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Soil fertility/Plant nutrition
= Fractionated analysis + AKRA-system
(a combined perspective)

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Soil fertility

Soil fertility is the ability of the soil to bear **fruit**, to serve as a site for **plants**, and to produce regular crop yields of high quality in a **sustainable** manner (Gisi, 1990). Schröder (1992) extends the definition by the terms **yield capacity** and productivity.

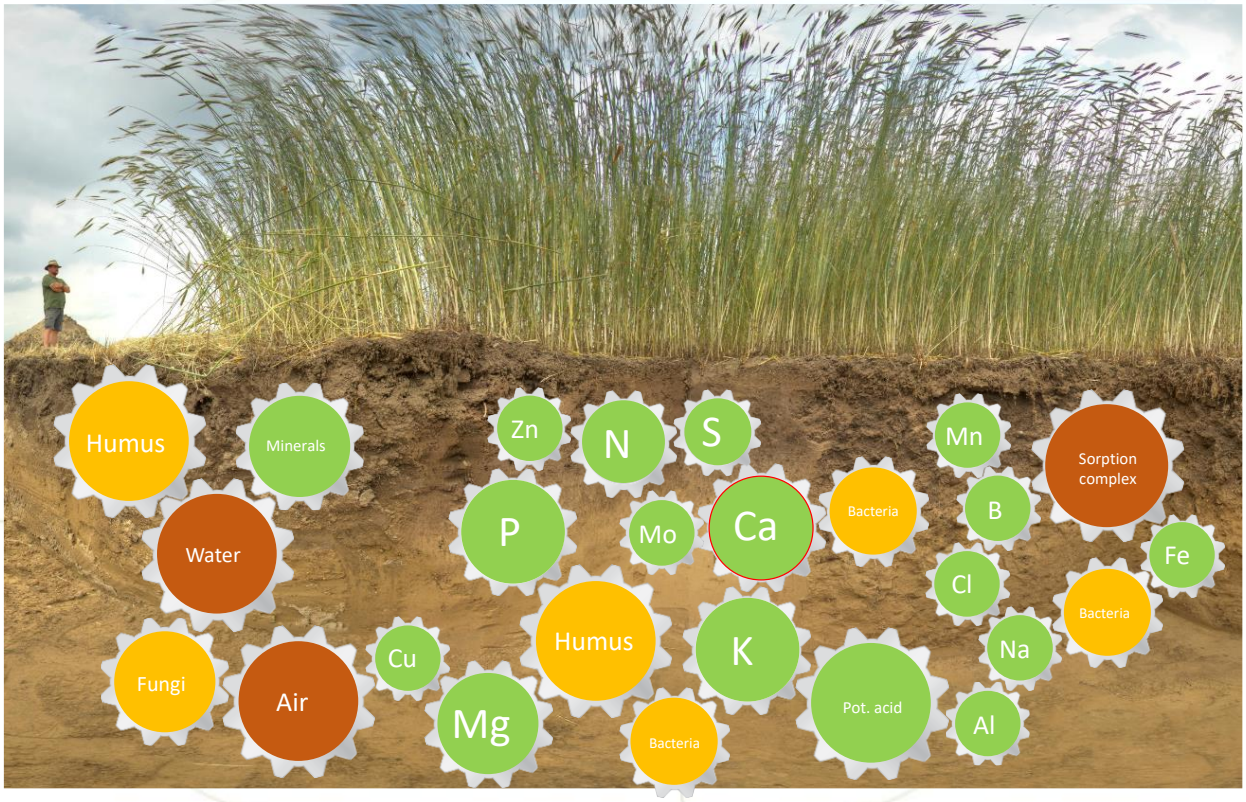


Figure: Schematic visualization of the "gearbox of soil fertility" (Unterfrauner, 2018; Idea: Ulrich Völker)

Soil fertility can be visualized as a "**set of gears**" in which the various reaction partners of the dynamic processes in the soil act as **cogs**. Only if the gearing is guaranteed and the speed of rotation is coordinated, the gears run smoothly and **soil fertility** (yield capacity) is ensured in a sustainable manner.

Through various **unfavourable** measures such as overfertilization, inappropriate fertilization, overuse, mistakes in soil cultivation, but also changes in climatic conditions (climate change), the interaction of these gears may be impaired and soil fertility may be disturbed.

The analytical recording of soil fertility is carried out with the **fractionated analysis**.

Fractionated analysis

The method of **fractionated analysis** was developed by Prof. Husz and is based on the **Russian-Hungarian Soil Science**, where the genetic point of view is in the focus. The method is **standardized** by the Austrian Standards Institute (ÖNORM 2122-1) and **accredited** by the Austrian Ministry of Science (BMWFW). Therefore, the scientific nature of this method has been repeatedly confirmed. In addition, it is not a static method, but subject to **continuous** review and **supplementation**!

By analyzing **137 individual parameters** per sample, many of the factors ("gears") are recorded and evaluated in their concentration and in relation to other relevant parameters. Therefore, each soil and each analysis are unique.

In case of deviations from the optimal ranges, recommendations are worked out to "lubricate" the gears in its entirety and to bring it back to full yield capacity (site-typical). It is **not** about the derivation of **fertilization measures**, but of measures to **structurally influence** the **dynamic** processes in the soil, which optimize the soil fertility sustainably.

