INTERNATIONAL
CERTIFIED CROP ADVISER

GLOSSARY

The American Society of Agronomy

Certified Crop Adviser Program

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INTERNATIONAL CERTIFIED CROP ADVISER GLOSSARY

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Nutrient Management Glossary

Acid soil: A soil that has a pH value less than 7.0.

Aerobic: A condition identified by the presence of oxygen.

Agronomic nutrient rate: Amount of supplemental nutrient required by a crop for a realistic yield goal (yield potential), after all the soil, water, plant, and air credits are considered. Agronomic rates consider nutrient credits from all soil tests, legumes, manure residuals, and any other nutrient source.

Alkaline soil: A soil that has a pH value greater than 7.0.

Alum: A potassium aluminum sulfate or ammonium aluminum sulfate.

Ammonia (NH_3): See anhydrous ammonia

Ammonium (NH_4^+): A form of nitrogen that is available to plants and is derived from fertilizer addition and soil organic matter mineralization.

Ammonium nitrate solution: Non-pressure solution of ammonium nitrate in water usually standardized to 20% nitrogen used for direct application or for making multinutrient liquid fertilizer. Analysis is 20-0-0.

Ammonium phosphates: A group of phosphorus fertilizers manufactured by the reaction of anhydrous ammonia with superphosphoric acid to produce either solid or liquid fertilizers.

Ammonium sulfate: Fertilizer material with an analysis of 21-0-0. Also contains 24% sulfur.

Anaerobic: A condition identified by the absence of oxygen.

Anhydrous ammonia (NH_3): Fertilizer in pressurized gas form, made by reacting nitrogen in air with hydrogen gas (H_2) under high temperature and pressure in the presence of a catalyst. The analysis is 82-0-0.

Animal unit: 1,000 pounds of live animal weight; a term used to determine volumes of animal manure produced.

Anion: An ion with a negative charge. Common soil anions are chloride, nitrate, sulfate and bicarbonate.

Anion exchange capacity: The sum total of exchangeable anions that a soil can adsorb at a specific pH. Expressed as centimoles of charge per kilogram ($cmol_c/kg$) of soil or milliequivalents per 100 g of soil (meq/100 g of soil).

Application rate: The weight or volume of a fertilizer, soil amendment, or pesticide applied per unit area.

Aqua ammonia: A 20% N solution made by dissolving anhydrous ammonia in water.

Available nutrient: A nutrient in a form that a plant can absorb.

Banded nutrients: Placing solid granular or liquid fertilizer in a band on the soil surface or ejected below the soil surface before, at, or after planting.

Base saturation percentage: The proportion of the soil's cation exchange capacity occupied by basic cations (sodium, potassium, magnesium and calcium).

Bioremediation: The use of biological agents to remove substances hazardous to human health or the environment from contaminated soil or water.

Biosolid: Any organic material, such as livestock manure, compost, sewage sludge, or yard wastes applied to the soil to add nutrients or for soil improvement.

Buildup and maintenance: Nutrients applied in order to build up a target soil test level and then maintained by annual addition of the quantity of nutrients expected to be removed in the harvested portion of the crop.

Buffer pH: A soil test procedure whereby the pH of the soil is measured in buffer solution. This measurement is used to determine the exchangeable acidity of the soil and estimate the lime requirement of the soil.

Calcitic lime: Limestone consisting of $CaCO_3$ based material with very low magnesium content.

Calcium carbonate equivalent (CCE): The liming potential of a material as compared to $CaCO_3$.

Cation: An ion that has a positive electrical charge. Common soil cations are calcium, magnesium, hydrogen, sodium, and potassium.

Cation exchange capacity (CEC): The sum total of exchangeable cations that a soil can adsorb at a specific pH. Expressed as centimoles of charge per kilogram ($cmol_c/kg$) of soil or milliequivalents per 100 g of soil (meq/100 g of soil).

Cation exchange sites: Negative charged sites on the surfaces of clays and organic matter.

Chelate molecule: A large, water soluble organic molecule that binds with a free metal ion to form a water soluble compound. This process increases the amount of metal ion or atom dissolved in the water and can modify the availability of that ion/atom to plants.

Critical value: The nutrient tissue or soil concentration falling just between deficiency and sufficiency for a given crop.

Crop nutrient requirement: The amount of nutrients needed to grow a specified yield of a crop.

Crop nutrient uptake: The total amount of nutrients, per unit area, required by the crop to produce both vegetation and grain, including nutrients used to produce roots, stems, crowns, and other unharvested plant parts as well as the harvested portion that is removed from the field.

Crop removal rate: The amount of nutrients, per unit area, that are removed from the field with plant harvest. This would include harvested fruit, grain, forage, and any crop residues that are physically removed from the field.

Crop rotation: A planned sequence of crops growing in a regularly recurring succession on the same area of land.

Crop utilization rate: The total amount of nutrients required by the crop to produce both vegetation and grain or fruit, including nutrients used to produce roots, stems, crowns, and other unharvested plant parts as well as the harvested portion that is removed from the field.

Crop sequence: The order of crops planted and harvested in a field over a period of time.

Denitrification: The microbial transformation of nitrates or nitrites to nitrogen or nitrogen oxide gas under anaerobic conditions.

Diammonium phosphate (DAP): Fertilizer containing both nitrogen and phosphorus with an analysis of 18-46-0.

Diffusion: The movement of ions/molecules from an area of higher concentration to an area of lower concentration.

Dolomitic lime: A naturally occurring liming material composed chiefly of carbonates of magnesium and calcium.

Elemental sulfur: Sulfur in the elemental form that must be oxidized by soil microbes to the sulfate form for plant uptake.

Environmentally sensitive area: Places on the landscape that can be readily impacted by human or natural activity so as to degrade the condition of the site.

Essential plant nutrients: Elements that are required for growth and development of plants. C, H, O, N, P, K, Ca, Mg, S, B, Cl, Cu, Fe, Mn, Mo, Ni, Zn.

Erosion: The wearing away of the land surface by running water, wind, ice, geological agents, or mechanical erosion.

Fertigation: Applying fertilizer through an irrigation system.

Fertilizer: Organic or inorganic material added to a soil to supply one or more nutrients essential to plant growth.

Fertilizer analysis: The composition of a fertilizer, expressed as a percent of total nutrients, for example total N, available phosphoric acid (P_2O_5), and water-soluble potash (K_2O).

