

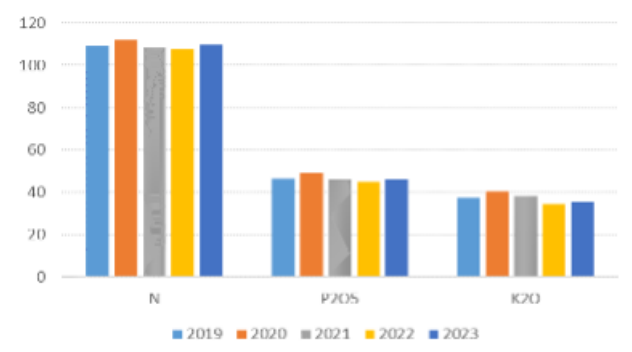
Introduction to fertilizers

Plants require nutrients to grow and develop. While some soils naturally contain sufficient nutrients to support crop growth, others may require fertilizer application to optimize plant health and yield. The term fertilizer refers to “a chemical or natural substance or material that is used to provide nutrients to plants”¹. It is commonly assumed that about half of the food we eat relies on mineral fertilizer applications².

What main nutrients do fertilizers bring?

Nutrients are applied either from organic sources (for example manure and compost) or inorganic sources (mineral fertilizers). Independently from the source, the goal of fertilization is to bring supplemental nutrients to crops. Each nutrient plays a specific role in plant physiology and cannot be replaced by another nutrient. Nitrogen, phosphorus, and potassium are primary nutrients and will be the focus of this series. Others, like sulfur or magnesium, are secondary nutrients that are also essential to plants, but in smaller quantities.

Global fertilizer consumption (million tonnes nutrient)³



Nitrogen (N) is the most important nutrient. It is the basic constituent of proteins. Its availability determines the ability of plants to grow, develop and reach full yield potential. Nitrogen fertilizers need to be applied each year to maintain yield and biomass, except for nitrogen-fixing crops like soybean. It is the most widely used nutrient with over 100 million tonnes used globally each year.

Phosphorus (P, in the form of its oxide P₂O₅) promotes root development, drought resistance, and ripening of fruits and seeds. Close to 50 million tonnes of phosphorus are applied annually.

Potassium (K, in the form of its oxide K₂O) is critical for photosynthesis; it supports the resistance of crops against

lodging and diseases. Global applications of potassium are about 40 million tonnes.

Soils retain phosphorus and potassium for longer periods and farmers may decide to skip applications of P and K fertilizers depending on market contexts. Global use of phosphates and potash can thus vary from one year to the next, more than the use of nitrogen.

What are the main fertilizers?

The terms nitrogen, phosphorous and potassium used in the previous section refer to the nutrients required by plants. Those nutrients are contained in fertilizer products which are in turn called nitrogen, phosphate, and potash fertilizers. A given fertilizer may contain one or more nutrients, in specific concentrations. Fertilizers are characterized by their concentration in each nutrient.

Nutrient content of the most widely used fertilizers				
Fertilizer group	Commercial name	% N	% P ₂ O ₅	% K ₂ O
Nitrogen	AN - Ammonium nitrate	33.5	0	0
	CAN - Calcium Ammonium Nitrate	26	0	0
	UAN - Urea Ammonium Nitrate	32	0	0
	Urea	46	0	0
Phosphate	DAP - Diammonium Phosphate	18	46	0
	MAP - Monoammonium Phosphate	11	52	0
Potash	MOP - Muriate of Potash	0	0	60
NPK	NPK 15-15-15	15	15	15

For instance, the N fertilizer urea 46-0-0 contains 46% nitrogen, 0% phosphate, 0% potash. When considering fertilizer market data, it is critical to pay attention to the unit being reported, either fertilizer tonnes or nutrient tonnes.

As a conclusion, fertilizers differ in terms of the nutrients they contain. In the next issue of the AMIS Fertilizer series, we will dig into the different processes to produce N, P, K fertilizers, and the implications for supply to the global market.

1. FAO, 2019. The International Code of Conduct for the Sustainable Use and Management of Fertilizers. Rome.

2. How a century of ammonia synthesis changed the world", Nature Geoscience, Vol. 1/10, pp. 636-639, <https://doi.org/10.1038/ngeo325>

3. IFA, 2023. Public Summary: Short-Term Fertilizer Outlook 2023-2024.