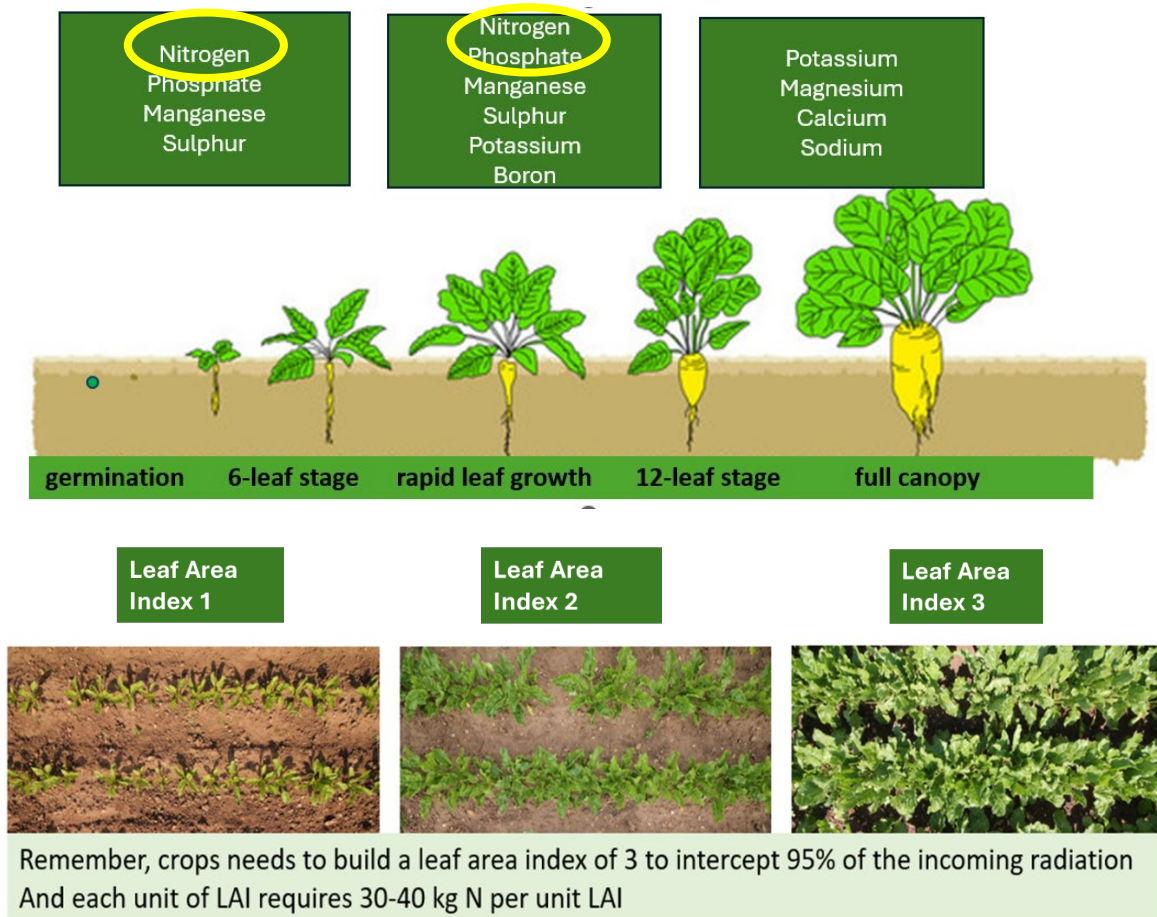


Nitrogen fertiliser for 2024- Getting the balance right

Nitrogen is an essential nutrient for the sugar beet crop, especially for the rapid establishment of the early leaf stages, and then the formation of a full and vigorous canopy. Get this right and it will translate in to optimising the interception of light across the long growing season and producing good yields.

Nitrogen is vital for early canopy growth



However, too much nitrogen, especially a high soil nitrogen level later in the season can have a detrimental effect on yield, encouraging excessive canopy growth at the expense of root growth, as well as increasing the risk of high nitrogen content in the root and higher levels of impurities such as Amino-N. Both effects can conspire to reduce root yield and importantly sugar content.

Analysis of impurity levels in delivered beet crops over the last few years indicates that the amino N impurities have been increasing. This may be due to several interacting factors, including changing weather patterns, but it does mean that crops are more likely to be subjected to the negative effects of high nitrogen on sugar content.

- As storage root N increase, so does the amino-N level
- Typically, amino N levels >150 mg/100g sugar will reduce sugar content
- Remobilisation of N late in the season for example due to leaf senescence following drought, foliar disease, and frost will increase amino N levels.
- Flushes of N in late summer/ autumn due to soil mineralisation can also increase the risk of higher Amino-N levels

Getting the balance right on how much nitrogen to apply is therefore essential.

Assessing the potential Soil Nitrogen Supply (SNS) to your crops is key to making the right decision on nitrogen rates. There is a tendency to treat all sugar beet crops alike but remember when it comes to soil nitrogen levels, no one field is alike and paying more attention to what individual fields require, and adjusting nitrogen rates accordingly is likely to pay dividends for optimising yields and crop gross margins.

High winter rainfall has increased the likelihood of nitrogen leaching losses ahead of 2024 so this factor also needs considering.

Determine the SNS index of each crop

There are six SNS indices and most mineral soils are between Indices 0-4. Organic and peaty soils are usually SNS indices 3-6. The most common approach is to classify the SNS according to the field assessment method. This uses soil type, previous cropping, and rainfall to allocate a field to one of the six SNS indices. It does not take account of the availability of nitrogen from any organic manures applied, cover crops or other organic amendments such as digestate or compost.