Fertilizer suspension: A fluid fertilizer containing dissolved and undissolved plant nutrients. The undissolved nutrients are kept in suspension, usually by swelling type clays.

Field capacity: The amount of water a soil holds after free water has drained because of gravity.

Foliar fertilization: Application of a dilute solution of fertilizer to plant foliage, usually made to supplement soil-applied nutrients.

Green manure: Living plant material incorporated into the soil, or killed and left on the surface, for soil improvement, or when composed of legumes to increase the soil N supply.

Guaranteed analysis: Minimum quantities of available nutrients contained in a fertilizer material, stated as percentages on the fertilizer material's label.

Gypsum: Calcium sulfate ($CaSO_4 \cdot 2H_2O$) used to supply calcium and sulfur and to improve sodic soils.

Immobile nutrient: A plant nutrient that moves only slowly in the soil or plant.

Immobilization: The conversion of an element from the inorganic to the organic form in microbial tissues resulting in that element not being readily available to other organisms or plants.

Impermeable layer: Soil layers, either natural or man-made, that resist penetration by water or roots.

Injection: Placement, by mechanical means, below the surface of the soil.

Inorganic nitrogen: Mineral forms of nitrogen.

Inorganic phosphorus: A salt of phosphoric acid or any of its anions, usually orthophosphate or polyphosphate.

Leaching: The movement of dissolved materials with water moving through the soil.

Lime fineness: The particle size of limestone determined by the fineness of grinding. The finer the grind, the more reactive the material and the more quickly the material neutralizes soil acidity.

Lime material: A material capable of neutralizing soil acidity.

Lime purity: The measure of impurities in a given liming material, needed to estimate the material's neutralizing value.

Lime requirement: The amount of liming material required to change the soil pH to a specific desired value.

Luxury consumption: The absorption by plants of an essential nutrient in excess of the need for growth. Luxury concentrations in early growth may be used in later growth.

Macronutrient: A nutrient that a plant needs in relatively large amounts. Essential macronutrients are nitrogen (N), phosphorus (P), potassium (K), calcium (Ca), magnesium (Mg), and sulfur (S).

Mass flow: The movement of solutes associated with the net movement of water.

Micronutrient: Nutrients that plants need in only small or trace amounts. Boron (B), chlorine (Cl), copper (Cu), iron (Fe), manganese (Mn), molybdenum (Mo), nickel (Ni), and zinc (Zn) are considered micronutrients.

Mineralization: The conversion of an element from an organic form to an inorganic form by soil organisms.

Mobile nutrient: A nutrient that moves readily in the soil or plant.

Monoammonium phosphate (MAP): A fertilizer created the reaction of ammonia and phosphoric acid, with a typical analysis of 11-52-0.

N-based nutrient application: The rate of application of a nitrogen containing material such that the desired amount of nitrogen is applied, regardless of the amounts of other nutrients being applied in the material.

Nitrate (NO_3^-): An inorganic nitrogen form that is very soluble, easily leached from soils, readily available to plants, and readily denitrified.

Nitrite (NO_2^-): A form of nitrogen resulting from the first step in nitrification by soil microbes. Nitrite is subsequently oxidized to nitrate (NO_3^-) by other soil microbes.

Nitrification: The conversion of ammonium to nitrite, and then to nitrate by soil microbes.

Nitrification inhibitor: A substance that slows the conversion of ammonium to nitrate in the soil, reducing the risk of nitrate-N losses from the field.

Nitrogen: Essential nutrient for plants and animals. Nitrogen is a component of chlorophyll, enzymes, amino acids, and nucleic acids.

Nitrogen index: An environmental risk assessment tool to determine the potential for nitrogen movement from agricultural lands by leaching, runoff or volatilization. The index is a function of the rate, form, timing and method of application of nitrogen sources, and the interaction of these factors with temperature and precipitation.

Nutrient buildup: An increase in soil levels of a nutrient due to application of that nutrient at rates that are greater than crop removal.

Nutrient drawdown: A decrease in soil levels of a nutrient due to application of that nutrient at rates that are less than crop removal.

Nutrient management plan (NMP): A written plan for a farming operation or a part of farming operation that specifies the most efficient allocation and utilization of fertilizer, animal manures, biosolids and other nutrient sources to provide for crop nutrient needs while protecting water, soil and air quality.

Organic nitrogen: Nitrogen that is bound with organic carbon and forms organic molecules.

Organic phosphorus: Phosphorus that is bound with organic carbon and forms organic molecules.

Orthophosphate: An inorganic form of plant available phosphorus.

P-based nutrient application: Applying crop nutrients with a focus on the most efficient allocation and utilization of phosphorus to supply crop needs, balance nutrient levels, maximize returns, and protect water quality.

P index: An environmental risk assessment tool for assessing the potential for phosphorus movement from agricultural lands. The index is usually based on an estimation of potential soil erosion, the phosphorus soil test level, and phosphorus management practices such as rate of application, source of phosphorus, and timing and method of application.

P_2O_5: Phosphorus pentoxide, phosphate; used in a fertilizer analysis to denote the percentage of available phosphorus expressed as P_2O_5.

Phosphorus: Essential nutrient for plants and animals. Component of cell walls, nucleic acids, and energy transfer molecules.

Plant available nitrogen (PAN): A calculated quantity of nitrogen made available during the growing season after application of fertilizer. PAN includes a percentage of the organic nitrogen, a percentage of the ammonium N, and all the nitrate nitrogen in the fertilizer.

Plant residues: Plant material (roots and shoots) that remains in the field after harvest.

Potash (K_2O): Potassium oxide, potash; used in a fertilizer analysis to denote the percentage of water soluble potassium expressed as K_2O.

Potassium: Essential nutrient for plants and animals. Involved in plant moisture regulation, energy metabolism, starch synthesis, and sugar degradation.

Primary nutrients: The three macronutrients used by plants in the largest quantities: nitrogen, phosphorus, and potassium.

Recommended rate: A prescribed amount of nutrients to apply based on soil or plant analysis, crop removal, projected crop yields, or other crop-related factors,

Remote sensing: The collection and analysis of data from above the crop canopy, using sensors that respond to different frequencies of electromagnetic radiation.

Rhizobia: Bacteria capable of living symbiotically with higher plants by receiving food and carbon and providing nitrogen to the plant.

Root interception: Nutrient uptake due to direct contact between the root and soil particle surfaces during root exploration of the soil.

Runoff: Portion of precipitation, snowmelt, or irrigation that moves by surface flow from an area.

