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SOIL SCIENCE AND SOIL TERMINOLOGY

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ABSTRACT: - Soil science involves the study of the formation and distribution of soil, the biological, chemical and physical properties and processes of soil and how these processes interact with wider systems to help inform environmental management, industry and sustainable development.

KEYWORDS: Soil, terminology, usage, variety, environment

INTRODUCTION

The increasing use of conservation tillage, no-till, and cover crops is changing the way we view the soil and the environment. New concepts and terminology are being used to describe these changes. Understanding the terms defined in this fact sheet will help farmers understand relationships between tillage, crop rotation, cover crops, carbon sequestration, organic matter pool, agricultural sustainability, and soil and water quality.

Sustainable agriculture and soil quality are terms that are increasingly important to modern farming. With higher costs for labor, seed, fuel, fertilizer, and pesticides, agricultural producers are looking for more economical ways to improve crop production and maintain ecosystem sustainability.

One of the goals of sustainable agriculture is to work with the natural cycles of the terrestrial ecosystems, especially with the soil biology to enhance the efficiency of agricultural management practices. The terms below are used to describe these biologically efficient and economically viable agricultural production systems. The terms are listed in alphabetical order.

Actinomycetes: A large group of rod-shaped or filamentous bacterium that includes some that cause diseases and some that are the sources of antibiotics. These soil microorganisms generally resemble fungi and have branched mycelium.

Active Carbon (AC): The portion of total soil organic carbon (matter) that is relatively easily metabolized or utilized by microorganisms. The half-life of active carbon ranges from a few days to a few years. Active carbon would include simple polysaccharides and glucose equivalent reduced sugars, amino acids and proteins, soluble and extractable carbon, and microbial biomass carbon, etc.

Aerobic: Aerobic means in the presence of oxygen or growing in the presence of oxygen. Aerobic soils have plenty of oxygenated air to carry out oxidative reactions, such as soil organic matter decomposition and nutrient cycling.

Aggregates: Primary soil particles (sand, silt, and clay) held together in a single mass or cluster, such as a crumb, block, prism or clod using organic matter as cementing material. Soil aggregates are usually greater than ten millimeters in diameter and formed by natural forces (such as alternate wetting-drying) and organic substances derived from root exudates, roots, soil animals and microbial by-products which cement primary particles into smaller aggregates or smaller aggregates into larger particles, such as macroaggregates.

Air Quality: Defined as a measure of the amount or concentration of pollutants emitted into the atmosphere and the dispersion potential of an area to dilute those pollutants. The common air pollutants are ground-level ozone, carbon monoxide, sulfur dioxide, nitrogen oxide (e.g. N2O), radon, and emitted heavy metal dusts. These pollutants can harm field crops, public health, birds and other animals, and the environment, and cause property damage. Carbon dioxide and N2O are greenhouse gases that are normally present in the atmosphere, but at higher levels may contribute to global warming.

Anaerobic: Absence of oxygen or growing in the absence of oxygen. Soils that are heavy textured (clay), compacted, wet or flooded tend to be anaerobic because they have less oxygenated air to carry out oxidative reactions. Anaerobesis of soil is also responsible for widespread soil-borne diseases.

Bacteria: A large group of single-celled microorganisms lacking chlorophyll and are prokaryotic (lacking a nucleus). Typically a few micrometers in length, bacteria have a wide range of shapes, ranging from spheres to rods and spirals. Bacteria are important for functioning of biochemical properties and/or processes. Bacteria are active in the soil for decomposing organic matter, recycling nutrients, and detoxification of contaminants. Bacteria dominate in disturbed (e.g. conventionally tilled) soils because they are generalist feeders that prefer aerobic (oxygenated) conditions, and survive in small soil pore spaces (micropores).

Basal Respiration (BR): Respiration, or oxygen used, by soil microbes to decompose organic matter or any crop residues as a food and energy source and released as carbon dioxide into the soil atmosphere. Soil respiration is a direct and sensitive assessment of soil antecedent biological activity. A high BR generally indicates higher soil microbial activity, however, not biological efficiency.

Bulk Density (ρb): The mass (weight) of unit soil divided by the total volume occupied. An ideal soil has a bulk density of about 1.25 g cm-3. Bulk density is the total soil porosity. Compacted soils have a bulk density of 1.5 g cm-3 or higher.

Carbon-Nitrogen Ratio (C/N): Ratio of the mass (weight) of organic carbon to the mass of total nitrogen in the soil, plants, or any other

organic compounds. Soil C:N is generally 10:1 to carry out ecological functions.

Carbon Sequestration Index (Cindex): A new term explains the simple and integrated index that identifies the rate of carbon accumulation in the soil. This index can be used as an early and sensitive indicator of carbon or soil organic matter accumulation and could help explain the complex nature of global carbon cycling.

Catalyst: Chemical substances generally produced by microorganisms or plants that promote biochemical reactions by lowering the energy needed during a reaction. It is not changed or consumed during the reaction. Catalysts are important in the soil in speeding up biochemical reactions and are usually only present in minute amounts.

Cellulose: The greatest amount of carbon in a plant in the form of carbohydrates is cellulose, which gives plants structural rigidity, and allows plants to grow erect. As a plant matures, the cellulose content of the plant generally increases.

Conventional Tillage (CT): The combined secondary and primary tillage operations performed in preparing a seedbed in a given geographical location. Examples of primary tillage include moldboard plowing, chisel plowing, and sub-soiling, while finishing tools like a disk, field cultivator, or cultipacker would be considered secondary tillage. Conventional tillage means that the soil is physically turned over (or loosened), and oxygenate. This process accelerates breakdown of crop residues and native soil organic matter and temporarily increases microbial respiration. Soil organic matter decomposition releases nutrients, especially N, but it also destroys soil structure and macropores leading to soil compaction and decreased soil organic matter levels.

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