For the implementation of the measures, a partner who also puts the holistic view of the system in the foreground is necessary. To ensure a proper nutrient supply for plants, it is not only about the supplementation of nitrogen, phosphorus and potassium!

The AKRA (fertilizing) system

With the **AKRA (fertilizer) system**, as is the case with the **fractionated analysis**, the **holistic consideration** of the soil fertility (=yielding capacity) is in the focus.
The measures derived from the fractionated analysis require certain products or product combinations which can be specifically composed and mixed by our partner company **KARNER Fertilizer Production**.

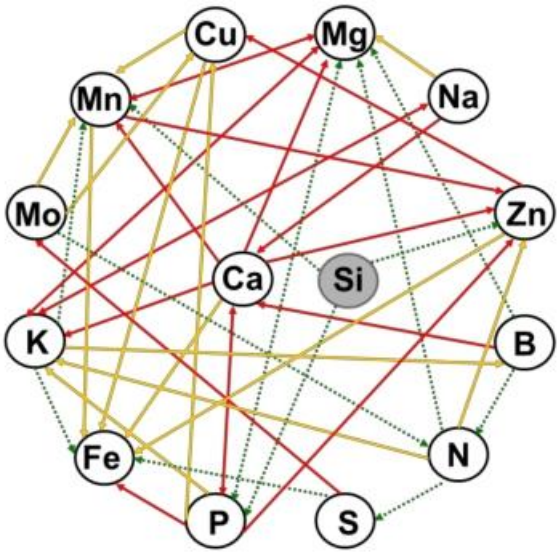
The AKRA (fertilizer) system consists of different components which complement each other and only bring the predicted success when fully implemented.

Products for the improvement and maintenance of soil fertility are **AKRA D-G-C** and **AKRA Kombi**.

AKRA D-G-C is a finely ground mixture of dolomite, gypsum and lime; This mixture neutralizes a certain calculated amount of acid and provides **calcium** from 3 different chemical bonding forms. Thus, calcium is available as a nutrient throughout the growing season and can also act as a bridge between clay-humus particles to promote aggregate stability. Furthermore, the nutrients **magnesium** and **sulfur** are released from the D-G-C. The application rate is based on the results of the fractionated analysis.

AKRA Kombi consists of 16 different **individual components**. The main and trace elements contained are embedded in low concentrations but optimal ratios in a matrix of **zeolite**.They are not water-soluble, but become plant-available only at low substance concentration levels in the soil solution. This provides a "basic supply" of trace elements for the crops via the soil, without the need of top-up fertilization of individual nutrients. The silicic acid contained in the soil can bind various phosphorus fractions in the soil and make them available for the crop. The high-quality zeolite increases the ability to bind nutrients in exchangeable form.

Both products, when used regularly, lead to a structural system change in the soil, the "gears" of soil fertility are lubricated!



The figure on the left shows the interactions between nutrients. If only individual nutrients are used in plant nutrition, the entire interaction structure shifts and there is a danger that other substances will be suppressed (antagonism), resulting in a deficiency. **There is no deficiency without a simultaneous surplus!**

AKRA products for above-ground plant nutrition

The **AKRA Blatt** product contains 2 main nutrients and 5 trace elements in sulfate bonding form. The **AKRA PLUS 9** contains 2 main nutrients and 7 trace elements in acetate bonding form. The different bonding forms cause a faster penetration into the leaf blade which allows the reduction of plant protection products (fungicide reduction = cost saving!) The substance concentrations are low, the substance ratios are optimal. If a plant stock indicates the deficiency of a nutrient (e.g. deficiency of manganese in spring), the supply of manganese as a single substance is risky (see figure above). If, on the other hand, a low concentration of many substances is applied, there are **NO blockages** due to deficiency/surplus and the metabolic processes can run optimally. These products are therefore suitable for optimal utilization of energy (photosynthesis) and for bypassing waterlogging and drought damage.

In addition to the standard application, a specially formulated lactic acid biology **(AKRA MSB)** is added, which strengthens the plants by increasing microbiological diversity and provides vitamin C.

To support nitrogen nutrition, **AKRA N bacteria** are added to foliar applications. **AKRA Azotobacter N bacteria** and **AKRA Azoarcus N bacteria** are free-living (nonsymbiotic), nitrogen-fixing bacteria that are fed by the plant only when N is required.
ATTENTION: The nitrogen bound via bacteria is "balance-free nitrogen"!

AKRA products for seed treatment

AKRA N-Bacteria can also be applied to seeds together with **AKRA MSB**. The seedling is provided with a balanced supply of nutrients and, in addition, the **AKRA N-bacteria** can systemically colonize the plant in the course of vegetation and provide another essential contribution to the N supply (see above).
The application of the bacteria is only efficient if the appropriate milieu conditions prevail in the soil (pH value). The regular use of **AKRA D-G-C** and **AKRA Kombi** optimizes the milieu conditions!

AKRA (fertilizer) system: Only the application of all components of the system brings sustainable success!

Fractionated analysis + AKRA (fertilizer) sytem = Soil fertility