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GLOSSARY OF TERMS ON SOIL AND WATER

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GLOSSARY OF TERMS ON SOIL AND WATER

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Indian Standard

GLOSSARY OF TERMS ON SOIL AND WATER

0. FOREWORD

0.1 This Indian Standard was adopted by the Indian Standards Institution on 27 November 1984, after the draft finalized by the Irrigation Equipment and Systems Sectional Committee had been approved by the Agricultural and Food Products Division Council.

0.2 Soil and water are the main two ingredients which help in increasing the productivity of agricultural crops. The definitions of the various terms that are used in the field of soil and water are available. However, connotations vary from person to person and place to place. Therefore, an attempt has been made in this standard to evolve definitions of various terms clearly to minimize the scope for varied interpretations and uses. It is hoped that this standard would help in adoption of uniform terminology in the country.

0.3 Terms included in this standard may cover various disciplines of agriculture, such as agricultural engineering, horticulture, soil sciences, agricultural chemistry and forestry. All these fields are viewed from point of view of soil and water management practices in agricultural field.

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1. SCOPE

1.1 This standard gives definitions of terms used in the field of soil and water in agriculture field.

2. TERMINOLOGY

2.0 The terms are arranged in an alphabetical order. Some of the terms with similar meaning may appear in different clauses, in such cases, the definition in full has been given where the term is more commonly used.

2.1 A Horizon — The upper horizon of the soil mass from which material has been removed by percolating waters.

2.2 Accelerated Erosion — *See* erosion (b).

2.3 Acid Soil — A 'sour' soil containing more hydrogen than hydroxyle ions.

2.4 Acre-Foot — Quantity of water that would cover 1 acre for a depth of 1 foot (43 560 ft^3 = 1 233·5 m^3).

2.5 Acre-Inch — Quantity of water that would cover 1 acre for a depth of 1 inch (3 630 ft^3 = 102·8 m^3).

2.6 Adapter (Sprinkler Irrigation) — A device used as a fitting to connect two variable pipes of different sizes.

2.7 Aerate — To impregnate with a gas, usually air.

2.8 Aeration Soil — The process by which air in the soil is replaced by air with low airflow rates from the atmosphere. In a well-aerated soil, the soil air is very similar in composition to the atmosphere above the soil. Poorly aerated soils usually contain a much higher percentage of carbon dioxide.

2.9 Aerobic

a) Having molecular oxygen as a part of the environment.

b) Growing only in the presence of molecular oxygen, as aerobic organisms.

c) Occurring only in the presence of molecular oxygen. (In cases of certain chemical or biochemical processes such as aerobic decomposition).

2.10 Agronomy — A specialization of agriculture concerned with the theory and practice of field-crop production and soil management. The scientific management of land.

2.11 Air Capacity — The quantity of air in the soil when the soil is at field moisture capacity.

2.12 Air Drainage (Soil) — Renewal of soil air by diffusion and meteorological factors, such as soil temperature changes, barometric variations and action of wind.

2.13 Air Dry

a) The state of dryness (of a soil) at equilibrium with the moisture content in the surrounding atmosphere. The actual moisture content will depend upon the relative humidity and the temperature of the surrounding atmosphere.

b) To allow to reach equilibrium in moisture content with the surrounding atmosphere.

2.14 Air Porosity — The proportion of the bulk volume of soil that is filled with air at any given time or under a given condition such as a specified moisture tension. Usually the large pores; that is, those drained by a tension of less than approximately 100 cm of water. (*See* moisture tension).

2.15 Alkaline — A chemical term referring to 'basic' reaction where the *p*H is above 7, as distinguished from 'acid' reaction where the *p*H is below 7.

2.16 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.

2.17 Alkaline Soil — Any soil having *p*H greater than 7·0. (*See* reaction soil).

2.18 Alkalinity Soil — The degree of intensity of alkalinity in a soil, expressed by a value greater than 7·0 for the soil *p*H.

2.19 Alkalization — A process where by the exchangeable-sodium content of the soil is increased.

2.20 Alluvial Soil

a) A soil developing from recently deposited alluvium and exhibiting essentially no horizon development or modification of the recently deposited materials.

b) When capitalized, the term refers to a great soil group of a zonal order consisting of soils with little or no modification of the recent sediment in which they are forming (indicated by absence of a **B horizon**).

2.21 Amendment Soil

a) An alteration of the properties of a soil, and thereby of the soil by the addition of substances such as lime, gypsum, sawdust, etc, to the soil for the purpose of making the soil more suitable for the production of the plants.

b) Any such substance used for this purpose strictly speaking such as even fertilizers constitute a special group of soil amendments.

2.22 Ammonification — The biochemical process whereby ammonical nitrogen is released from nitrogen containing organic compounds.

2.23 Ammonium Fixation — Adsorption of ammonium ions by minerals or organic fractions of the soil in forms that are relatively insolube and relatively inexchangeable by other cations.

2.24 Anaerobic

a) The absence of molecular oxygen.

b) Growing in the absence of molecular oxygen (such as anaerobic bacteria).

c) Occurring in the absence of molecular oxygen (as a biochemical process).

2.25 Anion-Exchange Capacity — The sum total of exchangeable anions that a soil can adsorb. Expressed as milliequivalents per 100 grams of soil (or of other adsorbing material such as clay).

2.26 Anisotropic Homogeneous Soils — Soils not having the same physical properties when the direction of measurement is changed. Commonly used in reference to permeability changes with direction of measurement.

2.27 Application Rate — Rate at which the water is applied to a given area. Usually expressed in depth of water per hour.

2.28 Appropriate Right — A doctrine of rights to use irrigation water, according to which rights are based on date of appropriation of water and the right to water in limited quantity by beneficial use on the land.

2.29 Aquifer — A formation that contains sufficient saturated permeable material to yield significant quantity of water to wells and springs.

2.30 Arid — A climate that is characterized by the low rainfall and high rate of evaporation. Arid climate for cool region is usually defined as less than 10 inches of precipitation per year, and semiarid as between 15 and 20 inches per year (37·5 and 50 mm).

2.31 Arid Climate — Climate characterized by low rainfall and high evaporation potential. A region is usually considered as arid where less than 10 inches of precipitation occurs per year (25 mm).

2.32 Automatic System (Drainage) — System where by the pumping unit starts and stops automatically in response to an automatic control, such as a float switch.

2.33 Auxiliary Spillway — Dam spillway built to carry runoff in excess of that carried by the principal spillway.

2.34 Available Nutrient or Nutrient Availability — The portion of any element or compound in the soil that can be readily absorbed and assimilated by growing plants. ('Available' should not be confused with exchangeable.)

2.35 Available Soil Moisture — The portion of soil moisture available for use by plants in the soil.

2.36 Available Soil Moisture Capacity — Total amount of available soil moisture that can be held by a soil for use by plants. Usually considered to be the moisture held between field capacity and wilting point.

B

2.37 B. Horizon — The horizon of deposition to which materials have been added by percolating waters.

2.38 Baffles — Vanes, guides, grids, grating, or similar devices placed in a conduit to check, deflect or regulate flow.

2.39 Banding Fertilizer — The method of placement of commercial fertilizers in concentrated strips, usually below the soil surface.

2.40 Bank — Margin of raised ground bordering a water course or lake.

2.41 Bank Storage — Water entering the banks of stream channels during flood period of stream flow. The water so stored is released after the flood.

2.42 Bar — A unit of pressure equal to one million dynes per square centimetre.

2.43 Base Exchanger — The replacement of cations, held on the soil complex by other cations. (*See also* cation exchange capacity.)

2.44 Base Saturation — Extent to which a material is saturated with exchangeable cations other than hydrogen, expressed as a percentage of the cation exchange capacity.

2.45 Base-Saturation Percentage — The extent to which the absorption complex of a soil is saturated with exchangeable cations other than hydrogen, expressed as a percentage of the cations other than hydrogen. It is expressed as a percentage of the total cation-exchange capacity.

2.46 Basin — Area drained by a river and its tributaries (Hydrology) or a level plot or field surrounded by levees, which may be flood irrigated.

2.47 Basin Irrigation — The application of water by flooding within areas of approximately level land surrounded by levees. Basins may vary in size from a few square feet to several acres.

2.48 Bedding — Method of surface drainage consisting of narrow-width plough in which the dead furrows run parallel to the prevailing land slope, and are used as field drains. Also known as crowning or ridging.

Also, the process of laying a drain or other conduit in its beak. The manner of bedding may be specified to conform to the earth load and conduit strength.

2.49 Bedding Ditch — The ploughed ditch formed in a bedding system of surface drainage.

2.50 Bed Load — Coarse material or sediment moving on the bed of a flowing stream.

2.51 Bed Rock — The solid rock underlying soils and the regolith in depth ranging from zero (where exposed by erosion) to several hundred feet.

2.52 Beehive — Dome-shaped grating placed on surface inlets to underdrains for excluding entrances of trash.

2.53 Berm — The undisturbed area between the edge of a ditch and the edge of the soil bank.

2.54 Black Alkali — *See* alkali soil and non-alkali soil.

2.55 Black Earth — A term used as synonymous with 'Chernozem' to describe self-matching black clays.

2.56 Black Soils — A term used to describe soils with dark surface horizons of the black (Chernozem) zone; includes black earth or chernozem, wiesenboden, solonetz, etc.

2.57 Blinding — Placement of loose soil around a tile or conduit to prevent damage or misalignment when the trench is backfilled. Allows water to flow more freely to the tile.

2.58 Blind Drain — Type of drain consisting of an excavated trench, refilled with pervious materials such as coarse sand, gravel or crushed stone, through whose voids water percolates and flows towards an outlet. Often referred to as a French drain because of its initial development and widespread use in France.

2.59 Blinding Material — Material placed on top of and around a closed drain to improve the flow of water to the drain and to prevent displacement during backfilling of the trench.

2.60 Blind Inlet — Surface water inlet to drain in which entrance of water is by percolation rather than open flow channels. It is used where quantity of water is small and amount of sediment is too large.

2.61 Blocky Soil Structure — *See* soil structure.

2.62 Bog Soil — A great soil group of the intrazonal soil order and hydromerphic suborder. Includes muck and peat.

2.63 Border Dike — Earth ridge built to guide or to hold irrigation or recharge water within prescribed limits in a field; a small levee.

2.64 Border Ditch — Ditch used as a border on irrigated strip or plot, water being spread from one or both sides of the ditch along its entire length.

2.65 Border Irrigation (Strip Irrigation) — The application of water to strips marked by levees 3 to 30 metre apart. The soil is essentially level between levees, on even topography, with a gentle slope so that the water forms a sheet over the whole area.

2.66 Bottom Land — *See* flood plain.

2.67 Breather — *See* vent.

2.68 Broad-Crested Weir — Weir for water measurement with a significant dimension in the direction of the stream. The crest should be long enough to attain a uniform depth of flow before discharge.

2.69 Brown Earth — Soil with a mull horizon but having no horizon of accumulation of clay or sesquioxides. Generally used as a synonym for 'Brown forest soil' but sometimes for similar soil acid in reaction.

2.70 Brown Forest Soils — A great soil group of the intrazonal order and calcimorphic suborder, formed on calcium-rich parent materials and possessing a high base status but lacking a pronounced *alluvial* horizon.

2.71 Brown Podzolic Soil — A zonal great soil group similar to podzolic soil but lacking the distinct A 2 horizon characteristic of the podzol group (some American Soil taxonomists prefer to class this soil as kind of podzol and not as a distinct great soil group).

2.72 Buffer Soil Compounds — The clay, organic matter, and compounds such as carbonates and phosphates which enable the soil to resist appreciable change in *p*H value.

2.73 Bulk Density — The ratio of the mass of waterfree soil to its bulk volume. Bulk density is expressed in grams per cubic centimetre and is sometimes referred to as 'apparent density'. When expressed in grams per cubic centimetre, bulk density is numerically equal to apparent specific gravity or volumetric weight.

2.74 Bulk Specific Gravity — The ratio of the bulk density of a soil to the mass of unit volume of water.

2.75 Bulk Volume — The volume, including the solids and the pores, of an arbitrary soil mass.

2.76 Bullet — Round-nosed cylindrical plough point of a mole drain plough which forms a rounded cavity as the plough is drawn through the soil. Also referred to as a torpedo. In older type ploughs a ball or plug is attached to the rear of the bullet to eliminate crumbs and smooth out the walls of the mole cavity.

2.77 By-Pass Ditch — Ditch or waterway for carrying water from a drainage area directly to the gravity outlet, by-passing the pumping plant.

C

2.78 C Horizon — A horizon of relatively unweathered material underlying the B horizon.

2.79 Calcareous Soil — Soil containing sufficient free calcium carbonate or calcium-magnesium carbonate to effervese visibly when treated with cold 0·1 N hydrochloric acid.

2.80 Caliche — In arid and semiarid regions, zones of the lower part of B Horizon or upper part of C Horizon cemented by calcium carbonate.

2.81 Canal — Constructed open channels of an irrigation system for transporting water from the source of supply to the point of use, to remove water from areas covered with water.

2.82 Capability Ratings — The classification of land (or soil) according to its ability to produce and practices necessary to obtain good production economically.

2.83 Capillary Capacity — The maximum amount of capillary water remaining in soil after the gravitational water has drained away.

2.84 Capillary Conductivity — Capacity of partially saturated soils to transmit water, measured at the ratio of water flow velocity to the driving force. As a soil becomes more saturated, capillary conductivity approaches the hydraulic conductivity.

2.85 Capillary Fringe — A zone just above the water table (zero gauge pressure) that remains almost saturated. (The extent and the degree of definition of the capillary fringe depends upon the size-distribution of pores.)

2.86 Capillary Moisture — Water held in the soil pores by force of surface tension as a continuous film around the soil particles.

2.87 Capillary Porosity — *See* porosity.

2.88 Capillary Potential — The energy required per unit mass to move water against the capillary field forces in the soil from a free water surface to any point in the soil.

2.89 Capillary Pressure Head — Head water that rises by surface tension above a free water surface in the soil. Also called capillary rise.

2.90 Capillary Soil Moisture — Moisture in soil held by surface tension forces against the force of gravity.

2.91 Capillary Zone — Soil zone above water level up to a limit in which pores become filled as a result of surface tension.

2.92 Catchment Area or Basin — Flow collected from a watershed o drainage basis; the area of such a basin.

2.93 Cation Exchange — The interchange between a cation in solution and another cation on the surface of any surface-active material such as clay colloid or organic colloid.