The following five steps should be followed when estimating the SNS index. More detailed information as well as the relevant charts are available in the Nutrient Management Guide (RB209)

- 1) Identify soil type category for each field**
- 2) Identify the previous crop**
- 3) Select the rainfall range for each crop (adjust for excess winter rainfall if appropriate)**

Many sugar beet crops are grown after cereals in eastern England (lower rainfall area) and are usually classified as SNS index 0-2 with lower indices (0/1) on very light sand soils and higher indices (1/2) on deep clays and silts.

Excess winter rainfall (EWR) is the amount of rainfall the land receives after the soil profile becomes fully wetted in the autumn (field capacity) and before the end of drainage in the spring (around the end of March). EWR has an important influence on the amount of nitrate leached and, thus, the nitrogen availability to a crop. It should be considered when planning nitrogen applications. Rainfall in the winter period (Oct 2023-Jan 2024) across the sugar beet growing area has been classed as high (>250mm) category, indicating that some nitrogen will have been lost from the soil profile. For some soil types following different crops this may mean a different SNS index to years with normal winter rainfall. For example, on deeper clay and silt soils following cereals with a SNS index greater than 2, the index is one unit lower. See Table 4.5 from RB209 below:

Table 4.5 SNS Indices for high rainfall (over 700 mm annual rainfall, or over 250 mm excess winter rainfall) – based on the last crop grown

Previous crop	Soil category					
	Light sand soils or shallow soils over sandstone	Medium soils or shallow soils not over sandstone	Deep clayey soils	Deep silty soils	Organic soils	Peat soils
Beans	0	1	2	2	All crops in SNS Index 3, 4, 5 or 6. Consult a FACTS Qualified Adviser.	All crops in SNS Index 4, 5 or 6. Consult a FACTS Qualified Adviser.
Cereals	0	1	1	1		
Forage crops (cut)	0	1	1	1		
Oilseed rape	0	1	1	2		
Peas	0	1	2	2		
Potatoes	0	1	1	2		
Sugar beet	0	1	1	1		
Uncropped land	0	1	1	2		
Vegetables (low N) ^a	0	1	1	1		
Vegetables (medium N) ^a	0	1	1	2		
Vegetables (high N) ^a	1 ^b	2	2	3		

- 4) Once the SNS index has been determined you can look up the BBRO recommendation for the nitrogen rate using Table 1

Table 1. BBRO Nitrogen rate recommendations

Major Nutrient Recommendations (Kg/Ha)							
Soil Index		0	1	2	3	4	5
Nitrogen	Mineral soils	120	120	100	80	0	0
	Organic soils					40	0
	Peaty soils						0

Extensive trials over many years have established these optimum rates at the different SNS indices. The crop yield response is very shallow above 100 kg N /ha and BBRO data does not support higher rates. In fact, when the fertiliser price is high (>£350/t) the economic optimum on Index 0 & 1 soils is between 90 and 100kg N/ha.

5) Adjust the rate for any additional sources of nitrogen

Having determined the appropriate nitrogen rate, it is important to make any necessary adjustments for additional nitrogen contributions from sources such as manures, slurries, and cover crops etc, to calculate the N fertiliser requirement. This is important for sugar beet to avoid excess nitrogen soil levels.

Table 2 provides some indicative values but be aware that these will vary according to the source, management, and timing of application and incorporation. Ideally, testing for the nitrogen content of sources such as FYM, slurries and digestates will be more accurate.

Table 2. Indicative values (BBRO data) of available nitrogen from organic amendments and cover crops

Source	Range of available N (kg N/ha)	
FYM & slurry	30-50+	Variable according to source, storage, application, and incorporation date
Digestate	0-20	Variable N content. Loss by volatilisation or leaching likely
Compost	low	Useful source of organic matter but not readily available source of N
Cover crops	30-70	Higher N where legumes are grown, variable depending on cover crop species and biomass

Cover crop nitrogen release. There is an increasing amount of data that show thorough destruction of a well-established cover crop (with good biomass) by the end of February can release useful quantities of nitrogen for the following spring crop; sufficient to increase the SNS by up 1-2 Indices.

Soil Mineral Nitrogen (SMN) testing. An alternative approach to the field assessment method, especially where an additional nitrogen source has been applied, is to undertake a SMN test in the spring. SMN is the measured amount of mineral nitrogen (nitrate-N plus ammonium-N) in the soil profile. SMN is usually measured at three depths in the soil profile (0-30cm, 30-60cm, 30-90cm). This is an especially useful approach following cover crops as the amount can vary significantly. Do not confuse Soil Nitrogen Supply (SNS) and Soil Mineral Nitrogen (SMN). An estimate of net mineralisable nitrogen must be added to the SMN result to calculate the SNS.

Winter rainfall losses from additional N sources.

Due to the high winter rainfall, it is possible that some of the additional nitrogen sources may have been lost. It is prudent to be conservative when adjusting the nitrogen contributions. SMN testing may help to confirm how much is present.

Placement of N can increase nitrogen use efficiency. Experience has shown that total nitrogen requirements can be reduced by 10-15%. Larger reductions are sometimes suggested but BBRO have no data to support these. BBRO has not undertaken any work with spot placement of fertiliser to date, but this is under investigation.

Early nitrogen application - remember that nitrogen is essential for early canopy formation. Make sure there is at least 60-80 kg of available N/ha for the crop before or at emergence at the latest. Don't delay in applying the balance as soon as possible after emergence