistance results in fewer options for effective, reliable disease control. It can lead to lower yields and loss of grain quality and therefore the FRAG-UK guidelines should be followed to help prolong the effective life of current fungicides.

What mixtures should I use?
For *Septoria tritici*, and many other cereal diseases, fungicide mixtures are the key to reliable disease control and yield protection. It is vitally important that mixtures should include partner fungicides with a different mode of action and be used at doses that are high enough to give effective control of the target disease. For control of *Septoria tritici*, any mixture should be based around a triazole product at a robust rate. Strobilurins, when added to a triazole, can broaden the disease control spectrum, maximise green leaf retention and yield, but should **not** be relied on specifically for *Septoria tritici* control.

It is important that dose rates of individual fungicides in a mixture should be effective for disease control and manufacturers' recommendations be followed.

Is timing important?
Timing of the sprays should be based primarily on disease pressure and local experience. If possible, treat crops before the disease becomes well established. Current recommendations suggest three-week intervals between fungicide applications should be adhered to, to prevent disease becoming established in the crop. However, where curative action is required only use products with a label recommendation for curative action. Further advice on timing is contained in the HGCA publication *Wheat disease management guidelines*

When should I apply my strobilurin fungicide?
The question of whether to apply strobilurins at T1 and T2 or at T2 and T3 is a difficult one and reasonable arguments can be made for both approaches.

- Where high Septoria tritici pressure is expected early in the season, which is commonly the case in N. Ireland, a strobilurin application at T1 makes sense.
- In regions with a long grain fill period, such as in N. Ireland again, a strong case can be made for including a strobilurin at T3 except for wholecrop cereals, were the crop is harvested during grain-fill.

Crops at Greenmount Campus will be treated with strobilurins at T1 and T2.

When to spray
The three conventional fungicide timings for winter wheat are commonly referred to as T1, T2 and T3. Ideally, the T1 spray should be applied as soon as leaf 3 (i.e. the second leaf below the flag leaf) has emerged. Although leaf 3 makes only a small direct contribution to grain yield it can, if diseased, serve as an important source of inoculum spreading disease onto leaf 2, the flag leaf and the ear, which together account for approximately 80% of grain yield. If older leaves are diseased, younger leaves which grow using the photosynthate produced by these older leaves will be smaller and this will also reduce yields.

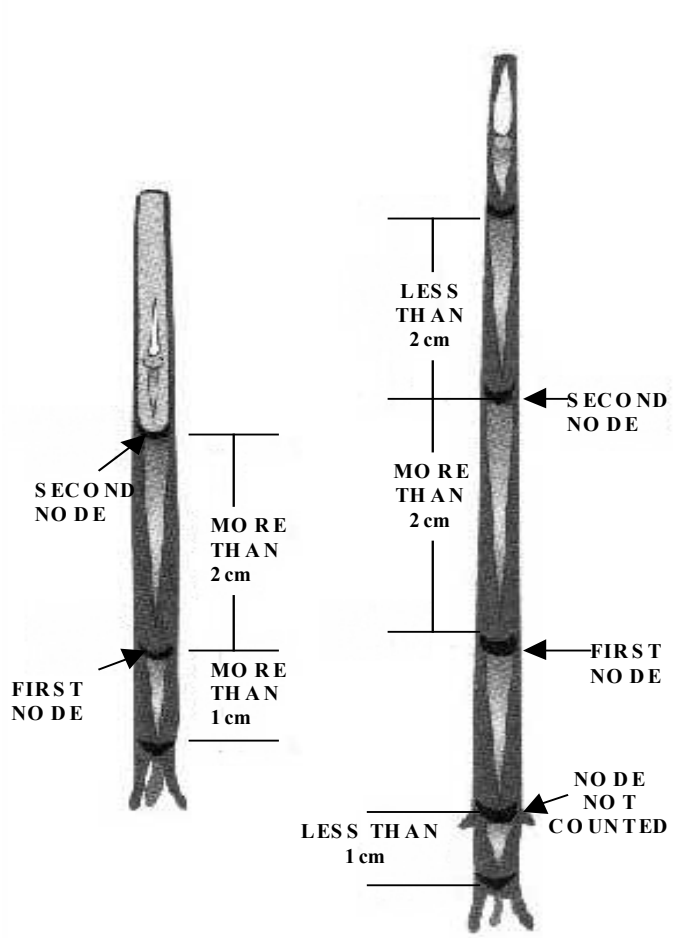
There are two ways to identify the T1 stage:

1. The most reliable, but more difficult, technique involves a sequential unrolling and peeling away of the leaves, starting with the older outer leaves, until the primordial ear is revealed. If it is found that two leaves have yet to emerge, then leaf 3 is recently emerged. If more than two leaves have yet to emerge, then leaf 3 has not yet emerged. If only one leaf has yet to emerge then leaf 3 emerged some time ago and requires treatment urgently.

2. An easier, but not quite as reliable, technique involves splitting the stem with a knife and noting the position of nodes. If the plant is at GS 32 (see diagram 1) then the second node is detectable 2 cm above the first node. At this stage leaf 3 has probably emerged very recently. In the case of late sown crops, however, leaf 3 can emerge before GS 32.

Whichever technique is used it is important to carry out the dissection on the main (normally the largest) shoot of several plants, since not all plants will be at exactly the same stage.

Growth stage (GS 32) 2nd node detectable. Note plant on right has a false node at the base.



Base fungicide programme

The number of strobilurins that can be applied to a wheat crop is now legally restricted to only two in any one season.

The table below outlines the basic fungicide programme for winter wheat

	BASE PROGRAMME		
	T1 – GS 32	**T2 – GS 39**	**T3* - GS 59-65**

Base treatment	triazole	triazole	triazole
In early or average crops or crops destined for wholecrop	strobilurin	strobilurin	-
Where grain filling is prolonged	-	strobilurin	strobilurin
		FOR SPECIFIC DISEASES ADD	
To strengthen Septoria protection	Chlorothalonil (e.g. Bravo)	chlorothalonil	-
To strengthen mildew control	quinoxyfen, metrafenone, spiroxamine or morpholine	quinoxyfen, metrafenone, spiroxamine or morpholine	-
Eyespot control	Cyprodinil Prochloraz or flusilazole		

Selection of particular products should be based were possible on the activity rating guide issued by HGCA. (www.hgca.com)

Based on the principles outlined above the disease control programme for winter wheat at Greenmount Campus will be: -

T1 Epoxiconazole e.g. Opus (0.5l/ha) + pyraclostrobin e.g. Comet (0.7l/ha)
T2 Epoxiconazole e.g. Opus (0.4l/ha) + epoxiconazole plus pyraclostrobin e.g. Opera (1.0l/ha)

All previous editions of Crop Monitor and Crop Management Notes are available on-line at www.ruralni.gov.uk /crops.

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