Glossary

ABSORPTION.—The process by which a substance is taken into and included within another substance, i. e., intake of water by soil, or intake of gases, water, nutrients, or other substances by plants.

ADSORPTION.—The increased concentration of molecules or ions at a surface, including exchangeable cations and anions on soil particles.

AGGREGATE.—A group of soil particles cohering so as to behave mechanically as a unit.

AGGREGATION.—The act or process of forming aggregates, or the state of being aggregated.

ALKALI SOIL.—A soil that contains sufficient exchangeable sodium to interfere with the growth of most crop plants, either with or without appreciable quantities of soluble salts. *See* Nonsaline-Alkali Soil and Saline-Alkali Soil.

ALKALINE.—A chemical term referring to basic reaction where the pH reading is above 7, as distinguished from acidic reaction where the pH reading is below 7.

ALKALINE SOIL.—A soil that has an alkaline reaction, i. e., a soil for which the pH reading of the saturated soil paste is higher than 7.

ALKALIZATION.—The process whereby the exchangeable-sodium content of a soil is increased.

ATMOSPHERE.—*See* Standard Atmosphere.

BASE-EXCHANGE CAPACITY.—*See* Cation-Exchange-Capacity.

BULK DENSITY.—The ratio of the mass of water-free soil to its bulk volume. Bulk density is expressed in pounds per cubic foot or grams per cubic centimeter and is sometimes referred to as "apparent density." When expressed in grams per cubic centimeter, bulk density is numerically equal to apparent specific gravity or volume weight.

CATION EXCHANGE.—The interchange of a cation in solution with another cation on a surface-active material.

CATION-EXCHANGE-CAPACITY.—The total quantity of cations which a soil can adsorb by cation exchange, usually expressed as milliequivalents per 100 grams. Measured values of cation-exchange-capacity depend somewhat on the method used for the determination.

CELL CONSTANT.—*See* Conductivity-Cell Constant.

COEFFICIENT OF CORRELATION.—A statistic used in linear correlation that provides a measure of the proportion of variation in one variable that is associated with variation in another variable.

COEFFICIENT OF DETERMINATION.—A statistic used in linear correlation that gives the fraction of the variance in one variable which is associated with variance in another variable. It is the square of the coefficient of correlation and is usually expressed in percent.

COEFFICIENT OF VARIATION.—Standard deviation expressed as percentage of the mean.

CONDUCTIVITY.—*See* Electrical Conductivity and Hydraulic Conductivity.

CONDUCTIVITY-CELL CONSTANT (k).—The product of the known electrical conductivity (EC) of a standard solution in a conductivity cell and the corresponding measured resistance (R) of the cell containing the standard solution. That is: $k=EC\times R$. The value of the cell constant is determined by the geometry of the cell and so is nearly independent of the temperature, but EC and R must be evaluated at the same temperature. Rearranging the equation and indicating temperatures by a subscript gives: $EC_t=k/R_t$. In this form, the equation may be used for evaluating the conductivity EC_t of an unknown solution in the cell at temperature (t), where R_t is the measured resistance of the cell containing the solution at the temperature t and k is the cell constant as evaluated from a previous measurement of a standard solution.

CONSUMPTIVE USE.—The water used by plants in transpiration and growth, plus water vapor loss from adjacent soil or snow or from intercepted precipitation in any specified time. Usually expressed as equivalent depth of free water per unit of time.

DARCY'S LAW.—1. Historical. The volume of water passing downward through a sand filter bed in unit time is proportional to the area of the bed and to the difference in hydraulic head and is inversely proportional to the thickness of the bed. 2. Generalization for three dimensions. The effective rate of viscous flow of water in isotropic porous media is proportional to, and in the direction of, the hydraulic gradient. 3. Generalization for other fluids. The effective rate of viscous flow of homogeneous fluids through isotropic porous media is proportional to, and in the direction of, the driving force.

DISPERSED SOIL.—Soil in which the clay readily forms a colloidal sol. Dispersed soils usually have low permeability. They tend to shrink, crack, and become hard on drying and to slake and become plastic on wetting.

DRAINAGE.—1. The processes of the discharge of water from an area of soil by sheet or stream flow (surface drainage) and the removal of excess water from within soil by downward flow through the soil (internal drainage). 2. The means for effecting the removal of water from the surface of soil and from within the soil, i. e., sloping topography or stream channels (surface drainage) and open ditches, underground tile lines, or pumped wells (artificial drainage).

