

SOILS

Wise management practices improve soil quality

by Jagadeesh Mosali / jmosali@noble.org



Surface soil produces our food and is vital for life. This precious resource is often called “skin of the Earth” and, just like skin, it is important to protect and maintain its quality.

Soil quality is the inherent capacity of a particular soil to support human health and habitation; maintain or enhance air and water quality; and, most importantly, sustain plant and animal productivity. From an agricultural standpoint, soil quality is vital for improving long-term agricultural productivity and maximizing profits through sustainable productivity.

It is important for soil to both function optimally for current needs and remain healthy for future use. Soil organic matter, tillage, soil compaction, soil structure, depth of soil, water-holding capacity, electrical conductivity, pH, ground cover, microbial biodiversity, carbon-to-nitrogen ratio (C:N ratio) and nutrient management are some of the important parameters of soil quality.

Improving and maintaining soil organic matter content is the most important quality parameter. Increasing organic matter improves soil structure as well as water- and

nutrient-holding capacity, supports soil microbes, and protects soil from erosion and compaction. Organic matter can be improved by using no-till or minimum till methods, growing cover crops, leaving crop residues, and using rotations with crops that balance optimal water and nutrient management practices.

Using reduced tillage practices will protect the soil surface, which decreases soil erosion and soil compaction, and decreases the loss of organic matter. Reduction in tillage also decreases the potential for destroying soil structure. Soil compaction can be caused by using heavy equipment on the surface when the soil is wet. Compaction will reduce the amount of air, water and pore space for growth of both soil microbes and plant roots. Soil compaction can be reduced by minimizing equipment use when the ground is wet and combining multiple farm tasks, such as applying both herbicides and fertilizer in one trip.

Growing cover crops and leaving residue from previous crops is the best way to reduce soil erosion by wind and water. Ground cover can be increased by growing perennial crops like grasses in a pasture situation. Ground cover will improve water availability, but care should

be taken to manage it properly to prevent disease outbreak.

Soil quality also relies on microbial organisms. Diversity in soil microbes may be helpful in controlling pest populations, diseases and weeds. Biodiversity can be achieved by increasing long-term crop rotations, since each plant in rotation contributes to unique soil structure and plant residue.

Understanding how to improve soil quality is aided by knowledge of the carbon-to-nitrogen (C:N) ratio for managing cover crops and nutrient cycling. The C:N ratio is the amount of carbon to the amount of nitrogen in a residue or other organic material applied to soil. If material with a higher C:N ratio residue is applied, it takes longer to decompose and may immobilize inorganic fertilizers that are applied. This problem can be reduced by growing a low C:N ratio crop (e.g., vetch or other legumes) in rotation with a high C:N ratio crop (e.g., wheat straw).

Finally, efficient nutrient management is important in maintaining soil quality. Test your soils regularly and make sure that you store all your records. Examining records over time will tell whether the management practices that were followed increased or depleted soil nutrients. ►

SOILS

Too much fertilizer or manure may cause groundwater contamination or may run off and enter water bodies and degrade water quality. Application of nutrients based on a soil test

will alleviate this problem.

What works on one farm may not work on another. Adjust your management plan by observing changes in soil quality on your farm. Wise

management decisions will improve the overall quality of the soil. Being proactive, rather than reactive, will make you a better steward of this limited resource. ■