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SOIL

Where food begins...

AT
Spotlight

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HOW ORGANIC FARMING BOOSTS SOIL HEALTH



Organic farming is a system of cultivating the land and growing crops in such a way that it continuously enriches the soil in many ways. To achieve this, organic farming relies on a number of objectives, principles and common practices which help in minimizing the impact on environment, and ensure that the agriculture system operates naturally.

According to Food and Agriculture Organisation (FAO) of the United Nations, "Organic agriculture is a holistic production management system which promotes and enhances agro-ecosystem health, including biodiversity, biological cycles, and soil biological activity."

Beginning of Organic Movement

Studies show that the agriculture sector is responsible for 20 pc of the global anthropogenic Green House Gas (GHG) emissions. According to studies, nearly 70 pc of global N₂O emission is from artificial fertilizers. Five pc of global carbon dioxide comes from the emissions from fossil fuel consumption and biomass burning. Nearly 50 pc of global methane emission is from enteric fermentation and rice paddies. Thus conventional agricultural practices are unsustainable for mainly three reasons:

(i) Destroys the complex ecosystem that was responsible for keeping the balance of the nutrients and soil. It not only leads to soil leaching or erosion but such practices also cause removal of nitrogen-

fixing bacteria.

(ii) Excess use of agrochemicals and mechanization results in soil deconditioning. This has an adverse effect on the water retention capacity of the soil. The practice also leads to groundwater contamination.

(iii) Over-grazing and deforestation increases GHG emissions and affects vegetation, resulting into reduction of land's ability to sequester CO₂.

In order to practice sustainable farming practices and control climate change, adoption of organic agriculture is the need of the hour.

The organic movement across the globe started nearly a century ago by visionary pioneers. They realized the connection between the way we live,

the food we produce and consume, our health and the eco-system. Later in the 70s, the writings and agricultural systems developed by the pioneers were codified into standards which were later converted into legally-mandated regulatory systems.

According to the International Federation for Organic Agriculture Movement (IFOAM), "Organic Agriculture is a production system that sustains the health of soils, eco-systems and people, is based on the principles of health, ecology, fairness and care."

Soil Health

Organic farming relies primarily on healthy soils. The two major parameters of soil health are:

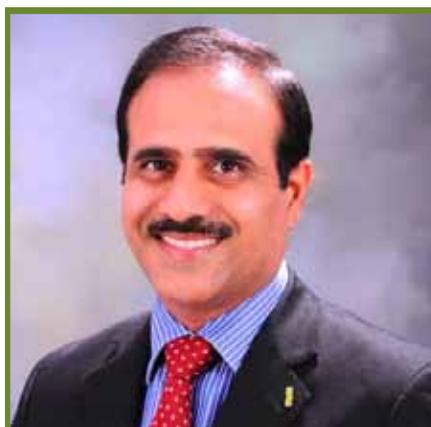
- (i) Organic matter in the soil, measured by Soil Organic Carbon (SOC)
- (ii) Soil microbial life—presence of beneficial micro-organisms in the soil.

Soil is the skin of the earth and provider of food for all plant life. It is important to have a healthy soil for the plants to grow. Primarily, a healthy soil will have the presence of bacteria, fungus, and micro-organisms—the beneficial types.

Organic farming introduces combination of sustainable practices which includes region specific crop rotation, incremental soil improvement/humus application, diversified and mixed farming with compost making.

All these measures help in building up of SOC levels by an average of 10 times compared to the conventional agricultural practices. It has been estimated that an increase in SOC level by every 0.1 pc has the potential to sequester 3,500-4,500 kgs of CO₂ per acre. Thus, by sequestering carbon, the soil is acting as a carbon sink. The phenomenon is a climate change mitigating factor.

Organic manures enriched with bio-fertilizers increase the supply of mineral nutrients by establishment of micorhizal symbiosis. This is highly significant for those nutrients whose ionic forms have poor mobility in the soil.



ABOUT THE AUTHOR

Mr Manoj Kumar Menon completed B.Sc. (Agri) from Gujarat Agriculture University. He was the state topper in his degree. He did MBA from Faculty of Management Studies (FMS), University of Delhi. He has nearly two decades of experience in management of agricultural projects and estates. He's also the founder director of IFOAM, Asia

Further, use of on-farm resources, such as livestock manure for fertilizer or feed produced on the farm, helps in maintaining the content and texture of the soil.

In organic farming, compost, a natural input, is used which adds organic matter and SOC. Chemical pesticides, fertilizers and weed killers are harmful to the plants. They also disturb the symbiotic relationship between plants and micro-organisms present in the soil.