2.94 Cation-Exchange Capacity — The milliequivalents of cations per 100 gm of soil which can be held by surface forces and which can be replaced by other cations. The term as applied to soils is synonymous with base exchange capacity but is somewhat more precise in its meaning. Cation exchange capacity depends on the method used for its determination. For example, using a different replacing cation or making the replacement at a different *p*H affects the result. For western soils it is usually determined by treating with neutral ammonium acetate and determining the absorbed ammonia.

2.95 Cemented Indurated — A condition occurring when the soil grains or aggregates are caused to adhere firmly and are bound together by some material that acts as a cementing agents.

2.96 Channel Capacity — Flow rate of a ditch, canal or natural channel when flowing full or at design flow.

2.97 Check-Basin Irrigation — *See* irrigation method.

2.98 Check-Drain — Conventional drain altered by use of checks so that it can be used as a sub-irrigation system.

2.99 Check Irrigation — Application of a comparatively large stream of water in level plots surrounded by levees.

2.100 Chisel, Subsoil — A tillage implement with one or more cultivator-type feet to which are attached strong knife like units used to shatter or loosen hard, compact layers, usually in the subsoil, to depths below normal plough depth.

2.101 Chlorosis — Yellowing or blanching of green portions of a plant, particularly the leaves. May be caused by chlorophyll deficiency, unavailability of nutrients, or other factors.

2.102 Cipoletti Weir — Trapezoidal weir with 1 to 4 side slopes. It does not require a correction for end contractions.

2.103 Clayey — Containing large amounts of clay or having properties similar to those of clay.

2.104 Clay

a) Naturally occurring inorganic crystalline material found in soils and other earthy deposits, the particles being of clay size, that is less than 0·002 mm in diameter.

b) Material as described under (a), but limited by particle size.

2.105 Clay Tile — Short lengths of pipe made from shales or clays, used for subsurface drains.

2.106 Clean Out — Removal of vegetative growth, silt and debris from an open or closed drain or other conduit without change in size or section.

2.107 Climatic Index — A simple numerical value that expresses climatic relationships into a simplified expression.

2.108 Climax — The final stage of a succession which continues to occupy an area as long as climatic or soil conditions remain unchanged.

2.109 Clod — A compact, coherent mass of soil ranging in size from 5 or 10 mm to as much as 200 or 250 mm. Produced artificially, usually by the activity of man by ploughing, digging, etc, especially when these operations are performed on soils that are either too wet or too dry for normal tillage operations.

2.110 Closed Drain — Surface drain, tile or perforated pipe, which receives surface water through surface inlets.

2.111 Coarse Fragments — Rock or mineral particles greater than 2·0 mm, in diameter.

2.112 Coarse Texture — The texture exhibited by sands, loamy sands, and sandy loams except very fine sandy loam.

2.113 Co-efficient of Discharge — Ratio of observed to theoretical discharge.

2.114 Co-efficient of Roughness — Factor in fluid flow or formulae expressing the character of a channel surface and its frictional resistance to flow.

2.115 Co-efficient of Runoff — Factor in the rational runoff formula expressing the ratio of the peak runoff rate to rainfall intensity.

2.116 Compost — A mingled and decomposed mixture for fertilizing. Made of plant parts, lime, soil or commercial fertilizer that may be added, mixed and decomposed.

2.117 Common Outlet — All outlet used in common by several drains.

2.118 Concentrated Flow — The flowing of a rather large accumulated body of water over a relatively narrow course. It often causes serious erosion and gullying.

2.119 Conduit — Any open or closed channel intended for the conveyance of water.

2.120 Confined Water — Under groundwater, constrained by an overlying confining bed, which is under sufficient pressure to rise above the bottom of the confining bed.

2.121 Confining Clays — Impervious or slowly pervious clay layers in the subsoil which restrict or confine the movement of percolating water.

2.122 Consistency

a) The resistance of a material to deformation or rupture, and

b) The degree of cohesion or adhesion of the soil mass.

2.123 Consistency Constants — The minimum percentage by weight of moisture at which a small sample of soil will barely flow under a standard treatment.

2.124 Consumptive Use — The water used by plants in transpiration and growth, plus water vapour 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.

2.125 Continuous Flow Irrigation — System of irrigation water delivery where each irrigator receives his allotted quantity of water at a continuous rate.

2.126 Contour Basin — Basin made by levees or borders following the contours of the land.

2.127 Contour Ditch — Irrigation ditch laid out approximately on the contour.

2.128 Contour Flooding — Method of irrigating by flooding from contour ditches.

2.129 Contour Furrows — Furrows ploughed on the contour on pasture or range land to prevent soil loss and allow water to penetrate into the soil. Also furrows are laid out on the contour for irrigation purposes.

2.130 Contour Guide Lines — Lines laid out approximately on the contour to serve as a guide for farming operations.

2.131 Contracted Weir — A measuring notch which has sides designed to produce a contraction in the cross sectional width of the over flowing water.

2.132 Controlled Drainage — Regulation of the water table by means of pumps, control dams or check drains, or a combination of these for maintaining the water level at a depth favourable to boost crop growth.

2.133 Control Structure — Water regulating structure, usually for gravity flow systems.

2.134 Conveyance Loss — Loss of water from a channel or pipe during conveyance, including losses due to seepage, evaporation and transpiration by plants growing in or near the channel.

2.135 Core Trench — Excavation for a core wall in the construction of an earthern embankment.

2.136 Core Wall — A wall of masonary, sheet piling, or puddled clay built inside a dam or embankment to reduce percolation.

2.137 Corrugation Irrigation — Application of water in small furrows running down from the head ditch. The furrow guides the water, but some over topping may occur.

2.138 Cover Crop — A crop planted to cover or protect the soil for a certain part of the year. May be used for green manure.

2.139 Cover Drain — Closed drain beneath the surface of the soil. (*See* tile drain).

2.140 Crack Width — Width between the ends of adjacent drain tile. Also called joint space.

2.141 Craddle — Footing structure shaped to fit the conduit it supports or a large, smooth area which is levelled out for large trees to be felled on to prevent breakage.

2.142 Creep — Slow mass movement of soil and soil material down relatively steep slopes primarily under the influence of gravity, but facilitated by saturation with water and by alternate freezing and thawing.

2.143 Crest — Top of a dam, dike, spillway, or weir; or the summit of a wave or peaks of a flood.

2.144 Critical Depth — Depth of flow in a channel of specified dimensions at which specific energy is minimum for a given discharge.

2.145 Critical Reaction — In biology that *p*H at which a biological process becomes too slow to measure or at which organisms die.

2.146 Critical Velocity — Velocity at which a given discharge changes from tranquil to rapid flow; that velocity in open channels for which the specific energy (sum of the depth and velocity head) is minimum for a given discharge.

2.147 Cross (Sprinkler) — Pipe fitting with four outlets or connections each 90° apart.

2.148 Crumb — A soft, porous, more or less rounded bed from 1 to 5 mm in diameter.

2.149 Crumb Structure — A structural condition with porous aggregates of irregular shape, rarely over 2 cm in diameter and of a medium to soft consistence.

2.150 Crust — A surface layer on soils where the upper or surface horizon coherers into plate or crust distinct from the horizon immediately below it.

2.151 Crystal — A homogeneous inorganic substance of definite chemical composition bounded by plane surface that forms definite angles with each other, thus giving the substance a regular geometrical form. (*See* soil mineral.)

2.152 Crystal Structure — The orderly arrangement of atoms in a crystalline material.

2.153 Crystalline Rock — A rock consisting of various minerals that have crystallized in place from magma. (*See* igneous rock and sedimentary rock.)

2.154 Cubic Metre per Second — A flow of water equivalent to a stream one metre wide and one metre deep flowing at a velocity of one metre per second.

2.155 Cultivation — A tillage operation use in preparing land for seeding or transplanting or later for weed control and for loosening the soil.

2.156 Cumulative Infiltration — Summation of the depth of water absorbed by a soil in a specified elapsed time in reference to the time of initial water application. (*See* infiltration.)

2.157 Cut — Portion of land surface or area from which earth or rock has been removed or will be removed by excavation; the depth below original ground surface to excavated surface.

2.158 Cut-and-Fill — Process of earth moving by excavating part of an area and using the excavated material for adjacent embankments or fill areas.

2.159 Cut-off — Wall, collar, or other structure such as a trench filled with relatively impervious material intended to reduce percolation of water through porous strata. In river hydraulics, the new and relatively short channel formed either naturally or artificially when a stream cuts through the neck of an O-bow Meander.

2.160 Cut-off Drain — A tile drain system normally placed near the upper edge of a wet area to intercept water before it gets down the slope.

2.161 Cyclic Salt — Salt deposited or soils near the sea or inland salt lakes from wind or rain fall.

D

2.162 Dam — An artificial structure to store or divert water, to create a hydraulic head, to prevent gully erosion, or for retention of soil, rock or other debris.

2.163 Darcy's Law

a) *Historical* — The volume of water passing downward through a sand filter bed in unit time is proportional to the area of bed and to the difference in hydraulic head and is inversely proportional to the thickness of the bed. A law describing the rate of flow of water through porous media. As formulated by Darcy the law is:

$$Q = KS \frac{(H + e)}{e}$$

where

Q = the volume of water passed in unit time,

S = the area of the bed,

e = the thickness of the bed,

H = the height of the water on top of the bed, and

K = the co-efficient depending on the nature of the sand and for cases where the pressure 'under the filter is equal to the weight of the atmosphere.'

b) *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.

c) *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.

2.164 Deep Percolation — Water which percolates downward below the root zone and cannot be used by plants.

2.165 Deflocculate

a) To separate the individual components of compound particles by chemical and/or physical means, and

b) to cause the particles of the disperse phase of a colloidal system to become suspended in the dispersion medium.

2.166 Degradation — The process of changing a soil from one type to a more highly leached one. Particularly, bringing about replacement of sodium by hydrogen by leaching a saline or alkali soil (incorrect to use degradation to denote a decrease in soil fertility).

2.167 Degraded Alkali Soil — As used by De Sigmand, this term refers to a soil containing less than 0·1 percent salt but with appreciable quantities of exchangeble sodium and hydrogen. Soil *p*H values in the surface horizons may be below 6·0 but are usually between 6·5 and 8·0. This corresponds approximately to the great soil group known as soloth.

2.168 Delivery Box — A structure for the control and measurement of water diverted to a farm unit.

2.169 Delivery Loss — *See* conveyance loss.

2.170 Delta — Alluvial deposit formed where a stream or river drops its sediment load on entering a body of more quiet water.

2.171 Denitrification — Reduction of nitrates to nitrites, to ammonia, and to free nitrogen; or any part of this process.

2.172 Density — Mass per unit volume. (*See* bulk density and particle density.)

2.173 Depletion Curve — Lower portion of recession curve for soil moisture, stream flow, ground water, etc. Usually shown as a decay function.

2.174 Depression Storage — Water stored in shallow surface depressions and therefore, not available for producing surface runoff.

2.175 Depth of Irrigation — Depth of soil to be brought to field capacity.

2.176 Desalinization — Removal of excessive soluble salts from the saline soil, usually by leaching.

2.177 Desert Crust — A hard layer, containing calcium carbonate, gypsum, or other binding material, exposed at the surface in desert regions.

2.178 Desert Pavement — The layer of gravel or stones left on the land surface in desert regions after the removal of the fine material by wind erosion.

2.179 Design Application Efficiency — Compound application efficiency when water is to be applied at design rate and design time of set.

2.180 Design Run-off Rate — Maximum run-off rate expected in a given period of time.

2.181 Desilting Area — Area of grass, shrubs or other vegetation used solely for including deposition of soil and debris from flowing water, located above a stock tank, pond, field or other area needing protection from sediment accumulation. *See* filter strip.

2.182 Dielectric Constant — A constant which denotes the non-conductivity to an electric charge of a substance.

2.183 Differential Water Capacity — *See* soil water.

2.184 Diffuse Layer — A system, when referred to soils, which consists of a charged (negative particle) surface and an equal amount of counter ions (positive) accumulated in the liquid near the particle surface.

2.185 Diffusion Pressure Deficit — Amount by which the pressure of water in a solution is less than that of pure water at the same temperature and atmospheric pressure.

2.186 Dispersed Soil — Soil in which the clay and colloid fraction is dispersed and forms a colloidal soil. A soil in a dispersed state depends, among other things, on the composition and concentration of the soil solution and is to be distinguished from the degranulated or unaggregated conditions. A dispersed soil usually runs together and becomes plastic or sticky, when wet. It usually has low permeability, tends to have high bulk density, and forms hard, infriable lumps upon drying.

2.187 Dispersion Medium — The portion of a colloidal system in which the disperse phase distributed.

2.188 Distributary — Smaller conduit taking water from a canal for delivery to farms; any system of secondary conduits; river channel flowing away from the main stream and not rejoining it, as contrasted to a tributary.

2.189 Distribution Efficiency — Measure of the uniformity of irrigation water distribution over a field.

2.190 Distribution Loss — *See* conveyance loss.

2.191 Distribution System

a) System of ditches, and their appurtenances, which conveys irrigation water from the main canal to the units.

b) Any system which distributes water to users.

2.192 District — A political subdivision or public corporation organized, under state laws, for the purpose of creating, operating and maintaining works for the specified purpose which may be irrigation, drainage, soil conservation, water conservation, flood control, etc.

2.193 Ditch — Constructed open channel for conducting water. (*See* canal drain.)

2.194 Ditch Storage — *See* channel storage.

2.195 Diversion — Channel constructed across the slope for the purpose of intercepting surface run-off, changing the accustomed course of all or part of a stream.

2.196 Diversion Dam — A structure or barrier built to divert part or all of the water of a stream to a different course.

2.197 Diversion Duty of Water — The irrigation water diverted at the intake of a canal system usually expressed in depth or the irrigable area under the system.

2.198 Diversion Box — Structure built into a canal or ditch for dividing the water into predetermined portions and diverting it into other canals or ditches.

2.199 Doctrine of Appropriation — Legal prior rights of water which asserts that all rights are based on beneficial use.

2.200 Double Ditch or Drain — Designating an area of land which is drained by both the laterals and a main tile.

2.201 Drag — The force of the flow of fluid over the surface of the ground on the boundary.

2.202 Drain

a) To provide channels, such as open ditches or drain tile, so that excess water can be removed by surface or by internal flow.

b) To lose water (from the soil) by percolation.

2.203 Drainage, Excessive — Too much or too rapid loss of water from soils, either by percolation or by surface flow. Loss greater than that necessary to prevent the development of an aerobic condition for any appreciable length of time.

