

**IFP**INORGANIC FEED PHOSPHATES

---

## Phosphorus and the environment

Phosphorus is essential to all living organisms and, together with nitrogen, it is one of the main nutrients for animal and plant growth.

However, an oversupply of nitrogen and phosphorus can modify the natural environmental balance of certain ecosystems. This is most noticeable in aquatic systems where an increase in these nutrients can lead, in some cases, to eutrophication and problems such as excessive algal growth.

An increase in nitrogen and phosphorus levels can result from a number of factors including poor farm management (inappropriate use of mineral or organic fertilisers, hedge removal, tilling unsuitable land, the absence of crop cover in winter, etc.), inadequately treated domestic sewage and industrial waste water, or from atmospheric sources.

Traditionally, manure has offered a cheap, natural source of both nitrogen and phosphorus. But when the supply of these nutrients exceeds plant growth requirements, the excess nitrogen is either converted into volatile compounds such as ammonia, or into nitrates which can easily run off into surface water or leach into the groundwater system. The excess phosphorus can accumulate in the soil in phosphate form and enter the water system through run-off and soil erosion.

## Basic measures

At a basic level, more adequate measures to store manure, better synchronisation of its application with crop growth cycles and more ecological application techniques, (such as injecting it into the soil and avoiding spreading manure on frozen ground) are important steps to limit the initial run off of nitrates and phosphates into surface water.

Although there is no surplus of manure in Europe as a whole, there are some regions, however, such as parts of The Netherlands and northern Italy, where modern intensive livestock production - principally veal, pigs and poultry - coincides with insufficient land to spread the resulting manure. Initiatives to address this imbalance have primarily focused on two areas:

- The formulation of animal diets to match the animal's nutritional requirements more closely, so reducing the total amount of nitrogen and phosphorus excreted in manure
- Finding effective ways to treat excess manure and recycle the nutrients it contains.



## **Balanced nutrition**

Phase and split sex feeding, corresponding more closely to a particular animal's nutritional requirement at specific stages of its development, is being increasingly adopted by livestock producers in Europe and helps reduce excretion of both nitrogen and phosphorus. In addition, the use of synthetic amino acids, in combination with reduced protein levels in the feed, can further reduce the amounts of nitrogen excreted.

In the same way, significant reductions phosphorus excretions can be achieved by increasing the amount of digestible phosphorus in the diet.

Currently, a large part of the total phosphorus content in a typical diet for monogastrics comes from plant material in the form of phytate phosphorus. This, therefore, passes virtually undigested through the animal and directly into the manure.

Feed formulators are using three main routes to increase the levels of digestible phosphorus in the feed:

- Selection of feed raw materials with an inherently higher phosphorus digestibility
- Supplementing these with high quality inorganic feed phosphates of known digestibility
- Increasing the digestibility of phosphorus from plant material.

Although these measures reduce phosphorus excretion, they also reduce both the nutritive and economic value of the manure. In addition, as has been shown earlier, particular care must be taken to ensure that any reduction in the feed's mineral content does not compromise the nutritional requirements of the animal.

## **Manure management**

Current manure management schemes have been largely prompted by national legislation to reduce the overall nitrogen and phosphorus burden on the land. They have primarily focused on recycling the nutrients contained in manure by processing it to extend its range of applications and reduce the need for other more expensive types of chemical fertiliser.

The main approach to date has been to reduce volume and liquid content of the manure in order to produce a more marketable fertiliser, often in a granulate form. Where suitably processed manure cannot be used locally, the objective has been to make it economically viable to transport it to mineral-deficient areas for use in other agricultural or horticultural applications.

Specific processing techniques have included accumulating the manure's nutrients in a specific fraction, via separation or incineration, or concentrating the phosphorus and other non-volatile compounds through evaporation or drying.

Research continues into viable nitrate and phosphate recycling and CEFIC is actively involved in the research and development of processes to recover phosphorus for recycling into industrial products. Combined with the nutritional measures described above, these activities can lead to a significant reduction in both nitrogen and phosphorus levels and offer a considerable improvement in maintaining an appropriate environmental balance