

UNDERSTANDING SOIL HEALTH:
QUALITY, FERTILITY, AND RISK
OF EXPOSURE TO DISEASE

MICROBIOME ANALYSIS

AGRICULTURAL SOIL: A LIMITLESS SOURCE OF INFORMATION

In a single kilo of healthy agricultural soil there are billions of living organisms, collectively known as “microbiota” which can be analyzed using high-capacity sequencing technology in conjunction with cutting-edge bioinformatics software, to

- identify hundreds of thousands of sequences specific to soil organisms
- inventory the organisms living in a soil sample;
- determine the proportion of each organism in the soil's biological community; and
- connect the known biological functions of each organism to the soil sample.

Soil microbiota analysis measures a number of biological indicators that—in conjunction with physical-chemical, agronomic or climatic indicators—can be used to calculate indices of the soil's health, quality, fertility, as well as its susceptibility to disease.





HEALTHY, FERTILE SOIL

A RESOURCE WORTH PROTECTING

Agricultural soils host a wide variety of life forms. Organisms residing in soil help maintain good structure, promote water retention, degrade organic matter, and recycle nutrients.

A UNIQUE SIGNATURE AND A HIGHLY ACCURATE TECHNIQUE

Just like humans, organisms living in the soil have a unique DNA that can be used to identify them and confirm their presence. New soil health analysis techniques employ high-throughput DNA sequencing to detect the presence of bacteria, fungi, and microfauna. These methods can be used in addition to conventional analyses to help agronomists provide accurate recommendations to growers.

Less than 10% of living organisms in soil can be isolated using conventional identification methods, while DNA sequencing detects all the organisms present.



A POTENTIAL BOON FOR THE AGRO-ENVIRONMENTAL SECTOR

NEW ANALYSIS TECHNIQUES AVAILABLE

Molecular analysis techniques have made great strides in recent decades. Microbiota analysis can now identify hundreds of thousands of organism-specific sequences to help scientists inventory all the living organisms in a soil sample.

COMPREHENSIVE INFORMATION IN A SINGLE ANALYSIS

A single soil microbiota analysis provides more detailed biological information than several hundred conventional microbiological analyses!



SELECTING THE BEST AGRICULTURAL PRACTICES

Microbiota analyses and their various associated indices help agronomists advise growers regarding the best agricultural practices to optimize soil productivity, ensure the sustainability of crop production systems, and enhance their competitiveness.

ASSESSING THE PERFORMANCE OF CORRECTIVE MEASURES

Microbiota analyses can also be used to assess the impact of modifications made to soil (e.g., compaction, organic material content, pH, drainage), to cultivation practices (e.g., tillage, semi direct, reduction in work time, fertilization type), and to crop production systems (e.g., type and duration of rotations, green manures, covering crops). They are also useful when evaluating the efficacy of corrective actions.





FUTURE AGRICULTURAL AND ENVIRONMENTAL POLICIES

TOOLS TO ASSIST POLICY MAKERS

High-throughput DNA sequencing has proven its worth in complex fields like medicine and forensic sciences. Due to its high level of precision, it has also become a leading edge tool in the agri-environmental sector.

The very precise tools used and the high quality data generated by microbiota analysis represent major assets for officials designing policies to regulate agri-environmental development in Québec.



IRDA MICROBIAL ECOLOGY LAB

A CUTTING EDGE FACILITY

IRDA offers metagenomic analyses—a methodology that can identify and characterize the full scope of the bacteria, archaea, fungi, and microfauna populations in complex environments such as soil and biofilm, or in any other ecosystem.

OUR SERVICES

- Measurement of alpha and beta diversity indices that provide information on a single sample or a comparative analysis of different samples
- Taxonomic identification and relative presence of each microbial community or group in the soil
- Interpretations as per your study methodology and parameters (PCoA, etc.)
- Measurement of the impact of agricultural protocols and practices on soil microbial communities

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