Secondary macronutrients: The macronutrients of calcium, magnesium, and sulfur.

Sidedress: To apply a fertilizer, pesticide, or soil amendment to one side of a growing plant or row of plants, either by surface application or injection into the soil.

Soil analysis: A chemical, physical, or biological procedure that estimates soil characteristics relative to plant growth and the potential of a crop growth response to additional nutrients.

Soil drainage: The process where water is moved by gravity, either by surface channels or internal pores, deeper into/through the soil profile.

Soil organic matter: The organic fraction of the soil exclusive of undecayed plant and animal residues. Often used synonymously with “humus”.

Soil pH: The degree of acidity or alkalinity of a soil, expressed on a scale from 0 to 14, with 7.0 indicating neutrality. Increasing values indicate increasing alkalinity, while decreasing values indicate increasing acidity.

Soil productivity: A measure of the soil’s ability to produce a particular crop or sequence of crops under a specific management system.

Soil reaction: A quantitative term that describes the general degree of acidity or alkalinity of a soil.

Soil sampling: Process of obtaining a portion of soil to represent a field or any designated part of that field.

Soil solution: The aqueous liquid phase of the soil and its solutes contained in soil pores.

Soil structure: The combination or arrangement of primary soil particles into secondary soil particle units, or peds.

Soil test interpretation: Using soil analysis data to manage soil fertility and monitor environmental conditions.

Soil test level: The nutrient status of the soil, as indicated by analysis of a soil sample.

Soil test recommendation: The suggested amount of nutrient/amendment to be added to the soil to achieve the expected crop yield based on the nutrient supplying power of the soil.

Soil texture: The relative proportions of sand, silt, and clay in the soil.

Starter fertilizer: A fertilizer applied in relatively small amounts with or near the seed at planting.

Sufficiency level: a) For interpretation of plant analysis: A nutrient concentration in the plant tissue at/above which the crop is amply supplied, and below which the crop is deficient. b) For interpretation of soil analysis: A soil test level at/above which economic responses to applied fertilizer are unlikely to occur.

Subsurface band: To apply nutrients, pesticides, or soil amendments in narrow bands below the surface of the soil.

Surface band: To apply nutrients, pesticides, or soil amendments in narrow bands over the surface of the soil.

Surface broadcast: To apply nutrients, pesticides, or soil amendments uniformly over the surface of the soil.

Symbiotic N fixation: Conversion of molecular nitrogen (N_2) to ammonia and subsequently to organic nitrogen forms by organisms.

Topdress: To surface broadcast nutrients, pesticides, or soil amendments on the soil surface after crop emergence.

Total nitrogen: The sum of the organic and inorganic forms of nitrogen in a sample.

Toxicity level: A quantity of a material in plants, soil, or water that can harm or impair the physiological function of plants or soil microbes

Triple superphosphate: A product that has a guaranteed analysis between 40 and 50% available phosphate. The most common analysis is 0-46-0.

Uptake antagonism: When one nutrient interferes with the uptake of another nutrient. Often the nutrients in question have a similar plant uptake mechanism/pathway.

Urea: A nitrogen fertilizer that is a white crystalline solid, very soluble in water and having an analysis of 46-0-0.

Urea ammonium nitrate (UAN) solution: A non-pressurized solution containing dissolved urea and ammonium nitrate in approximately equal proportions. The nitrogen content of the fertilizer solution ranges from 28 to 32%.

Volatilization: Conversion of a solid or a liquid to a gas. Usually refers to ammonia (NH_3) loss to the air from soil surface crop residue or leaf surfaces.

Soil and Water Management Glossary

A horizon: Mineral soil horizon formed at or near the soil surface. It displays the greatest amount of leaching and is usually higher in organic matter and biological activity than the deeper horizons.

Aggregate, soil: A mass of fine soil particles held together by clay, organic matter, or microbial gums. Aggregates are part of soil structure. Also known as a soil ped.

Alluvium: A general term for all eroded material deposited by running water including gravel, sand, silt, and clay.

Anion: An ion with a negative charge.

Anion exchange capacity (AEC): The sum total of exchangeable anions that a soil can adsorb at a specific pH, expressed as centimoles of change per kilogram ($cmol_c/kg$) of soil or milliequivalents per 100 g of soil (meq/100 g soil).

Aquifer: Layers of underground porous or fractured rock, gravel, or sand through which considerable quantities of groundwater can flow and which can supply water at a reasonable rate. May be classified as perched, confined, or unconfined.

Available nutrient: A nutrient in a form that a plant can absorb.

Available water: Portion of water in soil that can be readily absorbed by plant roots.

B horizon: The zone of accumulation of materials such as clay, iron, aluminum, and organic matter moving down from the above horizons.

Bedrock: Solid, or consolidated, rock lying under the soil.

Biological oxygen demand (BOD): The amount of oxygen required by aerobic microorganisms to decompose the organic matter in a sample of water. Used as a measure of water pollution.

Biomass: Plant and plant-derived material, including manure, forestry products, wood-processing wastes, wastes associated with food-processing operations, energy crops such as switchgrass and poplar trees, and agricultural crop residues such as corn stover and wheat straw.

Biosolid: Any organic material, such as livestock manure, compost, sewage sludge, or yard wastes applied to the soil to add nutrients or for soil improvement.

Blocky: Soil structure classification in which aggregates are in the shape of blocks or polyhedrons.

Buffer strip: Areas or strips of land maintained in vegetation and strategically located on the landscape to help control runoff, erosion, and entrap contaminants.

Buffering: The ability of a soil or solution, such as irrigation water, to resist changes in pH when acid or alkaline substances are added. Often used when speaking of soil to describe the soil's resistance to pH changes when limed or acidified.

Bulk density: The mass of oven-dry soil per unit volume, usually expressed as grams per cubic centimeter.

C horizon: Zone of parent material; contains the material from which A and B horizons formed originally.

Carbon sequestration: The process through which carbon dioxide from the atmosphere is absorbed by trees, plants, and crops through photosynthesis, and stored as organic carbon in biomass and soils.

Calcareous soil: A soil containing significant amounts of naturally occurring calcium carbonate, which releases carbon dioxide gas (fizzes) when dilute acid is applied.

Capillary action: Movement of water in the soil through small soil pores.

Carbon-nitrogen (C:N) ratio: The ratio of the mass of carbon to the mass of nitrogen in soil, organic material, or plants.

