Glossary of soil terms

Absorption: Uptake of matter or energy by a substance
Acid soil: Soil with a pH value less than 7.0.
Acidification: Process whereby soil becomes acid (pH < 7) because acid parent material is present or in regions with high rainfall, where soil leaching occurs.
Acidification can be accelerated by human activities (use of fertilisers, deposition of industrial and vehicular pollutants).
Adsorption: Process by which atoms, molecules or ions are retained on the surfaces of solids by chemical or physical bonding.
Aeration of soil: Amount of air-filled pores in the soil, expressed as the volume difference between total porosity and actual soil moisture. Optimum soil aeration is 30% but strongly depends on the structure and packing state of soil particles; 15–20% is normally satisfactory for the growth of grasses and cereals; below 10% is not good for plant growth.
Aggregate: Soil aggregate consisting of two or more soil particles bound together by various forces.
Aggregation: Process whereby primary soil particles (sand, silt, clay) are bound together, usually by natural forces and substances derived from **root exudates** and microbial activity. Soil aggregates are arranged to form soil peds, units of soil structure, classified by size, shape (platy, prismatic, columnar, angular, subangular, blocky, granular…) and grade (single-grain, massive, weak, moderate, strong). From an agronomical point of view, the most important soil aggregates are in range 3 – 1 mm.
Anion: Particle with a negative charge. See also **ion, cation.**
Anion exchange capacity: Sum of exchangeable anions that a soil can adsorb. Usually expressed as centimoles, or millimoles, of charge per kilogram of soil (or of other adsorbing material such as clay).
Arable land: Agricultural land that is cultivated by ploughing, usually to 20 or 30 cm depth. More than 30 cm represents deep ploughing.

Black Earth: Term synonymous with Chernozem used (e.g. in Australia) to describe self-mulching black clays.
bog: Wetland that has no significant inflows or outflows, supports acidophilic mosses, particularly Sphagnum and in which peat is accumulating. Similar to: **fen, marsh, pocosin, swamp,** and **wetland.**
Boulder clay: Unstratified glacial deposits laid down directly beneath the ice or dropped from the surface as the ice melted; boulder clay and till are synonymous terms for this unsorted material which ranges from rock flour to rocks and boulders of great size, according to the nature of the bedrock

Calcification: Process whereby the soil is kept sufficiently supplied with calcium to saturate the soil cation exchange sites.
Capillary water: Water in capillary pores influenced by forces that hold water in soils against a tension usually greater than 60cm. Capillary water can move upwards against gravity.

Carbon cycle: Sequence of transformations whereby carbon dioxide is converted to organic forms by photosynthesis or chemosynthesis, recycled through the biosphere (with partial incorporation into sediments), and ultimately returned to its original state through respiration or combustion.
Cation: Particle with positive charge; reactions between **anions** and cations create electrical forces.
Cation exchange: Interchange between a cation in solution and another cation in the boundary layer between the solution and surface of negatively charged material such as clay or organic matter.
Clay: Soil particle smaller than 0.002mm or 2µm, with high specific area mainly influencing soil **colloidal properties** (see also colloid) as well as stability of soil structure: high stability in both wet and dry conditions; also a soil texture class.
Clay coating/film: Coatings of oriented clay on the surfaces of peds and mineral grains and lining pores, also called clay skins, clay flows, illuviation cutans, or argillans**.**
Clay loam: Soil texture class. See also **soil texture.**
Clay minerals: Clay-sized hydrous aluminium silicates having a large interlayer space that can hold significant amounts of water and other substances; they have large a surface area allowing **swelling** and **shrinking;** examples are montmorillonite or smectite and kaolinite.
Coating: Layer of a substance completely or partly covering a surface of soil material; coatings can comprise clay, calcite, gypsum, iron, organic material, salt, etc.
Colloid: Particle, which may be a molecular aggregate, with a diameter of 0.1 to 0.001µm; clay and soil organic matter are often called soil colloids because they have particle sizes that are within, or approach, colloidal dimensions.
Colluvial: Pertaining to material or processes associated with transportation and/or deposition by mass movement (direct gravitational action) and local, unconcentrated runoff on slopes and/or at the base of slopes.
Colluvium: Unconsolidated, unsorted colluvial material.

