

Influence of Organic Farming on Soil Physio-chemical and Biological Properties

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ARTICLE ID: 093

Organic Farming

Organic farming is the form of agriculture that relies on crop rotation, green manure, compost, biological pest control, organically approved pesticide application and mechanical cultivation to maintain soil productivity and control pests, excluding or strictly limiting the use of synthetic fertilizers and synthetic pesticides, plant growth regulators, livestock antibiotics, food additives and genetically modified organisms. Organic farming is one of the several approaches found to meet the objectives of sustainable agriculture. Organic farming is based on various laws and certification programmes, which prohibit the use of almost all synthetic inputs, and health of the soil is recognized as the central theme of the method.



According to the International Federation of Organic Agriculture Movement, the primary objective of organic farming is the sustainable crop production for maintaining long-term soil fertility in harmony with natural systems. Sustainability does not mean that a system has an infinite life span, but a sustainable system is one that attains its expected life span consistent with temporal and spatial scale. Therefore, to sustain the agricultural productivity and environmental quality soil health management should be the primary concern of all stakeholders of agricultural development. Soil health is inevitable for better growth and development of crop leading to higher production.



Soil Health

Soil health is defined as the continued capacity of soil to function as a vital living system. The biological elements are key to ecosystem function within land-use boundaries and are able to sustain not only biological productivity of soil but also maintain the quality of surrounding environment. These ultimately promote plant, animal, and human health. Impact of organic farming in long run:

- It enhances environmental quality.
- It makes efficient use of on-farm resources and integrate appropriate natural biological cycles and controls.
- It sustains the economic viability of farm operations.
- It satisfies human food and fibre needs.
- It enhances the quality of life for farmers and society as a whole.

Degradation of soil fertility due to application of excessive chemical fertilizers, imbalanced nutrient management, and soil pollution are considered most important Presence of soil organic matter and soil microbial population are primarily useful indicators of soil health and productivity of both crops and livestock.



Organic Farming Systems

Organic farming systems utilize carbon-based amendments, diverse crop rotations, and cover crops to build and maintain soil fertility. Organic amendment helps to increase significant amount of organic carbon and nitrogen content in soil. Overall, it has been found that organic systems had 32% to 84% greater microbial biomass carbon, microbial biomass nitrogen, total phospholipid fatty-acids, and dehydrogenase, urease and protease activities than conventional systems. As a consequence of the increased organic matter, a significant improvement in the structural stability, permeability and carbon sequestration is found in soil. These practices increase biologically available soil organic matter and beneficial soil microbe and invertebrate activities, improve soil physical properties by increasing water stable aggregates in soil, reduce disease potential and promote improved crop stand.



Organic amendments are known to reduce the effects of saline soil on plants and soil microorganisms, therefore positively influencing microbial activity and nutrient cycling and hence contributing substantially to nutrient availability in the soil, especially, when external input is low. The reason for this is likely a higher C availability for soil microorganisms after amendment of organic materials, which allows them to produce osmolytes, counteracting the osmotic effects of increased salinity.

Realizing the negative impacts of continuous reliance on such technologies with advancements in science and technology, sustainable-development strategies like organic farming is developed for sustainable agriculture with due care for the factors that are impacted by agriculture, such as productivity, ecological safety, economic viability, and social responsibility and equity.

The key characterization of organic farming in relation to soil fertility and crop production includes:

- Protecting the long-term fertility of soil by maintaining soil organic matter levels, fostering soil and biological activity and careful mechanical inversion,
- Plant nutrients supply through relatively insoluble nutrient sources (organic sources) made available by the action of soil microbes,
- Meeting crop need of nitrogen through nitrogen fixation by leguminous crops in the cropping systems and recycling of farm organic materials including crop residues and livestock wastes,
- Importance of crop rotation, natural predators, resistance varieties and other agronomic manipulations of plant protection including weed management, and
- Biodiversity management, soil and environmental health.

Conclusion

Conventionally farmed agricultural systems strongly depend on potentially environmental harmful and highly energy consuming processes which is not only problematic in regard to global climate change but also enhance the loss of biodiversity, soil degradation soil organic carbon and leads to the emission of potent greenhouse gases such as nitrous oxide.

In order to stop accelerating agricultural-mediated global climate change and its consequences, negative impacts of agricultural system there is dire need to shift focus towards organic farming which utilize carbon-based amendments, diverse crop rotations, and cover crops to build and maintain soil fertility which leads to significant increase in organic carbon and Nitrogen in soil and also microbial activity. Organic farming might represent a possible answer for eco-friendly agricultural intensification in order to meet the growing demand for food, fodder and biofuels while simultaneously coping with challenging climatic



conditions and reducing the impact exploitation of Earth's limited resources and other environmental impacts.