Cation: An ion with a positive charge.

Cation exchange capacity: The sum total of exchangeable cations that a soil can adsorb at a specific pH, expressed as centimoles of charge per kilogram ($cmol_c/kg$) of soil or milliequivalents per 100 g of soil (meq/100 g soil).

Clay: 1) The class of smallest soil particles, smaller than 0.002 millimeter in diameter. 2) The textural class with more than 40% clay and less than 45% sand, and less than 40% silt.

Claypan: A dense, compact, slowly permeable layer found in the subsoil having a higher clay content than the overlying material that limits or slows the downward movement of water through the soil.

Clean till: May be referred to as conventional or inversion tillage. Tillage where all plant residues are covered. Low surface residue levels provide little protection from wind and/or water erosion.

Coliform bacteria: Microorganisms, which typically inhabit the intestines of warm-blooded animals. They are commonly tested for in drinking water analyses to indicate pollution by human or animal waste.

Colloid: A very tiny particle capable of being suspended in water without settling out. Soil colloids have a charged surface that attracts ions.

Compaction (soil): Increasing the soil bulk density, thereby decreasing the soil porosity, by the application of mechanical forces to the soil.

Composite soil sample: A soil sample resulting from mixing together many individual samples.

Conservation tillage: A general term for tillage practices that leave crop residues on the soil surface to reduce erosion.

Contaminant: Any physical, chemical, biological, or radiological substance that is above background concentration but does not necessarily cause harm.

Contour: An imaginary line perpendicular to the slope that represents the same elevation.

Contour tillage: Tillage following the contours of a slope, rather than up and down a slope. Helps prevent erosion and runoff.

Crust: A thin layer of poorly aggregated surface soil formed by wetting and drying that can impede plant emergence.

Deep tillage: Tillage deeper than that needed to produce loose soil for a seedbed, usually used to loosen a compacted subsoil.

Discharge: Flow of surface water in a stream or the flow of groundwater towards the soil surface, or from a pipe, spring, ditch, or flowing artesian well.

Drainage: Rate and amount of water removal from soil by surface or sub-surface flow.

Ecosystem: Community of animals and plants and the physical environment in which they live.

Effluent: Discharge or emission of a liquid or gas.

Erodibility index: A value representing the potential of a soil map unit to erode by sheet and rill erosion as determined by the formula EI = RKLS/T, using values from the Universal Soil Loss Equation. The index is a numerical expression of the potential of a soil to erode; the higher the index, the greater the need to maintain the sustainability of the soil resource base if intensively cropped.

Erosion: The wearing away of the land surface by running water, wind, ice, geological agents or mechanical actions, such as tillage or land leveling.

Eutrophication: A natural process of enrichment of nutrients into aquatic systems, primarily nitrogen (N) and phosphorus (P). Accelerated, or cultural, eutrophication is caused by the addition of excess nutrients to a system. This results in excessive vegetative growth. Decomposition of this plant material can result in the depletion of oxygen in water, leading to the death of aquatic organisms.

Evapotranspiration (ET): Loss of water to the atmosphere from the soil surface by evaporation and by transpiration through plants.

Fallow: Fields left idle on which vegetative growth is controlled by tillage or herbicides to accumulate water and/or mineral nutrients.

Field capacity: The amount of water a soil holds after free water has drained due to gravity.

Flood plain: Land near a stream that is commonly flooded when the water levels are high. Soil can form in sediments deposited during flooding.

Fragipan: A dense and brittle subsurface layer of soil that restricts root penetration and water movement.

Friable: The ease by which a moist soil can be crumbled.

Granular: Soil structure where the units are approximately spherical or polyhedral.

Gravitational water: Water that moves through the soil under the influence of gravity.

Groundwater: Water in the saturated zone below the soil surface.

Gully, Classic: A large channel in the soil, caused by erosion that is deep and wide enough that it cannot be crossed by tillage equipment.

Gully, Ephemeral: a shallow gully that can be obliterated by normal tillage operations, but it reoccurs in the same location in the field following surface water flow after heavy rain events.

Hardpan: A dense, hard, or compacted layer in soil that slows water percolation and movement of air and obstructs root growth. Pans may be caused by compaction, clay, or chemical cementation.

Hazardous waste: Solid, liquid, or gaseous substance which, because of its source or measurable characteristics, is classified under state or federal law as potentially dangerous and is subject to special handling, shipping, and disposal requirements.

Heavy metals: Refers to: lead, copper, zinc, mercury, arsenic, cadmium, nickel, and selenium. Some states may list additional metals.

Highly erodible land: A soil mapping unit with an Erodibility Index (EI) of 8 or more.

Horizon (soil): A horizontal layer of soil, created by soil-forming processes, that differs in physical or chemical properties from adjacent layers.

Humus: Highly decomposed organic matter that is dark-colored and highly colloidal.

Hydrologic cycle: Movement of water in and on the earth and atmosphere through processes such as precipitation, evaporation, runoff, and infiltration.

Hygroscopic water: Water held tightly by adhesion to soil particles. This water is not available to plants and remains in soil after air-drying.

Impaired waters: A waterbody (i.e., stream reaches, lakes, waterbody segments) with chronic or recurring monitored violations of the applicable numeric and/or narrative water quality criteria.

Infiltration: Entry of water into the soil from precipitation, irrigation, or runoff.

Irrigation: Application of water to supplement natural rainfall.

Landscape position: Using topography and/or slope characteristics to separate a field into different zones having similar soil characteristics and crop productivity.

Lateral flow: Movement of water horizontally below the soil surface, usually along an impervious layer.

Leaching: The movement of soluble materials through the soil profile via water movement within the profile.

Loading: Amount of a substance entering the environment (soil, water, or air).

Mapping unit (soil): Basis for setting boundaries in a soil map. May include one or more soil series.

Mass flow: The movement of solutes associated with net movement of water.

Massive soil: A structureless soil, often restrictive to plant root growth and penetration.

Mineral soil: A soil whose traits are determined mainly by its mineral content; mineral soils are defined as soils that contain less than 20 or 30 percent organic matter in the US and Canada, respectively.

Mineralization: The conversion of an element by soil organisms from an organic form to an inorganic form.

Minimum tillage: Tillage methods that involve fewer tillage operations than clean tillage does.

Mottling: Spots of different colors in a soil reflecting whether iron in the soil is reduced (greenish-grey colors when poorly drained) or oxidized (reddish-brown colors when well drained). Usually indicative of cycling between poor and good aeration.

