

PHOSPHORUS FERTILIZERS applied to soils can have up to **90%** USE EFFICIENCY¹

10% to 30% of the phosphorus **applied to soils in fertilizers** is used by crops in the year of application. Most of the remainder becomes available for crops in subsequent years.²

A wide range of factors affect the **content of phosphorus in soil:**

- Type of material from which the soil is derived
- Degree of weathering and erosion
- Climatic conditions
- Crop removal and fertilization

Phosphorus found in soil is classified into two broad groups: **organic** and **inorganic**.



Organic

Organic phosphorus comes from **plant residues, manures and microbial biomass**. In soils that are low in organic matter only 3% of the total phosphorus content may be in the organic form, while for those that are high in organic matter, it might constitute 50% or more.³

Organic phosphorus cannot be used directly by plants. It has to be **broken down** (mineralized) by soil microbes into **soluble inorganic forms**. Approximately 1-3% of the total organic phosphorus in soils becomes available to crops each year this way.

Inorganic

Inorganic forms of phosphorus found in soil consist of **apatite, iron and aluminum phosphates**, and phosphorus that has been adsorbed onto clay particles.

Because both organic and inorganic forms of phosphorus have **extremely low solubility** only **very small amounts** of soil phosphorus are in solution at any one time.

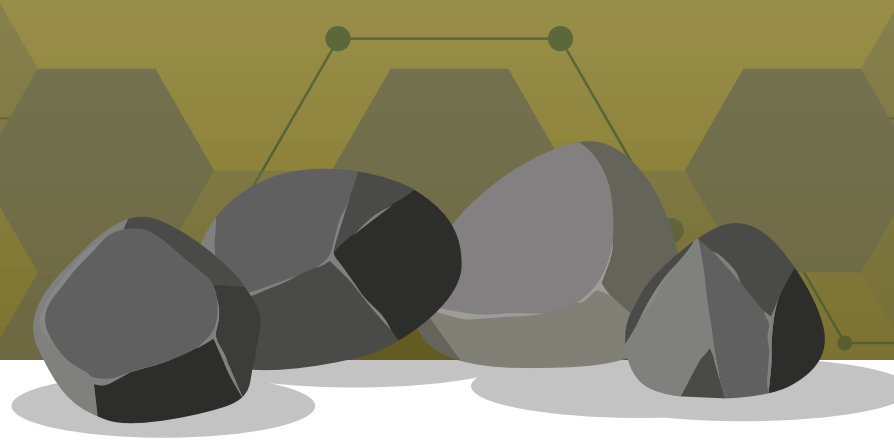
By assessing reserves and using **phosphorus fertilizers alongside good crop and soil management**, the amount of phosphorus in solution in soils can be replaced fast enough to ensure optimal crop yields.

When plants are **growing vigorously** the phosphorus in soil solution may have to be replenished as often as **10 times each day**. A rapidly growing crop could take up the equivalent of about **2.5 kg of P₂O₅ per hectare daily**, for example.⁴

Soluble phosphorus, from both fertilizer or natural weathering, **reacts with clay, iron and aluminum compounds in the soil**, readily converting it to less available forms through **phosphorus fixation**.

Due to its **immovability** very little soil phosphorus is lost by leaching. Fixed phosphorus instead remains in the plant rooting zone where it **slowly becomes available to crops**. Phosphorus tends to be lost by soil erosion and through crop removal.

The more contact there is between **soluble phosphorus** and **soil particles** the greater the risk of **phosphorus immobilization** in soil. As a result, the most efficient way to use phosphorus fertilizer is generally to **apply it shortly before planting crops**.



1 <http://www.fao.org/3/a1595e/a1595e00.pdf>

2 The Agronomy Handbook, Midwest Laboratories. Editors: Don Ankerman, B.S., Richard Large, Ph.D. Page 25.

3 <https://www.cropnutrition.com/efu-phosphorus>

4 http://www.fertilizerseurope.com/fileadmin/user_upload/publications/agriculture_publications/EFMA_Phosphorus_booklet_2_.pdf