Decision support on sulphur application to wheat

Action

Assess S responsiveness index for your location using local soil texture and over-winter rainfall data, along with the matrix table and S deposition map.

Consider other factors (eg organic manuring or buyer's specific S requirements) to decide if your crop needs S fertiliser.

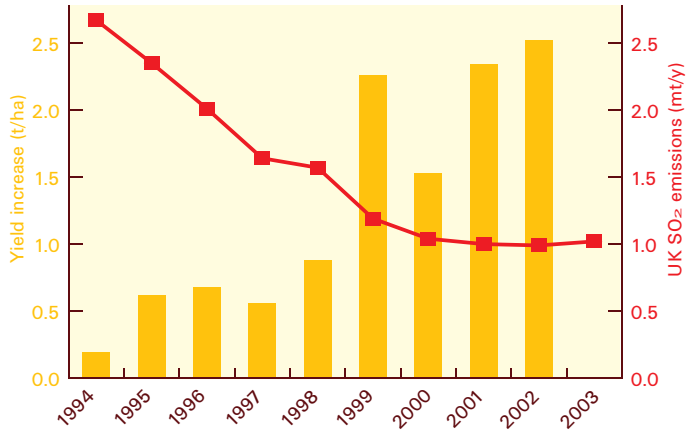
Where response to S is likely, or predicted, apply around 20kg S/ha (50kg SO_3/ha) in March or April.

Always consider your local conditions and consult a FACTS-qualified adviser if necessary.

Atmospheric sulphur deposition

Atmospheric deposition of sulphur (S) to land in the UK has decreased markedly during the past 30 years, as S emissions have fallen. As a result, S deficiency in crops has become more widespread. Responsiveness of crops to S has also increased, particularly at very deficient sites (Figure 1).

Figure 1. Yield responses of winter wheat to fertiliser S have increased while SO_2 emissions have fallen



Trials on sandy soil at Woburn, Bedfordshire, a site prone to severe S deficiency. 20kg S/ha was applied each year to trial plots.

Figure 2 shows S inputs to crops from atmospheric deposition are now less than 15kg/ha in most areas of Britain. Until recently, S deposition varied depending upon proximity to coal-burning industries and prevailing wind direction. However, these factors are now relatively unimportant in determining deposition in any area.

Figure 2. Sulphur deposition map

Data for 2000-2004, provided by Centre for Ecology and Hydrology.

Update on S deficiency

Sulphur deficiency in wheat is expressed as chlorosis in younger leaves. Winter wheat typically requires about 20kg S/ha (1kg S = 2.5kg SO_3). Sulphur improves breadmaking quality. Organic manure applied in autumn would provide very limited S to crops in spring.

Data from 88 field trials on S responses in wheat carried out by TAG and Rothamsted Research since 2000 were collated and analysed statistically.

Key findings were:

- an average 6% yield increase across all trials in response to S application
- a quarter of the trials responded significantly to S; in these, the average yield increase was 27%
- responses were particularly influenced by soil type, over-winter rainfall and S deposition.

HGCA

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Decision support matrix

Using the results of statistical analysis plus knowledge of the S requirement of wheat, a matrix was devised to aid decision making on S application (Table 1).

Table 1. Estimating likely responsiveness of wheat to S fertiliser

a) High sulphur deposition sites (equal to or more than 15kg S/ha/year) *Over-winter (Nov-Feb) rainfall*			
Soil texture	Low (<175mm)	Medium (175-375mm)	High (>375mm)
Sandy	High		
Loamy and coarse silty	Low	Intermediate	
Clay, fine silty or peaty	Low		
b) Low sulphur deposition sites (less than 15kg S/ha/year) *Over-winter (Nov-Feb) rainfall*			
Soil texture	Low (<175mm)	Medium (175-375mm)	High (>375mm)
Sandy	High		
Loamy and coarse silty	Low	High	
Clay, fine silty or peaty	Low		Intermediate

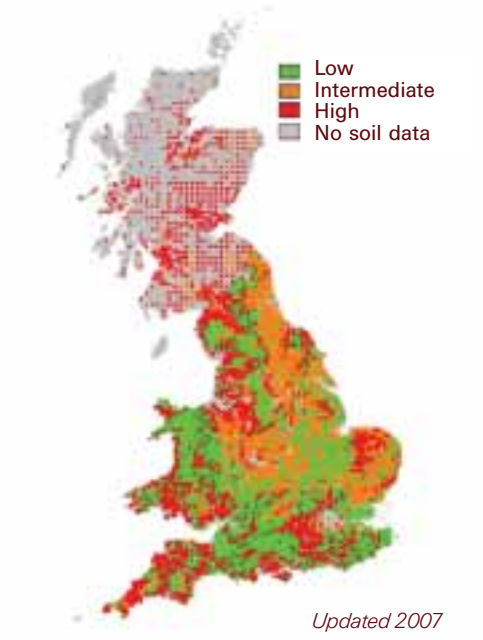
Low S deposition sites correspond to deposition areas red and orange in Figure 2 overleaf.

Yield responsiveness

Figure 3 shows the responsiveness of wheat to S, based on deposition data for 2000-2004, average over-winter rainfall and national soil data (5 km x 5 km grid). Based on this map, the High and Intermediate responsive areas are estimated to account for 26% and 39% of arable land, respectively.

Sulphur application to deficient wheat crops is currently very cost-effective and is not associated with any environmental problems.

Figure 3. Yield responsiveness of wheat to S



Reason for project

Previous HGCA-funded projects have shown that S deficiency has become more common in wheat, affecting both yield and quality. However, farmers may have difficulty in determining whether crops need S fertiliser. To address this, HGCA and The Arable Group funded a project to collate and analyse results from 88 wheat trials and develop a decision support matrix on S fertiliser need.

Main findings

The main factors contributing to potential S deficiency are soil texture, over-winter rainfall and the location of the farm on a yield responsiveness map. The principles developed in this project apply to other cereals, although the data available were not comprehensive and so were not analysed.

Further information

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