Muck: An organic soil in which the organic matter is mostly decomposed.

Mulch: Natural or artificial layer of plant residue or other material covering the land surface which conserves soil moisture, holds soil in place, aids in establishing plant cover, and minimizes temperature fluctuations.

Mulch till: A full-width tillage and planting combination that leaves some plant residues or other material on the soil surface.

Non-point source (NPS) contamination: Water contamination derived from diffuse sources such as construction sites, agricultural fields, and urban runoff.

No-till/Direct seeding/Zero-till: Method of growing crops that involves no seedbed preparation prior to planting.

O horizon: A surface soil horizon primarily composed of organic matter.

Organic matter: The organic fraction of the soil exclusive of undecayed plant and animal residues.

Organic soil: Soil containing more than 20 or 30 percent organic matter in the US and Canada, respectively.

Peat: Unconsolidated soil material consisting of undecayed or slightly decayed organic matter that has accumulated underwater where low oxygen conditions inhibit decay.

Ped: A natural soil aggregate, such as a granule or prism.

Percolation: Downward movement of water through soil or rock.

Permanent wilting point: The soil water content at which most plants cannot obtain sufficient water to prevent permanent tissue damage.

Permeability: Capacity of soil, sediment, or porous rock to transmit water and gases.

pH: The negative logarithm of the hydrogen ion concentration, a measure of acidity or alkalinity on a scale of 0 to 14. Neutral is pH 7, values below 7 are acidic, and values above 7 are alkaline.

Platy: A soil structure consisting of soil aggregates that are developed predominantly along the horizontal axis; laminated; flaky.

Point source contamination: Water contamination from specific sources such as leaking underground storage tanks, landfills, industrial waste discharge points, chemical mixing sites or municipal sewage treatment.

Potable: Water that is suitable for drinking.

Preferential flow: The relatively rapid movement of water and its constituents through the soil via large and continuous pores, as compared to the slower movement of water through the soil matrix.

Prismatic (columnar): Soil structure where the individual units are bounded by flat or slightly rounded vertical faces. Units are distinctly longer vertically, and the faces are typically casts or molds of adjoining units. Vertices are angular or sub-rounded; the tops of the prisms are somewhat indistinct and normally flat.

Recharge: Downward movement of water through soil to groundwater.

Recharge area: Land area over which surface water infiltrates into soil and percolates downward to replenish an aquifer.

Restrictive layer: A nearly continuous layer that has one or more physical, chemical, or thermal properties that significantly impede the movement of water and air through the soil or that restricts roots or otherwise provide an unfavorable root environment.

Rill: A channel in the soil caused by runoff water erosion that is small enough to be erased by tillage. As opposed to an ephemeral gully, it is not expected to reoccur in the same location after being erased.

Riparian zone: The transitional semi-terrestrial area that is regularly influenced by fresh water that extends from the edges of water bodies to the edges of upland communities.

Runoff: Portion of precipitation, snowmelt, or irrigation, which moves by surface flow from an area.

RUSLE II: Revised Universal Soil Loss Equation: $A = RKLSCP$. An equation for predicting soil losses, where A is the average annual soil loss, *R* is the rainfall factor, *K* is the soil erodibility factor, *L* is the length of slope, *S* is the percent slope, *C* is the cover and management factor, and *P* is the conservation practice factor.

Saline soil: A non-sodic soil containing sufficient soluble salt to adversely affect the growth of most crops.

Salinity: An index of concentration of dissolved salts in the soil.

Saltation – Movement of individual soil particles/small aggregates by wind, in which the particles are lifted as much as 12 inches above the soil surface, then travel a short distance before dropping back to the soil surface. From 50 to 80 percent of total soil transport by wind is by saltation.

Saturated zone: Portion of the soil or rock profile in which all pores are filled with water.

Sediment: Eroded soil and rock material, and plant debris, transported and deposited by wind or water.

Sheet and rill erosion: A water erosion process caused by raindrop impact on the soil surface and a thin layer of water (sheet) moving over the soil surface.

Single grain: A structureless soil in which each particle exists separately as in sand.

Sodic soil: Soil high in sodium and low in soluble salts.

Soil map unit: A collection of areas defined and named the same in terms of their soil components or miscellaneous areas or both. Each map unit differs in some respect from all others in a survey area and is uniquely identified on a soil map. Each individual area on the map is delineation.

Soil loss tolerance (T value): (i) The maximum average annual soil loss that will allow continuous cropping and maintain soil productivity without requiring additional management inputs. (ii) The maximum soil erosion loss that is offset by the theoretical maximum rate of soil development, which will maintain an equilibrium between soil losses and gains.

Soil structure: The combination or arrangement of primary soil particles into secondary soil particle units, or peds.

Soil survey: The examination, description, and mapping of soils of an area according to a soil classification system.

Soil texture: The relative proportions of sand, silt, and clay.

Solubility: Amount of a solute substance that will dissolve in a given amount of a liquid solvent, typically water.

Solute: A substance that is dissolved in a liquid solvent, thus forming a solution.

Stomate: Opening in the surface of a leaf through which water vapor, carbon dioxide, and oxygen pass.

Strip-till: A tillage and planting system that disturbs a relatively narrow area of the soil (normally 8 to 10 inches wide), into which the crop is planted and some or all of the crop fertilizer is applied. The area between the tilled strips is left undisturbed, which reduces the potential for soil erosion.

Surface creep: Movement of sand-sized particles/aggregates by wind, in which the particles roll along the soil surface. Surface creep may account for 7 to 25 percent of total transport by wind.

Suspension: Movement of fine (<0.1 mm) soil particles by wind. The particles are dislodged from the soil surface, are small enough to remain in the air mass for an extended period. From 20 percent to more than 60 percent of an eroding soil may be carried in suspension.

Tillage erosion: The downslope displacement of soil through the action of tillage operations.

Tillage pan: Also known as a plow pan. A subsurface layer of soil having a bulk density that is higher than the layer either above or below it. The compaction is caused by the forces exerted during tillage operations.

Tilth: Physical condition of the soil in terms of how easily it can be tilled, how good a seedbed can be made, and how easily seedling shoots and roots can penetrate.

Total Maximum Daily Load (TMDL): (i) A regulatory term in the U.S. Clean Water Act, describing the maximum amount of a pollutant a body of water can receive while still meeting water quality standards; (ii) An allocation of that water pollutant deemed acceptable to the subject receiving waters.