2.204 Drain Tile — Concrete or ceramic pipe used to conduct water from the soil.

2.205 Drainage Classification — Standards describing the drainability of the soil, that is, SCS classification.

2.206 Drainage Co-efficient — Design rate at which water is to be removed from a drainage area. It may be expressed in millimetres of depth per day or in terms of flow rate per unit area.

2.207 Drainage Curves — Design curves giving prescribed rates of surface run-off for different levels of crop protection, and which vary according to the size of drainage area.

2.208 Drainage Furrows — Furrows for carrying run-off water.

2.209 Drainage Pattern — Arrangement of drains or lines of drains, one with another arrangement of tributaries within a watershed.

2.210 Drainage Pumping Plant — One or more pump's power units and appurtenances for lifting drainage water from a collecting basin to a gravity outlet.

2.211 Drainage System — Collection of open and/or closed drains, used to collect and dispose of excess surface or subsurface water.

2.212 Drainage Terrace — Graded terrace with a relatively deep channel.

2.213 Drain Well — Vertical opening to a permeable substratum into which surface and subsurface drainage water is channeled.

2.214 Draw — A small natural stream tributary, drainage hollow, usually without a permanent stream in its bottom.

2.215 Drawdown — Vertical fall of the water surface, water table, or piezometric surface resulting from a withdrawal of water.

2.216 Drilled Fertilizer — Commercial fertilizer placed below the soil surface, usually by a special machine (drill).

2.217 Drop-Inlet Spillway — Overall structure in which the water is dropped through a vertical riser connected to a discharge conduit.

2.218 Drop Spillway — Overall structure in which the water drops over a vertical wall into an apron at a lower elevation and dissipating its kinetic energy.

2.219 Drop Structure — Structure for transferring water in a channel to a lower level channel. A drop may be vertical or inclined. The later is called a chute.

2.220 Drought — Climatic condition in which there is insufficient soil moisture available for normal vegetative growth and animal life of a place.

2.221 Duty of Water — The quantity of irrigation water applied to a given area for the purpose of maturing its crops.

2.222 Dust Mulch — A loose, finely granular, or powdery condition on the surface of the soil, usually produced by shallow cultivation.

E

2.223 Earth Dam — A water barrier composed of compacted soil or rock material.

2.224 Ecology — The science that deals with the inter-relations of organisms and their environment.

2.225 Edaphic — of or pertaining to the soil is the condition resulting from or influenced by factors inherent in the soil on other substrata, rather than by climatic factors.

2.226 Edaphology — The science that deals with the soil as a natural body and its natural position with influence of soils or living things, particularly plants, including man's use of land for plant growth.

2.227 Effective Precipitation — The portion of the total precipitation which becomes available for plant growth.

2.228 Effluent Seepage — Diffuse discharge of ground water to the ground surface.

2.229 Effluent Stream — Stream of reach of a stream which receives water from ground water or seepage.

2.230 Electrical Conductivity — The property of a medium of transferring electrical charge. The reciprocal of the electrical resistivity. The resistivity is the resistance in ohms of a conductor which is 1 cm long and has a cross-sectional area of 1 cm^2. Hence, electrical conductivity is expressed in reciprocal ohms/cm or mhos/cm. The terms electrical conductivity and specific electrical conductance have identical meaning.

2.231 Electrical Resistance Blocks — Small blocks consisting of a pair of electricals set in an absorbent material, such as plaster of paris, used to estimate soil moisture content. Resistance between the electrodes is a function of the moisture content of the block and surrounding soil.

2.232 Electro kinetic (Zeta) Potential

a) The difference in electrical potential between the immobile liquid layer attached to the surface of a charged particle and the bulk liquid phase.

b) The work done in bringing a unit charge from infinite (bulk solution) to the plane of shear in the diffuse double layer.

2.233 Elevation Head — Energy possessed by a fluid due to its position above some datum.

2.234 Eluvial Horizon — Soil horizon from which some fine material has been removed by water suspension.

2.235 Elluviation — The removal of soil material in suspension (or in solution) from a layer or layers of a soil. (Usually, the loss of material in solution is described by the term 'leaching'.) (*See* illuviation and leaching.)

2.236 Endodynamamorphic Soils — Soils with properties that have been influenced primarily by parent material.

2.237 Energy Gradient — Change in energy per unit length in the direction of flow or motion. (*See* potential gradient.)

2.238 Equalizing Ditch — Secondary ditch, usually parallel to a field ditch, used to furnish irrigation water to two or more furrows.

2.239 Equipotential — Line or surface having a constant potential energy.

2.240 Erode — To wear away or remove the land surface by wind, water, or any other agents.

2.241 Erodible — Susceptible to erosion (expressed by terms, such as highly erodible, slightly erodible, etc).

2.242 Erosion

a) The wearing away of the land surface by running water, wind, ice, or other geological agents, including process such as gravitational creep.

b) Detachment and movement of soil or rock by water, wind, ice, or gravity. The terms given in **2.243** to **2.254** are used to describe different types of water erosion.

2.243 Accelerated Erosion — Erosion much more rapid than normal, natural, geological erosion, primarily as a result of the influence of the activities of man or, in some cases, of animals.

2.244 Geological Erosion or Normal Erosion — The normal or natural slow and steady erosion caused by geological process, acting over long geological periods and resulting in the wearing away of mountains, the building up of flood plains, coastal plains, etc, synonymous with natural erosion.

2.245 Gully Erosion — The erosion process whereby water accumulates in narrow channels and over short periods, removes the soil from this narrow area to considerable depths, ranging from 0·3 or 0·6 m to as much as 22·5 to 30 m.

2.246 Natural Erosion — Wearing away of the earth's surface by water, ice, or other natural agents under natural environmental conditions of climate, vegetation, etc. Undisturbed by man. Synonymous with geological erosion.

2.247 Normal Erosion — The gradual erosion of land used by man which does not greatly exceed natural erosion. (*See* geological erosion.)

2.248 Rill Erosion — Soil erosion by water process in which numerous small well defined channels of only several centimetres in depth are formed; occurs mainly on recently cultivated soils. (*See* rill.)

2.249 Sheet Erosion — The removal of a fairly uniform layers of soil from the land surface by run off water.

2.250 Splash Erosion — The spattering of small soil particles caused by the impact of raindrop or very wet soils. The loosened and spattered particles may or may not be subsequenly removed by surface run-off.

2.251 Erosion Pavment — A layer of coarse fragements, such as sand or gravel, remaining on the surface of the ground after the removal of fine particles by erosion.

2.252 Erosion Potential — Amount of erosion that may be expected under given climatic, topographic, soil, crop and cultural conditions.

2.253 Erosive — Tending to cause erosion.

2.254 Erosive Velocity — Velocity of the erosive agent necessary to cause erosion of the material in question.

2.255 Essential Elements — Those elements that must be present for a plant to grow. There may be primary (those needed in quantity) or minor elements (those needed in small amount).

2.256 Evaporation — Conversion of water from liquid or solid state into vapour through the transfer of heat energy.

2.257 Evapo-Transpiration — The sum of water used for vegetation and that lost by evaporation for a particular area during a specified time.

2.258 Exchangeable Ions — Those ions held on the soil complex that may be replaced by other ions. There are ions held so tightly that they can not be exchanged.

2.259 Exchange Capacity — The total ionic charge of the adsorption complex active in the adsorption of ions. (*See* anion-exchange capacity and cation-exchange capacity.)

2.260 Exchange Complex — Active surface constituents of soils which are capable of ion exchange.

2.261 Exchangeable-Cation Percentage (ECP) — The extent to which the adsorption complex of a soil is occupied by a particular cation. It is expressed as follows:

$$\text{ECP} = \frac{\text{Exchangeable cation (meq/100 g soil)}}{\text{Cation-exchange capacity (meq/100 g soil)}} \times 100$$

NOTE — meq = milli-equivalent.

2.262 Exchangeable Phosphate — The phosphate anion reversibly attached to the surface of the solid phase of the soil in such a form that it may go into solution by anionic equilibrium reactions with isotopes of phosphorus or with other anions of the liquid phase without solution of the colloid phase to which it was attached.

2.263 Exchangeable Potassium — The potassium that is held mainly by the adsorption complex of the soil and is easily exchanged with the cation of neutral non-potassium salt solutions.

2.264 Exchangeable-Sodium Percentage (ESP) — This term indicates the degree of saturation of the soil exchange complex with sodium and is defined as follows:

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

NOTE — meq = milli-equivalent.

F

2.265 Family, Soil — In soil classification one of the categories intermediate between the great soil group and the soil series. (*See* classification, soil.)

2.266 Farm Distribution System — Ditches, pipelines and appurtenant structures which constitute the means of conveying irrigation water from a farm turnout to the fields to be irrigated.

2.267 Farm Drain — *See* drain.

2.268 Farm Irrigation Efficiency — *See* irrigation efficiency.

2.269 Farm Lateral — *See* lateral.

2.270 Farm Percolation Loss — *See* deep percolation.

2.271 Farm Pond — *See* pond, tank.

2.272 Farm Water Management — General term applying to the management of all water on a farm.

2.273 Fertility — The quality of soil to aid plant growth by supplying nutrients in desirable proportions and quantity.

2.274 Fertilizer — Any organic or inorganic material of natural or synthetic origin which is added to a soil to supply certain elements essential to the growth of plants.

2.275 Fertilizer Elements — The three primary essential elements are nitrogen, phosphorus, and potassium. They are so named because they are artificially supplied to the soil in manure or commercial fertilizer form.

2.276 Fertilizer Grade — The guaranteed minimum analysis in percent, of the major plant nutrient elements contained in a fertilizer

material or in a mix fertilizer. (Usually refer to the percentage of N-P_2O_5-K_2O but proposals are pending to change the designation to the percentage of N.P.K.)

2.277 Fertilizer Ratio — The ratio of nitrogen, phosphorus, and potassium in a fertilizer. The ratio is expressed in small, whole numbers, such as 1-2-1 or 1-3-2.

2.278 Fertilizer Requirement — The quantity of certain plant nutrient elements needed, in addition to the amount supplied by the soil, to increase plant growth to a designated optimum.

2.279 Field Capacity (Field Capillary Moisture Capacity and Specific Retention) — The amount of water retained in a soil against a force of gravity at any specified time (about 24 to 36 hours) after flooding. It is approximated by moisture equivalent and one-third atmosphere percentage.

2.280 Field Ditch — A smaller ditch constructed within a field either for irrigation or for drainage.

2.281 Fifteen Atmosphere Percentage — The moisture percentage in soil sample which has been wetted and then brought to equilibrium on a cellulose membrane in the pressure-membrane apparatus at a pressure of 15 kg/cm^2. This characteristic moisture value for soils is expressed in terms of moisture percentage, dry-weight basis, and lies in the wilting range for many soils.

2.282 Film Water — A layer of water surrounding soil particles and varying in thickness from 1 or 2 perhaps 100 or more molecular layers. Usually considered as that water remaining after drainage has occurred, because it is not distinguishable in saturated soils.

2.283 Filter (Drain) — Envelope of graded porous material placed around a closed drain to prevent soil from entering the drain. (*See* lining material.)

2.284 Filter Strip — Strip of permanent vegetation planted above farm ponds, diversion terraces and other structures to retard flow of run-off water, causing deposition of transported material, thereby reducing sediment flow to structure or reservoir below. (*See* desilting area.)

2.285 Final Infiltration Rate or Final Intake of Water — Rate at which water is absorbed by soil when the infiltration has become essentially constant. Also called final intake rate. (*See* infiltration.)

2.286 Fine Sand

a) A soil separate. (*See* soil separates.)

b) Soil textural class. (*See* soil texture).

2.287 Fine Texture — Consisting of or containing large quantities of the fine fractions, particularly of silt and clay. (Includes clay forms and clays; that is, clay loam, sandy clay loam, silty clay loam, sandy clay, silky clay, and clay textural classes. Sometimes subdivided into clayey texture and moderately fine texture.) (*See* soil texture.)

2.288 Firm — A term describing the consistency of a moist soil that offers distinctly noticeable resistance to crushing but can be crushed with moderate pressure between the thumb and forefinger. (*See* consistency.)

2.289 Fixation — The holding of nutrients in soil after the soluble forms are converted into less soluble or insoluble forms, as fixation of nitrogen.

2.290 Flood Plain — The land bordering a stream, built up of sediments from overflow of the stream and subject to inundation when the stream is at flood stage.

2.291 Flow Velocity (of Water in Soil) — The volume of water transferred per unit of time and per unit of area normal to the direction of the net flow.

2.292 Flume — Open conduit for conveying water by creating obstructions to a canal. The entire canal is elevated above natural ground. Also called as aqueduct. Grade control structure having a relatively steep slope.

2.293 Foliar Diagnosis — An estimation of the extent to which plants are getting certain necessary chemical elements from the soil by examination of the colour and growth habits of the foliage of the plants.

2.294 Forest Soils or Forest Land

a) Soils developed under forest vegetation.

b) Soils formed in temperate climates under forest vegetation (European usage).

2.295 Foot Valve — Check valve opening upwards installed at the inlet end of the suction pipe to retain water in the pump for priming.

2.296 Forced Outlet — Basin or box outlet for a tile line in which the discharge will fill the basin and flow away over the ground surface. Used where a free fall outlet is not available.

2.297 Fragipan — Dense and brittle pan or layer in soils that owe their hardness mainly to extreme density or compactness rather than high clay content or cementation. Removed fragments are friable, but the material in plane is so dense that roots cannot penetrate and water moves through it very slowly.

2.298 Free Flow — Flow through or over a structure and not effected by submergence.

2.299 Free Ground Water — Ground water in aquifers not bounded or confined by impervious strata.

2.300 Free Weir — Weir that is not affected by the elevation of the tail water.

2.301 French Drain — *See* blind drain.

2.302 Friability — A consistency term pertaining to the case of crumbling of soils. (*See* consistency.)

2.303 Friction Head — Energy required to over come friction due to fluid movement with respect to the walls of the conduits or containing medium.

2.304 Frost, Concrete — Ice in the soil in such quantity as to constitute a virtually solid block.

2.305 Frost, Honey Comb — Ice in the soil in insufficient quantity to be continuous. Thus giving the soil an open, porous structure permitting the ready entrance of water.

2.306 Fallic Acid — A mixture of organic substances remaining in solution upon acidification of a dilute alkali extract from the soil.

2.307 Furrow — Small ditch for conveying irrigation water. Depression left by ploughing.

G

2.308 Gauge — Device for registering water level, discharge, velocity, pressure, etc.

2.309 Gauging Station — Selected section in a stream channel equipped with a gauge or facilities for obtaining stream flow data.