Decalcification: Removal of calcium carbonate or calcium ions from the soil by leaching.
Diagnostic horizon: see **horizon.**

Electrical conductivity (EC): Conduction of electricity through water or a solution of soil commonly used to estimate the soluble salt content in solution, e.g. soil solution.
Erosion: The wearing away of the land surface by water, wind, ice, gravity or other natural or anthropogenic agents that abrade, detach and remove soil particles or rock material from one point on the earth's surface, for deposition elsewhere, including gravitational creep and so-called tillage erosion.

Feldspar: Group of hard crystalline minerals that consist of aluminum silicates of sodium or calcium or barium.
Fen: Flat and swampy land, usually low in altitude and similar to a **bog** or **marsh.**
Fertilization: Application of mainly mineral compounds, in order to increase soil fertility. In some cases, (e.g. liming) the purpose of fertilization is also to improve specific soil properties (pH, stability of soil structure).

Field capacity: Field capacity has been defined as the soil moisture state when, 48 hours after saturation or heavy rain, all downward movement of water has ceased. It is the water content retained at low suctions (5-33kPa) depending on soil type, and is the upper limit of plant available water.
Fine texture: (i) A broad group of textures consisting of, or containing, large quantities of fine fractions, particularly silt and clay. Includes sandy clay, silty clay, and clay texture classes. (ii) When used in reference to family particle-size classes in U.S. and FAO soil taxonomy, is specifically defined as having 35 to 60 percent clay. See also **soil texture.**
Fluvioglacial deposits: Material moved from the margins of glaciers and subsequently sorted and deposited by streams flowing from the melting ice.

Geomorphology: Science of landforms that studies the evolution of the Earth's surface and interprets landforms as records of geological history.
Gibbsite: Al(OH)3. Mineral with a platy structure, that occurs in highly weathered soils and in laterite.
Glacial drift: Unstratified deposits laid down directly beneath the ice or dropped from the surface as the ice melted.
Glaciers: Large masses of ice that form by the compaction and recrystallization of snow under freezing conditions; glaciers often move downslope or outward in all directions because of the stress of their own weight; they may be stagnant or retreating under warming conditions.
Glaciofluvial deposits: Material moved by glaciers and subsequently sorted and deposited by streams flowing from the melting ice. The deposits are stratified and may occur in the form of outwash plains, deltas, kames, eskers, and kame terraces. See also **Glacial drift** and **till.**
Glaciolacustrine deposits: Material ranging from fine clay to sand derived from glaciers and deposited in glacial lakes by water originating mainly from the melting of glacial ice; many such deposits are bedded or laminated with varves.
Gley soil: Soil formed under naturally wet or waterlogged conditions as evidenced by grey colours stemming from the reduction, under anaerobic conditions, of ferric iron to the ferrous state.
Ground water: That portion of the water below the surface of the ground at a pressure equal to, or greater than, that of the atmosphere. See also **water table.**
Gully: Channel resulting from erosion and caused by the concentrated but intermittent flow of water during and immediately following heavy rainfall; gullies are deep enough (usually >0.5 m) to interfere with, but not obliterated by, normal **tillage** operations.

Horizon: Single layer in soil profile with similar properties or material but which differs at least in one property, e.g. colour or texture from adjacent horizons above or below in the profile; **diagnostic horizon:** Dominant soil property or material defines name of horizon, e.g. gypsic horizon having distinct calcium sulfate (gypsum: CaSO4) enrichment; **genetic horizon** depending on the type of **pedogenesis.**
Humification: Process whereby the carbon of organic residues is transformed and converted to **humic** substances through biochemical and abiotic processes.
Humus: Organic compounds in soil, exclusive of undecayed plant and animal tissues, their partial decomposition products, and the soil biomass; a term often used

synonymously with soil organic matter, its structure is amorphous, specific weight is low and surface area high. Humus is important for soil fertility, and helps to bind soil particles and aggregates together.
Hydromorphic soils: Formed under conditions of poor drainage in marshes, swamps, seepage areas or flats.

Ion: Electrically charged atom or group of atoms.

Karst: Topography with sinkholes, caves and underground drainage that is formed in limestone, gypsum or other rocks by dissolution (dissolving).

