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Review Article

HEALTHY SOIL – A LIVING ECOSYSTEM FOR AGRICULTURAL AND ENVIRONMENTAL SUSTAINABILITY

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ABSTRACT: Soil health as a vital living system must often refers to the ability of the soil to sustain agricultural productivity and protect environmental resources. It provides many functions including nutrient cycling, regulation of air and water supply, biological control of plant pests and diseases, carbon sequestration and storage and many more. Its assessment implies the evaluation of fitness of soil to perform desired function and its capacity to resist and recover from degradation. In the present review, the concept of soil health assessment and how well soil performs all of its functions preserved for future use has been discussed. Soil health cannot be measured directly and as such the indicators which are measurable properties of soil and plant that provide clues about how well the soil can function have also been discussed in length.

Keywords: *Carbon cycle, ecosystem, indicators, microorganisms, nutrient cycling, soil aggregate.*

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INTRODUCTION

Soil is the upper most layer of the landscape of the Earth in which plants grow. It is typically consisting of a mixture of organic remains, minerals, gases, liquids and organisms that support life. Its colour varies from gray to black to yellow to brown to dark brown to white. Soil colour is produced by the minerals present organic matter content and water. It is one of the world's most important non-renewable natural resources which are important and essential and when present in proper amounts are the backbones of all terrestrial plant ecosystems. With respect to Earth's carbon cycle, soil is an important carbon reservoir and it is the most reactive to human disturbance (Pouyat *et al.* 2002). It acts as a habitat to soil organisms, a provider to anchorage of roots enabling plants to stand erect, acts as a recycling system for nutrients and organic wastes, a regulator of water quality, acts as an abode of flora and fauna which suitably transform nutrients for uptake by plant roots, a modifier of atmospheric composition and a medium of plant growth making it a critically important provider of ecosystem services (Dominati *et al.* 2010). In addition, a healthy soil provides habitat of local species, increases carbon sequestration and storage, increases the capture of water into underground mass, improves the water quality in the watersheds, increases the water filtration in the deeper layer of the soil and provides a foundation of other ecosystem services (Renot *et al.* 2019). All of these functions are essential for life on Earth and healthy soil provides these essential services through its capacity to perform the above functions under changing management and climatic condition. In the present review the characteristics of different soil properties in relation to plant growth and the concept of soil health assessment on the basis of indicators has been discussed for agricultural and environmental sustainability.

Soil may be described as the three phase system: solid phase, liquid phase and gaseous phase. When completely dry or frozen, soil becomes two-phase system, the liquid phase being either absent or a part of solid phase (Ponge 2015). Soil is influenced by several factors viz. climate, relief (elevation, orientation and slope of terrain), organisms and the soil parent materials (original minerals) interacting over time. It continually undergoes development by way of numerous physical, chemical and biological processes called weathering. According to Soil Taxonomy (1999), soil is defined as a natural body comprised of solid,