Volatile organic compounds (VOC): Some carbon containing chemicals that readily evaporate and undergo a photochemical reaction with potentially harmful health effects.

Volatilization: The loss of a compound in gaseous form.

Water holding capacity: Similar to field capacity; the amount of water a soil holds after free water has drained because of gravity.

Watershed: A topographically delineated area of land where all of the water draining from it drains to the same stream or river system.

Water table: Upper surface of the ground water or layer of soil saturated with water.

WEPS (Wind Erosion Prediction System): A process-based daily time-step model that simulates weather (wind speed and direction, precipitation, and evapotranspiration) and field conditions (crop growth, surface roughness, crop residue, and windbreaks or barriers) to predict soil erosion by wind.

Wetland: A land area that is inundated or saturated with surface or groundwater at a frequency or duration sufficient to support a prevalence of vegetation adapted to saturated soil conditions. Wetlands are delineated on the basis and presence of three factors: hydrology, hydric soil, and hydrophytic vegetation.

Pest Management Glossary

Abiotic: Non-living, physical or chemical, includes solar radiation, temperature, humidity, and pH; used in context of an effect, such as abiotic injury.

Action threshold: The pest density at which a pest management tactic must be implemented in order to avoid economic loss. It is equivalent to the economic threshold and precedes the economic injury level.

Active ingredient: The chemical in a formulated product that is responsible for the herbicidal/insecticidal/fungicidal effects as indicated on the product label.

Acute exposure: Contact with a pesticide or toxin over a short period of time.

Adjuvant: Substance that enhances the effectiveness of a pesticide.

Bacteria: Unicellular organisms that include free living, saprophytic, and parasitic forms.

Banded pesticides: Pesticide application either over the rows or in-between the rows to reduce the overall application rate per acre.

Beneficial organisms: Organisms that reduce pest numbers or improve soil or plant quality.

Best Management Practice (BMP): Also called Good Farming Practices. Practices recognized as effective and practical means for producing a crop in an economically and environmentally sound way.

Biological pest control: The process of conserving, augmenting or introducing beneficial living organisms to reduce a pest population or its impacts. It includes the use of insects, nematodes, mites, fungi, bacteria, viruses, plants, vertebrates, and other living organisms.

Biological pesticides: Pesticides derived from living organisms such as Bt (*Bacillus thuringiensis*).

Biotic: Pertaining to living organisms.

Broad-spectrum pesticide: Pesticides that are toxic to a wide range of organisms.

Carcinogen: Substance that may initiate cancerous tumor formation in animals.

Chemical pest control: The use of pesticides to reduce a pest population or its impacts.

Chronic exposure: Contact with a pesticide or toxin over a long period of time, usually at low levels.

Common pesticide name: Name given to a specific pesticide active ingredient. Many pesticides are known by a number of trade or brand names, but have only one recognized common name.

Contact pesticide: A pesticide that is toxic to an organism by contact rather than a result of translocation or ingestion.

Cultural pest control: The use of practices other than chemical and biological controls to reduce a pest population or its impacts. Such practices include tillage, row spacing, irrigation, fertility, timely harvest, and all forms of mechanical pest control.

Dichotomous key: A system used for identification in which a decision is reached in stepwise fashion, where the user proceeds at each step by choosing among distinguishing characteristics that eventually leads to the final decision.

Disease triangle: The interaction of the plant, pathogen, and environment that is necessary for disease development.

Economic Injury Level: The pest damage level at which the cost of controlling the pest population equals the value of the crop lost.

Endangered species (United States): Any plant or animal which is in danger of extinction throughout all or a significant portion of its range.

Fumigant: Gaseous phase of a pesticide used to destroy insects, pathogens, weed seeds, or other pests in soil or grain bins.

Fungi: Organisms which lack chlorophyll and vascular tissue and range in form from a single cell to a body mass of branched filamentous hyphae that often produce specialized fruiting bodies. Fungi cannot produce their own food.

Genetic resistance: Genetically based mechanisms within host plants which hinder pest development.

Good Farming Practices: See BMP.

Herbicide carryover: Occurs when a herbicide does not break down during the season of application and persists in sufficient quantities to injure succeeding crops.

Host: A living organism serving as a food source and refuge for a parasite.

Integrated pest management (IPM): A sustainable approach that combines the use of prevention, avoidance, monitoring and suppression strategies in a way that minimizes economic, health, and environmental risks.

LD50 or LC50: The lethal dose of a substance that kills for 50% of the test organisms expressed as milligrams (mg) per kilogram of body weight. It is also the concentration expressed as parts per million (ppm) or parts per billion (ppb) in the environment (usually water) that kills 50% of the test organisms exposed.

Mechanical pest control: A component of cultural pest control that uses physical methods to reduce a pest population or its impacts. Mechanical controls include cultivation, hoeing, hand weeding, mowing, pruning, or vacuuming.

Mode of action: The mechanism by which pesticides affect target organisms.

Monitoring: Systematically observing or sampling a crop to assess its condition, stage of growth, infection by disease, infestation of pests, etc.

Narrow-spectrum pesticide: Pesticides that act on a limited range of species.

Nematode: An unsegmented worm with an elongated rounded body pointed at both ends and piercing mouth parts; most are free-living but some are parasitic.

Non-point Source (NPS) Pollution: Contamination derived from diffuse sources such as construction sites, agricultural fields, and urban runoff.

PAMS: An acronym that classifies pest management practices into four groups: prevention, avoidance, monitoring, and suppression of pest populations.

Parasite: An organism which lives on or in another living organism and obtains part or all of its nutrients from that other living organism.

Parasitoid: An insect that feeds on and develops in another insect, and causes death in the host insect.

Parts per billion (ppb)/ Parts per million (ppm): A means of expression concentration: parts of analyte per billion/million parts of sample.

Pathogen: Living agents that cause diseases in plants and animals.

Pest: Organism that directly or indirectly causes damage to crops.

Pest density: The number of pests per unit area or plant structure.

Pesticide resistance: The inherited ability of an organism to survive and reproduce following exposure to a dose of pesticide normally lethal to the wild type.

Persistence: Ability of a pesticide to resist degradation as measured by the period of time required for breakdown of a material. Depends on environmental conditions and chemical properties.

Personal Protective Equipment: Clothing and protective devices required by EPA to be worn by users of pesticide products.

Phytotoxic: Injurious or toxic to plants.