2.310 Gate (Irrigation) — Structure or device for controlling the rate of flow into or from a canal or ditch.

2.311 Gilgai — The micro relief of soils produced by expansion and contraction with changes in moisture. Found in soils that contain large amounts of clay which swells and shrinks considerably with wetting and drying. Usually a succession of microbasins and microknolls in nearly level areas or of microvalleys and microridges parallel to the direction of the slope. (*See* microrelief.)

2.312 Glacial Drift — Rock debris that has been transported by glaciers and deposited, either directly from the ice or from the melt water. The debris may or may not be heterogeneous.

2.313 Gleyzation — A soil-forming process resulting in the development of gley soils. (*See* hanic gley soil and dark grey gleysolic soil.)

2.314 Graded Contour Furrow — Furrow irrigation system in which the furrow grade deviates from the contour by a small, set amount.

2.315 Gradient — Change of elevation, velocity, pressure or other characteristics per unit length.

2.316 Grain Density — *See* particles density.

2.317 Granule — A natural soil aggregate which is relatively non-porous. (*See* soil structure and soil structure types.)

2.318 Gravel Filter — Graded sand and gravel aggregate placed around a drain or well screen to prevent the infiltration of fine materials from the aquifer into the drain or well.

2.319 Gravelly — Containing appreciable or significant amounts of gravel (used to describe soil or land). (*See* coarse fragments.)

2.320 Gravitational Potential — *See* soil water.

2.321 Gravitational Water — Water which moves into through, or out of the soil under the influences of gravity.

2.322 Gravity Dam — Dam which depends on its weight to resist overturning and sliding.

2.323 Gravity Irrigation — Irrigation in which the water is not pumped but flows by gravity, including sprinkler system.

2.324 Gravity Outlet — Outlet for a drain line or system where the water flows by gravity.

2.325 Green Manure — Quick maturing green material, grown on the land, and incorporated in the soil to increase organic matter and fertility.

2.326 Green Manure Crop — A crop grown for use as green manure. (*See* green manure.)

2.327 Ground Rainfall — The portion of rainfall received on the soil surface.

2.328 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.

2.329 Ground Water Aquifer — *See* aquifer.

2.330 Ground Water Flow — Flow of water in an aquifer or soil. That portion of the discharge of a stream which is derived from ground water under hydraulic gradient.

2.331 Ground-Water Laterite Soil — A great soil group of the intrazonal order and hydromorphic suborder, consisting of soil characterized by hardpans or concretional horizons rich in iron and aluminium (and sometimes manganese) that have formed immediately above the water table.

2.332 Ground-Water Podzol Soil — A great soil group of the intrazonal order and hydromorphic suborder, consisting of soils with an organic mat on the surface over a very thin layer of acid humus material underlaid by a whitish-grey leached layer, which may be as much as 0·6 or 0·9 metre in thickness, and is underlaid by a brown or very dark-brown cemented hardpan layer, formed under various types of forest vegetation in cool to tropical, humid climates under conditions for poor drainage.

2.333 Ground Water Runoff — That part of the groundwater which is discharged into a stream channel as spring or seepage water.

2.334 Gully — A channel resulting from erosion and caused by the concentrated but intermittent flow of water usually during and immediately following heavy rains.

H

2.335 Head — Energy in the system expressed as the equivalent height to which a column of water rises, or would rise, above a given datum.

2.336 Head Ditch — Ditch across upper side of field used for distributing water to irrigation furrows or checks.

2.337 Head Gate — Water control structure; the gate at the entrance to a conduit or diversion on a large canal or stream.

2.338 Head Loss — Energy loss due to friction, eddys, changes in velocity or direction of flow. (*See* friction head.)

2.339 Head Works — Diversion structures at the upper end of a conduit.

2.340 Horizon — A series of soil layers overlying one another.

2.341 Hue — One of the three variables of colour. It is caused by light of certain wave lengths and changes with the wave length. (*See* munsell colour system, chroma, value, and colour.)

2.342 Humic Acid — Any of the alkali soluble end products of the decomposition of organic matter in the soil and composts. Weak acid which forms salty.

2.343 Humification — The processes involved in the decomposition of organic matter and leading to the formation of humus.

2.344 Humin — The fraction of the soil organic matter that is not dissolved upon extraction of the soil with dilute alkali.

2.345 Hummock — A small, rounded knoll or ridge.

2.346 Humus — Well-decomposed, more or less stable part of organic matter of the soil which has lost its original structure but has not yet been reduced to the simple end products.

2.347 Hydraulic Conductivity

a) The ratio of the flow velocity to the driving force for the viscous flow under saturated conditions of a specified liquid in a porous medium. Physical dimensions will depend on the equation selected to express the flow.

b) *Practical Units* — The ratio $v/i = K$, where v is the flow velocity of a specified liquid under saturated conditions, and i is the hydraulic gradient in the Darcy's equation $v = Ki$.

2.348 Hydraulic Head — The hydraulic head has a value at each point in the soil water system and is defined as the height with respect to a standard datum at which water stands in a riser (or piezometer or manometer) which connects to the point in question. In soil-water, the Kinetic energy head associated with velocity is usually negligible compared with the pressure and gravity heads. Porous cups make it possible to measure the hydraulic head in saturated soil. Hydraulic head has the dimensions of length.

2.349 Hydraulic Soil — Soil developed under the influence of water standing within the profile for considerable periods, formed mainly in cold, humid regions.

3.350 Hydrograph — Graphical or tabular representation of runoff rate with respect to time.

2.351 Hydrologic Cycle — A group of numerous arcs which represents the different paths through which the water in nature circulates and is transformed.

2.352 Hydrology — Science dealing with water on the earth, its occurrence, circulation and on or in the earth and its reaction with the environment.

2.353 Hodrostatic Pressure — Force per unit of area exerted by a liquid due to its elevation above a point.

2.354 Hydras Mica — A silicate clay with 2 : 1 lattice structure, but of indefinite chemical composition since usually part of the silicon in the silica tetrahedral layer has been replaced by aluminium, and containing a considerable amount of potassium which serves as an additional bonding between the crystal units, resulting in particles larger than normal in montmorillonite and, consequently, in a lower cation-exchange capacity. Sometimes referred to as illite. (*See* clay mineral.)

2.355 Hygroscopic Moisture — Moisture absorbed by a soil from a saturated atmosphere and not available to plants in any way.

2.356 Hygroscopic Water — Water adsorbed by a dry soil from an atmosphere of high relative humidity, water remaining in the soil after 'air drying' or water held by the soil when it is in equilibrium with an atmosphere of a specified relative humidity at a specified temperature, usually 98 percent relative humidity at 25°C.

I

2.357 Igneous Rock — Rock formed from the cooling and solidification of original molten material and that has not been changed appreciably since its formation.

2.358 Illuvial Horizon — A soil layer or horizon in which material carried from an overlying layer has been precipitated from solution or deposited from suspension. The layer of accumulation. (*See* eluvial horizon.)

2.359 Illuviation — The process of deposition of soil material removed from one horizon to another in the soil, usually from an upper to a lower horizon in the soil profile. (*See* elluviation.)

2.360 Impeded Drainage — Condition in which the downward movement of gravitational water in soil is restricted.

2.361 Impermeable Boundary — *See* impermeable layer.

2.362 Impermeable Floor — Impervious bottom, such as in the bottom of a ditch or reservoir.

2.363 Impermeable Layer — Layer of soil resistant to penetration by water, air or roots.

2.364 Immature Soil — A soil having a profile with compact subsoil horizons with distinct clay accumulations; moderately weathered and immature soils.

2.365 Immobilization — The conversion of an element from the inorganic to the organic form in microbial tissues or in plant tissues, thus rendering the element of readily available to other organism or to plants.

2.366 Impervious — Resistant to penetration by fluids or by roots.

2.367 Incomplete Fertilizer (Single Carrier) — A commercial fertilizer not having all three of the fertilizer elements.

2.368 Indicator Plants — Plants characteristic of specific soil or site condition.

3.369 Indurated Soil — Cemented, hardened or rock-like, as a true hardpan, which will not soften when wetted.

2.370 Infiltration — The downward entry of water into the soil.

2.371 Infiltration Rate — The maximum rate at which a soil, in a given condition at a given time, can absorb water. Also, the maximum rate at which a soil will absorb water impounded on the surface at a shallow depth when adequate precautions are taken regarding border or fringe effects. Defined as the volume of water passing into the soil per unit of area per unit of time, it has the dimensions of velocity (LT^{-1}).

2.372 Inflitrometer — A device for measuring the rate of entry of fluid into a porous body when applied uniformally over the area, for example, water into soil.

2.373 Infinite Soil — Soil of essentially unlimited depth for plant root development.

2.374 Inlet — Surface connection to a tile drain; structure at the diversion end of a conduit; upstream end of any structure through which water may flow.

2.375 Intake — Head-works of a conduit; the place of diversion; water infiltration by soil.

2.376 Intercepter Drain — Surface or subsurface drain, or a combination of both designed and installed to collect subsurface flow before it resurfaces.

2.377 Inter Flow — That portion of rainfall which infiltrates into the soil and moves laterally through the upper soil horizons until intercepted by a stream channel or until it returns to the surface at the same point down slope from its point of infiltration.

2.378 Intergrade — A soil that possesses moderately well-developed distinguishing characteristics of two or more genetically related great soil groups.

2.379 Internal Drainage — Drainage of the soil profile; may be either natural or artificial.

2.380 Interstices — Voids, pores or spaces between soil particles or soil aggregates.

2.381 Intrinsic Permeability — The property of a porous material that relates to the ease with which gases or liquids can pass through it. The Darcy 'K' multiplied by n/eg;

$$\text{Intrinsic Permeability} = K\frac{n}{eg}$$

where

n is the viscosity of the fluid in poises;

e is the density of the fluid in g/cm^3, and

g is the acceleration of gravity in cm/sec^2.

(*See* permeability and soil water.)

2.382 Ion — An electrically charged particle, element, or group of elements.

2.383 Iron-pan — An indurated soil horizon in which iron oxide is the principal cementing agent.

2.384 Irrigable Area — Area capable or being irrigated, principally as regards quality and elevation of land.

2.385 Irrigation Stream — Flow used for irrigation of a particular tract of land; flow of water distributed at a single irrigation or that in a single farm lateral.

2.386 Irrigation — Artificial application of water to soil for the purpose of supplying moisture essential to plant growth.

2.387 Irrigation Efficiency — The ratio of the water consumed by crops of an irrigated farm or project to the water diverted from a river or other natural water source into the farm or project canals.

2.388 Irrigation Frequency — Time interval between irrigations.

2.389 Irrigation Methods — The manner in which water is artificially applied to an area. The methods and the manner of applying the water are as follows.

2.389.1 *Border-strip* — The water is applied at the upper end of a strip with earth borders to confine the water to the strip. They have slope in the direction of irrigation.

2.389.2 *Check-basin* — The water is applied rapidly to relatively level plots surrounded by levels. The basin is a small check.

2.389.3 *Corrugation* — The water is applied to small, closely-spaced furrows running down from the head ditch frequently in grain and forage crops, to continue the flow of irrigation water to one direction.

2.389.4 *Flooding* — The water is released from field ditches and allowed to flood over the land.

2.389.5 *Furrows* — The water is applied to row crops in ditches made by tillage implements.

3.389.6 *Sprinkler* — The water is sprayed over the soil surface through nozzles from a pressure system.

2.389.7 *Sub-irrigation* — The water is applied in open ditches or tile lines until the water table is raised sufficiently to wet the soil for crop needs.

2.389.8 *Wild-flooding* — The water is released at high points in the field and distribution is uncontrolled.

2.390 Isomorphous Substitution — The replacement of one atom by another of similar size in a crystal lattice without disrupting or changing the crystal structure of the mineral.

J

2.391 Junction — Point of intersection of two or closed drains; accessory used to effect a junction between two tile lines.

2.392 Junction Box — A rectangular manhole or other structure which serves to join one or more drains.

K

2.393 Kaolin

a) An aluminosilicate mineral of the 1 : 1 crystal lattice group; that is, consisting of one silicon tetrahedral layer and one aluminium oxide-hydroxide octahedral layer.

b) The 1 : 1 group of family of aluminosilicates.

L

2.394 Laminar Flow — Flow in which viscous forces are so strong, related to the internal forces and where the fluid particles move in defined parallel streamlines. Laminar flow is sometimes called streamline or viscous flow.

2.395 Laminar Velocity — Velocity at which flow is laminar.

2.396 Land Capability — Classification of land units for the purpose of showing their relative suitability for some specific use, such as crop production with minimum erosion hazard.

2.397 Land Classification — The arrangement of land units into various categories based upon the properties of the land or its suitability for some particular purpose.

2.398 Land Leveler — Equipment designed to smooth with continuous slope and plane the soil surface.

2.399 Landscape — All the natural features such as fields, hills, forests, water, etc, which distinguish part of the earth's surface from another. Usually, that portion of land or territory which the eye can comprehend in a single view, including all its natural characteristics.

2.400 Land Smoothing — Process of eliminating minor surface irregularities without changing the general contours of the land; the finishing operation in land levelling.

2.401 Land-use Planning — Development of plans for the use of land that will, over a long period, best serve the general public.

2.402 Land, Wild — Uncultivated land; it may or may not be maintained by the owner for its productive vegetative cover or for wood, forage production, recreation, or wildlife.

2.403 Lateral — Secondary or side channel, ditch or conduit. Also called branch line or drain, spur, lateral ditch, group lateral, etc.

2.404 Lateritic Soil — A suborder of zonal soils formed in warm, temperate, and tropical regions and including the following great soil group: yellow podzolic, red podzodic, yellowish — brown lateritic, and lateritic. (*See* classification, soil and latosol.)

2.405 Latosol — A suborder of zonal soils including soils formed under forested, tropical, humid conditions and characterized by low silicases-quioxide ratios of the clay fractions, low base-exchange capacity, low activity of the clay, low content of most primary minerals, low content of soluble constituents, a high degree of aggregate stability, and usually having a red colour. (*See* classification, soil and lateritic soil.)

2.406 Lattice — A three dimensional grid of lines connecting the points representing the centres of atoms or ions in a crystal.

2.407 Lattice Energy — The energy required to separate the ions of a crystal to an infinite distance from each other.

2.408 Leaching — The process of removal of soluble material from soil by the passage of water through the soil. This is a primary step in the improvement of saline soils.

2.409 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 large-time average conditions.

2.410 Lime — Strictly, calcium oxide (CaO), but as commonly used in agricultural 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.

