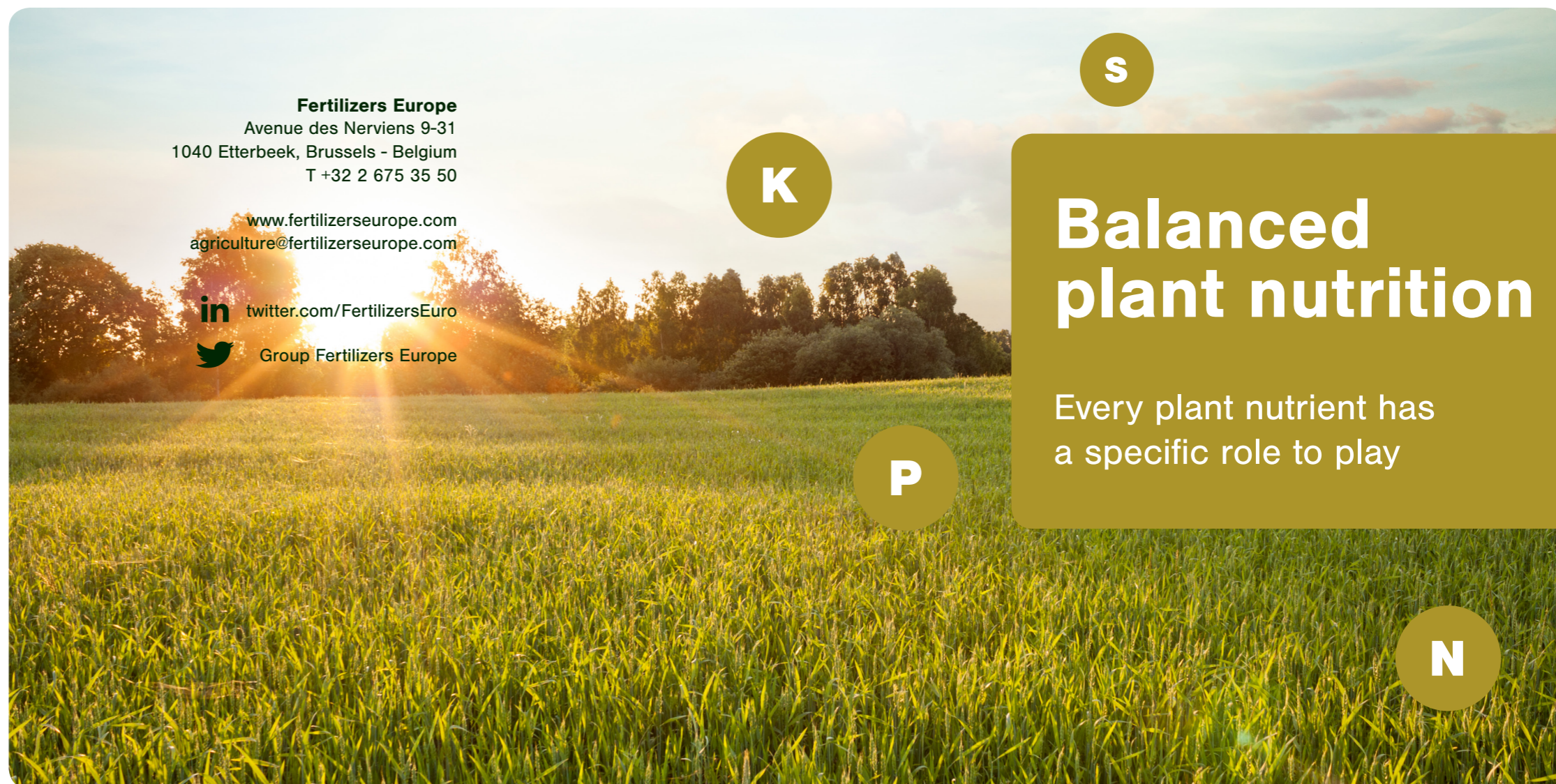


This publication is part of the series highlighting respective contribution of the main nutrients used by farmers and growers in Europe.

- N Nitrogen in food production**
A vital nutrient for life
- P Phosphorus in food production**
Key nutrient for optimal growth
- K Potassium in food production**
Key nutrient for quality
- S Sulphur in food production**
A forgotten nutrient with an essential role



