



Growing soybeans: Microbiomes in the soil & plant

Key takeaways

In agriculture, having the right kind of **soil microbiome** can **support plant growth** and **resilience**, contributing to:

- improved yields
- increased resilience to environmental stress
- reduced costs & better profits for farmers
- more resilient and sustainable food systems

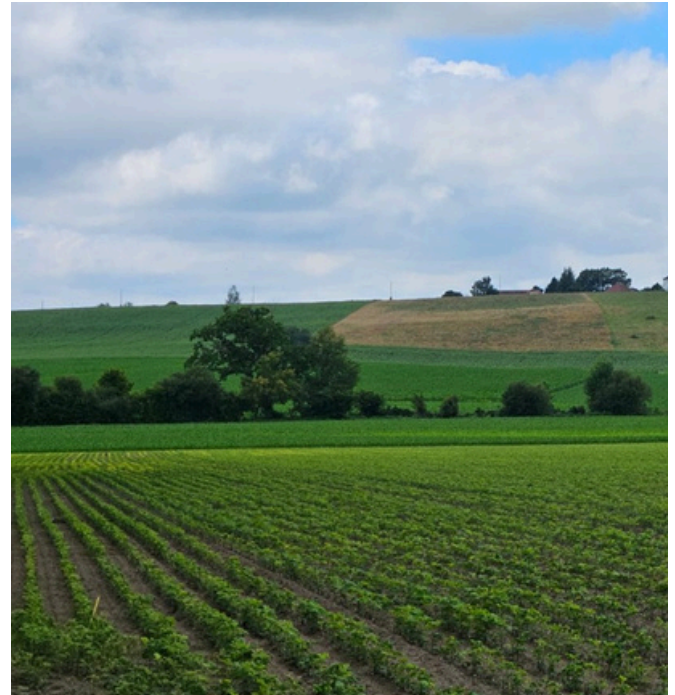


Figure 1: European soybean field

Microbiomes in European soybeans

European soybean growers face challenges from **poor soil health**, **difficult climate conditions** and **high agrochemical costs**. In MICROBIOMES4SOY, we aim to boost soybean yields by using **natural soil microorganisms** to improve crop health and resilience while **reducing reliance on chemical fertilisers**.

Soils, plants and roots host diverse microbial communities, notably in the **rhizosphere** (the region around the roots), which contribute to nutrient provision and stress resilience. By analysing soybean soils across Europe, our research team aims to identify **which microorganisms help soybean grow stronger, absorb nutrients, tolerate drought and resist diseases**. Beneficial microorganisms identified by MICROBIOMES4SOY will be tested in lab and field conditions for their effects on plant growth and stress resilience. Scientists will develop **AI-based models to match microbial strains to specific field conditions**, ensuring effective use by farmers. The aim is to ensure **easy adoption of microbiome-based farming practices for farmers**: European soybean growers will receive guidelines and resources to learn about how beneficial microorganisms can help in their crop system.

What is the microbiome?

Microorganisms (e.g., bacteria, archaea, fungi and viruses) are everywhere: in our bodies, our food, and the environment. A **microbiome** describes a community of microorganisms living in a particular environment, along with their interactions with each other and their surroundings.



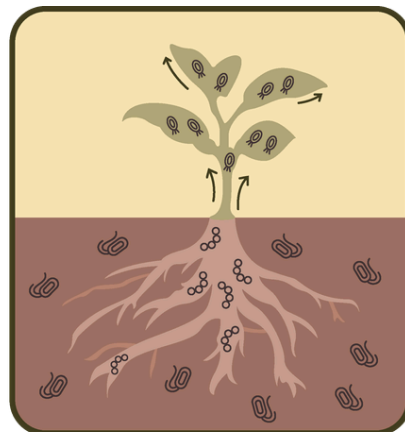
Enhanced inoculants improve seed quality and soil health.



Microbiome-informed practices can make soya plants more resilient, with stable yields even under stress conditions like drought, and **improved disease resistance**.



Improved plant growth results in more nutrient-rich crops, leading to healthier food.



Better agricultural practices can help farmers boost their yields and improve their livelihoods.

Figure 2: The role of plant and soil microorganisms in soybean crop health and nutrition

The research process

In MICROBIOMES4SOY, **universities, research institutes, & agri-companies collaborate to help farmers grow better soybeans using nature-based solutions**. Soils were collected in France, Austria, Hungary, Italy and the Netherlands. Field trials and plant trait assessments took place in Italy, and plant microbiome and seed quality analysis were carried out in Austria.



Figure 3: Lysimeter trials in Italy



Figure 4: Soybean soil collection in Europe

The way forward



Figure 5: Phenotyping center in Utrecht

Microbiomes are vital to human and planetary health and their benefits ripple through the food chain, contributing to healthier, more resilient food systems. MICROBIOMES4SOY applies this concept from **soil to gut**, where microorganisms and farmers can work together to influence healthier and more productive yields.

- **In agriculture**, plant-associated microbiota and agricultural management approaches influence plant, soil and seed quality.
- This has **trickle-down effects on the nutritional content of crops**, with more protein-rich soybeans and potentially reduced antinutritional factors.

Follow MICROBIOMES4SOY to learn more

Understanding microbiomes across the food chain can help create healthier diets and more sustainable food production. Follow MICROBIOMES4SOY to discover how this research is shaping the future of food.



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Partners