2.411 Lime Concretion — An aggregate of precipitated calcium carbonate, or of other material cemented by precipitated calcium carbonate.

2.412 Lime Elements — The essential primary lime elements are, calcium and magnesium. They are so called because they are usually applied as found in lime.

2.413 Lime-pan — A hardened layer cemented by calcium carbonate.

2.414 Lime Requirement — The mass of agricultural limestone, or the equivalent of other specified liming material, required per acre to a soil depth of 15 centimetres (or on 2 million pounds of soil) to raise the *p*H of the soil to a desired value under field conditions.

2.415 Liquid Limit — The minimum percentage (by mass) of moisture at which a small sample of soil will barely flow under a standard treatment. Synonymous with 'upper plastic limit'.

2.416 Lithosequence — A group of related soils that differ one from the other in certain properties primarily as a result of differences in the parent rock as a soil forming factor.

2.417 Lithosols — A great soil group of azonal soils characterized by an incomplete solum and not clearly expressed soil morphology and consisting of freshly and imperfectly weathered mass of rock.

2.418 Loamy — Intermediate in texture and properties between fine-textured and coarse-textured soils. Includes all textural classes with the words 'loam' or 'loamy' as a part of the class name, such as clay loam or loamy sand. (*See* soil texture.)

2.419 Loess — Material transported and deposited by wind and consisting of predominantly silt sized particles.

2.420 Loose — A soil with particles or small aggregates that are independent of each other or are weakly cohering, with a maximum of pore space and the minimum resistance to forces tending to cause rupture.

2.421 Luxury Consumption — The consumption of an element above the point at which the element increases growth and resulting in an increase in content of that element in the plant.

2.422 Lysimeter

a) A vessel or container placed below the ground surface to intercept and collect water moving downward through the soil.

b) A device for measuring percolation and leaching losses from a column of soil under controlled conditions.

c) A device for measuring gains (precipitation and condensation) and losses (evapotranspiration) by a column of soil.

M

2.423 Macronutrient — A chemical element necessary in large amount for the growth of plant and usually applied artificially as fertilizer or liming materials ('macro' refers to quantity and not to the essentiality of the element). (*See* micronutrient.)

2.424 Main Canal — Principal canal for the conveyance of a water supply to the laterals.

2.425 Main Ditch — Principal ditch, channel, or stream, natural, improved, or constructed, serving one or more drainage enterprises. Local names of streams, rivers or channels are often used for identification. Also called main outlet ditch, community ditch, main canal, main line, trunk channel, outlet ditch, master ditch, main outlet, major outlet, and outlet channel.

2.426 Main Drain (Subsurface Drainage) — Principal drain which conducts drainage water from the collection (lateral) drains and submains to an outlet. Also called major drain, outlet drain, and trunk drain.

2.427 Manometer — Instrument which measures fluid pressure by fluid displacement. Also called a differential of U-tube manometer.

2.428 Mature Soil — A soil with well-developed soil horizons produced by the natural processes of soil formation and essentially in equilibrium with its present environment.

2.429 Maximum Water-Holding Capacity — Capacity of soil to hold water against gravity.

2.430 Meadow Podzol or Depression Podzol — Poorly drained depressional soils of the grassland and parkland regions of Canada with bleached AZ horizons and finer-textured B horizons. Also referred as slough podzol.

2.431 Medium-Texture — Intermediate between fine-textured and coarse-textured (soils). (It includes the following textural classes: very fine sandy loam, silt loam, and silt).

2.432 Metamorphic Rock — Rock derived from pre-existing rocks but that differ from them in physical, chemical, and mineralogical properties as a result of natural geological processes, principally heat and pressure, originating within the earth. The pre-existing rocks may have been igneous, sedimentary, or another form of metamorphic rock.

2.433 Mhos — Reciprocal ohms. A unit of conductance of an electrical charge.

2.434 Microclimate — The climatic condition of a small area resulting from the modification of the general climatic conditions.

2.435 Micronutrient — A chemical element necessary in only extremely small amounts (less than 1 ppm in the plant) for the growth of plants. Examples are: B, Cl, Cu, Fe, Mn, and Zn ('micro' refers to the amount used rather than to its essentiality). (*See* macronutrient.)

2.436 Microrelief — Small-scale, local differences in topography, including mounds, swales, or pits that are only a few feet in diameter and with elevation differences of up to 6 feet. (*See* gilgai.)

2.437 Mineralization — The conversion of an element from an organic form to an inorganic state as a result of microbial decomposition.

2.438 Mineralogical Analysis — The estimation or determination of the kinds or amounts of minerals present in a rock or in a soil.

2.439 Mineral Soil — A soil consisting predominantly of, and having its properties determined predominantly by, mineral matter. Usually contains less than 20 percent organic matter, but may contain an organic surface layer up to 30 cm thick.

2.440 Minor Elements — The essential elements needed in but small amounts (iron, copper, zinc, manganese, boron, and molybdenum).

2.441 Moderately Coarse-Texture — Consisting predominantly of coarse particles. (In soil textural classification, it includes all the sandy loams except the very fine sandy loam.) (*See* coarse texture.)

2.442 Moderately Fine-Texture — Consisting predominantly of intermediate-size (soil) particles. (In soil textural classification, it includes clay loam, sandy clay loam, and silty clay loam.) (*See* fine texture.)

2.443 Moisture Content — Percentage by weight of moisutre based on wet weight in a sample.

2.444 Moisture Density — Mass of water per unit volume. When expressed in grams per cubic centimetre, it is numerically equal to the percentage of total space occupied by the water.

2.445 Moisture Equivalent — The moisture retained in air-dried, screened sample of soil which has been wetted and drained in a standard manner and centrifuged for 30 min in a centrifugal field equal to 1 000 times gravity. Moisture equivalent is expressed as moisture percentage on a dry-weight basis and approximates field capacity for many medium and fine-textured soils.

2.446 Moisture Penetration — Depth to which moisture penetrates following irrigation or rainfall before the rate of downward movement becomes negligible.

2.447 Moisture Percentage — The percentage of water in soil and plant usually expressed on a dry-weight basis. If otherwise expressed, the basis should be stated.

2.448 Moisture-Retention Curve — A graph showing the soil moisture percentage (by weight or by volume) versus applied tension (or pressure). Points on the graph are usually obtained by increasing (or decreasing) the applied tension or pressure over a specified range.

2.449 Moisture Tension — The equivalent negative gauge pressure, or suction, in the soil moisture. Soil moisture tension is equal to the equivalent negative or gauge pressure to which water must be subjected in order to be in hydraulic equilibrium, through a porous permeable wall or membrane, with the water in the soil.

2.450 Moisture Volume Percentage — The ratio of the volume of water in a soil to the total bulk volume of the soil.

2.451 Moisture Weight Percentage — The moisture content expressed as a percentage of the over-dry weight of soil. (*See* dry-weight percentage.)

2.452 Montmorillonite — An alumine silicate clay mineral with a 2 : 1 expanding crystal structure that is with two silicon tetrahedral layers enclosing an aluminium octahedral layers. Considerable expansion may be caused along the C axis by water moving between silica layers of continuous units. (*See* montmorillonite saponite group.)

2.453 Mentmorillonite-Saponite Group — Clay mineral with 2 : 1 crystal lattice structure; that is, two silicon tetrahedral layers enclosing an aluminium octahedral layer. Consists of montmorillonite, beidellite, nontronite, saponite, and others.

2.454 Mar — Wetlands imperfectly drained and which are clay loams with sufficient organic matter.

2.455 Mottled Zone — A layer that is marked with spots or blotches of different colour or shades of colour. The pattern of mottling and the size, abundance, and colour of the mottles may vary considerably and should be specified in soil description.

2.456 Mottling — Spots or blotches of different colour or shades or colour interspersed with the dominant colour.

2.457 Mulch

a) Any material such as straw, sawdust, leaves, plastic film, loose soil, etc, that is, spread upon the surface of the soil to protect the soil and plant roots from the effects of rain drops, soil crushing, freezing, evaporation, etc.

b) To apply mulch to the soil surface.

2.458 Mulch Tillage — Tillage or preparation of soil in such a way that plant residues are left on the surface.

2.459 Mull — A type of forest humus in which the F layer may or may not be present and in which there is no H layer. The A1 horizon consists of an intimate mixture of organic matter and mineral soil with gradual transition between the A1 and the horizon beneath. (Sometimes differentiated into tirum mull, sand mull, coarse mull, medium mull, and fine mull.)

2.460 Munsell Colour System — A colour designation system that specifies the relative degree of the three simple variables of colour : hue, value and chroma.

For example: 10YR 6/4 is a colour (of soil) with a hue = 10YR, value = 6, and chroma = 4. These notations can be translated into several different systems of colour names as defined. (*See* chroma, hue, value, and colour.)

N

2.461 Neutral Soil — A soil in which the surface layer, at least to normal plough depth, is neither acid nor alkaline in reaction. (*See* acid soil, alkaline soil, *p*H, and reaction, soil.)

2.462 Nitrate Reduction — The biochemical reduction of nitrate to nitrite form.

2.463 Nitrification — Formation of nitrates from ammonia. An oxidation process carried on in the soil by micro-organism.

2.464 Nitrogen Assimilation — The incorporation of nitrogen into organic cell substances by living organisms.

2.465 Nitrogen Cycle — The sequence of bio-chemical changes undergone by nitrogen wherein it is used by a living organism, liberated upon the death and decomposition of the organism, and converted to its original state of oxidation.

2.466 Nitrogen Fixation — Conversion of free nitrogen to nitrogen compounds by symbiotic or non-symbiotic microbial activity.

2.467 Non-saline Alkali Soil — A soil which 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, the conductivity of the saturation extract is less than 4 millimhos per centimetre (at 25°C) and the *p*H of the saturated soil usually ranges between 8·5 and 10·0.

O

2.468 Observation Well — Hole bored to a desired depth below the ground surface, used for observing the water table level.

2.469 One-third Atmosphere Percentage — The moisture retained in an air-dried and screened sample of soil that has been wetted and this brought to equilibrium on a permeable membrane at a soil moisture tension of 345 cm of water. This characteristic moisture value for soils is expressed in terms of moisture percentage, dry-weight basis, and closely approximates the moisture equivalent and field capacity for many soils.

2.470 Organic Soil — A soil which contains a high percentage greater than 15 or 20 percent of organic matter throughout the solum.

2.471 Osmotic Pressure — The pressure that would have to be applied to a solution to give it the same escaping tendency as the solvent. For example, if a solution is contained in a rigid semipermeable membrane which is immersed in water, it is found that in order to prevent transfer of water through the membrane, either the pressure on the water must be decreased or the pressure on the solution increased. The pressure difference required for equilibrium across the memberane is the osmotic pressure. Osmotic pressure ordinarily is determined by freezing point measurements, using the formula:

$$OP = 12{\cdot}06\ \triangle - 0{\cdot}21\ \triangle^2,$$

where

OP = osmotic pressure of the solution in atmospheres, and

$\triangle$ = freezing point depression in degrees centrigrade.

2.472 Out Fall — Point where water flows from a conduit, stream or drain.

2.473 Outlet — Point of water disposal from a stream, river, lake, tidewater, or artificial drain.

2.474 Oven-dry Soil — Soil which has been dried at 105°C until it reaches constant weight.

P

2.475 Pans — Horizons or layers, in soils, that are strongly compacted, indurated, or very fragipan, and hardpan.

2.476 Pan, Genetic — A natural subsurface soil layer of low or very low permeability, with a high concentration of small particles, and differing in certain physical and chemical properties from the soil immediately above or below the pan. (*See* fragipan, and hardpan, all of which are genetic pans.)

2.477 Pan, Pressure or Induced — A subsurface horizon or soil layer having a higher bulk density and a lower total porosity than the soil directly above or below it, as a result of pressure that has been applied by normal tillage operations or by other artificial means. Frequently, referred to as ploughpan, ploughsole, or traffic pan.

2.478 Parent Material — The unconsolidated and more or less chemically weathered mineral or organic matter from which the column of soil is developed by pedogenic processes.

2.479 Parshall Flume — A calibrated device, based on the principle of critical flow, used to measure the flow of water in open conduits. Formerly termed the improved venturi flume.

2.480 Particle Density — The average density of the soil particles excluding air spaces. Particle density is usually expressed in grams per cubic centimetre and is sometimes referred to as 'real density' and 'real specific gravity'.

2.481 Particle Size — The effective diameter of a particle measured by sedimentation, sieving, or micrometric methods.

2.482 Particle-Size Analysis — Determination of the various amounts of the different separates in a soil sample, usually by sedimentation, sieving, micrometry, or combinations of these methods.

2.483 Particle-Size Distribution — The amounts of the various soil separates in a soil sample, usually expressed as weight percentage.

2.484 Parts Per Million (ppm) — Weight units of any given substance per one million equivalent weight units of oven-dry soil; or in the case of soil solution or other solution, the weight units of solute per million weight units of solution.

2.485 Peat — Unconsolidated soil material consisting largely of undecomposed, or only slightly decomposed, organic matter accumulated under conditions of excessive moisture.

2.486 Peat Soil — An organic soil containing more than 50 percent organic matter. 'Peat' referring to the slightly decomposed or undecomposed deposits and 'muck' to the highly decomposed materials.

2.487 Ped — A unit of soil structure such as an aggregate, crumb, prism, block, or granule, formed by natural processes (in contrast with a clod, which is formed artificially).

2.488 Penetrability — The ease with which a probe can be pushed into the soil. May be expressed in units of distance, speed, force, or work depending on the type of penetrometer used.

2.489 Perched Water Table — A water table, usually of limited area, maintained above the normal ground water supply by the presence of an intervening, relatively impervious confining stratum.

2.490 Percolating Water — Subsurface water which passes downward through the soil or rocks due to the action of gravity.

2.491 Percolation, Soil Water — The downward movement of water through soil. Especially, the downward flow of water in saturated or nearly saturated soil.

2.492 Percolation Rate — *See* permeability.

2.493 Permanent Wilting (Wilting Co-efficient) — *See* wilting percentage.

2.494 Permanent Wilting Percentage — Soil moisture content below which plants cannot readily obtain water and permanently wilt. Also called permanent wilting point.

2.495 Permeability — The specific property of a soil which is a measure of the readiness with which the soil transmits water. The permeability is a velocity, and for agricultural purposes, it can be conveniently expressed either in inches per hour or in centimetres per hour. For most soils, both the chemical nature of the water used and the history and treatment of the sample greatly affect the permeability.

2.496 *p*H — The common logarithm of the reciprocal of the hydrogen ion concentration of a system. *p*H 7 is neutral, *p*H less than 7 is acidic and *p*H more than 7 is basic or alkaline.