DRAINAGE REQUIREMENTS.—Performance and capacity specifications for a drainage system, i. e., permissible depths and modes of variation of the water table with respect to the root zone or soil surface, and the volume of water that the drains must convey in a given time.

EFFICIENCY OF IRRIGATION.—The fraction of the water diverted from a river or other source that is consumed by the crop, expressed as percent. *See* Consumptive Use. Often applied to whole irrigation systems and takes account of conveyance losses.

EFFICIENCY OF WATER APPLICATION.—The fraction of the water delivered to the farm that is stored in the root zone for use by the crop, expressed as percent.

ELECTRICAL CONDUCTIVITY.—The reciprocal of the electrical resistivity. The resistivity is the resistance in ohms of a conductor, metallic or electrolytic, which is 1 cm. long and has a cross-sectional area of 1 $cm.^2$ Hence, electrical conductivity is expressed in reciprocal ohms per centimeter, or mhos per centimeter. The terms "electrical conductivity" and "specific electrical conductance" have identical meaning.

EQUIVALENT; EQUIVALENT WEIGHT.—The weight in grams of an ion or compound that combines with or replaces 1 gm. of hydrogen. The atomic weight or formula weight divided by its valence.

EQUIVALENT PER MILLION.—An equivalent weight of an ion or salt per 1 million gm. of solution or soil. For solutions, equivalents per million (e. p. m.) and milliequivalents per liter (meq./l.) are numerically identical if the specific gravity of the solution is 1.0.

ETHYLENE GLYCOL RETENTIVITY.—Weight of ethylene glycol adsorbed per unit weight of soil under specified equilibrium or quasi-equilibrium conditions. *See* Method 25.

EXCHANGE CAPACITY.—*See* Cation-Exchange-Capacity.

EXCHANGE COMPLEX.—The surface-active constituents of soils (both inorganic and organic) that are capable of cation exchange.

EXCHANGEABLE CATION.—A cation that is adsorbed on the exchange complex and which is capable of exchange with other cations.

EXCHANGEABLE-SODIUM-PERCENTAGE.—The degree of saturation of the soil exchange complex with sodium. It may be calculated by the formula:

$$ESP=\frac{\text{Exchangeable sodium (meq./100 gm. soil)}}{\text{Cation-exchange-capacity (meq./100 gm. soil)}}\times 100$$

FIELD CAPACITY.—The moisture content of soil in the field 2 or 3 days after a thorough wetting of the soil profile by rain or irrigation water. Field capacity is expressed as moisture percentage, dry-weight basis.

FIFTEEN-ATMOSPHERE PERCENTAGE.—The moisture percentage, dry-weight basis, of a soil sample which has been wetted and brought to equilibrium in a pressure-membrane apparatus at a pressure of 221 p. s. i. This characteristic moisture value for soils approximates the lower limit of water available for plant growth.

FIFTY PERCENT YIELD-DECREMENT VALUE.—The measured value of the soil salinity or alkali that decreases crop yield 50 percent as compared with yields of the same crop on nonsaline and nonalkali soils under similar growing conditions.

GROUND WATER.—Water in soil beneath the soil surface, usually under conditions where the pressure in the water is greater than the atmospheric pressure, and the soil voids are substantially filled with the water.

HYDRAULIC CONDUCTIVITY.—The proportionality factor in the Darcy flow law, which states that the effective flow velocity is proportional to the hydraulic gradient. Hydraulic conductivity, therefore, is the effective flow velocity at unit hydraulic gradient and has the dimensions of velocity (LT^{-1}).

HYDRAULIC GRADIENT.—The decrease in hydraulic head per unit distance in the soil in the direction of the greatest rate of decrease of hydraulic head.

HYDRAULIC HEAD.—The elevation with respect to a standard datum at which water stands in a riser or manometer connected to the point in question in the soil. This will include elevation head, pressure head, and also the velocity head, if the terminal opening of the sensing element is pointed upstream. For nonturbulent flow of water in soil the velocity head is negligible. In unsaturated soil a porous cup must be used for establishing hydraulic contact between the soil water and water in a manometer. Hydraulic head has the dimensions of length (L).

INDICATOR PLANT.—A native plant that indicates, in general, and often in a specific manner, the nature of soil conditions with regard to moisture and salinity. Dominant species are the most important indicators of such conditions.

INFILTRATION.—The downward entry of water into soil.