Lakpath Pandit, an organic farmer of Jharkhand started farming in 2002. For nearly 16 years, he used chemical fertilizers and pesticides. Use of chemicals led to decrease in the production of crops and vegetables. It also led to hardening of soil, low water retention capacity, soil erosion and increase in irrigation. All this

further caused a considerable drop in the production of crops and vegetables. The decay of plants caused the 40-year-old farmer a huge loss every year. Lakpath struggled to reap a good harvest of crops from his farm land.

In 2018, Lakpath underwent an organic farming training programme organized by the International Competence Centre for Organic Agriculture (ICCOA). He received training in preparing Beejamruth, Jeevamruth, Panchgavya, and Dasgavya. These organic fertilizers are made of cow dung, curd, cow milk, ghee, sugarcane, tender coconut water and jaggery.

After the completion of the training, he started preparing these fertilizers and pesticides at home. Within a year of their application, Lakpath saw a phenomenal change in the quality of soil. The soil became comparatively soft with improvement in soil structure. It gained water retention capacity as the irrigation cycle reduced. Lakpath had to water his crop 4 to 5 times earlier. This dropped to 3 to 4 times per crop-cycle.

Improved Efficiency of Water Use

Research reveals that organic systems use water more efficiently.

Volume of water retained/ha (to 30cm) in relation to Soil Organic Matter (SOM)

- 0.5 pc SOM = 80,000 litres (common level Africa, Asia)
- 1 pc SOM = 160,000 litres (common level Africa, Asia)
- 2 pc SOM = 320,000 litres



Mr Menon is an avid badminton player and he rarely misses his morning practice sessions. He's fond of reading books and articles on varied subjects. He loves listening to music. He is keen on the acquisition of knowledge to be a thought leader and create models in sustainable agriculture



- 3 pc SOM = 480,000 litres

Adapted from Morris, 2004

Soils rich in micro organisms take care of the crop nutrient requirement. There are two basic items to enrich soil. The first include on-farm inputs like green manure, crop residues, biomass, Farm Yard Manure (FYM) compost, enriched compost, vermi-compost etc. Among off-farm inputs, oil cakes, lime, rock phosphate, bio-fertilizers and bone meal are used.

In order to maintain the soil temperature, biological mulch is applied to the surface of soil. Mulch helps in the conservation of soil moisture, improves the fertility and health of the soil and reduces weed growth. If biomass residue is added to mulching, it helps in protecting all life forms including earthworms in soil.

Another method in organic farming that helps in maintaining soil health is green manuring and cover crops. Growing of green manure crops like sesbania, dhaincha and other leguminous crops and cover crops can protect the soil from soil erosion and moisture loss. This can be ploughed back into soil.

Soil fertility is the fundamental criteria in determining the productivity of a

farming system and its ability to supply nutrients to crops.

In a status report entitled Technology Intervention in Organic Farming through system Comparison and Development Of Organic Package of Practices, prepared by ICCOA for the Government of Sikkim, it has been mentioned that less use of fertilizers and pesticides in the region, which is far below the national average, makes the region highly suitable for organic farming.

ICCOA carried out studies during the year 2010-2013 in Sikkim in five different locations on maize, ginger, and cherry pepper as major crops and radish, spinach, mustard and cabbage as the rotation crop.

Under the system comparison trials, the effect of organic manures and bio-fertilizers was assessed on the soil fertility status of the experimental plots. The results clearly indicated that organic treatments had significantly improved the soil organic carbon content. It also resulted in increasing the percentage of all the three major nutrients NPK, viz. Nitrogen, Phosphorus and Potassium.

Organic farming has now become an integral part of the agricultural sector of many countries including India. It

includes all agricultural systems that promote environmentally, socially and economically sound production of vegetables. These systems take local soil fertility as a key to successful production.

By respecting the natural capacity of plants, animals and landscape, organic farming aims to optimize quality in all aspects of agriculture and the environment. Organic vegetable agriculture reduces external inputs by refraining from the use of chemo-synthetic fertilizers pesticides and pharmaceuticals. Instead it allows the powerful laws of nature to increase both agricultural yields and disease resistance.

We have exploited our natural resources beyond all limits to realize high productivity and production. Some of the chemicals used for the management of pest and diseases and increase soil fertility do not degrade easily. They enter into our food chain, leading to health hazards.

The need of the hour is 'Go Organic' for the betterment of both human beings and the eco-system. Use of organic manures will keep the soil protected, thus keeping the crops and fruits hale and hearty.