2.497 Phase, Soil — A subdivision of a soil type or other unit of classification having characteristics that affect the use and management of the soil but which do not vary sufficiently to differentiate it as a separate type. A variation in a property or characteristic such as degree of slope, degree of erosion, content of stones, etc.

2.498 Photomap — A mosaic map made from aerial photographs with physical and cultural features shown as on a planimetric map. (*See* planisaic and toposaic.)

2.499 Phreatic Surface — Ground water table.

2.500 Physical Proportions (of Soils) — Those characteristics, processes, or reactions of a soil which are caused by physical forces and which can be described by, or expressed in, physical terms or equations. Examples of physical properties are bulk density, water-holding capacity, hydraulic conductivity, porosity, poro-size distribution, etc.

2.501 Physical Weathering — The break down of rock and mineral particles into small particles by physical forces such as frost action. (*See* weathering.)

2.502 Piezometer — A device used to measure different kinds of pressure. Used in measuring height of water table.

2.503 Piezometric Head — Combined position and pressure head as measured by the height of the water column in a piezometer above a reference plane.

2.504 Piezometric Line or Surface — Line or surface having an equal piezometric head. In ground water flow it is the same as an equipotential line or surface. (*See* equipotential.)

2.505 Piping — Washing of fine materials in the tile line by the inflowing water.

2.506 Plasticity (Soil) — Property of a soil which allows it to be deformed without appreciable volume change or cracking.

2.507 Point Gauge — Sharp pointed rod attached to a graduated staff or vernier scale for measuring water surface elevation.

2.508 Polder — Area of low-lying land reclaimed from sea, lake or river by the protection of dikes or levees.

2.509 Pond — Small body of water, usually confined by constructed works.

2.510 Pore-Size Distribution — The volume of the various sizes of pores in a soil. Expressed as percentages of the bulk volume (soil plus pore space).

2.511 Porosity — The fraction of the soil volume not occupied by the soil particles. In other words, porosity is the ratio of the sum of the volumes of the liquid and gaseous phases to the sum of the volumes of the solid, liquid, and gaseous phases of the soil.

2.512 Poverty Adjustment — The range of supply of a limiting element through which an increase in that element brings about an increase in plant growth.

2.513 P.P.M. (Parts Per Million) — The concentration of a substance expressed as the number of unit weights of that substance per million units of weight of solution.

2.514 Precipitation Intensity or Rainfall Intensity — Rate of precipitation, generally expressed as centimetres per hour.

2.515 Precipitation Interception or Rainfall Interception — The stopping, interrupting and temporary holding of precipitation in any form by a vegetative canopy or vegetation residue.

2.516 Pressure — Total load or force acting upon a surface expressed as a weight per unit area.

2.517 Pressure Head — Weight per unit area exerted on an object.

2.518 Pressure Membrane — A membrane permeable to water and only very slightly permeable to gas when wet, through which water can escape from a soil sample in response to a pressure gradient.

2.519 Primers (Pump) — Device attached to a pump for the purpose of pumping out the air and causing the water to prime or fill the pump through the suction pipe.

2.520 Productivity — Soil productivity is the capacity of a soil, in its normal environment, for producing a specified plant or sequence of plants under a specified system of management.

2.521 Productive Soil — A soil in which the chemical, physical and biological conditions are favourable for the economic production of crops suited to a particular area.

2.522 Profile, Soil — A verticle section of the soil through all its horizons and extending into the parent material.

2.523 Puddled Soil — Soil condition resulting from the handling of a soil when it is in a wet, plastic condition, so that when dried, it becomes hard, cloddy and almost impervious to air and water.

2.524 Pump Drainage — Drainage system which pumps the water into an outlet.

Q

2.525 Quadrat Method — A study of vegetation involving marking of a square area of determined size and recording frequency of the various species found in this area.

R

2.526 Rainfall Component — That part of the flow of a channel that can be attributed to rainfall directly on the surface of the channel.

2.527 Rainfall Excess — The part of rainfall excluding subsurface runoff.

2.528 Rainfall Frequency — Frequency, usually expressed in years, at which a given rainfall in intensity and duration can be expected to be equalled or exceeded.

2.529 Rainfall Intensity — Rate of rainfall for any given time interval, usually expressed in centimetres per hour.

2.530 Rate of Application, Sprinkler — Rate at which water is applied from a sprinkler or sprinkler system, usually based on the sprinkler system output and nominal area covered per setting.

2.531 Rate of Storage — Inflow to a body of water (surface or subsurface) less the outflow per unit time.

2.532 Reaction Soil — The degree of acidity or alkalinity of a soil, usually expressed as a *p*H value. Descriptive terms commonly associated with certain ranges in *p*H are:

extremely acid, less than 4·5; very strongly acid, 4·5-5·0; strongly acid; 5·1-5·5; moderately acid, 5·6-6·0; slightly acid, 6·1-6·5; neutral 6·6-7·3; slightly alkaline, 7·4-7·8; moderately alkaline, 7·9-8·4; strongly alkaline, 8·5-9·0; and very strongly alkaline greater than 9·1.

2.533 Real Density — Mass per unit volume of the oven dry solid (soil matter), pore space excluded. When expressed as grams per cubic centimetre, it is equal numerically to the specific gravity of the solids.

2.534 Recession Curve — Descending portion of a stream flow or flood hydrograph.

2.535 Recharge — Progress by which water is added to the zone of saturation, as recharge of an aquifer.

2.536 Red Desert Soil — A zonal great soil group consisting of soils formed under warm-temperate to hot, dry regions under desert type vegetation, mostly shrubs.

2.537 Regur — An intrazonal group of dark calcareous soils high in clay, which is mainly montmorillonitic, and formed mainly from rocks low in quartz; occurring extensively on the Deccan plateu of India.

2.538 Relative Humidity — Ratio of the amount of water present in the air to the amount required for saturation at the same dry bulb temperature and barometric pressure. May be computed from vapour pressure, mole fraction or from weight data.

2.539 Rendzina — A great soil group of the intrazonal order and calcimorphic suborder consisting of soils with brown or black friable surface horizons underlain by light grey to pale yellow calcareous material, developed from soft, highly calcareous parent material under grass vegetation or mixed grasses and forest in humid and semiarid climates.

2.540 Reservoir — A natural or constructed place in which water is collected and stored for use.

2.541 Residual Soil — Unconsolidated and partly weathered mineral materials accumulated by disintegration of consolidated rock in place.

2.542 Residual Shrinkages — The decrease in the bulk volume of soil in addition to that caused by the loss of water.

2.543 Retention — Precipitation on an area that does not escape as run off; the difference between total precipitation and total runoff.

2.544 Retentive Profile, Soil — A graph showing the retaining capacity of a soil as a function of depth. The retaining capacity may be for water, at any given tension, for cafians, or for any other substances held by soils.

2.545 Return Flow — That portion of the water diverted from a stream which finds its way back to the stream channel, either as surface or underground flow.

2.546 Reversion — The reappearance of the character after a lapse of one or more generations, due to character being recessive or being dependent on complementary factors, as a result of back mutation.

2.547 Riparian — The doctrine of water right according to which a landowner along a stream is entitled to have the water flow by natural channel undiminished and unpolluted. Modification in the irrigated area allows for reasonable use of water for irrigation purposes.

2.548 Riser Outlet Plug (Sprinkler) — Threaded plug used to close a riser outlet where a sprinkler is not used.

2.549 Riser Pipe (Sprinkler) — Pipe used to elevate the sprinkler head above ground or crop level.

2.550 River Wash — Barren alluvial land, usually coarse textured, exposed along streams at low water and subject to shifting during normal high water. A miscellaneous land type.

2.551 Rock Land — Areas containing frequent rock outcrops and shallow soils. Rock outcrops usually occupy from 25 to 90 percent of the area. A miscellaneous land type.

2.552 Root Zone — That depth of soil which plant roots readily penetrate.

2.553 Rotation Irrigation System — System of irrigation in which a number of irrigators rotate a portion of the entire flow in turn for a limited period of time.

2.554 Rough Broken Land — Land with very steep topography and numerous intermittent drainage channels but usually covered with vegetation. *See* miscellaneous land type.

2.555 Row Crop — Crop planted in rows for enough apart to allow cultivation between rows during the growing season.

2.556 Rubble Land — Land areas with 90 percent or more of the surface covered with stones and boulders. A miscellaneous land type.

2.557 Runoff — That portion of the precipitation on an area which is discharged from the area through stream channels as surface or subsurface flow.

2.558 Runoff Co-efficient — Percentage of rainfall in a storm which is of a specified magnitude that may be expected to flow as runoff from a watershed.

2.559 Runoff Plots — Areas of land, usually small, from which runoff and transported soluble materials and soil may be measured.

S

2.560 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 conductivity of the saturation extract is greater than 4 millimhos per centimetre (at 25°C). The *p*H of the saturated soil is usually less than 8·5.

2.561 Saline Soil — A non alkali soil containing soluble salts in such quantities that they interfere with the growth of most crop plants. The conductivity of the saturation extract is greater than 4 millimhos per centimetre (at 25°C), the exchangeble sodium percentage is less than 15, and the *p*H of the saturated soil is usually less than 8·5.

2.562 Salinity — Concentration of salt in a given fluid or material,

2.563 Salinization — The process of accumulation of salts in the soil.

2.564 Salt-Affected Soil — Soil that has been adversely modified for the growth of most crop plants by the presence of soluble salts, exchangeable sodium, or both. *See* saline soil, saline-sodic soil and sodic soil.

2.565 Salted Soil — A generic term applying to all soils having characteristics which are caused by exposure to excessive amounts of soluble salts.

2.566 Sand

a) A soil particle between 0·05 and 2·0 mm in diameter.

b) Any one of five soil separates, namely; very coarse sand, coarse sand, medium sand and very fine sand. (*See* soil separates).

c) A soil textural class. (*See* soil texture).

2.567 Sand Lens — Lenticular band of sand in distinctly sedimentary bonded material.

2.568 Sand Trap — Device, often a simple enlargement in a ditch or conduit for detaining sand and other heavy particles carried by water. May also include means for removing such material.

2.569 Sandy — Containing a large amount of sand. (Applied to any one of the soil classes that contains a large percentage of sand.) (*See* class, soil and soil texture).

2.570 Saturate

a) To fill all the voids between soil particles with a liquid.

b) To form the most concentrated solution possible under a given set of a physical conditions in the presence of an excess of the adsorption complex with a cation species; for example, if saturated.

2.571 Saturated Flow — Flow of water through a porous material under saturated condition. (*See* saturate).

2.572 Saturation Extract — The solution obtained by pressure or vacuum filtration of a soil paste that has been made up to a saturated condition by adding water while stirring.

2.573 Saturation Percentage — The moisture content of a sample of soil that has been brought to saturation by adding water while stirring. Expressed as grams of water per 100 g of dry soil.

2.574 Saturation Point — That point at which a soil or aquifer will no longer absorb any amount of water without losing an equal amount.

2.575 Sedimentary Rock — A rock formed from materials deposited from suspension of precipitated solution and usually being or less consolidated. The principal sedimentary rocks are sand stones, shales, limestones, and conglomerates.

2.576 Seepage — Movement of water into, through, or from soil.

2.577 Seepage Meter — Device for measuring rate of seepage.

2.578 Self-Matching Soil — A soil in which the surface layer becomes so well aggregated that it does not crust and seal and serves as a surface mulch upon drying.

2.579 Semiarid — Term applied to an area where the climate is neither entirely arid nor humid but intermediate between the two conditions.

2.580 Side Dressing — The placement of fertilizers along the side of the row after the row is established.

2.581 Sierozem — A zonal great soil group consisting of soils with plate greyish. *A* horizons grading into calcareous material at a depth of 1 foot or less, and formed in temperature to cool, arid climates under a vegetation of desert plants, short grass, scattered under a vegetation of a desert plants, short grass and scattered brush.

2.582 Silt

a) A soil separate consisting of particles between 0·05 and 0·002 mm in equivalent diameter. *See* soil separates.

b) A soil textural class. *See* soil texture.

2.583 Silting — The deposition of water-borne sediments in stream channels, lakes, reservoirs, or an flood plains, usually resulting from a decrease in the velocity of the water.

2.584 Silt Loam — A soil textural class containing large amount of silt and small quantities of sand and clay. 12 to 27 percent clay.

2.585 Silt Clay — A soil textured class containing a relatively large amount of 40 percent or more silt and clay and a small amount of sand. (*See* soil texture and class, soil).

2.586 Silty Clay Loam — A soil textural class containing a relatively large amount of silt, a lesser quantity of clay (27 to 40 percent), and a still smaller quantity of sand (20 percent).

2.587 Site

a) In ecology, an area described or defined by its biotic, climatic, and soil conditions as related to its capacity to produce vegetation.

b) An area sufficiently uniform in biotic, climatic, and soil conditions to produce a particular climate vegetation.

2.588 Site Index

a) A quantitative evaluation of the productivity of a soil for forest growth under the existing or specified environment.

b) The height in metres of the dominant forest vegetation taken at or calculated to an index age, usually 50 or 100 years.

2.589 Slickers — Fine-textured materials separated in placer mining and in ore-mill operations; may be detrimental to plant growth unless confined in specially constructed basin. A miscellaneous land type.

2.590 Slick Spots — Small areas in a field that are somewhat black alkali when wet due to alkali or high exchangeable sodium.

2.591 Slope — Degree of deviation of a surface from the horizontal, usually expressed in percent or degrees.

2.592 Sodic Soil

a) A soil containing sufficient exchangeable sodium to interfere with the growth of most crop plants.

b) A soil in which the sodium - adsorption ratio of the saturation extract is 15 or more.

2.593 Sodium Adsorption Ratio (SAR) — A ratio for soil extracts and irrigation waters used to express the relative activity of sodium zones in exchange reaction with soil:

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

where the sodic concentrations are expressed in meq.

NOTE — meq = milli-equivalent.

2.594 Sodium Percentage — The percentnge of total cations in water that is sodium. Calculations are based on milli equivalents rather than weight.

2.595 Soil

a) The unconsolidated mineral materials on the immediate surface of the earth that serves as a natural medium for the growth of land plants.

b) The unconsolidated mineral matter on the surface of the earth that has been subjected to and influenced but genetic and environmental factors of parent material, climate (including moisture and temperature effects), macro — and microorganisms,

and topography, all acting over a period of time and producing a product — soil — that differs from the material from which it is derived in many physical, chemical, biological and morphological properties, and characteristics.