INFILTRATION RATE; INFILTRATION CAPACITY.—The maximum rate at which a soil, in a given condition at a given time, can absorb rain. Also, the rate at which a soil will absorb water ponded on the surface at a shallow depth when the ponded area is infinitely large or when adequate precautions are taken to minimize the effect of divergent flow at the borders. It is the volume of water passing into the soil per unit of area per unit of time, and has the dimensions of velocity (LT^{-1}).

INTAKE RATE; INFILTRATION VELOCITY.—The rate of water entry into the soil expressed as a depth of water per unit of time. This term involves no restrictions on area of application or divergence of flow in the soil; therefore, the measuring procedure should be specified. It has the dimensions of velocity (LT^{-1}).

INTRINSIC PERMEABILITY.—The factor k' in the equation,

$$v=\frac{k'dgi}{\eta}=\frac{k'}{\eta}(dF_g-\nabla p)$$

where v=flow velocity, d=density, g=scalar value for acceleration of gravity, i=hydraulic gradient, η=viscosity, F_g=gravitational force per unit of mass, and ∇p=pressure gradient. Intrinsic permeability has the dimensions of length squared (L^2). *See* Permeability (Quantitative).

ISOBATH.—1. Having constant depth. 2. A line connecting points of equal depth to water table.

ISOPLETH.—1. A graph showing the occurrence or frequency of any phenomenon as a function of two variables. 2. A line showing the variation in time and position along a field profile of the point of intersection of a water-table contour line and the profile.

LEACHING.—The process of removal of soluble material by the passage of water through soil.

LEACHING REQUIREMENT.—The fraction of the water entering the soil that must pass through the root zone in order to prevent soil salinity from exceeding a specified value. Leaching requirement is used primarily under steady-state or long-time average conditions.

LIME.—Strictly, calcium oxide (CaO), but as commonly used in agriculture terminology calcium carbonate ($CaCO_3$) and calcium hydroxide ($Ca(OH)_2$) are included. Agricultural lime refers to any of these compounds, with or without magnesia, used as an amendment for acid soils.

MILLIEQUIVALENT.—One thousandth of an equivalent.

MILLIEQUIVALENT PER LITER.—A milliequivalent of an ion or a compound in 1 liter of solution.

MOISTURE PERCENTAGE.—1. Dry-weight basis. The weight of water per 100 units of weight of material dried to constant weight at a standard temperature. 2. Depth basis. The equivalent depth of free water per 100 units of depth of soil. Numerically this value approximates the volume of water per 100 units of volume of soil.

NONSALINE-ALKALI SOIL.—A soil that contains sufficient exchangeable sodium to interfere with the growth of most crop plants and does not contain appreciable quantities of soluble salts. The exchangeable-sodium-percentage is greater than 15 and the electrical conductivity of the saturation extract is less than 4 millimhos per centimeter (at 25° C.). The pH reading of the saturated soil paste is usually greater than 8.5.

ONE-THIRD-ATMOSPHERE PERCENTAGE.—The moisture percentage, dry-weight basis, of a soil sample that has been air-dried, screened, wetted, and brought to hydraulic equilibrium with a permeable membrane at a soil-moisture tension of 345 cm. of water. This retentivity value closely approximates the moisture equivalent value of many soils.

OSMOTIC PRESSURE.—The equivalent negative pressure that influences the rate of diffusion of water through a semipermeable membrane. Its direct experimental value for a solution is the pressure difference required to equalize the diffusion rates between the solution and pure water across a semipermeable membrane. Osmotic pressure in atmospheres may be calculated from the freezing-point depression ΔT in °C. by the formula $OP=12.06\Delta T-0.021\Delta T^2$.

PARTICLE DENSITY.—The average density of the soil particles. Particle density is usually expressed in grams per cubic centimeter and is sometimes referred to as "real density" or "grain density."

PERCOLATION.—A qualitative term applying to the downward movement of water through soil. Especially, the downward flow of water in saturated or nearly saturated soil at hydraulic gradients of one or less.

PERMANENT WILTING PERCENTAGE.—The moisture percentage of soil at which plants wilt and fail to recover turgidity. It is usually determined with dwarf sunflowers. The expression has significance only for nonsaline soils.

PERMEABILITY.—1. Qualitative. The quality or state of a porous medium relating to the readiness with which such a medium conducts or transmits fluids. 2. Quantitative. The specific property governing the rate or readiness with which a porous medium transmits fluids under standard conditions. The equation used for expressing the flow should take into account the properties of the fluid so that proper measurements on a given medium give the same permeability value for all fluids that do not alter the medium. The physical dimensions of the permeability unit are determined by the equation used to express the flow. *See* Intrinsic Permeability.