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Balanced plant nutrition

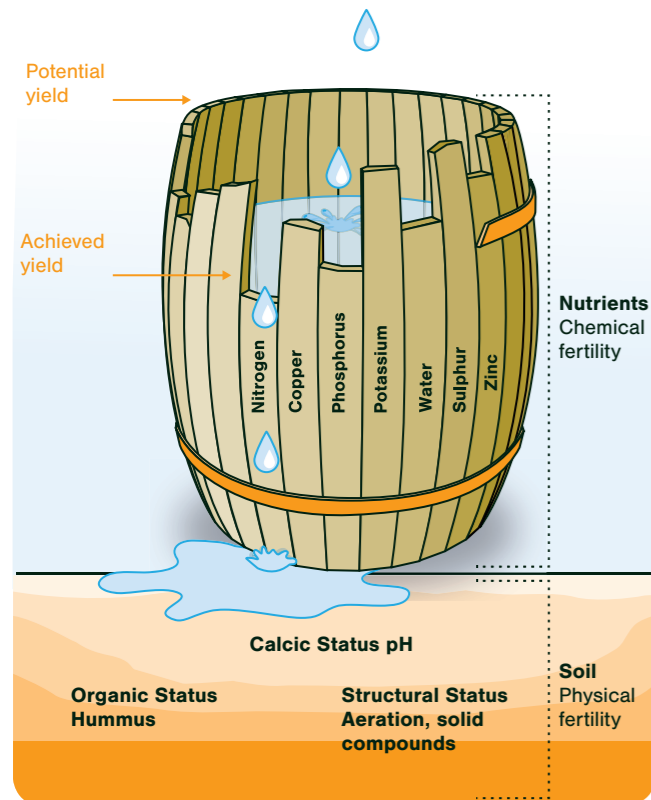
Every plant nutrient has a specific role to play

Balanced plant nutrition is a vital element of sustainable crop and soil management.

Did you know?

- 1** _____
There are **17** most important nutrients for plants, all different pieces of the very same puzzle. Plants must obtain these nutrients from their environment and different sources to grow optimally.
- 2** _____
One nutrient alone cannot deliver sufficient yield and crop quality. It is the **balanced nutrition** between the different nutrients that ensures reaching yields according to the genetic potential of the crops.
- 3** _____
The rate and ratio at which each **nutrient** is needed by a plant changes over its growth cycle. A deficiency in one nutrient cannot be compensated by a surplus of another nutrient.
- 4** _____
Healthy and **fertile soils** need adequate supply of nutrient. Enriching European soils is a prerequisite for sustaining agriculture and European farmers.

What is balanced plant nutrition?



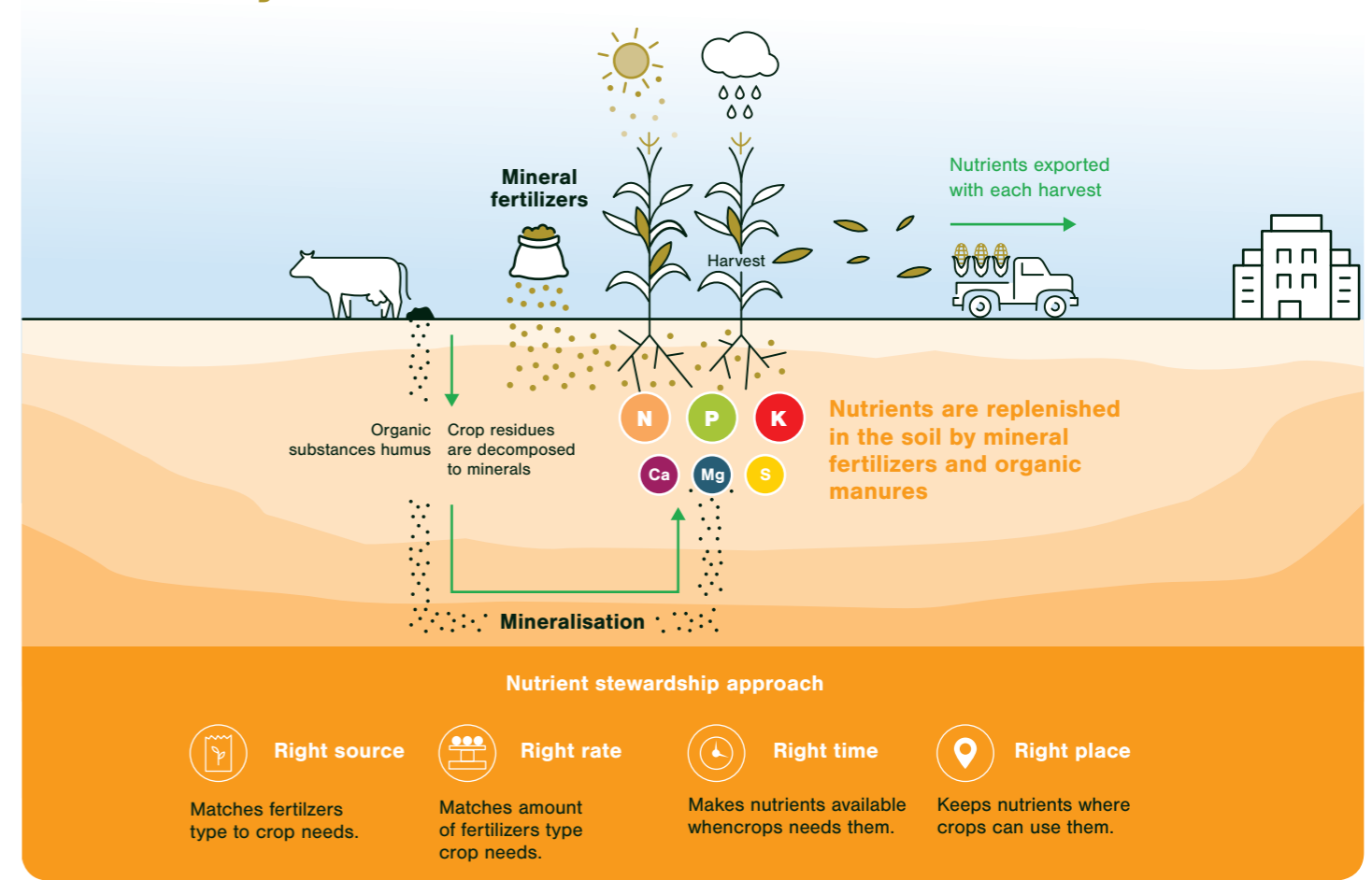
According to «Liebig's barrel» principle, plant growth is dictated by scarcest resource (limiting factor) and not by total resources available.