2.596 Soil Aeration — Movement of air into the soil as water is drained out. A process by which air and other gases in the soil are renewed.

2.597 Soil Association

a) A group of defined and named taxonomic soil units occurring together in individual and characteristic pattern over a geographic region, comparable to plant associations in many ways. (Sometimes called 'natural land type'.)

b) A mapping unit used on general soil maps in which two or more defined taxonomic units occurring together in characteristic pattern and combined because the scale of the map or the purpose for which it is being made does not require delineation of the individual soils.

2.598 Soil Auger — A tool for boring into the soil and withdrawing a small sample for field or laboratory observation. Soil augers may be classified into several types as follows:

a) those with worm-type bits, unenclosed;

b) those with worm-type bits enclosed in a cylinder; and

c) those with hollow cylinder with a cutting edge at the lower end.

2.599 Soil Chemistry — A division of soil science concerned with the chemical constitution, the chemical properties, and the chemical reactions of soils.

2.600 Soil Classification — *See* classification, soil.

2.601 Soil Colloids — Negatively charged soil particles smaller than 0·001 mm in diameter.

2.602 Soil Complex — A mapping unit used in detained soil surveys where two or more defined taxonomic units are so intimately intermixed geographically that it is undesirable or impractical, because of the scale being used to separate them.

2.603 Soil Conservation

a) Protection of the soil against physical loss by erosion or against chemical deterioration; that is, excessive loss of fertility by either netural or artificial means.

b) A combination of all management and land use methods which safeguard the soil against depletion or deterioration by natural or by man induced factors.

c) A division of soil science concerned with soil conservation (a) and (b).

2.604 Soil Conserving Crops — Crops that offer an appreciable retardance to erosion and maintain or replenish rather than deplete soil organic matter.

2.605 Soil Depleting Crops — Crops that do not offer an appreciable retardance to erosion and which tend to deplete organic matter in the soil, and to permit deterioration of soil structure.

2.606 Soil Erosion — Detachment and movement of soil from the land surface by wind or water, including normal soil erosion and accelerated erosion — (*see* gully erosion, rill erosion, sheet erosion, splash erosion, wind erosion).

2.607 Soil Extract — The solution separated from a soil suspension or from a soil by filtration, centrifugation, suction or pressure (may or may not be heated prior to separation).

2.608 Soil-Formation Factors — The variables, usually interrelated, natural agencies that are active in and responsible for the formation of soil. The factors are usually grouped into five major categories as follows:

(a) Rock, (b) Climate, (c) Organisms, (d) Topography, and (e) Time.

2.609 Soil Genesis

a) The mode of origin of the soil with special reference to the processes or soil-forming factors responsible for the development of the solum, or true soil, from the unconsolidated parent material.

b) A division of soil science concerned with soil genesis (a).

2.610 Soil Geography — A subspecialization of physical geography concerned with the areal distributions of soil types.

2.611 Soil Horizon — A layer of soil or soil material approximately parallel to the land surface and differing from adjacent genetically related layers in physical, chemical, and biological properties or characteristics, such as colour, structure, texture, consistency, kinds and numbers of organisms present, degree of acidity or alkalinity, etc.

2.612 Soil Management Groups — Groups of taxonomic soil units with similar adaptations or management requirements for one or more specific purposes, such as adapted crops or crop rotations, drainage practices, fertilization, forestry, highway engineering, etc.

2.613 Soil Map — A map showing the distribution of soil types or other soil mapping units in relation to the prominent physical and cultural features of the earth's surface.

2.614 Soil Mechanics and Engineering — A subspecialization of soil science concerned with the effect of forces on the soil and the application of engineering principles to problems involving the soil.

2.615 Soil Microbiology — A subspecialization of soil science concerned with soil-inhibiting micro-organisms and their relation to agriculture, including both plant and animal growth.

2.616 Soil Minerology — A subspecialization of soil science concerned with the homogeneous inorganic material found in the earth's crust to the depth of weathering or of sedimentation.

2.617 Soil Moisture Stress — The sum of the soil moisture tension and the osmatic 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.

2.618 Soil Moisture Deficiency — Amount of water required to raise the moisture content of soil to field capacity.

2.619 Soil Moisture Potential — Work required to move a unit mass of water in a soil from an arbitrary datum to the point in question.

2.620 Soil Moisture Tension — The equivalent negative pressure or suction in the soil moisture. This tension may be expressed in any convenient pressure units. In the 1 atmosphere tension range, it is the negative pressure to which water in porous cup must be subjected in order to bring the water in the cup into static equilibrium through the porous wall with the moisture in the soil.

2.621 Soil Monolith — A vertical section of a soil profile removed from the soil and mounted for display or study.

2.622 Soil Morphology — The physical constitution of the soil including the texture, structure, porosity, consistency and colour of the various soil horizons, their thickness and their arrangement in the soil profile.

2.623 Soil Organic Matter — The organic fraction of the soil; includes plant and animal residues at various stages of decomposition, cells and tissues of soil organisms, and substances synthesized by the soil population. Usually determined on soils which have been sieved through a 2·0 mm sieve.

2.626 Soil Permeability — Capacity of the soil to transmit fluids. (*See* permeability).

2.625 Soil Plasticity — *See* plasticity.

2.626 Soil Population — All organisms living in the soil, including plants and animals.

2.627 Soil Pores — That part of the bulk volume of soil not occupied by soil particles, interstices and voids.

2.628 Soil Profile — Vertical section of the soil from the surface through all its horizons into the parent material.

2.629 Soil Science — That science dealing with soils as a natural resource on the surface of the earth including soil formation, classification and mapping, and the physical, chemical, biological, and fertility properties of soils; and these properties in relation to their management for crop production.

2.630 Soil Separates — One of the several grain size groups into which the soil is separated by mechanical analysis. Mineral particles, less than 2·0 mm in equivalent diameter ranging between specified size limits.

2.631 Soil Series — The basic unit of soil classification being a subdivision of a family and consisting of soils which are essentially alike in all major profile characteristics except the texture of the A horizon.

2.632 Soil Solution — The liquid phase of the soil and its solutes consisting of ions dissociated from the surface of the soil particles and of other soluble materials.

2.633 Soil Structure — The combination or arrangement of primary soil particles into secondary particles, units, or peds. These secondary units may be but usually are not, arranged in the profile in such a manner as to give a distinctive characteristic pattern. The secondary units are characterized and classified on the basis of size, shape, and degree of distinctness into classes, types, and grades, respectively. (*See* soil structure classes, soil structure grades, and soil structure types).

2.634 Soil Structure Classes — A grouping of soil structural units or peds on the basis of size. (*See* soil structures, soil structure types).

2.635 Soil Structure Grades — A grouping or classification of soil structure on the basis of inter and intra-aggregate adhesion, cohesion, or stability of the profile. Four grades of structure designated from 0 to 3 are recognized as follows:

0) *Structureless* — no observable aggregation or no definite and orderly arrangement of natural lines of weakness. Massive, if coherent; single grain, if noncoherent.

1) *Weak* — poorly formed indistinct peds, barely, observable in place.

2) *Moderate* — well formed distinct peds, moderately durable on evident but not distinct in undisturbed soil.

3) *Strong* — durable peds that are quite evident in undisturbed soil, adhere weakly to one another, withstand displacement, and become separated when the soil is disturbed.

2.636 Soil Structure Types — A classification of soil structure based on the shape of the aggregates or peds and their arrangement in the profile. (*See* soil structure, soil structure classes, soil structure grades).

2.637 Soil Survey — The systematic examination, description classification, and mapping of soils in an area. Soil surveys are classified according to the kind and intensity of field examination.

2.638 Soil Texture — The texture is the term indicating the courseness or fineness of the soil. The amount and quantity of each of the grain size group of particle that constitute the soil.

2.639 Sand — Soil material that contains 85 percent or more of sand, percentage of silt, plus 1·5 times the percentage of clay, shall not exceed 15.

2.640 Coarse Sand — 35 percent or more very coarse and coarse sand, and less than 50 percent any other one grade of sand.

2.641 Sand — 35 percent or more very coarse, coarse, and medium sand, and less than 50 percent fine or very fine sand.

2.642 Fine Sand — 50 percent or more fine sand (or) less than 25 percent very coarse, coarse, and medium sand and less than 50 percent very fine sand.

2.643 Very Fine Sand — 50 percent or more very fine sand.

2.644 Loamy Sand — Soil material that contains at the upper limit 85 to 90 percent sand, and the percentage of silt plus 1·5 times the percentage of clay is not less than 15; at the lower limit it contains not less than 70 to 85 percent sand, and the percentage of clay does not exceed 30.

2.644.1 *Loamy Coarse Sand* — 25 percent or more very coarse and coarse sand, and less than 50 percent any other one grade of sand.

2.644.2 *Loamy Sand* — 25 percent or more very coarse, coarse and medium sand and less than 50 percent fine or very fine sand.

2.644.3 *Loamy Fine Sand* — 50 percent or more fine sand (or) less than 25 percent very coarse, coarse and medium sand and less than 50 percent very fine sand.

2.644.4 *Loamy Very Fine Sand* — 50 percent or more very fine sand.

2.645 Sandy Loam — Soil material that contains either 20 percent clay or less and the percentage of silt plus twice the percentage of clay exceeds 30 percent and 52 percent or more sand, or less than 7 percent clay, less than 50 percent silt, and between 43 percent and 52 percent sand.

2.645.1 *Coarse Sandy Loam* — 25 percent or more very coarse, and coarse sand and less than 50 percent any other one grade of sand.

2.645.2 *Sandy Loam* — 30 percent or more very coarse, coarse and medium sand, but less than 25 percent very coarse sand, and less than 30 percent very fine or fine sand.

2.645.3 *Fine Sandy Loam* — 30 percent or more fine sand and 30 percent very fine sand (or) between 15 and 30 percent very coarse, coarse and medium sand.

2.645.4 *Very Fine Sandy Loam* — 30 percent or more fine (or) 40 percent fine and very fine sand, at least half of which is very fine sand and less than 15 percent very coarse, coarse, and medium sand.

2.646 Loam — Soil material that contains 7 to 27 percent clay, 28 to 50 percent silt, and less than 52 percent sand.

2.647 Silt Loam — Soil material that contains 50 percent or more silt and 12 to 27 percent clay (or) 50 to 80 percent silt and less than 12 percent clay.

2.648 Silt — Soil material that contains 80 percent or more silt and less than 12 percent clay.

2.649 Sandy Clay Loam — Soil material that contains 20 to 35 percent clay, less than 28 percent silt, and 45 percent or more sand.

2.650 Clay Loam — Soil material that contains 27 percent to 40 percent clay and 20 to 45 percent sand.

2.651 Silty Clay Loam — Soil material that contains 27 to 40 percent clay and less than 20 percent sand.

2.652 Sandy Clay — soil material that contains 35 percent or more clay and 45 percent or more sand and less than 20 percent silt.

2.653 Silty Clay — Soil material that contains 40 percent or more clay and 40 percent or more silt.

2.654 Clay — Soil material that contains 40 percent or more clay, less than 45 percent sand, and less than 40 percent silt.

2.655 Soil Type — The lowest unit in the natural system of soil classification; a subdivision of a soil series and consisting of or describing soils that are alike in all characteristics including the texture of the A horizon.

2.656 Soil Variant — A soil whose properties are believed to be sufficiently different from other known soils to justify a new series name but comprising such a limited geographic area that creation of a new series is not justified.

2.657 Solodized Soil — A grey leached layer over the dark coloured hard layer of solonetz.

2.658 Solonchak Soils — An intrazonal group of soils, having a high concentration of soluble salts, usually light-coloured; without characteristic structural form; developed under salt-loving grass of shrub vegetation mostly in arid, semiarid or subhumid climate.

2.659 Solonetz Soils — An intrazonal group of soils having a variable surface, horizon of friable soil underlain by hard soil, ordinarily with columnar structure; usually highly alkaline; developed under grass or shrubs vegetation mostly in a subhumid or semiarid climate.

2.660 Solum — The upper most weathered part of the soil profile; the A and B horizons.

2.661 Soloth — An intrazonal group of soils having a thin surface layer of brown friable soil above a grey leached horizon which rest upon a brown or dark-brown horizon; developed under shrubs, grasses, a semiarid or subhumid climate.

2.662 Soluble Sodium Percentage — The proportion of sodium ions in solution in relation to the total cation concentration, defined as follows:

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

The term is used in connection with irrigation waters and soil extracts.

NOTE — meq = milli-equivalent.

2.663 Specific Ion Effect — Any effect of a salt constituent in the substrate on plant growth which is not due to the osmatic properties of the substrate.

2.664 Spillway — Conduit through or around a dam for the passage of excess water, may have controls.

2.665 Splash Erosion — Erosion resulting from the impact of rain drops directly on soil particles or on thin water surfaces.

2.666 Spoil — Soil excavated from a land, ditch, basin, or other site. Also called waste.

2.667 Spoil Bank — Rock waste, banks, and dumps, from the excavation of ditches.

2.668 Sprinkler Irrigation — The application of water to the soil by spraying through nozzle.

2.669 Sprinkler Systems — All the equipments required to apply water to a given area from the source of water to sprinkler nozzle.

2.669.1 *Boom Type* — An elevated, cantilevered sprinkler(s) mounted on a central stand. The sprinkler boom rotates about a central pivot.

2.669.2 *Farm System* — System which will properly distribute the required amount of water to the entire farm.

2.669.3 *Field System* — That part of a farm system which covers one field or area for which it is designed.

2.669.4 *Hand Move* — Method of moving the sprinkler system by uncoupling and picking up the pipes manually requiring no special tools. This includes systems in which lateral pipes are loaded and unloaded manually from racks or trailers used to move the pipes from one lateral setting to another.

2.669.5 *Mechanized* — System which is moved either by engine power tractor power, water power or hand power on wheels or skids. Generally considered as any type of system that can be moved without carrying manually.

2.669.6 *Permanent* — System consisting of permanent underground piping with either permanent risers for sprinkers, or quick coupling valves, in such a manner that sprinklers may be attached.

2.669.7 *Self-Propelled System* — Portable powered system which moves continuously when in operation. May rotate about a pivot in the centre of field or move laterally across the field in a predetermined direction.

2.669.8 *Semiportable* — Systems designed with permanent pumping units and mains, but with portable sprinkler laterals.

2.669.9 *Side-Roll System* — System mounted on wheels, usually employing the lateral pipeline as an axle, where the lateral is moved at right angles to the mainline by rotating the pipeline either by hand or by engine power.