PLANT COMMUNITY.—An assemblage of plants living together under the same environmental conditions.

POROSITY.—The fraction of the soil volume not occupied by soil particles, i. e., the ratio of the sum of the volumes of the liquid and gas phases to the sum of the volumes of the solid, liquid, and gas phases of the soil.

POTASSIUM-ADSORPTION-RATIO.—A ratio for soil extracts and irrigation waters used to express the relative activity of potassium ions in exchange reactions with soil.

$$PAR=\frac{K^{+}}{\sqrt{(Ca^{++}+Mg^{++})/2}}$$

where the ionic concentrations are expressed in milliequivalents per liter.

RECLAMATION.—The process of removing excess soluble salts or excess exchangeable sodium from soils.

REGRESSION COEFFICIENT.—A statistic used in linear correlation that gives the change in one variable that is associated with unit change in another variable.

SALINE-ALKALI SOIL.—A soil containing sufficient exchangeable sodium to interfere with the growth of most crop plants and containing appreciable quantities of soluble salts. The exchangeable-sodium-percentage is greater than 15, and the electrical conductivity of the saturation extract is greater than 4 mmhos per centimeter (at 25° C.). The pH reading of the saturated soil is usually less than 8.5.

SALINE SOIL.—A nonalkali soil containing soluble salts in such quantities that they interfere with the growth of most crop plants. The electrical conductivity of the saturation extract is greater than 4 mmhos per centimeter (at 25° C.), and the exchangeable-sodium-percentage is less than 15. The pH reading of the saturated soil is usually less than 8.5.

SALINIZATION.—The process of accumulation of soluble salts in soil.

SATURATED SOIL PASTE.—A particular mixture of soil and water. At saturation the soil paste glistens as it reflects light, flows slightly when the container is tipped, and the paste slides freely and cleanly from a spatula for all soils except those with high clay content.

SATURATION EXTRACT.—The solution extracted from a soil at its saturation percentage.

SATURATION PERCENTAGE.—The moisture percentage of a saturated soil paste, expressed on a dry-weight basis.

SEMIPERMEABLE MEMBRANE.—A membrane that permits the diffusion of one component of a solution but not the other. In biology, a septum which permits the diffusion of water but not of the solute.

SODIUM-ADSORPTION-RATIO.—A ratio for soil extracts and irrigation waters used to express the relative activity of sodium ions in exchange reactions with soil.

$$SAR=\frac{Na^{+}}{\sqrt{(Ca^{++}+Mg^{++})/2}}$$

where the ionic concentrations are expressed in milliequivalents per liter.

SOIL EXTRACT.—The solution separated from a soil suspension or a soil at a particular moisture content.

SOIL-MOISTURE STRESS.—The sum of the soil-moisture tension and the osmotic pressure of the soil solution. It is the suction or negative pressure to which water must be subjected to be at equilibrium through a semipermeable membrane with the solution in soil.

SOIL-MOISTURE TENSION.—The equivalent negative pressure or suction of water in soil. Experimentally, the suction of water in soil is the pressure difference required across a permeable membrane to produce hydraulic equilibrium between the soil water and free water.

SOLUBLE-SODIUM PERCENTAGE.—A term used in connection with irrigation waters and soil extracts to indicate the proportion of sodium ions in solution in relation to the total cation concentration. It may be calculated by the formula:

$$SSP=\frac{\text{Soluble sodium concentration (meq./l.)}}{\text{Total cation concentration (meq./l.)}}\times 100$$

SPECIFIC ION EFFECT.—Any effect of a salt constituent in the substrate on plant growth that is not caused by the osmotic properties of the substrate.

SPECIFIC SURFACE.—The surface area, per unit weight of soil, commonly expressed as square meters per gram of soil ($m.^2/gm.$).

STANDARD ATMOSPHERE.—A unit of pressure defined as follows: 1 atmosphere$=1.013\times10^{6}$ dynes per sq. cm.$=14.71$ pounds per sq. in.$=76.39$ cm. of mercury column$=1{,}036$ cm. of water column$=34.01$ ft. of water column. (Water and mercury at 20° C.).

STANDARD DEVIATION.—A statistic used to measure the dispersion of a set of values around their mean.

SUCTION.—*See* Soil-Moisture Tension.

WATER TABLE.—The upper boundary for ground water. The upper surface of the locus of points at which the pressure in the ground water is equal to atmospheric pressure.