Landslide: A general term for a **mass movement** landform and a process characterized by moderately rapid to rapid (greater than 30 cm per year) downslope transport by means of gravitational stresses, of a mass of rock and regolith that may or may not be water saturated.
Leaching: Removal of soluble materials from one zone in soil to another via water movement in the profile.
Loess: Material transported and deposited by wind and consisting of predominantly silt-sized particles, forming important fertile soils.

Map scale: Relationship between a certain distance on the map and the corresponding distance on the ground (e.g. 1:10,000, which means 1 cm on the map equals to 10,000 cm or 100 m on the ground); the scale is usually located in the legend box of a map.
Marsh: A transition zone between water and land usually covered by grass.
Mass movement: Dislodgement and downslope transport of soil and rock material as a unit under direct gravitational stress; includes slow displacements, such as creep and solifluction, and rapid movements such as landslides, rock slides, earthflows, debris flows and avalanches; water, ice and to a lesser extent air usually play an important role in the process.
Moderately fine textured: Texture group consisting of clay loam, sandy clay loam and silty clay loam textures; see also **soil texture.**
Monolith: Representative vertical section taken from vertical face of a soil profile pit or section, which represents arrangement of soil horizons; there are various methods of how to take and conserve soil monoliths.
Munsell Color System: Colour designation system that specifies the relative degrees of the three simple variables of colour: hue (wavelength), value (degree of lightness or darkness), and chroma (purity or strength). For example: 10YR 6/4 is a colour (of soil) with a hue = 10YR, value = 6, and chroma = 4.

Organic soil material: Consists of organic debris that accumulates at the surface under either wet or dry conditions and in which any mineral component present does not significantly affect the soil properties. Organic soil material must have organic carbon (organic matter) contents as follows: (1) if saturated with water for long periods (unless artificially drained), and excluding live roots, either: 18 % organic carbon (30 % organic matter) or more if the mineral fraction comprise 60 % or more clay; or 12 % organic carbon (20 % organic matter) or more if the mineral fraction has no clay; or a

proportional lower limit of organic carbon content between 12 and 18 % if the clay content of the mineral fraction is between 0 and 60 %; or (2) if never saturated with water for more than a few days, 20 % or more organic carbon.
Organic soil: A soil in which the sum of the thicknesses of layers comprising organic soil materials is generally greater than the sum of the thicknesses of mineral layers.

Parent material: Mineral or rock material on and/or from which soils are formed during pedogenesis (soil formation process); parent material is one of the five major soil forming factors.
Pasture: Grassland used for grazing of mainly domestic herbivores.
Peat: Organic soil material with more than 50% of organic matter derived from plant residues with not fully destroyed structure. Peat forms in a wet soil environment or below the water table where mineralisation of organic matter comes close to zero; a peat horizon or layer is normally more than 30cm thick.
Peatland: A generic term for any wetland where partially decayed plant matter accumulates; mire, moor and muskeg are terms used for peatlands in Europe and Canada; see also **bog** and **fen**.
Pedogenesis: Process of soil formation and development by soil forming factors: climate (mainly temperature and precipitation), parent material, living organisms (plants and biota), topography, time, water and Man.
Pedon: A three-dimensional body of soil with lateral dimensions (1 to 10 m2) large enough to permit the study of horizon shapes and relations.
Periglacial: Pertaining to processes, conditions, areas, climates and topographic features occurring at the immediate margins of glaciers and ice sheets and influenced by cold temperature of the ice.
Permafrost: (i) permanently frozen subsurface material underlying the solum; (ii) perennially frozen soil horizon where temperature remains below 0°C throughout the year and in which Cryosols form.
Permanent grassland: Natural (mainly steppe areas) or agricultural soils with grass cover not normally ploughed.
Ploughing (tillage): mechanical cultivation of agricultural soils by the plough to different depths (20 – 30cm) deep, creating arable land.
Pocosin: A bog formed in shallow depressions with poor drainage, supporting predominantly evergreen shrubs or small trees.
Primary mineral: A mineral that has not been altered chemically since crystallization and deposition from molten lava. See also **secondary mineral.**
Protection of soil: Conscious process necessary for soil and soil properties preservation realised at different levels (personal, local, national, continental) and using information obtained by soil research. Sustainability is the result of this process.

