The microbial biomass consists mostly of bacteria and fungi, which decompose crop residues and organic matter in soil. This process releases nutrients, such as nitrogen (N), sulfur (S) and, to a lesser extent, phosphate (P) into the soil that are available for plant uptake. About half the microbial biomass is located in the surface of a soil profile and most of the nutrient release also occurs here. Generally, up to 5% of the total organic carbon and N in soil is in the microbial biomass. When microorganisms die, these nutrients are released in forms that can be taken up by plants.

Factors affecting microbial biomass

The microbial biomass is affected by factors that change the water regime or carbon content of soil, and include soil type, climate and management practices. Soil properties that affect microbial biomass are clay, soil pH, and organic C. Soils with more clay generally have a higher microbial biomass as they retain more water and often contain more organic C. A soil pH near 7.0 is most suitable for the microbial biomass.

Management of crop residues influences microbial biomass as they are one of the primary forms of organic carbon and nutrients used by the microbial biomass. Retaining crop residues rather than burning them provides a practical means of increasing the microbial biomass in soil by increasing the amount of organic carbon available to them. Tillage practices that are less disruptive to soil can increase the microbial biomass because of by increasing labile carbon in soil. These management practices also protect soil aggregates and do not break fungal networks, which are an important habitat for the microbial biomass in soil. The type of crops in a rotation can affect the microbial biomass. The residues of legume crops can increase microbial biomass due to their high N contents.
Measurement of soil microbial biomass at Eurofins AgroScience

Measures of microbial biomass usually measure either the weight of carbon or nitrogen in soil microorganisms. A challenge in interpreting values of microbial biomass is the difficulty of knowing the attainable microbial biomass for a given land use and what level of microbial biomass may constrain production.

Eurofins AgroScience uses an innovative method, near infrared spectroscopy (NIRS) technique, which gives insight in the microbial soil life. This information can be used to adjust the soil fertility. Eurofins AgroScience measures three indicators together provide a picture of the microbial soil life: the microbial biomass, microbial activity, and the fungal-to-bacteria ratio. These indicators as standard in soil fertility management as an example shown in the below table.

- **Microbial biomass**: The total amount of biomass in a soil sample is determined based on the phospholipid fatty acids (PLFAs) present. These fatty acids are an important component of the cell walls of all microorganisms in the soil. Because these fatty acids break down rapidly in the soil when an organism dies, Eurofins Agro uses PLFAs to measure the living soil life.
- **Microbial activity**: By measuring how much organic matter is being broken down by the soil life, we can obtain an impression of the activity of the microorganisms present. The amount of nitrogen (N) released when organic matter breaks down within a certain time determines the microbial activity.
- **Fungal-to-bacteria ratio**: The fungal-to-bacteria ratio provides a picture of the mineralization process in the soil. If there are large numbers of fungi in the soil, organic matter will build up. In soils with relatively larger numbers of bacteria, however, the amount of organic matter will decline as it breaks down and nitrogen and sulfur mineralization will be relatively higher.

<table>
<thead>
<tr>
<th>Unit</th>
<th>Result</th>
<th>Target value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Microbial biomass</td>
<td>237</td>
<td>165 - 495</td>
</tr>
<tr>
<td>Microbial activity</td>
<td>7.4</td>
<td>60 - 80</td>
</tr>
<tr>
<td>Fungal/bacterial ratio</td>
<td>0.7</td>
<td>0.6 - 0.9</td>
</tr>
</tbody>
</table>

An understanding of the indicators of soil life is essential if we want to improve the resilience and fertility of our soil. With this information, we can put the right measures in place to maintain or even improve our soil ecosystem.

In addition, Eurofins AgroScience also determines the quality of organic matter in relation to soil microorganisms. Organic matter consists primarily of C, N, P, S. If the organic matter contains relatively high amounts of N and/or S, this makes it attractive to soil organisms. N and S are released in the process and the amount of organic matter decreases slightly (dynamic organic matter). Organic matter can also contain a lot of C. This is generally less attractive to soil organisms (bacteria). As a result, the organic matter is not consumed as quickly by the soil organisms; making the organic matter more stable. Stable organic matter contributes - among other factors - to the workability of the soil and the looseness. Dynamic organic matter contributes primarily to the release of N and S and is therefore a source of these nutrients for the crop. The quality of the organic matter can be changed (gradually) by paying attention to the properties of soil improvers such as animal manure, compost and crop residues.

About Eurofins Agro

Eurofins Agro is a leading laboratory in the agricultural sector with nearly 100 years of experience. We provide innovative analyses, accurate and timely data and clear, case-specific advice, to help agricultural entrepreneurs to manage their production process. Our products and services are the result of everyday, practical knowledge supported by scientific research.

Eurofins Agro’s Vision and Mission

We help you to collect the right data, and provide insight into soil and crop health, fertilization, irrigation, feed value, and food safety. We give you greater insight with the prospect of profitable growth – growth that you can be proud of.