Plant disease triangle: Diagrammatic representation of the three key factors contributing to plant diseases: 1) susceptible hosts, 2) pathogen presence, 3) proper environmental conditions.

Plant parasitic nematodes: Microscopic, non-segmented roundworms that usually survive in soil, and invade plant roots.

Point source pollution: Contamination from specific identifiable source.

Postemergence: Applied after emergence of the specified weed or planted crop.

Preemergence: Applied to the soil surface prior to emergence of the specified weed or planted crop.

Preplant incorporated (PPI): Applied and tilled into the soil before seeding or transplanting.

Race or strain: Organisms of the same species and variety that differ in their ability to parasitize varieties of a given host, or that differ in their reaction to pesticides.

Reduced-risk pesticides: These are pesticides which: 1) reduce pesticide risks to human health; 2) reduce pesticide risks to nontarget organisms; 3) reduce the potential for contamination of valued, environmental resources.

Re-entry interval: A time period set by EPA that restricts individuals from entering a pesticide-treated area.

Refugia: Areas, untreated with pesticides, provided to preserve susceptible populations of pests.

Sampling: Any valid method to determine a representative value for a field parameter.

Scouting: Sampling or observing crops to determine levels of pest populations and disease; also used to assess crop health and yield potential, and levels of beneficial insects.

Selectivity: Pesticides that are toxic primarily to the target pest (and perhaps a few related species), leaving most other organisms, including natural enemies, unharmed.

Selection Pressure: An action, event, or chemical that preferentially allows survival of one group over another.

Setback: The distance from sensitive areas, such as surface water, wetlands, or tile drain inlets, where no pesticides are to be applied.

Species at risk (Canada): Any plant or animal with a small population, limited range and/or are associated with habitats that have been lost or drastically reduced.

Spray drift: Movement of airborne spray droplets of a pesticide outside the intended area of application.

Surfactant: A material that favors or improves the emulsifying, dispersing, spreading, wetting, or other surface modifying properties of pesticides in solution.

Systemic: Not localized; movement away from the area of application to other plant tissues through translocation.

Tank mix: A mixture of two or more compatible pesticides intended for simultaneous application.

Tolerance: The inherited ability of a species to survive and reproduce after pesticide treatment. Also refers to the ability of a crop to yield satisfactorily in presence of pests or adverse environmental conditions.

Toxicity: Degree to which a pesticide is poisonous; the ability of a substance to interfere adversely with the vital processes of an organism.

Trade name: Name given to a product sold by a company to distinguish it from similar products made by other companies.

Transgenic resistance: An organism whose genome has been modified to incorporate pest resistance by the introduction of external DNA sequences into the germ line or gene transfer from outside the normal range of sexual compatibility.

Transgenics (bioengineered organisms): Plants or animals that contain DNA derived from a foreign plant or animal.

Translocation: Actively moved within and between plant tissues and organs.

Trap crop: A crop that attracts and concentrates insect pests.

Vapor drift: The movement of chemical vapors from the area of application.

Viruses: Non-cellular parasites/pathogens comprised of a protein shell and a simple genetic core, usually RNA in plant viruses.

Worker Protection Standard: EPA regulations requiring protective clothing and practices designed to protect users of pesticides by reducing pesticide exposure.

Crop Management Glossary

Accuracy: The ability of a measurement to match the actual value of the quantity being measured.

Allelopathy: Any harmful effect of one plant or microorganism on other organisms through the production and release of chemical compounds into the environment.

Annual, summer: Plants whose seeds germinate in the spring, the plants produce seed and die the same fall

Annual, winter: Plants whose seeds germinate in the fall, the plants produce seed in the spring and die in the summer.

Anther (male): The pollen-bearing portion of a stamen.

Anthesis: The time of flowering in a plant.

Applied Information Technology: Using advanced information technology to make better decisions in crop, soil, and environmental management systems.

Basis: The difference between the cash price and the futures price, for the time, place and quality where delivery actually occurs.

Biennial plant: A flowering plant that takes 12-24 months to complete the life cycle. It grows vegetative the first year and reproduces the second year.

Biomass: The mass of a specific plant or plant part in a given area, usually expressed as weight or volume per unit area.

Boot stage: A grass growth stage when an inflorescence is enclosed by the sheath of the uppermost leaf, just prior to inflorescence emergence.

Certified seed: The progeny of breeder, select, foundation, or registered seed so handled as to maintain satisfactory genetic purity, identity, and seed quality acceptable to the certifying agency.

Clean till: Tillage where all plant residues are covered to prevent growth of all vegetation except that of the crop being produced.

Companion crop: A crop sown with another crop, especially one that will emerge and develop slowly. Also called a nurse crop.

Competition: The simultaneous demand by two or more organisms for limited environmental resources.

Continuous cropping: Growing a crop in a field every year.

Cover crop: A crop grown to: 1) protect the soil from erosion during periods when it would otherwise be bare; 2) scavenge excess nutrients from a previous crop to prevent nutrient loss; or both.

Crop management zone: A sub-region of a field that has a relatively uniform combination of yield-limiting factors where a single level of crop management is appropriate.

Crop residue: Plant material remaining in the field after harvest.

Crop rotation: The practice of growing different crops in a planned regular sequence on the same land.

Cropping pattern: The yearly sequence and spatial arrangement of crops, or crops and fallow, in a given area.

Cultivar: A variety, strain, or race that has originated and persisted under cultivation, or was specifically developed for crop production.

Day neutral crop: A crop whose flowering is not influenced by day or night length.

Desiccation: The removal of moisture from a material.

Determinate plant: A plant that initiates flowering based on day length, with the change from vegetative to reproductive growth over a relatively short time.

Double cropping: The practice of consecutively producing two crops of either like or unlike commodities on the same land within the same year.

Dough stage: Stage of seed development at which the endosperm is pliable, like dough, defined as the time when 50% of the seeds on an inflorescence have dough-like endosperm.

Evaporation: The process in which a liquid is changed into a gas.

Evapotranspiration: The loss of water from a given area by both evaporation from plant and soil surfaces, and transpiration from plants.

Fallow land: Land not being used to grow a crop, but on which plant growth is controlled with tillage or herbicides. Used to store water, control weeds, and increase available soil nutrients.

Fibrous root system: A plant root system having a large number of small, finely divided, widely spreading roots, but no large individual roots; common with grass species.

Field composite approach: The whole field is managed the same, where all parts of the field receive the same inputs and at the same rate.

