

T1.19 FERTILISATION

What is this?

Fertilisation is a process in which *nutrients* that are not in the required amount are added to the soil. The process aims to increase yield, quality, and profits.

Precision fertilisation technology is emerging as the times require and is becoming an effective means to achieve green and efficient global agriculture. Precision fertilisation technology, supported by information technology, is a new type of agriculture that comprehensively integrates information technology and agricultural production by positioning, timing, and quantitatively implementing modern farm operation and management systems in accordance with spatial variation.

Some additional information...

Every soil has a natural *nutrient* availability, and nature has the means to restore them. In agriculture, however, crops are harvested from the field after reaching a certain degree of maturity, at which point essential *nutrients* are removed from the soil. As a result, the soil is gradually depleted, and yields begin to deteriorate. The soil is supplemented with *nutrients* through fertilisation to counteract these processes.

Fertilisers are applied to provide essential *nutrients* for plant growth after their natural content in the soil has been depleted. Fertilisation, however, must be controlled because excess amounts of fertilisers create a prerequisite for pollution, both of the cultivated plants and the waters. Contamination of water sources is often the result of surface runoff and the leaching of fertilisers from agricultural lands.

For most modern agricultural practices, fertilisation focuses on three primary *macronutrients*: nitrogen (N), phosphorus (P), and potassium (K), with the occasional addition of supplements like rock flour for *micronutrients*. On this basis, there are three main types of fertilisers: *nitrate fertilisers*, which are nitrogen-based and present the largest and most important group; *phosphorus fertilisers*, which come from phosphate rock, and *potassium fertilisers*.

On the one hand, the world industry uses millions of tonnes of natural raw materials such as air, natural gas, and various ore fossils to produce high-quality plant nutrition products.

On the other hand, farmers can use so-called *organic fertilisers*. They are products of natural origin and represent by-products or waste matter. Human intervention for their transformation into fertilisers is reduced to physical extraction or limited assistance in the processing stages.



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Most often in the form of *organic fertilisers*, applied to nourish the soil, they find animal manure, compost, waste from the food industry, sewage sludge, household solids, and others. The positive characteristics of *organic fertilisers* are that they improve soil health and gradually release *nutrients*. The negatives are associated with the high energy costs for their transport and application, as well as the presence of some toxic substances in them.

It is considered that a more stable and sustainable way to provide the soil with *nutrients* compared to traditional inorganic and *organic fertilisers* is the application of the so-called *bio-organic fertilisers based on microorganisms (BFM)*. It is a new type of organic fertiliser that consists of specific living microorganisms in microbial aggregates. These microbial aggregates can capture *nutrients* or benefit from *nutrient* transformation. When *BFM* is applied to the soil of arable land, microorganisms activate, correct, or regulate environmental conditions and affect the food cycle.

Fertilisers are increasingly popular because they successfully support plant growth and increase yield. But there are *some adverse effects* if fertilisers are used without knowing the soil's *nutrient* needs. The most significant are:

1. No optimal yield due to under- or over-fertilisation;
2. Wasting money on fertilisers farmer's soil does not need;
3. Wasting limited resources;
4. Causing environmental damage due to over-fertilising;

The *primary purpose of fertilisation is to maintain soil fertility*. A soil whose fertility is maintained has *favourable opportunities* for plant growth and ensures the production of food containing *nutrients* necessary for human health.

The first steps of precision fertilisation were made in the 1990s. At that time, attention was focused on the correspondence between the specific environment of the particular crop and the methods of fertilisation, the types of fertilisers, and the amounts of their application. In this period, farmers analyse soil type, weather conditions, crop needs, and other factors to determine a specific fertilisation approach instead of the general field-wide approach previously practised. The development of modern techniques and technologies gives even more excellent opportunities to farmers for individual treatment of crops based on the available rich information about soil availability, climate, and crop needs.

Modern *precision fertilisation tools* allow farmers to fertilise at variable rates depending on the *nutrient* needs of the particular crop, chelating factors, soil fertility, topography, and other factors. The rule of the 4 R's: the right place, the right price, the right time, and the right source is derived, which describes the meaning of *precision fertilisation* technology.





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Precision in variable fertilisation rates is ensured using GPS-guided technology, which limits the risk of errors and the possibility of duplication of already treated areas. Existing equipment and *advanced fertilisation tools* allow easy and accurate application of variable amounts of fertilisers with the required *nutrients* and at the right time. A specific term in the process of feeding crops is *fertigation*. It is a process in which a water-soluble fertiliser is applied to the plant's root along with water. This simple approach provides an adequate amount of water and *nutrients* directly to the plants' roots.

Developing the techniques and technologies allows farmers to apply *precision fertigation*. Depending on the type of equipment that farmers have, fertigation systems can be manual or automated. Both sprinkler-based systems and drip and flood irrigation systems are used.

It has been found that *nutrients* are absorbed more efficiently when the plant's root system is wet. This makes fertigation extremely beneficial to crops. Through this process, *nutrient* absorption is improved, and feeding

can be done whenever the plant needs fertilisers, unlike traditional fertilisation, which is done once a year. Despite its strengths, it should be noted that fertigation carries a high degree of contamination risk and should be applied very carefully.

Advanced fertilisation systems allow crop production to be optimised regardless of the wide variety of crops and the wide range of climatic conditions observed worldwide. The abundance of data from the multitude of sensors used in modern agriculture allows precise specification of applied fertilisers. As a result, input costs and carbon footprints are reduced, and productivity and profits are increased, contributing to improved farm and public welfare in sync with environmental protection.



Farmer capturing Green Seeker value in Wheat for nitrogen Management at the right time. (Photo: CSISA)

Source:

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Links

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Video

https://www.youtube.com/watch?v=W6E_MyVjQX4

<https://www.youtube.com/watch?v=jJSUN-r3ZXo>

Keywords

Nutrients

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Organic fertilisers

Bio-organic fertilisers based on microorganisms (BFM)

Precision/Advanced fertilisation tools

Precision fertigation