

Necessity of Organic Matter in Crop Production

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Soil organic matter content is key for a healthy and high-quality soil. Soil organic matter content which can help ensure adequate soil functionality and soil fertility.

The importance of soil organic matter in a healthy soil

Soil organic matter is the organic component of soil. It consists of organic material from plants and animals, and material that has been converted by microorganisms in the soil at different stages of decomposition. Soil organic matter has direct benefits for agricultural and forestry production. Healthy soils with stable levels of soil organic matter are also better equipped to prevent and fight soil-borne diseases. Soil organic matter plays a vital part in enhancing soil fertility and quality, on three levels:

CHEMICAL

Soil organic matter significantly improves the soil's capacity to store and supply essential nutrients (such as nitrogen, phosphorus, potassium, calcium and magnesium), and to retain toxic elements. It allows the soil to cope with changes in soil acidity, and helps soil minerals to decompose faster.

PHYSICAL: Soil organic matter improves soil structure. This ultimately helps to control soil erosion and improves water infiltration and water holding capacity, giving plant roots and soil organisms better living conditions.

BIOLOGICAL: Soil organic matter is a primary source of carbon (C) which gives energy and nutrients to soil organisms. This supports soil functionality because it improves the activity of microorganisms in the soil and it can enhance biodiversity. Capturing carbon in the soil also lowers emissions of CO₂ to the atmosphere, and this mitigates climate change.

Common organic manures:

The importance of organic matter was recognized by man even before he knew the real significance of it. Different types of organic manures and crop residues are used by farmers from time

immemorial and their beneficial effect individually and in combination with chemical fertilizers is also known. Of late, industrial wastes are also considered as source of organic matter. Farmyardmanure (FYM), phospho-compost (rock phosphate + organic matter), poultry manure, sewage sludge, sugar factory wastes (pressmud or filtercake, bagasse and molasses), sugarcane trash, coir pith, cakes non-edible oil (castor, neem and pongamia), biogas slurry (superior to FYM), bio-inoculants or bio-fertilizers, green manures (sunhemp, diancha, pillipesara, mung bean, cowpea, guar, senji), vermicompost, industrial waste materials (lignite flyash from thermal power stations, effluents from the sugar factory, fertilizer factory and paper industry) and crop residues are some of the common source of organic matter which can be efficiently utilised for better crop production.

Improving organic matter on the farm

Soil organic matter content on the farm by adding carbon inputs. This can be plant or animal waste produced on the farm, or organic material from outside the farm. Soil organic matter can also be increased through reduced and no-tillage practices, by selecting crops that produce more diverse organic residues, and by applying crop rotations. Keeping the soil covered for a longer period of time, for instance with green manures (cover crops that are incorporated into the soil) can also improve organic matter content. The biological quality of soils may also be improved by inoculating the soil with beneficial microorganisms or by using 'bioeffectors' which stimulate biological activities in the soil.

Tips to maintain the soil organic matter status:

1. Application of organic waste material, FYM, compost etc, in combination with inorganic fertilizers.
2. Utilization of crop residues and industrial wastes with proper treatment as complementary source of plant nutrients with chemical fertilizers in the intensive crop sequences.
3. Addition of green leaf manure or inclusion of green manure crops in the cropping sequence.
4. Inclusion of legumes in the cropping system. Adding biofertilizers and suitable bio inoculants.
5. Application of mulches
6. Growing of cover crops.

For long term carbon storage in soil

To improve soil fertility, farmers often focus on the soil's chemical elements and the use of chemical fertilisers. However, improving soil fertility may not always be relevant as an ultimate goal. Indian soils are poor in fertile soils. If the purpose is to increase carbon in the soil (C sequestration), then practices that favour a slow decomposition rate of soil organic matter are the most effective. However, a slow or reduced decomposition rate may restrict the supply of nutrients to crops. The best solution may be to ensure a stable level of soil organic matter, with yield-related and financial benefits in the long run, and advantages for soil health and disease prevention as well.

Soils with high clay content, high CEC holds more carbon on long term basis. In term, Soil Carbon is a building block of soil productivity that contributes to higher water-holding capacity, better drainage, higher cation exchange capacity, and better storage of nutrients, which are key factors of soil productivity, soil health, soil quality and long-term sustainability (Doran and Jones, 1996)

Reference:

Doran, J.W. and Jones, A.J. (1996) Methods for Assessing Soil Quality. SSSA Publication No. 49, Soil Science Society of America, Madison, WI.
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