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# Soil Quality and Health

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## Editorial

The focus of all applied sciences, especially agriculture, is on preserving natural resources on Earth. Soil, being the most vital resource, is fundamental to agricultural production and fulfills the food and health needs of living organisms. Protecting this resource contributes to sustainable development and ecological balance, and directly impacts soil quality and health, thereby advancing the goals of sustainable development in agriculture. Therefore, soil quality has been recognized as one of the three main components of environmental quality, alongside water and air. It also represents the soil's ability to perform functions within the ecosystem while using the land with the aim of preserving the quality of the ecosystem and increasing its biological productivity. This is through the soil's ability to provide the necessary requirements for plant growth, sustainability, and increased productivity. Thus, preserving and improving soil quality through sound management practices has become a major international goal. The assessment of soil quality and performance is reflected through measuring soil properties, whether they are physical, chemical, fertility-related, or biological, or the combined effect of these properties on soil quality. The assessment process is a preliminary step to addressing the problems that appear in the soil and are reflected in its properties, thus reducing its quality [1-3].

Soil quality is defined as the capacity of soil to perform a wide range of functions, which can be assessed by measuring its chemical, physical, and biological properties. To prevent soil degradation, adapt to climate change, and achieve the 2030 Sustainable Development Goals set by the United Nations General Assembly, it is crucial to determine and assess agricultural soil quality and evaluate how it changes over time. This enables the implementation of appropriate management practices. And to complement the quality of the soil, the importance of its health becomes evident. The two terms are metaphorically linked by a close connection, and both express the soil's ongoing ability to function as a living ecosystem that sustains plants, animals, and humans. This links agricultural and soil sciences with public policies to determine sound management. Soil health plays a crucial role in agricultural productivity, food quality, environmental resilience, and ecosystem sustainability. Consequently, there is a significant interest in evidence-based research on the benefits and costs of investing in healthy soils. Soil health depends on a delicate balance of biological, chemical, and physical parameters, as each influences the overall vitality and productivity of the soil ecosystem. Biological parameters include the number and diversity of microorganisms. Organic matter content nourishes microbial activity, improves nutrient cycling, and builds soil structure [4-6].

Previously, soil quality assessment was primarily based on crop yield, both quantitatively and qualitatively. However, these assessments are no longer sufficient today. Soil health now encompasses the role of soil in the quality of these crops, water, and its impact on climate change and human health. Despite the growing recognition of the importance of soil biodiversity, chemical indicators still dominate soil health measurements. This is due to limited knowledge and a lack of effective methods to determine the ecosystem services

provided by soil, as well as the indicators used to measure soil functions and integrate them into soil health indicators [7,8].

Soil quality is crucial for crop yields and overall soil productivity. Monitoring and managing soil conditions allows farmers to optimize irrigation and resource allocation, ultimately leading to increased soil productivity and reduced environmental impacts. Regular and periodic assessment of soil quality is crucial for maintaining high crop productivity and addressing the gap between consumption and production. In recent years, many researchers have explored machine learning, deep learning, and various algorithms to model and predict soil quality. The use of artificial intelligence applications has proven to be efficient and accurate in predicting soil quality by utilizing indicators of physical, chemical, and biological properties without the need for complex calculations. Therefore, soil quality and health are considered today as fundamental factors that directly affect agricultural production and environmental sustainability. Soil plays a pivotal role in supporting plants, regulating the water cycle, and storing carbon. Considering the increasing environmental challenges and climate change, it becomes essential to accurately assess soil conditions to ensure optimal use of natural resources and environmental preservation.

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