Flag leaf: The uppermost leaf on a fruiting grass stem. The leaf immediately below the inflorescence.

Flowering stage: The physiological stage when anthesis occurs in a plant, or flowers are visible in non-grass plants.

Genetically Modified Organism (GMO/GM): See also transgenic. A living entity that has been modified or transformed through recombinant DNA technology.

Geographic coordinates: The system of latitude and longitude that defines the location of any point on the earth's surface.

Geographic Information Systems (GIS): A computer system for measuring and relating environmental and crop data to positions on Earth's surface.

Germination: The resumption of growth of a seed embryo after a period of dormancy. Requires a favorable environment of adequate water, oxygen, and suitable temperature.

Germination test: A method to measure seed viability, when placed under favorable environmental conditions.

Global Positioning System (GPS): A system that uses a number of orbiting satellites to identify a location on Earth, based on longitude, latitude, and altitude.

Grid management: A precision farming technique where crop inputs are applied on a sub-field basis, the sub-field areas delineated by subdividing the field using geographic coordinates.

Growing Degree Unit (GDU): Heat accumulation, calculated by subtracting a base temperature from an average of the maximum and minimum daily temperatures for an area.

Growth regulator: A substance that when applied to plants in small amounts either inhibits, stimulates, or otherwise modifies the growth process.

Harvest index: The quantity of harvestable biomass produced per unit of total biomass.

Harvest population: The number of harvestable plants per unit area remaining at the end of a growing season.

Heading: The developmental stage of a grass plant from initial emergence of the inflorescence from the boot until the inflorescence is fully emerged.

Hybrid: First generation progeny resulting from the controlled cross-fertilization between individuals that differ in one or more genes.

Identity-preserved (IP) crop: A crop in which specific genetic traits are known to exist.

Indeterminate plant: Plant whose flowering is not affected by day length, and continues vegetative growth after reproductive growth has begun.

Inflorescence: The flowering part of a plant or arrangement of flowers on a stalk.

Inoculant: A seed or soil additive, typically some type of bacteria or fungi, which enhances plant growth and development.

Intercropping: Growing two or more crops together in the same field at the same time.

Irrigation efficiency: The ratio of the amount of water actually consumed by a crop or stored in the root zone on an irrigated area to the amount of water applied to the area.

Least Significant Difference (LSD): A statistical range test used to determine true differences among treatment means.

Lodging, root: Condition in which stalks or stems fall due to a weak root system, root damage, or soil condition.

Lodging, stalk: Condition in which stalks or stems break or fall above the soil surface, because of weak stalk, damage, or weather events.

Long day crop: Crop in which flowering occurs when night length is less than the crop's required critical length.

Maturity: The developmental stage when a plant reaches maximum dry matter production, yield, or desirable quality.

Milk stage: In grain, the stage of development following pollination in which the endosperm appears as a whitish liquid like milk.

Monoculture: Growing the same crop continuously in the same field, year after year.

Open pollinated: Plants pollinated by the wind, insects, birds or animals, and not by human manipulation.

Organic farming: Crop production systems that do not use synthetic pesticides or fertilizers.

Panicle: A grass inflorescence, the main axis of which is branched, and whose branches bear loose flower clusters.

Perennial plant: Plants that have vegetative structures that allow them to live more than 2 years.

Photoperiodism: The growth and flowering response of plants in relation to changes in the length of daylight hours.

Physiological maturity: Plant growth stage representing the end of reproductive development, where the maximum dry weight has been accumulated.

Pollination: The transfer of pollen from the anther to the stigma of a flower.

Precision: The ability of a measurement to be consistently reproduced.

Precision agriculture: Using the best technologies to identify and manage in-field soil and crop variability to improve production and economic return.

Pure live seed: Percentage of pure germinating seed, calculated as: pure seed percentage x germination percentage/100.

Radicle: The first root of a plant that elongates during germination of a seed and forms the primary root.

Randomization: A random arrangement of treatments or plots, in order to obtain representative data for an experiment.

Real-Time Kinematic (RTK): A position location correction process whereby signals received from a GPS receiver can be compared using carrier phase corrections transmitted from a reference station to the user's roving receiver.

Relay cropping: A system in which one crop is planted into a standing crop prior to harvest of the established crop, which does not hinder the yield of either crop.

Remote sensing: The collection and analysis of data from a distance, often using sensors that respond to different heat intensities or light wavelengths.

Replication: Repeating plots or treatments in an experiment in order to increase precision.

Resistance, pest: Genetic ability to avoid, repel, or limit attack by a pest by genetic manipulation.

Resistance, pesticide: The inherited ability of an organism to survive and reproduce following exposure to a dose of pesticide normally lethal to the wild type.

Rhizobium: Bacteria which fix atmospheric nitrogen in nodules on the roots of legume plants.

Self-pollinated: A plant pollinated by its own pollen.

Short day crop: A crop in which flowering is initiated when the crop's critical night length is exceeded.

Stigma: The female part of a flower where pollen is deposited.

Taproot: The primary root of a plant formed in direct continuation with the root tip or radicle of the embryo. Forms a thick, tapering main root from which arise smaller, lateral branches.

Tilth: Physical condition of the soil that defines how easily it can be tilled, how good a seedbed can be made, and how easily seedling shoots and roots can penetrate.

Tolerance: The inherited ability of a species to survive and reproduce after pesticide treatment. Also refers to the ability of a crop to yield satisfactorily in presence of pests or adverse environmental conditions.

Transgenic: Plants or animals that contain DNA derived from a foreign plant or animal.

Variable Rate Technology (VRT): The ability to vary the application of crop production inputs based on criteria for crop response or soil conditions. VRT allows for the targeted application of inputs at varying rates across a field.

Variety: A taxonomic subdivision of selectively bred individuals that are distinct, uniform, and stable, that are often referred to as a cultivar when registered for use.

Vegetative: 1) The non-reproductive parts of plants. 2) The non-reproductive stage of plant development.

Vernalization: Exposure of germinating seeds or plants to low temperatures to induce flowering.

Viability: A measure of the potential for seeds to germinate, grow, and develop normally under favorable conditions.

Yield map: The pattern of crop yield in a field based on data collected using a yield sensor on a harvester, and geographic positioning of these yield values using a Global Positioning System.

Zone management: A precision farming technique where crop inputs are applied on a sub-field basis, the sub-field areas delineated by spatial variability such as soil mapping units, soil test results, crop yields, etc.