

HISTORY AND OUTLOOK FOR SULPHUR FERTILIZERS IN EUROPE

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Abstract

Sulphur emissions increased during the industrialisation of Europe, but by the mid-20th century, the adverse effects of sulphur dioxide on human health and direct effects on crop yields had been recognised. After this, the effects of «acid rain» on natural ecosystems were also documented and legislation was further tightened to severely reduce sulphur emissions in the 1990s. Data on sulphur dioxide in air and sulphate in rain from many Western European countries shows that due to emission controls in the last ten years, the concentrations and potential deposition in all countries is becoming smaller and more similar. During this period the amounts of sulphur in deposition have dropped below the requirements of many crops. Recent evidence shows that most arable soils have not stored the anthropogenic sulphur that was deposited in the past, and that leaching is resulting in decreasing soil sulphur status. This, coupled with the earlier change in Europe to low sulphur fertilisers has meant that crop responses to sulphur-containing fertilisers are now becoming common. There is evidence from the UK that the reduction in sulphur emissions is running almost 10 years ahead of schedule and the occurrence of sulphur deficiency is increasing. The rate of development of sulphur deficiency varies amongst European states, and Eastern European countries are at present less likely to respond. However, with re-structuring of heavy industry in eastern states and the need to abide by EU environmental rules in future, it is likely the same developments will take place throughout Europe. In conclusion, the need for sulphur fertilisers for optimum crop yields, for optimum use of nitrogen and for crop quality is increasing rapidly and will become more widespread in the near future.

Keywords: Atmosphere, Deposition, Acid rain, Sulphur dioxide, Leaching, Crop responses.

SOURCES OF SULPHUR, THEIR PROCESSING AND USE IN FERTILISER MANUFACTURE

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Abstract

Since the start of industrial times, sulphur has been a key raw material for the fertiliser and chemical industries. It is the primary source for sulphuric acid, the world's most widely used chemical, in a host of manufacturing processes. Sulphuric acid is used by the fertiliser industry to manufacture primarily phosphates or phosphoric acid, and also other fertilisers like ammonium sulphate. The sulphur industry has undergone major changes during the past four decades. From being essentially a mining industry, the sector has evolved to a non-voluntary co-product of the petroleum and non-ferrous metals sectors. Changes in sulphur consumption have also been marked. Although sulphur is an increasingly important plant nutrient in its own right, its greatest use in the fertiliser industry is as an input for phosphate fertiliser manufacture. In the 1950s and 1960s a shift from low to high concentration phosphate materials signified a sharp increase in sulphur demand. More recently, non-fertiliser sulphur use gained importance resulting from increased use in hydrometallurgical applications. Sulphur fertilisers can be divided into three groups, fertilisers containing sulphate, fertilisers containing elemental sulphur and liquid sulphur fertilisers.

Sulphate fertilisers provide most of the fertiliser sulphur applied to soils. Elemental sulphur-based fertilisers are the most concentrated sulphur carriers. Modern technologies have improved their properties and increased their use in direct applications or as additives to various fertilisers. Thiosulphates will continue to gain in popularity for fluid fertiliser applications. Sulphur-modified or enriched compound fertilisers using either sulphate or elemental sulphur have several advantages, including improved chemical and physical properties; and providing multi-nutrients with balanced ratios for plant nutrition for direct application purposes. The sulphur fertiliser industry has made several advancements with products in recent years. The sector has developed materials adapted to particular crop and management situations. Sulphur fertilisers include a wide range of products, offering versatility for a variety of applications.

Keywords: Brimstone, Elemental sulphur, Elemental sulphur fertilisers, Frasch, Liquid sulphur fertilisers, Pyrites, Sulphate sulphur fertilisers, Sulphur-containing compound fertilisers, Sulphur in other forms, Sulphuric acid.