A deficiency in one nutrient cannot be compensated by a surplus of any of the others. So one nutrient alone cannot ensure the yield, and the balance between the nutrients is essential to ensure reaching yields according to the genetic potential of the crops.

The principle of the Liebig's barrel highlights the key importance of a good soil management as a basis of agriculture practices.

Liebig's barrel - a principle developed in agricultural science by Carl Sprengel and later popularized by Justus von Liebig in the 19th century, a German chemist who made major contributions to agricultural and biological chemistry.

Fertilisers maintain soil fertility

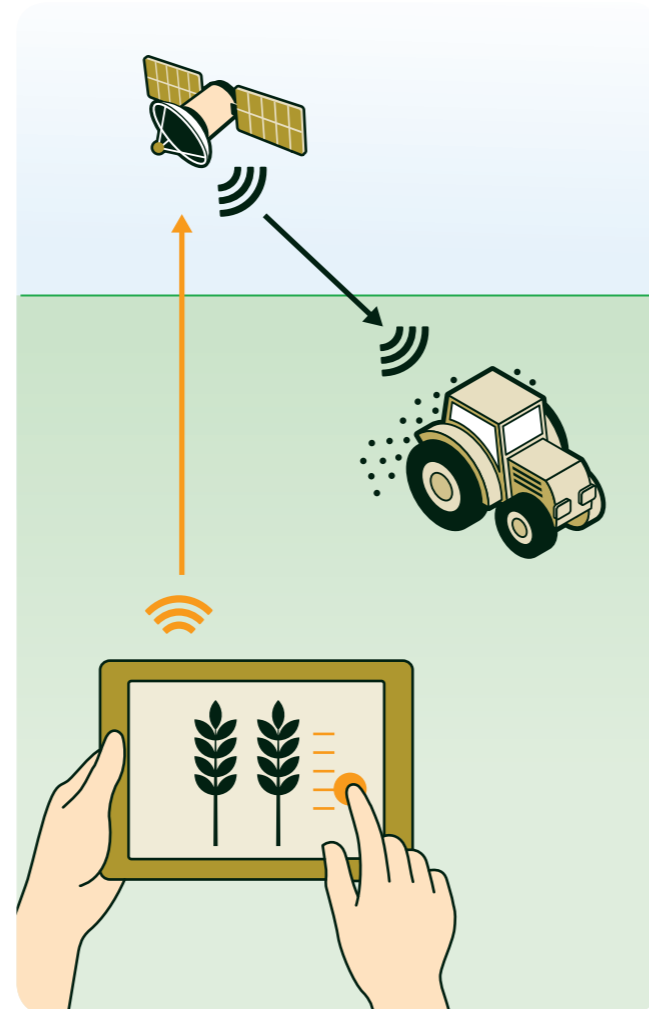


From Liebig's barrel to targeted crop nutrition

The fertilizer industry today focuses on developing practical tools, including GSM-based mobile applications, to help farmers assessing plant nutrient needs and improving nutrient management.

The best indicator of the nutrient supply comes from the crop itself and is used to guide fertilizer application rates later in the growth cycle.

The tools range from simple portable devices such as hand-held metering devices all the way to farm machinery equipped with satellite-produced biomass field maps.



How does a crop actually grow?

Crop growth requires sunlight, carbon dioxide (CO₂), water and a balanced supply of the 17 essential plant nutrients. These nutrients support a plant's essential metabolic functions and are primarily absorbed from water in the soil via the plant's root system.

A certain proportion of nutrients are naturally present in the soil as a result of natural microbial processes that break down decaying plant and organic matter, but usually these need to be supplemented by nutrients from other organic and mineral sources such as mineral fertilizers to ensure optimal plant growth.

When a plant is harvested, the nutrients it has absorbed are exported from the soil and the nutrient supply is depleted. This is why it is essential to feed the crops, and consequently the soil, after every harvest in order to avoid soil depletion.

Balancing crop nutrition for healthy crops and fertile soils

A good crop feeding strategy at farm level can be achieved with a balanced supply of the main nutrients needed. Balanced nutrition is essential to help crops reaching high yields and quality, moving towards a crop's maximum genetic potential.

The challenge for farmers and growers is that the rate and the ratio at which each nutrient is needed by a plant changes over its growth cycle.

The objective of balanced fertilization is, therefore, to ensure that the plant has access to an adequate supply of each nutrient at every growth stage in order to avoid any over or under-supply and to optimize plant yield.