Regolith: The unconsolidated mantle of weathered rock and soil material on the Earth's surface, sometimes considered to be loose earth materials above solid rock.
Root exudates: Substances released from plant root system in drops or small quantities of carbohydrates, organic acids, vitamins and many other substances essential for life of **soil micro-organisms.**

Saline soil: A non-**sodic soil** (see sodic soil) containing sufficient soluble salt to adversely affect the growth of most crop plants. The lower limit of electrical conductivity in the saturation extract of such soils is conventionally set at 4 dS m-1(at 25°C), though sensitive plants are affected at about half this salinity and highly tolerant ones at about twice this salinity.
Saline-sodic soil: Salt-affected soils with a high exchangeable sodium percentage (ESP) greater than 15%, pH usually less than 8.5; in general these soils are not suitable for agriculture.
Sand: Soil particles between 0.05 mm and 2 mm (in some countries 0.06 mm is the lower size limit), with low specific area and also used as a texture class name for coarse soil materials. Unlike clays, sandy soils do not shrink and swell on drying and wetting and, unless artificially compacted, are rapidly permeable.
Salt-affected soil: Soil that has been adversely affected by the presence of soluble salts, with or without high amounts of exchangeable sodium. See also **saline soil, saline-sodic soil,** and **sodic soil.**
Secondary mineral: A mineral resulting from the decomposition of a primary mineral or from the reprecipitation of the products of decomposition of a **primary mineral.**
Silt: Soil particles between 0.002 mm and 0.05 mm (in some countries 0.06 mm is the upper size limit), with high or medium-high specific area influencing stability of soil structure; also used as a texture class name for medium and medium-fine soil materials.
Sodic soil: Soil with excess of sodium, pH is higher than 7, usually in the range 8 - 10, exchangeable sodium percentage, ESP> 15 and very poor soil structure. These soils need special management and are not used for agriculture; non-**sodic soils** are without excess of sodium.
Soil biology: A scientific discipline dealing with living components of soils, which are represented mainly by bacteria, fungi, protozoa, nematodes, arthropods and earthworms as well as by mammals.
Soil chemistry: A scientific discipline dealing with chemical properties of soils and studies on the influence of fertilizers, pesticides and the other chemical substances applied on or into the soil on soil behaviour and fertility.
Soil classification: Also termed soil taxonomy, is the scientific discipline dealing with grouping of soils into soil morphological units or soil types, according to similar or comparable soil forming properties. Many countries in the world have national soil classification systems but those of FAO, WRB and USDA are used internationally. For transnational comparisons, an international soil classification system, into which the majority of national systems can be translated, is needed. In future, this will be the WRB.
Soil colour: soil colour is one of the indicators of soil status and depends on many factors, mainly on the amount and state of organic matter and iron oxide, as well as amount of air and water in soil pores; In general, dark soils have high organic matter content, grey soils are waterlogged or anaerobic, brown soils are well-drained and aerated soils. Soil colour is measured using **Munsell Soil Color charts.**
Soil compaction: changing the nature of the soil such that there is a decrease in the volume of voids between soil particles or aggregates; it is manifest as an increase in bulk density and a severely compacted soil can become effectively impermeable. Some soils are naturally compacted, e.g. very heavy textured soils (fine textured). Man-made

compaction is caused by the passage of heavy machinery and very intensive soil exploitation.

Soil cracks: Openings in horizontal (mm or several cm) and vertical (cm or several m) orientation, mainly affecting soil hydraulic properties, arising from **swelling** and **Shrinking** processes. Heavy clay soils are more susceptible to cracks formation than loamy soils whereas in sandy soils cracks do not form or they are very small and unstable. Soil cultivation destroys crack system, mainly by **tillage.**

Soil degradation: Negative process often accelerated by human activities (improper soil use and cultivation practices, building areas) that leads to deterioration of soil properties and functions or destruction of soil as a whole, e.g. **compaction, erosion,** salinisation.

Soil depth: depth of soil profile from the top to parent material or bedrock or to the layer of obstacles for roots. It differs significantly for different soil types. It is one of basic criterions used in soil classification. Soils can be very shallow (less than 25 cm), shallow (25 cm-50 cm), moderately deep (50 cm-90 cm), deep (90cm-150 cm) and very deep (more than 150 cm).