2.669.10 *Solid Set* — System, either permanent or portable, which covers the complete field with pipes and sprinklers in such a manner that all the field can be irrigated without moving any of the system.

2.669.11 *Towed System* — System where lateral lines are mounted on wheels, casters, sleds, or skids, and are pulled or towed in the field to be irrigated in a direction approximately parallel to the lateral.

2.670 Standard Atmosphere — A unit of pressure defined as follows:

1 atmosphere = $1{\cdot}023 \times 10^6$ dynes/cm^2 = 14·71 pounds/in^2, 76·39 cm of mercury column = 1 036 cm of water column = 34·01 ft water column (water and mercury at 20°C).

2.671 Sticky Point

a) A condition of consistency at which the soil barely fails to stick to a foreign object.

b) specifically and numerically, the weight moisture percentage of a well-mixed kneaded soil that barely fails to adhere to a polished or nickel or stainless steel surface when the shearing speed is 5 cm/s.

2.672 Stokes Law — An equation relating the terminal settling velocity of a smooth, rigid sphere in a viscous fluid of known density and viscosity to the diameter of the sphere when subjected to a known force of field. Used in particle-size analysis of soils by the pipette, hydrometer, or centrifuge methods. The equation is:

$$V = \frac{2gr^2 (d_1 - d_2)}{g/n}$$

where

V = velocity of fall (cm/s),

g = acceleration of gravity (cm/s^2),

r = 'equivalent' radius of particles (cm),

d_1 = density of particle (g/cm^3),

d_2 = density of medium (g/cm^3), and

n = viscosity of medium (dyne. second/cm^2).

2.673 Stones — Rock fragments 25 cm in diameter if rounded, and 38 cm along the greater axis if flat (*see* **2.111** Coarse Fragments).

2.674 Stoniness — An abnormal development of grit cells as in the pear.

2.675 Stony — Containing sufficient stones to interfere with or to prevent tillage. To be classified as stony, 0·01 percent of the surface of the soil must be covered with stones. Used to modify soil class, as stony clay, loam or clay loam, stony phase. (*See* coarse fragments).

2.676 Stony Land — Areas containing sufficient stones to make use of machinery impractical; usually 15 to 90 percent of the surface is covered with stones. A miscellaneous land type. (*See* stoniness and rubble land).

2.677 Stratified — Arranged in or composed of strata or layers.

2.678 Structure Index — Any measurement of a soil physical property, such as aggregation, porosity, permeability to air and water or bulk density, that denotes or indicates the structural condition of soil.

2.679 Sub drain — Tile line.

2.680 Sub irrigation — Application of water by percolating from wide-spaced furrows to an impermeable layer in the soil with a temporary rise of water table to wet the entire soil body. This practice requires an impervious subsoil layer, a porous surface soil, and a uniform topography of moderate slope.

2.681 Submerged Flow — Flow across any critical depth measuring structure where the downstream water depth is high enough to interfere with establishment of critical velocity at the control section. Submergence is usually expressed as the ratio of down stream to upstream water level.

2.682 Submerged Orifice — Orifice which discharges water below a free water surface.

2.683 Submerged Weir — Weir not having free discharge conditions, due to downstream conditions affecting the flow depth through the weir. (*See* submerged flow).

2.684 Sub Soil — That part of the soil beneath the top soil, usually that not having an appreciable organic matter content.

2.685 Subsoiling — Tillage operation that is primarily concerned with altering the soil below plough depth. This includes chiselling or other means of breaking into subsoil.

2.686 Substrate

a) That which is laid or spread under, an underlying layer, such as the subsoil.

b) The substance, base or nutrient on which an organism grows.

c) Compounds or substances that are acted upon by enzymes or catalysts and changed to other compounds in the chemical reaction.

2.687 Subsurface Drains — Subsurface channels used primarily to remove subsurface water from soil. Also known as underdrains and internal drains or tile drains.

2.688 Subsurface Tillage — Tillage with a special sweeplike plough or blade which is drawn beneath the surface at depths of several centimetres and cuts plant roots and loosens the soil without inverting it or without incorporating the surface cover.

2.689 Summation Curve, Particle Size — A curve showing the cumulative percentage by weight of particles within increasing (or decreasing) size limits as a function of diameter; the percent by weight of each size fraction is plotted cumulatively on the ordinate as function of the total range of diameters represented in the sample plotted on the abscissa.

2.690 Sump — Pit, tank, or reservoir in which water is collected or stored for withdrawal by a pump.

2.691 Supplemental Irrigation — Irrigation which is used primarily to supplement rainfall.

2.692 Surface Compaction — Moulding together and collapse of structure of surface soil when subjected to pressure.

2.693 Surface Inlet — Structure for diverting surface water into an open ditch or a tile line. May be called drain inlet structure intake, open inlet, surface well, direct inlet.

2.694 Surface Irrigation — Irrigation where the soil surface is used as a conduit as in furrow and border irrigation.

2.695 Surface Sealing — The orientation and packing of dispersed soil particles in the immediate surface layer of the soil, rending it relatively impermeable to water.

2.696 Surface Soil — The uppermost part of the cultivated soil, ordinarily moved in tillage, or its equivalent in uncultivated soils and ranging in depth from 3 to 4 inches (8 to 10 centimetres). Frequently designated as the ' plough layer '. The ' Ap layer ' or the ' Ap horizon '.

2.697 Surface Tension — Free energy in a liquid surface produced by the imbalanced inward pull exerted by underlying molecules upon the layer of molecules at the surface.

2.698 Surface Waste — That portion of the irrigation water which has been applied to crops and appears at the lower levels of the irrigated areas on the surface, not having been absorbed or evaporated as it passes over the irrigated land. Also called field waste.

2.699 Surface Water — Water stored on or flowing over the surface of the soil.

2.700 Swamp — An area saturated with water through out the year but with the surface of the soil usually not deeply submerged. Usually characterized by free or shrub vegetation.

2.701 Swelling (Soil) — Physical expanding of the soil mass, usually caused by an increase in moisture content in an expanding type clay.

2.702 Symbiosis — The living together in intimated association of two dissimilar organisms, the cohabitation being mutually beneficial.

2.703 Symmetry Concentration — That quantity of cations (or anions) equivalent to the exchange capacity of a soil. For example, if the cation-exchange capacity of a soil is 10 meq/100 g of soil, then one symmetry concentration is 10 meq of any cation.

NOTE — meq = milli-equivalent.

2.704 Symmetry Value — The percentage of the adsorbed or released when one symmetry concentration of another one is added.

T

2.705 Tank (Earth) — An excavation for impounding water.

2.706 Tankage — Fertilizer prepared out of the meat and bone products of carcasses of animals slaughtered or which have died of natural causes.

2.707 Tensiometer — A device to measure the tension with which water is held in the soil.

2.708 Tension Gradient — Change in soil moisture tension with distance.

2.709 Terminal Velocity — Final steady state velocity of fall for rain drops or sprinkler discharge drops.

2.710 Thermal Analysis (Differential Thermal Analysis) — A method of analyzing a soil sample for constituents, based on a differential rate of heating of the unknown and standard samples when a uniform source of heat is applied.

2.711 Tight Soil — A compact, relatively impervious and tenacious soil (or subsoil) which may or may not be plastic.

2.712 Tile Drain — Concrete or ceramic pipe placed at suitable depths and spacings in the soil or subsoil to provide water outlets from the soil.

2.713 Tile Drainage — Land drainage by means of a series of tile lines laid at a specified depth and grade.

2.714 Tile Drainage System — Drainage system consisting of a drainage outlet tile main, submain and laterals. The laterals remove free water from the soil and the submains and main convey water to the outlet.

2.715 Tile Joint — Opening between two drain tiles through which water from the surrounding soil flows. (*See* crack width).

2.716 Tile Outlet — Point of discharge of a tile drain system.

2.717 Till

a) Unstratified glacial drift deposited directly by the ice and consisting of clay, sand gravel, and boulders intermingled in any proportion.

b) To plough and prepare for seeding; to seed or cultivate the soil.

2.718 Tilth — The physical condition of soil as related to its ease of tillage fitness as a seedbed, and its impedance to seeding emergence and root penetration.

2.719 Toposequence — A sequence of related soils that differ, one from the other, primarily because of topography as a soil-formation factor.

2.720 Topsoil

a) The layer of soil moved in cultivation. *See* surface soil.

b) The A horizon.

c) The AI horizon.

d) Persumeably fertile soil material used to topdress roadbanks, gardens, and lawns.

2.721 Total Moisture Stress — The osmotic and physical force with which water is held in the soil.

2.722 Total Suction Head — The vertical head, in metres, from the water level to the centre line of the pump plus velocity head, entrance losses and friction losses in suction line, including foot valves, strainers, and fittings.

2.723 Transpiration Ratio (Water Requirement) — Ratio of weight of water absorbed and transpired by the plant to the weight of the dry matter produced. Evaporation from soil not included.

2.724 Trapezoidal Weir — A liquid flow measuring device with a trapezoidal notch.

2.725 Triangular Weir — A contracted measuring weir notch with sides that form an angle with its apex downward.

2.726 Turbulent Flow — Flow in which the fluid particles move in an irregular random manner and for which the head loss in approximately proportional to the second power of the velocity. In pipes, it usually occurs above a Renolds number of 2 000.

U

2.727 Unavailable Water (Moisture) — Soil water held so firmly by adhesion.

2.728 Uniform Soil — Soil having uniform properties throughout its profile.

2.729 Unit Stream — Amount of water, per metre of width, turned in to each border strip during irrigation.

2.730 Unsaturated Flow — The movement of water in a soil which is not filled to its field capacity with water.

2.731 Unsaturated Zone — That part of the soil profile in which the voids are not completely filled with water.

2.732 Upper Plastic Limit — *See* liquid limit.

V

2.733 Vapour Pressure — The pressure exerted on the liquid surface by its own vapour when vapour and liquid surface are in equilibrium. It may be the pressure exerted by the vapour present.

2.734 Vapour Pressure Deficit — Difference between the existing vapour pressure and that of a saturated atmosphere at the same dry temperature.

2.735 Velocity Head — Head due to the velocity of a moving fluid, equal to the square of the mean velocity divided by twice the acclera-tion due to gravity.

2.736 Vent — Open, vertical pipe riser from a tile or irrigation line which allows air to enter or escape from the pipe system.

2.737 Vertical Drain — The disposal of excess water through surface inlets or walls into a pervious subsoil.

2.738 Viscous Flow — Flow in which the viscous effects predominate and flow lines are parallel.

2.739 Volume Weight (Apparent Specific Gravity) — The ratio of the weight of a given volume of dry soil to the weight of an equal volume of water. It signifies the relative compaction and air space. (*See* bulk density).

W

2.740 Wasteland — Land not suitable for producing material or services of value. A miscellaneous land type.

2.741 Water Application Efficiency — The ratio of water stored in soil root zone to the amount of water delivered at the farm.

2.742 Water Conservation — The physical control, protection, management, and use of water resources in such a way as to maintain crops, grazing and forest lands, vegetal cover, wildlife and water supplies for maximum sustained benefits to people, agriculture, industry, commerce and other segments of the national economy.

2.743 Water Control (Soil and Water Conservation) — Physical control of water by measures such as conservation practices on the land, channel improvements, and installation of structures for water retardation and sediment detention.

2.744 Water Disposal System — Complete system for removing excess water from land with minimum erosion. For sloping land it may include a terrace system, terrace outlet channels, dams, and grassed waterways. For level land it may include only surface drains or both surface and subsurface drains.

2.745 Water Gate — Gate in a fence hung across a ditch, to prevent live stock from passing through during low water and to allow debris to pass through during high water.

2.746 Water Level — Water surface; also its elevation above any datum; gauge height; stage.

2.747 Waterlogging — Addition of excessive water to a soil, resulting in loss of structure of soil and a water stagnating condition.

2.748 Water Resources — Supply of water in a given area or watershed, usually interpreted in terms of availability of surface or underground water.

2.749 Water Rights — Legal rights to water supplies derived from common law, court decisions or statutory enactments.

2.750 Watershed Management — Use of land in a watershed in accordance with predetermined objectives, such as the control of erosion, stream flow, sedimentation, floods, water storage, etc.

2.751 Watershed Planning — Planning the use and treatment of land and water for optimum long range benefit of both the individual farmers and all other residents of a watershed.

2.752 Water-Stable Aggregate — A soil aggregate which is stable to the action of water such as falling drops, or agitation as in wetsieving analysis.

2.753 Water Table — The upper surface of ground water, locus of points in soil water at which the hydraulic pressure is equal to atmospheric pressure.

2.754 Water Table, Perched — The upper surface of a body of free ground water in a zone of saturation separated by unsaturated material, from an underlying body of ground water in a different zone of saturation.

2.755 Waterway — Natural constructed course for the flow of water.

2.756 Water Yield — The total outflow of groundwater and surface runoff from a watershed.

2.757 Weep Holes — Opening left in retaining walls, aprons, livings or foundations to allow drainage for preventing buildup of pressure.

2.758 Weir Box — Box installed in a channel upstream from a weir to provide an enlargement of the waterway thereby reducing the velocity of approach to the weir.

2.759 Wetness Index — Numerical quantity, usually expressed in percentage, used to designate the relation of preciptitation or annual runoff of a stream or drainage basin for a given year to the coverage over a considerable period of years.

2.760 Wetted Perimeter — Length of the wetted contact of a liquid, measured along a plane at right angles to the direction of flow.

2.761 Wilting Percentage, or Permanent Wilting Percentage — The moisture content of soil at which plants wilt and fail to recover turgidity when placed in a dark, humid chamber. The permanent wilting percentage approximately, for practical purposes, the minimum moisture found in soils under plants in the field at depths below the influence of surface evaporation.

2.762 Wilting Point — The percentage of water in soil (based on dry weight soil) when permanent wilting of plants occurs.

2.763 Wind Break — Planting of trees, shrubs, or other vegetation, usually perpendicular to the principal wind direction, to protect soil, crops, homesteads, roads, etc, against the effects of winds, such as wind erosion and the drifting of soil and snow.

2.764 Wind Erosion — Detachment, transportation, and deposition of soil by the action of wind. The removal and redeposition may be in more or less uniform layers or as localized blowouts and dunes.

X

2.765 Xerophytes — Plants that grow in or extremely dry soils or soil materials.

Z

2.766 Zeta Potential — *See* electrokinetic potential.

2.767 Zone of Aeration — Subsurface zone above the water table in which the soil or permeable rock is not saturated. (*See* unsaturated zone.)

2.768 Zone of Saturation — Layer of earth (may be both soil and underlying strata) containing gravitational or free water.