Soil fertility: A measure of the ability of soil to provide plants with sufficient amount of nutrients and water, and a suitable medium for root development to assure proper plant growth and maturity.

Soil geography: Scientific discipline dealing with distribution of soil types in landscapes, describing this distribution according to geographical rules.

Soil micro-organisms: Represented by protozoa, viruses, bacteria, fungi and algae. The most prevalent are bacteria and fungi, and depending on conditions (water and nutrients content, temperature, etc.) they can be in an active or non-active state. According to nutrient (and oxygen) demand, micro-organisms are divided to *autotropic* and *heterotrophic*, (*aerobic* and *anaerobic*) groups. Micro-organisms are a good indicator of soil status and quality.

Soil monitoring: Repeated observation and measurement of selected soil properties and functions, mainly for studying changes in soil conditions.

Soil morphology: Form and arrangement of pedological features.

Soil Organic Matter: see Organic soil material

Soil physics: Scientific discipline dealing with physical properties of soil (density, porosity, water retention and permeability, hydraulic conductivity etc.).

Soil porosity: Volume of water and air that can be held in a soil; ratio of the volume of voids to the total volume of the soil.

Soil profile: Vertical section of soil horizons from upper layer to the parent material, showing the arrangement (configuration) of soil horizons typical for single soil types and used as a basis for soil classification.

Soil sorption: Selective process, which occurs on soil particles smaller than 0.002mm (<2μm); these small particles have colloidal properties, are able to hold and exchange ions, water or gases.

Soil texture: Numerical proportion (% by wt.) of sand, silt and clay in a soil. Sand, silt and clay content are estimated in the field, and/or quantitatively in the laboratory, and then placed within the texture triangle to determine soil texture class. Texture can be coarse (sand particles predominate), medium (silt particles predominate), or fine (clay particles predominate).

Stoniness: It is the relative proportion (vol %) of coarse particles (larger than 2 mm diameter) in the soil or on soil surface; 15% stones is a high value and can hinder cultivation and reduce water holding capacity.
Surface soil: the layer of soil occurring on the surface, synonym **topsoil.**
Swamp: Seasonally flooded low land. Similar to **marsh,** but with more woody plants and to **bog** but with better drainage.
Swamp: wetland that features permanent inundation of large areas of land by shallow bodies of water, generally with a substantial number of hummocks, or dry-land protrusions. Swamps are usually regarded as including a large amount of woody vegetation
Swelling and shrinking: Two opposite processes of soil volume change. Swelling, increase of soil volume, shrinking, decrease of soil volume. These processes are influenced by actual water content and presence of clay minerals, which are able to take or to lose water in their interlayer spaces. Difference in volume can range from 5% to more than 100% depending on quality and quantity of clay minerals.

Tidal flats: Nearly flat areas, periodically covered by **tidal** (periodical) waters, not suitable for agricultural use.
Till: unsorted glacial sediment. Glacial drift is a general term for the coarsely graded and extremely heterogeneous sediments of glacial origin
Tillage: see ploughing.
Topsoil: (i) The surface soil horizon (A) which is modified when cultivated, and designated Ap. See also **surface soil.** (ii) Fertile soil material used to topdress roadbanks, gardens, and lawns.

Vadose water: Water in the **vadose zone**.
Vadose zone: The aerated region of soil above the permanent water table.

Water retention: The ability of soil to hold water for a period that is longer than infiltration, normally 48h in a freely draining soil. It strongly depends on organic matter and bulk density. Soil texture also has an influence on water retention.
Water table: The upper surface of ground water or that level in the ground where the water is at atmospheric pressure.
Weathering: The breakdown and changes in rocks and sediments at or near the Earth's surface produced by biological, chemical, and physical agents or combinations of them.
Wetland: A transitional area between aquatic and terrestrial ecosystems that is inundated or saturated with water for long enough periods to produce hydric soils and support hydrophytic vegetation. See also **bay, bog, fen, marsh, pocosin, swamp,** and **tidal flats.**
Wilting point: Soil moisture content when the rate of absorption of water by plant roots is too slow to maintain plant turgidity and permanent wilting occurs. The average moisture tension at the outside surface of the moisture film around soil particles when permanent wilting occurs is 15 atmospheres or 1500kPa.